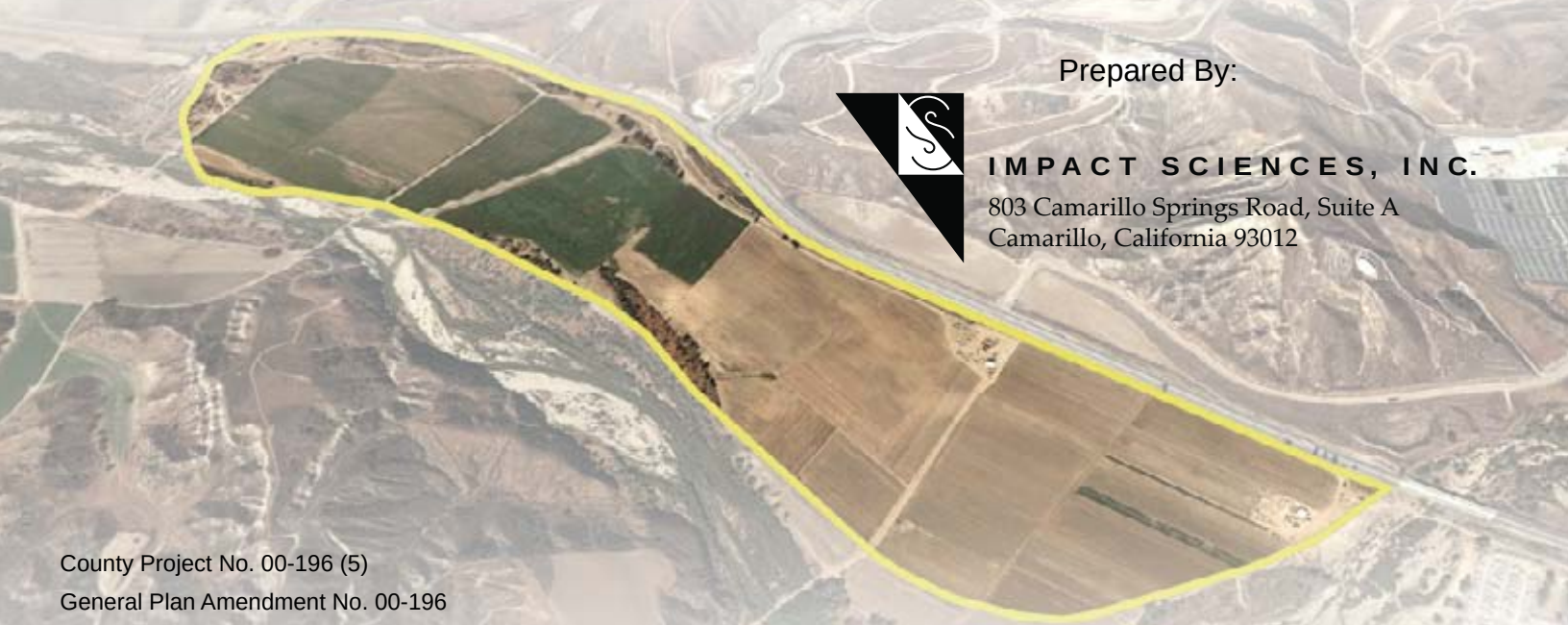
County of Los Angeles

# Revised Final Environmental Impact Report

SCH No. 2004021002

## Volume III
## Appendices F1.0 - F4.3

# LANDMARK VILLAGE



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County Project No. 00-196 (5)
General Plan Amendment No. 00-196
Sub Plan Amendment No. 00-196
Specific Plan Amendment No. 00-196
Vesting Tentative Tract Map No. 53108
SEA Conditional Use Permit No. 200500112
Oak Tree Permit No. 00-196
Off-Site Materials Transport Approval No. CUP00-196
Conditional Use Permit (Off-Site Grading) CUP00-196

NEWHALL RANCH
Newhall Ranch Company

September 2011

# Landmark Village

# Revised Final Environmental Impact Report

# SCH No. 2004021002

# Volume III

# Appendices F1.0 – F4.3

**Prepared for:**

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**September 2011**

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# APPENDIX F1.0

## Project Description

**CBRE Letter to Alex Herrell, January 18, 2011**

COMMERCIAL REAL ESTATE SERVICES

CBRE
CB RICHARD ELLIS

**Doug Sonderegger**
Executive Vice President

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January 18, 2011

Mr. Alex Herrell
Newhall Land & Farming
25124 Springfield Court, Suite 300
Valencia, CA 91355

**RE: Projection; Job Creation/Businesses**
**Entrada (VTTM 53295)**
**Property # 1; 53.8 acres, (PA 1-3)**
**Property # 2; 2.9 acres, (PA 14)**

Dear Alex:

As requested I have reviewed the proposed development Site Plans for the two subject properties within **Valencia Gateway** with the intent to project the number of Jobs created and Businesses/Companies that will be encompassed within each development at "build out".

My partner (Craig Peters) and I have worked extensively in North Los Angeles/Ventura County's i.e. San Fernando, Santa Clarita and Antelope Valley's for over 20 years and have compiled a historical data base within all product designations (Office, Industrial Retail and Mixed Use) and believe the information that has been provided will be representative of the Jobs created and the Businesses/Companies that will occupy the projects at "build out".

The total GLA of both Property 1 and Property 2 is 726,000 square feet. The total jobs created encompass 2,573.

**Property # 1; (GLA 676,000 square feet)**

Location: North Commercial; NEC of Commerce Center Drive and Magic Mountain Pkwy
Acres: 53.8

This site is planned for mixed use Office (professional) and Commercial/Retail development.

The Office (professional) portion of the development is 400,000 square feet, will encompass four Class A steel frame buildings each 4-stories and approximating 100,000 square feet. The total GLA of the Office segment of the development will encompass 400,000 square feet.

The larger floor plates (25,000 square feet) of the 4 Class "A" buildings would most likely attract larger tenants than the average for the Santa Clarita Valley. Hence, the assumption for the average size office tenant will range between 2,500 to 10,000 square feet.

The Commercial/Retail portion of the development is 276,000 square feet and will encompass seven buildings with the buildings ranging in size from approximately 142,000 square feet to as small as 5,000 square feet.

The larger size of the proposed Commercial/Retail buildings (approximately 142,000 and 60,000 square feet) indicates a larger average size retail tenant than is typical in the area. The size range of the smaller retail tenancies will approximate 2,000 to 5,000 square feet in the multi-tenant building.

The matrix below incorporates these assumptions and projects total Jobs created and number of Businesses/Companies that will occupy the development at "build out".

**Summary:**

| Property Type | Mixed Use Office/Retail | Jobs Created | Businesses |
|---|---|---|---|
| Number of Acres | 53.8 | | |
| SF of Office: | 400,000 | | |
| Average size Office tenant | 7,000 | | |
| Number of Office Jobs per 1,000 | 4.00 | 1,600 | |
| Number of Office Businesses | | | 60 |
| SF of Retail: | 276,000 | | |
| Average size Retail tenant | 14,055 | | |
| Number of Retail jobs per 1,000 SF | 2.85 | 789 | |
| Number of Retail Businesses | | | 18 |
| **Total GLA, Jobs and Businesses Created** | 676,000 | 2,389 | 78 |

**Property # 2; (GLA 50,000 square feet)**

Location: The Old Road; across the street from Restaurant Row
Acres: 2.9

This site is also planned for mixed use Office and Commercial/Retail. The smaller size of the development and building is representative of the preponderance of the developments in the Santa Clarita Valley especially in the mid and east valley. The more typical average tenant sizes have been used. Below the matrix provides the projected Jobs created and number of Businesses/Companies that will occupy the development at "build out".

**Summary:**

| Property Type | Mixed Use Office/Retail | Jobs Created | Businesses |
|---|---|---|---|
| Number of Acres | 2.9 | | |
| SF of Office: | 36,000 | | |
| Average size Office tenant | 2,500 | | |
| Number of Office jobs per 1,000 SF | 4.00 | 144 | |
| Number of Office Businesses | | | 14 |
| SF of Retail: | 14,000 | | |
| Average size Retail tenant | 1,800 | | |
| Number of Retail jobs per 1,000 SF | 2.85 | 40 | |
| Number of Retail Businesses | | | 8 |
| **Total GLA, Jobs and Businesses Created** | 50,000 | 184 | 22 |

I have also attached the aerials of the sites for your reference. Please contact me should you have any questions.

Sincerely,

**CB RICHARD ELLIS, INC.**

Doug Sonderegger
Executive Vice President
(818) 907-4607

CC: James E. Brown

Enclosure

# APPENDIX F4.1

## Geotechnical and Soil Resources

**Allan E. Seward Engineering Geology, Inc.**
**Geologic and Geotechnical Report**
**December 21, 2009**

# ALLAN E. SEWARD
## ENGINEERING GEOLOGY, INC.
Geological And Geotechnical Consultants


**GEOLOGIC AND GEOTECHNICAL REPORT**
***Review of Revised Vesting Tentative Tract Map 53108***
***(Dated 12/21/09)***
Landmark Village
Newhall Ranch, Los Angeles County, California

**VOLUME I**

Prepared for:

The Newhall Land and Farming Company
23823 West Valencia Boulevard
Valencia, California 91355

Job No: 09-1702R-4
Dated December 21, 2009


27825 Smyth Drive, Valencia, California 91355 661-294-0065 FAX 661-294-0833

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# ALLAN E. SEWARD
## ENGINEERING GEOLOGY, INC.
Geological And Geotechnical Consultants


December 21, 2009 Job No: 09-1702R-4

The Newhall Land and Farming Company
23823 West Valencia Boulevard
Valencia, California 91355

**Attention:** Mr. Fred MacMurdo

**Subject**: **GEOLOGIC AND GEOTECHNICAL REPORT**
***Review of Revised Vesting Tentative Tract Map 53108 (Dated 12/21/09)***

**Project:** Landmark Village
Newhall Ranch
Los Angeles County, California

**References:** See end of text

Dear Mr. MacMurdo:

This report presents our opinions regarding the existing geologic and geotechnical conditions at the above-referenced site and their effects on the proposed development.

## 1.0 INTRODUCTION

The following report has been prepared at the request of The Newhall Land and Farming Company (Newhall Land) to address the revised tentative map design for Landmark Village. This firm previously prepared a Geologic and Geotechnical report dated September 27, 2000 and a subsequent addendum report dated February 10, 2001 addressing the tentative map dated June 11, 2000. This tentative map was subsequently approved from a geologic and geotechnical standpoint in review sheets dated March 1, 2001 and March 19, 2001, respectively. The revised tentative map design addressed herein was prepared by Psomas and consists of 13 sheets, dated December 21, 2009. The revised plans now include off-site grading for a borrow site and associated water tank site at Adobe Canyon to the south, a levee at Onion Field to the south, interim grading for the construction of an interchange at the intersection of Highway 126 and Chiquito Canyon Road/Long Canyon Road and associated widening of Highway 126, a utility corridor to the proposed Newhall Ranch Water Reclamation Plant (WRP) site to the west, and construction of a water tank site on PM 18108

to the northeast. All of this adjacent (off-site) property is currently owned by Newhall Land. The geologic and geotechnical conditions at the proposed borrow site, levee, and proposed improvements north of Highway 126 at Chiquito Canyon Road were previously described in our report for The Homestead project, VTT 060678 (see referenced report dated 9/30/05). The proposed Utility Corridor was addressed from a geotechnical standpoint in our referenced report (dated 5/25/07). The conclusions and recommendations presented in our previous referenced reports remain applicable, except where superceded in this report.

## 2.0 SCOPE OF WORK

The scope of work performed for this study included the following tasks:

1. Coordination with Newhall Land and the project supervising Civil Engineer, Psomas.

2. Review of the tentative map plans dated 12/21/09 prepared by Psomas, which utilizes updated topography prepared by Hunsaker and Associates, flown on 5/24/06 and compiled on 11/15/06.

3. Review of our previous reports for Landmark Village, the subject portions of the adjacent Homestead development (VTTM 060678), the proposed Utility Corridor, and the proposed Newhall Ranch WRP site.

4. Review of updated liquefaction analyses and incorporation of the results into our conclusions and recommendations for the site.

5. Revision of our geologic cross sections to reflect the revised, proposed grades and updated topography.

6. Updating of previous slope stability analyses at critical cross sections, based on the revised grades and topography.

7. Geologic and geotechnical review of the off-site grading proposed north of Highway 126, east of Chiquito Canyon Road, and of previous mapping and analyses for the Homestead project in this area. Preparation of pertinent cross sections, geologic and geotechnical analyses, completion of appropriate stability analyses, and development of conclusions and recommendations for the proposed grading.

8. Geologic and Geotechnical review of grading proposed for the off-site borrow area and for the associated tank site at Adobe Canyon, located south of the Santa Clara River, and of previous mapping and analyses for the Homestead project in this area. Preparation of pertinent cross sections, geologic and geotechnical analyses, completion of appropriate stability analyses, and development of conclusions and recommendations for the proposed grading.

9. Geologic and geotechnical review of the temporary levee proposed south of the Santa Clara River at the Onion Field portion of The Homestead project, based on data from our referenced report.

10. Geologic and geotechnical review of the proposed grading for the Utility Corridor design and incorporation of data and conclusions presented in our referenced report.

11. Review of the water tank site proposed at Parcel Map 18108 and a report prepared by R.T. Frankian & Associates dated 3/28/08, addressing the geologic and geotechnical conditions at the site.

12. Preparation of updated geologic/geotechnical maps for the site utilizing the revised tentative map as a base.

13. Preparation of the text of this report, which summarizes the results of our analyses and updated conclusions and recommendations for the development of the site.

14. Preparation of this report and associated figures, logs, and tables in hard copy and digital (Pdf) format.

## 3.0 SITE DESCRIPTION

Vesting Tentative Tract 53108, also known as Landmark Village, is a portion of the Newhall Ranch Development located in northwestern Los Angeles County. This 292.6 acre site is located south of Highway 126, north of the Santa Clara River, west of Castaic Creek and east of the Chiquito Canyon drainage. The limits of development adjacent to the Santa Clara River and Castaic Creek channels have been modified from the 6/11/00 design to provide a wider buffer between areas proposed for development and the river habitat. The site is generally flat except for existing banks between younger and older alluvium, and ascending fill slopes and local bedrock outcrops along the south side of Highway 126. The site ranges

in elevation from approximately 900 feet along the Santa Clara River on the southwestern portion of the site to a high point of 1005 ft on a knob along Highway 126 (see Tentative Map for details of the site topography). Much of the site is currently used for agricultural purposes. Portions of the northern margin of the site have been disturbed by construction associated with Highway 126, the abandoned Southern Pacific railroad line, and various pipelines. Debris, including concrete and asphalt concrete blocks, has been placed on several portions of the site. There are five abandoned oil wells and at least 13 water wells on or immediately adjacent to the site. The revised tentative map plans also include off-site grading on the Adobe Canyon, Onion Field, and Chiquito Canyon portions of the adjacent Homestead Project (VTT 060678), along the south side of Highway 126 westward to the proposed WRP site, and to the north at PM 18108 (see attached plans for details).

## 4.0 PROPOSED DEVELOPMENT

Vesting Tentative Tract 53108 is proposed as a residential and commercial development consisting of 422 lots that are to provide 1444 dwelling units (see Sheets 3 and 4). In addition to residential and commercial buildings, a school, a fire station, park site, open space and recreational areas, and a fire station are proposed. A lot summary of the proposed development is provided on Sheet 1 of the Tentative Map. A buried, soil-cement liner is proposed to provide bank protection along the edges of the channels of the Santa Clara River, Castaic Creek, and Chiquito Canyon drainage. A variable gradient (not steeper than 3:1) fill slope is proposed in front of the channel liner. Access to the site will be provided along Highway 126 at Wolcott Road and at Chiquito Canyon/Long Canyon Road. Final grade will be raised from 1 to 18 ft over much of the site, requiring the import of approximately 5.92 million $yd^3$ of fill. The tallest proposed cut and fill slopes on Landmark Village are located along the south side of Highway 126. Retaining walls up to 12 ft in height are now incorporated into the slope design, as shown on the Tentative Map. All of the proposed cut and fill slopes are less than 28 ft in height.

Additional grading has now been incorporated into the tentative map design for VTT 53108 at several off-site locations. The off-site improvements include grading to construct an interchange between Highway 126 and Chiquito Canyon Road/Long Canyon Road and associated widening of Highway 126 for an off ramp (see Sheets 3 and 11). Grading for a borrow site and associated water tank site at the Adobe Canyon portion of the Homestead project (VTT 060678) located south of the Santa Clara River, is shown on Sheet 11. A temporary levee with a soil cement liner is proposed along the south side of the Santa Clara River at the Onion Field portion of the Homestead project (See Sheet 5). A Utility Corridor

is proposed extending along the south side of Highway 126 from the west end of Landmark Village westward to the proposed WRP site (see Sheets 9 and 10). Off-site debris basins associated with the WRP site are also shown on Sheet 9. A Zone 1A water tank site is proposed on the adjacent PM 18108, as shown on Sheet 6. Geologic and geotechnical conditions at Chiquito Canyon Road, Adobe Canyon, and Onion Fields are presented in the referenced report by AESEGI for the Homestead project. The interim conditions proposed on the Landmark Village tentative map for these off-site areas are addressed herein utilizing data from our 9/30/05 Homestead report (see References). The anticipated geologic conditions for the proposed Utility Corridor are described in our referenced report (dated 5/25/07) and the proposed off-site debris basins associated with the WRP site are addressed in our referenced reports (dated 6/19/06, 9/8/06, and 1/25/08). The Zone 1A Tank site at PM 18108 has been addressed by the project geotechnical consultant for PM 18108. A copy of their report is included as **Appendix D** of this report.

## 5.0 GEOLOGY

The subject site is in the eastern Ventura Basin of southern California. The Ventura Basin is a westerly plunging depositional basin produced by tectonic downwarping initiated during the early Miocene and its axis approximately coincides with the Santa Clara River. All of the geologic formations exposed on the subject site were deposited within the Ventura Basin. Most of the subject site is covered by alluvium and older alluvium. Bedrock of the Pico Formation and Saugus Formation locally crops out on the site along the south side of Highway 126. The bedrock exposed at the site has been warped into an east-plunging anticinal fold. Details of the geologic units and structural at the site are provided in the referenced reports for VTT 53108 and in the referenced reports for the associated off-site areas.

## 6.0 SEISMIC CONSIDERATIONS

### 6.1 California Building Code Response Spectrum

The following parameters should be used for calculation of the California Building Code (CBC) response spectrum:

- Site Class = D [CBC, Table 1613A.5.2]
- $S_s$ = 2.242g
- $S_1$ = 0.685g
- $F_a$ = 1.0 [CBC, Table 1613.5.3 (1)]
- $F_v$ = 1.5 [CBC, Table 1613.5.3 (2)]

The values for $S_s$ and $S_1$ listed above were obtained using the Seismic Hazard Curves and Uniform Hazard Response Spectra computer program developed by the United States Geologic Survey (USGS).

### 6.2 Liquefaction

The potential for liquefaction at the Landmark Village site and for associated post-earthquake liquefaction-induced settlement was originally assessed for 8 of the 64 CPT soundings presented in our referenced report dated 9/27/00. We subsequently analyzed the potential for liquefaction in 21 CPT soundings utilizing current procedures set forth by the California Geological Survey and in the 2007 California Building Code. Details of our liquefaction analyses are presented in **Appendix C**.

Our analyses indicate that potential liquefaction-induced settlement will be less than one inch at 11 of the 21 CPT sounding locations that we analyzed and that potential liquefaction-induced settlement between about one and two inches could occur in the vicinity of CPT soundings 5, 13, 19, 96, 105, 106, 108, 109, 111, and 115. We have made minor revisions to the recommended alluvial removal depths shown on the attached Geotechnical Map in order to mitigate potential liquefaction-induced settlements in the vicinity of these CPT soundings.

## 7.0 GENERAL CONCLUSIONS AND RECOMMENDATIONS

### 7.1 Feasibility of Development

Vesting Tentative Tract 53108 is feasible for development from a geologic/geotechnical standpoint, provided that the recommendations presented in our prior reports and in this report are incorporated into the Tentative Map design and implemented during construction. The earthworks recommendations provided in our previous reports remain applicable, except where superceded in this report.

## 7.2 Earthworks Recommendations

### 7.2.1 Removals

Removal depth recommendations are provided on the attached Geologic/Geotechnical Map for VTT 53108 based on our previous review of the site alluvial conditions and on our updated liquefaction analyses. Ground water may be encountered during grading removals, as discussed in our previous reports. The grading contractor should be prepared to implement dewatering measures as necessary, to achieve the recommended removals. Anticipated removal depths for off-site grading are based on previous, site-specific investigations, as described herein.

### 7.2.2 Fill Compaction for Roadways

Roads with gradients as shallow as 0.5% are proposed at the site. As discussed in our referenced Geotechnical Letter Report (dated 8/27/07), fill depths and underlying dense alluvial deposits are expected to be relatively uniform across the site and the fill materials are anticipated to be dominantly granular in nature. Therefore, potential differential settlement is expected to have a negligible impact on the constructed gradients of the proposed roadway alignments, provided that our recommendations for removal of unsuitable soils and fill placement are followed during the grading operations. In order to further limit potential affects of fill settlement on the roadway gradients, the top 2 ft of fill materials below the road base should be compacted to at least 95% of Maximum Dry Density (per ASTM D1557).

### 7.2.3 Proposed Fill Slopes

Review of the revised Tentative Map indicates that no fill slopes greater than 28 ft in height are proposed on Landmark Village. All fill slopes are proposed at a gradient of 2:1 (h:v) or shallower. Based on the shear strengths of site materials and of anticipated import materials, gross stability of these fill slopes is expected to be satisfactory. However, granular alluvial soils at the site have a low cohesion and are not expected to provide satisfactory surficial stability. Therefore, the fill material within one equipment width (12 ft minimum) of the slope face should be constructed with cohesive material obtained by selective grading of on-site or imported cohesive materials.

7.2.4 Proposed Cut Slopes

Review of the revised Tentative Map design for VTT 53108 indicates that no cut slopes greater than 28 ft in height are proposed.

A 27 ft high cut slope is proposed along Highway 126 on the western portion of the site. Based on conditions observed in Bucket-Auger Boring BA-1R, a daylighted bedding component will be exposed in the Pico Formation bedrock, as shown on Cross Sections 1-1' and 2-2' (see Sheet 3). Slope stability analyses of Cross Sections 1-1' and 2-2' are presented in **Appendix B**. Results of these analyses indicate a factor of safety under static loading conditions greater than 1.5 for Cross Section 1-1'. However, owing to fill-over-cut conditions that would exist over most of this slope, a 15 ft wide stability fill with a 3 ft deep keyway is recommended. Slope stability results for Cross Section 2-2' indicate a factor of safety less than 1.5 under static loading conditions for this slope. Therefore, a 15 ft wide buttress with a 3 ft deep keyway is recommended for this slope.

Daylighted bedding conditions and older alluvium are also anticipated to be exposed in a small, 28 ft high composite cut slope located farther to the east, based on conditions observed in Boring BA-2R. Slope stability analysis of Cross Section 3-3' also indicates a factor of safety less than 1.5 under static loading conditions. In order to satisfy minimum safety factor requirements and to prevent potential surficial instability from fill-over-cut and older alluvium-over-bedrock conditions, a 15 ft wide buttress with a 3 ft deep keyway is recommended for this slope.

Minor cut slopes are proposed elsewhere on the site that will expose alluvium or artificial fill. These materials should be removed and replaced with a compacted stability fill. Therefore, no cut slopes will remain on the site following completion of grading. Selective grading and stockpiling of cohesive soils for subsequent placement in stability fills and buttress fills is recommended, as discussed in the Proposed Fill Slope section above.

## 7.3 Retaining Walls

Retaining walls up to 12 ft in height are now proposed along much of the proposed slope descending from Highway 126. Specific parameters for the design of these retaining walls will be provided at the grading plan stage. Gross slope stability of slopes behind and in

front of the proposed retaining walls has been evaluated. The results of these analyses are provided in **Appendix B**.

### 7.4 Buried Bank Stabilization

A buried soil cement liner is proposed along the southern, eastern, and western boundaries of the project in order to protect the development from erosion and damage resulting from potential storm flow events along the Santa Clara River, Castaic Creek, and Chiquito Canyon drainages respectively. The bank protection alignment and design has been modified from the Tentative Map layout addressed in our referenced 9/27/00 report. A Geotechnical report will be provided under separate cover addressing the proposed soil-cement design.

## 8.0 OFF-SITE GRADING

The recommendations provided below for specific off-site locations supplement the general recommendations provided in the preceding section of this report.

### 8.1 Onion Field Levee

A levee with buried bank stabilization is proposed along the south bank of the Santa Clara River (see Sheet 5) to protect the Onion Field area from erosion damage during storm flows. The levee is underlain by granular alluvium and older alluvium. This area was addressed from a geotechnical standpoint in our report for VTT 060678 (dated 9/30/05). Pertinent subsurface exploration locations and recommended removal depths in the vicinity of the proposed levee are shown on Sheet 5 of the attached Geologic/Geotechnical Map. Ground water may be encountered within the removal excavation for the levee. The grading contractor should be prepared to implement dewatering measures, if necessary. Removals should extend a horizontal distance equal to the removal depth behind the toe of the 5:1 (h:v) levee back slope in order to provide lateral support for the fill and to avoid the need to undercut the 5:1 fill slope during future removals for the adjacent Onion Field area. None of the recommended removals are anticipated to be deeper than the excavation for the buried liner. A detailed geotechnical report addressing the buried bank protection will be provided under separate cover.

### 8.2 Zone 1A Water Tank at PM 18108

A Zone 1A Water Tank is proposed at elevation 1172.0 above Franklin Parkway on PM 18108 as part of the Tentative Map for Landmark Village (see Sheet 6). A Geotechnical Report addressing the tank site was completed by the Project Geotechnical Engineer for PM 18108, R.T. Frankian and Associates dated 3/28/08. A copy of their report is attached in **Appendix D**. We have reviewed this report and accept that the findings, conclusions and recommendations presented therein are acceptable for the proposed use.

### 8.3 Utility Corridor to WRP Site

Sheets 9 and 10 illustrate a proposed Utility Corridor alignment extending along the south side of Highway 126 from the west end of Landmark Village to the proposed Newhall Ranch Water Reclamation Plant (WRP) site, west of San Martinez Grande Canyon. This segment of the proposed Utility Corridor was evaluated in our referenced report dated 5/25/07. Soil-cement and turf reinforcement mat are proposed along portions of the Utility Corridor to protect the utility lines from damage during storm flows along the Santa Clara River. A geotechnical evaluation of the proposed bank protection will be provided under separate cover. Proposed mass grading for the WRP Site and for the desilting basins located to the north of Highway 126 were addressed in our referenced reports for the WRP site and the associated storm drains (dated 6/19/06, 9/8/06, and 1/25/08).

### 8.4 Interchange at Highway 126 and Chiquito Canyon Road/Long Canyon Road

#### 8.4.1 Introduction

Sheet 11 of the attached Tentative Map illustrates proposed grading to allow for construction of an interchange where Highway 126 crosses the ultimate alignment of Chiquito Canyon Road/Long Canyon Road. The proposed design includes widening of Highway 126 to the north to allow for construction of on ramps and off ramps. The proposed grading includes construction of south-facing cut slopes and fill slopes and small north-facing cut slopes adjacent to Highway 126, placement of disposal fill in adjacent tributary canyons and on the east side of Chiquito Canyon, and construction of necessary debris basins. Landslide Qls-XVIII(B) will be completely removed by the proposed grading.

8.4.2 Cut Slopes

Cut slopes are proposed along the north side of Highway 126 at gradients ranging from 2:1 to 3.5:1 (h:v). The large, south-facing cut slopes are designated as CS-1 through CS-4 on the attached Geotechnical Map for ease of reference. Bedding structure dips in the direction of these south-facing slopes, producing potentially adverse conditions. Four geologic cross sections (4-4' through 7-7') were therefore constructed to illustrate the subsurface bedrock geometry at critical locations for analysis. Data from two new borings (designated as B-1 and B-2) were used to help define the stratigraphy and structure of the bedrock and ground water conditions in this area. The location of the interfingering contact between the Saugus and Pico Formations was revised based on these borings.

Cut-slope CS-1: A small (30 ft high maximum), south-facing cut slope is proposed west of Chiquito Canyon Road and north of the proposed on ramp. This slope is anticipated to expose daylighted bedding conditions within the Pico Formation. Owing to the small size of the slope, a stability/buttress fill with a 15 ft wide, 3 ft deep keyway is considered adequate to provide global and surficial stability. Cut-slope CS-1 bends northward along Chiquito Canyon Road. This portion of the slope will expose neutral bedding conditions and is expected to be grossly stable.

Cut-slope CS-2: A large (175 ft high), south-facing cut slope is proposed east of Chiquito Canyon Road and north of the proposed off ramp. The lower 20 to 25 ft of this slope is proposed at a 2:1 (h:v) gradient, in general conformance with future proposed grades for VTT 060678 (in-progress). The upper portion of the slope is above future proposed grades for VTT 060678 and is designed at a gradient of 3.5:1 (h:v). Cross section 4-4' was constructed to illustrate the subsurface geologic conditions and to use for evaluating the stability of this slope. The cut slope is in close proximity to the interfingering contact between the Pico and Saugus Formations. The more conservative cross bedding strength (from the Pico Formation) and the more conservative bedding plane strength (from the Saugus Formation) were used in our stability analyses.

Analysis of cross section 4-4' indicates that cut-slope CS-2 meets minimum Los Angeles County factor of safety requirements (see **Appendix B**). However, a buttress was previously recommended for the lower portion of this slope relative to design grades for VTT 060678 and potential subsurface water conditions that were analyzed in our referenced report, dated 9/30/05. The design and need for this buttress should be

confirmed relative to the final Tentative Map design for VTT 060678. A stability fill with a 5 ft deep by 25 ft wide keyway may be needed on the lower 2:1 (h:v) portion of the slope as a precaution relative to the daylighted bedding conditions and because of potential exposure of weak interbeds along the Pico/Saugus Formation contact. Portions of Landslides Qls-XVI(B) and Qls-XVII(B) will be exposed on the eastern portion of CS-2. It is recommended that this slope be expanded to the east to allow for removal and replacement of the landslide material. Landslide Qls-XVI(B) is up slope of the proposed debris basin and should be removed to eliminate potential impacts to this basin.

Cut-slope CS-3: A 125 ft high cut slope is proposed east of CS-2. The lower two-thirds of this slope is proposed at a 2:1 (h:v) gradient in general conformance with future proposed grades for VTT 060678. The upper third of the slope is above future proposed grade for VTT 060678 and is designed at a 3.5:1 (h:v) gradient. This slope is expected to dominantly expose bedrock of the Saugus Formation. However, the Pico Formation may locally be exposed owing to the interfingering nature of the Pico/Saugus contact. The more conservative of the two formational strengths for bedding plane and cross bedding conditions were therefore used in our stability analyses. The geometry of the proposed slope relative to existing topographic and geologic conditions is illustrated on cross section 7-7', which was modified from cross section 9B-9B' from our referenced report for VTT 060678. Based on our analyses, the slope does not meet the minimum required factor of safety for stability (see **Appendix B**). A buttress with a keyway 7 ft deep and 75 ft wide will increase the factor of safety above Los Angeles County's minimum requirements. This recommended buttress design is shown on geologic cross section 7-7' (**Plate I**) and on the attached Geologic/Geotechnical Map for Sheet 11 (see **Appendix E**). A buttress was also recommended for the lower portion of this slope during our investigation for VTT 060678 (see referenced report dated 9/30/05). The design of this buttress should be confirmed relative to the final Tentative Map design for VTT 060678.

Cut-slope CS-4: A 215-ft high, composite cut and fill slope is proposed east of CS-3 on the north side of Highway 126. The cut slope areas are dissected by three narrow canyons. Placement of fill will be required in these canyons to achieve the proposed slope grades. This slope is proposed at a 2.5:1 (h:v) gradient. Cross section 5-5' and 6-6' were constructed to illustrate critical bedrock conditions relative to the proposed slope. This cut slope is expected to expose bedrock of the Saugus Formation. Analysis of cross section 5-5' indicates that the western portion of the slope does not meet the Los

Angeles County minimum factor of safety requirement for pseudo-static conditions (see **Appendix B**). A buttress with a 7 ft deep and 75 ft wide keyway will increase the factor of safety of the subject portion of CS-4 above the Los Angeles County minimum requirements. This buttress design is illustrated on geologic cross section 5-5' (see **Plate I**) and on the attached Geologic/Geotechnical Map for Sheet 11 (See **Appendix E**). Analysis of cross section 6-6' indicates that the eastern portion of the slope will have factors of safety in excess of Los Angeles County minimum requirements. However, owing to the sliver cuts and fills proposed at this slope and potentially adverse bedding conditions, a stability fill with a 55 ft wide and 5 ft deep keyway is recommended for the eastern portion of the slope.

The small, north-facing cut slopes between Highway 126 and the proposed off ramps are expected to expose antidip bedding and are anticipated to be grossly stable.

8.4.3 Disposal Fills

Disposal fill areas are proposed at four locations north of Highway 126, designated as DF-1 through DF-4 for reference (see Sheet 11 for locations). Canyon subdrains will be required for these disposal fills. The design of these drains should be addressed at the Grading Plan stage.

Disposal fill DF-1: This disposal fill is located in the small tributary canyon between cut-slopes CS-3 and CS-4 and includes construction of a fill slope connecting the two cut slopes. Much of this canyon is underlain by artificial fill associated with a pad for the Exxon Mobil Corp Castaic Junction Gas Unit #1' well. The portions of the artificial fill and any loose soil or slopewash underlying the proposed fill slope should be removed prior to placement of compacted fill. The artificial fill and any underlying soils and slopewash behind the slope should also be removed to allow placement of structural fill for future use as part of VTT 060678. Alternatively, if the artificial fill is not removed (for the intended use as a disposal fill only), the area of nonstructural fill should be designated with a Geotechnical Note to address potential future settlement. Any remaining artificial fill should be removed and recompacted prior to future development for VTT 060678. The well should be tested in the field during grading to check for leaks and abandoned in compliance with the requirements of the California Division of Oil and Gas.

Disposal fill DF-2: This disposal fill is proposed in the tributary canyon located between cut-slopes CS-2 and CS-3, and includes construction of a fill slope connecting the two cut slopes. This disposal fill overlies portions of Landslides Qls-XIII(B), Qls-XIV(B) and Qls-XVI(B). Analyses of cross sections 8-8' and 9-9' (modified from cross sections 7B-7B' and 10B-10B' for VTT 060678) indicate that these landslides do not meet the minimum Los Angeles County factor of safety requirements with placement of the proposed disposal fill. For the current intended use as a disposal fill, it is our understanding that these landslides will not be mitigated. Therefore, the landslides have been designated within a recommended Restricted Use Area on the attached Geologic/Geotechnical Map. Recommendations to mitigate these landslides relative to future proposed development for VTT 060678 are provided in our referenced report dated 9/30/05. All compressible landslide material, slopewash and alluvium must be removed prior to placement of future structural fills.

Qls-XVI(B) is a shallow landslide located on the east margin of cut-slope CS-2. Disposal fill and a debris basin are proposed to overlie this landslide. In order to mitigate potential impacts to the proposed debris basin from settlement and potential accumulation of landslide debris, it is recommended that this landslide be completely removed and the slope reconstructed as an extension of CS-2.

Disposal fill DF-3: This disposal fill is proposed to the northwest of CS-2 on the east side of Chiquito Canyon Road. A 4:1 (h:v) fill slope roughly 90 ft high is proposed with this disposal site. Based on previous analyses of higher, steeper fill slopes in this area for VTT 060678, this slope will be grossly stable per Los Angeles County criteria. This fill will overlie alluvium and Pico Formation bedrock. The alluvial removals within the footprint of this disposal fill that are recommended in our referenced report for VTT 060678 dated 9/30/05 should be completed prior to placement of compacted fill (see Sheet 11 for details).

Disposal fill DF-4: This disposal fill is proposed on the east side of Chiquito Canyon Road, roughly 1500 ft north of Highway 126. A 70-ft high 4:1 (h:v) fill slope is proposed at this site. This fill will overlie Pico Formation bedrock, landslides Qls-X(B) and Qls-XI(B), surficial failures, and alluvium. All unsuitable landslide material, artificial fill, and surficial failures within the disposal fill footprint should be removed prior to placement of compacted fill. The alluvial removals recommended in our referenced report for VTT 060678 should also be completed prior to placement of compacted fill (see Sheet 11 for details). Additional removals will likely be required

beyond the proposed disposal fill footprint at Qls-XI(B) in order to tie the fill slope into competent material.

### 8.5 Adobe Canyon Borrow Site and Water Tank Site

A borrow site is proposed at the Adobe Canyon portion of VTT 060678, on the south side of the Santa Clara River. This borrow site is designed to generate 6,468,500 cubic yards of raw cut and a net export of 6,322,200 cubic yards of export fill. The borrow materials will be generated almost entirely from the granular, lower member of the Saugus Formation. The fills will be generated by cutting of ridges on the flanks of Adobe Canyon, which will produce cut slopes to heights of up to 175 ft. All of these cut slopes are expected to expose antidip to neutral bedding conditions or bedding dipping steeper that the slope. The slopes will expose the lower member of the Saugus Formation, with local exposure of subhorizontal terraced deposits (see cross sections 28L-28L' through 37L-37L' on **Plate I** in **Appendix E**, which are revised from our referenced report for VTT 060678). Analysis of the highest cut slope (CS-34L) with cross section 28L-28L indicates that the antidip cut slopes will be grossly stable per Los Angeles County requirements.

Two small landslides (Qls-XIL and Qls-XIIL) are within the borrow site footprint. Most of the landslide material will be removed by proposed borrow site grading. The remainder of these landslides will be removed by the proposed grading for VTT 060678. The alluvial and artificial fill removals recommended in our referenced report for VTT 060678 for Adobe Canyon should be completed prior to future development of the site.

A water tank site is proposed at an elevation of 1170 ft near the top of cut-slope CS-36La. The cut slopes proposed adjacent to the tanks site will expose antidip to neutral bedding conditions and will be grossly stable based on analysis of the more critical conditions at cut-slope CS-34L.

## 9.0 LOS ANGELES COUNTY 111 STATEMENT

In compliance with Section 111 of the Los Angeles County Building Code, it is the finding of this firm that the proposed development designated on Vesting Tentative Tract 53108 will be safe against hazard from landslide, settlement or slippage and will not affect off-site property provided that all our recommendations are incorporated into the Grading Plan and implemented during construction. It is also our finding that the proposed grading shown on

off-site areas associated with the Landmark Tentative Map will be safe for the uses intended and will not affect off-site property provided that all our recommendations are incorporated in the Grading Plan and implemented during construction.

## 10.0 GEOLOGIST/GEOTECHNICAL ENGINEER OF RECORD

This report has been prepared assuming that Allan E. Seward Engineering Geology, Inc. will refine all geologic and geotechnical data, as required, for the Grading Plan phase of this project. If this work is performed by another party, that party must review this report, assume full responsibility for recommendations contained herein, and assume the title of responsibility as "Geologist/Geotechnical Engineer of Record" for the specific work.

## 11.0 LIMITATIONS

This report has been prepared by Allan E. Seward Engineering Geology, Inc. for the exclusive use of The Newhall Land and Farming Company and its design consultants for the specific site discussed herein. This report should not be considered transferable. Prior to use by others, this firm must be notified, as additional work may be required to update this report.

In the event that any modification in the location or design of the proposed development is planned, the conclusions and recommendations contained in this report will require a written review by this firm with respect to the planned modifications.

The proposed development is located in southern California, a geologically and tectonically active region, where large magnitude, potentially destructive earthquakes are common. Therefore, ground motions from moderate or large magnitude earthquakes could affect the subject site during the design life of the proposed structures.

Typically, faulting is confined to the area adjacent to a known fault. However, absolute assurance against future fault displacement in other areas is not possible in tectonically active regions because new faults can form over time and long inactive (pre-Holocene) faults may be reactivated in response to evolving tectonic stresses and geologic conditions in the earth's crust. Therefore, the location and magnitude of new ground surface ruptures during a seismic event cannot be anticipated.

In performing these professional services, this firm has used the degree of care and skill ordinarily exercised under similar circumstances by reputable geologists and geotechnical engineers practicing in this or similar localities. The data presented in this report are based on results of pertinent field and laboratory testing. It should be recognized that subsurface conditions can vary in time, and laterally, and with depth at a given site. Since the conclusions and recommendations presented in this report are based on our observations and testing, our **conclusions** and **recommendations** are **professional opinions** and are **not meant** to be a control of nature. Therefore, we make no other **warranty** either **expressed** or **implied**.

**This report may not be duplicated without the written consent of this firm.**

This opportunity to be of service is appreciated. Please contact us if you would like to discuss this report further.

Respectfully submitted,

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**The following attachments and appendices complete this report.**

**VOLUME I**

**References**

**APPENDIX A – SUBSURFACE LOGS**

Bucket-Auger Borings

- B-1 and B-2

**APPENDIX B – SLOPE STABILITY**

**APPENDIX C – LIQUEFACTION ANALYSIS**

**APPENDIX D – ZONE 1A TANK SITE REPORT**

- Geotechnical Grading Plan Review
  Proposed Offsite Zone 1A Water Tank Site
  Vesting Tentative Tract Map No. 53108
  Los Angeles County, California
  Dated March, 28, 2008 – JN: 99-802-21
  By R.T. Frankian & Associates

**VOLUME II**

**APPENDIX E – CROSS SECTIONS AND MAPS**

Geologic Cross Sections — Plate I

- 1-1' through 3-3': Landmark Village
- 4-4' through 9-9': Off-site Grading at Chiquito Canyon
- 28L-28L', 29L-29L', 31L-31L', 32L-32L', 33L-33L', 36L-36L' & 37L-37L': Off-site Grading @ Adobe Canyon Borrow Site

Vesting Tentative Tract Map 53108

- Cover Sheet and Notes — Sheet 1
- Typical Sections and Details — Sheet 2
- Tentative Map Plan with Geologic/Geotechnical Mapping (1"=100') — Sheets 3 and 4
- South Bank Temporary Levee with Geologic/Geotechnical Mapping — Sheet 5
- Sewer and Water Key Maps, Zone 1A Water Tank Site, and Profiles — Sheet 6
- Interim Design at Long Canyon Road and Typical Sections — Sheet 7

**VOLUME III**

- Wolcott Road Interchange and Chiquito Canyon Outlet Details — Sheet 8
- Off-site Improvements for Trunk Sewer/Utility Corridor to WRP Site with Geologic/Geotechnical Mapping — Sheets 9 and 10
- Off-site Grading for Chiquito and Adobe Canyons with Geologic and Geotechnical Mapping — Sheet 11
- Details and Sections — Sheet 12
- Large Lot Conveyance Map, Phasing Map & Detail Plan — Sheet 13

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Geotechnical and Materials Engineering
Attn: Soils
Attn: Geology

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1. **GEOLOGIC/GEOTECHNICAL REPORT**
***Vesting Tentative Tract 53108, dated 6/11/00***
River Village, Newhall Ranch
Castaic, California
Dated September 27, 2000 – JN: 00-1702R-4

2. **GEOLOGIC AND GEOTECHNICAL REPORT – ADDENDUM NO. 1**
***Response to County Comments (Review Sheets dated 12/12/00 and 1/2/01)***
***Vesting Tentative Tract 53108, Map Dated 6/11/00***
River Village, Newhall Ranch
Castaic, California
Dated February 10, 2001 – JN: 01-1702R-4

3. **GEOLOGIC AND GEOTECHNICAL REPORT**
***Review of Vesting Tentative Tract Map 060678 (Dated 8/3/05)***
Vesting Tentative Tract 060678
Homestead
Newhall Ranch, California
Dated September 30, 2005 - Job No: 05-2062-4

4. **GEOLOGIC AND GEOTECHNICAL REPORT**
***Review of Grading Plans (Dated 3/13/06)***
Proposed Water Reclamation Plant
Newhall Ranch Project
Castaic, Los Angeles County, California
Dated June 19, 2006 - Job No: 06-1707-1

5. **GEOTECHNICAL REPORT**
***Review of Storm Drain Plans***
P.D. No. 2606
Proposed Water Reclamation Plant
Castaic area, Los Angeles County, California
Dated September 8, 2006 - Job No: 06-1707-1

6. **PRELIMINARY GEOLOGIC/GEOTECHNICAL REPORT**
***Review of Utility Corridor Plans (30% Submittal)***
Utility Corridor along Highway 126
Newhall Ranch WRP Site to Travel Village
Castaic, California
Dated May 25, 2007 – JN: 07-2079 (0)

7. **GEOTECHNICAL LETTER REPORT**
***Review of Impacts of Potential Differential Settlement on Proposed Road Gradients***
Landmark Village – VTTM 53108
Newhall Ranch
Los Angeles County, California
Dated August 27, 2007 – JN: 07-1702R (12)

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***Response to Los Angeles County Geologic Review Sheet dated October 30, 2006***
***And Soils Engineering Review Sheet dated October 31, 2006***
**GEOTECHNICAL REPORT**
***Review of Revised Storm Drain Plans (undated) and***
***Rough Grading Plan (undated) for P.D. No. 2606***
P.D. No. 2606
Proposed Water Reclamation Plant
Castaic Area, Los Angeles County, California
Dated January 25, 2008 – JN: 08-1707-1

# Appendix A

CLIENT: The Newhall Land & Farming Company
PROJECT: Highway 126 Widening
DRILLING COMPANY: All Ways Drilling
DRILLING METHOD: Bucket Auger
HAMMER TYPE: Telescoping Kelly Bar
DRIVING WEIGHTS: 0-30'=5619 lb, 31-60'=3745 lb, 61-90'=2230 lb, 91-120'=1223 lb

JOB NO.: 05-2088-1 (0)
DATE: 12/21/09
LOGGED BY: MBW
DRILLED: 10/10-12/05
HOLE DIA: 24'
AVERAGE DROP: 12"
ELEVATION: 971'

# DRILL HOLE LOG

BORING NO. B-1

| DEPTH (feet) | SAMPLE TYPE | BLOWS / 6" | GRAPHIC LOG | ATTITUDES, DRY DENSITY (pcf)/ MOISTURE CONTENT (%) | USCS SYMBOL | DESCRIPTION | Remarks |
|---|---|---|---|---|---|---|---|
| | | | | | | QUATERNARY ALLUVIUM; Qal (0 - 16.5') | @ 0-3' Casing |
| | | | | | | @ 0' Yellowish-brown silty sand; loose; damp | |
| 5 | | Push/ 18" | | 116/6.2 | | @ 4' Grades to pebbly sand<br>@ 4.5' Sandy silt<br>@ 5' Pebbly sand<br>@ 5.5' Sandy silt with local pebbly sand channels | |
| 10 | | 1<br>1<br>1 | | 122/8.1 | | @ 9' Stiff | |
| 15 | | 2<br>3<br>3 | | 94/6.6 | | | |
| | | | | fr: N53W,33NE<br>B: N88E,26SE | | BEDROCK; TQs (16.5 - 99')<br>@ 16.5' Light-gray, silty, fine-grained sandstone; hard; damp<br>@ 18' Gray to olive-brown clayey mudstone; abundant caliche-lined fractures | @ 18-22' Moderately fractured |
| 20 | | 2<br>5 | | fr: N03E,29SE<br>112/16.6<br>B: N85E,26SE | | @ 19.5' Interbedded gray to yellowish-brown, silty, fine-grained sandstone and brown mudstone | @ 22-27' Slightly fractured |
| | | | | B: N87W,30SW | | @ 24' Approximately 5-inch-thick gray mudstone interbed with iron-oxide staining | |
| 25 | | | | B: N78E,26SE | | @ 25' Slightly sheared mudstone interbed<br>@ 25.5' Brown mudstone; massive | |
| 30 | | 5<br>10<br>15 | | B: N82E,24SW<br>126/12.9 | | @ 30' Slightly sheared mudstone interbed; slightly plastic | @ 30' Bulk sample Shear Test |
| 35 | | | | Apx B: E-W,24S | | @ 35' Gray silty sandstone to sandy siltstone; gradational contact with overlying and underlying units<br>@ 36' Brown mudstone; moist; massive | LL= 51 PI= 24 |

| | | | |
|---|---|---|---|
| CLIENT: The Newhall Land & Farming Company | JOB NO.: 05-2088-1 (0) | **DRILL HOLE LOG** | |
| PROJECT: Highway 126 Widening | DATE: 12/21/09 | | |
| | LOGGED BY: MBW | | |
| DRILLING COMPANY: All Ways Drilling | DRILLED: 10/10-12/05 | | |
| DRILLING METHOD: Bucket Auger | HOLE DIA: 24" | | |
| HAMMER TYPE: Telescoping Kelly Bar | AVERAGE DROP: 12" | BORING NO. B-1 | |
| DRIVING WEIGHTS: 0-30'=5619 lb, 31-60'=3745 lb, 61-90'=2280 lb, 91-120'=1223 lb | ELEVATION: 971' | | |

| DEPTH (feet) | SAMPLE TYPE | BLOWS / 6" | GRAPHIC LOG | ATTITUDES; DRY DENSITY (pcf)/ MOISTURE CONTENT (%) | USCS SYMBOL | DESCRIPTION | Remarks |
|---|---|---|---|---|---|---|---|
| | | | | B: N83E,28SE | | | |
| 40 | | | | | | @ 39' Grades to gray to yellowish-brown pebbly sandstone; massive; coarsens down; southward imbrication of pebbles | Shear test |
| | | 10 | | | | | |
| 45 | | | | | | | |
| | | | | | | | @ 47-99' Surface logged due to water |
| 50 | | | | | | | |
| | | 6 8/5" | | 127/8.6 | | | |
| | | | | | | @ 52' Standing water | |
| 55 | | | | | | | |
| | | | | | | @ 56' Brown, fine-grained sandstone; wet | |
| | | | | | | @ 59' Silty, fine-grained sandstone | |
| 60 | | | | | | | |
| | | 8/5" | | | | | |
| 65 | | | | | | | |
| | | | | | | @ 66' Bluish-gray, silty, fine-grained sandstone | |
| | | | | | | @ 67' Bluish-gray siltstone | @ 67' Bulk sample |
| | | | | | | @ 68' Brown, medium- to coarse-grained sandstone | |
| 70 | | | | | | | |
| | | 10 10/1" | | 114/16.1 | | | |
| | | | | | | @ 72' Brown, coarse-grained pebbly sandstone | |
| 75 | | | | | | | |

| | | | |
|---|---|---|---|
| CLIENT: The Newhall Land & Farming Company | JOB NO.: 05-2088-1 (0) | **DRILL HOLE LOG** | |
| PROJECT: Highway 126 Widening | DATE: 12/21/09 | | |
| | LOGGED BY: MBW | | |
| DRILLING COMPANY: All Ways Drilling | DRILLED: 10/10-12/05 | | |
| DRILLING METHOD: Bucket Auger | HOLE DIA: 24" | | |
| HAMMER TYPE: Telescoping Kelly Bar | AVERAGE DROP: 12" | BORING NO. B-1 | |
| DRIVING WEIGHTS: 0-30'=5619 lb, 31-60'=3745 lb, 61-90'=2280 lb, 91-120'=1223 lb | ELEVATION: 971' | | |

| DEPTH (feet) | SAMPLE TYPE | BLOWS / 6" | GRAPHIC LOG | ATTITUDES, DRY DENSITY (pcf) MOISTURE CONTENT (%) | USCS SYMBOL | DESCRIPTION | Remarks |
|---|---|---|---|---|---|---|---|
| | | | | | | @ 77' Difficult to drill due to hardness<br>@ 78' Gray, pebbly, coarse-grained sandstone | |
| 80 | | | | | | | |
| | | 10<br>8/1" | | | | | |
| 85 | | | | | | | |
| 90 | | | | | | @ 91' Grayish-brown mudstone | @ 92' Top 2" of sample is disturbed |
| | | 20/5" | | 119/16.5 | | | |
| 95 | | | | | | @ 94' Gray to bluish-gray siltstone<br>@ 97' Gray mudstone | |
| | | 29 | | | | @ 99' No recovery | |
| 100 | | | | | | TOTAL DEPTH 99' (Elev. 872')<br>Ground Water @ 52' (Elev. 919')<br>Minor Caving from 58 to 64' | |
| 105 | | | | | | | |
| 110 | | | | | | | |

| | | | |
|---|---|---|---|
| CLIENT: The Newhall Land & Farming Company | JOB NO.: 05-2088-1 (0) | **DRILL HOLE LOG** | |
| PROJECT: Highway 126 Widening | DATE: 12/21/09 | | |
| | LOGGED BY: MBW | | |
| DRILLING COMPANY: All Ways Drilling | DRILLED: 10/12 & 13/05 | | |
| DRILLING METHOD: Bucket Auger | HOLE DIA: 24" | | |
| HAMMER TYPE: Telescoping Kelly Bar | AVERAGE DROP: 12" | **BORING NO.** B-2 | |
| DRIVING WEIGHTS: 0-30'=5619 lb, 31-60'=3745 lb, 61-90'=2280 lb, 91-120'=1223 lb | ELEVATION: 971' | | |

| DEPTH (feet) | SAMPLE TYPE | BLOWS / 6" | GRAPHIC LOG | ATTITUDES, DRY DENSITY (pcf)/ MOISTURE CONTENT (%) | USCS SYMBOL | DESCRIPTION | Remarks |
|---|---|---|---|---|---|---|---|
| | | | | | | **BEDROCK; TQs (0 - 116')** | @ 0-5' Bulk sample |
| | | | | | | @ 0' Yellowish-brown, sandy siltstone with pebbles; moderately hard; damp; generally massive with some faint laminations; moderately weathered | |
| 5 | | 3<br>7 | | Apx B: N63E, 11SE<br>123/3.8 | | @ 4' 6"-thick, brown mudstone interbed; some roots; possible old soil layer; not fully planar | |
| | | | | Apx B: N56E, 17SE | | @ 8' Grades sandier | |
| 10 | | 3<br>6 | | 102/4.6 | | @ 10' Silty sandtone with pebbles | |
| 15 | | 2<br>3 | | 115/2.4 | | @ 16' Cobbly, very friable | |
| 20 | | 2<br>2 | | 116/4.2 | | @ 20' Local caliche stringers | |
| 25 | | | | | | @ 24' Yellowish-brown, silty, pebbly sandstone with local cobbles; damp; hard; massive | |
| 30 | | 5<br>6 | | 116/3.6 | | | |
| 35 | | | | | | @ 35' Grayish-brown siltstone; gradational contact with overlying and underlying units | |

| | | | |
|---|---|---|---|
| CLIENT: The Newhall Land & Farming Company | JOB NO.: 05-2088-1 (0) | **DRILL HOLE LOG** | |
| PROJECT: Highway 126 Widening | DATE: 12/21/09 | | |
| | LOGGED BY: MBW | | |
| DRILLING COMPANY: All Ways Drilling | DRILLED: 10/12 & 13/05 | | |
| DRILLING METHOD: Bucket Auger | HOLE DIA: 24" | | |
| HAMMER TYPE: Telescoping Kelly Bar | AVERAGE DROP: 12" | BORING NO. B-2 | |
| DRIVING WEIGHTS: 0-30'=5619 lb, 31-60'=3745 lb, 61-90'=2280 lb, 91-120'=1223 lb | ELEVATION: 971' | | |

| DEPTH (feet) | SAMPLE TYPE | BLOWS / 6" | GRAPHIC LOG | ATTITUDES, DRY DENSITY (pcf)/ MOISTURE CONTENT (%) | USCS SYMBOL | DESCRIPTION | Remarks |
|---|---|---|---|---|---|---|---|
| 40 | | Bounce | | | | @ 38' Yellowish-brown, pebbly sandstone | |
| 45 | | | | | | @ 47' Cobbly; local mudstone ripups | |
| | | | | Apx B: N46E,10SE | | @ 48' Contact between sandstone and mudstone may be channelized | |
| 50 | | 17 | | B: N53E,15SE | | | |
| | | | | Apx B: N49E,14SE | | @ 52' Minor seepage | |
| 55 | | | | Apx B: N59E,14SE | | @ 55' 6"-thick, sandy mudstone interbed | |
| | | | | B: N58E,16SE | | @ 58' Yellowish-brown to gray, pebbly sandstone; massive; locally laminated | |
| 60 | | 25/4" | | 101/3.6 | | | |
| 65 | | | | | | | |
| 70 | | 20 | | | | @ 71' Pebbly, cobbly, coarse-grained sandstone; wet | |
| 75 | | | | | | | |

| | | | |
|---|---|---|---|
| CLIENT: The Newhall Land & Farming Company | JOB NO.: 05-2088-1 (3) | **DRILL HOLE LOG** | |
| PROJECT: Highway 126 Widening | DATE: 12/21/09 | | |
| | LOGGED BY: MBW | | |
| DRILLING COMPANY: All Ways Drilling | DRILLED: 10/12 & 13/05 | | |
| DRILLING METHOD: Bucket Auger | HOLE DIA: 24" | | |
| HAMMER TYPE: Telescoping Kelly Bar | AVERAGE DROP: 12" | **BORING NO.** B-2 | |
| DRIVING WEIGHTS: 0-30'=5619 lb, 31-60'=3745 lb, 61-90'=2280 lb, 91-120'=1223 lb | ELEVATION: 971' | | |

| DEPTH (feet) | SAMPLE TYPE | BLOWS / 6" | GRAPHIC LOG | ATTITUDES, DRY DENSITY (pcf)/ MOISTURE CONTENT (%) | USCS SYMBOL | DESCRIPTION | Remarks |
|---|---|---|---|---|---|---|---|
| 80 | | 25 | | B: N58E,16SE 106/16.4 | | @ 80' 4"-thick, reddish-brown to gray mudstone interbed | |
| | | | | B: N64E, 17SE | | @ 82' 5"-thick, reddish-brown mudstone interbed | |
| | | | | B: N58E,23SE | | @ 83' Slightly sheared mudstone interbed; steeper than overlying laminated sandstone | |
| 85 | | | | | | @ 84' Gray to reddish-brown mudstone; moist; massive | |
| | | | | B: N55E,14SE | | | |
| 90 | | 25 | | Apx B: N60E,14SE | | | |
| 95 | | | | | | | |
| 100 | | | | | | | |
| 105 | | | | | | | @ 105-116' Surface logged due to water |
| 110 | | | | | | @ 112' Greenish-gray, fine- to medium-grained sandstone; wet | |

| | | | |
|---|---|---|---|
| CLIENT: The Newhall Land & Farming Company | JOB NO.: 05-2088-1 (0) | **DRILL HOLE LOG** | |
| PROJECT: Highway 126 Widening | DATE: 12/21/09 | | |
| | LOGGED BY: MBW | | |
| DRILLING COMPANY: All Ways Drilling | DRILLED: 10/12 & 13/05 | | |
| DRILLING METHOD: Bucket Auger | HOLE DIA: 24" | | |
| HAMMER TYPE: Telescoping Kelly Bar | AVERAGE DROP: 12" | BORING NO. B-2 | |
| DRIVING WEIGHTS: 0-30'=5619 lb, 31-60'=3745 lb, 61-90'=2280 lb, 91-120'=1223 lb | ELEVATION: 971' | | |

| DEPTH (feet) | SAMPLE TYPE | BLOWS / 6" | GRAPHIC LOG | ATTITUDES, DRY DENSITY (pcf)/ MOISTURE CONTENT (%) | USCS SYMBOL | DESCRIPTION | Remarks |
|---|---|---|---|---|---|---|---|
| 115 | | | TQs | | | | |
| | | | | | | TOTAL DEPTH 116' (Elev. 855')<br>Minor Seep @ 52'<br>Ground Water @ 71' (Elev. 900')<br>No Caving | |
| 120 | | | | | | | |
| 125 | | | | | | | |
| 130 | | | | | | | |
| 135 | | | | | | | |
| 140 | | | | | | | |
| 145 | | | | | | | |
| 150 | | | | | | | |

# Appendix B

# APPENDIX B

## SLOPE STABILITY ANALYSES

### Introduction

Static stability and pseudo-static stability were analyzed for cut slopes along the south side of Highway 126 and for cut slopes and natural slopes in off-site areas, including portions of Chiquito Canyon and Adobe Canyon of the adjacent Homestead Project, VTT 060678 (see attached plans in **Appendix E** for details). Cross sections that illustrate critical bedding geometry and/or slope height were selected for analysis. The Spencer method was used for calculation of the factor of safety of the analyzed slopes. A horizontal acceleration of 0.15g was used in the pseudo-static (earthquake) stability analyses. Results of the stability analyses, including slope geometry parameters, are summarized in **Table B1** – Results of Slope Stability Analyses. Slope stability diagrams that graphically illustrate the results of our analyses are attached for review.

The GSTABL7 computer program by Garry H. Gregory (Gregory Geotechnical Software) was used to calculate the factor of safety of slopes at the project site. Output is appended from the slope stability analysis runs (including a slope cross section that shows the surface with the lowest factor of safety, geotechnical parameters of soil layers, and other pertinent data). The analysis surfaces with the lowest factor of safety value are also plotted on the cross sections in **Appendix E**.

### Slope Geometries and Subsurface Conditions

Stability analyses performed on the following slopes included cross-bedding and potential adverse bedding conditions, based on geologic data obtained near each cross section listed in **Table B1**. Buttresses were used in the stability analyses as mitigation for proposed cut slopes with calculated factors of safety lower than the minimum values required by Los Angeles County. The geometries of proposed cut slopes at the site include the removal of vegetation, surficial soil, Terrace Deposits, and/or bedrock materials, and placement of compacted fill on portions of slopes where buttresses or stability fills are recommended.

- **Landmark Village (VTT 53108)**

  Analyzed cut slopes within Landmark Village are shown on cross sections 1-1', 2-2', and 3-3', and are located along the south side of Highway 126. Fill-over-cut conditions are shown on cross sections 1-1' and 3-3' with retaining walls proposed at top and/or bottom of slope on each cross section. These slopes are about 20 to 28 ft in height, with

2:1 (h:v) gradients and with daylighted bedding dipping out of the slope at about 15 to 17 degrees. In order to meet Los Angeles County requirements for gross and surficial slope stability, a buttress/stability fill with a 3 ft deep by 15 ft wide keyway is recommended for each slope.

- **Adobe Canyon (VTT 060678)**

  Proposed cut-slope CS-34L, shown on cross section 28L-28L', is the highest 2:1 (h:v) cut slope in the Adobe Canyon off-site grading area (175 ft). Since favorable (antidip) bedding conditions are anticipated to be exposed in this cut slope, it meets Los Angeles County requirements for gross stability.

- **North of Highway 126 (VTT 060678)**

  Proposed cut-slopes CS-2 and CS-3 are shown on cross sections 4-4' and 7-7', respectively. Cut-slope CS-2 is a 175 ft high, combination 2:1 (h:v) and 3.5:1 (h:v) slope with potential adverse bedding dipping at about 15 degrees in the direction of the slope face. Cut-slope CS-3 is a 125 ft high, combination 2:1 (h:v) and 3.5:1 (h:v) slope with daylighted bedding dipping out of slope at about 18 degrees. In order to meet Los Angeles County requirements for gross slope stability, a buttress with a 7 ft deep by 75 ft wide keyway is recommended for cut-slope CS-3.

  Proposed cut-slope CS-4 is shown on cross sections 5-5' and 6-6'. Based on cross section 5-5', CS-4 is 215 ft in height, with a 2.5:1 (h:v) gradient and with daylighted bedding dipping out of the slope at about 17 to 21 degrees. The natural portion of the slope in the additional 20 ft above CS-4 has a 5:1 (h:v) gradient (total slope height of 236 ft). In order to meet Los Angeles County requirements for gross slope stability, a buttress with a keyway 7 ft deep by 75 ft wide is recommended for the western portion of cut-slope CS-4 per analysis of cross section 5-5'. A 5 ft deep by 55 ft wide stability fill is recommended on the eastern portion of CS-4 owing to fill-over-cut and sliver cut and fill conditions.

  Landslides Qls-XIV(B) and Qls-XIII(B) and the proposed disposal fills are shown on cross sections 8-8' and 9-9', respectively. Our analyses indicate that although the proposed fills will improve stability of these landslides, the slopes that include these landslides will not satisfy the factor of safety requirements of Los Angeles County. It is our understanding that Landslides Qls-XIV(B) and Qls-XIII(B) will not be removed or mitigated relative to the future intended use as a fill disposal site. Therefore, Restricted

**APPENDIX B**

Use Areas are recommended on the attached Geotechnical Maps for landslides Qls-XIV(B) and Qls-XIII(B). Recommendations for mitigation of these landslides relative to future development of the site for VTT 060678 are provided in our referenced report dated 9/30/05.

## Ground Water

Review of ground water data obtained during our previous investigations and from Bucket-Auger borings B1 and B2 indicates that the proposed cut slopes in bedrock (Adobe Canyon and North of Highway 126) are above historic high ground water levels. Ground water was modeled in the slope stability analyses using a pore pressure parameter ($r_u$=0.12) at locations where a potential source for future ground water existed directly up gradient (updip) of the slope being analyzed.

## Shear Strength and Density Parameters

Shear strength and density parameters developed for our original Review of Tentative Tract Map report for VTT 53108 (dated September 27, 2000) were used for on-site slopes located within the subject VTT 53108 and an assumed shear strength and density were adopted for select fill materials recommended for use in the stability fills and buttresses. These parameters are summarized in the following table:

**Shear Strength Parameters – VTT 53108**

| Materials | Unit Density (pcf) | Static | | Pseudo-static | |
|---|---|---|---|---|---|
| | | Phi (deg) | c (psf) | Phi (deg) | c (psf) |
| Bedrock (Tp), parallel to bedding | 130 | 18 | 200 | 18 | 200 |
| Bedrock (Tp), cross bedding | 130 | 31 | 185 | 45 | 203 |
| Older Alluvium (Qoa) | 125 | 28.5 | 151 | 30 | 200 |
| Compacted Fill (Cef) | 135 | 30.6 | 100 | 31 | 154 |
| Select Fill | 135 | 30 | 300 | 30 | 300 |

Shear strength and density parameters developed for our Review of Tentative Tract Map report for VTT 060678 (dated September 30, 2005) were used for slopes located within VTT 060678. These parameters are summarized in the following table:

**APPENDIX B**

**Shear Strength Parameters – VTT 060678**

| Materials | Unit Weight (pcf) | Static | | Pseudo-static | |
|---|---|---|---|---|---|
| | | Phi (deg) | c (psf) | Phi (deg) | c (psf) |
| Bedrock ($TQs_L$), parallel to bedding | 130 | 20 | 200 | 29 | 500 |
| Bedrock ($TQs_L$), cross bedding | 130 | 35 | 500 | 38 | 600 |
| Bedrock (Tp), parallel to bedding | 125 | 22 | 275 | 28 | 400 |
| Bedrock (Tp), cross bedding | 125 | 30 | 350 | 36 | 500 |
| Terrace Deposits (Qt) | 125 | 28 | 250 | 28 | 300 |
| Older Alluvium (Qoa) | 120 | 28 | 250 | 29 | 300 |
| Compacted Fill (Cef) | 130 | 30 | 300 | 30 | 300 |
| Landslide Mass (Qls) | 125 | 25 | 200 | 29 | 300 |
| Slide Plane | 125 | 12 | 125 | 15 | 250 |

The strength parameters provided above for static loading conditions are residual values and the strength values for pseudo-static loading conditions are peak values.

## Surficial Stability

Permanent cut slopes that expose cut/fill transitions, daylighted bedrock, or Terrace Deposits should be constructed as stability fills. The need for additional stability fills should be evaluated during grading operations.

## Conclusions

The analyzed cut slopes comply with Los Angeles County minimum requirements for gross stability under static and pseudo-static loading conditions and for surficial stability, as applicable, provided that our recommendations are followed and incorporated into project construction. The analyzed landslides do not comply with Los Angeles County minimum requirements for gross stability. The results of the stability analyses are summarized in **Table B1.**

**The following attachments are located within this Appendix.**

Slope Stability Analyses Results Table B1
Slope Stability Diagrams and Data Sheets for Runs 1 to 31

# APPENDIX B

## SLOPE STABILITY ANALYSES RESULTS

| CROSS SECTION | FILE NAME | SLOPE DESIGNATION | ANALYZED SURFACE | METHOD | FACTOR OF SAFETY | | COMMENTS | RUN NO. |
|---|---|---|---|---|---|---|---|---|
| | | | | | STATIC | PSEUDOSTATIC (COEFF = 0.15) | | |
| 1-1′ | T1S1A<br>T1PS1A | Cut slope | Bedding Plane | Spencer | 1.70 | 1.22 | Minimum safety factor for daylighted slope behind proposed retaining wall; recommended stability fill with 15′w by 3′d keyway for surficial stability. | 1<br>2 |
| 2-2′ | T2S1A<br>T2PS1A | Cut slope | Bedding Plane | Spencer | 1.52 | 1.06 | Daylighted slope behind proposed retaining wall; Pseudo-static safety factor < 1.10; see recommended mitigation below. | 3<br>4 |
| 2-2′ | T2S2A<br>T2PS2A | Cut slope | Circular | Spencer | 1.51 | 1.61 | Circular failure through slope less critical than bedding plane failure. | 5<br>6 |
| 2-2′ | T2S1B<br>T2PS1B | Cut slope | Bedding Plane | Spencer | 1.68 | 1.22 | Analyses including proposed buttress / stability fill with 15′w by 3′d keyway. | 7<br>8 |
| 3-3′ | T3S1A<br>T3PS1A | Cut slope | Bedding Plane | Spencer | 1.40 | 1.05 | Safety factor < minimum requirements; see recommended mitigation below. | 9<br>10 |
| 3-3′ | T3S2A<br>T3PS2A | Cut slope | Circular | Spencer | 1.50 | 1.58 | Circular failure through slope less critical than bedding plane failure. | 11<br>12 |
| 3-3′ | T3S1B<br>T3PS1B | Cut slope | Bedding Plane | Spencer | 1.66 | 1.34 | Analyses including proposed buttress / stability fill with 15′w by 3′d keyway. | 13<br>14 |
| 4-4′ | T4S1A<br>T4PS1A | Cut slope CS-2 | Bedding Plane | Spencer | 1.68 | 1.10 | Minimum safety factor. | 15<br>16 |
| 5-5′ | T5S2B<br>T5PS2B | Cut slope CS-4 | Bedding Plane | Spencer | 1.56 | 1.07 | Pseudo-static safety factor < 1.10; see recommended mitigation below. | 17<br>18 |
| 5-5′ | T5S1B<br>T5PS1B | Cut slope CS-4 | Bedding Plane | Spencer | 1.66 | 1.14 | Analyses including proposed buttress with 75′w by 7′d keyway. | 19<br>20 |
| 6-6′ | T6S1B<br>T6PS1B | Cut slope CS-4 | Bedding Plane | Spencer | 1.78 | 1.28 | Minimum safety factor. | 21<br>22 |
| 7-7′ | T7S1A | Cut slope CS-3 | Bedding Plane | Spencer | 1.48 | -- | Current design with day-lighted bedding. Minimum safety factor < 1.5. See mitigation below. | 23 |

# APPENDIX B

## SLOPE STABILITY ANALYSES RESULTS

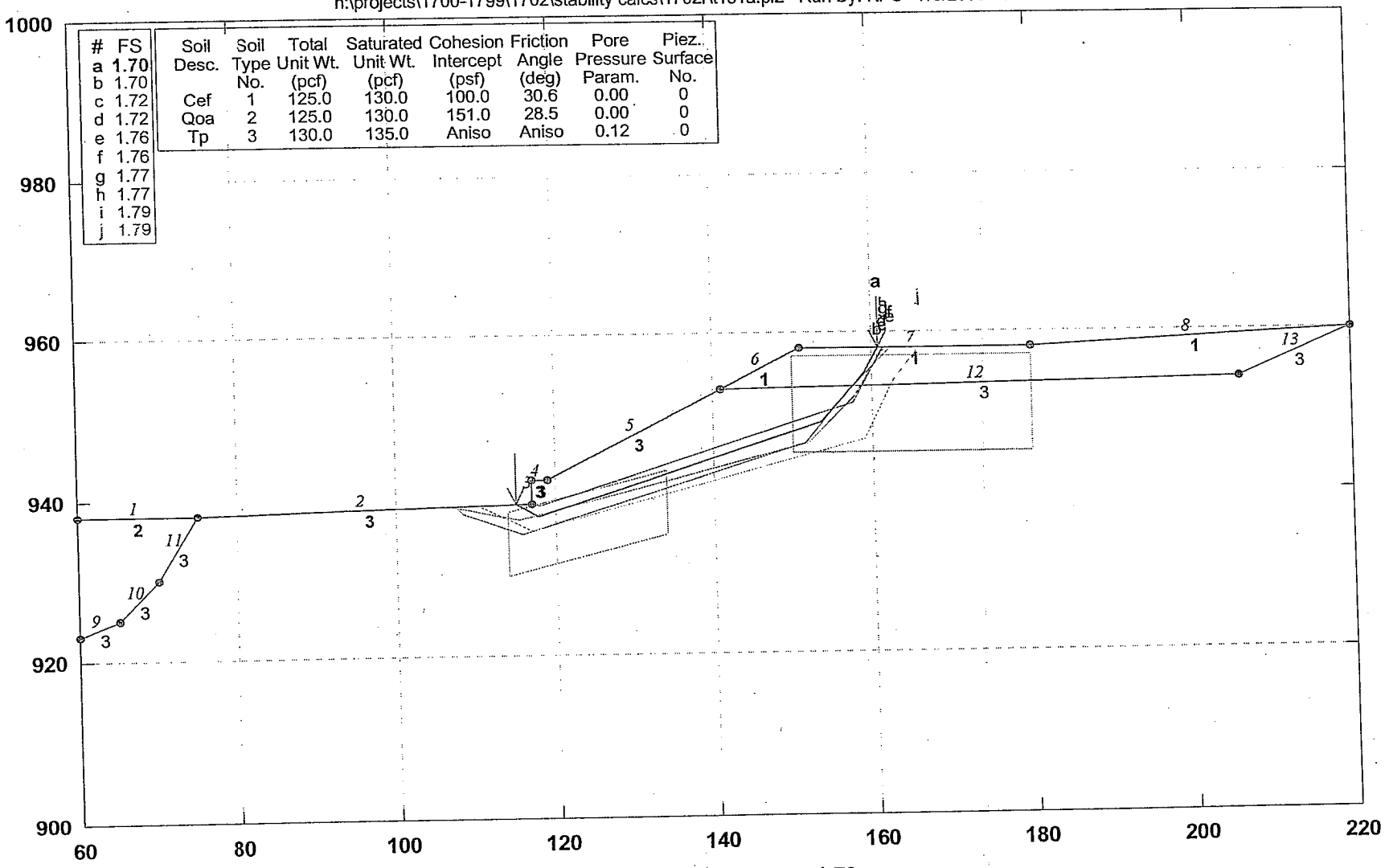
| CROSS SECTION | FILE NAME | SLOPE DESIGNATION | ANALYZED SURFACE | METHOD | FACTOR OF SAFETY | | COMMENTS | RUN NO. |
|---|---|---|---|---|---|---|---|---|
| | | | | | STATIC | PSEUDOSTATIC (COEFF = 0.15) | | |
| 7-7′ | T7S2A<br>T7PS2A | Cut slope CS-3 | Bedding Plane | Spencer | 1.64 | 1.13 | Analyses including proposed buttress with 75′w by 7′d keyway. | 24<br>25 |
| 8-8′ | T8S1A | Qls-XIV(B) | Landslide Plane | Spencer | 2.40 | | Failure surface along entire basal slide plane. | 26 |
| 8-8′ | T8S4B | Qls-XIV(B) | Landslide Plane | Spencer | 1.43 | -- | Failure surface along upper portion of basal slide plane. FS < 1.5; place Qls in RUA. | 27 |
| 9-9′ | T9S2A | Qls-XIII(B) | Landslide Plane | Spencer | 1.42 | -- | Failure surface along entire basal slide plane. FS < 1.5; place Qls in RUA. | 28 |
| 28L-28L′ | T28LS1A<br>T28LPS1A | Cut slope CS-34L | Circular | Spencer | 2.27 | 1.75 | Highest 2:1 cut slope in Adobe Canyon area. Minimum safety factor. | 29<br>30 |

# TT 53108, 1-1'; static; planar; daylighted bedding w/ Ru=0.12

n:\projects\1700-1799\1702\stability calcs\1702r\t1s1a.pl2 Run By: KPC 7/9/2008 03:24PM

| # | FS |
|---|---|
| a | 1.70 |
| b | 1.70 |
| c | 1.72 |
| d | 1.72 |
| e | 1.76 |
| f | 1.76 |
| g | 1.77 |
| h | 1.77 |
| i | 1.79 |
| j | 1.79 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Piez. Surface No. |
|---|---|---|---|---|---|---|---|
| Cef | 1 | 125.0 | 130.0 | 100.0 | 30.6 | 0.00 | 0 |
| Qoa | 2 | 125.0 | 130.0 | 151.0 | 28.5 | 0.00 | 0 |
| Tp | 3 | 130.0 | 135.0 | Aniso | Aniso | 0.12 | 0 |




GSTABL7 v.2 FSmin=1.70

Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2)

GSTABL7

Run No. 1

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **
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**********
SLOPE STABILITY ANALYSIS SYSTEM
Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
**********

Analysis Run Date: 7/9/2008
Time of Run: 03:24PM
Run By: KPC
Input Data Filename: N:\Projects\1700-1799\1702\Stability Calcs\1702R\t1s1a.in
Output Filename: N:\Projects\1700-1799\1702\Stability Calcs\1702R\t1s1a.OUT
Unit System: English
Plotted Output Filename: N:\Projects\1700-1799\1702\Stabi Calcs\1702R\t1s1a.PLT
PROBLEM DESCRIPTION: TT 53108, 1-1'; static; planar;
daylighted bedding w/ Ru=0.12

BOUNDARY COORDINATES
8 Top Boundaries
13 Total Boundaries

| Boundary No. | X-Left (ft) | Y-Left (ft) | X-Right (ft) | Y-Right (ft) | Soil Type Below Bnd |
|---|---|---|---|---|---|
| 1 | 60.00 | 938.00 | 75.00 | 938.00 | 2 |
| 2 | 75.00 | 938.00 | 117.00 | 939.00 | 3 |
| 3 | 117.00 | 939.00 | 117.01 | 942.00 | 3 |
| 4 | 117.01 | 942.00 | 119.00 | 942.00 | 3 |
| 5 | 119.00 | 942.00 | 141.00 | 953.00 | 3 |
| 6 | 141.00 | 953.00 | 151.00 | 958.00 | 1 |
| 7 | 151.00 | 958.00 | 180.00 | 958.00 | 1 |
| 8 | 180.00 | 958.00 | 220.00 | 960.00 | 1 |
| 9 | 60.00 | 923.00 | 65.00 | 925.00 | 3 |
| 10 | 65.00 | 925.00 | 70.00 | 930.00 | 3 |
| 11 | 70.00 | 930.00 | 75.00 | 938.00 | 3 |
| 12 | 141.00 | 953.00 | 206.00 | 954.00 | 3 |
| 13 | 206.00 | 954.00 | 220.00 | 960.00 | 3 |

User Specified Y-Origin = 900.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
3 Type(s) of Soil

| Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No. |
|---|---|---|---|---|---|---|---|
| 1 | 125.0 | 130.0 | 100.0 | 30.6 | 0.00 | 0.0 | 0 |
| 2 | 125.0 | 130.0 | 151.0 | 28.5 | 0.00 | 0.0 | 0 |
| 3 | 130.0 | 135.0 | 185.0 | 31.0 | 0.12 | 0.0 | 0 |

ANISOTROPIC STRENGTH PARAMETERS
1 soil type(s)
Soil Type 3 Is Anisotropic
Number Of Direction Ranges Specified = 3

| Direction Range No. | Counterclockwise Direction Limit (deg) | Cohesion Intercept (psf) | Friction Angle (deg) |
|---|---|---|---|
| 1 | 14.0 | 185.00 | 31.00 |
| 2 | 18.0 | 200.00 | 18.00 |
| 3 | 90.0 | 185.00 | 31.00 |

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and

C equal to zero, with water weight in the tension crack.
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Sliding Block Surfaces, Has Been
Specified.
1000 Trial Surfaces Have Been Generated.
2 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of
Sliding Block Is 8.0

| Box No. | X-Left (ft) | Y-Left (ft) | X-Right (ft) | Y-Right (ft) | Height (ft) |
|---|---|---|---|---|---|
| 1 | 114.00 | 934.00 | 134.00 | 939.00 | 8.00 |
| 2 | 150.00 | 951.00 | 180.00 | 951.00 | 12.00 |

Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By GLE (Spencer's) Method (0-2) * *
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
The option of no water in the tension crack on
the last slice has been selected.
Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces
(if applicable) have been applied to the slice base(s)
on which they intersect.
Total Number of Trial Surfaces Evaluated = 1000
WARNING! The Factor of Safety Calculation for one or More Trial Surfaces
Did Not Converge in 20 Iterations.
Number of Trial Surfaces with Non-Converged FS = 34
Number of Trial Surfaces with Misleading FS = 2
Percentage of Trial Surfaces With Non-Valid FS Solutions
of the Total Evaluated = 3.6 %
Statistical Data On All Valid FS Values:
FS Max = 7.342 FS Min = 1.697 FS Ave = 2.871
Standard Deviation = 0.651 Coefficient of Variation = 22.66 %
((Simplified Janbu FS for Critical Surface = 1.572))
Failure Surface Specified By 5 Coordinate Points

| Point No. | X-Surf (ft) | Y-Surf (ft) |
|---|---|---|
| 1 | 115.09 | 938.95 |
| 2 | 117.89 | 937.37 |
| 3 | 153.59 | 948.76 |
| 4 | 158.94 | 954.71 |
| 5 | 160.88 | 958.00 |

*** FOS = 1.697 Theta (ki=1.0) = 19.00 ***
Lambda = 0.344
Individual data on the 10 slices

| Slice No. | Width (ft) | Weight (lbs) | Water Force Top (lbs) | Water Force Bot (lbs) | Tie Force Norm (lbs) | Tie Force Tan (lbs) | Earthquake Force Hor (lbs) | Earthquake Force Ver (lbs) | Surcharge Load (lbs) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 1.9 | 139.4 | 0.0 | 19.2 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 2 | 0.0 | 3.4 | 0.0 | 0.5 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 3 | 0.9 | 501.0 | 0.0 | 69.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 4 | 1.1 | 641.7 | 0.0 | 80.8 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 5 | 22.0 | 17913.9 | 0.0 | 2256.3 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 6 | 10.0 | 11788.1 | 0.0 | 1484.8 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 7 | 2.6 | 3192.9 | 0.0 | 402.2 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 8 | 4.0 | 3576.1 | 0.0 | 641.9 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 9 | 1.3 | 656.5 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 10 | 1.9 | 398.0 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |

Failure Surface Specified By 5 Coordinate Points

| Point No. | X-Surf (ft) | Y-Surf (ft) |
|---|---|---|
| 1 | 115.09 | 938.95 |
| 2 | 117.89 | 937.37 |
| 3 | 153.59 | 948.76 |
| 4 | 158.94 | 954.71 |

```
     5        160.88      958.00
***  FOS =      1.697   Theta (ki=1.0) =     19.00  ***
                    Lambda =    0.344
```

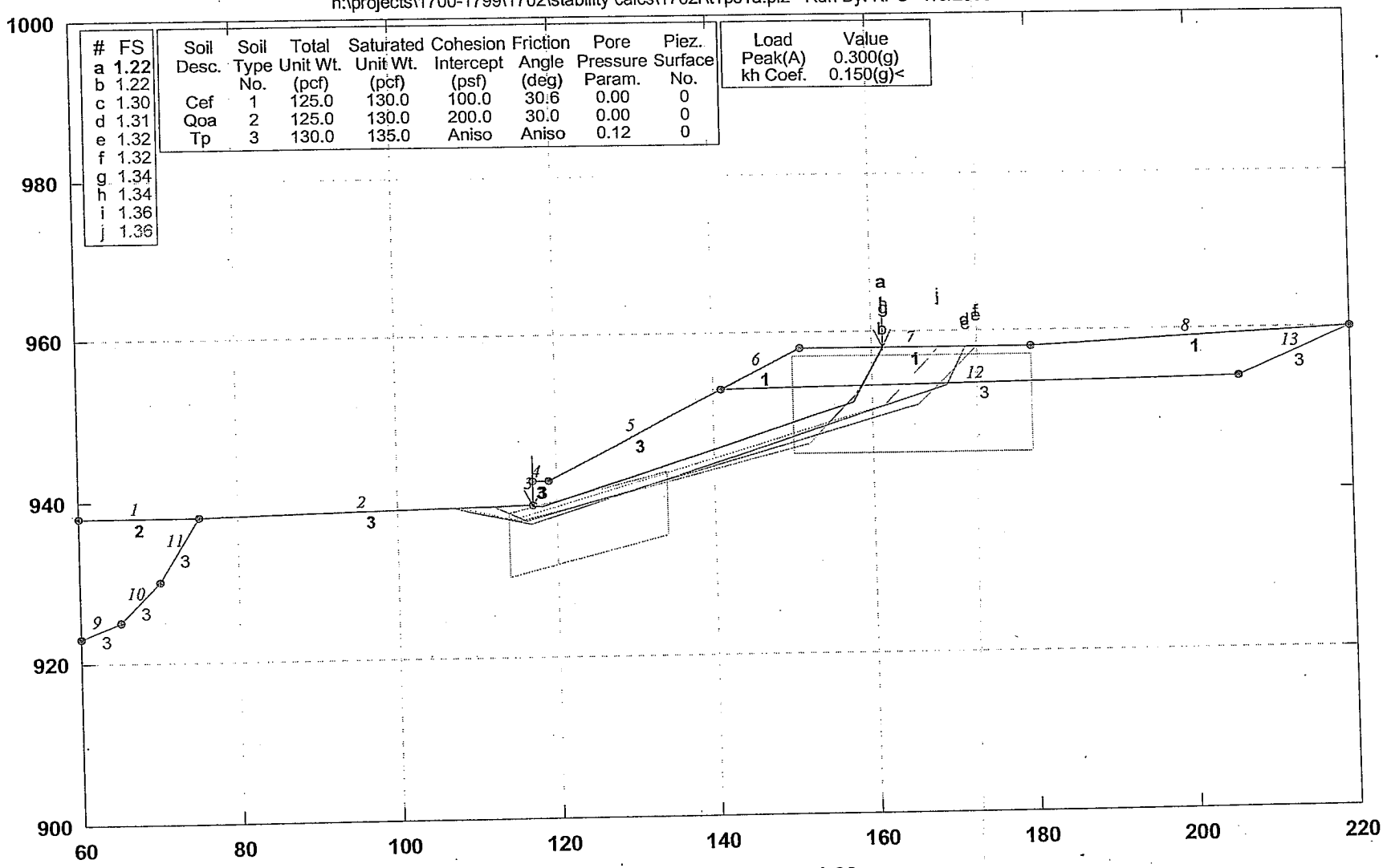
# TT 53108, 1-1'; pseudo; planar; daylighted bedding w/ Ru=0.12

n:\projects\1700-1799\1702\stability calcs\1702r\t1ps1a.pl2 Run By: KPC 7/9/2008 03:25PM

| # | FS |
|---|---|
| a | 1.22 |
| b | 1.22 |
| c | 1.30 |
| d | 1.31 |
| e | 1.32 |
| f | 1.32 |
| g | 1.34 |
| h | 1.34 |
| i | 1.36 |
| j | 1.36 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Piez. Surface No. |
|---|---|---|---|---|---|---|---|
| Cef | 1 | 125.0 | 130.0 | 100.0 | 30.6 | 0.00 | 0 |
| Qoa | 2 | 125.0 | 130.0 | 200.0 | 30.0 | 0.00 | 0 |
| Tp | 3 | 130.0 | 135.0 | Aniso | Aniso | 0.12 | 0 |

| Load | Value |
|---|---|
| Peak(A) | 0.300(g) |
| kh Coef. | 0.150(g)< |




GSTABL7 v.2 FSmin=1.22

Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2)

GSTABL7

Run No. 2

```
                    *** GSTABL7 ***
              ** GSTABL7 by Garry H. Gregory, P.E. **
   ** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **
              (All Rights Reserved-Unauthorized Use Prohibited)
*******************************************************************************
                    SLOPE STABILITY ANALYSIS SYSTEM
      Modified Bishop, Simplified Janbu, or GLE Method of Slices.
      (Includes Spencer & Morgenstern-Price Type Analysis)
      Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
      Nonlinear Undrained Shear Strength, Curved Phi Envelope,
      Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
      Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
*******************************************************************************
Analysis Run Date:          7/9/2008
Time of Run:                03:25PM
Run By:                     KPC
Input Data Filename:        N:\Projects\1700-1799\1702\Stability Calcs\1702R\t1ps1a.in
Output Filename:            N:\Projects\1700-1799\1702\Stability Calcs\1702R\t1ps1a.OUT
Unit System:                English
Plotted Output Filename:    N:\Projects\1700-1799\1702\Stabi Calcs\1702R\t1ps1a.PLT
PROBLEM DESCRIPTION:  TT 53108, 1-1'; pseudo; planar;
                      daylighted bedding w/ Ru=0.12

BOUNDARY COORDINATES
    8 Top   Boundaries
   13 Total Boundaries
Boundary     X-Left      Y-Left     X-Right     Y-Right     Soil Type
   No.         (ft)        (ft)        (ft)        (ft)     Below Bnd
    1         60.00      938.00       75.00      938.00         2
    2         75.00      938.00      117.00      939.00         3
    3        117.00      939.00      117.01      942.00         3
    4        117.01      942.00      119.00      942.00         3
    5        119.00      942.00      141.00      953.00         3
    6        141.00      953.00      151.00      958.00         -
    7        151.00      958.00      180.00      958.00         1
    8        180.00      958.00      220.00      960.00         1
    9         60.00      923.00       65.00      925.00         3
   10         65.00      925.00       70.00      930.00         3
   11         70.00      930.00       75.00      938.00         3
   12        141.00      953.00      206.00      954.00         3
   13        206.00      954.00      220.00      960.00         3
 User Specified Y-Origin =        900.00(ft)
 Default X-Plus Value = 0.00(ft)
 Default Y-Plus Value = 0.00(ft)
ISOTROPIC SOIL PARAMETERS
  3 Type(s) of Soil
 Soil  Total  Saturated  Cohesion  Friction   Pore    Pressure   Piez.
 Type Unit Wt. Unit Wt. Intercept   Angle   Pressure Constant Surface
  No.  (pcf)    (pcf)     (psf)     (deg)    Param.    (psf)     No.
   1   125.0    130.0     100.0     30.6     0.00      0.0       0
   2   125.0    130.0     200.0     30.0     0.00      0.0       0
   3   130.0    135.0     203.0     45.0     0.12      0.0       0
ANISOTROPIC STRENGTH PARAMETERS
     1 soil type(s)
 Soil Type  3 Is Anisotropic
 Number Of Direction Ranges Specified =  3
 Direction     Counterclockwise     Cohesion     Friction
   Range       Direction Limit     Intercept      Angle
    No.            (deg)             (psf)        (deg)
     1              14.0             203.00        45.00
     2              18.0             200.00        18.00
     3              90.0             203.00        45.00
 ANISOTROPIC SOIL NOTES:
    (1) An input value of 0.01 for C and/or Phi will cause Aniso
        C and/or Phi to be ignored in that range.
    (2) An input value of 0.02 for Phi will set both Phi and
        C equal to zero, with no water weight in the tension crack.
    (3) An input value of 0.03 for Phi will set both Phi and
```

C equal to zero, with water weight in the tension crack.
Specified Peak Ground Acceleration Coefficient (A) = 0.300(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Sliding Block Surfaces, Has Been
Specified.
1000 Trial Surfaces Have Been Generated.
2 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of
Sliding Block Is 8.0

| Box No. | X-Left (ft) | Y-Left (ft) | X-Right (ft) | Y-Right (ft) | Height (ft) |
|---|---|---|---|---|---|
| 1 | 114.00 | 934.00 | 134.00 | 939.00 | 8.00 |
| 2 | 150.00 | 951.00 | 180.00 | 951.00 | 12.00 |

Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By GLE (Spencer's) Method (0-2) * *
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
The option of no water in the tension crack on
the last slice has been selected.
Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces
(if applicable) have been applied to the slice base(s)
on which they intersect.
Total Number of Trial Surfaces Evaluated = 1000
WARNING! The Factor of Safety Calculation for one or More Trial Surfaces
Did Not Converge in 20 Iterations.
Number of Trial Surfaces with Non-Converged FS = 145
Number of Trial Surfaces with Misleading FS = 10
Percentage of Trial Surfaces With Non-Valid FS Solutions
of the Total Evaluated = 15.5 %
Statistical Data On All Valid FS Values:
FS Max = 6.485 FS Min = 1.215 FS Ave = 2.891
Standard Deviation = 0.667 Coefficient of Variation = 23.08 %
((Simplified Janbu FS for Critical Surface = 1.183))
Failure Surface Specified By 4 Coordinate Points

| Point No. | X-Surf (ft) | Y-Surf (ft) |
|---|---|---|
| 1 | 117.09 | 938.89 |
| 2 | 118.10 | 938.71 |
| 3 | 157.60 | 951.13 |
| 4 | 161.35 | 958.00 |

*** FOS = 1.215 Theta (ki=1.0) = 18.53 ***
Lambda = 0.335
Individual data on the 8 slices

| Slice No. | Width (ft) | Weight (lbs) | Water Force Top (lbs) | Water Force Bot (lbs) | Tie Force Norm (lbs) | Tie Force Tan (lbs) | Earthquake Force Hor (lbs) | Earthquake Force Ver (lbs) | Surcharge Load (lbs) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.0 | 2.1 | 0.0 | 0.3 | 0. | 0. | 0.3 | 0.0 | 0.0 |
| 2 | 1.1 | 454.3 | 0.0 | 55.2 | 0. | 0. | 68.1 | 0.0 | 0.0 |
| 3 | 0.9 | 368.7 | 0.0 | 46.4 | 0. | 0. | 55.3 | 0.0 | 0.0 |
| 4 | 22.0 | 14450.1 | 0.0 | 1817.7 | 0. | 0. | 2167.5 | 0.0 | 0.0 |
| 5 | 10.0 | 10307.5 | 0.0 | 1296.6 | 0. | 0. | 1546.1 | 0.0 | 0.0 |
| 6 | 6.6 | 6631.3 | 0.0 | 834.2 | 0. | 0. | 994.7 | 0.0 | 0.0 |
| 7 | 1.2 | 855.5 | 0.0 | 214.5 | 0. | 0. | 128.3 | 0.0 | 0.0 |
| 8 | 2.6 | 761.3 | 0.0 | 0.0 | 0. | 0. | 114.2 | 0.0 | 0.0 |

Failure Surface Specified By 4 Coordinate Points

| Point No. | X-Surf (ft) | Y-Surf (ft) |
|---|---|---|
| 1 | 117.00 | 938.89 |
| 2 | 118.10 | 938.71 |
| 3 | 157.60 | 951.13 |

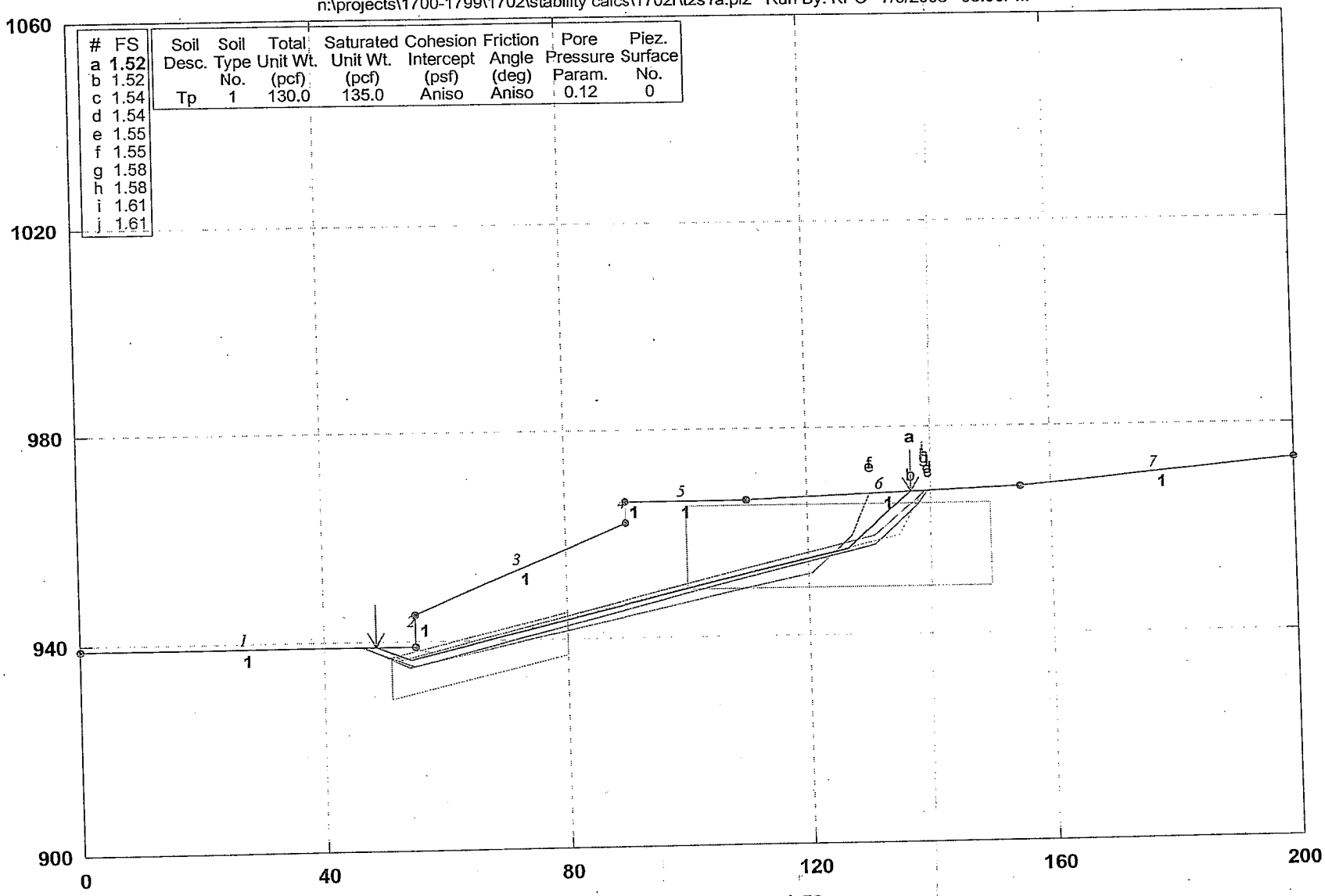
```
     4          161.35       958.00
***  FOS =        1.215    Theta (ki=1.0) =     18.53  ***
                        Lambda =    0.335
```

# TT 53108, 2-2'; static; planar; daylighted bedding w/ Ru=0.12

n:\projects\1700-1799\1702\stability calcs\1702r\t2s1a.pl2 Run By: KPC 7/9/2008 03:06PM

| # | FS |
|---|---|
| a | 1.52 |
| b | 1.52 |
| c | 1.54 |
| d | 1.54 |
| e | 1.55 |
| f | 1.55 |
| g | 1.58 |
| h | 1.58 |
| i | 1.61 |
| j | 1.61 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Piez. Surface No. |
|---|---|---|---|---|---|---|---|
| Tp | 1 | 130.0 | 135.0 | Aniso | Aniso | 0.12 | 0 |




GSTABL7 v.2 FSmin=1.52

Safety Factors Are Calculated By GLE (Spencer's) Method (0-2)

GSTABL7

Run No. 3

```
                    *** GSTABL7 ***
              ** GSTABL7 by Garry H. Gregory, P.E. **
   ** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **
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*******************************************************************************
                    SLOPE STABILITY ANALYSIS SYSTEM
      Modified Bishop, Simplified Janbu, or GLE Method of Slices.
      (Includes Spencer & Morgenstern-Price Type Analysis)
      Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
      Nonlinear Undrained Shear Strength, Curved Phi Envelope,
      Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
      Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
*******************************************************************************
Analysis Run Date:          7/9/2008
Time of Run:                03:06PM
Run By:                     KPC
Input Data Filename:        N:\Projects\1700-1799\1702\Stability Calcs\1702R\t2s1a.in
Output Filename:            N:\Projects\1700-1799\1702\Stability Calcs\1702R\t2s1a.OUT
Unit System:                English
Plotted Output Filename:    N:\Projects\1700-1799\1702\Stabi Calcs\1702R\t2s1a.PLT
PROBLEM DESCRIPTION:  TT 53108, 2-2'; static; planar;
                      daylighted bedding w/ Ru=0.12

BOUNDARY COORDINATES
    7 Top   Boundaries
    7 Total Boundaries
Boundary     X-Left      Y-Left     X-Right     Y-Right     Soil Type
   No.         (ft)        (ft)        (ft)        (ft)     Below Bnd
    1          0.00      939.00       55.00      939.00         1
    2         55.00      939.00       55.01      945.00         1
    3         55.01      945.00       90.00      962.00         1
    4         90.00      962.00       90.01      966.00         1
    5         90.01      966.00      110.00      966.00         1
    6        110.00      966.00      155.00      968.00         1
    7        155.00      968.00      200.00      973.00         1
User Specified Y-Origin =        900.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)
ISOTROPIC SOIL PARAMETERS
  1 Type(s) of Soil
Soil  Total  Saturated  Cohesion  Friction   Pore    Pressure   Piez.
Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant Surface
 No.   (pcf)    (pcf)     (psf)    (deg)   Param.    (psf)     No.
  1   130.0    135.0     185.0     31.0    0.12       0.0       0
ANISOTROPIC STRENGTH PARAMETERS
    1 soil type(s)
 Soil Type  1 Is Anisotropic
 Number Of Direction Ranges Specified =  3
 Direction     Counterclockwise     Cohesion      Friction
   Range       Direction Limit     Intercept       Angle
    No.            (deg)             (psf)         (deg)
     1              13.5             185.00         31.00
     2              16.5             200.00         18.00
     3              90.0             185.00         31.00
 ANISOTROPIC SOIL NOTES:
    (1) An input value of 0.01 for C and/or Phi will cause Aniso
        C and/or Phi to be ignored in that range.
    (2) An input value of 0.02 for Phi will set both Phi and
        C equal to zero, with no water weight in the tension crack.
    (3) An input value of 0.03 for Phi will set both Phi and
        C equal to zero, with water weight in the tension crack.
 A Critical Failure Surface Searching Method, Using A Random
 Technique For Generating Sliding Block Surfaces, Has Been
 Specified.
 1000 Trial Surfaces Have Been Generated.
 2 Boxes Specified For Generation Of Central Block Base
 Length Of Line Segments For Active And Passive Portions Of
 Sliding Block Is  10.0
```

| Box No. | X-Left (ft) | Y-Left (ft) | X-Right (ft) | Y-Right (ft) | Height (ft) |
|---|---|---|---|---|---|
| 1 | 51.00 | 933.00 | 80.00 | 941.00 | 8.00 |
| 2 | 100.00 | 957.00 | 150.00 | 957.00 | 16.00 |

Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By GLE (Spencer's) Method (0-2) * *
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
The option of no water in the tension crack on
the last slice has been selected.
Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces
(if applicable) have been applied to the slice base(s)
on which they intersect.
Total Number of Trial Surfaces Evaluated = 1000
WARNING! The Factor of Safety Calculation for one or More Trial Surfaces
Did Not Converge in 20 Iterations.
Number of Trial Surfaces with Non-Converged FS = 21
Number of Trial Surfaces with Misleading FS = 2
Percentage of Trial Surfaces With Non-Valid FS Solutions
of the Total Evaluated = 2.3 %
Statistical Data On All Valid FS Values:
FS Max = 6.622 FS Min = 1.516 FS Ave = 2.738
Standard Deviation = 0.758 Coefficient of Variation = 27.70 %
((Simplified Janbu FS for Critical Surface = 1.428))

Failure Surface Specified By 5 Coordinate Points

| Point No. | X-Surf (ft) | Y-Surf (ft) |
|---|---|---|
| 1 | 48.52 | 939.00 |
| 2 | 54.23 | 936.41 |
| 3 | 126.45 | 956.62 |
| 4 | 133.52 | 963.70 |
| 5 | 137.02 | 967.20 |

*** FOS = 1.516 Theta (ki=1.0) = 15.36 ***
Lambda = 0.275

Individual data on the 9 slices

| Slice No. | Width (ft) | Weight (lbs) | Water Force Top (lbs) | Water Force Bot (lbs) | Tie Force Norm (lbs) | Tie Force Tan (lbs) | Earthquake Force Hor (lbs) | Earthquake Force Ver (lbs) | Surcharge Load (lbs) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 5.7 | 961.3 | 0.0 | 126.7 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 2 | 0.8 | 247.2 | 0.0 | 30.8 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 3 | 0.0 | 7.0 | 0.0 | 0.9 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 4 | 35.0 | 54470.0 | 0.0 | 6787.6 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 5 | 0.0 | 22.9 | 0.0 | 2.8 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 6 | 20.0 | 43600.2 | 0.0 | 5433.1 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 7 | 16.4 | 25754.5 | 0.0 | 3209.3 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 8 | 7.1 | 6184.6 | 0.0 | 1049.6 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 9 | 3.5 | 762.6 | 0.0 | 129.5 | 0. | 0. | 0.0 | 0.0 | 0.0 |

Failure Surface Specified By 5 Coordinate Points

| Point No. | X-Surf (ft) | Y-Surf (ft) |
|---|---|---|
| 1 | 48.52 | 939.00 |
| 2 | 54.23 | 936.41 |
| 3 | 126.45 | 956.62 |
| 4 | 133.52 | 963.70 |
| 5 | 137.02 | 967.20 |

*** FOS = 1.516 Theta (ki=1.0) = 15.36 ***
Lambda = 0.275

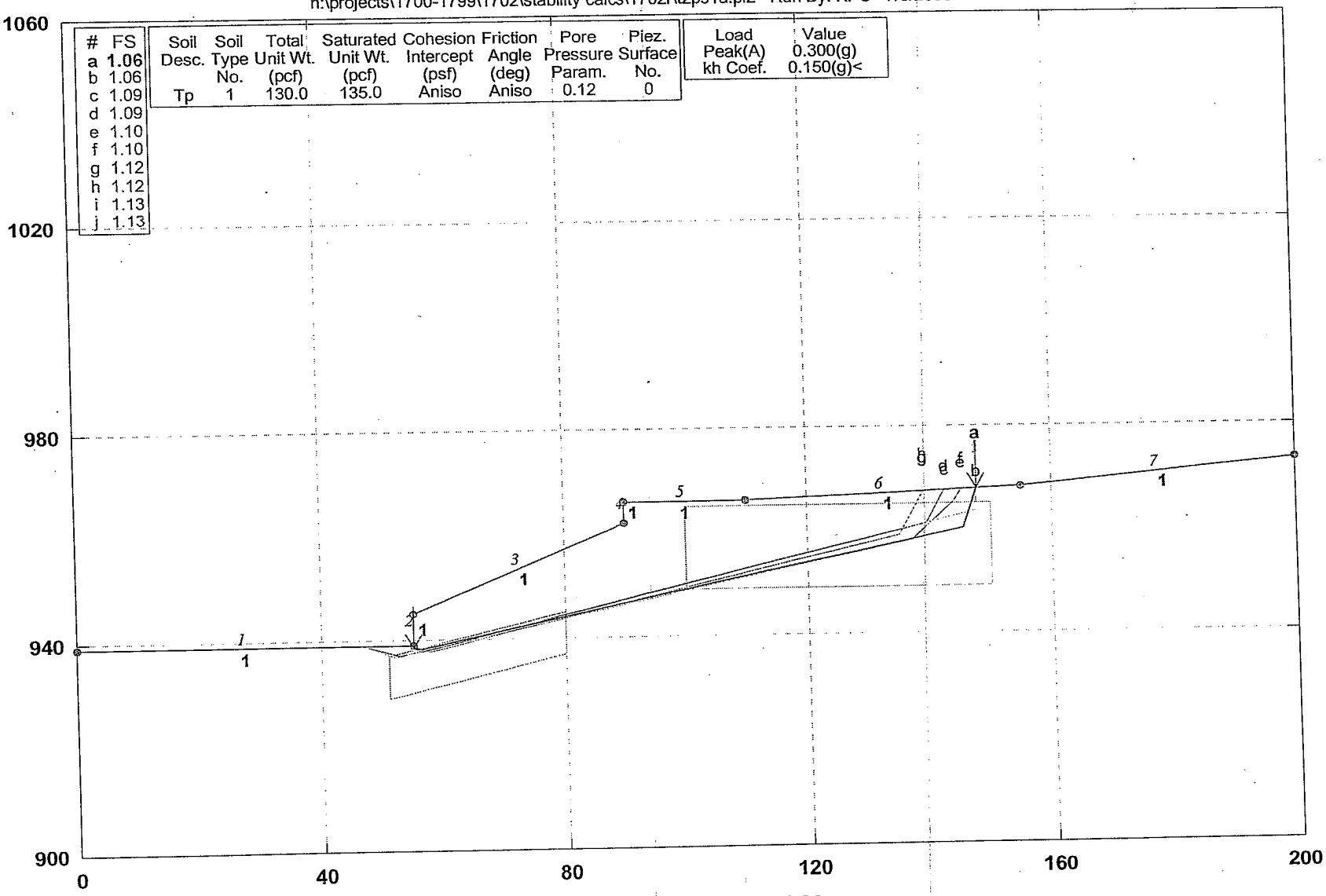
# TT 53108, 2-2'; pseudo; planar; daylighted bedding w/ Ru=0.12

n:\projects\1700-1799\1702\stability calcs\1702r\t2ps1a.pl2 Run By: KPC 7/9/2008 03:07PM

| # | FS |
|---|---|
| a | 1.06 |
| b | 1.06 |
| c | 1.09 |
| d | 1.09 |
| e | 1.10 |
| f | 1.10 |
| g | 1.12 |
| h | 1.12 |
| i | 1.13 |
| j | 1.13 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Piez. Surface No. |
|---|---|---|---|---|---|---|---|
| Tp | 1 | 130.0 | 135.0 | Aniso | Aniso | 0.12 | 0 |

| Load | Value |
|---|---|
| Peak(A) | 0.300(g) |
| kh Coef. | 0.150(g)< |




GSTABL7 v.2 FSmin=1.06

Safety Factors Are Calculated By GLE (Spencer's) Method (0-2)

GSTABL7

Run No. 4

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **
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SLOPE STABILITY ANALYSIS SYSTEM
Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

Analysis Run Date: 7/9/2008
Time of Run: 03:07PM
Run By: KPC
Input Data Filename: N:\Projects\1700-1799\1702\Stability Calcs\1702R\t2psla.in
Output Filename: N:\Projects\1700-1799\1702\Stability Calcs\1702R\t2psla.OUT
Unit System: English
Plotted Output Filename: N:\Projects\1700-1799\1702\Stabi Calcs\1702R\t2psla.PLT
PROBLEM DESCRIPTION: TR 53108, 2-2'; pseudo; planar;
daylighted bedding w/ Ru=0.12

BOUNDARY COORDINATES
7 Top Boundaries
7 Total Boundaries

| Boundary No. | X-Left (ft) | Y-Left (ft) | X-Right (ft) | Y-Right (ft) | Soil Type Below Bnd |
|---|---|---|---|---|---|
| 1 | 0.00 | 939.00 | 55.00 | 939.00 | 1 |
| 2 | 55.00 | 939.00 | 55.01 | 945.00 | 1 |
| 3 | 55.01 | 945.00 | 90.00 | 962.00 | 1 |
| 4 | 90.00 | 962.00 | 90.01 | 966.00 | 1 |
| 5 | 90.01 | 966.00 | 110.00 | 966.00 | 1 |
| 6 | 110.00 | 966.00 | 155.00 | 968.00 | 1 |
| 7 | 155.00 | 968.00 | 200.00 | 973.00 | 1 |

User Specified Y-Origin = 900.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
1 Type(s) of Soil

| Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No. |
|---|---|---|---|---|---|---|---|
| 1 | 130.0 | 135.0 | 203.0 | 45.0 | 0.12 | 0.0 | 0 |

ANISOTROPIC STRENGTH PARAMETERS
1 soil type(s)
Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

| Direction Range No. | Counterclockwise Direction Limit (deg) | Cohesion Intercept (psf) | Friction Angle (deg) |
|---|---|---|---|
| 1 | 13.5 | 203.00 | 45.00 |
| 2 | 16.5 | 200.00 | 18.00 |
| 3 | 90.0 | 203.00 | 45.00 |

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.
Specified Peak Ground Acceleration Coefficient (A) = 0.300(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.

1000 Trial Surfaces Have Been Generated.
2 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of
Sliding Block Is 10.0

| Box No. | X-Left (ft) | Y-Left (ft) | X-Right (ft) | Y-Right (ft) | Height (ft) |
|---|---|---|---|---|---|
| 1 | 51.00 | 933.00 | 80.00 | 941.00 | 8.00 |
| 2 | 100.00 | 957.00 | 150.00 | 957.00 | 16.00 |

Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By GLE (Spencer's) Method (0-2) * *
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
The option of no water in the tension crack on
the last slice has been selected.
Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces
(if applicable) have been applied to the slice base(s)
on which they intersect.
Total Number of Trial Surfaces Evaluated = 1000
WARNING! The Factor of Safety Calculation for one or More Trial Surfaces
Did Not Converge in 20 Iterations.
Number of Trial Surfaces with Non-Converged FS = 163
Number of Trial Surfaces with Misleading FS = 7
Percentage of Trial Surfaces With Non-Valid FS Solutions
of the Total Evaluated = 17.0 %
Statistical Data On All Valid FS Values:
FS Max = 5.922 FS Min = 1.064 FS Ave = 2.738
Standard Deviation = 0.685 Coefficient of Variation = 25.03 %
((Simplified Janbu FS for Critical Surface = 1.018))
Failure Surface Specified By 4 Coordinate Points

| Point No. | X-Surf (ft) | Y-Surf (ft) |
|---|---|---|
| 1 | 55.00 | 938.53 |
| 2 | 56.27 | 936.29 |
| 3 | 145.59 | 960.25 |
| 4 | 147.77 | 967.68 |

*** FOS = 1.064 Theta (ki=1.0) = 13.00 ***
Lambda = 0.231
Individual data on the 7 slices

| Slice No. | Width (ft) | Weight (lbs) | Water Force Top (lbs) | Water Force Bot (lbs) | Tie Force Norm (lbs) | Tie Force Tan (lbs) | Earthquake Force Hor (lbs) | Earthquake Force Ver (lbs) | Surcharge Load (lbs) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.0 | 4.5 | 0.0 | 0.6 | 0. | 0. | 0.7 | 0.0 | 0.0 |
| 2 | 1.3 | 1132.9 | 0.0 | 138.4 | 0. | 0. | 169.9 | 0.0 | 0.0 |
| 3 | 33.7 | 49869.1 | 0.0 | 6162.6 | 0. | 0. | 7480.4 | 0.0 | 0.0 |
| 4 | 0.0 | 22.7 | 0.0 | 2.8 | 0. | 0. | 3.4 | 0.0 | 0.0 |
| 5 | 20.0 | 44074.6 | 0.0 | 5446.5 | 0. | 0. | 6611.2 | 0.0 | 0.0 |
| 6 | 35.6 | 50513.1 | 0.0 | 6242.1 | 0. | 0. | 7577.0 | 0.0 | 0.0 |
| 7 | 2.2 | 1037.1 | 0.0 | 442.8 | 0. | 0. | 155.6 | 0.0 | 0.0 |

Failure Surface Specified By 4 Coordinate Points

| Point No. | X-Surf (ft) | Y-Surf (ft) |
|---|---|---|
| 1 | 55.00 | 938.53 |
| 2 | 56.27 | 938.29 |
| 3 | 145.59 | 960.25 |
| 4 | 147.77 | 967.68 |

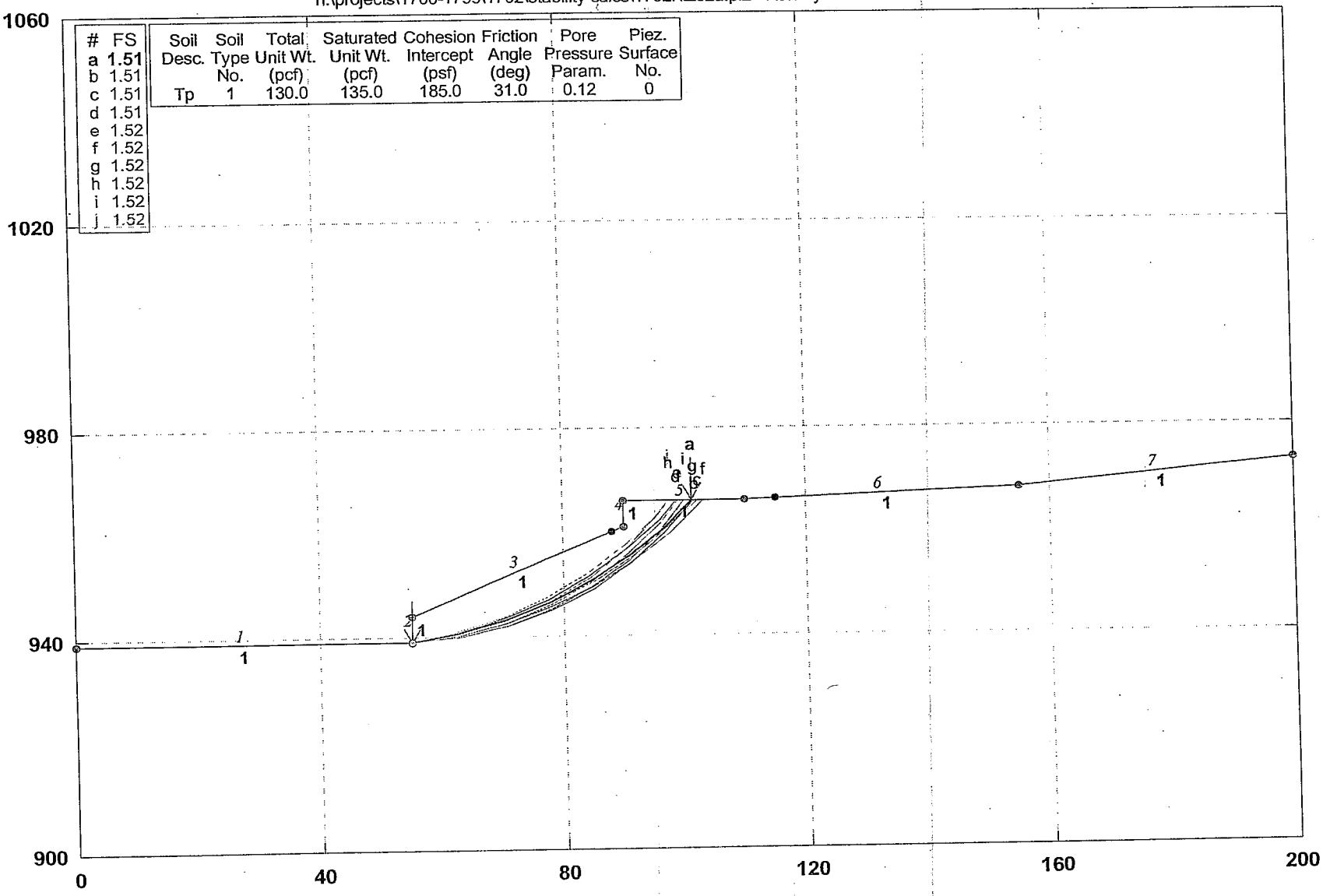
*** FOS = 1.064 Theta (ki=1.0) = 13.00 ***
Lambda = 0.231

# TT 53108, 2-2'; static; circular; daylighted bedding w/ Ru=0.12

n:\projects\1700-1799\1702\stability calcs\1702r\t2s2a.pl2 Run By: KPC 7/8/2008 09:24AM

| # | FS |
|---|---|
| a | 1.51 |
| b | 1.51 |
| c | 1.51 |
| d | 1.51 |
| e | 1.52 |
| f | 1.52 |
| g | 1.52 |
| h | 1.52 |
| i | 1.52 |
| j | 1.52 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Piez. Surface No. |
|---|---|---|---|---|---|---|---|
| Tp | 1 | 130.0 | 135.0 | 185.0 | 31.0 | 0.12 | 0 |




GSTABL7 v.2 FSmin=1.51

Safety Factors Are Calculated By GLE (Spencer's) Method (0-2)

GSTABL7

Run No. 5

```
                    *** GSTABL7 ***
                ** GSTABL7 by Garry H. Gregory, P.E. **
  ** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **
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*******************************************************************************
                    SLOPE STABILITY ANALYSIS SYSTEM
      Modified Bishop, Simplified Janbu, or GLE Method of Slices.
      (Includes Spencer & Morgenstern-Price Type Analysis)
      Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
      Nonlinear Undrained Shear Strength, Curved Phi Envelope,
      Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
      Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
*******************************************************************************
Analysis Run Date:          7/8/2008
Time of Run:                09:24AM
Run By:                     KPC
Input Data Filename:        N:\Projects\1700-1799\1702\Stability Calcs\1702R\t2s2a.in
Output Filename:            N:\Projects\1700-1799\1702\Stability Calcs\1702R\t2s2a.OUT
Unit System:                English
Plotted Output Filename:    N:\Projects\1700-1799\1702\Stabi Calcs\1702R\t2s2a.PLT
PROBLEM DESCRIPTION:  TT 53108, 2-2'; static; circular;
                      daylighted bedding w/ Ru=0.12

BOUNDARY COORDINATES
    7 Top   Boundaries
    7 Total Boundaries
Boundary      X-Left      Y-Left     X-Right     Y-Right     Soil Type
   No.         (ft)        (ft)        (ft)        (ft)     Below Bnd
    1          0.00      939.00       55.00      939.00         1
    2         55.00      939.00       55.01      944.00         1
    3         55.01      944.00       90.00      961.00         1
    4         90.00      961.00       90.01      966.00         1
    5         90.01      966.00      110.00      966.00         1
    6        110.00      966.00      155.00      968.00         1
    7        155.00      968.00      200.00      973.00         1
User Specified Y-Origin =        900.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)
ISOTROPIC SOIL PARAMETERS
  1 Type(s) of Soil
Soil  Total  Saturated  Cohesion Friction   Pore   Pressure   Piez.
Type Unit Wt. Unit Wt. Intercept  Angle  Pressure Constant Surface
 No.  (pcf)    (pcf)     (psf)    (deg)   Param.    (psf)     No.
  1   130.0    135.0     185.0    31.0    0.12       0.0       0
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
 500 Trial Surfaces Have Been Generated.
 500 Surface(s) Initiate(s) From Each Of     1 Points Equally Spaced
Along The Ground Surface Between  X =  55.00(ft)
                              and X =  55.00(ft)
Each Surface Terminates Between   X =  80.00(ft)
                              and X = 115.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is  Y =       0.00(ft)
 8.00(ft) Line Segments Define Each Trial Failure Surface.
Restrictions Have Been Imposed Upon The Angle Of Initiation.
The Angle Has Been Restricted Between The Angles Of -25.0
And  15.0 deg.

Following Are Displayed The Ten Most Critical Of The Trial
      Failure Surfaces Evaluated. They Are
      Ordered - Most Critical First.
      * * Safety Factors Are Calculated By GLE (Spencer's) Method (0-2) * *
      Selected Ki function = Bi-linear
      Selected Lambda Coefficient =  1.00
      The option of no water in the tension crack on
      the last slice has been selected.
      Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces
```

(if applicable) have been applied to the slice base(s)
on which they intersect.
Total Number of Trial Surfaces Evaluated = 500
WARNING! The Factor of Safety Calculation for one or More Trial Surfaces
Did Not Converge in 20 Iterations.
Number of Trial Surfaces with Non-Converged FS = 1
Number of Trial Surfaces with Misleading FS = 1
Percentage of Trial Surfaces With Non-Valid FS Solutions
of the Total Evaluated = 0.4 %
Statistical Data On All Valid FS Values:
FS Max = 2.363 FS Min = 1.507 FS Ave = 1.962
Standard Deviation = 0.260 Coefficient of Variation = 13.26 %
((Modified Bishop FS for Critical Surface = 1.508))
Failure Surface Specified By 8 Coordinate Points

| Point No. | X-Surf (ft) | Y-Surf (ft) |
|---|---|---|
| 1 | 55.00 | 939.00 |
| 2 | 62.82 | 940.70 |
| 3 | 70.41 | 943.22 |
| 4 | 77.69 | 946.54 |
| 5 | 84.57 | 950.62 |
| 6 | 90.97 | 955.42 |
| 7 | 96.82 | 960.87 |
| 8 | 101.26 | 966.00 |

Circle Center At X = 43.25 ; Y = 1012.25 ; and Radius = 74.18
*** FOS = 1.507 Theta (ki=1.0) = 27.07 ***
Lambda = 0.511
Individual data on the 10 slices

| Slice No. | Width (ft) | Weight (lbs) | Water Force Top (lbs) | Water Force Bot (lbs) | Tie Force Norm (lbs) | Tie Force Tan (lbs) | Earthquake Force Hor (lbs) | Earthquake Force Ver (lbs) | Surcharge Load (lbs) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.0 | 3.2 | 0.0 | 0.4 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 2 | 7.8 | 6139.5 | 0.0 | 753.9 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 3 | 7.6 | 7581.0 | 0.0 | 958.6 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 4 | 7.3 | 7920.0 | 0.0 | 1044.7 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 5 | 6.9 | 7251.8 | 0.0 | 1011.9 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 6 | 5.4 | 4959.8 | 0.0 | 743.6 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 7 | 0.0 | 11.5 | 0.0 | 1.7 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 8 | 1.0 | 1366.1 | 0.0 | 204.8 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 9 | 5.9 | 5974.9 | 0.0 | 980.2 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 10 | 4.4 | 1477.7 | 0.0 | 271.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |

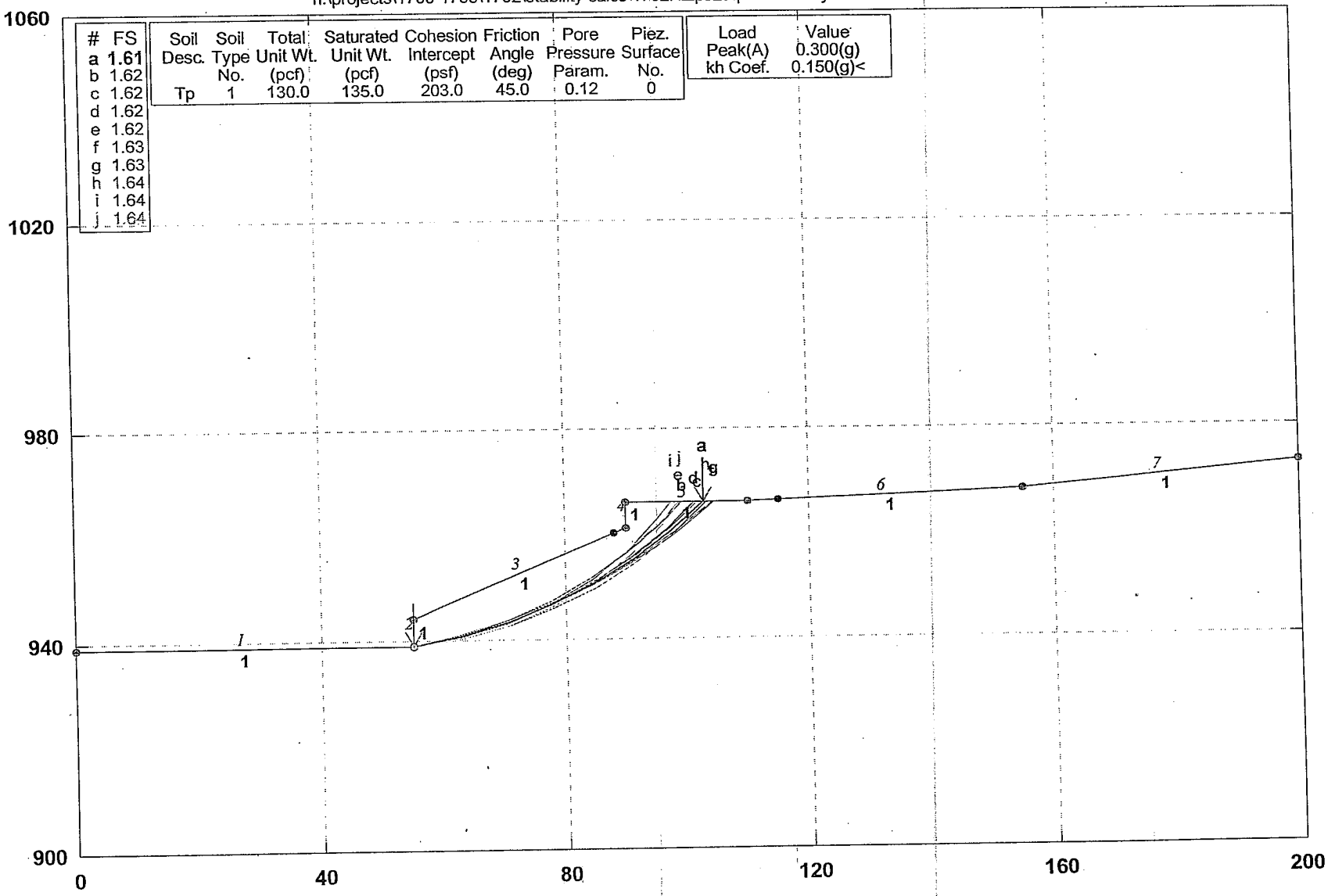
# TT 53108, 2-2'; cut slope; pseudo; circular; Ru=0.12

n:\projects\1700-1799\1702\stability calcs\1702r\t2ps2a.pl2 Run By: KPC 7/8/2008 09:41AM

| # | FS |
|---|---|
| a | 1.61 |
| b | 1.62 |
| c | 1.62 |
| d | 1.62 |
| e | 1.62 |
| f | 1.63 |
| g | 1.63 |
| h | 1.64 |
| i | 1.64 |
| j | 1.64 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Piez. Surface No. |
|---|---|---|---|---|---|---|---|
| Tp | 1 | 130.0 | 135.0 | 203.0 | 45.0 | 0.12 | 0 |

| Load | Value |
|---|---|
| Peak(A) | 0.300(g) |
| kh Coef. | 0.150(g)< |




GSTABL7 v.2 FSmin=1.61

Safety Factors Are Calculated By GLE (Spencer's) Method (0-2)

GSTABL7

RUN No. 6

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                    *** GSTABL7 ***
                ** GSTABL7 by Garry H. Gregory, P.E. **
   ** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **
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*******************************************************************************
                    SLOPE STABILITY ANALYSIS SYSTEM
       Modified Bishop, Simplified Janbu, or GLE Method of Slices.
       (Includes Spencer & Morgenstern-Price Type Analysis)
       Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
       Nonlinear Undrained Shear Strength, Curved Phi Envelope,
       Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
       Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
*******************************************************************************
Analysis Run Date:          7/8/2008
Time of Run:                09:41AM
Run By:                     KPC
Input Data Filename:        N:\Projects\1700-1799\1702\Stability Calcs\1702R\t2ps2a.in
Output Filename:            N:\Projects\1700-1799\1702\Stability Calcs\1702R\t2ps2a.OUT
Unit System:                English
Plotted Output Filename:    N:\Projects\1700-1799\1702\Stabi Calcs\1702R\t2ps2a.PLT
PROBLEM DESCRIPTION:  TT 53108, 2-2'; cut slope; pseudo;
                      circular; Ru=0.12

BOUNDARY COORDINATES
    7 Top   Boundaries
    7 Total Boundaries
Boundary     X-Left      Y-Left     X-Right     Y-Right     Soil Type
   No.         (ft)        (ft)        (ft)        (ft)     Below Bnd
    1         0.00      939.00       55.00      939.00         1
    2        55.00      939.00       55.01      944.00         1
    3        55.01      944.00       90.00      961.00         1
    4        90.00      961.00       90.01      966.00         1
    5        90.01      966.00      110.00      966.00         1
    6       110.00      966.00      155.00      968.00         1
    7       155.00      968.00      200.00      973.00         1
User Specified Y-Origin =        900.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)
ISOTROPIC SOIL PARAMETERS
 1 Type(s) of Soil
Soil  Total  Saturated  Cohesion Friction   Pore   Pressure   Piez.
Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant Surface
 No.  (pcf)    (pcf)     (psf)     (deg)    Param.    (psf)     No.
  1   130.0    135.0     203.0     45.0     0.12       0.0      0
Specified Peak Ground Acceleration Coefficient (A) =   0.300(g)
Specified Horizontal Earthquake Coefficient (kh) =   0.150(g)
Specified Vertical Earthquake Coefficient (kv) =   0.000(g)
Specified Seismic Pore-Pressure Factor =   0.000
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
 500 Trial Surfaces Have Been Generated.
 500 Surface(s) Initiate(s) From Each Of     1 Points Equally Spaced
Along The Ground Surface Between  X =  55.00(ft)
                             and  X =  55.00(ft)
Each Surface Terminates Between   X =  88.00(ft)
                             and  X = 115.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is  Y =       0.00(ft)
 8.00(ft) Line Segments Define Each Trial Failure Surface.
Restrictions Have Been Imposed Upon The Angle Of Initiation.
The Angle Has Been Restricted Between The Angles Of -25.0
And  15.0 deg.
Factor Of Safety Calculation By GLE (Spencer's) Method of Slices
Has Gone Through 20 Iterations
 Theta       FOS         FOS
 (deg)     (Moment)    (Force)
(ki=1.0)   (Equil.)    (Equil.)   Lambda
 13.00       1.772       1.592     0.231
```

| | | | |
|---|---|---|---|
| 19.50 | 1.730 | 1.605 | 0.354 |
| 39.02 | 2.159 | 1.658 | 0.810 |
| 10.90 | 1.781 | 1.588 | 0.193 |
| 0.00 | 1.809 | 1.569 | 0.000 |
| 73.73 | 1.812 | 1.809 | 3.426 |
| 75.02 | 1.354 | 0.692 | 3.737 |
| 73.72 | 1.294 | 1.295 | 3.424 |
| 73.29 | -0.769 | 1.198 | 3.332 |
| 73.86 | 1.319 | 1.331 | 3.457 |
| 73.87 | 1.098 | 1.726 | 3.458 |
| 13.17 | 1.771 | 1.593 | 0.234 |
| 10.84 | 1.781 | 1.588 | 0.192 |
| 52.56 | 2.334 | 1.725 | 1.306 |
| 0.00 | 1.809 | 1.569 | 0.000 |
| 0.00 | 1.809 | 1.569 | 0.000 |
| 0.00 | 1.809 | 1.564 | 0.000 |
| 0.00 | 1.809 | 1.564 | 0.000 |
| 0.00 | 1.809 | 1.564 | 0.000 |
| 0.00 | 1.809 | 1.564 | 0.000 |

The Trial Failure Surface In Question Is Defined
By The Following 8 Coordinate Points

| Point No. | X-Surf (ft) | Y-Surf (ft) |
|---|---|---|
| 1 | 55.00 | 939.00 |
| 2 | 62.83 | 940.66 |
| 3 | 70.44 | 943.13 |
| 4 | 77.75 | 946.38 |
| 5 | 84.68 | 950.37 |
| 6 | 91.15 | 955.07 |
| 7 | 97.10 | 960.41 |
| 8 | 102.14 | 966.00 |

Factor Of Safety Calculation By GLE (Spencer's) Method of Slices
Has Gone Through 20 Iterations

| Theta (deg) (ki=1.0) | FOS (Moment) (Equil.) | FOS (Force) (Equil.) | Lambda |
|---|---|---|---|
| 13.00 | 1.742 | 1.594 | 0.231 |
| 19.50 | 1.714 | 1.606 | 0.354 |
| 43.37 | 2.078 | 1.668 | 0.945 |
| 8.10 | 1.755 | 1.586 | 0.142 |
| 0.00 | 1.769 | 1.573 | 0.000 |
| 77.37 | 1.637 | 1.655 | 4.464 |
| 68.81 | 2.214 | 1.885 | 2.580 |
| 76.79 | 1.745 | 1.811 | 4.259 |
| 75.01 | 2.289 | 2.069 | 3.735 |
| 76.24 | 1.264 | 1.263 | 4.083 |
| 76.25 | 0.042 | 1.048 | 4.087 |
| 17.61 | 1.724 | 1.603 | 0.317 |
| 6.47 | 1.758 | 1.583 | 0.113 |
| 54.64 | 2.393 | 1.723 | 1.409 |
| 0.00 | 1.769 | 1.573 | 0.000 |
| 0.00 | 1.769 | 1.573 | 0.000 |
| 40.63 | 1.635 | 1.659 | 0.858 |
| 34.74 | 1.473 | 1.641 | 0.693 |
| 43.90 | 1.809 | 1.670 | 0.962 |
| 38.37 | 1.125 | 1.651 | 0.792 |

The Trial Failure Surface In Question Is Defined
By The Following 8 Coordinate Points

| Point No. | X-Surf (ft) | Y-Surf (ft) |
|---|---|---|
| 1 | 55.00 | 939.00 |
| 2 | 62.76 | 940.95 |
| 3 | 70.24 | 943.78 |
| 4 | 77.34 | 947.46 |
| 5 | 83.97 | 951.94 |
| 6 | 90.03 | 957.17 |
| 7 | 95.45 | 963.05 |

8 97.58 966.00

Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By GLE (Spencer's) Method (0-2) * *
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
The option of no water in the tension crack on
the last slice has been selected.
Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces
(if applicable) have been applied to the slice base(s)
on which they intersect.
Total Number of Trial Surfaces Evaluated = 500
WARNING! The Factor of Safety Calculation for one or More Trial Surfaces
Did Not Converge in 20 Iterations.
Number of Trial Surfaces with Non-Converged FS = 2
Percentage of Trial Surfaces With Non-Valid FS Solutions
of the Total Evaluated = 0.4 %
Statistical Data On All Valid FS Values:
FS Max = 2.463 FS Min = 1.608 FS Ave = 2.094
Standard Deviation = 0.258 Coefficient of Variation = 12.31 %
((Modified Bishop FS for Critical Surface = 1.639))
Failure Surface Specified By 8 Coordinate Points

| Point No. | X-Surf (ft) | Y-Surf (ft) |
|---|---|---|
| 1 | 55.00 | 939.00 |
| 2 | 62.81 | 940.73 |
| 3 | 70.41 | 943.22 |
| 4 | 77.73 | 946.46 |
| 5 | 84.69 | 950.41 |
| 6 | 91.22 | 955.02 |
| 7 | 97.26 | 960.27 |
| 8 | 102.68 | 966.00 |

Circle Center At X = 41.54 ; Y = 1018.37 ; and Radius = 80.50
*** FOS = 1.608 Theta (ki=1.0) = 19.47 ***
Lambda = 0.353
Individual data on the 10 slices

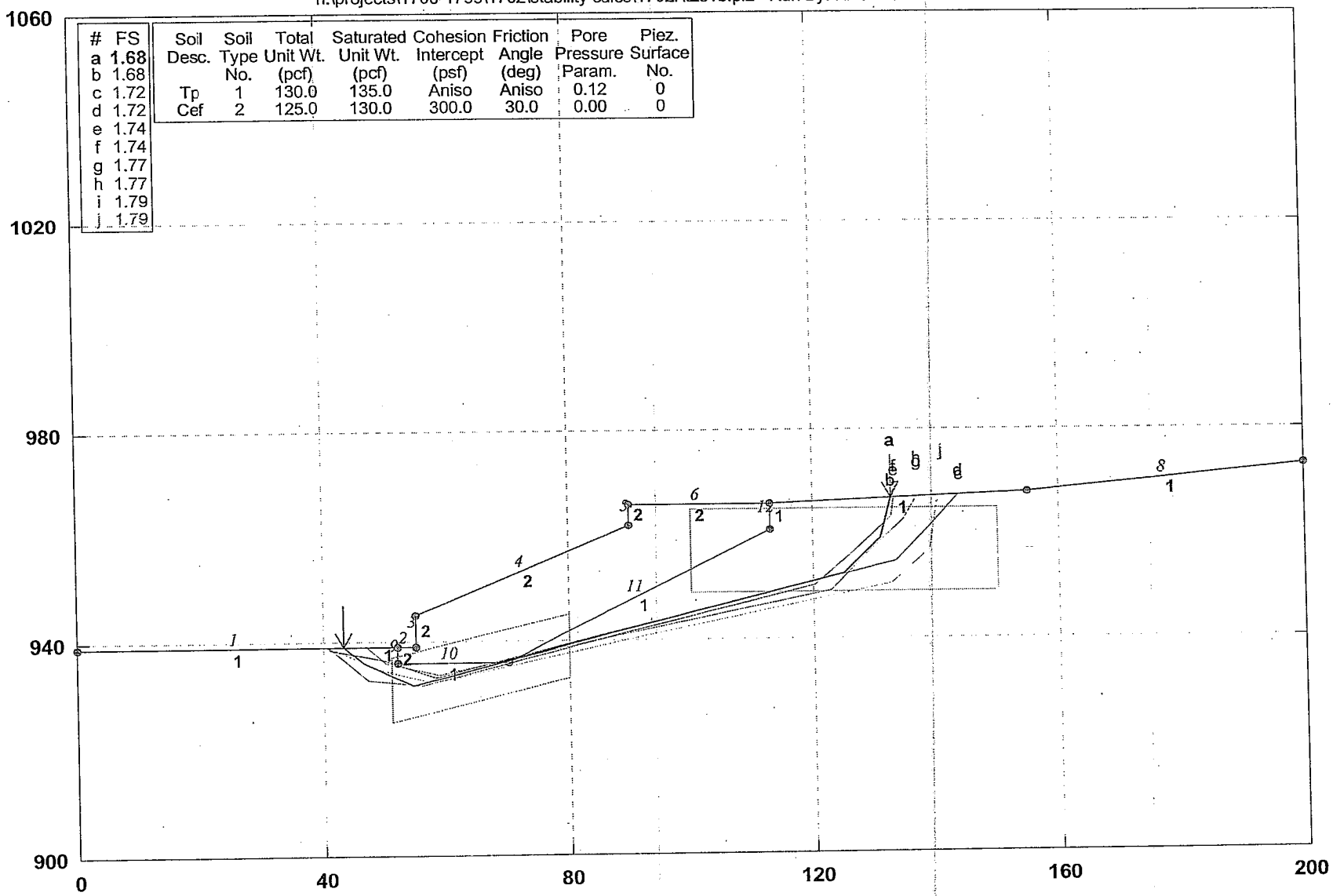
| Slice No. | Width (ft) | Weight (lbs) | Water Force Top (lbs) | Water Force Bot (lbs) | Tie Force Norm (lbs) | Tie Force Tan. (lbs) | Earthquake Force Hor (lbs) | Earthquake Force Ver (lbs) | Surcharge Load (lbs) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.0 | 3.2 | 0.0 | 0.4 | 0. | 0. | 0.5 | 0.0 | 0.0 |
| 2 | 7.8 | 6115.0 | 0.0 | 751.5 | 0. | 0. | 917.2 | 0.0 | 0.0 |
| 3 | 7.6 | 7569.9 | 0.0 | 956.1 | 0. | 0. | 1135.5 | 0.0 | 0.0 |
| 4 | 7.3 | 8007.0 | 0.0 | 1050.7 | 0. | 0. | 1201.0 | 0.0 | 0.0 |
| 5 | 7.0 | 7504.0 | 0.0 | 1035.2 | 0. | 0. | 1125.6 | 0.0 | 0.0 |
| 6 | 5.3 | 5128.6 | 0.0 | 753.6 | 0. | 0. | 769.3 | 0.0 | 0.0 |
| 7 | 0.0 | 12.1 | 0.0 | 1.8 | 0. | 0. | 1.8 | 0.0 | 0.0 |
| 8 | 1.2 | 1793.8 | 0.0 | 263.6 | 0. | 0. | 269.1 | 0.0 | 0.0 |
| 9 | 6.0 | 6563.2 | 0.0 | 1042.7 | 0. | 0. | 984.5 | 0.0 | 0.0 |
| 10 | 5.4 | 2017.9 | 0.0 | 352.7 | 0. | 0. | 302.7 | 0.0 | 0.0 |

# TT 53108, 2-2'; static; planar; Ru=0.12; stab. fill w/ 3'd by 15'w key

n:\projects\1700-1799\1702\stability calcs\1702r\t2s1b.pl2 Run By: KPC 7/10/2008 11:29AM

| # | FS |
|---|---|
| a | 1.68 |
| b | 1.68 |
| c | 1.72 |
| d | 1.72 |
| e | 1.74 |
| f | 1.74 |
| g | 1.77 |
| h | 1.77 |
| i | 1.79 |
| j | 1.79 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Piez. Surface No. |
|---|---|---|---|---|---|---|---|
| Tp | 1 | 130.0 | 135.0 | Aniso | Aniso | 0.12 | 0 |
| Cef | 2 | 125.0 | 130.0 | 300.0 | 30.0 | 0.00 | 0 |




GSTABL7 v.2 FSmin=1.68

Safety Factors Are Calculated By GLE (Spencer's) Method (0-2)

GSTABL7

Run No. 7

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                    *** GSTABL7 ***
                ** GSTABL7 by Garry H. Gregory, P.E. **
  ** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **
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*******************************************************************************
                    SLOPE STABILITY ANALYSIS SYSTEM
      Modified Bishop, Simplified Janbu, or GLE Method of Slices.
      (Includes Spencer & Morgenstern-Price Type Analysis)
      Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
      Nonlinear Undrained Shear Strength, Curved Phi Envelope,
      Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
      Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
*******************************************************************************
Analysis Run Date:          7/10/2008
Time of Run:                11:29AM
Run By:                     KPC
Input Data Filename:        N:\Projects\1700-1799\1702\Stability Calcs\1702R\t2s1b.in
Output Filename:            N:\Projects\1700-1799\1702\Stability Calcs\1702R\t2s1b.OUT
Unit System:                English
Plotted Output Filename:    N:\Projects\1700-1799\1702\Stabi Calcs\1702R\t2s1b.PLT
PROBLEM DESCRIPTION:  TT 53108, 2-2'; static; planar;
                      Ru=0.12; stab. fill w/ 3'd by 15'w key

BOUNDARY COORDINATES
    8 Top   Boundaries
   12 Total Boundaries
Boundary     X-Left      Y-Left     X-Right     Y-Right     Soil Type
   No.        (ft)        (ft)       (ft)        (ft)     Below Bnd
    1         0.00      939.00      52.00       939.00        2
    2        52.00      939.00      55.00       939.00        2
    3        55.00      939.00      55.01       945.00        2
    4        55.01      945.00      90.00       962.00        2
    5        90.00      962.00      90.01       966.00        2
    6        90.01      966.00     113.00       966.00        2
    7       113.00      966.00     155.00       968.00        1
    8       155.00      968.00     200.00       973.00        1
    9        52.00      939.00      52.01       936.00        1
   10        52.01      936.00      70.00       936.00        1
   11        70.00      936.00     112.99       961.00        1
   12       112.99      961.00     113.00       966.00        1
User Specified Y-Origin =        900.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)
ISOTROPIC SOIL PARAMETERS
  2 Type(s) of Soil
Soil  Total  Saturated  Cohesion Friction   Pore    Pressure   Piez.
Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant Surface
 No.  (pcf)    (pcf)     (psf)     (deg)   Param.    (psf)     No.
  1   130.0    135.0     185.0     31.0    0.12       0.0       0
  2   125.0    130.0     300.0     30.0    0.00       0.0       0
ANISOTROPIC STRENGTH PARAMETERS
    1 soil type(s)
Soil Type  1 Is Anisotropic
Number Of Direction Ranges Specified =  3
Direction     Counterclockwise      Cohesion      Friction
  Range       Direction Limit     Intercept       Angle
   No.            (deg)              (psf)         (deg)
    1             13.5              185.00         31.00
    2             16.5              200.00         18.00
    3             90.0              185.00         31.00
ANISOTROPIC SOIL NOTES:
   (1) An input value of 0.01 for C and/or Phi will cause Aniso
       C and/or Phi to be ignored in that range.
   (2) An input value of 0.02 for Phi will set both Phi and
       C equal to zero, with no water weight in the tension crack.
   (3) An input value of 0.03 for Phi will set both Phi and
       C equal to zero, with water weight in the tension crack.
A Critical Failure Surface Searching Method, Using A Random
```

Technique For Generating Sliding Block Surfaces, Has Been
Specified.
1000 Trial Surfaces Have Been Generated.
2 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of
Sliding Block Is 9.0

| Box No. | X-Left (ft) | Y-Left (ft) | X-Right (ft) | Y-Right (ft) | Height (ft) |
|---|---|---|---|---|---|
| 1 | 51.00 | 931.00 | 80.00 | 939.00 | 12.00 |
| 2 | 100.00 | 957.00 | 150.00 | 957.00 | 16.00 |

Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By GLE (Spencer's) Method (0-2) * *
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
The option of no water in the tension crack on
the last slice has been selected.
Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces
(if applicable) have been applied to the slice base(s)
on which they intersect.
Total Number of Trial Surfaces Evaluated = 1000
WARNING! The Factor of Safety Calculation for one or More Trial Surfaces
Did Not Converge in 20 Iterations.
Number of Trial Surfaces with Non-Converged FS = 44
Percentage of Trial Surfaces With Non-Valid FS Solutions
of the Total Evaluated = 4.4 %
Statistical Data On All Valid FS Values:
FS Max = 8.709 FS Min = 1.682 FS Ave = 3.037
Standard Deviation = 0.904 Coefficient of Variation = 29.78 %
((Simplified Janbu FS for Critical Surface = 1.539))
Failure Surface Specified By 6 Coordinate Points

| Point No. | X-Surf (ft) | Y-Surf (ft) |
|---|---|---|
| 1 | 43.24 | 939.00 |
| 2 | 46.56 | 935.93 |
| 3 | 54.59 | 931.86 |
| 4 | 124.91 | 952.48 |
| 5 | 130.95 | 959.15 |
| 6 | 132.69 | 966.94 |

*** FOS = 1.682 Theta (ki=1.0) = 13.02 ***
Lambda = 0.231
Individual data on the 15 slices

| Slice No. | Width (ft) | Weight (lbs) | Water Force Top (lbs) | Water Force Bot (lbs) | Tie Force Norm (lbs) | Tie Force Tan (lbs) | Earthquake Force Hor (lbs) | Earthquake Force Ver (lbs) | Surcharge Load (lbs) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 3.3 | 662.3 | 0.0 | 108.3 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 2 | 5.4 | 3145.9 | 0.0 | 423.3 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 3 | 0.0 | 7.5 | 0.0 | 1.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 4 | 2.6 | 2135.0 | 0.0 | 287.3 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 5 | 0.4 | 373.2 | 0.0 | 46.7 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 6 | 0.0 | 12.7 | 0.0 | 1.6 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 7 | 13.7 | 24687.9 | 0.0 | 3087.2 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 8 | 2.6 | 5172.9 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 9 | 18.7 | 42203.1 | 0.0 | 5277.5 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 10 | 0.0 | 27.5 | 0.0 | 3.4 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 11 | 23.0 | 59563.4 | 0.0 | 7448.4 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 12 | 0.0 | 22.0 | 0.0 | 2.8 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 13 | 11.9 | 24085.2 | 0.0 | 3011.9 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 14 | 6.0 | 8559.9 | 0.0 | 1530.3 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 15 | 1.7 | 869.6 | 0.0 | 479.9 | 0. | 0. | 0.0 | 0.0 | 0.0 |

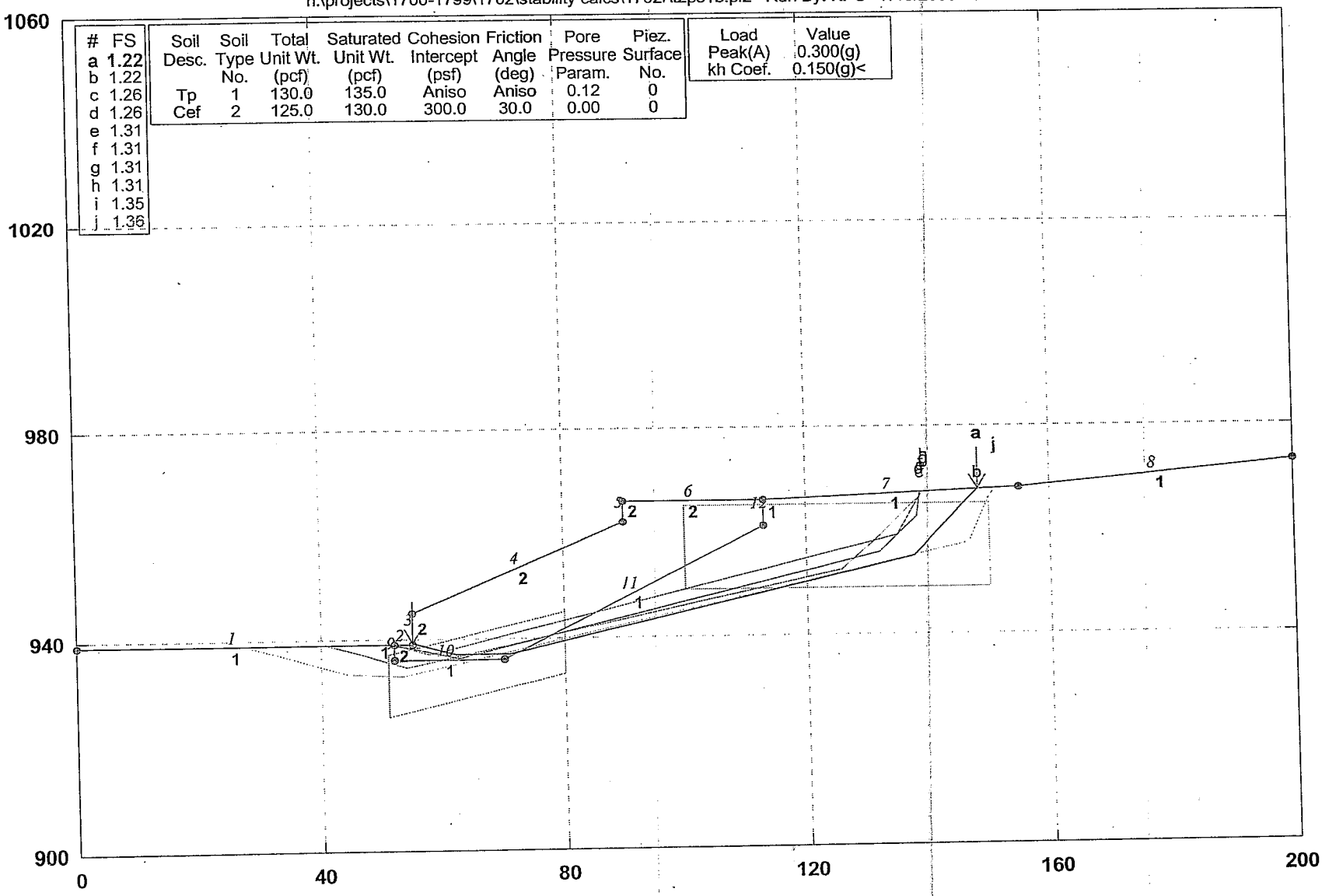
# TT 53108, 2-2'; pseudo; planar; Ru=0.12; stab. fill w/ 3'd by 15'w key

n:\projects\1700-1799\1702\stability calcs\1702r\t2ps1b.pl2 Run By: KPC 7/10/2008 11:31AM

| # | FS |
|---|---|
| a | 1.22 |
| b | 1.22 |
| c | 1.26 |
| d | 1.26 |
| e | 1.31 |
| f | 1.31 |
| g | 1.31 |
| h | 1.31 |
| i | 1.35 |
| j | 1.36 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Piez. Surface No. |
|---|---|---|---|---|---|---|---|
| Tp | 1 | 130.0 | 135.0 | Aniso | Aniso | 0.12 | 0 |
| Cef | 2 | 125.0 | 130.0 | 300.0 | 30.0 | 0.00 | 0 |

| Load | Value |
|---|---|
| Peak(A) | 0.300(g) |
| kh Coef. | 0.150(g)< |




GSTABL7 v.2 FSmin=1.22

Safety Factors Are Calculated By GLE (Spencer's) Method (0-2)

GSTABL7

Run No. 8

```
                    *** GSTABL7 ***
                ** GSTABL7 by Garry H. Gregory, P.E. **
   ** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **
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*******************************************************************************
                    SLOPE STABILITY ANALYSIS SYSTEM
       Modified Bishop, Simplified Janbu, or GLE Method of Slices.
       (Includes Spencer & Morgenstern-Price Type Analysis)
       Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
       Nonlinear Undrained Shear Strength, Curved Phi Envelope,
       Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
       Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
*******************************************************************************
Analysis Run Date:        7/10/2008
Time of Run:              11:31AM
Run By:                   KPC
Input Data Filename:      N:\Projects\1700-1799\1702\Stability Calcs\1702R\t2ps1b.in
Output Filename:          N:\Projects\1700-1799\1702\Stability Calcs\1702R\t2ps1b.OUT
Unit System:              English
Plotted Output Filename:  N:\Projects\1700-1799\1702\Stabi Calcs\1702R\t2ps1b.PLT
PROBLEM DESCRIPTION:  TT 53108, 2-2'; pseudo; planar;
                      Ru=0.12; stab. fill w/ 3'd by 15'w key

BOUNDARY COORDINATES
    8 Top   Boundaries
   12 Total Boundaries
Boundary     X-Left      Y-Left     X-Right     Y-Right     Soil Type
   No.        (ft)        (ft)       (ft)        (ft)      Below Bnd
    1         0.00      939.00      52.00       939.00        1
    2        52.00      939.00      55.00       939.00        2
    3        55.00      939.00      55.01       945.00        2
    4        55.01      945.00      90.00       962.00        2
    5        90.00      962.00      90.01       966.00        2
    6        90.01      966.00     113.00       966.00        2
    7       113.00      966.00     155.00       968.00        1
    8       155.00      968.00     200.00       973.00        1
    9        52.00      939.00      52.01       936.00        1
   10        52.01      936.00      70.00       936.00        1
   11        70.00      936.00     112.99       961.00        1
   12       112.99      961.00     113.00       966.00        1
 User Specified Y-Origin =        900.00(ft)
 Default X-Plus Value = 0.00(ft)
 Default Y-Plus Value = 0.00(ft)
ISOTROPIC SOIL PARAMETERS
  2 Type(s) of Soil
 Soil  Total  Saturated  Cohesion Friction   Pore   Pressure   Piez.
 Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant Surface
  No.  (pcf)    (pcf)     (psf)     (deg)   Param.    (psf)     No.
   1   130.0    135.0     203.0     45.0    0.12       0.0      0
   2   125.0    130.0     300.0     30.0    0.00       0.0      0
ANISOTROPIC STRENGTH PARAMETERS
     1 soil type(s)
 Soil Type  1 Is Anisotropic
 Number Of Direction Ranges Specified =  3
 Direction    Counterclockwise      Cohesion      Friction
   Range      Direction Limit     Intercept       Angle
    No.           (deg)             (psf)         (deg)
     1            13.5             203.00         45.00
     2            16.5             200.00         18.00
     3            90.0             203.00         45.00
 ANISOTROPIC SOIL NOTES:
    (1) An input value of 0.01 for C and/or Phi will cause Aniso
        C and/or Phi to be ignored in that range.
    (2) An input value of 0.02 for Phi will set both Phi and
        C equal to zero, with no water weight in the tension crack.
    (3) An input value of 0.03 for Phi will set both Phi and
        C equal to zero, with water weight in the tension crack.
 Specified Peak Ground Acceleration Coefficient (A) =   0.300(g)
```

Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Sliding Block Surfaces, Has Been
Specified.
1000 Trial Surfaces Have Been Generated.
2 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of
Sliding Block Is 9.0

| Box No. | X-Left (ft) | Y-Left (ft) | X-Right (ft) | Y-Right (ft) | Height (ft) |
|---|---|---|---|---|---|
| 1 | 51.00 | 931.00 | 80.00 | 939.00 | 12.00 |
| 2 | 100.00 | 937.00 | 150.00 | 957.00 | 16.00 |

Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By GLE (Spencer's) Method (0-2) * *
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
The option of no water in the tension crack on
the last slice has been selected.
Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces
(if applicable) have been applied to the slice base(s)
on which they intersect.
Total Number of Trial Surfaces Evaluated = 1000
WARNING! The Factor of Safety Calculation for one or More Trial Surfaces
Did Not Converge in 20 Iterations.
Number of Trial Surfaces with Non-Converged FS = 157
Number of Trial Surfaces with Misleading FS = 13
Percentage of Trial Surfaces With Non-Valid FS Solutions
of the Total Evaluated = 17.0 %
Statistical Data On All Valid FS Values:
FS Max = 5.607 FS Min = 1.221 FS Ave = 2.639
Standard Deviation = 0.710 Coefficient of Variation = 26.89 %
((Simplified Janbu FS for Critical Surface = 1.170))
Failure Surface Specified By 6 Coordinate Points

| Point No. | X-Surf (ft) | Y-Surf (ft) |
|---|---|---|
| 1 | 55.00 | 939.35 |
| 2 | 61.97 | 937.11 |
| 3 | 70.97 | 936.95 |
| 4 | 137.73 | 955.05 |
| 5 | 143.42 | 962.02 |
| 6 | 148.18 | 967.68 |

*** FOS = 1.221 Theta (ki=1.0) = 11.76 ***
Lambda = 0.208
Individual data on the 11 slices

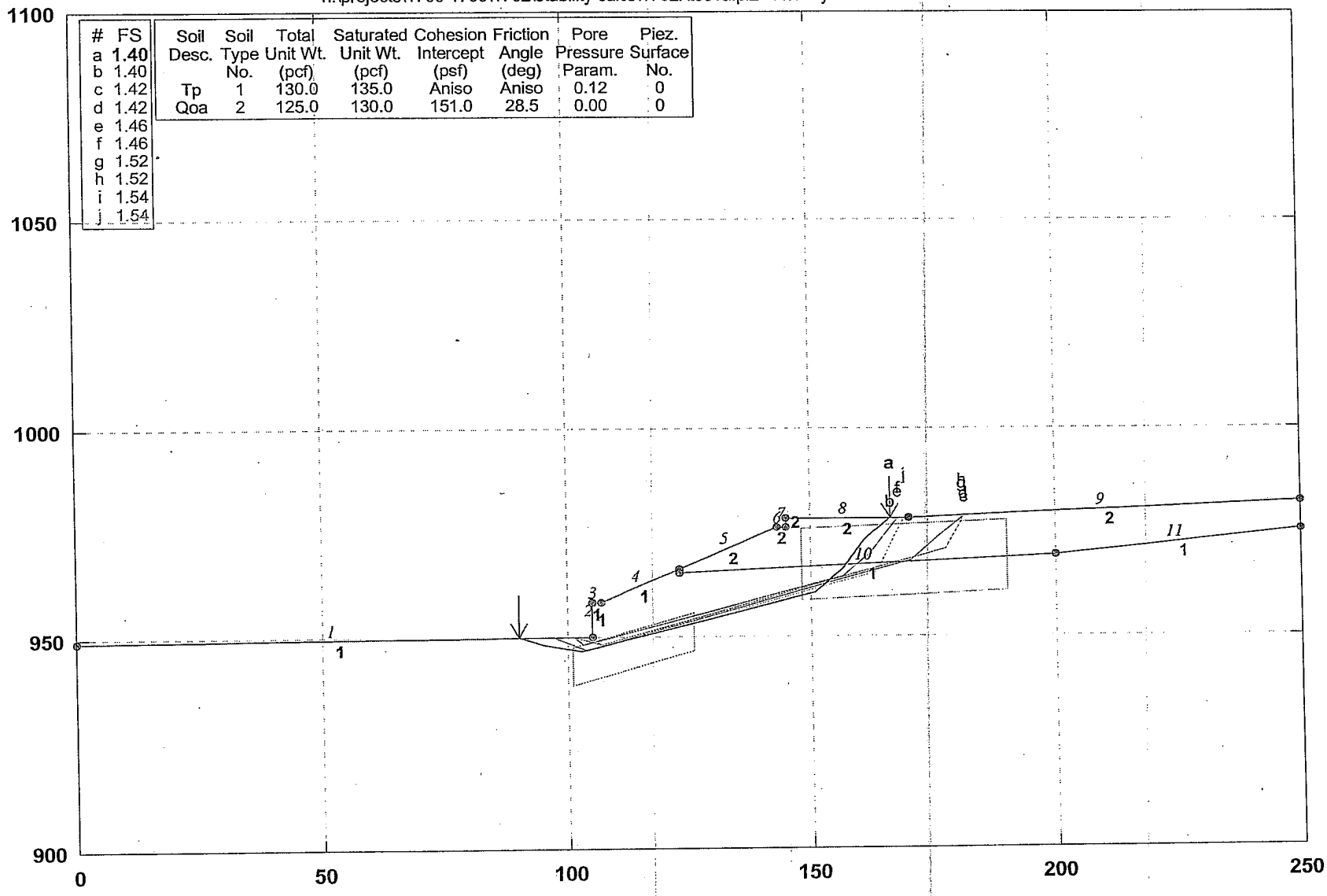
| Slice No. | Width (ft) | Weight (lbs) | Water Force Top (lbs) | Water Force Bot (lbs) | Tie Force Norm (lbs) | Tie Force Tan (lbs) | Earthquake Force Hor (lbs) | Earthquake Force Ver (lbs) | Surcharge Load (lbs) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.0 | 3.3 | 0.0 | 0.0 | 0. | 0. | 0.5 | 0.0 | 0.0 |
| 2 | 7.0 | 7367.3 | 0.0 | 0.0 | 0. | 0. | 1105.1 | 0.0 | 0.0 |
| 3 | 9.0 | 15229.7 | 0.0 | 0.0 | 0. | 0. | 2284.5 | 0.0 | 0.0 |
| 4 | 1.2 | 2459.8 | 0.0 | 0.0 | 0. | 0. | 369.0 | 0.0 | 0.0 |
| 5 | 17.8 | 40244.2 | 0.0 | 5003.6 | 0. | 0. | 6036.6 | 0.0 | 0.0 |
| 6 | 0.0 | 27.6 | 0.0 | 3.4 | 0. | 0. | 4.1 | 0.0 | 0.0 |
| 7 | 23.0 | 60723.1 | 0.0 | 7549.8 | 0. | 0. | 9108.5 | 0.0 | 0.0 |
| 8 | 0.0 | 22.8 | 0.0 | 2.8 | 0. | 0. | 3.4 | 0.0 | 0.0 |
| 9 | 24.7 | 47883.4 | 0.0 | 5953.4 | 0. | 0. | 7182.5 | 0.0 | 0.0 |
| 10 | 5.7 | 6492.1 | 0.0 | 1232.7 | 0. | 0. | 973.8 | 0.0 | 0.0 |
| 11 | 4.8 | 1679.9 | 0.0 | 313.0 | 0. | 0. | 252.0 | 0.0 | 0.0 |

# TT 53108, 3-3'; static; planar; daylighted bedding w/ Ru=0.12

n:\projects\1700-1799\1702\stability calcs\1702r\t3s1a.pl2 Run By: KPC 7/9/2008 02:51PM

| # | FS |
|---|---|
| a | 1.40 |
| b | 1.40 |
| c | 1.42 |
| d | 1.42 |
| e | 1.46 |
| f | 1.46 |
| g | 1.52 |
| h | 1.52 |
| i | 1.54 |
| j | 1.54 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Piez. Surface No. |
|---|---|---|---|---|---|---|---|
| Tp | 1 | 130.0 | 135.0 | Aniso | Aniso | 0.12 | 0 |
| Qoa | 2 | 125.0 | 130.0 | 151.0 | 28.5 | 0.00 | 0 |




GSTABL7 v.2 FSmin=1.40

Safety Factors Are Calculated By GLE (Spencer's) Method (0-2)

GSTABL7

Run No. 9

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **
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**********

SLOPE STABILITY ANALYSIS SYSTEM
Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
**********

Analysis Run Date: 7/9/2008
Time of Run: 02:51PM
Run By: KPC
Input Data Filename: N:\Projects\1700-1799\1702\Stability Calcs\1702R\t3s1a.in
Output Filename: N:\Projects\1700-1799\1702\Stability Calcs\1702R\t3s1a.OUT
Unit System: English
Plotted Output Filename: N:\Projects\1700-1799\1702\Stabi Calcs\1702R\t3s1a.PLT
PROBLEM DESCRIPTION: TT 53108, 3-3'; static; planar;
daylighted bedding w/ Ru=0.12

BOUNDARY COORDINATES
9 Top Boundaries
11 Total Boundaries

| Boundary No. | X-Left (ft) | Y-Left (ft) | X-Right (ft) | Y-Right (ft) | Soil Type Below Bnd |
|---|---|---|---|---|---|
| 1 | 0.00 | 949.00 | 105.00 | 950.00 | 1 |
| 2 | 105.00 | 950.00 | 105.01 | 958.00 | 1 |
| 3 | 105.01 | 958.00 | 107.00 | 958.00 | 1 |
| 4 | 107.00 | 958.00 | 123.00 | 966.00 | 1 |
| 5 | 123.00 | 966.00 | 143.00 | 976.00 | 2 |
| 6 | 143.00 | 976.00 | 145.00 | 976.00 | 2 |
| 7 | 145.00 | 976.00 | 145.01 | 978.00 | 2 |
| 8 | 145.01 | 978.00 | 170.00 | 978.00 | 2 |
| 9 | 170.00 | 978.00 | 250.00 | 982.00 | 2 |
| 10 | 123.00 | 965.00 | 200.00 | 969.00 | 1 |
| 11 | 200.00 | 969.00 | 250.00 | 975.00 | 1 |

User Specified Y-Origin = 900.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
2 Type(s) of Soil

| Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No. |
|---|---|---|---|---|---|---|---|
| 1 | 130.0 | 135.0 | 185.0 | 31.0 | 0.12 | 0.0 | 0 |
| 2 | 125.0 | 130.0 | 151.0 | 28.5 | 0.00 | 0.0 | 0 |

ANISOTROPIC STRENGTH PARAMETERS
1 soil type(s)
Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

| Direction Range No. | Counterclockwise Direction Limit (deg) | Cohesion Intercept (psf) | Friction Angle (deg) |
|---|---|---|---|
| 1 | 15.5 | 185.00 | 31.00 |
| 2 | 18.5 | 200.00 | 18.00 |
| 3 | 90.0 | 185.00 | 31.00 |

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been

Specified.
1000 Trial Surfaces Have Been Generated.
2 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of
Sliding Block Is 8.0

| Box No. | X-Left (ft) | Y-Left (ft) | X-Right (ft) | Y-Right (ft) | Height (ft) |
|---|---|---|---|---|---|
| 1 | 101.00 | 943.00 | 126.00 | 951.00 | 9.00 |
| 2 | 148.00 | 967.00 | 190.00 | 969.00 | 17.00 |

Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By GLE (Spencer's) Method (0-2) * *
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
The option of no water in the tension crack on
the last slice has been selected.
Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces
(if applicable) have been applied to the slice base(s)
on which they intersect.
Total Number of Trial Surfaces Evaluated = 1000
WARNING! The Factor of Safety Calculation for one or More Trial Surfaces
Did Not Converge in 20 Iterations.
Number of Trial Surfaces with Non-Converged FS = 62
Percentage of Trial Surfaces With Non-Valid FS Solutions
of the Total Evaluated = 6.2 %
Statistical Data On All Valid FS Values:
FS Max = 6.363 FS Min = 1.401 FS Ave = 2.752
Standard Deviation = 0.744 Coefficient of Variation = 27.04 %
((Simplified Janbu FS for Critical Surface = 1.313))
Failure Surface Specified By 7 Coordinate Points

| Point No. | X-Surf (ft) | Y-Surf (ft) |
|---|---|---|
| 1 | 89.85 | 949.86 |
| 2 | 94.93 | 948.06 |
| 3 | 102.79 | 946.60 |
| 4 | 150.91 | 960.37 |
| 5 | 156.54 | 966.06 |
| 6 | 160.92 | 972.75 |
| 7 | 166.16 | 978.00 |

*** FOS = 1.401 Theta (ki=1.0) = 16.72 ***
Lambda = 0.300
Individual data on the 14 slices

| Slice No. | Width (ft) | Weight (lbs) | Water Force Top (lbs) | Water Force Bot (lbs) | Tie Force Norm (lbs) | Tie Force Tan (lbs) | Earthquake Force Hor (lbs) | Earthquake Force Ver (lbs) | Surcharge Load (lbs) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 5.1 | 607.7 | 0.0 | 77.3 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 2 | 7.9 | 2667.3 | 0.0 | 325.5 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 3 | 2.2 | 881.0 | 0.0 | 110.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 4 | 0.0 | 8.8 | 0.0 | 1.1 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 5 | 2.0 | 2710.6 | 0.0 | 338.3 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 6 | 16.0 | 24761.7 | 0.0 | 3090.6 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 7 | 20.0 | 40415.6 | 0.0 | 5044.4 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 8 | 2.0 | 4479.1 | 0.0 | 559.1 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 9 | 0.0 | 23.3 | 0.0 | 2.9 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 10 | 5.9 | 13824.5 | 0.0 | 1725.5 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 11 | 5.6 | 10493.7 | 0.0 | 1790.8 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 12 | 0.5 | 675.2 | 0.0 | 147.8 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 13 | 3.9 | 4040.6 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 14 | 5.2 | 1721.0 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |

# TT 53108, 3-3'; pseudo; planar; daylighted bedding w/ Ru=0.12

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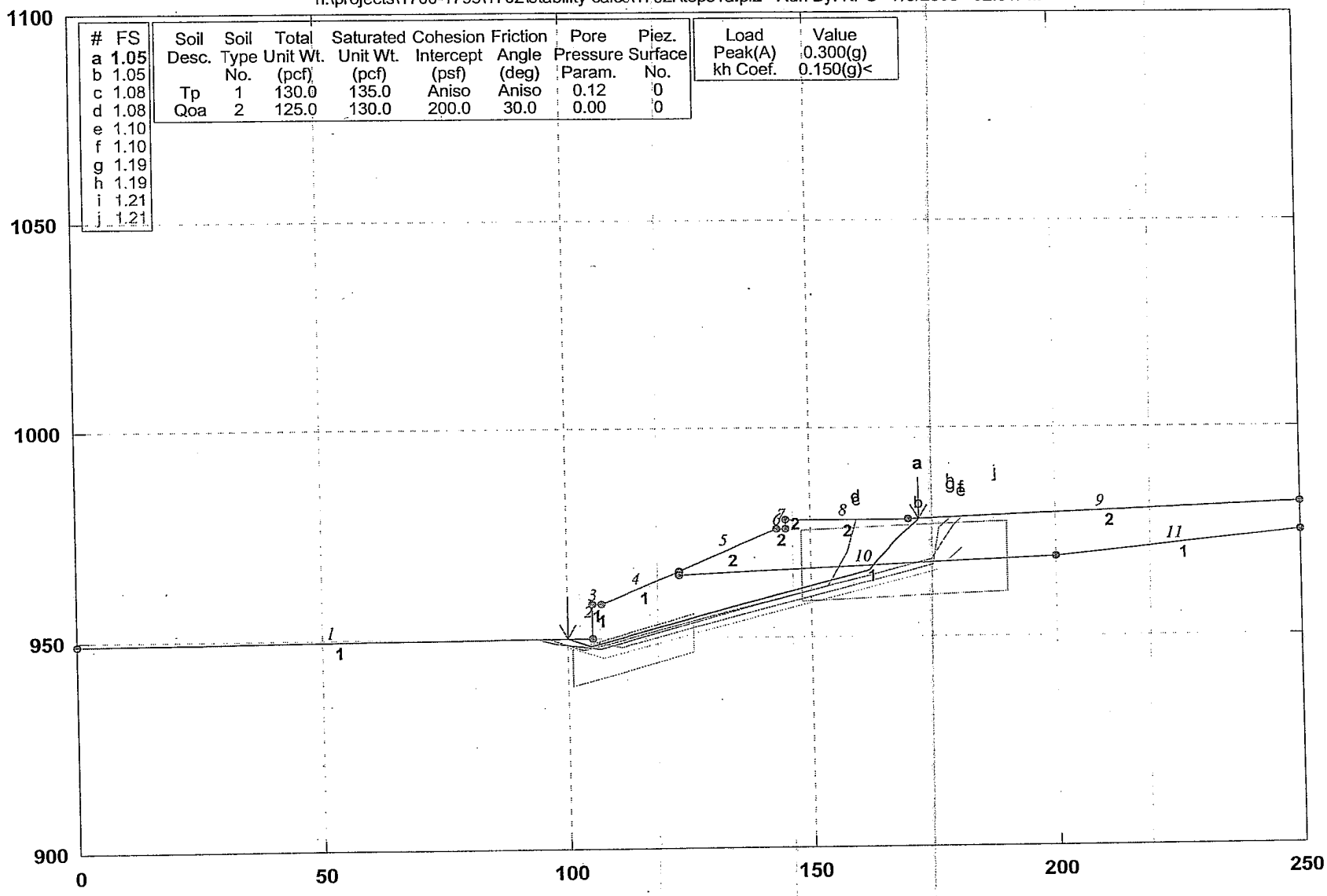
| # | FS |
|---|---|
| a | 1.05 |
| b | 1.05 |
| c | 1.08 |
| d | 1.08 |
| e | 1.10 |
| f | 1.10 |
| g | 1.19 |
| h | 1.19 |
| i | 1.21 |
| j | 1.21 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Piez. Surface No. |
|---|---|---|---|---|---|---|---|
| Tp | 1 | 130.0 | 135.0 | Aniso | Aniso | 0.12 | 0 |
| Qoa | 2 | 125.0 | 130.0 | 200.0 | 30.0 | 0.00 | 0 |

| Load | Value |
|---|---|
| Peak(A) | 0.300(g) |
| kh Coef. | 0.150(g)< |




GSTABL7 v.2 FSmin=1.05

Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2)

GSTABL7

Run No. 10

```
                    *** GSTABL7 ***
              ** GSTABL7 by Garry H. Gregory, P.E. **
   ** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **
              (All Rights Reserved-Unauthorized Use Prohibited)
*******************************************************************************
                    SLOPE STABILITY ANALYSIS SYSTEM
      Modified Bishop, Simplified Janbu, or GLE Method of Slices.
      (Includes Spencer & Morgenstern-Price Type Analysis)
      Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
      Nonlinear Undrained Shear Strength, Curved Phi Envelope,
      Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
      Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
*******************************************************************************
Analysis Run Date:          7/9/2008
Time of Run:                02:51PM
Run By:                     KPC
Input Data Filename:        N:\Projects\1700-1799\1702\Stability Calcs\1702R\t3ps1a.in
Output Filename:            N:\Projects\1700-1799\1702\Stability Calcs\1702R\t3ps1a.OUT
Unit System:                English
Plotted Output Filename:    N:\Projects\1700-1799\1702\Stabi Calcs\1702R\t3ps1a.PLT
PROBLEM DESCRIPTION:  CT 53108, 3-3'; pseudo; planar;
                      daylighted bedding w/ Ru=0.12

BOUNDARY COORDINATES
    9 Top   Boundaries
   11 Total Boundaries
Boundary     X-Left      Y-Left     X-Right     Y-Right     Soil Type
   No.        (ft)        (ft)       (ft)        (ft)      Below Bnd
    1          0.00      949.00      105.00      950.00        1
    2        105.00      950.00      105.01      958.00        1
    3        105.01      958.00      107.00      958.00        1
    4        107.00      958.00      123.00      966.00        1
    5        123.00      966.00      143.00      976.00        2
    6        143.00      976.00      145.00      976.00        2
    7        145.00      976.00      145.01      978.00        2
    8        145.01      978.00      170.00      978.00        2
    9        170.00      978.00      250.00      982.00        2
   10        123.00      965.00      200.00      969.00        1
   11        200.00      969.00      250.00      975.00        1
User Specified Y-Origin =        900.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)
ISOTROPIC SOIL PARAMETERS
  2 Type(s) of Soil
 Soil  Total  Saturated  Cohesion  Friction   Pore    Pressure   Piez.
 Type Unit Wt. Unit Wt. Intercept   Angle   Pressure Constant Surface
  No.   (pcf)    (pcf)     (psf)    (deg)    Param.    (psf)     No.
   1    130.0    135.0     203.0     45.0     0.12      0.0       0
   2    125.0    130.0     200.0     30.0     0.00      0.0       0
ANISOTROPIC STRENGTH PARAMETERS
    1 soil type(s)
 Soil Type  1 Is Anisotropic
 Number Of Direction Ranges Specified =  3
 Direction     Counterclockwise     Cohesion      Friction
   Range       Direction Limit     Intercept       Angle
    No.            (deg)             (psf)         (deg)
     1              15.5             203.00         45.00
     2              18.5             200.00         18.00
     3              90.0             203.00         45.00
 ANISOTROPIC SOIL NOTES:
    (1) An input value of 0.01 for C and/or Phi will cause Aniso
        C and/or Phi to be ignored in that range.
    (2) An input value of 0.02 for Phi will set both Phi and
        C equal to zero, with no water weight in the tension crack.
    (3) An input value of 0.03 for Phi will set both Phi and
        C equal to zero, with water weight in the tension crack.
 Specified Peak Ground Acceleration Coefficient (A) =  0.300(g)
 Specified Horizontal Earthquake Coefficient (kh) =  0.150(g)
```

Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Sliding Block Surfaces, Has Been
Specified.
1000 Trial Surfaces Have Been Generated.
2 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of
Sliding Block Is 9.0

| Box No. | X-Left (ft) | Y-Left (ft) | X-Right (ft) | Y-Right (ft) | Height (ft) |
|---|---|---|---|---|---|
| 1 | 101.00 | 943.00 | 126.00 | 951.00 | 9.00 |
| 2 | 148.00 | 967.00 | 190.00 | 969.00 | 17.00 |

Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By GLE (Spencer's) Method (0-2) * *
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
The option of no water in the tension crack on
the last slice has been selected.
Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces
(if applicable) have been applied to the slice base(s)
on which they intersect.
Total Number of Trial Surfaces Evaluated = 1000
WARNING! The Factor of Safety Calculation for one or More Trial Surfaces
Did Not Converge in 20 Iterations.
Number of Trial Surfaces with Non-Converged FS = 214
Number of Trial Surfaces with Misleading FS = 14
Percentage of Trial Surfaces With Non-Valid FS Solutions
of the Total Evaluated = 22.8 %
Statistical Data On All Valid FS Values:
FS Max = 6.754 FS Min = 1.052 FS Ave = 2.797
Standard Deviation = 0.676 Coefficient of Variation = 24.17 %
((Simplified Janbu FS for Critical Surface = 0.932))
Failure Surface Specified By 5 Coordinate Points

| Point No. | X-Surf (ft) | Y-Surf (ft) |
|---|---|---|
| 1 | 100.00 | 949.95 |
| 2 | 104.54 | 947.98 |
| 3 | 161.97 | 965.85 |
| 4 | 167.41 | 973.03 |
| 5 | 172.21 | 978.11 |

*** FOS = 1.052 Theta (Xi=1.0) = 15.48 ***
Lambda = 0.277
Individual data on the 13 slices

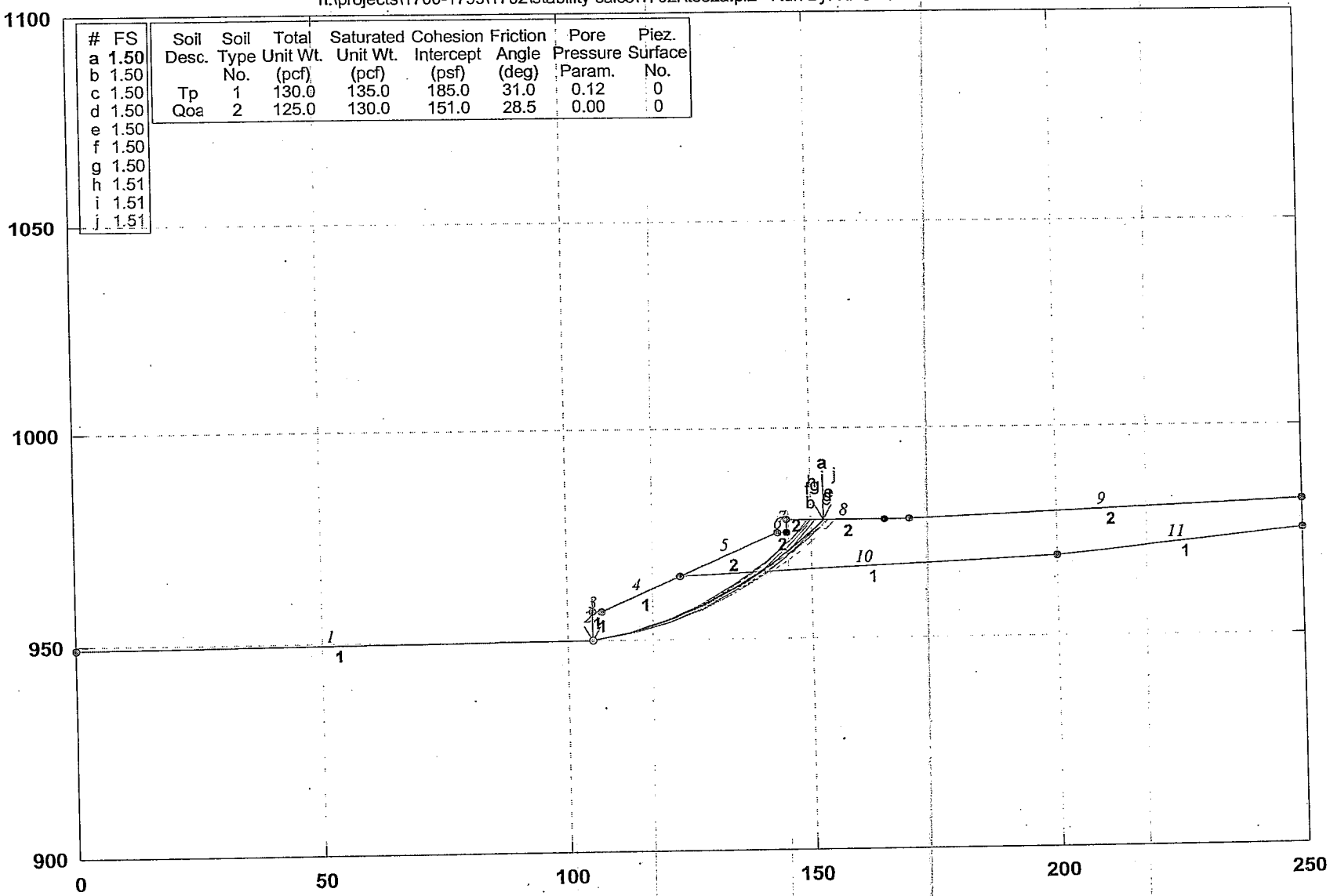
| Slice No. | Width (ft) | Weight (lbs) | Water Force Top (lbs) | Water Force Bot (lbs) | Tie Force Norm (lbs) | Tie Force Tan (lbs) | Earthquake Force Hor (lbs) | Earthquake Force Ver (lbs) | Surcharge Load (lbs) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 4.5 | 595.6 | 0.0 | 77.9 | 0. | 0. | 89.3 | 0.0 | 0.0 |
| 2 | 0.5 | 115.3 | 0.0 | 14.5 | 0. | 0. | 17.3 | 0.0 | 0.0 |
| 3 | 0.0 | 7.6 | 0.0 | 1.0 | 0. | 0. | 1.1 | 0.0 | 0.0 |
| 4 | 2.0 | 2474.8 | 0.0 | 311.0 | 0. | 0. | 371.2 | 0.0 | 0.0 |
| 5 | 16.0 | 22394.5 | 0.0 | 2814.5 | 0. | 0. | 3359.2 | 0.0 | 0.0 |
| 6 | 20.0 | 36277.7 | 0.0 | 4559.3 | 0. | 0. | 5441.7 | 0.0 | 0.0 |
| 7 | 2.0 | 3993.3 | 0.0 | 501.9 | 0. | 0. | 599.0 | 0.0 | 0.0 |
| 8 | 0.0 | 20.8 | 0.0 | 2.6 | 0. | 0. | 3.1 | 0.0 | 0.0 |
| 9 | 17.0 | 31637.2 | 0.0 | 3976.1 | 0. | 0. | 4745.6 | 0.0 | 0.0 |
| 10 | 0.9 | 1331.8 | 0.0 | 264.8 | 0. | 0. | 199.8 | 0.0 | 0.0 |
| 11 | 4.5 | 4480.9 | 0.0 | 0.0 | 0. | 0. | 672.1 | 0.0 | 0.0 |
| 12 | 2.6 | 1167.1 | 0.0 | 0.0 | 0. | 0. | 175.1 | 0.0 | 0.0 |
| 13 | 2.2 | 308.0 | 0.0 | 0.0 | 0. | 0. | 46.2 | 0.0 | 0.0 |

# TT 53108, 3-3'; static; circular; daylighted bedding w/ Ru=0.12

n:\projects\1700-1799\1702\stability calcs\1702r\t3s2a.pl2 Run By: KPC 7/9/2008 02:19PM

| # | FS |
|---|---|
| a | 1.50 |
| b | 1.50 |
| c | 1.50 |
| d | 1.50 |
| e | 1.50 |
| f | 1.50 |
| g | 1.50 |
| h | 1.51 |
| i | 1.51 |
| j | 1.51 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Piez. Surface No. |
|---|---|---|---|---|---|---|---|
| Tp | 1 | 130.0 | 135.0 | 185.0 | 31.0 | 0.12 | 0 |
| Qoa | 2 | 125.0 | 130.0 | 151.0 | 28.5 | 0.00 | 0 |




GSTABL7 v.2 FSmin=1.50

Safety Factors Are Calculated By GLE (Spencer's) Method (0-2)

GSTABL7

Run No. 11

```
                    *** GSTABL7 ***
              ** GSTABL7 by Garry H. Gregory, P.E. **
  ** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **
            (All Rights Reserved-Unauthorized Use Prohibited)
*******************************************************************************
                    SLOPE STABILITY ANALYSIS SYSTEM
      Modified Bishop, Simplified Janbu, or GLE Method of Slices.
      (Includes Spencer & Morgenstern-Price Type Analysis)
      Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
      Nonlinear Undrained Shear Strength, Curved Phi Envelope,
      Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
      Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
*******************************************************************************
Analysis Run Date:          7/9/2008
Time of Run:                02:19PM
Run By:                     KPC
Input Data Filename:        N:\Projects\1700-1799\1702\Stability Calcs\1702R\t3s2a.in
Output Filename:            N:\Projects\1700-1799\1702\Stability Calcs\1702R\t3s2a.OUT
Unit System:                English
Plotted Output Filename:    N:\Projects\1700-1799\1702\Stabi-Calcs\1702R\t3s2a.PLT
PROBLEM DESCRIPTION:  TT 53108, 3-3'; static; circular;
                      daylighted bedding w/ Ru=0.12

BOUNDARY COORDINATES
    9 Top   Boundaries
   11 Total Boundaries
Boundary     X-Left      Y-Left     X-Right     Y-Right     Soil Type
   No.        (ft)        (ft)        (ft)        (ft)     Below Bnd
    1         0.00      949.00      105.00      950.00         1
    2       105.00      950.00      105.01      957.00         1
    3       105.01      957.00      107.00      957.00         1
    4       107.00      957.00      123.00      965.00         1
    5       123.00      965.00      143.00      975.00         2
    6       143.00      975.00      145.00      975.00         2
    7       145.00      975.00      145.01      978.00         2
    8       145.01      978.00      170.00      978.00         2
    9       170.00      978.00      250.00      982.00         2
   10       123.00      965.00      200.00      969.00         1
   11       200.00      969.00      250.00      975.00         1
 User Specified Y-Origin =       900.00(ft)
 Default X-Plus Value = 0.00(ft)
 Default Y-Plus Value = 0.00(ft)
ISOTROPIC SOIL PARAMETERS
  2 Type(s) of Soil
 Soil  Total  Saturated  Cohesion Friction   Pore   Pressure   Piez.
 Type Unit Wt. Unit Wt. Intercept  Angle  Pressure Constant Surface
  No.  (pcf)    (pcf)     (psf)    (deg)   Param.    (psf)     No.
   1   130.0    135.0     165.0    31.0    0.12      0.0       0
   2   125.0    130.0     151.0    28.5    0.00      0.0       0
 A Critical Failure Surface Searching Method, Using A Random
 Technique For Generating Circular Surfaces, Has Been Specified.
  750 Trial Surfaces Have Been Generated.
  750 Surface(s) Initiate(s) From Each Of     1 Points Equally Spaced
 Along The Ground Surface Between  X = 105.00(ft)
                              and  X = 105.00(ft)
 Each Surface Terminates Between   X = 145.00(ft)
                              and  X = 165.00(ft)
 Unless Further Limitations Were Imposed, The Minimum Elevation
 At Which A Surface Extends Is  Y =       0.00(ft)
  8.00(ft) Line Segments Define Each Trial Failure Surface.
 Restrictions Have Been Imposed Upon The Angle Of Initiation.
 The Angle Has Been Restricted Between The Angles Of -20.0
 And  15.0 deg.
 Factor Of Safety Calculation By GLE (Spencer's) Method of Slices
 Has Gone Through 20 Iterations
  Theta        FOS         FOS
  (deg)      (Moment)    (Force)
 (ki=1.0)    (Equil.)    (Equil.)    Lambda
```

| | | | |
|---|---|---|---|
| 13.00 | 1.606 | 1.473 | 0.231 |
| 19.50 | 1.577 | 1.481 | 0.354 |
| 40.81 | 25.987 | 1.517 | 0.863 |
| 19.39 | 1.577 | 1.481 | 0.352 |
| 12.14 | 1.609 | 1.471 | 0.215 |
| 44.04 | 2.823 | 1.524 | 0.967 |
| 7.10 | 1.622 | 1.465 | 0.125 |
| 0.00 | 1.633 | 1.456 | 0.000 |
| 83.69 | 1.428 | 20.000 | 9.047 |
| 1.05 | 1.631 | 1.457 | 0.018 |
| 0.00 | 1.633 | 1.456 | 0.000 |
| 89.94 | 1.408 | 307.372 | ***** |
| 0.07 | 1.633 | 1.456 | 0.001 |
| 0.00 | 1.633 | 1.456 | 0.000 |
| 89.94 | 1.408 | 0.434 | ***** |
| 0.00 | 1.633 | 1.456 | 0.000 |
| 0.00 | 1.633 | 1.456 | 0.000 |
| 0.00 | 1.631 | 1.456 | 0.000 |
| 0.00 | 1.631 | 1.456 | 0.000 |
| 0.00 | 1.631 | 1.456 | 0.000 |

The Trial Failure Surface In Question Is Defined
By The Following 8 Coordinate Points

| Point No. | X-Surf (ft) | Y-Surf (ft) |
|---|---|---|
| 1 | 105.00 | 950.00 |
| 2 | 112.74 | 952.03 |
| 3 | 120.24 | 954.81 |
| 4 | 127.43 | 958.31 |
| 5 | 134.24 | 962.52 |
| 6 | 140.60 | 967.37 |
| 7 | 146.45 | 972.83 |
| 8 | 151.00 | 978.00 |

Following Are Displayed The Ten Most Critical Of The Trial
failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By GLE (Spencer's) Method (0-2) * *
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
The option of no water in the tension crack on
the last slice has been selected.
Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces
(if applicable) have been applied to the slice base(s)
on which they intersect.
Total Number of Trial Surfaces Evaluated = 750
WARNING! The Factor of Safety Calculation for one or More Trial Surfaces
Did Not Converge in 20 Iterations.
Number of Trial Surfaces with Non-Converged FS = 1
Percentage of Trial Surfaces With Non-Valid FS Solutions
of the Total Evaluated = 0.1 %
Statistical Data On All Valid FS Values:
FS Max = 2.241 FS Min = 1.496 FS Ave = 1.905
Standard Deviation = 0.225 Coefficient of Variation = 11.81 %
((Modified Bishop FS for Critical Surface = 1.493))
Failure Surface Specified By 9 Coordinate Points

| Point No. | X-Surf (ft) | Y-Surf (ft) |
|---|---|---|
| 1 | 105.00 | 950.00 |
| 2 | 112.76 | 951.96 |
| 3 | 120.29 | 954.65 |
| 4 | 127.54 | 958.04 |
| 5 | 134.43 | 962.11 |
| 6 | 140.90 | 966.81 |
| 7 | 146.90 | 972.10 |
| 8 | 152.36 | 977.94 |
| 9 | 152.41 | 978.00 |

Circle Center At X = 88.26 ; Y = 1032.50 ; and Radius = 84.18
*** FOS = 1.496 Theta (ki=1.0) = 27.12 ***

Lambda = 0.512

Individual data on the 15 slices

| Slice No. | Width (ft) | Weight (lbs) | Water Force Top (lbs) | Water Force Bot (lbs) | Tie Force Norm (lbs) | Tie Force Tan (lbs) | Earthquake Force Hor (lbs) | Earthquake Force Ver (lbs) | Surcharge Load (lbs) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.0 | 4.6 | 0.0 | 0.6 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 2 | 2.0 | 1745.1 | 0.0 | 216.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 3 | 5.8 | 5391.0 | 0.0 | 667.3 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 4 | 7.5 | 8281.0 | 0.0 | 1055.1 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 5 | 2.7 | 3183.5 | 0.0 | 421.8 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 6 | 4.5 | 5372.3 | 0.0 | 711.9 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 7 | 6.9 | 7860.9 | 0.0 | 1095.2 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 8 | 5.2 | 5225.3 | 0.0 | 774.9 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 9 | 1.3 | 1189.0 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 10 | 2.1 | 1769.7 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 11 | 2.0 | 1363.2 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 12 | 0.0 | 7.6 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 13 | 1.9 | 1586.6 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 14 | 5.5 | 2034.4 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 15 | 0.0 | 0.2 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |

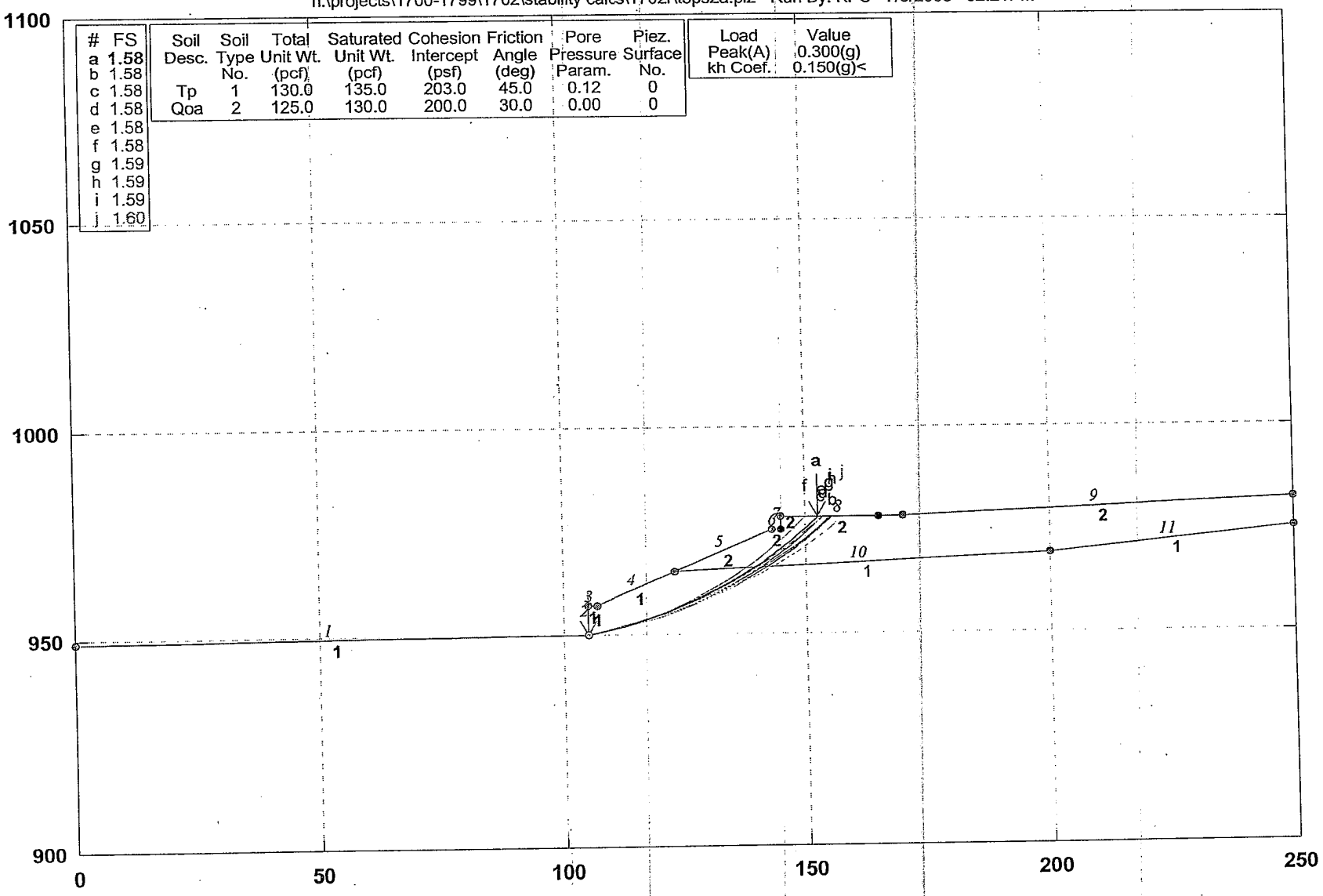
# TT 53108, 3-3'; pseudo; circular; daylighted bedding w/ Ru=0.12

n:\projects\1700-1799\1702\stability calcs\1702r\t3ps2a.pl2 Run By: KPC 7/9/2008 02:21PM

| # | FS |
|---|---|
| a | 1.58 |
| b | 1.58 |
| c | 1.58 |
| d | 1.58 |
| e | 1.58 |
| f | 1.58 |
| g | 1.59 |
| h | 1.59 |
| i | 1.59 |
| j | 1.60 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Piez. Surface No. |
|---|---|---|---|---|---|---|---|
| Tp | 1 | 130.0 | 135.0 | 203.0 | 45.0 | 0.12 | 0 |
| Qoa | 2 | 125.0 | 130.0 | 200.0 | 30.0 | 0.00 | 0 |

| Load | Value |
|---|---|
| Peak(A) | 0.300(g) |
| kh Coef. | 0.150(g)< |




GSTABL7 v.2 FSmin=1.58

Safety Factors Are Calculated By GLE (Spencer's) Method (0-2)

GSTABL7

Run No. 12

```
                    *** GSTABL7 ***
                ** GSTABL7 by Garry H. Gregory, P.E. **
   ** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **
            (All Rights Reserved-Unauthorized Use Prohibited)
*******************************************************************************
                    SLOPE STABILITY ANALYSIS SYSTEM
      Modified Bishop, Simplified Janbu, or GLE Method of Slices.
      (Includes Spencer & Morgenstern-Price Type Analysis)
      Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
      Nonlinear Undrained Shear Strength, Curved Phi Envelope,
      Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
      Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
*******************************************************************************
Analysis Run Date:          7/9/2008
Time of Run:                02:21PM
Run By:                     KPC
Input Data Filename:        N:\Projects\1700-1799\1702\Stability Calcs\1702R\t3ps2a.in
Output Filename:            N:\Projects\1700-1799\1702\Stability Calcs\1702R\t3ps2a.OUT
Unit System:                English
Plotted Output Filename:    N:\Projects\1700-1799\1702\Stabi Calcs\1702R\t3ps2a.PLT
PROBLEM DESCRIPTION:  TT 53108, 3-3'; pseudo; circular;
                      daylighted bedding w/ Ru=0.12

BOUNDARY COORDINATES
    9 Top   Boundaries
   11 Total Boundaries
Boundary     X-Left      Y-Left     X-Right     Y-Right     Soil Type
   No.        (ft)        (ft)       (ft)        (ft)     Below Bnd
    1          0.00      949.00     105.00      950.00        1
    2        105.00      950.00     105.01      957.00        1
    3        105.01      957.00     107.00      957.00        1
    4        107.00      957.00     123.00      965.00        1
    5        123.00      965.00     143.00      975.00        2
    6        143.00      975.00     145.00      975.00        2
    7        145.00      975.00     145.01      978.00        2
    8        145.01      978.00     170.00      978.00        2
    9        170.00      978.00     250.00      982.00        2
   10        123.00      965.00     200.00      969.00        1
   11        200.00      969.00     250.00      975.00        1
User Specified Y-Origin =        900.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)
ISOTROPIC SOIL PARAMETERS
 2 Type(s) of Soil
Soil  Total  Saturated  Cohesion  Friction   Pore    Pressure   Piez.
Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant Surface
 No.  (pcf)    (pcf)     (psf)     (deg)   Param.    (psf)     No.
  1   130.0    135.0     203.0      45.0    0.12       0.0      0
  2   125.0    130.0     200.0      30.0    0.00       0.0      0
Specified Peak Ground Acceleration Coefficient (A) =   0.300(g)
Specified Horizontal Earthquake Coefficient (kh) =   0.150(g)
Specified Vertical Earthquake Coefficient (kv) =   0.000(g)
Specified Seismic Pore-Pressure Factor =   0.000
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
 750 Trial Surfaces Have Been Generated.
 750 Surface(s) Initiate(s) From Each Of     1 Points Equally Spaced
Along The Ground Surface Between  X = 105.00(ft)
                            and   X = 105.00(ft)
Each Surface Terminates Between   X = 145.00(ft)
                            and   X = 165.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is  Y =       0.00(ft)
 8.00(ft) Line Segments Define Each Trial Failure Surface.
Restrictions Have Been Imposed Upon The Angle Of Initiation.
The Angle Has Been Restricted Between The Angles Of -20.0
And  15.0 deg.
```

Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By GLE (Spencer's) Method (0-2) * *
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
The option of no water in the tension crack on
the last slice has been selected.
Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces
(if applicable) have been applied to the slice base(s)
on which they intersect.
Total Number of Trial Surfaces Evaluated = 750
WARNING! The Factor of Safety Calculation for one or More Trial Surfaces
Did Not Converge in 20 Iterations.
Number of Trial Surfaces with Non-Converged FS = 9
Number of Trial Surfaces with Misleading FS = 2
Percentage of Trial Surfaces With Non-Valid FS Solutions
of the Total Evaluated = 1.5 %
Statistical Data On All Valid FS Values:
FS Max = 2.361 FS Min = 1.575 FS Ave = 2.028
Standard Deviation = 0.232 Coefficient of Variation = 11.45 %
((Modified Bishop FS for Critical Surface = 1.580))
Failure Surface Specified By 9 Coordinate Points

| Point No. | X-Surf (ft) | Y-Surf (ft) |
|---|---|---|
| 1 | 105.00 | 950.00 |
| 2 | 112.76 | 951.96 |
| 3 | 120.29 | 954.65 |
| 4 | 127.54 | 958.04 |
| 5 | 134.43 | 962.11 |
| 6 | 140.90 | 966.81 |
| 7 | 146.90 | 972.10 |
| 8 | 152.36 | 977.94 |
| 9 | 152.41 | 978.00 |

Circle Center At X = 88.26 ; Y = 1032.50 ; and Radius = 84.18
*** FOS = 1.575 Theta (ki=1.0) = 27.56 ***
Lambda = 0.522
Individual data on the 15 slices

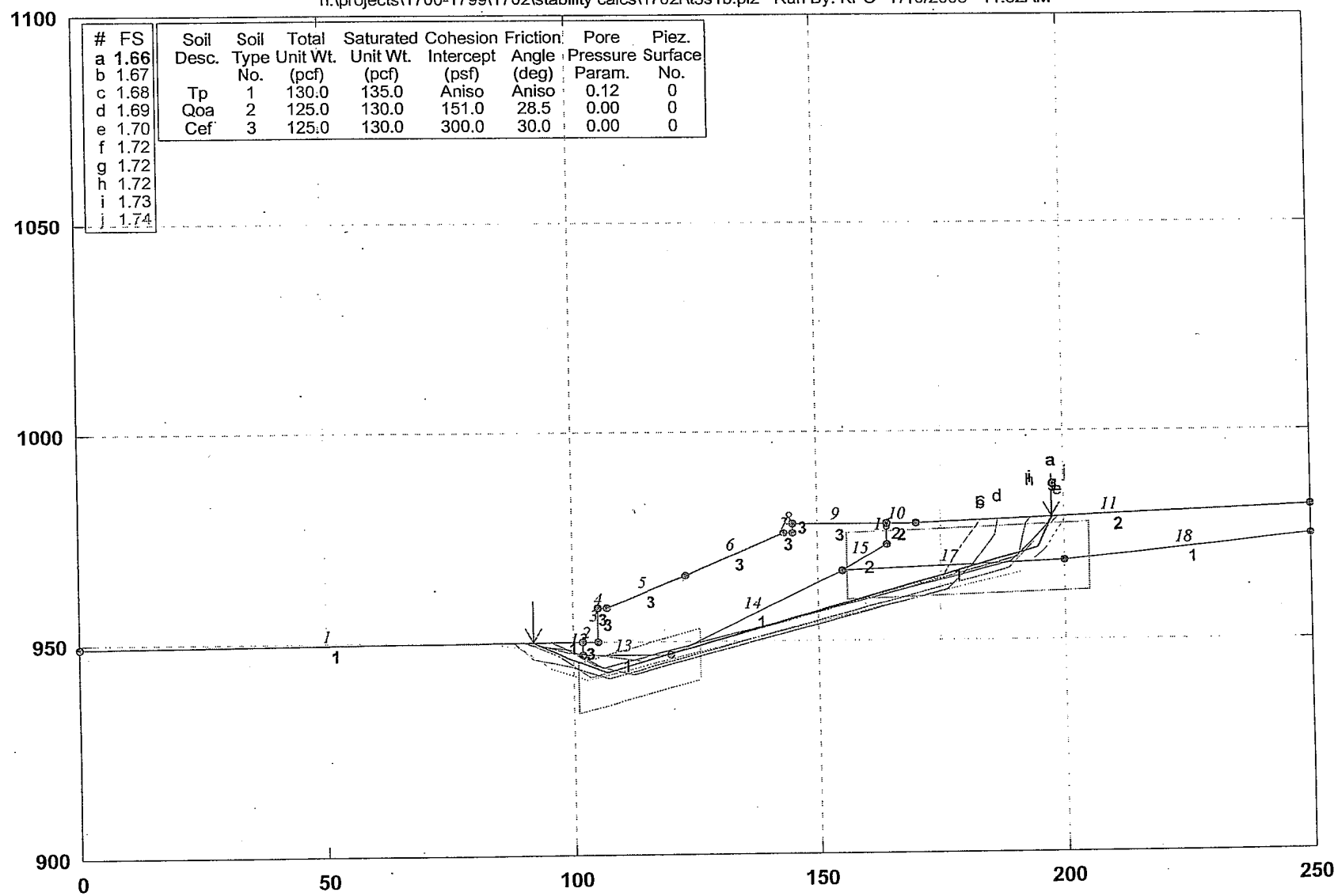
| Slice No. | Width (ft) | Weight (lbs) | Water Force Top (lbs) | Water Force Bot (lbs) | Tie Force Norm (lbs) | Tie Force Tan (lbs) | Earthquake Force Hor (lbs) | Earthquake Force Ver (lbs) | Surcharge Load (lbs) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.0 | 4.6 | 0.0 | 0.6 | 0. | 0. | 0.7 | 0.0 | 0.0 |
| 2 | 2.0 | 1745.1 | 0.0 | 216.0 | 0. | 0. | 261.8 | 0.0 | 0.0 |
| 3 | 5.8 | 5391.0 | 0.0 | 667.3 | 0. | 0. | 808.6 | 0.0 | 0.0 |
| 4 | 7.5 | 8281.0 | 0.0 | 1055.1 | 0. | 0. | 1242.2 | 0.0 | 0.0 |
| 5 | 2.7 | 3183.5 | 0.0 | 421.8 | 0. | 0. | 477.5 | 0.0 | 0.0 |
| 6 | 4.5 | 5372.3 | 0.0 | 711.9 | 0. | 0. | 805.8 | 0.0 | 0.0 |
| 7 | 6.9 | 7860.9 | 0.0 | 1095.2 | 0. | 0. | 1179.1 | 0.0 | 0.0 |
| 8 | 5.2 | 5225.3 | 0.0 | 774.9 | 0. | 0. | 783.8 | 0.0 | 0.0 |
| 9 | 1.3 | 1189.0 | 0.0 | 0.0 | 0. | 0. | 178.3 | 0.0 | 0.0 |
| 10 | 2.1 | 1769.7 | 0.0 | 0.0 | 0. | 0. | 265.5 | 0.0 | 0.0 |
| 11 | 2.0 | 1363.2 | 0.0 | 0.0 | 0. | 0. | 204.5 | 0.0 | 0.0 |
| 12 | 0.0 | 7.6 | 0.0 | 0.0 | 0. | 0. | 1.1 | 0.0 | 0.0 |
| 13 | 1.9 | 1586.6 | 0.0 | 0.0 | 0. | 0. | 238.0 | 0.0 | 0.0 |
| 14 | 5.5 | 2034.4 | 0.0 | 0.0 | 0. | 0. | 305.2 | 0.0 | 0.0 |
| 15 | 0.0 | 0.2 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |

# TT 53108, 3-3'; static; planar; Ru=0.12; stab fill w/ 3' x 15' key

n:\projects\1700-1799\1702\stability calcs\1702r\t3s1b.pl2 Run By: KPC 7/10/2008 11:32AM

| # | FS |
|---|---|
| a | 1.66 |
| b | 1.67 |
| c | 1.68 |
| d | 1.69 |
| e | 1.70 |
| f | 1.72 |
| g | 1.72 |
| h | 1.72 |
| i | 1.73 |
| j | 1.74 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Piez. Surface No. |
|---|---|---|---|---|---|---|---|
| Tp | 1 | 130.0 | 135.0 | Aniso | Aniso | 0.12 | 0 |
| Qoa | 2 | 125.0 | 130.0 | 151.0 | 28.5 | 0.00 | 0 |
| Cef | 3 | 125.0 | 130.0 | 300.0 | 30.0 | 0.00 | 0 |




GSTABL7 v.2 FSmin=1.66

Safety Factors Are Calculated By GLE (Spencer's) Method (0-2)

GSTABL7

Run No. 13

```
                    *** GSTABL7 ***
              ** GSTABL7 by Garry H. Gregory, P.E. **
   ** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **
            (All Rights Reserved-Unauthorized Use Prohibited)
*******************************************************************************
                    SLOPE STABILITY ANALYSIS SYSTEM
      Modified Bishop, Simplified Janbu, or GLE Method of Slices.
      (Includes Spencer & Morgenstern-Price Type Analysis)
      Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
      Nonlinear Undrained Shear Strength, Curved Phi Envelope,
      Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
      Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
*******************************************************************************
Analysis Run Date:          7/10/2008
Time of Run:                11:32AM
Run By:                     KPC
Input Data Filename:        N:\Projects\1700-1799\1702\Stability Calcs\1702R\t3s1b.in
Output Filename:            N:\Projects\1700-1799\1702\Stability Calcs\1702R\t3s1b.OUT
Unit System:                English
Plotted Output Filename:    N:\Projects\1700-1799\1702\Stabi Calcs\1702R\t3s1b.PLT
PROBLEM DESCRIPTION:  TT 53108, 3-3'; static; planar;
                      Ru=0.12; stab fill w/ 3' x 15' key

BOUNDARY COORDINATES
   11 Top   Boundaries
   18 Total Boundaries
Boundary     X-Left      Y-Left     X-Right     Y-Right     Soil Type
   No.        (ft)        (ft)       (ft)        (ft)      Below Bnd
    1          0.00      949.00     102.00      950.00         1
    2        102.00      950.00     105.00      950.00         3
    3        105.00      950.00     105.01      958.00         3
    4        105.01      958.00     107.00      958.00         3
    5        107.00      958.00     123.00      966.00         3
    6        123.00      966.00     143.00      976.00         3
    7        143.00      976.00     145.00      976.00         3
    8        145.00      976.00     145.01      978.00         3
    9        145.01      978.00     164.00      978.00         3
   10        164.00      978.00     170.00      978.00         2
   11        170.00      978.00     250.00      982.00         2
   12        102.00      950.00     102.01      947.00         1
   13        102.01      947.00     120.00      947.00         1
   14        120.00      947.00     155.00      967.00         1
   15        155.00      967.00     163.99      973.00         2
   16        163.99      973.00     164.00      978.00         2
   17        155.00      967.00     200.00      969.00         1
   18        200.00      969.00     250.00      975.00         1
User Specified Y-Origin =        900.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)
ISOTROPIC SOIL PARAMETERS
  3 Type(s) of Soil
Soil  Total  Saturated  Cohesion  Friction   Pore    Pressure   Piez.
Type Unit Wt. Unit Wt. Intercept   Angle   Pressure Constant Surface
 No.  (pcf)    (pcf)     (psf)     (deg)    Param.    (psf)     No.
  1   130.0    135.0     185.0     31.0     0.12      0.0       0
  2   125.0    130.0     151.0     28.5     0.00      0.0       0
  3   125.0    130.0     300.0     30.0     0.00      0.0       0
ANISOTROPIC STRENGTH PARAMETERS
    1 soil type(s)
Soil Type  1 Is Anisotropic
Number Of Direction Ranges Specified =  3
Direction     Counterclockwise     Cohesion      Friction
  Range       Direction Limit     Intercept       Angle
   No.            (deg)             (psf)         (deg)
    1              15.5             185.00         31.00
    2              18.5             200.00         18.00
    3              90.0             185.00         31.00
ANISOTROPIC SOIL NOTES:
```

(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.

750 Trial Surfaces Have Been Generated.

2 Boxes Specified For Generation Of Central Block Base

Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 6.0

| Box No. | X-Left (ft) | Y-Left (ft) | X-Right (ft) | Y-Right (ft) | Height (ft) |
|---|---|---|---|---|---|
| 1 | 101.00 | 939.00 | 126.00 | 947.00 | 12.00 |
| 2 | 156.00 | 968.00 | 205.00 | 970.00 | 16.00 |

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Evaluated. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By GLE (Spencer's) Method (0-2) * *

Selected ki function = Bi-linear

Selected Lambda Coefficient = 1.00

The option of no water in the tension crack on the last slice has been selected.

Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces (if applicable) have been applied to the slice base(s) on which they intersect.

Total Number of Trial Surfaces Evaluated = 750

WARNING! The Factor of Safety Calculation for one or More Trial Surfaces Did Not Converge in 20 Iterations.

Number of Trial Surfaces with Non-Converged FS = 7

Percentage of Trial Surfaces With Non-Valid FS Solutions of the Total Evaluated = 0.9 %

Statistical Data On All Valid FS Values:

FS Max = 6.536 FS Min = 1.655 FS Ave = 2.853

Standard Deviation = 0.722 Coefficient of Variation = 25.30 %

((Simplified Janbu FS for Critical Surface = 1.445))

Failure Surface Specified By 6 Coordinate Points

| Point No. | X-Surf (ft) | Y-Surf (ft) |
|---|---|---|
| 1 | 91.72 | 949.90 |
| 2 | 92.19 | 949.55 |
| 3 | 99.39 | 946.06 |
| 4 | 106.77 | 942.96 |
| 5 | 194.65 | 972.23 |
| 6 | 197.42 | 979.37 |

*** FOS = 1.655 Theta (ki=1.0) = 12.89 ***

Lambda = 0.229

Individual data on the 21 slices

| Slice No. | Width (ft) | Weight (lbs) | Water Force Top (lbs) | Water Force Bot (lbs) | Tie Force Norm (lbs) | Tie Force Tan (lbs) | Earthquake Force Hor (lbs) | Earthquake Force Ver (lbs) | Surcharge Load (lbs) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.5 | 10.8 | 0.0 | 1.6 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 2 | 7.2 | 1995.7 | 0.0 | 266.2 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 3 | 2.6 | 1517.6 | 0.0 | 197.6 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 4 | 0.0 | 6.5 | 0.0 | 0.8 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 5 | 3.0 | 2158.8 | 0.0 | 281.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 6 | 0.0 | 13.0 | 0.0 | 1.7 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 7 | 1.8 | 3253.1 | 0.0 | 423.5 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 8 | 0.2 | 442.9 | 0.0 | 56.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 9 | 11.9 | 23843.2 | 0.0 | 3015.7 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 10 | 2.6 | 5681.0 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 11 | 1.5 | 3190.5 | 0.0 | 403.5 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 12 | 20.0 | 48528.2 | 0.0 | 6137.9 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 13 | 2.0 | 5213.0 | 0.0 | 659.4 | 0. | 0. | 0.0 | 0.0 | 0.0 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 14 | 0.0 | 26.9 | 0.0 | 3.4 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 15 | 10.0 | 26110.3 | 0.0 | 3302.5 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 16 | 9.0 | 19939.6 | 0.0 | 2522.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 17 | 0.0 | 20.3 | 0.0 | 2.6 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 18 | 6.0 | 11368.0 | 0.0 | 1437.8 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 19 | 12.6 | 19353.9 | 0.0 | 2447.9 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 20 | 12.0 | 13078.2 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 21 | 2.8 | 1210.3 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| | *** | | | | | | | | |

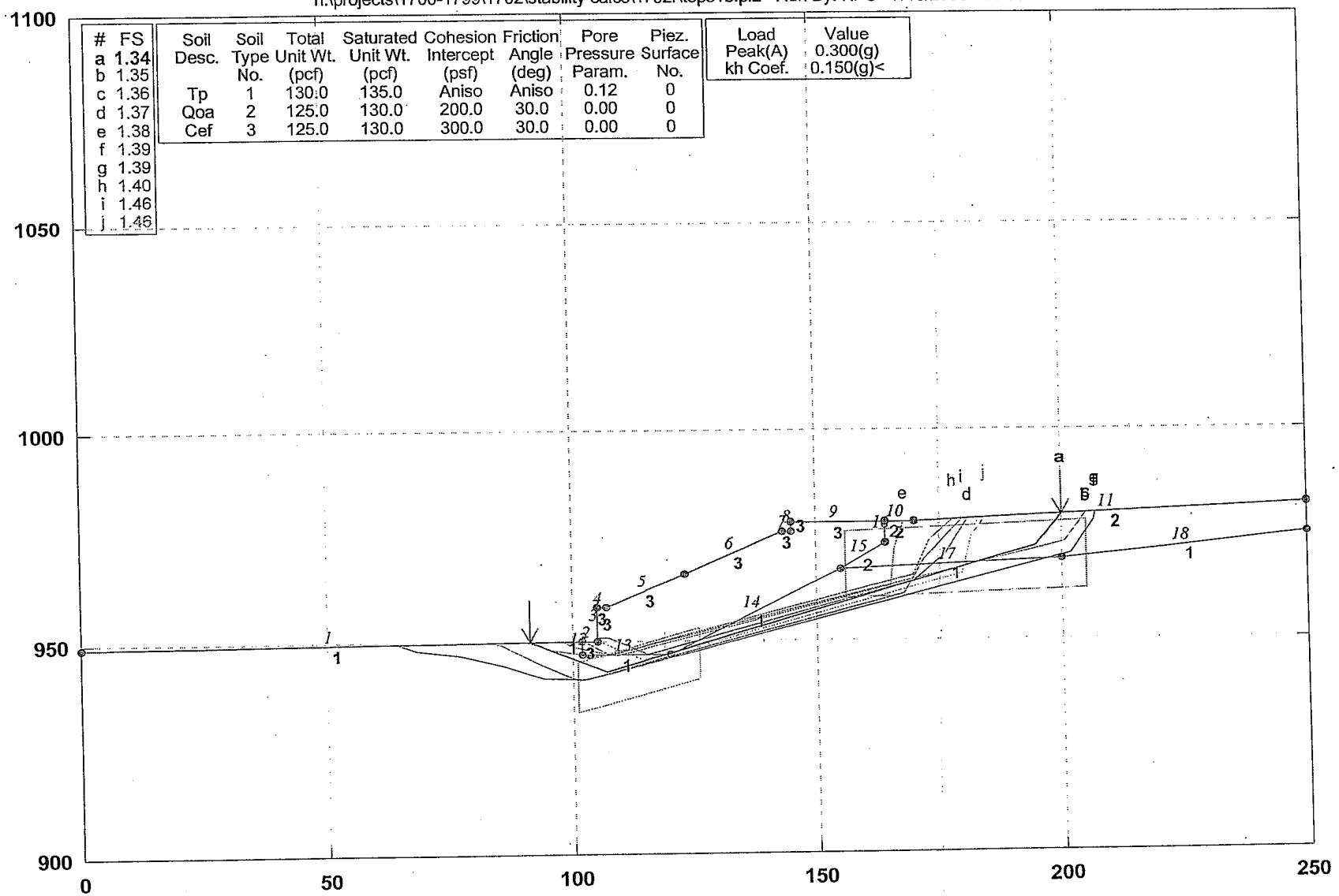
# TT 53108, 3-3'; pseudo; planar; Ru=0.12; stab fill w/ 3' x 15' key

n:\projects\1700-1799\1702\stability calcs\1702r\t3ps1b.pl2 Run By: KPC 7/10/2008 11:33AM

| # | FS |
|---|---|
| a | 1.34 |
| b | 1.35 |
| c | 1.36 |
| d | 1.37 |
| e | 1.38 |
| f | 1.39 |
| g | 1.39 |
| h | 1.40 |
| i | 1.46 |
| j | 1.46 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Piez. Surface No. |
|---|---|---|---|---|---|---|---|
| Tp | 1 | 130.0 | 135.0 | Aniso | Aniso | 0.12 | 0 |
| Qoa | 2 | 125.0 | 130.0 | 200.0 | 30.0 | 0.00 | 0 |
| Cef | 3 | 125.0 | 130.0 | 300.0 | 30.0 | 0.00 | 0 |

| Load | Value |
|---|---|
| Peak(A) | 0.300(g) |
| kh Coef. | 0.150(g)< |




GSTABL7 v.2 FSmin=1.34

Safety Factors Are Calculated By GLE (Spencer's) Method (0-2)

GSTABL7

Run No: 14

```
                    *** GSTABL7 ***
              ** GSTABL7 by Garry H. Gregory, P.E. **
   ** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **
            (All Rights Reserved-Unauthorized Use Prohibited)
*******************************************************************************
                    SLOPE STABILITY ANALYSIS SYSTEM
      Modified Bishop, Simplified Janbu, or GLE Method of Slices.
      (Includes Spencer & Morgenstern-Price Type Analysis)
      Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
      Nonlinear Undrained Shear Strength, Curved Phi Envelope,
      Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
      Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
*******************************************************************************
Analysis Run Date:          7/10/2008
Time of Run:                11:33AM
Run By:                     KPC
Input Data Filename:        N:\Projects\1700-1799\1702\Stability Calcs\1702R\t3ps1b.in
Output Filename:            N:\Projects\1700-1799\1702\Stability Calcs\1702R\t3ps1b.OUT
Unit System:                English
Plotted Output Filename:    N:\Projects\1700-1799\1702\Stabi Calcs\1702R\t3ps1b.PLT
PROBLEM DESCRIPTION:  CT 53108, 3-3'; pseudo; planar;
                      Ru=0.12; stab fill w/ 3' x 15' key

BOUNDARY COORDINATES
   11 Top   Boundaries
   18 Total Boundaries
Boundary     X-Left      Y-Left     X-Right     Y-Right     Soil Type
   No.        (ft)        (ft)       (ft)        (ft)      Below Bnd
    1         0.00      949.00      102.00      950.00         1
    2       102.00      950.00      105.00      950.00         3
    3       105.00      950.00      105.01      958.00         3
    4       105.01      958.00      107.00      958.00         3
    5       107.00      958.00      123.00      966.00         3
    6       123.00      966.00      143.00      976.00         3
    7       143.00      976.00      145.00      976.00         3
    8       145.00      976.00      145.01      978.00         3
    9       145.01      978.00      164.00      978.00         3
   10       164.00      978.00      170.00      978.00         2
   11       170.00      978.00      250.00      982.00         2
   12       102.00      950.00      102.01      947.00         1
   13       102.01      947.00      120.00      947.00         1
   14       120.00      947.00      155.00      967.00         1
   15       155.00      967.00      163.99      973.00         2
   16       163.99      973.00      164.00      978.00         2
   17       155.00      967.00      200.00      969.00         1
   18       200.00      969.00      250.00      975.00         1
User Specified Y-Origin =        900.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)
ISOTROPIC SOIL PARAMETERS
  3 Type(s) of Soil
Soil  Total  Saturated  Cohesion Friction   Pore    Pressure   Piez.
Type Unit Wt. Unit Wt. Intercept  Angle   Pressure Constant Surface
 No.  (pcf)    (pcf)     (psf)    (deg)    Param.    (psf)     No.
  1   130.0    135.0     203.0     45.0     0.12      0.0       0
  2   125.0    130.0     200.0     30.0     0.00      0.0       0
  3   125.0    130.0     300.0     30.0     0.00      0.0       0
ANISOTROPIC STRENGTH PARAMETERS
    1 soil type(s)
Soil Type  1 Is Anisotropic
Number Of Direction Ranges Specified =  3
Direction     Counterclockwise     Cohesion      Friction
  Range       Direction Limit     Intercept       Angle
   No.            (deg)             (psf)         (deg)
    1              15.5             203.00         45.00
    2              18.5             200.00         18.00
    3              90.0             203.00         45.00
ANISOTROPIC SOIL NOTES:
```

(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

Specified Peak Ground Acceleration Coefficient (A) = 0.300(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
750 Trial Surfaces Have Been Generated.
2 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 9.0

| Box No. | X-Left (ft) | Y-Left (ft) | X-Right (ft) | Y-Right (ft) | Height (ft) |
|---|---|---|---|---|---|
| 1 | 101.00 | 939.00 | 126.00 | 947.00 | 12.00 |
| 2 | 156.00 | 968.00 | 205.00 | 970.00 | 16.00 |

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Evaluated. They Are Ordered - Most Critical First.
* * Safety Factors Are Calculated By GLE (Spencer's) Method (0-2) * *
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
The option of no water in the tension crack on the last slice has been selected.
Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces (if applicable) have been applied to the slice base(s) on which they intersect.
Total Number of Trial Surfaces Evaluated = 750
WARNING! The Factor of Safety Calculation for one or More Trial Surfaces Did Not Converge in 20 Iterations.
Number of Trial Surfaces with Non-Converged FS = 153
Number of Trial Surfaces with Misleading FS = 12
Percentage of Trial Surfaces With Non-Valid FS Solutions of the Total Evaluated = 22.0 %
Statistical Data On All Valid FS Values:
FS Max = 5.687 FS Min = 1.337 FS Ave = 2.675
Standard Deviation = 0.601 Coefficient of Variation = 22.45 %
[(Simplified Janbu FS for Critical Surface = 1.152))
Failure Surface Specified By 6 Coordinate Points

| Point No. | X-Surf (ft) | Y-Surf (ft) |
|---|---|---|
| 1 | 91.36 | 949.90 |
| 2 | 98.47 | 946.45 |
| 3 | 106.77 | 942.96 |
| 4 | 194.65 | 972.23 |
| 5 | 199.98 | 979.49 |
| 6 | 199.98 | 979.50 |

*** FOS = 1.337 Theta (ki=1.0) = 12.87 ***
Lambda = 0.229
Individual data on the 21 slices

| Slice No. | Width (ft) | Weight (lbs) | Water Force Top (lbs) | Water Force Bot (lbs) | Tie Force Norm (lbs) | Tie Force Tan (lbs) | Earthquake Force Hor (lbs) | Earthquake Force Ver (lbs) | Surcharge Load (lbs) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 7.1 | 1624.8 | 0.0 | 216.7 | 0. | 0. | 243.7 | 0.0 | 0.0 |
| 2 | 3.5 | 1962.9 | 0.0 | 255.5 | 0. | 0. | 294.4 | 0.0 | 0.0 |
| 3 | 0.0 | 6.5 | 0.0 | 0.8 | 0. | 0. | 1.0 | 0.0 | 0.0 |
| 4 | 3.0 | 2158.8 | 0.0 | 281.0 | 0. | 0. | 323.8 | 0.0 | 0.0 |
| 5 | 0.0 | 13.0 | 0.0 | 1.7 | 0. | 0. | 2.0 | 0.0 | 0.0 |
| 6 | 1.8 | 3253.1 | 0.0 | 423.5 | 0. | 0. | 488.0 | 0.0 | 0.0 |
| 7 | 0.2 | 442.9 | 0.0 | 56.0 | 0. | 0. | 66.4 | 0.0 | 0.0 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 8 | 11.9 | 23843.1 | 0.0 | 3015.7 | 0. | 0. | 3576.5 | 0.0 | 0.0 |
| 9 | 2.6 | 5681.0 | 0.0 | 0.0 | 0. | 0. | 852.1 | 0.0 | 0.0 |
| 10 | 1.5 | 3190.5 | 0.0 | 403.5 | 0. | 0. | 478.6 | 0.0 | 0.0 |
| 11 | 20.0 | 48528.2 | 0.0 | 6137.9 | 0. | 0. | 7279.2 | 0.0 | 0.0 |
| 12 | 2.0 | 5213.0 | 0.0 | 659.4 | 0. | 0. | 782.0 | 0.0 | 0.0 |
| 13 | 0.0 | 26.9 | 0.0 | 3.4 | 0. | 0. | 4.0 | 0.0 | 0.0 |
| 14 | 10.0 | 26110.3 | 0.0 | 3302.5 | 0. | 0. | 3916.5 | 0.0 | 0.0 |
| 15 | 9.0 | 19939.6 | 0.0 | 2522.0 | 0. | 0. | 2990.9 | 0.0 | 0.0 |
| 16 | 0.0 | 20.3 | 0.0 | 2.6 | 0. | 0. | 3.0 | 0.0 | 0.0 |
| 17 | 6.0 | 11368.0 | 0.0 | 1437.8 | 0. | 0. | 1705.2 | 0.0 | 0.0 |
| 18 | 12.6 | 19353.9 | 0.0 | 2447.9 | 0. | 0. | 2903.1 | 0.0 | 0.0 |
| 19 | 12.0 | 13078.2 | 0.0 | 0.0 | 0. | 0. | 1961.7 | 0.0 | 0.0 |
| 20 | 5.3 | 2333.6 | 0.0 | 0.0 | 0. | 0. | 350.0 | 0.0 | 0.0 |
| 21 | 0.0 | 0.0 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |

# Landmark off-site grading; 4-4'; CS-2; static; planar

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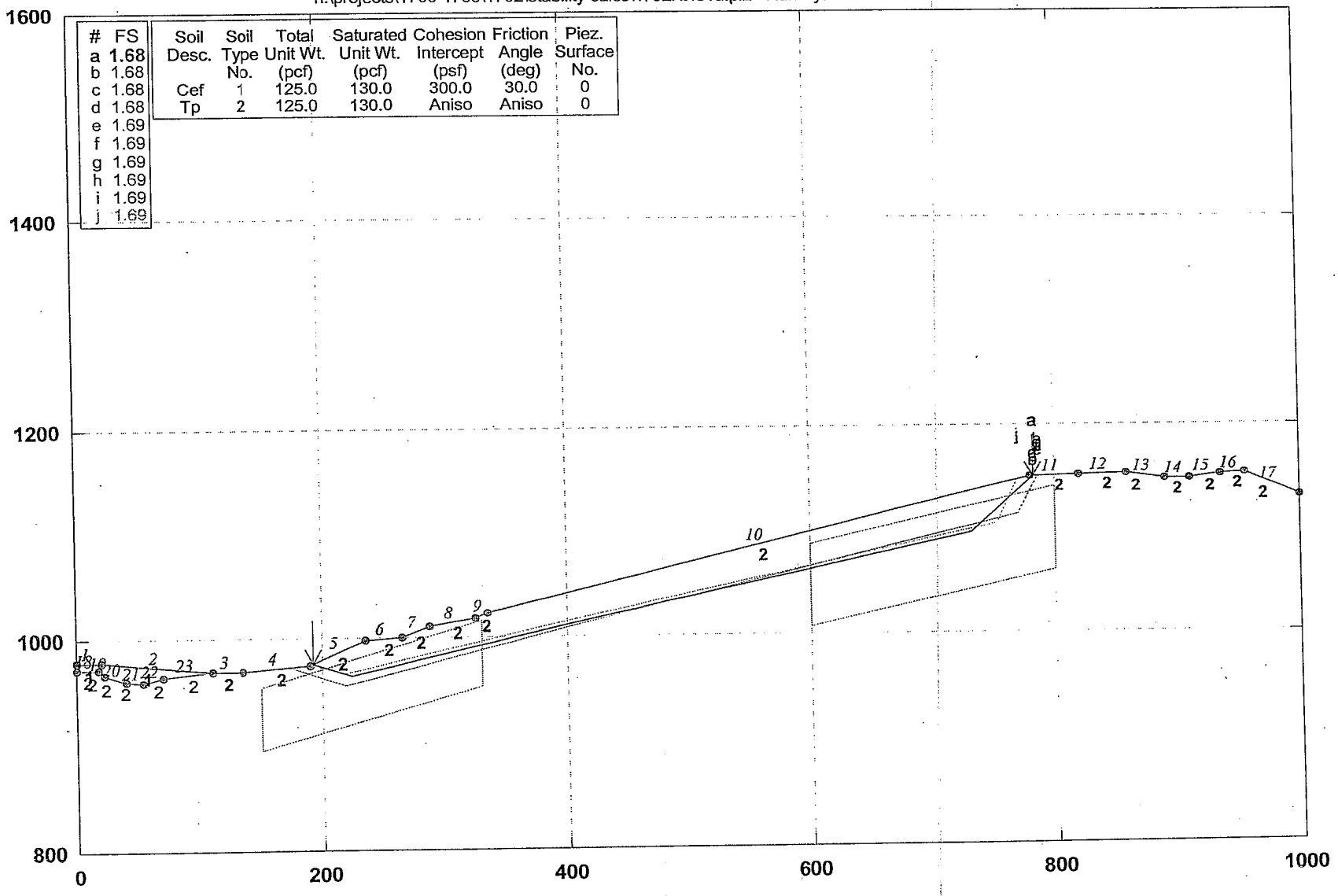
| # | FS |
|---|---|
| a | 1.68 |
| b | 1.68 |
| c | 1.68 |
| d | 1.68 |
| e | 1.69 |
| f | 1.69 |
| g | 1.69 |
| h | 1.69 |
| i | 1.69 |
| j | 1.69 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Cef | 1 | 125.0 | 130.0 | 300.0 | 30.0 | 0 |
| Tp | 2 | 125.0 | 130.0 | Aniso | Aniso | 0 |




GSTABL7 v.2 FSmin=1.68

Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2)

GSTABL7

Run No. 15

```
                    *** GSTABL7 ***
                ** GSTABL7 by Garry H. Gregory, P.E. **
   ** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **
            (All Rights Reserved-Unauthorized Use Prohibited)
*******************************************************************************
                    SLOPE STABILITY ANALYSIS SYSTEM
      Modified Bishop, Simplified Janbu, or GLE Method of Slices.
      (Includes Spencer & Morgenstern-Price Type Analysis)
      Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
      Nonlinear Undrained Shear Strength, Curved Phi Envelope,
      Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
      Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
*******************************************************************************
Analysis Run Date:          7/10/2008
Time of Run:                09:51AM
Run By:                     KPC
Input Data Filename:        N:\Projects\1700-1799\1702\Stability Calcs\1702R\t4s1a.in
Output Filename:            N:\Projects\1700-1799\1702\Stability Calcs\1702R\t4s1a.OUT
Unit System:                English
Plotted Output Filename:    N:\Projects\1700-1799\1702\Stabi Calcs\1702R\t4s1a.PLT
PROBLEM DESCRIPTION:  Landmark off-site grading; 4-4'; CS-2;
                      static; planar

BOUNDARY COORDINATES
   17 Top   Boundaries
   23 Total Boundaries
Boundary     X-Left      Y-Left     X-Right     Y-Right     Soil Type
   No.        (ft)        (ft)       (ft)        (ft)      Below Bnd
    1         0.00      979.00      20.00       979.00        1
    2        20.00      979.00     110.00       970.00        1
    3       110.00      970.00     135.00       970.00        2
    4       135.00      970.00     190.00       975.00        2
    5       190.00      975.00     235.00       998.00        2
    6       235.00      998.00     255.00      1000.00        2
    7       255.00     1000.00     288.00      1010.00        2
    8       288.00     1010.00     325.00      1017.00        2
    9       325.00     1017.00     335.00      1022.00        2
   10       335.00     1022.00     780.00      1150.00        2
   11       780.00     1150.00     820.00      1151.00        2
   12       820.00     1151.00     859.00      1153.00        2
   13       859.00     1153.00     890.00      1148.00        2
   14       890.00     1148.00     910.00      1148.00        2
   15       910.00     1148.00     935.00      1151.00        2
   16       935.00     1151.00     955.00      1153.00        2
   17       955.00     1153.00    1000.00      1130.00        2
   18         0.00      973.00      17.00       972.00        2
   19        17.00      972.00      23.00       967.00        2
   20        23.00      967.00      40.00       961.00        2
   21        40.00      961.00      54.00       960.00        2
   22        54.00      960.00      70.00       965.00        2
   23        70.00      965.00     110.00       970.00        2
 User Specified Y-Origin =        800.00(ft)
 Default X-Plus Value = 0.00(ft)
 Default Y-Plus Value = 0.00(ft)
ISOTROPIC SOIL PARAMETERS
  2 Type(s) of Soil
 Soil  Total  Saturated  Cohesion  Friction   Pore    Pressure   Piez.
 Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant Surface
  No.  (pcf)    (pcf)     (psf)     (deg)   Param.    (psf)     No.
   1   125.0    130.0     300.0     30.0    0.00       0.0      0
   2   125.0    130.0     350.0     30.0    0.00       0.0      0
ANISOTROPIC STRENGTH PARAMETERS
    1 soil type(s)
 Soil Type  2 Is Anisotropic
 Number Of Direction Ranges Specified =  3
 Direction     Counterclockwise      Cohesion      Friction
   Range       Direction Limit      Intercept       Angle
    No.            (deg)              (psf)         (deg)
```

| | | | |
|---|---|---|---|
| 1 | 13.5 | 350.00 | 30.00 |
| 2 | 16.5 | 200.00 | 20.00 |
| 3 | 90.0 | 350.00 | 30.00 |

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
2000 Trial Surfaces Have Been Generated.
2 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 50.0

| Box No. | X-Left (ft) | Y-Left (ft) | X-Right (ft) | Y-Right (ft) | Height (ft) |
|---|---|---|---|---|---|
| 1 | 150.00 | 925.00 | 330.00 | 985.00 | 60.00 |
| 2 | 600.00 | 1046.00 | 800.00 | 1100.00 | 80.00 |

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Evaluated. They Are Ordered - Most Critical First.
* * Safety Factors Are Calculated By GLE (Spencer's) Method (0-2) * *
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
The option of no water in the tension crack on the last slice has been selected.
Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces (if applicable) have been applied to the slice base(s) on which they intersect.
Total Number of Trial Surfaces Evaluated = 2000
WARNING! The Factor of Safety Calculation for one or More Trial Surfaces Did Not Converge in 20 Iterations.
Number of Trial Surfaces with Non-Converged FS = 46
Percentage of Trial Surfaces With Non-Valid FS Solutions of the Total Evaluated = 2.3 %
Statistical Data On All Valid FS Values:
FS Max = 5.018 FS Min = 1.681 FS Ave = 2.688
Standard Deviation = 0.538 Coefficient of Variation = 20.01 %
((Simplified Janbu FS for Critical Surface = 1.607))
Failure Surface Specified By 5 Coordinate Points

| Point No. | X-Surf (ft) | Y-Surf (ft) |
|---|---|---|
| 1 | 192.50 | 976.28 |
| 2 | 223.86 | 965.35 |
| 3 | 731.19 | 1096.57 |
| 4 | 766.19 | 1132.28 |
| 5 | 783.08 | 1150.08 |

*** FOS = 1.681 Theta (ki=1.0) = 17.55 ***
Lambda = 0.316
Individual data on the 10 slices

| Slice No. | Width (ft) | Weight (lbs) | Water Force Top (lbs) | Water Force Bot (lbs) | Tie Force Norm (lbs) | Tie Force Tan (lbs) | Earthquake Force Hor (lbs) | Earthquake Force Ver (lbs) | Surcharge Load (lbs) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 31.4 | 52839.8 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 2 | 11.1 | 39492.6 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 3 | 30.0 | 100837.1 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 4 | 23.0 | 74852.1 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 5 | 37.0 | 123838.4 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 6 | 10.0 | 33371.8 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 7 | 396.2 | 1666265.5 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 8 | 35.0 | 116237.7 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 9 | 13.8 | 14603.5 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 10 | 3.1 | 610.7 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |

Failure Surface Specified By 5 Coordinate Points

| Point No. | X-Surf (ft) | Y-Surf (ft) |
|---|---|---|
| 1 | 192.50 | 976.28 |
| 2 | 223.86 | 965.35 |
| 3 | 731.19 | 1096.57 |
| 4 | 766.19 | 1132.28 |
| 5 | 783.08 | 1150.08 |

*** FOS = 1.681 Theta (ki=1.0) = 17.55 ***

Lambda = 0.316

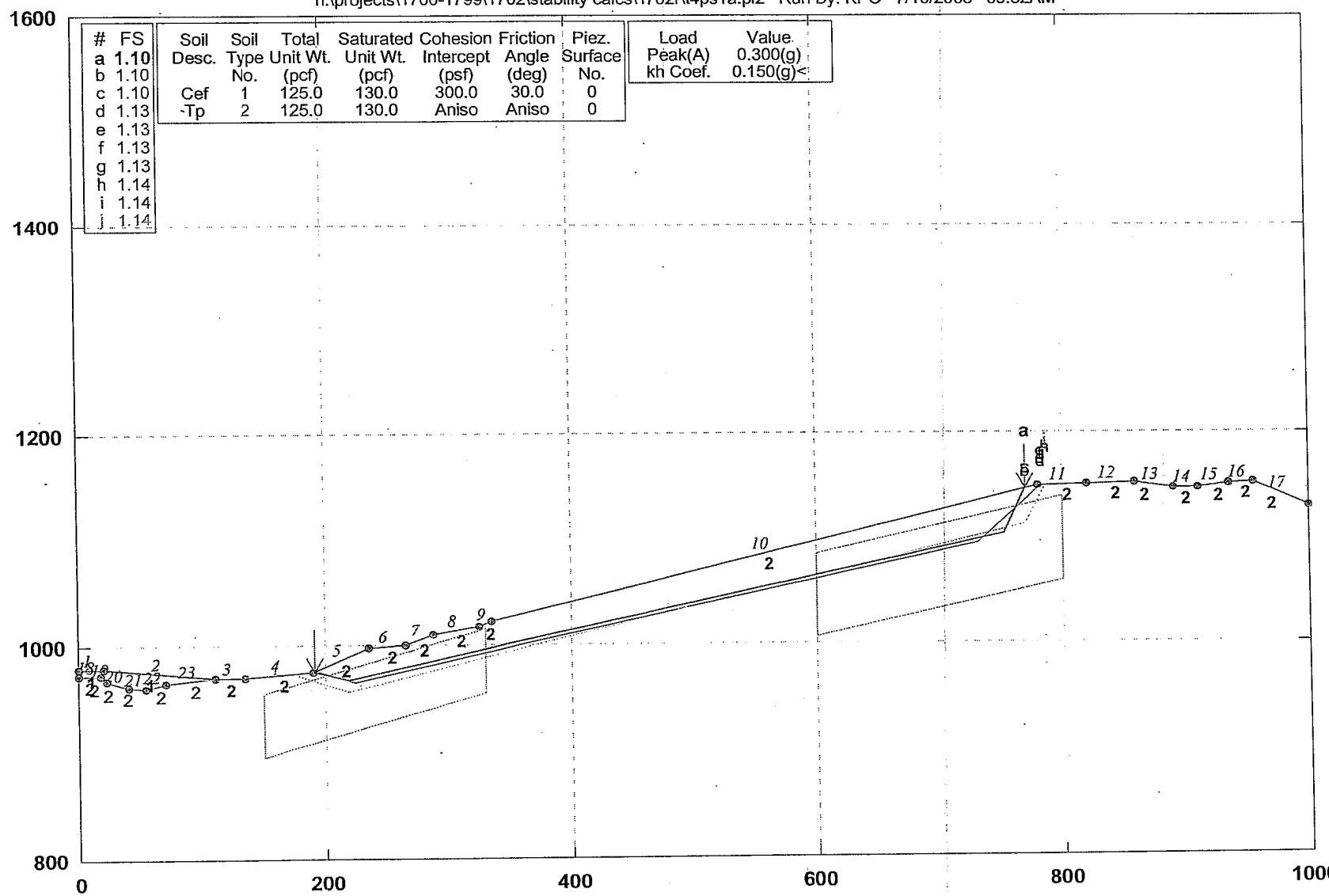
# Landmark off-site grading; 4-4'; CS-2; pseudo; planar

n:\projects\1700-1799\1702\stability calcs\1702r\t4ps1a.pl2 Run By: KPC 7/10/2008 09:52AM

| # | FS |
|---|---|
| a | 1.10 |
| b | 1.10 |
| c | 1.10 |
| d | 1.13 |
| e | 1.13 |
| f | 1.13 |
| g | 1.13 |
| h | 1.14 |
| i | 1.14 |
| j | 1.14 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Cef | 1 | 125.0 | 130.0 | 300.0 | 30.0 | 0 |
| -Tp | 2 | 125.0 | 130.0 | Aniso | Aniso | 0 |

| Load | Value |
|---|---|
| Peak(A) | 0.300(g) |
| kh Coef. | 0.150(g)<= |




GSTABL7 v.2 FSmin=1.10

Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2)

GSTABL7

Run No. 16

```
                    *** GSTABL7 ***
               ** GSTABL7 by Garry H. Gregory, P.E. **
   ** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **
            (All Rights Reserved-Unauthorized Use Prohibited)
*******************************************************************************
                    SLOPE STABILITY ANALYSIS SYSTEM
      Modified Bishop, Simplified Janbu, or GLE Method of Slices.
      (Includes Spencer & Morgenstern-Price Type Analysis)
      Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
      Nonlinear Undrained Shear Strength, Curved Phi Envelope,
      Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
      Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
*******************************************************************************
Analysis Run Date:          7/10/2008
Time of Run:                09:52AM
Run By:                     KPC
Input Data Filename:        N:\Projects\1700-1799\1702\Stability Calcs\1702R\t4psla.in
Output Filename:            N:\Projects\1700-1799\1702\Stability Calcs\1702R\t4psla.OUT
Unit System:                English
Plotted Output Filename:    N:\Projects\1700-1799\1702\Stabi Calcs\1702R\t4psla.PLT
PROBLEM DESCRIPTION:  Landmark off-site grading; 4-4'; CS-2;
                      pseudo; planar
BOUNDARY COORDINATES
   17 Top   Boundaries
   23 Total Boundaries
Boundary     X-Left      Y-Left     X-Right     Y-Right     Soil Type
   No.        (ft)        (ft)       (ft)        (ft)     Below Bnd
    1          0.00      979.00      20.00      979.00        1
    2         20.00      979.00     110.00      970.00        1
    3        110.00      970.00     135.00      970.00        2
    4        135.00      970.00     190.00      975.00        2
    5        190.00      975.00     235.00      998.00        2
    6        235.00      998.00     265.00     1000.00        2
    7        265.00     1000.00     288.00     1010.00        2
    8        288.00     1010.00     325.00     1017.00        2
    9        325.00     1017.00     335.00     1022.00        2
   10        335.00     1022.00     780.00     1150.00        2
   11        780.00     1150.00     820.00     1151.00        2
   12        820.00     1151.00     859.00     1153.00        2
   13        859.00     1153.00     890.00     1148.00        2
   14        890.00     1148.00     910.00     1148.00        2
   15        910.00     1148.00     935.00     1151.00        2
   16        935.00     1151.00     955.00     1153.00        2
   17        955.00     1153.00    1000.00     1130.00        2
   18          0.00      973.00      17.00      972.00        2
   19         17.00      972.00      23.00      967.00        2
   20         23.00      967.00      40.00      961.00        2
   21         40.00      961.00      54.00      960.00        2
   22         54.00      960.00      70.00      965.00        2
   23         70.00      965.00     110.00      970.00        2
 User Specified Y-Origin =       800.00(ft)
 Default X-Plus Value = 0.00(ft)
 Default Y-Plus Value = 0.00(ft)
ISOTROPIC SOIL PARAMETERS
  2 Type(s) of Soil
 Soil  Total  Saturated  Cohesion  Friction   Pore    Pressure   Piez.
 Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant Surface
  No.   (pcf)    (pcf)     (psf)     (deg)   Param.    (psf)     No.
   1    125.0    130.0     300.0     30.0    0.00       0.0      0
   2    125.0    130.0     500.0     36.0    0.00       0.0      0
ANISOTROPIC STRENGTH PARAMETERS
    1 soil type(s)
 Soil Type  2 Is Anisotropic
 Number Of Direction Ranges Specified =  3
 Direction     Counterclockwise      Cohesion      Friction
   Range       Direction Limit     Intercept       Angle
    No.            (deg)             (psf)         (deg)
```

| | | | |
|---|---|---|---|
| 1 | 13.5 | 500.00 | 36.00 |
| 2 | 16.5 | 200.00 | 20.00 |
| 3 | 90.0 | 500.00 | 36.00 |

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

Specified Peak Ground Acceleration Coefficient (A) = 0.300(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
2000 Trial Surfaces Have Been Generated.
2 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 50.0

| Box No. | X-Left (ft) | Y-Left (ft) | X-Right (ft) | Y-Right (ft) | Height (ft) |
|---|---|---|---|---|---|
| 1 | 150.00 | 925.00 | 330.00 | 985.00 | 60.00 |
| 2 | 600.00 | 1046.00 | 800.00 | 1100.00 | 80.00 |

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Evaluated. They Are Ordered - Most Critical First.
* * Safety Factors Are Calculated By GLE (Spencer's) Method (0-2) * *
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
The option of no water in the tension crack on the last slice has been selected.
Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces (if applicable) have been applied to the slice base(s) on which they intersect.
Total Number of Trial Surfaces Evaluated = 2000
WARNING! The Factor of Safety Calculation for one or More Trial Surfaces Did Not Converge in 20 Iterations.
Number of Trial Surfaces with Non-Converged FS = 221
Number of Trial Surfaces with Misleading FS = 17
Percentage of Trial Surfaces With Non-Valid FS Solutions of the Total Evaluated = 11.9 %
Statistical Data On All Valid FS Values:
FS Max = 3.149 FS Min = 1.103 FS Ave = 2.108
Standard Deviation = 0.435 Coefficient of Variation = 20.61 %
((Simplified Janbu FS for Critical Surface = 1.070))
Failure Surface Specified By 4 Coordinate Points

| Point No. | X-Surf (ft) | Y-Surf (ft) |
|---|---|---|
| 1 | 190.87 | 975.44 |
| 2 | 219.11 | 967.58 |
| 3 | 752.48 | 1105.52 |
| 4 | 770.61 | 1147.30 |

*** FOS = 1.103 Theta (ki=1.0) = 14.97 ***
Lambda = 0.267
Individual data on the 8 slices

| Slice No. | Width (ft) | Weight (lbs) | Water Force Top (lbs) | Water Force Bot (lbs) | Tie Force Norm (lbs) | Tie Force Tan (lbs) | Earthquake Force Hor (lbs) | Earthquake Force Ver (lbs) | Surcharge Load (lbs) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 28.2 | 39378.7 | 0.0 | 0.0 | 0. | 0. | 5906.8 | 0.0 | 0.0 |
| 2 | 15.9 | 48271.7 | 0.0 | 0.0 | 0. | 0. | 7240.7 | 0.0 | 0.0 |
| 3 | 30.0 | 87886.0 | 0.0 | 0.0 | 0. | 0. | 13182.9 | 0.0 | 0.0 |
| 4 | 23.0 | 64924.4 | 0.0 | 0.0 | 0. | 0. | 9738.7 | 0.0 | 0.0 |
| 5 | 37.0 | 107870.0 | 0.0 | 0.0 | 0. | 0. | 16180.5 | 0.0 | 0.0 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 6 | 10.9 | 29056.5 | 0.0 | 0.0 | 0. | 0. | 4358.5 | 0.0 | 0.0 |
| 7 | 417.5 | 1591947.1 | 0.0 | 0.0 | 0. | 0. | ******* | 0.0 | 0.0 |
| 8 | 18.1 | 41429.2 | 0.0 | 0.0 | 0. | 0. | 6214.4 | 0.0 | 0.0 |

Failure Surface Specified By 4 Coordinate Points

| Point No. | X-Surf (ft) | Y-Surf (ft) |
|---|---|---|
| 1 | 190.87 | 975.44 |
| 2 | 219.11 | 967.58 |
| 3 | 752.48 | 1105.52 |
| 4 | 770.61 | 1147.30 |

*** FOS = 1.103 Theta (ki=1.0) = 14.97 ***

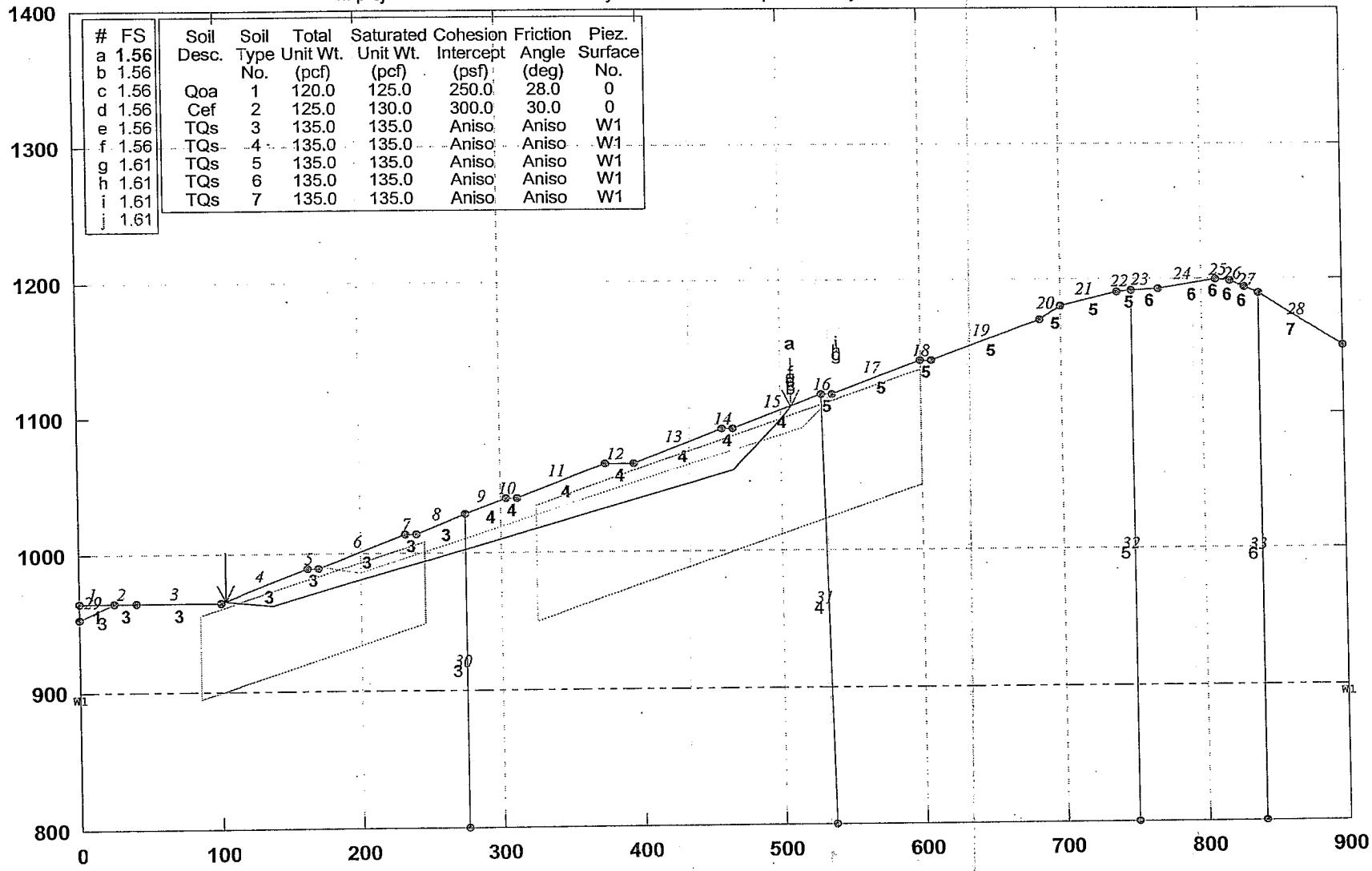
Lambda = 0.267

# Lndmrk off-site grading; 5-5'; CS-4; static; planar

n:\projects\1700-1799\1702\stability calcs\1702r\t5s2b.pl2 Run By: KPC 7/9/2008 10:29AM

| # | FS |
|---|---|
| a | 1.56 |
| b | 1.56 |
| c | 1.56 |
| d | 1.56 |
| e | 1.56 |
| f | 1.56 |
| g | 1.61 |
| h | 1.61 |
| i | 1.61 |
| j | 1.61 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Qoa | 1 | 120.0 | 125.0 | 250.0 | 28.0 | 0 |
| Cef | 2 | 125.0 | 130.0 | 300.0 | 30.0 | 0 |
| TQs | 3 | 135.0 | 135.0 | Aniso | Aniso | W1 |
| TQs | 4 | 135.0 | 135.0 | Aniso | Aniso | W1 |
| TQs | 5 | 135.0 | 135.0 | Aniso | Aniso | W1 |
| TQs | 6 | 135.0 | 135.0 | Aniso | Aniso | W1 |
| TQs | 7 | 135.0 | 135.0 | Aniso | Aniso | W1 |




GSTABL7 v.2 FSmin=1.56

Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2)

GSTABL7

Run No. 17

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **
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SLOPE STABILITY ANALYSIS SYSTEM
Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

Analysis Run Date: 7/9/2008
Time of Run: 10:29AM
Run By: KPC
Input Data Filename: N:\Projects\1700-1799\1702\Stability Calcs\1702R\t5s2b.in
Output Filename: N:\Projects\1700-1799\1702\Stability Calcs\1702R\t5s2b.OUT
Unit System: English
Plotted Output Filename: N:\Projects\1700-1799\1702\Stabi Calcs\1702R\t5s2b.PLT
PROBLEM DESCRIPTION: Lndmrk off-site grading; 5-5'; CS-4; static; planar

BOUNDARY COORDINATES
28 Top Boundaries
33 Total Boundaries

| Boundary No. | X-Left (ft) | Y-Left (ft) | X-Right (ft) | Y-Right (ft) | Soil Type Below Bnd |
|---|---|---|---|---|---|
| 1 | 0.00 | 964.00 | 25.00 | 964.00 | 1 |
| 2 | 25.00 | 964.00 | 40.00 | 964.00 | 3 |
| 3 | 40.00 | 964.00 | 100.00 | 964.00 | 3 |
| 4 | 100.00 | 964.00 | 162.00 | 989.00 | 3 |
| 5 | 162.00 | 989.00 | 170.00 | 989.00 | 3 |
| 6 | 170.00 | 989.00 | 232.00 | 1014.00 | 3 |
| 7 | 232.00 | 1014.00 | 240.00 | 1014.00 | 3 |
| 8 | 240.00 | 1014.00 | 275.00 | 1028.00 | 3 |
| 9 | 275.00 | 1028.00 | 304.00 | 1040.00 | 4 |
| 10 | 304.00 | 1040.00 | 312.00 | 1040.00 | 4 |
| 11 | 312.00 | 1040.00 | 375.00 | 1064.00 | 4 |
| 12 | 375.00 | 1064.00 | 395.00 | 1064.00 | 4 |
| 13 | 395.00 | 1064.00 | 458.00 | 1090.00 | 4 |
| 14 | 458.00 | 1090.00 | 466.00 | 1090.00 | 4 |
| 15 | 466.00 | 1090.00 | 529.00 | 1115.00 | 4 |
| 16 | 529.00 | 1115.00 | 537.00 | 1115.00 | 5 |
| 17 | 537.00 | 1115.00 | 600.00 | 1140.00 | 5 |
| 18 | 600.00 | 1140.00 | 608.00 | 1140.00 | 5 |
| 19 | 608.00 | 1140.00 | 685.00 | 1170.00 | 5 |
| 20 | 685.00 | 1170.00 | 700.00 | 1180.00 | 5 |
| 21 | 700.00 | 1180.00 | 740.00 | 1190.00 | 5 |
| 22 | 740.00 | 1190.00 | 750.00 | 1191.00 | 5 |
| 23 | 750.00 | 1191.00 | 770.00 | 1193.00 | 6 |
| 24 | 770.00 | 1193.00 | 810.00 | 1199.00 | 6 |
| 25 | 810.00 | 1199.00 | 820.00 | 1198.00 | 6 |
| 26 | 820.00 | 1198.00 | 830.00 | 1194.00 | 6 |
| 27 | 830.00 | 1194.00 | 840.00 | 1189.00 | 6 |
| 28 | 840.00 | 1189.00 | 900.00 | 1150.00 | 7 |
| 29 | 0.00 | 953.00 | 25.00 | 964.00 | 3 |
| 30 | 275.00 | 1026.00 | 275.01 | 800.00 | 3 |
| 31 | 529.00 | 1115.00 | 535.00 | 800.00 | 4 |
| 32 | 750.00 | 1191.00 | 750.01 | 800.00 | 5 |
| 33 | 840.00 | 1189.00 | 840.01 | 800.00 | 6 |

User Specified Y-Origin = 800.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
7 Type(s) of Soil

| Soil Type | Total Unit Wt. | Saturated Unit Wt. | Cohesion Intercept | Friction Angle | Pore Pressure | Pressure Constant | Piez. Surface |
|---|---|---|---|---|---|---|---|

| No. | (pcf) | (pcf) | (psf) | (deg) | Param. | (psf) | No. |
|---|---|---|---|---|---|---|---|
| 1 | 120.0 | 125.0 | 250.0 | 28.0 | 0.00 | 0.0 | 0 |
| 2 | 125.0 | 130.0 | 300.0 | 30.0 | 0.00 | 0.0 | 0 |
| 3 | 135.0 | 135.0 | 500.0 | 35.0 | 0.00 | 0.0 | 1 |
| 4 | 135.0 | 135.0 | 500.0 | 35.0 | 0.00 | 0.0 | 1 |
| 5 | 135.0 | 135.0 | 500.0 | 35.0 | 0.00 | 0.0 | 1 |
| 6 | 135.0 | 135.0 | 500.0 | 35.0 | 0.00 | 0.0 | 1 |
| 7 | 135.0 | 135.0 | 500.0 | 35.0 | 0.00 | 0.0 | 1 |

ANISOTROPIC STRENGTH PARAMETERS

5 soil type(s)

Soil Type 3 Is Anisotropic

Number Of Direction Ranges Specified = 3

| Direction Range No. | Counterclockwise Direction Limit (deg) | Cohesion Intercept (psf) | Friction Angle (deg) |
|---|---|---|---|
| 1 | 15.5 | 500.00 | 35.00 |
| 2 | 18.5 | 200.00 | 20.00 |
| 3 | 90.0 | 500.00 | 35.00 |

Soil Type 4 Is Anisotropic

Number Of Direction Ranges Specified = 3

| Direction Range No. | Counterclockwise Direction Limit (deg) | Cohesion Intercept (psf) | Friction Angle (deg) |
|---|---|---|---|
| 1 | 16.5 | 500.00 | 35.00 |
| 2 | 19.5 | 200.00 | 20.00 |
| 3 | 90.0 | 500.00 | 35.00 |

Soil Type 5 Is Anisotropic

Number Of Direction Ranges Specified = 3

| Direction Range No. | Counterclockwise Direction Limit (deg) | Cohesion Intercept (psf) | Friction Angle (deg) |
|---|---|---|---|
| 1 | 19.5 | 500.00 | 35.00 |
| 2 | 22.5 | 200.00 | 20.00 |
| 3 | 90.0 | 500.00 | 35.00 |

Soil Type 6 Is Anisotropic

Number Of Direction Ranges Specified = 3

| Direction Range No. | Counterclockwise Direction Limit (deg) | Cohesion Intercept (psf) | Friction Angle (deg) |
|---|---|---|---|
| 1 | 13.5 | 500.00 | 35.00 |
| 2 | 16.5 | 200.00 | 20.00 |
| 3 | 90.0 | 500.00 | 35.00 |

Soil Type 7 Is Anisotropic

Number Of Direction Ranges Specified = 3

| Direction Range No. | Counterclockwise Direction Limit (deg) | Cohesion Intercept (psf) | Friction Angle (deg) |
|---|---|---|---|
| 1 | 8.5 | 500.00 | 35.00 |
| 2 | 11.5 | 200.00 | 20.00 |
| 3 | 90.0 | 500.00 | 35.00 |

ANISOTROPIC SOIL NOTES:

(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.

(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.

(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

1 PIEZOMETRIC SURFACE(S) SPECIFIED

Unit Weight of Water = 62.40 (pcf)

Piezometric Surface No. 1 Specified by 2 Coordinate Points

Pore Pressure Inclination Factor = 0.50

| Point No. | X-Water (ft) | Y-Water (ft) |
|---|---|---|
| 1 | 0.00 | 900.00 |
| 2 | 900.00 | 900.00 |

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been

Specified.
3000 Trial Surfaces Have Been Generated.
2 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of
Sliding Block Is 45.0

| Box No. | X-Left (ft) | Y-Left (ft) | X-Right (ft) | Y-Right (ft) | Height (ft) |
|---|---|---|---|---|---|
| 1 | 85.00 | 925.00 | 245.00 | 978.00 | 60.00 |
| 2 | 325.00 | 992.00 | 600.00 | 1090.00 | 85.00 |

Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By GLE (Spencer's) Method (0-2) * *
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
The option of no water in the tension crack on
the last slice has been selected.
Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces
(if applicable) have been applied to the slice base(s)
on which they intersect.
Total Number of Trial Surfaces Evaluated = 3000
WARNING! The Factor of Safety Calculation for one or More Trial Surfaces
Did Not Converge in 20 Iterations.
Number of Trial Surfaces with Non-Converged FS = 48
Percentage of Trial Surfaces With Non-Valid FS Solutions
of the Total Evaluated = 1.6 %
Statistical Data On All Valid FS Values:
FS Max = 9.245 FS Min = 1.559 FS Ave = 3.226
Standard Deviation = 0.872 Coefficient of Variation = 27.04 %
((Simplified Janbu FS for Critical Surface = 1.521))
Failure Surface Specified By 5 Coordinate Points

| Point No. | X-Surf (ft) | Y-Surf (ft) |
|---|---|---|
| 1 | 103.98 | 965.60 |
| 2 | 136.87 | 961.47 |
| 3 | 466.11 | 1059.28 |
| 4 | 496.38 | 1092.58 |
| 5 | 507.41 | 1106.43 |

*** FOS = 1.559 Theta (ki=1.0) = 16.56 ***
Lambda = 0.297
Individual data on the 16 slices

| Slice No. | Width (ft) | Weight (lbs) | Water Force Top (lbs) | Water Force Bot (lbs) | Tie Force Norm (lbs) | Tie Force Tan (lbs) | Earthquake Force Hor (lbs) | Earthquake Force Ver (lbs) | Surcharge Load (lbs) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 32.9 | 38619.7 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 2 | 25.1 | 63555.9 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 3 | 8.0 | 20386.4 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 4 | 62.0 | 175593.2 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 5 | 8.0 | 24928.0 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 6 | 35.0 | 111956.6 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 7 | 0.0 | 3.9 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 8 | 29.0 | 106438.3 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 9 | 8.0 | 29907.9 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 10 | 63.0 | 247891.9 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 11 | 20.0 | 77809.2 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 12 | 63.0 | 250811.3 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 13 | 8.0 | 34499.5 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 14 | 0.1 | 451.4 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 15 | 30.3 | 82226.7 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 16 | 11.0 | 7058.3 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |

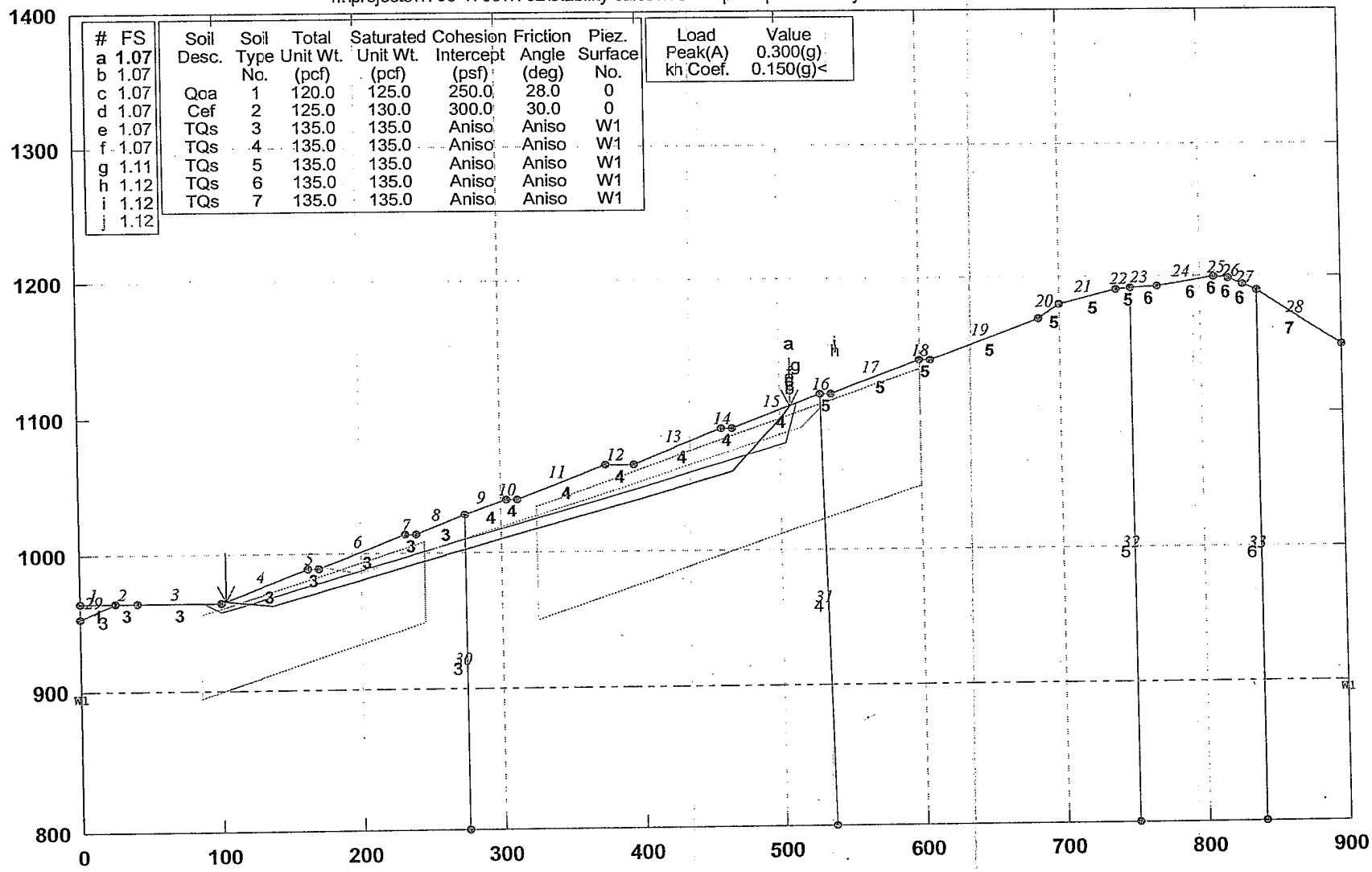
# Lndmrk off-site grading; 5-5'; CS-4; pseudo; planar

n:\projects\1700-1799\1702\stability calcs\1702r\t5ps2b.pl2 Run By: KPC 7/9/2008 10:30AM

| # | FS |
|---|---|
| a | 1.07 |
| b | 1.07 |
| c | 1.07 |
| d | 1.07 |
| e | 1.07 |
| f | 1.07 |
| g | 1.11 |
| h | 1.12 |
| i | 1.12 |
| j | 1.12 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Qoa | 1 | 120.0 | 125.0 | 250.0 | 28.0 | 0 |
| Cef | 2 | 125.0 | 130.0 | 300.0 | 30.0 | 0 |
| TQs | 3 | 135.0 | 135.0 | Aniso | Aniso | W1 |
| TQs | 4 | 135.0 | 135.0 | Aniso | Aniso | W1 |
| TQs | 5 | 135.0 | 135.0 | Aniso | Aniso | W1 |
| TQs | 6 | 135.0 | 135.0 | Aniso | Aniso | W1 |
| TQs | 7 | 135.0 | 135.0 | Aniso | Aniso | W1 |

| Load | Value |
|---|---|
| Peak(A) | 0.300(g) |
| kh Coef. | 0.150(g)< |




GSTABL7 v.2 FSmin=1.07

Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2)

GSTABL7

Run No. 18

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **
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SLOPE STABILITY ANALYSIS SYSTEM
Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

Analysis Run Date: 7/9/2008
Time of Run: 10:30AM
Run By: KPC
Input Data Filename: N:\Projects\1700-1799\1702\Stability Calcs\1702R\t5ps2b.in
Output Filename: N:\Projects\1700-1799\1702\Stability Calcs\1702R\t5ps2b.OUT
Unit System: English
Plotted Output Filename: N:\Projects\1700-1799\1702\Stabi Calcs\1702R\t5ps2b.PLT
PROBLEM DESCRIPTION: Lndmrk off-site grading; 5-5'; CS-4;
pseudo; planar

BOUNDARY COORDINATES
28 Top Boundaries
33 Total Boundaries

| Boundary No. | X-Left (ft) | Y-Left (ft) | X-Right (ft) | Y-Right (ft) | Soil Type Below Bnd |
|---|---|---|---|---|---|
| 1 | 0.00 | 964.00 | 25.00 | 964.00 | 1 |
| 2 | 25.00 | 964.00 | 40.00 | 964.00 | 3 |
| 3 | 40.00 | 964.00 | 100.00 | 964.00 | 3 |
| 4 | 100.00 | 964.00 | 162.00 | 989.00 | 3 |
| 5 | 162.00 | 989.00 | 170.00 | 989.00 | 3 |
| 6 | 170.00 | 989.00 | 232.00 | 1014.00 | 3 |
| 7 | 232.00 | 1014.00 | 240.00 | 1014.00 | 3 |
| 8 | 240.00 | 1014.00 | 275.00 | 1028.00 | 3 |
| 9 | 275.00 | 1028.00 | 304.00 | 1040.00 | 4 |
| 10 | 304.00 | 1040.00 | 312.00 | 1040.00 | 4 |
| 11 | 312.00 | 1040.00 | 375.00 | 1064.00 | 4 |
| 12 | 375.00 | 1064.00 | 395.00 | 1064.00 | 4 |
| 13 | 395.00 | 1064.00 | 458.00 | 1090.00 | 4 |
| 14 | 458.00 | 1090.00 | 466.00 | 1090.00 | 4 |
| 15 | 466.00 | 1090.00 | 529.00 | 1115.00 | 4 |
| 16 | 529.00 | 1115.00 | 537.00 | 1115.00 | 5 |
| 17 | 537.00 | 1115.00 | 600.00 | 1140.00 | 5 |
| 18 | 600.00 | 1140.00 | 608.00 | 1140.00 | 5 |
| 19 | 608.00 | 1140.00 | 685.00 | 1170.00 | 5 |
| 20 | 685.00 | 1170.00 | 700.00 | 1180.00 | 5 |
| 21 | 700.00 | 1180.00 | 740.00 | 1190.00 | 5 |
| 22 | 740.00 | 1190.00 | 750.00 | 1191.00 | 5 |
| 23 | 750.00 | 1191.00 | 770.00 | 1193.00 | 6 |
| 24 | 770.00 | 1193.00 | 810.00 | 1199.00 | 6 |
| 25 | 810.00 | 1199.00 | 820.00 | 1198.00 | 6 |
| 26 | 820.00 | 1198.00 | 830.00 | 1194.00 | 6 |
| 27 | 830.00 | 1194.00 | 840.00 | 1189.00 | 6 |
| 28 | 840.00 | 1189.00 | 900.00 | 1150.00 | 7 |
| 29 | 0.00 | 953.00 | 25.00 | 964.00 | 3 |
| 30 | 275.00 | 1028.00 | 275.01 | 800.00 | 3 |
| 31 | 529.00 | 1115.00 | 535.00 | 800.00 | 4 |
| 32 | 750.00 | 1191.00 | 750.01 | 800.00 | 5 |
| 33 | 840.00 | 1189.00 | 840.01 | 800.00 | 6 |

User Specified Y-Origin = 800.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
7 Type(s) of Soil

| Soil Type | Total Unit Wt. | Saturated Unit Wt. | Cohesion Intercept | Friction Angle | Pore Pressure | Pressure Constant | Piez. Surface |
|---|---|---|---|---|---|---|---|

| No. | (pcf) | (pcf) | (psf) | (deg) | Param. | (psf) | No. |
|---|---|---|---|---|---|---|---|
| 1 | 120.0 | 125.0 | 250.0 | 28.0 | 0.00 | 0.0 | 0 |
| 2 | 125.0 | 130.0 | 300.0 | 30.0 | 0.00 | 0.0 | 0 |
| 3 | 135.0 | 135.0 | 600.0 | 38.0 | 0.00 | 0.0 | 1 |
| 4 | 135.0 | 135.0 | 600.0 | 38.0 | 0.00 | 0.0 | 1 |
| 5 | 135.0 | 135.0 | 600.0 | 38.0 | 0.00 | 0.0 | 1 |
| 6 | 135.0 | 135.0 | 600.0 | 38.0 | 0.00 | 0.0 | 1 |
| 7 | 135.0 | 135.0 | 600.0 | 38.0 | 0.00 | 0.0 | 1 |

ANISOTROPIC STRENGTH PARAMETERS

5 soil type(s)

Soil Type 3 Is Anisotropic

Number Of Direction Ranges Specified = 3

| Direction Range No. | Counterclockwise Direction Limit (deg) | Cohesion Intercept (psf) | Friction Angle (deg) |
|---|---|---|---|
| 1 | 15.5 | 600.00 | 38.00 |
| 2 | 18.5 | 200.00 | 20.00 |
| 3 | 90.0 | 600.00 | 38.00 |

Soil Type 4 Is Anisotropic

Number Of Direction Ranges Specified = 3

| Direction Range No. | Counterclockwise Direction Limit (deg) | Cohesion Intercept (psf) | Friction Angle (deg) |
|---|---|---|---|
| 1 | 16.5 | 600.00 | 38.00 |
| 2 | 19.5 | 200.00 | 20.00 |
| 3 | 90.0 | 600.00 | 38.00 |

Soil Type 5 Is Anisotropic

Number Of Direction Ranges Specified = 3

| Direction Range No. | Counterclockwise Direction Limit (deg) | Cohesion Intercept (psf) | Friction Angle (deg) |
|---|---|---|---|
| 1 | 19.5 | 600.00 | 38.00 |
| 2 | 22.5 | 200.00 | 20.00 |
| 3 | 90.0 | 600.00 | 38.00 |

Soil Type 6 Is Anisotropic

Number Of Direction Ranges Specified = 3

| Direction Range No. | Counterclockwise Direction Limit (deg) | Cohesion Intercept (psf) | Friction Angle (deg) |
|---|---|---|---|
| 1 | 13.5 | 600.00 | 38.00 |
| 2 | 16.5 | 200.00 | 20.00 |
| 3 | 90.0 | 600.00 | 38.00 |

Soil Type 7 Is Anisotropic

Number Of Direction Ranges Specified = 3

| Direction Range No. | Counterclockwise Direction Limit (deg) | Cohesion Intercept (psf) | Friction Angle (deg) |
|---|---|---|---|
| 1 | 8.5 | 600.00 | 38.00 |
| 2 | 11.5 | 200.00 | 20.00 |
| 3 | 90.0 | 600.00 | 38.00 |

ANISOTROPIC SOIL NOTES:

(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.

(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.

(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

1 PIEZOMETRIC SURFACE(S) SPECIFIED

Unit Weight of Water = 62.40 (pcf)

Piezometric Surface No. 1 Specified by 2 Coordinate Points

Pore Pressure Inclination Factor = 0.50

| Point No. | X-Water (ft) | Y-Water (ft) |
|---|---|---|
| 1 | 0.00 | 900.00 |
| 2 | 900.00 | 900.00 |

Specified Peak Ground Acceleration Coefficient (A) = 0.300(g)

Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)

Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Sliding Block Surfaces, Has Been
Specified.
3000 Trial Surfaces Have Been Generated.
2 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of
Sliding Block Is 45.0

| Box No. | X-Left (ft) | Y-Left (ft) | X-Right (ft) | Y-Right (ft) | Height (ft) |
|---|---|---|---|---|---|
| 1 | 85.00 | 925.00 | 245.00 | 978.00 | 60.00 |
| 2 | 325.00 | 992.00 | 600.00 | 1090.00 | 85.00 |

Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By GLE (Spencer's) Method (0-2) * *
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
The option of no water in the tension crack on
the last slice has been selected.
Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces
(if applicable) have been applied to the slice base(s)
on which they intersect.
Total Number of Trial Surfaces Evaluated = 3000
WARNING! The Factor of Safety Calculation for one or More Trial Surfaces
Did Not Converge in 20 Iterations.
Number of Trial Surfaces with Non-Converged FS = 300
Number of Trial Surfaces with Misleading FS = 5
Percentage of Trial Surfaces With Non-Valid FS Solutions
of the Total Evaluated = 10.2 %
Statistical Data On All Valid FS Values:
FS Max = 5.443 FS Min = 1.067 FS Ave = 2.380
Standard Deviation = 0.542 Coefficient of Variation = 22.78 %
((Simplified Janbu FS for Critical Surface = 1.035))
Failure Surface Specified By 5 Coordinate Points

| Point No. | X-Surf (ft) | Y-Surf (ft) |
|---|---|---|
| 1 | 103.98 | 965.60 |
| 2 | 136.87 | 961.47 |
| 3 | 466.11 | 1059.23 |
| 4 | 496.38 | 1092.59 |
| 5 | 507.41 | 1106.43 |

*** FOS = 1.067 Theta (ki=1.0) = 14.63 ***
Lambda = 0.261
Individual data on the 16 slices

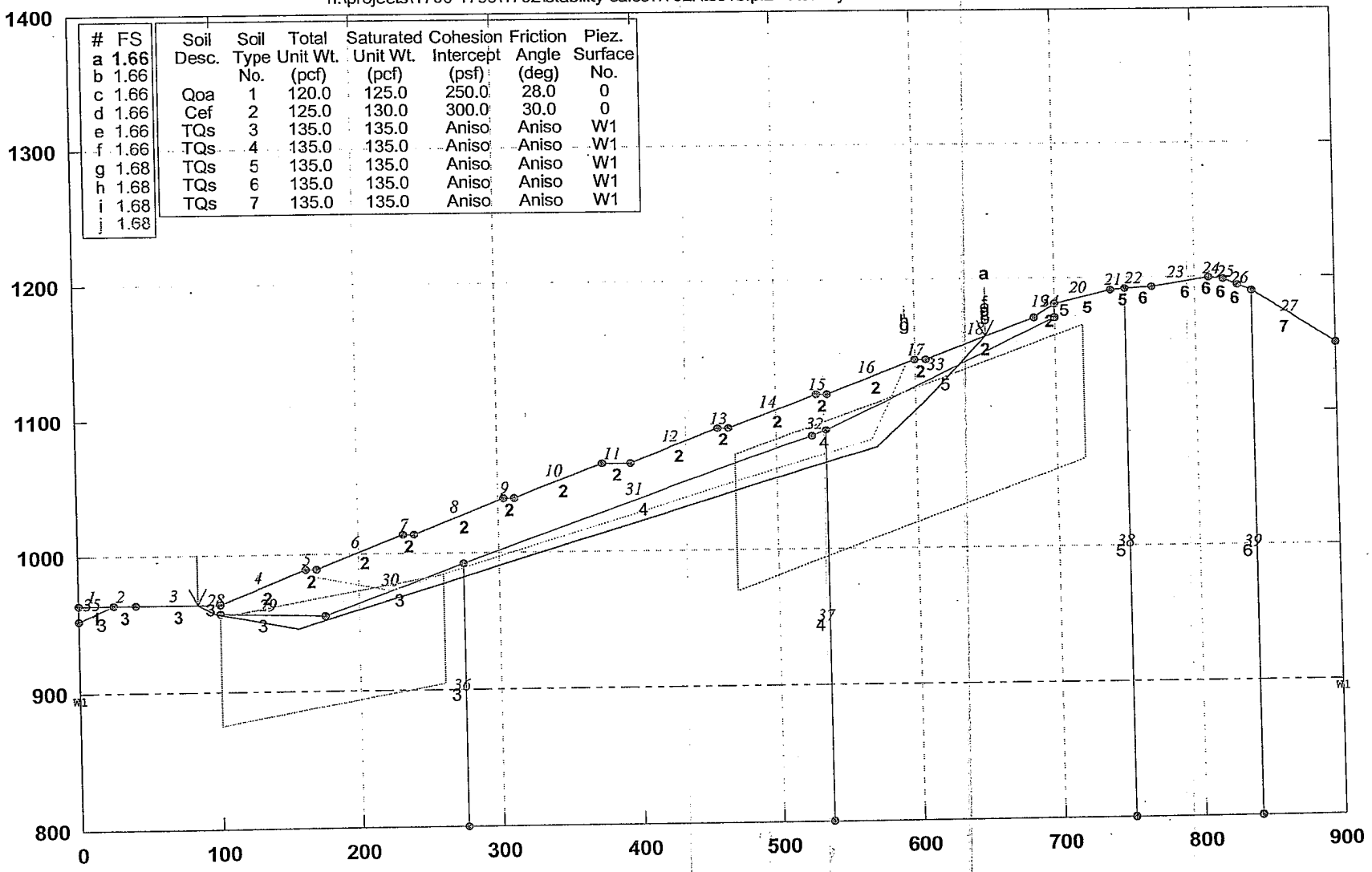
| Slice No. | Width (ft) | Weight (lbs) | Water Force Top (lbs) | Water Force Bot (lbs) | Tie Force Norm (lbs) | Tie Force Tan (lbs) | Earthquake Force Hor (lbs) | Earthquake Force Ver (lbs) | Surcharge Load (lbs) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 32.9 | 38619.7 | 0.0 | 0.0 | 0. | 0. | 5792.9 | 0.0 | 0.0 |
| 2 | 25.1 | 63555.9 | 0.0 | 0.0 | 0. | 0. | 9533.4 | 0.0 | 0.0 |
| 3 | 8.0 | 20386.4 | 0.0 | 0.0 | 0. | 0. | 3058.0 | 0.0 | 0.0 |
| 4 | 62.0 | 175593.2 | 0.0 | 0.0 | 0. | 0. | 26339.0 | 0.0 | 0.0 |
| 5 | 8.0 | 24928.0 | 0.0 | 0.0 | 0. | 0. | 3739.2 | 0.0 | 0.0 |
| 6 | 35.0 | 111956.6 | 0.0 | 0.0 | 0. | 0. | 16793.5 | 0.0 | 0.0 |
| 7 | 0.0 | 3.9 | 0.0 | 0.0 | 0. | 0. | 0.6 | 0.0 | 0.0 |
| 8 | 29.0 | 106438.3 | 0.0 | 0.0 | 0. | 0. | 15965.7 | 0.0 | 0.0 |
| 9 | 8.0 | 29907.9 | 0.0 | 0.0 | 0. | 0. | 4486.2 | 0.0 | 0.0 |
| 10 | 63.0 | 247891.9 | 0.0 | 0.0 | 0. | 0. | 37183.8 | 0.0 | 0.0 |
| 11 | 20.0 | 77809.2 | 0.0 | 0.0 | 0. | 0. | 11671.4 | 0.0 | 0.0 |
| 12 | 63.0 | 250811.3 | 0.0 | 0.0 | 0. | 0. | 37621.7 | 0.0 | 0.0 |
| 13 | 8.0 | 34499.5 | 0.0 | 0.0 | 0. | 0. | 5174.9 | 0.0 | 0.0 |
| 14 | 0.1 | 451.4 | 0.0 | 0.0 | 0. | 0. | 67.7 | 0.0 | 0.0 |
| 15 | 30.3 | 82226.7 | 0.0 | 0.0 | 0. | 0. | 12334.0 | 0.0 | 0.0 |
| 16 | 11.0 | 7058.3 | 0.0 | 0.0 | 0. | 0. | 1058.8 | 0.0 | 0.0 |

# Lndmrk off-site grading; 5-5'; CS-4 w/ 7x75 buttress; static; planar

n:\projects\1700-1799\1702\stability calcs\1702r\t5s1b.pl2 Run By: KPC 7/10/2008 11:36AM

| # | FS |
|---|---|
| a | 1.66 |
| b | 1.66 |
| c | 1.66 |
| d | 1.66 |
| e | 1.66 |
| f | 1.66 |
| g | 1.68 |
| h | 1.68 |
| i | 1.68 |
| j | 1.68 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Qoa | 1 | 120.0 | 125.0 | 250.0 | 28.0 | 0 |
| Cef | 2 | 125.0 | 130.0 | 300.0 | 30.0 | 0 |
| TQs | 3 | 135.0 | 135.0 | Aniso | Aniso | W1 |
| TQs | 4 | 135.0 | 135.0 | Aniso | Aniso | W1 |
| TQs | 5 | 135.0 | 135.0 | Aniso | Aniso | W1 |
| TQs | 6 | 135.0 | 135.0 | Aniso | Aniso | W1 |
| TQs | 7 | 135.0 | 135.0 | Aniso | Aniso | W1 |




GSTABL7 v.2 FSmin=1.66

Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2)

GSTABL7

Run No. 19

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **
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SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

**********

Analysis Run Date: 7/10/2008
Time of Run: 11:36AM
Run By: KPC
Input Data Filename: N:\Projects\1700-1799\1702\Stability Calcs\1702R\t5s1b.in
Output Filename: N:\Projects\1700-1799\1702\Stability Calcs\1702R\t5s1b.OUT
Unit System: English
Plotted Output Filename: N:\Projects\1700-1799\1702\Stabi Calcs\1702R\t5s1b.PLT
PROBLEM DESCRIPTION: Lndmrk off-site grading; 5-5'; CS-4
w/ 7x75 buttress; static; planar

BOUNDARY COORDINATES
27 Top Boundaries
39 Total Boundaries

| Boundary No. | X-Left (ft) | Y-Left (ft) | X-Right (ft) | Y-Right (ft) | Soil Type Below Bnd |
|---|---|---|---|---|---|
| 1 | 0.00 | 964.00 | 25.00 | 964.00 | 1 |
| 2 | 25.00 | 964.00 | 40.00 | 964.00 | 3 |
| 3 | 40.00 | 964.00 | 100.00 | 964.00 | 3 |
| 4 | 100.00 | 964.00 | 162.00 | 989.00 | 2 |
| 5 | 162.00 | 989.00 | 170.00 | 989.00 | 2 |
| 6 | 170.00 | 989.00 | 232.00 | 1014.00 | 2 |
| 7 | 232.00 | 1014.00 | 240.00 | 1014.00 | 2 |
| 8 | 240.00 | 1014.00 | 304.00 | 1040.00 | 2 |
| 9 | 304.00 | 1040.00 | 312.00 | 1040.00 | 2 |
| 10 | 312.00 | 1040.00 | 375.00 | 1064.00 | 2 |
| 11 | 375.00 | 1064.00 | 395.00 | 1064.00 | 2 |
| 12 | 395.00 | 1064.00 | 458.00 | 1090.00 | 2 |
| 13 | 458.00 | 1090.00 | 466.00 | 1090.00 | 2 |
| 14 | 466.00 | 1090.00 | 529.00 | 1115.00 | 2 |
| 15 | 529.00 | 1115.00 | 537.00 | 1115.00 | 2 |
| 16 | 537.00 | 1115.00 | 600.00 | 1140.00 | 2 |
| 17 | 600.00 | 1140.00 | 608.00 | 1140.00 | 2 |
| 18 | 608.00 | 1140.00 | 685.00 | 1170.00 | 2 |
| 19 | 685.00 | 1170.00 | 700.00 | 1180.00 | 2 |
| 20 | 700.00 | 1180.00 | 740.00 | 1190.00 | 5 |
| 21 | 740.00 | 1190.00 | 750.00 | 1191.00 | 5 |
| 22 | 750.00 | 1191.00 | 770.00 | 1193.00 | 6 |
| 23 | 770.00 | 1193.00 | 810.00 | 1199.00 | 6 |
| 24 | 810.00 | 1199.00 | 820.00 | 1198.00 | 6 |
| 25 | 820.00 | 1190.00 | 830.00 | 1194.00 | 6 |
| 26 | 830.00 | 1194.00 | 840.00 | 1189.00 | 6 |
| 27 | 840.00 | 1189.00 | 900.00 | 1150.00 | 7 |
| 28 | 100.00 | 964.00 | 100.01 | 957.00 | 3 |
| 29 | 100.01 | 957.00 | 175.00 | 955.50 | 3 |
| 30 | 175.00 | 955.50 | 275.00 | 992.00 | 3 |
| 31 | 275.00 | 992.00 | 525.00 | 1083.00 | 4 |
| 32 | 525.00 | 1083.00 | 535.00 | 1088.00 | 4 |
| 33 | 535.00 | 1088.00 | 699.99 | 1170.00 | 5 |
| 34 | 699.99 | 1170.00 | 700.00 | 1180.00 | 5 |
| 35 | 0.00 | 953.00 | 25.00 | 964.00 | 3 |
| 36 | 275.00 | 992.00 | 275.01 | 800.00 | 3 |
| 37 | 535.00 | 1088.00 | 535.01 | 800.00 | 4 |
| 38 | 750.00 | 1191.00 | 750.01 | 800.00 | 5 |
| 39 | 840.00 | 1189.00 | 840.01 | 800.00 | 6 |

User Specified Y-Origin = 800.00(ft)

Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

7 Type(s) of Soil

| Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No. |
|---|---|---|---|---|---|---|---|
| 1 | 120.0 | 125.0 | 250.0 | 28.0 | 0.00 | 0.0 | 0 |
| 2 | 125.0 | 130.0 | 300.0 | 30.0 | 0.00 | 0.0 | 0 |
| 3 | 135.0 | 135.0 | 500.0 | 35.0 | 0.00 | 0.0 | 1 |
| 4 | 135.0 | 135.0 | 500.0 | 35.0 | 0.00 | 0.0 | 1 |
| 5 | 135.0 | 135.0 | 500.0 | 35.0 | 0.00 | 0.0 | 1 |
| 6 | 135.0 | 135.0 | 500.0 | 35.0 | 0.00 | 0.0 | 1 |
| 7 | 135.0 | 135.0 | 500.0 | 35.0 | 0.00 | 0.0 | 1 |

ANISOTROPIC STRENGTH PARAMETERS

5 soil type(s)

Soil Type 3 Is Anisotropic
Number Of Direction Ranges Specified = 3

| Direction Range No. | Counterclockwise Direction Limit (deg) | Cohesion Intercept (psf) | Friction Angle (deg) |
|---|---|---|---|
| 1 | 15.5 | 500.00 | 35.00 |
| 2 | 18.5 | 200.00 | 20.00 |
| 3 | 90.0 | 500.00 | 35.00 |

Soil Type 4 Is Anisotropic
Number Of Direction Ranges Specified = 3

| Direction Range No. | Counterclockwise Direction Limit (deg) | Cohesion Intercept (psf) | Friction Angle (deg) |
|---|---|---|---|
| 1 | 16.5 | 500.00 | 35.00 |
| 2 | 19.5 | 200.00 | 20.00 |
| 3 | 90.0 | 500.00 | 35.00 |

Soil Type 5 Is Anisotropic
Number Of Direction Ranges Specified = 3

| Direction Range No. | Counterclockwise Direction Limit (deg) | Cohesion Intercept (psf) | Friction Angle (deg) |
|---|---|---|---|
| 1 | 19.5 | 500.00 | 35.00 |
| 2 | 22.5 | 200.00 | 20.00 |
| 3 | 90.0 | 500.00 | 35.00 |

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

| Direction Range No. | Counterclockwise Direction Limit (deg) | Cohesion Intercept (psf) | Friction Angle (deg) |
|---|---|---|---|
| 1 | 13.5 | 500.00 | 35.00 |
| 2 | 16.5 | 200.00 | 20.00 |
| 3 | 90.0 | 500.00 | 35.00 |

Soil Type 7 Is Anisotropic
Number Of Direction Ranges Specified = 3

| Direction Range No. | Counterclockwise Direction Limit (deg) | Cohesion Intercept (psf) | Friction Angle (deg) |
|---|---|---|---|
| 1 | 8.5 | 500.00 | 35.00 |
| 2 | 11.5 | 200.00 | 20.00 |
| 3 | 90.0 | 500.00 | 35.00 |

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water = 62.40 (pcf)
Piezometric Surface No. 1 Specified by 2 Coordinate Points
Pore Pressure Inclination Factor = 0.50

| Point No. | X-Water (ft) | Y-Water (ft) |
|---|---|---|
| 1 | 0.00 | 900.00 |
| 2 | 900.00 | 900.00 |

A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Sliding Block Surfaces, Has Been
Specified.
3000 Trial Surfaces Have Been Generated.
2 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of
Sliding Block Is 60.0

| Box No. | X-Left (ft) | Y-Left (ft) | X-Right (ft) | Y-Right (ft) | Height (ft) |
|---|---|---|---|---|---|
| 1 | 100.00 | 915.00 | 260.00 | 945.00 | 80.00 |
| 2 | 470.00 | 1020.00 | 720.00 | 1114.00 | 100.00 |

Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By GLE (Spencer's) Method (0=2) * *
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
The option of no water in the tension crack on
the last slice has been selected.
Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces
(if applicable) have been applied to the slice base(s)
on which they intersect.
Total Number of Trial Surfaces Evaluated = 3000
WARNING! The Factor of Safety Calculation for one or More Trial Surfaces
Did Not Converge in 20 Iterations.
Number of Trial Surfaces with Non-Converged FS = 14
Percentage of Trial Surfaces With Non-Valid FS Solutions
of the Total Evaluated = 0.5 %
Statistical Data On All Valid FS Values:
FS Max = 6.727 FS Min = 1.663 FS Ave = 3.089
Standard Deviation = 0.747 Coefficient of Variation = 24.19 %
(Simplified Janbu FS for Critical Surface = 1.575))
Failure Surface Specified By 6 Coordinate Points

| Point No. | X-Surf (ft) | Y-Surf (ft) |
|---|---|---|
| 1 | 84.21 | 964.00 |
| 2 | 97.25 | 957.93 |
| 3 | 156.08 | 946.16 |
| 4 | 571.67 | 1074.21 |
| 5 | 613.93 | 1116.80 |
| 6 | 649.73 | 1156.26 |

*** FOS = 1.663 Theta (ki=1.0) = 16.11 ***
Lambda = 0.289
Individual data on the 27 slices

| Slice No. | Width (ft) | Weight (lbs) | Water Force Top (lbs) | Water Force Bot (lbs) | Tie Force Norm (lbs) | Tie Force Tan (lbs) | Earthquake Force Hor (lbs) | Earthquake Force Ver (lbs) | Surcharge Load (lbs) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 13.0 | 5342.7 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 2 | 2.7 | 2355.6 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 3 | 0.0 | 8.1 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 4 | 2.1 | 1898.1 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 5 | 54.0 | 165746.9 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 6 | 5.9 | 30645.4 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 7 | 8.0 | 40306.7 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 8 | 5.0 | 24463.2 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 9 | 57.0 | 300339.6 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 10 | 8.0 | 43778.2 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 11 | 35.0 | 194080.1 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 12 | 29.0 | 172708.5 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 13 | 8.0 | 47917.3 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 14 | 63.0 | 386954.1 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 15 | 20.0 | 121336.9 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 16 | 63.0 | 385343.5 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 17 | 8.0 | 51152.3 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 18 | 59.0 | 388557.0 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 19 | 4.0 | 27821.0 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 20 | 6.0 | 41234.6 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 21 | 2.0 | 13444.3 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 22 | 34.7 | 239679.8 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 23 | 28.3 | 169538.7 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 24 | 8.0 | 34448.5 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 25 | 5.9 | 20988.6 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 26 | 17.2 | 42622.1 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 27 | 18.6 | 15354.7 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |

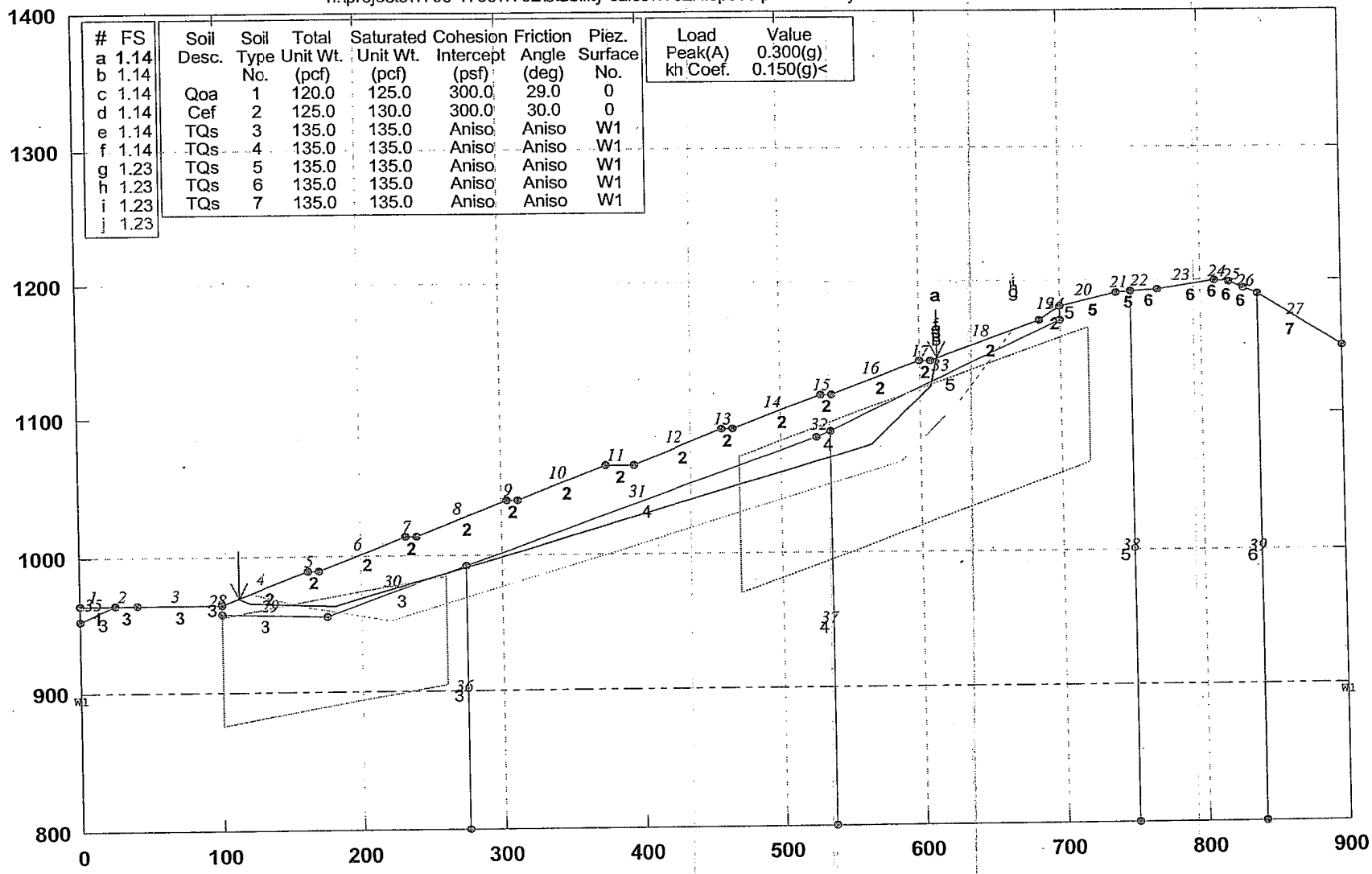
# Lndmrk off-site grading; 5-5'; CS-4 w/ 7x75 buttress; pseduo; planar

n:\projects\1700-1799\1702\stability calcs\1702r\t5ps1b.pl2 Run By: KPC 7/10/2008 01:13PM

| # | FS |
|---|---|
| a | 1.14 |
| b | 1.14 |
| c | 1.14 |
| d | 1.14 |
| e | 1.14 |
| f | 1.14 |
| g | 1.23 |
| h | 1.23 |
| i | 1.23 |
| j | 1.23 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Qoa | 1 | 120.0 | 125.0 | 300.0 | 29.0 | 0 |
| Cef | 2 | 125.0 | 130.0 | 300.0 | 30.0 | 0 |
| TQs | 3 | 135.0 | 135.0 | Aniso | Aniso | W1 |
| TQs | 4 | 135.0 | 135.0 | Aniso | Aniso | W1 |
| TQs | 5 | 135.0 | 135.0 | Aniso | Aniso | W1 |
| TQs | 6 | 135.0 | 135.0 | Aniso | Aniso | W1 |
| TQs | 7 | 135.0 | 135.0 | Aniso | Aniso | W1 |

| Load | Value |
|---|---|
| Peak(A) | 0.300(g) |
| kh Coef. | 0.150(g)< |




GSTABL7 v.2 FSmin=1.14

Safety Factors Are Calculated By GLE (Spencer's) Method (0-2)

GSTABL7

Run No. 20

```
                              *** GSTABL7 ***
                        ** GSTABL7 by Garry H. Gregory, P.E. **
          ** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **
                        (All Rights Reserved-Unauthorized Use Prohibited)
*******************************************************************************
                        SLOPE STABILITY ANALYSIS SYSTEM
             Modified Bishop, Simplified Janbu, or GLE Method of Slices.
             (Includes Spencer & Morgenstern-Price Type Analysis)
             Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
             Nonlinear Undrained Shear Strength, Curved Phi Envelope,
             Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
             Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
*******************************************************************************
Analysis Run Date:          7/10/2008
Time of Run:                01:13PM
Run By:                     KPC
Input Data Filename:        N:\Projects\1700-1799\1702\Stability Calcs\1702R\t5ps1b.in
Output Filename:            N:\Projects\1700-1799\1702\Stability Calcs\1702R\t5ps1b.OUT
Unit System:                English
Plotted Output Filename:    N:\Projects\1700-1799\1702\Stabi Calcs\1702R\t5ps1b.PLT
PROBLEM DESCRIPTION:  Lndmrk off-site grading; 5-5'; CS-4
                      w/ 7x75 buttress; pseduo; planar

BOUNDARY COORDINATES
   27 Top   Boundaries
   39 Total Boundaries
```

| Boundary No. | X-Left (ft) | Y-Left (ft) | X-Right (ft) | Y-Right (ft) | Soil Type Below Bnd |
|---|---|---|---|---|---|
| 1 | 0.00 | 964.00 | 25.00 | 964.00 | 1 |
| 2 | 25.00 | 964.00 | 40.00 | 964.00 | 3 |
| 3 | 40.00 | 964.00 | 100.00 | 964.00 | 3 |
| 4 | 100.00 | 964.00 | 162.00 | 989.00 | 2 |
| 5 | 162.00 | 989.00 | 170.00 | 989.00 | 2 |
| 6 | 170.00 | 989.00 | 232.00 | 1014.00 | 2 |
| 7 | 232.00 | 1014.00 | 240.00 | 1014.00 | 2 |
| 8 | 240.00 | 1014.00 | 304.00 | 1040.00 | 2 |
| 9 | 304.00 | 1040.00 | 312.00 | 1040.00 | 2 |
| 10 | 312.00 | 1040.00 | 375.00 | 1064.00 | 2 |
| 11 | 375.00 | 1064.00 | 395.00 | 1064.00 | 2 |
| 12 | 395.00 | 1064.00 | 458.00 | 1090.00 | 2 |
| 13 | 458.00 | 1090.00 | 466.00 | 1090.00 | 2 |
| 14 | 466.00 | 1090.00 | 529.00 | 1115.00 | 2 |
| 15 | 529.00 | 1115.00 | 537.00 | 1115.00 | 2 |
| 16 | 537.00 | 1115.00 | 600.00 | 1140.00 | 2 |
| 17 | 600.00 | 1140.00 | 608.00 | 1140.00 | 2 |
| 18 | 608.00 | 1140.00 | 685.00 | 1170.00 | 2 |
| 19 | 685.00 | 1170.00 | 700.00 | 1180.00 | 2 |
| 20 | 700.00 | 1180.00 | 740.00 | 1190.00 | 5 |
| 21 | 740.00 | 1190.00 | 750.00 | 1191.00 | 5 |
| 22 | 750.00 | 1191.00 | 770.00 | 1193.00 | 6 |
| 23 | 770.00 | 1193.00 | 810.00 | 1199.00 | 6 |
| 24 | 810.00 | 1199.00 | 820.00 | 1198.00 | 6 |
| 25 | 820.00 | 1198.00 | 830.00 | 1194.00 | 6 |
| 26 | 830.00 | 1194.00 | 840.00 | 1189.00 | 6 |
| 27 | 840.00 | 1189.00 | 900.00 | 1150.00 | 7 |
| 28 | 100.00 | 964.00 | 100.01 | 957.00 | 3 |
| 29 | 100.01 | 957.00 | 175.00 | 955.50 | 3 |
| 30 | 175.00 | 955.50 | 275.00 | 992.00 | 3 |
| 31 | 275.00 | 992.00 | 525.00 | 1083.00 | 4 |
| 32 | 525.00 | 1083.00 | 535.00 | 1088.00 | 4 |
| 33 | 535.00 | 1088.00 | 699.99 | 1170.00 | 5 |
| 34 | 699.99 | 1170.00 | 700.00 | 1180.00 | 5 |
| 35 | 0.00 | 953.00 | 25.00 | 964.00 | 3 |
| 36 | 275.00 | 992.00 | 275.01 | 800.00 | 3 |
| 37 | 535.00 | 1088.00 | 535.01 | 800.00 | 4 |
| 38 | 750.00 | 1191.00 | 750.01 | 800.00 | 5 |
| 39 | 840.00 | 1189.00 | 840.01 | 800.00 | 6 |

User Specified Y-Origin = 800.00(ft)

Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
7 Type(s) of Soil

| Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No. |
|---|---|---|---|---|---|---|---|
| 1 | 120.0 | 125.0 | 300.0 | 29.0 | 0.00 | 0.0 | 0 |
| 2 | 125.0 | 130.0 | 300.0 | 30.0 | 0.00 | 0.0 | 0 |
| 3 | 135.0 | 135.0 | 600.0 | 38.0 | 0.00 | 0.0 | 1 |
| 4 | 135.0 | 135.0 | 600.0 | 38.0 | 0.00 | 0.0 | 1 |
| 5 | 135.0 | 135.0 | 600.0 | 38.0 | 0.00 | 0.0 | 1 |
| 6 | 135.0 | 135.0 | 600.0 | 38.0 | 0.00 | 0.0 | 1 |
| 7 | 135.0 | 135.0 | 600.0 | 38.0 | 0.00 | 0.0 | 1 |

ANISOTROPIC STRENGTH PARAMETERS
5 soil type(s)

Soil Type 3 Is Anisotropic
Number Of Direction Ranges Specified = 3

| Direction Range No. | Counterclockwise Direction Limit (deg) | Cohesion Intercept (psf) | Friction Angle (deg) |
|---|---|---|---|
| 1 | 15.5 | 600.00 | 38.00 |
| 2 | 18.5 | 200.00 | 20.00 |
| 3 | 90.0 | 600.00 | 38.00 |

Soil Type 4 Is Anisotropic
Number Of Direction Ranges Specified = 3

| Direction Range No. | Counterclockwise Direction Limit (deg) | Cohesion Intercept (psf) | Friction Angle (deg) |
|---|---|---|---|
| 1 | 16.5 | 600.00 | 38.00 |
| 2 | 19.5 | 200.00 | 20.00 |
| 3 | 90.0 | 600.00 | 38.00 |

Soil Type 5 Is Anisotropic
Number Of Direction Ranges Specified = 3

| Direction Range No. | Counterclockwise Direction Limit (deg) | Cohesion Intercept (psf) | Friction Angle (deg) |
|---|---|---|---|
| 1 | 19.5 | 600.00 | 38.00 |
| 2 | 22.5 | 200.00 | 20.00 |
| 3 | 90.0 | 600.00 | 38.00 |

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

| Direction Range No. | Counterclockwise Direction Limit (deg) | Cohesion Intercept (psf) | Friction Angle (deg) |
|---|---|---|---|
| 1 | 13.5 | 600.00 | 38.00 |
| 2 | 16.5 | 200.00 | 20.00 |
| 3 | 90.0 | 600.00 | 38.00 |

Soil Type 7 Is Anisotropic
Number Of Direction Ranges Specified = 3

| Direction Range No. | Counterclockwise Direction Limit (deg) | Cohesion Intercept (psf) | Friction Angle (deg) |
|---|---|---|---|
| 1 | 8.5 | 600.00 | 38.00 |
| 2 | 11.5 | 200.00 | 20.00 |
| 3 | 90.0 | 600.00 | 38.00 |

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water = 62.40 (pcf)
Piezometric Surface No. 1 Specified by 2 Coordinate Points
Pore Pressure Inclination Factor = 0.50

| Point No. | X-Water (ft) | Y-Water (ft) |
|---|---|---|
| 1 | 0.00 | 900.00 |
| 2 | 900.00 | 900.00 |

Specified Peak Ground Acceleration Coefficient (A) = 0.300(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Sliding Block Surfaces, Has Been
Specified.
3000 Trial Surfaces Have Been Generated.
2 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of
Sliding Block Is 60.0

| Box No. | X-Left (ft) | Y-Left (ft) | X-Right (ft) | Y-Right (ft) | Height (ft) |
|---|---|---|---|---|---|
| 1 | 100.00 | 915.00 | 260.00 | 945.00 | 80.00 |
| 2 | 470.00 | 1020.00 | 720.00 | 1114.00 | 100.00 |

Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By GLE (Spencer's) Method (0-2) * *
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
The option of no water in the tension crack on
the last slice has been selected.
Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces
(if applicable) have been applied to the slice base(s)
on which they intersect.
Total Number of Trial Surfaces Evaluated = 3000
WARNING! The Factor of Safety Calculation for one or More Trial Surfaces
Did Not Converge in 20 Iterations.
Number of Trial Surfaces with Non-Converged FS = 403
Number of Trial Surfaces with Misleading FS = 39
Percentage of Trial Surfaces With Non-Valid FS Solutions
of the Total Evaluated = 14.7 %
Statistical Data On All Valid FS Values:
FS Max = 4.829 FS Min = 1.141 FS Ave = 2.275
Standard Deviation = 0.500 Coefficient of Variation = 21.99 %
((Simplified Janbu FS for Critical Surface = 1.074))
Failure Surface Specified By 6 Coordinate Points

| Point No. | X-Surf (ft) | Y-Surf (ft) |
|---|---|---|
| 1 | 112.12 | 968.89 |
| 2 | 120.67 | 965.34 |
| 3 | 180.62 | 962.71 |
| 4 | 565.08 | 1078.08 |
| 5 | 607.01 | 1121.00 |
| 6 | 612.22 | 1141.64 |

*** FOS = 1.141 Theta (ki=1.0) = 15.85 ***
Lambda = 0.284
Individual data on the 24 slices

| Slice No. | Width (ft) | Weight (lbs) | Water Force Top (lbs) | Water Force Bot (lbs) | Tie Force Norm (lbs) | Tie Force Tan (lbs) | Earthquake Force Hor (lbs) | Earthquake Force Ver (lbs) | Surcharge Load (lbs) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 8.6 | 3738.3 | 0.0 | 0.0 | 0. | 0. | 560.7 | 0.0 | 0.0 |
| 2 | 41.3 | 83854.6 | 0.0 | 0.0 | 0. | 0. | 12578.2 | 0.0 | 0.0 |
| 3 | 8.0 | 25649.2 | 0.0 | 0.0 | 0. | 0. | 3847.4 | 0.0 | 0.0 |
| 4 | 10.6 | 37416.9 | 0.0 | 0.0 | 0. | 0. | 5612.5 | 0.0 | 0.0 |
| 5 | 51.4 | 213388.0 | 0.0 | 0.0 | 0. | 0. | 32008.2 | 0.0 | 0.0 |
| 6 | 8.0 | 34671.4 | 0.0 | 0.0 | 0. | 0. | 5200.7 | 0.0 | 0.0 |
| 7 | 20.1 | 86729.5 | 0.0 | 0.0 | 0. | 0. | 13009.4 | 0.0 | 0.0 |
| 8 | 14.9 | 67906.4 | 0.0 | 0.0 | 0. | 0. | 10186.0 | 0.0 | 0.0 |
| 9 | 29.0 | 140930.5 | 0.0 | 0.0 | 0. | 0. | 21139.6 | 0.0 | 0.0 |

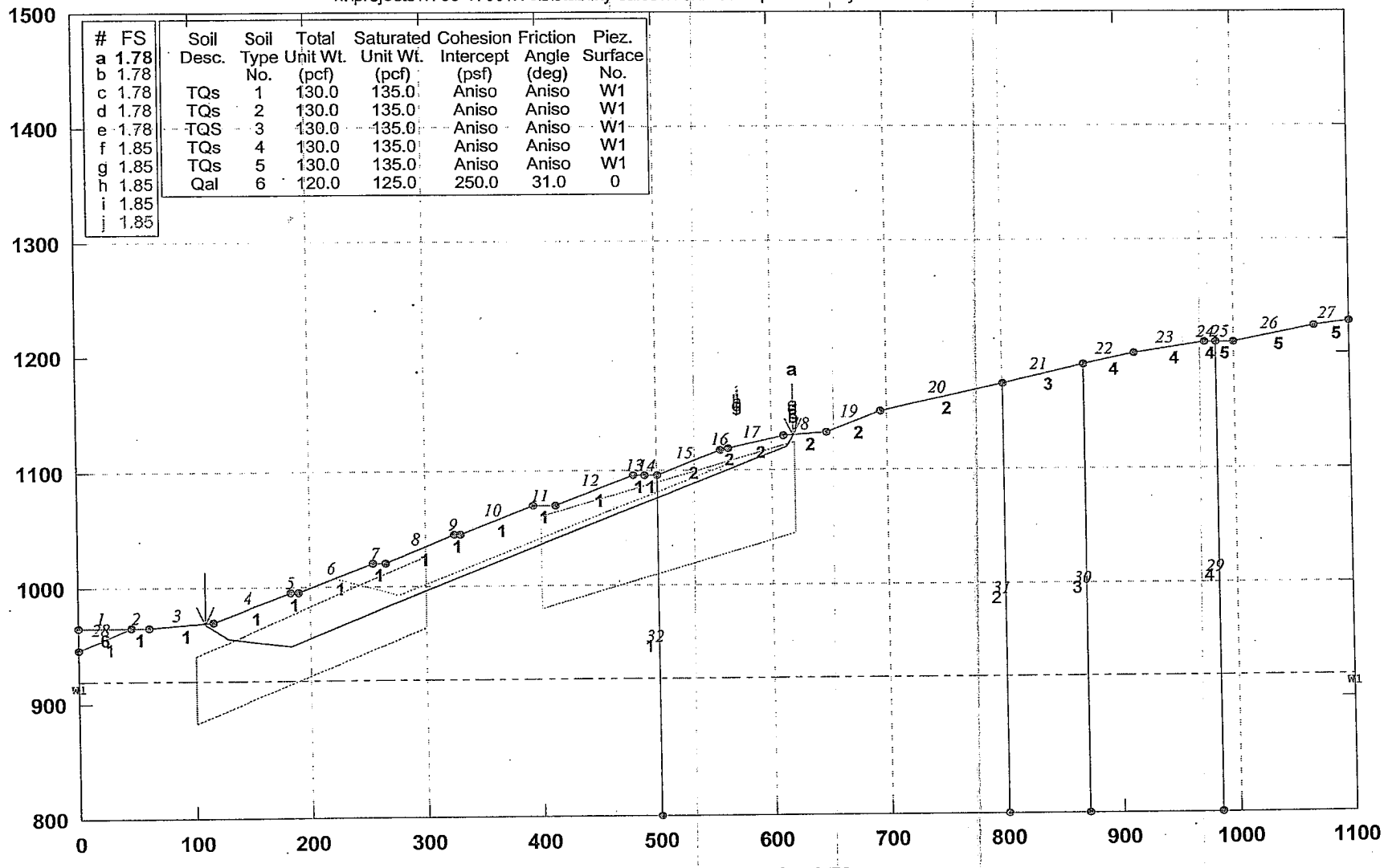
| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 10 | 8.0 | 39311.0 | 0.0 | 0.0 | 0. | 0. | 5896.6 | 0.0 | 0.0 |
| 11 | 63.0 | 321608.8 | 0.0 | 0.0 | 0. | 0. | 48241.3 | 0.0 | 0.0 |
| 12 | 20.0 | 101494.0 | 0.0 | 0.0 | 0. | 0. | 15224.1 | 0.0 | 0.0 |
| 13 | 63.0 | 325678.8 | 0.0 | 0.0 | 0. | 0. | 48851.8 | 0.0 | 0.0 |
| 14 | 8.0 | 43884.2 | 0.0 | 0.0 | 0. | 0. | 6582.6 | 0.0 | 0.0 |
| 15 | 59.0 | 337102.4 | 0.0 | 0.0 | 0. | 0. | 50565.4 | 0.0 | 0.0 |
| 16 | 4.0 | 24469.4 | 0.0 | 0.0 | 0. | 0. | 3670.4 | 0.0 | 0.0 |
| 17 | 6.0 | 36237.9 | 0.0 | 0.0 | 0. | 0. | 5435.7 | 0.0 | 0.0 |
| 18 | 2.0 | 11789.8 | 0.0 | 0.0 | 0. | 0. | 1768.5 | 0.0 | 0.0 |
| 19 | 28.1 | 170114.9 | 0.0 | 0.0 | 0. | 0. | 25517.2 | 0.0 | 0.0 |
| 20 | 34.9 | 167504.9 | 0.0 | 0.0 | 0. | 0. | 25125.7 | 0.0 | 0.0 |
| 21 | 7.0 | 20116.0 | 0.0 | 0.0 | 0. | 0. | 3017.4 | 0.0 | 0.0 |
| 22 | 0.8 | 1763.3 | 0.0 | 0.0 | 0. | 0. | 264.5 | 0.0 | 0.0 |
| 23 | 0.2 | 358.5 | 0.0 | 0.0 | 0. | 0. | 53.8 | 0.0 | 0.0 |
| 24 | 4.2 | 3975.0 | 0.0 | 0.0 | 0. | 0. | 596.3 | 0.0 | 0.0 |

# Lndmrk off-site grading; 6-6'; CS-4; static; planar

n:\projects\1700-1799\1702\stability calcs\1702r\t6s1b.pl2 Run By: KPC 7/09/2008 01:20PM

| # | FS |
|---|---|
| a | 1.78 |
| b | 1.78 |
| c | 1.78 |
| d | 1.78 |
| e | 1.78 |
| f | 1.85 |
| g | 1.85 |
| h | 1.85 |
| i | 1.85 |
| j | 1.85 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| TQs | 1 | 130.0 | 135.0 | Aniso | Aniso | W1 |
| TQs | 2 | 130.0 | 135.0 | Aniso | Aniso | W1 |
| TQS | 3 | 130.0 | 135.0 | Aniso | Aniso | W1 |
| TQs | 4 | 130.0 | 135.0 | Aniso | Aniso | W1 |
| TQs | 5 | 130.0 | 135.0 | Aniso | Aniso | W1 |
| Qal | 6 | 120.0 | 125.0 | 250.0 | 31.0 | 0 |




GSTABL7 v.2 FSmin=1.78

Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2)

GSTABL7

Run No. 21

```
                    *** GSTABL7 ***
              ** GSTABL7 by Garry H. Gregory, P.E. **
   ** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **
              (All Rights Reserved-Unauthorized Use Prohibited)
*******************************************************************************
                    SLOPE STABILITY ANALYSIS SYSTEM
      Modified Bishop, Simplified Janbu, or GLE Method of Slices.
      (Includes Spencer & Morgenstern-Price Type Analysis)
      Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
      Nonlinear Undrained Shear Strength, Curved Phi Envelope,
      Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
      Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
*******************************************************************************
Analysis Run Date:          7/09/2008
Time of Run:                01:20PM
Run By:                     KPC
Input Data Filename:        N:\Projects\1700-1799\1702\Stability Calcs\1702R\t6s1b.in
Output Filename:            N:\Projects\1700-1799\1702\Stability Calcs\1702R\t6s1b.OUT
Unit System:                English
Plotted Output Filename:    N:\Projects\1700-1799\1702\Stabi Calcs\1702R\t6s1b.PLT
PROBLEM DESCRIPTION:  Lndmrk off-site grading; 6-6'; CS-4;
                      static; planar

BOUNDARY COORDINATES
   27 Top   Boundaries
   32 Total Boundaries
```

| Boundary No. | X-Left (ft) | Y-Left (ft) | X-Right (ft) | Y-Right (ft) | Soil Type Below Bnd |
|---|---|---|---|---|---|
| 1 | 0.00 | 967.00 | 45.00 | 967.00 | 6 |
| 2 | 45.00 | 967.00 | 60.00 | 967.00 | 1 |
| 3 | 60.00 | 967.00 | 115.00 | 970.00 | 1 |
| 4 | 115.00 | 970.00 | 183.00 | 995.00 | 1 |
| 5 | 183.00 | 995.00 | 190.00 | 995.00 | 1 |
| 6 | 190.00 | 995.00 | 255.00 | 1020.00 | 1 |
| 7 | 255.00 | 1020.00 | 265.00 | 1020.00 | 1 |
| 8 | 265.00 | 1020.00 | 325.00 | 1045.00 | 1 |
| 9 | 325.00 | 1045.00 | 330.00 | 1045.00 | 1 |
| 10 | 330.00 | 1045.00 | 393.00 | 1069.00 | 1 |
| 11 | 393.00 | 1069.00 | 413.00 | 1070.00 | 1 |
| 12 | 413.00 | 1070.00 | 480.00 | 1095.00 | 1 |
| 13 | 480.00 | 1095.00 | 490.00 | 1096.00 | 1 |
| 14 | 490.00 | 1096.00 | 500.00 | 1096.00 | 1 |
| 15 | 500.00 | 1096.00 | 555.00 | 1118.00 | 2 |
| 16 | 555.00 | 1118.00 | 562.00 | 1119.00 | 2 |
| 17 | 562.00 | 1119.00 | 610.00 | 1130.00 | 2 |
| 18 | 610.00 | 1130.00 | 647.00 | 1133.00 | 2 |
| 19 | 647.00 | 1133.00 | 695.00 | 1150.00 | 2 |
| 20 | 695.00 | 1150.00 | 800.00 | 1174.00 | 2 |
| 21 | 800.00 | 1174.00 | 870.00 | 1190.00 | 3 |
| 22 | 870.00 | 1190.00 | 915.00 | 1200.00 | 4 |
| 23 | 915.00 | 1200.00 | 975.00 | 1210.00 | 4 |
| 24 | 975.00 | 1210.00 | 985.00 | 1210.00 | 4 |
| 25 | 985.00 | 1210.00 | 1000.00 | 1210.00 | 5 |
| 26 | 1000.00 | 1210.00 | 1070.00 | 1223.00 | 5 |
| 27 | 1070.00 | 1223.00 | 1100.00 | 1228.00 | 5 |
| 28 | 0.00 | 947.00 | 45.00 | 967.00 | 1 |
| 29 | 985.00 | 1210.00 | 985.01 | 800.00 | 4 |
| 30 | 870.00 | 1190.00 | 870.01 | 800.00 | 3 |
| 31 | 800.00 | 1174.00 | 800.01 | 800.00 | 2 |
| 32 | 500.00 | 1096.00 | 500.01 | 800.00 | 1 |

```
User Specified Y-Origin =        800.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)
ISOTROPIC SOIL PARAMETERS
  6 Type(s) of Soil
```

| Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No. |
|---|---|---|---|---|---|---|---|

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | 130.0 | 135.0 | 500.0 | 35.0 | 0.00 | 0.0 | 1 |
| 2 | 130.0 | 135.0 | 500.0 | 35.0 | 0.00 | 0.0 | 1 |
| 3 | 130.0 | 135.0 | 500.0 | 35.0 | 0.00 | 0.0 | 1 |
| 4 | 130.0 | 135.0 | 500.0 | 35.0 | 0.00 | 0.0 | 1 |
| 5 | 130.0 | 135.0 | 500.0 | 35.0 | 0.00 | 0.0 | 1 |
| 6 | 120.0 | 125.0 | 250.0 | 31.0 | 0.00 | 0.0 | 0 |

ANISOTROPIC STRENGTH PARAMETERS
5 soil type(s)

Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

| Direction Range No. | Counterclockwise Direction Limit (deg) | Cohesion Intercept (psf) | Friction Angle (deg) |
|---|---|---|---|
| 1 | 21.5 | 500.00 | 35.00 |
| 2 | 24.5 | 200.00 | 20.00 |
| 3 | 90.0 | 500.00 | 35.00 |

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

| Direction Range No. | Counterclockwise Direction Limit (deg) | Cohesion Intercept (psf) | Friction Angle (deg) |
|---|---|---|---|
| 1 | 19.5 | 500.00 | 35.00 |
| 2 | 22.5 | 200.00 | 20.00 |
| 3 | 90.0 | 500.00 | 35.00 |

Soil Type 3 Is Anisotropic
Number Of Direction Ranges Specified = 3

| Direction Range No. | Counterclockwise Direction Limit (deg) | Cohesion Intercept (psf) | Friction Angle (deg) |
|---|---|---|---|
| 1 | 14.5 | 500.00 | 35.00 |
| 2 | 17.5 | 200.00 | 20.00 |
| 3 | 90.0 | 500.00 | 35.00 |

Soil Type 4 Is Anisotropic
Number Of Direction Ranges Specified = 3

| Direction Range No. | Counterclockwise Direction Limit (deg) | Cohesion Intercept (psf) | Friction Angle (deg) |
|---|---|---|---|
| 1 | 10.5 | 500.00 | 35.00 |
| 2 | 13.5 | 200.00 | 20.00 |
| 3 | 90.0 | 500.00 | 35.00 |

Soil Type 5 Is Anisotropic
Number Of Direction Ranges Specified = 3

| Direction Range No. | Counterclockwise Direction Limit (deg) | Cohesion Intercept (psf) | Friction Angle (deg) |
|---|---|---|---|
| 1 | 5.5 | 500.00 | 35.00 |
| 2 | 8.5 | 200.00 | 20.00 |
| 3 | 90.0 | 500.00 | 35.00 |

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water = 62.40 (pcf)
Piezometric Surface No. 1 Specified by 2 Coordinate Points
Pore Pressure Inclination Factor = 0.50

| Point No. | X-Water (ft) | Y-Water (ft) |
|---|---|---|
| 1 | 0.00 | 920.00 |
| 2 | 1100.00 | 920.00 |

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
2500 Trial Surfaces Have Been Generated.

2 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of
Sliding Block Is 55.0

| Box No. | X-Left (ft) | Y-Left (ft) | X-Right (ft) | Y-Right (ft) | Height (ft) |
|---|---|---|---|---|---|
| 1 | 100.00 | 912.00 | 300.00 | 955.00 | 60.00 |
| 2 | 400.00 | 1020.00 | 620.00 | 1085.00 | 80.00 |

Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By GLE (Spencer's) Method (0-2) * *
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
The option of no water in the tension crack on
the last slice has been selected.
Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces
(if applicable) have been applied to the slice base(s)
on which they intersect.
Total Number of Trial Surfaces Evaluated = 2500
WARNING! The Factor of Safety Calculation for one or More Trial Surfaces
Did Not Converge in 20 Iterations.
Number of Trial Surfaces with Non-Converged FS = 17
Percentage of Trial Surfaces With Non-Valid FS Solutions
of the Total Evaluated = 0.7 %
Statistical Data On All Valid FS Values:
FS Max = 5.601 FS Min = 1.778 FS Ave = 3.383
Standard Deviation = 0.610 Coefficient of Variation = 18.04 %
((Simplified Janbu FS for Critical Surface = 1.576))
Failure Surface Specified By 5 Coordinate Points

| Point No. | X-Surf (ft) | Y-Surf (ft) |
|---|---|---|
| 1 | 108.91 | 969.67 |
| 2 | 127.93 | 956.52 |
| 3 | 182.60 | 950.51 |
| 4 | 613.22 | 1120.78 |
| 5 | 618.26 | 1130.67 |

*** FOS = 1.778 Theta (ki=1.0) = 16.49 ***
Lambda = 0.296
Individual data on the 19 slices

| Slice No. | Width (ft) | Weight (lbs) | Water Force Top (lbs) | Water Force Bot (lbs) | Tie Force Norm (lbs) | Tie Force Tan (lbs) | Earthquake Force Hor (lbs) | Earthquake Force Ver (lbs) | Surcharge Load (lbs) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 6.1 | 1797.3 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 2 | 12.9 | 19147.2 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 3 | 54.7 | 222376.0 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 4 | 0.4 | 2276.9 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 5 | 7.0 | 39083.6 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 6 | 65.0 | 348257.2 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 7 | 10.0 | 50551.2 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 8 | 60.0 | 292857.5 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 9 | 5.0 | 24176.5 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 10 | 63.0 | 292795.0 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 11 | 20.0 | 82784.9 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 12 | 67.0 | 240740.3 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 13 | 10.0 | 33040.5 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 14 | 10.0 | 28551.8 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 15 | 55.0 | 143787.3 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 16 | 7.0 | 17610.7 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 17 | 48.0 | 90344.4 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 18 | 3.2 | 4177.3 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 19 | 5.0 | 3103.8 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |

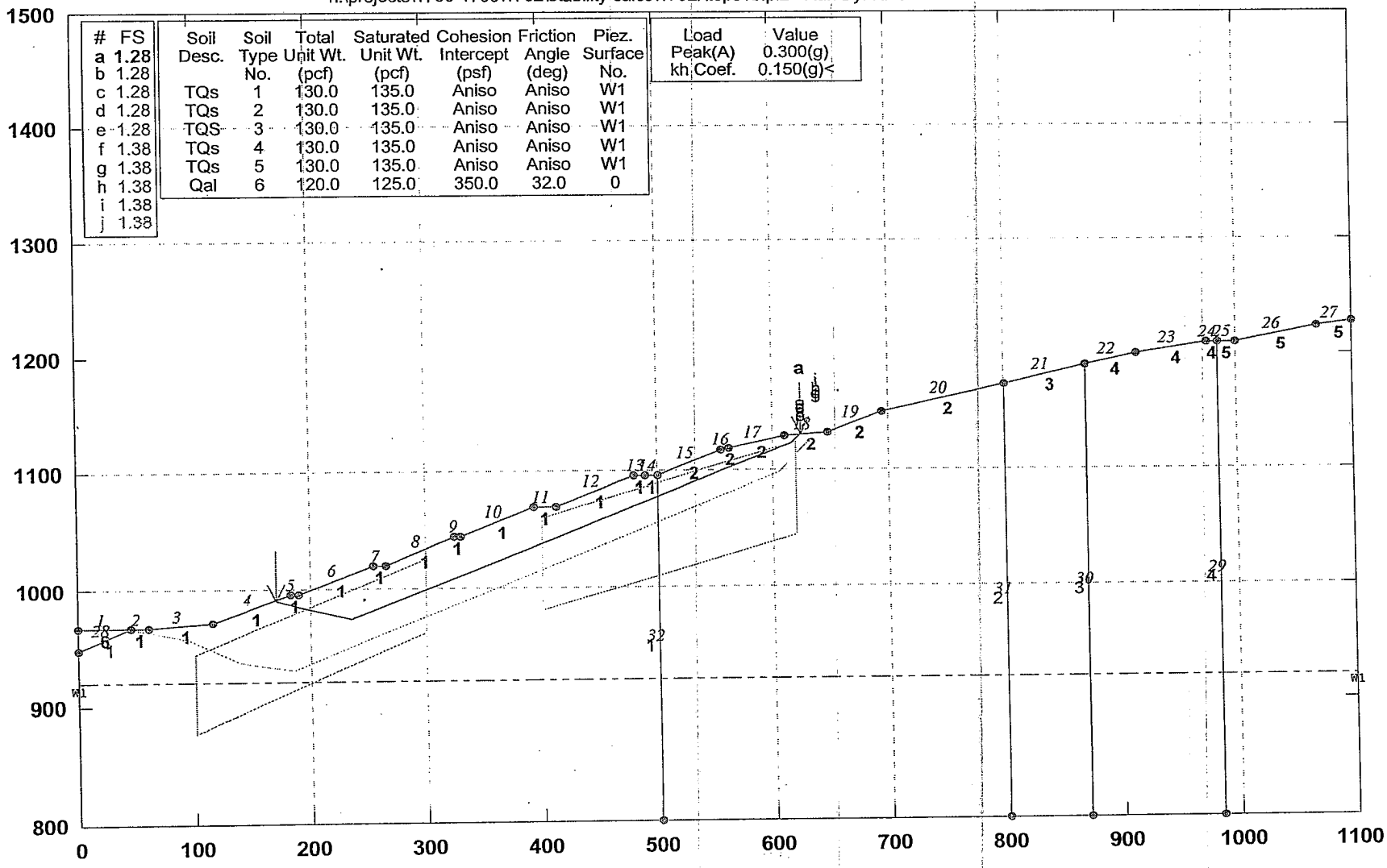
# Lndmrk off-site grading; 6-6'; CS-4; pseudo; planar

n:\projects\1700-1799\1702\stability calcs\1702r\t6ps1b.pl2 Run By: KPC 7/09/2008 01:24PM

| # | FS |
|---|---|
| a | 1.28 |
| b | 1.28 |
| c | 1.28 |
| d | 1.28 |
| e | 1.28 |
| f | 1.38 |
| g | 1.38 |
| h | 1.38 |
| i | 1.38 |
| j | 1.38 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| TQs | 1 | 130.0 | 135.0 | Aniso | Aniso | W1 |
| TQs | 2 | 130.0 | 135.0 | Aniso | Aniso | W1 |
| TQS | 3 | 130.0 | 135.0 | Aniso | Aniso | W1 |
| TQs | 4 | 130.0 | 135.0 | Aniso | Aniso | W1 |
| TQs | 5 | 130.0 | 135.0 | Aniso | Aniso | W1 |
| Qal | 6 | 120.0 | 125.0 | 350.0 | 32.0 | 0 |

| Load | Value |
|---|---|
| Peak(A) | 0.300(g) |
| kh Coef. | 0.150(g)< |




GSTABL7 v.2 FSmin=1.28

Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2)

GSTABL7

Run No. 22

```
                    *** GSTABL7 ***
              ** GSTABL7 by Garry H. Gregory, P.E. **
   ** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **
            (All Rights Reserved-Unauthorized Use Prohibited)
*******************************************************************************
                    SLOPE STABILITY ANALYSIS SYSTEM
      Modified Bishop, Simplified Janbu, or GLE Method of Slices.
      (Includes Spencer & Morgenstern-Price Type Analysis)
      Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
      Nonlinear Undrained Shear Strength, Curved Phi Envelope,
      Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
      Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
*******************************************************************************
Analysis Run Date:          7/09/2003
Time of Run:                01:24PM
Run By:                     KPC
Input Data Filename:        N:\Projects\1700-1799\1702\Stability Calcs\1702R\t6ps1b.in
Output Filename:            N:\Projects\1700-1799\1702\Stability Calcs\1702R\t6ps1b.OUT
Unit System:                English
Plotted Output Filename:    N:\Projects\1700-1799\1702\Stabi Calcs\1702R\t6ps1b.PLT
PROBLEM DESCRIPTION:  Lndmrk off-site grading; 6-6'; CS-4;
                      pseudo; planar
BOUNDARY COORDINATES
   27 Top   Boundaries
   32 Total Boundaries
```

| Boundary No. | X-Left (ft) | Y-Left (ft) | X-Right (ft) | Y-Right (ft) | Soil Type Below Bnd |
|---|---|---|---|---|---|
| 1 | 0.00 | 967.00 | 45.00 | 967.00 | 6 |
| 2 | 45.00 | 967.00 | 60.00 | 967.00 | 1 |
| 3 | 60.00 | 967.00 | 115.00 | 970.00 | 1 |
| 4 | 115.00 | 970.00 | 183.00 | 995.00 | 1 |
| 5 | 183.00 | 995.00 | 190.00 | 995.00 | 1 |
| 6 | 190.00 | 995.00 | 255.00 | 1020.00 | 1 |
| 7 | 255.00 | 1020.00 | 265.00 | 1020.00 | - |
| 8 | 265.00 | 1020.00 | 325.00 | 1045.00 | 1 |
| 9 | 325.00 | 1045.00 | 330.00 | 1045.00 | 1 |
| 10 | 330.00 | 1045.00 | 393.00 | 1069.00 | 1 |
| 11 | 393.00 | 1069.00 | 413.00 | 1070.00 | 1 |
| 12 | 413.00 | 1070.00 | 480.00 | 1095.00 | 1 |
| 13 | 480.00 | 1095.00 | 490.00 | 1096.00 | 1 |
| 14 | 490.00 | 1096.00 | 500.00 | 1096.00 | 1 |
| 15 | 500.00 | 1096.00 | 555.00 | 1118.00 | 2 |
| 16 | 555.00 | 1118.00 | 562.00 | 1119.00 | 2 |
| 17 | 562.00 | 1119.00 | 610.00 | 1130.00 | 2 |
| 18 | 610.00 | 1130.00 | 647.00 | 1133.00 | 2 |
| 19 | 647.00 | 1133.00 | 695.00 | 1150.00 | 2 |
| 20 | 695.00 | 1150.00 | 800.00 | 1174.00 | 2 |
| 21 | 800.00 | 1174.00 | 870.00 | 1190.00 | 3 |
| 22 | 870.00 | 1190.00 | 915.00 | 1200.00 | 4 |
| 23 | 915.00 | 1200.00 | 975.00 | 1210.00 | 4 |
| 24 | 975.00 | 1210.00 | 985.00 | 1210.00 | 4 |
| 25 | 985.00 | 1210.00 | 1000.00 | 1210.00 | 5 |
| 26 | 1000.00 | 1210.00 | 1070.00 | 1223.00 | 5 |
| 27 | 1070.00 | 1223.00 | 1100.00 | 1228.00 | 5 |
| 28 | 0.00 | 947.00 | 45.00 | 967.00 | 1 |
| 29 | 985.00 | 1210.00 | 985.01 | 800.00 | 4 |
| 30 | 870.00 | 1190.00 | 870.01 | 800.00 | 3 |
| 31 | 800.00 | 1174.00 | 800.01 | 800.00 | 2 |
| 32 | 500.00 | 1096.00 | 500.01 | 800.00 | 1 |

```
 User Specified Y-Origin =        800.00(ft)
 Default X-Plus Value = 0.00(ft)
 Default Y-Plus Value = 0.00(ft)
ISOTROPIC SOIL PARAMETERS
  6 Type(s) of Soil
```

| Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Parem. | Pressure Constant (psf) | Piez. Surface No. |
|---|---|---|---|---|---|---|---|

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | 130.0 | 135.0 | 600.0 | 38.0 | 0.00 | 0.0 | 1 |
| 2 | 130.0 | 135.0 | 600.0 | 38.0 | 0.00 | 0.0 | 1 |
| 3 | 130.0 | 135.0 | 600.0 | 38.0 | 0.00 | 0.0 | 1 |
| 4 | 130.0 | 135.0 | 600.0 | 38.0 | 0.00 | 0.0 | 1 |
| 5 | 130.0 | 135.0 | 600.0 | 38.0 | 0.00 | 0.0 | 1 |
| 6 | 120.0 | 125.0 | 350.0 | 32.0 | 0.00 | 0.0 | 0 |

ANISOTROPIC STRENGTH PARAMETERS

5 soil type(s)

Soil Type 1 Is Anisotropic

Number Of Direction Ranges Specified = 3

| Direction Range No. | Counterclockwise Direction Limit (deg) | Cohesion Intercept (psf) | Friction Angle (deg) |
|---|---|---|---|
| 1 | 21.5 | 600.00 | 38.00 |
| 2 | 24.5 | 200.00 | 20.00 |
| 3 | 90.0 | 600.00 | 38.00 |

Soil Type 2 Is Anisotropic

Number Of Direction Ranges Specified = 3

| Direction Range No. | Counterclockwise Direction Limit (deg) | Cohesion Intercept (psf) | Friction Angle (deg) |
|---|---|---|---|
| 1 | 19.5 | 600.00 | 38.00 |
| 2 | 22.5 | 200.00 | 20.00 |
| 3 | 90.0 | 600.00 | 38.00 |

Soil Type 3 Is Anisotropic

Number Of Direction Ranges Specified = 3

| Direction Range No. | Counterclockwise Direction Limit (deg) | Cohesion Intercept (psf) | Friction Angle (deg) |
|---|---|---|---|
| 1 | 14.5 | 600.00 | 38.00 |
| 2 | 17.5 | 200.00 | 20.00 |
| 3 | 90.0 | 600.00 | 38.00 |

Soil Type 4 Is Anisotropic

Number Of Direction Ranges Specified = 3

| Direction Range No. | Counterclockwise Direction Limit (deg) | Cohesion Intercept (psf) | Friction Angle (deg) |
|---|---|---|---|
| 1 | 10.5 | 600.00 | 38.00 |
| 2 | 13.5 | 200.00 | 20.00 |
| 3 | 90.0 | 600.00 | 38.00 |

Soil Type 5 Is Anisotropic

Number Of Direction Ranges Specified = 3

| Direction Range No. | Counterclockwise Direction Limit (deg) | Cohesion Intercept (psf) | Friction Angle (deg) |
|---|---|---|---|
| 1 | 5.5 | 600.00 | 38.00 |
| 2 | 8.5 | 200.00 | 20.00 |
| 3 | 90.0 | 600.00 | 38.00 |

ANISOTROPIC SOIL NOTES:

(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.

(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.

(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

1 PIEZOMETRIC SURFACE(S) SPECIFIED

Unit Weight of Water = 62.40 (pcf)

Piezometric Surface No. 1 Specified by 2 Coordinate Points

Pore Pressure Inclination Factor = 0.50

| Point No. | X-Water (ft) | Y-Water (ft) |
|---|---|---|
| 1 | 0.00 | 920.00 |
| 2 | 1100.00 | 920.00 |

Specified Peak Ground Acceleration Coefficient (A) = 0.300(g)

Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)

Specified Vertical Earthquake Coefficient (kv) = 0.000(g)

Specified Seismic Pore-Pressure Factor = 0.000

A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Sliding Block Surfaces, Has Been
Specified.
2500 Trial Surfaces Have Been Generated.
2 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of
Sliding Block Is 47.0

| Box No. | X-Left (ft) | Y-Left (ft) | X-Right (ft) | Y-Right (ft) | Height (ft) |
|---|---|---|---|---|---|
| 1 | 100.00 | 910.00 | 390.00 | 993.00 | 65.00 |
| 2 | 400.00 | 1020.00 | 620.00 | 1085.00 | 80.00 |

Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By GLE (Spencer's) Method (0-2) * *
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
The option of no water in the tension crack on
the last slice has been selected.
Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces
(if applicable) have been applied to the slice base(s)
on which they intersect.
Total Number of Trial Surfaces Evaluated = 2500
WARNING! The Factor of Safety Calculation for one or More Trial Surfaces
Did Not Converge in 20 Iterations.
Number of Trial Surfaces with Non-Converged FS = 214
Number of Trial Surfaces with Misleading FS = 21
Percentage of Trial Surfaces With Non-Valid FS Solutions
of the Total Evaluated = 9.4 %
Statistical Data On All Valid FS Values:
FS Max = 5.626 FS Min = 1.279 FS Ave = 2.468
Standard Deviation = 0.403 Coefficient of Variation = 16.32 %
((Simplified Janbu FS for Critical Surface = 1.123))
Failure Surface Specified By 5 Coordinate Points

| Point No. | X-Surf (ft) | Y-Surf (ft) |
|---|---|---|
| 1 | 169.93 | 990.19 |
| 2 | 190.29 | 984.48 |
| 3 | 235.78 | 972.66 |
| 4 | 615.42 | 1122.47 |
| 5 | 623.64 | 1131.11 |

*** FOS = 1.279 Theta (ki=1.0) = 15.95 ***
Lambda = 0.286
Individual data on the 18 slices

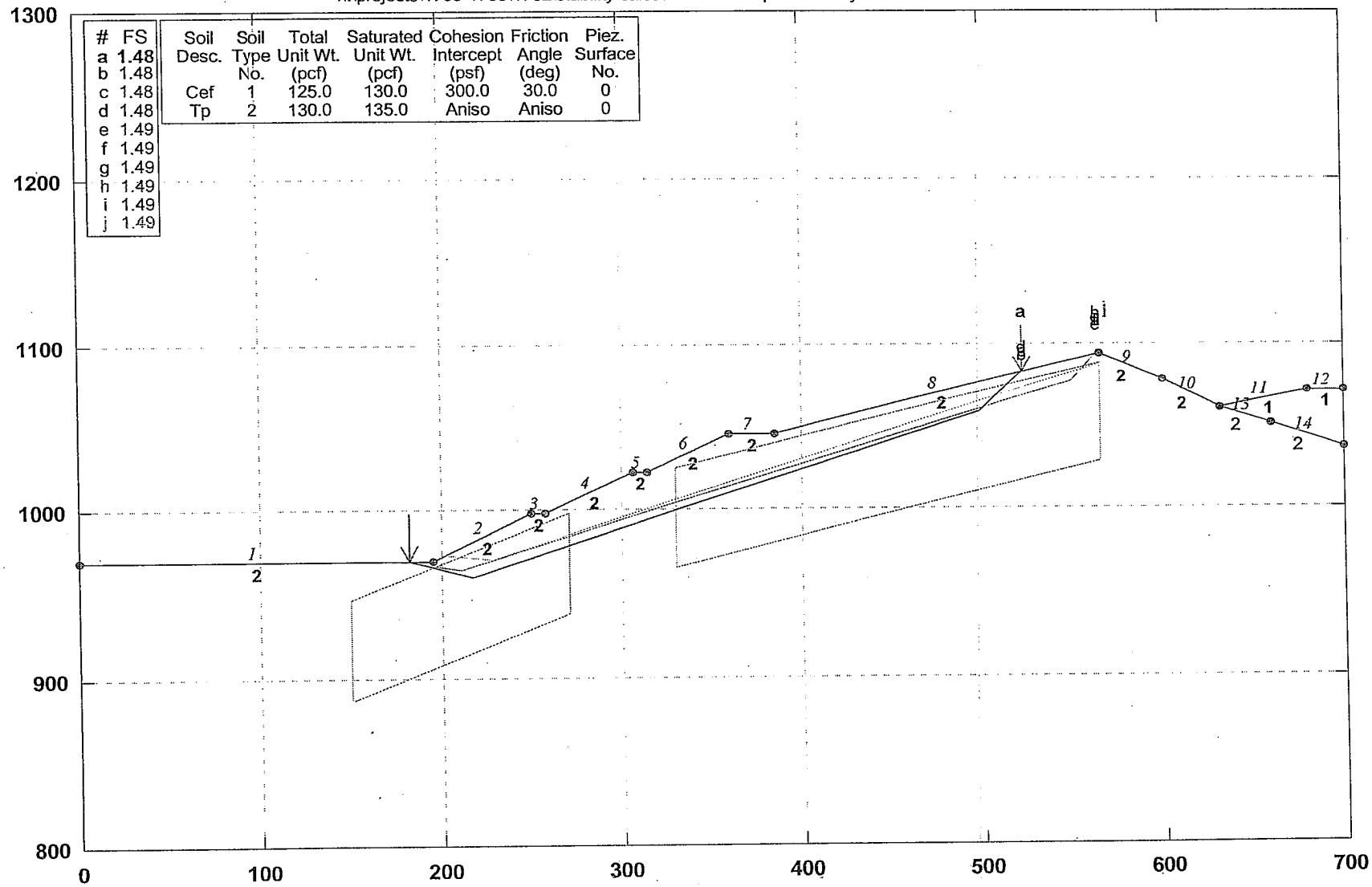
| Slice No. | Width (ft) | Weight (lbs) | Water Force Top (lbs) | Water Force Bot (lbs) | Tie Force Norm (lbs) | Tie Force Tan (lbs) | Earthquake Force Hor (lbs) | Earthquake Force Ver (lbs) | Surcharge Load (lbs) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 13.1 | 7201.2 | 0.0 | 0.0 | 0. | 0. | 1080.2 | 0.0 | 0.0 |
| 2 | 7.0 | 8608.1 | 0.0 | 0.0 | 0. | 0. | 1291.2 | 0.0 | 0.0 |
| 3 | 0.3 | 395.1 | 0.0 | 0.0 | 0. | 0. | 59.3 | 0.0 | 0.0 |
| 4 | 45.5 | 149563.3 | 0.0 | 0.0 | 0. | 0. | 22434.5 | 0.0 | 0.0 |
| 5 | 19.2 | 99577.9 | 0.0 | 0.0 | 0. | 0. | 14936.7 | 0.0 | 0.0 |
| 6 | 10.0 | 49116.5 | 0.0 | 0.0 | 0. | 0. | 7367.5 | 0.0 | 0.0 |
| 7 | 60.0 | 284471.0 | 0.0 | 0.0 | 0. | 0. | 42670.7 | 0.0 | 0.0 |
| 8 | 5.0 | 23494.8 | 0.0 | 0.0 | 0. | 0. | 3524.2 | 0.0 | 0.0 |
| 9 | 63.0 | 284431.5 | 0.0 | 0.0 | 0. | 0. | 42664.7 | 0.0 | 0.0 |
| 10 | 20.0 | 80217.6 | 0.0 | 0.0 | 0. | 0. | 12032.6 | 0.0 | 0.0 |
| 11 | 67.0 | 232447.1 | 0.0 | 0.0 | 0. | 0. | 34867.1 | 0.0 | 0.0 |
| 12 | 10.0 | 31843.3 | 0.0 | 0.0 | 0. | 0. | 4776.5 | 0.0 | 0.0 |
| 13 | 10.0 | 27365.1 | 0.0 | 0.0 | 0. | 0. | 4104.8 | 0.0 | 0.0 |
| 14 | 55.0 | 137450.0 | 0.0 | 0.0 | 0. | 0. | 20617.5 | 0.0 | 0.0 |
| 15 | 7.0 | 16826.9 | 0.0 | 0.0 | 0. | 0. | 2524.0 | 0.0 | 0.0 |
| 16 | 48.0 | 85109.9 | 0.0 | 0.0 | 0. | 0. | 12766.5 | 0.0 | 0.0 |
| 17 | 5.4 | 6215.1 | 0.0 | 0.0 | 0. | 0. | 932.3 | 0.0 | 0.0 |
| 18 | 8.2 | 4257.1 | 0.0 | 0.0 | 0. | 0. | 638.6 | 0.0 | 0.0 |

# Lndmrk off-site grading; 7-7'; CS-3; planar; static

n:\projects\1700-1799\1702\stability calcs\1702r\t7s1a.pl2 Run By: KPC 7/9/2008 03:56PM

| # | FS |
|---|---|
| a | 1.48 |
| b | 1.48 |
| c | 1.48 |
| d | 1.48 |
| e | 1.49 |
| f | 1.49 |
| g | 1.49 |
| h | 1.49 |
| i | 1.49 |
| j | 1.49 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Cef | 1 | 125.0 | 130.0 | 300.0 | 30.0 | 0 |
| Tp | 2 | 130.0 | 135.0 | Aniso | Aniso | 0 |




GSTABL7 v.2 FSmin=1.48

Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2)

GSTABL7

Run No. 23

```
                              *** GSTABL7 ***
                        ** GSTABL7 by Garry H. Gregory, P.E. **
      ** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **
                    (All Rights Reserved-Unauthorized Use Prohibited)
*******************************************************************************
                        SLOPE STABILITY ANALYSIS SYSTEM
          Modified Bishop, Simplified Janbu, or GLE Method of Slices.
          (Includes Spencer & Morgenstern-Price Type Analysis)
          Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
          Nonlinear Undrained Shear Strength, Curved Phi Envelope,
          Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
          Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
*******************************************************************************
Analysis Run Date:          7/9/2008
Time of Run:                03:56PM
Run By:                     KPC
Input Data Filename:        N:\Projects\1700-1799\1702\Stability Calcs\1702R\t7s1a.in
Output Filename:            N:\Projects\1700-1799\1702\Stability Calcs\1702R\t7s1a.OUT
Unit System:                English
Plotted Output Filename:    N:\Projects\1700-1799\1702\Stabi Calcs\1702R\t7s1a.PLT
PROBLEM DESCRIPTION:  Lndmrk off-site grading; 7-7'; CS-3;
                      planar; static
BOUNDARY COORDINATES
   12 Top   Boundaries
   14 Total Boundaries
Boundary     X-Left      Y-Left     X-Right     Y-Right     Soil Type
   No.        (ft)        (ft)       (ft)        (ft)      Below Bnd
    1          0.00      970.00     195.00      970.00         2
    2        195.00      970.00     249.00      998.00         2
    3        249.00      998.00     257.00      998.00         2
    4        257.00      998.00     306.00     1022.00         2
    5        306.00     1022.00     314.00     1022.00         2
    6        314.00     1022.00     360.00     1045.00         2
    7        360.00     1045.00     385.00     1045.00         2
    8        385.00     1045.00     565.00     1094.00         2
    9        565.00     1094.00     600.00     1077.00         2
   10        600.00     1077.00     632.00     1060.00         2
   11        632.00     1060.00     680.00     1070.00         1
   12        680.00     1070.00     700.00     1070.00         1
   13        632.00     1060.00     660.00     1050.00         2
   14        660.00     1050.00     700.00     1036.00         2
User Specified Y-Origin =       800.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)
ISOTROPIC SOIL PARAMETERS
  2 Type(s) of Soil
Soil  Total  Saturated  Cohesion Friction   Pore    Pressure   Piez.
Type Unit Wt. Unit Wt. Intercept  Angle  Pressure Constant Surface
 No.  (pcf)    (pcf)     (psf)    (deg)   Param.    (psf)     No.
  1   125.0    130.0     300.0    30.0    0.00       0.0      0
  2   130.0    135.0     350.0    30.0    0.00       0.0      0
ANISOTROPIC STRENGTH PARAMETERS
    1 soil type(s)
Soil Type  2 Is Anisotropic
Number Of Direction Ranges Specified =  3
Direction    Counterclockwise     Cohesion      Friction
  Range       Direction Limit    Intercept       Angle
   No.            (deg)            (psf)         (deg)
    1              16.5            350.00         30.00
    2              19.5            200.00         20.00
    3              90.0            350.00         30.00
ANISOTROPIC SOIL NOTES:
   (1) An input value of 0.01 for C and/or Phi will cause Aniso
       C and/or Phi to be ignored in that range.
   (2) An input value of 0.02 for Phi will set both Phi and
       C equal to zero, with no water weight in the tension crack.
   (3) An input value of 0.03 for Phi will set both Phi and
```

C equal to zero, with water weight in the tension crack.
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Sliding Block Surfaces, Has Been
Specified.
2000 Trial Surfaces Have Been Generated.
2 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of
Sliding Block Is 50.0

| Box No. | X-Left (ft) | Y-Left (ft) | X-Right (ft) | Y-Right (ft) | Height (ft) |
|---|---|---|---|---|---|
| 1 | 150.00 | 917.00 | 270.00 | 968.00 | 60.00 |
| 2 | 330.00 | 995.00 | 565.00 | 1058.00 | 60.00 |

Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By GLE (Spencer's) Method (0-2) * *
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
The option of no water in the tension crack on
the last slice has been selected.
Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces
(if applicable) have been applied to the slice base(s)
on which they intersect.
Total Number of Trial Surfaces Evaluated = 2000
WARNING! The Factor of Safety Calculation for one or More Trial Surfaces
Did Not Converge in 20 Iterations.
Number of Trial Surfaces with Non-Converged FS = 82
Number of Trial Surfaces with Misleading FS = 1
Percentage of Trial Surfaces With Non-Valid FS Solutions
of the Total Evaluated = 4.2 %
Statistical Data On All Valid FS Values:
FS Max = 6.905 FS Min = 1.476 FS Ave = 2.941
Standard Deviation = 0.892 Coefficient of Variation = 30.32 %
((Simplified Janbu FS for Critical Surface = 1.411))
Failure Surface Specified By 4 Coordinate Points

| Point No. | X-Surf (ft) | Y-Surf (ft) |
|---|---|---|
| 1 | 182.18 | 970.00 |
| 2 | 217.17 | 959.69 |
| 3 | 499.06 | 1058.07 |
| 4 | 522.37 | 1082.40 |

*** FOS = 1.476 Theta (ki=1.0) = 16.89 ***
Lambda = 0.304
Individual data on the 10 slices

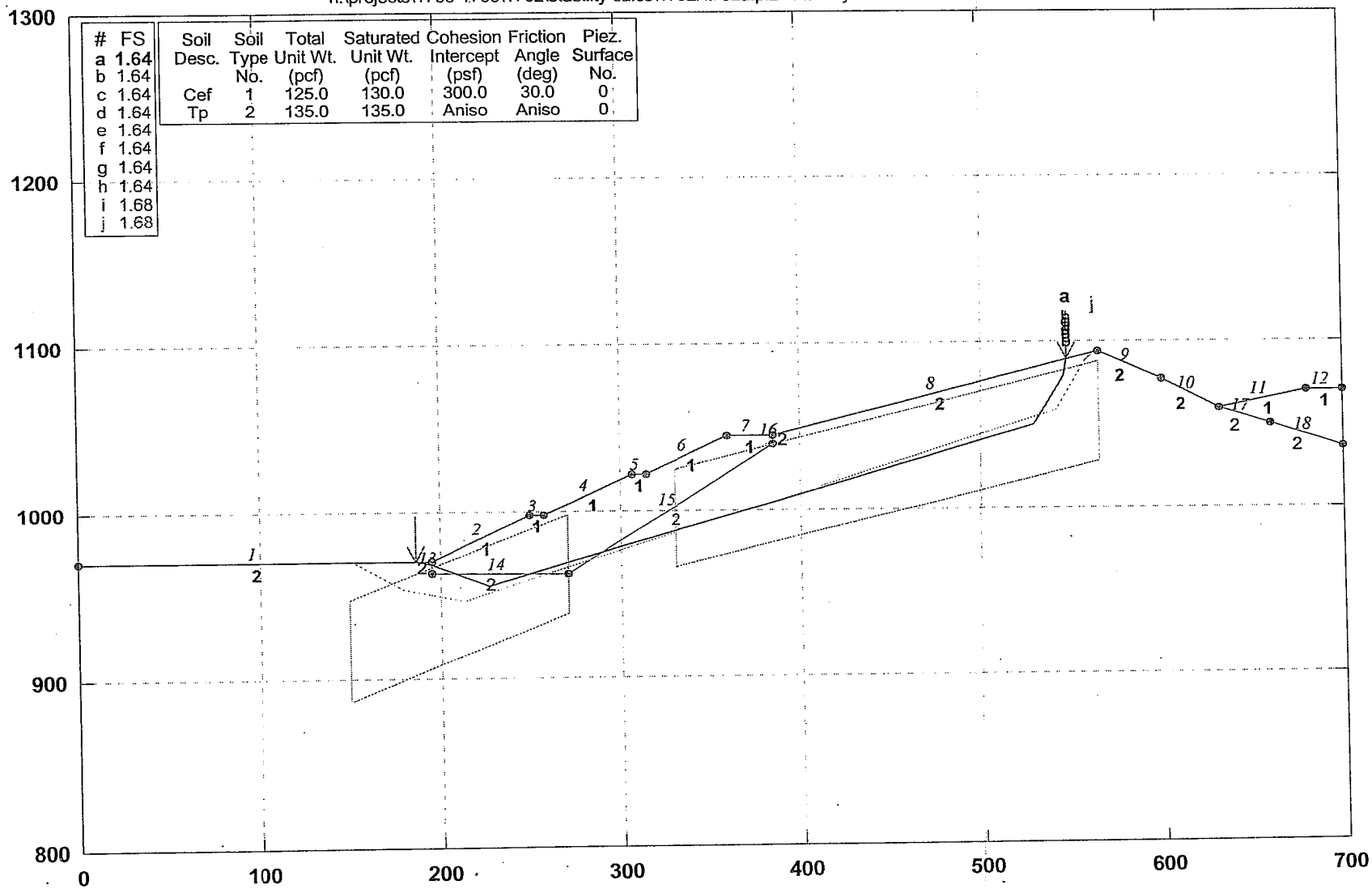
| Slice No. | Width (ft) | Weight (lbs) | Water Force Top (lbs) | Water Force Bot (lbs) | Tie Force Norm (lbs) | Tie Force Tan (lbs) | Earthquake Force Hor (lbs) | Earthquake Force Ver (lbs) | Surcharge Load (lbs) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 12.8 | 3146.5 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 2 | 22.2 | 36859.2 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 3 | 31.8 | 101375.2 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 4 | 8.0 | 26833.6 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 5 | 49.0 | 177437.0 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 6 | 8.0 | 31105.1 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 7 | 46.0 | 191275.7 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 8 | 25.0 | 101063.8 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 9 | 114.1 | 331495.9 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 10 | 23.3 | 27237.8 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |

# Lndmrk off-site grading; 7-7'; CS-3; planar; static; buttress w/ 7'dx75'w key

n:\projects\1700-1799\1702\stability calcs\1702r\t7s2a.pl2 Run By: KPC 7/21/2008 02:08PM

| # | FS |
|---|---|
| a | 1.64 |
| b | 1.64 |
| c | 1.64 |
| d | 1.64 |
| e | 1.64 |
| f | 1.64 |
| g | 1.64 |
| h | 1.64 |
| i | 1.68 |
| j | 1.68 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Cef | 1 | 125.0 | 130.0 | 300.0 | 30.0 | 0 |
| Tp | 2 | 135.0 | 135.0 | Aniso | Aniso | 0 |




GSTABL7 v.2 FSmin=1.64

Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2)

GSTABL7

Run No. 24

```
                    *** GSTABL7 ***
                ** GSTABL7 by Garry H. Gregory, P.E. **
   ** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **
            (All Rights Reserved-Unauthorized Use Prohibited)
*******************************************************************************
                    SLOPE STABILITY ANALYSIS SYSTEM
       Modified Bishop, Simplified Janbu, or GLE Method of Slices.
       (Includes Spencer & Morgenstern-Price Type Analysis)
       Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
       Nonlinear Undrained Shear Strength, Curved Phi Envelope,
       Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
       Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
*******************************************************************************
Analysis Run Date:          7/21/2008
Time of Run:                02:09PM
Run By:                     KPC
Input Data Filename:        N:\Projects\1700-1799\1702\Stability Calcs\1702R\t7s2a.in
Output Filename:            N:\Projects\1700-1799\1702\Stability Calcs\1702R\t7s2a.OUT
Unit System:                English
Plotted Output Filename:    N:\Projects\1700-1799\1702\Stabi Calcs\1702R\t7s2a.PLT
PROBLEM DESCRIPTION:  Lndmrk off-site grading; 7-7'; CS-3;
                      planar; static; buttress w/ 7'dx75'w key
BOUNDARY COORDINATES
   12 Top   Boundaries
   18 Total Boundaries
Boundary     X-Left      Y-Left     X-Right     Y-Right     Soil Type
   No.        (ft)        (ft)       (ft)        (ft)     Below Bnd
    1         0.00      970.00      195.00      970.00        2
    2       195.00      970.00      249.00      998.00        1
    3       249.00      998.00      257.00      998.00        1
    4       257.00      998.00      306.00     1022.00        1
    5       306.00     1022.00      314.00     1022.00        1
    6       314.00     1022.00      360.00     1045.00        1
    7       360.00     1045.00      385.00     1045.00        1
    8       385.00     1045.00      565.00     1094.00        2
    9       565.00     1094.00      600.00     1077.00        2
   10       600.00     1077.00      632.00     1060.00        2
   11       632.00     1060.00      680.00     1070.00        1
   12       680.00     1070.00      700.00     1070.00        1
   13       195.00      970.00      195.01      963.00        2
   14       195.01      963.00      270.00      962.00        2
   15       270.00      962.00      384.99     1040.00        2
   16       384.99     1040.00      385.00     1045.00        2
   17       632.00     1060.00      660.00     1050.00        2
   18       660.00     1050.00      700.00     1036.00        2
 User Specified Y-Origin =        800.00(ft)
 Default X-Plus Value = 0.00(ft)
 Default Y-Plus Value = 0.00(ft)
ISOTROPIC SOIL PARAMETERS
  2 Type(s) of Soil
 Soil  Total  Saturated  Cohesion Friction   Pore   Pressure   Piez.
 Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant Surface
  No.  (pcf)    (pcf)     (psf)     (deg)   Param.    (psf)     No.
   1   125.0    130.0     300.0     30.0    0.00       0.0      0
   2   135.0    135.0     350.0     30.0    0.00       0.0      0
ANISOTROPIC STRENGTH PARAMETERS
     1 soil type(s)
 Soil Type  2 Is Anisotropic
 Number Of Direction Ranges Specified =  3
 Direction    Counterclockwise     Cohesion      Friction
   Range       Direction Limit    Intercept       Angle
    No.            (deg)            (psf)         (deg)
     1             16.5             350.00         30.00
     2             19.5             200.00         20.00
     3             90.0             350.00         30.00
 ANISOTROPIC SOIL NOTES:
    (1) An input value of 0.01 for C and/or Phi will cause Aniso
```

C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
3000 Trial Surfaces Have Been Generated.
2 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 34.0

| Box No. | X-Left (ft) | Y-Left (ft) | X-Right (ft) | Y-Right (ft) | Height (ft) |
|---|---|---|---|---|---|
| 1 | 150.00 | 917.00 | 270.00 | 968.00 | 60.00 |
| 2 | 330.00 | 995.00 | 565.00 | 1058.00 | 60.00 |

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Evaluated. They Are Ordered - Most Critical First.
* * Safety Factors Are Calculated By GLE (Spencer's) Method (0-2) * *
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
The option of no water in the tension crack on the last slice has been selected.
Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces (if applicable) have been applied to the slice base(s) on which they intersect.
Total Number of Trial Surfaces Evaluated = 3000
WARNING! The Factor of Safety Calculation for one or More Trial Surfaces Did Not Converge in 20 Iterations.
Number of Trial Surfaces with Non-Converged FS = 24
Percentage of Trial Surfaces With Non-Valid FS Solutions of the Total Evaluated = 0.8 %
Statistical Data On All Valid FS Values:
FS Max = 12.401 FS Min = 1.638 FS Ave = 3.023
Standard Deviation = 1.078 Coefficient of Variation = 35.67 %
((Simplified Janbu FS for Critical Surface = 1.510))
Failure Surface Specified By 6 Coordinate Points

| Point No. | X-Surf (ft) | Y-Surf (ft) |
|---|---|---|
| 1 | 186.16 | 970.00 |
| 2 | 194.79 | 967.63 |
| 3 | 226.28 | 954.82 |
| 4 | 529.30 | 1049.82 |
| 5 | 546.40 | 1079.21 |
| 6 | 547.55 | 1089.25 |

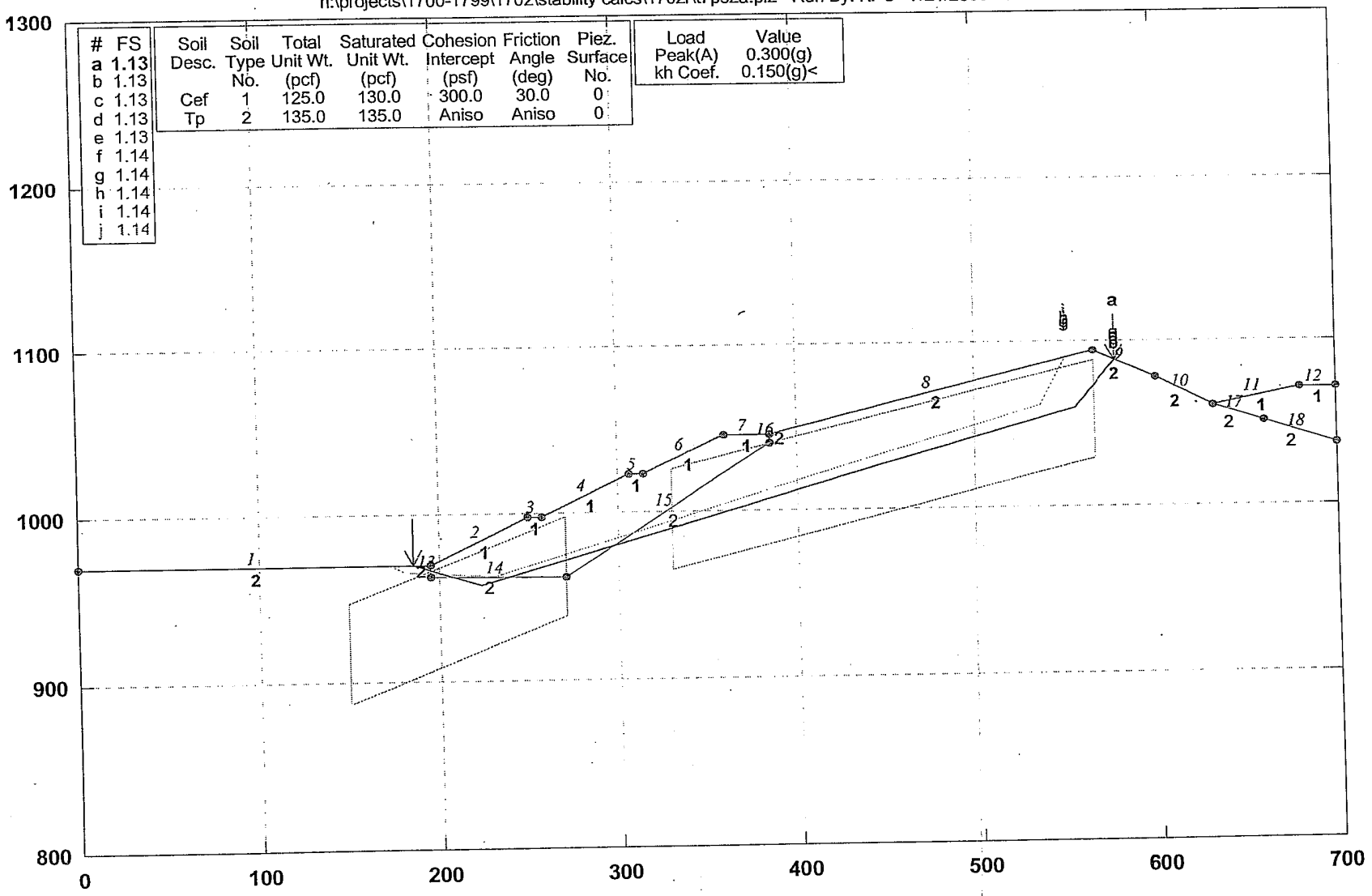
*** FOS = 1.638 Theta (ki=1.0) = 17.13 ***
Lambda = 0.308
Individual data on the 17 slices

| Slice No. | Width (ft) | Weight (lbs) | Water Force Top (lbs) | Water Force Bot (lbs) | Tie Force Norm (lbs) | Tie Force Tan (lbs) | Earthquake Force Hor (lbs) | Earthquake Force Ver (lbs) | Surcharge Load (lbs) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 8.6 | 1378.9 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 2 | 0.2 | 69.2 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 3 | 0.0 | 1.1 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 4 | 11.5 | 11262.5 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 5 | 19.7 | 55689.1 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 6 | 22.7 | 96699.1 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 7 | 1.0 | 4621.8 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 8 | 7.0 | 30182.5 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 9 | 30.9 | 140057.3 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 10 | 18.1 | 92481.0 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 11 | 8.0 | 41578.3 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 12 | 46.0 | 261060.6 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 13 | 25.0 | 146223.2 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 14 | 0.0 | 54.4 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 15 | 144.3 | 729396.8 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 16 | 17.1 | 51005.9 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 17 | 1.2 | 756.2 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |

# Lndmrk off-site grading; 7-7'; CS-3; planar; pseudo; buttress w/ 7'dx75'w key

n:\projects\1700-1799\1702\stability calcs\1702r\t7ps2a.pl2 Run By: KPC 7/21/2008 02:10PM




| # | FS |
|---|---|
| a | 1.13 |
| b | 1.13 |
| c | 1.13 |
| d | 1.13 |
| e | 1.13 |
| f | 1.14 |
| g | 1.14 |
| h | 1.14 |
| i | 1.14 |
| j | 1.14 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Cef | 1 | 125.0 | 130.0 | 300.0 | 30.0 | 0 |
| Tp | 2 | 135.0 | 135.0 | Aniso | Aniso | 0 |

| Load | Value |
|---|---|
| Peak(A) | 0.300(g) |
| kh Coef. | 0.150(g)< |

GSTABL7 v.2 FSmin=1.13

Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2)

GSTABL7

Run No. 25

```
                    *** GSTABL7 ***
                ** GSTABL7 by Garry H. Gregory, P.E. **
   ** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **
             (All Rights Reserved-Unauthorized Use Prohibited)
*******************************************************************************
                    SLOPE STABILITY ANALYSIS SYSTEM
       Modified Bishop, Simplified Janbu, or GLE Method of Slices.
       (Includes Spencer & Morgenstern-Price Type Analysis)
       Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
       Nonlinear Undrained Shear Strength, Curved Phi Envelope,
       Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
       Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
*******************************************************************************
Analysis Run Date:          7/21/2008
Time of Run:                02:10PM
Run By:                     KPC
Input Data Filename:        N:\Projects\1700-1799\1702\Stability Calcs\1702R\t7ps2a.in
Output Filename:            N:\Projects\1700-1799\1702\Stability Calcs\1702R\t7ps2a.OUT
Unit System:                English
Plotted Output Filename:    N:\Projects\1700-1799\1702\Stabi Calcs\1702R\t7ps2a.PLT
PROBLEM DESCRIPTION:  Lndmrk off-site grading; 7-7'; CS-3;
                      planar; pseudo; buttress w/ 7'dx75'w key

BOUNDARY COORDINATES
   12 Top   Boundaries
   18 Total Boundaries
```

| Boundary No. | X-Left (ft) | Y-Left (ft) | X-Right (ft) | Y-Right (ft) | Soil Type Below Bnd |
|---|---|---|---|---|---|
| 1 | 0.00 | 970.00 | 195.00 | 970.00 | 2 |
| 2 | 195.00 | 970.00 | 249.00 | 998.00 | 1 |
| 3 | 249.00 | 998.00 | 257.00 | 998.00 | 1 |
| 4 | 257.00 | 998.00 | 306.00 | 1022.00 | 1 |
| 5 | 306.00 | 1022.00 | 314.00 | 1022.00 | 1 |
| 6 | 314.00 | 1022.00 | 360.00 | 1045.00 | 1 |
| 7 | 360.00 | 1045.00 | 385.00 | 1045.00 | 2 |
| 8 | 385.00 | 1045.00 | 565.00 | 1094.00 | 2 |
| 9 | 565.00 | 1094.00 | 600.00 | 1077.00 | 2 |
| 10 | 600.00 | 1077.00 | 632.00 | 1060.00 | 2 |
| 11 | 632.00 | 1060.00 | 680.00 | 1070.00 | 1 |
| 12 | 680.00 | 1070.00 | 700.00 | 1070.00 | 1 |
| 13 | 195.00 | 970.00 | 195.01 | 963.00 | 2 |
| 14 | 195.01 | 963.00 | 270.00 | 962.00 | 2 |
| 15 | 270.00 | 962.00 | 384.99 | 1040.00 | 2 |
| 16 | 384.99 | 1040.00 | 385.00 | 1045.00 | 2 |
| 17 | 632.00 | 1060.00 | 660.00 | 1050.00 | 2 |
| 18 | 660.00 | 1050.00 | 700.00 | 1036.00 | 2 |

```
User Specified Y-Origin =        800.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)
ISOTROPIC SOIL PARAMETERS
  2 Type(s) of Soil
```

| Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No. |
|---|---|---|---|---|---|---|---|
| 1 | 125.0 | 130.0 | 300.0 | 30.0 | 0.00 | 0.0 | 0 |
| 2 | 135.0 | 135.0 | 500.0 | 36.0 | 0.00 | 0.0 | 0 |

```
ANISOTROPIC STRENGTH PARAMETERS
     1 soil type(s)
 Soil Type  2 Is Anisotropic
 Number Of Direction Ranges Specified =  3
```

| Direction Range No. | Counterclockwise Direction Limit (deg) | Cohesion Intercept (psf) | Friction Angle (deg) |
|---|---|---|---|
| 1 | 16.5 | 500.00 | 36.00 |
| 2 | 19.5 | 200.00 | 20.00 |
| 3 | 90.0 | 500.00 | 36.00 |

```
 ANISOTROPIC SOIL NOTES:
    (1) An input value of 0.01 for C and/or Phi will cause Aniso
```

C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

Specified Peak Ground Acceleration Coefficient (A) = 0.300(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
3000 Trial Surfaces Have Been Generated.
2 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 50.0

| Box No. | X-Left (ft) | Y-Left (ft) | X-Right (ft) | Y-Right (ft) | Height (ft) |
|---|---|---|---|---|---|
| 1 | 150.00 | 917.00 | 270.00 | 968.00 | 60.00 |
| 2 | 330.00 | 995.00 | 565.00 | 1058.00 | 60.00 |

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Evaluated. They Are Ordered - Most Critical First.
* * Safety Factors Are Calculated By GLE (Spencer's) Method (0-2) * *
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
The option of no water in the tension crack on the last slice has been selected.
Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces (if applicable) have been applied to the slice base(s) on which they intersect.
Total Number of Trial Surfaces Evaluated = 3000
WARNING! The Factor of Safety Calculation for one or More Trial Surfaces Did Not Converge in 20 Iterations.
Number of Trial Surfaces with Non-Converged FS = 129
Number of Trial Surfaces with Misleading FS = 5
Percentage of Trial Surfaces With Non-Valid FS Solutions of the Total Evaluated = 4.5 %
Statistical Data On All Valid FS Values:
FS Max = 5.951 FS Min = 1.125 FS Ave = 2.315
Standard Deviation = 0.645 Coefficient of Variation = 27.85 %
(Simplified Janbu FS for Critical Surface = 1.057))
Failure Surface Specified By 4 Coordinate Points

| Point No. | X-Surf (ft) | Y-Surf (ft) |
|---|---|---|
| 1 | 185.54 | 970.00 |
| 2 | 223.12 | 957.29 |
| 3 | 554.31 | 1058.93 |
| 4 | 577.19 | 1088.03 |

*** FOS = 1.125 Theta (ki=1.0) = 15.79 ***
Lambda = 0.263
Individual data on the 16 slices

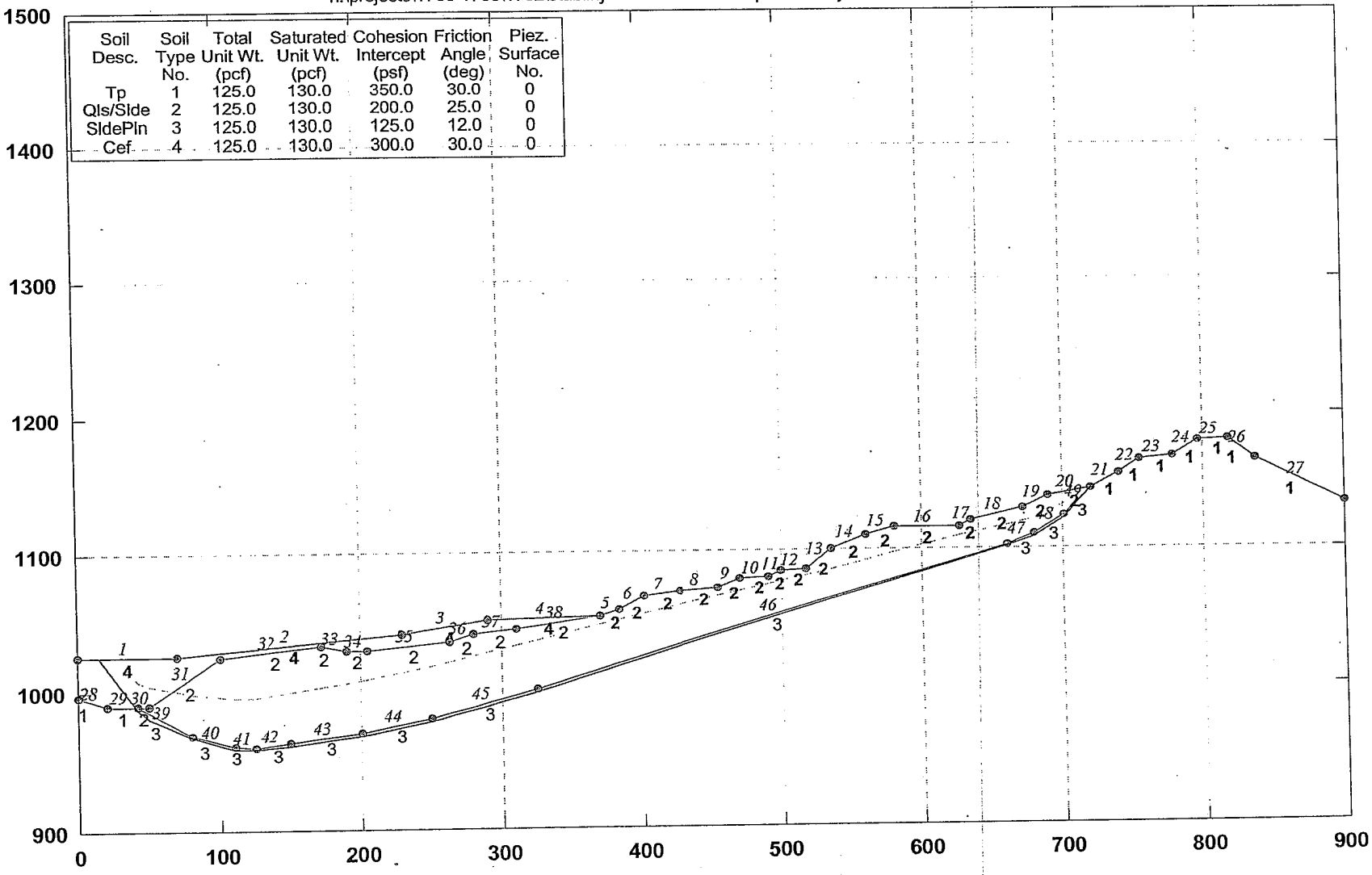
| Slice No. | Width (ft) | Weight (lbs) | Water Force Top (lbs) | Water Force Bot (lbs) | Tie Force Norm (lbs) | Tie Force Tan (lbs) | Earthquake Force Hor (lbs) | Earthquake Force Ver (lbs) | Surcharge Load (lbs) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 9.5 | 2044.3 | 0.0 | 0.0 | 0. | 0. | 306.7 | 0.0 | 0.0 |
| 2 | 0.0 | 1.9 | 0.0 | 0.0 | 0. | 0. | 0.3 | 0.0 | 0.0 |
| 3 | 11.7 | 11990.7 | 0.0 | 0.0 | 0. | 0. | 1798.6 | 0.0 | 0.0 |
| 4 | 16.4 | 42037.5 | 0.0 | 0.0 | 0. | 0. | 6305.6 | 0.0 | 0.0 |
| 5 | 16.7 | 61017.6 | 0.0 | 0.0 | 0. | 0. | 9152.6 | 0.0 | 0.0 |
| 6 | 9.2 | 36593.4 | 0.0 | 0.0 | 0. | 0. | 5489.0 | 0.0 | 0.0 |
| 7 | 8.0 | 31544.2 | 0.0 | 0.0 | 0. | 0. | 4731.6 | 0.0 | 0.0 |
| 8 | 39.0 | 165378.6 | 0.0 | 0.0 | 0. | 0. | 24806.8 | 0.0 | 0.0 |
| 9 | 10.0 | 47943.1 | 0.0 | 0.0 | 0. | 0. | 7191.5 | 0.0 | 0.0 |
| 10 | 8.0 | 38466.4 | 0.0 | 0.0 | 0. | 0. | 5770.0 | 0.0 | 0.0 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 11 | 46.0 | 244275.4 | 0.0 | 0.0 | 0. | 0. | 36641.3 | 0.0 | 0.0 |
| 12 | 25.0 | 137896.0 | 0.0 | 0.0 | 0. | 0. | 20684.4 | 0.0 | 0.0 |
| 13 | 0.0 | 51.1 | 0.0 | 0.0 | 0. | 0. | 7.7 | 0.0 | 0.0 |
| 14 | 169.3 | 802300.7 | 0.0 | 0.0 | 0. | 0. | ******* | 0.0 | 0.0 |
| 15 | 10.7 | 38679.2 | 0.0 | 0.0 | 0. | 0. | 5801.9 | 0.0 | 0.0 |
| 16 | 12.2 | 17663.8 | 0.0 | 0.0 | 0. | 0. | 2649.6 | 0.0 | 0.0 |

# Lndmrk off-site grading; 8-8'; Qls-XIV(B); static; basal Qls plane - no removals

n:\projects\1700-1799\1702\stability calcs\1702r\t8s1a.plt Run By: MJG 7/17/2008 03:57PM

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Tp | 1 | 125.0 | 130.0 | 350.0 | 30.0 | 0 |
| Qls/Slde | 2 | 125.0 | 130.0 | 200.0 | 25.0 | 0 |
| SldePln | 3 | 125.0 | 130.0 | 125.0 | 12.0 | 0 |
| Cef | 4 | 125.0 | 130.0 | 300.0 | 30.0 | 0 |




GSTABL7 v.2 FSmin=2.40

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

GSTABL7

Run No. 26

```
                    *** GSTABL7 ***
              ** GSTABL7 by Garry H. Gregory, P.E. **
   ** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **
            (All Rights Reserved-Unauthorized Use Prohibited)
*******************************************************************************
                    SLOPE STABILITY ANALYSIS SYSTEM
      Modified Bishop, Simplified Janbu, or GLE Method of Slices.
      (Includes Spencer & Morgenstern-Price Type Analysis)
      Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
      Nonlinear Undrained Shear Strength, Curved Phi Envelope,
      Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
      Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
*******************************************************************************
Analysis Run Date:        7/17/2008
Time of Run:              03:57PM
Run By:                   MJG
Input Data Filename:      N:\Projects\1700-1799\1702\Stability Calcs\1702R\t8s1a.in
Output Filename:          N:\Projects\1700-1799\1702\Stability Calcs\1702R\t8s1a.OUT
Unit System:              English
Plotted Output Filename:  N:\Projects\1700-1799\1702\Stabi Calcs\1702R\t8s1a.PLT
PROBLEM DESCRIPTION:  Lndmrk off-site grading; 8-8'; Qls-XIV(B
                      ); static; basal Qls plane - no removals

BOUNDARY COORDINATES
   27 Top   Boundaries
   49 Total Boundaries
```

| Boundary No. | X-Left (ft) | Y-Left (ft) | X-Right (ft) | Y-Right (ft) | Soil Type Below Bnd |
|---|---|---|---|---|---|
| 1 | 0.00 | 1025.00 | 70.00 | 1025.00 | 4 |
| 2 | 70.00 | 1025.00 | 230.00 | 1040.00 | 4 |
| 3 | 230.00 | 1040.00 | 290.00 | 1050.00 | 4 |
| 4 | 290.00 | 1050.00 | 370.00 | 1052.00 | 4 |
| 5 | 370.00 | 1052.00 | 384.00 | 1056.00 | 2 |
| 6 | 384.00 | 1056.00 | 402.00 | 1066.00 | 2 |
| 7 | 402.00 | 1066.00 | 428.00 | 1070.00 | 2 |
| 8 | 428.00 | 1070.00 | 455.00 | 1072.00 | 2 |
| 9 | 455.00 | 1072.00 | 470.00 | 1079.00 | 2 |
| 10 | 470.00 | 1079.00 | 490.00 | 1080.00 | 2 |
| 11 | 490.00 | 1080.00 | 500.00 | 1085.00 | 2 |
| 12 | 500.00 | 1085.00 | 517.00 | 1086.00 | 2 |
| 13 | 517.00 | 1086.00 | 535.00 | 1100.00 | 2 |
| 14 | 535.00 | 1100.00 | 560.00 | 1110.00 | 2 |
| 15 | 560.00 | 1110.00 | 580.00 | 1116.00 | 2 |
| 16 | 580.00 | 1116.00 | 627.00 | 1116.00 | 2 |
| 17 | 627.00 | 1116.00 | 634.00 | 1120.00 | 2 |
| 18 | 634.00 | 1120.00 | 672.00 | 1130.00 | 2 |
| 19 | 672.00 | 1130.00 | 690.00 | 1138.00 | 2 |
| 20 | 690.00 | 1138.00 | 720.00 | 1144.00 | 2 |
| 21 | 720.00 | 1144.00 | 740.00 | 1155.00 | 1 |
| 22 | 740.00 | 1155.00 | 755.00 | 1166.00 | 1 |
| 23 | 755.00 | 1166.00 | 779.00 | 1168.00 | 1 |
| 24 | 779.00 | 1168.00 | 796.00 | 1179.00 | 1 |
| 25 | 796.00 | 1179.00 | 818.00 | 1180.00 | 1 |
| 26 | 818.00 | 1180.00 | 837.00 | 1165.00 | 1 |
| 27 | 837.00 | 1165.00 | 900.00 | 1133.00 | 1 |
| 28 | 0.00 | 997.00 | 20.00 | 990.00 | 1 |
| 29 | 20.00 | 990.00 | 42.00 | 990.00 | 1 |
| 30 | 42.00 | 990.00 | 50.00 | 990.00 | 2 |
| 31 | 50.00 | 990.00 | 100.00 | 1024.00 | 2 |
| 32 | 100.00 | 1024.00 | 172.00 | 1032.00 | 2 |
| 33 | 172.00 | 1032.00 | 190.00 | 1028.00 | 2 |
| 34 | 190.00 | 1028.00 | 205.00 | 1028.00 | 2 |
| 35 | 205.00 | 1028.00 | 263.00 | 1034.00 | 2 |
| 36 | 263.00 | 1034.00 | 280.00 | 1039.00 | 2 |
| 37 | 280.00 | 1039.00 | 310.00 | 1043.00 | 2 |
| 38 | 310.00 | 1043.00 | 370.00 | 1052.00 | 2 |
| 39 | 42.00 | 990.00 | 80.00 | 969.00 | 3 |
| 40 | 80.00 | 969.00 | 110.00 | 961.00 | 3 |

| | | | | | |
|---|---|---|---|---|---|
| 41 | 110.00 | 961.00 | 125.00 | 960.00 | 3 |
| 42 | 125.00 | 960.00 | 150.00 | 963.00 | 3 |
| 43 | 150.00 | 963.00 | 200.00 | 970.00 | 3 |
| 44 | 200.00 | 970.00 | 250.00 | 980.00 | 3 |
| 45 | 250.00 | 980.00 | 325.00 | 1000.00 | 3 |
| 46 | 325.00 | 1000.00 | 660.00 | 1103.00 | 3 |
| 47 | 660.00 | 1103.00 | 680.00 | 1110.00 | 3 |
| 48 | 680.00 | 1110.00 | 701.00 | 1124.00 | 3 |
| 49 | 701.00 | 1124.00 | 720.00 | 1144.00 | 3 |

User Specified Y-Origin = 900.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

4 Type(s) of Soil

| Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No. |
|---|---|---|---|---|---|---|---|
| 1 | 125.0 | 130.0 | 350.0 | 30.0 | 0.00 | 0.0 | 0 |
| 2 | 125.0 | 130.0 | 200.0 | 25.0 | 0.00 | 0.0 | 0 |
| 3 | 125.0 | 130.0 | 125.0 | 12.0 | 0.00 | 0.0 | 0 |
| 4 | 125.0 | 130.0 | 300.0 | 30.0 | 0.00 | 0.0 | 0 |

Trial Failure Surface Specified By 14 Coordinate Points

| Point No. | X-Surf (ft) | Y-Surf (ft) |
|---|---|---|
| 1 | 15.00 | 1025.00 |
| 2 | 42.00 | 988.00 |
| 3 | 50.00 | 981.00 |
| 4 | 80.00 | 967.00 |
| 5 | 110.00 | 959.00 |
| 6 | 125.00 | 958.00 |
| 7 | 150.00 | 961.00 |
| 8 | 200.00 | 968.00 |
| 9 | 250.00 | 978.00 |
| 10 | 325.00 | 998.00 |
| 11 | 660.00 | 1101.00 |
| 12 | 680.00 | 1108.00 |
| 13 | 701.00 | 1122.00 |
| 14 | 720.00 | 1144.00 |

| Theta (deg) (ki=1.0) | FOS (Moment) (Equil.) | FOS (Force) (Equil.) | Lambda |
|---|---|---|---|
| 9.00 | 2.146 | 2.544 | 0.158 |
| 13.50 | 0.001 | 3.040 | 0.240 |
| 8.10 | 2.296 | 2.469 | 0.142 |
| 5.83 | 2.556 | 2.308 | 0.102 |
| 6.82 | 2.451 | 2.374 | 0.120 |
| 7.41 | 2.379 | 2.416 | 0.130 |
| 7.15 | 2.411 | 2.398 | 0.125 |
| 7.22 | 2.403 | 2.403 | 0.127 |

((Simplified Janbu FS for Specified Surface = 2.008))
Factor Of Safety For The Preceding Specified Surface = 2.403
Theta (ki = 1.0) = 7.22 Deg Lambda = 0.127
Factor Of Safety Is Calculated By GLE (Spencer's) Method (0-2)
Forces from Reinforcement, Piers/Piles, Applied Forces, and Soil Nails
(if applicable) have been applied to the slice base(s)
on which they intersect.
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
Tension Crack Water Force = 0.00(lbs)
Specified Tension Crack Water Force Factor = 0.000
Depth of Tension Crack (zo) at Center of Last Slice = 0.905(ft)

*** Line of Thrust and Slice Force Data ***

| Slice No. | X Coord. | Y Coord. | L/R | Side Force (lbs) | ki | Force Angle (Deg) | Vert. Shear Force(lbs) |
|---|---|---|---|---|---|---|---|
| 1 | 40.54 | 1009.12 | 0.546 | 214205. | 1.000 | 7.22 | 27134.9 |
| 2 | 42.00 | 1007.25 | 0.520 | 238376. | 1.000 | 7.22 | 30196.9 |
| 3 | 50.00 | 1004.23 | 0.528 | 288434. | 1.000 | 7.22 | 36538.1 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 4 | 70.00 | 1000.55 | 0.542 | 366506. | 1.000 | 7.22 | 46428.1 |
| 5 | 80.00 | 998.34 | 0.532 | 411423. | 1.000 | 7.22 | 52118.1 |
| 6 | 100.00 | 996.30 | 0.524 | 472722. | 1.000 | 7.22 | 59883.2 |
| 7 | 110.00 | 995.16 | 0.518 | 505968. | 1.000 | 7.22 | 64094.8 |
| 8 | 125.00 | 995.48 | 0.519 | 528128. | 1.000 | 7.22 | 66902.0 |
| 9 | 150.00 | 999.06 | 0.532 | 522408. | 1.000 | 7.22 | 66177.4 |
| 10 | 172.00 | 1002.50 | 0.545 | 513611. | 1.000 | 7.22 | 65063.0 |
| 11 | 190.00 | 1005.31 | 0.556 | 506519. | 1.000 | 7.22 | 64164.6 |
| 12 | 200.00 | 1006.88 | 0.562 | 502621. | 1.000 | 7.22 | 63670.7 |
| 13 | 205.00 | 1007.86 | 0.566 | 498192. | 1.000 | 7.22 | 63109.7 |
| 14 | 230.00 | 1012.75 | 0.587 | 476590. | 1.000 | 7.22 | 60373.2 |
| 15 | 250.00 | 1016.67 | 0.592 | 459760. | 1.000 | 7.22 | 58241.3 |
| 16 | 263.00 | 1019.80 | 0.599 | 442412. | 1.000 | 7.22 | 56043.6 |
| 17 | 280.00 | 1023.91 | 0.608 | 420272. | 1.000 | 7.22 | 53239.0 |
| 18 | 290.00 | 1026.34 | 0.614 | 407539. | 1.000 | 7.22 | 51626.0 |
| 19 | 310.00 | 1031.16 | 0.658 | 383323. | 1.000 | 7.22 | 48558.5 |
| 20 | 325.00 | 1034.72 | 0.694 | 366524. | 1.000 | 7.22 | 46430.3 |
| 21 | 370.00 | 1045.85 | 0.847 | 314218. | 1.000 | 7.22 | 39804.4 |
| 22 | 384.00 | 1049.24 | 0.828 | 300329. | 1.000 | 7.22 | 38044.9 |
| 23 | 402.00 | 1053.52 | 0.718 | 281491. | 1.000 | 7.22 | 35658.6 |
| 24 | 428.00 | 1059.99 | 0.752 | 254120. | 1.000 | 7.22 | 32191.3 |
| 25 | 455.00 | 1066.43 | 0.836 | 229333. | 1.000 | 7.22 | 29051.3 |
| 26 | 470.00 | 1069.95 | 0.752 | 216329. | 1.000 | 7.22 | 27404.1 |
| 27 | 490.00 | 1074.62 | 0.828 | 199714. | 1.000 | 7.22 | 25299.2 |
| 28 | 500.00 | 1076.91 | 0.756 | 191828. | 1.000 | 7.22 | 24300.2 |
| 29 | 517.00 | 1080.76 | 0.819 | 178933. | 1.000 | 7.22 | 22666.8 |
| 30 | 535.00 | 1085.01 | 0.600 | 164282. | 1.000 | 7.22 | 20810.8 |
| 31 | 560.00 | 1091.61 | 0.537 | 140408. | 1.000 | 7.22 | 17786.6 |
| 32 | 580.00 | 1097.32 | 0.528 | 120753. | 0.993 | 7.17 | 15080.5 |
| 33 | 627.00 | 1109.45 | 0.739 | 83884. | 0.660 | 4.78 | 4622.8 |
| 34 | 634.00 | 1110.97 | 0.666 | 79537. | 0.610 | 4.42 | 3748.2 |
| 35 | 660.00 | 1116.55 | 0.602 | 63111. | 0.426 | 3.09 | 1447.7 |
| 36 | 672.00 | 1119.33 | 0.570 | 54382. | 0.340 | 2.47 | 798.4 |
| 37 | 680.00 | 1121.18 | 0.516 | 48581. | 0.284 | 2.06 | 495.3 |
| 38 | 690.00 | 1126.20 | 0.494 | 33055. | 0.213 | 1.54 | 189.6 |
| 39 | 701.00 | 1132.71 | 0.589 | 18549. | 0.135 | 0.98 | 42.7 |
| 40 | 720.00 | 1314.67 | 0.000 | -13. | 0.000 | 0.00 | 0.0 |

***Table 1 - Individual data on the 40 slices***

| Slice No. | Width (ft) | Weight (lbs) | Water Force Top (lbs) | Water Force Bot (lbs) | Tie Force Norm (lbs) | Tie Force Tan (lbs) | Earthquake Force Hor (lbs) | Earthquake Force Ver (lbs) | Surcharge Load (lbs) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 25.5 | 55369.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2 | 1.5 | 6567.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 3 | 8.0 | 40500.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 4 | 20.0 | 121666.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 5 | 10.0 | 70169.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 6 | 20.0 | 156354.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 7 | 10.0 | 84934.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 8 | 15.0 | 133037.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 9 | 25.0 | 224452.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 10 | 22.0 | 195226.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 11 | 18.0 | 157649.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 12 | 10.0 | 86773.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 13 | 5.0 | 43076.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 14 | 25.0 | 210400.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 15 | 20.0 | 164166.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 16 | 13.0 | 105110.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 17 | 17.0 | 134264.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 18 | 10.0 | 77291.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 19 | 20.0 | 147291.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 20 | 15.0 | 102539.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 21 | 45.0 | 261672.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 22 | 14.0 | 70020.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 23 | 18.0 | 94708.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 24 | 26.0 | 137567.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 25 | 27.0 | 125484.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 26 | 15.0 | 66044.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 27 | 20.0 | 84608.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 28 | 10.0 | 40289.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 29 | 17.0 | 66046.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 30 | 18.0 | 74699.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 31 | 25.0 | 120592.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 32 | 20.0 | 99179.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 33 | 47.0 | 190183.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 34 | 7.0 | 22821.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 35 | 26.0 | 85858.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 36 | 12.0 | 37981.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 37 | 8.0 | 25177.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 38 | 10.0 | 30555.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 39 | 11.0 | 28554.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 40 | 19.0 | 21612.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

- TABLE 2 - Base Stress Data on the 40 Slices -

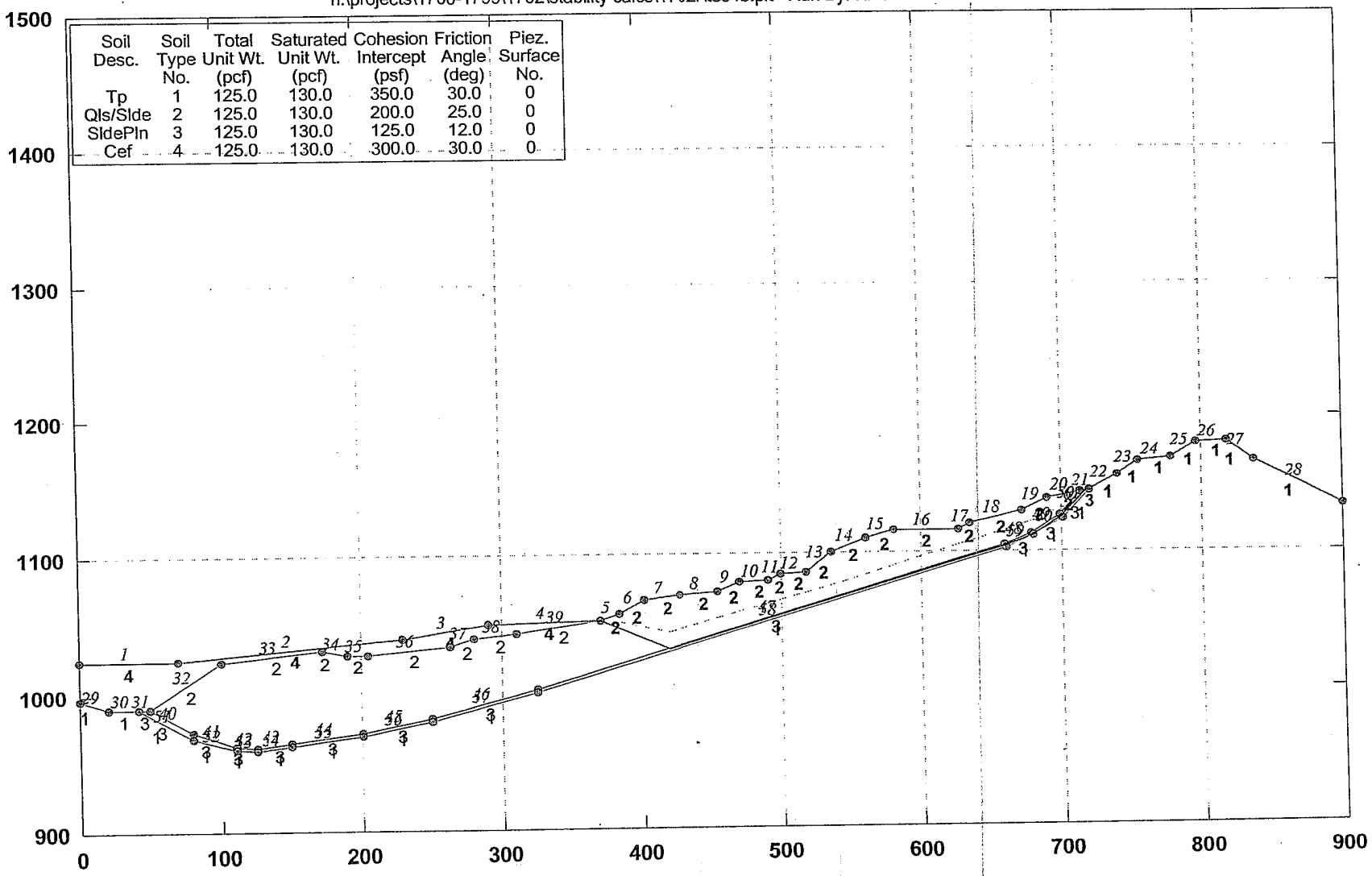
| Slice No. | Alpha (deg) | X-Coord. Slice Cntr (ft) | Base Leng. (ft) | Total Normal Stress (psf) | Total Vert. Stress (psf) | Mobilized Shear Stress (psf) |
|---|---|---|---|---|---|---|
| 1 | -53.88 | 27.77 | 43.33 | 5088.22 | 1289.46 | 1347.61 |
| 2 | -53.88 | 41.27 | 2.48 | 10110.49 | 2652.61 | 2575.31 |
| 3 | -41.19 | 46.00 | 10.63 | 6388.98 | 3809.92 | 617.27 |
| 4 | -25.02 | 60.00 | 22.07 | 6882.35 | 5512.62 | 660.92 |
| 5 | -25.02 | 75.00 | 11.04 | 7933.23 | 6358.62 | 753.89 |
| 6 | -14.93 | 90.00 | 20.70 | 8415.30 | 7553.75 | 796.54 |
| 7 | -14.93 | 105.00 | 10.35 | 9140.84 | 8206.71 | 860.73 |
| 8 | -3.81 | 117.50 | 15.03 | 9112.02 | 8849.50 | 858.18 |
| 9 | 6.84 | 137.50 | 25.18 | 8849.57 | 8814.56 | 834.96 |
| 10 | 7.97 | 161.00 | 22.21 | 8708.51 | 8788.20 | 822.48 |
| 11 | 7.97 | 181.00 | 18.18 | 8595.02 | 8673.69 | 812.44 |
| 12 | 7.97 | 195.00 | 10.10 | 8515.59 | 8593.54 | 805.41 |
| 13 | 11.31 | 202.50 | 5.10 | 8345.83 | 8447.93 | 790.40 |
| 14 | 11.31 | 217.50 | 25.50 | 8152.76 | 8252.58 | 773.31 |
| 15 | 11.31 | 240.00 | 20.40 | 7951.48 | 8048.93 | 755.51 |
| 16 | 14.93 | 256.50 | 13.45 | 7721.65 | 7812.42 | 735.17 |
| 17 | 14.93 | 271.50 | 17.59 | 7542.43 | 7631.24 | 719.32 |
| 18 | 14.93 | 285.00 | 10.35 | 7381.13 | 7468.19 | 705.05 |
| 19 | 14.93 | 300.00 | 20.70 | 7032.64 | 7115.92 | 674.22 |
| 20 | 14.93 | 317.50 | 15.52 | 6527.32 | 6605.12 | 629.51 |
| 21 | 17.09 | 347.50 | 47.08 | 5503.18 | 5558.16 | 538.90 |
| 22 | 17.09 | 377.00 | 14.65 | 4732.09 | 4780.63 | 470.68 |
| 23 | 17.09 | 393.00 | 18.83 | 4978.62 | 5029.22 | 492.49 |
| 24 | 17.09 | 415.00 | 27.20 | 5006.56 | 5057.40 | 494.97 |
| 25 | 17.09 | 441.50 | 28.25 | 4396.60 | 4442.33 | 441.00 |
| 26 | 17.09 | 462.50 | 15.69 | 4164.75 | 4208.55 | 420.49 |
| 27 | 17.09 | 480.00 | 20.92 | 4001.17 | 4043.60 | 406.02 |
| 28 | 17.09 | 495.00 | 10.46 | 3810.17 | 3851.00 | 389.12 |
| 29 | 17.09 | 508.50 | 17.79 | 3673.81 | 3713.51 | 377.06 |
| 30 | 17.09 | 526.00 | 18.83 | 3924.94 | 3966.73 | 399.27 |
| 31 | 17.09 | 547.50 | 26.15 | 4563.56 | 4610.69 | 455.77 |
| 32 | 17.09 | 570.00 | 20.92 | 4686.67 | 4739.97 | 466.66 |
| 33 | 17.09 | 603.50 | 49.17 | 3756.25 | 3867.76 | 384.35 |
| 34 | 17.09 | 630.50 | 7.32 | 3037.67 | 3114.87 | 320.77 |
| 35 | 17.09 | 647.00 | 27.20 | 3097.02 | 3156.44 | 326.03 |
| 36 | 19.29 | 666.00 | 12.71 | 2967.20 | 2987.44 | 314.54 |
| 37 | 19.29 | 676.00 | 8.48 | 2962.50 | 2970.54 | 314.12 |
| 38 | 33.69 | 685.00 | 12.02 | 2771.96 | 2542.38 | 297.27 |
| 39 | 33.69 | 695.50 | 13.22 | 2369.22 | 2159.86 | 261.64 |
| 40 | 49.18 | 710.50 | 29.07 | 962.04 | 743.49 | 137.14 |

**** END OF GSTABL7 OUTPUT ****

# Lndmrk off-site grading; 8-8'; Qls-XIV(B); static; basal Qls plane - no removals

n:\projects\1700-1799\1702\stability calcs\1702r\t8s4b.plt Run By: KPC 7/21/2008 09:04AM

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Tp | 1 | 125.0 | 130.0 | 350.0 | 30.0 | 0 |
| Qls/Slde | 2 | 125.0 | 130.0 | 200.0 | 25.0 | 0 |
| SldePln | 3 | 125.0 | 130.0 | 125.0 | 12.0 | 0 |
| Cef | 4 | 125.0 | 130.0 | 300.0 | 30.0 | 0 |




GSTABL7 v.2 FSmin=1.43

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

GSTABL7

Run No. 27

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **
(All Rights Reserved-Unauthorized Use Prohibited)

SLOPE STABILITY ANALYSIS SYSTEM
Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

Analysis Run Date: 7/21/2008
Time of Run: 09:04AM
Run By: KPC
Input Data Filename: N:\Projects\1700-1799\1702\Stability Calcs\1702R\t8s4b.in
Output Filename: N:\Projects\1700-1799\1702\Stability Calcs\1702R\t8s4b.OUT
Unit System: English
Plotted Output Filename: N:\Projects\1700-1799\1702\Stabi Calcs\1702R\t8s4b.PLT
PROBLEM DESCRIPTION: Landmark off-site grading; 8-8'; Qls-XIV(B
); static; basal Qls plane - no removals

BOUNDARY COORDINATES
28 Top Boundaries
61 Total Boundaries

| Boundary No. | X-Left (ft) | Y-Left (ft) | X-Right (ft) | Y-Right (ft) | Soil Type Below Bnd |
|---|---|---|---|---|---|
| 1 | 0.00 | 1025.00 | 70.00 | 1025.00 | 4 |
| 2 | 70.00 | 1025.00 | 230.00 | 1040.00 | 4 |
| 3 | 230.00 | 1040.00 | 290.00 | 1050.00 | 4 |
| 4 | 290.00 | 1050.00 | 370.00 | 1052.00 | 4 |
| 5 | 370.00 | 1052.00 | 384.00 | 1056.00 | 2 |
| 6 | 384.00 | 1056.00 | 402.00 | 1066.00 | 2 |
| 7 | 402.00 | 1066.00 | 428.00 | 1070.00 | 2 |
| 8 | 428.00 | 1070.00 | 455.00 | 1072.00 | 2 |
| 9 | 455.00 | 1072.00 | 470.00 | 1079.00 | 2 |
| 10 | 470.00 | 1079.00 | 490.00 | 1080.00 | 2 |
| 11 | 490.00 | 1080.00 | 500.00 | 1085.00 | 2 |
| 12 | 500.00 | 1085.00 | 517.00 | 1086.00 | 2 |
| 13 | 517.00 | 1086.00 | 535.00 | 1100.00 | 2 |
| 14 | 535.00 | 1100.00 | 560.00 | 1110.00 | 2 |
| 15 | 560.00 | 1110.00 | 580.00 | 1116.00 | 2 |
| 16 | 580.00 | 1116.00 | 627.00 | 1116.00 | 2 |
| 17 | 627.00 | 1116.00 | 634.00 | 1120.00 | 2 |
| 18 | 634.00 | 1120.00 | 672.00 | 1130.00 | 2 |
| 19 | 672.00 | 1130.00 | 690.00 | 1138.00 | 2 |
| 20 | 690.00 | 1138.00 | 713.00 | 1143.00 | 2 |
| 21 | 713.00 | 1143.00 | 720.00 | 1144.00 | 3 |
| 22 | 720.00 | 1144.00 | 740.00 | 1155.00 | 1 |
| 23 | 740.00 | 1155.00 | 755.00 | 1166.00 | 1 |
| 24 | 755.00 | 1166.00 | 779.00 | 1168.00 | 1 |
| 25 | 779.00 | 1168.00 | 796.00 | 1179.00 | 1 |
| 26 | 796.00 | 1179.00 | 818.00 | 1180.00 | 1 |
| 27 | 818.00 | 1180.00 | 837.00 | 1165.00 | 1 |
| 28 | 837.00 | 1165.00 | 900.00 | 1133.00 | 1 |
| 29 | 0.00 | 997.00 | 20.00 | 990.00 | 1 |
| 30 | 20.00 | 990.00 | 42.00 | 990.00 | 1 |
| 31 | 42.00 | 990.00 | 50.00 | 990.00 | 3 |
| 32 | 50.00 | 990.00 | 100.00 | 1024.00 | 2 |
| 33 | 100.00 | 1024.00 | 172.00 | 1032.00 | 2 |
| 34 | 172.00 | 1032.00 | 190.00 | 1028.00 | 2 |
| 35 | 190.00 | 1028.00 | 205.00 | 1028.00 | 2 |
| 36 | 205.00 | 1028.00 | 263.00 | 1034.00 | 2 |
| 37 | 263.00 | 1034.00 | 280.00 | 1039.00 | 2 |
| 38 | 280.00 | 1039.00 | 310.00 | 1043.00 | 2 |
| 39 | 310.00 | 1043.00 | 370.00 | 1052.00 | 2 |
| 40 | 50.00 | 990.00 | 80.00 | 973.00 | 3 |

| | | | | | |
|---|---|---|---|---|---|
| 41 | 80.00 | 973.00 | 110.00 | 963.00 | 3 |
| 42 | 110.00 | 963.00 | 125.00 | 962.00 | 3 |
| 43 | 125.00 | 962.00 | 150.00 | 965.00 | 3 |
| 44 | 150.00 | 965.00 | 200.00 | 972.00 | 3 |
| 45 | 200.00 | 972.00 | 250.00 | 982.00 | 3 |
| 46 | 250.00 | 982.00 | 325.00 | 1002.00 | 3 |
| 47 | 325.00 | 1002.00 | 659.00 | 1105.00 | 3 |
| 48 | 659.00 | 1105.00 | 678.00 | 1113.00 | 3 |
| 49 | 678.00 | 1113.00 | 699.00 | 1126.00 | 3 |
| 50 | 699.00 | 1126.00 | 713.00 | 1143.00 | 3 |
| 51 | 42.00 | 990.00 | 80.00 | 969.00 | 1 |
| 52 | 80.00 | 969.00 | 110.00 | 961.00 | 1 |
| 53 | 110.00 | 961.00 | 125.00 | 960.00 | 1 |
| 54 | 125.00 | 960.00 | 150.00 | 963.00 | 1 |
| 55 | 150.00 | 963.00 | 200.00 | 970.00 | 1 |
| 56 | 200.00 | 970.00 | 250.00 | 980.00 | 1 |
| 57 | 250.00 | 980.00 | 325.00 | 1000.00 | 1 |
| 58 | 325.00 | 1000.00 | 660.00 | 1103.00 | 1 |
| 59 | 660.00 | 1103.00 | 680.00 | 1111.00 | 1 |
| 60 | 680.00 | 1111.00 | 701.00 | 1124.00 | 1 |
| 61 | 701.00 | 1124.00 | 720.00 | 1144.00 | 1 |

User Specified Y-Origin = 900.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

4 Type(s) of Soil

| Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No. |
|---|---|---|---|---|---|---|---|
| 1 | 125.0 | 130.0 | 350.0 | 30.0 | 0.00 | 0.0 | 0 |
| 2 | 125.0 | 130.0 | 200.0 | 25.0 | 0.00 | 0.0 | 0 |
| 3 | 125.0 | 130.0 | 125.0 | 12.0 | 0.00 | 0.0 | 0 |
| 4 | 125.0 | 130.0 | 300.0 | 30.0 | 0.00 | 0.0 | 0 |

Trial Failure Surface Specified By 6 Coordinate Points

| Point No. | X-Surf (ft) | Y-Surf (ft) |
|---|---|---|
| 1 | 370.00 | 1052.00 |
| 2 | 420.00 | 1031.00 |
| 3 | 659.50 | 1104.00 |
| 4 | 679.00 | 1112.00 |
| 5 | 700.00 | 1125.00 |
| 6 | 716.50 | 1143.50 |

| Theta (deg) (ki=1.0) | FOS (Moment) (Equil.) | FOS (Force) (Equil.) | Lambda |
|---|---|---|---|
| 9.00 | 1.560 | 1.354 | 0.158 |
| 13.50 | 1.433 | 1.424 | 0.240 |
| 13.76 | 1.422 | 1.429 | 0.245 |
| 13.64 | 1.427 | 1.427 | 0.243 |

((Simplified Janbu FS for Specified Surface = 1.245))
Factor Of Safety For The Preceding Specified Surface = 1.427
Theta (ki = 1.0) = 13.64 Deg Lambda = 0.243
Factor Of Safety Is Calculated By GLE (Spencer's) Method (0-2)
Forces from Reinforcement, Piers/Piles, Applied Forces, and Soil Nails (if applicable) have been applied to the slice base(s) on which they intersect.
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
Tension Crack Water Force = 0.00(lbs)
Specified Tension Crack Water Force Factor = 0.000
Depth of Tension Crack (zo) at Center of Last Slice = 1.631(ft)

*** Line of Thrust and Slice Force Data ***

| Slice No. | X Coord. | Y Coord. | L/H | Side Force (lbs) | ki | Force Angle (Deg) | Vert. Shear Force(lbs) |
|---|---|---|---|---|---|---|---|
| 1 | 384.00 | 1050.76 | 0.470 | 13236. | 1.000 | 13.64 | 3212.6 |
| 2 | 402.00 | 1046.68 | 0.296 | 65067. | 1.000 | 13.64 | 15793.2 |
| 3 | 419.59 | 1043.05 | 0.317 | 150022. | 1.000 | 13.64 | 36413.4 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 4 | 420.00 | 1043.03 | 0.319 | 151478. | 1.000 | 13.64 | 36767.0 |
| 5 | 428.00 | 1045.36 | 0.326 | 146705. | 1.000 | 13.64 | 35608.3 |
| 6 | 455.00 | 1053.11 | 0.377 | 132451. | 1.000 | 13.64 | 32148.7 |
| 7 | 470.00 | 1057.40 | 0.341 | 125060. | 1.000 | 13.64 | 30354.8 |
| 8 | 490.00 | 1063.10 | 0.389 | 115699. | 1.000 | 13.64 | 28082.7 |
| 9 | 500.00 | 1065.94 | 0.356 | 111310. | 1.000 | 13.64 | 27017.2 |
| 10 | 517.00 | 1070.75 | 0.401 | 104198. | 1.000 | 13.64 | 25291.1 |
| 11 | 535.00 | 1075.95 | 0.292 | 95947. | 1.000 | 13.64 | 23288.3 |
| 12 | 560.00 | 1083.57 | 0.273 | 81967. | 1.000 | 13.64 | 19895.1 |
| 13 | 580.00 | 1089.96 | 0.281 | 70361. | 1.000 | 13.64 | 17078.0 |
| 14 | 627.00 | 1105.08 | 0.502 | 49356. | 1.000 | 13.64 | 11979.8 |
| 15 | 634.00 | 1107.31 | 0.466 | 47035. | 1.000 | 13.64 | 11416.3 |
| 16 | 659.00 | 1115.06 | 0.493 | 38446. | 0.830 | 11.39 | 6424.4 |
| 17 | 659.50 | 1115.20 | 0.493 | 38279. | 0.823 | 11.29 | 6285.6 |
| 18 | 672.00 | 1119.50 | 0.497 | 31390. | 0.642 | 8.86 | 3141.6 |
| 19 | 678.00 | 1121.42 | 0.466 | 28235. | 0.556 | 7.68 | 2115.2 |
| 20 | 679.00 | 1121.73 | 0.461 | 27706. | 0.541 | 7.48 | 1969.1 |
| 21 | 690.00 | 1126.91 | 0.422 | 17691. | 0.382 | 5.30 | 627.9 |
| 22 | 699.00 | 1131.38 | 0.449 | 10640. | 0.253 | 3.51 | 164.7 |
| 23 | 700.00 | 1131.90 | 0.454 | 9954. | 0.238 | 3.31 | 134.0 |
| 24 | 713.00 | 1127.07 | -3.652 | 30. | 0.051 | 0.70 | 0.0 |
| 25 | 716.50 | 1597.46 | 0.000 | -1. | 0.000 | 0.00 | 0.0 |

***Table 1 - Individual data on the 25 slices***

| Slice No. | Width (ft) | Weight (lbs) | Water Force Top (lbs) | Water Force Bot (lbs) | Tie Force Norm (lbs) | Tie Force Tan (lbs) | Earthquake Force Hor (lbs) | Earthquake Force Ver (lbs) | Surcharge Load (lbs) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 14.0 | 8644.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2 | 18.0 | 41985.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 3 | 17.6 | 71444.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 4 | 0.4 | 1915.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 5 | 8.0 | 37165.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 6 | 27.0 | 112882.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 7 | 15.0 | 59148.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 8 | 20.0 | 75529.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 9 | 10.0 | 35799.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 10 | 17.0 | 58490.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 11 | 18.0 | 66804.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 12 | 25.0 | 109805.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 13 | 20.0 | 90699.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 14 | 47.0 | 170779.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 15 | 7.0 | 19984.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 16 | 25.0 | 72662.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 17 | 0.5 | 1420.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 18 | 12.5 | 34048.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 19 | 6.0 | 15730.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 20 | 1.0 | 2636.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 21 | 11.0 | 27707.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 22 | 9.0 | 19555.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 23 | 1.0 | 1921.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 24 | 13.0 | 15111.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 25 | 3.5 | 749.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

- TABLE 2 - Base Stress Data on the 25 Slices -

| Slice No. * | Alpha (deg) | X-Coord. Slice Cntr (ft) | Base Leng. (ft) | Total Normal Stress (psf) | Total Vert. Stress (psf) | Mobilized Shear Stress (psf) |
|---|---|---|---|---|---|---|
| 1 | -22.78 | 377.00 | 15.18 | 1042.47 | 569.32 | 480.90 |
| 2 | -22.78 | 393.00 | 19.52 | 3559.15 | 2150.53 | 1303.44 |
| 3 | -22.78 | 410.80 | 19.08 | 6095.59 | 3744.15 | 2132.45 |
| 4 | -22.78 | 419.80 | 0.44 | 5960.79 | 4339.36 | 975.66 |
| 5 | 16.95 | 424.00 | 8.36 | 4283.70 | 4443.83 | 725.81 |
| 6 | 16.95 | 441.50 | 28.23 | 3854.59 | 3999.20 | 661.98 |
| 7 | 16.95 | 462.50 | 15.68 | 3635.24 | 3771.91 | 629.20 |
| 8 | 16.95 | 480.00 | 20.91 | 3481.30 | 3612.41 | 606.26 |
| 9 | 16.95 | 495.00 | 10.45 | 3299.89 | 3424.45 | 579.24 |
| 10 | 16.95 | 508.50 | 17.77 | 3171.24 | 3291.14 | 560.07 |
| 11 | 16.95 | 526.00 | 18.82 | 3421.19 | 3550.13 | 597.31 |

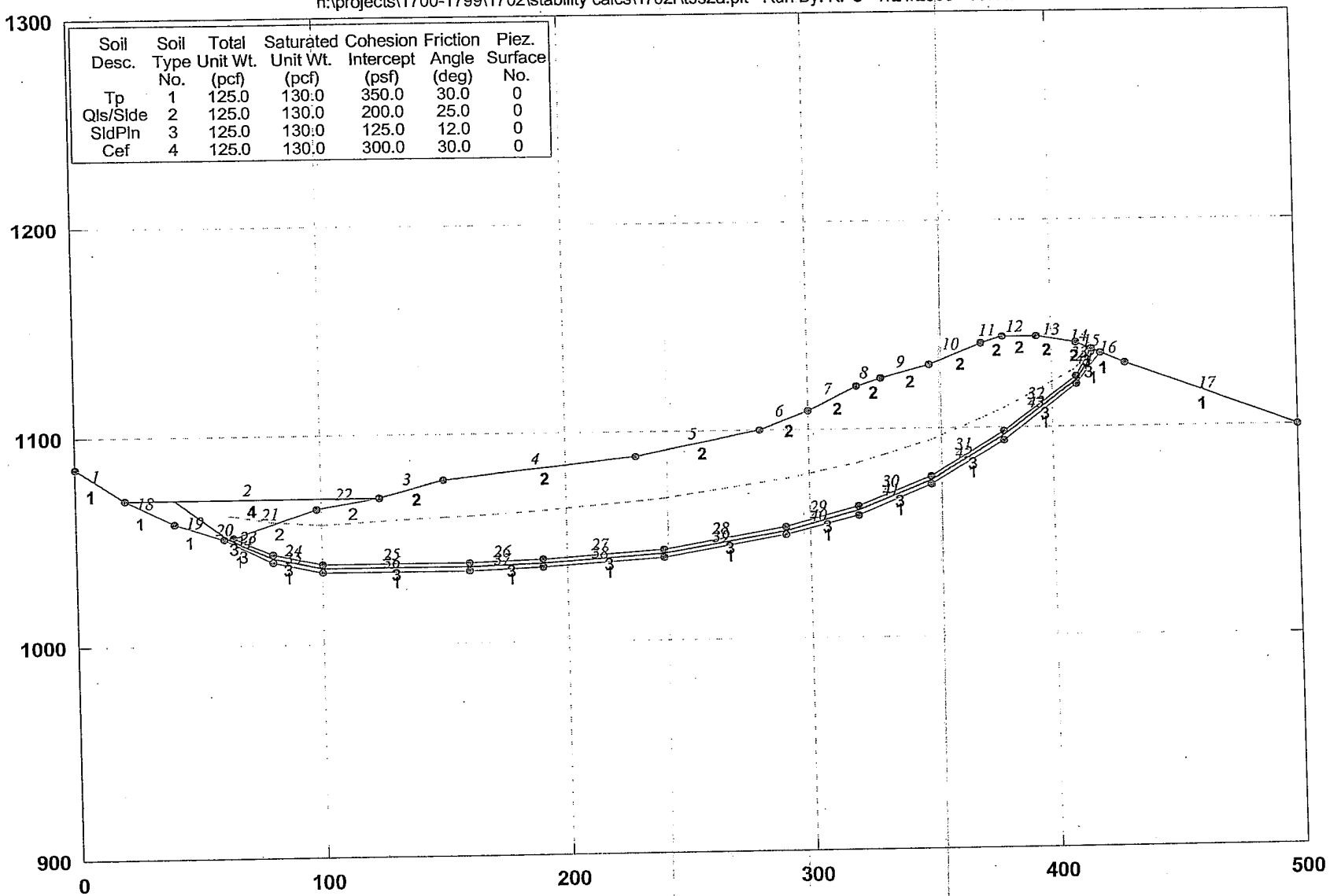
| | | | | | | |
|---|---|---|---|---|---|---|
| 12 | 16.95 | 547.50 | 26.14 | 4049.73 | 4201.40 | 690.95 |
| 13 | 16.95 | 570.00 | 20.91 | 4181.50 | 4337.94 | 710.58 |
| 14 | 16.95 | 603.50 | 49.13 | 3349.39 | 3475.74 | 586.61 |
| 15 | 16.95 | 630.50 | 7.32 | 2630.52 | 2730.87 | 479.51 |
| 16 | 16.95 | 646.50 | 26.14 | 2620.62 | 2780.20 | 478.04 |
| 17 | 16.95 | 659.25 | 0.52 | 2507.06 | 2716.72 | 461.12 |
| 18 | 22.31 | 665.75 | 13.51 | 2332.57 | 2520.06 | 435.12 |
| 19 | 22.31 | 675.00 | 6.49 | 2270.29 | 2425.60 | 425.84 |
| 20 | 22.31 | 678.50 | 1.08 | 2295.26 | 2439.44 | 429.56 |
| 21 | 31.76 | 684.50 | 12.94 | 2092.28 | 2141.69 | 399.32 |
| 22 | 31.76 | 694.50 | 10.56 | 1839.65 | 1847.53 | 361.69 |
| 23 | 31.76 | 699.50 | 1.18 | 1639.71 | 1634.08 | 331.90 |
| 24 | 48.27 | 706.50 | 19.53 | 874.01 | 773.70 | 217.82 |
| 25 | 48.27 | 714.75 | 5.26 | 99.13 | 142.45 | 102.38 |

**** END OF GSTABL7 OUTPUT ****

# Lndmrk off-site grading; 9-9'; Qls-XIII(B); static; Qls plane - no removals

n:\projects\1700-1799\1702\stability calcs\1702r\t9s2a.plt Run By: KPC 7/21/2008 08:41AM

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Tp | 1 | 125.0 | 130.0 | 350.0 | 30.0 | 0 |
| Qls/Side | 2 | 125.0 | 130.0 | 200.0 | 25.0 | 0 |
| SldPln | 3 | 125.0 | 130.0 | 125.0 | 12.0 | 0 |
| Cef | 4 | 125.0 | 130.0 | 300.0 | 30.0 | 0 |




GSTABL7 v.2 FSmin=1.42

Factor Of Safety Is Calculated By GLE (Spencer's) Method (0-2)

GSTABL7

Run No. 28

```
                    *** GSTABL7 ***
              ** GSTABL7 by Garry H. Gregory, P.E. **
   ** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **
              (All Rights Reserved-Unauthorized Use Prohibited)
*******************************************************************************
                    SLOPE STABILITY ANALYSIS SYSTEM
       Modified Bishop, Simplified Janbu, or GLE Method of Slices.
       (Includes Spencer & Morgenstern-Price Type Analysis)
       Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
       Nonlinear Undrained Shear Strength, Curved Phi Envelope,
       Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
       Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
*******************************************************************************
Analysis Run Date:        7/21/2008
Time of Run:              08:41AM
Run By:                   KPC
Input Data Filename:      N:\Projects\1700-1799\1702\Stability Calcs\1702R\t9s2a.in
Output Filename:          N:\Projects\1700-1799\1702\Stability Calcs\1702R\t9s2a.OUT
Unit System:              English
Plotted Output Filename:  N:\Projects\1700-1799\1702\Stabi Calcs\1702R\t9s2a.PLT
PROBLEM DESCRIPTION:      Lndmrk off-site grading; 9-9'; Qls-XIII(
                          B); static; Qls plane - no removals

BOUNDARY COORDINATES
   17 Top   Boundaries
   44 Total Boundaries
```

| Boundary No. | X-Left (ft) | Y-Left (ft) | X-Right (ft) | Y-Right (ft) | Soil Type Below Bnd |
|---|---|---|---|---|---|
| 1 | 0.00 | 1085.00 | 20.00 | 1070.00 | 1 |
| 2 | 20.00 | 1070.00 | 124.00 | 1070.00 | 4 |
| 3 | 124.00 | 1070.00 | 150.00 | 1078.00 | 2 |
| 4 | 150.00 | 1078.00 | 229.00 | 1088.00 | 2 |
| 5 | 229.00 | 1088.00 | 280.00 | 1100.00 | 2 |
| 6 | 280.00 | 1100.00 | 300.00 | 1109.00 | 2 |
| 7 | 300.00 | 1109.00 | 320.00 | 1120.00 | 2 |
| 8 | 320.00 | 1120.00 | 330.00 | 1124.00 | 2 |
| 9 | 330.00 | 1124.00 | 350.00 | 1130.00 | 2 |
| 10 | 350.00 | 1130.00 | 371.00 | 1140.00 | 2 |
| 11 | 371.00 | 1140.00 | 380.00 | 1143.00 | 2 |
| 12 | 380.00 | 1143.00 | 394.00 | 1143.00 | 2 |
| 13 | 394.00 | 1143.00 | 410.00 | 1140.00 | 2 |
| 14 | 410.00 | 1140.00 | 416.00 | 1137.00 | 2 |
| 15 | 416.00 | 1137.00 | 420.00 | 1135.00 | 3 |
| 16 | 420.00 | 1135.00 | 430.00 | 1130.00 | 1 |
| 17 | 430.00 | 1130.00 | 500.00 | 1100.00 | 1 |
| 18 | 20.00 | 1070.00 | 40.00 | 1059.00 | 1 |
| 19 | 40.00 | 1059.00 | 60.00 | 1051.00 | 1 |
| 20 | 60.00 | 1051.00 | 64.00 | 1052.00 | 3 |
| 21 | 64.00 | 1052.00 | 98.00 | 1065.00 | 2 |
| 22 | 98.00 | 1065.00 | 124.00 | 1070.00 | 2 |
| 23 | 64.00 | 1052.00 | 80.00 | 1044.00 | 3 |
| 24 | 80.00 | 1044.00 | 100.00 | 1039.00 | 3 |
| 25 | 100.00 | 1039.00 | 160.00 | 1039.00 | 3 |
| 26 | 160.00 | 1039.00 | 190.00 | 1040.00 | 3 |
| 27 | 190.00 | 1040.00 | 240.00 | 1044.00 | 3 |
| 28 | 240.00 | 1044.00 | 290.00 | 1054.00 | 3 |
| 29 | 290.00 | 1054.00 | 320.00 | 1063.00 | 3 |
| 30 | 320.00 | 1063.00 | 350.00 | 1077.00 | 3 |
| 31 | 350.00 | 1077.00 | 380.00 | 1098.00 | 3 |
| 32 | 380.00 | 1098.00 | 410.00 | 1124.00 | 3 |
| 33 | 410.00 | 1124.00 | 416.00 | 1137.00 | 3 |
| 34 | 60.00 | 1051.00 | 80.00 | 1040.00 | 1 |
| 35 | 80.00 | 1040.00 | 100.00 | 1035.00 | 1 |
| 36 | 100.00 | 1035.00 | 160.00 | 1035.00 | 1 |
| 37 | 160.00 | 1035.00 | 190.00 | 1036.00 | 1 |
| 38 | 190.00 | 1036.00 | 240.00 | 1040.00 | 1 |
| 39 | 240.00 | 1040.00 | 290.00 | 1050.00 | 1 |
| 40 | 290.00 | 1050.00 | 320.00 | 1059.00 | 1 |

| | | | | | |
|---|---|---|---|---|---|
| 41 | 320.00 | 1059.00 | 350.00 | 1073.00 | 1 |
| 42 | 350.00 | 1073.00 | 380.00 | 1094.00 | 1 |
| 43 | 380.00 | 1094.00 | 410.00 | 1120.00 | 1 |
| 44 | 410.00 | 1120.00 | 420.00 | 1135.00 | 1 |

User Specified Y-Origin = 900.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)
ISOTROPIC SOIL PARAMETERS
4 Type(s) of Soil

| Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No. |
|---|---|---|---|---|---|---|---|
| 1 | 125.0 | 130.0 | 350.0 | 30.0 | 0.00 | 0.0 | 0 |
| 2 | 125.0 | 130.0 | 200.0 | 25.0 | 0.00 | 0.0 | 0 |
| 3 | 125.0 | 130.0 | 125.0 | 12.0 | 0.00 | 0.0 | 0 |
| 4 | 125.0 | 130.0 | 300.0 | 30.0 | 0.00 | 0.0 | 0 |

Trial Failure Surface Specified By 13 Coordinate Points

| Point No. | X-Surf (ft) | Y-Surf (ft) |
|---|---|---|
| 1 | 40.00 | 1070.00 |
| 2 | 62.00 | 1051.50 |
| 3 | 80.00 | 1042.00 |
| 4 | 100.00 | 1037.00 |
| 5 | 160.00 | 1037.00 |
| 6 | 190.00 | 1038.00 |
| 7 | 240.00 | 1042.00 |
| 8 | 290.00 | 1052.00 |
| 9 | 320.00 | 1061.00 |
| 10 | 350.00 | 1075.00 |
| 11 | 380.00 | 1096.00 |
| 12 | 410.00 | 1122.00 |
| 13 | 418.00 | 1136.00 |

| Theta (deg) (ki=1.0) | FOS (Moment) (Equil.) | FOS (Force) (Equil.) | Lambda |
|---|---|---|---|
| 9.00 | 1.394 | 1.431 | 0.158 |
| 13.50 | 1.063 | 1.546 | 0.240 |
| 8.51 | 1.421 | 1.420 | 0.150 |
| 6.87 | 1.507 | 1.385 | 0.120 |
| 8.53 | 1.420 | 1.420 | 0.150 |

((Simplified Janbu FS for Specified Surface = 1.267))
Factor Of Safety For The Preceding Specified Surface = 1.420
Theta (ki = 1.0) = 8.53 Deg Lambda = 0.150
Factor Of Safety Is Calculated By GLE (Spencer's) Method (0-2)
Forces from Reinforcement, Piers/Piles, Applied Forces, and Soil Nails (if applicable) have been applied to the slice base(s) on which they intersect.
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
Tension Crack Water Force = 0.00(lbs)
Specified Tension Crack Water Force Factor = 0.000
Depth of Tension Crack (zo) at Center of Last Slice = 1.527(ft)

*** Line of Thrust and Slice Force Data ***

| Slice No. | X Coord. | Y Coord. | L/H | Side Force (lbs) | ki | Force Angle (Deg) | Vert. Shear Force(lbs) |
|---|---|---|---|---|---|---|---|
| 1 | 62.00 | 1062.40 | 0.589 | 85159. | 1.000 | 8.53 | 12773.0 |
| 2 | 64.00 | 1062.15 | 0.599 | 89414. | 1.000 | 8.53 | 13411.1 |
| 3 | 80.00 | 1059.08 | 0.610 | 131394. | 1.000 | 8.53 | 19707.7 |
| 4 | 98.00 | 1057.69 | 0.621 | 163755. | 1.000 | 8.53 | 24561.5 |
| 5 | 100.00 | 1057.51 | 0.622 | 167630. | 1.000 | 8.53 | 25142.8 |
| 6 | 124.00 | 1059.00 | 0.667 | 185144. | 1.000 | 8.53 | 27769.6 |
| 7 | 150.00 | 1060.46 | 0.572 | 206129. | 1.000 | 8.53 | 30917.3 |
| 8 | 160.00 | 1060.95 | 0.567 | 215097. | 1.000 | 8.53 | 32262.4 |
| 9 | 190.00 | 1063.05 | 0.556 | 237312. | 1.000 | 8.53 | 35594.3 |
| 10 | 229.00 | 1066.92 | 0.550 | 256567. | 1.000 | 8.53 | 38482.4 |
| 11 | 240.00 | 1068.01 | 0.535 | 262168. | 1.000 | 8.53 | 39322.5 |
| 12 | 280.00 | 1074.85 | 0.497 | 253649. | 1.000 | 8.53 | 38044.8 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 13 | 290.00 | 1076.57 | 0.468 | 251399. | 1.000 | 8.53 | 37707.3 |
| 14 | 300.00 | 1078.91 | 0.443 | 242830. | 1.000 | 8.53 | 36422.0 |
| 15 | 320.00 | 1083.73 | 0.385 | 224534. | 1.000 | 8.53 | 33677.9 |
| 16 | 330.00 | 1087.31 | 0.371 | 204468. | 1.000 | 8.53 | 30668.2 |
| 17 | 350.00 | 1094.37 | 0.352 | 166132. | 0.899 | 7.68 | 20160.0 |
| 18 | 371.00 | 1104.50 | 0.294 | 104953. | 0.622 | 5.33 | 6084.3 |
| 19 | 380.00 | 1108.93 | 0.275 | 80377. | 0.503 | 4.31 | 3045.9 |
| 20 | 394.00 | 1117.49 | 0.268 | 39290. | 0.317 | 2.73 | 593.9 |
| 21 | 410.00 | 1127.44 | 0.302 | 8973. | 0.106 | 0.91 | 15.1 |
| 22 | 416.00 | 1141.19 | 1.931 | 152. | 0.026 | 0.23 | 0.0 |
| 23 | 418.00 | 1295.07 | 0.000 | 7. | 0.000 | 0.00 | 0.0 |

***Table 1 - Individual data on the 23 slices***

| Slice No. | Width (ft) | Weight (lbs) | Water Force Top (lbs) | Water Force Bot (lbs) | Tie Force Norm (lbs) | Tie Force Tan (lbs) | Earthquake Force Hor (lbs) | Earthquake Force Ver (lbs) | Surcharge Load (lbs) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 22.0 | 25437.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2 | 2.0 | 4757.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 3 | 16.0 | 47555.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 4 | 18.0 | 68062.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 5 | 2.0 | 8187.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 6 | 24.0 | 99000.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 7 | 26.0 | 120250.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 8 | 10.0 | 52041.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 9 | 30.0 | 163742.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 10 | 39.0 | 224111.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 11 | 11.0 | 65634.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 12 | 40.0 | 246470.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 13 | 10.0 | 64062.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 14 | 10.0 | 66562.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 15 | 20.0 | 141250.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 16 | 10.0 | 73333.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 17 | 20.0 | 141666.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 18 | 21.0 | 138206.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 19 | 9.0 | 54731.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 20 | 14.0 | 71633.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 21 | 16.0 | 52866.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 22 | 6.0 | 8437.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 23 | 2.0 | 562.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

- TABLE 2 - Base Stress Data on the 23 Slices -

| Slice No. * | Alpha (deg) | X-Coord. Slice Cntr (ft) | Base Leng. (ft) | Total Normal Stress (psf) | Total Vert. Stress (psf) | Mobilized Shear Stress (psf) |
|---|---|---|---|---|---|---|
| 1 | -40.06 | 51.00 | 28.74 | 2899.28 | 884.95 | 1390.00 |
| 2 | -27.82 | 63.00 | 2.26 | 2975.55 | 2103.49 | 533.41 |
| 3 | -27.82 | 72.00 | 18.09 | 3700.18 | 2628.59 | 641.87 |
| 4 | -14.04 | 89.00 | 18.55 | 4228.14 | 3668.35 | 720.89 |
| 5 | -14.04 | 99.00 | 2.06 | 4574.36 | 3971.52 | 772.72 |
| 6 | 0.00 | 112.00 | 24.00 | 4233.24 | 4125.00 | 721.66 |
| 7 | 0.00 | 137.00 | 26.00 | 4744.72 | 4625.00 | 798.22 |
| 8 | 0.00 | 155.00 | 10.00 | 5337.14 | 5204.12 | 886.89 |
| 9 | 1.91 | 175.00 | 30.02 | 5537.34 | 5455.04 | 916.86 |
| 10 | 4.57 | 209.50 | 39.12 | 5743.86 | 5728.14 | 947.77 |
| 11 | 4.57 | 234.50 | 11.04 | 5963.83 | 5947.75 | 980.69 |
| 12 | 11.31 | 260.00 | 40.79 | 5934.90 | 6042.10 | 976.36 |
| 13 | 11.31 | 285.00 | 10.20 | 6170.55 | 6281.84 | 1011.64 |
| 14 | 16.70 | 295.00 | 10.44 | 6223.28 | 6375.53 | 1019.53 |
| 15 | 16.70 | 310.00 | 20.88 | 6603.86 | 6764.65 | 1076.49 |
| 16 | 25.02 | 325.00 | 11.04 | 6537.93 | 6645.34 | 1066.62 |
| 17 | 25.02 | 340.00 | 22.07 | 6203.11 | 6418.79 | 1016.51 |
| 18 | 34.99 | 360.50 | 25.63 | 5363.93 | 5391.57 | 890.90 |
| 19 | 34.99 | 375.50 | 10.99 | 5076.44 | 4981.96 | 847.87 |
| 20 | 40.91 | 387.00 | 18.53 | 4197.71 | 3866.61 | 716.34 |
| 21 | 40.91 | 402.00 | 21.17 | 2761.73 | 2496.92 | 501.40 |
| 22 | 60.26 | 413.00 | 12.09 | 973.56 | 697.70 | 233.75 |
| 23 | 60.26 | 417.00 | 4.03 | 100.56 | 139.54 | 103.08 |

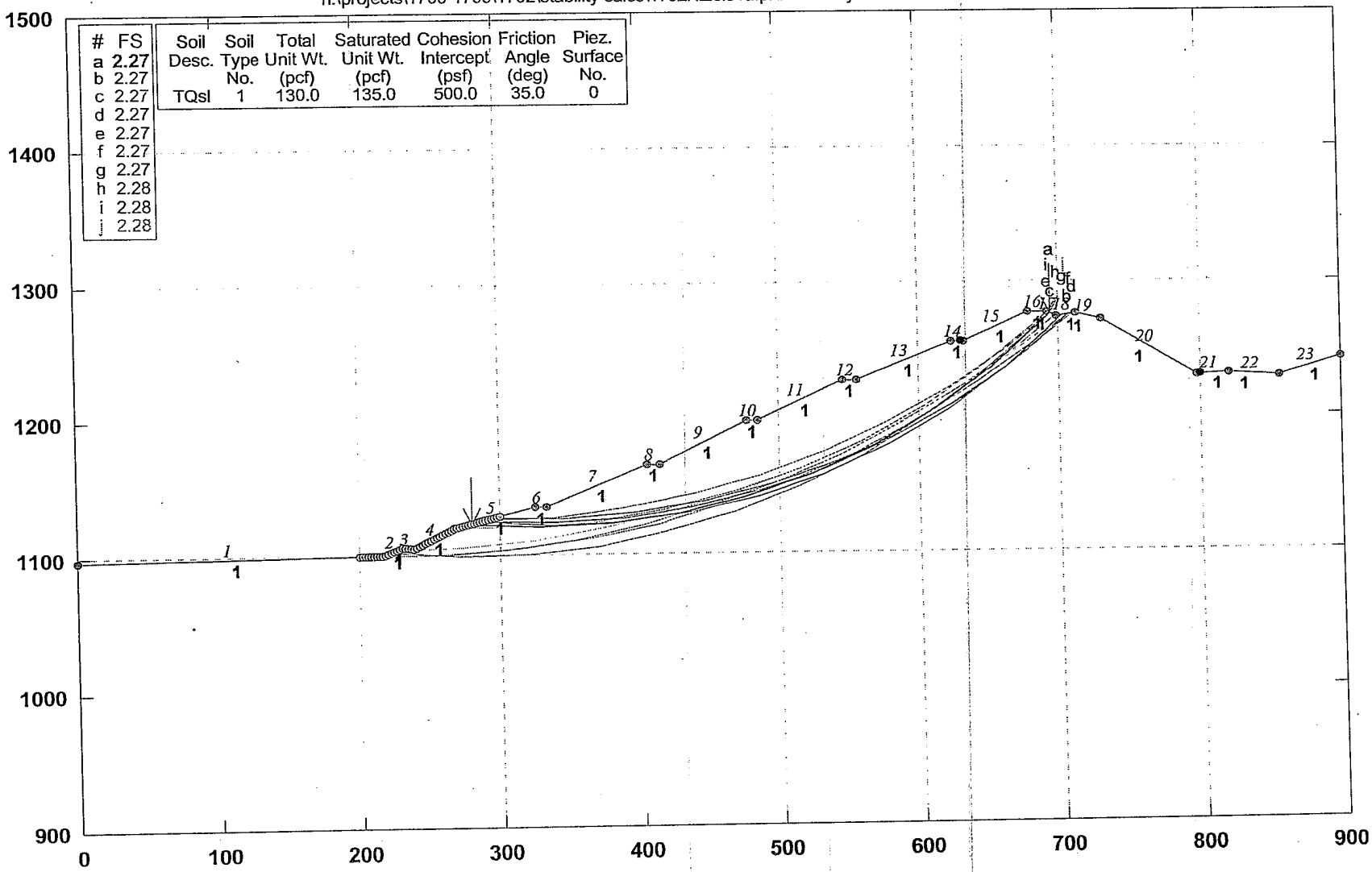
**** END OF GSTABL7 OUTPUT ****

# Lndmrk off-site grading; 28L-28L'; CS-34L; circular; static

n:\projects\1700-1799\1702\stability calcs\1702r\t28ls1a.pl2 Run By: KPC 7/14/2008 02:57PM

| # | FS |
|---|---|
| a | 2.27 |
| b | 2.27 |
| c | 2.27 |
| d | 2.27 |
| e | 2.27 |
| f | 2.27 |
| g | 2.27 |
| h | 2.28 |
| i | 2.28 |
| j | 2.28 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| TQsl | 1 | 130.0 | 135.0 | 500.0 | 35.0 | 0 |




GSTABL7 v.2 FSmin=2.27

Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2)

GSTABL7

Run No. 29

```
                    *** GSTABL7 ***
                ** GSTABL7 by Garry H. Gregory, P.E. **
   ** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **
              (All Rights Reserved-Unauthorized Use Prohibited)
*******************************************************************************
                    SLOPE STABILITY ANALYSIS SYSTEM
      Modified Bishop, Simplified Janbu, or GLE Method of Slices.
      (Includes Spencer & Morgenstern-Price Type Analysis)
      Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
      Nonlinear Undrained Shear Strength, Curved Phi Envelope,
      Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
      Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
*******************************************************************************
Analysis Run Date:          7/14/2008
Time of Run:                02:57PM
Run By:                     KPC
Input Data Filename:        N:\Projects\1700-1799\1702\Stability Calcs\1702R\t28ls1a.in
Output Filename:            N:\Projects\1700-1799\1702\Stability Calcs\1702R\t28ls1a.OUT
Unit System:                English
Plotted Output Filename:    N:\Projects\1700-1799\1702\Stabi Calcs\1702R\t28ls1a.PLT
PROBLEM DESCRIPTION:  Lndmrk off-site grading; 28L-28L';
                      CS-34L; circular; static

BOUNDARY COORDINATES
   23 Top   Boundaries
   23 Total Boundaries
Boundary     X-Left      Y-Left     X-Right     Y-Right     Soil Type
   No.        (ft)        (ft)       (ft)        (ft)      Below Bnd
    1         0.00     1097.00      217.00     1100.00        1
    2       217.00     1100.00      231.00     1106.00        1
    3       231.00     1106.00      239.00     1105.00        1
    4       239.00     1105.00      268.00     1120.00        1
    5       268.00     1120.00      325.00     1135.00        1
    6       325.00     1135.00      333.00     1135.00        1
    7       333.00     1135.00      405.00     1167.00        1
    8       405.00     1167.00      414.00     1167.00        1
    9       414.00     1167.00      477.00     1198.00        1
   10       477.00     1198.00      485.00     1198.00        1
   11       485.00     1198.00      546.00     1227.00        1
   12       546.00     1227.00      556.00     1227.00        1
   13       556.00     1227.00      623.00     1256.00        1
   14       623.00     1256.00      632.00     1256.00        1
   15       632.00     1256.00      678.00     1277.00        1
   16       678.00     1277.00      692.00     1277.00        1
   17       692.00     1277.00      699.00     1274.00        1
   18       699.00     1274.00      712.00     1276.00        1
   19       712.00     1276.00      730.00     1271.00        1
   20       730.00     1271.00      798.00     1230.00        1
   21       798.00     1230.00      820.00     1231.00        1
   22       820.00     1231.00      856.00     1228.00        1
   23       856.00     1228.00      900.00     1242.00        1
User Specified Y-Origin =        900.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)
ISOTROPIC SOIL PARAMETERS
  1 Type(s) of Soil
Soil  Total  Saturated  Cohesion  Friction   Pore    Pressure   Piez.
Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant Surface
 No.  (pcf)    (pcf)     (psf)     (deg)   Param.     (psf)     No.
  1   130.0    135.0     500.0     35.0    0.00       0.0       0
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
1500 Trial Surfaces Have Been Generated.
  30 Surface(s) Initiate(s) From Each Of    50 Points Equally Spaced
Along The Ground Surface Between  X = 200.00(ft)
                              and  X = 300.00(ft)
Each Surface Terminates Between   X = 630.00(ft)
                              and  X = 800.00(ft)
```

Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00(ft)
50.00(ft) Line Segments Define Each Trial Failure Surface.
Restrictions Have Been Imposed Upon The Angle Of Initiation.
The Angle Has Been Restricted Between The Angles Of -25.0
And 15.0 deg.

Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By GLE (Spencer's) Method (0-2) * *
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
The option of no water in the tension crack on
the last slice has been selected.
Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces
(if applicable) have been applied to the slice base(s)
on which they intersect.
Total Number of Trial Surfaces Evaluated = 1500
WARNING! The Factor of Safety Calculation for one or More Trial Surfaces
Did Not Converge in 20 Iterations.
Number of Trial Surfaces with Non-Converged FS = 9
Percentage of Trial Surfaces With Non-Valid FS Solutions
of the Total Evaluated = 0.6 %
Statistical Data On All Valid FS Values:
FS Max = 3.703 FS Min = 2.265 FS Ave = 2.792
Standard Deviation = 0.307 Coefficient of Variation = 10.99 %
((Modified Bishop FS for Critical Surface = 2.266))
Failure Surface Specified By 11 Coordinate Points

| Point No. | X-Surf (ft) | Y-Surf (ft) |
|---|---|---|
| 1 | 279.59 | 1123.05 |
| 2 | 329.52 | 1120.32 |
| 3 | 379.47 | 1122.60 |
| 4 | 428.94 | 1129.86 |
| 5 | 477.43 | 1142.03 |
| 6 | 524.47 | 1158.99 |
| 7 | 569.57 | 1180.57 |
| 8 | 612.29 | 1206.55 |
| 9 | 652.20 | 1236.67 |
| 10 | 688.90 | 1270.63 |
| 11 | 693.83 | 1276.21 |

Circle Center At X = 331.78 ; Y = 1619.69 ; and Radius = 499.38
*** FOS = 2.265 Theta (ki=1.0) = 19.65 ***
Lambda = 0.357
Individual data on the 22 slices

| Slice No. | Width (ft) | Weight (lbs) | Water Force Top (lbs) | Water Force Bot (lbs) | Tie Force Norm (lbs) | Tie Force Tan (lbs) | Earthquake Force Hor (lbs) | Earthquake Force Ver (lbs) | Surcharge Load (lbs) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 45.4 | 42597.0 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 2 | 4.5 | 8547.4 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 3 | 3.5 | 6610.2 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 4 | 46.5 | 143682.0 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 5 | 25.5 | 122336.2 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 6 | 9.0 | 46792.9 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 7 | 14.9 | 81376.3 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 8 | 48.1 | 314199.8 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 9 | 0.4 | 3142.0 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 10 | 7.6 | 53728.1 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 11 | 39.5 | 284797.8 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 12 | 21.5 | 161635.0 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 13 | 10.0 | 71913.2 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 14 | 13.6 | 92831.2 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 15 | 42.7 | 269700.2 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 16 | 10.7 | 59990.1 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 17 | 9.0 | 44429.7 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 18 | 20.2 | 82889.9 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 19 | 25.8 | 75474.8 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 20 | 10.9 | 16163.4 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 21 | 3.1 | 1861.6 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 22 | 1.8 | 340.3 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |

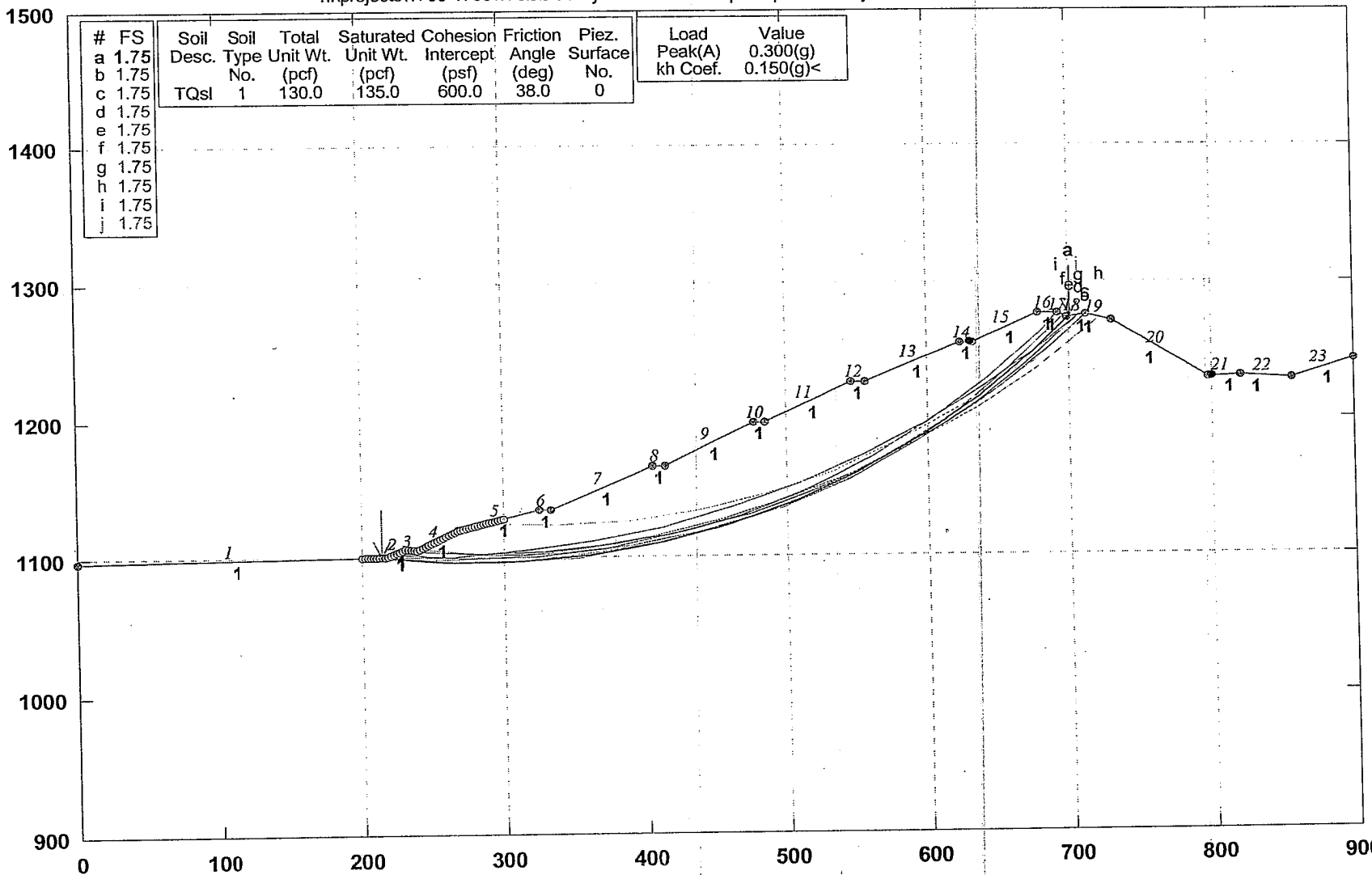
# Lndmrk off-site grading; 28L-28L'; CS-34L; circular; pseudo

n:\projects\1700-1799\1702\stability calcs\1702r\t28lps1a.pl2 Run By: KPC 7/14/2008 02:58PM

| # | FS |
|---|---|
| a | 1.75 |
| b | 1.75 |
| c | 1.75 |
| d | 1.75 |
| e | 1.75 |
| f | 1.75 |
| g | 1.75 |
| h | 1.75 |
| i | 1.75 |
| j | 1.75 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| TQsl | 1 | 130.0 | 135.0 | 600.0 | 38.0 | 0 |

| Load | Value |
|---|---|
| Peak(A) | 0.300(g) |
| kh Coef. | 0.150(g)< |




GSTABL7 v.2 FSmin=1.75

Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2)

GSTABL7

Run No. 30

```
                    *** GSTABL7 ***
                ** GSTABL7 by Garry H. Gregory, P.E. **
   ** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **
            (All Rights Reserved-Unauthorized Use Prohibited)
*******************************************************************************
                    SLOPE STABILITY ANALYSIS SYSTEM
      Modified Bishop, Simplified Janbu, or GLE Method of Slices.
      (Includes Spencer & Morgenstern-Price Type Analysis)
      Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
      Nonlinear Undrained Shear Strength, Curved Phi Envelope,
      Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
      Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
*******************************************************************************
Analysis Run Date:          7/14/2008
Time of Run:                02:58PM
Run By:                     KPC
Input Data Filename:        N:\Projects\1700-1799\1702\Stability Calcs\1702R\t28lpsla.in
Output Filename:            N:\Projects\1700-1799\1702\Stability Calcs\1702R\t28lpsla.OUT
Unit System:                English
Plotted Output Filename:    N:\Projects\1700-1799\1702\Stabi Calcs\1702R\t28lpsla.PLT
PROBLEM DESCRIPTION:  Lndmrk off-site grading; 28L-28L';
                      CS-34L; circular; pseudo

BOUNDARY COORDINATES
   23 Top   Boundaries
   23 Total Boundaries
Boundary     X-Left      Y-Left     X-Right     Y-Right     Soil Type
   No.        (ft)        (ft)        (ft)        (ft)     Below Bnd
    1         0.00     1097.00      217.00     1100.00         1
    2       217.00     1100.00      231.00     1106.00         1
    3       231.00     1106.00      239.00     1105.00         1
    4       239.00     1105.00      268.00     1120.00         1
    5       268.00     1120.00      325.00     1135.00         1
    6       325.00     1135.00      333.00     1135.00         1
    7       333.00     1135.00      405.00     1167.00         1
    8       405.00     1167.00      414.00     1167.00         1
    9       414.00     1167.00      477.00     1198.00         1
   10       477.00     1198.00      485.00     1198.00         1
   11       485.00     1198.00      546.00     1227.00         1
   12       546.00     1227.00      556.00     1227.00         1
   13       556.00     1227.00      623.00     1256.00         1
   14       623.00     1256.00      632.00     1256.00         1
   15       632.00     1256.00      678.00     1277.00         1
   16       678.00     1277.00      692.00     1277.00         1
   17       692.00     1277.00      699.00     1274.00         1
   18       699.00     1274.00      712.00     1276.00         1
   19       712.00     1276.00      730.00     1271.00         1
   20       730.00     1271.00      798.00     1230.00         1
   21       798.00     1230.00      820.00     1231.00         1
   22       820.00     1231.00      856.00     1228.00         1
   23       856.00     1228.00      900.00     1242.00         1
 User Specified Y-Origin =        900.00(ft)
 Default X-Plus Value = 0.00(ft)
 Default Y-Plus Value = 0.00(ft)
ISOTROPIC SOIL PARAMETERS
  1 Type(s) of Soil
 Soil  Total  Saturated  Cohesion  Friction   Pore    Pressure   Piez.
 Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant Surface
  No.  (pcf)    (pcf)     (psf)     (deg)   Param.    (psf)     No.
   1   130.0    135.0     600.0     38.0    0.00       0.0       0
 Specified Peak Ground Acceleration Coefficient (A) =   0.300(g)
 Specified Horizontal Earthquake Coefficient (kh) =   0.150(g)
 Specified Vertical Earthquake Coefficient (kv) =   0.000(g)
 Specified Seismic Pore-Pressure Factor =   0.000
 A Critical Failure Surface Searching Method, Using A Random
 Technique For Generating Circular Surfaces, Has Been Specified.
 1500 Trial Surfaces Have Been Generated.
   30 Surface(s) Initiate(s) From Each Of    50 Points Equally Spaced
```

Along The Ground Surface Between X = 200.00(ft)
and X = 300.00(ft)
Each Surface Terminates Between X = 630.00(ft)
and X = 800.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00(ft)
50.00(ft) Line Segments Define Each Trial Failure Surface.
Restrictions Have Been Imposed Upon The Angle Of Initiation.
The Angle Has Been Restricted Between The Angles Of -25.0
And 15.0 deg.

Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By GLE (Spencer's) Method (0-2) * *
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
The option of no water in the tension crack on
the last slice has been selected.
Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces
(if applicable) have been applied to the slice base(s)
on which they intersect.
Total Number of Trial Surfaces Evaluated = 1500
WARNING! The Factor of Safety Calculation for one or More Trial Surfaces
Did Not Converge in 20 Iterations.
Number of Trial Surfaces with Non-Converged FS = 6
Percentage of Trial Surfaces With Non-Valid FS Solutions
of the Total Evaluated = 0.4 %
Statistical Data On All Valid FS Values:
FS Max = 2.721 FS Min = 1.745 FS Ave = 2.010
Standard Deviation = 0.141 Coefficient of Variation = 7.03 %
((Modified Bishop FS for Critical Surface = 1.764))
Failure Surface Specified By 12 Coordinate Points

| Point No. | X-Surf (ft) | Y-Surf (ft) |
|---|---|---|
| 1 | 214.29 | 1099.96 |
| 2 | 264.14 | 1096.19 |
| 3 | 314.14 | 1096.73 |
| 4 | 363.91 | 1101.58 |
| 5 | 413.07 | 1110.69 |
| 6 | 461.26 | 1124.01 |
| 7 | 508.13 | 1141.43 |
| 8 | 553.32 | 1162.82 |
| 9 | 596.50 | 1188.03 |
| 10 | 637.35 | 1216.87 |
| 11 | 675.56 | 1249.12 |
| 12 | 700.59 | 1274.25 |

Circle Center At X = 283.10 ; Y = 1673.59 ; and Radius = 577.74
*** FOS = 1.745 Theta (ki=1.0) = 18.63 ***
Lambda = 0.337
Individual data on the 28 slices

| Slice No. | Width (ft) | Weight (lbs) | Water Force Top (lbs) | Water Force Bot (lbs) | Tie Force Norm (lbs) | Tie Force Tan (lbs) | Earthquake Force Hor (lbs) | Surcharge Ver (lbs) | Surcharge Load (lbs) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2.7 | 42.8 | 0.0 | 0.0 | 0. | 0. | 6.4 | 0.0 | 0.0 |
| 2 | 14.0 | 6865.4 | 0.0 | 0.0 | 0. | 0. | 1029.8 | 0.0 | 0.0 |
| 3 | 8.0 | 7388.4 | 0.0 | 0.0 | 0. | 0. | 1108.3 | 0.0 | 0.0 |
| 4 | 25.1 | 46938.3 | 0.0 | 0.0 | 0. | 0. | 7040.7 | 0.0 | 0.0 |
| 5 | 3.9 | 11426.4 | 0.0 | 0.0 | 0. | 0. | 1714.0 | 0.0 | 0.0 |
| 6 | 46.1 | 177484.5 | 0.0 | 0.0 | 0. | 0. | 26622.7 | 0.0 | 0.0 |
| 7 | 10.9 | 51263.2 | 0.0 | 0.0 | 0. | 0. | 7689.5 | 0.0 | 0.0 |
| 8 | 8.0 | 38295.7 | 0.0 | 0.0 | 0. | 0. | 5744.3 | 0.0 | 0.0 |
| 9 | 30.9 | 167925.2 | 0.0 | 0.0 | 0. | 0. | 25188.8 | 0.0 | 0.0 |
| 10 | 41.1 | 280379.5 | 0.0 | 0.0 | 0. | 0. | 42056.9 | 0.0 | 0.0 |
| 11 | 8.1 | 59837.9 | 0.0 | 0.0 | 0. | 0. | 8975.7 | 0.0 | 0.0 |
| 12 | 0.9 | 6812.6 | 0.0 | 0.0 | 0. | 0. | 1021.9 | 0.0 | 0.0 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 13 | 47.3 | 375697.3 | 0.0 | 0.0 | 0. | 0. | 56354.6 | 0.0 | 0.0 |
| 14 | 15.7 | 137483.7 | 0.0 | 0.0 | 0. | 0. | 20622.5 | 0.0 | 0.0 |
| 15 | 8.0 | 69320.9 | 0.0 | 0.0 | 0. | 0. | 10398.1 | 0.0 | 0.0 |
| 16 | 23.1 | 199542.8 | 0.0 | 0.0 | 0. | 0. | 29931.4 | 0.0 | 0.0 |
| 17 | 37.9 | 332839.1 | 0.0 | 0.0 | 0. | 0. | 49925.9 | 0.0 | 0.0 |
| 18 | 7.3 | 62717.4 | 0.0 | 0.0 | 0. | 0. | 9407.6 | 0.0 | 0.0 |
| 19 | 2.7 | 22088.6 | 0.0 | 0.0 | 0. | 0. | 3313.3 | 0.0 | 0.0 |
| 20 | 40.5 | 313555.8 | 0.0 | 0.0 | 0. | 0. | 47033.4 | 0.0 | 0.0 |
| 21 | 26.5 | 182169.5 | 0.0 | 0.0 | 0. | 0. | 27325.4 | 0.0 | 0.0 |
| 22 | 9.0 | 53918.1 | 0.0 | 0.0 | 0. | 0. | 8087.7 | 0.0 | 0.0 |
| 23 | 5.3 | 29363.0 | 0.0 | 0.0 | 0. | 0. | 4404.4 | 0.0 | 0.0 |
| 24 | 38.2 | 169743.5 | 0.0 | 0.0 | 0. | 0. | 25461.5 | 0.0 | 0.0 |
| 25 | 2.4 | 8286.2 | 0.0 | 0.0 | 0. | 0. | 1242.9 | 0.0 | 0.0 |
| 26 | 14.0 | 33501.2 | 0.0 | 0.0 | 0. | 0. | 5025.2 | 0.0 | 0.0 |
| 27 | 7.0 | 5795.3 | 0.0 | 0.0 | 0. | 0. | 869.3 | 0.0 | 0.0 |
| 28 | 1.6 | 140.5 | 0.0 | 0.0 | 0. | 0. | 21.1 | 0.0 | 0.0 |

# Appendix C

# APPENDIX C

## EVALUATION OF POTENTIAL FOR LIQUEFACTION, EARTHQUAKE-INDUCED SETTLEMENT, AND LATERAL SPREADING

1. Introduction

The potential for liquefaction, earthquake-induced settlement, and lateral spreading at the Landmark Village site were previously assessed and presented in our Geologic and Geotechnical Report - Vesting Tentative Tract 53108, dated 9/27/00. We have subsequently updated our liquefaction assessment in conformance with the current criteria of the State of California and reassessed our recommendation for removal depths and potential grading constraints.

Potentials for liquefaction and for earthquake-induced settlement were reassessed (in accordance with current criteria of the County of Los Angeles and the DMG SP117 Guidelines referenced in those criteria) for 21 of the 64 CPT soundings that were previously performed at the site. The procedures presented in the following references were used for this evaluation:

- *Liquefaction Resistance of Soils: Summary Report* (NCEER/NSF, 2001), by Youd, Idriss, et al.

- *Cyclic Liquefaction and its Evaluation Based on the SPT and CPT,* by Robertson and Wride, 1997.

- *Revised Multilinear Regression Equations for Prediction of Lateral Spread Displacement,* Youd, Hanson, Corbett and Bartlett, ASCE Journal of Geotechnical and Geoenvironmental Engineering, December 2002.

- *Evaluation of Settlements In Sands Due To Earthquake Shaking,* Tokimatsu and Seed, ASCE Journal of Geotechnical Engineering, August, 1987.

Field and laboratory data obtained during previous investigations were used in our analyses.

The liquefaction potential and seismic settlement analyses were performed in accordance with current criteria of the County of Los Angeles and the DMG SP117 Guidelines referenced in those criteria and updated in conformance with the requirements of the

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2007 edition of the California Building Code (CBC). Our analyses indicate that potential liquefaction-induced settlement will be less than one inch at 11 of the 21 CPT sounding locations that we analyzed and that potential liquefaction-induced settlement between about one and two inches could occur in the vicinity of CPT soundings 5, 13, 19, 96, 105, 106, 108, 109, 111, and 115. We have made minor revisions to the recommended alluvial removal depths shown on the attached Geotechnical Map in order to mitigate potential liquefaction-induced settlements in the vicinity of these CPT soundings.

Potential for lateral spreading at the project site is believed to be low since laterally continuous, potentially liquefiable soil layers with a relative density corresponding to $N1_{60} \leq 15$ are not present at the site.

2. Data and Assumptions

Factors that affect potential for liquefaction and seismic settlements at the project site include estimated ground motion parameters, engineering characteristics of site soils, and groundwater depth.

a. Estimated Ground Motion Parameters

In compliance with new criteria presented in the 2007 CBC, an updated Probabilistic Seismic Hazard Analysis (PSHA) was completed to evaluate the design basis ground acceleration at the site for use in our liquefaction analysis. The computer program FRISKSP (version 4.0) by Thomas Blake was used in the analysis. Per CBC criteria, we assessed potential accelerations with a 2% chance of exceedance in a 50 year period, i.e. a 2475 year return period. Per CBC criteria, two-thirds of this acceleration should be used for analysis.

The unweighted acceleration with a 2% chance of exceedance in 50 years at the site is estimated to be 1.24g, and two-thirds of this value is 0.83g. The most likely scenario generating this acceleration is a 6.5 magnitude earthquake on the Santa Susana fault. This design acceleration value is nearly the same as, but slightly lower than, the acceleration value of 0.87g with a 10% chance of exceedance in 50 years estimated during our previous analyses of the site. The acceleration weighted for a standardized 7.5 magnitude earthquake is 0.56g, which is also slightly lower than the 0.59g value estimated in our previous analyses. The reported accelerations are

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the unweighted average of the three accelerations indicated by the attention relationships of Boore et al (1997) for site Class D, Sadigh et al (1997) for deep soil, and Campbell and Bozorgnia (1997) for alluvium (see summary **Table C2** and sample output file for Boore et al (2007) run for details). Weighted and unweighted accelerations of 0.56g and 0.83g, respectively, were used in our updated liquefaction analyses.

It should be emphasized that the ground acceleration values presented in our report are based on simplified curves of fault rupture area to magnitude, and ground motion attenuation relationship which represent averages of highly variable data measured during historic earthquakes. Predicted accelerations should be considered rough estimates rather than precise facts and, therefore, ground accelerations at the subject site from future seismic events may exceed the predicted accelerations. Due to the dip-slip nature of most of the faults in southern California, vertical accelerations may equal horizontal accelerations. Ground motions may originate from virtually any direction due to the presence of major faults in all directions from the site.

b. Engineering Characteristics of Site Soils

Engineering characteristics of site soils were interpreted principally from data from Cone Penetration Test (CPT) soundings. These data include tip resistance ($q_c$), friction ratio ($f_s$), interpreted soil types and fines contents, and groundwater levels from dynamic groundwater pressure dissipation tests. As noted in our referenced 9/27/00 report, there is substantial consistency between the soil types and the SPT blow counts observed in rotary-wash borings RW-11 and RW-13 and the soil types and SPT blow counts interpreted at adjacent locations in CPT soundings CPT-103 and CPT-109, respectively.

c. Ground Water Depth

Existing ground water depths and Historic High ground water depths at the locations of the CPT soundings are provided in **Table C1**.

Historic High Ground Water depth was adopted herein for evaluation of liquefaction potential and associated phenomena.

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In-situ ground water depths were used for correcting SPT blow count data measured during sampling of boreholes to the standard effective overburden pressure (1.0 tsf) used in liquefaction analyses. Effective vertical soil pressure based on the historic high ground water depth was used to estimate cyclic shear stress induced in site soils by earthquake shaking.

3. CPT Logs and Interpretations

Two versions of CPT logs and soil type interpretations have been prepared for each CPT sounding. Soil type interpretation in the first version of the CPT logs, which were prepared by the company that performed the CPT soundings, is based on the procedures described by Robertson and Campanella, 1989. This version is presented in our referenced 9/27/00 report. The interpreted soil types from this version are used herein for estimation of equivalent SPT blow count values (for comparison with SPT blow count data from exploration borings).

The second version of the CPT logs was prepared by AESEGI. The interpreted soil types and percent fines provided in these logs were evaluated based on the procedures presented in *Liquefaction Resistance of Soils: Summary Report* (NCEER/NSF, 2001), by Youd, Idriss, et al. Measured cone-tip resistance ($q_c$), friction ratio ($f_s$), and interpreted corrected SPT resistance ($N1_{60}$) from the first version of the CPT logs were used to evaluate the interpreted soil types and normalized $q_c$ and $f_s$ values shown on the second version of the CPT logs. This version is presented as an attachment at the end of this appendix.

4. Methods of Analysis

a. Assessment of Liquefaction Potential

Liquefaction is a phenomenon in which porewater pressure generated by earthquake shaking causes sudden, temporary loss of shear strength in saturated, typically granular soils. Foundations founded on liquefied soils may settle and/or move laterally.

Liquefaction potential analyses generally are performed by a method first proposed by Seed and Idriss (1970) and subsequently revised by Youd, Idriss, et al (NCEER/NSF, 2001). In these methods, earthquake-induced cyclic shear stresses in

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the ground are estimated and compared with empirically based cyclic shear strength (resistance) derived from data from case histories in which liquefaction was observed and case histories in which liquefaction was not observed.

Estimation of cyclic shear strength against liquefaction is based on measured CPT tip resistance ($q_c$) and friction ratio ($f_s$), percent fines estimated from CPT data, and estimated in-situ effective overburden pressure. CPT tip penetration resistance data corrected to 1.0 tsf pressure ($q_{c1N}$) are used to calculate the Cyclic Resistance Ratio (CRR) for clean sandy soils subjected Magnitude 7.5 earthquakes. The overburden pressure correction for the CPT tip resistance is calculated using the following equations from Youd, Idriss, et al (NCEER/NSF, 2001):

$$C_Q = (1/\sigma'_o)^{0.5}, \quad 0.5 \leq C_Q \leq 1.7$$
$$q_{c1N} = C_Q \cdot q_c$$

where: $\sigma'_o$ = effective overburden pressure [tsf or kg/cm$^2$]
$q_c$ = uncorrected CPT tip resistance [tsf or kg/cm$^2$]

The overburden pressure corrected CPT tip resistance ($q_{c1N}$) is further corrected for fines content in order to obtain an equivalent clean sand CPT tip resistance value, as recommended by Youd, Idriss, et al (NCEER/NSF, 2001) and by Robertson & Wride (NCEER, 1997). The fines content corrected CPT tip resistance, $(q_{c1N})_{cs}$, is used to calculate the Cyclic Resistance Ratio (CRR) against liquefaction, in accordance with Youd, Idriss, et al (NCEER/NSF, 2001).

The earthquake-induced cyclic shear stress ratio (CSR or $\tau_{av}/\sigma'_v$) for each depth in question is calculated using the following equation by Youd, Idriss, et al (NCEER/NSF, 2001):

$$\tau_{av}/\sigma'_v = 0.65 \cdot (a_{max}/g) \cdot \sigma_o/\sigma'_v \cdot r_d$$

Where: $a_{max}/g$ = Peak horizontal ground surface acceleration (PGHA) divided by the acceleration of gravity
$\sigma_o$ = Total overburden pressure at the depth in question
$\sigma'_v$ = Effective overburden pressure at the depth in question
$r_d$ = Shear stress reduction factor which accounts for soil deformability at the depth in question

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Cyclic Resistance Ratio (CRR) vs. corrected cone-tip resistance $(q_{c1N})_{cs}$ curves are presented by Youd, Idriss, et al (NCEER/NSF, 2001). These curves are based on case histories in which liquefaction was observed / not observed in clean sands subjected to earthquakes with a magnitude of about 7.5. Soils with $(q_{c1N})_{cs}$ and CSR values that plot above these curves are potentially liquefiable and soils with $(q_{c1N})_{cs}$ and CSR values that plot below these curves generally are not liquefiable. In accordance with the requirements of the County of Los Angeles Department of Public Works, a soil deposit is considered to be liquefiable if its factor of safety against liquefaction (i.e., CRR divided by CSR) is less than 1.3.

Values of the factor of safety against liquefaction for the soil profiles in each of the CPT logs were calculated using fines content corrected values of tip resistance ($q_{c1N}$) at 6-inch depth intervals, per Youd, Idriss, et al (NCEER/NSF, 2001). A typical spreadsheet that illustrates the factor of safety calculations is shown on **Figure C22** – Typical Spreadsheet of Liquefaction Potential Analyses. Non-liquefiable soil deposits may settle as a result of earthquake shaking. This non-liquefied, earthquake-induced settlement is included in our settlement estimates, as discussed in the following section.

b. Estimation of Earthquake-Induced Settlements

Tokimatsu and Seed (1987) provide procedures for estimation of earthquake-induced settlement of unsaturated sands and of saturated sands. These procedures were used herein to estimate the distribution of potential earthquake-induced settlement vs. depth. The Tokimatsu and Seed method for estimation of earthquake-induced settlement is described below.

One-dimensional volumetric strain of unsaturated sandy soils caused by earthquake shaking is estimated based on estimated cyclic shear strain and $N1_{60}$ values (estimated from the CPT soundings). This one-dimensional strain is doubled in order to estimate strain produced by multi-directional earthquake shaking. Settlement is calculated by multiplying the volumetric strain value by the thickness of the soil layer. Although this procedure for estimating earthquake-induced settlement was developed based on data from clean to slightly silty sands, CPT tip resistances ($q_c$) used herein to estimate $N1_{60}$ values of unsaturated soils were not

corrected for fines content. Omitting the fines content correction yields conservative (i.e., higher) settlement estimates for silty sands and silts.

Volumetric strain of saturated sands caused by earthquake shaking is estimated using earthquake-induced cyclic shear stress ($\tau_{av}$) and $N1_{60}$ values derived from CPT tip resistance ($q_c$) values. Since the design chart for volumetric strain of saturated sands includes the effect of multi-directional earthquake shaking, it is not necessary to double the volumetric strain calculated for saturated sand deposits. Although the referenced procedure strictly applies only to saturated clean sands, it may also be used to estimate settlement in silty sands because the interpreted $N1_{60}$ values used to estimate volumetric strain are based on $q_c$ values which have been corrected for fines content (i.e., an equivalent CPT tip resistance that corresponds to clean sand is used to estimate $N1_{60}$ for silty sand and silt deposits). Settlement is calculated by multiplying the thickness of the saturated soil layer by the volumetric strain.

c. Estimation of Potential For Lateral Spreading

Regression equations for estimation of potential magnitude of lateral spread displacement that can occur if liquefaction occurs in soils beneath flat to gently sloping sites were developed by Youd, Hanson, Corbett, and Bartlett (ASCE, December 2002). According to these equations, the magnitude of lateral spreading displacement depends on earthquake magnitude, site to fault distance, slope of the site surface, thickness of potentially liquefiable deposits at the site with an $N1_{60} \leq 15$ ($T_{15}$), and the median grain size and percent fines in the $T_{15}$ layer. The data base used to develop the regression equations was limited to $T_{15}$ values between 1 and 15 meters. It may be inferred from this that significant lateral spreading was not observed by the researchers at sites with less than about 1 meter of potentially liquefiable soils with $N1_{60} \leq 15$ blows/foot. Accordingly, it is assumed herein that earthquake shaking will not cause lateral spreading at a site unless it is underlain by a liquefiable layer that is at least about 1 meter in total thickness and which has an $N1_{60} \leq 15$ blows/foot.

In addition, the data base used to develop the regression equations for the magnitude of lateral spread displacement is based on case histories in which the liquefiable ($T_{15}$) layers extended laterally for substantial distances without being impeded by boundary effects. It may be inferred that significant lateral spreading has not been

observed at narrow sites that are bounded by denser soils or bedrock, or at sites where liquefiable ($T_{15}$) layers are laterally discontinuous. Accordingly, it is assumed herein that earthquake shaking will not cause lateral spreading at a site that does not have a laterally continuous, liquefiable layer with $N1_{60} \leq 15$ blows/foot.

5. Results of Analyses

a. Liquefaction Potential Assessment

Results of our liquefaction analyses using data from the selected CPT soundings are graphically summarized herein on individual sheets (Analysis of Liquefaction Potential Based $q_c$ and $f_s$ from CPT Data - **Figures C1 through C21**). These sheets present plots of depth vs. normalized CPT tip resistance and friction ratio, fines content interpreted from the CPT data, cyclic shear stress induced by earthquake shaking, maximum resistance to cyclic shear stress interpreted from the CPT data, and cumulative settlement that would be caused by earthquake shaking. The sheets also display groundwater depth at the time of the CPT soundings and estimated historic high groundwater depths.

b. Earthquake-Induced Settlement

Potential earthquake-induced settlement that could result from liquefaction prior to proposed grading was calculated (per CDMG Special Publication 117, 1997) to vary from 0 to about 1.9 inches at the locations of 21 CPT soundings (see Table C1). At the locations of CPT soundings 5, 13, 19, 96, 105, 106, 108, 111, and 115, potential liquefaction-induced settlements range from 1.0 to about 1.9 inches. Potential liquefaction-induced *differential* settlements at the locations of these CPT soundings varies from about 0.6 to 1.2 inches. Options to mitigate these potential differential settlements are provided below.

c. Lateral Spreading

As stated above, significant lateral spreading is expected only if a site is underlain by a laterally continuous, liquefiable layer that is at least about 1 meter thick and that has a relative density that corresponds to an $N1_{60}$ value of about 15 blows/ft, or less. Potential for lateral spreading due to liquefaction at the project site is low

because there is no laterally continuous, potentially liquefiable layer with a relative density that corresponds to $N1_{60} \leq 15$ blows/foot.

6. Conclusions

Our analyses indicate that potential liquefaction-induced settlement will be less than one inch at 11 of the 21 CPT sounding locations that we analyzed and that potential liquefaction-induced settlement between about one and two inches could occur in the vicinity of CPT soundings 5, 13, 19, 96, 105, 106, 108, 109, 111, and 115. We have made minor revisions to the recommended alluvial removal depths shown on the attached Geotechnical Map in order to mitigate potential liquefaction-induced settlements in the vicinity of these CPT soundings. Of the ten CPT sounding locations where potential liquefaction-induced settlements exceed one inch, seven can be mitigated with standard grading (removal and recompaction) techniques without dewatering. At two closely spaced locations (CPT soundings 105 and 106) removals to reduce to the seismic settlements to less than one inch would extend up to 4.5 ft below the observed ground water depth. Considering the granular nature of the soils, the shallow intrusion into the water table, and proposed deeper removals and dewatering for the adjacent channel liner, it is anticipated that the recommended removals will be feasible by means of grading and minor dewatering with slot trenches.

At the location of CPT-13, a removal depth of 23 ft is indicated to limit total seismic settlements to less than 1 in. Ground water depth was not accurately measured at this CPT because the sounding hole caved at 12 ft depth. For purposes of analysis, we assumed existing ground water depth to be 15 ft. However, subsequent measurements from the nearby CPT-96 and Piezometer P-32F indicate that the depth of existing ground water is probably at least 20 ft. deep in the vicinity of CPT-13. Therefore, the recommended removals probably extend only 3 ft below the existing water table. In light of the limited extent of recommended removals below the water table at this location, it is anticipated that shallow dewatering with slot trenches will be sufficient for excavation and dewatering of the nearby channel liner. If the recommended removals below the water table cannot be performed, buildings in the vicinity of CPT-13 should be designed for 1.2 in of total seismic settlement in addition to static settlement.

In summary, if the recommended removals are performed total seismic settlements will be less than 1 in and the differential seismic settlements will be 0.67 in or less. Following the grading, static differential settlements are anticipated to be 0.25 in or less.

**APPENDIX C**

Therefore, total differential settlement between adjacent footing foundations is anticipated to be less than 1 in.

Potential for lateral spreading at the project site is low because there is no laterally continuous, potentially liquefiable layer with a relative density that corresponds to $N1_{60} \leq 15$ blows/foot.

**The following attachments complete this Appendix.**

- Liquefaction Potential Assessment References
- Summary Table of Subsurface Data, Potential Earthquake-Induced Settlements, and Removal Depths — Table C1
- Graphs of Analysis of Liquefaction Potential Based on $q_c$ and $f_s$ from CPT Data) — Figures C1 thru C21
- Typical Spreadsheet of Liquefaction Potential Analyses — Figure C22
- AESEGI Interpreted CPT Data
- Output File for Boore et al (1997) FRISKSP Run
- Summary of Calculated Peak Horizontal Ground Accelerations — Table C2

# APPENDIX C

## LIQUEFACTION POTENTIAL ASSESSMENT REFERENCES

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Robertson, P. K., and Wride, C.F., "Cyclic Liquefaction and its Evaluation Based on the SPT and CPT" in the *Proceedings of the NCEER Workshop on Evaluating the Liquefaction Resistance of Soils*, edited by Youd, T.L. and Idriss, I.M., Technical Report NCEER-97-0022, pp. 41-87, 1997

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**APPENDIX C**

| Analyzed Location CPT | Potential Earthquake-Induced Settlement (Inches) | | Proposed Additional Fill (feet) | Recommended Removals (feet) | Total Compacted Fill Cap Thickness (feet) | Thickness of Non-Liquefiable soils below proposed grades (feet) | Total Thickness of Potentially Liquefiable Soils Following Removals (feet) | Ground water Table Depth (feet) | |
|---|---|---|---|---|---|---|---|---|---|
| | Before Removals | After Removals | | | | | | Existing GWT | Historic GWT |
| 2 | 0.91 | 0.88 | 6 | 5 | 11 | 19 | 5 | 28 | 10 |
| 5 | 1.49 | 0.82 | 3.5 cut | 14 [1] | 10.5 | 9.5 | 6.5 | 24 | 11 |
| 7 | 0.48 | 0.48 | 7 | 5 | 12 | 24 | 3.5 | 20 | 17 |
| 13 | 1.58 | 0.98 | 3.5 | 23 | 19.5 | 17.5 | 7 | 15 [2] | 12 |
| 15 | 0.43 | 0.42 | 1.5 | 4 | 5.5 | 14.5 | 3.5 | 27 | 16 |
| 19 | 1.04 | 1.00 | 12 | 5 | 17 | 25 | 7.5 | 15 | 9 |
| 96 | 1.45 | 0.95 | 4 | 22 | 26 | 25.5 | 6 | 22.2 | 15 |
| 101 | 0.37 | 0.37 | 18 | 4 | 22 | 27.5 | 3.5 | 9.3 | 4 |
| 103 | 0.66 | 0.58 | 29 | 8 | 37 | 37 | 5 | 9.5 | 3 |
| 105 | 1.35 | 0.74 | 20 | 9 | 29 | 29 | 4.5 | 7.4 | 3 |
| 106 | 1.49 | 0.99 | 20 | 11 | 31 | 34 | 4 | 7.5 | 2 |
| 108 | 1.14 | 1.00 | 1 | 13 | 14 | 19 | 5.5 | 25.1 | 16 |
| 109 | 1.11 | 0.91 | 7 | 16 | 23 | 22 | 6.5 | 25 | 15 |
| 110 | 0.76 | 0.75 | 10.5 | 5 | 15.5 | 22.5 | 4.5 | 24 | 12 |
| 111 | 1.23 | 0.97 | 8.5 | 13 | 21.5 | 21.5 | 6 | 21.9 | 11 |
| 114 | 0.64 | 0.62 | 11.5 | 5 | 16.5 | 23.5 | 3 | 22.4 | 12 |
| 115 | 1.84 | 0.94 | 10 | 16 | 26 | 40 | 6.5 | 21.5 | 11 |
| 118 | 0.50 | 0.50 | 16 | 4 | 20 | 25 | 4 | 10.5 | 4 |

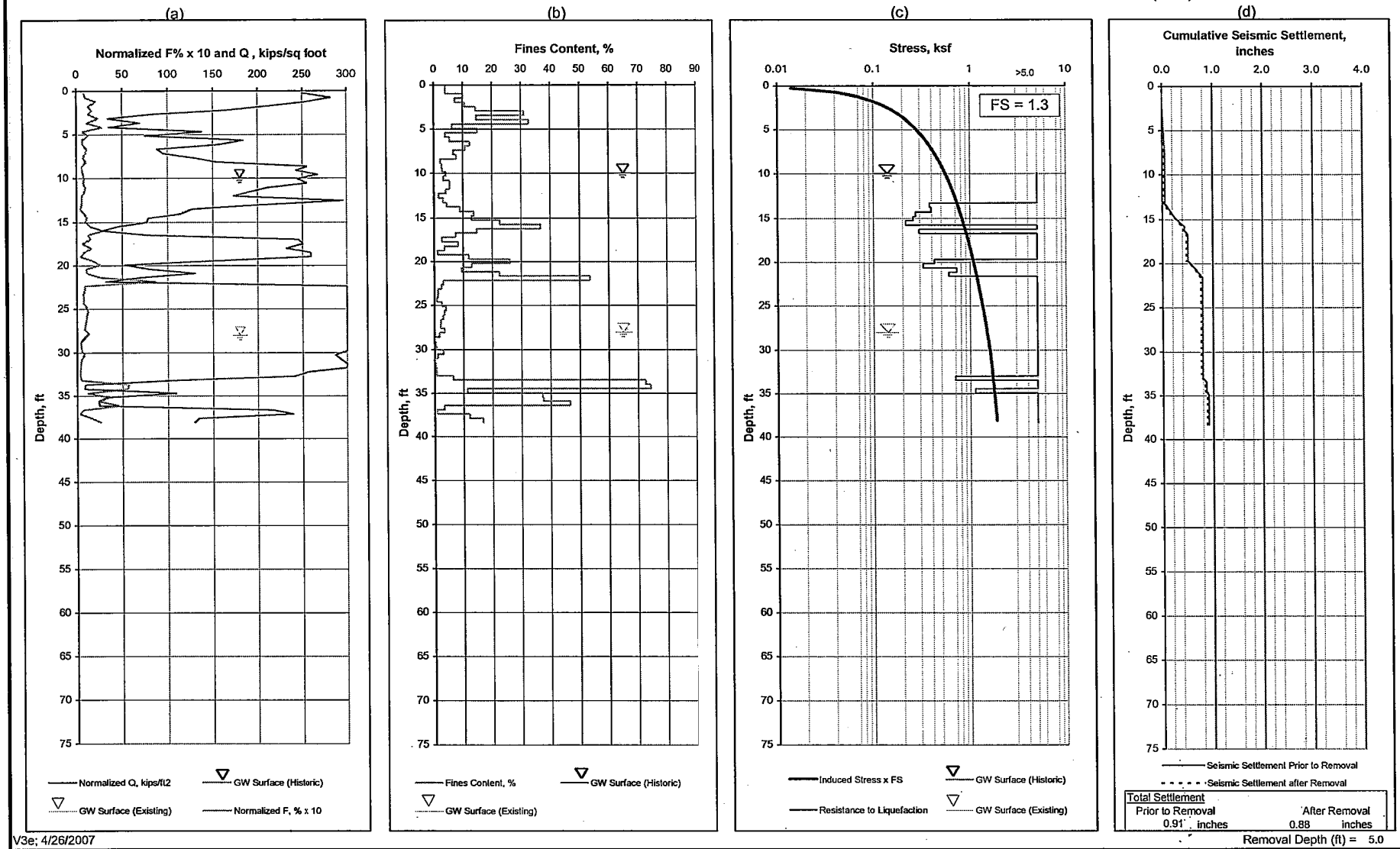
[1] Indicates removal depth in River Bank Slope Protection zone. In this area, excavation for placement of the typical Slope Protection system would be substantially deeper than the removal depth for mitigating potential seismic structural settlement at the respective CPT-5 location indicated in the table.

[2] A ground water depth of 15 ft was conservatively estimated. Subsequent data indicated that the existing ground water depth is probably at least 20 ft.

**APPENDIX C**

| Analyzed Location CPT | Potential Earthquake-Induced Settlement (Inches) | | Proposed Additional Fill (feet) | Recommended Removals (feet) | Total Compacted Fill Cap Thickness (feet) | Thickness of Non-Liquefiable soils below proposed grades (feet) | Total Thickness of Potentially Liquefiable Soils Following Removals (feet) | Ground water Table Depth (feet) | |
|---|---|---|---|---|---|---|---|---|---|
| | Before Removals | After Removals | | | | | | Existing GWT | Historic GWT |
| 122A | 0.73 | 0.73 | 29 | 4 | 33 | 34.5 | 6.5 | 4 | 4 |
| 125 | 0.00 | 0.00 | 20 | 4 | 24 | 32 | <1 | 11 | 9 |
| 128 | 0.28 | 0.24 | 0 | 9 | 9 | 19 | 1.5 | 26 | 20 |

**Location.....** **CPT-02**
Elevation (MSL)..... 964 ft

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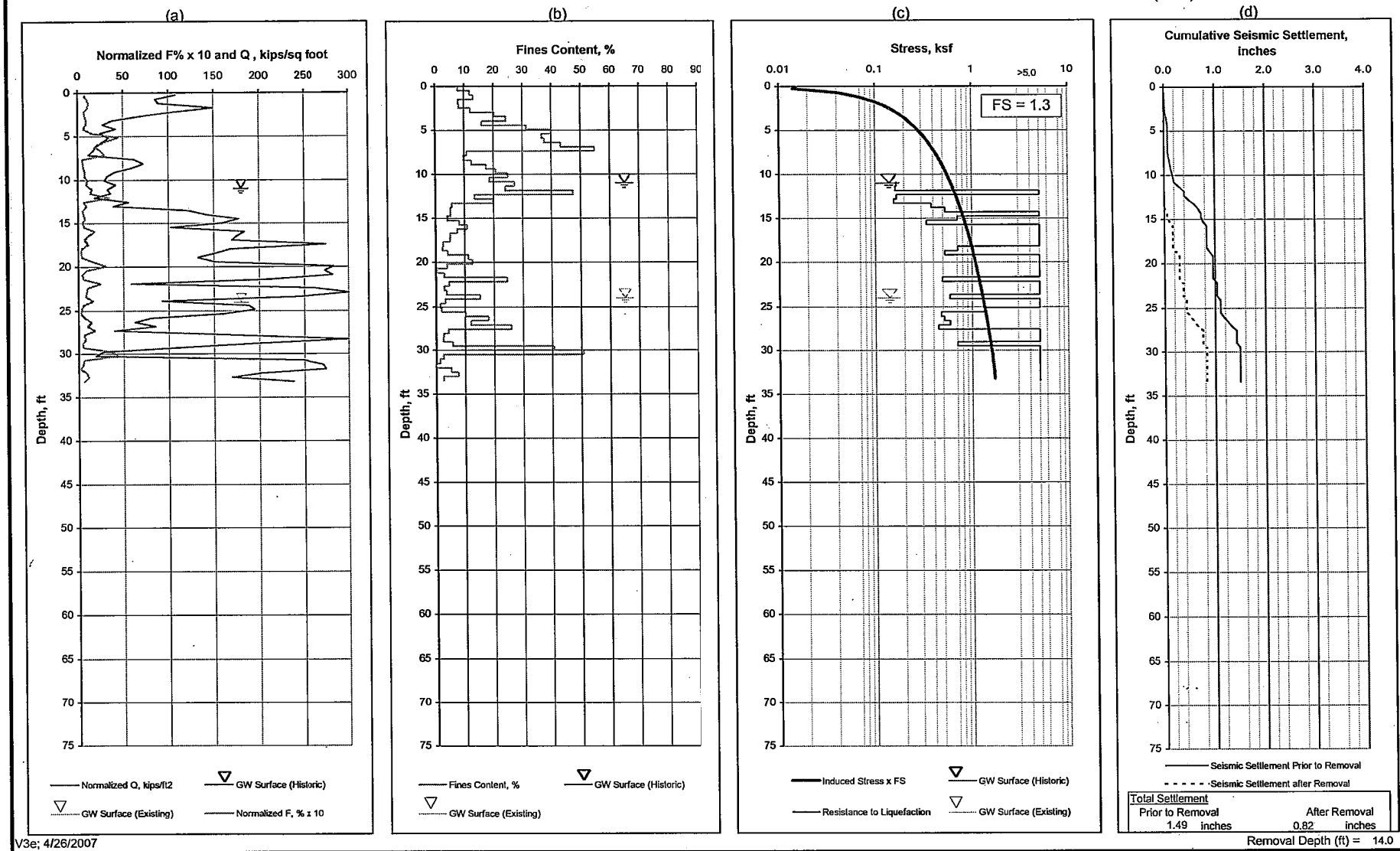
**Geological and Geotechnical Consultants**

**Analysis of Liquefaction Potential Based on $q_c$ and $f_s$ from CPT Data**

| | | | | |
|---|---|---|---|---|
| Riverwood Village, VTT 53108 | Weighted Gr. Acc. (M=7.5). | 0.56 g | Project No. | 1702R-4 |
| Castaic, L A County, California | Design Gr. Acc.(M= 6.5 )... | 0.83 g | Figure No. | C1 |
| For: Newhall Land & Farming Co. | Magnification Factor..... | 1 | Date. | 12-21-2009 |

**Location..... CPT-05**
Elevation (MSL)..... 954 ft

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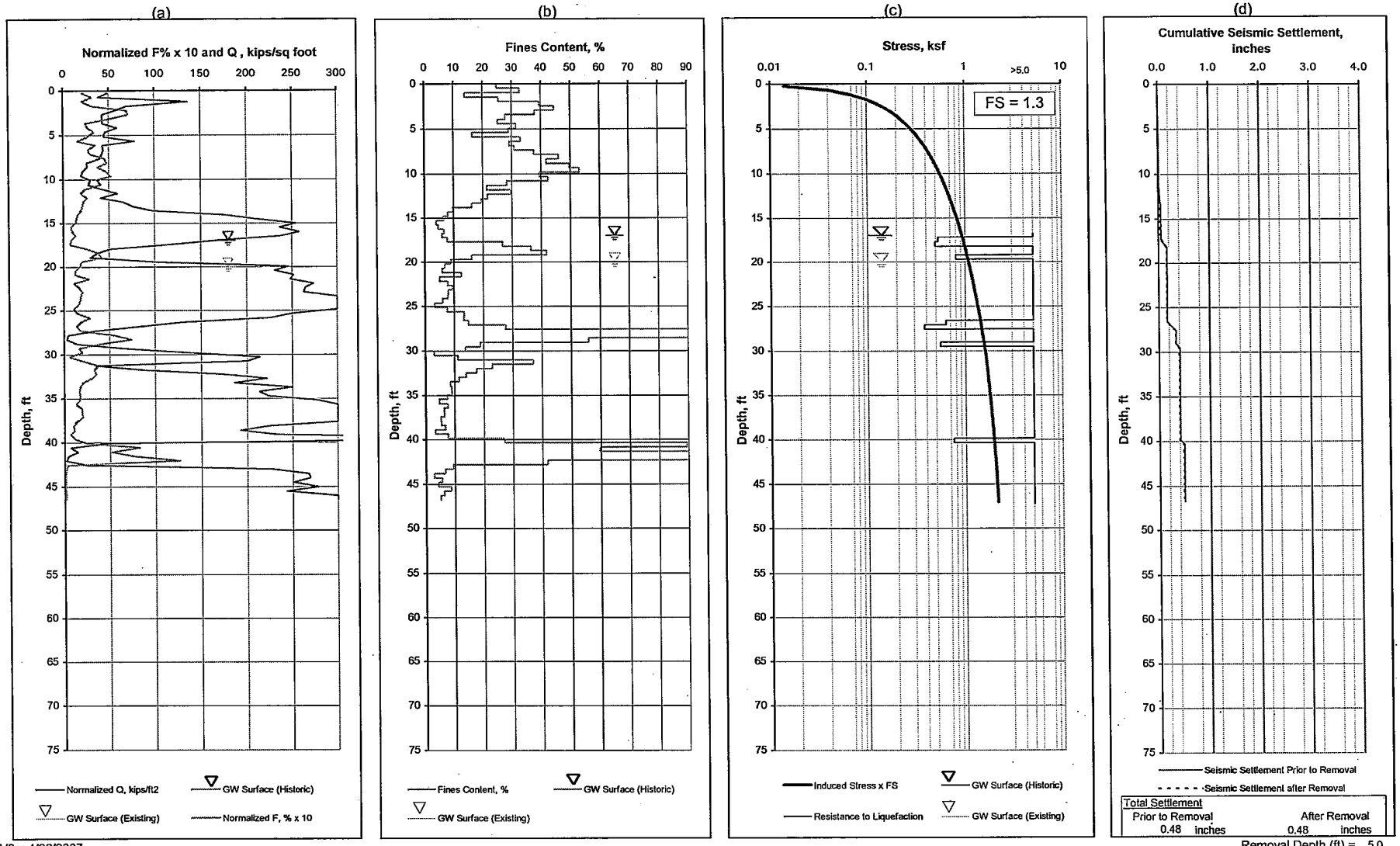
## Analysis of Liquefaction Potential Based on $q_c$ and $f_s$ from CPT Data

| | | | | |
|---|---|---|---|---|
| Riverwood Village, VTT 53108 | Weighted Gr. Acc. (M=7.5). | 0.56 g | Project No. | 1702R-4 |
| Castaic, L A County, California | Design Gr. Acc.(M= 6.5 )... | 0.83 g | Figure No. | C2 |
| For: Newhall Land & Farming Co. | Magnification Factor..... | 1 | Date. | 12-21-2009 |

**Location.....** **CPT-07**
Elevation (MSL)..... 955 ft

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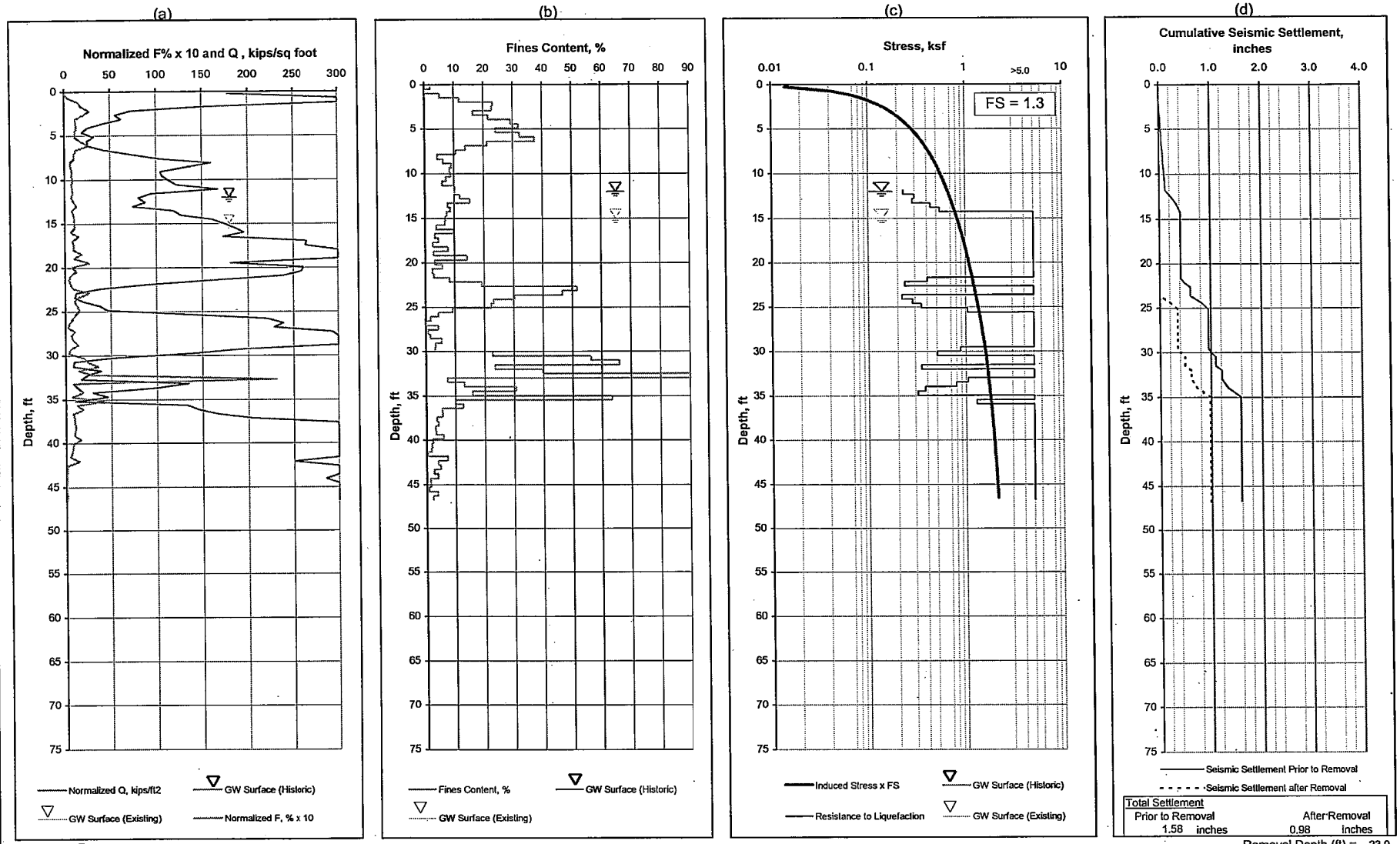
**Geological and Geotechnical Consultants**

## Analysis of Liquefaction Potential Based on $q_c$ and $f_s$ from CPT Data

| | | | | |
|---|---|---|---|---|
| Riverwood Village, VTT 53108 | Weighted Gr. Acc. (M=7.5). | 0.56 g | Project No. | 1702R-4 |
| Castaic, L A County, California | Design Gr. Acc.(M= 6.5 )... | 0.83 g | Figure No.. | C3 |
| For: Newhall Land & Farming Co. | Magnification Factor..... | 1 | Date. | 12-21-2009 |

**Location..... CPT-13**
Elevation (MSL)..... 940 ft

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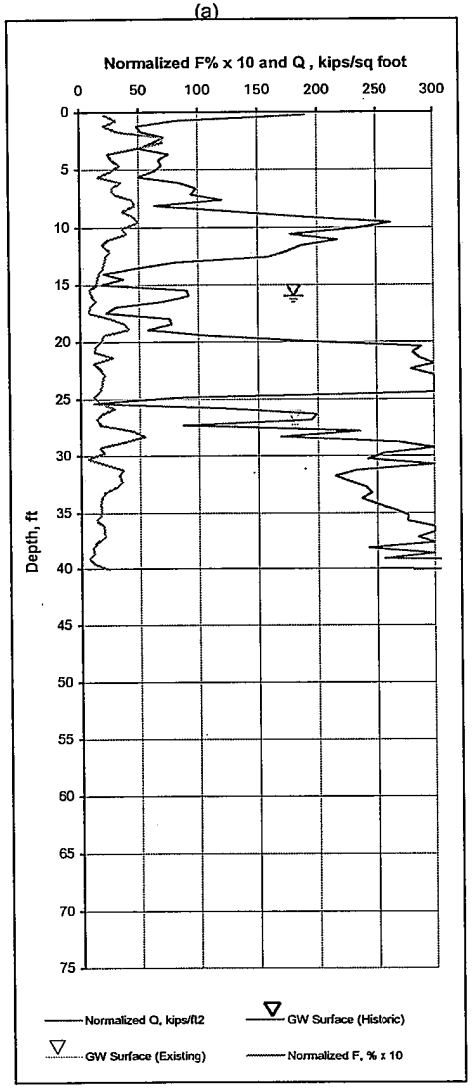
## Analysis of Liquefaction Potential Based on $q_c$ and $f_s$ from CPT Data

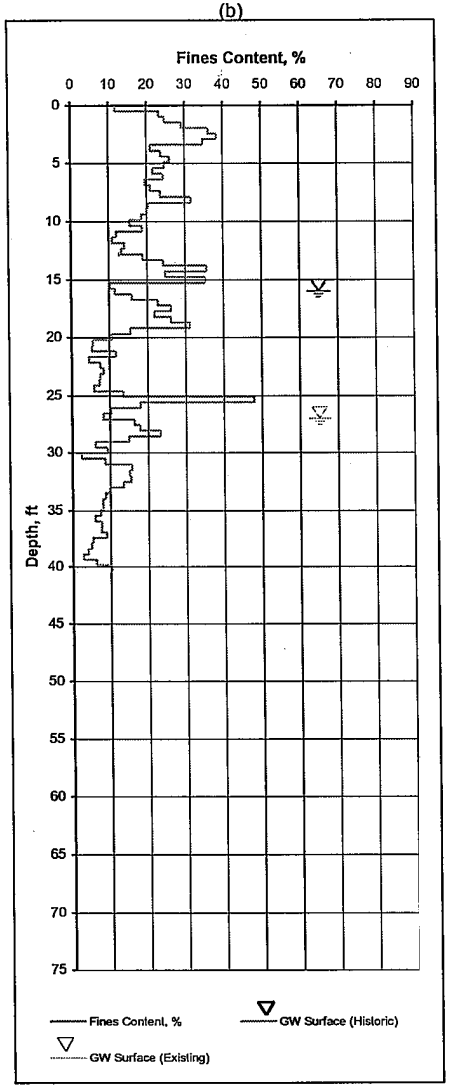
| | | | | |
|---|---|---|---|---|
| Riverwood Village, VTT 53108 | Weighted Gr. Acc. (M=7.5). | 0.56 g | Project No. | 1702R-4 |
| Castaic, L A County, California | Design Gr. Acc.(M= 6.5 )... | 0.83 g | Figure No. | C4 |
| For: Newhall Land & Farming Co. | Magnification Factor..... | 1 | Date. | 12-21-2009 |

**Location..... CPT-15**
Elevation (MSL)..... 946 ft

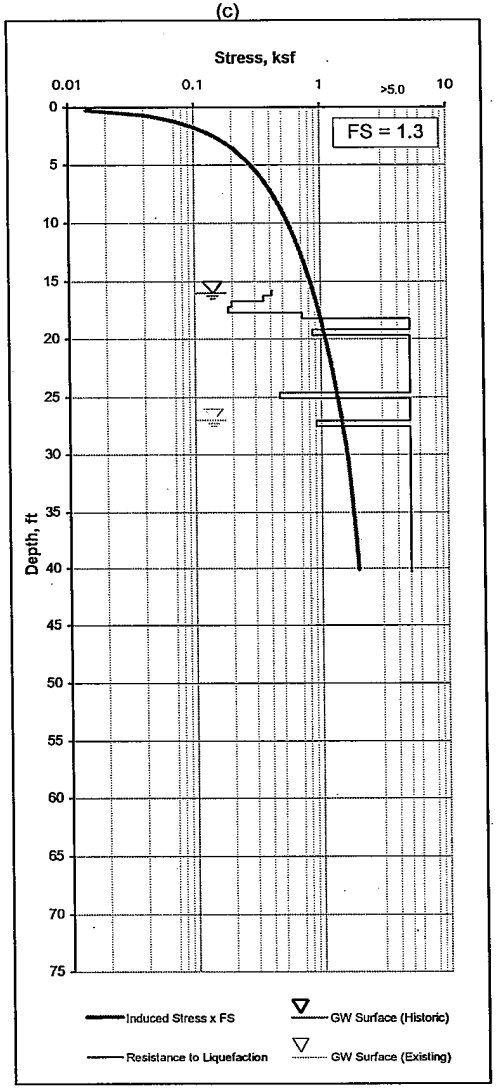
(a)



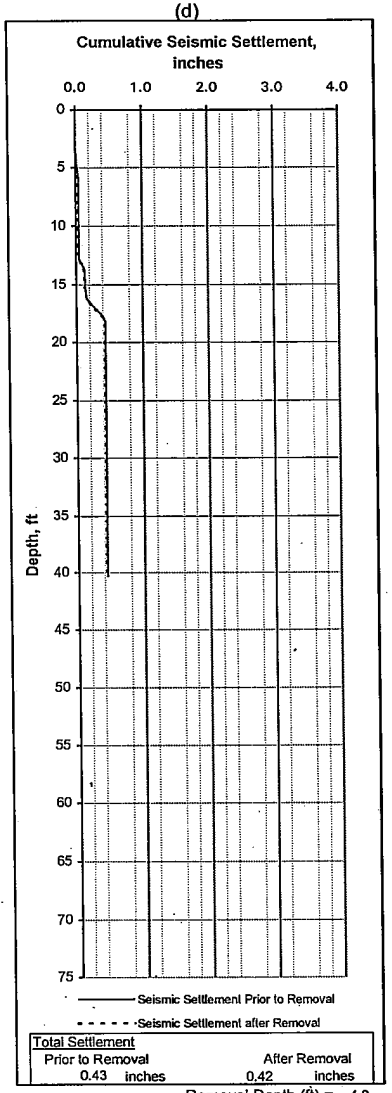

(b)




(c)




(d)




Removal Depth (ft) = 4.0

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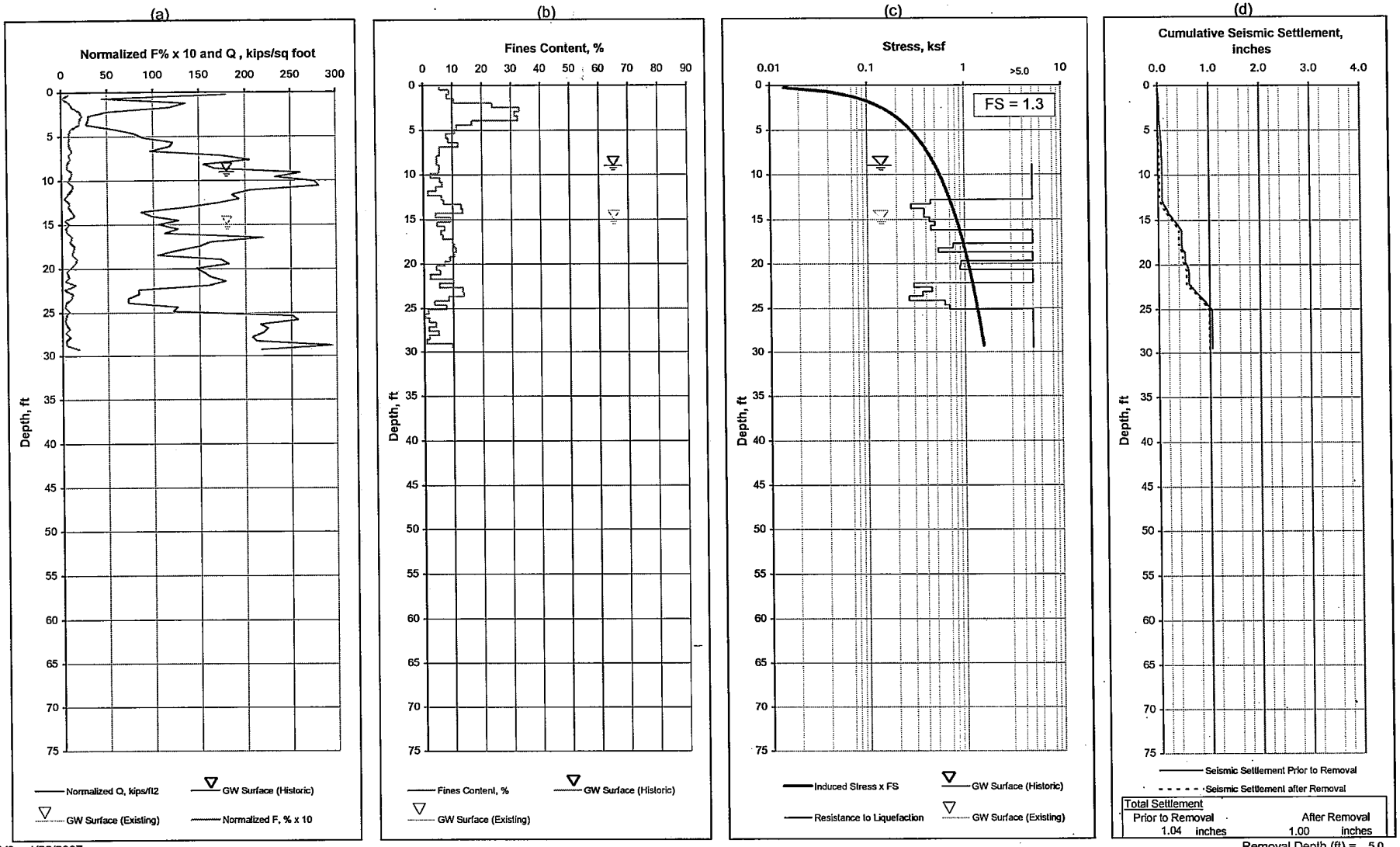
## Analysis of Liquefaction Potential Based on $q_c$ and $f_s$ from CPT Data

| | | | | |
|---|---|---|---|---|
| Riverwood Village, VTT 53108 | Weighted Gr. Acc. (M=7.5). | 0.56 g | Project No. | 1702R-4 |
| Castaic, L A County, California | Design Gr. Acc.(M= 6.5 )... | 0.83 g | Figure No. | C5 |
| For: Newhall Land & Farming Co. | Magnification Factor..... | 1 | Date. | 12-21-2009 |

**Location..... CPT-19**
Elevation (MSL)..... 923 ft

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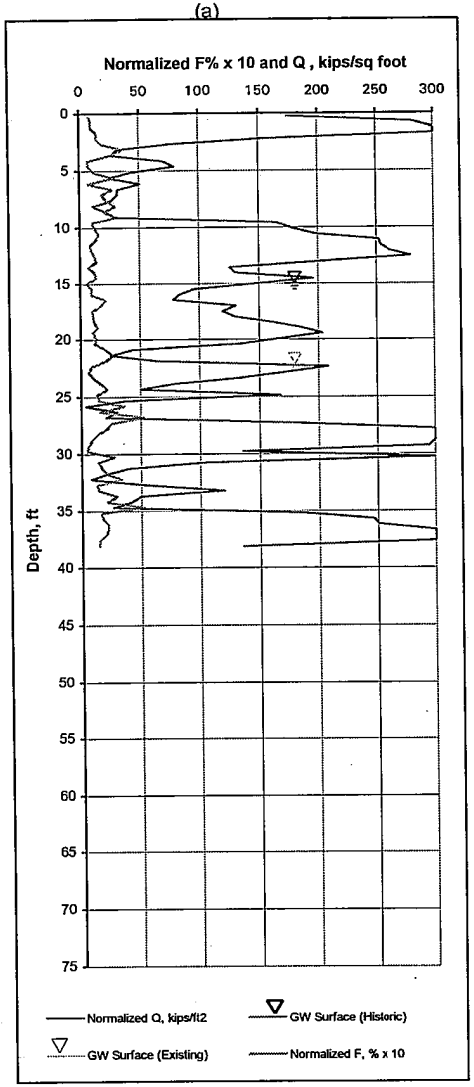
## Analysis of Liquefaction Potential Based on $q_c$ and $f_s$ from CPT Data

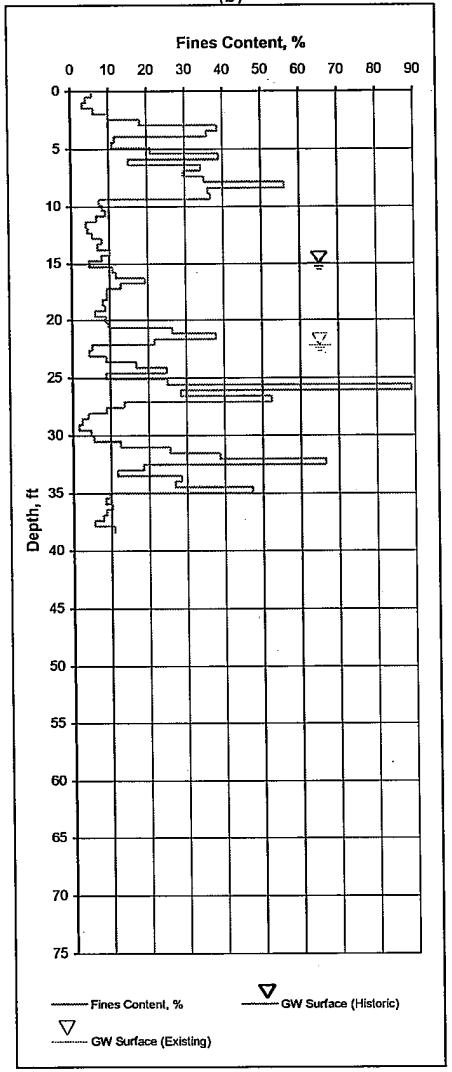
| | | | | |
|---|---|---|---|---|
| Riverwood Village, VTT 53108 | Weighted Gr. Acc. (M=7.5). | 0.56 g | Project No. | 1702R-4 |
| Castaic, L A County, California | Design Gr. Acc.(M= 6.5 )... | 0.83 g | Figure No. | C6 |
| For: Newhall Land & Farming Co. | Magnification Factor..... | 1 | Date. | 12-21-2009 |

**Location..... CPT-96**
Elevation (MSL)..... 964 ft

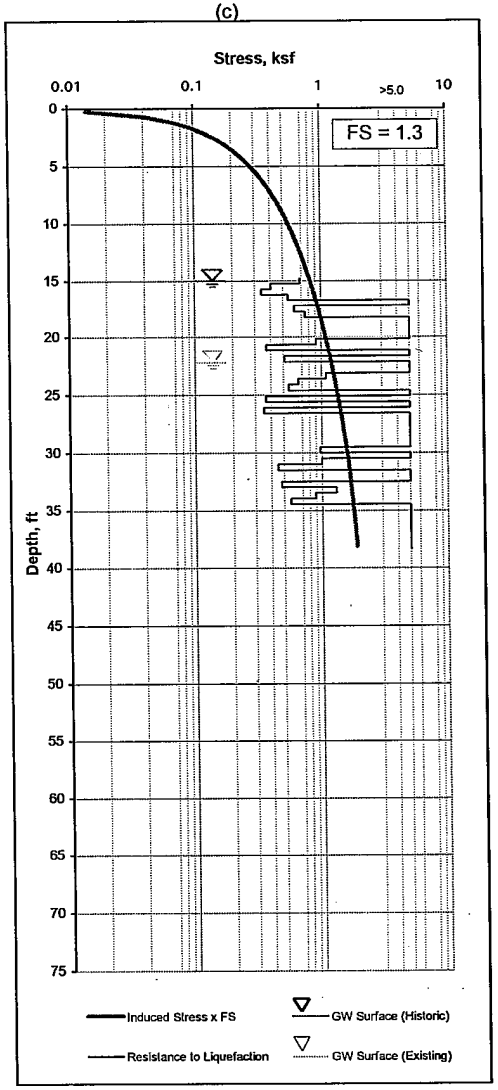
(a)



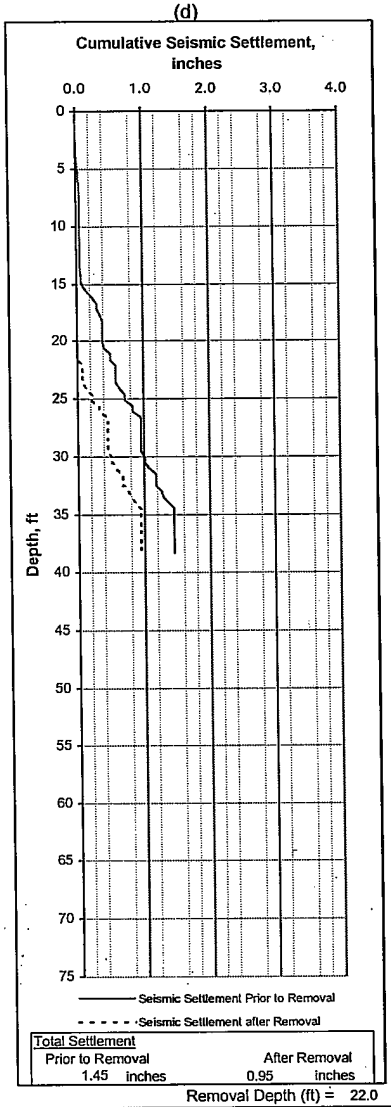

(b)




(c)




(d)




Removal Depth (ft) = 22.0

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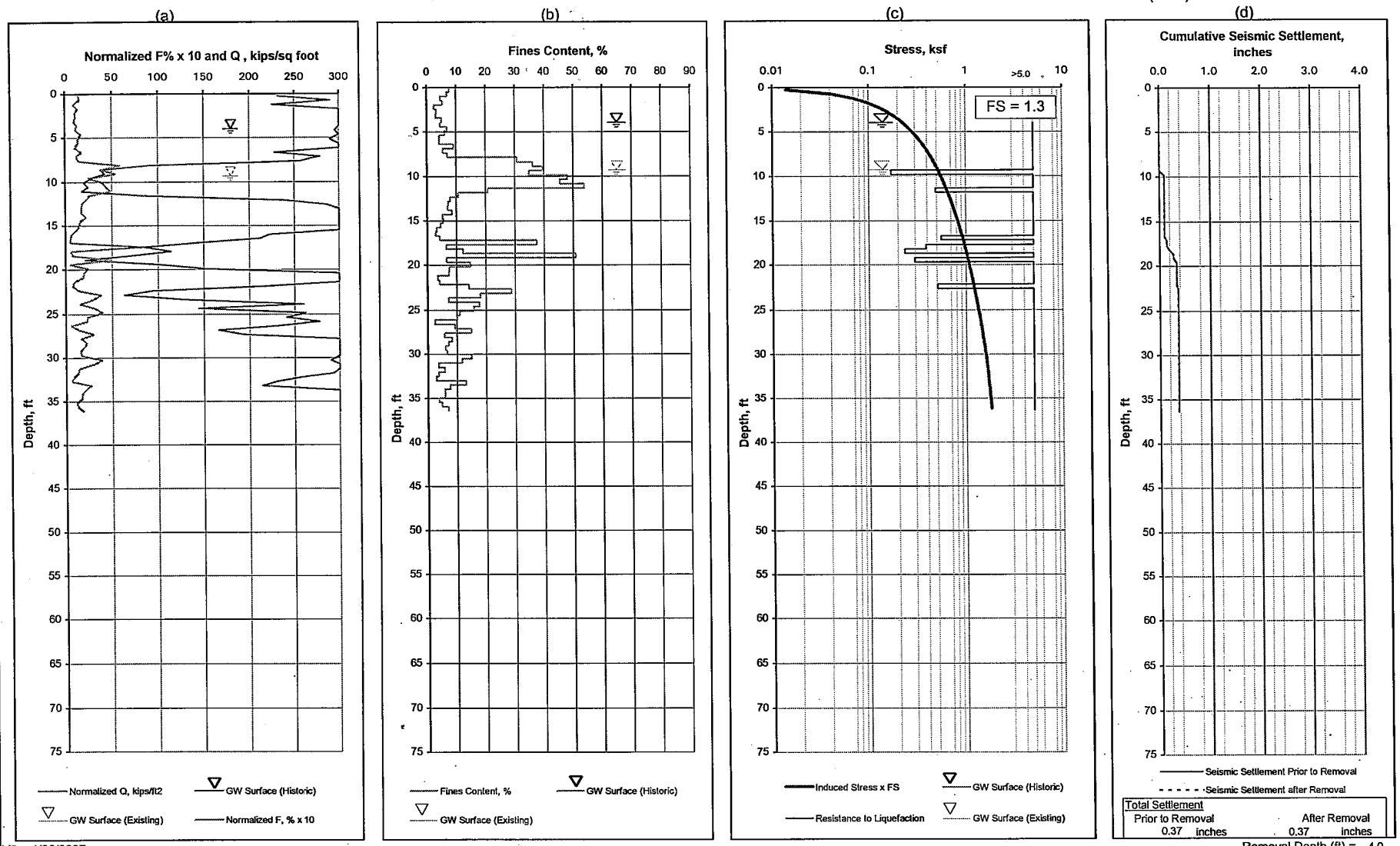
## Analysis of Liquefaction Potential Based on $q_c$ and $f_s$ from CPT Data

| | | | |
|---|---|---|---|
| Riverwood Village, VTT 53108 | Weighted Gr. Acc. (M=7.5). 0.56 g | Project No. | 1702R-4 |
| Castaic, L A County, California | Design Gr. Acc.(M= 6.5 )... 0.83 g | Figure No. | C7 |
| For: Newhall Land & Farming Co. | Magnification Factor..... 1 | Date. | 12-21-2009 |

**Location.....** **CPT-101**
Elevation (MSL)..... 914 ft

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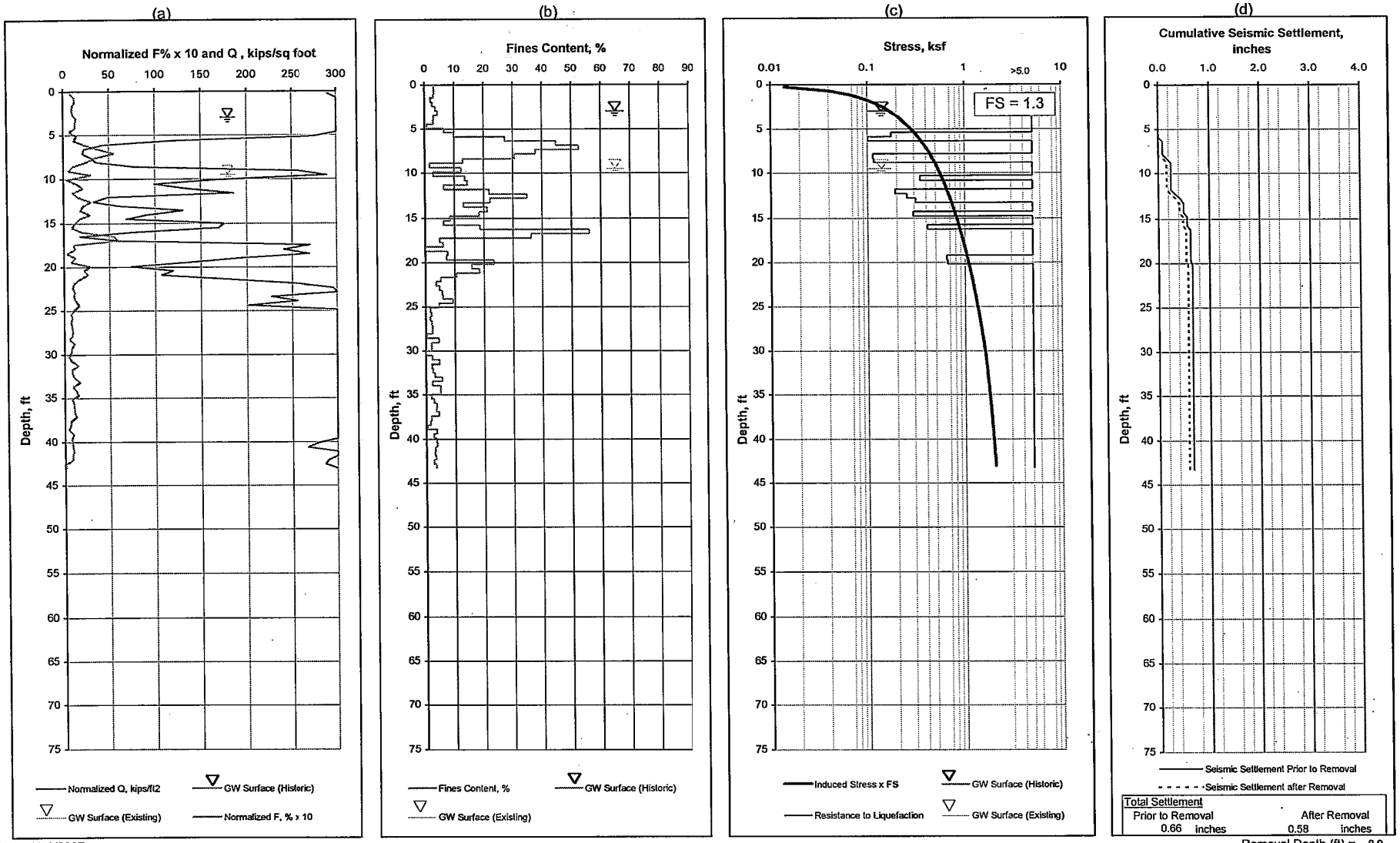
## Analysis of Liquefaction Potential Based on $q_c$ and $f_s$ from CPT Data

| | | | | |
|---|---|---|---|---|
| Riverwood Village, VTT 53108 | Weighted Gr. Acc. (M=7.5). | 0.56 g | Project No. | 1702R-4 |
| Castaic, L A County, California | Design Gr. Acc.(M= 6.5 )... | 0.83 g | Figure No. | C8 |
| For: Newhall Land & Farming Co. | Magnification Factor..... | 1 | Date. | 12-21-2009 |

**Location..... CPT-103**
Elevation (MSL)..... 905 ft

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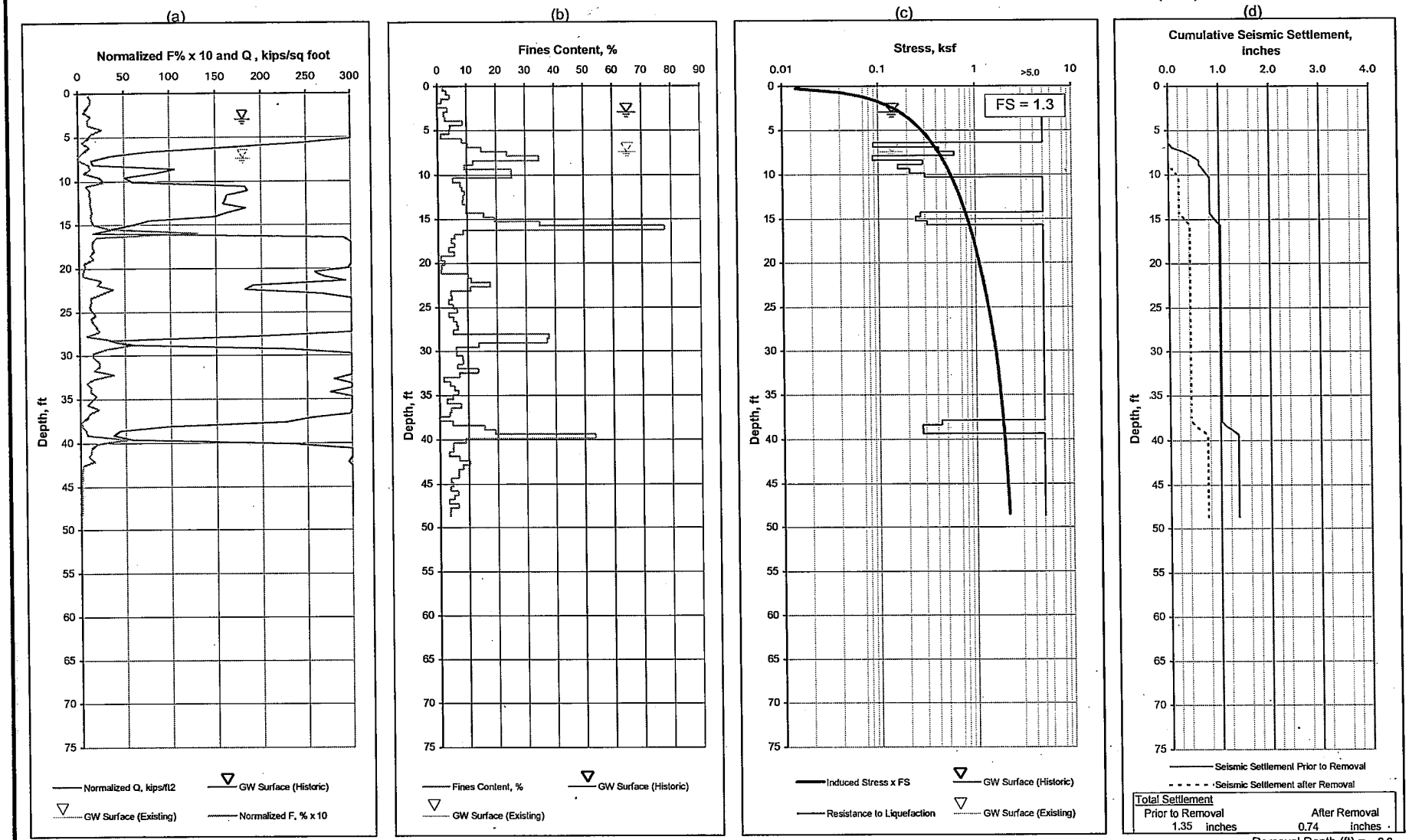
## Analysis of Liquefaction Potential Based on $q_c$ and $f_s$ from CPT Data

| | | | | |
|---|---|---|---|---|
| Riverwood Village, VTT 53108 | Weighted Gr. Acc. (M=7.5). | 0.56 g | Project No. | 1702R-4 |
| Castaic, L A County, California | Design Gr. Acc.(M= 6.5 )... | 0.83 g | Figure No. | C9 |
| For: Newhall Land & Farming Co. | Magnification Factor..... | 1 | Date. | 12-21-2009 |

**Location..... CPT-105**
Elevation (MSL)..... 907 ft

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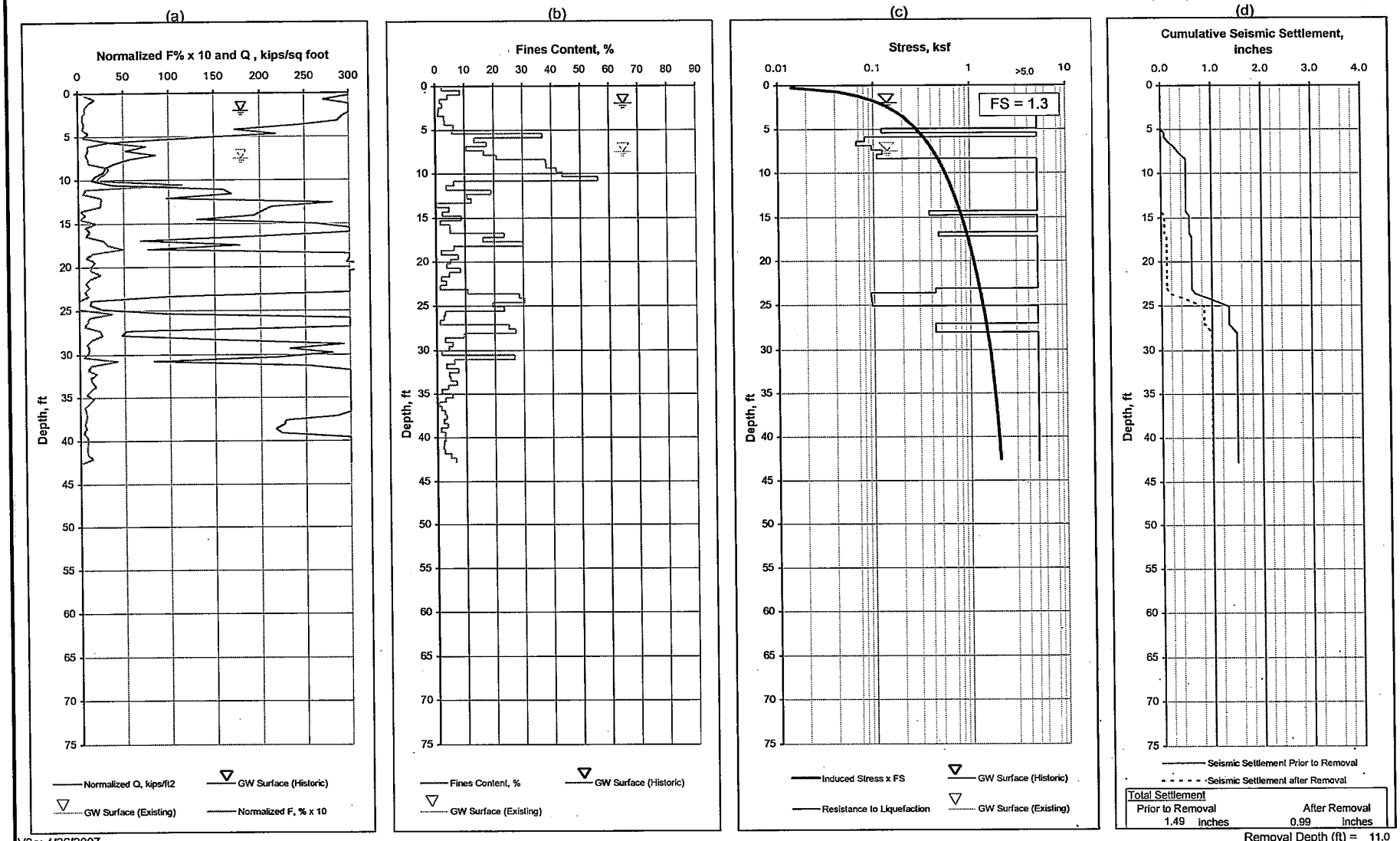
## Analysis of Liquefaction Potential Based on $q_c$ and $f_s$ from CPT Data

| | | | | |
|---|---|---|---|---|
| Riverwood Village, VTT 53108 | Weighted Gr. Acc. (M=7.5). | 0.56 g | Project No. | 1702R-4 |
| Castaic, L A County, California | Design Gr. Acc.(M= 6.5 )... | 0.83 g | Figure No. | C10 |
| For: Newhall Land & Farming Co. | Magnification Factor..... | 1 | Date. | 12-21-2009 |

**Location..... CPT-106**
Elevation (MSL)..... 905 ft

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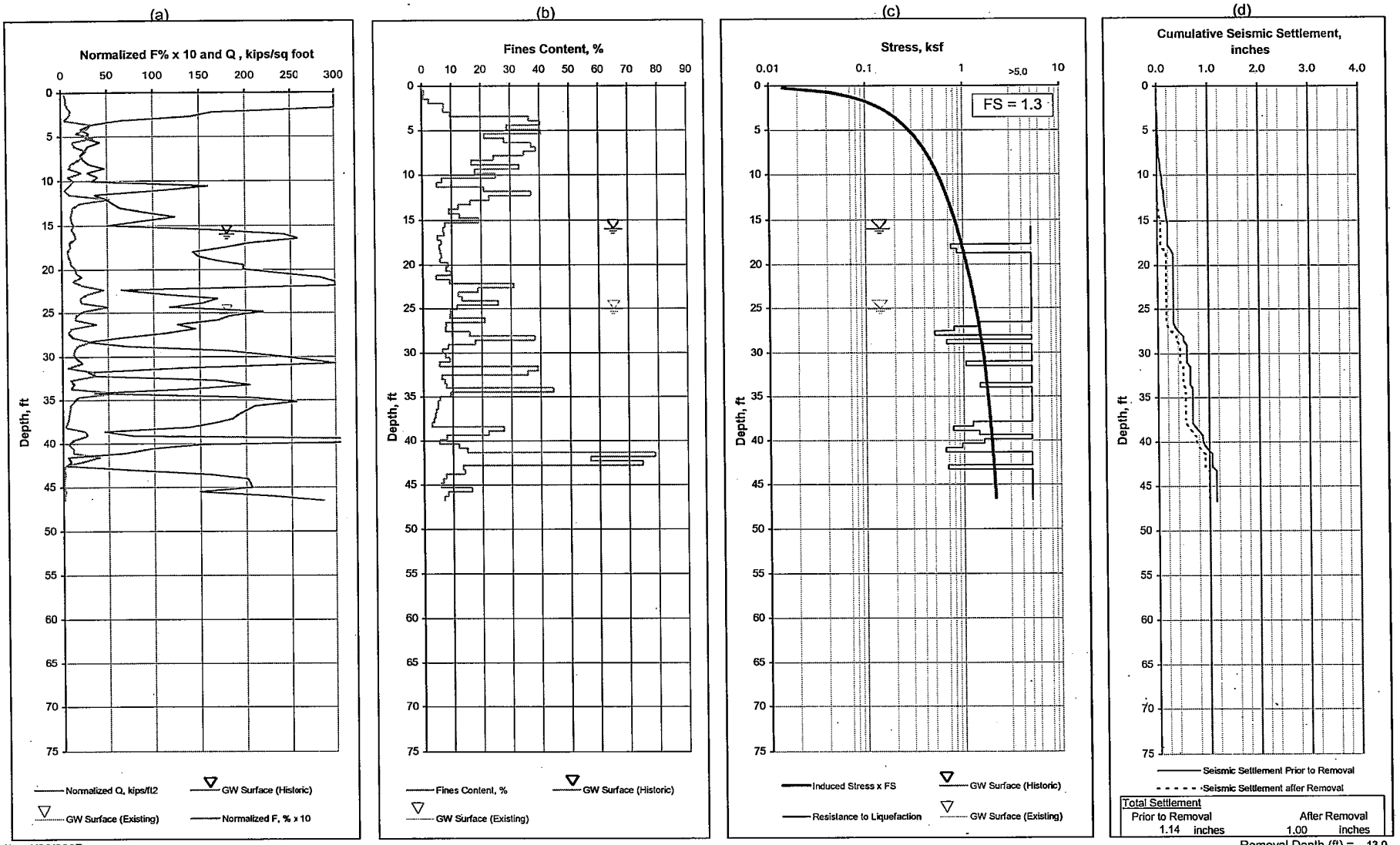
## Analysis of Liquefaction Potential Based on $q_c$ and $f_s$ from CPT Data

| | | | | |
|---|---|---|---|---|
| Riverwood Village, VTT 53108 | Weighted Gr. Acc. (M=7.5). | 0.56 g | Project No. | 1702R-4 |
| Castaic, L A County, California | Design Gr. Acc.(M= 6.5 )... | 0.83 g | Figure No. | C11 |
| For: Newhall Land & Farming Co. | Magnification Factor..... | 1 | Date. | 12-21-2009 |

**Location..... CPT-108**
Elevation (MSL)..... 951 ft

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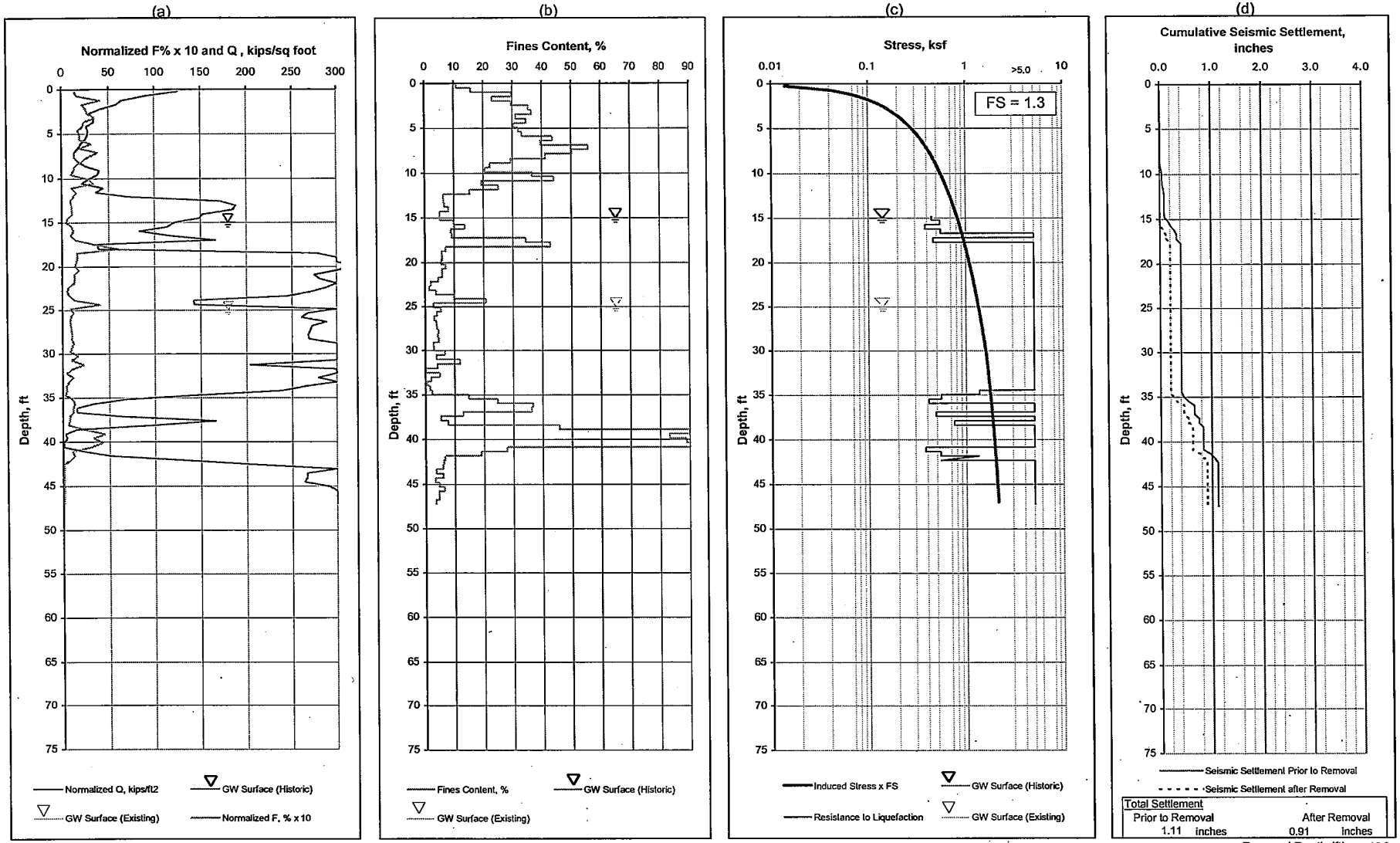
**Geological and Geotechnical Consultants**

## Analysis of Liquefaction Potential Based on $q_c$ and $f_s$ from CPT Data

| | | | | | |
|---|---|---|---|---|---|
| Riverwood Village, VTT 53108 | Weighted Gr. Acc. (M=7.5). | 0.56 g | Project No. | 1702R-4 |
| Castaic, L A County, California | Design Gr. Acc.(M= 6.5 )... | 0.83 g | Figure No. | C12 |
| For: Newhall Land & Farming Co. | Magnification Factor..... | 1 | Date. | 12-21-2009 |

**Location.....** **CPT-109**
Elevation (MSL)..... 952 ft

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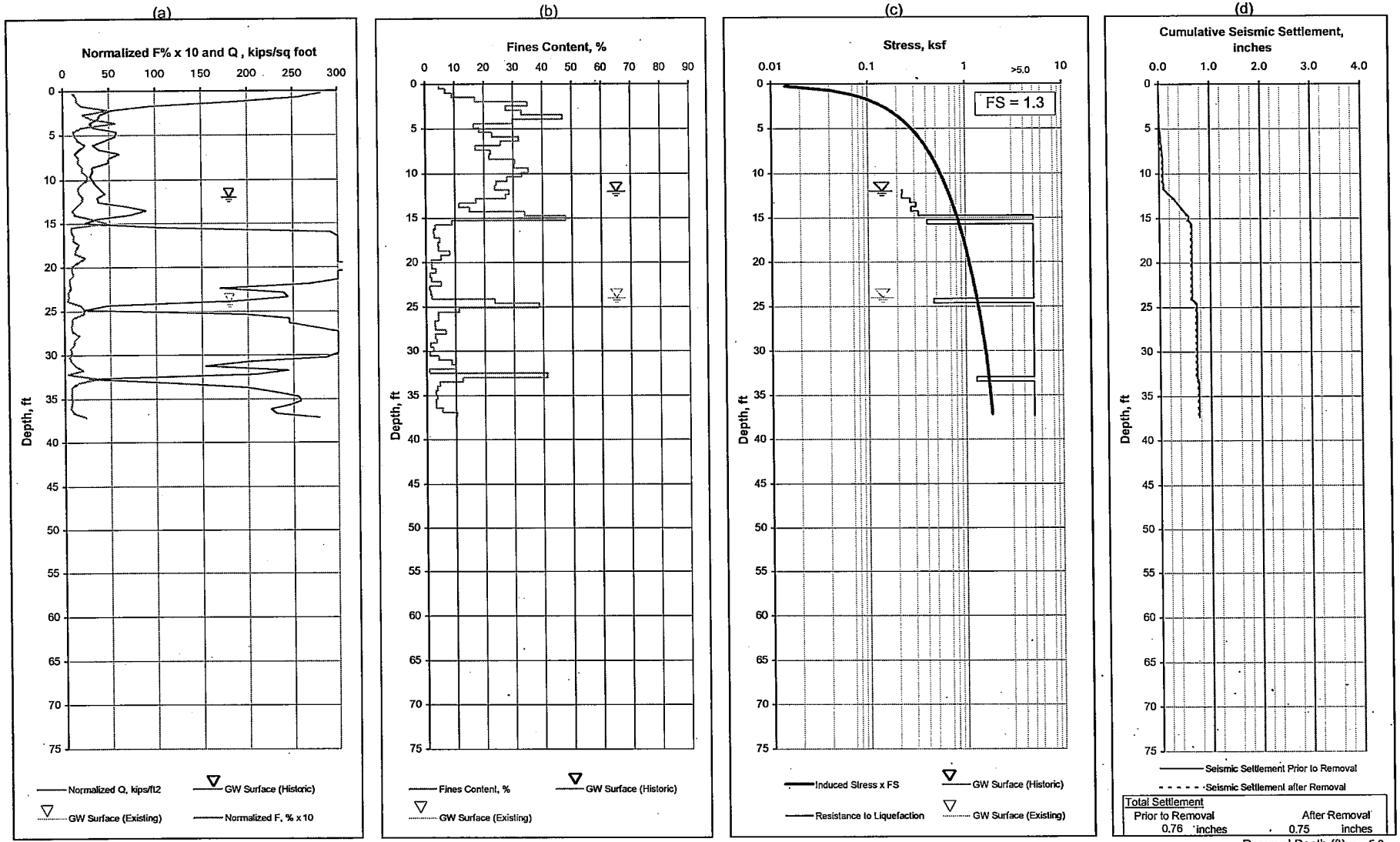
**Geological and Geotechnical Consultants**

## Analysis of Liquefaction Potential Based on $q_c$ and $f_s$ from CPT Data

| | | | | |
|---|---|---|---|---|
| River Village, VTT 53108 | Weighted Gr. Acc. (M=7.5). | 0.56 g | Project No. | 1702R-4 |
| Castaic, L A County, California | Design Gr. Acc.(M= 6.5 )... | 0.83 g | Figure No. | C13 |
| For: Newhall Land & Farming Co. | Magnification Factor..... | 1 | Date. | 12-21-2009 |

**Location..... CPT-110**
Elevation (MSL)..... 953 ft



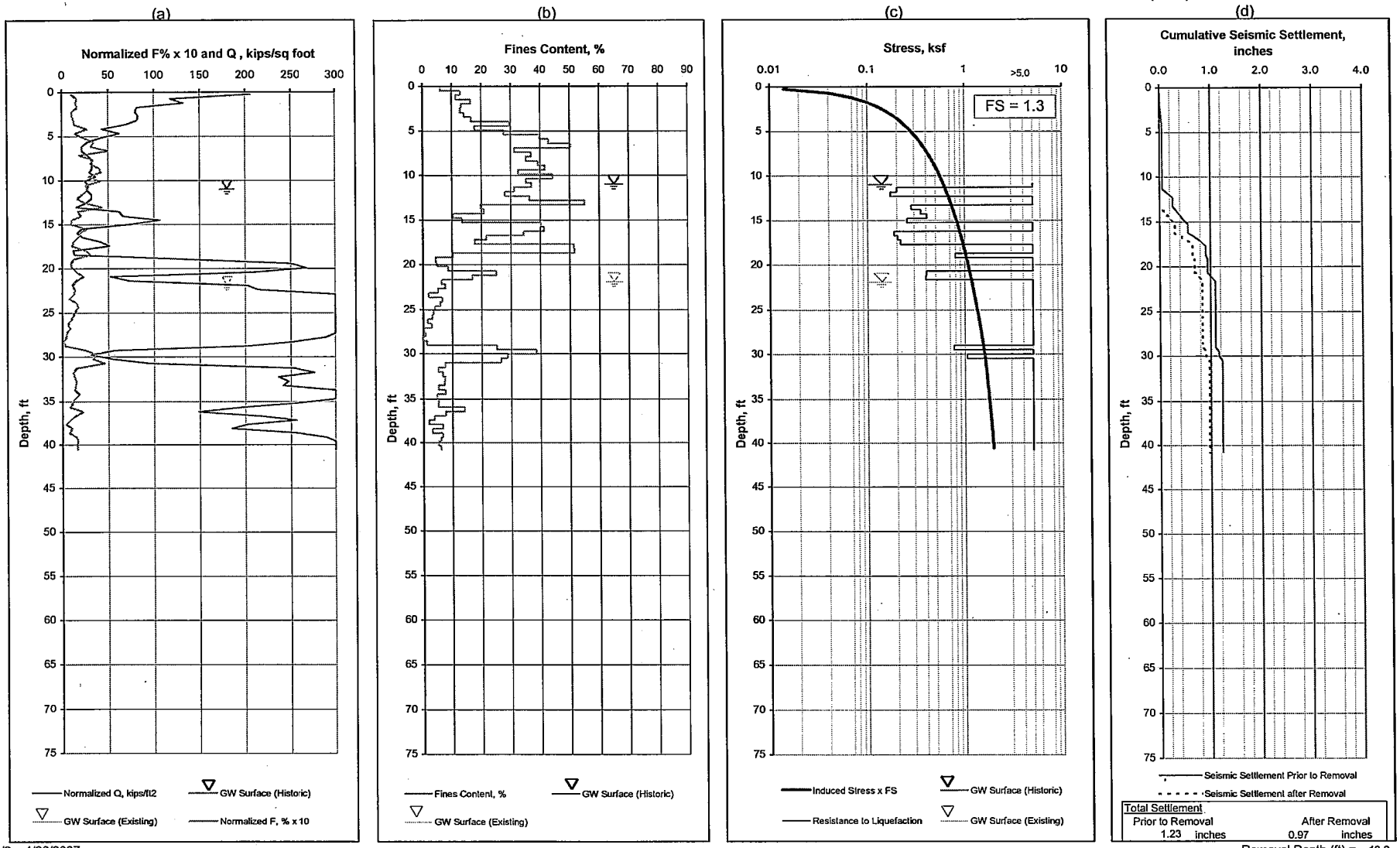

V3e; 4/26/2007

**Allan E. Seward Engineering Geology, Inc.**
**Geological and Geotechnical Consultants**

## Analysis of Liquefaction Potential Based on $q_c$ and $f_s$ from CPT Data

| | | | | | |
|---|---|---|---|---|---|
| River Village, VTT 53108 | Weighted Gr. Acc. (M=7.5). | 0.56 g | Project No. | 1702R-4 |
| Castaic, L A County, California | Design Gr. Acc.(M= 6.5 )... | 0.83 g | Figure No. | C14 |
| For: Newhall Land & Farming Co. | Magnification Factor..... | 1 | Date. | 12-21-2009 |

**Location.....** **CPT-111**
Elevation (MSL)..... 953 ft




V3e; 4/26/2007

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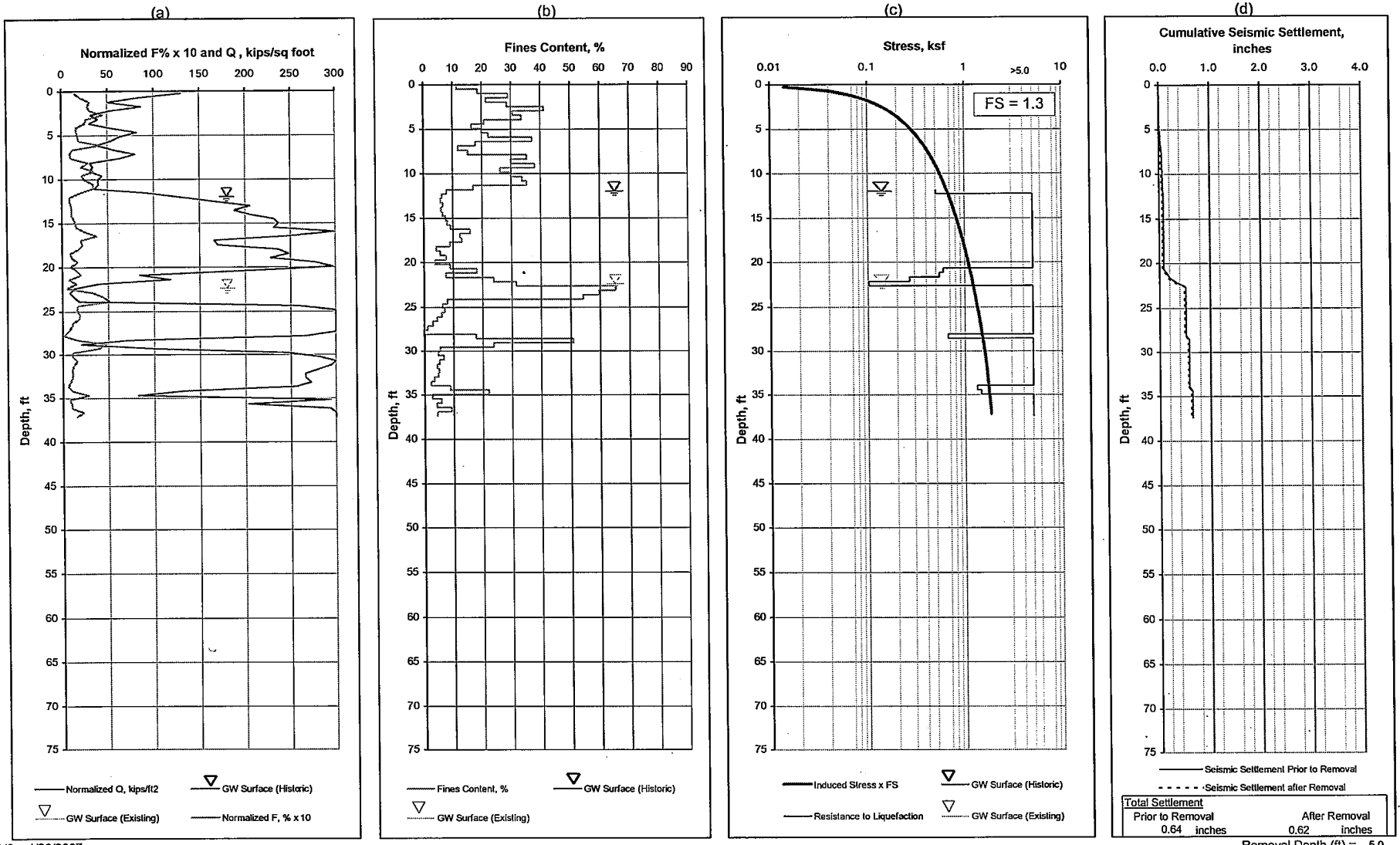
**Geological and Geotechnical Consultants**

## Analysis of Liquefaction Potential Based on $q_c$ and $f_s$ from CPT Data

| | | | | | |
|---|---|---|---|---|---|
| River Village, VTT 53108 | | Weighted Gr. Acc. (M=7.5). | 0.56 g | Project No. | 1702R-4 |
| Castaic, L A County, California | | Design Gr. Acc.(M= 6.5 )... | 0.83 g | Figure No. | C15 |
| For: Newhall Land & Farming Co. | | Magnification Factor..... | 1 | Date. | 12-21-2009 |

**Location.....** **CPT-114**
Elevation (MSL)..... 954 ft




V3e; 4/26/2007

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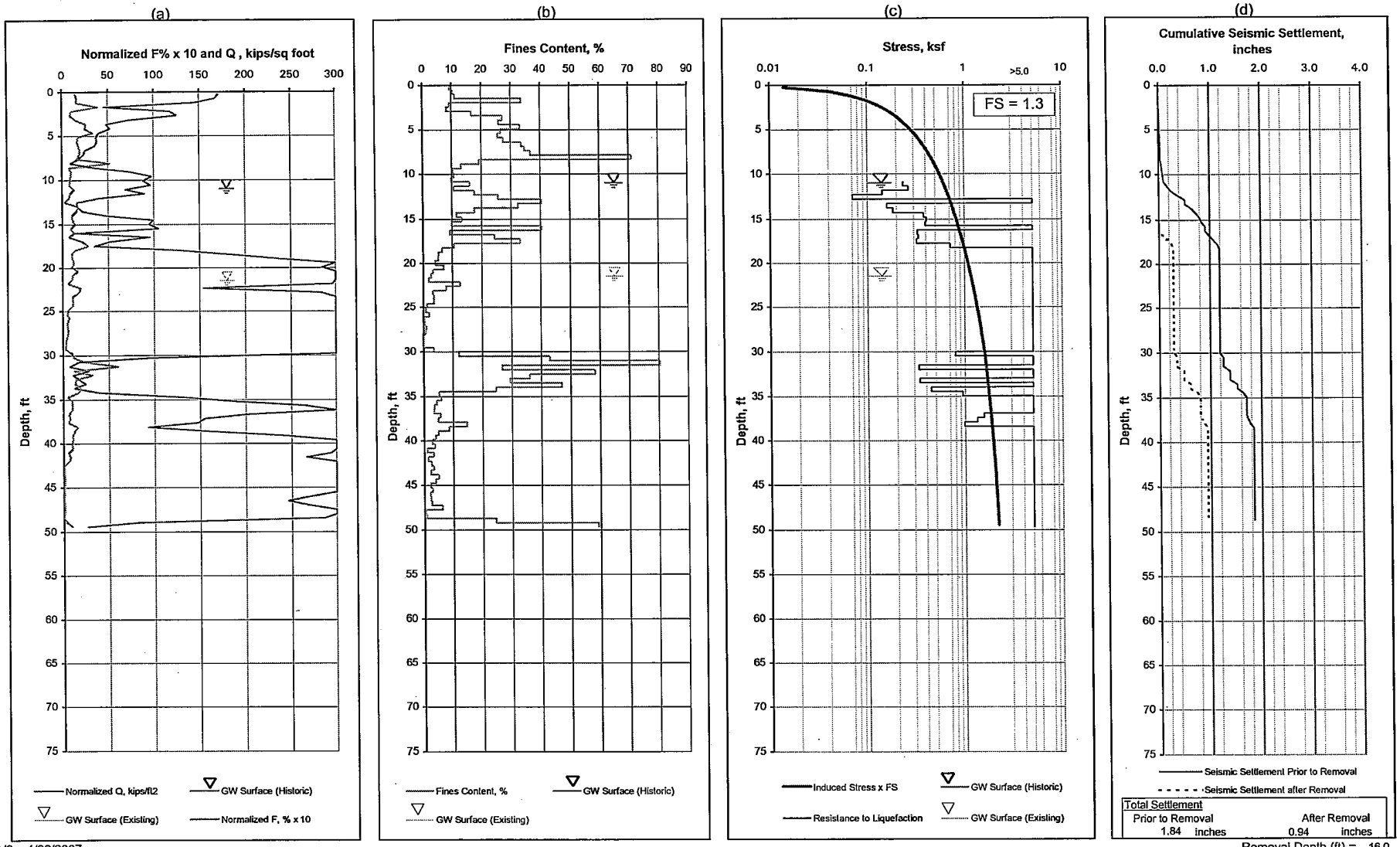
**Geological and Geotechnical Consultants**

## Analysis of Liquefaction Potential Based on $q_c$ and $f_s$ from CPT Data

| | | | | |
|---|---|---|---|---|
| River Village, VTT 53108 | Weighted Gr. Acc. (M=7.5). | 0.56 g | Project No. | 1702R-4 |
| Castaic, L A County, California | Design Gr. Acc.(M= 6.5 )... | 0.83 g | Figure No. | C16 |
| For: Newhall Land & Farming Co. | Magnification Factor..... | 1 | Date. | 12-21-2009 |

**Location.....** **CPT-115**
Elevation (MSL)..... 954 ft




V3e; 4/26/2007

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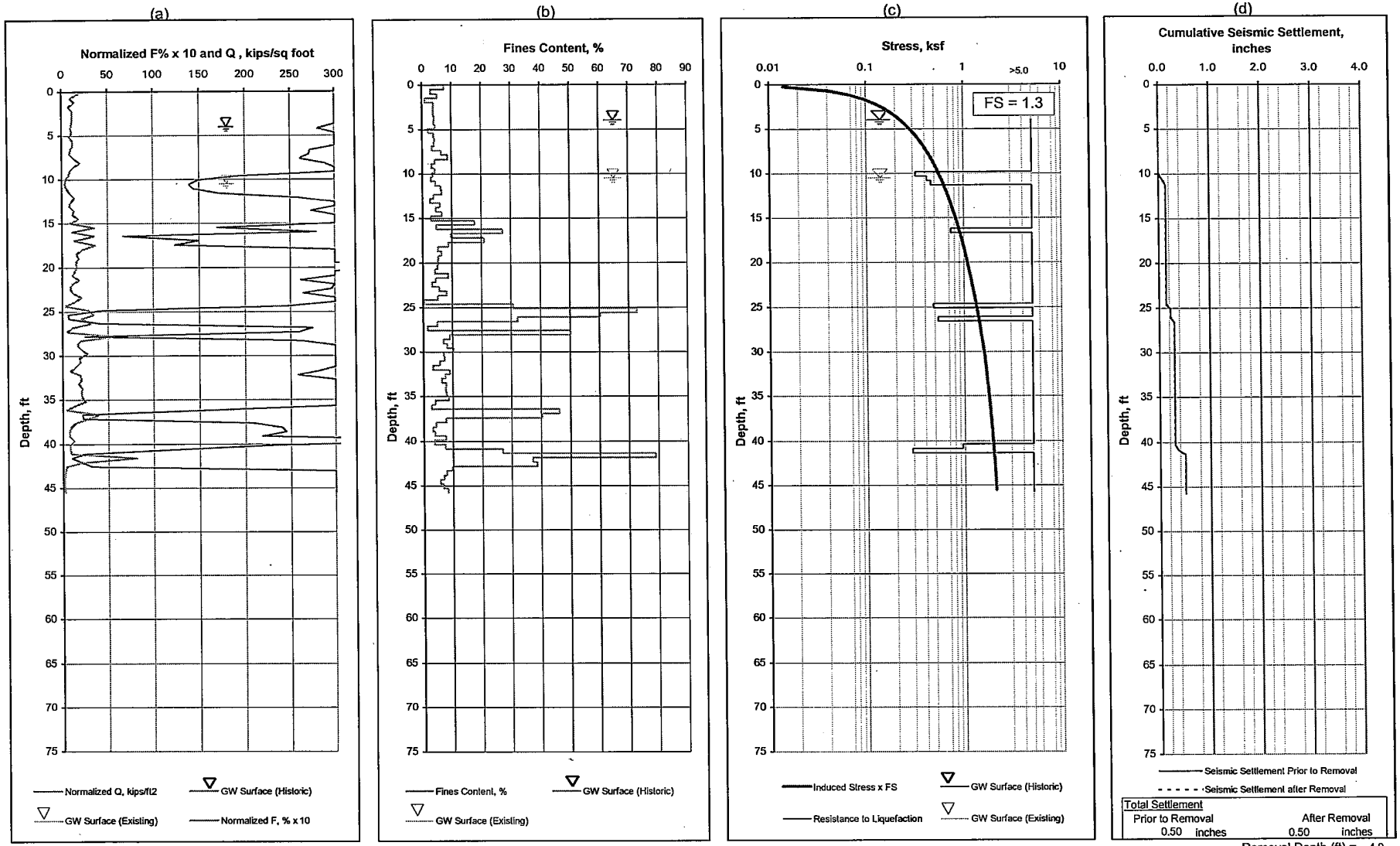
**Geological and Geotechnical Consultants**

## Analysis of Liquefaction Potential Based on $q_c$ and $f_s$ from CPT Data

| | | | |
|---|---|---|---|
| River Village, VTT 53108 | Weighted Gr. Acc. (M=7.5). 0.56 g | Project No. | 1702R-4 |
| Castaic, L A County, California | Design Gr. Acc.(M= 6.5 )... 0.83 g | Figure No. | C17 |
| For: Newhall Land & Farming Co. | Magnification Factor..... 1 | Date. | 12-21-2009 |

**Location.....** **CPT-118**
Elevation (MSL)..... 920 ft



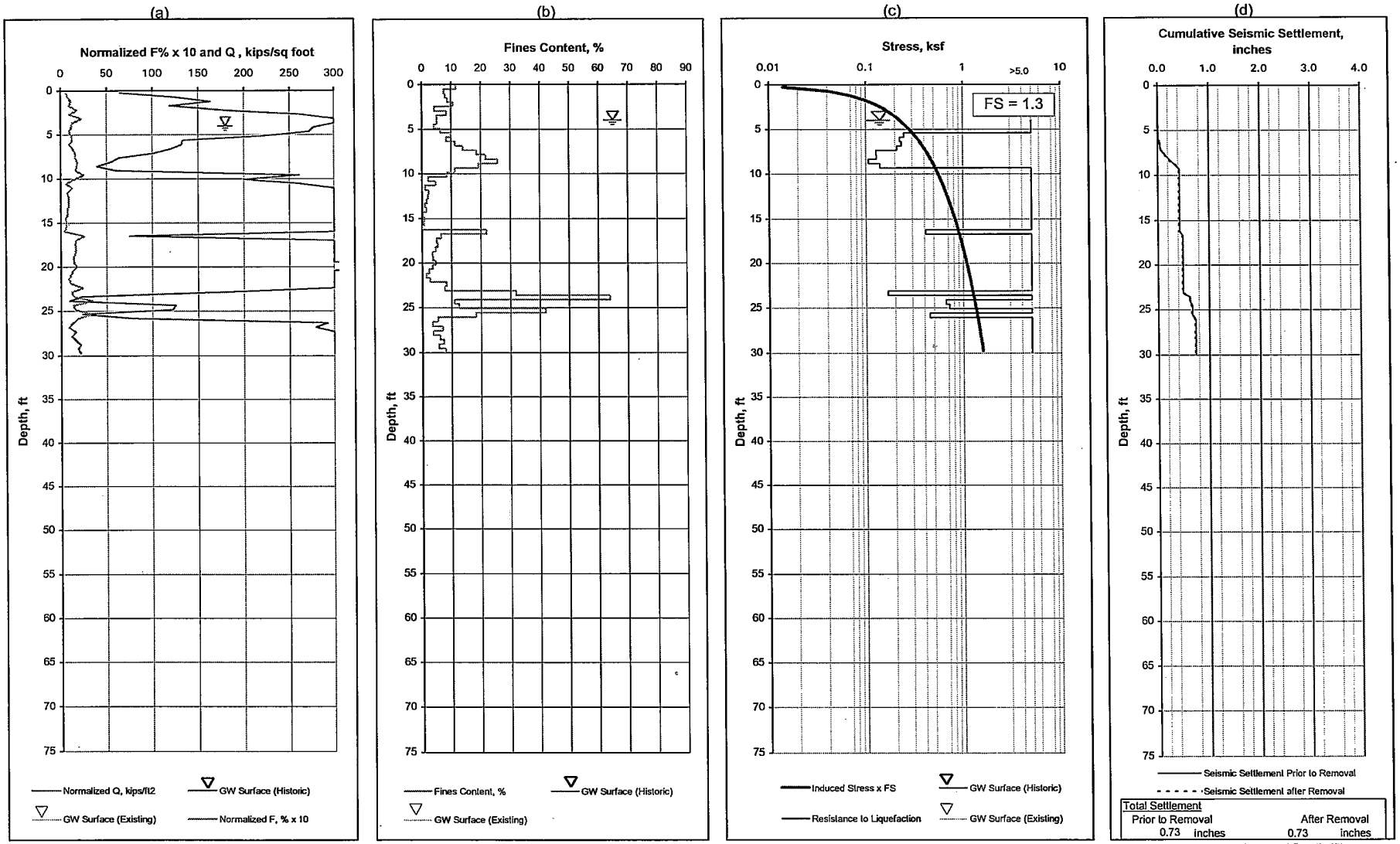

V3e; 4/26/2007

**Allan E. Seward Engineering Geology, Inc.**
**Geological and Geotechnical Consultants**

## Analysis of Liquefaction Potential Based on $q_c$ and $f_s$ from CPT Data

| | | | | | |
|---|---|---|---|---|---|
| River Village, VTT 53108 | | Weighted Gr. Acc. (M=7.5). | 0.56 g | Project No. | 1702R-4 |
| Castaic, L A County, California | | Design Gr. Acc.(M= 6.5 )... | 0.83 g | Figure No. | C18 |
| For: Newhall Land & Farming Co. | | Magnification Factor..... | 1 | Date. | 12-21-2009 |

**Location.....** **CPT-122A**
Elevation (MSL)..... 906 ft

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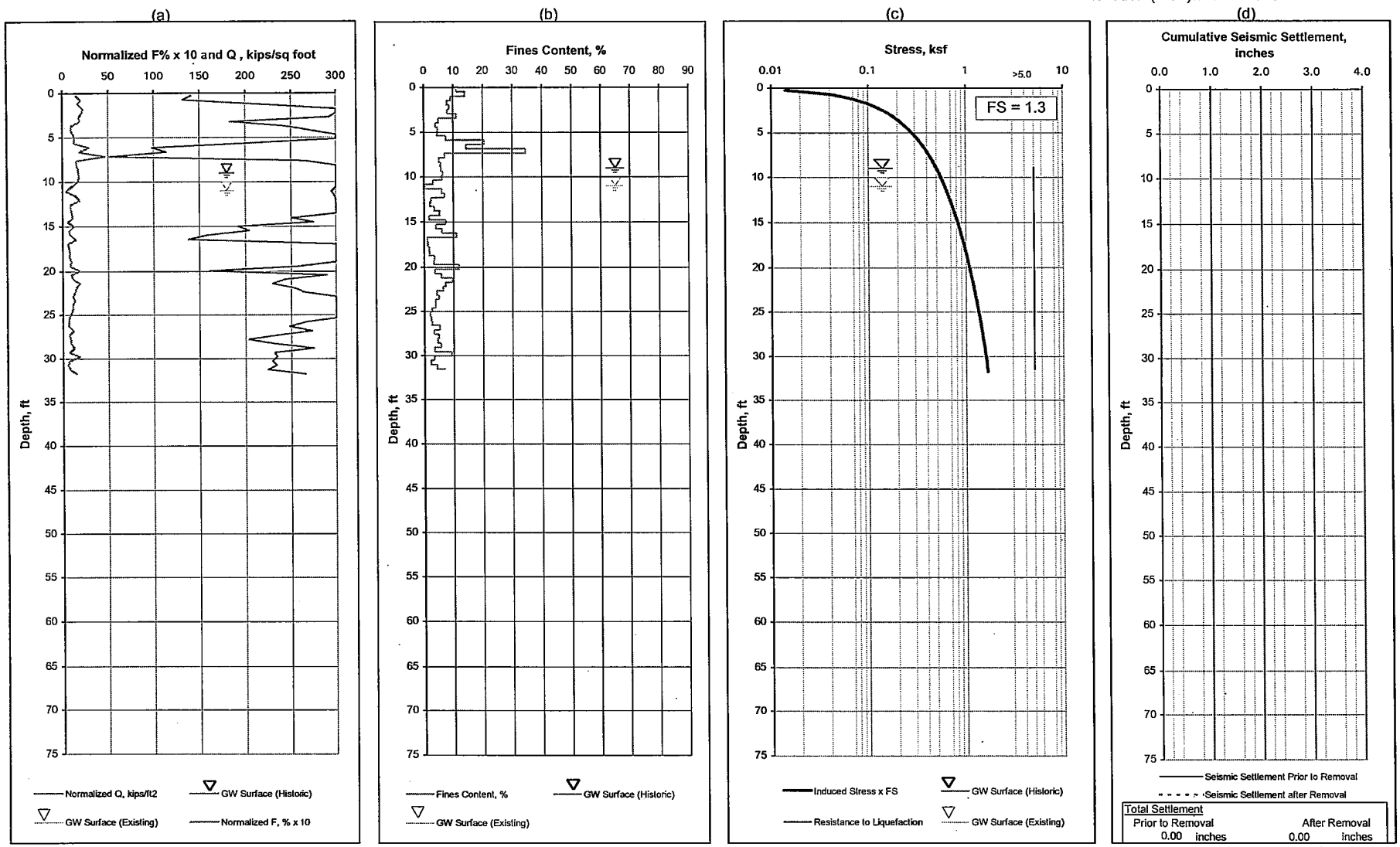
## Analysis of Liquefaction Potential Based on $q_c$ and $f_s$ from CPT Data

| | | | |
|---|---|---|---|
| River Village, VTT 53108 | Weighted Gr. Acc. (M=7.5). 0.56 g | Project No. | 1702R-4 |
| Castaic, L A County, California | Design Gr. Acc.(M= 6.5 )... 0.83 g | Figure No. | C19 |
| For: Newhall Land & Farming Co. | Magnification Factor..... 1 | Date. | 12-21-2009 |

**Location..... CPT-125**
Elevation (MSL)..... 913 ft

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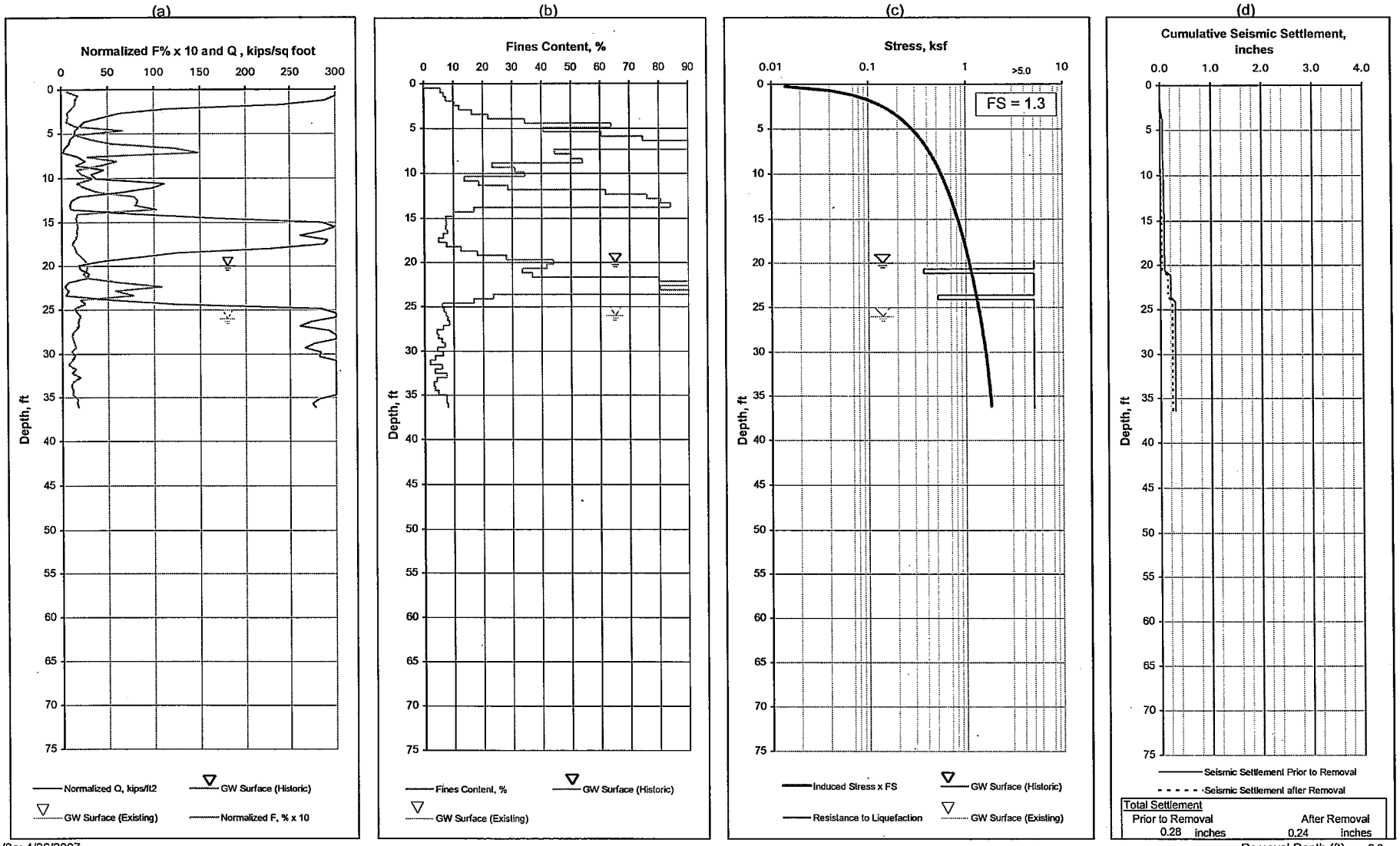
**Analysis of Liquefaction Potential Based on $q_c$ and $f_s$ from CPT Data**

| | | | | |
|---|---|---|---|---|
| River Village, VTT 53108 | Weighted Gr. Acc. (M=7.5). | 0.56 g | Project No. | 1702R-4 |
| Castaic, L A County, California | Design Gr. Acc.(M= 6.5 )... | 0.83 g | Figure No. | C20 |
| For: Newhall Land & Farming Co. | Magnification Factor..... | 1 | Date. | 12-21-2009 |

**Location.....** **CPT-128**
Elevation (MSL)..... 951 ft




V3e; 4/26/2007

**Allan E. Seward Engineering Geology, Inc.**
**Geological and Geotechnical Consultants**

## Analysis of Liquefaction Potential Based on $q_c$ and $f_s$ from CPT Data

| | | | |
|---|---|---|---|
| River Village, VTT 53108 | Weighted Gr. Acc. (M=7.5). 0.56 g | Project No. | 1702R-4 |
| Castaic, L A County, California | Design Gr. Acc.(M= 6.5 )... 0.83 g | Figure No. | C21 |
| For: Newhall Land & Farming Co. | Magnification Factor..... 1 | Date. | 12-21-2009 |

## LIQUEFACTION POTENTIAL AND CYCLIC SETTLEMENT ANALYSIS

**PROJECT:** River Village, VTT 63108
**Job No.:** 1702R-4

| | | | | | |
|---|---|---|---|---|---|
| Location | CPT-115 | Basic Earthquake Magnitude | 7.5 | Conditions: | Existing conditions with historic groundwater level |
| Type of Sampler (CPT/SPT/CD) | CPT | Approx. Distance From Site (miles) | 2.5 | | |
| Ground Surface Elevation | 954 ft. MSL | Design Magnitude | 6.5 | 1.30 | Specified Factor of Safety |
| Existing Ground Water Depth | 21.5 ft. Below GL | Peak Ground Accel (M =7.5 ) | 0.50 g. | | FS = 1.3 |
| Historic Ground Water Depth | 11.0 ft. Below GL | Design PGA (M = 6.5 ) | 0.57 g. | | |
| | | Magnification Factor | 1.0 | | |

| Layer No. | Mid-layer Depth (ft) | Elevation (ft MSL) | Depth of layer below Ground Level (ft) Top | Bottom | Total Unit Wt. (1) (kcf) | Total Stress (2) (ksf) | Effective Stress (3) (ksf) | CPT Tip Resistance (4) (ksf) | F, % normalized (5) | 1st trial $I_c$ (6) | 2nd trial $I_c$ (7) | exponent n of Final $I_c$ and $q_{c1N}$ (8) | $q_{c1N}$ normalized (9) (ksf) | Final $I_c$ (10) | $K_c$ factor for fines (11) | Equivalent $(q_{c1N})_{cs}$ clean sand (12) | Percent Fines, % Estimated (13) | Lab (14) | Cyclic Resistance Ratio (15) M=7.5 | Cyclic Resistance M = 7.5 (16) (ksf) | Stress Reduction Factor, $r_d$ (17) | Specified FS x Induced Cyclic Stress (18) M=7.5 (ksf) | Calculated Factor of Safety (19) | Cumulative Settlement after Removals (inches) | Thickness of Potentially Liquefiable Layers After Removals (ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.25 | 953.8 | 0 | 0.49 | 0.120 | 0.029 | 0.029 | 42.66 | 1.451 | 1.42 | 1.65 | 0.50 | 171.00 | 1.65 | 1.15 | 196.44 | 9 | | >0.6 | >5.0 | 0.999 | 0.019 | Non Liquefiable | 0.00 | |
| 2 | 0.74 | 953.3 | 0.49 | 0.98 | 0.120 | 0.088 | 0.088 | 72.24 | 1.832 | 1.54 | 1.90 | 0.50 | 167.18 | 1.90 | 1.19 | 198.64 | 10 | | >0.6 | >5.0 | 0.998 | 0.044 | Non Liquefiable | 0.00 | |
| 3 | 1.23 | 952.8 | 0.98 | 1.48 | 0.120 | 0.148 | 0.148 | 81.12 | 1.990 | 1.50 | 1.97 | 0.50 | 146.12 | 1.97 | 1.21 | 176.97 | 11 | | >0.6 | >5.0 | 0.997 | 0.073 | Non Liquefiable | 0.00 | |
| 4 | 1.73 | 952.3 | 1.48 | 1.97 | 0.120 | 0.207 | 0.207 | 30.30 | 3.817 | 2.26 | 2.56 | 0.50 | 45.77 | 2.56 | 3.10 | 141.82 | 34 | | 0.345 | 0.071 | 0.996 | 0.103 | 0.69 | 0.00 | |
| 5 | 2.22 | 951.8 | 1.97 | 2.46 | 0.120 | 0.266 | 0.266 | 65.20 | 0.861 | 1.54 | 1.85 | 0.50 | 117.58 | 1.85 | 1.15 | 134.81 | 9 | | 0.319 | 0.087 | 0.995 | 0.132 | 0.61 | 0.00 | |
| 6 | 2.71 | 951.3 | 2.46 | 2.95 | 0.120 | 0.325 | 0.325 | 100.72 | 0.890 | 1.52 | 1.80 | 0.50 | 125.12 | 1.80 | 1.11 | 138.84 | 8 | | 0.373 | 0.107 | 0.994 | 0.161 | 0.66 | 0.00 | |
| 7 | 3.20 | 950.8 | 2.95 | 3.44 | 0.120 | 0.385 | 0.385 | 65.30 | 1.479 | 1.86 | 2.13 | 0.50 | 72.46 | 2.13 | 1.51 | 109.11 | 17 | | 0.201 | 0.077 | 0.993 | 0.190 | 0.53 | 0.00 | |
| 8 | 3.69 | 950.3 | 3.44 | 3.94 | 0.120 | 0.443 | 0.443 | 47.03 | 2.574 | 2.16 | 2.42 | 0.50 | 48.54 | 2.42 | 2.39 | 115.89 | 27 | | 0.224 | 0.088 | 0.991 | 0.219 | 0.59 | 0.00 | |
| 9 | 4.19 | 949.8 | 3.94 | 4.43 | 0.120 | 0.502 | 0.502 | 53.42 | 2.513 | 2.17 | 2.36 | 0.50 | 57.20 | 2.39 | 2.25 | 117.00 | 36 | | 0.233 | 0.117 | 0.990 | 0.248 | 0.61 | 0.00 | |
| 10 | 4.68 | 949.3 | 4.43 | 4.92 | 0.120 | 0.561 | 0.561 | 33.98 | 3.330 | 2.44 | 2.64 | 0.70 | 40.16 | 2.55 | 3.05 | 122.60 | 30 | | 0.252 | 0.141 | 0.989 | 0.277 | 0.66 | 0.00 | |
| 11 | 5.17 | 948.8 | 4.92 | 5.41 | 0.120 | 0.620 | 0.620 | 47.44 | 1.706 | 2.20 | 2.40 | 0.50 | 57.08 | 2.40 | 2.32 | 105.65 | 28 | | 0.139 | [illegible] | 0.988 | 0.305 | 0.37 | 0.00 | |
| 12 | 5.66 | 948.3 | 5.41 | 5.91 | 0.120 | 0.679 | 0.679 | 45.38 | 1.655 | 2.19 | 2.36 | 0.50 | 57.14 | 2.36 | 2.22 | 114.05 | 25 | | 0.135 | 0.092 | 0.987 | 0.334 | 0.36 | 0.00 | |
| 13 | 6.15 | 947.8 | 5.91 | 6.40 | 0.120 | 0.739 | 0.739 | 44.07 | 1.600 | 2.20 | 2.42 | 0.50 | 56.26 | 2.42 | 2.41 | 114.96 | 27 | | 0.137 | 0.101 | 0.986 | 0.363 | 0.38 | 0.00 | |
| 14 | 6.65 | 947.4 | 6.40 | 6.89 | 0.120 | 0.797 | 0.797 | 25.65 | 1.926 | 2.47 | 2.63 | 0.70 | 24.98 | 2.56 | 2.10 | 77.38 | 34 | | 0.123 | 0.098 | 0.985 | 0.391 | 0.33 | 0.00 | |
| 15 | 7.14 | 946.9 | 6.89 | 7.38 | 0.120 | 0.856 | 0.856 | 20.00 | 1.013 | 2.50 | 2.65 | 0.70 | 23.14 | 2.50 | 3.24 | 71.07 | 35 | | 0.119 | 0.102 | 0.985 | 0.420 | 0.32 | 0.00 | |
| 16 | 7.63 | 946.4 | 7.38 | 7.87 | 0.120 | 0.915 | 0.915 | 17.46 | 1.572 | 2.63 | 2.83 | 1.00 | 16.91 | 2.83 | 3.50 | Fine Grained | 37 | | >0.6 | >5.0 | 0.982 | 0.448 | Non Liquefiable | 0.00 | |
| 17 | 8.12 | 945.9 | 7.87 | 8.37 | 0.120 | 0.974 | 0.974 | 9.78 | 5.370 | 3.17 | 3.17 | 1.00 | 9.04 | 3.17 | 6.09 | Fine Grained | 71 | | >0.6 | >5.0 | 0.981 | 0.477 | Non Liquefiable | 0.00 | |
| 18 | 8.62 | 945.4 | 8.37 | 8.86 | 0.120 | 1.034 | 1.034 | 53.06 | 0.785 | 2.00 | 2.21 | 0.50 | 56.47 | 2.21 | 1.65 | 91.02 | 10 | | 0.101 | 0.105 | 0.980 | 0.505 | 0.27 | 0.00 | |
| 19 | 9.11 | 944.9 | 8.86 | 9.35 | 0.120 | 1.093 | 1.020 | 144.30 | 0.980 | 1.80 | 2.00 | 0.50 | 75.15 | 2.00 | 1.31 | 98.15 | 13 | | 0.150 | 0.133 | 0.979 | 0.533 | 0.45 | 0.00 | |
| 20 | 9.60 | 944.4 | 9.35 | 9.84 | 0.120 | 1.151 | 1.151 | 151.60 | 0.617 | 1.60 | 1.80 | 0.50 | 97.15 | 1.80 | 1.10 | 115.10 | 10 | | 0.272 | 0.769 | 0.079 | 0.561 | 0.59 | 0.00 | |
| 21 | 10.09 | 943.9 | 9.84 | 10.33 | 0.120 | 1.210 | 1.210 | 141.16 | 0.647 | 1.62 | 1.91 | 0.50 | 88.19 | 1.91 | 1.20 | 105.80 | 11 | | 0.196 | 0.224 | 0.076 | 0.589 | 0.51 | 0.00 | |
| 22 | 10.58 | 943.4 | 10.33 | 10.83 | 0.120 | 1.270 | 1.270 | 157.60 | 0.617 | 1.71 | 1.87 | 0.50 | 96.13 | 1.87 | 1.16 | 111.50 | 10 | | 0.226 | 0.266 | 0.075 | 0.617 | 0.56 | 0.00 | |
| 23 | 11.07 | 942.9 | 10.83 | 11.32 | 0.120 | 1.329 | 1.324 | 145.68 | 1.295 | 2.08 | 2.11 | 0.50 | 69.03 | 2.11 | 1.47 | 101.17 | 16 | | 0.176 | 0.233 | 0.074 | 0.645 | 0.47 | 0.00 | 0.49 |
| 24 | 11.57 | 942.4 | 11.32 | 11.81 | 0.120 | 1.388 | 1.353 | 151.42 | 0.683 | 1.64 | 1.91 | 0.50 | 89.54 | 1.91 | 1.20 | 107.27 | 11 | | 0.195 | 0.263 | 0.073 | 0.673 | 0.51 | 0.00 | 0.49 |
| 25 | 12.06 | 941.9 | 11.81 | 12.30 | 0.120 | 1.447 | 1.381 | 68.68 | 0.715 | 2.08 | 2.15 | 0.50 | 40.16 | 2.15 | 1.06 | 42.66 | 57 | | 0.103 | 0.142 | 0.072 | 0.701 | 0.26 | 0.00 | 0.49 |
| 26 | 12.55 | 941.5 | 12.30 | 12.80 | 0.120 | 1.506 | 1.409 | 27.39 | 0.307 | 2.32 | 2.35 | 0.50 | 15.82 | 2.38 | 2.25 | 35.21 | 28 | | 0.090 | 0.075 | 0.071 | 0.730 | 0.13 | 0.00 | 0.5 |
| 27 | 13.04 | 941.0 | 12.8 | 13.29 | 0.120 | 1.565 | 1.438 | 24.15 | 1.741 | 2.70 | 2.70 | 1.00 | 15.00 | 2.70 | 3.97 | Fine-Grained | 40 | | >0.6 | >5.0 | 0.070 | 0.757 | Non Liquefiable | 0.00 | - |
| 28 | 13.54 | 940.5 | 13.29 | 13.78 | 0.120 | 1.624 | 1.466 | 38.80 | 1.512 | 2.46 | 2.54 | 0.50 | 30.15 | 2.54 | 2.96 | 86.36 | 37 | | 0.108 | 0.150 | 0.068 | 0.784 | 0.26 | 0.00 | 0.49 |
| 29 | 14.03 | 940.0 | 13.78 | 14.27 | 0.120 | 1.683 | 1.494 | 89.70 | 0.900 | 2.10 | 2.10 | 0.50 | 49.31 | 2.15 | 1.55 | 77.13 | 10 | | 0.123 | 0.100 | 0.067 | 0.812 | 0.29 | 0.00 | 0.49 |
| 30 | 14.52 | 939.5 | 14.27 | 14.76 | 0.120 | 1.742 | 1.522 | 174.08 | 1.101 | 1.09 | 1.94 | 0.50 | 99.18 | 1.94 | 1.23 | 121.80 | 11 | | 0.246 | 0.379 | 0.066 | 0.840 | 0.50 | 0.00 | 0.49 |
| 31 | 15.01 | 939.0 | 14.76 | 15.26 | 0.120 | 1.801 | 1.551 | 171.70 | 1.364 | 1.97 | 2.01 | 0.50 | 94.78 | 2.01 | 1.32 | 124.71 | 13 | | 0.200 | 0.404 | 0.065 | 0.867 | 0.61 | 0.00 | 0.5 |
| 32 | 15.51 | 938.5 | 15.26 | 15.75 | 0.120 | 1.861 | 1.579 | 191.81 | 0.621 | 1.83 | 1.87 | 0.50 | 114.84 | 1.87 | 1.17 | 122.27 | 10 | | 0.250 | 0.096 | 0.064 | 0.894 | 0.67 | 0.00 | 0.40 |
| 33 | 16.00 | 938.0 | 15.75 | 16.24 | 0.120 | 1.919 | 1.608 | 23.12 | 1.270 | 2.70 | 2.70 | 1.00 | [illegible] | 2.70 | 3.90 | Fine Grained | 40 | | >0.6 | >5.0 | 0.963 | 0.921 | Non Liquefiable | 0.00 | - |
| 34 | 16.49 | 937.5 | 16.24 | 16.73 | 0.120 | 1.978 | 1.636 | 177.18 | 0.739 | 1.81 | 1.85 | 0.50 | 95.21 | 1.85 | 1.14 | 108.72 | 9 | | 0.200 | 0.375 | 0.962 | 0.948 | 0.45 | 0.07 | 0.49 |
| 35 | 16.98 | 937.0 | 16.73 | 17.22 | 0.120 | 2.037 | 1.664 | 97.34 | 2.105 | 2.31 | 2.35 | 0.50 | 51.85 | 2.35 | 2.12 | 109.04 | 24 | | 0.201 | 0.334 | 0.960 | 0.975 | 0.44 | 0.16 | 0.49 |
| 36 | 17.47 | 936.5 | 17.22 | 17.72 | 0.120 | 2.096 | 1.693 | 53.68 | 2.700 | 2.52 | 2.55 | 0.50 | 34.70 | 2.55 | 3.09 | 105.70 | 33 | | 0.162 | 0.219 | 0.960 | 1.003 | 0.41 | 0.24 | 0.5 |
| 37 | 17.97 | 936.0 | 17.72 | 18.21 | 0.120 | 2.156 | 1.721 | 244.24 | 1.704 | 1.08 | 1.91 | 0.50 | 127.95 | 1.91 | 1.10 | 152.73 | 11 | | 0.411 | 0.700 | 0.959 | 1.030 | 0.80 | 0.28 | 0.49 |
| 38 | 18.46 | 935.5 | 18.21 | 18.70 | 0.120 | 2.215 | 1.749 | 359.72 | 0.596 | 1.69 | 1.71 | 0.50 | 181.00 | 1.71 | 1.05 | 192.50 | 6 | | >0.6 | >5.0 | 0.957 | 1.057 | Non Liquefiable | 0.28 | - |
| 39 | 18.95 | 935.1 | 18.7 | 19.19 | 0.120 | 2.274 | 1.778 | 460.97 | 1.045 | 1.65 | 1.65 | 0.50 | 237.62 | 1.65 | 1.31 | 258.92 | 5 | | >0.6 | >5.0 | 0.956 | 1.085 | Non Liquefiable | 0.28 | - |
| 40 | 19.44 | 934.6 | 19.19 | 19.68 | 0.120 | 2.333 | 1.806 | 593.74 | 1.245 | 1.61 | 1.61 | 0.50 | 303.38 | 1.64 | 1.00 | 303.23 | 5 | | >0.6 | >5.0 | 0.955 | 1.113 | Non Liquefiable | 0.28 | - |
| 41 | 19.94 | 934.1 | 19.68 | 20.18 | 0.120 | 2.392 | 1.835 | 582.87 | 0.984 | 1.54 | 1.56 | 0.50 | 285.58 | 1.56 | 1.00 | 285.58 | 4 | | >0.6 | >5.0 | 0.954 | 1.137 | Non Liquefiable | 0.28 | - |
| 42 | 20.43 | 933.6 | 20.18 | 20.67 | 0.120 | 2.451 | 1.863 | 609.90 | 1.047 | 1.73 | 1.74 | 0.50 | 304.10 | 1.74 | 1.07 | 324.45 | 7 | | >0.6 | >5.0 | 0.953 | 1.164 | Non Liquefiable | 0.28 | - |
| 43 | 20.92 | 933.1 | 20.67 | 21.16 | 0.120 | 2.510 | 1.891 | 801.49 | 1.100 | 1.57 | 1.53 | 0.50 | 400.17 | 1.53 | 1.00 | 400.57 | 3 | | >0.6 | >5.0 | 0.951 | 1.190 | Non Liquefiable | 0.28 | - |
| 44 | 21.41 | 932.6 | 21.16 | 21.65 | 0.120 | 2.569 | 1.919 | 821.58 | 0.963 | 1.46 | 1.49 | 0.50 | 407.50 | 1.49 | 1.00 | 407.58 | 2 | | >0.6 | >5.0 | 0.950 | 1.217 | Non Liquefiable | 0.28 | - |
| 45 | 21.90 | 932.1 | 21.65 | 22.15 | 0.120 | 2.628 | [illegible] | 630.20 | 0.642 | 1.47 | 1.43 | 0.50 | 290.57 | 1.43 | 1.00 | 298.57 | 2 | | >0.6 | >5.0 | 0.949 | 1.243 | Non Liquefiable | 0.28 | - |
| 46 | 22.40 | 931.6 | 22.15 | 22.64 | 0.120 | 2.687 | [illegible] | 302.62 | 1.454 | 2.02 | 1.98 | 0.50 | 153.72 | 1.98 | 1.28 | 196.41 | 12 | | >0.5 | >5.0 | 0.948 | 1.270 | Non Liquefiable | 0.28 | - |
| 47 | 22.89 | 931.1 | 22.64 | 23.13 | 0.120 | 2.746 | [illegible] | 673.24 | 1.787 | 1.81 | 1.70 | 0.50 | 260.72 | 1.70 | 1.00 | 310.17 | 6 | | >0.5 | >5.0 | 0.947 | 1.296 | Non Liquefiable | 0.28 | - |

Figure C22

## LIQUEFACTION POTENTIAL AND CYCLIC SETTLEMENT ANALYSIS

| Layer No. | Mid-layer Depth (ft) | Elevation (ft. MSL) | Depth of layer below Ground Level (ft) Top | Bottom | Total Unit Wt. (1) (kcf) | Total Stress (2) (ksf) | Effective Stress (3) (ksf) | CPT Tip Resistance (4) (ksf) | $F_r$ % normalized (5) | 1st trial $I_c$ (6) | 2nd trial $I_c$ (7) | exponent n of Final $I_c$ and $q_{c1N}$ (8) | $q_{c1N}$ normalized (9) (ksf) | Final $I_c$ (10) | $K_c$ factor for fines (11) | Equivalent $(q_{c1N})_{cs}$ clean sand (12) | Percent Fines, % Estimated (13) | Lab (14) | Cyclic Resistance Ratio (15) M=7.5 | Cyclic Resistance M = 7.5 (16) (ksf) | Stress Reduction Factor, $r_d$ (17) | Specified FS x Induced Cyclic Stress (18) M=7.5 (ksf) | Calculated Factor of Safety (19) | Cumulative Settlement after Removals (inches) | Thickness of Potentially Liquefiable Layers After Removals (ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 48 | 23.38 | 930.6 | 23.13 | 23.62 | 0.120 | 2.805 | 2.689 | 910.68 | 1.060 | 1.50 | 1.53 | 0.50 | 331.76 | 1.53 | 1.00 | 331.76 | 3 | | >0.6 | >5.0 | 0.945 | 1.322 | Non Liquefiable | 0.28 | - |
| 49 | 23.87 | 930.1 | 23.62 | 24.11 | 0.120 | 2.864 | 2.719 | 878.92 | 1.034 | 1.50 | 1.55 | 0.50 | 338.46 | 1.55 | 1.00 | 338.46 | 4 | | >0.6 | >5.0 | 0.944 | 1.348 | Non Liquefiable | 0.28 | - |
| 50 | 24.36 | 929.6 | 24.11 | 24.61 | 0.120 | 2.923 | 2.745 | 873.98 | 1.094 | 1.50 | 1.55 | 0.50 | 332.58 | 1.55 | 1.00 | 332.58 | 4 | | >0.6 | >5.0 | 0.943 | 1.375 | Non Liquefiable | 0.28 | - |
| 51 | 24.86 | 929.1 | 24.61 | 25.10 | 0.120 | 2.983 | 2.773 | 874.34 | 0.612 | 1.42 | 1.36 | 0.50 | 340.46 | 1.36 | 1.00 | 340.46 | 1 | | >0.6 | >5.0 | 0.942 | 1.401 | Non Liquefiable | 0.28 | - |
| 52 | 25.35 | 928.7 | 25.10 | 25.60 | 0.120 | 3.041 | 2.801 | 780.52 | 0.577 | 1.39 | 1.34 | 0.50 | 324.01 | 1.34 | 1.00 | 324.01 | 1 | | >0.6 | >5.0 | 0.941 | 1.427 | Non Liquefiable | 0.28 | - |
| 53 | 25.84 | 928.2 | 25.60 | 26.09 | 0.120 | 3.100 | 2.830 | 786.68 | 0.600 | 1.48 | 1.43 | 0.50 | 321.41 | 1.43 | 1.00 | 321.41 | 2 | | >0.6 | >5.0 | 0.940 | 1.452 | Non Liquefiable | 0.28 | - |
| 54 | 26.33 | 927.7 | 26.09 | 26.57 | 0.120 | 3.159 | 2.858 | 885.67 | 0.502 | 1.34 | 1.30 | 0.50 | 300.75 | 1.30 | 1.00 | 300.65 | 0 | | >0.6 | >5.0 | 0.939 | 1.478 | Non Liquefiable | 0.28 | - |
| 55 | 26.82 | 927.2 | 26.57 | 27.07 | 0.120 | 3.218 | 2.885 | 530.62 | 0.577 | 1.35 | 1.31 | 0.50 | 304.33 | 1.31 | 1.00 | 304.33 | 0 | | >0.6 | >5.0 | 0.937 | 1.504 | Non Liquefiable | 0.28 | - |
| 56 | 27.32 | 926.7 | 27.07 | 27.56 | 0.120 | 3.278 | 2.915 | 671.35 | 0.592 | 1.41 | 1.36 | 0.50 | 350.62 | 1.36 | 1.00 | 350.62 | 1 | | >0.6 | >5.0 | 0.936 | 1.530 | Non Liquefiable | 0.28 | - |
| 57 | 27.81 | 926.2 | 27.56 | 28.05 | 0.120 | 3.337 | 2.943 | 846.36 | 0.522 | 1.30 | 1.30 | 0.50 | 339.06 | 1.30 | 1.00 | 339.06 | 1 | | >0.6 | >5.0 | 0.935 | 1.556 | Non Liquefiable | 0.28 | |
| 58 | 28.30 | 925.7 | 28.05 | 28.54 | 0.120 | 3.395 | 2.971 | 807.40 | 0.341 | 1.25 | 1.19 | 0.50 | 359.85 | 1.19 | 1.00 | 359.85 | 0 | | >0.6 | >5.0 | 0.934 | 1.581 | Non Liquefiable | 0.28 | - |
| 59 | 28.79 | 925.2 | 28.54 | 29.04 | 0.120 | 3.455 | 3.000 | 808.70 | 0.341 | 1.25 | 1.19 | 0.50 | 352.37 | 1.19 | 1.00 | 352.37 | 0 | | >0.6 | >5.0 | 0.933 | 1.607 | Non Liquefiable | 0.28 | - |
| 60 | 29.29 | 924.7 | 29.04 | 29.53 | 0.120 | 3.514 | 3.028 | 800.10 | 0.231 | 1.17 | 1.11 | 0.50 | 330.71 | 1.11 | 1.00 | 330.71 | 0 | | >0.6 | >5.0 | 0.932 | 1.532 | Non Liquefiable | 0.28 | - |
| 61 | 29.78 | 924.2 | 29.53 | 30.02 | 0.120 | 3.573 | 3.057 | 837.72 | 0.474 | 1.50 | 1.54 | 0.50 | 329.32 | 1.54 | 1.00 | 329.32 | 3 | | >0.6 | >5.0 | 0.931 | 1.558 | Non Liquefiable | 0.28 | - |
| 62 | 30.27 | 923.7 | 30.02 | 30.51 | 0.120 | 3.632 | 3.085 | 252.00 | 1.107 | 2.03 | 1.96 | 0.50 | 96.63 | 1.96 | 1.25 | 120.74 | 12 | | 0.250 | 1.750 | 0.930 | 1.580 | 0.61 | 0.34 | 0.49 |
| 63 | 30.76 | 923.2 | 30.51 | 31.00 | 0.120 | 3.691 | 3.113 | 56.58 | 2.280 | 2.74 | 2.74 | 1.00 | 16.86 | 2.74 | 4.33 | Fine Grained | 45 | | >0.6 | >5.0 | 0.924 | 1.700 | Non Liquefiable | 0.34 | - |
| 64 | 31.25 | 922.8 | 31.00 | 31.50 | 0.120 | 3.750 | 3.142 | 26.30 | 6.010 | 3.29 | 3.29 | 1.00 | 7.18 | 3.29 | 10.59 | Fine Grained | 60 | | >0.6 | >5.0 | 0.920 | 1.719 | Non Liquefiable | 0.34 | - |
| 65 | 31.75 | 922.3 | 31.5 | 31.99 | 0.120 | 3.809 | 3.170 | 71.58 | 1.163 | 2.50 | 2.41 | 0.50 | 27.07 | 2.41 | 3.04 | 84.50 | 27 | | 0.105 | 0.333 | 0.918 | 1.739 | 0.26 | 0.45 | 0.49 |
| 66 | 32.24 | 921.8 | 31.99 | 32.48 | 0.120 | 3.868 | 3.198 | 37.46 | 3.211 | 3.03 | 3.00 | 1.00 | 10.54 | 3.00 | 6.70 | Fine Grained | 58 | | >0.6 | >5.0 | 0.912 | 1.758 | Non Liquefiable | 0.45 | - |
| 67 | 32.73 | 921.3 | 32.48 | 32.97 | 0.120 | 3.927 | 3.227 | 60.64 | 1.411 | 2.61 | 2.61 | 1.00 | 17.55 | 2.61 | 3.41 | Fine Grained | 30 | | >0.6 | >5.0 | 0.904 | 1.777 | Non Liquefiable | 0.45 | - |
| 68 | 33.22 | 920.8 | 32.97 | 33.46 | 0.120 | 3.985 | 3.255 | 94.47 | 1.290 | 2.57 | 2.47 | 0.50 | 24.54 | 2.47 | 2.62 | 64.34 | 20 | | 0.105 | 0.341 | 0.904 | 1.700 | 0.25 | 0.61 | 0.49 |
| 69 | 33.71 | 920.3 | 33.46 | 33.96 | 0.120 | 4.045 | 3.283 | 44.10 | 1.874 | 2.81 | 2.81 | 1.00 | 12.20 | 2.81 | 4.81 | Fine Grained | 47 | | >0.6 | >5.0 | 0.900 | 1.814 | Non Liquefiable | 0.61 | - |
| 70 | 34.21 | 919.8 | 33.96 | 34.45 | 0.120 | 4.105 | 3.312 | 103.06 | 1.583 | 2.40 | 2.35 | 0.50 | 24.79 | 2.35 | 2.13 | 42.55 | 25 | | 0.134 | 0.445 | 0.896 | 1.833 | 0.32 | 0.73 | 0.49 |
| 71 | 34.70 | 919.3 | 34.45 | 34.94 | 0.120 | 4.163 | 3.340 | 344.04 | 0.535 | 1.73 | 1.65 | 0.50 | 129.30 | 1.65 | 1.00 | 129.50 | 5 | | 0.207 | 0.060 | 0.892 | 1.851 | 0.86 | 0.80 | 0.49 |
| 72 | 35.19 | 918.8 | 34.94 | 35.43 | 0.120 | 4.222 | 3.368 | 496.40 | 0.918 | 1.76 | 1.68 | 0.50 | 186.84 | 1.68 | 1.03 | 191.71 | 6 | | >0.6 | >5.0 | 0.888 | 1.869 | Non Liquefiable | 0.80 | - |
| 73 | 35.68 | 918.3 | 35.43 | 35.93 | 0.120 | 4.282 | 3.397 | 719.97 | 0.680 | 1.67 | 1.60 | 0.50 | 267.35 | 1.60 | 1.00 | 267.35 | 4 | | >0.6 | >5.0 | 0.884 | 1.888 | Non Liquefiable | 0.80 | - |
| 74 | 36.18 | 917.8 | 35.93 | 36.42 | 0.120 | 4.341 | 3.425 | 806.00 | 0.935 | 1.62 | 1.55 | 0.50 | 298.34 | 1.55 | 1.00 | 298.34 | 4 | | >0.6 | >5.0 | 0.880 | 1.906 | Non Liquefiable | 0.80 | - |
| 75 | 36.67 | 917.3 | 36.42 | 36.91 | 0.120 | 4.400 | 3.454 | 545.06 | 0.515 | 1.63 | 1.54 | 0.50 | 201.66 | 1.54 | 1.00 | 201.66 | 2 | | >0.6 | >5.0 | 0.875 | 1.924 | Non Liquefiable | 0.80 | - |
| 76 | 37.16 | 916.8 | 36.91 | 37.40 | 0.120 | 4.459 | 3.482 | 420.52 | 0.716 | 1.76 | 1.67 | 0.50 | 156.69 | 1.67 | 1.00 | 157.01 | 0 | | 0.445 | 1.651 | 0.872 | 1.937 | 1.04 | 0.81 | 0.49 |
| 77 | 37.65 | 916.4 | 37.40 | 37.89 | 0.120 | 4.517 | 3.510 | 401.48 | 0.576 | 1.72 | 1.63 | 0.50 | 147.79 | 1.63 | 1.00 | 147.70 | 2 | | 0.377 | 1.124 | 0.868 | 1.954 | 0.86 | 0.84 | 0.49 |
| 78 | 38.14 | 915.9 | 37.89 | 38.39 | 0.120 | 4.577 | 3.539 | 253.90 | 1.539 | 2.15 | 2.08 | 0.50 | 92.73 | 2.08 | 1.38 | 128.00 | 15 | | 0.277 | 0.979 | 0.864 | 1.971 | 0.65 | 0.94 | 0.5 |
| 79 | 38.64 | 915.4 | 38.39 | 38.88 | 0.120 | 4.636 | 3.567 | 441.00 | 1.223 | 1.90 | 1.82 | 0.50 | 160.45 | 1.82 | 1.12 | 179.86 | 9 | | >0.6 | >5.0 | 0.860 | 1.987 | Non Liquefiable | 0.94 | - |
| 80 | 39.13 | 914.9 | 38.88 | 39.37 | 0.120 | 4.695 | 3.595 | 667.64 | 0.687 | 1.71 | 1.63 | 0.50 | 249.00 | 1.63 | 1.00 | 249.00 | 5 | | >0.6 | >5.0 | 0.856 | 2.003 | Non Liquefiable | 0.94 | - |
| 81 | 39.62 | 914.4 | 39.37 | 39.86 | 0.120 | 4.754 | 3.623 | 851.64 | 1.020 | 1.66 | 1.57 | 0.50 | 311.10 | 1.57 | 1.00 | 311.10 | 4 | | >0.6 | >5.0 | 0.852 | 2.018 | Non Liquefiable | 0.94 | - |
| 82 | 40.11 | 913.9 | 39.86 | 40.35 | 0.120 | 4.813 | 3.652 | 967.70 | 0.894 | 1.57 | 1.49 | 0.50 | 348.02 | 1.49 | 1.00 | 348.02 | 3 | | >0.6 | >5.0 | 0.848 | 2.034 | Non Liquefiable | 0.94 | - |
| 83 | 40.60 | 913.4 | 40.35 | 40.85 | 0.120 | 4.872 | 3.680 | 905.96 | 1.015 | 1.64 | 1.56 | 0.50 | 324.91 | 1.56 | 1.00 | 324.91 | 4 | | >0.6 | >5.0 | 0.844 | 2.049 | Non Liquefiable | 0.94 | - |
| 84 | 41.10 | 912.9 | 40.85 | 41.34 | 0.120 | 4.931 | 3.709 | 824.60 | 0.560 | 1.45 | 1.38 | 0.50 | 294.37 | 1.38 | 1.00 | 294.37 | 1 | | >0.6 | >5.0 | 0.840 | 2.064 | Non Liquefiable | 0.94 | - |
| 85 | 41.59 | 912.4 | 41.34 | 41.83 | 0.120 | 4.990 | 3.737 | 752.52 | 0.775 | 1.61 | 1.52 | 0.50 | 267.19 | 1.52 | 1.00 | 267.19 | 3 | | >0.6 | >5.0 | 0.836 | 2.079 | Non Liquefiable | 0.94 | - |
| 86 | 42.08 | 911.9 | 41.83 | 42.32 | 0.120 | 5.049 | 3.765 | 895.72 | 0.593 | 1.40 | 1.39 | 0.50 | 317.27 | 1.39 | 1.00 | 317.27 | 1 | | >0.6 | >5.0 | 0.832 | 2.093 | Non Liquefiable | 0.94 | - |
| 87 | 42.57 | 911.4 | 42.32 | 42.81 | 0.120 | 5.108 | 3.793 | 857.52 | 0.734 | 1.56 | 1.47 | 0.50 | 302.80 | 1.47 | 1.00 | 302.80 | 2 | | >0.6 | >5.0 | 0.828 | 2.107 | Non Liquefiable | 0.94 | - |
| 88 | 43.06 | 910.9 | 42.81 | 43.31 | 0.120 | 5.167 | 3.822 | 524.87 | 0.835 | 1.61 | 1.53 | 0.50 | 375.06 | 1.53 | 1.00 | 375.06 | 3 | | >0.6 | >5.0 | 0.824 | 2.121 | Non Liquefiable | 0.94 | - |
| 89 | 43.56 | 910.4 | 43.31 | 43.80 | 0.120 | 5.227 | 3.850 | 1046.77 | 0.824 | 1.50 | 1.45 | 0.50 | 368.45 | 1.45 | 1.00 | 368.45 | 2 | | >0.6 | >5.0 | 0.820 | 2.135 | Non Liquefiable | 0.94 | - |
| 90 | 44.05 | 910.0 | 43.80 | 44.29 | 0.120 | 5.285 | 3.879 | 1060.70 | 1.307 | 1.71 | 1.63 | 0.50 | 377.60 | 1.63 | 1.00 | 377.60 | 5 | | >0.6 | >5.0 | 0.816 | 2.149 | Non Liquefiable | 0.94 | |
| 91 | 44.54 | 909.5 | 44.29 | 44.78 | 0.120 | 5.344 | 3.907 | 1107.06 | 1.176 | 1.64 | 1.56 | 0.50 | 384.95 | 1.56 | 1.00 | 384.95 | 4 | | >0.6 | >5.0 | 0.812 | 2.162 | Non Liquefiable | 0.94 | - |
| 92 | 45.03 | 909.0 | 44.78 | 45.28 | 0.120 | 5.404 | 3.935 | 1030.20 | 0.794 | 1.54 | 1.45 | 0.50 | 355.56 | 1.45 | 1.00 | 355.56 | 2 | | >0.6 | >5.0 | 0.808 | 2.175 | Non Liquefiable | 0.94 | - |
| 93 | 45.53 | 908.5 | 45.28 | 45.77 | 0.120 | 5.463 | 3.964 | 923.18 | 0.825 | 1.56 | 1.49 | 0.50 | 318.69 | 1.49 | 1.00 | 318.69 | 3 | | >0.6 | >5.0 | 0.804 | 2.188 | Non Liquefiable | 0.94 | - |
| 94 | 46.02 | 908.0 | 45.77 | 46.26 | 0.120 | 5.522 | 3.992 | 792.12 | 0.634 | 1.54 | 1.44 | 0.50 | 272.47 | 1.44 | 1.00 | 272.47 | 2 | | >0.6 | >5.0 | 0.800 | 2.201 | Non Liquefiable | 0.94 | - |
| 95 | 46.51 | 907.5 | 46.26 | 46.75 | 0.120 | 5.581 | 4.020 | 710.12 | 0.504 | 1.56 | 1.45 | 0.50 | 245.47 | 1.45 | 1.00 | 245.47 | 2 | | >0.6 | >5.0 | 0.796 | 2.213 | Non Liquefiable | 0.94 | - |
| 96 | 47.00 | 907.0 | 46.75 | 47.24 | 0.120 | 5.639 | 4.049 | 760.12 | 0.675 | 1.56 | 1.48 | 0.50 | 252.27 | 1.48 | 1.00 | 263.77 | 3 | | >0.6 | >5.0 | 0.792 | 2.225 | Non Liquefiable | 0.94 | - |
| 97 | 47.49 | 906.5 | 47.24 | 47.74 | 0.120 | 5.699 | 4.077 | 980.14 | 1.449 | 1.79 | 1.70 | 0.50 | 305.37 | 1.70 | 1.04 | 315.91 | 8 | | >0.6 | >5.0 | 0.788 | 2.237 | Non Liquefiable | 0.94 | - |
| 98 | 47.99 | 906.0 | 47.74 | 48.23 | 0.120 | 5.758 | 4.106 | 988.44 | 0.493 | 1.41 | 1.30 | 0.50 | 334.60 | 1.30 | 1.00 | 334.60 | 0 | | >0.6 | >5.0 | 0.783 | 2.249 | Non Liquefiable | 0.94 | - |
| 99 | 48.48 | 905.5 | 48.23 | 48.72 | 0.120 | 5.817 | 4.134 | 849.50 | 0.449 | 1.45 | 1.33 | 0.50 | 287.15 | 1.33 | 1.00 | 287.15 | - | | >0.6 | >5.0 | 0.780 | 2.261 | Non Liquefiable | 0.94 | - |
| 100 | 48.97 | 905.0 | 48.72 | 49.21 | 0.120 | 5.876 | 4.162 | 240.40 | 3.403 | 2.45 | 2.35 | 0.50 | 47.81 | 2.35 | 2.11 | 174.35 | 24 | | >0.6 | >5.0 | 0.770 | 2.272 | Non Liquefiable | 0.94 | - |
| 101 | 49.46 | 904.5 | 49.21 | 49.70 | 0.120 | 5.935 | 4.191 | 114.72 | 9.401 | 3.01 | 3.01 | 1.00 | 25.96 | 3.01 | 6.84 | Fine Grained | 59 | | >0.6 | >5.0 | 0.772 | 2.283 | Non Liquefiable | 0.94 | - |

Total Thickness of Potentially Liquefiable Zones Remaining = 10.3

Figure C22

Allan E. Seward, Engineering Geology, Inc.

Geological and Geotechnical Consultants

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*******************************************
*                                         *
*        FRISKSP - IBM-PC VERSION         *
*                                         *
*  Modified from *FRISK* (McGuire 1978)   *
*   To Perform Probabilistic Earthquake   *
*  Hazard Analyses Using Multiple Forms   *
* of Ground-Motion-Attenuation Relations  *
*                                         *
*   Modifications by:  Thomas F. Blake    *
*              - 1988-2000 -              *
*                                         *
*              VERSION 4.00               *
*             (Visual Fortran)            *
*******************************************
```

TITLE: LandMark Village - Boore et al (1997) Site Class D

IPR_FILE
 0

IPLOT
 0

SITE CONDITION
 0.00

BASEMENT DEPTH (km)
 5.00

RHGA FACTOR RHGA DIST (km)
 1.000 0.000

NFLT NSITE NPROB NATT LCD

21 1 2 6 1

| ATT | C1 | C2 | C3 | C4 | C5 | C6 | C7 | C8 | C9 | C10 |
|---|---|---|---|---|---|---|---|---|---|---|
| C11 | C12 | C13 | C14 | | | | | | | |
| 1 | -0.3130 | 0.5270 | 0.0000 | -0.7780 | -0.3710 | 1396.0000 | 5.5700 | 250.0000 | 0.0000 | 0.0000 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | | | | | | | |
| ATT | C15 | C16 | C17 | C18 | C19 | C20 | C21 | C22 | C23 | PER |
| DSMIN | SIGA | IRELAF | ICHK | | | | | | | |
| 1 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0000 | 0.5200 | 35 | 0 | | | | | | | |

| ATT | C1 | C2 | C3 | C4 | C5 | C6 | C7 | C8 | C9 | C10 |
|---|---|---|---|---|---|---|---|---|---|---|
| C11 | C12 | C13 | C14 | | | | | | | |
| 2 | -0.1170 | 0.5270 | 0.0000 | -0.7780 | -0.3710 | 1396.0000 | 5.5700 | 250.0000 | 0.0000 | 0.0000 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | | | | | | | |
| ATT | C15 | C16 | C17 | C18 | C19 | C20 | C21 | C22 | C23 | PER |
| DSMIN | SIGA | IRELAF | ICHK | | | | | | | |
| 2 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0000 | 0.5200 | 35 | 0 | | | | | | | |

| ATT | C1 | C2 | C3 | C4 | C5 | C6 | C7 | C8 | C9 | C10 |
|---|---|---|---|---|---|---|---|---|---|---|
| C11 | C12 | C13 | C14 | | | | | | | |
| 3 | -0.3130 | 0.5270 | 0.0000 | -0.7780 | -0.3710 | 1396.0000 | 5.5700 | 250.0000 | 0.0000 | 0.0000 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | | | | | | | |
| ATT | C15 | C16 | C17 | C18 | C19 | C20 | C21 | C22 | C23 | PER |
| DSMIN | SIGA | IRELAF | ICHK | | | | | | | |
| 3 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0000 | 0.5200 | 35 | 0 | | | | | | | |

| ATT | C1 | C2 | C3 | C4 | C5 | C6 | C7 | C8 | C9 | C10 |
|---|---|---|---|---|---|---|---|---|---|---|
| C11 | C12 | C13 | C14 | | | | | | | |
| 4 | -0.1170 | 0.5270 | 0.0000 | -0.7780 | -0.3710 | 1396.0000 | 5.5700 | 250.0000 | 0.0000 | 0.0000 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | | | | | | | |
| ATT | C15 | C16 | C17 | C18 | C19 | C20 | C21 | C22 | C23 | PER |
| DSMIN | SIGA | IRELAF | ICHK | | | | | | | |
| 4 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0000 | 0.5200 | 35 | 0 | | | | | | | |

| ATT | C1 | C2 | C3 | C4 | C5 | C6 | C7 | C8 | C9 | C10 |
|---|---|---|---|---|---|---|---|---|---|---|
| C11 | C12 | C13 | C14 | | | | | | | |
| 5 | -0.1170 | 0.5270 | 0.0000 | -0.7780 | -0.3710 | 1396.0000 | 5.5700 | 250.0000 | 0.0000 | 0.0000 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | | | | | | | |
| ATT | C15 | C16 | C17 | C18 | C19 | C20 | C21 | C22 | C23 | PER |
| DSMIN | SIGA | IRELAF | ICHK | | | | | | | |
| 5 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 0.0000 | 0.5200 | 35 | 0 | | | | | | | |

| ATT | C1 | C2 | C3 | C4 | C5 | C6 | C7 | C8 | C9 | C10 |
|---|---|---|---|---|---|---|---|---|---|---|

```
C11        C12        C13        C14
  6    -0.1170     0.5270     0.0000    -0.7780    -0.3710 1396.0000     5.5700  250.0000     0.0000     0.0000
0.0000     0.0000     0.0000     0.0000
ATT        C15        C16        C17        C18        C19        C20        C21        C22        C23        PER
DSMIN       SIGA     IRELAF      ICHK
  6     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000
0.0000     0.5200         35          0

 PROBLEM DATA:

 BOORE ET AL(1997) NEHRP D (250)1 AMPLITUDES:
     15          0.100     0.200     0.300     0.400     0.500     0.600     0.700     0.800     0.900     1.000
                 1.100     1.200     1.300     1.400     1.500

      MAGNITUDE WEIGHTING FACTORS:      MWF:    0     MWF MAGNITUDE:       0.00

 BOORE ET AL(1997) NEHRP D (250)2 AMPLITUDES:
     15          0.100     0.200     0.300     0.400     0.500     0.600     0.700     0.800     0.900     1.000
                 1.100     1.200     1.300     1.400     1.500

      MAGNITUDE WEIGHTING FACTORS:      MWF:    2     MWF MAGNITUDE:       7.50

 RISKS SPECIFIED:
   5      0.010000  0.005000  0.002105  0.001000  0.000404

 SITE COORDINATES:
  1     -118.6386   34.4243


 FAULT INFORMATION:

 ------------------------------------------------------------------------------

 FAULT  1

 FAULT NAME:  HOLSER


 NFP     NRL    ATTENUATION CODES:
  5      10       2  4

 AMMIN    AMSTEP   IRATE     RATE    BETA    ECTR    ECDP    COEF
 5.000    0.1000       1   0.4000   2.072   1.000   2.000   1.000

 NMAX AMMAX   PMAX
  1    6.50   1.00
```

```
  dmchar ampchar dmpchar
    0.50    6.00    1.00

 Slip Rate (  0.4000 mm/yr) Converted to Activity Rate:
 Input Shear Modulus - dyne/cm**2
0.330E+12
 Input Fault Area    - cm**2
0.280E+13
 LOG10[Mo(m)]        = (1.50)m + (16.05)
   IMAX   AMMAX    PMAX     ARATE = EX-RATE + CH-RATE
      1  6.5000  1.0000   0.00212   0.00097   0.00115


 IND_RL
      2

 RUPTURE AREA VS. MAGNITUDE  A_RA       B_RA     SIG_RA  -3.490      0.910      0.240

 FAULT SEGMENT COORDINATES
  1     -118.7533   34.4386
  2     -118.7345   34.4386
  3     -118.6741   34.4499
  4     -118.6427   34.4487
  5     -118.5483   34.4172

 NDP
   2
 ORIGINAL FAULT CROSS SECTION
  1        0.0000    0.0000
  2        5.9000   12.7000

 Computed Total Fault Area = 0.26E+03

 ------------------------------------------------------------------------------

 FAULT  2

 FAULT NAME:  NORTHRIDGE (E. Oak Ridge)


 NFP     NRL    ATTENUATION CODES:
  2      10       5  6

 AMMIN    AMSTEP  IRATE    RATE    BETA    ECTR    ECDP    COEF
 5.000    0.1000      1  1.5000  2.072   1.500   2.000   1.000

 NMAX AMMAX  PMAX
  1    6.90  1.00
```

```
  dmchar ampchar dmpchar
    0.50    6.40    1.00

 Slip Rate (  1.5000 mm/yr) Converted to Activity Rate:
 Input Shear Modulus - dyne/cm**2
0.360E+12
 Input Fault Area    - cm**2
0.682E+13
 LOG10[Mo(m)]        = (1.50)m + (16.05)
   IMAX   AMMAX    PMAX     ARATE = EX-RATE + CH-RATE
      1  6.9000  1.0000   0.00891   0.00602   0.00288


 IND_RL
      2

 RUPTURE AREA VS. MAGNITUDE  A_RA      B_RA    SIG_RA  -3.490     0.910     0.240

 FAULT SEGMENT COORDINATES
  1    -118.7027   34.4057
  2    -118.4078   34.2781

 NDP
    3
 ORIGINAL FAULT CROSS SECTION
  1       0.0000    4.9900
  2       0.0000    5.0000
  3      16.3000   19.7000

 Computed Total Fault Area = 0.67E+03

 ------------------------------------------------------------------------------

 FAULT  3

 FAULT NAME:  SAN GABRIEL


 NFP    NRL   ATTENUATION CODES:
 10     10      1  3

 AMMIN   AMSTEP  IRATE    RATE   BETA   ECTR   ECDP   COEF
 5.000   0.1000      1  1.0000  2.072  3.600  2.000  1.000

 NMAX AMMAX  PMAX
  1    7.00  1.00
```

```
   dmchar ampchar dmpchar
     0.50    6.50    1.00

 Slip Rate (  1.0000 mm/yr) Converted to Activity Rate:
 Input Shear Modulus - dyne/cm**2
0.330E+12
 Input Fault Area    - cm**2
0.936E+13
 LOG10[Mo(m)]        = (1.50)m + (16.05)
   IMAX   AMMAX    PMAX     ARATE = EX-RATE + CH-RATE
      1  7.0000  1.0000   0.00616   0.00445   0.00171


 IND_RL
      2

 RUPTURE AREA VS. MAGNITUDE  A_RA       B_RA     SIG_RA  -3.490      0.910      0.240

 FAULT SEGMENT COORDINATES
  1     -118.2802   34.3179
  2     -118.3118   34.3394
  3     -118.3904   34.3598
  4     -118.4577   34.3853
  5     -118.5587   34.4363
  6     -118.5975   34.4649
  7     -118.6873   34.5536
  8     -118.7026   34.5700
  9     -118.7312   34.5792
 10     -118.8761   34.7139

 NDP
    2
 ORIGINAL FAULT CROSS SECTION
  1        0.0000    0.0000
  2        0.0000   13.0000

 Computed Total Fault Area = 0.93E+03

 ------------------------------------------------------------------------------

 FAULT  4

 FAULT NAME:  OAK RIDGE (Onshore)


 NFP    NRL   ATTENUATION CODES:
```

```
 9      10       2  4

AMMIN    AMSTEP  IRATE     RATE    BETA    ECTR    ECDP    COEF
5.000    0.1000      1   4.0000   2.072   2.500   2.000   1.000

NMAX AMMAX  PMAX
 1    6.90  1.00


  dmchar ampchar dmpchar
    0.50    6.40    1.00

 Slip Rate (  4.0000 mm/yr) Converted to Activity Rate:
 Input Shear Modulus - dyne/cm**2
0.330E+12
 Input Fault Area    - cm**2
0.700E+13
 LOG10[Mo(m)]        = (1.50)m + (16.05)
   IMAX    AMMAX     PMAX      ARATE = EX-RATE + CH-RATE
      1  6.9000  1.0000   0.02235   0.01511   0.00723


 IND_RL
      2

 RUPTURE AREA VS. MAGNITUDE  A_RA      B_RA     SIG_RA  -3.490      0.910      0.240

 FAULT SEGMENT COORDINATES
  1    -119.2050   34.2481
  2    -119.1582   34.2630
  3    -119.0974   34.3165
  4    -119.0402   34.3522
  5    -118.9589   34.3631
  6    -118.8805   34.3813
  7    -118.8104   34.3850
  8    -118.7742   34.4013
  9    -118.7227   34.3978

 NDP
   3
 ORIGINAL FAULT CROSS SECTION
  1       0.0000    1.0000
  2       0.0000    1.1000
  3       5.9000   13.7000

 Computed Total Fault Area = 0.67E+03

 ------------------------------------------------------------------------------
```

FAULT 5

FAULT NAME: SANTA SUSANA

| NFP | NRL | ATTENUATION CODES: | |
|---|---|---|---|
| 8 | 10 | 2 | 4 |

| AMMIN | AMSTEP | IRATE | RATE | BETA | ECTR | ECDP | COEF |
|---|---|---|---|---|---|---|---|
| 5.000 | 0.1000 | 1 | 5.0000 | 2.072 | 1.300 | 2.000 | 1.000 |

| NMAX | AMMAX | PMAX |
|---|---|---|
| 1 | 6.60 | 1.00 |

| dmchar | ampchar | dmpchar |
|---|---|---|
| 0.50 | 6.10 | 1.00 |

Slip Rate ( 5.0000 mm/yr) Converted to Activity Rate:
Input Shear Modulus - dyne/cm**2
0.330E+12
Input Fault Area - cm**2
0.432E+13
LOG10[Mo(m)] = (1.50)m + (16.05)

| IMAX | AMMAX | PMAX | ARATE = EX-RATE + CH-RATE | | |
|---|---|---|---|---|---|
| 1 | 6.6000 | 1.0000 | 0.03249 | 0.01677 | 0.01573 |

IND_RL
2

| RUPTURE AREA VS. MAGNITUDE | A_RA | B_RA | SIG_RA |
|---|---|---|---|
| | -3.490 | 0.910 | 0.240 |

FAULT SEGMENT COORDINATES

| | | |
|---|---|---|
| 1 | -118.4950 | 34.3242 |
| 2 | -118.4955 | 34.3242 |
| 3 | -118.5340 | 34.3030 |
| 4 | -118.5811 | 34.3204 |
| 5 | -118.6163 | 34.3229 |
| 6 | -118.6339 | 34.3330 |
| 7 | -118.7081 | 34.3506 |
| 8 | -118.7672 | 34.3594 |

NDP
2
ORIGINAL FAULT CROSS SECTION

| | | |
|---|---|---|
| 1 | 0.0000 | 0.0000 |

```
 2       9.2000   13.1000

Computed Total Fault Area = 0.41E+03

--------------------------------------------------------------------------------

FAULT  6

FAULT NAME:  SAN CAYETANO


NFP    NRL   ATTENUATION CODES:
 9     10      2  4

AMMIN   AMSTEP  IRATE    RATE   BETA   ECTR   ECDP   COEF
5.000   0.1000      1  6.0000  2.072  2.200  2.000  1.000

NMAX AMMAX  PMAX
 1    6.80  1.00


  dmchar ampchar dmpchar
    0.50    6.30    1.00

Slip Rate (  6.0000 mm/yr) Converted to Activity Rate:
Input Shear Modulus - dyne/cm**2
0.330E+12
Input Fault Area    - cm**2
0.660E+13
LOG10[Mo(m)]        = (1.50)m + (16.05)
  IMAX   AMMAX    PMAX     ARATE = EX-RATE + CH-RATE
     1  6.8000  1.0000   0.03867   0.02422   0.01445


IND_RL
     2

RUPTURE AREA VS. MAGNITUDE  A_RA      B_RA    SIG_RA  -3.490     0.910     0.240

FAULT SEGMENT COORDINATES
 1    -118.7621   34.4361
 2    -118.8313   34.4047
 3    -118.9130   34.4172
 4    -118.9281   34.4587
 5    -118.9382   34.4612
 6    -118.9835   34.4348
 7    -119.0690   34.4361
 8    -119.1067   34.4386
```

```
 9    -119.1708   34.4625

NDP
  2
ORIGINAL FAULT CROSS SECTION
 1       0.0000    0.0000
 2       7.5000   13.0000

Computed Total Fault Area = 0.60E+03

--------------------------------------------------------------------------------

FAULT  7

FAULT NAME:  SIERRA MADRE (San Fernando)


NFP     NRL    ATTENUATION CODES:
 8      10       2  4

AMMIN    AMSTEP  IRATE     RATE    BETA    ECTR    ECDP    COEF
5.000    0.1000      1  2.0000   2.072   0.900   2.000   1.000

NMAX AMMAX  PMAX
 1    6.70  1.00


   dmchar ampchar dmpchar
     0.50    6.20    1.00

 Slip Rate (  2.0000 mm/yr) Converted to Activity Rate:
 Input Shear Modulus - dyne/cm**2
0.330E+12
 Input Fault Area    - cm**2
0.324E+13
 LOG10[Mo(m)]        = (1.50)m + (16.05)
   IMAX    AMMAX     PMAX     ARATE = EX-RATE + CH-RATE
      1  6.7000   1.0000    0.00781   0.00447   0.00334


 IND_RL
      2

 RUPTURE AREA VS. MAGNITUDE  A_RA      B_RA     SIG_RA  -3.490      0.910      0.240

 FAULT SEGMENT COORDINATES
  1    -118.2940   34.2782
  2    -118.2951   34.2782
```

```
 3     -118.3196    34.2745
 4     -118.3956    34.2905
 5     -118.4189    34.3039
 6     -118.4520    34.2940
 7     -118.4778    34.3027
 8     -118.4790    34.3027

NDP
  2
ORIGINAL FAULT CROSS SECTION
 1        0.0000     0.0000
 2       12.7000    12.7000

Computed Total Fault Area = 0.33E+03

--------------------------------------------------------------------------------

FAULT  8

FAULT NAME:  SIMI-SANTA ROSA


NFP     NRL    ATTENUATION CODES:
 5      10       2  4

AMMIN    AMSTEP   IRATE     RATE    BETA    ECTR    ECDP    COEF
5.000    0.1000       1   1.0000   2.072   1.500   2.000   1.000

NMAX AMMAX   PMAX
 1    6.70   1.00


   dmchar ampchar dmpchar
     0.50    6.20    1.00

 Slip Rate (  1.0000 mm/yr) Converted to Activity Rate:
 Input Shear Modulus - dyne/cm**2
0.330E+12
 Input Fault Area    - cm**2
0.450E+13
 LOG10[Mo(m)]        = (1.50)m + (16.05)
   IMAX    AMMAX     PMAX      ARATE = EX-RATE + CH-RATE
      1  6.7000   1.0000    0.00543   0.00311   0.00232


 IND_RL
      2
```

RUPTURE AREA VS. MAGNITUDE  A_RA  B_RA  SIG_RA  -3.490  0.910  0.240

FAULT SEGMENT COORDINATES

| | | |
|---|---|---|
| 1 | -118.7982 | 34.2901 |
| 2 | -118.9084 | 34.2578 |
| 3 | -118.9364 | 34.2615 |
| 4 | -118.9680 | 34.2615 |
| 5 | -119.1147 | 34.2261 |

NDP
3

ORIGINAL FAULT CROSS SECTION

| | | |
|---|---|---|
| 1 | 0.0000 | 1.0000 |
| 2 | 0.0000 | 1.1000 |
| 3 | 7.5000 | 14.0000 |

Computed Total Fault Area = 0.45E+03

---

FAULT 9

FAULT NAME: VERDUGO

| NFP | NRL | ATTENUATION CODES: |
|---|---|---|
| 7 | 10 | 2 4 |

| AMMIN | AMSTEP | IRATE | RATE | BETA | ECTR | ECDP | COEF |
|---|---|---|---|---|---|---|---|
| 5.000 | 0.1000 | 1 | 0.5000 | 2.072 | 1.400 | 2.000 | 1.000 |

| NMAX | AMMAX | PMAX |
|---|---|---|
| 1 | 6.70 | 1.00 |

| dmchar | ampchar | dmpchar |
|---|---|---|
| 0.50 | 6.20 | 1.00 |

Slip Rate ( 0.5000 mm/yr) Converted to Activity Rate:
Input Shear Modulus - dyne/cm**2
0.330E+12
Input Fault Area - cm**2
0.522E+13
LOG10[Mo(m)] = (1.50)m + (16.05)

| IMAX | AMMAX | PMAX | ARATE = EX-RATE + CH-RATE | | |
|---|---|---|---|---|---|
| 1 | 6.7000 | 1.0000 | 0.00315 | 0.00180 | 0.00135 |

```
IND_RL
     2

RUPTURE AREA VS. MAGNITUDE  A_RA       B_RA     SIG_RA  -3.490      0.910      0.240

FAULT SEGMENT COORDINATES
 1     -118.1536    34.1313
 2     -118.1865    34.1496
 3     -118.2285    34.1551
 4     -118.2907    34.1971
 5     -118.3657    34.2227
 6     -118.4077    34.2538
 7     -118.4206    34.2612

NDP
  2
ORIGINAL FAULT CROSS SECTION
 1       0.0000     0.0000
 2      12.7000    12.7000

Computed Total Fault Area = 0.52E+03

--------------------------------------------------------------------------------

FAULT 10

FAULT NAME:  SANTA YNEZ (East)


NFP     NRL    ATTENUATION CODES:
 6      10       1  3

AMMIN    AMSTEP   IRATE     RATE    BETA    ECTR    ECDP    COEF
5.000    0.1000       1   2.0000   2.072   3.400   2.000   1.000

NMAX AMMAX   PMAX
 1    7.00   1.00


   dmchar ampchar dmpchar
     0.50    6.50    1.00

 Slip Rate (  2.0000 mm/yr) Converted to Activity Rate:
 Input Shear Modulus - dyne/cm**2
0.330E+12
 Input Fault Area    - cm**2
0.884E+13
 LOG10[Mo(m)]        = (1.50)m + (16.05)
```

| IMAX | AMMAX | PMAX | ARATE = | EX-RATE + | CH-RATE |
|---|---|---|---|---|---|
| 1 | 7.0000 | 1.0000 | 0.01164 | 0.00840 | 0.00323 |

IND_RL
2

| RUPTURE AREA VS. MAGNITUDE | A_RA | B_RA | SIG_RA | -3.490 | 0.910 | 0.240 |
|---|---|---|---|---|---|---|

FAULT SEGMENT COORDINATES

| | | |
|---|---|---|
| 1 | -119.6298 | 34.4939 |
| 2 | -119.5091 | 34.4864 |
| 3 | -119.3783 | 34.5065 |
| 4 | -119.1972 | 34.5367 |
| 5 | -119.1167 | 34.5317 |
| 6 | -118.9055 | 34.5870 |

NDP
2

ORIGINAL FAULT CROSS SECTION

| | | |
|---|---|---|
| 1 | 0.0000 | 0.0000 |
| 2 | 2.3000 | 12.8000 |

Computed Total Fault Area = 0.89E+03

---

FAULT 11

FAULT NAME: SAN ANDREAS - 1857 Rupture

| NFP | NRL | ATTENUATION CODES: |
|---|---|---|
| 12 | 10 | 1 3 |

| AMMIN | AMSTEP | IRATE | RATE | BETA | ECTR | ECDP | COEF |
|---|---|---|---|---|---|---|---|
| 5.000 | 0.1000 | 1 | 34.0000 | 2.072 | 17.200 | 2.000 | 0.500 |

| NMAX | AMMAX | PMAX |
|---|---|---|
| 1 | 7.80 | 1.00 |

| dmchar | ampchar | dmpchar |
|---|---|---|
| 0.50 | 7.30 | 1.00 |

Slip Rate ( 34.0000 mm/yr) Converted to Activity Rate:
Input Shear Modulus - dyne/cm**2
0.300E+12

```
 Input Fault Area     - cm**2
0.414E+14
 LOG10[Mo(m)]          = (1.50)m + (16.05)
   IMAX    AMMAX     PMAX      ARATE = EX-RATE + CH-RATE
      1  7.8000   1.0000    0.22372    0.20895    0.01477


 IND_RL
      2

 RUPTURE AREA VS. MAGNITUDE  A_RA       B_RA     SIG_RA  -3.490      0.910      0.240

 FAULT SEGMENT COORDINATES
  1     -120.5605    36.0019
  2     -120.2928    35.7488
  3     -119.8632    35.3106
  4     -119.8598    35.3072
  5     -119.6673    35.1336
  6     -119.4061    34.9395
  7     -119.2103    34.8639
  8     -118.9010    34.8175
  9     -118.5075    34.7006
 10     -118.5024    34.6989
 11     -118.0075    34.5116
 12     -117.5298    34.3106

 NDP
   2
 ORIGINAL FAULT CROSS SECTION
  1        0.0000     0.0000
  2        0.0000    12.0000

 Computed Total Fault Area = 0.41E+04

 ------------------------------------------------------------------------------

 FAULT 12

 FAULT NAME:  SAN ANDREAS - Mojave


 NFP     NRL    ATTENUATION CODES:
  3      10       1  3

 AMMIN    AMSTEP  IRATE     RATE    BETA    ECTR    ECDP    COEF
 5.000    0.1000      1 30.0000  2.072  4.900  2.000  0.500

 NMAX AMMAX   PMAX
```

```
 1    7.10  1.00


   dmchar ampchar dmpchar
     0.50    6.60    1.00

 Slip Rate ( 30.0000 mm/yr) Converted to Activity Rate:
 Input Shear Modulus - dyne/cm**2
0.300E+12
 Input Fault Area    - cm**2
0.119E+14
 LOG10[Mo(m)]        = (1.50)m + (16.05)
   IMAX   AMMAX    PMAX     ARATE = EX-RATE + CH-RATE
      1  7.1000  1.0000   0.17754   0.13551   0.04202


 IND_RL
      2

 RUPTURE AREA VS. MAGNITUDE  A_RA       B_RA     SIG_RA  -3.490      0.910      0.240

 FAULT SEGMENT COORDINATES
  1    -118.5024   34.6989
  2    -118.0075   34.5116
  3    -117.5298   34.3106

 NDP
   2
 ORIGINAL FAULT CROSS SECTION
  1       0.0000    0.0000
  2       0.0000   12.0000

 Computed Total Fault Area = 0.12E+04

 ------------------------------------------------------------------------------

 FAULT 13

 FAULT NAME:  SAN ANDREAS - Carrizo


 NFP    NRL   ATTENUATION CODES:
  6     10      1  3

 AMMIN   AMSTEP  IRATE    RATE   BETA   ECTR   ECDP   COEF
 5.000   0.1000      1 34.0000  2.072  7.200  2.000  0.500

 NMAX AMMAX   PMAX
```

```
 1    7.20  1.00


   dmchar ampchar dmpchar
     0.50    6.70    1.00

 Slip Rate ( 34.0000 mm/yr) Converted to Activity Rate:
 Input Shear Modulus - dyne/cm**2
0.300E+12
 Input Fault Area    - cm**2
0.174E+14
 LOG10[Mo(m)]        = (1.50)m + (16.05)
   IMAX   AMMAX    PMAX     ARATE = EX-RATE + CH-RATE
      1  7.2000  1.0000   0.24626   0.19696   0.04930


 IND_RL
      2

 RUPTURE AREA VS. MAGNITUDE  A_RA       B_RA     SIG_RA  -3.490      0.910      0.240

 FAULT SEGMENT COORDINATES
  1     -119.8598    35.3072
  2     -119.6673    35.1336
  3     -119.4061    34.9395
  4     -119.2103    34.8639
  5     -118.9010    34.8175
  6     -118.5075    34.7006

 NDP
   2
 ORIGINAL FAULT CROSS SECTION
  1        0.0000     0.0000
  2        0.0000    12.0000

 Computed Total Fault Area = 0.17E+04

 ------------------------------------------------------------------------------

 FAULT 14

 FAULT NAME:  SIERRA MADRE


 NFP     NRL    ATTENUATION CODES:
 12      10       2  4

 AMMIN    AMSTEP  IRATE     RATE    BETA    ECTR    ECDP    COEF
```

```
 5.000    0.1000       1  3.0000   2.072   2.800   2.000   1.000

 NMAX AMMAX  PMAX
  1    7.00  1.00


   dmchar ampchar dmpchar
     0.50    6.50    1.00

 Slip Rate (  3.0000 mm/yr) Converted to Activity Rate:
 Input Shear Modulus - dyne/cm**2
0.330E+12
 Input Fault Area    - cm**2
0.103E+14
 LOG10[Mo(m)]        = (1.50)m + (16.05)
   IMAX   AMMAX    PMAX     ARATE = EX-RATE + CH-RATE
      1  7.0000  1.0000   0.02034   0.01469   0.00565


 IND_RL
      2

 RUPTURE AREA VS. MAGNITUDE  A_RA       B_RA     SIG_RA  -3.490      0.910      0.240

 FAULT SEGMENT COORDINATES
  1     -117.7397   34.1231
  2     -117.7691   34.1317
  3     -117.8176   34.1323
  4     -117.8807   34.1470
  5     -117.9402   34.1501
  6     -118.0027   34.1752
  7     -118.0683   34.1758
  8     -118.1118   34.2010
  9     -118.1492   34.2028
 10     -118.2461   34.2279
 11     -118.2896   34.2751
 12     -118.2960   34.2751

 NDP
   2
 ORIGINAL FAULT CROSS SECTION
  1       0.0000    0.0000
  2      12.7000   12.7000

 Computed Total Fault Area = 0.11E+04

 ------------------------------------------------------------------------
```

FAULT 15

FAULT NAME: MALIBU COAST

| NFP | NRL | ATTENUATION CODES: | |
|---|---|---|---|
| 4 | 10 | 2 | 4 |

| AMMIN | AMSTEP | IRATE | RATE | BETA | ECTR | ECDP | COEF |
|---|---|---|---|---|---|---|---|
| 5.000 | 0.1000 | 1 | 0.3000 | 2.072 | 1.800 | 2.000 | 1.000 |

| NMAX | AMMAX | PMAX |
|---|---|---|
| 1 | 6.70 | 1.00 |

| dmchar | ampchar | dmpchar |
|---|---|---|
| 0.50 | 6.20 | 1.00 |

Slip Rate ( 0.3000 mm/yr) Converted to Activity Rate:
Input Shear Modulus - dyne/cm**2
0.330E+12
Input Fault Area - cm**2
0.481E+13
LOG10[Mo(m)] = (1.50)m + (16.05)

| IMAX | AMMAX | PMAX | ARATE = EX-RATE + CH-RATE | | |
|---|---|---|---|---|---|
| 1 | 6.7000 | 1.0000 | 0.00174 | 0.00100 | 0.00074 |

IND_RL
2

| RUPTURE AREA VS. MAGNITUDE | A_RA | B_RA | SIG_RA | -3.490 | 0.910 | 0.240 |
|---|---|---|---|---|---|---|

FAULT SEGMENT COORDINATES

| | | |
|---|---|---|
| 1 | -118.5333 | 34.0299 |
| 2 | -118.6339 | 34.0412 |
| 3 | -118.6666 | 34.0387 |
| 4 | -118.9332 | 34.0513 |

NDP
2
ORIGINAL FAULT CROSS SECTION

| | | |
|---|---|---|
| 1 | 0.0000 | 0.0000 |
| 2 | 3.4000 | 12.6000 |

Computed Total Fault Area = 0.48E+03

---

FAULT 16

FAULT NAME: HOLLYWOOD

| NFP | NRL | ATTENUATION CODES: | |
|---|---|---|---|
| 4 | 10 | 2 | 4 |

| AMMIN | AMSTEP | IRATE | RATE | BETA | ECTR | ECDP | COEF |
|---|---|---|---|---|---|---|---|
| 5.000 | 0.1000 | 1 | 1.0000 | 2.072 | 0.800 | 2.000 | 1.000 |

| NMAX | AMMAX | PMAX |
|---|---|---|
| 1 | 6.40 | 1.00 |

| dmchar | ampchar | dmpchar |
|---|---|---|
| 0.50 | 5.90 | 1.00 |

Slip Rate ( 1.0000 mm/yr) Converted to Activity Rate:
Input Shear Modulus - dyne/cm**2
0.330E+12
Input Fault Area - cm**2
0.238E+13
LOG10[Mo(m)] = (1.50)m + (16.05)

| IMAX | AMMAX | PMAX | ARATE = EX-RATE + CH-RATE | | |
|---|---|---|---|---|---|
| 1 | 6.4000 | 1.0000 | 0.00575 | 0.00229 | 0.00346 |

IND_RL
2

| RUPTURE AREA VS. MAGNITUDE | A_RA | B_RA | SIG_RA |
|---|---|---|---|
| | -3.490 | 0.910 | 0.240 |

FAULT SEGMENT COORDINATES

| | | |
|---|---|---|
| 1 | -118.2302 | 34.1192 |
| 2 | -118.3170 | 34.1104 |
| 3 | -118.3723 | 34.0991 |
| 4 | -118.4063 | 34.0827 |

NDP
2
ORIGINAL FAULT CROSS SECTION

| | | |
|---|---|---|
| 1 | 0.0000 | 0.0000 |
| 2 | 4.8000 | 13.2000 |

Computed Total Fault Area = 0.25E+03

---

FAULT 17

FAULT NAME: SANTA MONICA

| NFP | NRL | ATTENUATION CODES: |
|---|---|---|
| 3 | 10 | 2 4 |

| AMMIN | AMSTEP | IRATE | RATE | BETA | ECTR | ECDP | COEF |
|---|---|---|---|---|---|---|---|
| 5.000 | 0.1000 | 1 | 1.0000 | 2.072 | 1.400 | 2.000 | 1.000 |

| NMAX | AMMAX | PMAX |
|---|---|---|
| 1 | 6.60 | 1.00 |

| dmchar | ampchar | dmpchar |
|---|---|---|
| 0.50 | 6.10 | 1.00 |

Slip Rate ( 1.0000 mm/yr) Converted to Activity Rate:
Input Shear Modulus - dyne/cm**2
0.360E+12
Input Fault Area - cm**2
0.364E+13
LOG10[Mo(m)] = (1.50)m + (16.05)

| IMAX | AMMAX | PMAX | ARATE = EX-RATE + CH-RATE | | |
|---|---|---|---|---|---|
| 1 | 6.6000 | 1.0000 | 0.00597 | 0.00308 | 0.00289 |

IND_RL
2

RUPTURE AREA VS. MAGNITUDE A_RA B_RA SIG_RA -3.490 0.910 0.240

FAULT SEGMENT COORDINATES

| | | |
|---|---|---|
| 1 | -118.4085 | 34.0814 |
| 2 | -118.5244 | 34.0263 |
| 3 | -118.6855 | 33.9896 |

NDP
2
ORIGINAL FAULT CROSS SECTION

| | | |
|---|---|---|
| 1 | 0.0000 | 0.0000 |
| 2 | 3.4000 | 12.6000 |

Computed Total Fault Area = 0.35E+03

FAULT 18

FAULT NAME: VENTURA - PITAS POINT

| NFP | NRL | ATTENUATION CODES: | |
|---|---|---|---|
| 6 | 10 | 2 | 4 |

| AMMIN | AMSTEP | IRATE | RATE | BETA | ECTR | ECDP | COEF |
|---|---|---|---|---|---|---|---|
| 5.000 | 0.1000 | 1 | 1.0000 | 2.072 | 2.000 | 2.000 | 1.000 |

| NMAX | AMMAX | PMAX |
|---|---|---|
| 1 | 6.80 | 1.00 |

| dmchar | ampchar | dmpchar |
|---|---|---|
| 0.50 | 6.30 | 1.00 |

Slip Rate ( 1.0000 mm/yr) Converted to Activity Rate:
Input Shear Modulus - dyne/cm**2
0.330E+12
Input Fault Area - cm**2
0.533E+13
LOG10[Mo(m)] = (1.50)m + (16.05)

| IMAX | AMMAX | PMAX | ARATE = EX-RATE + CH-RATE | | |
|---|---|---|---|---|---|
| 1 | 6.8000 | 1.0000 | 0.00520 | 0.00326 | 0.00195 |

IND_RL
2

RUPTURE AREA VS. MAGNITUDE A_RA B_RA SIG_RA -3.490 0.910 0.240

FAULT SEGMENT COORDINATES

| | | |
|---|---|---|
| 1 | -119.1411 | 34.3453 |
| 2 | -119.1940 | 34.3088 |
| 3 | -119.2243 | 34.2928 |
| 4 | -119.3034 | 34.2892 |
| 5 | -119.4040 | 34.3166 |
| 6 | -119.5527 | 34.3093 |

NDP
3
ORIGINAL FAULT CROSS SECTION

| | | |
|---|---|---|
| 1 | 0.0000 | 1.0000 |
| 2 | 0.0000 | 1.1000 |

```
 3       3.4000   13.6000

Computed Total Fault Area = 0.51E+03

--------------------------------------------------------------------------------

FAULT 19

FAULT NAME:  M.RIDGE-ARROYO PARIDA-SANTA ANA


NFP     NRL    ATTENUATION CODES:
14      10       2  4

AMMIN    AMSTEP  IRATE     RATE    BETA    ECTR    ECDP    COEF
5.000    0.1000      1  0.4000  2.072   3.200   2.000   1.000

NMAX AMMAX  PMAX
 1    6.70  1.00


  dmchar ampchar dmpchar
    0.50    6.20    1.00

 Slip Rate (  0.4000 mm/yr) Converted to Activity Rate:
 Input Shear Modulus - dyne/cm**2
0.330E+12
 Input Fault Area    - cm**2
0.975E+13
 LOG10[Mo(m)]        = (1.50)m + (16.05)
   IMAX    AMMAX     PMAX      ARATE = EX-RATE + CH-RATE
      1  6.7000  1.0000   0.00470   0.00269   0.00201


 IND_RL
      2

 RUPTURE AREA VS. MAGNITUDE  A_RA      B_RA    SIG_RA  -3.490     0.910     0.240

 FAULT SEGMENT COORDINATES
  1    -119.1658   34.4701
  2    -119.2878   34.4298
  3    -119.3456   34.4235
  4    -119.4261   34.4160
  5    -119.4714   34.4273
  6    -119.5104   34.4311
  7    -119.6110   34.4411
  8    -119.6914   34.4499
```

```
 9    -119.7430   34.4424
10    -119.7506   34.4411
11    -119.7857   34.4336
12    -119.8071   34.4336
13    -119.8688   34.4248
14    -119.8977   34.4298

NDP
  2
ORIGINAL FAULT CROSS SECTION
 1       0.0000    0.0000
 2       7.5000   13.0000

Computed Total Fault Area = 0.10E+04

--------------------------------------------------------------------------------

FAULT 20

FAULT NAME:  ANACAPA-DUME


NFP    NRL   ATTENUATION CODES:
 6     10      2  4

AMMIN   AMSTEP  IRATE    RATE   BETA   ECTR   ECDP   COEF
5.000   0.1000      1  3.0000  2.072  3.700  2.000  1.000

NMAX AMMAX  PMAX
 1    7.30  1.00


  dmchar ampchar dmpchar
    0.50    6.80    1.00

 Slip Rate (  3.0000 mm/yr) Converted to Activity Rate:
 Input Shear Modulus - dyne/cm**2
0.330E+12
 Input Fault Area    - cm**2
0.210E+14
 LOG10[Mo(m)]        = (1.50)m + (16.05)
   IMAX   AMMAX    PMAX     ARATE = EX-RATE + CH-RATE
      1  7.3000  1.0000   0.02430   0.02021   0.00409


 IND_RL
      2
```

```
RUPTURE AREA VS. MAGNITUDE  A_RA      B_RA     SIG_RA  -3.490      0.910      0.240

FAULT SEGMENT COORDINATES
 1     -118.6945    33.9849
 2     -118.7913    33.9530
 3     -118.9120    33.9508
 4     -119.1410    33.9838
 5     -119.3403    33.9792
 6     -119.4963    33.9883

NDP
  2
ORIGINAL FAULT CROSS SECTION
 1       0.0000     0.0000
 2      19.8000    19.8000

Computed Total Fault Area = 0.20E+04

--------------------------------------------------------------------------------

FAULT 21

FAULT NAME:  NEWPORT-INGLEWOOD (L.A.Basin)


NFP     NRL    ATTENUATION CODES:
 5      10       1  3

AMMIN    AMSTEP  IRATE     RATE    BETA    ECTR    ECDP    COEF
5.000    0.1000      1  1.0000   2.072   3.200   2.000   1.000

NMAX AMMAX   PMAX
 1    6.90   1.00


   dmchar ampchar dmpchar
     0.50    6.40    1.00

 Slip Rate (  1.0000 mm/yr) Converted to Activity Rate:
 Input Shear Modulus - dyne/cm**2
0.330E+12
 Input Fault Area    - cm**2
0.832E+13
 LOG10[Mo(m)]        = (1.50)m + (16.05)
   IMAX    AMMAX     PMAX      ARATE = EX-RATE + CH-RATE
      1  6.9000  1.0000   0.00664   0.00449   0.00215
```

```
IND_RL
     2

RUPTURE AREA VS. MAGNITUDE  A_RA       B_RA     SIG_RA  -3.490      0.910      0.240

FAULT SEGMENT COORDINATES
 1     -118.3723    34.0337
 2     -118.1862    33.8073
 3     -118.1510    33.7822
 4     -118.1208    33.7746
 5     -117.9246    33.6061

NDP
   2
ORIGINAL FAULT CROSS SECTION
 1        0.0000     0.0000
 2        0.0000    13.0000

Computed Total Fault Area = 0.83E+03

--------------------------------------------------------------------------------------------------------------
-------

 SITE 1 COORDINATES: -118.6386  34.4243

 BOORE ET AL(1997) NEHRP D (250)1
      AMPLITUDES (g):
0.1000E+000.2000E+000.3000E+000.4000E+000.5000E+000.6000E+000.7000E+000.8000E+000.9000E+000.1000E+01
      LN (AMPLITUDE):       -2.30     -1.61     -1.20     -0.92     -0.69     -0.51     -0.36     -0.22
-0.11      0.00
   FAULT    1 E(NO/YR)
0.2096E-020.1835E-020.1429E-020.1046E-020.7423E-030.5192E-030.3612E-030.2514E-030.1756E-030.1233E-03
   FAULT    2 E(NO/YR)
0.7261E-020.4503E-020.2916E-020.1941E-020.1304E-020.8798E-030.5967E-030.4074E-030.2802E-030.1943E-03
   FAULT    3 E(NO/YR)
0.4270E-020.2436E-020.1491E-020.9303E-030.5836E-030.3680E-030.2339E-030.1501E-030.9735E-040.6388E-04
   FAULT    4 E(NO/YR)
0.1342E-010.6350E-020.3254E-020.1752E-020.9773E-030.5616E-030.3311E-030.1998E-030.1231E-030.7731E-04
   FAULT    5 E(NO/YR)
0.3130E-010.2544E-010.1903E-010.1378E-010.9808E-020.6921E-020.4869E-020.3429E-020.2423E-020.1720E-02
   FAULT    6 E(NO/YR)
0.2448E-010.1084E-010.4953E-020.2358E-020.1169E-020.6021E-030.3212E-030.1769E-030.1002E-030.5828E-04
   FAULT    7 E(NO/YR)
0.5602E-020.2581E-020.1143E-020.5135E-030.2380E-030.1144E-030.5706E-040.2945E-040.1569E-040.8602E-05
   FAULT    8 E(NO/YR)
0.3152E-020.1138E-020.4131E-030.1580E-030.6418E-040.2762E-040.1252E-040.5948E-050.2944E-050.1511E-05
   FAULT    9 E(NO/YR)
```

0.1477E-020.4019E-030.1151E-030.3625E-040.1252E-040.4693E-050.1887E-050.8056E-060.3624E-060.1707E-06
FAULT 10 E(NO/YR)
0.2786E-020.5931E-030.1496E-030.4321E-040.1397E-040.4963E-050.1907E-050.7832E-060.3405E-060.1555E-06
FAULT 11 E(NO/YR)
0.1320E-010.3970E-020.1530E-020.6243E-030.2670E-030.1196E-030.5601E-040.2731E-040.1381E-040.7223E-05
FAULT 12 E(NO/YR)
0.1959E-010.4129E-020.1037E-020.2973E-030.9531E-040.3355E-040.1278E-040.5200E-050.2241E-050.1015E-05
FAULT 13 E(NO/YR)
0.2047E-010.4221E-020.1079E-020.3169E-030.1041E-030.3746E-040.1456E-040.6035E-050.2646E-050.1217E-05
FAULT 14 E(NO/YR)
0.5994E-020.1403E-020.3847E-030.1192E-030.4093E-040.1532E-040.6163E-050.2637E-050.1190E-050.5622E-06
FAULT 15 E(NO/YR)
0.7029E-030.1489E-030.3453E-040.9145E-050.2731E-050.9025E-060.3249E-060.1257E-060.5174E-070.2247E-07
FAULT 16 E(NO/YR)
0.2275E-020.3994E-030.7818E-040.1807E-040.4826E-050.1453E-050.4824E-060.1739E-060.6724E-070.2760E-07
FAULT 17 E(NO/YR)
0.2328E-020.4461E-030.9489E-040.2346E-040.6624E-050.2088E-050.7220E-060.2696E-060.1076E-060.4541E-07
FAULT 18 E(NO/YR)
0.1298E-020.2083E-030.4044E-040.9409E-050.2539E-050.7729E-060.2596E-060.9464E-070.3698E-070.1533E-07
FAULT 19 E(NO/YR)
0.8252E-030.9859E-040.1589E-040.3249E-050.7960E-060.2244E-060.7073E-070.2444E-070.9113E-080.3626E-08
FAULT 20 E(NO/YR)
0.6369E-020.1683E-020.5410E-030.1908E-030.7268E-040.2963E-040.1282E-040.5840E-050.2785E-050.1382E-05
FAULT 21 E(NO/YR)
0.8024E-030.8572E-040.1274E-040.2437E-050.5642E-060.1514E-060.4570E-070.1519E-070.5467E-080.2107E-08
TOTAL E(NO/YR)
0.1697E+000.7291E-010.3974E-010.2417E-010.1551E-010.1024E-010.6891E-020.4699E-020.3241E-020.2259E-02
TOTAL RISK
0.1561E+000.7031E-010.3896E-010.2388E-010.1539E-010.1019E-010.6867E-020.4688E-020.3236E-020.2257E-02

| AMPLITUDES (g): | 0.1100E+01 | 0.1200E+01 | 0.1300E+01 | 0.1400E+01 | 0.1500E+01 |
|---|---|---|---|---|---|
| LN (AMPLITUDE): | 0.10 | 0.18 | 0.26 | 0.34 | 0.41 |
| FAULT 1 E(NO/YR) | 0.8713E-04 | 0.6200E-04 | 0.4444E-04 | 0.3209E-04 | 0.2334E-04 |
| FAULT 2 E(NO/YR) | 0.1359E-03 | 0.9586E-04 | 0.6819E-04 | 0.4891E-04 | 0.3537E-04 |
| FAULT 3 E(NO/YR) | 0.4241E-04 | 0.2848E-04 | 0.1934E-04 | 0.1327E-04 | 0.9201E-05 |
| FAULT 4 E(NO/YR) | 0.4942E-04 | 0.3211E-04 | 0.2118E-04 | 0.1416E-04 | 0.9591E-05 |
| FAULT 5 E(NO/YR) | 0.1229E-02 | 0.8832E-03 | 0.6392E-03 | 0.4657E-03 | 0.3417E-03 |
| FAULT 6 E(NO/YR) | 0.3470E-04 | 0.2110E-04 | 0.1309E-04 | 0.8264E-05 | 0.5303E-05 |
| FAULT 7 E(NO/YR) | 0.4844E-05 | 0.2795E-05 | 0.1648E-05 | 0.9923E-06 | 0.6085E-06 |
| FAULT 8 E(NO/YR) | 0.8017E-06 | 0.4379E-06 | 0.2456E-06 | 0.1411E-06 | 0.8287E-07 |
| FAULT 9 E(NO/YR) | 0.8367E-07 | 0.4250E-07 | 0.2229E-07 | 0.1203E-07 | 0.6663E-08 |
| FAULT 10 E(NO/YR) | 0.7414E-07 | 0.3672E-07 | 0.1882E-07 | 0.9937E-08 | 0.5394E-08 |
| FAULT 11 E(NO/YR) | 0.3892E-05 | 0.2155E-05 | 0.1224E-05 | 0.7105E-06 | 0.4212E-06 |
| FAULT 12 E(NO/YR) | 0.4802E-06 | 0.2361E-06 | 0.1201E-06 | 0.6297E-07 | 0.3395E-07 |
| FAULT 13 E(NO/YR) | 0.5842E-06 | 0.2910E-06 | 0.1499E-06 | 0.7954E-07 | 0.4336E-07 |
| FAULT 14 E(NO/YR) | 0.2765E-06 | 0.1410E-06 | 0.7421E-07 | 0.4019E-07 | 0.2234E-07 |
| FAULT 15 E(NO/YR) | 0.1023E-07 | 0.4849E-08 | 0.2385E-08 | 0.1212E-08 | 0.6346E-09 |
| FAULT 16 E(NO/YR) | 0.1193E-07 | 0.5398E-08 | 0.2542E-08 | 0.1241E-08 | 0.6254E-09 |

```
   FAULT  17 E(NO/YR)      0.2014E-070.9328E-080.4489E-080.2236E-080.1149E-08
   FAULT  18 E(NO/YR)      0.6692E-080.3055E-080.1452E-080.7146E-090.3631E-09
   FAULT  19 E(NO/YR)      0.1526E-080.6738E-090.3105E-090.1486E-090.7346E-10
   FAULT  20 E(NO/YR)      0.7109E-060.3775E-060.2062E-060.1156E-060.6634E-07
   FAULT  21 E(NO/YR)      0.8604E-090.3697E-090.1660E-090.7749E-100.3739E-10
   TOTAL     E(NO/YR)      0.1590E-020.1129E-020.8091E-030.5846E-030.4258E-03
   TOTAL RISK              0.1589E-020.1129E-020.8088E-030.5844E-030.4257E-03

     SPECIFIED RISKS:         0.010000  0.005000  0.002105  0.001000  0.000404
     ESTIMATED LN AMP.  :      -0.503    -0.246     0.019     0.211 *********
      ESTIMATED AMP. (g):     0.60448   0.78217   1.01906   1.23539 *********

 BOORE ET AL(1997) NEHRP D (250)2
      AMPLITUDES (g):
0.1000E+000.2000E+000.3000E+000.4000E+000.5000E+000.6000E+000.7000E+000.8000E+000.9000E+000.1000E+01
      LN (AMPLITUDE):       -2.30     -1.61     -1.20     -0.92     -0.69     -0.51     -0.36     -0.22
-0.11      0.00
   FAULT   1 E(NO/YR)
0.1738E-020.1123E-020.6868E-030.4049E-030.2359E-030.1380E-030.8161E-040.4899E-040.2989E-040.1854E-04
   FAULT   2 E(NO/YR)
0.4338E-020.2605E-020.1647E-020.1019E-020.6249E-030.3842E-030.2383E-030.1497E-030.9526E-040.6148E-04
   FAULT   3 E(NO/YR)
0.2454E-020.1417E-020.8425E-030.4866E-030.2787E-030.1606E-030.9378E-040.5566E-040.3361E-040.2065E-04
   FAULT   4 E(NO/YR)
0.7471E-020.3306E-020.1544E-020.7469E-030.3748E-030.1949E-030.1048E-030.5810E-040.3311E-040.1935E-04
   FAULT   5 E(NO/YR)
0.2384E-010.1538E-010.9810E-020.6045E-020.3670E-020.2227E-020.1362E-020.8429E-030.5288E-030.3364E-03
   FAULT   6 E(NO/YR)
0.1337E-010.5016E-020.1918E-020.7723E-030.3300E-030.1491E-030.7081E-040.3513E-040.1812E-040.9671E-05
   FAULT   7 E(NO/YR)
0.3100E-020.1082E-020.3656E-030.1297E-030.4917E-040.1990E-040.8541E-050.3862E-050.1829E-050.9016E-06
   FAULT   8 E(NO/YR)
0.1606E-020.4132E-030.1111E-030.3322E-040.1100E-040.3979E-050.1553E-050.6464E-060.2844E-060.1313E-06
   FAULT   9 E(NO/YR)
0.6755E-030.1211E-030.2480E-040.6002E-050.1675E-050.5248E-060.1809E-060.6753E-070.2696E-070.1140E-07
   FAULT  10 E(NO/YR)
0.1407E-020.2469E-030.5098E-040.1250E-040.3532E-050.1120E-050.3906E-060.1473E-060.5937E-070.2533E-07
   FAULT  11 E(NO/YR)
0.7694E-020.3460E-020.1511E-020.6601E-030.2967E-030.1385E-030.6717E-040.3380E-040.1759E-040.9442E-05
   FAULT  12 E(NO/YR)
0.1022E-010.1920E-020.4115E-030.1032E-030.2960E-040.9488E-050.3334E-050.1265E-050.5121E-060.2193E-06
   FAULT  13 E(NO/YR)
0.1116E-010.2221E-020.5100E-030.1358E-030.4104E-040.1376E-040.5028E-050.1975E-050.8255E-060.3638E-06
   FAULT  14 E(NO/YR)
0.2973E-020.5964E-030.1362E-030.3613E-040.1090E-040.3654E-050.1337E-050.5263E-060.2204E-060.9740E-07
   FAULT  15 E(NO/YR)
0.2870E-030.3726E-040.5980E-050.1194E-050.2844E-060.7788E-070.2388E-070.8035E-080.2923E-080.1136E-08
   FAULT  16 E(NO/YR)
```

0.6740E-030.5163E-040.5846E-050.9027E-060.1754E-060.4059E-070.1078E-070.3200E-080.1041E-080.3663E-09
FAULT 17 E(NO/YR)
0.8541E-030.8899E-040.1232E-040.2207E-050.4821E-060.1229E-060.3546E-070.1131E-070.3925E-080.1462E-08
FAULT 18 E(NO/YR)
0.5311E-030.5530E-040.7768E-050.1414E-050.3138E-060.8121E-070.2375E-070.7677E-080.2696E-080.1016E-08
FAULT 19 E(NO/YR)
0.2739E-030.1921E-040.2148E-050.3341E-060.6583E-070.1549E-070.4184E-080.1263E-080.4179E-090.1492E-09
FAULT 20 E(NO/YR)
0.3366E-020.1017E-020.3126E-030.1036E-030.3727E-040.1446E-040.5991E-050.2628E-050.1212E-050.5834E-06
FAULT 21 E(NO/YR)
0.3218E-030.2317E-040.2596E-050.4019E-060.7865E-070.1836E-070.4923E-080.1476E-080.4847E-090.1719E-09
TOTAL E(NO/YR)
0.9835E-010.4020E-010.1992E-010.1070E-010.5996E-020.3459E-020.2045E-020.1235E-020.7613E-030.4779E-03
TOTAL RISK
0.9367E-010.3940E-010.1972E-010.1064E-010.5978E-020.3453E-020.2043E-020.1235E-020.7610E-030.4778E-03

| AMPLITUDES (g): | 0.1100E+01 | 0.1200E+01 | 0.1300E+01 | 0.1400E+01 | 0.1500E+01 |
|---|---|---|---|---|---|
| LN (AMPLITUDE): | 0.10 | 0.18 | 0.26 | 0.34 | 0.41 |
| FAULT 1 E(NO/YR) | 0.1168E-04 | 0.7474E-05 | 0.4852E-05 | 0.3194E-05 | 0.2129E-05 |
| FAULT 2 E(NO/YR) | 0.4022E-04 | 0.2666E-04 | 0.1789E-04 | 0.1216E-04 | 0.8351E-05 |
| FAULT 3 E(NO/YR) | 0.1290E-04 | 0.8191E-05 | 0.5279E-05 | 0.3450E-05 | 0.2286E-05 |
| FAULT 4 E(NO/YR) | 0.1157E-04 | 0.7066E-05 | 0.4398E-05 | 0.2786E-05 | 0.1793E-05 |
| FAULT 5 E(NO/YR) | 0.2171E-03 | 0.1420E-03 | 0.9409E-04 | 0.6314E-04 | 0.4287E-04 |
| FAULT 6 E(NO/YR) | 0.5322E-05 | 0.3010E-05 | 0.1745E-05 | 0.1034E-05 | 0.6256E-06 |
| FAULT 7 E(NO/YR) | 0.4609E-06 | 0.2433E-06 | 0.1322E-06 | 0.7373E-07 | 0.4211E-07 |
| FAULT 8 E(NO/YR) | 0.6326E-07 | 0.3163E-07 | 0.1635E-07 | 0.8704E-08 | 0.4761E-08 |
| FAULT 9 E(NO/YR) | 0.5071E-08 | 0.2356E-08 | 0.1138E-08 | 0.5687E-09 | 0.2932E-09 |
| FAULT 10 E(NO/YR) | 0.1135E-07 | 0.5314E-08 | 0.2584E-08 | 0.1300E-08 | 0.6744E-09 |
| FAULT 11 E(NO/YR) | 0.5212E-05 | 0.2952E-05 | 0.1711E-05 | 0.1014E-05 | 0.6121E-06 |
| FAULT 12 E(NO/YR) | 0.9860E-07 | 0.4627E-07 | 0.2254E-07 | 0.1136E-07 | 0.5903E-08 |
| FAULT 13 E(NO/YR) | 0.1679E-06 | 0.8071E-07 | 0.4022E-07 | 0.2070E-07 | 0.1097E-07 |
| FAULT 14 E(NO/YR) | 0.4509E-07 | 0.2174E-07 | 0.1087E-07 | 0.5611E-08 | 0.2982E-08 |
| FAULT 15 E(NO/YR) | 0.4674E-09 | 0.2022E-09 | 0.9135E-10 | 0.4292E-10 | 0.2087E-10 |
| FAULT 16 E(NO/YR) | 0.1376E-09 | 0.5436E-10 | 0.2237E-10 | 0.9563E-11 | 0.4092E-11 |
| FAULT 17 E(NO/YR) | 0.5789E-09 | 0.2417E-09 | 0.1057E-09 | 0.4778E-10 | 0.2243E-10 |
| FAULT 18 E(NO/YR) | 0.4064E-09 | 0.1713E-09 | 0.7554E-10 | 0.3462E-10 | 0.1635E-10 |
| FAULT 19 E(NO/YR) | 0.5680E-10 | 0.2279E-10 | 0.9525E-11 | 0.4094E-11 | 0.1780E-11 |
| FAULT 20 E(NO/YR) | 0.2920E-06 | 0.1512E-06 | 0.8071E-07 | 0.4429E-07 | 0.2492E-07 |
| FAULT 21 E(NO/YR) | 0.6505E-10 | 0.2595E-10 | 0.1077E-10 | 0.4619E-11 | 0.1953E-11 |
| TOTAL E(NO/YR) | 0.3051E-03 | 0.1979E-03 | 0.1303E-03 | 0.8694E-04 | 0.5876E-04 |
| TOTAL RISK | 0.3051E-03 | 0.1979E-03 | 0.1303E-03 | 0.8694E-04 | 0.5876E-04 |

| SPECIFIED RISKS: | 0.010000 | 0.005000 | 0.002105 | 0.001000 | 0.000404 |
|---|---|---|---|---|---|
| ESTIMATED LN AMP. : | -0.892 | -0.634 | -0.365 | -0.172 | 0.036 |
| ESTIMATED AMP. (g): | 0.40978 | 0.53058 | 0.69387 | 0.84212 | 1.03628 |

CLOSEST DISTANCES BETWEEN SITE AND FAULT RUPTURES

| NO. | FAULT NAME | CD_1DRP | CD_2DRP | CDIST | CLODIS | CD_EPI | CD_HYPO | |
|---|---|---|---|---|---|---|---|---|
| 1 | HOLSER | 2.4 | 0.0 | 2.2 | 2.2 | 0.1 | 2.2 | km |
| 2 | NORTHRIDGE (E. Oak Ridge) | 4.6 | 4.6 | 6.8 | 6.8 | 5.4 | 7.8 | km |
| 3 | SAN GABRIEL | 5.9 | 5.9 | 5.9 | 5.9 | 5.9 | 6.1 | km |
| 4 | OAK RIDGE (Onshore) | 8.3 | 8.3 | 8.3 | 8.3 | 9.4 | 9.6 | km |
| 5 | SANTA SUSANA | 9.6 | 0.4 | 7.9 | 7.9 | 1.1 | 7.9 | km |
| 6 | SAN CAYETANO | 11.4 | 11.4 | 11.4 | 11.4 | 12.6 | 12.6 | km |
| 7 | SIERRA MADRE (San Fernando) | 19.9 | 14.8 | 17.5 | 17.5 | 15.9 | 18.5 | km |
| 8 | SIMI-SANTA ROSA | 20.9 | 18.9 | 20.6 | 20.6 | 20.0 | 21.6 | km |
| 9 | VERDUGO | 27.0 | 26.8 | 26.9 | 26.9 | 27.9 | 28.0 | km |
| 10 | SANTA YNEZ (East) | 30.4 | 28.6 | 30.1 | 30.1 | 29.4 | 30.8 | km |
| 11 | SAN ANDREAS - 1857 Rupture | 33.0 | 33.0 | 33.0 | 33.0 | 33.0 | 33.2 | km |
| 12 | SAN ANDREAS - Mojave | 33.0 | 33.0 | 33.0 | 33.0 | 33.0 | 33.0 | km |
| 13 | SAN ANDREAS - Carrizo | 33.0 | 33.0 | 33.0 | 33.0 | 33.0 | 33.0 | km |
| 14 | SIERRA MADRE | 35.5 | 31.6 | 33.5 | 33.5 | 32.8 | 34.6 | km |
| 15 | MALIBU COAST | 42.6 | 39.2 | 41.1 | 41.1 | 39.5 | 41.1 | km |
| 16 | HOLLYWOOD | 43.5 | 38.7 | 40.9 | 40.9 | 39.1 | 41.0 | km |
| 17 | SANTA MONICA | 43.6 | 40.2 | 42.1 | 42.1 | 40.5 | 42.1 | km |
| 18 | VENTURA - PITAS POINT | 46.9 | 46.9 | 46.9 | 46.9 | 48.0 | 48.0 | km |
| 19 | M.RIDGE-ARROYO PARIDA-SANTA ANA | 48.6 | 48.6 | 48.6 | 48.6 | 49.8 | 49.8 | km |
| 20 | ANACAPA-DUME | 49.1 | 32.9 | 38.4 | 38.4 | 34.2 | 39.2 | km |
| 21 | NEWPORT-INGLEWOOD (L.A.Basin) | 49.8 | 49.8 | 49.8 | 49.8 | 50.9 | 50.9 | km |

EXPLANATION

CD_1DRP = Closest distance to projection of rupture area along fault trace.
CD_2DRP = Closest distance to surface projection of the rupture area.
CDIST = Closest distance to seismogenic rupture.
CLODIS = Closest distance to subsurface rupture.
CD_EPI = Closest epicentral distance.
CD_HYPO = Closest hypocentral distance.

**APPENDIX C**

| Attenuation Relationship | Unweighted Peak Acceleration (6.5M) | | | Weighted Peak Acceleration (7.5M) | | |
|---|---|---|---|---|---|---|
| | 475 Yr Return Period (g) | 2475 Yr Return Period | | 475 Yr Return Period (g) | 2475 Yr Return Period | |
| | | Raw Data (g) | Two-Thirds (g) | | Raw Data (g) | Two-Thirds (g) |
| Boore et al (1997) | 1.01906 | 1.51646 | 1.01096 | 0.69387 | 1.03628 | 0.69085 |
| Sadigh et al (1997) | 0.78175 | 1.13498 | 0.75665 | 0.52372 | 0.75463 | 0.50308 |
| Campbell & Bozorgnia | 0.80553 | 1.10252 | 0.73501 | 0.54633 | 0.74883 | 0.49922 |
| **Average** | **0.87** | 1.25132 | **0.83** | **0.59** | 0.84658 | **0.56** |

# Appendix D

RTF&A
GEOTECHNICAL ENGINEERING & ENGINEERING GEOLOGY

March 28, 2008

Newhall Land and Farming Company
23823 West Valencia Boulevard
Valencia, California 91355

Job No. 99-802-21

Attention: Mr. Fred MacMurdo

Subject: Geotechnical Grading Plan Review
Proposed Offsite Zone 1A Water Tank Site
Vesting Tentative Tract Map No. 53108
Los Angeles County, California

References: See Attached List

Gentlemen:

This report presents the results of our geotechnical grading plan review conducted for the Zone 1A Water Tank Site (herein referred to as the tank site), Vesting Tentative Tract Map No. 53108, located in Los Angeles County, California. The scope of this study was planned in consultation with Mr. Fred MacMurdo of Newhall Land and Farming Company (NLF) as outlined in our proposal dated March 12, 2008 (Proposal No. P025-2008-21). We are in receipt of the *Proposed Offsite Zone 1A Water Tank Grading Exhibit* prepared by Psomas. This plan, prepared at a scale of 1 inch equals 100 feet (1"=100'), is designated as Sheet 6 of 13 of the "Major Land Division, Vesting Tentative Tract Map No. 53108" plan. The geotechnical data collected as part of our investigation is presented on the Psomas plan and included in this report as the Geotechnical Map, Figure 1.

**R. T. FRANKIAN & ASSOCIATES**
1329 SCOTT ROAD BURBANK CALIFORNIA 91504
TEL. (818) 531-1501 FAX (818) 531-1511 WWW.RTFRANKIAN.COM

## SCOPE OF WORK

The scope of work for the geotechnical grading plan review was described in our March 12, 2008 proposal to NLF. The rough grading plan review consisted of the following:

- a review of data, aerial photographs, geologic literature, and previous geotechnical and engineering geologic reports;
- engineering geologic evaluation of the site to asses the impact of geologic conditions on future site development;
- engineering evaluation of the geotechnical data to develop recommendations for mass grading earthwork; and
- drafting and report preparation.

## PROPOSED CONSTRUCTION

The proposed tank site is located along an easterly descending ridge approximately ¼ mile north of Franklin Parkway, west of the U.S. Postal Service Distribution Center. Based on plans provided our office by Psomas, the proposed tank site pad will be graded to an approximate elevation of 1,172 feet above mean sea level (msl). Based on the proposed grading, a 2:1 (horizontal:vertical) cut slope on the order of 110 feet high will ascend from the north and west sides of the tank pad. A 20± feet high 2:1 combination cut and fill slope will descend from the south side of the tank pad. The proposed pad will support a water tank approximately 120 feet in diameter. The tank access road will extend along the south side of the tank and will include a 10±feet high, 2:1 graded slope along the north side of the road.

## SUBSURFACE EXPLORATIONS

Subsurface data was available for the site and adjacent areas from a prior R. T. Frankian & Associates (RTF&A) investigation (RTF&A, 2001b). The logs of the RTF&A borings and test pits pertinent to the tank site are presented in Appendix A.

## LABORATORY TESTS

Laboratory tests were performed on selected samples obtained from prior borings drilled on the site. The prior laboratory data has been presented in our prior investigation (RTF&A, 2001b) and is included in this report as Appendix B.

## GEOLOGY

### REGIONAL GEOLOGY

The tank site is located at the eastern end of the Ventura basin within the Transverse Ranges geomorphic province of California. The Ventura basin consists of a narrow, elongate sedimentary trough extending from the Santa Barbara Channel on the west to the San Gabriel fault on the east. The axis of the trough trends east-west, reflecting the overall east-west trend of the Transverse Ranges, and generally coincides with the Santa Clara River Valley. The Ventura basin has been an area of subsidence and sediment accumulation since the beginning of the Tertiary period, with the present trough-like form developing near the beginning of the Miocene epoch (Winterer and Durham, 1962).

The structure of the basin is defined as a highly folded "synclinorium" formed by north-south compressional forces (Kew, 1924), and containing a maximum 50,000± feet of marine and nonmarine Tertiary through Quaternary age sedimentary

rocks (Bailey and Jahns, 1954). Within the Santa Clarita Valley the primary sedimentary rock formations are the Pico and Saugus Formations. The Pico Formation outcrops along the northern flanks of the Santa Susana Mountains and in the Hasley Canyon-Val Verde area. The Saugus Formation overlies the Pico Formation and comprises most of the hills of the valley between Newhall and Castaic. Other geologic materials exposed within the valley include Pleistocene fanglomerate and terrace deposits (Oakeshott, 1958; Winterer and Durham, 1962), exposed in the southern and southwestern portion of the valley, and Holocene alluvium mantling the valley floor.

The Pico and Saugus Formations have been deformed into a series of closely spaced anticlines and synclines whose moderately to steeply dipping flanks are broken by the Holser fault and cut off diagonally by the San Gabriel fault (Bailey and Jahns, 1954). The San Gabriel fault, the dominant geologic feature in the Santa Clarita Valley, forms the eastern Ventura basin boundary, and separates the Ventura basin from the structurally similar Soledad basin.

## SITE GEOLOGY

**General**: The tank site is situated on the northerly limb of the Ventura basin "synclinorium", approximately 0.6 mile southwest of the Holser fault. Bedrock beneath the site, and in the surrounding area, has been deformed along the Holser fault, as indicated by several tight folds that trend subparallel to the fault trace. The east-west trend of the Holser fault, and the subparallel fold axes reflect the north-south compressional tectonic forces that have shaped the region.

The seismically active San Gabriel fault zone, trending northwest-southeast through the Santa Clarita Valley, is located approximately 3 miles northeast of the tank site.

**Geologic Materials**: Geologic materials observed within the tank site include the Saugus Formation, terrace deposits, landslide deposits, and man-made deposits. The areal extent of the various geologic units are depicted on the Geotechnical Map, (Figure 1) and are described below.

Saugus Formation (TQs): The Plio-Pleistocene age Saugus Formation (map unit "TQs") underlies the tank site. As observed in outcrops and exploratory borings and test pits, the Saugus Formation is composed of poorly sorted, weakly cemented to moderately well cemented sandstone and pebbly sandstone, with alternating beds of poorly to moderately indurated siltstone, sandy siltstone/silty sandstone, and claystone. Sandstone, pebbly sandstone, and siltstone constitute the dominant rock types. Sandstones are primarily light brown to light gray/yellowish gray fine to coarse grained, with some thin interbedded very fine to fine grained laminated and cross-bedded sandstone. The siltstone and claystone are generally reddish-brown.

Terrace Deposits (Qt): Remnant stream-terrace deposits (map unit "Qt") are situated along the west side of the existing water tank access road and east of the proposed tank site. The Pleistocene age deposits are composed of yellowish brown to brown, poorly bedded friable sand, gravel and silt.

Landslides (Qls): Numerous landslides (map unit "Qls") were identified within the area of the tank site, with two landslides occurring within the area of the proposed tank site and access road grading. The landslides are generally composed of disturbed bedrock materials derived from the underlying Saugus Formation.

As well as the bedrock landslides, a surficial failure was identified northeast of the tank site. The surficial failure is probably limited to five to eight feet in depth and incorporates weathered, less competent near-surface earth materials.

Man-made Deposits (af and cef): Man-made deposits include artificial fill and certified engineered fill (map units "af" and "cef", respectively) placed during construction of the existing tank site and the Post Office. The artificial fill is located in the existing debris basins along the north side of the existing tank access road, and bordering the Post Office site. The certified engineered fill is located beneath the existing water tank, and along potions of the tank access road.

**Geologic Structure**: Saugus Formation units beneath the tank site have been folded into an east-west trending, easterly-plunging syncline. Sedimentary beds forming the north limb of the synclinal fold strike east-northeast and dip 37 to 60 degrees southerly towards the fold axis. Beds on the south limb strike west-northwest to northwest, dipping northerly 24 to 37 degrees towards the axis.

The approximate location of the axial trace of the syncline is shown on Figure 1. A stereonet analyses of the structural configuration of the syncline indicates that the syncline plunges approximately 12 to 15 degrees to the east.

## SLOPE STABILITY

### GENERAL

Grading for the proposed tank site will include a cut pad at an approximate elevation of 1,172 feet, which will create an ascending cut slope on the north and west side of the tank pad (designated Cut Slope CS-1), and a descending cut slope

from the south side (Cut Slope CS-2). A 2:1 combination fill and cut slope (CS-3) will be graded along the north side of the tank site access road.

The maximum cut slope height is approximately 110 feet. Fill slopes are planned at gradients of 2:1. The maximum proposed fill slope height is approximately 20 feet.

## SHEAR STRENGTH PARAMETERS

Direct shear tests were performed for the previous geotechnical investigation of the tank site (RTF&A, 2001a and 2001b). In addition, we reviewed shear strength parameters for other jobs we have done in the vicinity of the site. Presented below are the recommended shear strengths for use at the subject site.

**SUMMARY OF SHEAR STRENGTH PARAMETERS**

| MATERIAL | Static Cohesion (psf) | Static $\phi$ (degrees) |
|---|---|---|
| Landslide Failure Plane Material | 200 | 16 |
| Clayey Bedding Plane Material | 250 | 20 |
| Clayey Bedding Plane Material (Seismic) | 375 | 19 |
| Saugus Cross Bedding | 640 | 32 |
| Alluvium | 100 | 40 |
| Compacted Fill | 300 | 32 |

## CUT SLOPE CS-1

Cut Slope CS-1 will be graded as a 110 feet high, east- to south-facing 2:1 cut slope. This slope will be underlain by sedimentary rock units of the Saugus Formation. The Saugus Formation can range from massive to thinly bedded sedimentary rock units of sandstone, conglomerate, siltstone, and

claystone/mudstone. Bedding planes within the Saugus Formation are poorly to moderately-well developed, and can constitute planes of weakness, particularly where sandstone/conglomerate beds are in contact with claystone. Where bedding is adversely oriented, or "daylighted," with respect to natural or cut slopes, potential for bedding plane, or "block-glide," failure exists.

The subsurface geologic conditions relative to CS-1 are depicted on Geologic Sections A-A' and B-B' (Figures 2.1 and 2.2, respectively). Geologic Section A-A' illustrates geologic conditions parallel to the axis of the easterly-plunging syncline, for the segment of the cut slope facing to the east. Bedding in this area strikes northeast and dips 40 degrees to 45 degrees to the southeast. The apparent dip, with respect to the east-facing cut slope segment, is 32 degrees towards the east. As illustrated, the proposed east-facing segment of the cut slope is considered to be grossly stable from a geologic standpoint, as the angle of apparent dip (32 degrees) is steeper than the proposed 2:1 (or approximately 26 degrees) cut-slope.

Geologic Section B-B' depicts the geologic conditions for CS-1 perpendicular to the synclinal axis, and across the south-facing portion of the cut-slope. Bedding with respect to the south-facing segment of CS-1 exhibits an apparent dip of 37 degrees to the south. This bedding orientation dips steeper than the 2:1 (26 degrees) cut slope gradient and the south-facing segment of CS-1 is considered grossly stable from a geologic standpoint.

**CUT SLOPE CS-2**

Cut Slope CS-2 is planned as a 20 feet high, south-facing combination cut and fill slope that will descend from the tank pad to the tank access road. Cut slope CS-2

will expose landslide debris and, at depth, Saugus Formation units. The landslide debris is loose and inherently unstable. As depicted on Geologic Section B-B', a portion of CS-2, and the south edge of the proposed cut pad, will expose landslide deposits which have failed in the trough of the syncline.

The landslide debris should be completely removed and the entire slope constructed as a 2:1 stability fill slope which will mitigate the existing landslide. The estimated landslide depth, based on Test Pit TP-7, is 5 to 10 feet. The landslide removal will likely extend into a portion of the tank pad. Accordingly, construction of the fill slope should include fill placement to restore the pad grade. The keyway for the proposed 2:1 stability fill should measure a minimum of 15 feet wide, and be founded at least 3 feet into competent bedrock. Backdrains should be constructed at the fill/bedrock interface as addressed in the "CONLUSIONS AND RECOMMENDATIONS" section of the report and as shown on Figure 4 – Stability Fill Details for Grossly Stable Slopes.

**CUT SLOPE CS-3**

Cut Slope CS-3 will consist of a 10 feet high variable 2:1 to 3:1 combination fill and cut slope. The slope will likely encounter Saugus Formation units, landslide debris, and terrace deposits. The terrace deposits primarily consist of weakly to moderately cemented, massive to thickly bedded sand, silty sand, and gravel. Where noted, bedding in the terrace deposits is generally flat-lying. The terrace deposits are very granular and tend to lack cementation. Accordingly, these materials may be subject to erosion from water.

Geologic Section C-C' (Figure 2.3) depicts the proposed cut slope relative to the landslide. The landslide is potentially unstable, and the terrace deposits are susceptible to erosion. Therefore, it is recommended that the landslide be removed and the entire slope constructed as a stability fill slope which will mitigate the existing landslide. The estimated landslide depth, based on Test Pit TP-5, is 15 to 20 feet. The keyway for stability fill should measure a minimum of 15 feet wide, and be founded at least 3 feet into competent bedrock or terrace deposits. Backdrains should be constructed at the fill/bedrock interface. The stability fill, and backdrains, should be constructed in accordance with the recommendations presented in this report and as shown on Figure 4 – Stability Fill Details for Grossly Stable Slopes.

## CONCLUSIONS AND RECOMMENDATIONS

### GEOLOGIC CONSIDERATIONS

**General**: Based on the geologic data developed during the geotechnical investigation pertinent to the Zone 1A Water Tank Site, it is our opinion that the site may be developed as planned provided our recommendations are incorporated in the design of the project.

**Faulting**: No mapped active or potentially active faults underlie the proposed tank site, and the site is not within an Alquist-Priolo Earthquake Fault Zone, as established by California Division of Mines and Geology (CDMG) (1999). The closest active fault to the site is the San Gabriel fault, located approximately 3 miles northwest of the tank site.

**Landslides**: Two small landslides are located along the southern edge of the tank site and a portion of the tank access road. Complete removal of these landslides

will be required during grading operations. The estimated depth of these landslides ranges from 10 to 20 feet.

**Liquefaction**: The proposed tank pad is not within a liquefaction-mapped zone and by inspection of the materials encountered in the boring is not susceptible to liquefaction.

**Erosion Protection**: Friable sandstone beds are common within the Saugus Formation and have been identified at the site. If exposed in graded slopes, these beds could be subject to erosion and rilling, due to the lack of cementation. Under most circumstances, the erosion can be controlled by the establishment of vegetative cover over the slope upon completion of grading. Extensive or thick deposits of the friable beds may warrant construction of stability fills. The abundance of erosion susceptible beds should be determined during grading.

In order to reduce the potential for erosion, all graded slopes should be seeded or planted with proper ground cover as soon as possible, following grading. The ground cover should consist of drought-resistant, deep-rooting vegetation. A landscaping expert should be consulted for ground cover recommendations. If the potential for some erosion of the slopes is acceptable, at a minimum, a 3-foot deep, 5-foot wide ditch may be excavated at the toe of all slopes so when the materials do erode down the slope they do not threaten the tank or any other adjoining structures.

Drainage from the proposed slopes should be directed to non-erosive drainage devices. Surface drainage for the tank pad should be controlled and directed to drainage devices to minimize erosion of the slopes that descend from the proposed tank pad.

**Rippability**: Grading operations can be performed using conventional grading equipment. Heavy ripping may be needed when excavating well-cemented sandstone or conglomerate beds.

## RESTRICTED USE AREAS

Based upon the geologic conditions and proposed grading, there are no Restricted Use Areas (RUAs) at the subject site.

## GRADING

**Site Preparation**: Prior to performing earthwork, the existing vegetation and any deleterious debris should be removed from the site. Existing utility lines should be relocated or properly protected in-place. All unsuitable soils, landslide material, and uncertified fills in the areas of grading receiving new fill should be removed to competent earth materials and replaced with engineered fill.

**Material for Fill**: The on-site soils, less any debris or organic matter, may be used in required fills. Any expansive clays discovered should be mixed with non-expansive soils to result in a mixture having an expansion index less than 30 if they are to be placed within the upper 8 feet beneath proposed rough grades.

Rocks or hard fragments larger than 8 inches may not be placed in the fill without special treatment. Rocks or hard fragments larger than 4 inches shall not compose more than 25% of the fill or a lift. Soils containing more than 25% rock or hard fragments larger than 4 inches must be compacted with successive passes (e.g., with a sheepsfoot roller) until rock or hard fragments larger than 4 inches constitute less than 25% of the fill or lift.

Import material should consist of relatively non-expansive soils with an expansion index less than 30. The imported materials should contain sufficient fines (binder material) so as to be relatively impermeable and result in a stable subgrade when compacted. The import material should be free of organic materials, debris, and cobbles larger than 8 inches. A bulk sample of potential import material, weighing at least 25 pounds, should be submitted to the Geotechnical Consultant of Record at least 48 hours in advance of fill operations. All proposed import materials should be approved by the Geotechnical Consultant of Record prior to being placed at the site.

**Compaction**: After the site is cleared and excavated as recommended, the exposed soils should be carefully observed for the removal of all unsuitable deposits. Next, the exposed soils should be scarified to a depth of 6 inches, brought to about 2% above optimum moisture content, and rolled with heavy compaction equipment. The upper 6 inches of exposed soils should be compacted to at least 90% of the maximum dry density obtainable by the ASTM D 1557-02 Method of Compaction.

After compacting the exposed soils, all required fills should be placed in loose lifts, not more than 8 inches in thickness, and compacted to at least 90%. The moisture content of the fill soils at the time of compaction should be about 2 to 4% above optimum moisture content. Compacted fill should not be allowed to dry out before subsequent lifts are placed.

Rough exterior grades should be sloped so as not to direct water flow over slope faces. Finished exterior grades should be sloped to drain away from building foundations to prevent ponding of water.

**Backfill**: All required backfill should be mechanically compacted in layers; flooding should not be permitted. Proper compaction of backfill will be necessary to reduce settlement of the backfill and any overlying slabs and paving. Backfill should be compacted to at least 90% of the maximum dry density obtainable by the ASTM D 1557-02 Method of Compaction.

**Proposed Tank Pad Subgrade**: It is anticipated that Saugus Formation bedrock materials exposed at pad grade may contain expansive claystone beds that could cause differential expansion. An 8-foot deep fill cap extending at least 8 feet outside of the footprint of the proposed water tank is recommended to reduce the effects of expansive soil conditions and the presence of the transition zone, associated with the recommended stability fill along the south side of the tank pad (see Figure 3). It is also recommended that the bedrock be removed and recompacted to a depth of at least 3 feet below proposed soil subgrade in exposed Saugus Formation areas to be paved. The soils generated by these over-excavations should be mixed with non-expansive soils to yield a relatively non-expansive mixture. Should the resulting fill soil still be expansive, special construction techniques and procedures may be required to reduce the potential for expansive soil related distress.

**Tank Subdrain System**: A subdrain system should be installed under the proposed water tank. A synthetic geomembrane (such as high-density polyethylene-HDPE) with a coefficient of permeability of $10^{-6}$ cm/sec or less be placed beneath the proposed tank site. A leakage collection and removal system should be provided between the tank bottom and the geomembrane. The tank manufacturer may also have other similar or equivalent drainage systems, which could be used in lieu of the

system recommended above. We should review the tank foundation and drainage plans after completion of rough grading operations.

**Subdrains**: A canyon subdrain is recommended to intercept and remove groundwater within the proposed canyon fill near the west end of the access road. The subdrain should extend up-canyon, with the drain inlet carried to within 15 feet of final pad grade. Specific subdrain location and length should be determined in the field during grading operations.

The subdrain should be surveyed by the Project Surveyor to establish line and grade during construction, and for future location reference. Subdrain excavation and placement should be observed by our geologist.

The subdrains should be installed in accordance with the manufacturer's specifications. A minimum 2% gradient is to be maintained in the subdrain pipes. There should be at least 8 uniformly spaced sets of 2 perforations per lineal foot of pipe. The width of the perforations should not exceed 1/16 of an inch. If PVC pipe with drilled perforations is utilized, the diameter of the holes should not exceed 3/8 of an inch, if gravel and filter fabric is used or 1/8 inch diameter if Los Angeles County Flood Control District (LACFCD) Designation F-1 Filter Material is used. When constructing the subdrain, the pipe should be placed so that the drilled perforations are positioned on the bottom half of the pipe. The upstream end of subdrains should be capped. The final 20 feet of pipe at the downstream end of canyon, stabilization, buttress, and side hill fills shall not be slotted or perforated. Provisions should be made at all times during construction to prevent damage to the subdrain from construction equipment, and to prevent soils from being washed into an exposed subdrain by surface waters.

For runs up to 500 feet, subdrains for the bottom of canyon fills should consist of at least 6-inch diameter pipe. For runs of 500 to 1,500 feet, 8-inch diameter pipe shall be used. For runs over 1,500 feet, 10-inch diameter pipe shall be used.

Canyon subdrains should be installed in a rectangular trench excavated to expose competent material and shall be approved by the Geotechnical Consultant of Record. The slotted subdrains should be surrounded by at least 3 cubic feet per lineal foot of granular filter material. The granular filter material for subdrains should meet the LACFCD Designation F1, or have a gradation approved by the Geotechnical Consultant of Record prior to placement. There should be at least 6 inches of compacted granular filter material on all sides of the pipe (See Figure 5). As an alternative, drains may be placed in a "V" ditch only after approval by the Engineering Geologist (see Figure 6).

As an alternative to the granular filter material, ¾ inch diameter gravel may be placed around the pipe. The gravel should be separated from the surrounding soils by a filter fabric such as Mirafi 140N, or equivalent, wrapped around the gravel ("burrito wrapped").

**Stability Fill Backdrains**: Backdrains should be installed at the backcut of the stability fills. The backdrains should consist of 4-inch diameter, or larger, perforated pipe surrounded by filter material. Non-perforated drain outlets should be provided at vertical intervals not exceeding 15 feet and horizontal intervals not exceeding 100 feet. The exact location of subdrains should be determined in the field by the Geotechnical Consultant of Record after the backcut has been made.

**Geotechnical Observation**: The grading operations should be observed by the Geotechnical Consultant of Record. The Geotechnical Consultant of Record's representative should have at least the following duties:

- observe the excavation so that any necessary modifications based on variations in the soil/rock conditions encountered can be made;

- observe the exposed subgrade in areas to receive fill and in areas where excavation has resulted in the desired finished subgrade. The representative should also observe proof-rolling and delineation of areas requiring overexcavation;

- evaluate the suitability of on-site and import soils for fill placement; collect and submit soil samples for required or recommended laboratory testing where necessary;

- observe the fill and backfill for uniformity during placement;

- test fill for field density and compaction to determine the percentage of compaction achieved during fill placement; and,

- geologic observation of all cut slopes, keyways, backcuts and geologic exposures during grading to ascertain that conditions conform to those anticipated in the report.

Once the necessary grading permits are obtained, the governmental agencies having jurisdiction over the project should be notified prior to commencement of grading so that arrangements can be made for required inspection(s). The contractor should be familiar with the inspection requirements of the regulatory agencies.

**FOUNDATIONS**

**General**: The proposed water tank and footings for auxiliary structures or retaining walls may be supported on continuous or individual spread footings established in properly compacted fill. It is recommended that a formal review of foundation plans and foundation loading details be performed by the Geotechnical Consultant of Record when plans become available to verify the applicability of the recommendations contained herein. The recommendations presented below should be considered preliminary and should be finalized after review of foundation plans. The preliminary design values are based upon this investigation, our experience with the soils in the area, and with the site preparation and grading recommendations for this project.

**Bearing Capacity**: It is assumed that the proposed water tank will be founded at approximately final planned grades shown on the Geotechnical Map. Individual or continuous footings should have a width of at least 12 inches and be placed at a depth of at least 24 inches below the lowest final adjacent grade.

Shallow footings established in certified compacted fill may be designed using a bearing value of 2,500 pounds per square foot (psf). The recommended bearing value is a net value, and the weight of concrete in the footings may be taken as 50 pounds per cubic foot (pcf). The weight of soil backfill may be neglected when determining the downward loads from the footings. A one-third increase in the bearing value may be used when considering wind or seismic loads.

While the actual bearing value of the fill placed at the site will depend on the materials used and the compaction methods employed, the quoted bearing value will

be applicable if acceptable soils are used and are compacted as recommended. The bearing value of the fill should be confirmed during grading.

**Lateral Resistance**: Lateral loads may be resisted by soil friction and by the passive resistance of the soils. A coefficient of friction of 0.4 applied to the dead loads may be used between the footings, floor slabs and the supporting soils. The passive resistance of properly compacted fill soils may be assumed to be equal to the pressure developed by a fluid with a density of 250 pcf. A one-third increase in the passive value may be used for wind or seismic loads. The frictional resistance and the passive resistance of the soils may be combined without reduction in determining the total lateral resistance.

**Settlement**: Provided that foundations are underlain by compacted fill soils as recommended, and maximum loads do not exceed 3.5 kips per lineal foot, we estimate that the maximum settlement will be about 1 inch (at the center) and differential settlement within a horizontal distance of 30 feet will be less than 0.75 inches.

**Foundation Observations**: To verify the presence of satisfactory soils at foundation design elevations, the excavations should be observed by the Geotechnical Consultant of Record. Excavations should be deepened as necessary to extend into satisfactory soils. Where the foundation excavations are deeper than four feet, the sides of the excavations should be sloped back at ¾:1 or shored for safety.

## RETAINING WALLS

**Lateral Earth Pressures**: For design of cantilevered walls below grade, where the surface of the backfill is level and the retained height of soils is less than 15 feet,

it may be assumed that drained, nonexpansive soils will exert a lateral pressure equal to that developed by a fluid with a density of 30 pcf. Where the surface of the backfill is inclined at 2:1, it may be assumed that drained soils will exert a lateral pressure equal to that developed by a fluid with a density of 45 pcf. In addition to the recommended earth pressure, the walls should be designed to resist any applicable surcharges due to buildings, walls, and storage or traffic loads. A drainage system, such as weepholes or a perforated pipe should be provided behind the walls to prevent the development of hydrostatic pressure. Recommendations for wall drains are presented as follows.

If a drainage system is not installed, the walls should be designed to resist a hydrostatic pressure equal to that developed by a fluid with a density of 80 pcf against the full height of the wall.

In addition to the recommended earth and hydrostatic pressures, the upper 10 feet of walls adjacent to vehicular traffic areas should be designed to resist a uniform lateral pressure of 100 psf. This pressure is based on an assumed 300 psf surcharge behind the walls due to normal traffic. If the traffic is kept back at least 10 feet from the walls, the traffic surcharge may be neglected. Special recommendations will be required where expansive soils are to be retained.

**Retaining Wall Drainage**: A drainage system should be provided behind retaining walls, or the walls should be designed to resist hydrostatic pressures. The drainage system could consist of a 4-inch diameter perforated pipe placed 6 inches from the base of the wall, with the perforations down, and connected to an outlet device. The pipe should be sloped at least 1 inch per 50 feet and surrounded on all sides by at least 6 inches of clean gravel. The gravel should be "burrito-wrapped"

with filter fabric, such as Mirafi 140N, or equivalent. As an alternative to the gravel and filter fabric, filter material meeting the requirements of Los Angeles County Flood Control District Designated F-1 Filter Material, and slotted pipe, may be used. The backside of the wall should be waterproofed.

A vertical six-inch wide gravel chimney drain, or a drainage geocomposite such as Miradrain, should be placed against and behind retaining walls that are higher than 3 feet. The top of the back drain should be capped with 18 inches of on-site soils. Details regarding the drainage system, chimney drain, Miradrain, waterproofing, and soil cap as shown on the attached Retaining Wall Details, Figures 7.1 and 7.2.

The installed drainage system should be observed by the Geotechnical Consultant of Record prior to backfilling the system. Inspection of the drainage system may also be required by the reviewing governmental agencies.

The drainage system should be observed by the Geotechnical Consultant of Record prior to backfilling the system. Inspection of the drainage system may also be required by the reviewing governmental agencies.

**PAVEMENT DESIGN**

Following the completion of grading operations, samples of the on-site soil should be obtained from near final grade in pavement areas to perform R-value tests. The following preliminary pavement section recommendations are based on the assumption that the on-site soils have an R-value of 18. The final pavement section recommendations could vary depending on the results of the actual R-value test results obtained from samples obtained from the pavement areas.

| TRAFFIC INDEX | ASPHALT THICKNESS (INCHES) | BASE COURSE (CAB) THICKNESS (INCHES) | BASE COURSE (CMB) THICKNESS (INCHES) |
|---|---|---|---|
| 4 | 3 | 4 | 6 |
| 6 | 4 | 7 | 9 |
| 8 | 5 | 11 | 13 |
| 10 | 7 | 18 | 20 |
| 11 | 7 | 21 | 23 |

Base course material should consist of crushed aggregate base (CAB), as defined by Section 200-2.2 of the Standard Specifications for Public Works Construction ("Greenbook"). If crushed miscellaneous base (CMB) is used, it should meet the specifications outlined in Section 200-2.4 of the "Greenbook". Base course should be compacted to at least 95% of the maximum dry density of that material.

Base course material should be purchased from a supplier who will certify that the base course will meet or exceed the specifications in the "Greenbook", as indicated. We could, at your request, perform sieve analysis and sand equivalency tests on material delivered to the site which appears suspect. Additional tests could be performed, upon request, to determine if the material is in compliance with the specifications.

The pavement section recommendations presented above are based upon assumed Traffic Index values. RTF&A does not take responsibility for the numerical determination of the Traffic Index values or the areas where they apply within the site. We would be pleased to provide pavement section recommendations for alternative Traffic Index values upon request.

## GEOTECHNICAL CONSULTANT OF RECORD

This report has been prepared assuming that RTF&A will perform all geologic and geotechnically-related field observations and testing. If the recommendations presented in this report are to be utilized, but observation of the grading activities is performed by others, the parties performing the work must review this report and assume responsibility for recommendations contained herein or provide their own recommendations. That party would then assume the title "Geotechnical Consultant of Record" for the project.

A representative of the Geotechnical Consultant of Record should be present to observe all grading operations as well as test compacted fills. A report presenting the results of these observations and related testing should be issued upon completion of these operations.

-oOo-

The following are attached and complete this report.

- References
- Geotechnical Map – Figure 1 (in pocket)
- Geotechnical Sections - Figures 2.1 through 2.3
- Transition Zone Detail - Figure 3
- Stability Fill Details for Grossly Stable Slopes – Figure 4
- Typical Canyon Subdrain - Figure 5
- Alternate Canyon Subdrain - Figure 6
- Retaining Wall Details – Figure 7.1 and 7.2
- Appendix - Field Explorations and Laboratory Testing
  - Log of Boring B-1
  - Test Pit Logs TP-1 through TP-9
  - Summary of Shear Test Data – (2 pages)

Respectfully submitted,

R. T. FRANKIAN & ASSOCIATES

by: Alan W. Rasplicka
Principal Geotechnical Engineer

and: Timothy P. Latiolait
Principal Engineering Geologist

AWR/TPL/sjc

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# Geotechnical Map

PREPARED FOR
Newhall Land and Farming Company

Project Location
Zone 1A Water Tank Site Grading
Castaic, California

| SCALE | DRAWN BY | CHECKED BY |
|---|---|---|
| AS SHOWN | MN | |
| DATE | | JOB NO. |
| 3-28-08 | Figure 1 | 99-802-21 |

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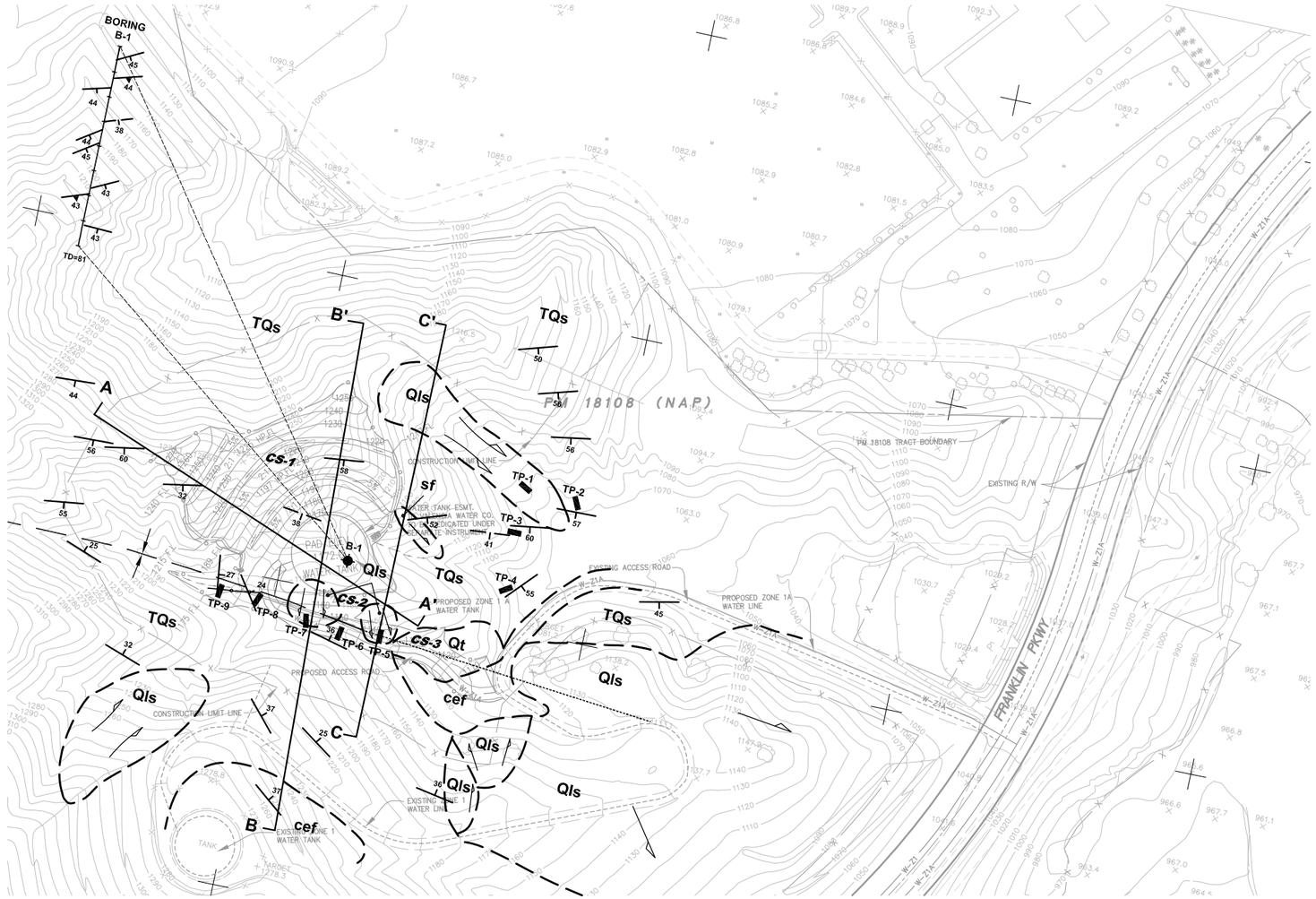


## EXPLANATION

| | |
|---|---|
| cef | Certified Engineered Fill |
| sf | Surficial Failure |
| Qls | Landslide Deposits |
| Qt | Terrace Deposits |
| TQs | Saugus Formation |
| | Geologic Contact, approximately located; queried where questionable |
| | Axial Trace of Syncline; dashed where approximate, dotted where concealed, queried where questionable; arrow on fold axis denotes direction of plunge |
| 49 | Strike and Dip of Bedding |
| 41 | Approximate Bedding |
| 24 | Strike and Dip of Bedding Shear |
| C — C' | Geologic Section Line |
| B-1 | Boring Location and Number |
| TP-9 | Test Pit Location and Number |
| CS-3 | Cut Slope Designation |
| | Subdrain |

| OFFSITE ZONE 1A WATER TANK SITE | |
|---|---|
| RAW CUT | 87,000 CUBIC YARDS |
| RAW FILL | 2,000 CUBIC YARDS |
| EXPORT | 87,000 CUBIC YARDS |

NEWHALL RANCH

100' 50' 0' 100' 200'
GRAPHIC SCALE
Note: For reduced sized prints, original scale is in inches

PROPOSED OFFSITE
ZONE 1A WATER TANK GRADING
EXHIBIT

PSOMAS

DATE: 03-07-08 REVISED ON:
JOB No:1NRC010708

SHEET 1 OF 1
RV122-01

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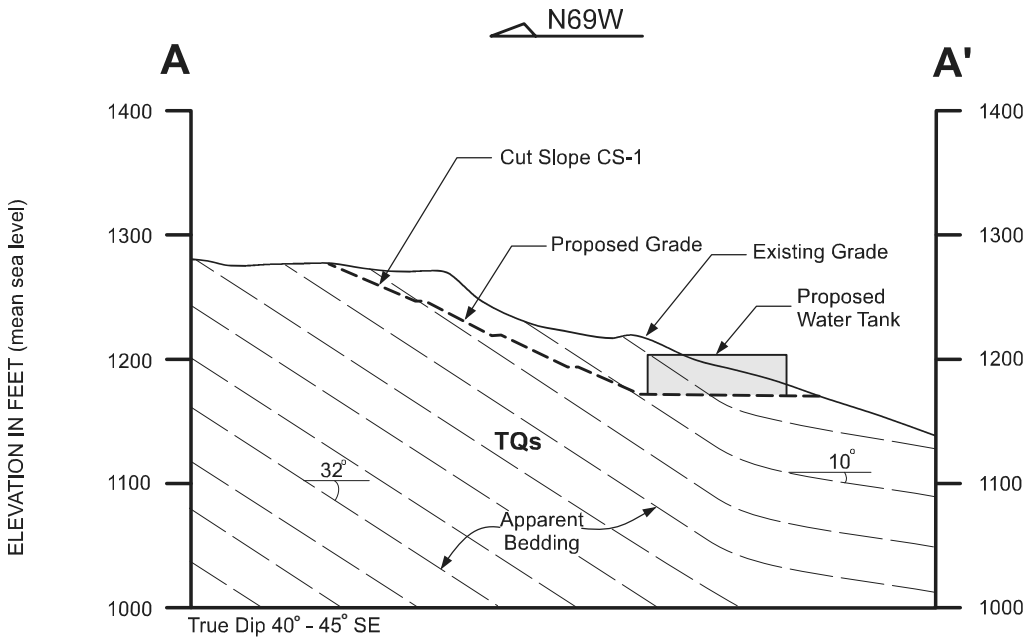
# GEOLOGIC SECTION A-A'




## Geologic Section

PREPARED FOR
Newhall Land and Farming Company

PROJECT LOCATION
Zone 1A Water Tank Site Grading
Vesting Tentative Tract Map No. 53108
Castaic, California

| SCALE | DRAWN BY | CHECKED BY |
|---|---|---|
| 1" = 100' | MN | |
| DATE | FIGURE 2.1 | JOB NO. |
| 3-28-08 | | 99-802-21 |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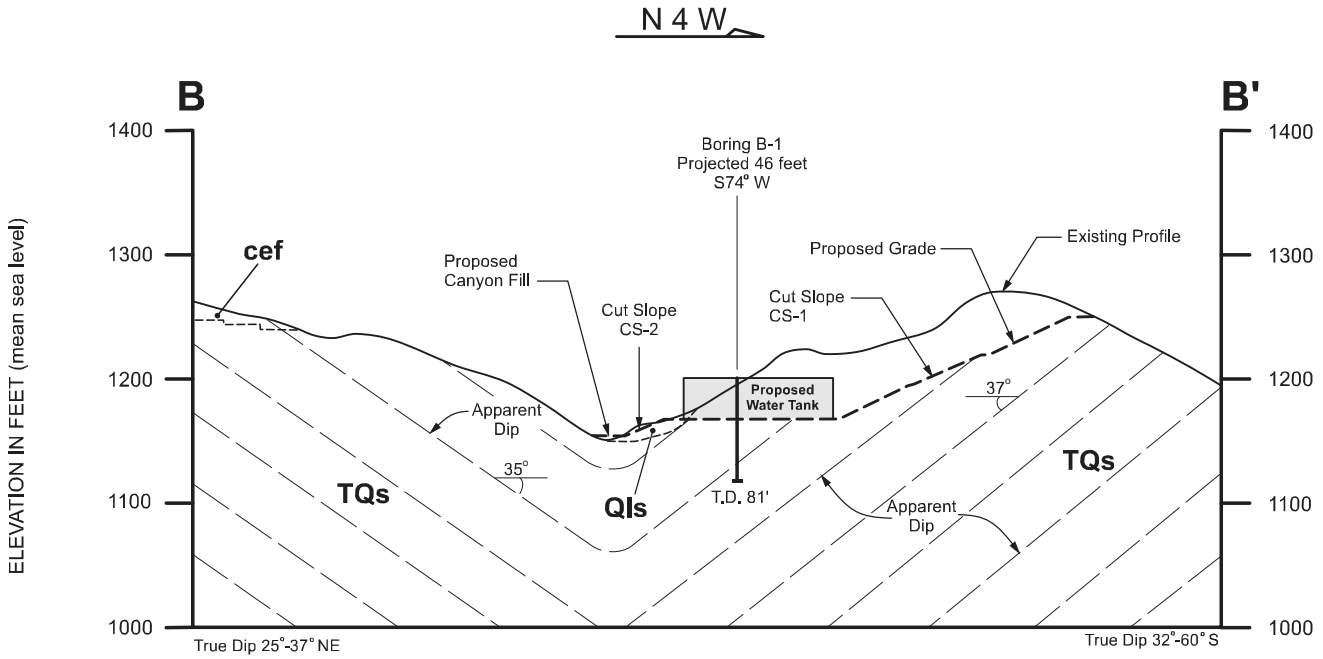
# GEOLOGIC SECTION B-B'




## Geologic Section

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PROJECT LOCATION
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Vesting Tentative Tract Map No. 53108
Castaic, California

| SCALE | DRAWN BY | CHECKED BY |
|---|---|---|
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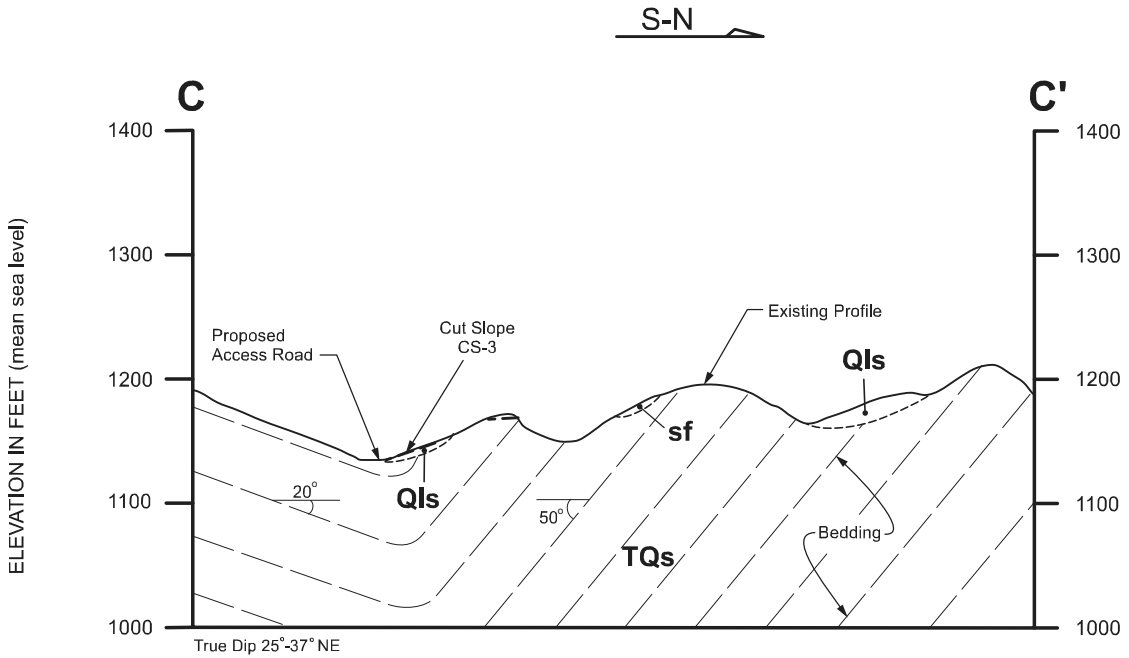
# GEOLOGIC SECTION C-C'




## Geologic Section

PREPARED FOR
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PROJECT LOCATION
Zone 1A Water Tank Site Grading
Vesting Tentative Tract Map No. 53108
Castaic, California

| SCALE | DRAWN BY | CHECKED BY |
|---|---|---|
| 1" = 100' | MN | |
| DATE | FIGURE 2.3 | JOB NO. |
| 3-28-08 | | 99-802-21 |


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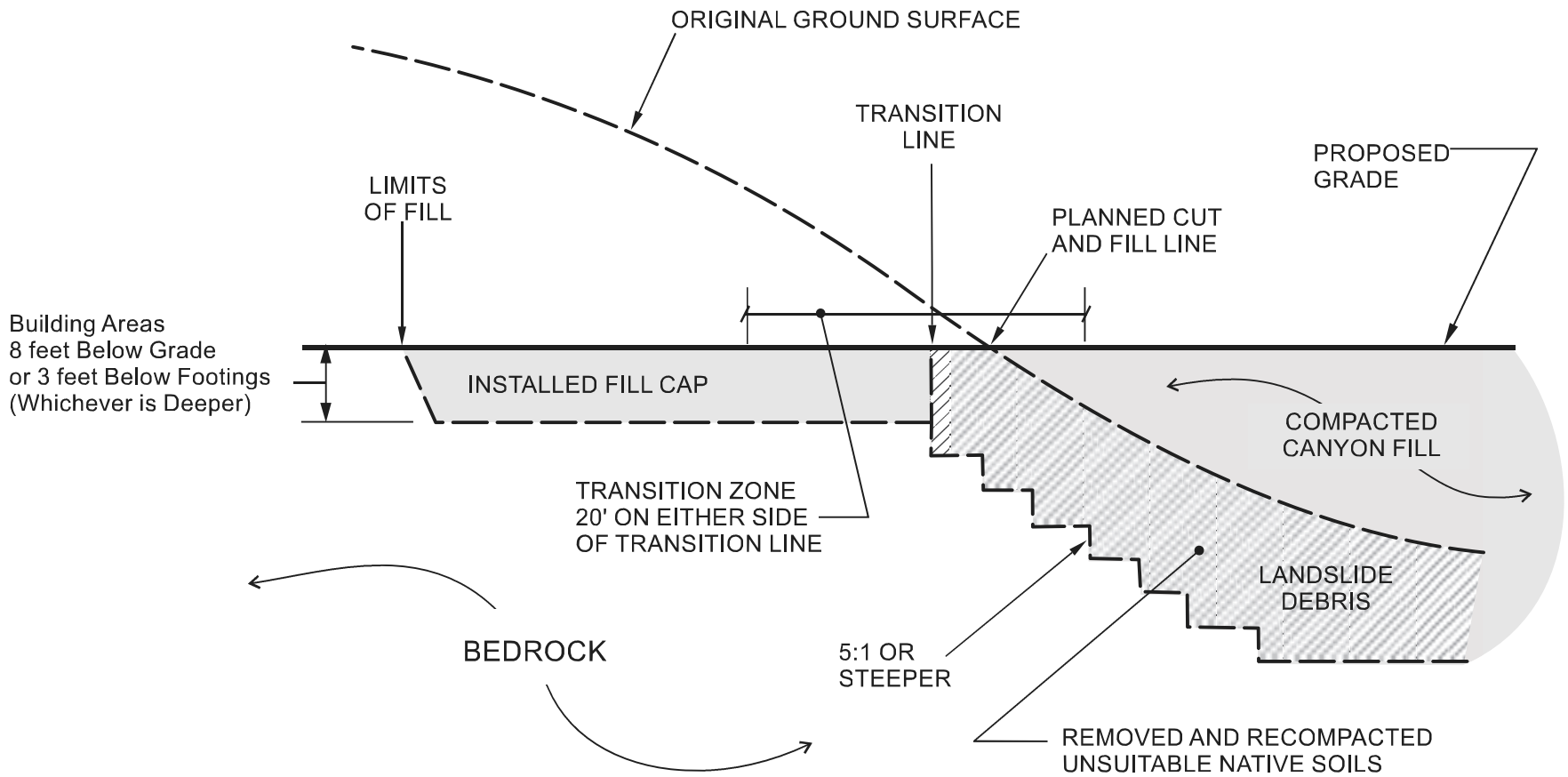
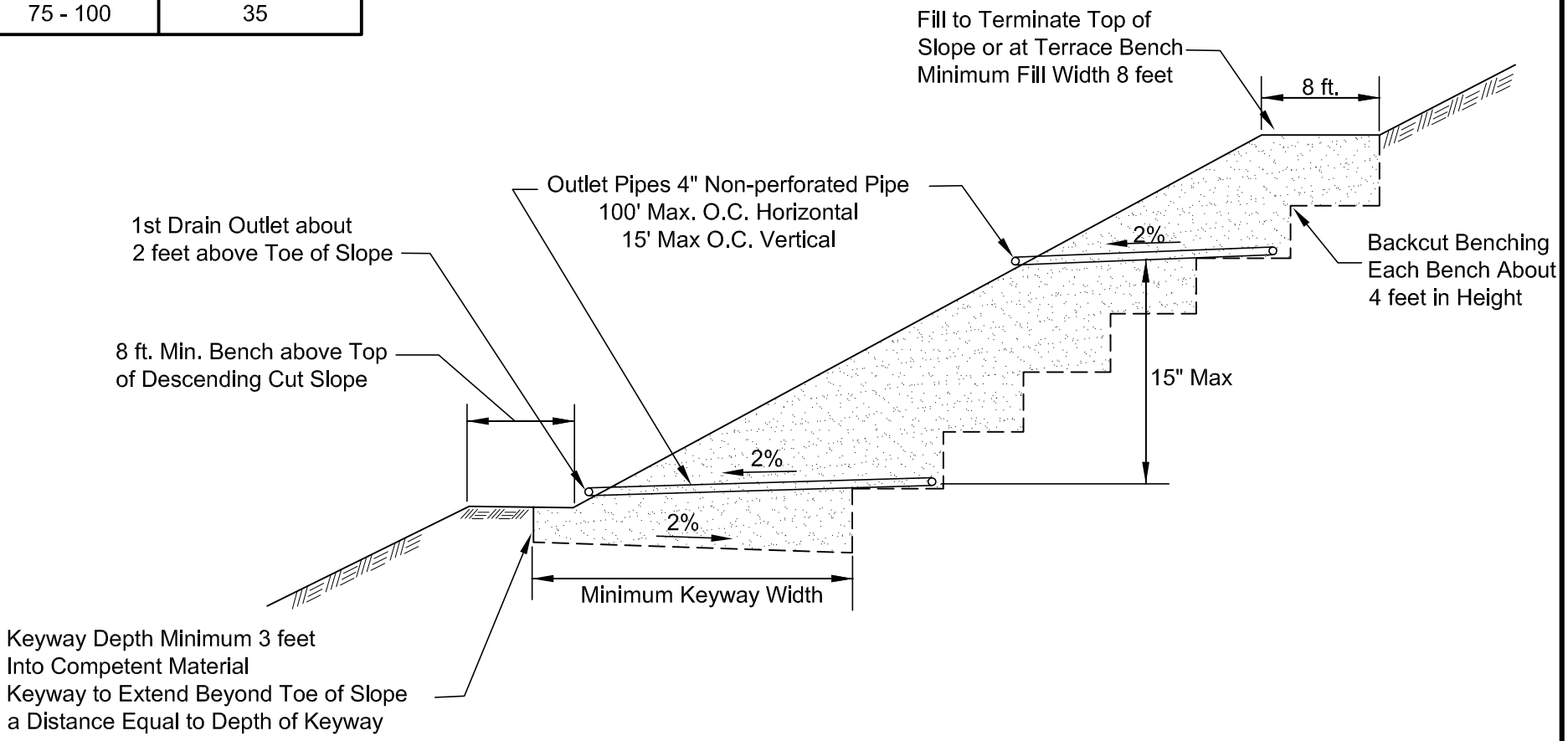



# TRANSITION ZONE DETAIL

**NOT TO SCALE**

| Stability Fill Height (feet) | Minimum Width of Keyway (feet) |
|---|---|
| 0 - 20 | 15 |
| 20 - 30 | 20 |
| 30 - 50 | 25 |
| 50 - 75 | 30 |
| 75 - 100 | 35 |




# STABILITY FIIL DETAILS FOR GROSSLY STABLE SLOPES

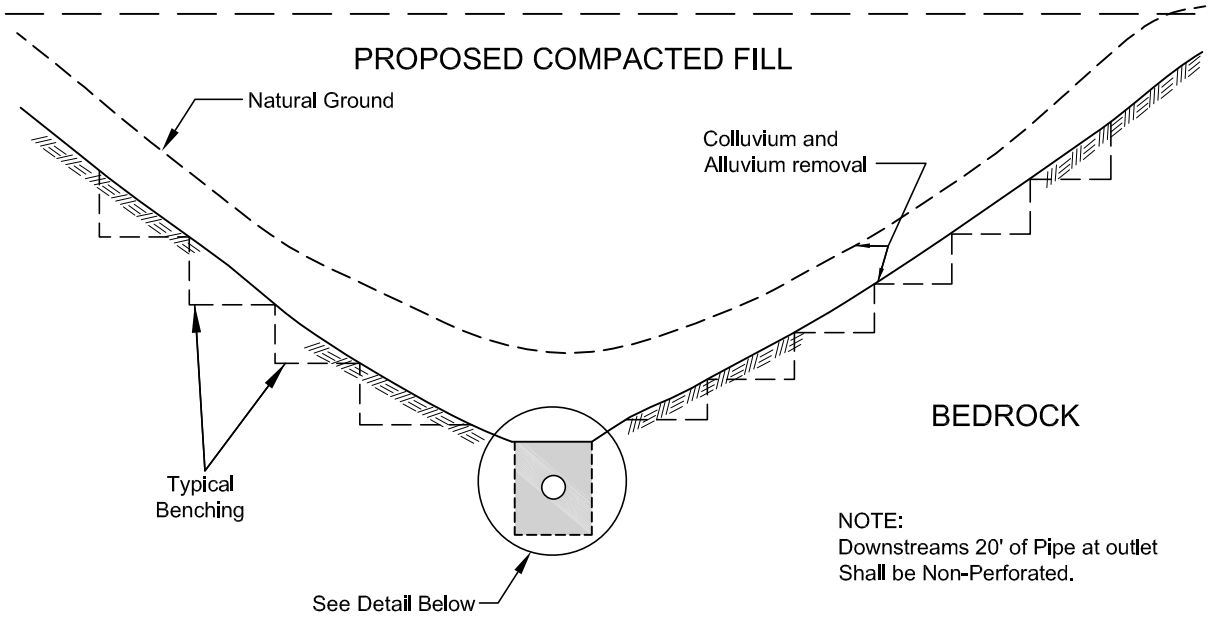
N.T.S.



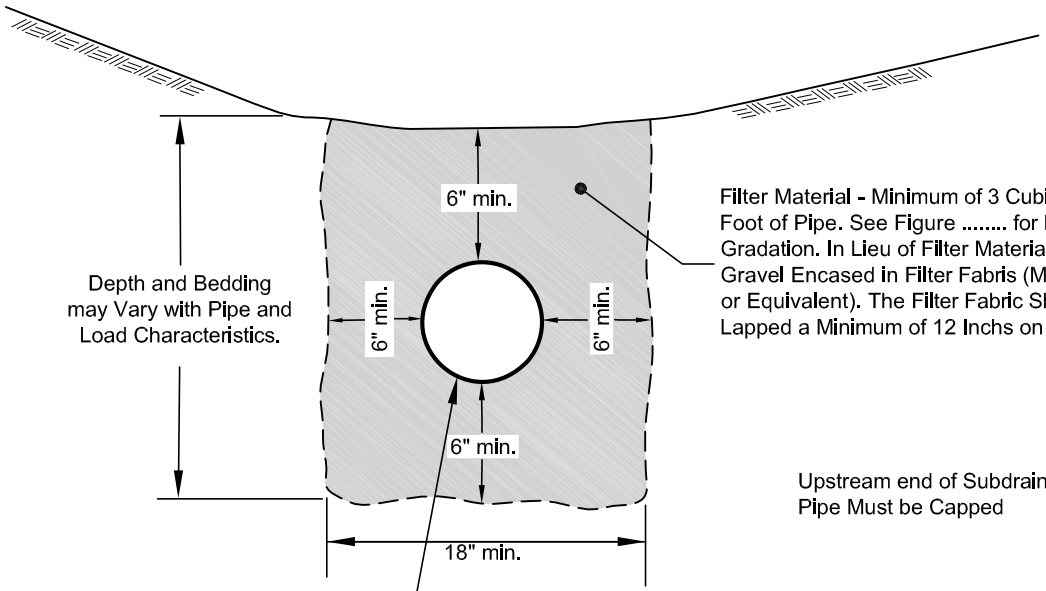
STABILITY(cad)

# TYPICAL CANYON SUBDRAIN

## MINIMUM STANDARD GRADING SPECIFICATIONS




NOTE:
Downstreams 20' of Pipe at outlet
Shall be Non-Perforated.




Filter Material - Minimum of 3 Cubic Feet per Foot of Pipe. See Figure ..... for Required Gradation. In Lieu of Filter Material Use Gravel Encased in Filter Fabris (Mirafi 140N or Equivalent). The Filter Fabric Shall be Lapped a Minimum of 12 Inchs on all Joints.

Upstream end of Subdrain
Pipe Must be Capped

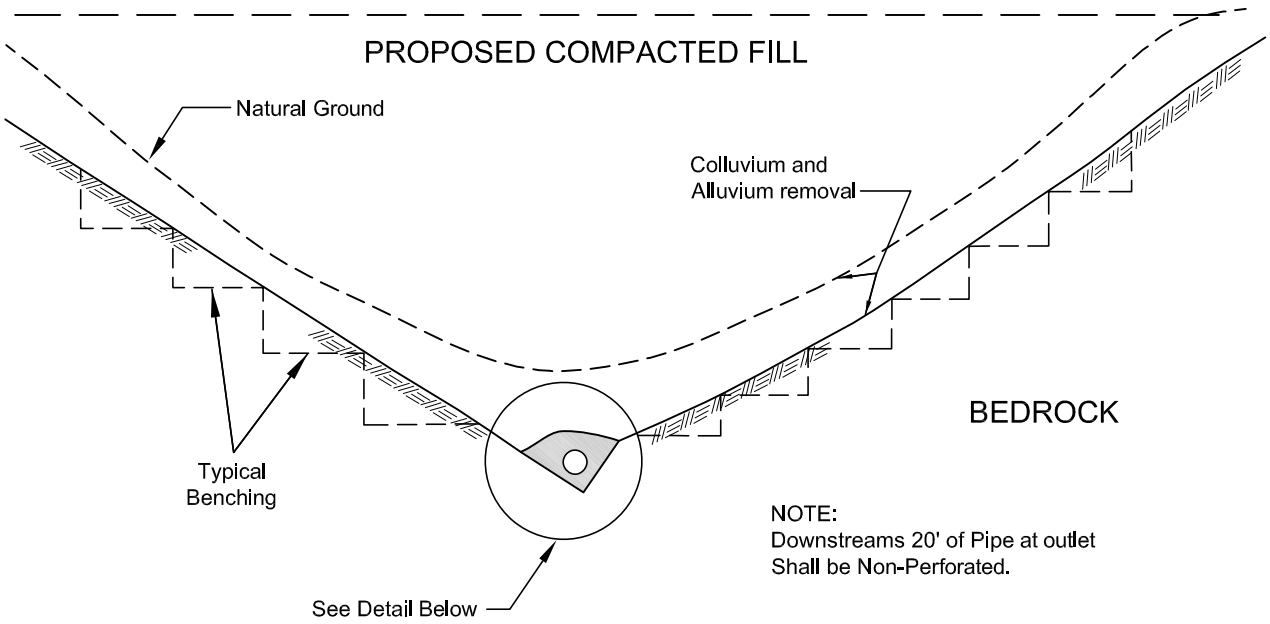
Minimum 4-inch Diameter, ADS Corrugated or ABS Class SDR 35 with a Crushing Strength of at Least 1000 Pound, with Minimum of 8 Uniformly Spaced Perforations per Foot of Pipe, Installed with Perforations on Bottom of Pipe.

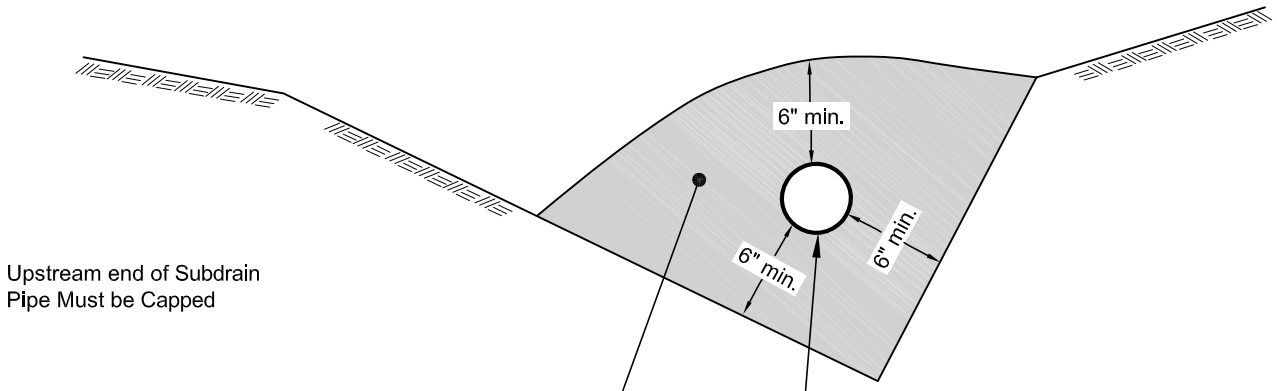
NOTE:
For Runs up to 500 feet Use 6-Inch Diameter Pipe
For Runs up to 500-1500 feet Use 8-Inch Diameter Pipe
For Runs Grather Than 1500 feet Use 10-Inch Diameter Pipe

CANYON-SUB(cad)

# TYPICAL CANYON SUBDRAIN

## MINIMUM STANDARD GRADING SPECIFICATIONS

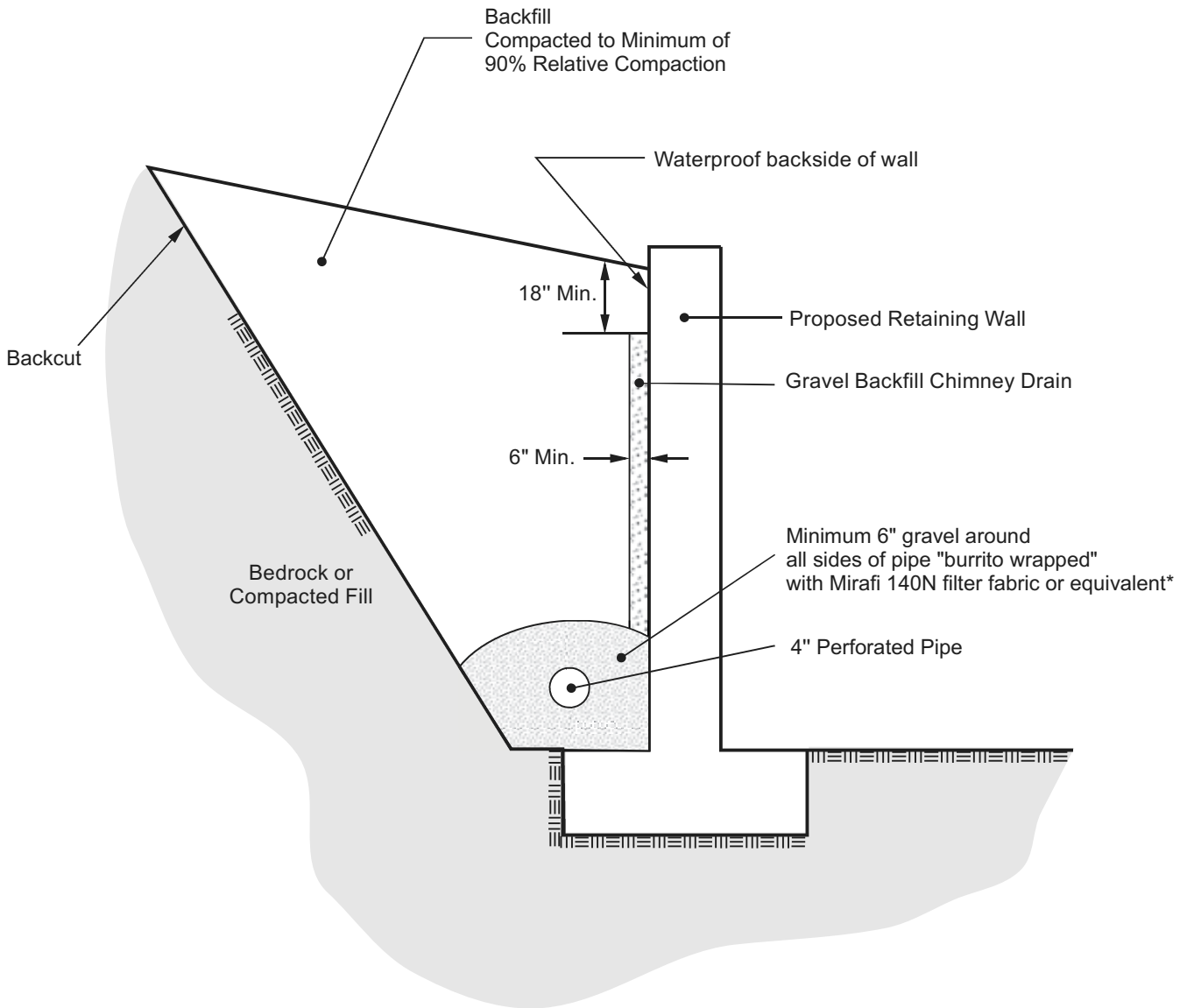



NOTE:
For Runs up to 500 feet Use 6-Inch Diameter Pipe
For Runs up to 500-1500 feet Use 8-Inch Diameter Pipe
For Runs Grater Than 1500 feet Use 10-Inch Diameter Pipe

# RETAINING WALL DETAIL

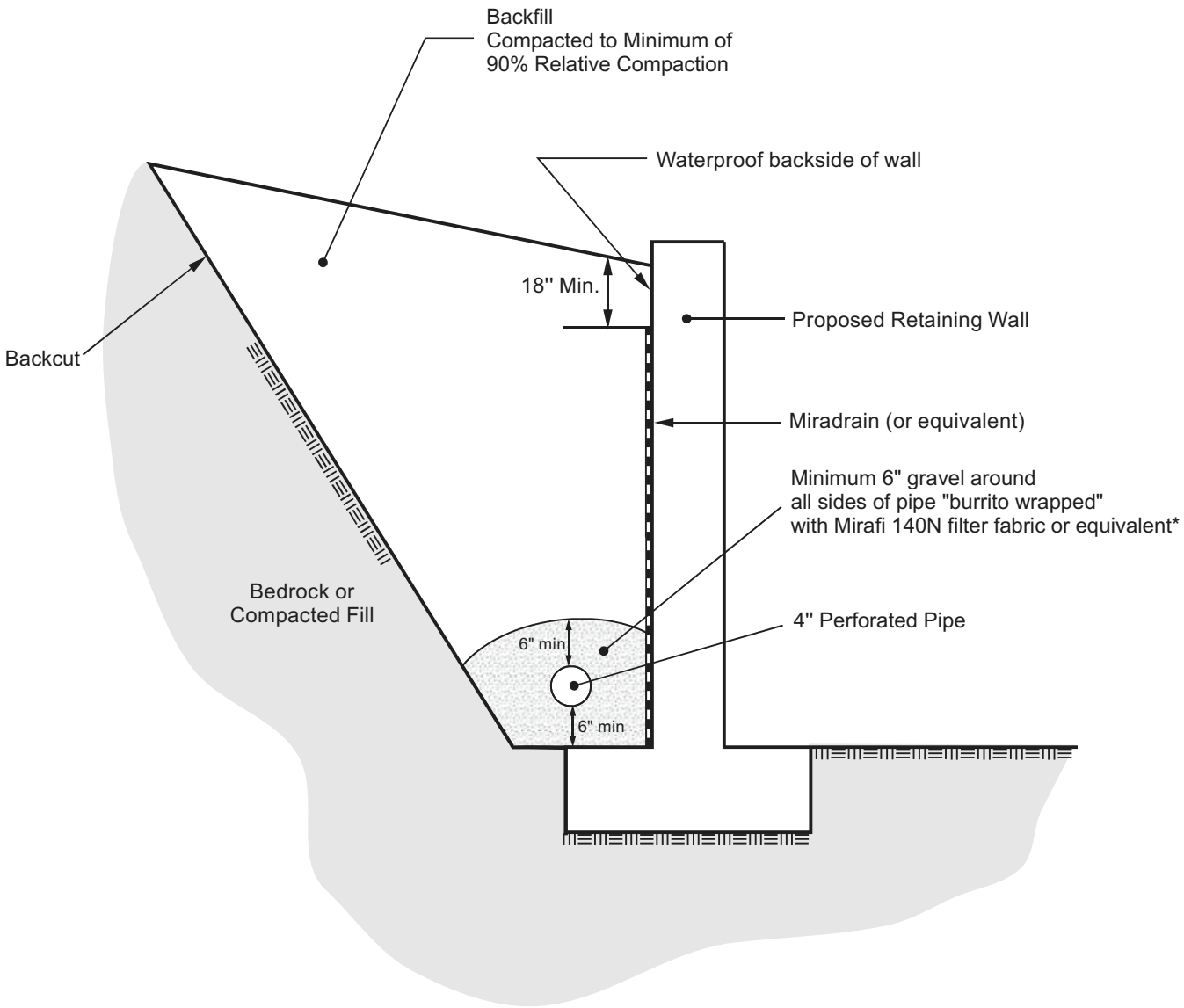
## WITH CHIMNEY DRAIN




*F-1 Filter Material
may be used as an alternative
to gravel and filter fabric with
slotted pipe

# RETAINING WALL DETAIL

## WITH MIRADRAIN




*F-1 Filter Material
may be used as an alternative
to gravel and filter fabric with
slotted pipe

Newhall Land and Farming Company
March 28, 2008
99-802-21

# APPENDIX

# FIELD EXPLORATIONS AND LABORATORY TESTING

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# APPENDIX

## FIELD EXPLORATIONS

The bedrock conditions beneath the site were explored in 2001 by drilling one bucket boring and excavation of test pits at the locations shown on the Geotechnical Map. The boring was drilled using a 24-inch-diameter bucket auger-type drilling equipment. The rock encountered was logged by our field geologist and undisturbed samples were obtained for laboratory inspection and testing. The lined-barrel sampler used to take undisturbed samples has an external diameter of 3.0 inches and an internal diameter of 2.625 inches. The depths at which the undisturbed samples were obtained are indicated on the logs. The sampler was driven using a hammer; the number of blows required to drive the sampler 12 inches are shown on the boring log. The driving weights are 3,160 pounds from 0 to 24 feet, 2,040 pounds from 24 feet to 47 feet, 1,120 pounds from 47 feet to 72 feet and 1,520 pounds from 72 feet to 81 feet.

## LABORATORY TESTING

Laboratory tests were performed on selected samples obtained from the borings to aid in the classification of the soils and to determine their engineering properties. The field moisture content and dry density of the soils encountered were determined by performing tests on the undisturbed samples. The results of the tests are shown to the left of the boring log.

Direct shear tests were performed on selected undisturbed samples to determine the strength of the site materials. In addition, shear test data were also available from our prior investigations at and nearby the site. The tests were performed after soaking the samples to near-saturated moisture content and at various surcharge pressures. The yield strength values determined from the direct shear tests are presented on Summary of Shear Test Data.

The optimum moisture content and maximum dry density of the existing fill soils were determined by performing compaction tests on a bulk sample bag obtained

from the boring. The test was performed in accordance with the ASTM Designation D1557-02 method of compaction. The results of the tests are presented below.

| Soil Description and Classification | Maximum Dry Density (lbs./cu. ft.) | Optimum Moisture Content (%) |
|---|---|---|
| Light gray brown fine to medium sand (SP) | 131 | 8 |
| Light brown silty fine to medium sand (SM) | 126 | 9.5 |

The optimum moisture contents are indicated in percent of dry weight, and the maximum dry densities are in pounds per cubic foot (pcf). The double-letter soil classifications that follow the Soil Descriptions are in accordance with the Uniform Soil Classification System (ASTM D 2487-00).

# BORING B-1

JOB NUMBER: 99-802-01
DATE DRILLED: 6-4-01
EQUIPMENT USED: 24"-Diameter Bucket Auger
ELEVATION: 1200 +/-
SURFACE CONDITIONS: Graded Pad

| BLOWS PER FOOT | MOISTURE CONTENT (%) | DRY UNIT WEIGHT (LBS. PER CU. FT.) | N-VALUE | DEPTH (FEET) | SAMPLE LOCATION | SOIL TYPE |
|---|---|---|---|---|---|---|
| 17 | 3 | 120 | - | 5 | | SAUGUS FORMATION (TQs)<br>SANDSTONE, very fine to fine, slight iron-oxide staining, soft, dry, yellowish orange to light gray<br>1" thick clayey silt bed: N56E, 56SE<br>@ 2.5 feet: fine to coarse, some laminations |
| 17 | 4 | 126 | - | 10 | | SANDY SILTSTONE to SILTY SANDSTONE, very fine very soft, slightly moist, light brownish gray<br>@ 6.5 feet: Bedding-N60E, 45SE<br>mafic mineral laminations: Bedding-N65E, 60SE |
| 15 | 5 | 122 | - | 15 | | PEBBLY SANDSTONE, fine to very coarse with pebbles and gravel, slightly clayey in upper 6 inches, soft, slightly moist, yellowish gray<br>@ 12.5 feet: 1/8" pale red clay shear: N72E, 24SE; truncates laminations |
| - | - | - | - | 20 | | CONGLOMERATIC SANDSTONE, very coarse, abundant pebbles, small cobbles, soft, slightly moist, moderate yellowish brown<br>@ 17 feet: 1" thick grayish brown clay seam (possible bedding shear): N55E, 50SE<br>Bedding-N73E, 43S |
| 25 | 4 | 122 | - | 25 | | Interbedded PEBBLY SANDSTONE and CONGLOMERATIC SANDSTONE, coarse to very coarse with abundant pebbles and small cobbles, soft, slightly moist, pale yellowish brown to moderate yellowish brown, average bed thickness 1½ to 2 feet |
| 24 | 11 | 124 | - | 30 | | approximate bedding-N70E, 44SE<br>SILTY CLAYSTONE, very soft, moist, moderate reddish brown, soft sediment deformation at contact with overlaying SANDSTONE |
| 22 | 5 | 123 | - | 35 | | SANDSTONE, very fine to fine, finely laminated with laminations defined by mafic minerals, soft, slightly moist, moderate yellowish brown to yellowish gray<br>Bedding-N52E, 44SE<br>fine to coarse<br>Bedding-N54E, 45SE |
| | | | | 40 | | |

Note: The log of subsurface conditions shown hereon applies only at the specific location and date indicated. It is not warranted to be representative of subsurface conditions at other locations or times.

(CONTINUED ON THE FOLLOWING FIGURE)

## LOG OF BORING

R.T. FRANKIAN & ASSOCIATES

# BORING B-1 (continued)

JOB NUMBER: 99-802-01
DATE DRILLED: 6-4-01

| BLOWS PER FOOT | MOISTURE CONTENT (%) | DRY UNIT WEIGHT (LBS. PER CU. FT.) | N-VALUE | DEPTH (FEET) | SAMPLE LOCATION | SOIL TYPE |
|---|---|---|---|---|---|---|
| 30 | 4 | 123 | - | 45 | | SANDSTONE, very coarse, soft, slightly moist, yellowish gray |
| 20 | 5 | 119 | - | | | trace cobbles |
| 25 | 5 | 112 | - | 50 | | SANDSTONE to PEBBLY SANDSTONE, very coarse with pebbles, soft, slightly moist, yellowish gray to very pale orange |
| 38 | - | - | - | 55 | | CONGLOMERATE, very coarse sand matrix, abundant gravel and small cobbles, massive, soft, slightly moist, yellowish gray to pale yellowish brown |
| | | | | | | Bedding-N62E, 43SE |
| 17 | 9 | 119 | - | 60 | | SANDSTONE to PEBBLY SANDSTONE, fine to very coarse, massive soft, slightly moist, pale yellowish brown |
| | | | | | | 1" thick brownish gray clay seam (possible bedding shear): N68E, 43SE |
| 22 | 4 | 112 | - | 65 | | SANDSTONE, fine to very coarse, soft, slightly moist, pale yellowish brown |
| | | | | | | some cross bedding |
| 29 | 4 | 113 | - | 70 | | |
| | | | | | | Bedding-N86W, 43SW |
| | | | | 75 | | PEBBLY SANDSTONE, coarse to very coarse, abundant pebbles and gravel, soft, slightly moist, pale yellowish brown to black yellowish orange |
| | | | | | | END OF BORING AT 81 FEET. No water. No caving. |
| 20 | 8 | 112 | - | 80 | | slightly silty |

Note: The log of subsurface conditions shown hereon applies only at the specific location and date indicated. It is not warranted to be representative of subsurface conditions at other locations or times.

**LOG OF BORING**

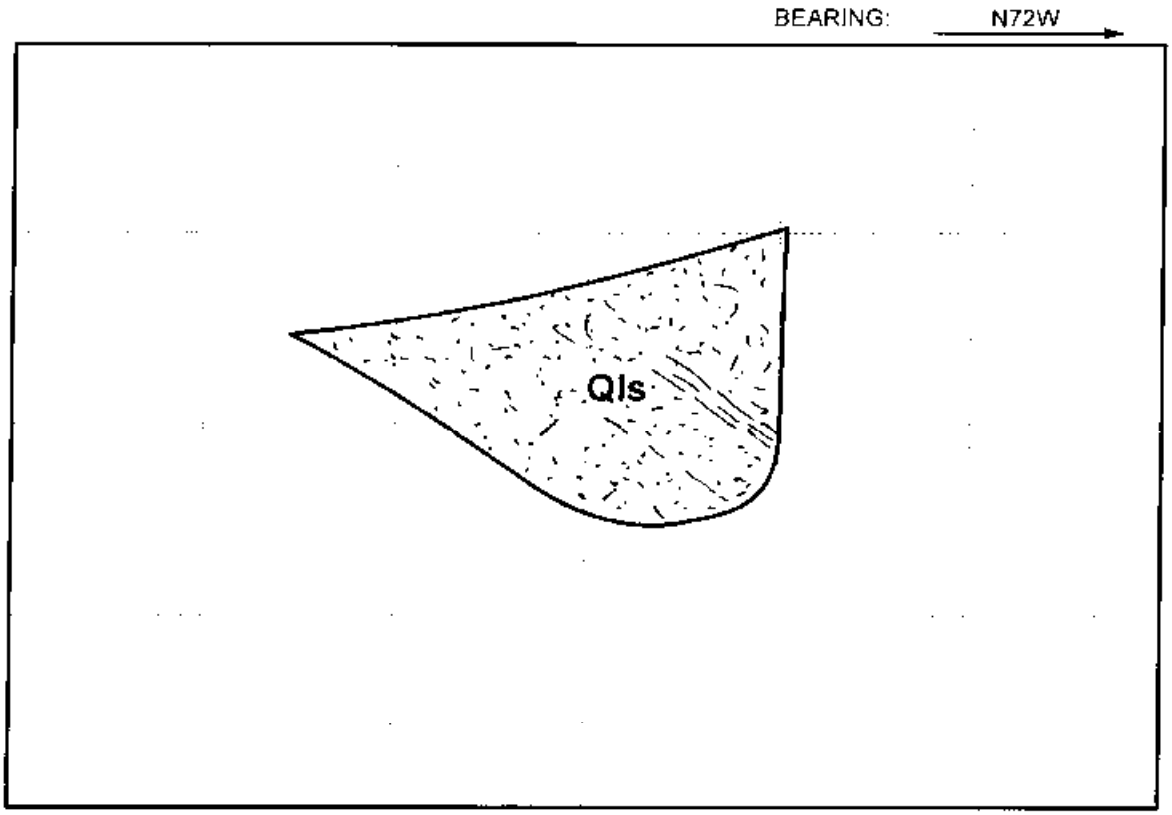
R.T. FRANKIAN & ASSOCIATES

# LOG OF TEST PIT TP-1

JOB NUMBER 99-802-01 CLIENT VALENCIA WATER COMPANY LOGGED BY DGF

LOCATION P.M. 18108 ELEVATION 1090' DATE LOGGED 5-15-01

0'-7' **LANDSLIDE (Qls):** fine grained sand with discontinued beds of siltstone, soft, dry, Pale yellowish brown (10YR 6/2)




SCALE: 1" = 5'

NOTE
THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC TEST PIT LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

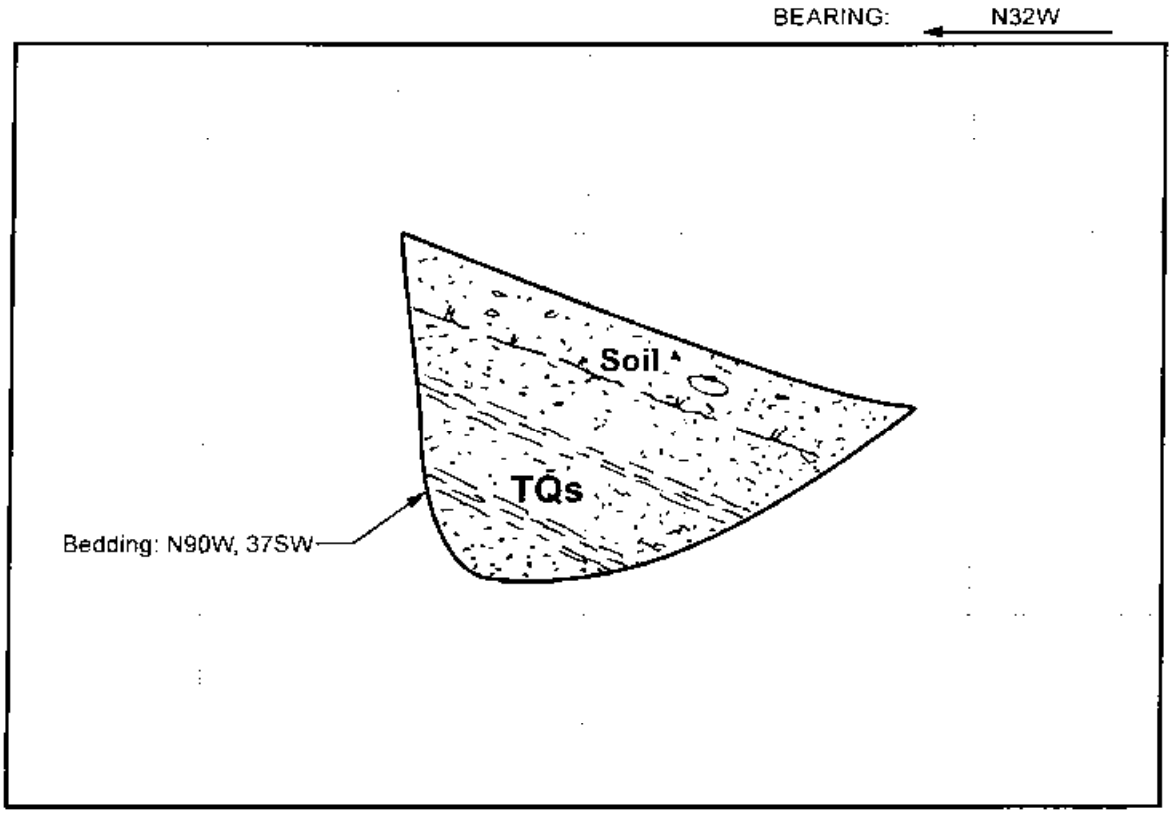
# LOG OF TEST PIT TP-2

JOB NUMBER 99-802-01 CLIENT VALENCIA WATER COMPANY LOGGED BY DGF

LOCATION P.M. 18108 ELEVATION 1070' DATE LOGGED 5-15-01

0'-2' **SOIL / COLLUVIUM (Qc):** fine to coarse grained silty sand with sandstone cobbles, soft, dry, pale yellowish brown (10YR 6/2)

2'-9' **SAUGUS FORMATION (TQs):** fine to coarse grained sandstone, hard, moist, pinkish gray (5YR 8/1), clayey siltstone, moderately hard, moist, moderate brown (5YR 4/4)




SCALE: 1" = 5'

NOTE:
THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC TEST PIT LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES

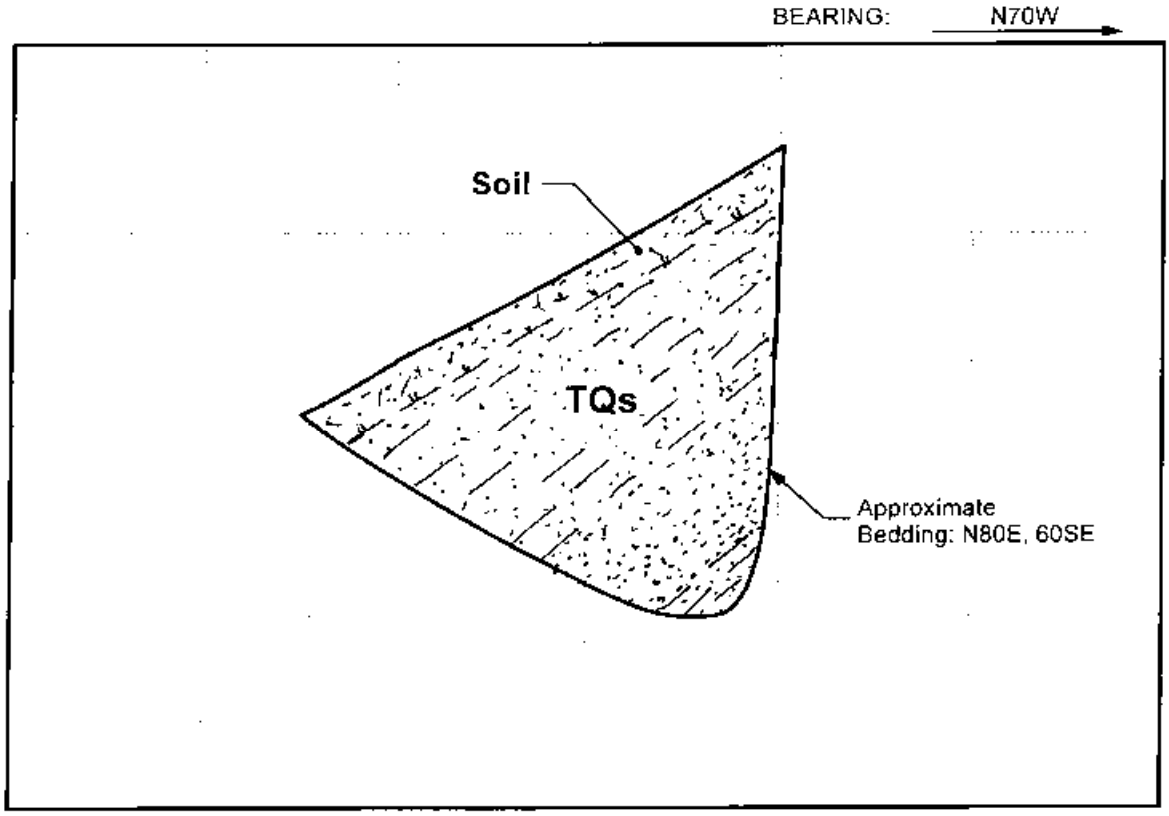
# LOG OF TEST PIT TP-3

JOB NUMBER 99-802-01 CLIENT VALENCIA WATER COMPANY LOGGED BY DGF

LOCATION P.M. 18108 ELEVATION 1105' DATE LOGGED 5-15-01

0'-2' **SOIL:** fine to coarse grained silty sand to silt, loose, dry, pale yellowish brown (10YR 6/2)

1'-12' **SAUGUS FORMATION (TQs):** fine grained sandy siltstone, moderately hard, moist, moderate yellowish brown (10YR 5/4),random fractures, no well define bedding




SCALE: 1" = 5'

NOTE:
THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC TEST PIT LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES

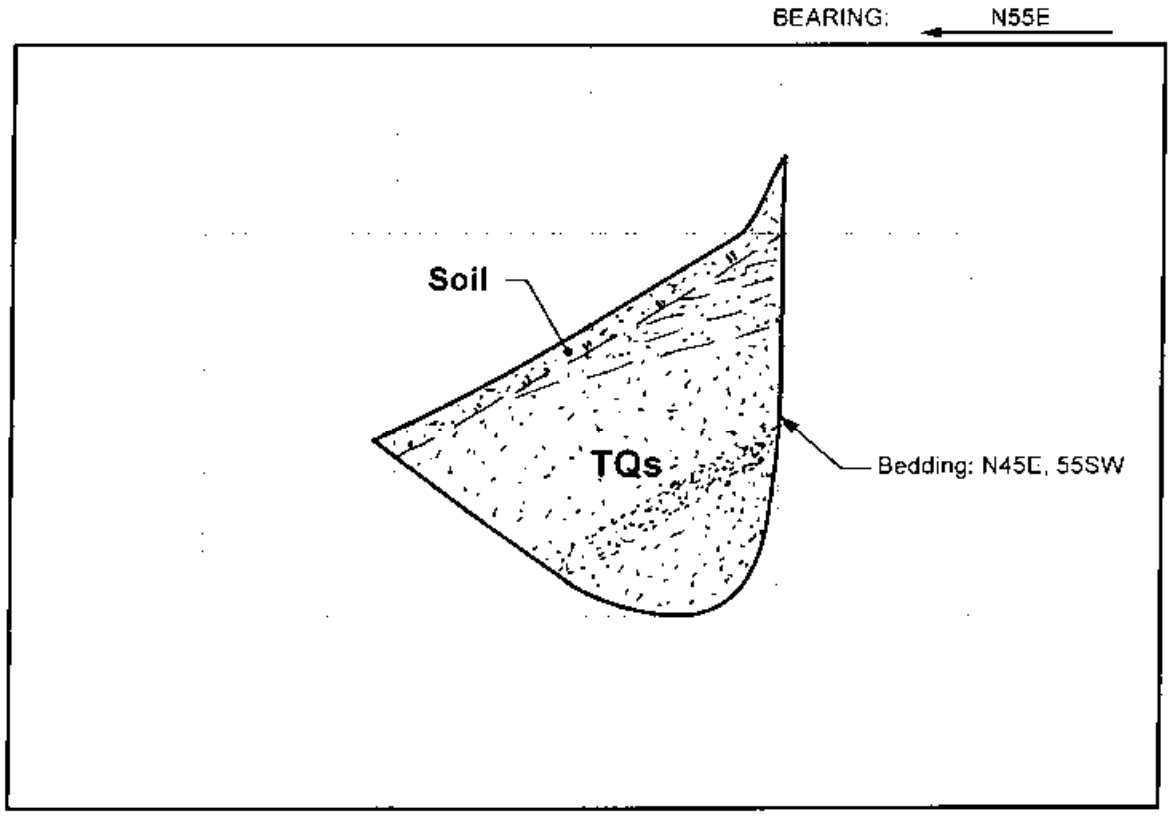
# LOG OF TEST PIT TP-4

JOB NUMBER 99-802-01 CLIENT VALENCIA WATER COMPANY LOGGED BY DGF

LOCATION P.M. 18108 ELEVATION 1080' DATE LOGGED 5-15-01

0'-0.5' **SOIL:** mostly sand, some silt, pale yellowish brown (10YR 6/2),loose, dry

2'-9' **SAUGUS FORMATION (TQs):** fine to medium grained sandstone, moderately hard, dry, pinkish gray (5YR 8/1) , well bedded




SCALE: 1" = 5'

NOTE:
THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC TEST PIT LOCATION AND AT THE DATE INDICATED IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES

R.T. FRANKIAN & ASSOCIATES

# LOG OF TEST PIT TP-5

JOB NUMBER 99-802-01 CLIENT VALENCIA WATER COMPANY LOGGED BY DGF

LOCATION P.M. 18108 ELEVATION 1135' DATE LOGGED 5-15-01

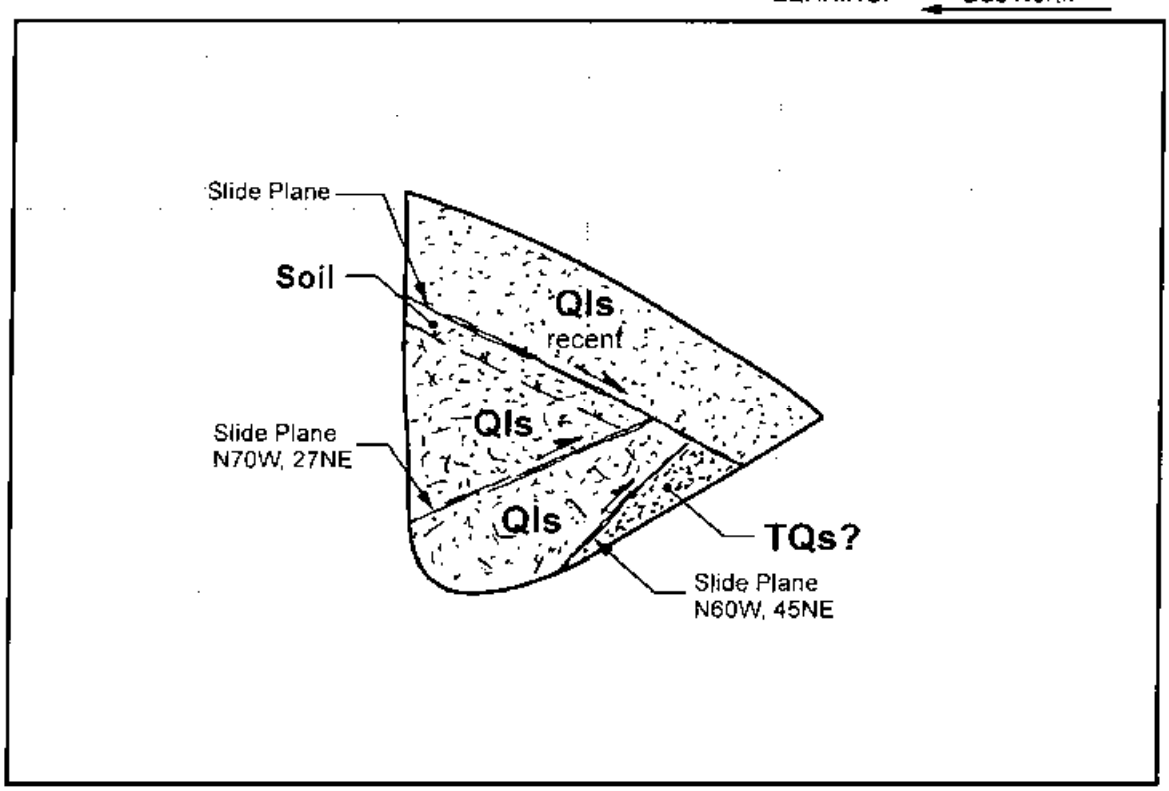
0'-10' **LANDSLIDE (Qls):**

0'-2' fine grained silty sand, loose, dry, grayish orange (10YR 7/4)

2'-2.5' **SOIL**

4'-10' silty sandstone, moderately hard, dry to moist, pale yellowish brown (10YR 6/2), fractured

BEARING: Due North




SCALE: 1" = 5'

NOTE:
THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC TEST PIT LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES

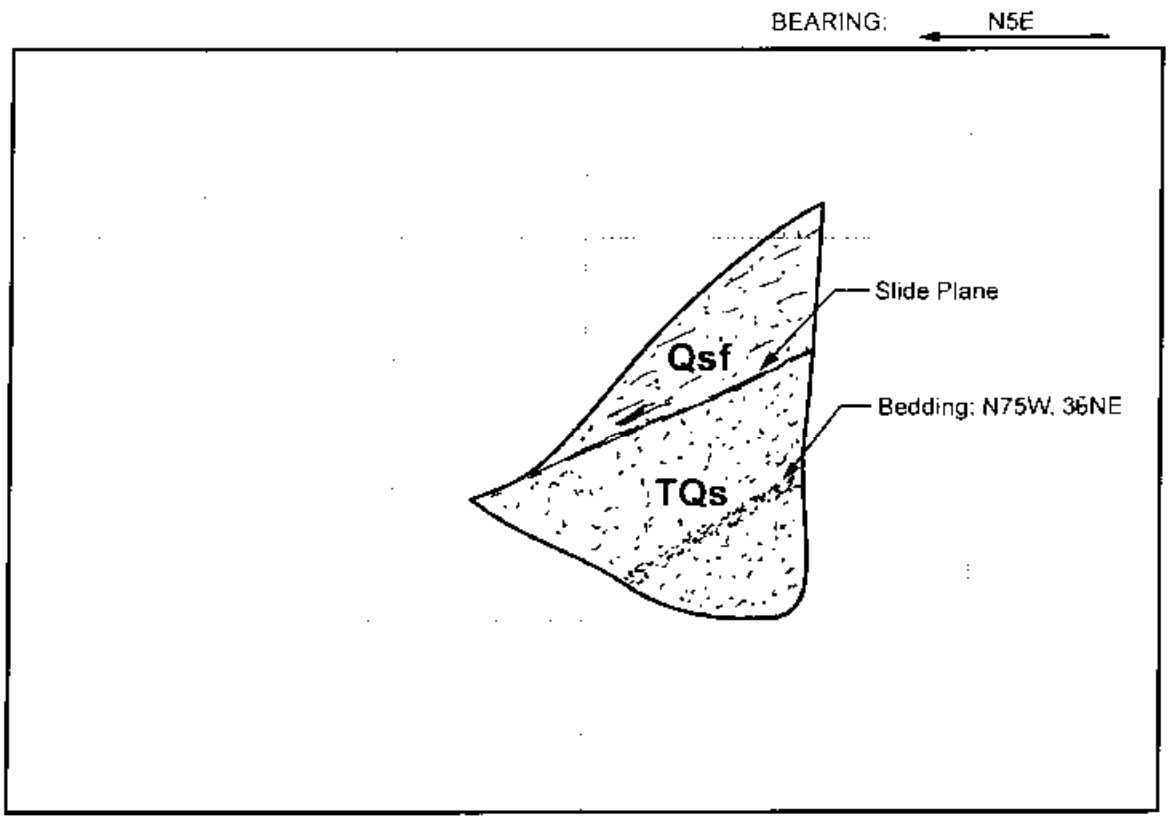
# LOG OF TEST PIT TP-6

JOB NUMBER 99-802-01 CLIENT VALENCIA WATER COMPANY LOGGED BY DGF

LOCATION P.M. 18108 ELEVATION 1140' DATE LOGGED 5-15-01

0'-4' **SURFICIAL FAILURE (Qsf)**: clayey siltstone moderately hard, moist, dark yellowish brown (10YR 4/2)

4'-11' **SAUGUS FORMATION (TQs):** fine grained silty sand, hard, moist, grayish orange (10YR 7/4)




SCALE: 1" = 5'

NOTE:
THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC TEST PIT LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES

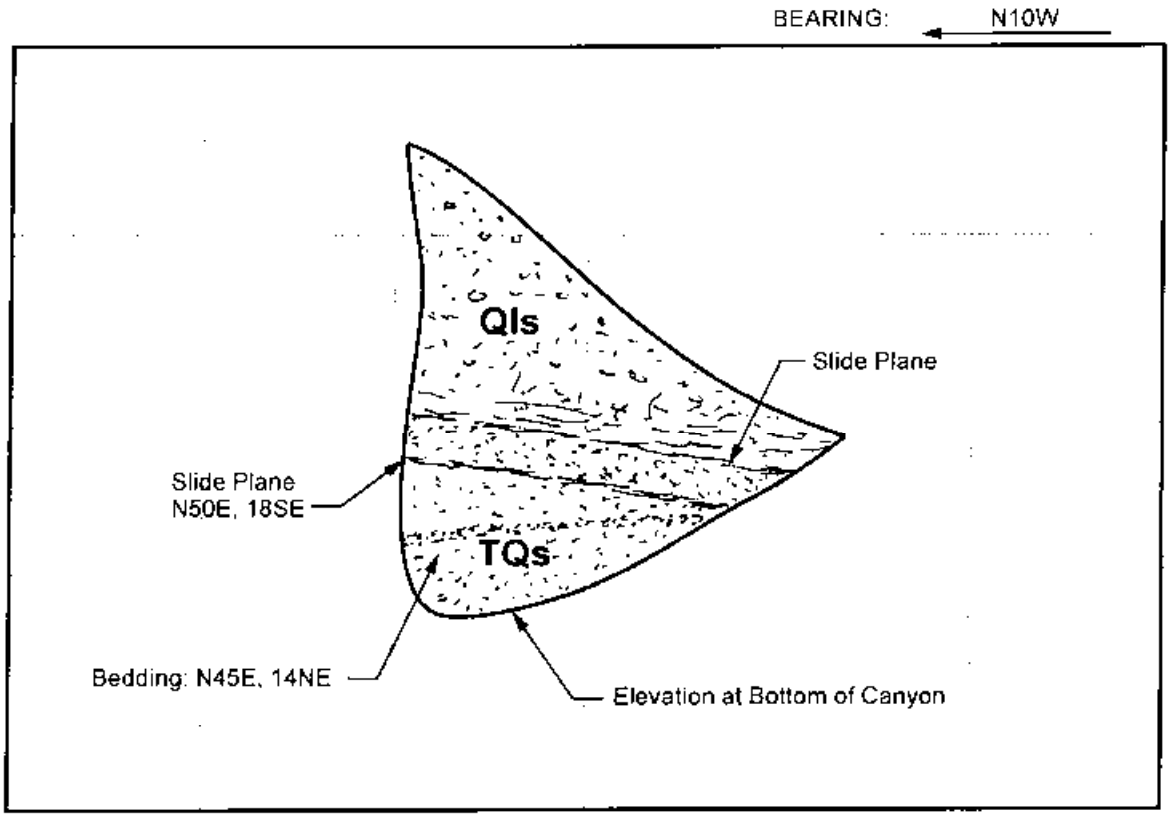
# LOG OF TEST PIT TP-7

JOB NUMBER 99-802-01 CLIENT VALENCIA WATER COMPANY LOGGED BY DGF

LOCATION P.M. 18108 ELEVATION 1155' DATE LOGGED 5-15-01

0'-7' **LANDSLIDE (Qls):** fine grained silty sand with beds and scattered cobbles, loose, dry, grayish orange (10YR 7/4)

7'-12' **SAUGUS FORMATION (TQs):** sandy siltstone, moderately hard, moist, pale yellowish brown (10YR 6/2), with coarse grained sandstone bed




SCALE: 1" = 5'

NOTE
THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC TEST PIT LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES

R.T. FRANKIAN & ASSOCIATES



For use with report dated 03/28/2008; RTF Job No. 99-802-21

# LOG OF TEST PIT TP-8

JOB NUMBER 99-802-01 CLIENT VALENCIA WATER COMPANY LOGGED BY DGF

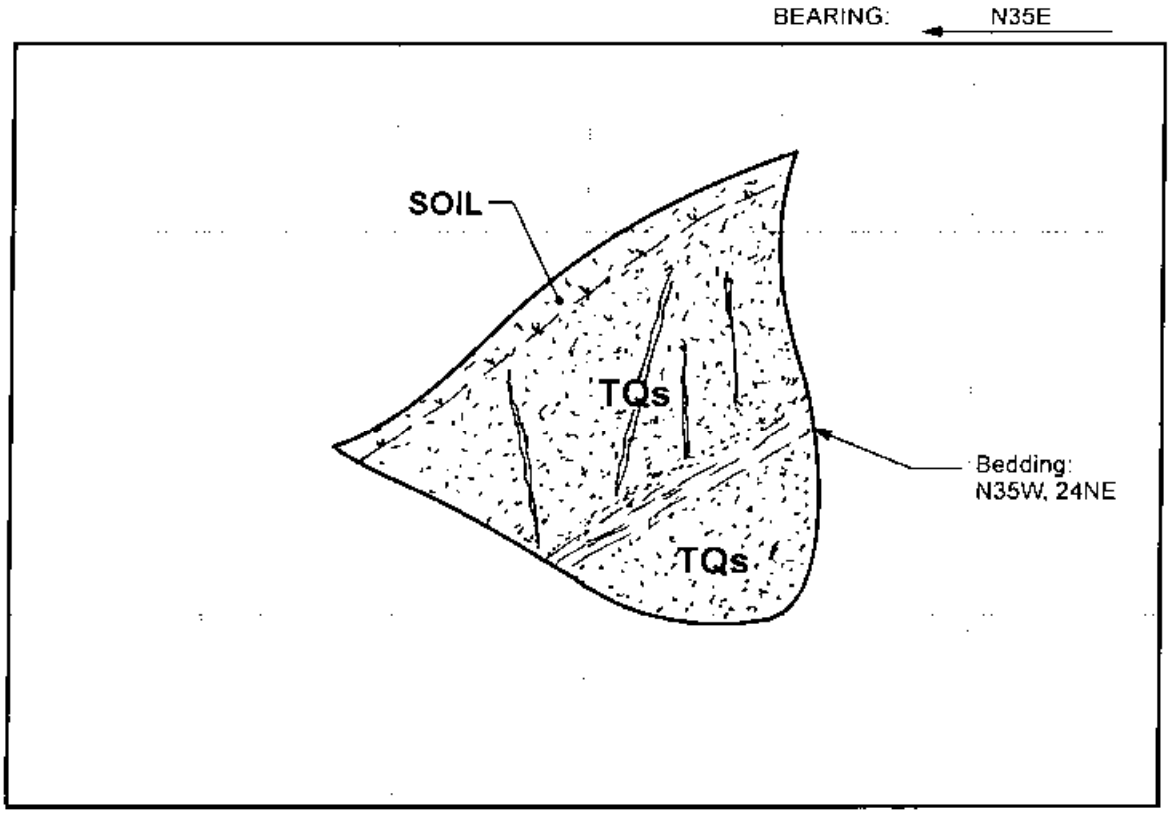
LOCATION P.M. 18108 ELEVATION 1160' DATE LOGGED 5-15-01

0'-0.5' **SOIL:** fine to coarse grained sand, loose, dry, pale yellowish brown (10YR 6/2)

0.5'-12.5' **SAUGUS FORMATION (TQs):**

0.5'-6' fine to coarse grained sandstone, loose, moist, pinkish gray (5YR 8/1), highly weathered, moderately well defined bedding at 6 feet

6'-12.5' fine grained silty sand, moderately hard, moist, grayish orange (10YR 7/4), with siltstone interbed




SCALE: 1" = 5'

NOTE
THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC TEST PIT LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES

R.T. FRANKIAN & ASSOCIATES

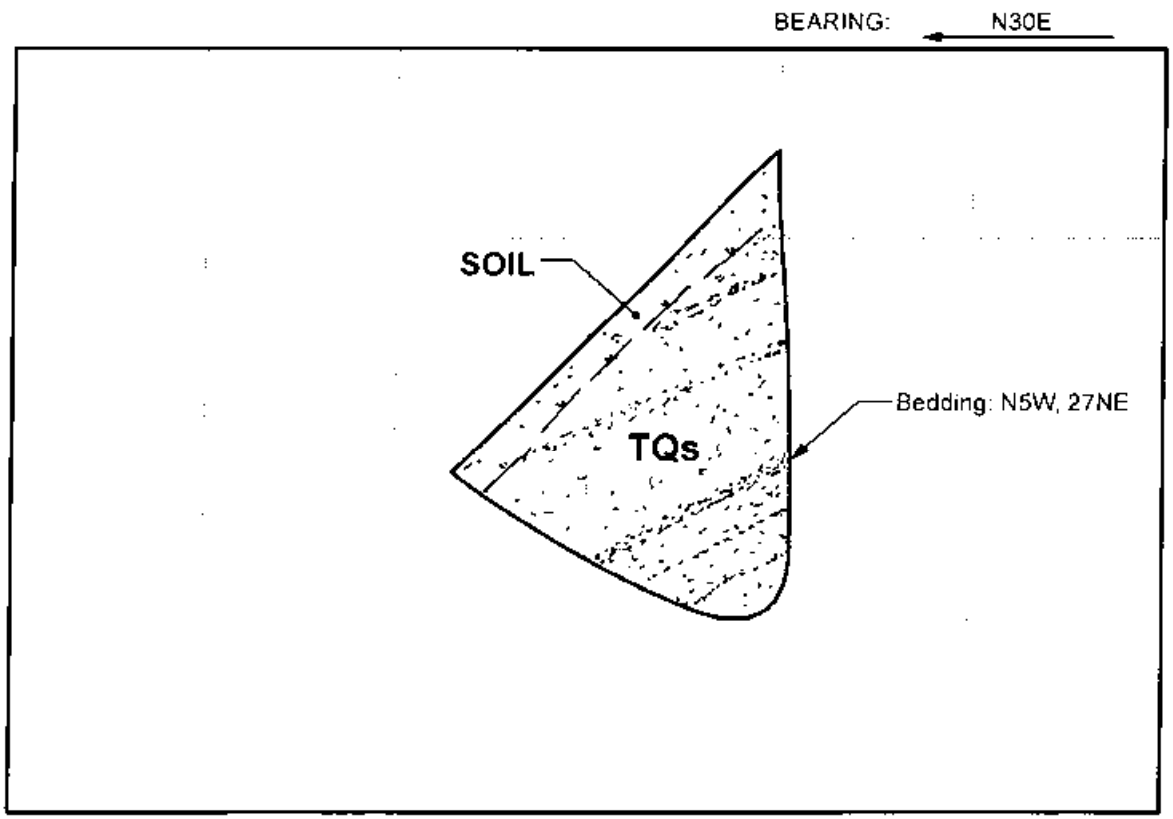
# LOG OF TEST PIT TP-9

JOB NUMBER 99-802-01 CLIENT VALENCIA WATER COMPANY LOGGED BY DGF

LOCATION P.M. 18108 ELEVATION 1170' DATE LOGGED 5-15-01

0'-1' **SOIL**: fine to coarse grained sand with silt, loose, dry, pale brown (5YR 5/2),

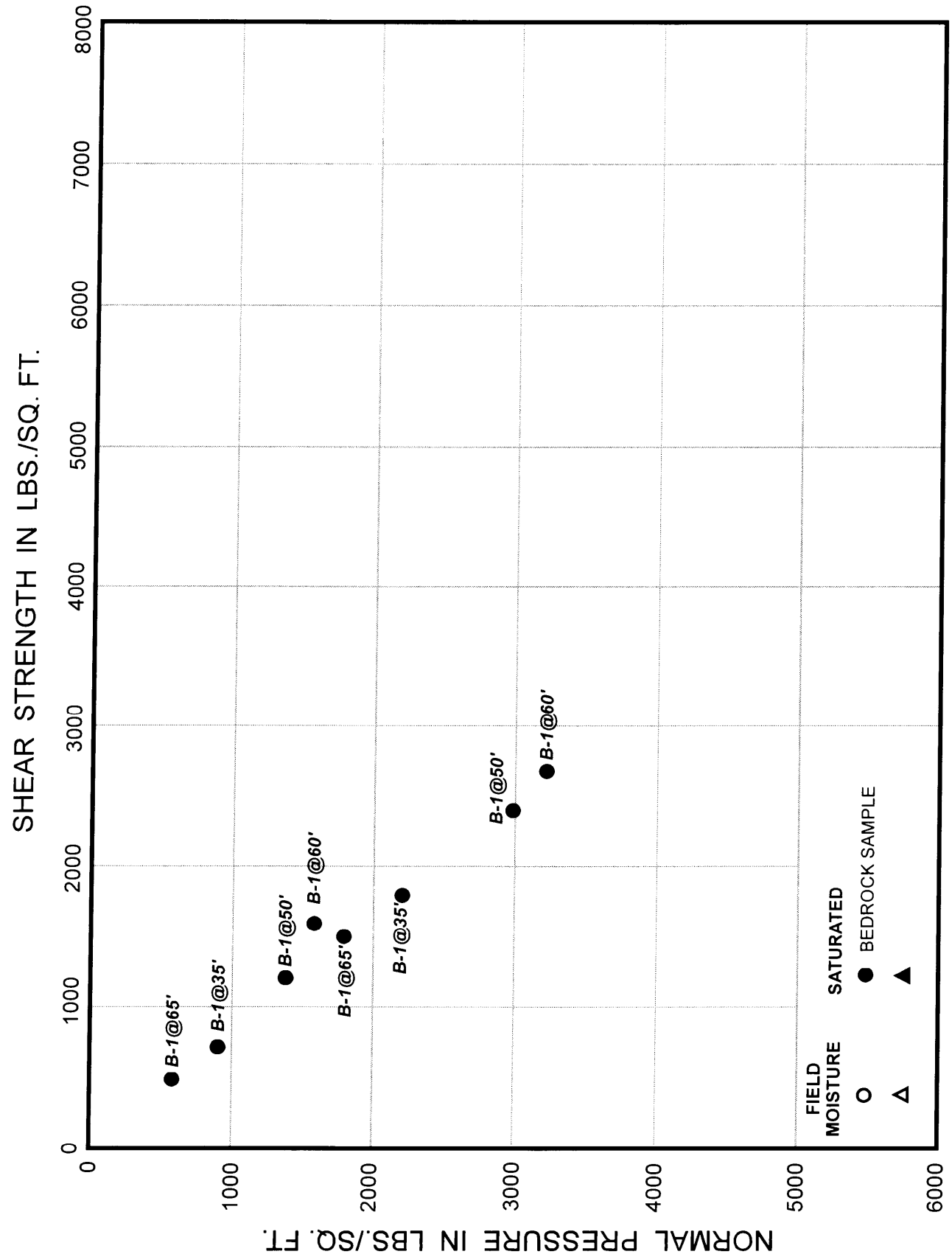
1'-13' **SAUGUS FORMATION (TQs):** fine to coarse grained sandstone with pebble conglomerate interbeds, soft, moist, pinkish gray (5YR 8/1), poorly cemented, well bedded, rock very poorly cemented possibly disturbed or creep affected




SCALE: 1" = 5'

NOTE:
THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC TEST PIT LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

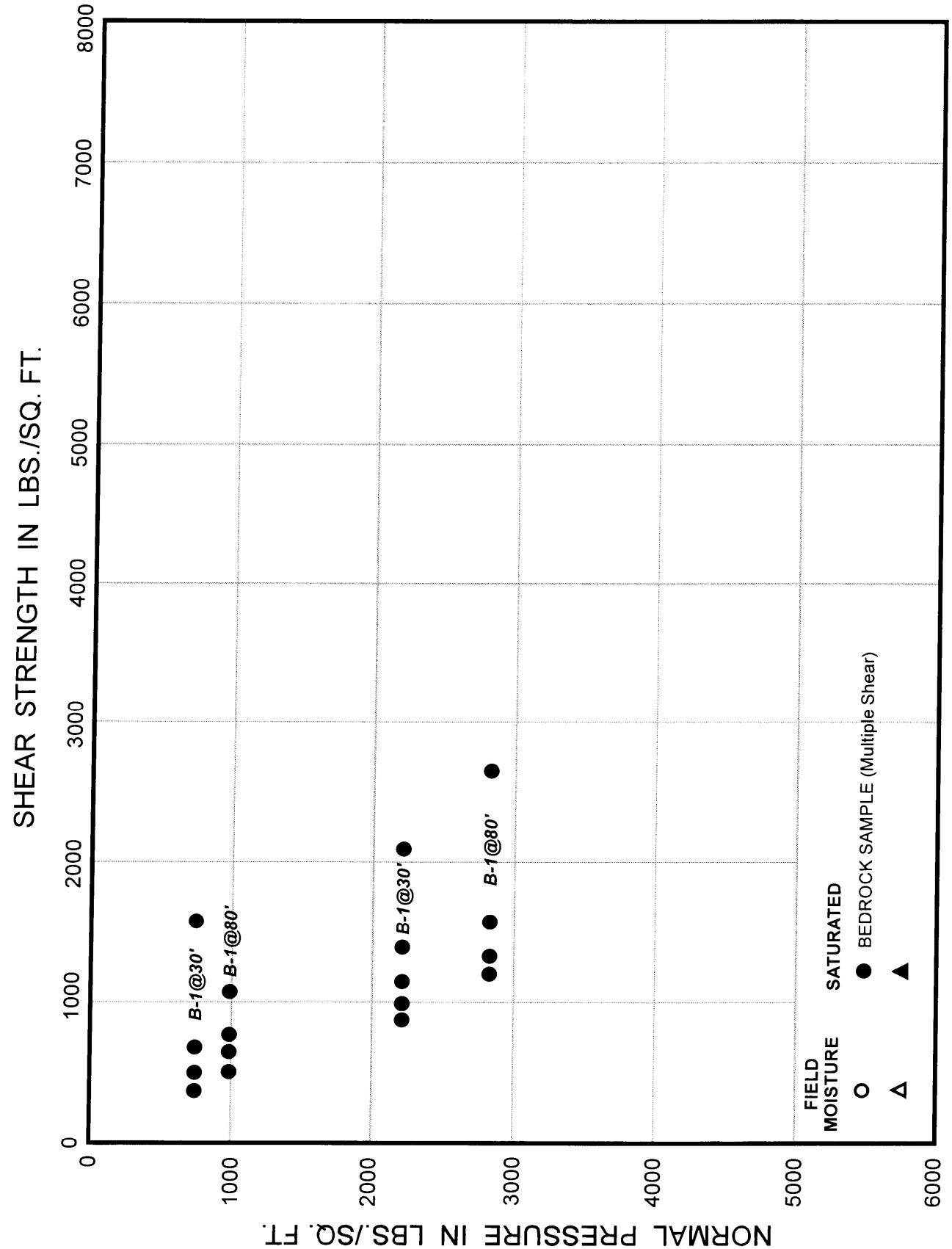
# SUMMARY OF SHEAR TEST DATA




R.T. FRANKIAN & ASSOCIATES

FIGURE A-1a

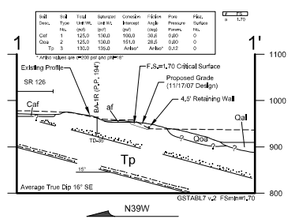
# SUMMARY OF SHEAR TEST DATA

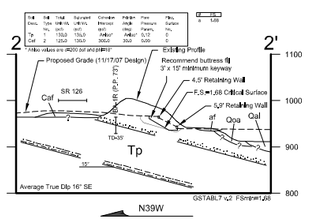


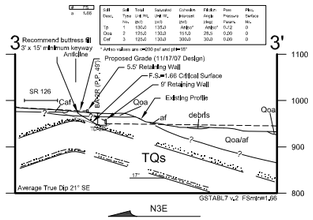

R.T. FRANKIAN & ASSOCIATES

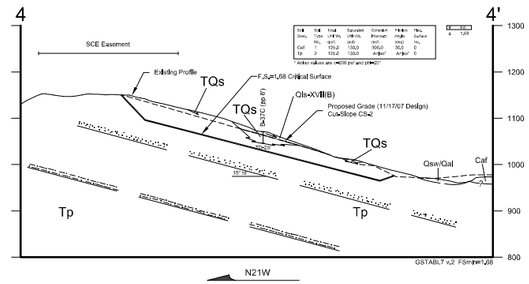
FIGURE A-1b

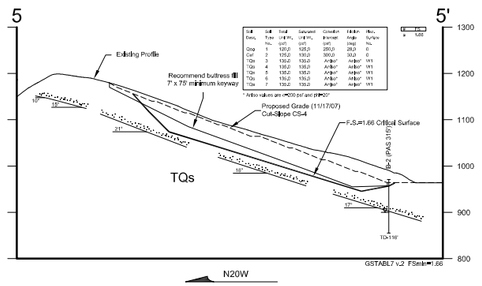
# Appendix E

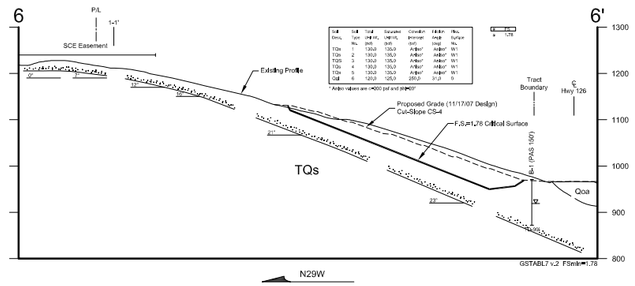


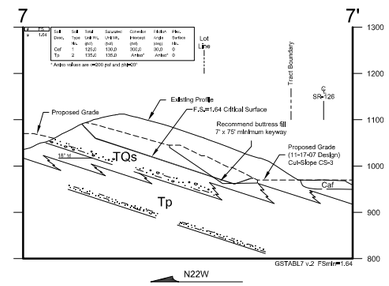



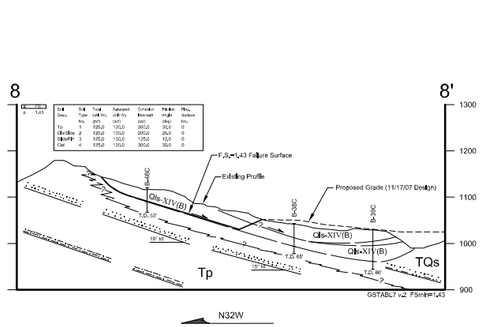



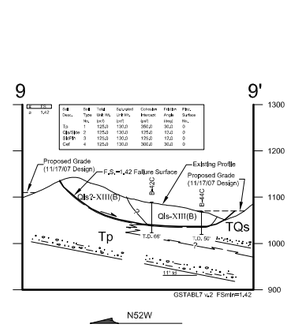



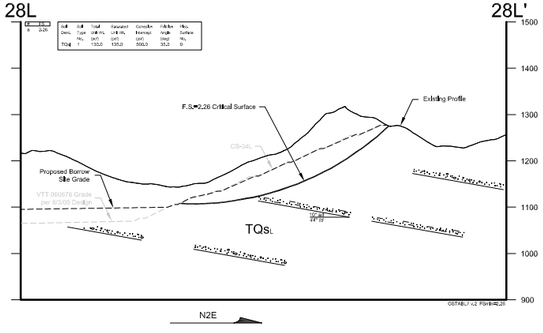



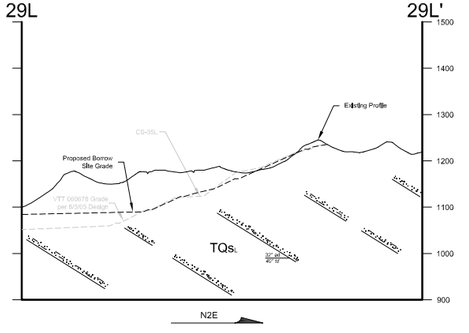



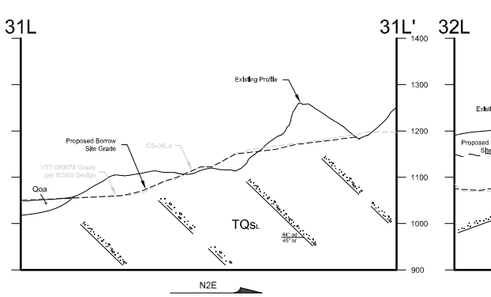



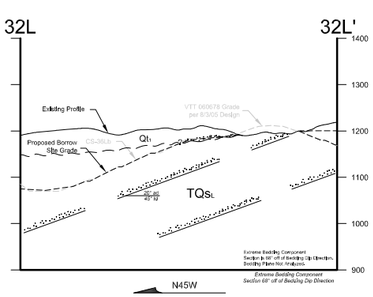



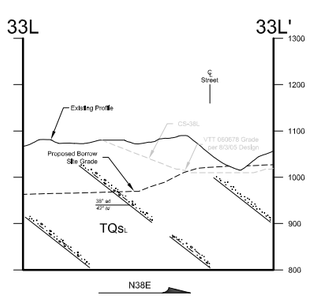



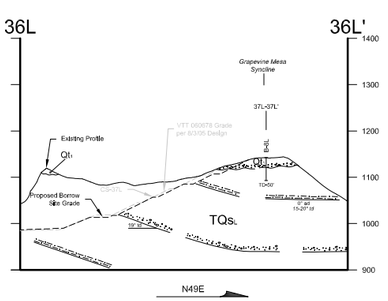



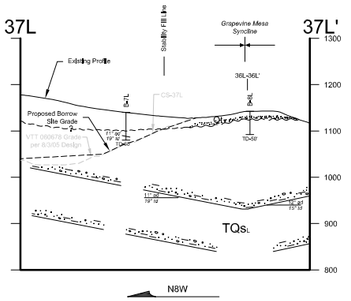



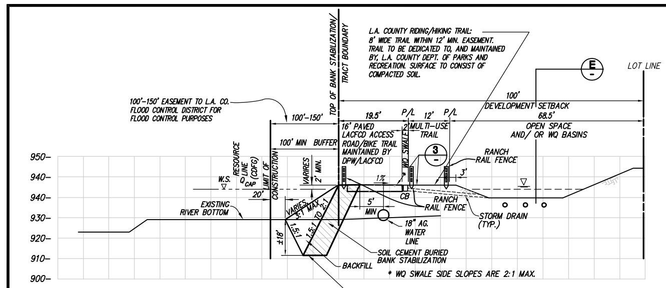



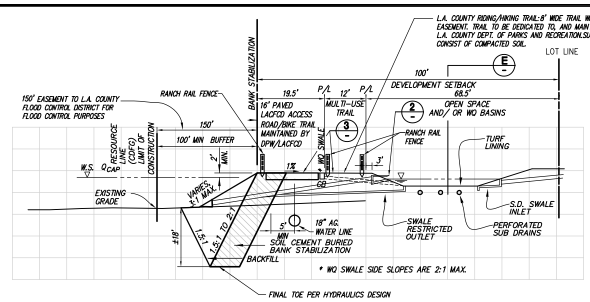

**ALLAN E. SEWARD**
**ENGINEERING GEOLOGY, INC.**
Geological and Geotechnical Consultants

# GEOLOGIC CROSS SECTIONS

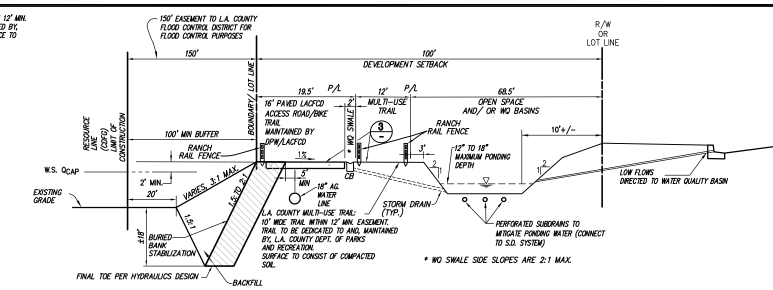
| | |
|---|---|
| Date: 12/21/09 | Job No.: 09-1702R |
| Scale: 1" = 100' | CAD File: Revised Sections Plate |
| PLATE I | Geology by: staff / Drawn by: staff |
| | Revised: |



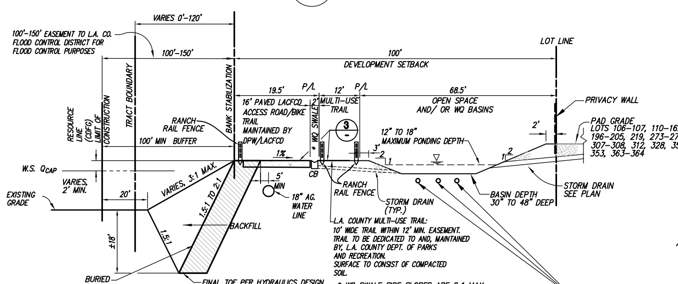
**SECTION (A)**
NOT TO SCALE



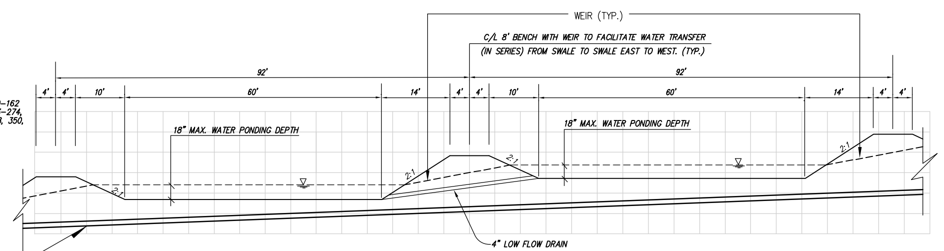
**SECTION (B)**
NOT TO SCALE



**WATER QUALITY BASIN AT LOT 311 (OPEN SPACE) (1)**

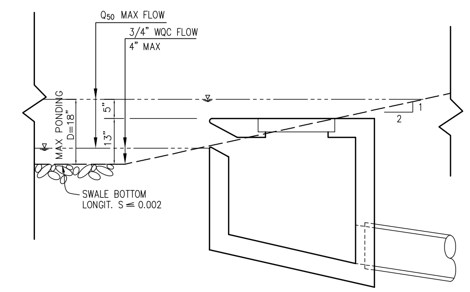


**TYPICAL WATER QUALITY SWALE CROSS-SECTION ***
N.T.S.
*OPEN SPACE LOTS (ADJACENT TO LOTS 106–107, 110–162, 196–205, 219, 273–274, 307–308, 312, 328, 350, 353, 363–364)

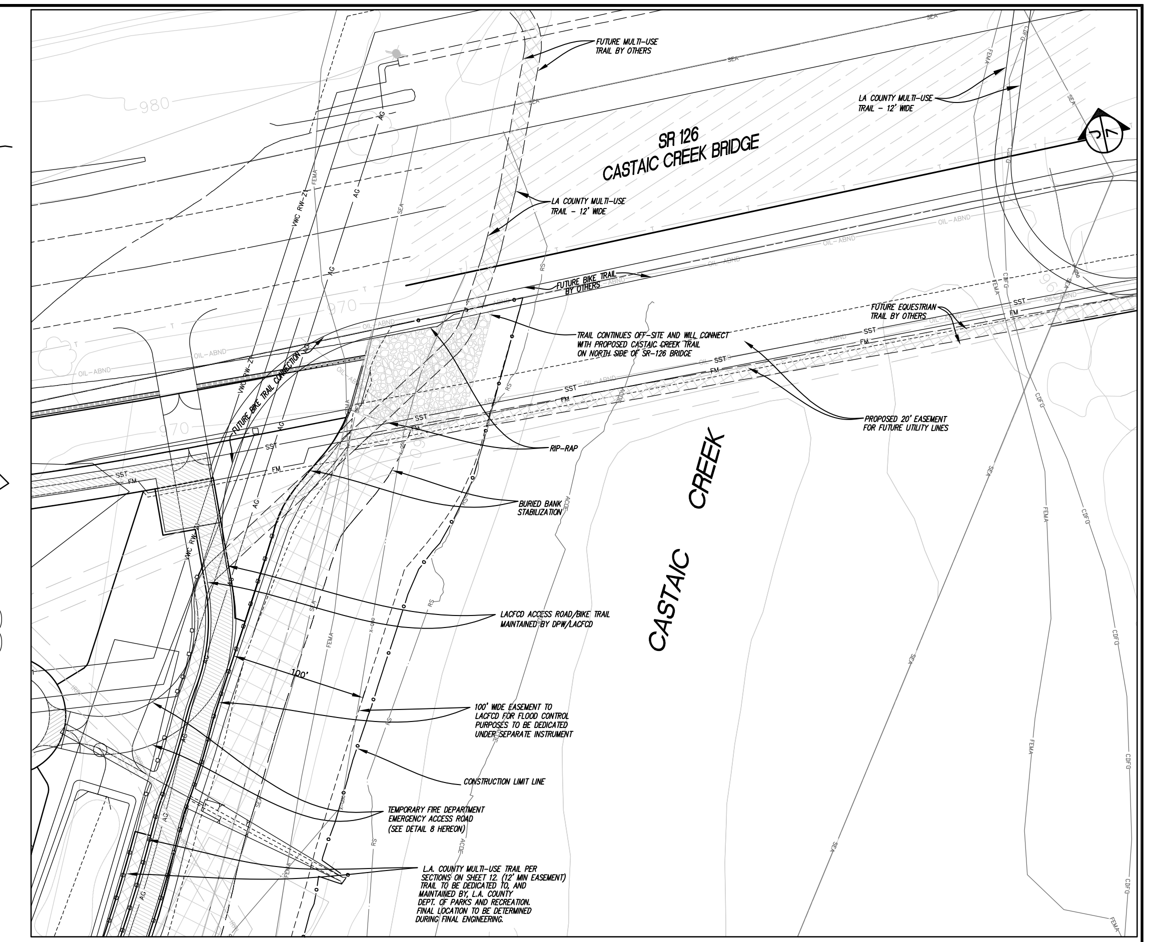


**PROPOSED WATER QUALITY SWALE**
**LONGITUDINAL SECTION LOOKING NORTH**
N.T.S.

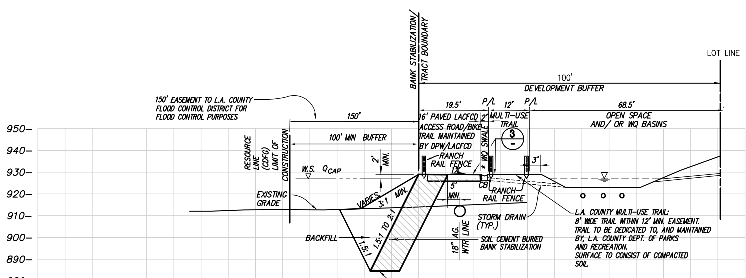
**PROPOSED WATER QUALITY SWALE DETAILS (E)**
NOT TO SCALE



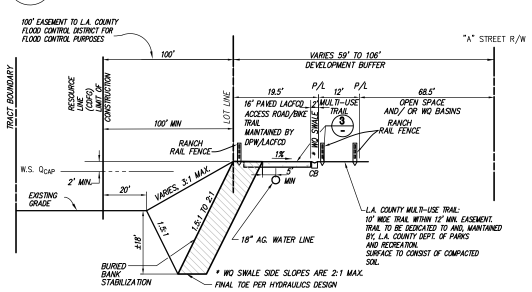
**DRAINAGE RELIEF ON WQC SWALES (2)**



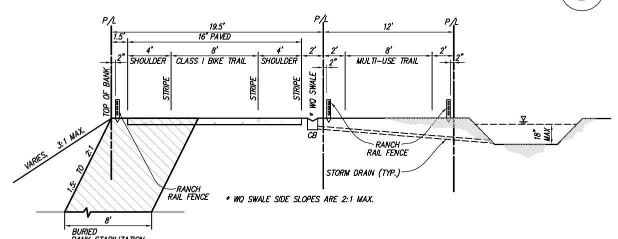
**ACCESS ROAD AT CASTAIC CREEK BRIDGE (7)**
SCALE: 1" = 40'



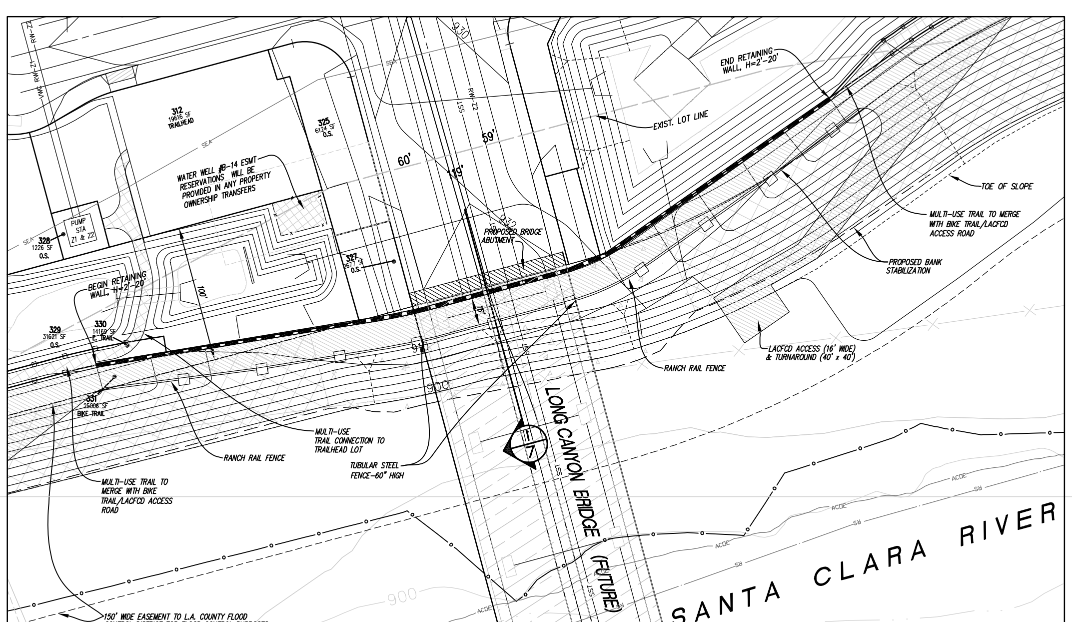
**SECTION (F)**
NOT TO SCALE



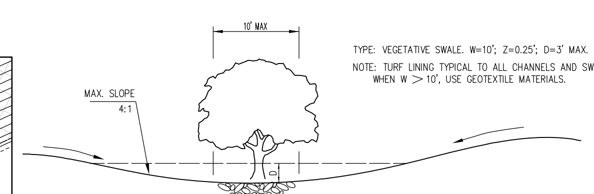
**LOT 372 (O.S. LOT) (G)**
NOT TO SCALE



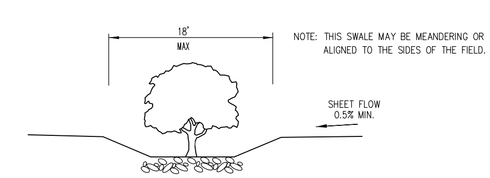
**LANDMARK VILLAGE TRAIL SECTION (3)**
NOT TO SCALE



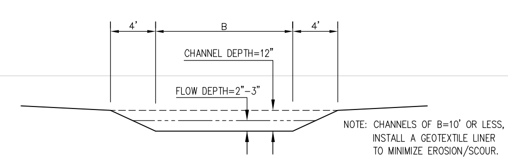
**ACCESS ROAD AT LONG CANYON BRIDGE (6)**
1" = 40'



PARK AREAS DRAINAGE

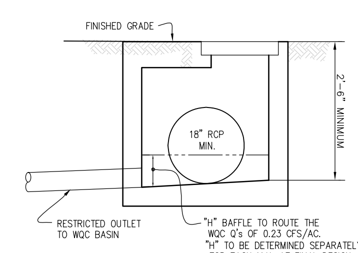


SIDE OF THE SPORTS FIELD

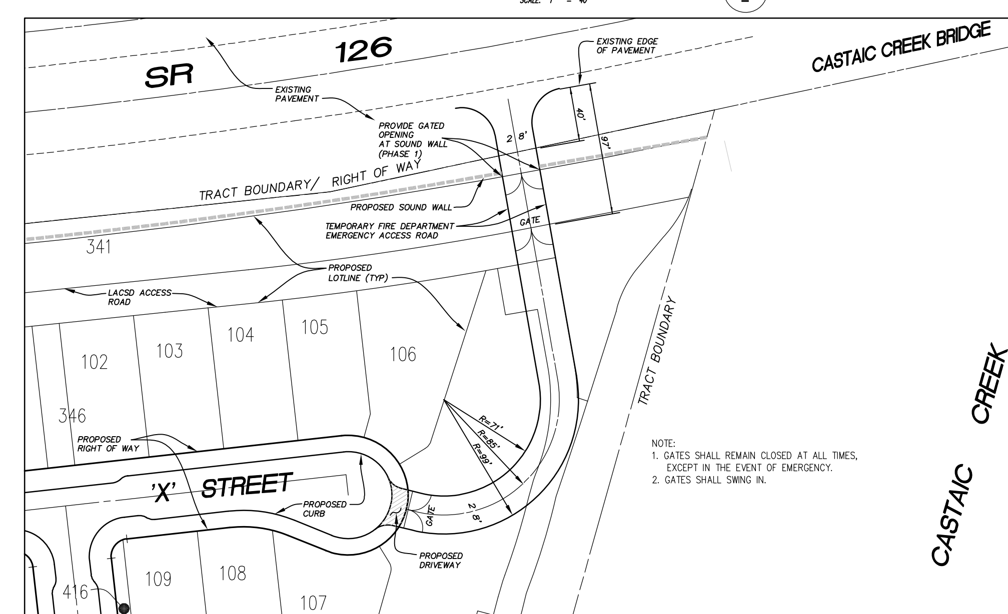


WATER QUALITY SWALE TYPICAL SECTION
LOTS 333 AND 337

**TYPICAL CONCEPT SECTION OF VEGETATIVE SWALE**
NOT TO SCALE



**SHALLOW S.D. MANHOLE DETAIL (4)**



**TEMPORARY FIRE DEPARTMENT EMERGENCY ACCESS ROAD (8)**
SCALE: 1" = 40'

REV. DATE: DECEMBER 21, 2009
DATE: MAY 2, 2007

LEGAL DESCRIPTION:
PARCELS 8, 9, 10, AND PORTION OF PARCELS 7, 20, 21 OF PARCEL MAP NO. 24500-01 PMB 293-34/67, RECORDS OF LOS ANGELES COUNTY.

PSOMAS
28480 Avenue Stanford, Suite 200
Santa Clarita, CA 91355
(661) 219-6000 (661) 775-2718 (FAX)

ERIK WINATA R.C.E. NO. C 67285 DATE

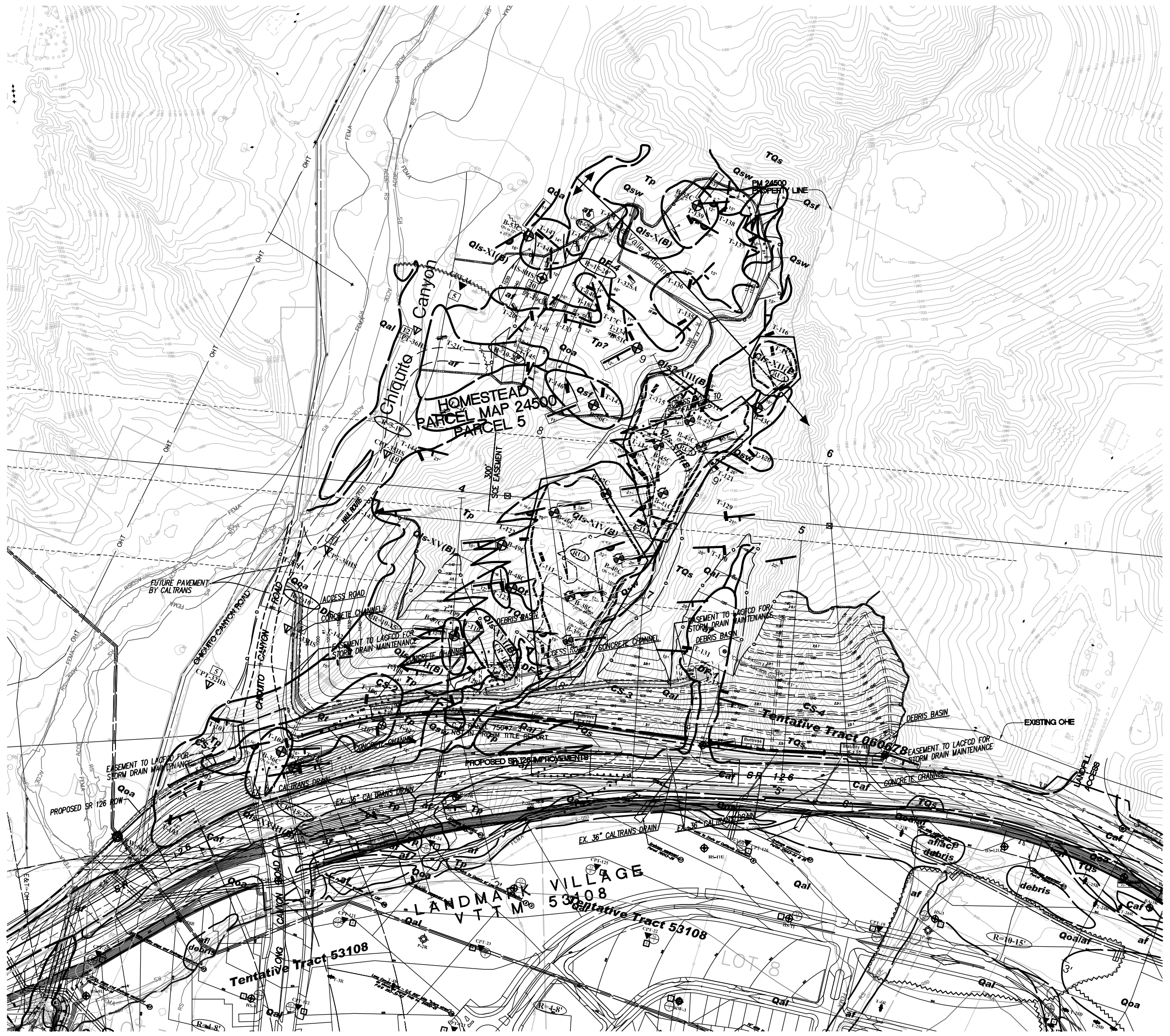
DESIGNED: NSK/YL
DRAFTED: TLC/JS
CHECKED: EW

OWNER/DEVELOPER:
NEWHALL RANCH
23823 WEST VALENCIA BOULEVARD
VALENCIA, CALIFORNIA 91355
TELEPHONE: (661) 255-4000
REPRESENTATIVE: MR. FRED MACMURDO

MAJOR LAND DIVISION
VESTING TENTATIVE TRACT MAP
NO. 53108
DETAILS & SECTIONS
IN THE UNINCORPORATED AREA OF THE COUNTY OF LOS ANGELES STATE OF CALIFORNIA

PROJECT NO. 1NLF010500
SHEET 12 OF 13

RV001-12.dwg




# OFFSITE GRADING
# CHIQUITO CANYON

| CHIQUITO CANYON EARTHWORK VOLUMES | |
|---|---|
| RAW CUT | 1,190,000 Cubic Yards |
| RAW FILL | 1,071,000 Cubic Yards |
| NET CUT | 1,190,000 Cubic Yards |
| NET FILL | 1,190,000 Cubic Yards |
| EXPORT | 0 Cubic Yards |

## LEGEND:

- EXISTING LOT LINE
- EXISTING EASEMENT
- PROPOSED CONTOUR
- DAYLIGHT LINE
- CUT & FILL
- FLOW LINE
- BENCH
- SWALE
- HAUL ROUTE ACCESS ROAD
- RIVER CORRIDOR–2003 (FORMERLY SEA 23)
- RIVER CORRIDOR (FORMERLY SEA 23)
- FEMA
- Q–CAP
- DEBRIS TRIBUTARY LIMIT
- SLOPE/ DEBRIS BASIN ACCESS
- DEBRIS BASIN
- OIL WELL GPS POSITIONED
- OIL WELL DEPT. OF OIL AND GAS CALCULATED POSITION
- OIL WELL DIGITIZED POSITION
- OIL WELL DEPT. OF OIL AND GAS METAL DETECTOR POSITION
- EXISTING OAK TREE
- RIP–RAP
- SPINE FLOWER
- SPINE FLOWER PROTECTION BOUNDARY

# OFFSITE GRADING
# ADOBE CANYON

| ADOBE CANYON EARTHWORK VOLUMES | |
|---|---|
| RAW CUT | 6,468,500 Cubic Yards |
| RAW FILL | 133,000 Cubic Yards |
| NET CUT | 6,468,500 Cubic Yards |
| NET FILL | 146,300 Cubic Yards |
| EXPORT | 6,322,200 Cubic Yards |

REV. DATE: DECEMBER 21, 2009
DATE: MAY 2, 2007

**ALLAN E. SEWARD**
**ENGINEERING GEOLOGY, INC.**
Geological And Geotechnical Consultants

Geologic/Geotechnical Map

| | |
|---|---|
| Date: 12/21/09 | Job No.: 09-1702R-4 |
| Scale: 1" = 100' | CAD File: Sheet 11 Revised Geologic Map |
| Sheet 11 | Geology by: BJS; Drawn by: GSD/JCH; Revised: |

SEE 9/30/05 REPORT FOR VTT 060678
AND SHEET 3 FOR GEOLOGIC LEGEND

LEGAL DESCRIPTION:

PARCELS 8, 9, 10, AND PORTION OF PARCELS 7, 20, 21 OF PARCEL MAP NO. 24500-01 PMB 293-34/67, RECORDS OF LOS ANGELES COUNTY.

REGISTERED PROFESSIONAL ENGINEER ERIK WINATA No. C-67285 Exp. 09/30/10 CIVIL STATE OF CALIFORNIA

PSOMAS
28480 Avenue Stanford, Suite 200
Santa Clarita, CA 91355
(661) 219-6000 (661) 775-2718 (FAX)

ERIK WINATA R.C.E. NO. C 67285 DATE

DESIGNED: NSK/YL
DRAFTED: TLC/JS
CHECKED: EW

OWNER/DEVELOPER:
NEWHALL RANCH
23823 WEST VALENCIA BOULEVARD
VALENCIA, CALIFORNIA 91335
TELEPHONE: (661) 255-4000
REPRESENTATIVE: MR. FRED MACMURDO

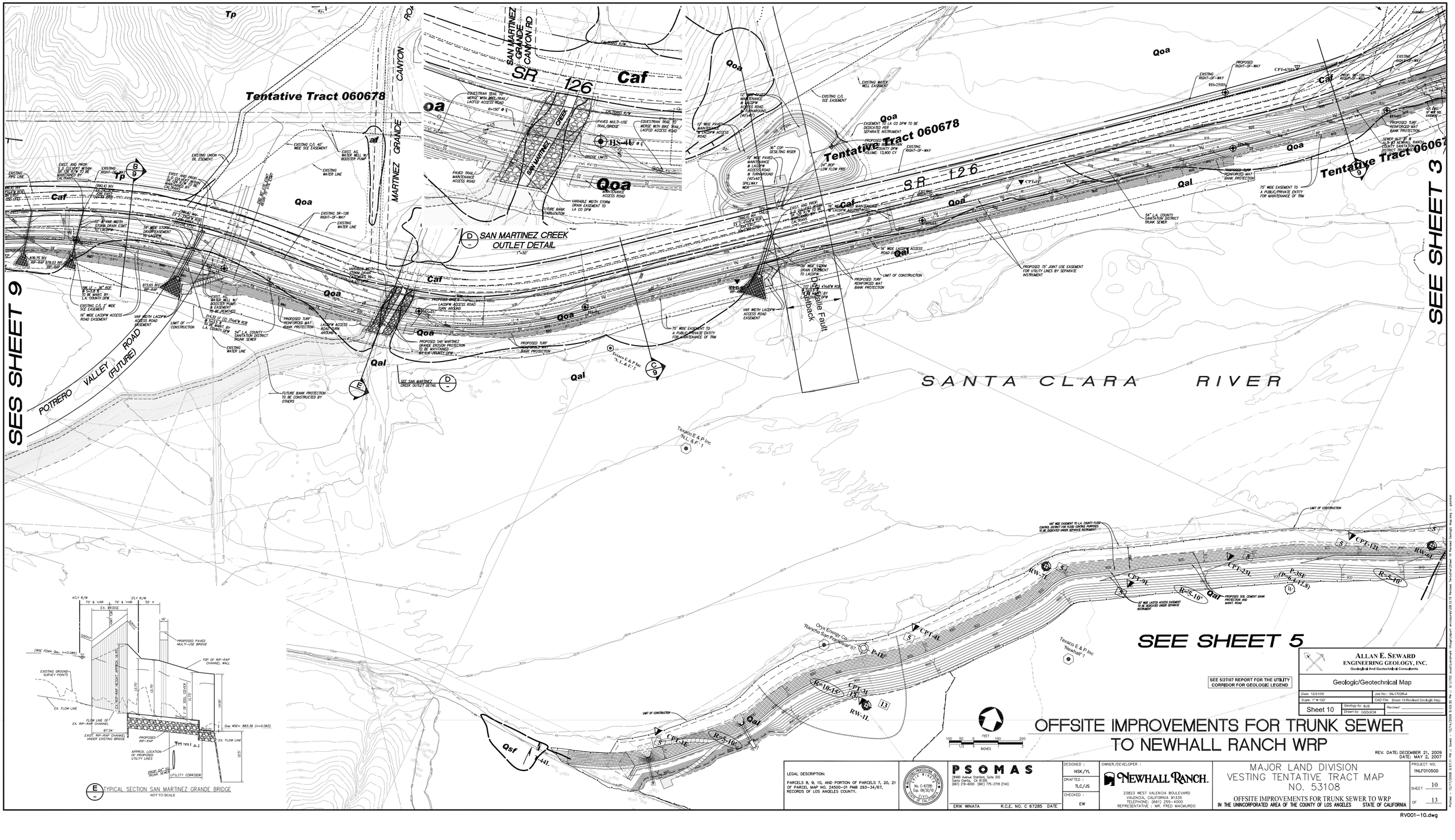
MAJOR LAND DIVISION
VESTING TENTATIVE TRACT MAP
NO. 53108

CHIQUITO CANYON & ADOBE CANYON OFFSITE GRADING
IN THE UNINCORPORATED AREA OF THE COUNTY OF LOS ANGELES STATE OF CALIFORNIA

PROJECT NO. 1NLF010500
SHEET 11 OF 13

RV001–11.dwg

Plotted – 12/17/2009 4:07:31 PM :: Saved – 12/15/2009 2:01:33 PM




ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geological And Geotechnical Consultants

Geologic/Geotechnical Map

Date: 12/21/09 | Job No.: 09-170ZR-4
Scale: 1" = 100' | CAD File: Sheet 10 Revised Geologic Map
Sheet 10 | Geology by: BJS | Revised:
Drawn by: GSD/JCH

SEE 5/27/07 REPORT FOR THE UTILITY CORRIDOR FOR GEOLOGIC LEGEND

# OFFSITE IMPROVEMENTS FOR TRUNK SEWER TO NEWHALL RANCH WRP

REV. DATE: DECEMBER 21, 2009
DATE: MAY 2, 2007

LEGAL DESCRIPTION:
PARCELS 8, 9, 10, AND PORTION OF PARCELS 7, 20, 21 OF PARCEL MAP NO. 24500-01 PMB 293-34/67, RECORDS OF LOS ANGELES COUNTY.

REGISTERED PROFESSIONAL ENGINEER No. C-67285 (exp. 09/30/10) CIVIL STATE OF CALIFORNIA

PSOMAS
3648 Avenue Stanford, Suite 200
Santa Clarita, CA 91355
(661) 259-4000 (661) 775-2778 (FAX)

ERIK WINATA R.C.E. NO. C 67285 DATE

DESIGNED : NSK/YL
DRAFTED : TLC/JS
CHECKED : EW

OWNER/DEVELOPER :
NEWHALL RANCH.
23823 WEST VALENCIA BOULEVARD
VALENCIA, CALIFORNIA 91335
TELEPHONE: (661) 255-4000
REPRESENTATIVE : MR. FRED MACMURDO

MAJOR LAND DIVISION
VESTING TENTATIVE TRACT MAP
NO. 53108

OFFSITE IMPROVEMENTS FOR TRUNK SEWER TO WRP
IN THE UNINCORPORATED AREA OF THE COUNTY OF LOS ANGELES STATE OF CALIFORNIA

PROJECT NO. 1NLF010500
SHEET 10 OF 13

RV001-10.dwg

| WRP DEBRIS BASIN EARTHWORK VOLUMES | |
|---|---|
| RAW CUT | 91,000 Cubic Yards |
| RAW FILL | 2,000 Cubic Yards |
| NET CUT | 91,000 Cubic Yards |
| NET FILL | 2,200 Cubic Yards |
| EXPORT | 88,800 Cubic Yards |

| UTILITY CORRIDOR GRADING EARTHWORK VOLUMES | |
|---|---|
| RAW CUT | 3,200 Cubic Yards |
| RAW FILL | 233,000 Cubic Yards |
| NET CUT | 3,200 Cubic Yards |
| NET FILL | 263,000 Cubic Yards |
| IMPORT | 259,800 Cubic Yards |

SEE SHEET 10

S R - 126

SANTA CLARA RIVER

Tentative Tract 060678

PROPOSED NEWHALL RANCH WASTE WATER RECLAMATION PLANT ( N A P )

PROPOSED DEBRIS BASIN REQUIRED FOR WRP CONSTRUCTION VOLUME: 1,070 CY

PROPOSED DEBRIS BASIN REQUIRED FOR WRP CONSTRUCTION VOLUME: 1,080 CY

TEMPORARY CONSTRUCTION LIMIT LINE

EXISTING WATER LINE

EXISTING PACIFIC & TELEGRAPH EASEMENT

EASEMENT TO BE DEDICATED PER SEPARATE INSTRUMENT

EXISTING C/L 40' WIDE SCE EASEMENT

EXISTING RIGHT-OF-WAY

EXISTING SCE EASEMENT

EXIST. AG. WATER BOOSTER PUMP TO BE RELOCATED

ALT #1 PUMP STATION AT END OF SANITATION DISTRICT GRAVITY TRUNK SEWER (MAINTAINED BY NEWHALL RANCH COUNTY SANITATION DISTRICT) SEE SHEET 6

EXISTING PIPE LINE

12' WIDE ACCESS ROAD (LASPW)

UTIL. CONN. TO SLEQ678

10' & VAR. WIDTH STORM DRAIN EASEMENT

PROPOSED 90' EASEMENT FOR FUTURE UTILITY LINES SEE SHEET 6

ALT #1 PROPOSED FORCE MAIN TO EXISTING SEWER PUMP STATION (MAINTAINED BY NEWHALL RANCH COUNTY SANITATION DISTRICT) SEE SHEET 6

75' WIDE EASEMENT TO A PUBLIC/PRIVATE ENTITY FOR MAINTENANCE OF TRM

16' WIDE LASPW ACCESS ROAD EASEMENT

PROPOSED SOIL CEMENT BANK PROTECTION

186 LF - 36" RCP @ S=4.0% TO BE MAINT. BY LA. COUNTY DPW

150' WIDE EASEMENT TO LA CO SANITATION DISTRICT FOR MAINTENANCE OF SOIL CEMENT

JOIN EXISTING WRP IMPROVEMENTS

LIMITS OF CONSTRUCTION

END OF SOIL CEMENT BANK PROTECTION AND BEGIN MAT BANK PROTECTION

FUTURE BANK PROTECTION BY OTHERS

Approximate Location of Abandoned Southern Pacific Railroad Line

Approximate Location of Abandoned Route of State Highway 126 (Asphalt Still Present)

LOT 19

Qt Qaf Qoa Qal Tp

FEET 100 50 0 100 200

INCHES 1 1/2 0 1 2

## OFFSITE IMPROVEMENTS FOR TRUNK SEWER TO NEWHALL RANCH WRP

TYPICAL SECTION A-A
BANK STABILIZATION - WRP
NOT TO SCALE

TYPICAL SECTION B-B
WRP TO POTRERO ROAD
NOT TO SCALE

TYPICAL SECTION C-C
POTRERO ROAD TO LANDMARK VILLAGE
NOT TO SCALE

* WO SWALE SIDE SLOPES ARE 4:1 MAX.

SEE 5/25/07 REPORT FOR THE UTILITY CORRIDOR FOR GEOLOGIC LEGEND

ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geological And Geotechnical Consultants

Geologic/Geotechnical Map

Date: 12/21/06 | Job No.: 09-1702R-4
Scale: 1" = 100' | CAD File: Sheet 9 Revised Geologic Map
Sheet 9 | Geology by: BJS | Revised:
Drawn by: GSD/JCH

REV. DATE: DECEMBER 21, 2009
DATE: MAY 2, 2007

LEGAL DESCRIPTION:
PARCELS 8, 9, 10, AND PORTION OF PARCELS 7, 20, 21 OF PARCEL MAP NO. 24500-01 PMB 293-34/67, RECORDS OF LOS ANGELES COUNTY.

REGISTERED PROFESSIONAL ENGINEER ERIK WINATA No. C-67285 Exp. 09/30/10 CIVIL STATE OF CALIFORNIA

PSOMAS
28480 Avenue Stanford, Suite 200
Santa Clarita, CA 91355
(661) 259-6000 (661) 775-2718 (FAX)

ERIK WINATA R.C.E. NO. C 67285 DATE

DESIGNED : NSK/YL
DRAFTED : TLC/JS
CHECKED : EW

OWNER/DEVELOPER :
NEWHALL RANCH.
23823 WEST VALENCIA BOULEVARD
VALENCIA, CALIFORNIA 91335
TELEPHONE: (661) 255-4000
REPRESENTATIVE : MR. FRED MACMURDO

MAJOR LAND DIVISION
VESTING TENTATIVE TRACT MAP
NO. 53108

OFFSITE IMPROVEMENTS FOR TRUNK SEWER TO WRP
IN THE UNINCORPORATED AREA OF THE COUNTY OF LOS ANGELES STATE OF CALIFORNIA

PROJECT NO. 1NLF010500
SHEET 9 OF 13

RV001-09.dwg

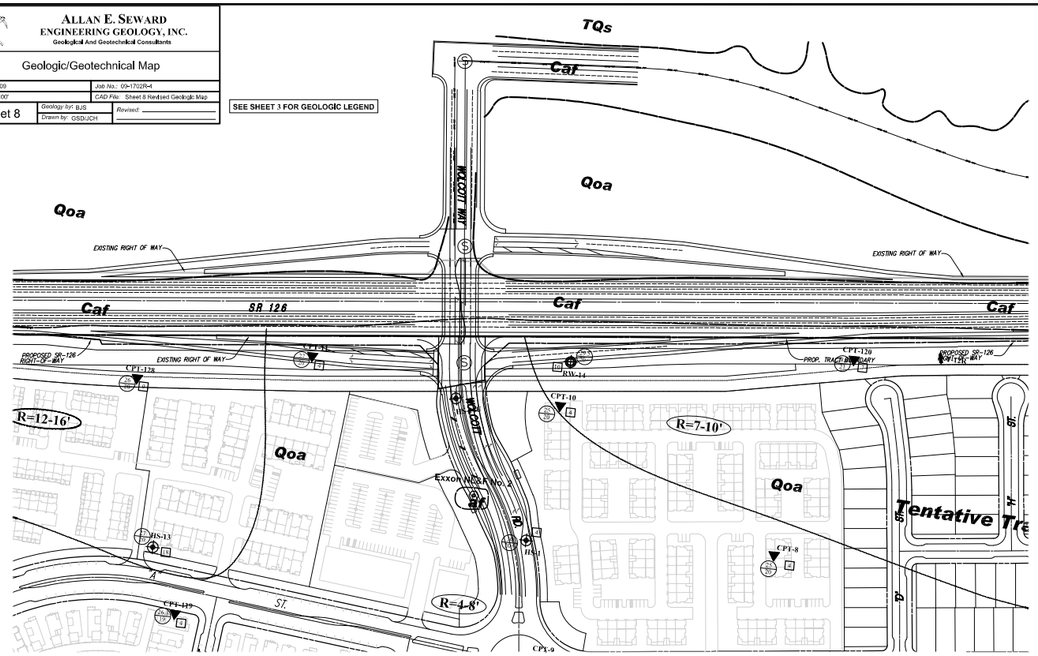
Model: --12/17/2009 3:48:27 PM-- Saved: 12/17/2009 3:48:27 PM -- Layout: 9 -- Plotted: 12/17/2009 3:49:31 PM -- By: GSD -- C:\Documents and Settings\Owner\Desktop\Current Working\Sheet 9 Revised Geologic Map.dwg -- plotted

ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geological And Geotechnical Consultants

Geologic/Geotechnical Map

Date: 12/21/09 | Job No.: 09-170ZR-4
Scale: 1" = 100' | CAD File: Sheet 8 Revised Geologic Map
Sheet 8 | Geology by: BJS | Revised: ——
Drawn by: GSD/JCH

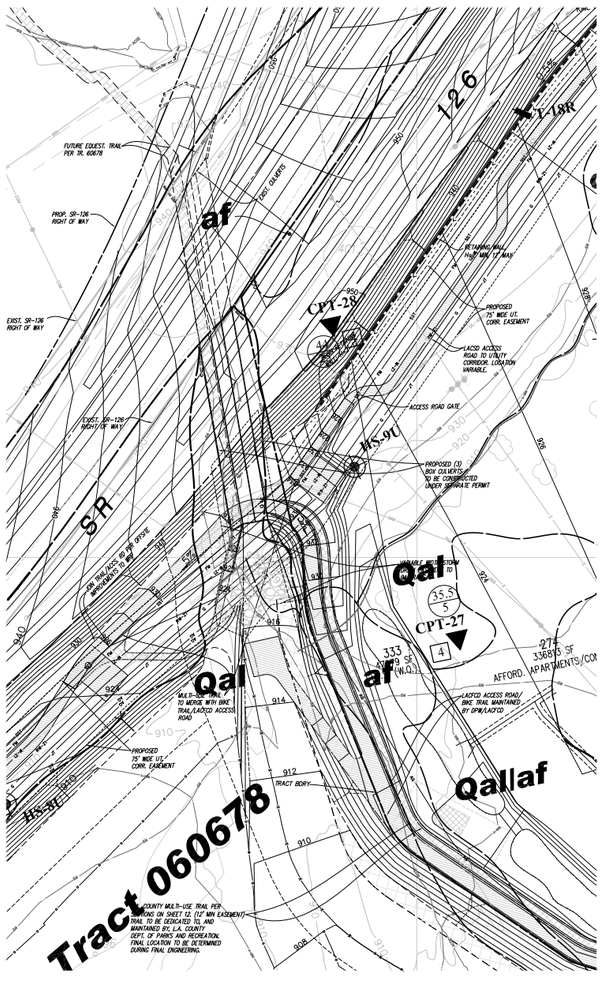
SEE SHEET 3 FOR GEOLOGIC LEGEND




# POSSIBLE LAYOUT OF FUTURE INTERCHANGE WOLCOTT ROAD - SR 126

1 / –

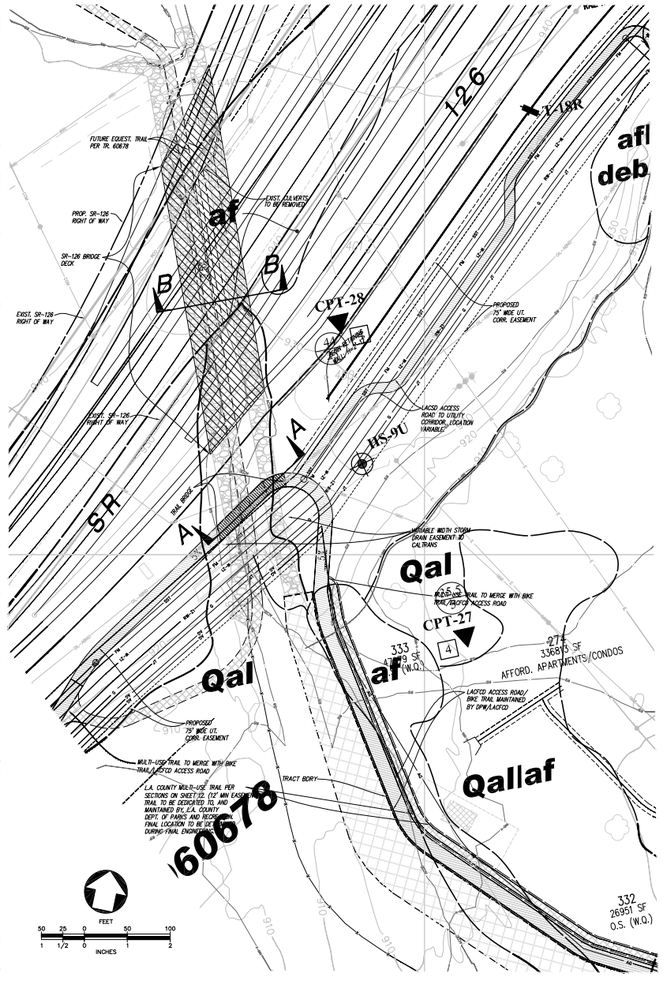
FEET 100 50 0 100 200
INCHES 1 1/2 0 1 2




## CHIQUITO CYN OUTLET DETAIL 2

–

FEET 50 25 0 50 100
INCHES 1 1/2 0 1 2




## CHIQUITO CYN OUTLET DETAIL BRIDGE ALTERNATE 3

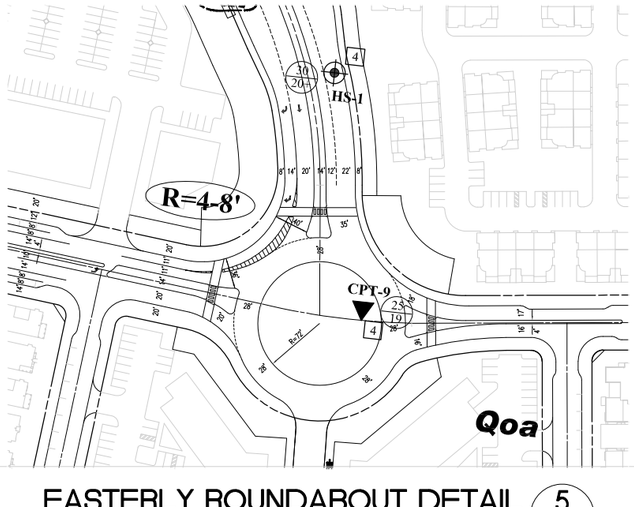
–

FEET 50 25 0 50 100
INCHES 1 1/2 0 1 2

## WESTERLY ROUNDABOUT DETAIL 4

–

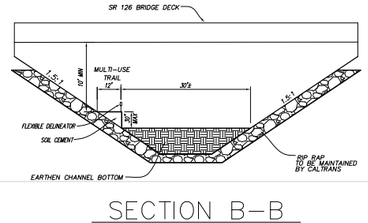
FEET 50 25 0 50 100
INCHES 1 1/2 0 1 2



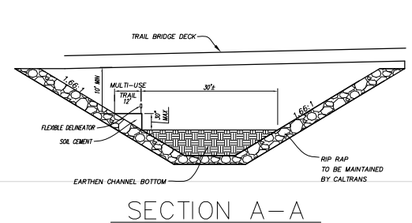

## EASTERLY ROUNDABOUT DETAIL 5

–

FEET 50 25 0 50 100
INCHES 1 1/2 0 1 2




SECTION B–B
NOT TO SCALE




SECTION A–A
NOT TO SCALE

REV. DATE: DECEMBER 21, 2009
DATE: MAY 2, 2007

LEGAL DESCRIPTION:
PARCELS 8, 9, 10, AND PORTION OF PARCELS 7, 20, 21 OF PARCEL MAP NO. 24500-01 PMB 293-34/67, RECORDS OF LOS ANGELES COUNTY.

REGISTERED PROFESSIONAL ENGINEER — ERIK WINATA — No. C-67285 — Exp. 09/30/10 — CIVIL — STATE OF CALIFORNIA

PSOMAS
28485 Avenue Stanford, Suite 200
Santa Clarita, CA 91355
(661) 259-4000 (661) 775-2718 (FAX)

ERIK WINATA R.C.E. NO. C 67285 DATE

DESIGNED : NSK/YL
DRAFTED : TLC/JS
CHECKED : EW

OWNER/DEVELOPER :
NEWHALL RANCH.
23823 WEST VALENCIA BOULEVARD
VALENCIA, CALIFORNIA 91335
TELEPHONE: (661) 255-4000
REPRESENTATIVE : MR. FRED MACMURDO

MAJOR LAND DIVISION
VESTING TENTATIVE TRACT MAP
NO. 53108

CHIQUITO LANDFILL DEBRIS BASIN & ALT. WOLCOTT/SR126 INTERCHANGE DETAILS
IN THE UNINCORPORATED AREA OF THE COUNTY OF LOS ANGELES STATE OF CALIFORNIA

PROJECT NO. 1NLF010500
SHEET 8 OF 13

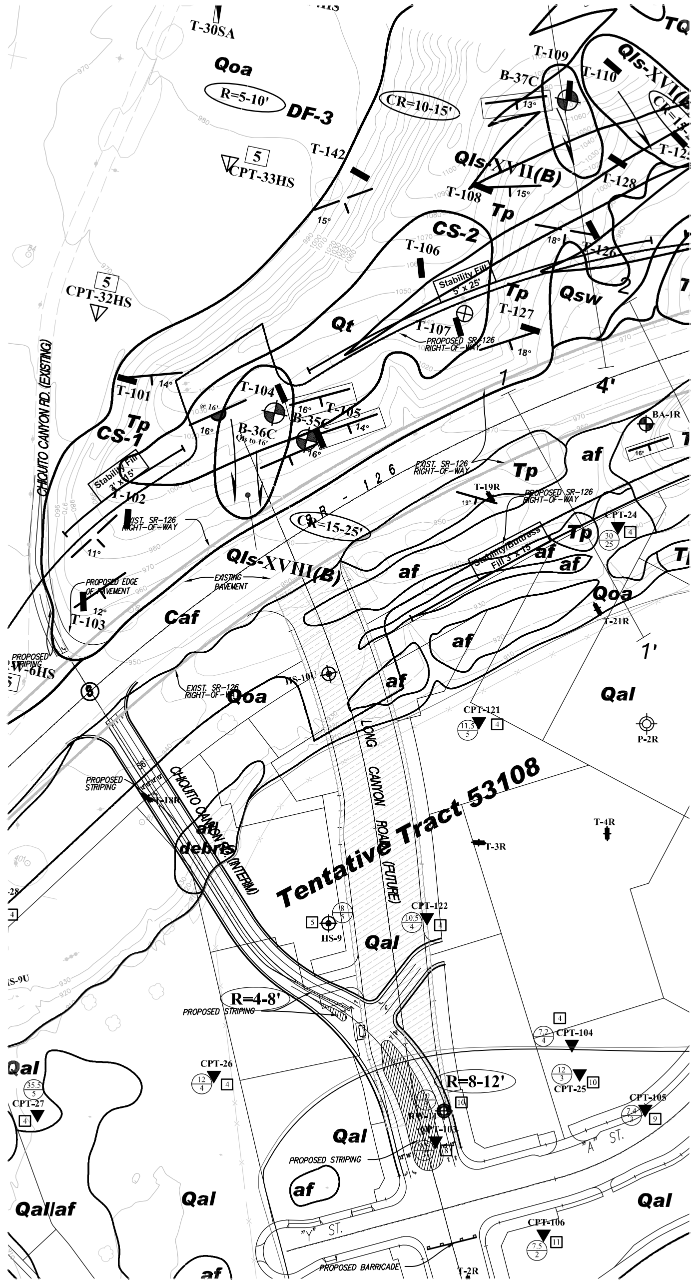
RV001–08.dwg

**ALLAN E. SEWARD**
**ENGINEERING GEOLOGY, INC.**
Geological And Geotechnical Consultants

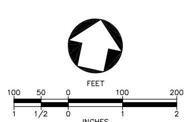
Geologic/Geotechnical Map

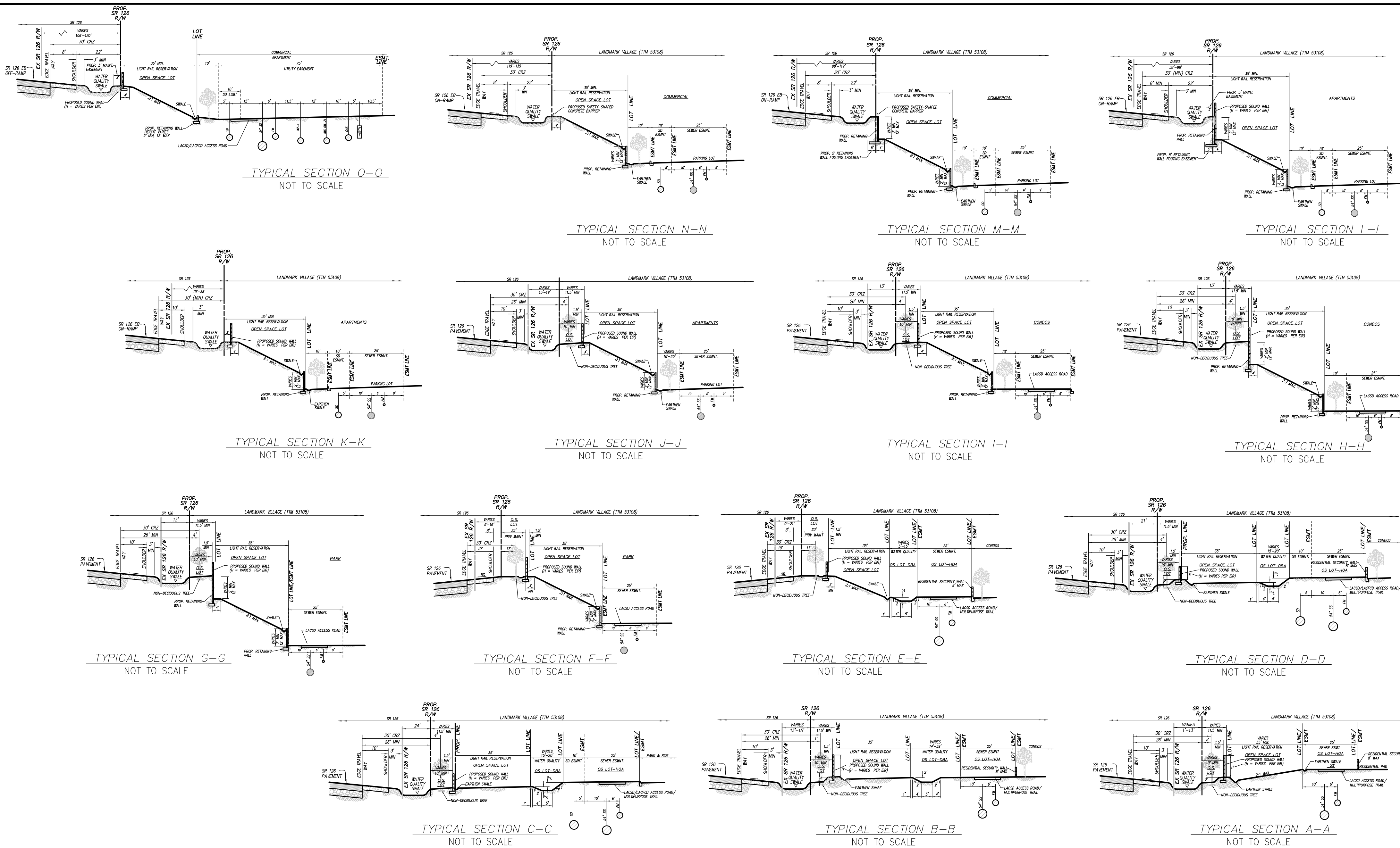
Date: 12/01/09 | Job No.: 09-1702R-4
Scale: 1" = 100' | CAD File: Sheet 7 Revised Geologic Map
Sheet 7 | Geology by: BJS | Drawn by: GSD/JCH | Revised:

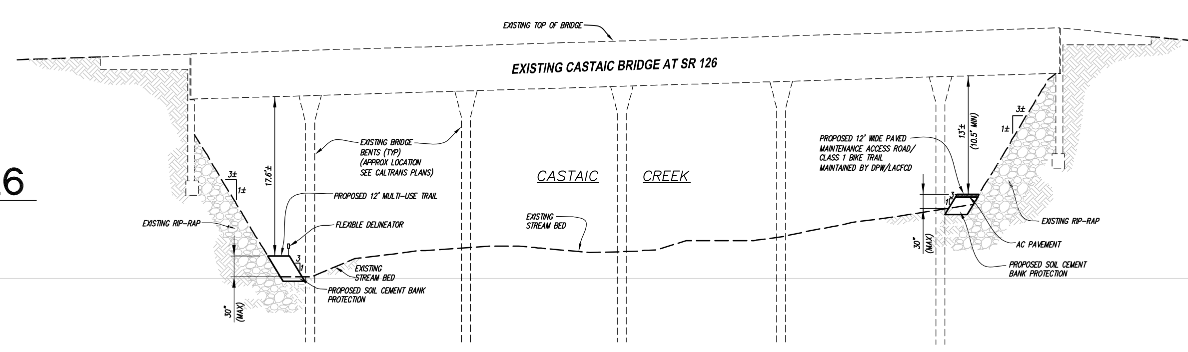
SEE SHEET 3 FOR GEOLOGIC LEGEND



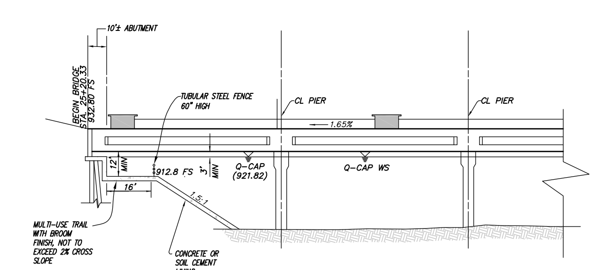

INTERIM DESIGN CHIQUITO CANYON RD. - SR 126 INTERCHANGE






TRAIL SECTION AT CASTAIC CREEK BRIDGE
NOT TO SCALE



TRAIL SECTION AT LONG CANYON BRIDGE
NOT TO SCALE

REV. DATE: DECEMBER 21, 2009
DATE: MAY 2, 2007

LEGAL DESCRIPTION:
PARCELS 8, 9, 10, AND PORTION OF PARCELS 7, 20, 21 OF PARCEL MAP NO. 24500-01 PMB 293-34/67, RECORDS OF LOS ANGELES COUNTY.

**PSOMAS**
28480 Avenue Stanford, Suite 200
Santa Clarita, CA 91355
(661) 219-6000 (661) 775-2718 (FAX)

ERIK WINATA R.C.E. NO. C 67285 DATE

DESIGNED: NSK/YL
DRAFTED: TLC/JS
CHECKED: EW

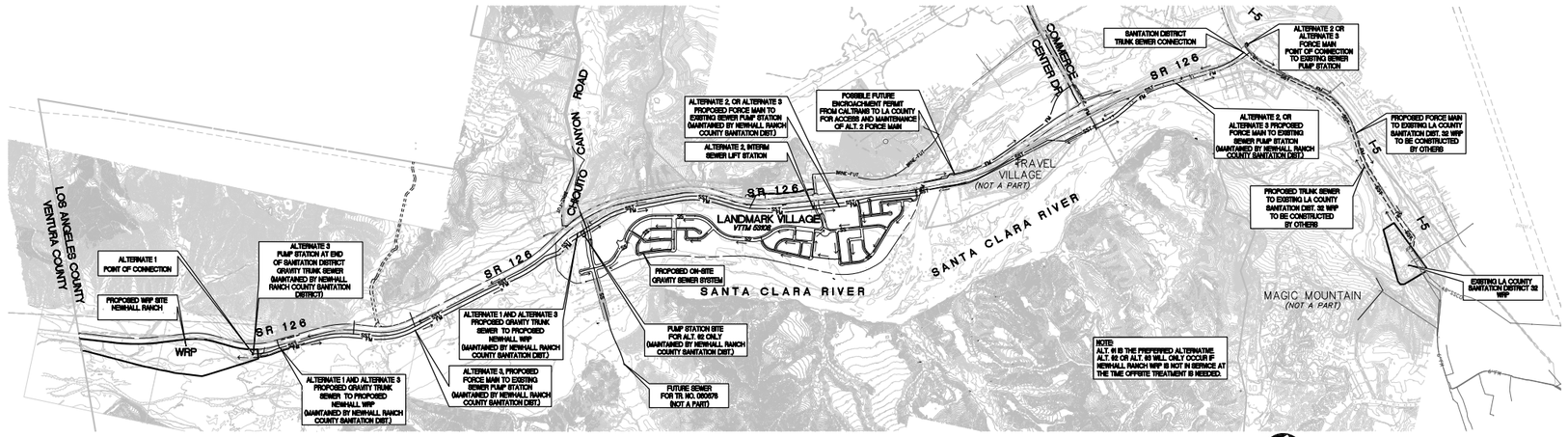
OWNER/DEVELOPER:
NEWHALL RANCH
23823 WEST VALENCIA BOULEVARD
VALENCIA, CALIFORNIA 91355
TELEPHONE: (661) 255-4000
REPRESENTATIVE: MR. FRED MACMURDO

MAJOR LAND DIVISION
VESTING TENTATIVE TRACT MAP
NO. 53108

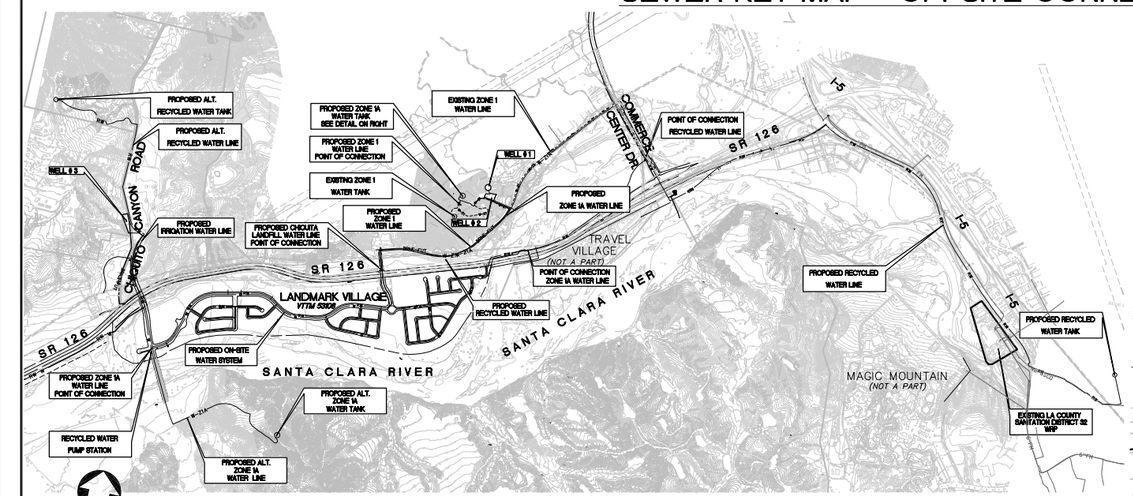
INTERIM DESIGN LONG CANYON - SR 126; UTIL. CORR. SECTIONS
IN THE UNINCORPORATED AREA OF THE COUNTY OF LOS ANGELES STATE OF CALIFORNIA

PROJECT NO. 1NLF010500
SHEET 7 OF 13

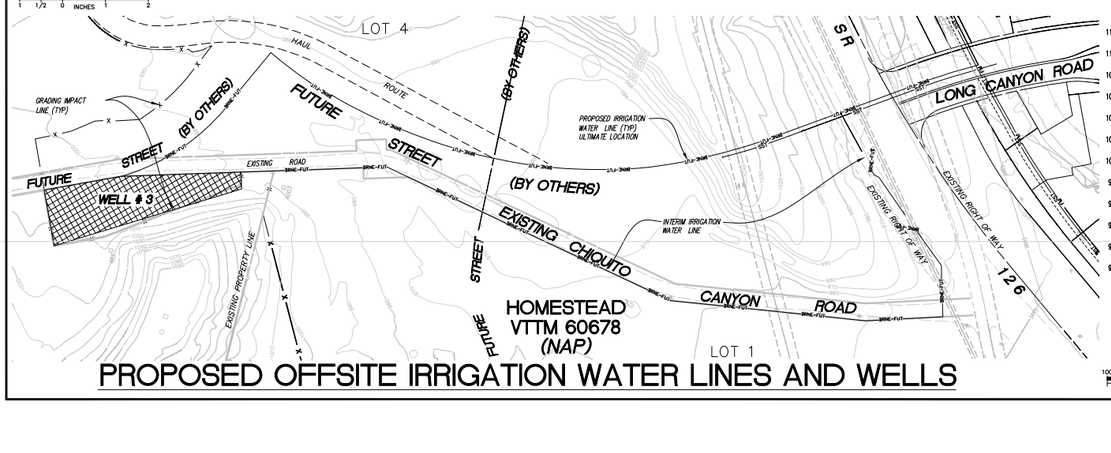
RV001-07.dwg



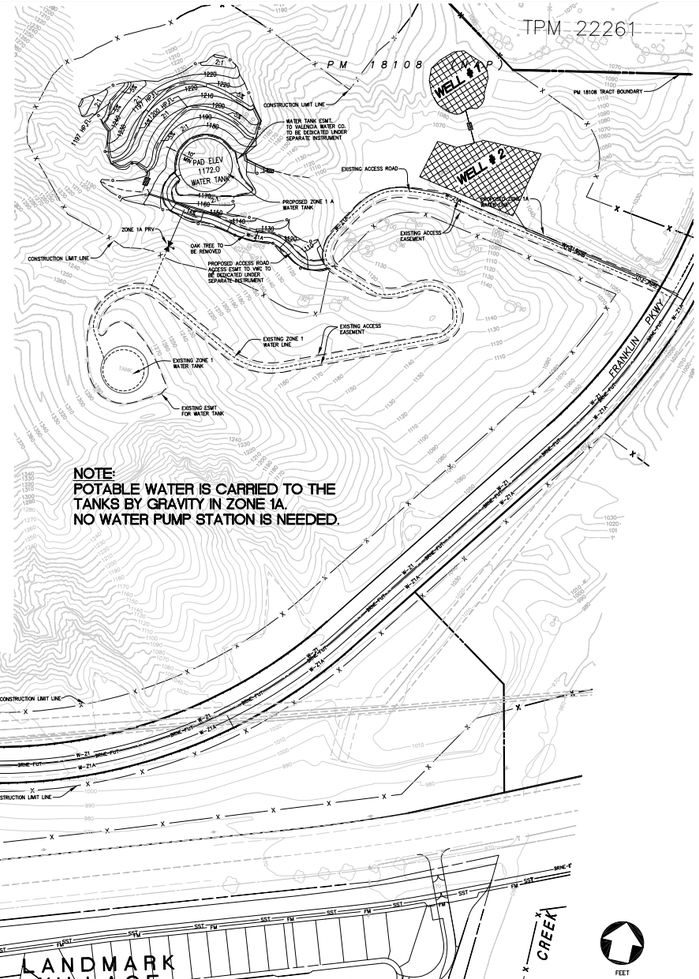

# SEWER KEY MAP - OFFSITE CONNECTION




# WATER KEY MAP - OFFSITE CONNECTION

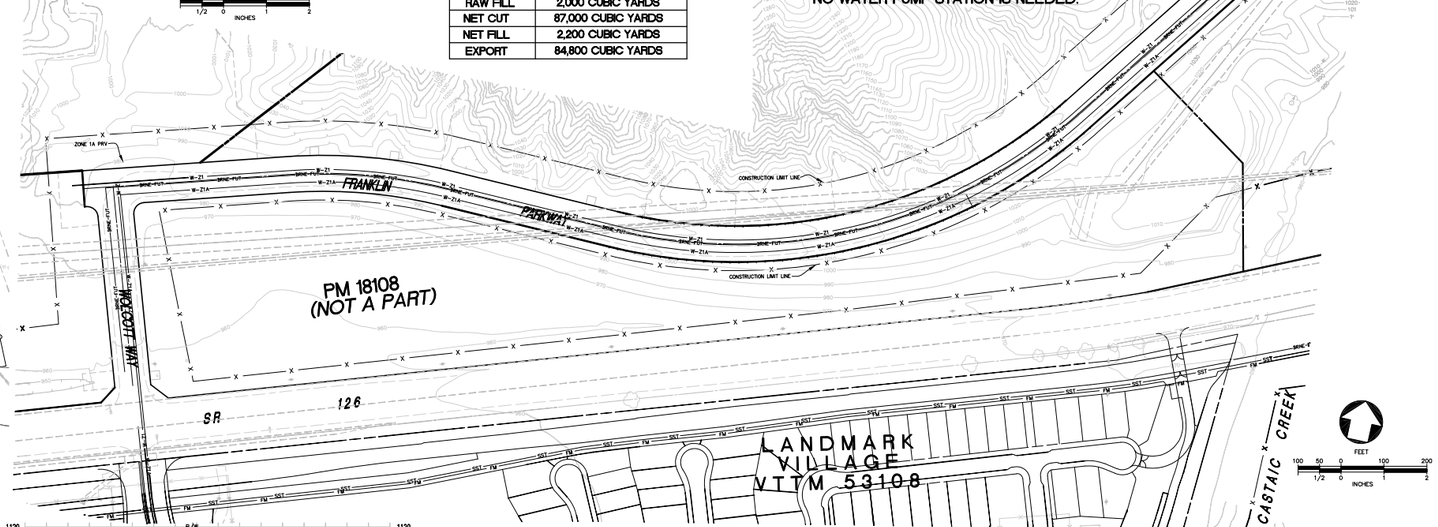



# PROPOSED OFFSITE IRRIGATION WATER LINES AND WELLS

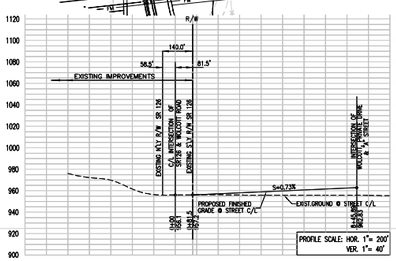



NOTE:
POTABLE WATER IS CARRIED TO THE TANKS BY GRAVITY IN ZONE 1A. NO WATER PUMP STATION IS NEEDED.

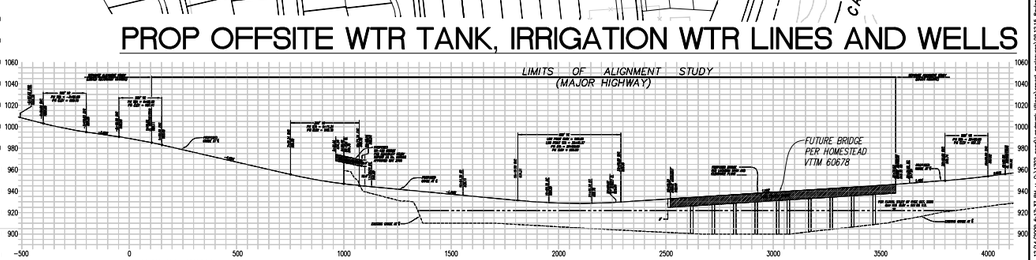
| OFFSITE ZONE 1A WATER TANK SITE | |
|---|---|
| RAW CUT | 87,000 CUBIC YARDS |
| RAW FILL | 2,000 CUBIC YARDS |
| NET CUT | 87,000 CUBIC YARDS |
| NET FILL | 2,200 CUBIC YARDS |
| EXPORT | 84,800 CUBIC YARDS |




# PROP OFFSITE WTR TANK, IRRIGATION WTR LINES AND WELLS




# WOLCOTT ROAD PROFILE




# LONG CANYON ROAD PROFILE

PROFILE SCALE:
HORIZ: 1"=200'
VERT: 1"=40'

REV. DATE: DECEMBER 21, 2009
DATE: MAY 2, 2007

LEGAL DESCRIPTION:
PARCELS 8, 9, 10, AND PORTION OF PARCELS 7, 20, 21 OF PARCEL MAP NO. 24500-01 PMB 293-34/67, RECORDS OF LOS ANGELES COUNTY.

REGISTERED PROFESSIONAL ENGINEER — No. C-67285 — Exp. 09/30/10 — CIVIL — STATE OF CALIFORNIA


PSOMAS
28480 Avenue Stanford, Suite 200
Santa Clarita, CA 91355
(661) 259-6000 (661) 775-2718 (FAX)


ERIK WINATA R.C.E. NO. C 67285 DATE

| | |
|---|---|
| DESIGNED : | NSK/YL |
| DRAFTED : | TLC/JS |
| CHECKED : | EW |

OWNER/DEVELOPER :
NEWHALL RANCH.
23823 WEST VALENCIA BOULEVARD
VALENCIA, CALIFORNIA 91335
TELEPHONE: (661) 255-4000
REPRESENTATIVE : MR. FRED MACMURDO

MAJOR LAND DIVISION
VESTING TENTATIVE TRACT MAP
NO. 53108
SEWER & WATER KEY MAPS, LONG CANYON RD & WOLCOTT RD PROFILES
PROPOSED OFFSITE IRRIGATION WATER LINES AND WELLS
IN THE UNINCORPORATED AREA OF THE COUNTY OF LOS ANGELES STATE OF CALIFORNIA

PROJECT NO. 1NLF010500
SHEET 6 OF 13

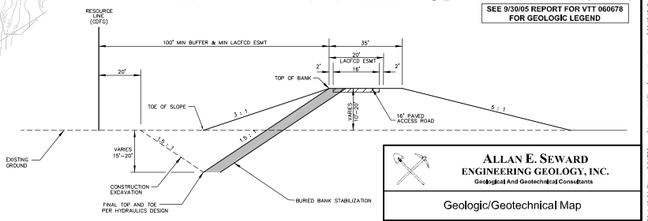
RV001-06.dwg

SEE SHEET 3

| SOUTH BANK TEMP. LEVEE EARTHWORK VOLUME | |
|---|---|
| RAW CUT | 0 Cubic Yards |
| RAW FILL | 250,000 Cubic Yards |
| NET CUT | 0 Cubic Yards |
| NET FILL | 316,000 Cubic Yards |
| IMPORT | 316,000 Cubic Yards |

SEE SHEET 4

SEE 9/30/05 REPORT FOR VTT 060678 FOR GEOLOGIC LEGEND




A BANK STABILIZATION TYPICAL SECTION
NTS

100' 50' 0' 100' 200'
GRAPHIC SCALE
Note: For reduced sized prints, original scale is in inches

**ALLAN E. SEWARD ENGINEERING GEOLOGY, INC.**
Geologicid And Geotechnical Consultants

Geologic/Geotechnical Map

| | |
|---|---|
| Date: 12/21/09 | Job No.: 09-170ZR-4 |
| Scale: 1" = 100' | CAD File: Sheet 5 Revised Geologic Map |
| Sheet 5 | Geology by: BJS / Drawn by: GSD/JCH / Assisted |

REV. DATE: DECEMBER 21, 2009
DATE: MAY 2, 2007

LEGAL DESCRIPTION:

PARCELS 8, 9, 10, AND PORTION OF PARCELS 7, 20, 21 OF PARCEL MAP NO. 24500-01 PMB 293-34/67, RECORDS OF LOS ANGELES COUNTY.

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PSOMAS
2940 Ahrens Stanton, Suite 200
Santa Clarita, CA 91355
(661) 259-6000 (661) 775-2778 (FAX)
ERIK WINATA R.C.E. NO. C 67285 DATE

DESIGNED : NSK/YL
DRAFTED : TLC/JS
CHECKED : EW

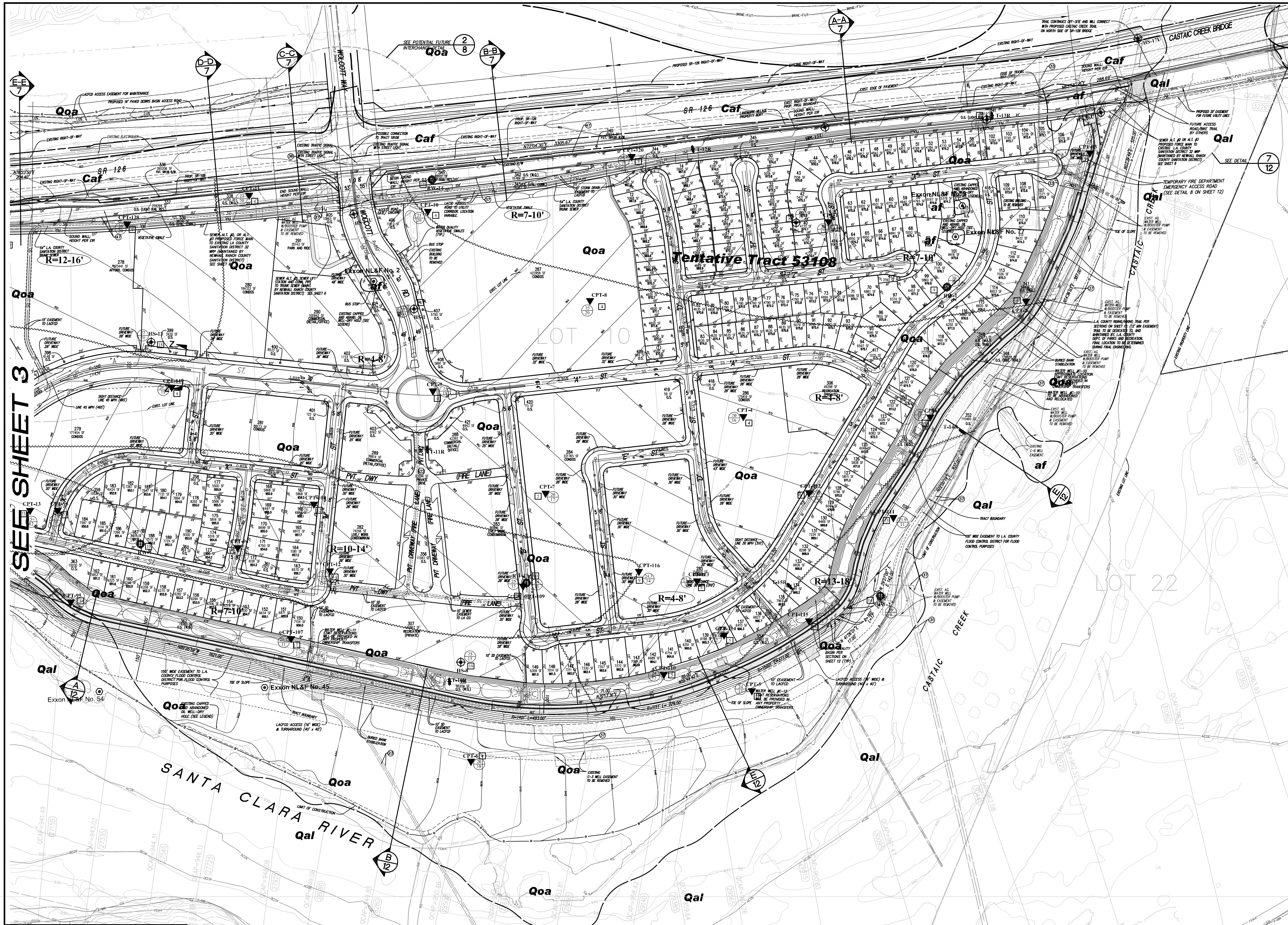
OWNER/DEVELOPER :
NEWHALL RANCH.
23823 WEST VALENCIA BOULEVARD
VALENCIA, CALIFORNIA 91355
TELEPHONE: (661) 255-4000
REPRESENTATIVE : MR. FRED MACMURDO

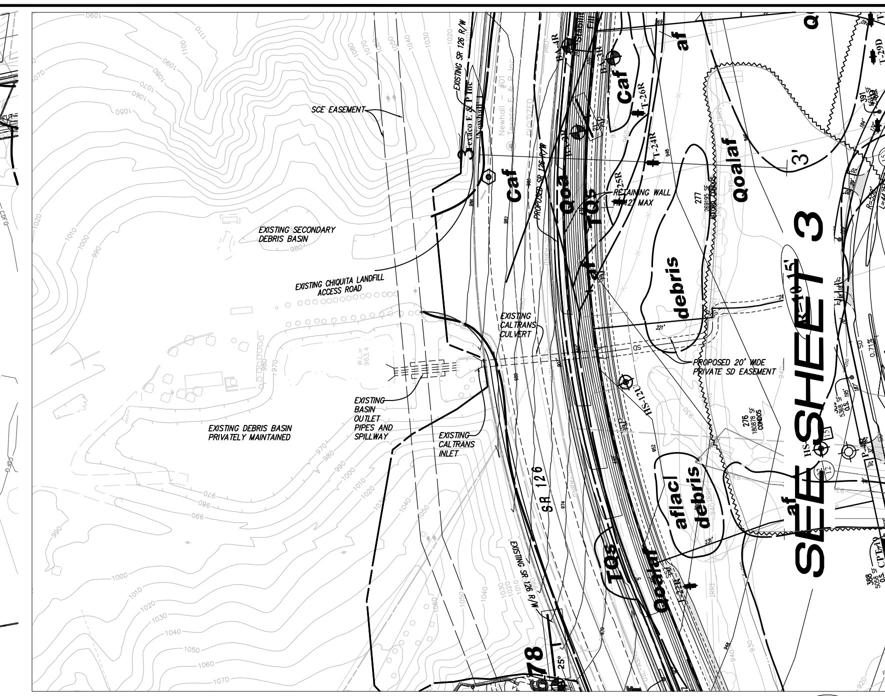
MAJOR LAND DIVISION
VESTING TENTATIVE TRACT MAP
NO. 53108

IN THE UNINCORPORATED AREA OF THE COUNTY OF LOS ANGELES STATE OF CALIFORNIA

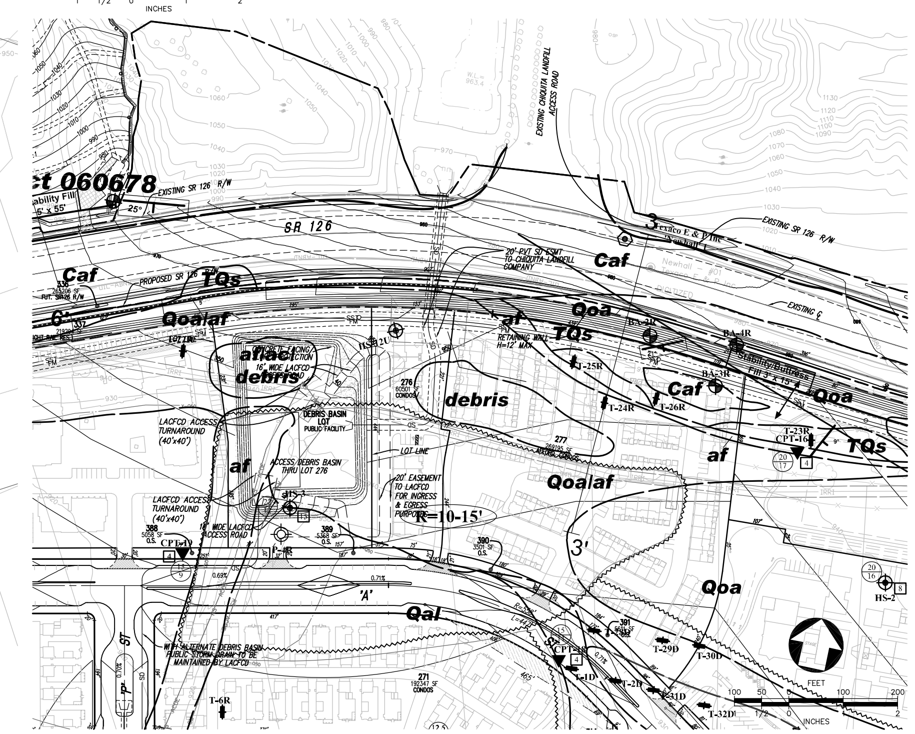
PROJECT NO. 1NLF010500
SHEET 5 OF 13

RV001-05.dwg




# EXISTING LANDFILL DEBRIS BASIN AS SHOWN ON VTTM 5




# ALTERNATE DEBRIS BASIN LOCATION 6

REV. DATE: DECEMBER 21, 2009
DATE: MAY 2, 2007

**ALLAN E. SEWARD ENGINEERING GEOLOGY, INC.**
Geological And Geotechnical Consultants

Geologic/Geotechnical Map

| | |
|---|---|
| Date: 12/21/09 | Job No.: 09-1702R-4 |
| Scale: 1" = 100' | CAD File: Sheet 4 Revised Geologic Map |
| Sheet 4 | Geology by: BJS; Drawn by: GSD/JCH; Revised: |

SEE SHEET 3 FOR GEOLOGIC LEGEND

GRAPHIC SCALE
Note: For reduced sized prints, original scale is in inches

LEGAL DESCRIPTION:

PARCELS 8, 9, 10, AND PORTION OF PARCELS 7, 20, 21 OF PARCEL MAP NO. 24500-01 PMB 293-34/67, RECORDS OF LOS ANGELES COUNTY.

REGISTERED PROFESSIONAL ENGINEER ERIK WINATA No. C-67285 Exp. 09/30/10 CIVIL STATE OF CALIFORNIA

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Santa Clarita, CA 91355
(661) 219-6000 (661) 775-2718 (FAX)

ERIK WINATA R.C.E. NO. C 67285 DATE

DESIGNED: NSK/YL
DRAFTED: TLC/JS
CHECKED: EW

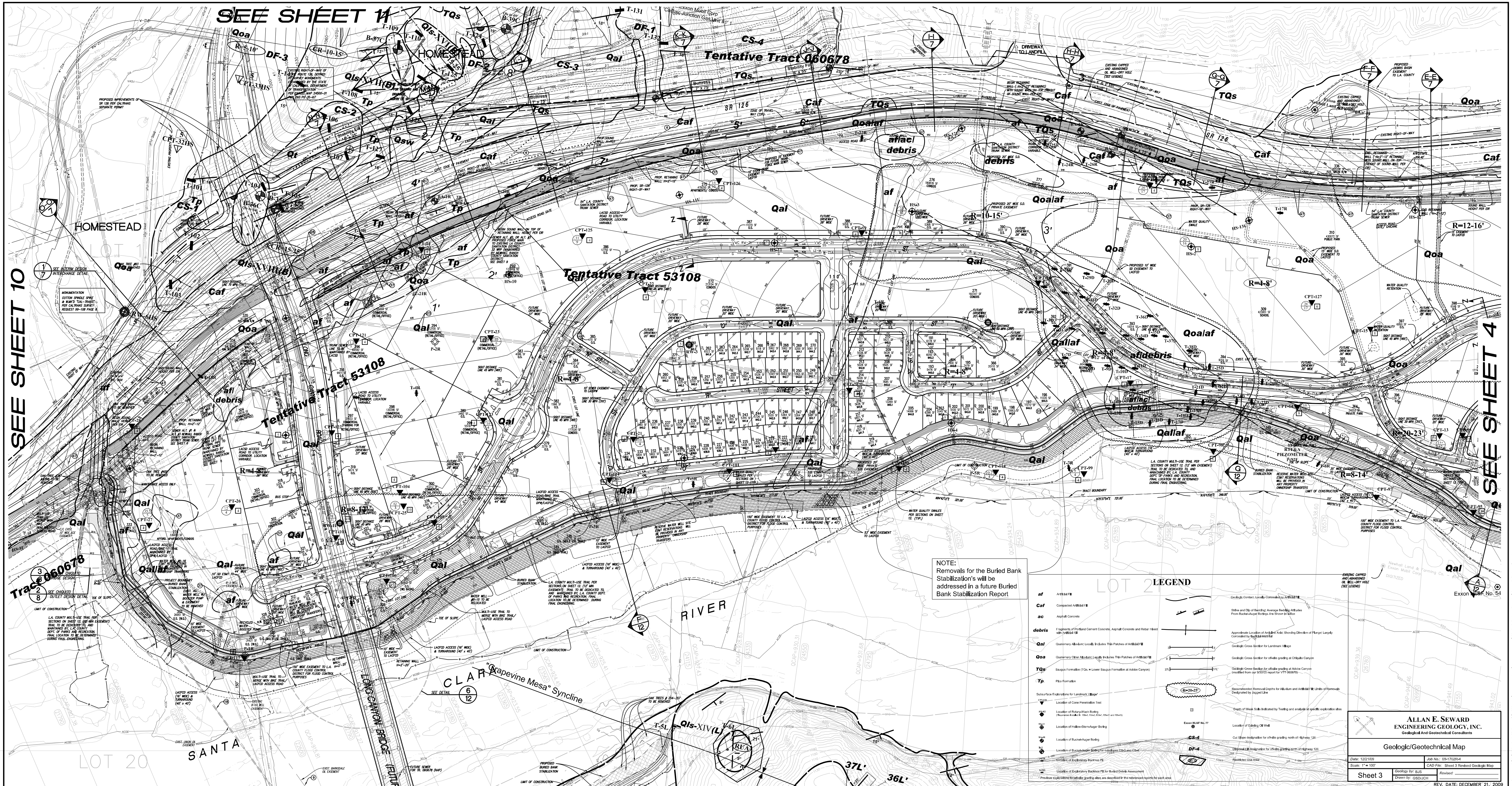
OWNER/DEVELOPER:
NEWHALL RANCH
23823 WEST VALENCIA BOULEVARD
VALENCIA, CALIFORNIA 91335
TELEPHONE: (661) 255-4000
REPRESENTATIVE: MR. FRED MACMURDO

MAJOR LAND DIVISION
VESTING TENTATIVE TRACT MAP
NO. 53108

IN THE UNINCORPORATED AREA OF THE COUNTY OF LOS ANGELES STATE OF CALIFORNIA

PROJECT NO. 1NLF010500
SHEET 4 OF 13

RV001-04.dwg




## LEGEND

| | | | |
|---|---|---|---|
| af | Artificial Fill | | Geologic Contact, Locally Concealed by Artificial Fill |
| Caf | Compacted Artificial Fill | | Strike and Dip of Bedding; Average Bedding Attitudes From Bucket-Auger Borings Are Shown In a Box |
| ac | Asphalt Concrete | | |
| debris | Fragments of Portland Cement Concrete, Asphalt Concrete and Rebar mixed with Artificial Fill | | Approximate Location of Anticline Axis; Showing Direction of Plunge; Largely Concealed by Surficial Material |
| Qal | Quaternary Alluvium; Locally Includes Thin Patches of Artificial Fill | 3 — 3' | Geologic Cross Section for Landmark Village |
| Qoa | Quaternary Older Alluvium; Locally Includes Thin Patches of Artificial Fill | 9 — 9' | Geologic Cross Section for off-site grading at Chiquito Canyon |
| TQs | Saugus Formation (TQsL = Lower Saugus Formation at Adobe Canyon) | 37L — 37L' | Geologic Cross Section for off-site grading at Adobe Canyon (modified from our 9/30/05 report for VTT 060678) |
| Tp | Pico Formation | R=20-25' | Recommended Removal Depths for Alluvium and Artificial Fill; Limits of Removals Designated by Jagged Line |

Subsurface Explorations for Landmark Village*

| | | | |
|---|---|---|---|
| CPT-128 | Location of Cone Penetration Test | 30 | Depth of Weak Soils Indicated by Testing and analysis at specific exploration sites |
| RW-12 | Location of Rotary-Wash Boring (Piezometers Installed In RW-1, RW-3, RW-7, RW-11 and RW-13) | | |
| HS-13 | Location of Hollow-Stem-Auger Boring | Exxon NL&F No. 77 | Location of Existing Oil Well |
| BA-4R | Location of Bucket-Auger Boring | CS-4 | Cut Slope designation for off-site grading north of Highway 126 |
| B-2 | Location of Bucket-Auger Boring for cut-slopes CS-3 and CS-4 | DF-4 | Disposal Fill designation for off-site grading north of Highway 126 |
| T-37R | Location of Exploratory Backhoe Pit | RUA | Restricted Use Area |
| T-38D | Location of Exploratory Backhoe Pit for Buried Debris Assessment | | |

* Previous explorations for off-site grading sites are described in the referenced reports for each area

**ALLAN E. SEWARD**
**ENGINEERING GEOLOGY, INC.**
Geological And Geotechnical Consultants

Geologic/Geotechnical Map

| | |
|---|---|
| Date: 12/21/09 | Job No.: 09-1702R-4 |
| Scale: 1" = 100' | CAD File: Sheet 3 Revised Geologic Map |
| Sheet 3 | Geology by: BJS / Drawn by: GSD/JCH / Revised: |

REV. DATE: DECEMBER 21, 2009
DATE: MAY 2, 2007

GRAPHIC SCALE
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DESIGNED: NSK/YL
DRAFTED: TLC/JS
CHECKED: EW

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VALENCIA, CALIFORNIA 91335
TELEPHONE: (661) 255-4000
REPRESENTATIVE: MR. FRED MACMURDO

MAJOR LAND DIVISION
VESTING TENTATIVE TRACT MAP
NO. 53108

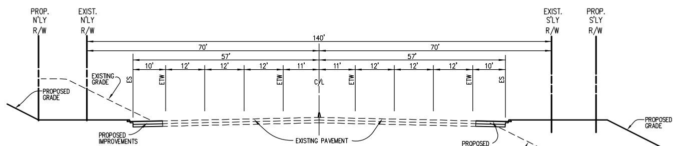
IN THE UNINCORPORATED AREA OF THE COUNTY OF LOS ANGELES STATE OF CALIFORNIA

PROJECT NO. 1NLF010500

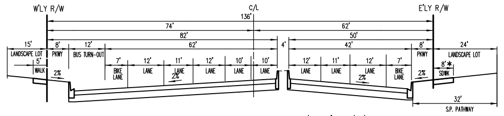
SHEET 3 OF 13

RV001-03.dwg

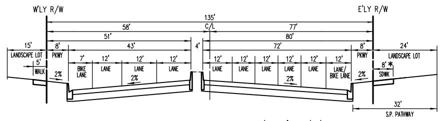
Plotted – 12/17/2009 2:56:22 PM :: Saved – 12/16/2009 12:10:37 PM :: G:\1702 acad\Landmark Village\report enclosures



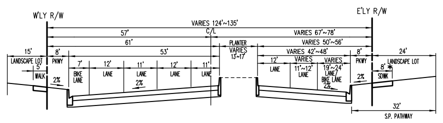
TYPICAL SR 126 STREET SECTION (140' R/W)



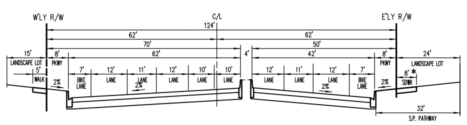
TYPICAL STREET SECTION (136' R/W)
LONG CANYON ROAD (North Side of 'A' Street)
Major Highway, Case 1, Section C
With Bus Turn-Out, On Street Bike Lane
No On Street Parking
60 MPH Design Speed



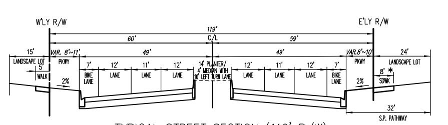
TYPICAL STREET SECTION (135' R/W)
LONG CANYON ROAD (South Side of SR 126)
Major Highway, Case 1, Section C
With On Street Bike Lane
No On Street Parking
60 MPH Design Speed



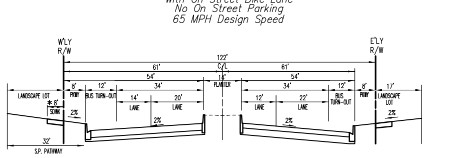
TYPICAL STREET SECTION (124'-135' R/W)
LONG CANYON ROAD (Between SR 126 & 'A' Street)
Major Highway, Case 1, Section C
With On Street Bike Lane
No On Street Parking
60 MPH Design Speed



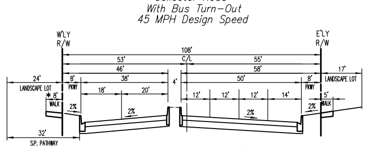
TYPICAL STREET SECTION (124' R/W)
LONG CANYON ROAD (South Side of 'A' Street)
Major Highway, Case 1, Section C
With On Street Bike Lane
No On Street Parking
60 MPH Design Speed



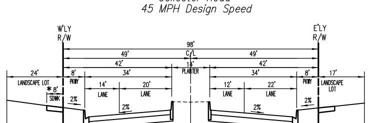
TYPICAL STREET SECTION (119' R/W)
LONG CANYON ROAD (South Side of 'A' STREET)
Major Highway, Case 1, Section C
With On Street Bike Lane
No On Street Parking
65 MPH Design Speed



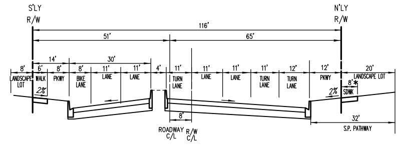
TYPICAL STREET SECTION (98' R/W)
WOLCOTT ROAD (North Side of 'A' STREET)
Collector Road
With Bus Turn-Out
45 MPH Design Speed



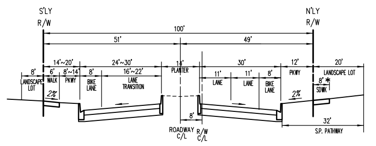
TYPICAL STREET SECTION (108' R/W)
WOLCOTT ROAD (South Side of SR 126)
Collector Road
45 MPH Design Speed



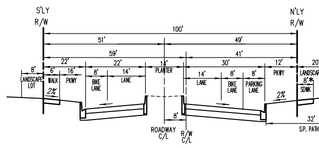
TYPICAL STREET SECTION (98' R/W)
WOLCOTT ROAD (North Side of 'A' STREET)
Collector Road
45 MPH Design Speed



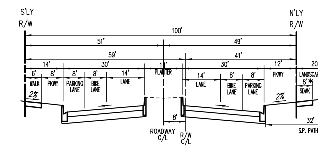
TYPICAL STREET SECTION (116' R/W)
"A" STREET (Spine Road Collector)
From Long Canyon Road to 200' East of Long Canyon Road
Local Access – 45 MPH Design Speed
With On Street Bike Lane
No On Street Parking



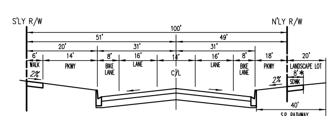
TYPICAL STREET SECTION (100' R/W)
"A" STREET (Spine Road Collector)
From 200' East of Long Canyon Road to Westerly Round About
Local Access – 45 MPH Design Speed
With On Street Bike Lane
No On Street Parking



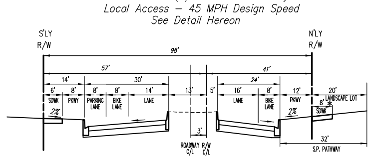
TYPICAL STREET SECTION (100' R/W)
"A" STREET (Spine Road Collector)
From Westerly Round About to "N" Street and
Local Access – 45 MPH Design Speed
With On Street Parking and On Street Bike Lane



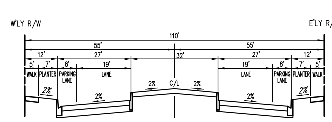
TYPICAL STREET SECTION (100' R/W)
"A" STREET (Spine Road Collector)
From "N" Street to "T" Street
From "J" Street to Wolcott Rd.
Local Access – 45 MPH Design Speed
With On Street Parking and On Street Bike Lane



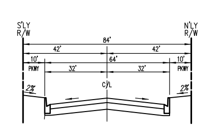
TYPICAL STREET SECTION Z – Z
"A" STREET (Spine Road Collector)
Local Access – 45 MPH Design Speed
See Detail Hereon



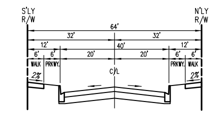
TYPICAL SECTION (98' R/W)
"A" STREET ( Spine Road Collector)
From "T" Street TO "J" Street
Local Access – 45 MPH Design Speed
With On Street Parking Lane (South Side) and On Street Bike Lane



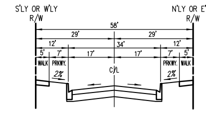
TYPICAL SECTION (110' R/W)
"P" DRIVE
Local Access – 30 MPH Design Speed



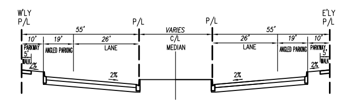
TYPICAL LOCAL STREET SECTION (84' R/W)
"Y" STREET (Industrial Collector)
Local Access – 30 MPH Design Speed



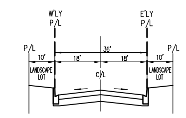
TYPICAL LOCAL STREET SECTION (64' R/W)
"A" STREET (From Wolcott Road to "D" Street)
Local Access – 30 MPH Design Speed



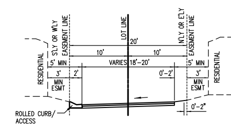
TYPICAL LOCAL STREET SECTION (58' R/W)
"A" STREET (FROM "D" STREET TO "C" STREET), "B", "C", "D", "E", "F", "H", "I", "J", "K", "L", "M", "N", "O", "Q", "R", "S", "T", "W", "X", "Z" STREETS
Local Access – 30 MPH Design Speed



TYPICAL CONCEPT SECTION
Private Driveway South of "A" Street
at Wolcott Road
Local Access – 30 MPH Design Speed



TYPICAL CONCEPT SECTION
Private Driveway South of "A" Street
at Wolcott Road
With No Median
Local Access – 30 MPH Design Speed

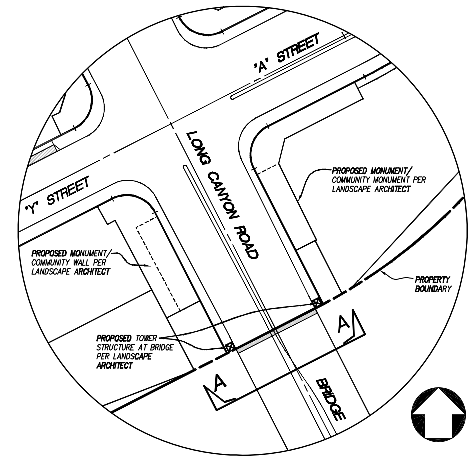


TYPICAL PRIVATE DRIVEWAY (20' EASEMENT)

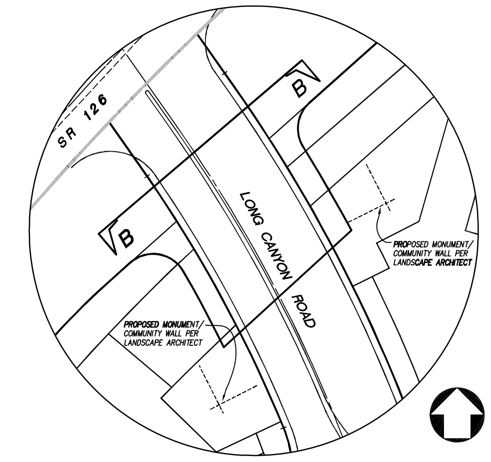
NOTE:
* 6' SIDEWALK WILL BE MEANDERING ENTIRELY WITHIN THE 24' OR 20' WIDE LANDSCAPE LOT

## STREET TYPICAL SECTIONS

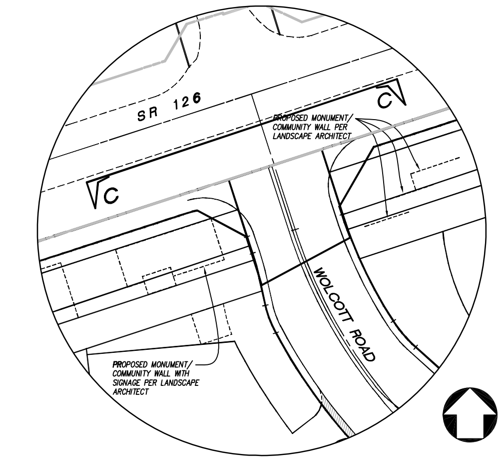
NOT TO SCALE



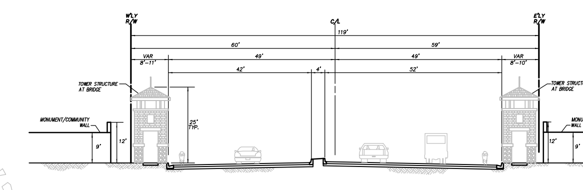

ENTRY AT LONG CANYON BRIDGE
SCALE: 1" = 60'



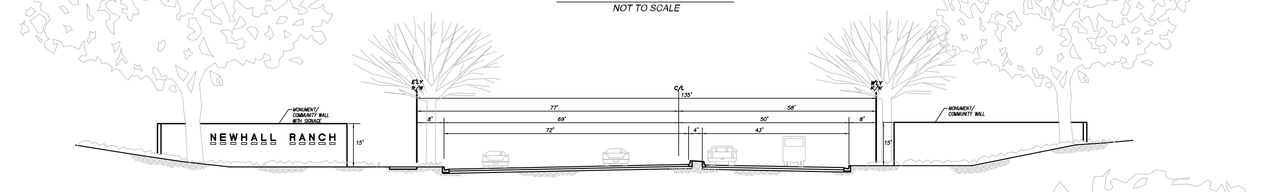

ENTRY AT LONG CANYON - SOUTH SR 126
SCALE: 1" = 60'



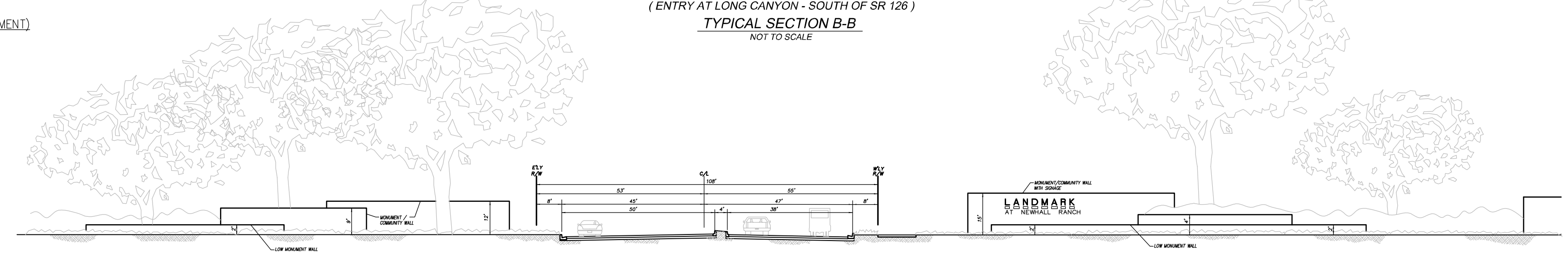

LANDMARK VILLAGE ENTRY AT WOLCOTT ROAD
SCALE: 1" = 60'



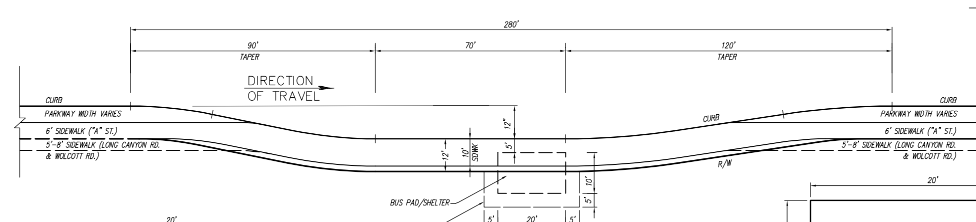
( ENTRY AT LONG CANYON BRIDGE )
TYPICAL SECTION A-A
NOT TO SCALE



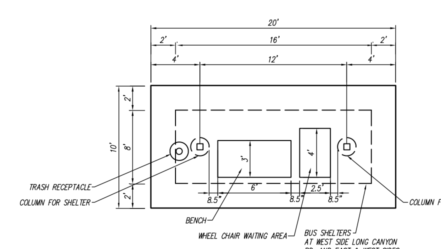

( ENTRY AT LONG CANYON - SOUTH OF SR 126 )
TYPICAL SECTION B-B
NOT TO SCALE



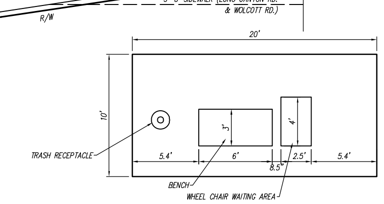

( LANDMARK VILLAGE ENTRY AT WOLCOTT ROAD SOUTH OF SR-126)
TYPICAL SECTION C-C
NOT TO SCALE



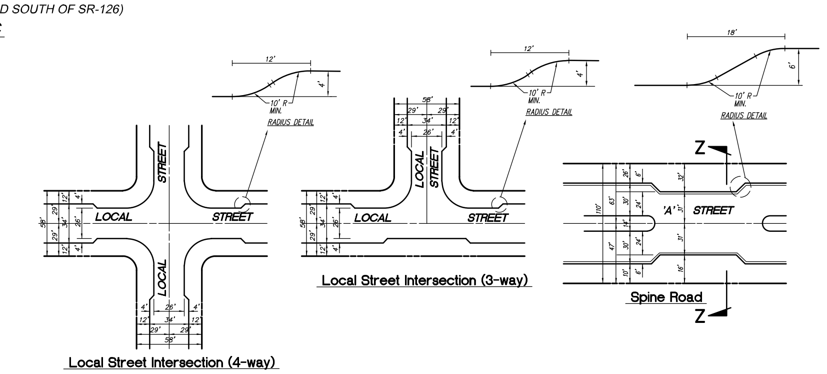

BUS TURN-OUT DETAIL
NOT TO SCALE




BUS PAD W/ SHELTER DETAIL
NOT TO SCALE




BUS PAD W/O SHELTER DETAIL
NOT TO SCALE




SPINE ROAD AND LOCAL STREET INTERSECTION DETAIL
NOT TO SCALE

REV. DATE: DECEMBER 21, 2009
DATE: MAY 2, 2007

| | | | | | |
|---|---|---|---|---|---|
| LEGAL DESCRIPTION: PARCELS 8, 9, 10, AND PORTION OF PARCELS 7, 20, 21 OF PARCEL MAP NO. 24500-01 PMB 293-34/67, RECORDS OF LOS ANGELES COUNTY. | PSOMAS<br>28480 Avenue Stanford, Suite 200<br>Santa Clarita, CA 91355<br>(661) 219-6000 (661) 775-2718 (FAX)<br>ERIK WINATA R.C.E. NO. C 67285 DATE | DESIGNED: NSK/YL<br>DRAFTED: TLC/JS<br>CHECKED: EW | OWNER/DEVELOPER: NEWHALL RANCH<br>23823 WEST VALENCIA BOULEVARD<br>VALENCIA, CALIFORNIA 91355<br>TELEPHONE: (661) 255-4000<br>REPRESENTATIVE: MR. FRED MACMURDO | MAJOR LAND DIVISION<br>VESTING TENTATIVE TRACT MAP<br>NO. 53108<br>IN THE UNINCORPORATED AREA OF THE COUNTY OF LOS ANGELES STATE OF CALIFORNIA | PROJECT NO. 1NLF010500<br>SHEET 2 OF 13 |

RV001-02.dwg

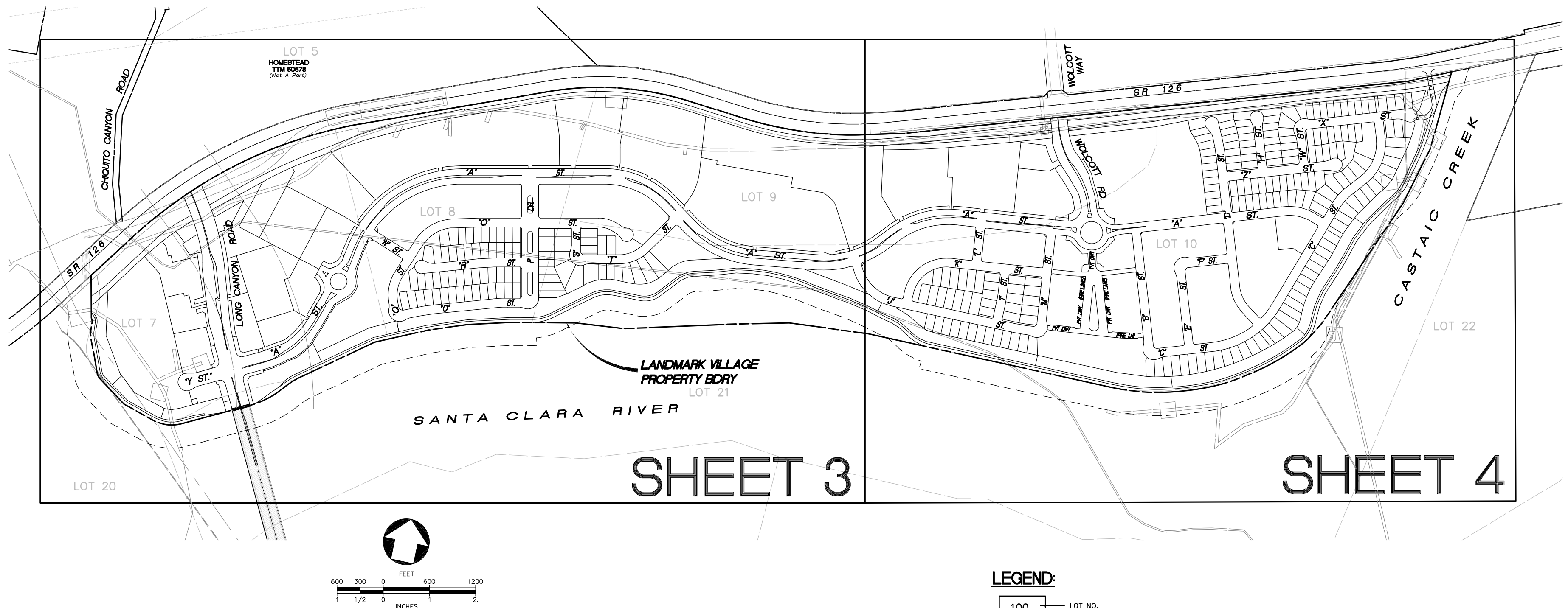
## LOT SUMMARY

| LOT NUMBERS | TOTAL LOTS/ BLDGS | TYPE (USE) | LOT SIZE | TOTAL D.U. | TOTAL S.F.D. or DET. CONDOS D.U. | MF D.U.s in bldgs w/1-4 D.U.s/bldg | MF D.U.s in bldgs w/5+ D.U.s/bldg |
|---|---|---|---|---|---|---|---|
| 1–93 | 93/93 | S.F.D 45' x 100' 4,500 S.F. | 472,574 S.F. | 93 | 93 | 0 | 0 |
| 94–190 | 97/97 | S.F.D 55' x 100' 5,500 S.F. | 663,229 S.F. | 97 | 97 | 0 | 0 |
| 191–270 | 80/80 | S.F.D 50' x 100' 5,000 S.F. | 485,758 S.F. | 80 | 80 | 0 | 0 |
| 271, 272, 279, 281 | 4/124 | CONDOMINIUM | 671,128 S.F. | 124 | 124 | 0 | 0 |
| 285–286 | 2/89 | CONDOMINIUM | 330,719 S.F. | 89 | 89 | 0 | 0 |
| 273, 284 | 2/40 | CONDOMINIUM | 398,791 S.F. | 120 | 0 | 120 | 0 |
| 276, 280, 287 | 3/42 | CONDOMINIUM | 788,159 S.F. | 239 | 0 | 60 | 179 |
| 277, 278 | 2/27 | AFFORDABLE CONDOMINIUM | 444,636 S.F. | 161 | 0 | 0 | 161 |
| 274 | 1/14 | AFFORDABLE CONDO/APARTMENT (FOR LEASE)** | 336,813 S.F. | 140 | 0 | 0 | 140 |
| 275 | 1/15 | CONDO/APARTMENT (FOR LEASE)** | 479,250 S.F. | 232 | 0 | 0 | 232 |
| 282, 283 | 2/14 | CONDO/APARTMENT (FOR LEASE)** | 160,132 S.F. | 69 | 0 | 11 | 58 |
| 288,289 | 2/2 | COMMERCIAL (FOR LEASE)** | 82,206 S.F. | – | – | – | – |
| 290 | 1/2 | COMMERCIAL (FOR LEASE)** | 100,942 S.F. | – | – | – | – |
| 292–301 | 10/9 | COMMERCIAL (FOR LEASE)** | 763,848 S.F. | – | – | – | – |
| 303–305 | 3/3 | COMMERCIAL (FOR LEASE)** | 147,490 S.F. | – | – | – | – |
| 422 | *1/0 | PRIVATE DRIVEWAY & FIRE LANE | 93,194 S.F. | – | – | – | – |
| 306–308 | 3/3 | RECREATION | 253,595 S.F. | – | – | – | – |
| 310 | *1/NA | COMMUNITY PARK SITE | 430,072 S.F. | – | – | – | – |
| 309 | *1/NA | SCHOOL SITE | 423,951 S.F. | – | – | – | – |
| 313–327, 344–346, 350, 352–353, 356–361, 363, 365–371, 374–421 | *83/0 | OPEN SPACE | 1,040,689 S.F. | – | – | – | – |
| 364 | *1/0 | PRIVATE PARK | 24,053 S.F. | – | – | – | – |
| 335, 336, 340 | *3/0 | SR 126 FUTURE R/W | 407,000 S.F. | – | – | – | – |
| 311, 329, 332, 333, 338, 342, 347, 351, 354, 355, 362, 372, 373 | *13/0 | OPEN SPACE (WATER QUALITY) | 777,807 S.F. | – | – | – | – |
| 339, 343 | *2/0 | OPEN SPACE (UTILITY CORRIDOR) | 114,213 S.F. | – | – | – | – |
| 331, 349 | *2/0 | OPEN SPACE (CL.1 BIKE TRAIL/ MAINT.ACCS.ROAD) | 203,596 S.F. | – | – | – | – |
| 330, 348 | *2/0 | OPEN SPACE (MULTI–USE TRAIL) | 117,342 S.F. | – | – | – | – |
| 334, 337, 341 | *3/0 | OPEN SPACE (LIGHT RAIL RESERVATION) | 349,556 S.F. | – | – | – | – |
| 302 | *1/NA | FIRE STATION | 58,404 S.F. | – | – | – | – |
| 312 | *1/NA | TRAIL HEAD | 19,617 S.F. | – | – | – | – |
| 291 | 1/NA | PARK & RIDE | 35,143 S.F. | – | – | – | – |
| 328 | *1/NA | RECYCLED WATER BOOSTER PUMP STATION | 1,226 S.F. | – | – | – | – |
| N/A | NA/NA | PUBLIC ROADS | 2,072,022 S.F. | – | – | – | – |
| TOTAL | 422 | | 12,747,155 SF | 1,444 | 483 | 191 | 770 |

* NO DEVELOPMENT PLANNED ON THESE LOTS
** TOTAL NUMBER OF LEASE RESIDENTIAL BUILDINGS = 43
TOTAL NUMBER OF LEASE COMMERCIAL BUILDINGS = 16

## UNIT SUMMARY:

S.F.D. UNITS: – 270 UNITS
CONDOMINIUM UNITS: – 744
APARTMENTS UNITS: – 430
COMMERCIAL LOT ACREAGE: 25.13 ACCRES




## PROJECT SUMMARY:

GROSS AREA – 292.6 Acres
TOTAL LOTS – 422
TOTAL D.U. – 1,444
EXISTING ZONING – SP (NEWHALL RANCH SPECIFIC PLAN)
PROPOSED ZONING – SP (NEWHALL RANCH SPECIFIC PLAN)
GENERAL PLAN LAND USE – SP (NEWHALL RANCH SPECIFIC PLAN)

## GRADING SUMMARY

ONSITE
RAW CUT 343,000 CY
RAW FILL 5,590,000 CY
NET CUT 343,000 CY
NET FILL 6,263,000 CY
IMPORT 5,920,000 CY

OFFSITE (ADOBE CANYON)
RAW CUT 6,468,500 CY
RAW FILL 133,000 CY
NET CUT 6,468,500 CY
NET FILL 146,300 CY
EXPORT 6,322,200 CY

OFFSITE (CHIQUITO CANYON)
RAW CUT 1,190,000 CY
RAW FILL 1,071,000 CY
NET CUT 1,190,000 CY
NET FILL 1,190,000 CY
EXPORT 0 CY

OFFSITE (SOUTH BANK TEMP. LEVEE)
RAW CUT 0 CY
RAW FILL 250,000 CY
NET CUT 0 CY
NET FILL 316,000 CY
EXPORT 316,000 CY

OFFSITE (UTILITY CORRIDOR GRADING)
RAW CUT 3,200 CY
RAW FILL 233,000 CY
NET CUT 3,200 CY
NET FILL 263,000 CY
IMPORT 259,800 CY

OFFSITE (WRP DEBRIS BASINS)
RAW CUT 91,000 CY
RAW FILL 2,000 CY
NET CUT 91,000 CY
NET FILL 2,200 CY
EXPORT 88,800 CY

OFFSITE (ZONE 1A WATER TANK SITE)
RAW CUT 87,000 CY
RAW FILL 2,000 CY
NET CUT 87,000 CY
NET FILL 2,200 CY
EXPORT 84,800 CY

TOTAL EARTHWORK
RAW CUT 8,182,700 CY
RAW FILL 7,281,000 CY
NET CUT 8,182,700 CY
NET FILL 8,182,700 CY
IMPORT/ EXPORT: 0 CY

NOTE:
STATE ROUTE 126 (SR126) IS DESIGNATED BY LOS ANGELES COUNTY AS "HENRY MAYO DRIVE".

## OFFSITE IMPROVEMENTS ASSOCIATED WITH VTTM 53108

1. LA COUNTY SANITATION DISTRICT TRUNK SEWER WESTERLY TO NEWHALL RANCH WRP
2. WATER MAIN EXTENSION TO VALENCIA WATER CO. STORAGE TANKS AND EXISTING PIPES
3. SEWER FORCE MAIN EASTERLY TO LA COUNTY SANITATION DISTRICT 32 WRP
4. BORROW SITE GRADING PER C.U.P. NO.200500112
5. DEBRIS BASINS NORTH OF SR 126
6. OFFSITE GRADING AS DEPICTED
7. OFFSITE IMPROVEMENTS FOR IRRIGATION WATER LINES AND WELLS

## UTILITY PROVIDERS:

SEWER: L.A. COUNTY SANITATION DIST. 32 AND NEWHALL RANCH WRP
WATER: VALENCIA WATER COMPANY
ELECTRICAL: SOUTHERN CALIFORNIA EDISON
GAS: SOUTHERN CALIFORNIA GAS CO.
TELEPHONE: AT&T
CABLE TV: TIME WARNER CABLE

## EASEMENTS:

EASEMENTS....... PLOTTABLE EASEMENTS ARE SHOWN FROM AN OWNER SUPPLIED TITLE REPORT. NON–PLOTTABLE ITEMS ARE NOTED BELOW AS INDETERMINATE OR DOES NOT AFFECT.

TITLE REPORT.... NORTH AMERICAN TITLE COMPANY REPORT NO. 7004810–23, DATED OCTOBER 31, 2007. THIS TITLE REPORT COVERS THIS PROPERTY.

(9) INDICATES TITLE REPORT EXCEPTION No

| EXCEPTION NO. | OWNER | PURPOSE | REFERENCE | STATUS |
|---|---|---|---|---|
| 2 | COUNTY OF LOS ANGELES | PUBLIC ROAD & HIGHWAY | JUNE 27, 1910 INSTRUMENT NO. 47 BOOK 4230, PAGE 2, DEEDS | PLOTTED |
| 3 | COUNTY OF LOS ANGELES | PUBLIC ROAD & HIGHWAY | APRIL 6, 1920 INSTRUMENT NO. 621 BOOK 7171, PAGE 90, DEEDS | PLOTTED |
| 6 | STATE OF CALIFORNIA | PUBLIC HIGHWAY, SLOPES/DRAINAGE | JANUARY 12, 1939 DOCUMENT NO. 714H CERT. NO. JJ 84561, TORRENS | PLOTTED |
| 7 | AGREEMENT BETWEEN: NEWHALL LAND & FARMING CO. AUGUST A. & MARY J. RUBEL | SEE DOCUMENTS FOR FULL PARTICULARS | JUNE 14, 1949 INSTR. NO. 988 MODIFIED NOVEMBER 19, 1980 INSTR. NO. 80–1162907 | INDETERMINATE |
| 9 | BARNSDALL OIL COMPANY | PIPE LINES | DEC. 4, 1944 INSTR. NO. 1236 AMENDED DECEMBER 4, 1944 INSTR. NO. 1236, O.R. | PLOTTED |
| 13 | SOUTHERN CALIFORNIA EDISON COMPANY | ELECTRIC LINES | APRIL 10, 1951 INSTRUMENT NO. 2549 BOOK 36011, PAGE 33, O.R. | INDETERMINATE |
| 14 | UNION OIL COMPANY OF CALIFORNIA | PIPE LINES & APPURTENANCES | JUNE 19, 1951 INSTRUMENT NO. 2670 BOOK 36565, PAGE 89, O.R. | INDETERMINATE |
| 15 | SOUTHERN CALIFORNIA EDISON COMPANY | ELECTRIC LINES | MAY 9, 1952 INSTRUMENT NO. 2456 BOOK 38895, PAGE 359, O.R. | INDETERMINATE |
| 16 | SOUTHERN CALIFORNIA EDISON COMPANY | ELECTRIC LINES | DECEMBER 21, 1953 INSTRUMENT NO. 1702 BOOK 43431, PAGE 69, O.R. | INDETERMINATE |
| 17 | SOUTHERN CALIFORNIA EDISON COMPANY | ELECTRIC LINES | DECEMBER 21, 1953 INSTRUMENT NO. 2788 BOOK 43504, PAGE 347, O.R. | INDETERMINATE |
| 18 | UNION OIL COMPANY OF CALIFORNIA | POWER POLES & APPURTENANCES | JUNE 13, 1958 INSTRUMENT NO. 3434 BOOK D127, PAGE 71, O.R. | PLOTTED |
| 20 | SOUTHERN CALIFORNIA EDISON COMPANY | ELECTRIC LINES | NOVEMBER 25, 1958 INSTRUMENT NO. 3316 BOOK D286, PAGE 279, O.R. | INDETERMINATE |
| 21 | UNION OIL COMPANY OF CALIFORNIA | PIPE LINES & APPURTENANCES | AUGUST 29, 1961 INSTRUMENT NO. 3943, O.R. | INDETERMINATE |
| 23 | UNION OIL COMPANY OF CALIFORNIA | PIPE LINES | FEBRUARY 7, 1962 INSTRUMENT NO. 3210 BOOK D1505, PAGE 463, O.R. | PLOTTED |
| 24 | SOUTHERN CALIFORNIA EDISON COMPANY | ELECTRIC LINES, INGRESS, EGRESS | JULY 23, 1964 INSTRUMENT NO. 5047, O.R. | DOES NOT AFFECT PROPERTY |
| 26 | HUMBLE OIL AND REFINING COMPANY | PIPE LINES, ACCESS ROADS, WELLS | MARCH 9, 1970 INSTRUMENT NO. 1741 BOOK M3439, PAGE 696, O.R. | INDETERMINATE |
| 27 | SOUTHERN CALIFORNIA EDISON COMPANY | ELECTRICAL & COMMUNICATION SYSTEMS | MAY 27, 1971 INSTRUMENT NO. 3947 BOOK D5071, PAGE 131, O.R. | INDETERMINATE |
| 28 | TEXACO INC. | PUMP STATION, PIPE LINES, & APPURTENANCES | OCTOBER 14, 1971 INSTRUMENT NO. 3990 BOOK D5223, PAGE 940, O.R. | PLOTTED |
| 30 | SOUTHERN CALIFORNIA EDISON COMPANY | ELECTRICAL & COMMUNICATION SYSTEMS | DECEMBER 2, 1971 INSTRUMENT NO. 2421 BOOK D5275, PAGE 682, O.R. | INDETERMINATE |
| 31 | EXXON CORPORATION | PIPE LINES & APPURTENANCES | JUNE 21, 1979 INSTRUMENT NO. 79–675839, O.R. | PLOTTED |
| 33 | THE PACIFIC TELEPHONE AND TELEGRAPH COMPANY | POLE LINES & APPURTENANCES | MARCH 6, 1981 INSTRUMENT NO. 81–2236554, O.R. | PLOTTED |
| 34 | TEXACO CALIFORNIA PIPELINES, INC. | PIPE LINE & PUMP STATION | SEPTEMBER 8, 1993 INSTRUMENT NO. 93–1746382, O.R. | INDETERMINATE |
| 36 | STATE OF CALIFORNIA | TRAFFIC CONTROL DEVICES | MARCH 21, 1997 INSTRUMENT NO. 97–434774, O.R. | PLOTTED |
| 37 | THE NEWHALL LAND AND FARMING COMPANY | WATER PIPELINES PUMP STATIONS, & APPURTENANCES | DECEMBER 23, 1999 INSTRUMENT NO.s 99–2360380 & 99–2360381, O.R. DECEMBER 28, 1999 INSTRUMENT NO. 99–2375698, O.R. MARCH 17, 2000 INSTRUMENT NO.s 00–399620, 00–399621, 00–399622, 00–399623, 00–399624, 00–399625, O.R. | PLOTTED |
| 38 | County of Los Angeles | INGRESS & EGRESS RESTRICTIONS | PARCEL MAP NO. 24500–01 P.M.B. 293–34–67 | PLOTTED |
| 39 | LONG CANYON ROAD | FUTURE STREET | PARCEL MAP NO. 24500–01 P.M.B. 293–34–67 | PLOTTED |
| 47 | STATE OF CALIFORNIA | SLOPES & DRAINAGE | SEPTEMBER 15, 2000 INSTRUMENT NO. 00–1445425, O.R. | PLOTTED |

## LEGEND:

- 100 — LOT NO.
- 5000 SF — LOT AREA (SQUARE FEET)
- 1210.5 — PAD ELEVATION
- O.S. — OPEN SPACE
- P.F. — PUBLIC FACILITY
- PROJECT BOUNDARY
- EXISTING RIGHT OF WAY
- PROPOSED EASEMENT
- EXISTING EASEMENT
- PROPOSED RIGHT OF WAY
- 950 — PROPOSED CONTOUR
- DAYLIGHT LINE
- SD — STORM DRAIN
- SS — SANITARY SEWER (SERVICE LOCAL)
- SST — SANITARY SEWER (TRUNK SEWER)
- FM — SANITARY SEWER (FORCE MAIN)
- W — WATER
- RW — RECLAIMED WATER
- IRRI — IRRIGATION LINE
- W — EXISTING WATER LINE
- E — EXISTING POWER LINE
- COM — EXISTING COMMUNICATION LINE
- VIREO_HABITAT — EXISTING VIREO HABITAT LINE
- EXISTING CMP INLET
- CATCH BASIN
- WATER GATE VALVE
- RC03 — RIVER CORRIDOR–2003
- FEMA — FEMA
- X–Q50 — EXISTING Q–CAP
- RS — RESOURCE LINE
- ACOE — ARMY CORPS OF ENGINEERS JURISDICTION LINE
- OIL WELL GPS POSITIONED
- OIL WELL DEPT. OF OIL AND GAS CALCULATED POSITION
- OIL WELL DIGITIZED POSITION
- OIL WELL DEPT. OF OIL AND GAS METAL DETECTOR POSITION
- COAST LIVE OAK (Quercus agrifolia)
- VALLEY OAK (Quercus lobata)
- EXISTING TREE CANOPY
- EXISTING POWER POLE
- W.S. — WATER SURFACE
- BIKE TRAIL/ LACFCD ACCESS ROAD/LACSD ACCESS ROAD
- LA COUNTY RIDING/HIKING TRAIL
- BURIED BANK STABILIZATION
- SIGHT DISTANCE LINE
- RETAINING WALL
- SOUND WALL

## SURVEY NOTES:

VERTICAL DATUM:

LOS ANGELES COUNTY DEPARTMENT OF PUBLIC WORKS BENCHMARK DESCRIBED AS FOLLOWS: LACDPW L5402 RND HD SPK IN LOWER CONC HDWL @ N END 24 FT W/O C/L THE OLD RD (W RDWY) AND 0.6 MI S/O HENRY MAYO DR @ MI MKR #6.25 NEWHALL QUAD, 1995 ADJUSTMENT (NAVD 1988) ELEVATION = 1031.951

THERE IS APPROXIMATELY 2.3 FEET DIFFERENCE BETWEEN PREVIOUS COUNTY OF LOS ANGELES DATUMS BASED UPON NAVD 1929 AND NAVD 1988 (NAVD 1988 IS 2.3 FEET HIGHER THAN NAVD 1929).

AERIAL PLANIMETRY:

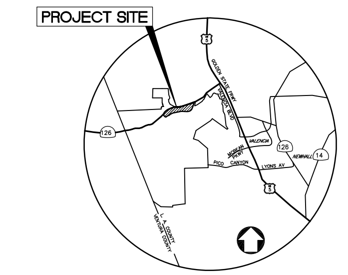
THIS SURVEY WAS PREPARED BY PHOTOGRAMMETRIC PROCESSES, UTILIZING AERIAL PHOTOGRAPHY DATED NOVEMBER 15, 2006. THE OUTLINE OF BUILDINGS AND OTHER ROOFED IMPROVEMENTS, MAY INCLUDE EAVES, CANOPIES AND BALCONIES, SINCE BUILDINGS BELOW THESE ITEMS ARE NOT VISIBLE TO THE CAMERA.

TOPOGRAPHY:

BY PHOTOGRAMMETRIC PROCESSES FROM LIDAR IMAGING DATED NOVEMBER 15, 2006, AND COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS.

CONTOUR INTERVAL:

10 FOOT, UNLESS OTHERWISE NOTED.




## VICINITY MAP

NOT TO SCALE

## GENERAL NOTES:

1. GRADE ELEVATIONS ON THE VTTM ARE APPROXIMATE. CHANGES IN THE ELEVATIONS DEPICTED ON THE TENTATIVE MAP WHICH WILL NOT RESULT IN PAD ELEVATION CHANGES OF MORE THAN 5 FEET ARE PERMITTED SUBJECT TO THE PROVISIONS OF SECTION 5.2 OF THE NEWHALL RANCH SPECIFIC PLAN, WHICH MAY REQUIRE AN AMENDED MAP.
2. PERMISSION IS REQUESTED FOR LOT LINES TO BE ADJUSTED TO THE SATISFACTION OF DRP AND DPW PROVIDED NO ADDITIONAL DEVELOPABLE LOTS ARE CREATED. THE DEGREE OF ADJUSTMENT SHALL BE CONSISTENT WITH THE INTENT OF THE SUBDIVISION MAP APPROVAL AND THE SUBDIVISION MAP ACT.
3. ALIGNMENT AND GEOMETRICS OF STREETS AND TRAILS ARE APPROXIMATE. PERMISSION IS REQUESTED FOR ADJUSTMENTS TO STREETS TO BE MADE PROVIDED THE DEPARTMENT OF PUBLIC WORKS AND DRP DETERMINE THAT THE ADJUSTMENTS ARE CONSISTENT WITH THE INTENT OF THE SUBDIVISION APPROVAL. ADJUSTMENTS TO TRAILS CAN BE MADE WITH APPROVAL BY DRP, DPW AND THE DEPARTMENT OF PARKS AND RECREATION.
4. BUILDING FOOTPRINTS SHOWN ON THE TENTATIVE MAP OR ACCOMPANYING SITE PLAN ARE ONLY FOR ILLUSTRATIVE PURPOSES. RELOCATION OF BUILDINGS, OR ADJUSTMENTS IN BUILDING SQUARE FOOTAGE, NUMBER OF BUILDINGS, PARKING REQUIREMENTS AND OTHER FEATURES WHICH WILL NOT RESULT IN AN INCREASE IN TOTAL SQUARE FOOTAGE OR THE NUMBER OF DWELLING UNITS ARE PERMITTED SUBJECT TO THE PROVISIONS OF SECTION 5.2 OF THE NEWHALL RANCH SPECIFIC PLAN.
5. PERMISSION IS REQUESTED TO FILE "LARGE LOT" PARCEL MAPS OF 20 ACRES OR MORE (WITHOUT IMPROVEMENTS) OR 5 ACRES OR MORE (WITH IMPROVEMENTS) AS THE FIRST UNIT FINAL MAP. RECORDATION OF A LARGE LOT PARCEL MAP SHALL BE CONSIDERED THE FILING OF THE FIRST UNIT MAP FOR THE PURPOSES OF TIME EXTENSIONS PUSUANT TO THE SUBDIVISION MAP ACT BUT SHALL NOT REQUIRE THE OBLIGATION OF FEES, DEDICATIONS (EG. RIGHTS OF WAY OR PARKS) EXACTIONS OR INFRASTRUCTURE EXCEPT AS MAY BE REQUIRED BY CHAPTER 21.32 OF THE SUBDIVISION MAP ACT.
6. PERMISSION IS REQUESTED FOR UNIT MAP PHASING.
7. PERMISSION IS REQUESTED TO COMBINE LOTS.
8. PERMISSION IS REQUESTED TO CREATE AND RECORD ADDITIONAL OPEN SPACE LOTS.
9. PERMISSION IS REQUESTED TO RECORD ADDITIONAL UTILITY LOTS AND PROVIDE MAINTENANCE EASEMENTS TO THE SATISFACTION OF THE DRP AND DPW.
10. THE LOCATIONS OF APPURTENANT STRUCTURES (E.G., PASEOS, PEDESTRIAN BRIDGES, TRANSIT SHELTERS) MAY BE RELOCATED IF DETERMINED TO BE CONSISTENT WITH THE APPROVED TENTATIVE MAP BY DRP AND DPW.
11. REQUEST PERMISSION TO PHASE MASS GRADE TO THE SATISFACTION OF DRP AND DPW AND THE PROVISIONS OF THE COUNTY CODE, APPROVED PROJECT CONDITIONS AND MITIGATION MEASURES.
12. PROPOSED STREET GRADES ARE APPROXIMATE AND SUBJECT TO ADJUSTMENTS PENDING DETERMINATION OF FINAL DEVELOPMENT LAYOUT AND PLANS. ANY CHANGES SHALL BE TO THE SATISFACTION OF DPW.
13. LOCATION OF TRAILS TO BE FINALIZED PRIOR TO FINAL MAP APPROVAL.
14. PROVIDE PROPERTY LINE RETURN RADII OF 13 FEET AT ALL LOCAL STREET AND PRIVATE DRIVE INTERSECTIONS, AND 27 FT AT THE INTERSECTION OF LOCAL STREETS OR PRIVATE DRIVES WITH PLANNED HIGHWAYS (THOSE ON THE COUNTY HIGHWAY PLAN) AND WHERE ALL PLANNED HIGHWAYS INTERSECT OR WHERE ONE OF THE ROADS SERVES A COMMERCIAL OR INDUSTRIAL DEVELOPMENT PLUS ADDITIONAL RIGHT OF WAY FOR CORNER CUT OFF TO MEET CURRENT GUIDELINES OF THE AMERICANS WITH DISABILITIES ACT (ADA) TO THE SATISFACTION OF PUBLIC WORKS.
15. MODIFIED STREET CROSS–SECTIONS AS SHOWN ON VESTING TENTATIVE TRACT MAP ARE REQUESTED. HOWEVER, PERMISSION IS SOUGHT TO CONSTRUCT STANDARD AND ALTERNATE STREET CROSS–SECTIONS AT THE DISCRETION OF THE SUBDIVIDER.
16. ALL DIMENSIONS SHOWN ARE APPROXIMATE.
17. TOPO COMPILED 11/15/06 BY HUNSAKER FROM DATA FLOWN 5/24/06.
18. ADDITIONAL RIGHT OF WAY WILL BE DEDICATED AS REQUIRED AT ALL PROPOSED ROUNDABOUT LOCATIONS ALONG "A" STREET AND ALONG WOLCOTT ROAD TO THE SATISFACTION OF PUBLIC WORKS.
19. AS A DEDICATION TO PUBLIC USE, WHILE ALL OF LONG CANYON ROAD, WOLCOTT ROAD, AND "A" STREET WITHIN THIS SUBDIVISION REMAINS A PUBLIC STREET, WE HEREBY GRANT TO THE COUNTY OF LOS ANGELES THE RIGHT TO RESTRICT DIRECT VEHICULAR INGRESS AND EGRESS TO SAID STREET.
20. RELATED ENTITLEMENTS:
    - SEA/SMA, PROJECT & OFF–SITE GRADING CUP 00–196
    - GPA 00–196 (MASTER PLAN OF HIGHWAYS)
    - LPA 00–196 (CIRCULATION PLAN)
    - SPA 00–196 (MASTER CIRCULATION PLAN & TEXT)
    - OAK TREE PERMIT 00–196
21. PERMISSION IS REQUESTED TO ALLOW OFFICE & RETAIL SPACE TO BE INTERCHANGEABLE PROVIDED THE REQUIRED PARKING IS SATISFIED.
22. PERMISSION IS REQUESTED TO ADJUST LOT LINES BETWEEN RESIDENTIAL OR COMMERCIAL LOTS AND OPEN SPACE LOTS SUBSEQUENT TO ANY UNIT MAP RECORDATION PROVIDED THE TOTAL OPEN SPACE IS EQUAL TO OR GREATER THAN 30%.
23. REQUEST MODIFICATION OF STREET FRONTAGE REQUIREMENTS PER SECTION 21–24–040 OF THE L.A. COUNTY CODE.
24. SHARED AND RECIPROCAL PARKING IS DEDICATED PER THE PROVISIONS OF THE NEWHALL RANCH SPECIFIC PLANS SUBJECT TO CONFORMANCE REVIEW OR APPROVAL OF A PARKING PROGRAM.
25. ALL DETAILS RELATED TO THE CONSTRUCTION OF ALTERNATIVE WATER QUALITY DEVICES, SUCH AS WATER QUALITY SWALES, ARE SUBJECT TO REVIEW DURING THE IMPROVEMENT PLAN STAGE.
26. ALL STREETS ARE PUBLIC STREETS UNLESS NOTED "PRIVATE DRIVEWAY AND FIRE LANE".
27. LOCATION AND DETAILS OF WATER QUALITY DEVICES AND DEBRIS BASINS ARE APPROXIMATE. PERMISSION IS REQUESTED TO ADJUST DESIGNS OF THESE FACILITIES PROVIDED DPW AND DRP DETERMINE THAT THE ADJUSTMENTS ARE CONSISTENT WITH THE INTENT OF THE SUBDIVISION APPROVAL.

NOTE:
THE ABOVE MENTIONED GENERAL NOTES (THAT ADDRESS MINOR MODIFICATION ) MAY REQUIRE REVIEW AND APPROVAL OF A REVISED EXHIBIT MAP.

## SPECIAL NOTES:

1. WATER QUALITY BASINS AND BIOSWALES WILL PROVIDE FOR TREATMENT OF STORM WATER RUN OFF PER THE APPROVED DRAINAGE CONCEPT.
2. THE WATER QUALITY BASINS SHALL BE DEDICATED TO THE COUNTY WHEN COMPLETED AND ACCEPTED.
3. PROPOSED RECLAIMED WATER LINES WILL BE LOCATED IN PUBLIC STREETS AND TRAILS.
4. THE FOLLOWING LOTS ARE SUBJECT TO R/W DEDICATION FOR FUTURE SR–126 IMPROVEMENTS: 335, 336 AND 340.
5. ACCESS WILL BE PROVIDED TO OPEN SPACE LOTS 328,330–333,348–349,351, AND 354–356 BY ACCESS EASEMENTS THROUGH ADJOINING LOTS.
6. ACCESS WILL BE PROVIDED TO COMMERCIAL LOTS 292–301, AND 303–305 BY RECIPROCAL ACCESS EASEMENTS THROUGH ADJOINING LOTS.
7. PROPOSED PRIVATE AGRICULTURAL WATER FACILITIES WILL BE LOCATED WITHIN OPEN SPACE LOTS ACCESSABLE BY TRAILS AND ACCESS DRIVES. EASEMENTS WILL BE RESERVED FOR THESE FACILITIES IN ANY LAND TRANSACTIONS.

REV. DATE: DECEMBER 21, 2009
DATE: MAY 2, 2007

LEGAL DESCRIPTION:

PARCELS 8, 9, 10, AND PORTION OF PARCELS 7, 20, 21 OF PARCEL MAP NO. 24500–01 PMB 293–34/67, RECORDS OF LOS ANGELES COUNTY.

REGISTERED PROFESSIONAL ENGINEER ERIK WINATA No. C–67285 Exp. 09/30/10 CIVIL STATE OF CALIFORNIA


PSOMAS
28480 Avenue Stanford, Suite 200
Santa Clarita, CA 91355
(661) 219–6000 (661) 775–2718 (FAX)
ERIK WINATA R.C.E. NO. C 67285 DATE


DESIGNED : NSK/YL
DRAFTED : TLC/JS
CHECKED : EW


OWNER/DEVELOPER :
NEWHALL RANCH.
23823 WEST VALENCIA BOULEVARD
VALENCIA, CALIFORNIA 91335
TELEPHONE: (661) 255–4000
REPRESENTATIVE : MR. FRED MACMURDO


# MAJOR LAND DIVISION VESTING TENTATIVE TRACT MAP NO. 53108

IN THE UNINCORPORATED AREA OF THE COUNTY OF LOS ANGELES STATE OF CALIFORNIA

PROJECT NO. 1NLF010500




Plotted – 12/17/2009 2:44:08 PM :: Saved – 12/15/2009 8:45:27 AM

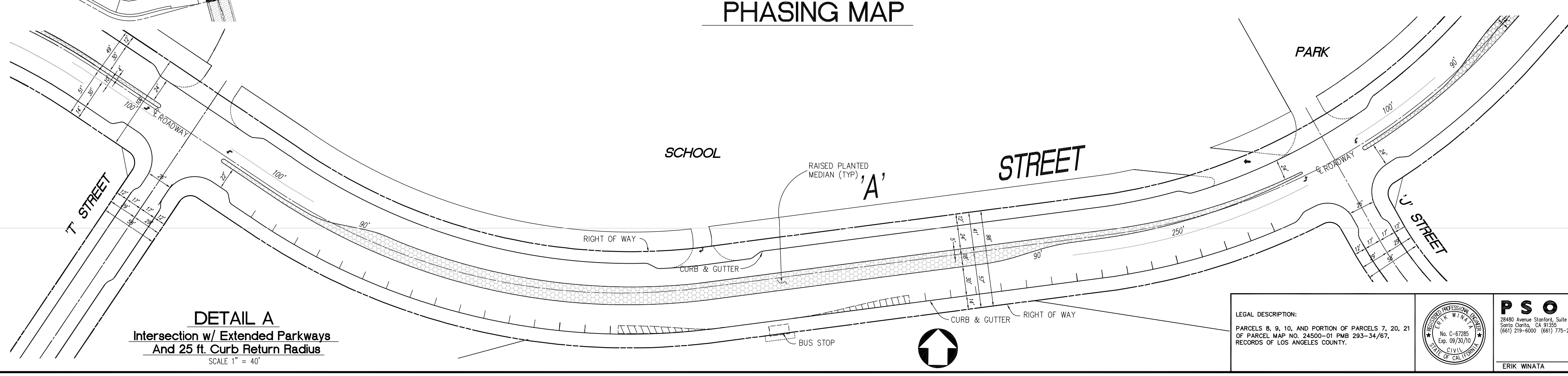
## 20 ACRE LARGE LOT PARCEL MAP

## PHASING MAP

| PHASE 1 | |
|---|---|
| Total Ac | 89.64 AC |
| Total Du | 502 DU |
| SFD | 149 DU |
| Condo's | 353 DU |
| Total Commercial Sf | 30,800 SF |
| Total Open Space | 27.07 AC |
| Park and Ride | 0.81 AC |

| PHASE 2 | |
|---|---|
| Total Ac | 184.95 AC |
| Total Du | 802 DU |
| SFD | 121 DU |
| Condo's | 681 DU |
| Total Commercial Sf | 592,400 SF |
| Total Open Space | 40.83 AC |
| Public Park | 11.26 AC |
| School | 9.73 AC |

| PHASE 3 | |
|---|---|
| Total Ac | 18.08 AC |
| Total Du | 140 DU |
| SFD | 0 DU |
| Condo's | 140 DU |
| Total Commercial Sf | 29,250 SF |
| Total Open Space | 6.66 AC |
| Fire Station | 1.34 AC |




**DETAIL A**
Intersection w/ Extended Parkways
And 25 ft. Curb Return Radius
SCALE 1" = 40'

REV. DATE: DECEMBER 21, 2009
DATE: MAY 2, 2007

LEGAL DESCRIPTION:

PARCELS 8, 9, 10, AND PORTION OF PARCELS 7, 20, 21 OF PARCEL MAP NO. 24500-01 PMB 293-34/67, RECORDS OF LOS ANGELES COUNTY.

REGISTERED PROFESSIONAL ENGINEER ERIK WINATA No. C-67285 Exp. 09/30/10 CIVIL STATE OF CALIFORNIA

PSOMAS
28480 Avenue Stanford, Suite 200
Santa Clarita, CA 91355
(661) 219-6000 (661) 775-2718 (FAX)

ERIK WINATA R.C.E. NO. C 67285 DATE

DESIGNED : NSK/YL
DRAFTED : TLC/JS
CHECKED : EW

OWNER/DEVELOPER :
NEWHALL RANCH
23823 WEST VALENCIA BOULEVARD
VALENCIA, CALIFORNIA 91335
TELEPHONE: (661) 255-4000
REPRESENTATIVE : MR. FRED MACMURDO

# MAJOR LAND DIVISION VESTING TENTATIVE TRACT MAP NO. 53108

LARGE LOT CONVEYANCE MAP, PHASING MAP & DETAIL PLAN
IN THE UNINCORPORATED AREA OF THE COUNTY OF LOS ANGELES STATE OF CALIFORNIA

PROJECT NO. 1NLF010500
SHEET 13 OF 13

RV001-13.dwg

# ALLAN E. SEWARD
## ENGINEERING GEOLOGY, INC.
Geological And Geotechnical Consultants


February 25, 2010 Job No. 10-1702R-4

The Newhall Land and Farming Company
25124 Springfield Court, Suite 300
Valencia, CA 91355

**Attention:** Mr. Fred MacMurdo

**Subject:** **GEOLOGIC AND GEOTECHNICAL REPORT – ADDENDUM NO. 1**
***Response to Los Angeles County Review Sheets (dated 2/5/10)***

**Project:** Vesting Tentative Tract 53108, Map dated 12/21/09
Landmark Village
Newhall Ranch
Los Angeles County, California

**References:** See end of text

Dear Mr. MacMurdo:

This addendum report has been prepared in response to Geologic and Soils Engineering Review Sheets (dated February 5, 2010), prepared by the Los Angeles County Department of Public Works Geotechnical and Materials Engineering Division regarding our December 21, 2009 report for the Revised Map for Vesting Tentative Tract 53108, also dated December 21, 2009. In order to facilitate the review process, we are presenting the County remarks (**in bold**) in the order in which they appear on the original review letter. Each remark is followed immediately by our response. A response to Remark No. 6 of the Soils Engineering Review Sheet is provided by R.T. Frankian and Associates in a Letter Report (attached as **Appendix B**). A copy of these review sheets is attached after the references.

## GEOLOGIC REVIEW SHEET DATED 2/5/10

**Remark No. 1**

**The base used for the geologic map does not conform to the most recent tentative map submitted through the Department of Regional Planning. This review is based solely on the geologic map, and additional review comments may be provided after receipt of a revised tentative map.**

**Response**

Acknowledged. A revised VTTM will be formally submitted through the Subdivision Committee process within the next few months.

**Remark No. 2**

**Show proposed final topography for landslides to be completely or partially removed.**

**Response**

No landslide removals are proposed to extend beyond the current limits of grading shown on the Tentative Tract Map at the offsite Chiquito Canyon Disposal Site areas. Potentially unstable landslides that will not be removed will be placed in Restricted Use Areas. We have provided additional details in response to this remark in our response to Comment No. 2 of the Soils Engineering Review Sheet.

**Remark No. 3**

**The proposed cut slope on sheet 11 above Trench T-23L may expose a daylighted component of bedding. Provide a geologic cross section(s) and stability analyses for this slope, and any mitigation recommendations as necessary. Note: Grading Plan review will require continuous stratigraphy be provided to further address stability of this cut.**

**Response**

The Tentative Tract Map submitted with our 12/21/09 report will be revised prior to formal submittal through the Subdivision Committee process to eliminate fill portions of the subject slope proposed at Adobe Canyon (attached Exhibit **Figure 1, Appendix A** reflects the intended modification to be incorporated in the formal VTTM submittal at a later date). Bedding attitudes measured at this slope indicate that the average true dip is 40° to the northeast, which is substantially steeper than the proposed 2.5:1 cut slope gradient. Cross Section 1A-1A' illustrates the anticipated conditions on the east-facing portion of the proposed cut slope. Bedding with an apparent dip of 24° will be exposed in this portion of the slope, which is steeper than the proposed 22° slope gradient. In addition, this portion of the slope is more than 45° off of the bedding dip direction, which is considered an extreme bedding component; therefore the bedding is interpreted as being generally neutral to the

slope face. This geometry is considered globally stable from a geologic standpoint and based on stability analysis of higher 2:1 cut slopes proposed at Adobe Canyon (see analysis of Cross Section 28L-28L' in our 12/29/09 report). The more southeasterly facing portion of the slope will expose neutral bedding conditions. In conclusion, the subject cut slope will expose bedding that is generally neutral to the slope or steeper than the proposed slope and is therefore considered globally stable from a geologic standpoint. This slope should be geologically observed during construction to assess if there is a potential for shallow wedge-type failures along weak bedding planes, which can be mitigated as needed with stability fills.

**Remark No. 4**

**The Soils Engineering review dated 2/5/10 is attached.**

**Response**

Our response to the Soils Engineering review sheet is presented below.

**SOILS ENGINEERING REVIEW SHEET DATED 2/5/10 (09)**

**Remark No. 1**

**The geotechnical map within the submitted report does not match the latest approved Tentative Tract Map dated by Regional Planning 5/2/07. Provide Revised Tentative Tract Map dated by Regional Planning and geotechnical map that conform.**

**Response**

Acknowledged. A revised VTTM will be formally submitted through the Subdivision Committee process within the next few months.

**Remark No. 2**

**Show the final graded contours of all landslides to be removed and recompacted on the geotechnical maps and Tentative Map. For example, Landslide Qls XVI (B) is recommended to be removed and recompacted, however, the final graded contours are not shown on the geotechnical map or the Tentative Map. Revise geotechnical maps and Tentative Map as necessary.**

**Response**

Per our discussions with Newhall Land, landslides mapped within and adjacent to the proposed fill disposal site areas north of Highway 126 will not be mitigated as part of the Landmark Village Development except at Landslide Qls-XVIB as described below. Therefore, grading is not anticipated to extend beyond the limits of grading on this Tentative Tract map. The disposal fills are generally proposed over the toe portions of the landslides, which will improve stability by adding resisting force to potential movement. The footprint of disposal site DF-4 has been modified to avoid impacting Landslide Qls-XIB (the attached Exhibit, **Figure 2, Appendix A** reflects the intended modification to be incorporated in the formal VTTM submittal at a later date). Restricted Use Areas have been recommended around these landslides on the attached geologic/geotechnical maps. Mitigation of these landslides was addressed in our September 30, 2005 Geologic/Geotechnical Report for future development of the Homestead Project, Vesting Tentative Tract 060678.

The limits of Landslide Qls-XVIB have been revised into two surficial failures based on additional review of Trench Logs T-110 and T-125, regional bedding structure, and geomorphic expression, as shown on the attached geologic/geotechnical maps (see attached Geologic/Geotechnical Map Sheet 11 of 13). Cross Section 2A-2A' has been prepared illustrating the anticipated geologic conditions oriented in the down-dip direction of bedding and in the likely direction of past movement of the lower surficial failure. Stability analysis of both the surficial failure and the underlying bedding conditions adjacent to the proposed debris basin indicate factors of safety in excess of minimum County requirements (see **Appendix A** for analysis). The portion of the landslide below the proposed debris basin should be removed and replaced with compacted fill to provide competent subgrade materials for the basin. The upper surficial failure will mostly be removed by cut-slope CS-3. The remaining portion of this failure is over 150 ft. from the proposed debris basin and, therefore, will not have any adverse impact. The remaining surficial failure material will be mitigated during future development of the Homestead project, Vesting Tentative Tract 060678.

**Remark No. 3**

**On the geotechnical map, delineate approximately limits of proposed disposal fills. Also delineate all soils unsuitable for the support of structures (proposed disposal fill, landslide debris) and prominently note/label with the note "Unsuitable Soils-Not Suitable for the Support of Structures".**

**Response**

The limits of the proposed disposal fills have been delineated on the attached geotechnical map and on the revised design for disposal site DF-4 (**Figure 2**). Based on discussions with Newhall Land, unsuitable landslide material and alluvial soils will not be mitigated for the intended use as disposal fills for Vesting Tentative Tract 53108 except as described in our responses to remarks No. 2 and No. 4. Unsuitable landslide, slopewash, and alluvial materials should be removed below the proposed fill slopes and adjacent debris basins at disposal sites DF-1 and DF-2 to provide stable, permanent slope conditions and support for the basins. The limits of this structural fill and of the soils not suitable for the support of structures have been prominently noted on the attached geotechnical map.

**Remark No. 4**

**Discuss and address whether the proposed fill slopes associated with Disposal Fill areas will be subject to erosion and/or slope instability. Provide updated surficial, static, and seismic slope stability analyses considering the density, moisture content, and shear strengths of the disposal fill materials as well as the proposed design shown on the latest geotechnical map and Tentative Map. Provide additional recommendations as necessary.**

**Response**

The fill placed in slope areas of the proposed disposal sites should be placed at a minimum 90% relative compaction. Specifically, fill within 20 feet horizontal of the proposed 4:1 slope face should be placed as a compacted and tested fill at Disposal Sites DF-3 and DF-4. The fill below and for 100 ft behind the 2:1 fill slope at Disposal Site DF-4 should be compacted to provide surficially and globally stable conditions. The fill placed for the proposed fill slopes and debris basins adjacent to Highway 126 at Disposal Sites of DF-1 and DF-2 should be placed as compacted fill and should be keyed into competent material to

provide both global and surficial stability. The anticipated removal depths are noted on the attached Sheet 11 of 13. Cross Section 3A-3A' illustrates the critical fill slope condition with uncompacted fill behind the slope. Stability analysis of this slope indicates factors of safety in excess of minimum County requirements for both static and pseudostatic conditions (see **Appendix A** for analysis). Based on previous analyses for VTT 060678 (see referenced report) compacted fill slope faces in this area exceed minimum County requirements for surficial stability. Owing to the gentle slope gradient, 4:1 slopes are anticipated to be globally stable with a compacted fill blanket overlying uncompacted fill.

**Remark No. 5**

**Proposed Disposal Fill areas DF-1 and DF-2 appear to show debris basins located in disposal fill. Clarify the soil material that will be used to construct the proposed debris basins and provide recommendations as necessary.**

**Response**

The disposal fill materials proposed below the debris basins are recommended to be placed at a minimum 90% relative compaction. It is also recommended that the landslide debris slopewash, alluvium and existing artificial fill be removed below the footprint of the proposed debris basins. Both debris basins will therefore be founded in compacted fill.

**Remark No. 6**

**Provide static and seismic slope stability analyses for the proposed cut slopes surrounding the Zone 1A Water Tank at PM 18108. The referenced R.T. Frankian Report dated 3/28/08 does not include slope stability analyses. Also, provide a geotechnical cross section, for each section analyzed, showing the critical failure plane used in the analyses. Indicate the various shear strength parameters used in the analyses, in the appropriate segments of each failure plane. Show locations of the cross sections used in the slope stability analyses on the geotechnical map. Recommend mitigation if factors of safety are below County minimum standards.**

**Response**

A response letter addressing this comment has been provided by the project geotechnical engineer for the tank site in the report by R.T. Frankian & Associates and is attached in **Appendix B** for review. We have reviewed this report and accept that the findings, conclusions and recommendations presented therein are acceptable for the proposed use.

**Remark No. 7**

**The submitted report states that the design of the bank protection has been modified. Provide clarification, additional discussion, and details in regards to the stated design modification in relation to proposed bank protection shown on both the North and South banks of the Santa Clara River. The proposed Bank Stabilization is necessary for the feasibility of the proposed tract development and therefore must be addressed at the Tentative Map stage. Clarify design and provide additional information as necessary.**

**Response**

The design presented on the Tentative Tract Map for Vesting Tentative Tract 53108 addressed in our previous report dated 9/27/00 consisted of a 2:1 (h:v) slope composed of either riprap, gunite or soil cement with an outboard 4:1 fill slope. The design on the Revised Tentative Map shows soil cement constructed at 1.5:1 to 2:1 gradient with a 3:1 outboard fill slope, both at Vesting Tentative Tract 53108 and at the onion fields site on the south side of the river. Cross Section 4A-4A illustrates the typical geometry for these slopes. Slope stability analysis of this Cross Section indicates that the proposed soil cement slope will exceed minimum County Factors of Safety for global static and pseudostatic slope stability. The slope also passes rapid draw down stability analysis (see **Appendix A** for stability analysis). A separate report addressing details of the proposed bank protection design and construction should be prepared when detailed plans are available for review.

**Remark No. 8**

**Show the following on the geotechnical map and Tentative Map:**

**a. Final graded contours for the removal and recompaction of existing landslides.**
**b. Delineate the location of the proposed disposal fill materials.**

**c. Delineate the approximate limits of all soils unsuitable for the support of structure and prominently note/label with the note: "Unsuitable Soils – Not suitable for the Support of Structures".**

**d. All recommended mitigation measures.**

**Response**

a. No landslide removals are proposed to extend beyond the grading footprint shown on the Tentative Map and in **Figure 2**. The Tentative Map will be modified by Psomas to incorporate the revised design for Disposal Site DF-4.
b. The locations of the proposed disposal fill materials are delineated on the attached Sheet 11 of 13 and on Figure 2. the Tentative Map will be modified by Psomas to incorporate the revised design for Disposal Site DF-4 into the Tentative Map and to delineate the locations of each disposal fill.
c. The limits of all soils unsuitable for the support of structures have been prominently labeled on Sheet 11 of 13 and on Figure 2. The Tentative map will be modified by Psomas to incorporate these limits.
d. Recommended mitigation measures for Landslide removals, alluvial removals, Restricted Use areas, and slope construction are noted on Sheet 11 of 13 and on Figure 2. The Tentative Map will be modified by Psomas to incorporate these notes into the Tentative Map.

**Remark No. 9**

**Requirements of the Geology Section are attached.**

**Response**

Responses to the Geological Review Sheet are provided in the first section of this report.

**Remark No. 10**

**Include a copy of this review sheet with your response.**

**Response**

A copy of this review sheet is attached after the references.

This opportunity to be of service is greatly appreciated. If you have any questions regarding this report, please call.

Respectfully submitted,

Brian J. Swanson, CEG 2055
Associate Geologist

Kevin P. Callahan, PE 72202
Professional Engineer

Reviewed by:

Eric J. Seward, CEG 2110
Principal Engineering Geologist
Vice President

**The following attachments and appendices complete this report.**

**References**
**Geologic Review Sheet dated 2/5/10**
**Soils Engineering Review Sheet dated 2/5/10 (09)**

**APPENDIX A**

- Geologic Cross Sections 1A-1A' through 4A-4A'
- Slope Stability Analyses
- Geologic/Geotechnical Map Sheet 11 of 13
- Exhibit Map – Revised Cut Slope at Adobe Canyon Figure 1
- Exhibit Map – Revised Design for Disposal Site DF-4 Figure 2

**APPENDIX B**

- Response to Soils Comment No. 6 Report by R.T. Frankian & Associates (dated 2/23/10)

**Distribution:** (1) The Newhall Land and Farming Company
Attn: Mr. Fred MacMurdo
(1) Psomas
Attn: Mr. Ross Barker
(2) County of Los Angeles Department of Public Works Geotechnical and Materials Engineering Division (Hardcopy and Electronic Copy)
Attn: Soils Section
Attn: Geology Section

## REFERENCES

1. **GEOLOGIC/GEOTECHNICAL REPORT**
***Vesting Tentative Tract 53108, dated 6/11/00***
River Village, Newhall Ranch
Castaic, California
Dated September 27, 2000 – JN: 00-1702R-4

2. **GEOLOGIC AND GEOTECHNICAL REPORT – ADDENDUM NO. 1**
***Response to County Comments (Review Sheets dated 12/12/00 and 1/2/01)***
***Vesting Tentative Tract 53108, Map Dated 6/11/00***
River Village, Newhall Ranch
Castaic, California
Dated February 10, 2001 – JN: 01-1702R-4

3. **GEOLOGIC AND GEOTECHNICAL REPORT**
***Review of Vesting Tentative Tract Map 060678 (Dated 8/3/05)***
Vesting Tentative Tract 060678
Homestead
Newhall Ranch, California
Dated September 30, 2005 - JN: 05-2062-4

4. **GEOLOGIC AND GEOTECHNICAL REPORT**
***Review of Revised Vesting Tentative Tract Map 53108 (Dated 12/21/09)***
Landmark Village
Newhall Ranch
Los Angeles County, California
Dated December 21, 20096 - JN: 09-1702R-4

Sheet 1 of 1

County of Los Angeles Department of Public Works
GEOTECHNICAL AND MATERIALS ENGINEERING DIVISION
GEOLOGIC REVIEW SHEET
900 So. Fremont Ave., Alhambra, CA 91803
TEL. (626) 458-4925

DISTRIBUTION
1 Geologist
__ Soils Engineer
1 GMED File
1 Subdivision

TENTATIVE TRACT MAP 53108
SUBDIVIDER Newhall Land & Farming Co.
ENGINEER Psomas
GEOLOGIST & SOILS ENGINEER Allan Seward

TENTATIVE MAP DATED 5/2/07 (Rev.)
LOCATION Newhall Ranch

REPORT DATE 12/21/09, 10/29/03, 2/10/01, 9/27/00

The Regional Planning Commission, developer, and engineer are advised that:

PRIOR TO RECOMMENDING APPROVAL OF THE TENTATIVE TRACT OR PARCEL MAP:

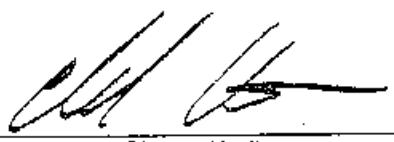
1. The base used for the geologic map does not conform to the most recent tentative map submitted through the Department of Regional Planning. This review is based solely on the geologic map, and additional review comments may be provided after receipt of a revised tentative map.

2. Show proposed final topography for landslides to be completely or partially removed.

3. The proposed cut slope on sheet 11 above trench T-23L may expose a daylighted component of bedding. Provide a geologic cross section(s) and stability analyses for this slope, and any mitigation recommendations as necessary. Note: grading plan review will require continuous stratigraphy be provided to further address stability of this cut.

4. The Soils Engineering review dated 2/5/10 is attached.

NOTE Provide a copy of this review with your resubmittal

Prepared by  Reviewed by _____ Date 2/5/10

Charles Nestle

Please complete a Customer Service Survey at http://dpw.lacounty.gov/go/gmedsurvey

COUNTY OF LOS ANGELES
DEPARTMENT OF PUBLIC WORKS
GEOTECHNICAL AND MATERIALS ENGINEERING DIVISION

SOILS ENGINEERING REVIEW SHEET

Address: 900 S. Fremont Ave., Alhambra, CA 91803
Telephone: (626) 458-4925
Fax: (626) 458-4913

District Office 8.2
Job Number GMPH
Sheet 1 of 1

DISTRIBUTION:
___ Drainage
___ Grading
___ Geo/Soils Central File
___ District Engineer
___ Geologist
___ Soils Engineer
___ Engineer/Architect

| | |
|---|---|
| Tentative Tract Map | 53108 |
| Location | Newhall Ranch |
| Developer/Owner | Newhall Land and Farming Company / Newhall Ranch Co. |
| Engineer/Architect | Psomas |
| Soils Engineer | Allan E. Seward Engineering Geology, Inc. |
| Geologist | Same as above |

Review of:
Revised Tentative Tract Map and Exhibit Dated 5/2/07
Soils Engineering and Geologic Reprot Dated 12/21/09, 10/29/03, 2/10/01, 9/27/00
Previous Review Sheet Dated 11/13/08

ACTION:

Tentative Map feasibility is not recommenced for approval.

REMARKS:

1. The geotechnical map within the submitted report does not match the latest approved Tentative Tract Map dated by Regional Planning 5/2/07. Provide revised Tentative Tract Map dated by Regional Planning and geotechnical map that conform.

2. Show the final graded contours of all landslides to be removed and recompacted on the geotechnical maps and Tentative Map. For example, Landslide Qls XVI(B) is recommended to removed and recompacted, however the final graded contours are not shown on the geotechnical map or the Tentative Map. Revise geotechnical maps and Tentative Map as necessary.

3. On the geotechnical map, delineate approximate limits of proposed disposal fills. Also delineate all soils unsuitable for the support of structures (proposed disposal fill, landslide debris) and prominently note/label with the note: "Unsuitable Soils - Not suitable for the Support of Structures".

4. Discuss and address whether the proposed fill slopes associated with Disposal Fill areas will be subject to erosion and/or slope instability. Provide updated surficial, static, and seismic slope stability analyses considering the density, moisture content, and shear strengths of the disposal fill materials as well as the proposed design shown on the latest geotechnical map and Tentative Map. Provide additional recommendations as necessary.

5. Proposed Disposal Fill areas DF-1 and DF-2 appear to show debris basins located in disposal fill. Clarify the soil material that will be used to construct the proposed debris basins and provide recommendations as necessary.

6. Provice static and seismic slope stability analyses for the proposed cut slopes surrounding the Zone 1A Water Tank at PM 18108. The referenced R.T. Frankian Report dated 3/28/08 does not include slope stability analyses. Also, provide a geotechnical cross section, for each section analyzed, showing the critical failure plane used in the analyses. Indicate the various shear strength parameters used in the analyses, in the appropriate segments of each failure plane. Show locations of the cross sections used in slope stability analyses on the geotechnical map. Recommend mitigation if factors of safety are below County minimum standards.

7. The submitted report states that the design of the bank protection has been modified. Provide clarification, additional discussion, and details in regards to the stated design modification in relation to proposed bank protection shown on both the North and South banks of the Santa Clara River. The proposed Bank Stabilization is necessary for the feasibility of the proposed tract development and therefore must be addressed at the Tentative Map stage. Clarify design and provide additional information as necessary.

8. Show the following on the geotechnical map and Tentative Map:
   a. Final graded contours for the removal and recompaction of existing landslides.
   b. Delineate the location of the proposed disposal fill materials.
   c. Delineate the approximate limits of all soils unsuitable for the support of structure and prominently note/label with the note: "Unsuitable Soils - Not suitable for the Support of Structures".
   d. All recommended mitigation measures.

9. Requirements of the Geology Section are attached.

10. Include a copy of this review sheet with your response.

REGISTERED PROFESSIONAL ENGINEER
YOSHIYA MORISAKU
No. 67587
Exp. 6/30/11
CIVIL
STATE OF CALIFORNIA

Reviewed by _____ Date 2/5/09
Yoshiya Morisaku

NOTICE: Public safety, relative to geotechnical subsurface explorations, is provided in accordance with current codes for excavations, including of the Los Angeles County Code, Chapter 11.48, and the State of California, Title 8, Construction Safety Orders.

# Appendix A

# APPENDIX A

## SLOPE STABILITY ANALYSES

### Introduction

Analyses were performed on Cross Sections 2A-2A' and 3A-3A' to evaluate stability of proposed fill and natural slopes in offsite areas north of Highway 126. Analyses were also performed on Cross Section 4A-4A' to evaluate stability of soil-cement channel liner slopes, considering potential rapid drawdown conditions and utilizing the Qcap flood event water level and assuming that the aesthetic 3:1 fill slope in front of the liner has been removed by erosion. The stability analyses utilized cross sections constructed to illustrate critical structural geometries and maximum slope heights for each analyzed slope. Our evaluation included static and pseudostatic gross stability conditions. The results of our stability analyses are summarized in **Table A1** along with slope parameters and recommended mitigations. Slope stability diagrams graphically illustrating the results of our analyses for each cross section are attached for review.

### Shear Strength Parameters

Shear strength parameters used in our analyses for the slopes within and adjacent to the proposed fill disposal site areas north of Highway 126 are based on direct shear strength testing performed for the Homestead Project, Vesting Tentative Tract 060678. The shear strength assigned for artificial fill and proposed uncompacted fill was reduced 20% from compacted fill for purposes of analysis. Shear strength parameters used to evaluate channel liner slopes were developed for our original Review of Tentative Tract Map report for VTT 53108 (dated September 27, 2000). Shear strength parameters of phi=45 degrees and cohesion=2000 psf were selected for soil cement. These values are conservative based on unconfined compressive strength tests performed on soil-cement cylinders prepared for similar projects. The strength parameters for static loading conditions are residual values and the strength values for pseudo-static loading conditions are peak values.

### Conclusion

The results of our stability analyses are presented in **Table A1 -** Slope Stability Analyses Results. General descriptions of geologic/geotechnical conditions at the site are provided in the referenced reports.

# APPENDIX A

The analyzed slopes comply with County of Los Angeles Building Code minimum requirements for global stability under static, pseudostatic, and rapid drawdown loading conditions, as applicable, provided that our recommendations are followed and incorporated into project construction.

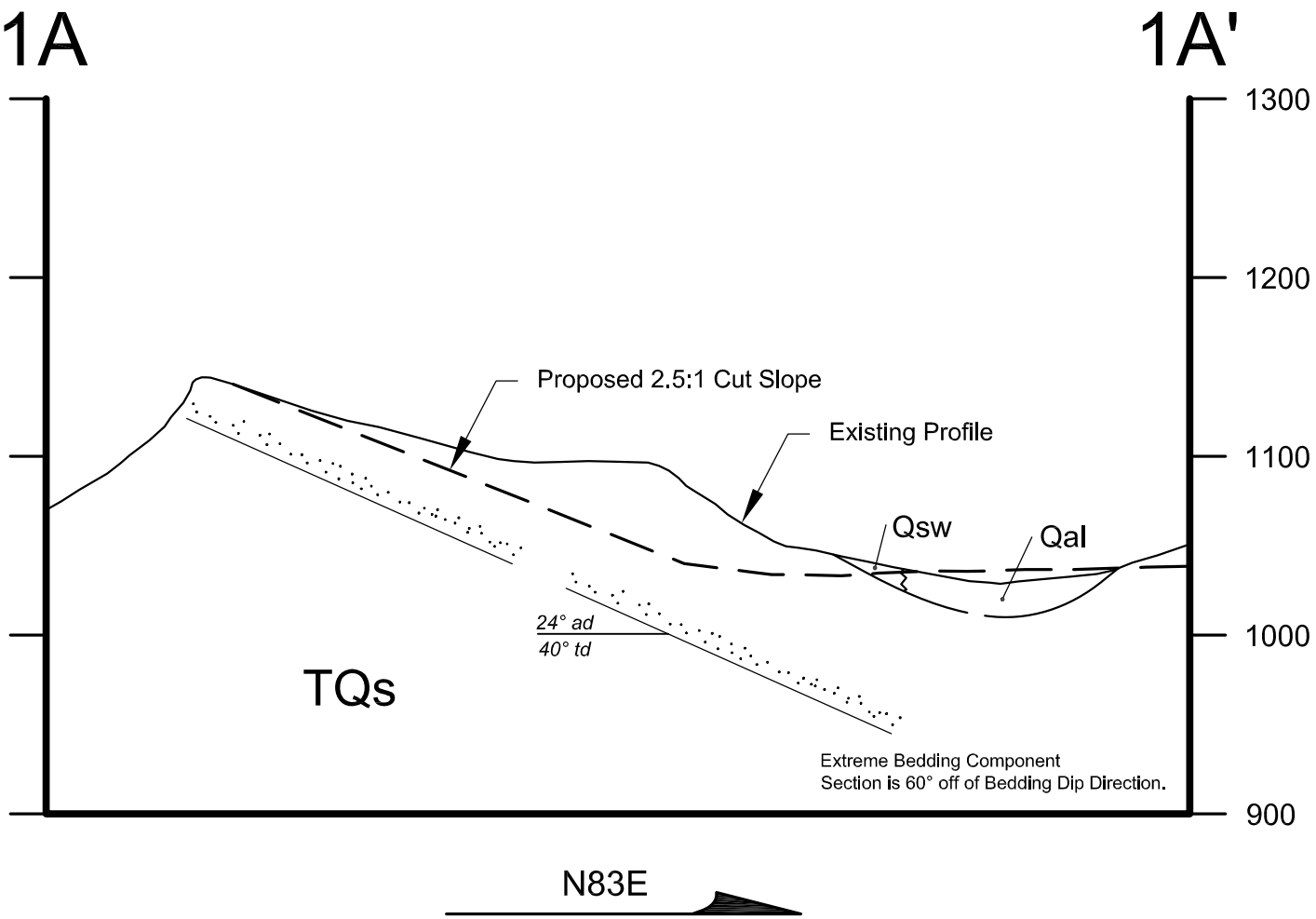
**The following attachments are located within this Appendix.**

Slope Stability Analyses Results **Table A1**
Slope Stability Diagrams and Data Sheets for Runs 1 through 7

## APPENDIX A

## TABLE A1 - SLOPE STABILITY ANALYSES RESULTS

| CROSS SECTION | FILE NAME | SLOPE DESIGNATION | ANALYZED SURFACE | METHOD | FACTOR OF SAFETY | | COMMENTS | RUN NO. |
|---|---|---|---|---|---|---|---|---|
| | | | | | STATIC | PSEUDOSTATIC (COEFF = 0.15) | | |
| 2A-2A' | T2AS2A | Natural slope w/ surficial failure (Qls-XVIB) | Landslide Plane | Spencer | 2.77 | -- | Minimum safety factor for potential failure surface along landslide plane located behind proposed compacted disposal fill. | 1 |
| 2A-2A' | T2AS1A<br>T2APS1A | Natural Slope | Bedding Plane | Spencer | 3.10 | 1.87 | Minimum safety factor for potential failure along bedding plane located below proposed compacted disposal fill. | 2<br>3 |
| 3A-3A' | T3AS1A<br>T3APS1A | Fill Slope | Circular | Spencer | 1.74 | 1.18 | Circular analyses through fill slope below proposed basin; Ru=0.12. | 4<br>5 |
| 4A-4A' | T4AS1A<br>T4APS1A | Soil-Cement Bank Protection | Circular | Spencer | 2.24 | 1.56 | Minimum safety factor considering potential rapid drawdown. Water elevation in slope material equal to Qcap. | 6<br>7 |

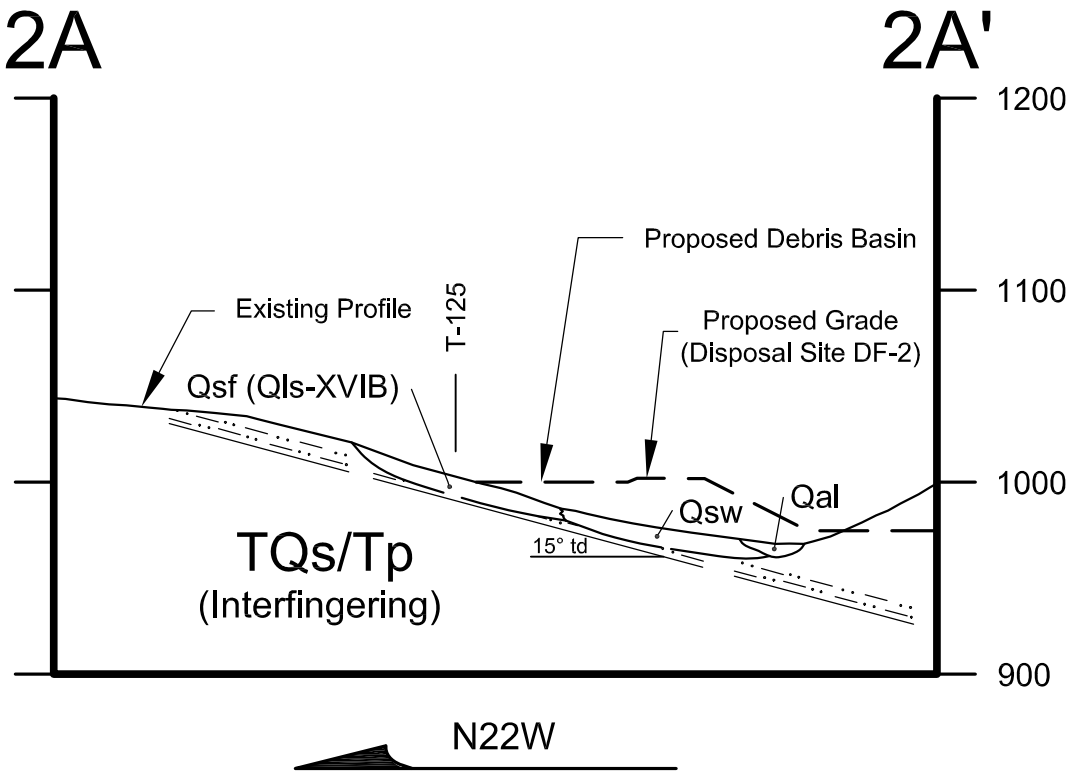



**ALLAN E. SEWARD**
**ENGINEERING GEOLOGY, INC.**
Geological and Geotechnical Consultants

# Cross Section 1A-1A '

*Job No.:* 10-1702R

*Date:* 2/25/10 | *Scale:* 1"=100' (H=V)

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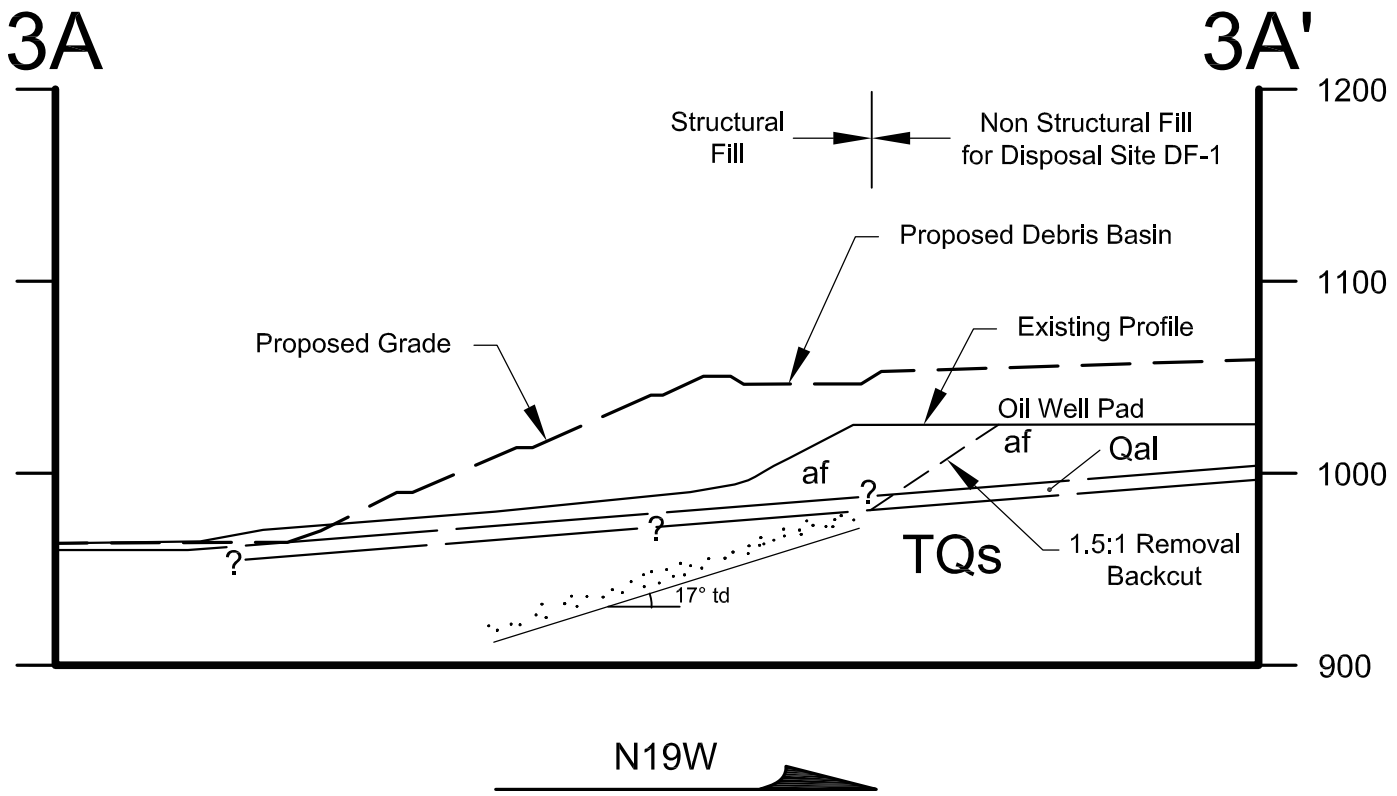
**ENGINEERING GEOLOGY, INC.**
Geological and Geotechnical Consultants

# Cross Section 2A-2A'

*Job No.:* 10-1702R

*Date:* 2/25/10 | *Scale:* 1"=100' (H=V)

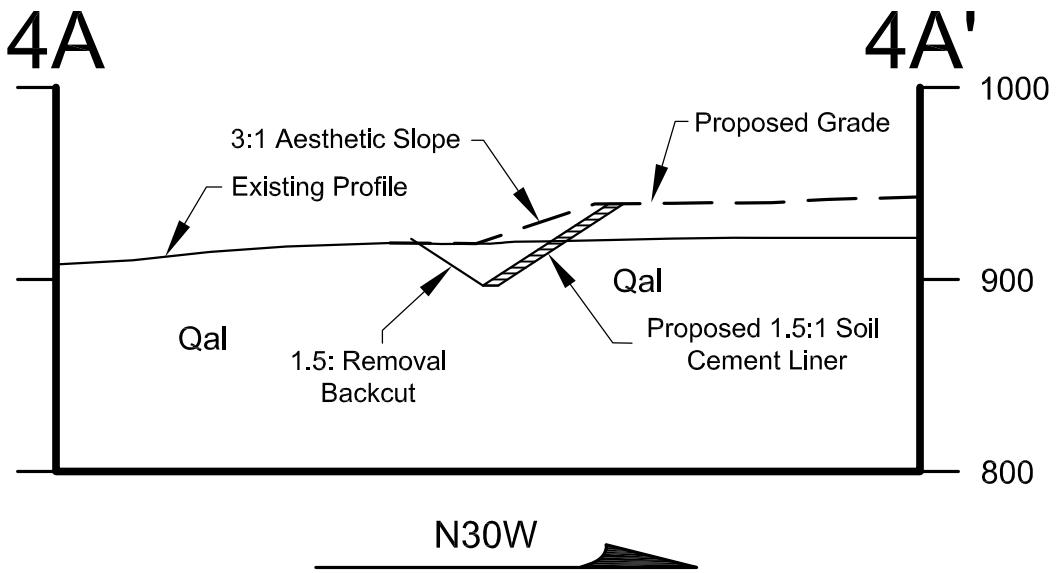



**ALLAN E. SEWARD**
**ENGINEERING GEOLOGY, INC.**
Geological and Geotechnical Consultants

# Cross Section 3A-3A'

*Job No.:* 10-1702R

*Date:* 2/25/10 | *Scale:* 1"=100' (H=V)




**ALLAN E. SEWARD**
**ENGINEERING GEOLOGY, INC.**
Geological and Geotechnical Consultants

# Cross Section 4A-4A'

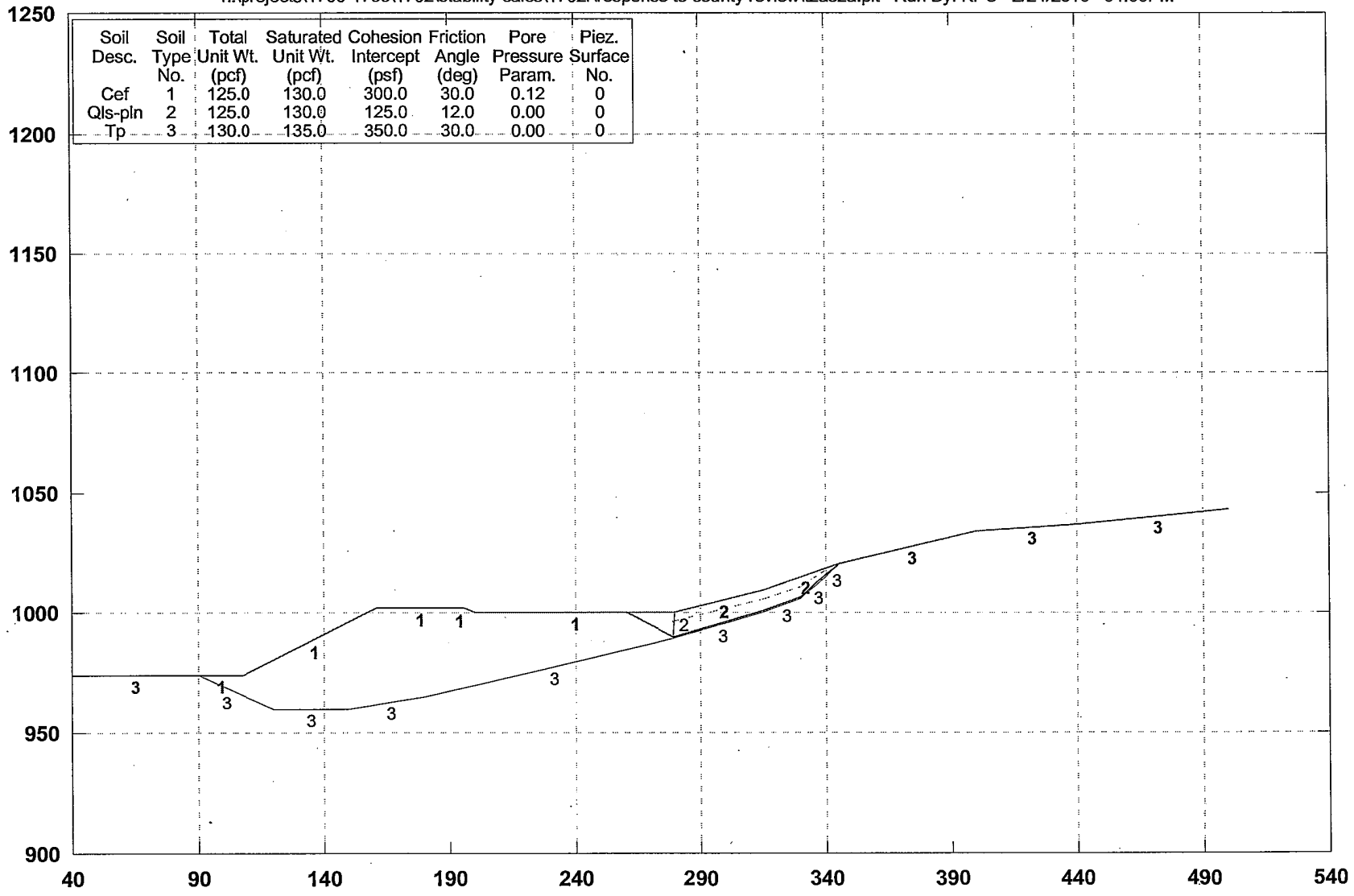
*Job No.:* 10-1702R

*Date:* 2/25/09 | *Scale:* 1"=100' (H=V)

# TT 53108, 2A-2A'; QlsXVIB; static; slide plane

n:\projects\1700-1799\1702\stability calcs\1702r\response to county review\t2as2a.plt Run By: KPC 2/24/2010 04:00PM

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Piez. Surface No. |
|---|---|---|---|---|---|---|---|
| Cef | 1 | 125.0 | 130.0 | 300.0 | 30.0 | 0.12 | 0 |
| Qls-pln | 2 | 125.0 | 130.0 | 125.0 | 12.0 | 0.00 | 0 |
| Tp | 3 | 130.0 | 135.0 | 350.0 | 30.0 | 0.00 | 0 |




GSTABL7 v.2 FSmin=2.77

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

GSTABL7

RUN No. 1

```
                    *** GSTABL7 ***
                ** GSTABL7 by Garry H. Gregory, P.E. **
    ** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **
              (All Rights Reserved-Unauthorized Use Prohibited)
 ************************************************************************
                    SLOPE STABILITY ANALYSIS SYSTEM
       Modified Bishop, Simplified Janbu, or GLE Method of Slices.
       (Includes Spencer & Morgenstern-Price Type Analysis)
       Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
       Nonlinear Undrained Shear Strength, Curved Phi Envelope,
       Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
       Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
 ************************************************************************
  Analysis Run Date:        2/24/2010
  Time of Run:              04:00PM
  Run By:                   KPC
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County Review\t2as2a.in
  Output Filename:          N:\Projects\1700-1799\1702\Stability Calcs\1702R\Response to
County Review\t2as2a.OUT
  Unit System:              English
  Plotted Output Filename:  N:\Projects\1700-1799\1702\Stabi Calcs\1702R\Response to County
Review\t2as2a.PLT
  PROBLEM DESCRIPTION:  TT 53108, 2A-2A'; QlsXVIB;
                        static; slide plane
  BOUNDARY COORDINATES
    11 Top   Boundaries
    20 Total Boundaries
  Boundary     X-Left      Y-Left     X-Right     Y-Right     Soil Type
     No.        (ft)        (ft)       (ft)        (ft)     Below Bnd
      1         40.00      974.00      90.00      974.00        3
      2         90.00      974.00     108.00      974.00        1
      3        108.00      974.00     161.00     1002.00        1
      4        161.00     1002.00     196.00     1002.00        1
      5        196.00     1002.00     200.00     1000.00        1
      6        200.00     1000.00     280.00     1000.00        1
      7        280.00     1000.00     315.00     1009.00        2
      8        315.00     1009.00     345.00     1020.00        2
      9        345.00     1020.00     400.00     1034.00        3
     10        400.00     1034.00     440.00     1037.00        3
     11        440.00     1037.00     500.00     1043.00        3
     12         90.00      974.00     120.00      960.00        3
     13        120.00      960.00     150.00      960.00        3
     14        150.00      960.00     180.00      965.00        3
     15        180.00      965.00     279.00      989.00        3
     16        279.00      989.00     280.00     1000.00        2
     17        279.00      989.00     315.00     1000.00        3
     18        315.00     1000.00     330.00     1006.00        3
     19        330.00     1006.00     340.00     1015.00        3
     20        340.00     1015.00     345.00     1020.00        3
  User Specified Y-Origin =       900.00(ft)
  Default X-Plus Value = 0.00(ft)
  Default Y-Plus Value = 0.00(ft)
 ISOTROPIC SOIL PARAMETERS
   3 Type(s) of Soil
  Soil  Total  Saturated  Cohesion Friction   Pore   Pressure   Piez.
  Type Unit Wt. Unit Wt. Intercept  Angle  Pressure Constant Surface
   No.  (pcf)    (pcf)     (psf)    (deg)   Param.    (psf)     No.
    1   125.0    130.0     300.0    30.0    0.12       0.0       0
    2   125.0    130.0     125.0    12.0    0.00       0.0       0
    3   130.0    135.0     350.0    30.0    0.00       0.0       0
  Trial Failure Surface Specified By  6 Coordinate Points
    Point      X-Surf      Y-Surf
     No.        (ft)        (ft)
      1        260.00     1000.00
      2        279.00      989.50
      3        315.00     1000.50
```

| | | |
|---|---|---|
| 4 | 330.00 | 1006.50 |
| 5 | 339.50 | 1015.50 |
| 6 | 344.50 | 1019.82 |

Circle Center At X = 286.814(ft) ; Y = 1075.730(ft); and Radius = 80.337(ft)

| Theta (deg) (ki=1.0) | FOS (Moment) (Equil.) | FOS (Force) (Equil.) | Lambda |
|---|---|---|---|
| 13.00 | 2.328 | 3.037 | 0.231 |
| 19.50 | 0.000 | 3.606 | 0.354 |
| 10.88 | 2.570 | 2.893 | 0.192 |
| 6.87 | 2.907 | 2.660 | 0.121 |
| 7.85 | 2.838 | 2.713 | 0.138 |
| 9.17 | 2.731 | 2.789 | 0.161 |
| 8.61 | 2.778 | 2.756 | 0.151 |
| 8.76 | 2.765 | 2.765 | 0.154 |

((Modified Bishop FS for Specified Surface = 2.328))
Factor Of Safety For The Preceding Specified Surface = 2.765
Theta (ki = 1.0) = 8.76 Deg Lambda = 0.154
Factor Of Safety Is Calculated By GLE (Spencer's) Method (0-2)
Forces from Reinforcement, Piers/Piles, Applied Forces, and Soil Nails
(if applicable) have been applied to the slice base(s)
on which they intersect.
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
Tension Crack Water Force = 0.00(lbs)
Specified Tension Crack Water Force Factor = 0.000
Depth of Tension Crack (zo) at Center of Last Slice = 0.777(ft)

*** Line of Thrust and Slice Force Data ***

| Slice No. | X Coord. | Y Coord. | L/H | Side Force (lbs) | ki | Force Angle (Deg) | Vert. Shear Force(lbs) |
|---|---|---|---|---|---|---|---|
| 1 | 279.00 | 996.21 | 0.639 | 15532. | 1.000 | 8.76 | 2394.6 |
| 2 | 279.05 | 996.22 | 0.640 | 15530. | 1.000 | 8.76 | 2394.3 |
| 3 | 280.00 | 996.47 | 0.653 | 15306. | 1.000 | 8.76 | 2359.7 |
| 4 | 315.00 | 1005.51 | 0.589 | 8023. | 1.000 | 8.76 | 1236.8 |
| 5 | 330.00 | 1010.67 | 0.521 | 4093. | 0.858 | 7.53 | 464.5 |
| 6 | 339.50 | 1017.41 | 0.769 | 195. | 0.296 | 2.61 | 2.6 |
| 7 | 344.50 | 1058.07 | 0.000 | -1. | 0.000 | 0.00 | 0.0 |

***Table 1 - Individual data on the 7 slices***

| Slice No. | Width (ft) | Weight (lbs) | Water Force Top (lbs) | Water Force Bot (lbs) | Tie Force Norm (lbs) | Tie Force Tan (lbs) | Earthquake Force Hor (lbs) | Earthquake Force Ver (lbs) | Surcharge Load (lbs) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 19.0 | 12468.8 | 0.0 | 1709.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2 | 0.0 | 61.3 | 0.0 | 7.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 3 | 1.0 | 1232.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 4 | 35.0 | 40894.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 5 | 15.0 | 15468.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 6 | 9.5 | 6224.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 7 | 5.0 | 776.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

- TABLE 2 - Base Stress Data on the 7 Slices -

| Slice No. * | Alpha (deg) | X-Coord. Slice Cntr (ft) | Base Leng. (ft) | Total Normal Stress (psf) | Total Vert. Stress (psf) | Mobilized Shear Stress (psf) |
|---|---|---|---|---|---|---|
| 1 | -28.93 | 269.50 | 21.71 | 0.00 | 574.38 | 0.00 |
| 2 | 16.99 | 279.02 | 0.05 | 1205.28 | 1254.36 | 327.31 |
| 3 | 16.99 | 279.52 | 1.00 | 1214.33 | 1236.09 | 138.56 |
| 4 | 16.99 | 297.50 | 36.60 | 1097.11 | 1117.40 | 129.55 |
| 5 | 21.80 | 322.50 | 16.16 | 938.59 | 957.49 | 117.36 |
| 6 | 43.45 | 334.75 | 13.09 | 519.01 | 475.65 | 85.11 |
| 7 | 40.81 | 342.00 | 6.61 | 107.28 | 117.49 | 53.46 |

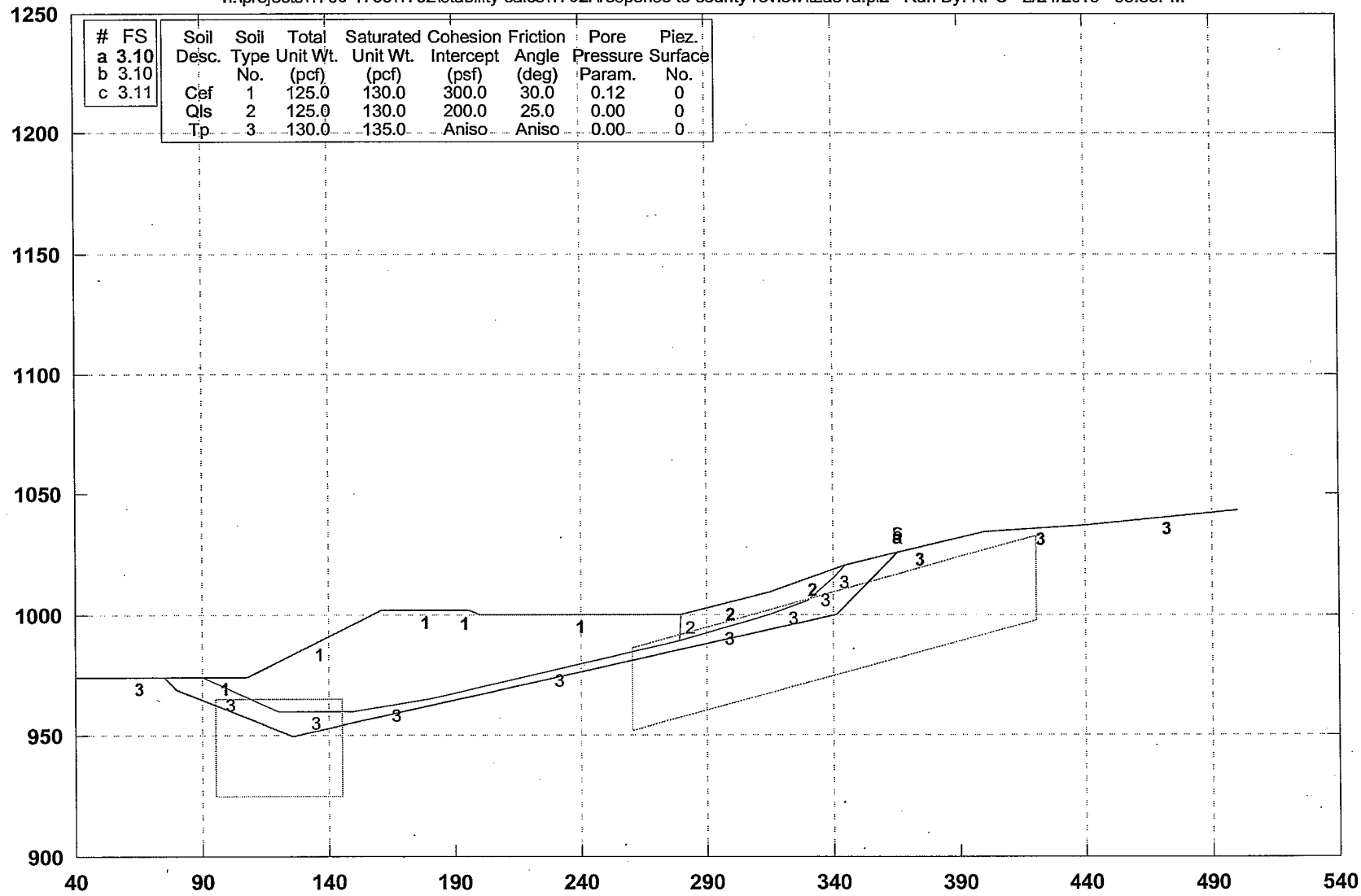
**** END OF GSTABL7 OUTPUT ****

# TT 53108, 2A-2A'; QlsXVIB; static; planar below R&R

n:\projects\1700-1799\1702\stability calcs\1702r\response to county review\t2as1a.pl2 Run By: KPC 2/24/2010 03:53PM

| # | FS |
|---|---|
| a | 3.10 |
| b | 3.10 |
| c | 3.11 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Piez. Surface No. |
|---|---|---|---|---|---|---|---|
| Cef | 1 | 125.0 | 130.0 | 300.0 | 30.0 | 0.12 | 0 |
| Qls | 2 | 125.0 | 130.0 | 200.0 | 25.0 | 0.00 | 0 |
| Tp | 3 | 130.0 | 135.0 | Aniso | Aniso | 0.00 | 0 |




GSTABL7 v.2 FSmin=3.10

Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2)

GSTABL7

RUN NO. 2

```
                              *** GSTABL7 ***
                        ** GSTABL7 by Garry H. Gregory, P.E. **
          ** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **
                    (All Rights Reserved-Unauthorized Use Prohibited)
     ************************************************************************
                          SLOPE STABILITY ANALYSIS SYSTEM
               Modified Bishop, Simplified Janbu, or GLE Method of Slices.
               (Includes Spencer & Morgenstern-Price Type Analysis)
               Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
               Nonlinear Undrained Shear Strength, Curved Phi Envelope,
               Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
               Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
     ************************************************************************
     Analysis Run Date:        2/24/2010
     Time of Run:              03:53PM
     Run By:                   KPC
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County Review\t2as1a.in
     Output Filename:          n:\Projects\1700-1799\1702\Stability Calcs\1702R\Response to
County Review\t2as1a.OUT
     Unit System:              English
     Plotted Output Filename:  n:\Projects\1700-1799\1702\Stabi Calcs\1702R\Response to County
Review\t2as1a.PLT
     PROBLEM DESCRIPTION:  TT 53108, 2A-2A'; QlsXVIB;
                           static; planar below R&R
     BOUNDARY COORDINATES
        11 Top   Boundaries
        20 Total Boundaries
     Boundary     X-Left     Y-Left    X-Right    Y-Right    Soil Type
        No.        (ft)       (ft)       (ft)       (ft)    Below Bnd
         1        40.00     974.00      90.00     974.00        3
         2        90.00     974.00     108.00     974.00        1
         3       108.00     974.00     161.00    1002.00        1
         4       161.00    1002.00     196.00    1002.00        1
         5       196.00    1002.00     200.00    1000.00        1
         6       200.00    1000.00     280.00    1000.00        1
         7       280.00    1000.00     315.00    1009.00        2
         8       315.00    1009.00     345.00    1020.00        2
         9       345.00    1020.00     400.00    1034.00        3
        10       400.00    1034.00     440.00    1037.00        3
        11       440.00    1037.00     500.00    1043.00        3
        12        90.00     974.00     120.00     960.00        3
        13       120.00     960.00     150.00     960.00        3
        14       150.00     960.00     180.00     965.00        3
        15       180.00     965.00     279.00     989.00        3
        16       279.00     989.00     280.00    1000.00        2
        17       279.00     989.00     315.00    1000.00        3
        18       315.00    1000.00     330.00    1006.00        3
        19       330.00    1006.00     340.00    1015.00        3
        20       340.00    1015.00     345.00    1020.00        3
     User Specified Y-Origin =        900.00(ft)
     Default X-Plus Value = 0.00(ft)
     Default Y-Plus Value = 0.00(ft)
    ISOTROPIC SOIL PARAMETERS
      3 Type(s) of Soil
     Soil  Total  Saturated  Cohesion Friction   Pore    Pressure   Piez.
     Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant Surface
      No.  (pcf)    (pcf)     (psf)     (deg)   Param.    (psf)     No.
       1   125.0    130.0     300.0     30.0    0.12       0.0       0
       2   125.0    130.0     200.0     25.0    0.00       0.0       0
       3   130.0    135.0     350.0     30.0    0.00       0.0       0
    ANISOTROPIC STRENGTH PARAMETERS
         1 soil type(s)
     Soil Type  3 Is Anisotropic
     Number Of Direction Ranges Specified =  3
     Direction     Counterclockwise     Cohesion      Friction
       Range        Direction Limit    Intercept       Angle
```

| No. | (deg) | (psf) | (deg) |
|---|---|---|---|
| 1 | 13.0 | 350.00 | 30.00 |
| 2 | 17.0 | 200.00 | 20.00 |
| 3 | 90.0 | 350.00 | 30.00 |

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
2500 Trial Surfaces Have Been Generated.
2 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 50.0

| Box No. | X-Left (ft) | Y-Left (ft) | X-Right (ft) | Y-Right (ft) | Height (ft) |
|---|---|---|---|---|---|
| 1 | 95.00 | 945.00 | 145.00 | 945.00 | 40.00 |
| 2 | 260.00 | 969.00 | 420.00 | 1015.00 | 35.00 |

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Evaluated. They Are Ordered - Most Critical First.
* * Safety Factors Are Calculated By GLE (Spencer's) Method (0-2) * *
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
The option of no water in the tension crack on the last slice has been selected.
Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces (if applicable) have been applied to the slice base(s) on which they intersect.
Total Number of Trial Surfaces Evaluated = 2500
WARNING! The Factor of Safety Calculation for one or More Trial Surfaces Did Not Converge in 20 Iterations.
Number of Trial Surfaces with Non-Converged FS = 516
Number of Trial Surfaces with Misleading FS = 15
Percentage of Trial Surfaces With Non-Valid FS Solutions of the Total Evaluated = 21.2 %
Statistical Data On All Valid FS Values:
FS Max = 24.684 FS Min = 3.096 FS Ave = 4.874
Standard Deviation = 1.493 Coefficient of Variation = 30.63 %
((Simplified Janbu FS for Critical Surface = 2.785))
Failure Surface Specified By 5 Coordinate Points

| Point No. | X-Surf (ft) | Y-Surf (ft) |
|---|---|---|
| 1 | 74.90 | 974.00 |
| 2 | 79.72 | 969.17 |
| 3 | 125.62 | 949.35 |
| 4 | 341.04 | 999.95 |
| 5 | 365.66 | 1025.26 |

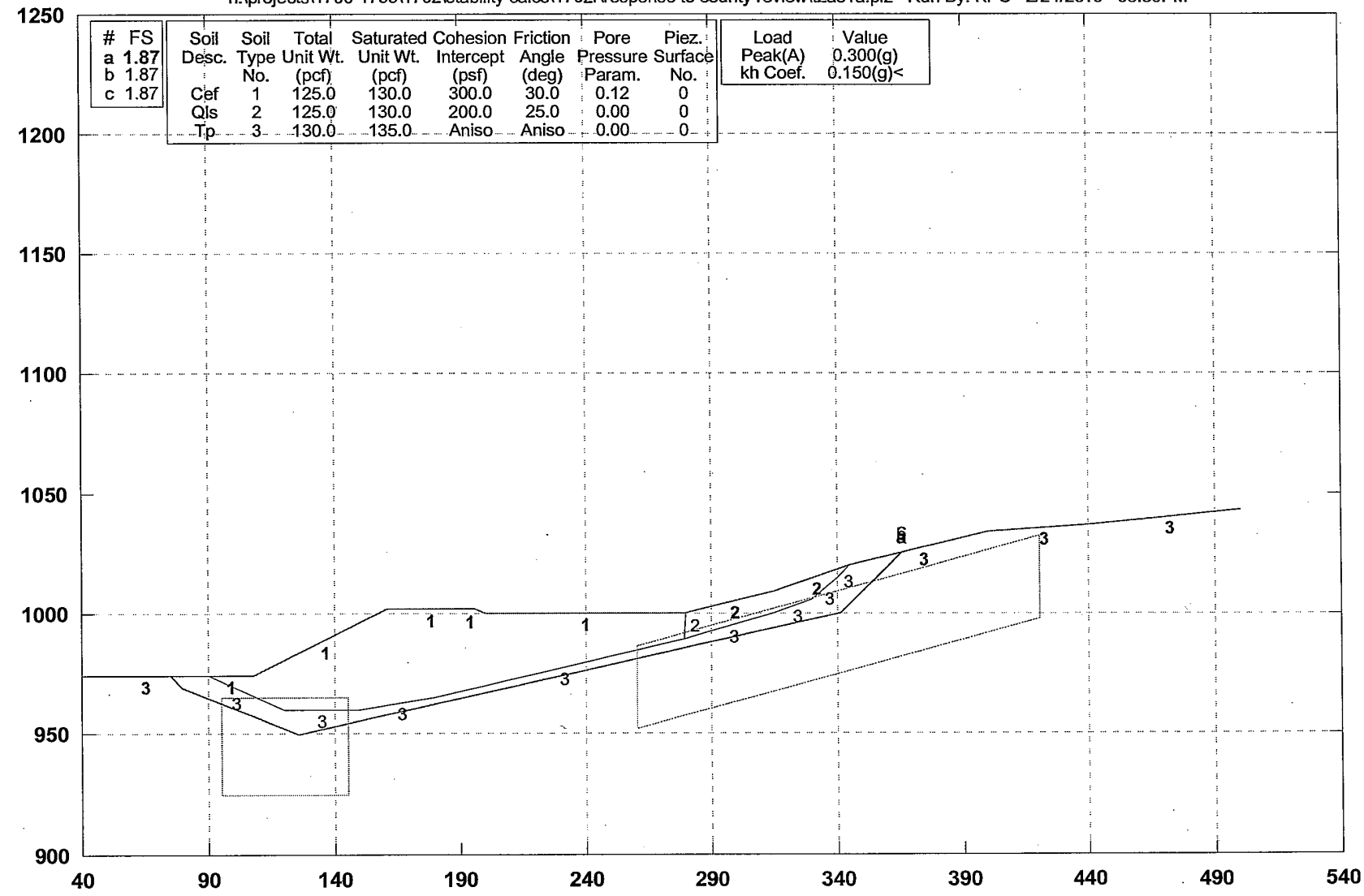
*** FOS = 3.096 Theta (ki=1.0) = 7.97 ***
Lambda = 0.140
Individual data on the 18 slices

| Slice No. | Width (ft) | Weight (lbs) | Water Force Top (lbs) | Water Force Bot (lbs) | Tie Force Norm (lbs) | Tie Force Tan (lbs) | Earthquake Force Hor (lbs) | Earthquake Force Ver (lbs) | Surcharge Load (lbs) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 4.8 | 1513.8 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 2 | 10.3 | 9413.9 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 3 | 18.0 | 30394.1 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 4 | 12.0 | 34701.6 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 5 | 5.6 | 22241.2 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 6 | 24.4 | 115331.2 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 7 | 11.0 | 59015.4 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 8 | 19.0 | 100388.8 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 9 | 16.0 | 76286.8 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 10 | 4.0 | 17401.2 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 11 | 79.0 | 237861.8 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 12 | 1.0 | 1840.6 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 13 | 35.0 | 65870.8 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 14 | 15.0 | 31022.1 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 15 | 10.0 | 22976.2 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 16 | 1.0 | 2515.7 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 17 | 4.0 | 8912.1 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 18 | 20.7 | 21569.1 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |

# TT 53108, 2A-2A'; QlsXVIB; pseudo; planar below R&R

n:\projects\1700-1799\1702\stability calcs\1702r\response to county review\t2as1a.pl2 Run By: KPC 2/24/2010 03:59PM




| # | FS |
|---|---|
| a | 1.87 |
| b | 1.87 |
| c | 1.87 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Piez. Surface No. |
|---|---|---|---|---|---|---|---|
| Cef | 1 | 125.0 | 130.0 | 300.0 | 30.0 | 0.12 | 0 |
| Qls | 2 | 125.0 | 130.0 | 200.0 | 25.0 | 0.00 | 0 |
| Tp | 3 | 130.0 | 135.0 | Aniso | Aniso | 0.00 | 0 |

| Load | Value |
|---|---|
| Peak(A) | 0.300(g) |
| kh Coef. | 0.150(g)< |

**GSTABL7 v.2 FSmin=1.87**

**Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2)**

GSTABL7

RUN NO. 3

```
                    *** GSTABL7 ***
               ** GSTABL7 by Garry H. Gregory, P.E. **
   ** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **
             (All Rights Reserved-Unauthorized Use Prohibited)
 ************************************************************************
                  SLOPE STABILITY ANALYSIS SYSTEM
      Modified Bishop, Simplified Janbu, or GLE Method of Slices.
      (Includes Spencer & Morgenstern-Price Type Analysis)
      Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
      Nonlinear Undrained Shear Strength, Curved Phi Envelope,
      Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
      Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
 ************************************************************************
  Analysis Run Date:        2/24/2010
  Time of Run:              03:59PM
  Run By:                   KPC
  Input Data Filename:      N:\Projects\1700-1799\1702\Stability Calcs\1702R\Response to
County Review\t2as1a.in
  Output Filename:          N:\Projects\1700-1799\1702\Stability Calcs\1702R\Response to
County Review\t2as1a.OUT
  Unit System:              English
  Plotted Output Filename:  N:\Projects\1700-1799\1702\Stabi Calcs\1702R\Response to County
Review\t2as1a.PLT
  PROBLEM DESCRIPTION:  TT 53108, 2A-2A'; QlsXVIB;
                        pseudo; planar below R&R
  BOUNDARY COORDINATES
     11 Top   Boundaries
     20 Total Boundaries
  Boundary     X-Left      Y-Left     X-Right     Y-Right     Soil Type
     No.        (ft)        (ft)       (ft)        (ft)      Below Bnd
      1         40.00      974.00      90.00      974.00        3
      2         90.00      974.00     108.00      974.00        1
      3        108.00      974.00     161.00     1002.00        1
      4        161.00     1002.00     196.00     1002.00        1
      5        196.00     1002.00     200.00     1000.00        1
      6        200.00     1000.00     280.00     1000.00        1
      7        280.00     1000.00     315.00     1009.00        2
      8        315.00     1009.00     345.00     1020.00        2
      9        345.00     1020.00     400.00     1034.00        3
     10        400.00     1034.00     440.00     1037.00        3
     11        440.00     1037.00     500.00     1043.00        3
     12         90.00      974.00     120.00      960.00        3
     13        120.00      960.00     150.00      960.00        3
     14        150.00      960.00     180.00      965.00        3
     15        180.00      965.00     279.00      989.00        3
     16        279.00      989.00     280.00     1000.00        2
     17        279.00      989.00     315.00     1000.00        3
     18        315.00     1000.00     330.00     1006.00        3
     19        330.00     1006.00     340.00     1015.00        3
     20        340.00     1015.00     345.00     1020.00        3
  User Specified Y-Origin =       900.00(ft)
  Default X-Plus Value = 0.00(ft)
  Default Y-Plus Value = 0.00(ft)
 ISOTROPIC SOIL PARAMETERS
   3 Type(s) of Soil
  Soil  Total  Saturated  Cohesion Friction   Pore    Pressure   Piez.
  Type Unit Wt. Unit Wt. Intercept  Angle  Pressure Constant Surface
   No.  (pcf)    (pcf)     (psf)     (deg)   Param.    (psf)     No.
    1   125.0    130.0     300.0     30.0    0.12      0.0       0
    2   125.0    130.0     200.0     25.0    0.00      0.0       0
    3   130.0    135.0     500.0     36.0    0.00      0.0       0
 ANISOTROPIC STRENGTH PARAMETERS
     1 soil type(s)
  Soil Type  3 Is Anisotropic
  Number Of Direction Ranges Specified =  3
  Direction     Counterclockwise     Cohesion      Friction
    Range       Direction Limit     Intercept       Angle
```

| No. | (deg) | (psf) | (deg) |
|---|---|---|---|
| 1 | 13.0 | 500.00 | 36.00 |
| 2 | 17.0 | 200.00 | 20.00 |
| 3 | 90.0 | 500.00 | 36.00 |

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

Specified Peak Ground Acceleration Coefficient (A) = 0.300(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
2500 Trial Surfaces Have Been Generated.
2 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 50.0

| Box No. | X-Left (ft) | Y-Left (ft) | X-Right (ft) | Y-Right (ft) | Height (ft) |
|---|---|---|---|---|---|
| 1 | 95.00 | 945.00 | 145.00 | 945.00 | 40.00 |
| 2 | 260.00 | 969.00 | 420.00 | 1015.00 | 35.00 |

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Evaluated. They Are Ordered - Most Critical First.
* * Safety Factors Are Calculated By GLE (Spencer's) Method (0-2) * *
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
The option of no water in the tension crack on the last slice has been selected.
Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces (if applicable) have been applied to the slice base(s) on which they intersect.
Total Number of Trial Surfaces Evaluated = 2500
WARNING! The Factor of Safety Calculation for one or More Trial Surfaces Did Not Converge in 20 Iterations.
Number of Trial Surfaces with Non-Converged FS = 323
Number of Trial Surfaces with Misleading FS = 18
Percentage of Trial Surfaces With Non-Valid FS Solutions of the Total Evaluated = 13.6 %
Statistical Data On All Valid FS Values:
FS Max = 4.667 FS Min = 1.865 FS Ave = 2.910
Standard Deviation = 0.578 Coefficient of Variation = 19.86 %
((Simplified Janbu FS for Critical Surface = 1.697))
Failure Surface Specified By 5 Coordinate Points

| Point No. | X-Surf (ft) | Y-Surf (ft) |
|---|---|---|
| 1 | 74.90 | 974.00 |
| 2 | 79.72 | 969.17 |
| 3 | 125.62 | 949.35 |
| 4 | 341.04 | 999.85 |
| 5 | 365.66 | 1025.26 |

*** FOS = 1.865 Theta (ki=1.0) = 6.76 ***
Lambda = 0.119
Individual data on the 18 slices

| Slice No. | Width (ft) | Weight (lbs) | Water Force Top (lbs) | Water Force Bot (lbs) | Tie Force Norm (lbs) | Tie Force Tan (lbs) | Earthquake Force Hor (lbs) | Earthquake Force Ver (lbs) | Surcharge Load (lbs) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 4.8 | 1513.8 | 0.0 | 0.0 | 0. | 0. | 227.1 | 0.0 | 0.0 |
| 2 | 10.3 | 9413.9 | 0.0 | 0.0 | 0. | 0. | 1412.1 | 0.0 | 0.0 |
| 3 | 18.0 | 30394.1 | 0.0 | 0.0 | 0. | 0. | 4559.1 | 0.0 | 0.0 |

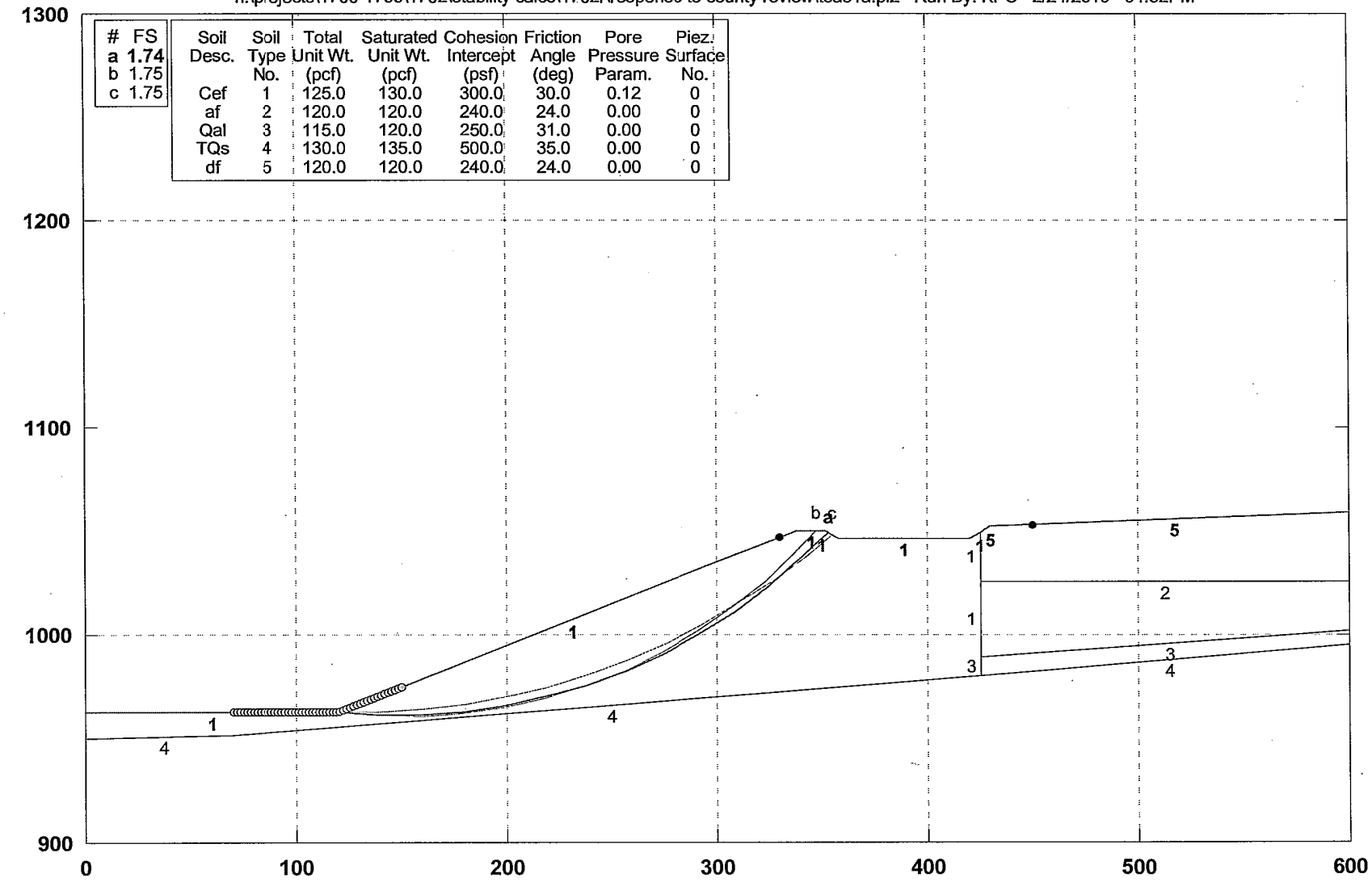
| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 4 | 12.0 | 34701.6 | 0.0 | 0.0 | 0. | 0. | 5205.2 | 0.0 | 0.0 |
| 5 | 5.6 | 22241.2 | 0.0 | 0.0 | 0. | 0. | 3336.2 | 0.0 | 0.0 |
| 6 | 24.4 | 115331.2 | 0.0 | 0.0 | 0. | 0. | 17299.7 | 0.0 | 0.0 |
| 7 | 11.0 | 59015.4 | 0.0 | 0.0 | 0. | 0. | 8852.3 | 0.0 | 0.0 |
| 8 | 19.0 | 100388.8 | 0.0 | 0.0 | 0. | 0. | 15058.3 | 0.0 | 0.0 |
| 9 | 16.0 | 76286.8 | 0.0 | 0.0 | 0. | 0. | 11443.0 | 0.0 | 0.0 |
| 10 | 4.0 | 17401.2 | 0.0 | 0.0 | 0. | 0. | 2610.2 | 0.0 | 0.0 |
| 11 | 79.0 | 237861.8 | 0.0 | 0.0 | 0. | 0. | 35679.3 | 0.0 | 0.0 |
| 12 | 1.0 | 1840.6 | 0.0 | 0.0 | 0. | 0. | 276.1 | 0.0 | 0.0 |
| 13 | 35.0 | 65870.8 | 0.0 | 0.0 | 0. | 0. | 9880.6 | 0.0 | 0.0 |
| 14 | 15.0 | 31022.1 | 0.0 | 0.0 | 0. | 0. | 4653.3 | 0.0 | 0.0 |
| 15 | 10.0 | 22976.2 | 0.0 | 0.0 | 0. | 0. | 3446.4 | 0.0 | 0.0 |
| 16 | 1.0 | 2515.7 | 0.0 | 0.0 | 0. | 0. | 377.4 | 0.0 | 0.0 |
| 17 | 4.0 | 8912.1 | 0.0 | 0.0 | 0. | 0. | 1336.8 | 0.0 | 0.0 |
| 18 | 20.7 | 21569.1 | 0.0 | 0.0 | 0. | 0. | 3235.4 | 0.0 | 0.0 |

# TT 53108, 3A-3A'; fill slope; static; circular

n:\projects\1700-1799\1702\stability calcs\1702r\response to county review\t3as1a.pl2 Run By: KPC 2/24/2010 04:52PM

| # | FS |
|---|---|
| a | 1.74 |
| b | 1.75 |
| c | 1.75 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Piez. Surface No. |
|---|---|---|---|---|---|---|---|
| Cef | 1 | 125.0 | 130.0 | 300.0 | 30.0 | 0.12 | 0 |
| af | 2 | 120.0 | 120.0 | 240.0 | 24.0 | 0.00 | 0 |
| Qal | 3 | 115.0 | 120.0 | 250.0 | 31.0 | 0.00 | 0 |
| TQs | 4 | 130.0 | 135.0 | 500.0 | 35.0 | 0.00 | 0 |
| df | 5 | 120.0 | 120.0 | 240.0 | 24.0 | 0.00 | 0 |




GSTABL7 v.2 FSmin=1.74

Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2)

GSTABL7

RUN #4

```
                    *** GSTABL7 ***
                ** GSTABL7 by Garry H. Gregory, P.E. **
      ** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **
                (All Rights Reserved-Unauthorized Use Prohibited)
  ************************************************************************
                    SLOPE STABILITY ANALYSIS SYSTEM
        Modified Bishop, Simplified Janbu, or GLE Method of Slices.
        (Includes Spencer & Morgenstern-Price Type Analysis)
        Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
        Nonlinear Undrained Shear Strength, Curved Phi Envelope,
        Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
        Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
  ************************************************************************
   Analysis Run Date:        2/24/2010
   Time of Run:              04:52PM
   Run By:                   KPC
   Input Data Filename:      N:\Projects\1700-1799\1702\Stability Calcs\1702R\Response to
County Review\t3as1a.in
   Output Filename:          N:\Projects\1700-1799\1702\Stability Calcs\1702R\Response to
County Review\t3as1a.OUT
   Unit System:              English
   Plotted Output Filename:  N:\Projects\1700-1799\1702\Stabi Calcs\1702R\Response to County
Review\t3as1a.PLT
   PROBLEM DESCRIPTION:  TT 53108, 3A-3A'; fill slope; static;
                         circular
   BOUNDARY COORDINATES
      8 Top   Boundaries
     16 Total Boundaries
   Boundary     X-Left      Y-Left     X-Right     Y-Right     Soil Type
     No.         (ft)        (ft)        (ft)        (ft)     Below Bnd
      1          0.00      963.00      120.00      963.00         1
      2        120.00      963.00      338.00     1050.00         1
      3        338.00     1050.00      352.00     1050.00         1
      4        352.00     1050.00      358.00     1046.00         1
      5        358.00     1046.00      420.00     1046.00         1
      6        420.00     1046.00      425.00     1049.00         1
      7        425.00     1049.00      430.00     1052.00         5
      8        430.00     1052.00      600.00     1059.00         5
      9        425.00     1049.00      425.10     1025.00         1
     10        425.10     1025.00      600.00     1025.00         2
     11        425.10     1025.00      425.20      989.00         1
     12        425.20      989.00      600.00     1002.00         3
     13        425.20      989.00      425.30      980.00         3
     14        425.30      980.00      600.00      995.00         4
     15          0.00      950.00       70.00      952.00         4
     16         70.00      952.00      425.30      980.00         4
   User Specified Y-Origin =       900.00(ft)
   Default X-Plus Value = 0.00(ft)
   Default Y-Plus Value = 0.00(ft)
  ISOTROPIC SOIL PARAMETERS
    5 Type(s) of Soil
   Soil  Total  Saturated  Cohesion Friction   Pore   Pressure   Piez.
   Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant Surface
    No.  (pcf)    (pcf)     (psf)     (deg)   Param.    (psf)     No.
     1   125.0    130.0     300.0     30.0    0.12       0.0       0
     2   120.0    120.0     240.0     24.0    0.00       0.0       0
     3   115.0    120.0     250.0     31.0    0.00       0.0       0
     4   130.0    135.0     500.0     35.0    0.00       0.0       0
     5   120.0    120.0     240.0     24.0    0.00       0.0       0
   A Critical Failure Surface Searching Method, Using A Random
   Technique For Generating Circular Surfaces, Has Been Specified.
   2500 Trial Surfaces Have Been Generated.
     50 Surface(s) Initiate(s) From Each Of    50 Points Equally Spaced
   Along The Ground Surface Between  X =  70.00(ft)
                                 and  X = 150.00(ft)
   Each Surface Terminates Between   X = 330.00(ft)
                                 and   X = 450.00(ft)
```

```
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is  Y =       0.00(ft)
20.00(ft) Line Segments Define Each Trial Failure Surface.
Restrictions Have Been Imposed Upon The Angle Of Initiation.
The Angle Has Been Restricted Between The Angles Of -45.0
And  25.0 deg.
      Following Are Displayed The Ten Most Critical Of The Trial
      Failure Surfaces Evaluated. They Are
      Ordered - Most Critical First.
      * * Safety Factors Are Calculated By GLE (Spencer's) Method (0-2) * *
      Selected ki function = Bi-linear
      Selected Lambda Coefficient =  1.00
      The option of no water in the tension crack on
      the last slice has been selected.
      Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces
      (if applicable) have been applied to the slice base(s)
      on which they intersect.
      Total Number of Trial Surfaces Evaluated =  2500
      WARNING! The Factor of Safety Calculation for one or More Trial Surfaces
      Did Not Converge in 20 Iterations.
      Number of Trial Surfaces with Non-Converged FS =   17
      Percentage of Trial Surfaces With Non-Valid FS Solutions
      of the Total Evaluated =   0.7 %
      Statistical Data On All Valid FS Values:
         FS Max =  26.535   FS Min =   1.743   FS Ave =   3.254
         Standard Deviation =    0.957   Coefficient of Variation =   29.40 %
                 ((Modified Bishop FS for Critical Surface =  1.743))
      Failure Surface Specified By 14 Coordinate Points
        Point      X-Surf      Y-Surf
        No.         (ft)        (ft)
          1        118.98      963.00
          2        138.93      961.61
          3        158.93      961.64
          4        178.88      963.09
          5        198.67      965.94
          6        218.22      970.18
          7        237.41      975.80
          8        256.16      982.76
          9        274.37      991.03
         10        291.95     1000.57
         11        308.81     1011.33
         12        324.87     1023.25
         13        340.04     1036.28
         14        353.13     1049.24
      Circle Center At X =   148.55 ; Y =  1243.70 ; and Radius =   282.25
      ***  FOS =     1.743   Theta (ki=1.0) =    19.27  ***
                          Lambda =   0.350
```

Individual data on the 16 slices

| Slice No. | Width (ft) | Weight (lbs) | Water Force Top (lbs) | Water Force Bot (lbs) | Tie Force Norm (lbs) | Tie Force Tan (lbs) | Earthquake Force Hor (lbs) | Earthquake Force Ver (lbs) | Surcharge Load (lbs) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 1.0 | 4.5 | 0.0 | 0.5 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 2 | 18.9 | 10663.7 | 0.0 | 1282.7 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 3 | 20.0 | 32294.9 | 0.0 | 3875.4 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 4 | 19.9 | 50250.8 | 0.0 | 6045.9 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 5 | 19.8 | 64176.7 | 0.0 | 7780.7 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 6 | 19.5 | 73870.5 | 0.0 | 9071.2 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 7 | 19.2 | 79265.6 | 0.0 | 9910.8 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 8 | 18.7 | 80430.2 | 0.0 | 10295.4 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 9 | 18.2 | 77566.9 | 0.0 | 10223.1 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 10 | 17.6 | 71005.9 | 0.0 | 9694.2 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 11 | 16.9 | 61197.1 | 0.0 | 8711.3 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 12 | 16.1 | 48701.1 | 0.0 | 7279.4 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 13 | 13.1 | 30346.4 | 0.0 | 4800.2 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 14 | 2.0 | 3724.3 | 0.0 | 589.1 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 15 | 12.0 | 11654.9 | 0.0 | 1969.1 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 16 | 1.1 | 132.9 | 0.0 | 22.4 | 0. | 0. | 0.0 | 0.0 | 0.0 |

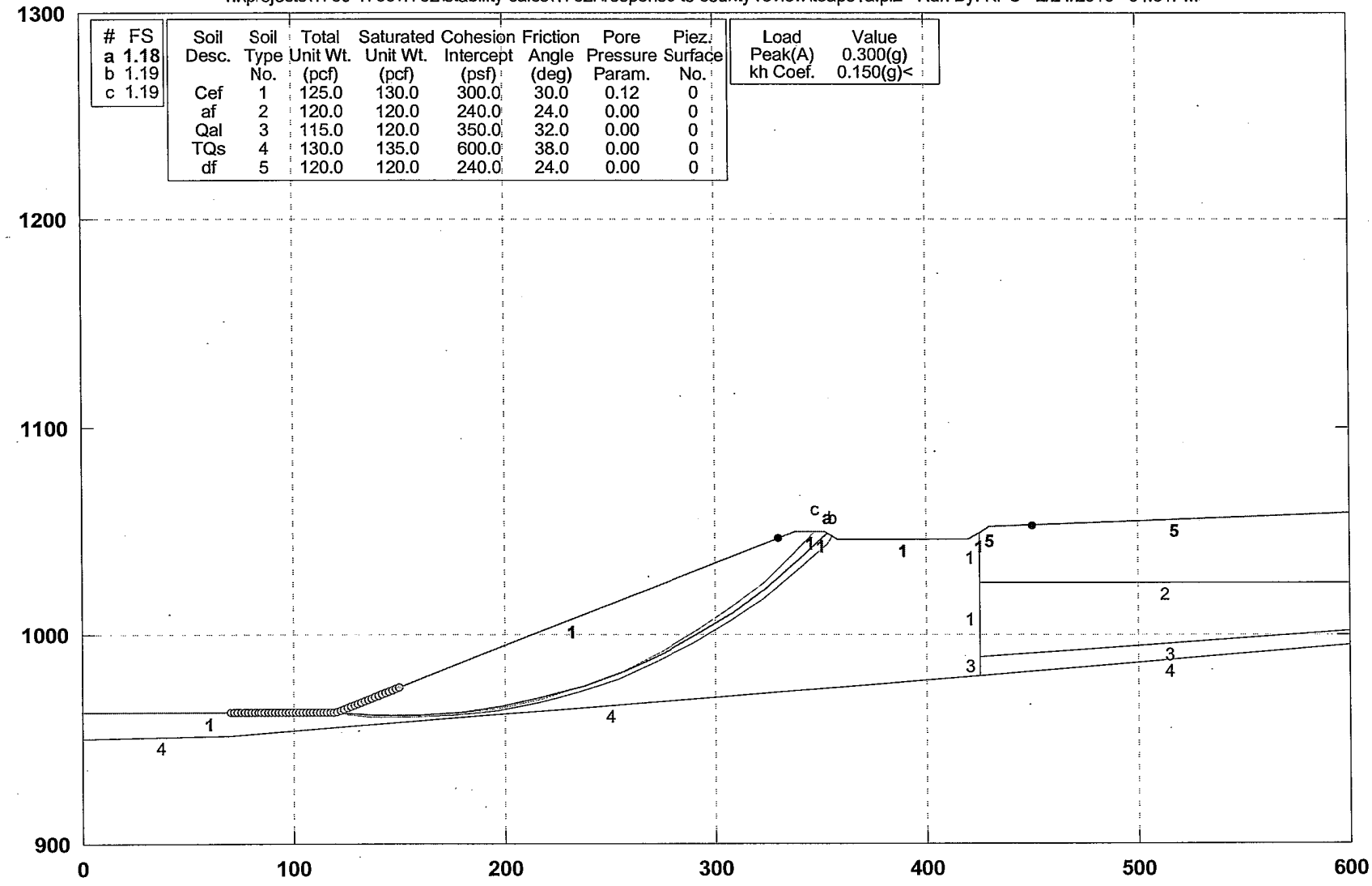
# TT 53108, 3A-3A'; fill slope; pseudo; circular

n:\projects\1700-1799\1702\stability calcs\1702r\response to county review\t3aps1a.pl2 Run By: KPC 2/24/2010 04:51PM

| # | FS |
|---|---|
| a | 1.18 |
| b | 1.19 |
| c | 1.19 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Piez. Surface No. |
|---|---|---|---|---|---|---|---|
| Cef | 1 | 125.0 | 130.0 | 300.0 | 30.0 | 0.12 | 0 |
| af | 2 | 120.0 | 120.0 | 240.0 | 24.0 | 0.00 | 0 |
| Qal | 3 | 115.0 | 120.0 | 350.0 | 32.0 | 0.00 | 0 |
| TQs | 4 | 130.0 | 135.0 | 600.0 | 38.0 | 0.00 | 0 |
| df | 5 | 120.0 | 120.0 | 240.0 | 24.0 | 0.00 | 0 |

| Load | Value |
|---|---|
| Peak(A) | 0.300(g) |
| kh Coef. | 0.150(g)< |




GSTABL7 v.2 FSmin=1.18

Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2)

GSTABL7

RUN # 5

```
                              *** GSTABL7 ***
                        ** GSTABL7 by Garry H. Gregory, P.E. **
          ** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **
                      (All Rights Reserved-Unauthorized Use Prohibited)
     ********************************************************************************
                          SLOPE STABILITY ANALYSIS SYSTEM
               Modified Bishop, Simplified Janbu, or GLE Method of Slices.
               (Includes Spencer & Morgenstern-Price Type Analysis)
               Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
               Nonlinear Undrained Shear Strength, Curved Phi Envelope,
               Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
               Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
     ********************************************************************************
     Analysis Run Date:        2/24/2010
     Time of Run:              04:51PM
     Run By:                   KPC
     Input Data Filename:      N:\Projects\1700-1799\1702\Stability Calcs\1702R\Response to
County Review\t3apsla.in
     Output Filename:          N:\Projects\1700-1799\1702\Stability Calcs\1702R\Response to
County Review\t3apsla.OUT
     Unit System:              English
     Plotted Output Filename:  N:\Projects\1700-1799\1702\Stabi Calcs\1702R\Response to County
Review\t3apsla.PLT
     PROBLEM DESCRIPTION:  TT 53108, 3A-3A'; fill slope; pseudo;
                           circular
     BOUNDARY COORDINATES
         8 Top   Boundaries
        16 Total Boundaries
     Boundary     X-Left     Y-Left    X-Right    Y-Right    Soil Type
        No.        (ft)       (ft)       (ft)       (ft)    Below Bnd
         1          0.00     963.00     120.00     963.00        1
         2        120.00     963.00     338.00    1050.00        1
         3        338.00    1050.00     352.00    1050.00        1
         4        352.00    1050.00     358.00    1046.00        1
         5        358.00    1046.00     420.00    1046.00        1
         6        420.00    1046.00     425.00    1049.00        1
         7        425.00    1049.00     430.00    1052.00        5
         8        430.00    1052.00     600.00    1059.00        5
         9        425.00    1049.00     425.10    1025.00        1
        10        425.10    1025.00     600.00    1025.00        2
        11        425.10    1025.00     425.20     989.00        1
        12        425.20     989.00     600.00    1002.00        3
        13        425.20     989.00     425.30     980.00        3
        14        425.30     980.00     600.00     995.00        4
        15          0.00     950.00      70.00     952.00        4
        16         70.00     952.00     425.30     980.00        4
     User Specified Y-Origin =       900.00(ft)
     Default X-Plus Value = 0.00(ft)
     Default Y-Plus Value = 0.00(ft)
    ISOTROPIC SOIL PARAMETERS
      5 Type(s) of Soil
     Soil  Total  Saturated  Cohesion Friction   Pore   Pressure   Piez.
     Type Unit Wt. Unit Wt. Intercept  Angle  Pressure Constant Surface
      No.  (pcf)    (pcf)     (psf)    (deg)   Param.    (psf)     No.
       1   125.0    130.0     300.0     30.0    0.12       0.0       0
       2   120.0    120.0     240.0     24.0    0.00       0.0       0
       3   115.0    120.0     350.0     32.0    0.00       0.0       0
       4   130.0    135.0     600.0     38.0    0.00       0.0       0
       5   120.0    120.0     240.0     24.0    0.00       0.0       0
     Specified Peak Ground Acceleration Coefficient (A) =   0.300(g)
     Specified Horizontal Earthquake Coefficient (kh) =   0.150(g)
     Specified Vertical Earthquake Coefficient (kv) =   0.000(g)
     Specified Seismic Pore-Pressure Factor =   0.000
     A Critical Failure Surface Searching Method, Using A Random
     Technique For Generating Circular Surfaces, Has Been Specified.
     2500 Trial Surfaces Have Been Generated.
       50 Surface(s) Initiate(s) From Each Of    50 Points Equally Spaced
```

```
Along The Ground Surface Between  X =  70.00(ft)
                            and  X = 150.00(ft)
Each Surface Terminates Between   X = 330.00(ft)
                            and   X = 450.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is  Y =      0.00(ft)
20.00(ft) Line Segments Define Each Trial Failure Surface.
Restrictions Have Been Imposed Upon The Angle Of Initiation.
The Angle Has Been Restricted Between The Angles Of -45.0
And  25.0 deg.

      Following Are Displayed The Ten Most Critical Of The Trial
      Failure Surfaces Evaluated. They Are
      Ordered - Most Critical First.
      * * Safety Factors Are Calculated By GLE (Spencer's) Method (0-2) * *
      Selected ki function = Bi-linear
      Selected Lambda Coefficient =  1.00
      The option of no water in the tension crack on
      the last slice has been selected.
      Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces
      (if applicable) have been applied to the slice base(s)
      on which they intersect.
      Total Number of Trial Surfaces Evaluated =  2500
      WARNING! The Factor of Safety Calculation for one or More Trial Surfaces
      Did Not Converge in 20 Iterations.
      Number of Trial Surfaces with Non-Converged FS =   17
      Percentage of Trial Surfaces With Non-Valid FS Solutions
      of the Total Evaluated =  0.7 %
      Statistical Data On All Valid FS Values:
         FS Max =  10.720   FS Min =   1.184   FS Ave =   2.188
         Standard Deviation =    0.534   Coefficient of Variation =   24.41 %
                 ((Modified Bishop FS for Critical Surface =  1.203))
      Failure Surface Specified By 14 Coordinate Points
        Point      X-Surf      Y-Surf
        No.         (ft)        (ft)
          1        118.98      963.00
          2        138.93      961.61
          3        158.93      961.64
          4        178.88      963.09
          5        198.67      965.94
          6        218.22      970.18
          7        237.41      975.80
          8        256.16      982.76
          9        274.37      991.03
         10        291.95     1000.57
         11        308.81     1011.33
         12        324.87     1023.25
         13        340.04     1036.28
         14        353.13     1049.24
      Circle Center At X =   148.55 ; Y =  1243.70 ; and Radius =   282.25
      ***  FOS =    1.184   Theta (ki=1.0) =    18.60  ***
                         Lambda =   0.337
```

Individual data on the 16 slices

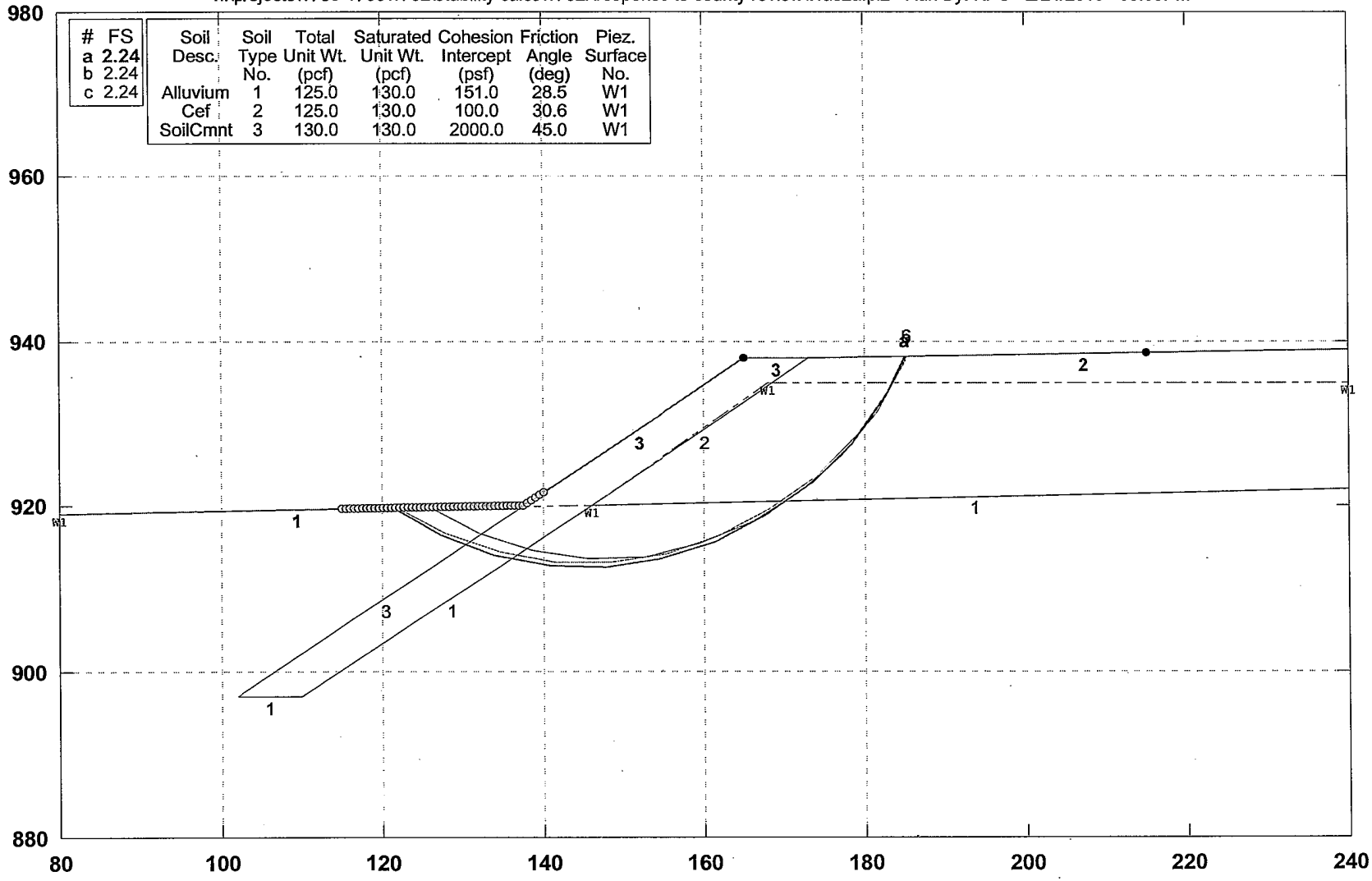
| Slice No. | Width (ft) | Weight (lbs) | Water Force Top (lbs) | Water Force Bot (lbs) | Tie Force Norm (lbs) | Tie Force Tan (lbs) | Earthquake Force Hor (lbs) | Earthquake Force Ver (lbs) | Surcharge Load (lbs) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 1.0 | 4.5 | 0.0 | 0.5 | 0. | 0. | 0.7 | 0.0 | 0.0 |
| 2 | 19.9 | 10663.7 | 0.0 | 1282.7 | 0. | 0. | 1599.6 | 0.0 | 0.0 |
| 3 | 20.0 | 32294.9 | 0.0 | 3875.4 | 0. | 0. | 4844.2 | 0.0 | 0.0 |
| 4 | 19.9 | 50250.8 | 0.0 | 6045.9 | 0. | 0. | 7537.6 | 0.0 | 0.0 |
| 5 | 19.8 | 64176.7 | 0.0 | 7780.7 | 0. | 0. | 9626.5 | 0.0 | 0.0 |
| 6 | 19.5 | 73870.5 | 0.0 | 9071.2 | 0. | 0. | 11080.6 | 0.0 | 0.0 |
| 7 | 19.2 | 79265.6 | 0.0 | 9910.8 | 0. | 0. | 11889.8 | 0.0 | 0.0 |
| 8 | 18.7 | 80430.2 | 0.0 | 10295.4 | 0. | 0. | 12064.5 | 0.0 | 0.0 |
| 9 | 18.2 | 77566.9 | 0.0 | 10223.1 | 0. | 0. | 11635.0 | 0.0 | 0.0 |
| 10 | 17.6 | 71005.9 | 0.0 | 9694.2 | 0. | 0. | 10650.9 | 0.0 | 0.0 |
| 11 | 16.9 | 61197.1 | 0.0 | 8711.3 | 0. | 0. | 9179.6 | 0.0 | 0.0 |
| 12 | 16.1 | 48701.1 | 0.0 | 7279.4 | 0. | 0. | 7305.2 | 0.0 | 0.0 |
| 13 | 13.1 | 30346.4 | 0.0 | 4800.2 | 0. | 0. | 4552.0 | 0.0 | 0.0 |
| 14 | 2.0 | 3724.3 | 0.0 | 589.1 | 0. | 0. | 558.7 | 0.0 | 0.0 |
| 15 | 12.0 | 11654.9 | 0.0 | 1968.1 | 0. | 0. | 1748.2 | 0.0 | 0.0 |
| 16 | 1.1 | 132.9 | 0.0 | 22.4 | 0. | 0. | 19.9 | 0.0 | 0.0 |

# Lndmrk Village Bank Pro.; 4A-4A'; rapid drawdown; static; circular

n:\projects\1700-1799\1702\stability calcs\1702r\response to county review\t4as2a.pl2 Run By: KPC 2/24/2010 05:09PM

| # | FS |
|---|---|
| a | 2.24 |
| b | 2.24 |
| c | 2.24 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Alluvium | 1 | 125.0 | 130.0 | 151.0 | 28.5 | W1 |
| Cef | 2 | 125.0 | 130.0 | 100.0 | 30.6 | W1 |
| SoilCmnt | 3 | 130.0 | 130.0 | 2000.0 | 45.0 | W1 |




GSTABL7 v.2 FSmin=2.24

Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2)

GSTABL7

Run #6

```
                    *** GSTABL7 ***
                ** GSTABL7 by Garry H. Gregory, P.E. **
      ** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **
                (All Rights Reserved-Unauthorized Use Prohibited)
   ************************************************************************
                    SLOPE STABILITY ANALYSIS SYSTEM
         Modified Bishop, Simplified Janbu, or GLE Method of Slices.
         (Includes Spencer & Morgenstern-Price Type Analysis)
         Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
         Nonlinear Undrained Shear Strength, Curved Phi Envelope,
         Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
         Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
   ************************************************************************
    Analysis Run Date:        2/24/2010
    Time of Run:              05:09PM
    Run By:                   KPC
    Input Data Filename:      n:\Projects\1700-1799\1702\Stability Calcs\1702R\Response to
County Review\t4as2a.in
    Output Filename:          n:\Projects\1700-1799\1702\Stability Calcs\1702R\Response to
County Review\t4as2a.OUT
    Unit System:              English
    Plotted Output Filename:  n:\Projects\1700-1799\1702\Stabi Calcs\1702R\Response to County
Review\t4as2a.PLT
    PROBLEM DESCRIPTION:  Lndmrk Village Bank Pro.; 4A-4A';
                          rapid drawdown; static; circular
    BOUNDARY COORDINATES
        4 Top   Boundaries
        9 Total Boundaries
    Boundary     X-Left      Y-Left     X-Right     Y-Right     Soil Type
       No.        (ft)        (ft)        (ft)        (ft)     Below Bnd
        1        80.00      919.00      137.50      920.00         1
        2       137.50      920.00      165.00      938.00         3
        3       165.00      938.00      173.00      938.00         3
        4       173.00      938.00      240.00      939.00         2
        5       102.00      897.00      137.50      920.00         3
        6       102.00      897.00      110.00      897.00         1
        7       110.00      897.00      146.00      920.00         1
        8       146.00      920.00      173.00      938.00         2
        9       146.00      920.00      240.00      922.00         1
    User Specified Y-Origin =       880.00(ft)
    Default X-Plus Value = 0.00(ft)
    Default Y-Plus Value = 0.00(ft)
   ISOTROPIC SOIL PARAMETERS
     3 Type(s) of Soil
    Soil  Total  Saturated  Cohesion Friction   Pore   Pressure   Piez.
    Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant Surface
     No.  (pcf)    (pcf)     (psf)     (deg)   Param.    (psf)     No.
      1   125.0    130.0     151.0     28.5    0.00       0.0      1
      2   125.0    130.0     100.0     30.6    0.00       0.0      1
      3   130.0    130.0    2000.0     45.0    0.00       0.0      1
    1 PIEZOMETRIC SURFACE(S) SPECIFIED
    Unit Weight of Water =  62.40 (pcf)
    Piezometric Surface No.  1 Specified by  4 Coordinate Points
    Pore Pressure Inclination Factor =  0.50
      Point      X-Water     Y-Water
       No.         (ft)        (ft)
        1         80.00      918.90
        2        146.00      920.00
        3        168.00      935.00
        4        240.00      935.00
    A Critical Failure Surface Searching Method, Using A Random
    Technique For Generating Circular Surfaces, Has Been Specified.
    2500 Trial Surfaces Have Been Generated.
      50 Surface(s) Initiate(s) From Each Of    50 Points Equally Spaced
    Along The Ground Surface Between  X = 115.00(ft)
                                  and  X = 140.00(ft)
    Each Surface Terminates Between   X = 165.00(ft)
```

and X = 215.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00(ft)
7.00(ft) Line Segments Define Each Trial Failure Surface.
Restrictions Have Been Imposed Upon The Angle Of Initiation.
The Angle Has Been Restricted Between The Angles Of -35.0
And 25.0 deg.
Factor Of Safety Calculation By GLE (Spencer's) Method of Slices
Has Gone Through 20 Iterations

| Theta (deg) (ki=1.0) | FOS (Moment) (Equil.) | FOS (Force) (Equil.) | Lambda |
|---|---|---|---|
| 15.00 | 3.396 | 4.189 | 0.268 |
| 22.50 | 3.152 | 4.634 | 0.414 |
| 3.50 | 3.591 | 3.706 | 0.061 |
| 0.00 | 3.622 | 3.589 | 0.000 |
| 0.00 | 3.622 | 3.589 | 0.000 |
| 12.49 | 3.453 | 4.068 | 0.222 |
| 0.86 | 3.615 | 3.617 | 0.015 |
| 0.00 | 3.622 | 3.589 | 0.000 |
| 0.82 | 3.616 | 3.615 | 0.014 |
| 0.83 | 3.616 | 3.616 | 0.015 |
| 0.83 | 3.616 | 3.616 | 0.015 |
| 0.83 | 3.616 | 3.616 | 0.015 |
| 0.83 | 3.616 | 3.616 | 0.015 |
| 0.83 | 3.616 | 3.616 | 0.015 |
| 0.83 | 3.616 | 3.616 | 0.015 |
| 0.83 | 3.616 | 3.616 | 0.015 |
| 0.83 | 3.616 | 3.616 | 0.015 |
| 0.83 | 3.616 | 3.616 | 0.015 |
| 0.83 | 3.616 | 3.616 | 0.015 |

##################### SOME LINES SKIPPED #####################
Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By GLE (Spencer's) Method (0-2) * *
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
The option of no water in the tension crack on
the last slice has been selected.
Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces
(if applicable) have been applied to the slice base(s)
on which they intersect.
Total Number of Trial Surfaces Evaluated = 2500
WARNING! The Factor of Safety Calculation for one or More Trial Surfaces
Did Not Converge in 20 Iterations.
Number of Trial Surfaces with Non-Converged FS = 117
Percentage of Trial Surfaces With Non-Valid FS Solutions
of the Total Evaluated = 4.7 %
Statistical Data On All Valid FS Values:
FS Max = 26.514 FS Min = 2.237 FS Ave = 2.861
Standard Deviation = 1.285 Coefficient of Variation = 44.92 %
((Modified Bishop FS for Critical Surface = 2.178))
Failure Surface Specified By 12 Coordinate Points

| Point No. | X-Surf (ft) | Y-Surf (ft) |
|---|---|---|
| 1 | 121.12 | 919.72 |
| 2 | 127.26 | 916.36 |
| 3 | 133.86 | 914.02 |
| 4 | 140.75 | 912.76 |
| 5 | 147.75 | 912.61 |
| 6 | 154.68 | 913.57 |
| 7 | 161.37 | 915.63 |
| 8 | 167.65 | 918.72 |
| 9 | 173.36 | 922.77 |
| 10 | 178.35 | 927.67 |

11 182.50 933.31
12 185.00 938.18
Circle Center At X = 145.16 ; Y = 956.29 ; and Radius = 43.77
*** FOS = 2.237 Theta (ki=1.0) = 12.53 ***
Lambda = 0.222
Individual data on the 23 slices

| Slice No. | Width (ft) | Weight (lbs) | Water Force Top (lbs) | Water Force Bot (lbs) | Tie Force Norm (lbs) | Tie Force Tan (lbs) | Earthquake Force Hor (lbs) | Earthquake Force Ver (lbs) | Surcharge Load (lbs) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.2 | 1.9 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 2 | 5.9 | 1377.4 | 0.0 | 700.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 3 | 3.0 | 1555.8 | 0.0 | 766.5 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 4 | 3.6 | 2463.6 | 0.0 | 1222.8 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 5 | 2.2 | 1718.8 | 0.0 | 820.2 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 6 | 1.3 | 1056.9 | 0.0 | 504.9 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 7 | 0.2 | 193.2 | 0.0 | 92.3 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 8 | 3.2 | 3380.9 | 0.0 | 1407.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 9 | 5.3 | 7608.5 | 0.0 | 2377.9 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 10 | 1.7 | 3055.4 | 0.0 | 730.6 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 11 | 6.9 | 14263.3 | 0.0 | 3845.5 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 12 | 6.7 | 16319.8 | 0.0 | 4997.9 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 13 | 3.6 | 9534.1 | 0.0 | 3227.2 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 14 | 2.7 | 6842.3 | 0.0 | 2459.4 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 15 | 0.3 | 864.1 | 0.0 | 359.8 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 16 | 0.5 | 1225.7 | 0.0 | 606.6 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 17 | 1.7 | 3954.1 | 0.0 | 1943.4 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 18 | 2.8 | 6006.2 | 0.0 | 2905.7 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 19 | 0.4 | 714.6 | 0.0 | 340.9 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 20 | 5.0 | 8245.5 | 0.0 | 4271.3 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 21 | 4.1 | 4044.3 | 0.0 | 1968.4 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 22 | 0.9 | 436.6 | 0.0 | 99.9 | 0. | 0. | 0.0 | 0.0 | 0.0 |
| 23 | 1.6 | 322.3 | 0.0 | 0.0 | 0. | 0. | 0.0 | 0.0 | 0.0 |

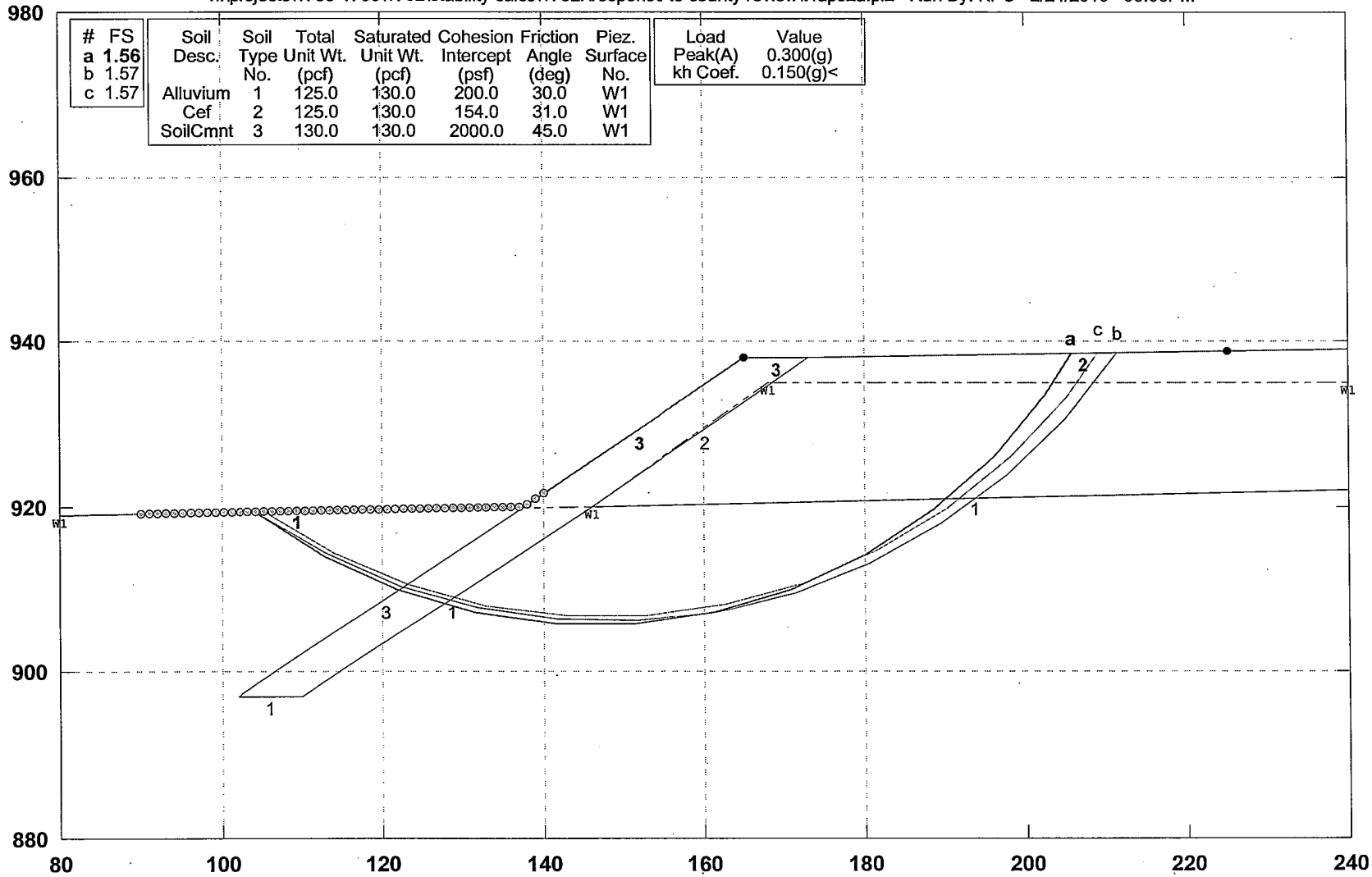
# Lndmrk Village Bank Pro.; 4A-4A'; rapid drawdown; pseudo; circular

n:\projects\1700-1799\1702\stability calcs\1702r\response to county review\t4aps2a.pl2 Run By: KPC 2/24/2010 05:06PM

| # | FS |
|---|---|
| a | 1.56 |
| b | 1.57 |
| c | 1.57 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Alluvium | 1 | 125.0 | 130.0 | 200.0 | 30.0 | W1 |
| Cef | 2 | 125.0 | 130.0 | 154.0 | 31.0 | W1 |
| SoilCmnt | 3 | 130.0 | 130.0 | 2000.0 | 45.0 | W1 |

| Load | Value |
|---|---|
| Peak(A) | 0.300(g) |
| kh Coef. | 0.150(g)< |




GSTABL7 v.2 FSmin=1.56

Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2)

GSTABL7

Run #7

```
                    *** GSTABL7 ***
                ** GSTABL7 by Garry H. Gregory, P.E. **
    ** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **
                (All Rights Reserved-Unauthorized Use Prohibited)
 ************************************************************************
                    SLOPE STABILITY ANALYSIS SYSTEM
        Modified Bishop, Simplified Janbu, or GLE Method of Slices.
        (Includes Spencer & Morgenstern-Price Type Analysis)
        Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
        Nonlinear Undrained Shear Strength, Curved Phi Envelope,
        Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
        Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
 ************************************************************************
 Analysis Run Date:        2/24/2010
 Time of Run:              05:06PM
 Run By:                   KPC
 Input Data Filename:      N:\Projects\1700-1799\1702\Stability Calcs\1702R\Response to
County Review\t4aps2a.in
 Output Filename:          N:\Projects\1700-1799\1702\Stability Calcs\1702R\Response to
County Review\t4aps2a.OUT
 Unit System:              English
 Plotted Output Filename:  N:\Projects\1700-1799\1702\Stabi Calcs\1702R\Response to County
Review\t4aps2a.PLT
 PROBLEM DESCRIPTION:  Lndmrk Village Bank Pro.; 4A-4A';
                       rapid drawdown; pseudo; circular
 BOUNDARY COORDINATES
    4 Top   Boundaries
    9 Total Boundaries
 Boundary     X-Left      Y-Left     X-Right     Y-Right     Soil Type
   No.         (ft)        (ft)        (ft)        (ft)     Below Bnd
    1         80.00      919.00      137.50      920.00         1
    2        137.50      920.00      165.00      938.00         3
    3        165.00      938.00      173.00      938.00         3
    4        173.00      938.00      240.00      939.00         2
    5        102.00      897.00      137.50      920.00         3
    6        102.00      897.00      110.00      897.00         1
    7        110.00      897.00      146.00      920.00         1
    8        146.00      920.00      173.00      938.00         2
    9        146.00      920.00      240.00      922.00         1
 User Specified Y-Origin =       880.00(ft)
 Default X-Plus Value = 0.00(ft)
 Default Y-Plus Value = 0.00(ft)
 ISOTROPIC SOIL PARAMETERS
  3 Type(s) of Soil
 Soil  Total  Saturated  Cohesion Friction   Pore   Pressure   Piez.
 Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant Surface
  No.  (pcf)    (pcf)     (psf)     (deg)   Param.    (psf)     No.
   1   125.0    130.0     200.0     30.0    0.00       0.0      1
   2   125.0    130.0     154.0     31.0    0.00       0.0      1
   3   130.0    130.0    2000.0     45.0    0.00       0.0      1
 1 PIEZOMETRIC SURFACE(S) SPECIFIED
 Unit Weight of Water =  62.40 (pcf)
 Piezometric Surface No.  1 Specified by  4 Coordinate Points
 Pore Pressure Inclination Factor =  0.50
   Point      X-Water     Y-Water
    No.         (ft)        (ft)
     1         80.00      918.90
     2        146.00      920.00
     3        168.00      935.00
     4        240.00      935.00
 Specified Peak Ground Acceleration Coefficient (A) =   0.300(g)
 Specified Horizontal Earthquake Coefficient (kh) =   0.150(g)
 Specified Vertical Earthquake Coefficient (kv) =   0.000(g)
 Specified Seismic Pore-Pressure Factor =   0.000
 A Critical Failure Surface Searching Method, Using A Random
 Technique For Generating Circular Surfaces, Has Been Specified.
 2500 Trial Surfaces Have Been Generated.
```

50 Surface(s) Initiate(s) From Each Of 50 Points Equally Spaced
Along The Ground Surface Between X = 90.00(ft)
and X = 140.00(ft)
Each Surface Terminates Between X = 165.00(ft)
and X = 225.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00(ft)
10.00(ft) Line Segments Define Each Trial Failure Surface.
Restrictions Have Been Imposed Upon The Angle Of Initiation.
The Angle Has Been Restricted Between The Angles Of -35.0
And 25.0 deg.

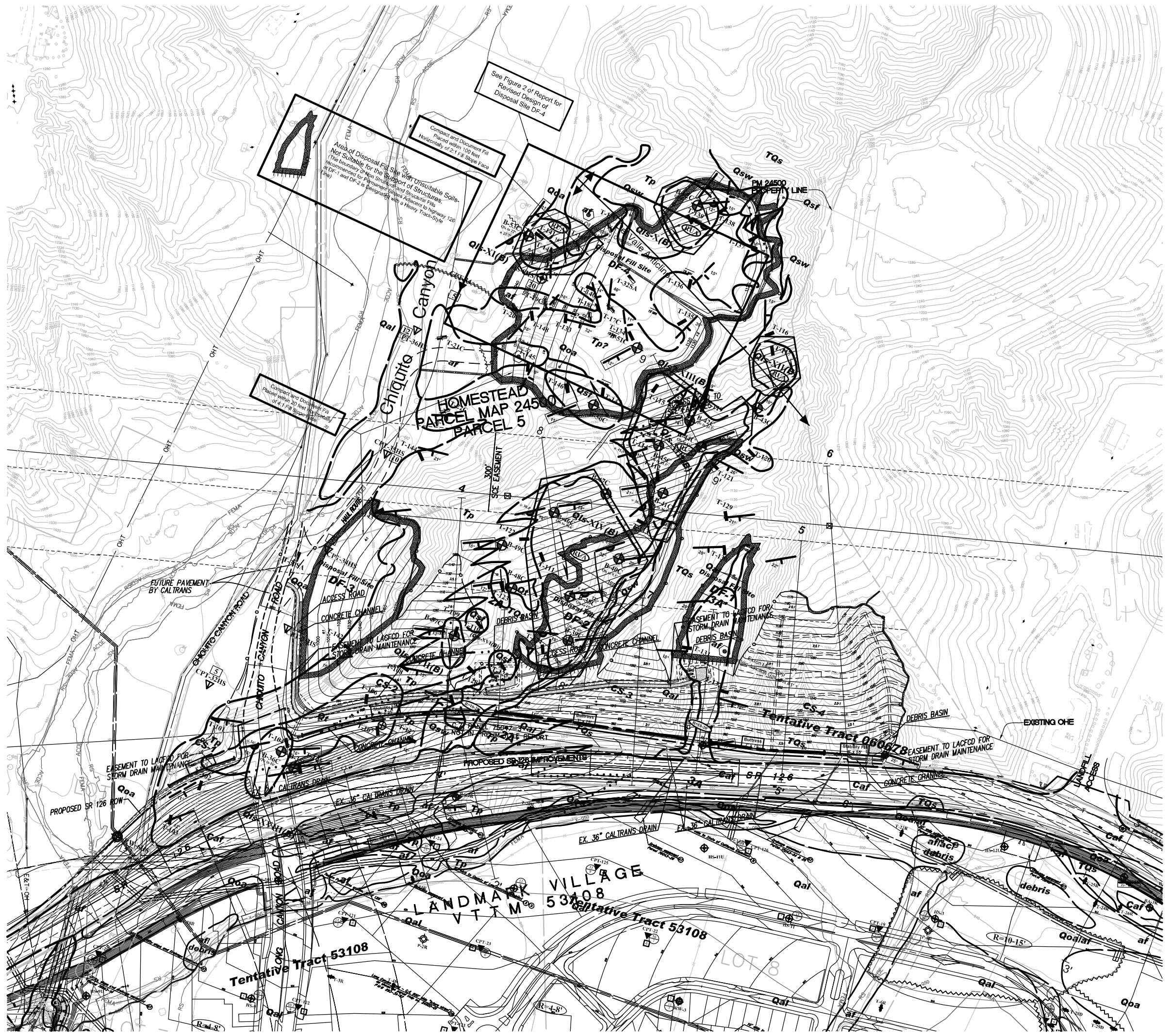
Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By GLE (Spencer's) Method (0-2) * *
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
The option of no water in the tension crack on
the last slice has been selected.
Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces
(if applicable) have been applied to the slice base(s)
on which they intersect.
Total Number of Trial Surfaces Evaluated = 2500
WARNING! The Factor of Safety Calculation for one or More Trial Surfaces
Did Not Converge in 20 Iterations.
Number of Trial Surfaces with Non-Converged FS = 235
Number of Trial Surfaces with Misleading FS = 16
Percentage of Trial Surfaces With Non-Valid FS Solutions
of the Total Evaluated = 10.0 %
Statistical Data On All Valid FS Values:
FS Max = 17.678 FS Min = 1.564 FS Ave = 1.978
Standard Deviation = 0.960 Coefficient of Variation = 48.52 %
((Modified Bishop FS for Critical Surface = 1.633))
Failure Surface Specified By 13 Coordinate Points

| Point No. | X-Surf (ft) | Y-Surf (ft) |
|---|---|---|
| 1 | 104.29 | 919.42 |
| 2 | 112.72 | 914.05 |
| 3 | 121.83 | 909.93 |
| 4 | 131.44 | 907.14 |
| 5 | 141.34 | 905.74 |
| 6 | 151.34 | 905.75 |
| 7 | 161.23 | 907.18 |
| 8 | 170.83 | 910.00 |
| 9 | 179.93 | 914.15 |
| 10 | 188.35 | 919.54 |
| 11 | 195.92 | 926.07 |
| 12 | 202.49 | 933.61 |
| 13 | 205.65 | 938.49 |

Circle Center At X = 146.24 ; Y = 976.01 ; and Radius = 70.44
*** FOS = 1.564 Theta (ki=1.0) = 7.35 ***
Lambda = 0.129
Individual data on the 24 slices

| Slice No. | Width (ft) | Weight (lbs) | Water Force Top (lbs) | Water Force Bot (lbs) | Tie Force Norm (lbs) | Tie Force Tan (lbs) | Earthquake Force Hor (lbs) | Earthquake Force Ver (lbs) | Surcharge Load (lbs) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.2 | 1.3 | 0.0 | 0.0 | 0. | 0. | 0.2 | 0.0 | 0.0 |
| 2 | 8.3 | 3018.7 | 0.0 | 1646.7 | 0. | 0. | 452.8 | 0.0 | 0.0 |
| 3 | 9.1 | 9063.8 | 0.0 | 4698.3 | 0. | 0. | 1359.6 | 0.0 | 0.0 |
| 4 | 0.1 | 110.0 | 0.0 | 54.3 | 0. | 0. | 16.5 | 0.0 | 0.0 |
| 5 | 5.7 | 7914.0 | 0.0 | 3908.2 | 0. | 0. | 1187.1 | 0.0 | 0.0 |
| 6 | 3.8 | 6046.2 | 0.0 | 2989.3 | 0. | 0. | 906.9 | 0.0 | 0.0 |
| 7 | 5.8 | 10032.5 | 0.0 | 4813.7 | 0. | 0. | 1504.9 | 0.0 | 0.0 |
| 8 | 0.2 | 399.7 | 0.0 | 191.8 | 0. | 0. | 59.9 | 0.0 | 0.0 |
| 9 | 3.8 | 7603.5 | 0.0 | 3355.6 | 0. | 0. | 1140.5 | 0.0 | 0.0 |
| 10 | 4.7 | 11092.7 | 0.0 | 4137.7 | 0. | 0. | 1663.9 | 0.0 | 0.0 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 11 | 5.3 | 14891.0 | 0.0 | 4502.3 | 0. | 0. | 2233.6 | 0.0 | 0.0 |
| 12 | 9.9 | 33078.8 | 0.0 | 10786.2 | 0. | 0. | 4961.8 | 0.0 | 0.0 |
| 13 | 3.8 | 14149.0 | 0.0 | 4932.7 | 0. | 0. | 2122.4 | 0.0 | 0.0 |
| 14 | 3.0 | 11360.7 | 0.0 | 4144.5 | 0. | 0. | 1704.1 | 0.0 | 0.0 |
| 15 | 0.5 | 1869.3 | 0.0 | 837.6 | 0. | 0. | 280.4 | 0.0 | 0.0 |
| 16 | 2.3 | 8570.6 | 0.0 | 3837.8 | 0. | 0. | 1285.6 | 0.0 | 0.0 |
| 17 | 2.2 | 7740.1 | 0.0 | 3649.3 | 0. | 0. | 1161.0 | 0.0 | 0.0 |
| 18 | 6.9 | 22846.3 | 0.0 | 10657.5 | 0. | 0. | 3426.9 | 0.0 | 0.0 |
| 19 | 8.4 | 23208.0 | 0.0 | 11329.8 | 0. | 0. | 3481.2 | 0.0 | 0.0 |
| 20 | 1.6 | 3758.7 | 0.0 | 1967.4 | 0. | 0. | 563.8 | 0.0 | 0.0 |
| 21 | 6.0 | 11353.5 | 0.0 | 5641.4 | 0. | 0. | 1703.0 | 0.0 | 0.0 |
| 22 | 6.6 | 7191.1 | 0.0 | 3218.8 | 0. | 0. | 1078.7 | 0.0 | 0.0 |
| 23 | 0.9 | 468.9 | 0.0 | 71.7 | 0. | 0. | 70.3 | 0.0 | 0.0 |
| 24 | 2.3 | 487.6 | 0.0 | 0.0 | 0. | 0. | 73.1 | 0.0 | 0.0 |




# OFFSITE GRADING
# CHIQUITO CANYON

| CHIQUITO CANYON EARTHWORK VOLUMES | |
|---|---|
| RAW CUT | 1,190,000 Cubic Yards |
| RAW FILL | 1,071,000 Cubic Yards |
| NET CUT | 1,190,000 Cubic Yards |
| NET FILL | 1,190,000 Cubic Yards |
| EXPORT | 0 Cubic Yards |

## LEGEND:

- EXISTING LOT LINE
- EXISTING EASEMENT
- PROPOSED CONTOUR (1100)
- DAYLIGHT LINE
- CUT & FILL
- FLOW LINE
- BENCH
- SWALE
- HAUL ROUTE ACCESS ROAD
- RIVER CORRIDOR–2003 (FORMERLY SEA 23) (RC03)
- RIVER CORRIDOR (FORMERLY SEA 23) (RC)
- FEMA
- Q–CAP (Q50)
- DEBRIS TRIBUTARY LIMIT
- SLOPE/ DEBRIS BASIN ACCESS
- DEBRIS BASIN
- OIL WELL GPS POSITIONED
- OIL WELL DEPT. OF OIL AND GAS CALCULATED POSITION
- OIL WELL DIGITIZED POSITION
- OIL WELL DEPT. OF OIL AND GAS METAL DETECTOR POSITION
- EXISTING OAK TREE
- RIP–RAP
- SPINE FLOWER
- SPINE FLOWER PROTECTION BOUNDARY

# OFFSITE GRADING
# ADOBE CANYON

| ADOBE CANYON EARTHWORK VOLUMES | |
|---|---|
| RAW CUT | 6,468,500 Cubic Yards |
| RAW FILL | 133,000 Cubic Yards |
| NET CUT | 6,468,500 Cubic Yards |
| NET FILL | 146,300 Cubic Yards |
| EXPORT | 6,322,200 Cubic Yards |

REV. DATE: DECEMBER 21, 2009
DATE: MAY 2, 2007

**ALLAN E. SEWARD ENGINEERING GEOLOGY, INC.**
Geological And Geotechnical Consultants

Geologic/Geotechnical Map

| | |
|---|---|
| Date: 12/21/09 | Job No.: 09-1702R-4 |
| Scale: 1" = 200' | CAD File: Sheet 11 Addendum Geologic Map |
| Sheet 11 | Geology by: BJS / Drawn by: GSD/JCH / Revised: 2/25/10 |

SEE 9/30/05 REPORT FOR VTT 060678 AND SHEET 3 FOR GEOLOGIC LEGEND

LEGAL DESCRIPTION:
PARCELS 8, 9, 10, AND PORTION OF PARCELS 7, 20, 21 OF PARCEL MAP NO. 24500-01 PMB 293-34/67, RECORDS OF LOS ANGELES COUNTY.

REGISTERED PROFESSIONAL ENGINEER ERIK WINATA No. C-67285 Exp. 09/30/10 CIVIL STATE OF CALIFORNIA

PSOMAS
28480 Avenue Stanford, Suite 200
Santa Clarita, CA 91355
(661) 219-6000 (661) 775-2718 (FAX)
ERIK WINATA R.C.E. NO. C 67285 DATE

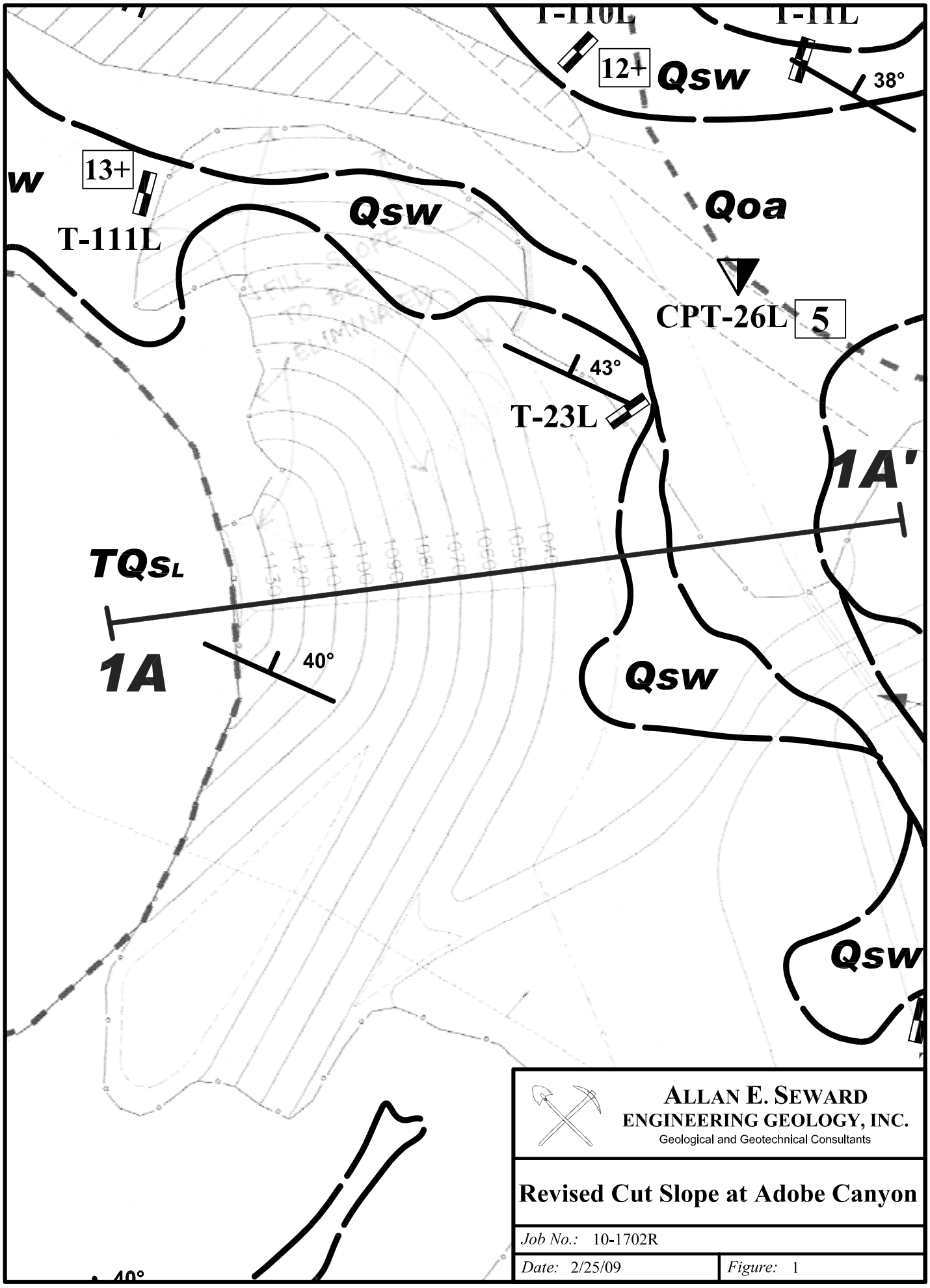
DESIGNED: NSK/YL
DRAFTED: TLC/JS
CHECKED: EW

OWNER/DEVELOPER:
NEWHALL RANCH
23823 WEST VALENCIA BOULEVARD
VALENCIA, CALIFORNIA 91335
TELEPHONE: (661) 255-4000
REPRESENTATIVE: MR. FRED MACMURDO

MAJOR LAND DIVISION
VESTING TENTATIVE TRACT MAP
NO. 53108
CHIQUITO CANYON & ADOBE CANYON OFFSITE GRADING
IN THE UNINCORPORATED AREA OF THE COUNTY OF LOS ANGELES STATE OF CALIFORNIA

PROJECT NO. 1NLF010500
SHEET 11 OF 13

RV001-11.dwg

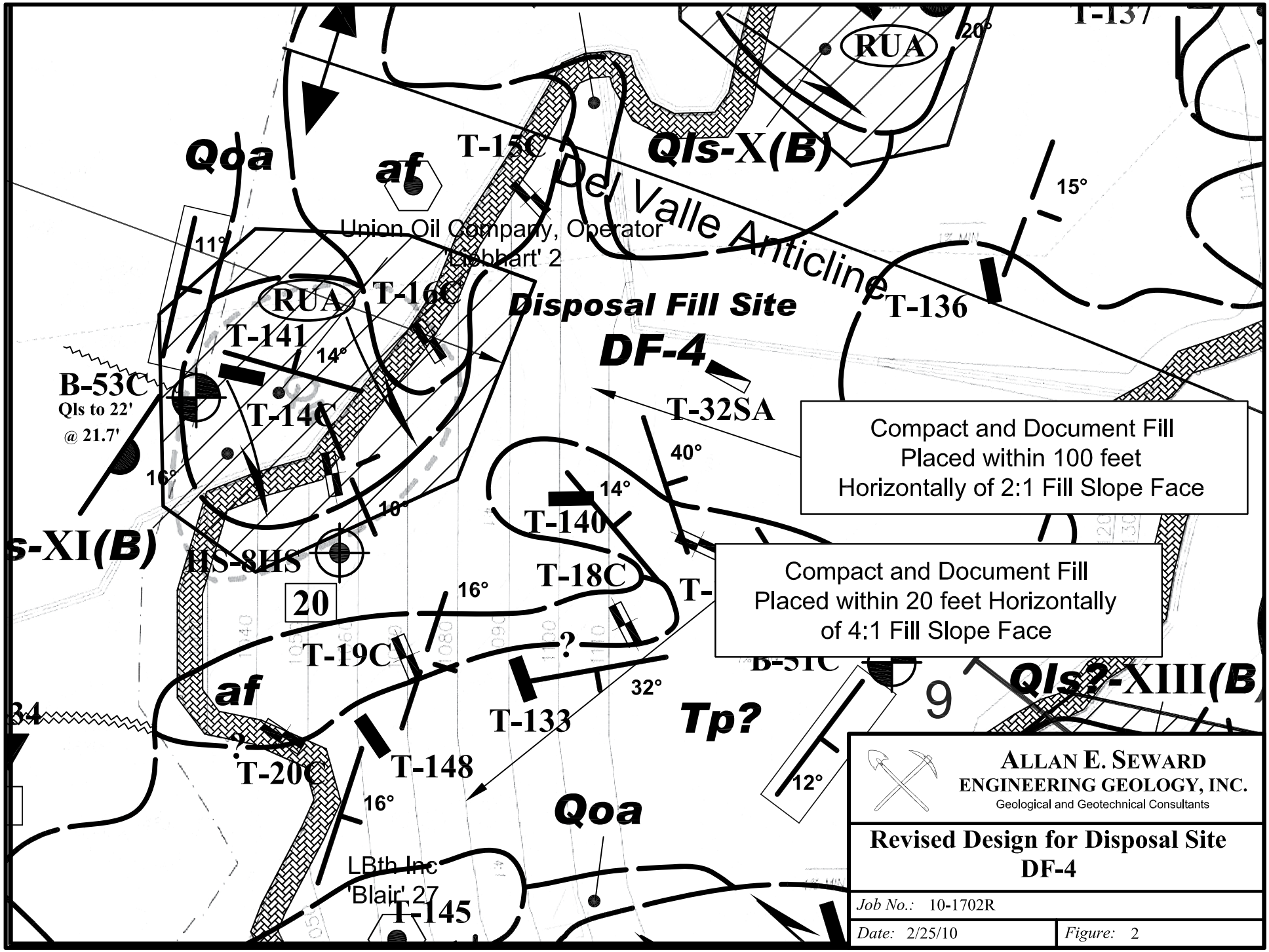



**ALLAN E. SEWARD**
**ENGINEERING GEOLOGY, INC.**
Geological and Geotechnical Consultants

# Revised Cut Slope at Adobe Canyon

*Job No.:* 10-1702R

*Date:* 2/25/09 | *Figure:* 1


Qoa
af
T-15C
Qls-X(B)
Del Valle Anticline
RUA
20°
T-137
15°
11°
Union Oil Company, Operator
'Ebbhart' 2
RUA
T-16C
Disposal Fill Site
T-136
T-141
14°
DF-4
B-53C
Qls to 22'
@ 21.7'
T-14C
T-32SA
16°
40°
14°
10°
T-140
s-XI(B)
HS-8HS
T-18C
20
16°
T-19C
?
32°
af
T-133
Tp?
Qls?-XIII(B)
9
T-20C
T-148
16°
12°
Qoa
LBth Inc
'Blair' 27
T-145
Compact and Document Fill
Placed within 100 feet
Horizontally of 2:1 Fill Slope Face
Compact and Document Fill
Placed within 20 feet Horizontally
of 4:1 Fill Slope Face
ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geological and Geotechnical Consultants
Revised Design for Disposal Site
DF-4
Job No.: 10-1702R
Date: 2/25/10
Figure: 2

# Appendix B

RTF&A
GEOTECHNICAL ENGINEERING & ENGINEERING GEOLOGY

February 23, 2010

Newhall Land and Farming Company
25124 Springfield Court, Suite 300
Valencia, California 91355

Job No. 99-802-022

Attention: Mr. Fred MacMurdo

Subject: Response to County Comment
Proposed Offsite Zone 1A Water Tank Site
Vesting Tentative Tract Map No. 53108
Castaic, Los Angeles County, California

Reference: Geotechnical Grading Plan Review
Proposed Offsite Zone 1A Water Tank Site
Vesting Tentative Tract Map No. 53108
Los Angeles County, California
Dated March 28, 2008, Job No. 99-802-022

Ladies/Gentlemen:

This submittal provides information requested by the County of Los Angeles Department of Public Works (LACDPW). The LACDPW comments were prepared following their review of the Allan E. Seward Engineering Geology, Inc. (AES) report dated December 21, 2009. The Soils Engineering Review Sheet has a date of February 5, 2009, but it is assumed to be actually issued on February 5, 2010 and a hand change has been made on the review sheet attached to this report. Our referenced report, dated March 28, 2008, was presented within Appendix D of the AES report. Comment No. 6 was the only comment related to the review of our referenced report. This response only includes responding to Comment No. 6 of the February 5, 2009 review comments. We understand that the remainder of the review comments will be addressed by AES.

**R. T. FRANKIAN & ASSOCIATES**
1329 SCOTT ROAD BURBANK CALIFORNIA 91504
TEL. (818) 531-1501 FAX (818) 531-1511 WWW.RTFRANKIAN.COM

## SOILS ENGINEERING REVIEW SHEET

1. **Provide static and seismic slope stability analyses for the proposed cut slopes surrounding the Zone 1A Water Tank at PM 18108. The referenced R. T. Frankian Report dated 3/28/08 does not include slope stability analyses. Also, provide a geotechnical cross section, for each section analyzed, showing the critical failure plane used in the analyses. Indicate the various shear strength parameters used in the analyses, in the appropriate segments of each failure plane. Show locations of the cross sections used in slope stability analyses on the geotechnical map. Recommend mitigation if factors of safety are below County minimum standards.**

The slope stability calculations presented in this response all utilized Saugus Cross Bedding shear strength parameters for cohesion of 640 psf and an angle of internal friction of 32 degrees. The referenced report recommended the following shear strength parameters for the subject site.

### SUMMARY OF SHEAR STRENGTH PARAMETERS

| MATERIAL | Static Cohesion (psf) | Static $\phi$ (degrees) |
|---|---|---|
| Landslide Failure Plane Material | 200 | 16 |
| Clayey Bedding Plane Material | 250 | 20 |
| Clayey Bedding Plane Material (Seismic) | 375 | 19 |
| Saugus Cross Bedding | 640 | 32 |
| Alluvium | 100 | 40 |
| Compacted Fill | 300 | 32 |

The Saugus Formation can range from massive to thinly bedded sedimentary rock units of sandstone, conglomerate, siltstone, and claystone/mudstone. Bedding planes within the Saugus Formation are poorly to moderately-well developed, and can constitute planes of weakness, particularly where sandstone/conglomerate beds are in contact with claystone. Where bedding is adversely oriented, or "daylighted," with

respect to natural or cut slopes, there is potential for bedding plane, or "block-glide," failure.

The subsurface geologic conditions are depicted on previously presented Geologic Sections A-A' and B-B,' which are presented as Figures 2.1 and 2.2, respectively, for this submittal. The locations of the Geologic Sections are shown on the Geotechnical Map, Figure 1.

Geologic Section A-A' illustrates geologic conditions parallel to the axis of the easterly-plunging syncline, for the segment of cut slope CS-1 facing to the east. Bedding in this area strikes northeast and dips 40 degrees to 45 degrees to the southeast. The apparent dip, with respect to the east-facing cut slope segment, is 32 degrees towards the east. The proposed east-facing segment of the cut slope is considered to be grossly stable relative to bedding plane failures, as the angle of apparent dip (32 degrees) is steeper than the proposed 2:1 (or approximately 26 degrees) cut slope. Slope stability calculations for a circular cross-bedding failure are presented in the Appendix and exceed the county minimum factor of safety requirements. The critical failure surface, material strength properties, and the calculated factor of safety are shown on Geotechnical Section A-A' presented in Figure 3.1.

Geologic Section B-B' depicts the geologic conditions for cut slope CS-1 perpendicular to the synclinal axis, and across the south-facing portion of the cut-slope. Bedding with respect to the south-facing segment of cut slope CS-1 exhibits an apparent dip of 37 degrees to the south. This bedding orientation dips steeper than the 2:1 (26 degrees) cut slope gradient, and the south-facing segment of cut slope CS-1 is considered grossly stable relative to bedding plane failures. Slope stability calculations for a circular cross-bedding failure are presented in the Appendix, and exceed the county minimum factor of safety requirements. The critical failure surface, material strength properties, and the calculated factor of safety are shown on Geotechnical Section B-B' presented in Figure 3.1.

The following are attached and complete this response:

- Soils Engineering Review Sheet dated February 5, 2009
- Geotechnical Map, Figure 1
- Geologic Cross Section A-A', Figure 2.1
- Geologic Cross Section B-B', Figure 2.2
- Geotechnical Section A-A', Figure 3.1
- Geotechncial Section B-B', Figure 3.2
- Appendix - Slope Stability Calculations (4 pages)

Yours very truly,

R. T. FRANKIAN & ASSOCIATES

by: Alan W. Rasplicka
Principal Geotechnical Engineer

and: Timothy P. Latiolait
Principal Engineering Geologist

Distribution: (5) Newhall Land & Farming Company
Mr. Fred MacMurdo
("wet signed," stamped, and unbound copies and a CD with a PDF file for regulatory submittal)

RTF&A
GEOTECHNICAL ENGINEERING & ENGINEERING GEOLOGY

COUNTY OF LOS ANGELES
DEPARTMENT OF PUBLIC WORKS
GEOTECHNICAL AND MATERIALS ENGINEERING DIVISION

## SOILS ENGINEERING REVIEW SHEET


Address: 900 S. Fremont Ave., Alhambra, CA 91803
Telephone: (626) 458-4925
Fax: (626) 458-4913


District Office 8.2
Job Number GMPH
Sheet 1 of 1

DISTRIBUTION:
___ Drainage
___ Grading
___ Geo/Soils Central File
___ District Engineer
___ Geologist
___ Soils Engineer
___ Engineer/Architect

| | |
|---|---|
| Tentative Tract Map | 53108 |
| Location | Newhall Ranch |
| Developer/Owner | Newhall Land and Farming Company / Newhall Ranch Co. |
| Engineer/Architect | Psomas |
| Soils Engineer | Allan E. Seward Engineering Geology, Inc. |
| Geologist | Same as above |

Review of:
Revised Tentative Tract Map and Exhibit Dated 5/2/07
Soils Engineering and Geologic Reprot Dated **12/21/09**, 10/29/03, 2/10/01, 9/27/00
Previous Review Sheet Dated 11/13/08

ACTION:

Tentative Map feasibility is not recommended for approval.

REMARKS:

1. The geotechnical map within the submitted report does not match the latest approved Tentative Tract Map dated by Regional Planning 5/2/07. Provide revised Tentative Tract Map dated by Regional Planning and geotechnical map that conform.

2. Show the final graded contours of all landslides to be removed and recompacted on the geotechnical maps and Tentative Map. For example, Landslide Qls XVI(B) is recommended to removed and recompacted, however the final graded contours are not shown on the geotechnical map or the Tentative Map. Revise geotechnical maps and Tentative Map as necessary.

3. On the geotechnical map, delineate approximate limits of proposed disposal fills. Also delineate all soils unsuitable for the support of structures (proposed disposal fill, landslide debris) and prominently note/label with the note: "Unsuitable Soils - Not suitable for the Support of Structures".

4. Discuss and address whether the proposed fill slopes associated with Disposal Fill areas will be subject to erosion and/or slope instability. Provide updated surficial, static, and seismic slope stability analyses considering the density, moisture content, and shear strengths of the disposal fill materials as well as the proposed design shown on the latest geotechnical map and Tentative Map. Provide additional recommendations as necessary.

5. Proposed Disposal Fill areas DF-1 and DF-2 appear to show debris basins located in disposal fill. Clarify the soil material that will be used to construct the proposed debris basins and provide recommendations as necessary.

6. Provide static and seismic slope stability analyses for the proposed cut slopes surrounding the Zone 1A Water Tank at PM 18108. The referenced R.T. Frankian Report dated 3/28/08 does not include slope stability analyses. Also, provide a geotechnical cross section, for each section analyzed, showing the critical failure plane used in the analyses. Indicate the various shear strength parameters used in the analyses, in the appropriate segments of each failure plane. Show locations of the cross sections used in slope stability analyses on the geotechnical map. Recommend mitigation if factors of safety are below County minimum standards.

7. The submitted report states that the design of the bank protection has been modified. Provide clarification, additional discussion, and details in regards to the stated design modification in relation to proposed bank protection shown on both the North and South banks of the Santa Clara River. The proposed Bank Stabilization is necessary for the feasibility of the proposed tract development and therefore must be addressed at the Tentative Map stage. Clarify design and provide additional information as necessary.

8. Show the following on the geotechnical map and Tentative Map:
   a. Final graded contours for the removal and recompaction of existing landslides.
   b. Delineate the location of the proposed disposal fill materials.
   c. Delineate the approximate limits of all soils unsuitable for the support of structure and prominently note/label with the note: "Unsuitable Soils - Not suitable for the Support of Structures".
   d. All recommended mitigation measures.

9. Requirements of the Geology Section are attached.

10. Include a copy of this review sheet with your response.

REGISTERED PROFESSIONAL ENGINEER YOSHIYA MORISAKU No. 67587 Exp. 6/30/11 CIVIL CALIFORNIA

2/5/10

Reviewed by _____ Date 2/5/09
Yosh

**NOTICE:** Public safety, relative to geotechnical subsurface explo[illegible] provided in accordance with current codes for excavations, inclusive of the Los Angeles County Code, Chapter 11.48, and the State of California, Title 8, Construction Safety Orders.
P:\Yosh\53108TentTk

# Geotechnical Map

PREPARED FOR
Newhall Land and Farming Company

Project Location
Zone 1A Water Tank Site Grading
Castaic, California

| SCALE | DRAWN BY | CHECKED BY |
|---|---|---|
| AS SHOWN | JH | |
| DATE | Figure 1 | JOB NO. |
| 2-23-2010 | | 99-802-22 |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RTF&A
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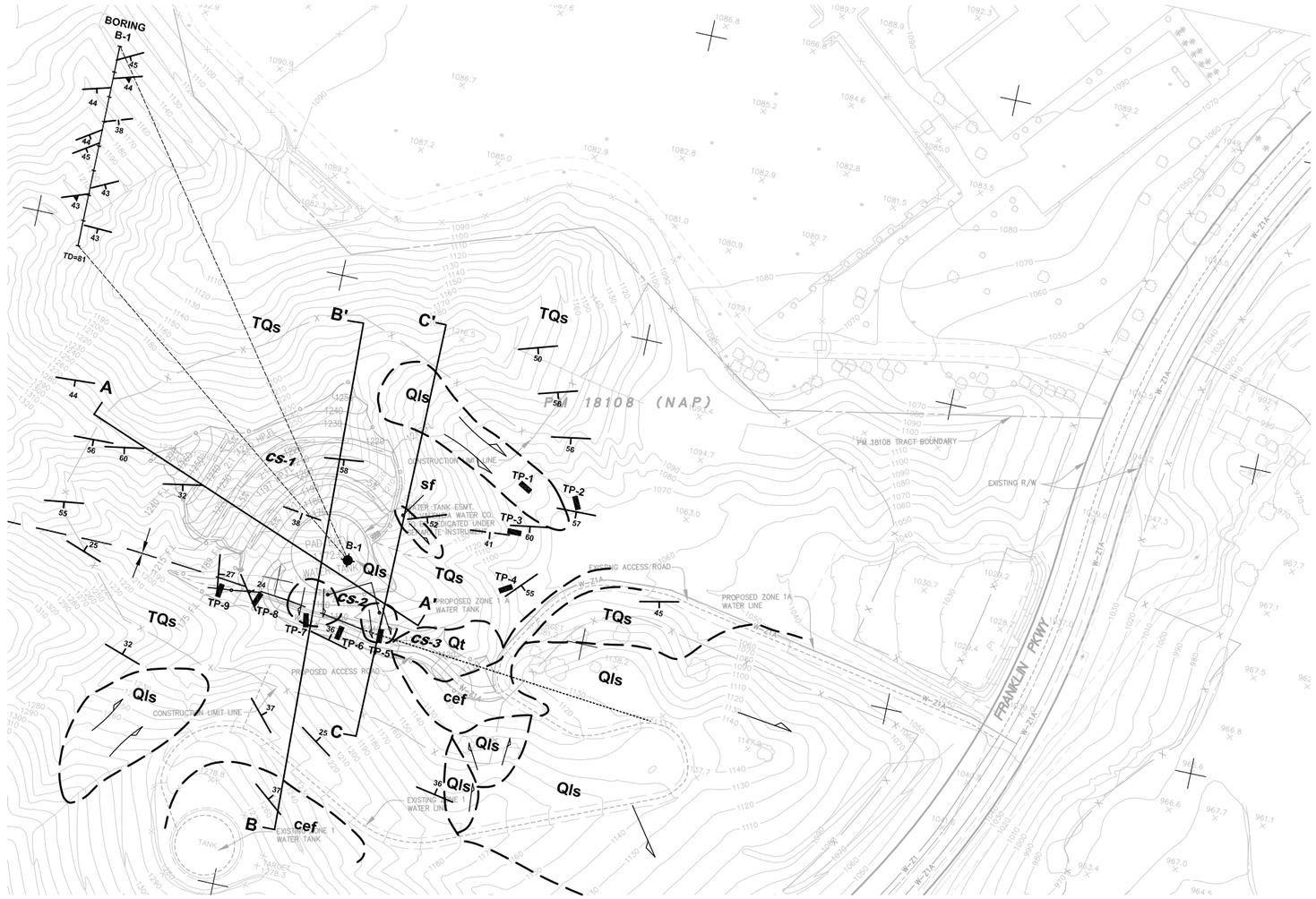



## EXPLANATION

| | |
|---|---|
| cef | Certified Engineered Fill |
| sf | Surficial Failure |
| Qls | Landslide Deposits |
| Qt | Terrace Deposits |
| TQs | Saugus Formation |
| | Geologic Contact, approximately located; queried where questionable |
| | Axial Trace of Syncline: dashed where approximate, dotted where concealed, queried where questionable; arrow on fold axis denotes direction of plunge |
| 49 | Strike and Dip of Bedding |
| 41 | Approximate Bedding |
| 24 | Strike and Dip of Bedding Shear |
| C — C' | Geologic Section Line |
| B-1 | Boring Location and Number |
| TP-9 | Test Pit Location and Number |
| CS-3 | Cut Slope Designation |
| | Subdrain |

| OFFSITE ZONE 1A WATER TANK SITE | |
|---|---|
| RAW CUT | 87,000 CUBIC YARDS |
| RAW FILL | 2,000 CUBIC YARDS |
| EXPORT | 87,000 CUBIC YARDS |

NEWHALL RANCH

100' 50' 0' 100' 200'
GRAPHIC SCALE
Note: For reduced sized prints, original scale is in inches

PROPOSED OFFSITE
ZONE 1A WATER TANK GRADING
EXHIBIT

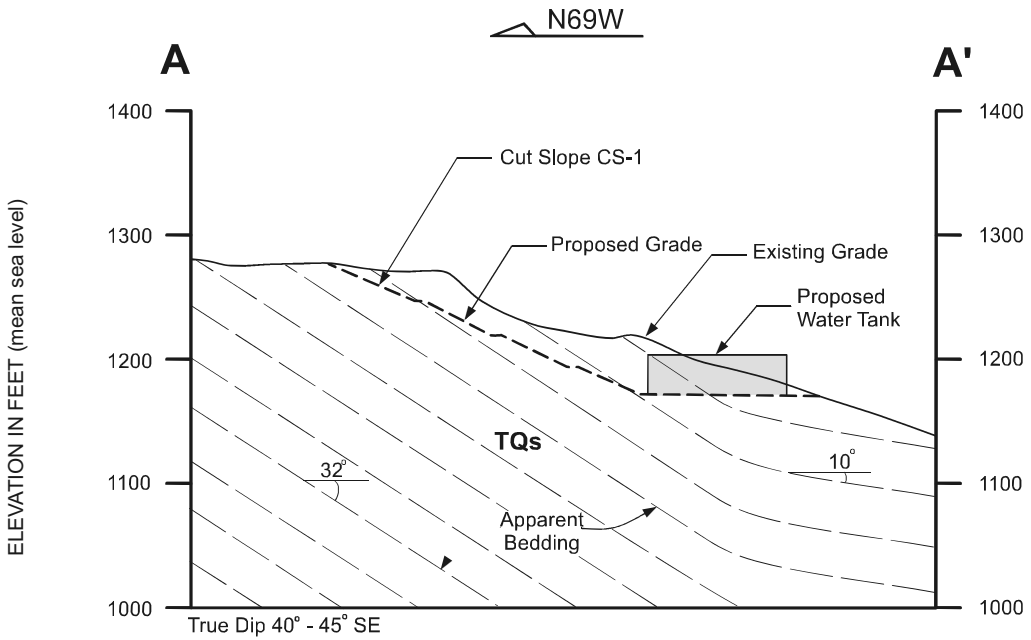
PSOMAS

DATE: 03-07-08 REVISED ON:
JOB No:1NRC010708

SHEET 1 OF 1
RV122-01


Plotted: 2/22/2010 10:37:41 AM :: Saved: 4/2/2008 9:46:34 AM :: C:\Documents and Settings\Administrator\My Documents\Work\Jobs\99-802\2-23-2010\RV122-01.dwg :: Administrator

# GEOLOGIC SECTION A-A'




## Geologic Section

PREPARED FOR
Newhall Land and Farming Company

PROJECT LOCATION
Zone 1A Water Tank Site Grading
Vesting Tentative Tract Map No. 53108
Castaic, California

| SCALE | DRAWN BY | CHECKED BY |
|---|---|---|
| 1" = 100' | JH | |
| DATE | FIGURE 2.1 | JOB NO. |
| 2-23-2010 | | 99-802-22 |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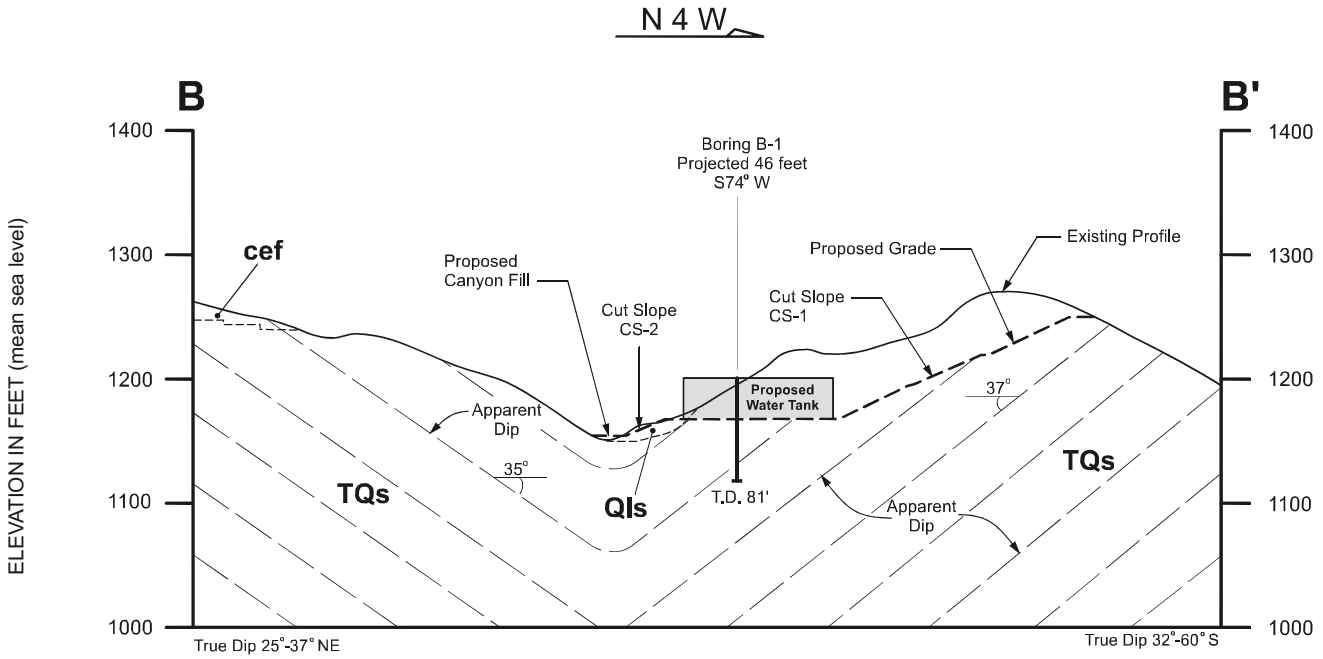
RTF&A
GEOTECHNICAL ENGINEERING & ENGINEERING GEOLOGY

# GEOLOGIC SECTION B-B'




## Geologic Section

PREPARED FOR
Newhall Land and Farming Company

PROJECT LOCATION
Zone 1A Water Tank Site Grading
Vesting Tentative Tract Map No. 53108
Castaic, California

| SCALE | DRAWN BY | CHECKED BY |
|---|---|---|
| 1" = 100' | JH | |
| DATE | FIGURE 2.2 | JOB NO. |
| 2-23-2010 | | 99-802-22 |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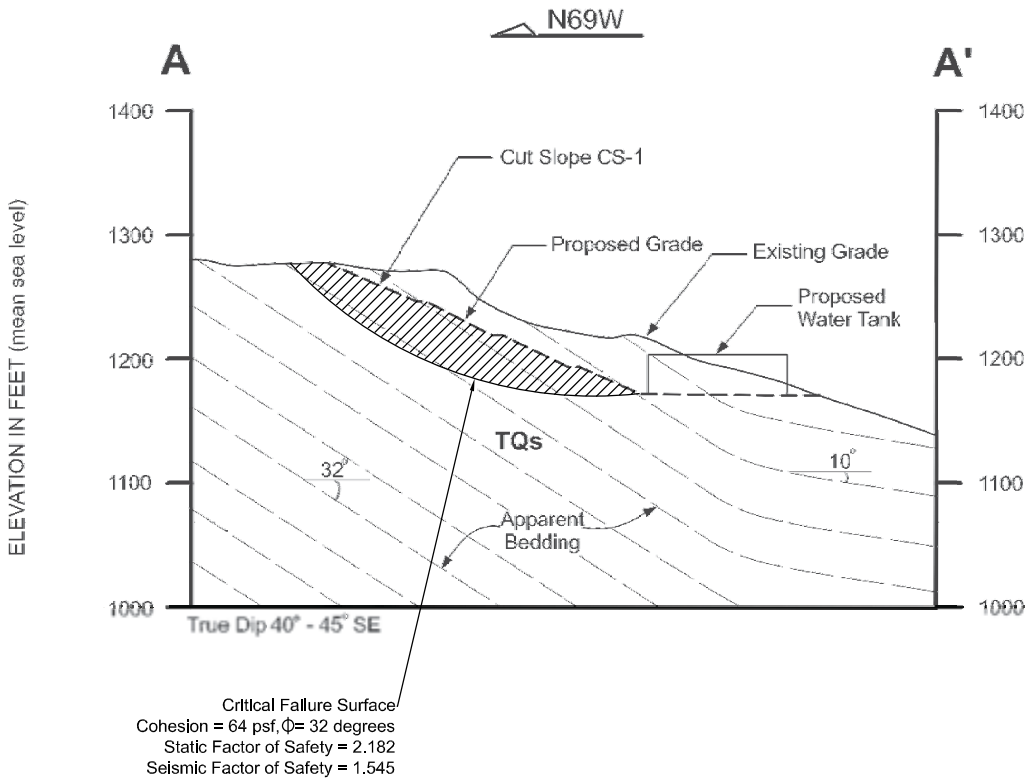
# GEOTECHNICAL SECTION A-A'




**Geotechnical Section**

Newhall Land and Farming Company

Zone 1A Water Tank Site Grading
Vesting Tentative Tract Map No. 53186
Castaic, California

| SCALE | DRAWN BY |
|---|---|
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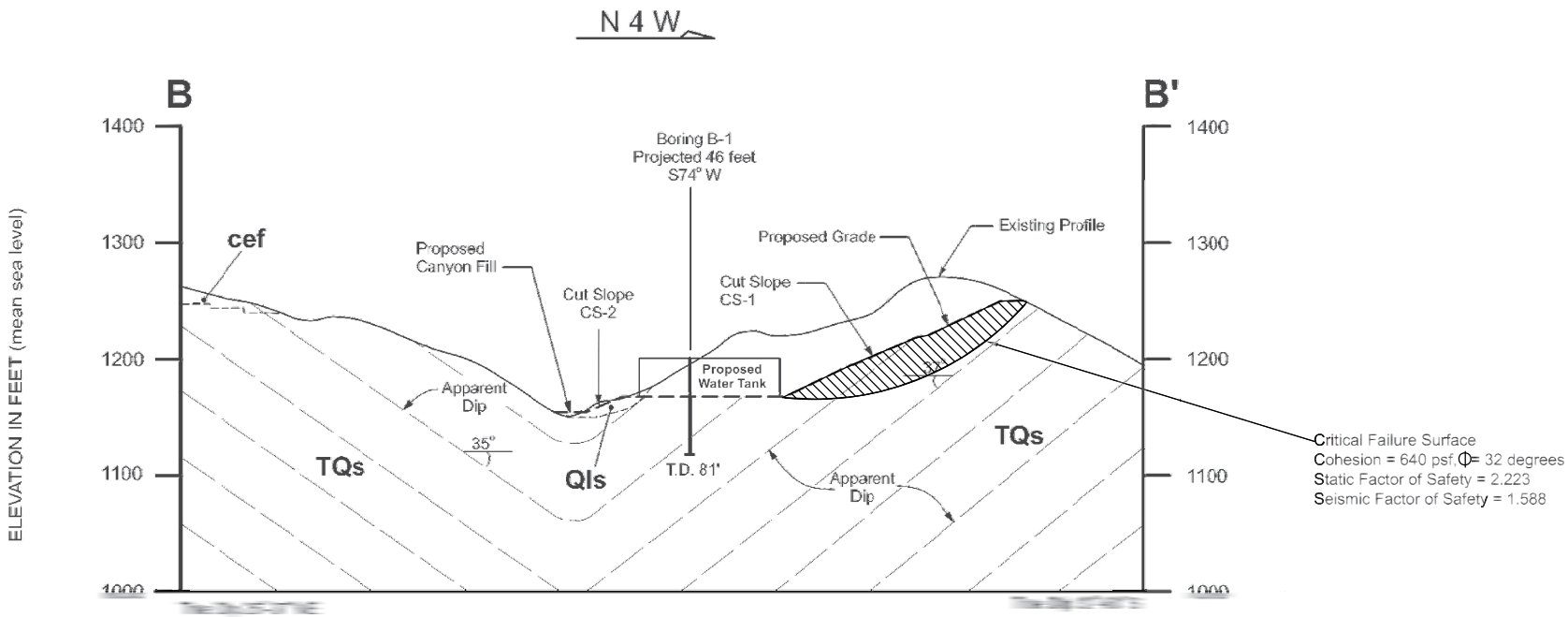
# GEOTECHNICAL SECTION B-B'




## Geotechnical Section

| | | |
|---|---|---|
| Newhall Land and Farming Company | | |
| Zone 1A Water Tank Site Grading<br>Vesting Tentative Tract Map No. 53108<br>Castaic, California | | |
| 1" = 100' | JH | |
| 2-23-2010 | FIGURE 3.2 | 99-802-22 |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Newhall Land and Farming Company
February 23, 2010
99-802-022

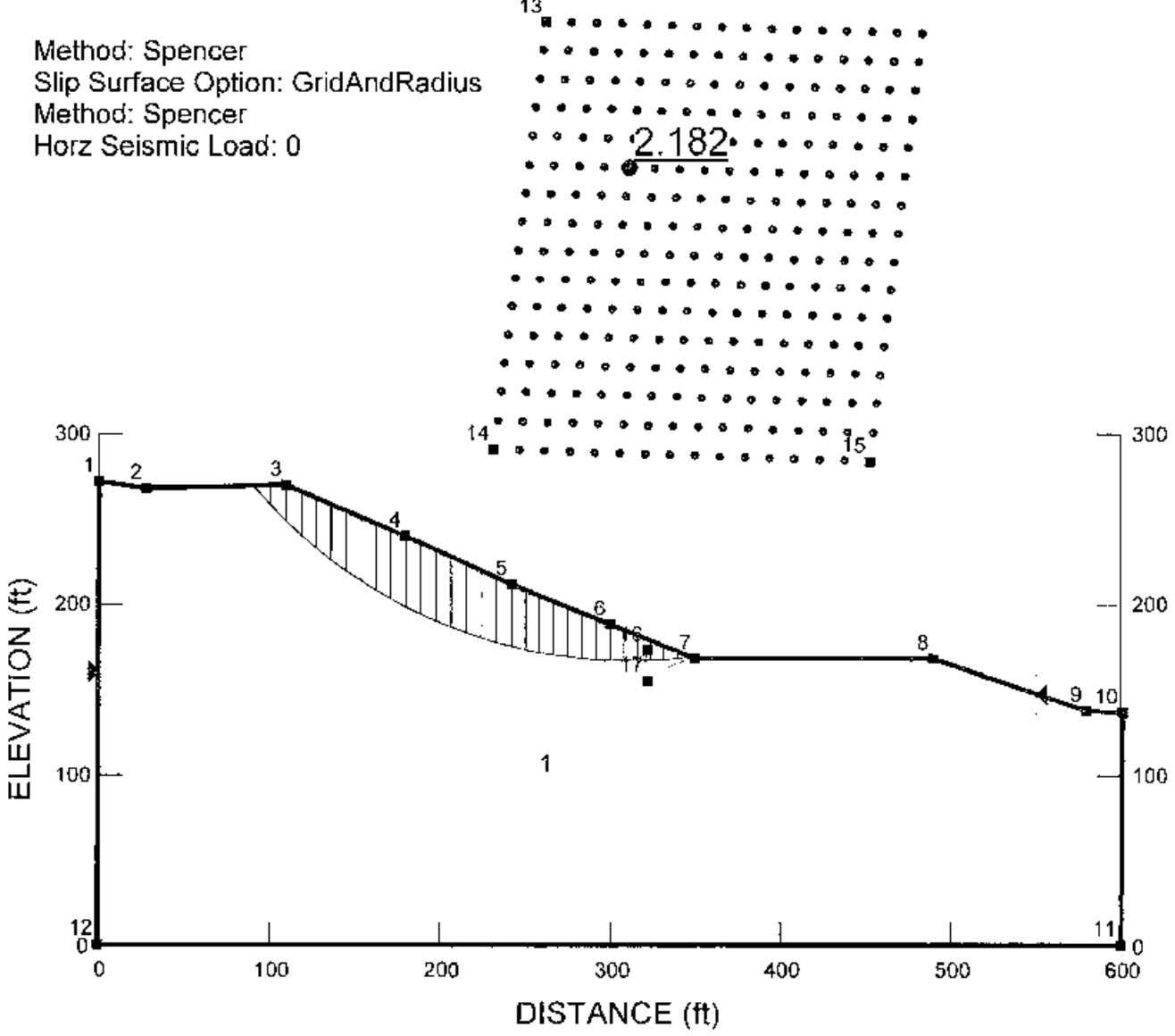
# APPENDIX

# SLOPE STABILITY CALCULATIONS

RTF&A
GEOTECHNICAL ENGINEERING & ENGINEERING GEOLOGY

Title: Zone 1a Water Tank 99-802-22
Comments: TQs Cross Bedding
Name: Section A-A' STATIC.gsz
Directory: C:\Documents and Settings\Alan\My Documents\Reports\1999\99-802\slope stab
Date: 2/18/2010 Time: 1:57:13 PM
Material #: 1 Wt: 130 C: 640 Phi: 32 Model: MohrCoulomb

Method: Spencer
Slip Surface Option: GridAndRadius
Method: Spencer
Horz Seismic Load: 0



Title: Zone 1a Water Tank 99-802-22
Comments: TQs Cross Bedding
Name: Section A-A' Seismic.gsz
Directory: C:\Documents and Settings\Alan\My Documents\Reports\1999\99-802\slope stab
Date: 2/18/2010 Time: 2:00:33 PM
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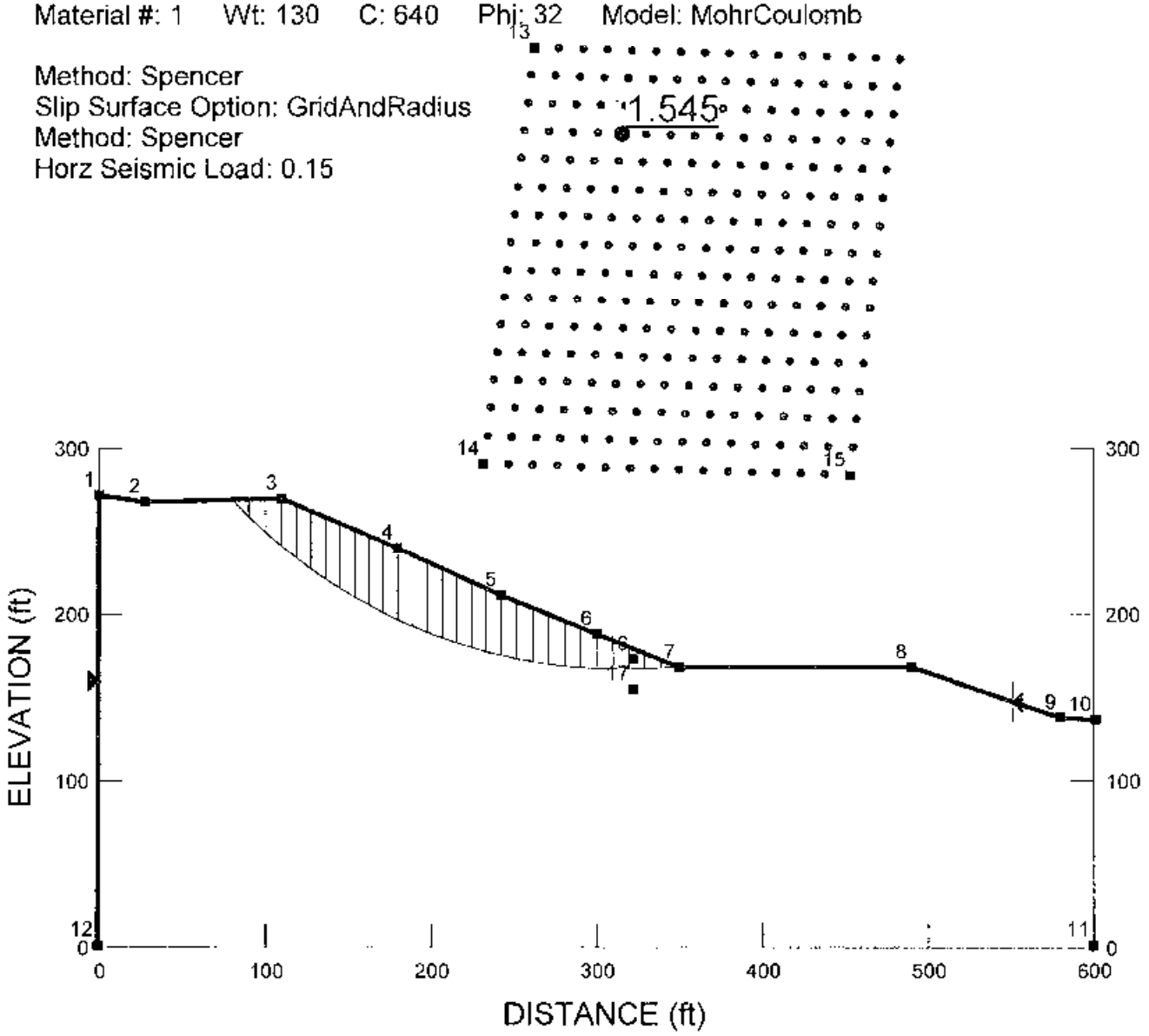
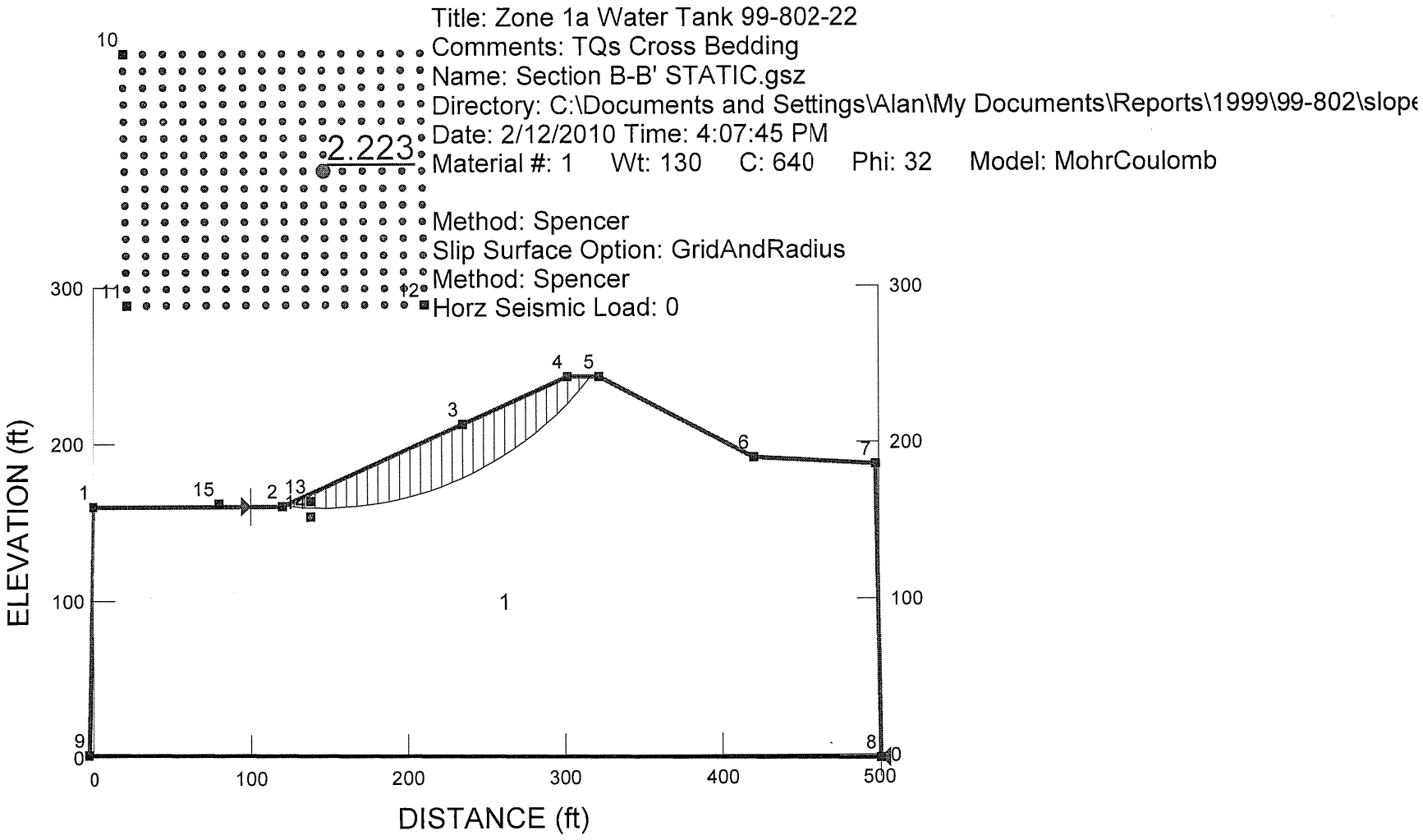
Method: Spencer
Slip Surface Option: GridAndRadius
Method: Spencer
Horz Seismic Load: 0.15



FOR USE WITH REPORT DATED 02/23/2010

RTF&A JOB NO. 99-802-022



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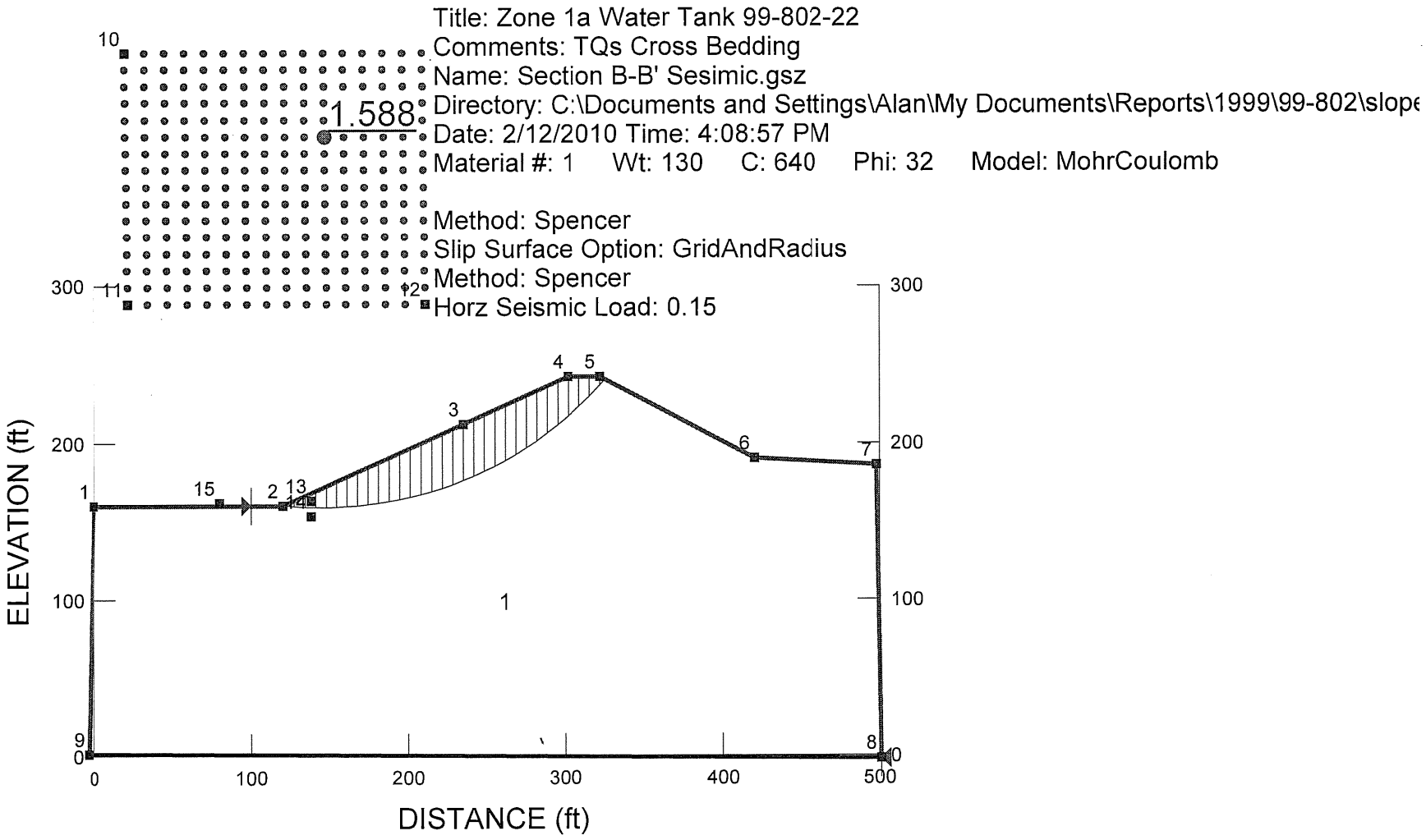
RTF&A JOB NO. 99-802-022



# APPENDIX F4.2

## Hydrology

**Drainage Concept Report for Landmark Village Tentative Tract Map No. 53108, dated November 2009.**

# COUNTY OF LOS ANGELES DEPARTMENT OF PUBLIC WORKS
## LAND DEVELOPMENT DIVISION
## STORM DRAIN AND HYDROLOGY SECTION

To: PACE AND PSOMAS

Attention MARK KREBS/PACE AND ERIK WINATA/PSOMAS

**REVIEW OF TR NO. 53108/LANDMARK VILLAGE**
**TRANS DATE: 11/12/09 & 11/16/09 (VOLUME I BY PSOMAS); 11/09/09 (VOLUME II, III, IV, & V BY PACE)**

[ ] Provide a drainage concept prior to approval of the tentative map. Sufficient information must be submitted to the Department showing the extent of the drainage problem and proposed solution.

[X] The Drainage Concept/SUSMP has been approved subject to conditions noted herein or shown on the returned map.

[ ] The drainage concept/SUSMP is unsatisfactory. Note the reasons stated herein or shown on returned map.

[ ] Prior to tentative map approval, comply with the Standard urban Stormwater Mitigation Plan (SUSMP) requirements. (www.888cleanla.com)

The first .75 inches of stormwater runoff volume from the site must be treated prior to discharging into stormwater conveyance systems.

[ ] Resubmit these sheets with check print, two (2) revised sets of the drainage concept, and the *MORA input/output file(s) on disk* (if applicable) for further consideration. Additional changes maybe required as determined by further review.

**COMMENTS:**

**Submit a scanned copy of the approved plans and report for this project on a CD to Land Development Division prior to improvement plan submittal.**

REVIEWED BY Yong Guo DATE 12/29/09

YONG GUO - (626) 458-4921

PSOMAS

# DCR VOLUME I OF V

# LANDMARK VILLAGE
# TENTATIVE TRACT MAP 53108
# DRAINAGE CONCEPT REPORT

November 2009

DRAINAGE CONCEPT/STORM WATER QUALITY PLAN

IS CONCEPTUALLY APPROVED

APPROVED BY: _____ RCE NO. 67363 DATE: 12/29/09

CHECKED BY: _____ DATE: 12/29/09

LAND DEVELOPMENT DIVISION

LOS ANGELES COUNTY DEPARTMENT OF PUBLIC WORKS

The DCR Volume I of V consists of three onsite drainage concept reports: Landmark Village/TR 53108 Drainage Concept, Offsite Borrow Areas Drainage Concept (Adobe Canyon borrow site and Chiquito Canyon borrow site-Under Conditional Used Permit), and Offsite Chiquito Landfill Drainage Concept.

Offsite hydraulics is addressed on the rest of DCR Volume.

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## TENTATIVE TRACT MAP
## DRAINAGE CONCEPTREPORT
## VOLUME I OF V

**REPORT I : LANDMARK VILLAGE TENTATIVE TRACT MAP 53108 DRAINAGE CONCEPT REPORT-HYDROLOGY**

**REPORT II : OFF-SITE BORROW AREAS (UNDER CONDITIONAL USE PERMIT) DRAINAGE CONCEPT REPORT**

**REPORT III : OFF-SITE CHIQUITO LANDFILL DRAINAGE CONCEPT REPORT**

# REPORT I

## LANDMARK VILLAGE
## TENTATIVE TRACT MAP 53108
## DRAINAGE CONCEPT REPORT-HYDROLOGY

# LANDMARK VILLAGE
# TENTATIVE TRACT MAP 53108
# DRAINAGE CONCEPT REPORT
# HYDROLOGY

Psomas Project No: 1NRC010708
Prepared: November 2009

Prepared for:

**NEWHALL LAND**
23823 W. Valencia Blvd.
Valencia, CA 91355-2194
Telephone: (661) 255-4000

Prepared by:

**PSOMAS**
28480 Avenue Stanford, Suite 200
Santa Clarita, California 91355
Telephone: (661) 219-6000
Fax: (661) 775-2718

11/12/09

ERIK WINATA R.C.E. No. C67285 Exp. Date **09-30-10**

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Purpose and Scope

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Watershed Characteristics
Existing Condition Results
Proposed Condition Results
Baseline Hydrology Comparison

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**5. References** ..... **19**

## APPENDICES

1. **LACDPW Hydrology Data**
2. **Existing Condition TC Calculations**
3. **Proposed Condition TC Calculations**
4. **Existing Condition LACDPW MORA Calculations**
5. **Existing Conditions – Burned LACDPW MORA Calculations**
6. **Proposed Condition LACDPW MORA Calculations**
7. **Proposed Condition – Burned LACDPW MORA Calculations**
8. **LA County Standard SUSMP Calculations**
9. **Geosyntec Memorandum – Stormwater Control BMP Sizing**
10. **Drainage Concept Exhibits**

# 1.0 Introduction

**NOTE: This Drainage Report was conceptually approved by Land Development Division, Los Angeles County Department of Public Work on July 5, 2007. A revised drainage report is needed for consistency with revised Vesting Tentative Tract Map.**

## *Project Background*

Psomas has been retained by the Newhall Land Co. to prepare a drainage concept report in conjunction with the preparation of Tentative Tract Map No. 53108 for Landmark Village. The project site, located in an unincorporated portion of Los Angeles County, is bounded by the Santa Clara River on the south, the SR 126 on the north and CA Interstate 5 on the east, consists of single- a -family residential, commercial, and recreational uses. Landmark Village is a part of Newhall Land's Newhall Ranch, an approximately 12,000-acre proposed master planned community. Two borrow site areas are associated with Landmark Village but are under a Conditional Use Permit (CUP), not part of the tentative tract map itself, and are addressed in Report II and Report III of Landmark Drainage Concept Report Volume I.

## *Purpose and Scope*

The project falls under the jurisdiction of the Los Angeles County Department of Public Works (LACDPW). The purpose of this drainage concept report is:

- To meet Los Angeles County Land Development requirements in support of the tentative tract map submittal, allowing final design and construction to proceed in a timely manner;
- To determine the proposed development's impact (increase peak flow rates) to existing hydrologic conditions;
- To provide sufficient detailed hydrology information to support detailed hydraulic design of storm drainage facilities; and
- To document that the Los Angeles County Standard Urban Stormwater Mitigation Plan (SUSMP) requirements will be met.

It should be noted that detailed catch basin, storm drain and detention basin hydraulics analysis and sizing is beyond the scope of this drainage concept report.

The following figure is a vicinity map of the Landmark Village site.

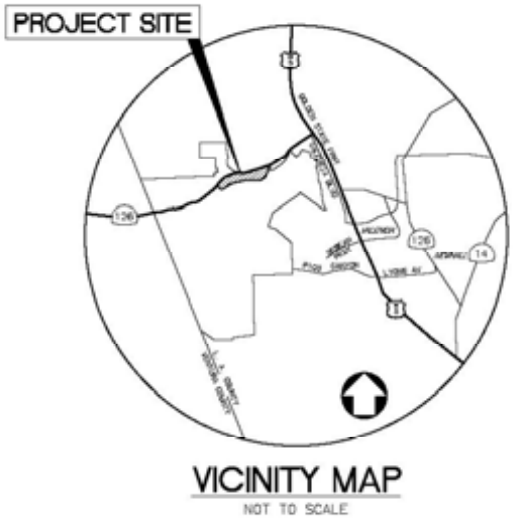



Figure 1. Vicinity Map

## 2.0 Hydrology

### *General Approach*

The watershed of the project was divided into several sub-basins that were identified and characterized for both existing and proposed conditions. Computer modeling was used to estimate the runoff for the 50-year storm events; the analysis considered burned hydrology but no additional bulking factors were used in the proposed conditions, as sediment trapping devices will be installed upstream of the project. In addition, the need for water quality mitigation (SUSMP) was evaluated and is addressed in section 4.

### *Data Sources*

The primary sources of data were the *LACDPW Hydrology/ Sedimentation Manual and Appendices* (LACDPW 1991, 1992, 1993, 2002) and the LA County *Standard Urban Stormwater Mitigation Plan* (March 2000). Other key sources included the *TC (v1.0),* and *MORA (v7.2)* manuals and the Newhall Ranch Specific Plan Master Hydrology and Drainage Concept, Sikand December, 1999 (appended for reference).

### *Watershed Characteristics*

The project site is bounded by the Santa Clara River on the south, SR 126 on the north, and CA Interstate 5 on the east. The off-site contributing drainage area for the site encompasses approximately 236 acres and extends predominantly in the northerly direction from the site. The majority of the area is undeveloped land with moderate slopes. The Chiquito Canyon Landfill drainage area is addressed in a separate study and excluded from this analysis.

The soil of the watershed is classified by Los Angeles County to be Type 020 and 097, as shown on the figure (LACDPW 1-H1.43) included in Appendix 1. The figure also shows that the drainage area is associated Debris Potential Area (DPA) number 9. As previously discussed, the proposed uses of sediment trapping devices preclude the necessity of bulking factors in the proposed conditions. The peak bulking factor curves and peak debris production rates used in the analysis are included in Appendix 1 (LACDPW P2 & P5).

Landmark Village is located in Los Angeles County's Rainfall Isohyet 5.8, as shown on the aforementioned figure in Appendix 1.

The drainage area for the site consists of six sub-basins that independently drain toward the Santa Clara River; refer to the Existing Condition Hydrology Map included with this report. The sub-basins drain southwesterly on site, ultimately tributary to the Santa Clara River.

The *LACDPW TC (TC_calc_depth.xls, June2002)* program was used to calculate the time of concentration for each sub area. The *LACDPW MORA (v7.2)* computer program was used for the *Modified Rational Method* calculations and calculation of peak runoff rates and hydrographs. The TC calculations and MORA program output are provided in Appendix 2-3 and 4-5, respectively. In accordance with LACDPW requirements, the 50-year burned, bulked storm event was used as the main design storm in the analysis.

### *Ex ti tion Results*

Existing condition hydrology results for the Capital Flood storm event is summarized in Table 1 below.

**Table 1: Existing Condition Hydrology Summary**

| Sub basins | Area (Ac) | 50-Year Storm Event[A] | | | |
|---|---|---|---|---|---|
| | | Time of Conc. (min) | $Q_u$ (cfs) | $Q_b$ (cfs) (MORA) | $Q_{bb}$ (cfs) 1.27*$Q_b$ |
| 100A | 32.7 | 22 | 30 | 41 | 52 |
| 110A | 49.6 | 20 | 42 | 59 | 75 |
| **Cumulative** | **82.3** | | | **88** | **112** |
| 200A | 17.3 | 17 | 17 | 23 | 29 |
| 210A | 35.8 | 24 | 28 | 39 | 50 |
| **Cumulative** | **53.1** | | | **60** | **76** |
| 400B | 18.4 | 24 | 14 | 20 | 25 |
| 405B | 38.9 | 28 | 27 | 39 | 50 |
| 408C | 15.3 | 8 | 24 | 31 | 39 |
| 410C | 44.3 | 19 | 41 | 56 | 71 |
| 415B | 35.3 | 11 | 47 | 62 | 79 |
| 420A | 34.4 | 24 | 26 | 37 | 47 |
| 425A | 39.9 | 20 | 35 | 48 | 61 |

| Sub basins | Area (Ac) | 50-Year Storm Event[A] | | | |
|---|---|---|---|---|---|
| | | Time of Conc. (min) | $Q_u$ (cfs) | $Q_b$ (cfs) (MORA) | $Q_{bb}$ (cfs) 1.27*$Q_b$ |
| **Cumulative** | **226.5** | | | **239** | **304** |
| 500A | 26.5 | 20 | 23 | 32 | 41 |
| 510A | 40.0 | 24 | 31 | 44 | 53 |
| **Cumulative** | **66.5** | | | **64** | **81** |
| CQT-1A | 6.1 | 8 | 10 | 13 | 16 |
| CQT-2A | 3.6 | 6 | 8 | 10 | 13 |
| CQT-3A | 1.8 | 5 | 4 | 5 | 6 |
| CQT-4A | 12.3 | 10 | 17 | 22 | 28 |
| CQT-5A | 4.4 | 5 | 9 | 11 | 14 |
| CQT-6A | 24.9 | 15 | 27 | 37 | 47 |
| CQT-7A | 2.1 | 5 | 4 | 5 | 6 |
| CQT-8A | 2.8 | 5 | 7 | 8 | 10 |
| CQT-9A | 31.8 | 14 | 36 | 49 | 62 |
| CQT-10A | 15.6 | 11 | 21 | 28 | 36 |
| CQT-11A | 10.2 | 17 | 16 | 17 | 22 |
| CQT-12A | 11.7 | 10 | 25 | 27 | 34 |
| 620A | 12.4 | 22 | 10 | 14 | 18 |
| **Cumulative** | **140** | | | **160** | **203** |
| **Total** | **568.1** | | | **611** | **776** |

*Notes*

A. *Burned and bulked flow. The Cumulative flow is the result shown in the MORA tabulations that are in the Appendix. The Total Flow is the sum of the Cumulative Flows shown.*

### *Post-Project Condition Results*

The post-project condition hydrologic analysis was based on the preliminary concept drainage plan prepared by Psomas, included with this report. The post-project (developed) Condition Drainage Concept Map is also included with this report. Post-development drainage patterns do not significantly differ from the aforementioned existing characteristics.

As with the proposed condition analysis, the *LACDPW TC* program was used to calculate the time of concentration, and the *LACDPW MORA* computer program was used to calculate the peak runoff rates and hydrographs for landmark offsite. The calculations and program output are provided in Appendix 3 and 5 respectively.

Land use impervious factors used were based on combination *LACDPW Hydrology/Sedimentation Appendix* and case by case studies. Details for land use impervious factors are shown on Appendix I.

Post-project condition hydrology results for the 50-year storm event is summarized in Table 3.

**Table 3: Post-Project Condition Hydrology Summary**

| Sub basins | Area(Ac) | Time of Conc. (min) | 50-Year Storm EventA | | | |
|---|---|---|---|---|---|---|
| | | | $Q_u$ (cfs) | $Q_b$ (cfs) (MORA) | $Q_{bb}$(cfs) 1.27*$Q_b$ | Qdesign (cfs) (MORA ) |
| R -1A | 18 | 19 | 22 | 26 | 33 | 26 |
| R -2A | 39 | 22 | 43 | 52 | 66 | 52 |
| R -3B | 15 | 7 | 32 | 37 | 47 | 37 |
| R -4B | 44 | 15 | 61 | 73 | 93 | 73 |
| R -6A | 35 | 9 | 65 | 76 | 97 | 76 |
| R -6A (Retention) | - | - | - | - | - | -90 |
| R -7A | 16 | 29 | 23 | | | 23 |
| **Subtotal(Off-Site)** | **168** | | | **$\Sigma Q_{b+d}$-detention** | | **98** |
| | | | | | | |
| RVE-8A | 6.35 | 8 | 15.8 | | | 15.8 |
| RVE-9B | 7.04 | 10 | 15.8 | | | 15.8 |
| RVE-10B | 0.69 | 6 | 2.0 | | | 2.0 |
| RVE-11C | 1.02 | 5 | 3.2 | | | 3.2 |
| RVE-12C | 0.63 | 5 | 2.0 | | | 2.0 |
| RVE-13C | 0.87 | 5 | 2.7 | | | 2.7 |
| RVE-14C | 0.2 | 5 | 0.6 | | | 0.6 |
| RVE-15C | 0.54 | 10 | 1.2 | | | 1.2 |
| RVE-16C | 2.78 | 10 | 6.3 | | | 6.3 |
| RVE-17C | 5.17 | 8 | 12.9 | | | 12.9 |
| RVE-18C | 0.66 | 11 | 1.4 | | | 1.4 |
| RVE-19C | 0.3 | 7 | 0.8 | | | 0.8 |
| RVE-20C | 4.68 | 18 | 8.0 | | | 8.0 |
| RVE-21D | 1.82 | 7 | 4.8 | | | 4.8 |
| RVE-22D | 0.34 | 7 | 0.9 | | | 0.9 |
| RVE-22.1D | 3.56 | 7 | 9.5 | | | 9.5 |
| RVE-23D | 0.55 | 10 | 1.2 | | | 1.2 |
| RVE-24D | 0.77 | 12 | 1.6 | | | 1.6 |
| RVE-25D | 0.21 | 5 | 0.7 | | | 0.7 |
| RVE-26D | 5.09 | 11 | 11.0 | | | 11.0 |

| Sub basins | Area(Ac) | Time of Conc. (min) | 50-Year Storm EventA | | | |
|---|---|---|---|---|---|---|
| | | | $Q_u$ (cfs) | $Q_b$ (cfs) (MORA) | $Q_{bb}$(cfs) 1.27*$Q_b$ | Qdesign (cfs) (MORA ) |
| RVE-27D | 0.95 | 13 | 1.9 | | | 1.9 |
| RVE-28D | 1.78 | 11 | 3.8 | | | 3.8 |
| RVE-29D | 2.08 | 11 | 4.5 | | | 4.5 |
| RVE-30E | 0.53 | 9 | 1.3 | | | 1.3 |
| RVE-31E | 0.47 | 5 | 1.5 | | | 1.5 |
| RVE-32E | 0.33 | 5 | 1.0 | | | 1.0 |
| RVE-33E | 5.86 | 9 | 13.9 | | | 13.9 |
| RVE-34E | 5.29 | 7 | 14.0 | | | 14.0 |
| RVE-35E | 1.23 | 8 | 3.1 | | | 3.1 |
| RVE-36E | 0.68 | 10 | 1.5 | | | 1.5 |
| RVE-37E | 1.7 | 10 | 3.8 | | | 3.8 |
| RVE-38F | 0.25 | 6 | 0.7 | | | 0.7 |
| RVE-39F | 2.03 | 6 | 5.8 | | | 5.8 |
| RVE-40F | 0.05 | 5 | 0.2 | | | 0.2 |
| RVE-41F | 1.79 | 9 | 4.2 | | | 4.2 |
| RVE-42F | 0.5 | 9 | 1.2 | | | 1.2 |
| RVE-43F | 3.86 | 12 | 8.0 | | | 8.0 |
| RVE-44F | 2.86 | 11 | 6.2 | | | 6.2 |
| RVE-45F | 0.14 | 5 | 0.4 | | | 0.4 |
| RVE-46F | 2.69 | 13 | 5.4 | | | 5.4 |
| RVE-51G | 2.99 | 8 | 7.5 | | | 7.5 |
| RVE-52G | 1.24 | 7 | 3.3 | | | 3.3 |
| RVE-53G | 1.21 | 6 | 3.5 | | | 3.5 |
| RVE-54G | 1.19 | 6 | 3.4 | | | 3.4 |
| RVE-55G | 0.82 | 5 | 2.6 | | | 2.6 |
| RVE-56G | 1.02 | 7 | 2.7 | | | 2.7 |
| RVE-57G | 3.37 | 9 | 8.0 | | | 8.0 |
| RVE-58G | 1.93 | 12 | 4.0 | | | 4.0 |
| RVE-59G | 1.9 | 10 | 4.3 | | | 4.3 |
| RVE-60G | 9.88 | 11 | 21.3 | | | 21.3 |
| RVE-61G | 1.36 | 9 | 3.2 | | | 3.2 |
| RVE-62G | 1.22 | 8 | 3.0 | | | 3.0 |
| RVE-63G | 4.11 | 10 | 9.3 | | | 9.3 |
| **Subtotal(RVE)** | **110.58** | | | | | - |

| Sub basins | Area(Ac) | Time of Conc. (min) | 50-Year Storm EventA | | | |
|---|---|---|---|---|---|---|
| | | | $Q_u$ (cfs) | $Q_b$ (cfs) (MORA) | $Q_{bb}$(cfs) 1.27*$Q_b$ | Qdesign (cfs) (MORA ) |
| | | | | | | |
| RVC-1A | 11.66 | 12 | 24.0 | | | 24.0 |
| RVC-2A | 4.08 | 9 | 9.7 | | | 9.7 |
| RVC-3A | 2.39 | 14 | 4.6 | | | 4.6 |
| RVC-4A | 1.67 | 13 | 3.3 | | | 3.3 |
| RVC-5A | 0.4 | 5 | 1.3 | | | 1.3 |
| RVC-6A | 0.78 | 5 | 2.4 | | | 2.4 |
| RVC-7A | 0.55 | 5 | 1.7 | | | 1.7 |
| RVC-8A | 1.52 | 7 | 4.0 | | | 4.0 |
| RVC-9B | 8.39 | 11 | 18.1 | | | 18.1 |
| RVC-10B | 1.03 | 9 | 2.4 | | | 2.4 |
| RVC-11B | 0.74 | 8 | 1.8 | | | 1.8 |
| RVC-12B | 9.79 | 10 | 22.0 | | | 22.0 |
| RVC-13B | 1.34 | 11 | 2.9 | | | 2.9 |
| RVC-14B | 2.83 | 11 | 6.1 | | | 6.1 |
| RVC-15C | 3.54 | 8 | 8.8 | | | 8.8 |
| **Subtotal(R )** | **50.71** | | | | | - |
| | | | | | | |
| RVW-1A | 0.8 | 6.0 | 2.4 | | | 2.4 |
| RVW-2A | 3.2 | 5.0 | 10.0 | | | 10.0 |
| RVW-3A | 1.5 | 7.0 | 3.9 | | | 3.9 |
| RVW-4A | 3.3 | 8.0 | 8.3 | | | 8.3 |
| RVW-5B | 0.3 | 5.0 | 1.1 | | | 1.1 |
| RVW-6B | 1.2 | 5.0 | 3.8 | | | 3.8 |
| RVW-7B | 0.2 | 5.0 | 0.6 | | | 0.6 |
| RVW-8B | 0.2 | 5.0 | 0.6 | | | 0.6 |
| RVW-9B | 2.2 | 7.0 | 5.9 | | | 5.9 |
| RVW-10B | 1.3 | 7.0 | 3.5 | | | 3.5 |
| RVW-11B | 0.3 | 5.0 | 1.1 | | | 1.1 |
| RVW-12B | 3.5 | 15.0 | 6.6 | | | 6.6 |
| RVW-12C | 0.9 | 12.0 | 1.8 | | | 1.8 |
| RVW-13C | 3.6 | 8.0 | 9.0 | | | 9.0 |
| RVW-14C | 2.6 | 12.0 | 5.3 | | | 5.3 |
| RVW-15C | 2.1 | 9.0 | 5.0 | | | 5.0 |
| RVW-16C | 1.0 | 7.0 | 2.6 | | | 2.6 |

| Sub basins | Area(Ac) | Time of Conc. (min) | 50-Year Storm EventA | | | |
|---|---|---|---|---|---|---|
| | | | $Q_u$ (cfs) | $Q_b$ (cfs) (MORA) | $Q_{bb}$(cfs) 1.27*$Q_b$ | Qdesign (cfs) (MORA ) |
| RVW-17C | 1.9 | 11.0 | 4.1 | | | 4.1 |
| RVW-18D | 1.9 | 7.0 | 5.1 | | | 5.1 |
| RVW-19D | 0.5 | 6.0 | 1.5 | | | 1.5 |
| RVW-20D | 0.4 | 6.0 | 1.1 | | | 1.1 |
| RVW-21D | 11.0 | 15.0 | 20.4 | | | 20.4 |
| RVW-22D | 1.9 | 13.0 | 3.7 | | | 3.7 |
| RVW-23D | 1.3 | 12.0 | 2.6 | | | 2.6 |
| RVW-24D | 4.9 | 11.0 | 10.6 | | | 10.6 |
| RVW-25D | 0.5 | 6.0 | 1.4 | | | 1.4 |
| RVW-26D | 1.1 | 5.0 | 3.5 | | | 3.5 |
| RVW-26.1D | 0.6 | 5.0 | 1.7 | | | 1.7 |
| RVW-27D | 1.0 | 6.0 | 2.9 | | | 2.9 |
| RVW-28D | 17.7 | 11.0 | 38.1 | | | 38.1 |
| RVW-29D | 4.1 | 8.0 | 10.1 | | | 10.1 |
| RVW-31E | 2.2 | 10.0 | 4.9 | | | 4.9 |
| RVW-32E | 0.7 | 5.0 | 2.2 | | | 2.2 |
| RVW-33E | 2.0 | 7.0 | 5.3 | | | 5.3 |
| RVW-34E | 2.4 | 10.0 | 5.5 | | | 5.5 |
| RVW-35E | 0.7 | 7.0 | 1.7 | | | 1.7 |
| RVW-36E | 0.3 | 5.0 | 0.8 | | | 0.8 |
| RVW-37E | 0.4 | 5.0 | 1.2 | | | 1.2 |
| RVW-38E | 0.8 | 6.0 | 2.2 | | | 2.2 |
| RVW-39E | 5.7 | 11.0 | 12.3 | | | 12.3 |
| RVW-39.1E | 0.8 | 8.0 | 1.9 | | | 1.9 |
| RVW-40E | 7.4 | 10.0 | 16.7 | | | 16.7 |
| RVW-41E | 2.3 | 10.0 | 5.2 | | | 5.2 |
| RVW-42E | 1.0 | 7.0 | 2.8 | | | 2.8 |
| RVW-43G | 1.3 | 8.0 | 3.2 | | | 3.2 |
| RVW-44G | 1.9 | 5.0 | 6.0 | | | 6.0 |
| **Subtotal(R )** | **107.0** | | | | | **-** |
| | | **$\Sigma Q_{peak}$ (Line 1 through Line 15)** | | | | **515** |
| CQT-1A | 30.0 | 11 | 42 | 54 | 69 | 69 |
| CQT-2A | 6.0 | 6 | 12 | 15 | 19 | 19 |
| CQT-3B | 4.0 | 5 | 9 | 11 | 14 | 11 |
| CQT-4B | 20.0 | 14 | 24 | 31 | 39 | 31 |

| Sub basins | Area(Ac) | Time of Conc. (min) | 50-Year Storm EventA | | | |
|---|---|---|---|---|---|---|
| | | | $Q_u$ (cfs) | $Q_b$ (cfs) (MORA) | $Q_{bb}$(cfs) 1.27*$Q_b$ | Qdesign (cfs) (MORA ) |
| CQT-5B | 7.0 | 7 | 13 | 16 | 20 | 16 |
| CQT-6B | 6.0 | 7 | 11 | 14 | 18 | 14 |
| CQT-7B | 13.0 | 9 | 24 | 28 | 35 | 28 |
| CQT-9C | 8.0 | 8 | 13 | 17 | 22 | 17 |
| CQT-10C | 9.0 | 11 | 12 | 16 | 20 | 16 |
| CQT-11C | 12.0 | 18 | 20 | | | 20 |
| CQT-12C | 2.0 | 16 | 2 | | | 2 |
| CQT-13C | 8.0 | 22 | 11 | | | 11 |
| **Subtotal (CQT) (offsite)** | **125** | $\Sigma Q_{peak}$ (CQT offsite) | | | | **159** |
| | | | | | | |
| **SUM** | **560** | | | | | **772[A]** |

*Notes*

*A. The Cumulative flow is the result shown in the MORA tabulations that are in the Appendix. The Total Flow is the sum of the Cumulative Flows shown. Burned flow for Subareas RVE 1A thru 6A, Develop flow for the remaining Subareas RVE, S -3B, CQT-4B, CQT-5B, CQT-9C Burned and bulked flow for Subareas CQT-1A and, CQT-2A, Develop flow for Subareas CQT-7B, CQT-11C , CQT-12C and CQT-13C.*

### *Baseli*

In accordance with Los Angeles County hydrology method, existing condition burned and bulked flow is assessed with proposed condition flow burned, unbulked due to the proposed addition of debris facilities where needed.

**Table 4: Existing vs. Proposed Condition Hydrology Comparison Summary**

| 50-Year Storm Event | | | | | | |
|---|---|---|---|---|---|---|
| **Sub area** | **Area (Ac)** | | | **$Q_{50}$ (cfs)** | | |
| | **Exist.[A]** | **Prop.[B]** | **Diff.** | **Exist[C].** | **Prop.[D]** | **Diff.** |
| **Total Study Area** | **568** | **560** | **-8** | **776** | **772** | **-4** |

*Notes*

A. *Existing Tributary Drainage Area*
B. *Proposed Tributary Drainage Area.*
C. *Burned and bulked flow*
D. *Burned flow for Subareas RVE 1A thru 6A, Develop flow for the remaining Subareas RVE, S , Burned flow for Subareas CQT-3B, CQT-4B, CQT-5B, CQT-9C Burned and bulked flow for Subareas CQT-1A and, CQT-2A, Develop flow for Subareas CQT-7B, CQT-11C , CQT-12C and CQT-13C.*

## 3.0 Standard Urban Stormwater Mitigation Plan (SUSMP)

Structural or Treatment Control Best Management Practices (BMPs) a
).

With respect to BMP sizing for Newhall Ranch projects, a performance standard has been established via another water quality report (Geosyntec Landmark Water Quality Technical Report, February 2008) that covers the entire Ranch (the Newhall Ranch Specific Plan Sub-Regional Stormwater Mitigation Plan). That plan states that all BMPs on the ranch will be sized to capture and treat 80 percent of the average annual runoff volume. The document further states that all BMPs will be sized to achieve this standard or the Los Angeles County SUSMP Manual sizing standard, whichever is more stringent.

Hence, all BMPs within Landmark Village project will be sized to achieve this Sub-Regional Stormwater Mitigation Plan or the Los Angeles County SUSMP Manual sizing standard, whichever is more stringent

Based on LA county methodology, minimum SUSMP requirements have been calculated and shown on Appendix 6.
Based on Geosyntec Water Quality Technical Report methodology, minimum SUSMP requirements have been calculated and shown on Appendix 7 (Geosyntec memorandum Table 1, 2 &3).

The LACDPW intensity-duration data and the runoff coefficient curve for soil type 20 are included in Appendix 1. Drainage area design parameters are shown on Appendix 3.

The BMPs requirements are summarized in the table 5. Refer to SUSMP Map (Sheet 2A) on Appendix 8 for BMPs locations and contributing subareas.

## Table 5: SUSMP Requirements

| Prop. BMP Site Number | Subarea | Area (ac) | LA County Required Design Flow(Qpm) cfs | Geosyntec Newhall standarad Design Flow(Qpm) cfs | LA County Required Mitigated Volume (Vm) Acre-Ft | Geosyntec Newhall standarad Mitigated Volume (Vm) Acre-Ft | Qpm or Vpm Designed |
|---|---|---|---|---|---|---|---|
| BMP 1 | RVE-9B/20C | 11.72 | | | 0.35 | 0.39 | 0.39 Ac.ft |
| BMP 2 | RVE-11C/12C/13C/14C/15C/16C/17C/18C/19C/29D | 14.25 | - | - | 0.53 | 0.58 | 0.58 Ac.f |
| BMP 3 | RVE-21D/22D/22.1D/23D/24D/25D/26D/27D/28D/37E | 16.77 | - | - | 0.70 | 0.74 | 0.74 Ac.ft |
| BMP 4 | RVE-30E/31E/32E/33E/34E/35E/36E/46F | 17.07 | - | - | 0.66 | 0.71 | 0.71 Ac.f |
| BMP 5 | RVE-38F/39F/40F/41F/42F/43F/44F/45F/8A | 13.00 | - | - | 0.50 | 0.54 | 0.54 Ac.ft |
| BMP 6/7 | RVC-1A/2A/3A/4A/5A/6A/7A/9B/10B/11B/12B/13B/14B/ RVW-1A/2A/3A/4A/5B/6B/7B/8B/9B/10B/11B/12B/17C RVW-12/C/13C/14C/15C/16C/43G | 77.23 | - | - | 3.24 | 3.45 | 3.45Ac.f |
| BMP 8 | RVW-18D/19D/20D/21D/22D/23D/24D/25D/26D/26.1D//27D/28D/29D/31E/32E/33E/34E/35E/36E/44G | 56.90 | - | - | 2.55 | 4.6 | 4.6 Ac.ft |
| BMP 9 | RVW-37E/38E/40E/42E | 9.59 | - | - | 0.45 | 0.47 | 0.47 Ac.f |
| BMP 10 | RVW-39.1E/39E/41E | 8.50 | - | - | 0.30 | 0.34 | 0.34 Ac.f |

| Prop. BMP Site Number | Subarea | Area (ac) | LA County Required Design Flow(Qpm) cfs | Geosyntec Newhall standarad Design Flow(Qpm) cfs | LA County Required Mitigated Volume (Vm) Acre-Ft | Geosyntec Newhall standarad Mitigated Volume (Vm) Acre-Ft | Qpm or Vpm Designed |
|---|---|---|---|---|---|---|---|
| BMP 11/12 | RVE-51G/52G/53G/54G/55G/56G/57G/58G/59G/63G | 19.78 | - | - | 0.79 | 0.84 | 0.84 Ac.ft |
| BMP 13 | RVE-15C | 3.54 | 0.15 | 0.24 | - | - | 0.24 cfs |
| BMP 14 | RVE-60G | 9.88 | - | - | 0.43 | 0.45 | 0.45 Ac.f |
| BMP 15 | RVE-62G | 1.22 | 0.20 | 0.31 | - | | 0.31 cfs |
| BMP 16 | RVE-61G | 1.36 | 0.22 | 0.34 | - | | 0.34 cfs |

**1 - SUSMP for Offsite development within Caltran R/W to be address per separate Caltran SR126 Design(RVE7A and CQT11C-13C).*

Based on Qpm or Vpm designed on Table 5, treatment goals can be achieved through a variety of BMPs including detention basins, biofilter swales, catch basin inserts and media filtration. Type of BMPs design will comply with both LA County SUSMP Manual and Geosyntec Water Quality Technical Report (February 2008).

Landmark Village Project will consist of one extended Bio (ED) basin, eleven Bio Basin areas, one vegetated swale, and two modular wetlands. The ED basin, identified as BMP-8, will provide treatment for 57 acres (21%) of the project development area; the 11 Bio Basin areas will provide treatment for 204 acres 560 of the project development area; the vegetated swale will provide treatment for 3.54 acres (~1.5%) of the project development area; and two modular wetlands will provide treatment for 2.6 acres (~1%) of the project development area.

Table 5 Summarized BMPs type for each BMP site. It also illustrates how the required treatment capacity can be met based on the area allocated.

## Table 5: BMPs Sites & Design

| Prop. BMP Site Number | Location of Prop. BMP Site | BMP Type | Required Qpm or Vpm (Table 5) | Area provided for SUSMP Treatment (AC) | Avg Width | Avg Length | Area provided for SUSMP Treatment (AC) | Max Volume With Vertical Wall | Max Volume With 2:1 Side Slope, 1' freeboard , 2.5' Total Depth |
|---|---|---|---|---|---|---|---|---|---|
| BMP 1 | RVE-20C | Bio Basin | 0.39 Ac.ft | 1.18 | 30 | 1650 | 1.18 | 1.77 | 1.36 |
| BMP 2 | RVE-29D | Bio Basin | 0.58 Ac.ft | 0.63 | 30 | 830 | 0.63 | 0.95 | 0.92 |
| BMP 3 | RVE-37E | Bio Basin | 0.74 Ac.ft | 0.54 | 45 | 580 | 0.54 | 0.81 | 0.72 |
| BMP 4 | RVE-46F | Bio Basin | 0.71 Ac.ft | 1.08 | 40 | 1120 | 1.08 | 1.62 | 1.34 |
| BMP 5 | RVC-8A | Bio Basin | 0.54 Ac.f | .41 | 45 | 395 | 0.41 | 0.62 | 0.56 |
| BMP 6/7 | RVW-12B/RVW-17C/43G | Bio Basin | 3.45Ac.ft | 2.73 | 45 | 2550 | 2.73 | 4.09 | 3.45 |
| BMP 8 | RVW-44G | WQ Extended Bio Basin *b | 4.6 Ac.ft | - | - | - | - | 5.06 *a | - |
| BMP 9 | RVW-42E | Bio Basin | 0.47 Ac.f | .48 | 45 | 360 | 0.48 | 0.72 | 0.42 |
| BMP 10 | RVW-41E | Bio Basin | 0.34 Ac.ft | 0.68 | 45 | 630 | 0.68 | 1.02 | 1.14 |
| BMP 11/12 | RVE-59G/63G | Bio Basin | 0.84 Ac.ft | 0.93 | 30 & 15 | 680 &1000 | 0.93 | 1.40 | 0.86 |
| BMP 13 | RVE-15C | Vegatative Swale | 0.24 cfs | - | 18 | 330 | - | - | - |
| BMP 14 | RVE-60G | Bio Basin | 0.45 Ac.ft | 0.3 | - | - | 0.30 | 0.45 | 0.51 |
| BMP 15 | RVE-62G | Modular Wetland Unit | 0.31 cfs | - | - | - | - | - | - |
| BMP 16 | RVE-61G | Modular Wetland Unit | 0.34 cfs | - | - | - | - | - | - |
| BMP 17 | RVE-8A | Bio Basin | 0.13 Ac.ft | 0.2 | - | - | 0.20 | 0.30 | 0.29 |

** - Volume based on 3:1 side slope, 2 ft freeboard. As shown on Extended Biodetention Basin Cross Section on SUSMP Map(Sheet 2A)*

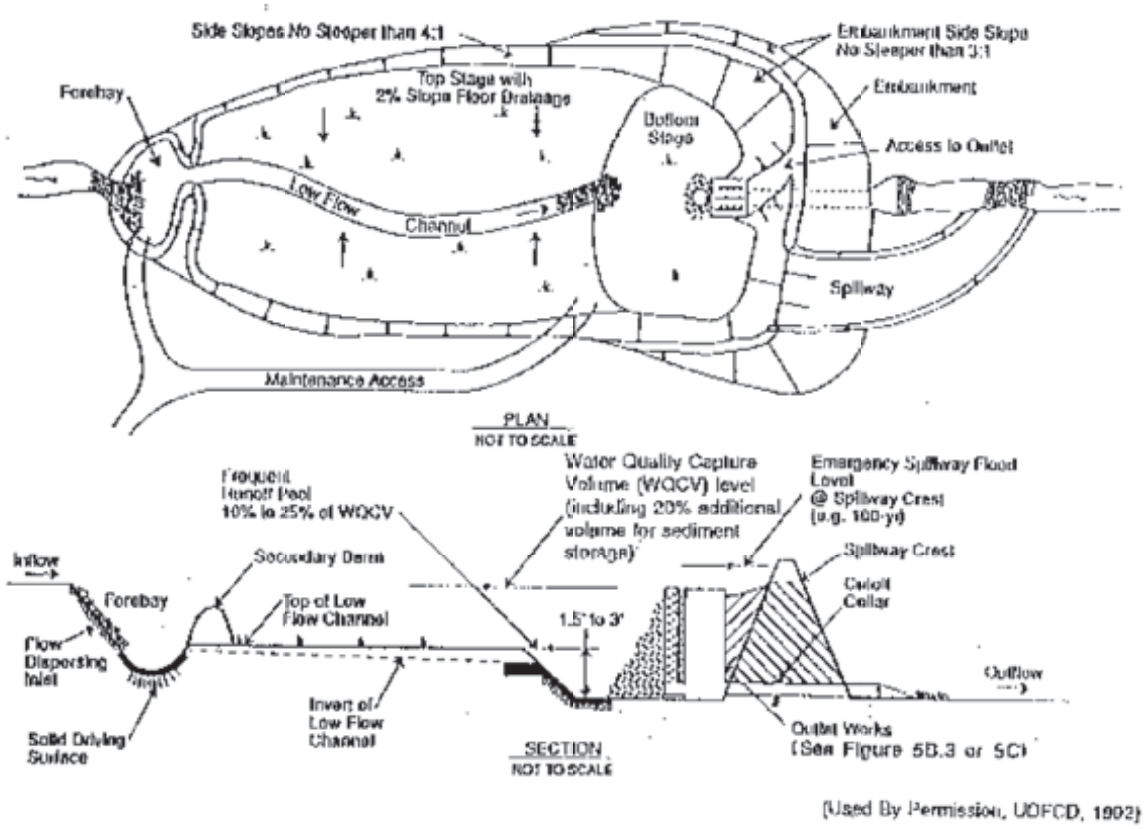
**b - The proposed EDB shall be designed to have a drawdown time or 48 hours, as described in the Geosyntec Report*

A comparison of the required treatment volumes and the volume available within the detention basin clearly indicates that this approach is feasible. The detailed design of the extended bio basin, bio basin areas, and biofilter swales for the project is beyond the scope of this report. However, this report does show that the 80% capture requirements can be met within the areas allocated for the proposed BMPs.

For contingency design, additional approved BMPs (pervious concrete, catch basin insert, etc) approved may be added to subarea RVW-28D (commercial lot) if ED size on BMP8 is reduced during the final engineering process. The same approach applied to multifamily lot on subarea RVC-1A and RVC-9B if BMP 6 is reduced during the final engineering process. However, analysis of this approach is beyond the scope of this preliminary analysis. It should be noted that the SUSMP requirements were calculated for all areas of the project site.

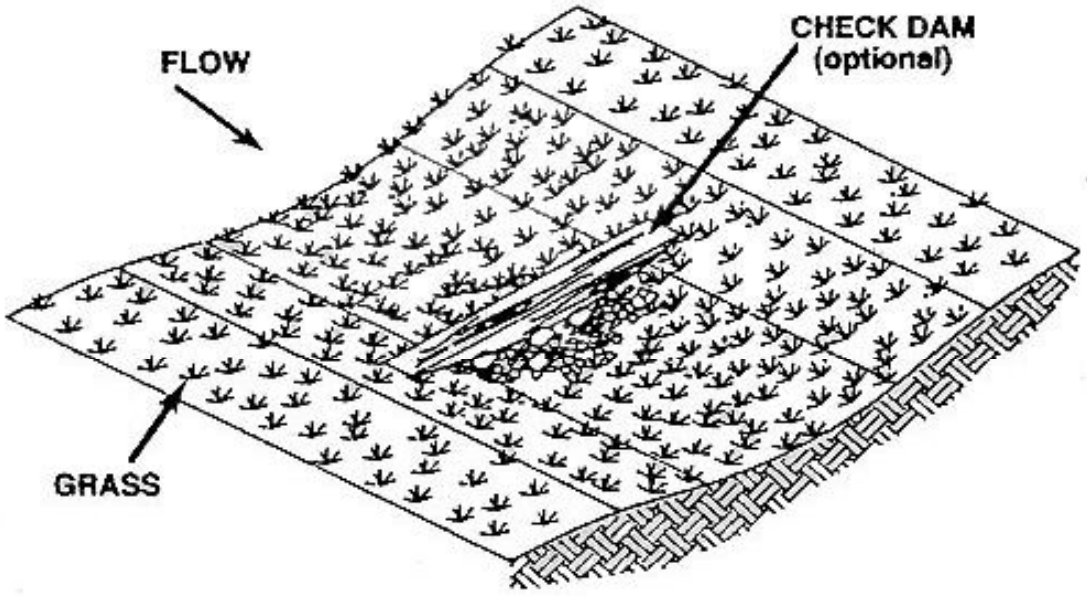
Both bio basin areas and vegetative swales will require flow spreaders so that stormwater flows from the inlet pipes will extend across the width of the swale or bio basin area and reduce the chance of channeling caused by concentrated flows.

Typical layouts of the proposed BMPs are shown below based on LA County SUSMP Manual. Project specific Typical Bio Basin and Extended Bio Basin cross sections are shown on SUSMP Map (Sheet 2A) on Appendix 8.

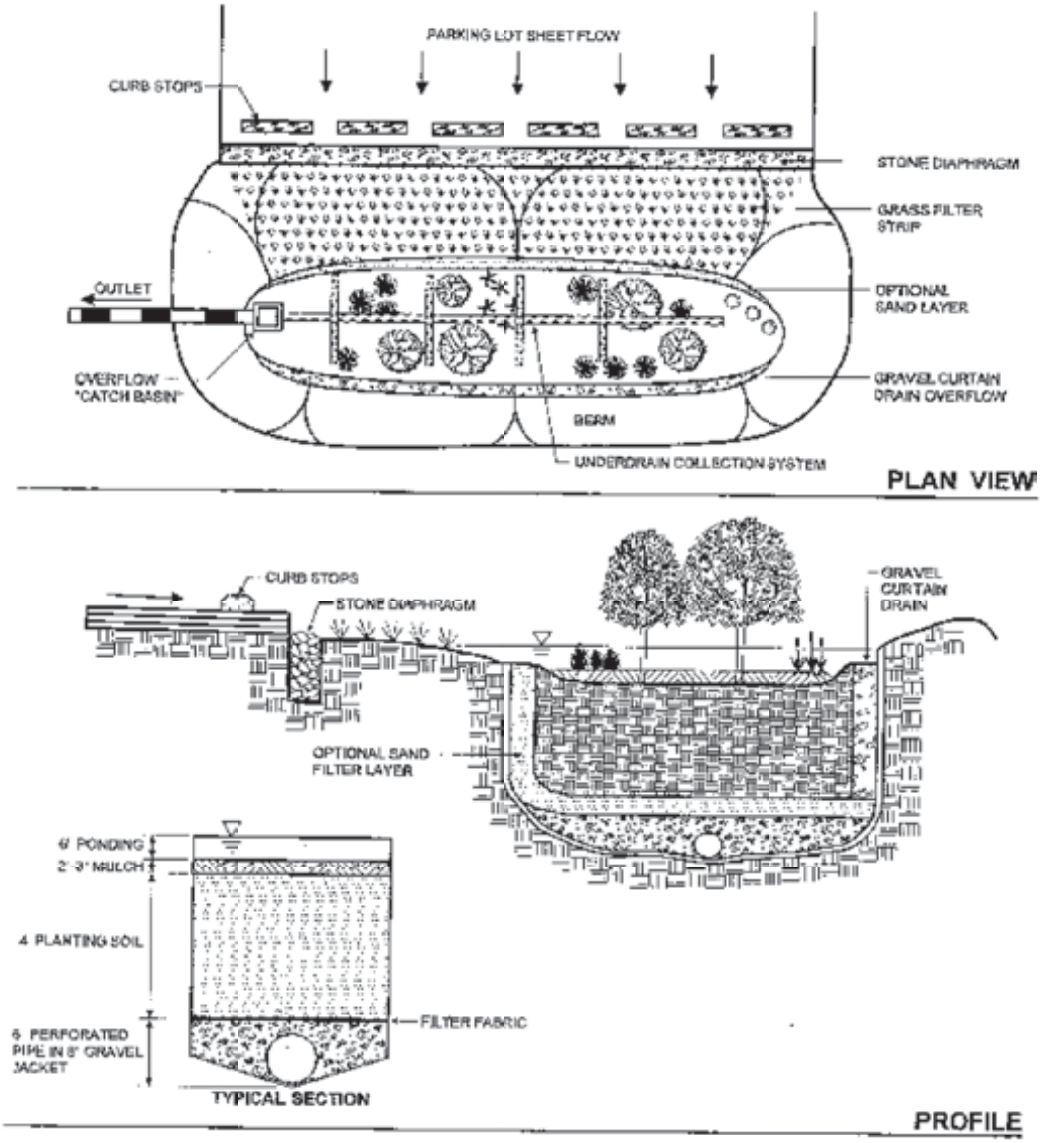



(Used By Permission, UDFCD, 1992)

PLAN AND SECTION OF AN EXTENDED DETENTION BASIN




TYPICAL VEGETATED SWALE




**Schematic of a Bioretention Facility (MDE, 2000)**

## 5.0 Limitations

This report was prepared to comply with the guidelines established by the County of Los Angeles and their representatives. Evaluation of the appropriateness of these guidelines and the accuracy of the County data were beyond the scope of this work.

Usage of the report is limited to address the purpose and scope previously defined by the project owner, Newhall Land. Psomas shall not be held responsible for any unauthorized application of this report and the contents herein.

The opinions represented in this report have been derived in accordance with current standards of civil engineering practice. No other warranty is expressed or implied.

## 6.0 References

California Stormwater Quality Association, *Stormwater Best Management Practice Handbook, New Development and Redevelopment*, January 2003

Los Angeles County Department of Public Works, *LACDPW Hydrology/ Sedimentation Manual and Appendices* (1991, 1992, 1993, 2002)

Los Angeles County Department of Public Works, *LACDPW TC v1.0 Manual, TC_calc_depth.xls* (December 1991, June 2002)

Los Angeles County Department of Public Works, *LACDPW Modified Rational Method, MORA (MORA) v7.2 Manual* (September 2002)

Los Angeles Regional Water Quality Control Board, *Standard Urban Stormwater Mitigation Plan for Los Angeles County and Cities in Los Angeles County* (March 2000)

Newhall Land and Farming Company, Landmark Village Water Quality Technical Report (GeoSyntec Consultants, April 10, 2005)

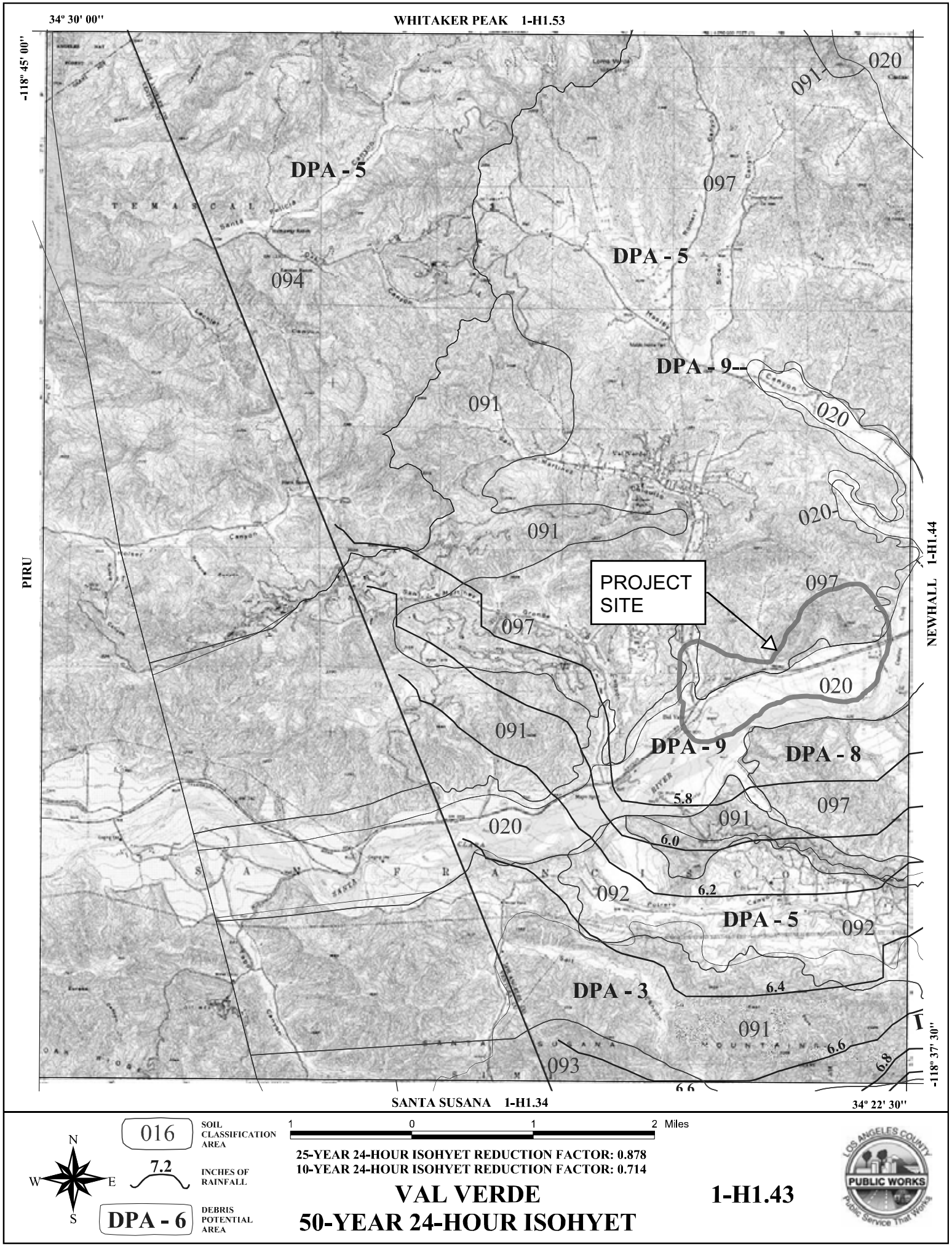
Newhall Ranch, Newhall Ranch Specific Plan Master Hydrology and Drainage Concept (Sikand, December, 1999)

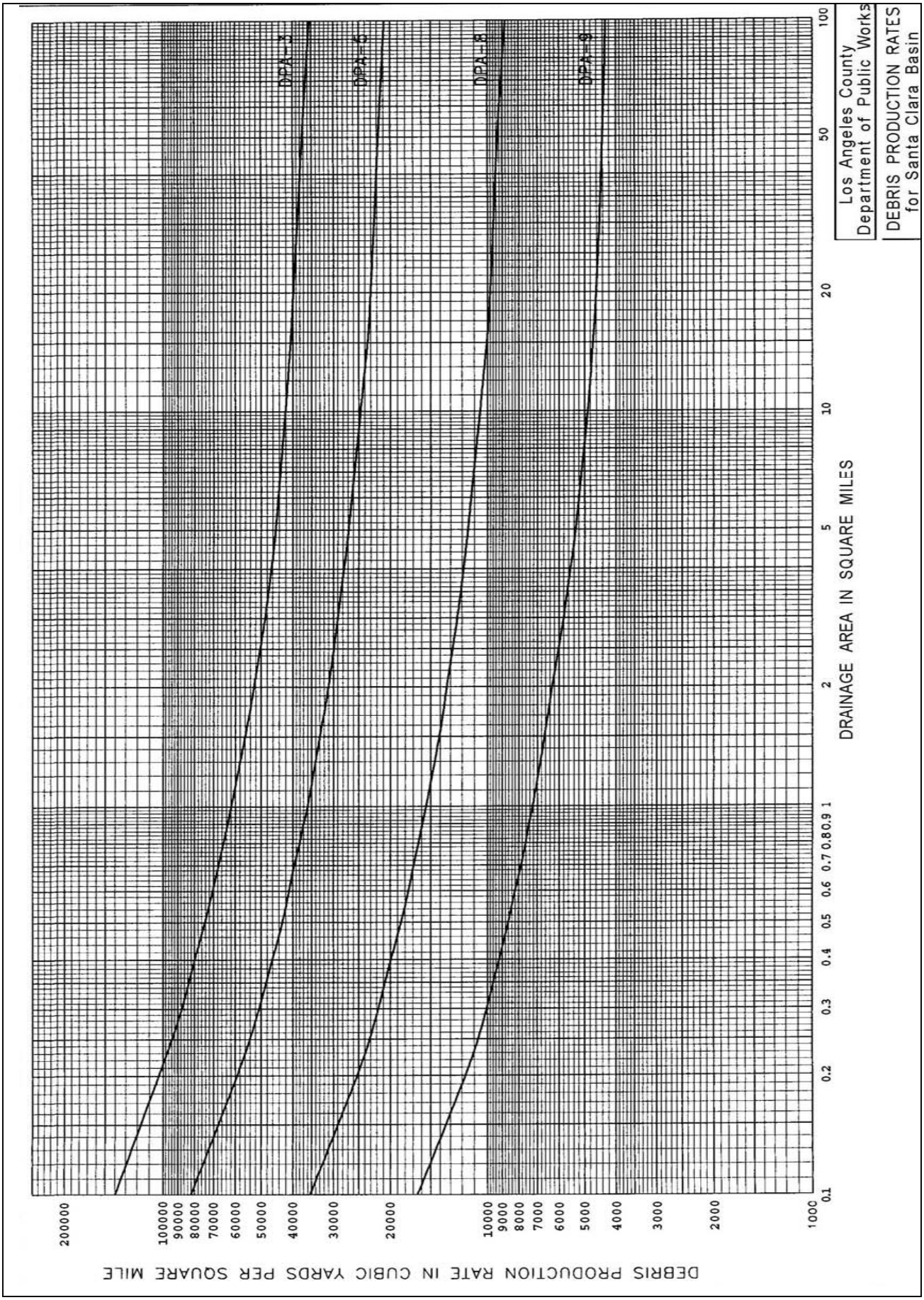
County of Los Angeles Low-Impact Development Manual

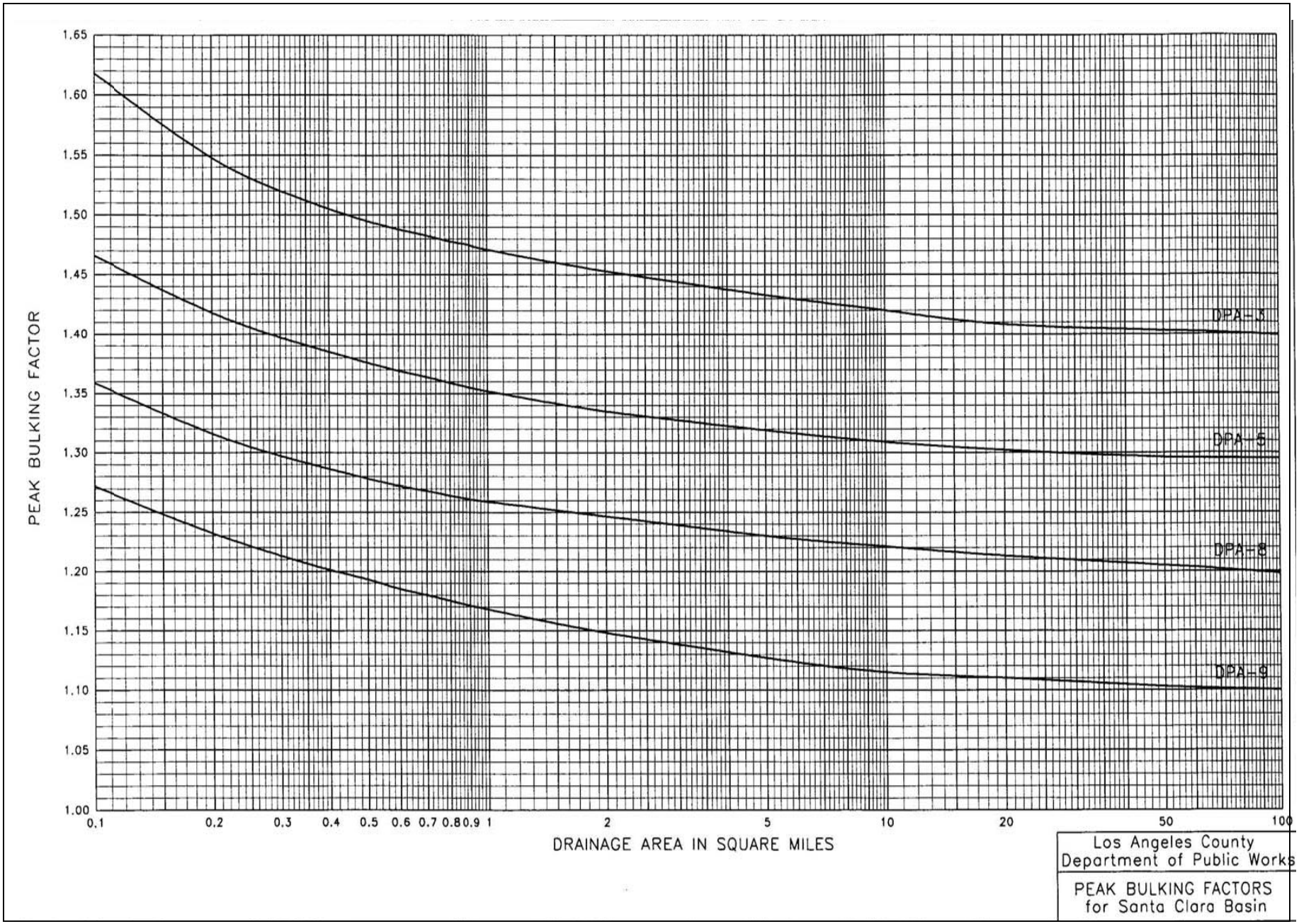
# APPENDICES

# APPENDIX 1

# LACDPW HYDROLOGY DATA


34° 30' 00"
WHITAKER PEAK 1-H1.53
-118° 45' 00"
PIRU
NEWHALL 1-H1.44
-118° 37' 30"
SANTA SUSANA 1-H1.34
34° 22' 30"
DPA - 5
DPA - 5
DPA - 9
DPA - 9
DPA - 8
DPA - 5
DPA - 3
PROJECT SITE
091
020
097
094
092
093
5.8
6.0
6.2
6.4
6.6
6.8
6.6
SANTA SUSANA MOUNTAINS
SAN FERNANDO
016
SOIL CLASSIFICATION AREA
7.2
INCHES OF RAINFALL
DPA - 6
DEBRIS POTENTIAL AREA
N
W
E
S
1 0 1 2 Miles
25-YEAR 24-HOUR ISOHYET REDUCTION FACTOR: 0.878
10-YEAR 24-HOUR ISOHYET REDUCTION FACTOR: 0.714
VAL VERDE
50-YEAR 24-HOUR ISOHYET
1-H1.43
LOS ANGELES COUNTY
PUBLIC WORKS
Public Service That Works


DEBRIS PRODUCTION RATE IN CUBIC YARDS PER SQUARE MILE
200000
100000
90000
80000
70000
60000
50000
40000
30000
20000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
DPA-1
DPA-2
DPA-3
DPA-4
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
2
5
10
20
50
100
DRAINAGE AREA IN SQUARE MILES
Los Angeles County
Department of Public Works
DEBRIS PRODUCTION RATES
for Santa Clara Basin


PEAK BULKING FACTOR
1.65
1.60
1.55
1.50
1.45
1.40
1.35
1.30
1.25
1.20
1.15
1.10
1.05
1.00
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
2
5
10
20
50
100
DRAINAGE AREA IN SQUARE MILES
DPA-3
DPA-5
DPA-8
DPA-9
Los Angeles County
Department of Public Works
PEAK BULKING FACTORS
for Santa Clara Basin

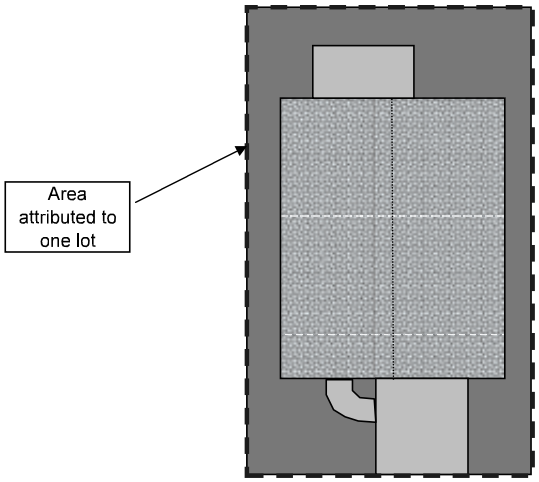
# Land Use Impervious Factors

| Land Use | Land Use Grouping for WQ and Hydro | Land Use %Imp | Source | Notes |
|---|---|---|---|---|
| 40’ x 95’ SFD | High Density Single Family | 58 | Study of typical lot dimensions | |
| 45' x 100' SFD | | | | |
| 50' x 100' SFD | | | | |
| 55' x 100' SFD | | | | Incorporates minor roadways |
| Duplex/Triplex | Multi-family | 74 | Hydrology Manual listing for Mixed Multi-Family; confirmed based on detailed study of proposed site designs | |
| Apartments/Affordable Apartments/Condos/Attached Condos | | | | |
| School | School | 82 | Hydrology Manual | Incorporates minor roadways |
| Mixed Commercial | Commercial | 91 | Hydrology Manual | |
| Future Metrolink Lot | Roads and Parking Lots | 91 | Hydrology Manual | Minor roads will be lumped with adjacent residential land uses; 91% accounts for medians and sidewalk buffers in larger ROWs |
| Future Public Drive | | | Hydrology Manual | |
| Private Driveway and Fire Lane | | | Hydrology Manual | |
| Trail Head | | | Hydrology Manual (assumed paved parking lot) | |
| Park and Ride Lot | | | Hydrology Manual | |
| Fire Station | Public Facility | 91 | Hydrology Manual | |
| Public Facility | | | Hydrology Manual | |
| Recreation | Recreation | 50 | Based on review of site designs | |
| Park | Neighborhood Park | 15 | Hydrology Manual | |
| Open Space | Open Space | 1 or 0 | Hydrology Manual | |
| Development Buffer Zone | Open Space | | Hydrology Manual | |

**Calculations of typical imperviousness in residential land uses**
Modify inputs on site-specific basis through inspection of VTTM drawings

| Average Lot Area, sf | Avg Lot Dimensions | | Set backs | | | Driveway Area | Lot Area | Lot Imp Area | **Total %Imp** |
|---|---|---|---|---|---|---|---|---|---|
| | Width (ft) | Depth (ft) | Sides (ft) | Front (ft) | Back (ft) | (sf) | (sf) | (sf) | |
| 4500 | 45 | 100 | 5 | 18 | 15 | 288 | 4500 | 2633 | **58.5%** |
| 5000 | 50 | 100 | 5 | 18 | 18 | 288 | 5000 | 2848 | **57.0%** |
| 5500 | 55 | 100 | 5 | 18 | 18 | 288 | 5500 | 3168 | **57.6%** |

**58%**

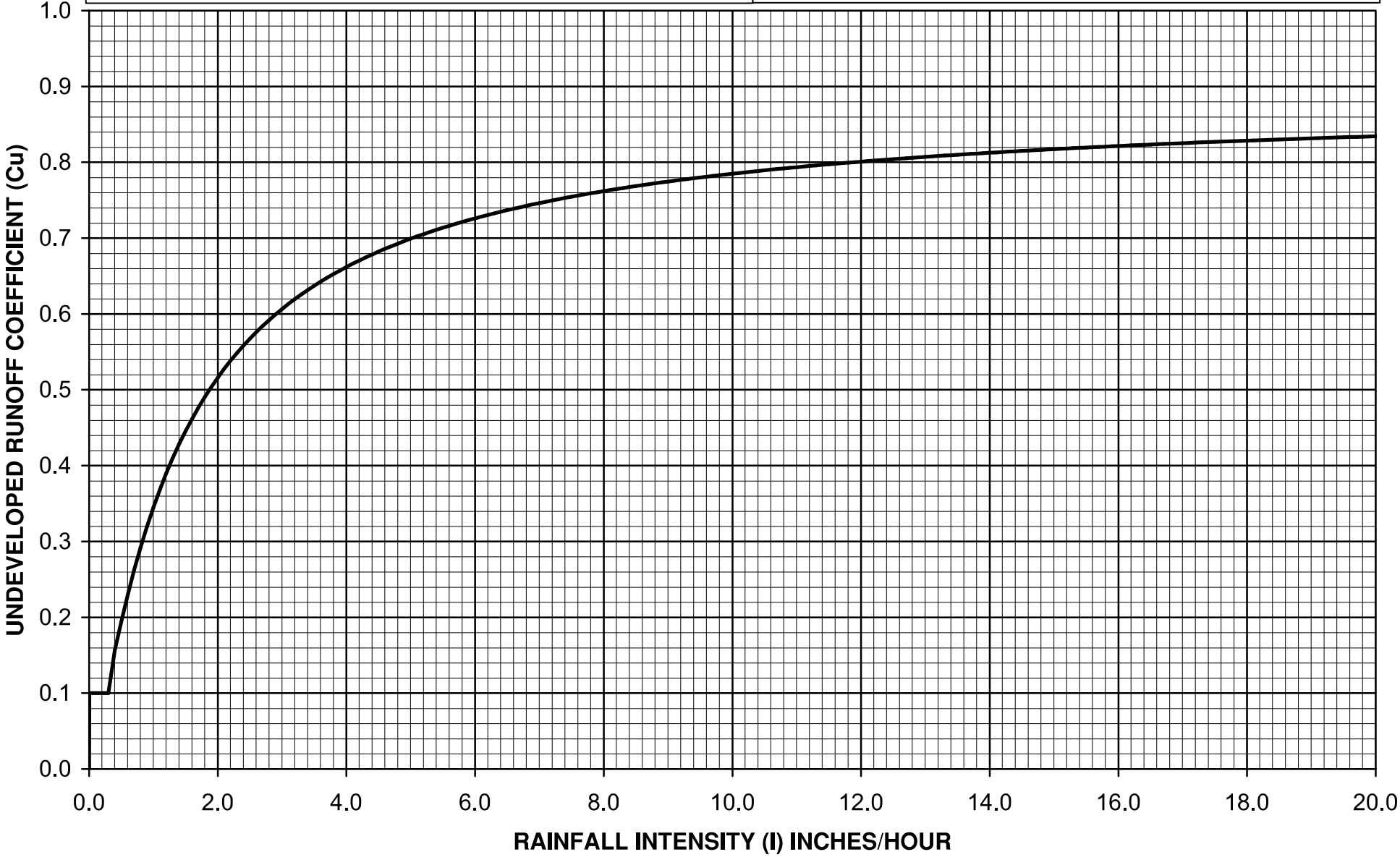


$C_D = (0.9 * IMP) + (1.0 - IMP) * C_U$

Where: $C_D$ = Developed Runoff Coefficient
IMP = Proportion Impervious
$C_U$ = Undeveloped runoff coefficient

Los Angeles County Department of Public Works

# RUNOFF COEFFICIENT CURVE
# SOIL TYPE NO. 020

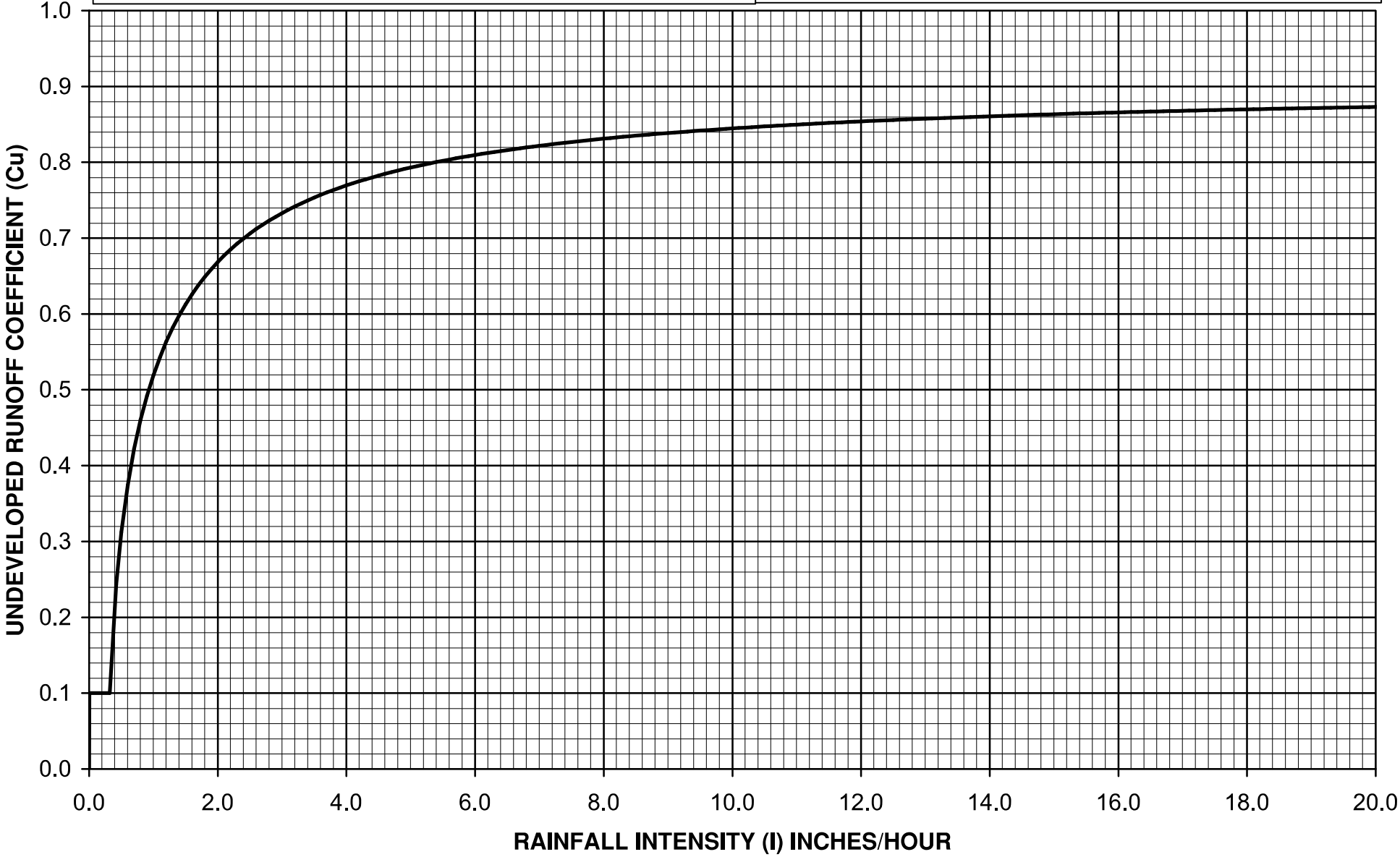


$C_D = (0.9 * IMP) + (1.0 - IMP) * C_U$

Where: $C_D$ = Developed Runoff Coefficient
IMP = Proportion Impervious
$C_U$ = Undeveloped runoff coefficient

Los Angeles County Department of Public Works

# RUNOFF COEFFICIENT CURVE
# SOIL TYPE NO. 097



# APPENDIX 2

# TC CALCULATIONS:
# EXISTING CONDITION

Landmark Village TR53108
Existing Condition
TC Data File

| Project | Subarea | Area | %imp | Frequency | Soil Type | Length | Slope | Isohyet |
|---|---|---|---|---|---|---|---|---|
| Area (E) | 100A | 32.7 | 0 | 50 | 20 | 1350 | 0.007 | 5.8 |
| Area (E) | 110A | 49.6 | 0 | 50 | 20 | 1250 | 0.008 | 5.8 |
| Area (E) | 200A | 17.3 | 0 | 50 | 20 | 1250 | 0.016 | 5.8 |
| Area (E) | 210A | 35.8 | 0 | 50 | 20 | 1990 | 0.015 | 5.8 |
| Area (E) | 400A | 18.4 | 0 | 50 | 20 | 2410 | 0.034 | 5.8 |
| Area (E) | 405A | 38.9 | 0 | 50 | 20 | 3600 | 0.068 | 5.8 |
| Area (E) | 408C | 15.3 | 0 | 50 | 20 | 1050 | 0.410 | 5.8 |
| Area (E) | 410C | 44.3 | 0 | 50 | 20 | 1990 | 0.048 | 5.8 |
| Area (E) | 415B | 35.3 | 0 | 50 | 20 | 1360 | 0.200 | 5.8 |
| Area (E) | 420A | 34.4 | 0 | 50 | 20 | 1950 | 0.015 | 5.8 |
| Area (E) | 425A | 39.9 | 0 | 50 | 20 | 1900 | 0.030 | 5.8 |
| Area (E) | 500A | 26.5 | 0 | 50 | 20 | 1560 | 0.016 | 5.8 |
| Area (E) | 510A | 40 | 0 | 50 | 20 | 1540 | 0.006 | 5.8 |
| Area (E) | CQT-1A | 6.1 | 0 | 50 | 20 | 890 | 0.265 | 5.8 |
| Area (E) | CQT-2A | 3.6 | 0 | 50 | 20 | 720 | 0.317 | 5.8 |
| Area (E) | CQT-3A | 1.8 | 0 | 50 | 20 | 530 | 0.336 | 5.8 |
| Area (E) | CQT-4A | 12.3 | 0 | 50 | 20 | 1160 | 0.229 | 5.8 |
| Area (E) | CQT-5A | 4.4 | 0 | 50 | 20 | 530 | 0.321 | 5.8 |
| Area (E) | CQT-6A | 24.9 | 0 | 50 | 20 | 1620 | 0.069 | 5.8 |
| Area (E) | CQT-7A | 2.1 | 0 | 50 | 20 | 490 | 0.269 | 5.8 |
| Area (E) | CQT-8A | 2.8 | 0 | 50 | 20 | 480 | 0.208 | 5.8 |
| Area (E) | CQT-9A | 31.8 | 0 | 50 | 20 | 1750 | 0.150 | 5.8 |
| Area (E) | CQT-10A | 15.6 | 0 | 50 | 20 | 1300 | 0.155 | 5.8 |
| Area (E) | CQT-11A | 10.2 | 65 | 50 | 20 | 2370 | 0.018 | 5.8 |
| Area (E) | CQT-12A | 11.7 | 65 | 50 | 20 | 1250 | 0.032 | 5.8 |
| Area (E) | 620A | 12.4 | 0 | 50 | 20 | 2120 | 0.030 | 5.8 |

Landmark Village TR53108
Existing Condition
TC Calculation Results

| Project | Subarea | Area (acre | %imp | Frequency | Soil Type | Length (ft) | Slope (ft/ft) | Isohyet (in. | Tc-calculat | Intensity (ir | Cu | Cd | Flowrate (cfs) | Tc Equation | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Area (E) | 100A | 32.7 | 0 | 50 | 20 | 1350 | 0.007 | 5.8 | 22 | 1.72 | 0.48 | 0.48 | 27 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^ | | |
| Area (E) | 110A | 49.6 | 0 | 50 | 20 | 1250 | 0.008 | 5.8 | 20 | 1.8 | 0.49 | 0.49 | 43.75 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^ | | |
| Area (E) | 200A | 17.3 | 0 | 50 | 20 | 1250 | 0.016 | 5.8 | 17 | 1.95 | 0.51 | 0.51 | 17.2 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^ | | |
| Area (E) | 210A | 35.8 | 0 | 50 | 20 | 1990 | 0.015 | 5.8 | 24 | 1.66 | 0.47 | 0.47 | 27.93 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^ | | |
| Area (E) | 400A | 18.4 | 0 | 50 | 20 | 2410 | 0.034 | 5.8 | 24 | 1.66 | 0.47 | 0.47 | 14.36 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^ | | |
| Area (E) | 405A | 38.9 | 0 | 50 | 20 | 3600 | 0.068 | 5.8 | 28 | 1.54 | 0.45 | 0.45 | 26.96 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^ | | |
| Area (E) | 408C | 15.3 | 0 | 50 | 20 | 1050 | 0.41 | 5.8 | 8 | 2.77 | 0.59 | 0.59 | 25 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^ | | |
| Area (E) | 410C | 44.3 | 0 | 50 | 20 | 1990 | 0.048 | 5.8 | 19 | 1.85 | 0.5 | 0.5 | 40.98 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^ | | |
| Area (E) | 415B | 35.3 | 0 | 50 | 20 | 1360 | 0.2 | 5.8 | 11 | 2.39 | 0.55 | 0.55 | 46.4 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^ | | |
| Area (E) | 420A | 34.4 | 0 | 50 | 20 | 1950 | 0.015 | 5.8 | 24 | 1.66 | 0.47 | 0.47 | 26.84 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^ | | |
| Area (E) | 425A | 39.9 | 0 | 50 | 20 | 1900 | 0.03 | 5.8 | 20 | 1.8 | 0.49 | 0.49 | 35.19 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^ | | |
| Area (E) | 500A | 26.5 | 0 | 50 | 20 | 1560 | 0.016 | 5.8 | 20 | 1.8 | 0.49 | 0.49 | 23.37 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^ | | |
| Area (E) | 510A | 40 | 0 | 50 | 20 | 1540 | 0.006 | 5.8 | 24 | 1.66 | 0.47 | 0.47 | 31.21 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^ | | |
| Area (E) | CQT-1A | 6.1 | 0 | 50 | 20 | 890 | 0.265 | 5.8 | 8 | 2.77 | 0.59 | 0.59 | 9.97 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^ | | |
| Area (E) | CQT-2A | 3.6 | 0 | 50 | 20 | 720 | 0.317 | 5.8 | 6 | 3.18 | 0.62 | 0.62 | 7.1 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^ | | |
| Area (E) | CQT-3A | 1.8 | 0 | 50 | 20 | 530 | 0.336 | 5.8 | 5 | 3.46 | 0.63 | 0.63 | 3.92 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^ | | |
| Area (E) | CQT-4A | 12.3 | 0 | 50 | 20 | 1160 | 0.229 | 5.8 | 10 | 2.5 | 0.56 | 0.56 | 17.22 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^ | | |
| Area (E) | CQT-5A | 4.4 | 0 | 50 | 20 | 530 | 0.321 | 5.8 | 5 | 3.46 | 0.63 | 0.63 | 9.59 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^ | | |
| Area (E) | CQT-6A | 24.9 | 0 | 50 | 20 | 1620 | 0.069 | 5.8 | 15 | 2.06 | 0.52 | 0.52 | 26.67 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^ | | |
| Area (E) | CQT-7A | 2.1 | 0 | 50 | 20 | 490 | 0.269 | 5.8 | 5 | 3.46 | 0.63 | 0.63 | 4.58 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^ | | |
| Area (E) | CQT-8A | 2.8 | 0 | 50 | 20 | 480 | 0.208 | 5.8 | 5 | 3.46 | 0.63 | 0.63 | 6.1 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^ | | |
| Area (E) | CQT-9A | 31.8 | 0 | 50 | 20 | 1750 | 0.15 | 5.8 | 14 | 2.13 | 0.53 | 0.53 | 35.9 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^ | | |
| Area (E) | CQT-10A | 15.6 | 0 | 50 | 20 | 1300 | 0.155 | 5.8 | 11 | 2.39 | 0.55 | 0.55 | 20.51 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^ | | |
| Area (E) | CQT-11A | 10.2 | 65 | 50 | 20 | 2370 | 0.018 | 5.8 | 17 | 1.95 | 0.51 | 0.9 | 17.9 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^ | | |
| Area (E) | CQT-12A | 11.7 | 65 | 50 | 20 | 1250 | 0.032 | 5.8 | 10 | 2.5 | 0.56 | 0.9 | 26.33 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^ | | |
| Area (E) | 620A | 12.4 | 0 | 50 | 20 | 2120 | 0.03 | 5.8 | 22 | 1.72 | 0.48 | 0.48 | 10.24 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^ | | |

# APPENDIX 3

# TC CALCULATIONS:
# PROPOSED CONDITION

Landmark Village TR53108
Proposed Condition
TC Data File

| Project | Subarea | Area (Acres) | % Impervious | Storm Frequency | Soil Type | Length (Ft) | Slope | Isohyet |
|---|---|---|---|---|---|---|---|---|
| RVE | 1A | 18.40 | 0.00 | 50 | 97 | 2,430 | 0.0340 | 5.8 |
| RVE | 2A | 38.90 | 0.00 | 50 | 97 | 3,550 | 0.0690 | 5.8 |
| RVE | 3B | 15.30 | 0.00 | 50 | 97 | 1,050 | 0.4100 | 5.8 |
| RVE | 4B | 44.30 | 0.00 | 50 | 97 | 1,990 | 0.0500 | 5.8 |
| RVE | 6A | 35.30 | 0.00 | 50 | 97 | 1,360 | 0.2000 | 5.8 |
| RVE | 7A | 15.53 | 1.00 | 50 | 20 | 4,200 | 0.0070 | 5.8 |
| RVE | 8A | 6.35 | 15.00 | 50 | 20 | 656 | 0.0106 | 5.8 |
| RVE | 9B | 7.04 | 65.64 | 50 | 20 | 761 | 0.0070 | 5.8 |
| RVE | 10B | 0.69 | 72.74 | 50 | 20 | 333 | 0.0070 | 5.8 |
| RVE | 11C | 1.02 | 63.18 | 50 | 20 | 238 | 0.0170 | 5.8 |
| RVE | 12C | 0.63 | 65.86 | 50 | 20 | 238 | 0.0170 | 5.8 |
| RVE | 13C | 0.87 | 65.97 | 50 | 20 | 303 | 0.0070 | 5.8 |
| RVE | 14C | 0.20 | 91.00 | 50 | 20 | 277 | 0.0070 | 5.8 |
| RVE | 15C | 0.54 | 91.00 | 50 | 20 | 760 | 0.0080 | 5.8 |
| RVE | 16C | 2.78 | 64.17 | 50 | 20 | 771 | 0.0080 | 5.8 |
| RVE | 17C | 5.17 | 68.75 | 50 | 20 | 656 | 0.0110 | 5.8 |
| RVE | 18C | 0.66 | 91.00 | 50 | 20 | 969 | 0.0090 | 5.8 |
| RVE | 19C | 0.30 | 91.00 | 50 | 20 | 432 | 0.0090 | 5.8 |
| RVE | 20C | 4.68 | 16.00 | 50 | 20 | 1,749 | 0.0050 | 5.8 |
| RVE | 21D | 1.82 | 64.16 | 50 | 20 | 495 | 0.0080 | 5.8 |
| RVE | 22D | 0.34 | 91.00 | 50 | 20 | 476 | 0.0080 | 5.8 |
| RVE | 22.1D | 3.56 | 74.00 | 50 | 20 | 538 | 0.0100 | 5.8 |
| RVE | 23D | 0.55 | 91.00 | 50 | 20 | 794 | 0.0080 | 5.8 |
| RVE | 24D | 0.77 | 91.00 | 50 | 20 | 1,099 | 0.0090 | 5.8 |
| RVE | 25D | 0.21 | 91.00 | 50 | 20 | 214 | 0.0080 | 5.8 |
| RVE | 26D | 5.09 | 74.00 | 50 | 20 | 1,036 | 0.0110 | 5.8 |
| RVE | 27D | 0.95 | 91.00 | 50 | 20 | 1,309 | 0.0090 | 5.8 |
| RVE | 28D | 1.78 | 72.83 | 50 | 20 | 867 | 0.0070 | 5.8 |
| RVE | 29D | 2.08 | 14.41 | 50 | 20 | 832 | 0.0050 | 5.8 |
| RVE | 30E | 0.53 | 91.00 | 50 | 20 | 689 | 0.0090 | 5.8 |
| RVE | 31E | 0.47 | 91.00 | 50 | 20 | 236 | 0.0080 | 5.8 |
| RVE | 32E | 0.33 | 91.00 | 50 | 20 | 109 | 0.0060 | 5.8 |
| RVE | 33E | 5.86 | 70.70 | 50 | 20 | 785 | 0.0110 | 5.8 |
| RVE | 34E | 5.29 | 71.29 | 50 | 20 | 557 | 0.0110 | 5.8 |
| RVE | 35E | 1.23 | 70.34 | 50 | 20 | 626 | 0.0080 | 5.8 |
| RVE | 36E | 0.68 | 91.00 | 50 | 20 | 808 | 0.0090 | 5.8 |
| RVE | 37E | 1.70 | 16.88 | 50 | 20 | 652 | 0.0050 | 5.8 |
| RVE | 38F | 0.25 | 91.00 | 50 | 20 | 361 | 0.0090 | 5.8 |
| RVE | 39F | 2.03 | 74.00 | 50 | 20 | 399 | 0.0120 | 5.8 |
| RVE | 40F | 0.05 | 91.00 | 50 | 20 | 71 | 0.0070 | 5.8 |
| RVE | 41F | 1.79 | 67.03 | 50 | 20 | 709 | 0.0080 | 5.8 |
| RVE | 42F | 0.50 | 91.00 | 50 | 20 | 663 | 0.0070 | 5.8 |
| RVE | 43F | 3.86 | 67.66 | 50 | 20 | 1,117 | 0.0080 | 5.8 |
| RVE | 44F | 2.86 | 66.42 | 50 | 20 | 915 | 0.0070 | 5.8 |
| RVE | 45F | 0.14 | 91.00 | 50 | 20 | 118 | 0.0070 | 5.8 |
| RVE | 46F | 2.69 | 17.39 | 50 | 20 | 1,120 | 0.0050 | 5.8 |
| RVE | 51G | 2.99 | 67.27 | 50 | 20 | 570 | 0.0080 | 5.8 |
| RVE | 52G | 1.24 | 66.31 | 50 | 20 | 460 | 0.0070 | 5.8 |
| RVE | 53G | 1.21 | 65.36 | 50 | 20 | 340 | 0.0070 | 5.8 |
| RVE | 54G | 1.19 | 65.49 | 50 | 20 | 344 | 0.0070 | 5.8 |

Landmark Village TR53108
Proposed Condition
TC Data File

| Project | Subarea | Area (Acres) | % Impervious | Storm Frequency | Soil Type | Length (Ft) | Slope | Isohyet |
|---|---|---|---|---|---|---|---|---|
| RVE | 1A | 18.40 | 0.00 | 50 | 97 | 2,430 | 0.0340 | 5.8 |
| RVE | 55G | 0.82 | 64.44 | 50 | 20 | 235 | 0.0070 | 5.8 |
| RVE | 56G | 1.02 | 69.00 | 50 | 20 | 485 | 0.0090 | 5.8 |
| RVE | 57G | 3.37 | 67.79 | 50 | 20 | 666 | 0.0070 | 5.8 |
| RVE | 58G | 1.93 | 73.28 | 50 | 20 | 1,218 | 0.0100 | 5.8 |
| RVE | 59G | 1.90 | 52.16 | 50 | 20 | 781 | 0.0080 | 5.8 |
| RVE | 60G | 9.88 | 74.00 | 50 | 20 | 961 | 0.0090 | 5.8 |
| RVE | 61G | 1.36 | 91.00 | 50 | 20 | 695 | 0.0100 | 5.8 |
| RVE | 62G | 1.22 | 91.00 | 50 | 20 | 580 | 0.0100 | 5.8 |
| RVE | 63G | 4.11 | 70.85 | 50 | 20 | 802 | 0.0080 | 5.8 |
| RVC | 1A | 11.66 | 78.91 | 50 | 20 | 1,103 | 0.0070 | 5.8 |
| RVC | 2A | 4.08 | 74.00 | 50 | 20 | 697 | 0.0100 | 5.8 |
| RVC | 3A | 2.39 | 91.00 | 50 | 20 | 1,547 | 0.0110 | 5.8 |
| RVC | 4A | 1.67 | 91.00 | 50 | 20 | 1,260 | 0.0100 | 5.8 |
| RVC | 5A | 0.40 | 91.00 | 50 | 20 | 213 | 0.0070 | 5.8 |
| RVC | 6A | 0.78 | 91.00 | 50 | 20 | 335 | 0.0100 | 5.8 |
| RVC | 7A | 0.55 | 50.00 | 50 | 20 | 100 | 0.0080 | 5.8 |
| RVC | 8A | 1.52 | 15.80 | 50 | 20 | 400 | 0.0050 | 5.8 |
| RVC | 9B | 8.39 | 74.00 | 50 | 20 | 1,014 | 0.0100 | 5.8 |
| RVC | 10B | 1.03 | 91.00 | 50 | 20 | 650 | 0.0070 | 5.8 |
| RVC | 11B | 0.74 | 91.00 | 50 | 20 | 602 | 0.0070 | 5.8 |
| RVC | 12B | 9.79 | 82.00 | 50 | 20 | 850 | 0.0080 | 5.8 |
| RVC | 13B | 1.34 | 91.00 | 50 | 20 | 840 | 0.0070 | 5.8 |
| RVC | 14B | 2.83 | 71.01 | 50 | 20 | 880 | 0.0070 | 5.8 |
| RVC | 15C | 3.54 | 15.00 | 50 | 20 | 560 | 0.0080 | 5.8 |
| RVW | 1A | 0.82 | 91.00 | 50 | 20 | 383 | 0.0070 | 5.8 |
| RVW | 2A | 3.21 | 74.00 | 50 | 20 | 335 | 0.0100 | 5.8 |
| RVW | 3A | 1.48 | 69.15 | 50 | 20 | 485 | 0.0070 | 5.8 |
| RVW | 4A | 3.34 | 63.73 | 50 | 20 | 550 | 0.0070 | 5.8 |
| RVW | 5B | 0.34 | 91.00 | 50 | 20 | 267 | 0.0070 | 5.8 |
| RVW | 6B | 1.21 | 74.00 | 50 | 20 | 250 | 0.0070 | 5.8 |
| RVW | 7B | 0.18 | 91.00 | 50 | 20 | 221 | 0.0180 | 5.8 |
| RVW | 8B | 0.20 | 91.00 | 50 | 20 | 225 | 0.0180 | 5.8 |
| RVW | 9B | 2.22 | 70.78 | 50 | 20 | 481 | 0.0070 | 5.8 |
| RVW | 10B | 1.33 | 76.54 | 50 | 20 | 462 | 0.0070 | 5.8 |
| RVW | 11B | 0.34 | 65.76 | 50 | 20 | 85 | 0.0080 | 5.8 |
| RVW | 12B | 3.54 | 16.00 | 50 | 20 | 1,360 | 0.0060 | 5.8 |
| RVW | 12C | 0.87 | 91.00 | 50 | 20 | 1,000 | 0.0070 | 5.8 |
| RVW | 13C | 3.60 | 65.43 | 50 | 20 | 597 | 0.0070 | 5.8 |
| RVW | 14C | 2.58 | 68.23 | 50 | 20 | 1,147 | 0.0080 | 5.8 |
| RVW | 15C | 2.13 | 65.28 | 50 | 20 | 650 | 0.0090 | 5.8 |
| RVW | 16C | 0.99 | 91.00 | 50 | 20 | 466 | 0.0070 | 5.8 |
| RVW | 17C | 1.91 | 15.61 | 50 | 20 | 800 | 0.0050 | 5.8 |
| RVW | 18D | 1.93 | 74.00 | 50 | 20 | 517 | 0.0110 | 5.8 |
| RVW | 19D | 0.51 | 91.00 | 50 | 20 | 305 | 0.0070 | 5.8 |
| RVW | 20D | 0.38 | 91.00 | 50 | 20 | 310 | 0.0070 | 5.8 |
| RVW | 21D | 11.00 | 74.00 | 50 | 20 | 1,570 | 0.0090 | 5.8 |
| RVW | 22D | 1.88 | 91.00 | 50 | 20 | 1,200 | 0.0080 | 5.8 |
| RVW | 23D | 1.26 | 91.00 | 50 | 20 | 1,071 | 0.0090 | 5.8 |
| RVW | 24D | 4.91 | 74.00 | 50 | 20 | 1,000 | 0.0100 | 5.8 |

Landmark Village TR53108
Proposed Condition
TC Data File

| Project | Subarea | Area (Acres) | % Impervious | Storm Frequency | Soil Type | Length (Ft) | Slope | Isohyet |
|---|---|---|---|---|---|---|---|---|
| RVE | 1A | 18.40 | 0.00 | 50 | 97 | 2,430 | 0.0340 | 5.8 |
| RVW | 25D | 0.49 | 91.00 | 50 | 20 | 320 | 0.0070 | 5.8 |
| RVW | 26D | 1.11 | 91.00 | 50 | 20 | 220 | 0.0100 | 5.8 |
| RVW | 26.1D | 0.56 | 91.00 | 50 | 20 | 280 | 0.0070 | 5.8 |
| RVW | 27D | 1.02 | 91.00 | 50 | 20 | 340 | 0.0070 | 5.8 |
| RVW | 28D | 17.71 | 74.00 | 50 | 20 | 982 | 0.0100 | 5.8 |
| RVW | 29D | 4.06 | 74.00 | 50 | 20 | 637 | 0.0100 | 5.8 |
| RVW | 31E | 2.17 | 91.00 | 50 | 20 | 720 | 0.0070 | 5.8 |
| RVW | 32E | 0.70 | 91.00 | 50 | 20 | 385 | 0.0190 | 5.8 |
| RVW | 33E | 1.99 | 91.00 | 50 | 20 | 615 | 0.0190 | 5.8 |
| RVW | 34E | 2.44 | 91.00 | 50 | 20 | 880 | 0.0100 | 5.8 |
| RVW | 35E | 0.65 | 91.00 | 50 | 20 | 510 | 0.0080 | 5.8 |
| RVW | 36E | 0.26 | 91.00 | 50 | 20 | 180 | 0.0100 | 5.8 |
| RVW | 37E | 0.37 | 91.00 | 50 | 20 | 320 | 0.0110 | 5.8 |
| RVW | 38E | 0.77 | 91.00 | 50 | 20 | 460 | 0.0130 | 5.8 |
| RVW | 39E | 5.72 | 78.52 | 50 | 20 | 930 | 0.0100 | 5.8 |
| RVW | 39.1E | 0.78 | 91.00 | 50 | 20 | 550 | 0.0100 | 5.8 |
| RVW | 40E | 7.41 | 91.00 | 50 | 20 | 1,050 | 0.0190 | 5.8 |
| RVW | 41E | 2.32 | 13.03 | 50 | 20 | 730 | 0.0050 | 5.8 |
| RVW | 42E | 1.04 | 13.12 | 50 | 20 | 400 | 0.0050 | 5.8 |
| RVW | 43G | 1.29 | 14.95 | 50 | 20 | 540 | 0.0050 | 5.8 |
| RVW | 44G | 1.94 | 9.81 | 50 | 20 | 140 | 0.0500 | 5.8 |
| CQT | 1A | 29.90 | 0.05 | 50 | 20 | 1,150 | 0.0895 | 5.8 |
| CQT | 2A | 6.40 | 0.05 | 50 | 20 | 630 | 0.2700 | 5.8 |
| CQT | 3B | 4.40 | 0.05 | 50 | 20 | 540 | 0.2800 | 5.8 |
| CQT | 4B | 19.60 | 0.10 | 50 | 20 | 1,404 | 0.0560 | 5.8 |
| CQT | 5B | 6.94 | 0.05 | 50 | 20 | 765 | 0.2100 | 5.8 |
| CQT | 6B | 5.90 | 0.05 | 50 | 20 | 580 | 0.0600 | 5.8 |
| CQT | 7B | 13.30 | 0.30 | 50 | 20 | 860 | 0.0600 | 5.8 |
| CQT | 9C | 7.70 | 0.05 | 50 | 20 | 1,050 | 0.2800 | 5.8 |
| CQT | 10C | 8.80 | 0.05 | 50 | 20 | 970 | 0.0600 | 5.8 |
| CQT | 11C | 11.80 | 0.80 | 50 | 20 | 1,890 | 0.0080 | 5.8 |
| CQT | 12C | 2.20 | 0.05 | 50 | 20 | 1,310 | 0.0240 | 5.8 |
| CQT | 13C | 7.50 | 0.80 | 50 | 20 | 2,500 | 0.0070 | 5.8 |

Landmark Village

Proposed Condition TC-Calc Output File

| Project | Subarea | Area (acres) | %imp | Frequency | Soil Type | Length (ft) | Slope (ft/ft) | Isohyet (in.) | Tc-calculated (min.) | Intensity (in./hr) | Cu | Cd | Flowrate (c | Tc Equation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RVE | 1A | 18.4 | 0.0 | 50 | 97 | 2430 | 0.034 | 5.8 | 19 | 1.85 | 0.65 | 0.65 | 22.13 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVE | 2A | 38.9 | 0.0 | 50 | 97 | 3550 | 0.069 | 5.8 | 22 | 1.72 | 0.64 | 0.64 | 42.82 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVE | 3B | 15.3 | 0.0 | 50 | 97 | 1050 | 0.41 | 5.8 | 7 | 2.95 | 0.73 | 0.73 | 32.95 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVE | 4B | 44.3 | 0.0 | 50 | 97 | 1990 | 0.05 | 5.8 | 15 | 2.06 | 0.67 | 0.67 | 61.14 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVE | 6A | 35.3 | 0.0 | 50 | 97 | 1360 | 0.2 | 5.8 | 9 | 2.63 | 0.71 | 0.71 | 65.92 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVE | 7A | 15.53 | 1.0 | 50 | 20 | 4200 | 0.007 | 5.8 | 29 | 1.51 | 0.45 | 0.9 | 21.11 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVE | 8A | 6.35 | 15.0 | 50 | 20 | 656 | 0.0106 | 5.8 | 8 | 2.77 | 0.59 | 0.9 | 15.83 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVE | 9B | 7.04 | 65.6 | 50 | 20 | 761 | 0.007 | 5.8 | 10 | 2.5 | 0.56 | 0.9 | 15.84 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVE | 10B | 0.69 | 72.7 | 50 | 20 | 333 | 0.007 | 5.8 | 6 | 3.18 | 0.62 | 0.9 | 1.97 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVE | 11C | 1.02 | 63.2 | 50 | 20 | 238 | 0.017 | 5.8 | 5 | 3.46 | 0.63 | 0.9 | 3.18 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVE | 12C | 0.63 | 65.9 | 50 | 20 | 238 | 0.017 | 5.8 | 5 | 3.46 | 0.63 | 0.9 | 1.96 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVE | 13C | 0.87 | 66.0 | 50 | 20 | 303 | 0.007 | 5.8 | 5 | 3.46 | 0.63 | 0.9 | 2.71 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVE | 14C | 0.2 | 91.0 | 50 | 20 | 277 | 0.007 | 5.8 | 5 | 3.46 | 0.63 | 0.9 | 0.62 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVE | 15C | 0.54 | 91.0 | 50 | 20 | 760 | 0.008 | 5.8 | 10 | 2.5 | 0.56 | 0.9 | 1.22 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVE | 16C | 2.78 | 64.2 | 50 | 20 | 771 | 0.008 | 5.8 | 10 | 2.5 | 0.56 | 0.9 | 6.26 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVE | 17C | 5.17 | 68.8 | 50 | 20 | 656 | 0.011 | 5.8 | 8 | 2.77 | 0.59 | 0.9 | 12.89 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVE | 18C | 0.66 | 91.0 | 50 | 20 | 969 | 0.009 | 5.8 | 11 | 2.39 | 0.55 | 0.9 | 1.42 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVE | 19C | 0.3 | 91.0 | 50 | 20 | 432 | 0.009 | 5.8 | 7 | 2.95 | 0.6 | 0.9 | 0.8 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVE | 20C | 4.68 | 16.0 | 50 | 20 | 1749 | 0.005 | 5.8 | 18 | 1.9 | 0.5 | 0.9 | 8 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVE | 21D | 1.82 | 64.2 | 50 | 20 | 495 | 0.008 | 5.8 | 7 | 2.95 | 0.6 | 0.9 | 4.83 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVE | 22D | 0.34 | 91.0 | 50 | 20 | 476 | 0.008 | 5.8 | 7 | 2.95 | 0.6 | 0.9 | 0.9 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVE | 22.1D | 3.56 | 74.0 | 50 | 20 | 538 | 0.01 | 5.8 | 7 | 2.95 | 0.6 | 0.9 | 9.45 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVE | 23D | 0.55 | 91.0 | 50 | 20 | 794 | 0.008 | 5.8 | 10 | 2.5 | 0.56 | 0.9 | 1.24 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVE | 24D | 0.77 | 91.0 | 50 | 20 | 1099 | 0.009 | 5.8 | 12 | 2.29 | 0.54 | 0.9 | 1.59 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVE | 25D | 0.21 | 91.0 | 50 | 20 | 214 | 0.008 | 5.8 | 5 | 3.46 | 0.63 | 0.9 | 0.65 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVE | 26D | 5.09 | 74.0 | 50 | 20 | 1036 | 0.011 | 5.8 | 11 | 2.39 | 0.55 | 0.9 | 10.95 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVE | 27D | 0.95 | 91.0 | 50 | 20 | 1309 | 0.009 | 5.8 | 13 | 2.21 | 0.54 | 0.9 | 1.89 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVE | 28D | 1.78 | 72.8 | 50 | 20 | 867 | 0.007 | 5.8 | 11 | 2.39 | 0.55 | 0.9 | 3.83 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVE | 29D | 2.08 | 14.4 | 50 | 20 | 832 | 0.005 | 5.8 | 11 | 2.39 | 0.55 | 0.9 | 4.47 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVE | 30E | 0.53 | 91.0 | 50 | 20 | 689 | 0.009 | 5.8 | 9 | 2.63 | 0.57 | 0.9 | 1.25 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVE | 31E | 0.47 | 91.0 | 50 | 20 | 236 | 0.008 | 5.8 | 5 | 3.46 | 0.63 | 0.9 | 1.46 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVE | 32E | 0.33 | 91.0 | 50 | 20 | 109 | 0.006 | 5.8 | 5 | 3.46 | 0.63 | 0.9 | 1.03 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVE | 33E | 5.86 | 70.7 | 50 | 20 | 785 | 0.011 | 5.8 | 9 | 2.63 | 0.57 | 0.9 | 13.87 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVE | 34E | 5.29 | 71.3 | 50 | 20 | 557 | 0.011 | 5.8 | 7 | 2.95 | 0.6 | 0.9 | 14.04 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVE | 35E | 1.23 | 70.3 | 50 | 20 | 626 | 0.008 | 5.8 | 8 | 2.77 | 0.59 | 0.9 | 3.07 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVE | 36E | 0.68 | 91.0 | 50 | 20 | 808 | 0.009 | 5.8 | 10 | 2.5 | 0.56 | 0.9 | 1.53 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVE | 37E | 1.7 | 16.9 | 50 | 20 | 652 | 0.005 | 5.8 | 10 | 2.5 | 0.56 | 0.9 | 3.83 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVE | 38F | 0.25 | 91.0 | 50 | 20 | 361 | 0.009 | 5.8 | 6 | 3.18 | 0.62 | 0.9 | 0.72 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVE | 39F | 2.03 | 74.0 | 50 | 20 | 399 | 0.012 | 5.8 | 6 | 3.18 | 0.62 | 0.9 | 5.81 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVE | 40F | 0.05 | 91.0 | 50 | 20 | 71 | 0.007 | 5.8 | 5 | 3.46 | 0.63 | 0.9 | 0.16 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVE | 41F | 1.79 | 67.0 | 50 | 20 | 709 | 0.008 | 5.8 | 9 | 2.63 | 0.57 | 0.9 | 4.24 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVE | 42F | 0.5 | 91.0 | 50 | 20 | 663 | 0.007 | 5.8 | 9 | 2.63 | 0.57 | 0.9 | 1.18 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVE | 43F | 3.86 | 67.7 | 50 | 20 | 1117 | 0.008 | 5.8 | 12 | 2.29 | 0.54 | 0.9 | 7.96 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVE | 44F | 2.86 | 66.4 | 50 | 20 | 915 | 0.007 | 5.8 | 11 | 2.39 | 0.55 | 0.9 | 6.15 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVE | 45F | 0.14 | 91.0 | 50 | 20 | 118 | 0.007 | 5.8 | 5 | 3.46 | 0.63 | 0.9 | 0.44 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVE | 46F | 2.69 | 17.4 | 50 | 20 | 1120 | 0.005 | 5.8 | 13 | 2.21 | 0.54 | 0.9 | 5.35 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVE | 51G | 2.99 | 67.3 | 50 | 20 | 570 | 0.008 | 5.8 | 8 | 2.77 | 0.59 | 0.9 | 7.45 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVE | 52G | 1.24 | 66.3 | 50 | 20 | 460 | 0.007 | 5.8 | 7 | 2.95 | 0.6 | 0.9 | 3.29 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVE | 53G | 1.21 | 65.4 | 50 | 20 | 340 | 0.007 | 5.8 | 6 | 3.18 | 0.62 | 0.9 | 3.46 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVE | 54G | 1.19 | 65.5 | 50 | 20 | 344 | 0.007 | 5.8 | 6 | 3.18 | 0.62 | 0.9 | 3.41 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVE | 55G | 0.82 | 64.4 | 50 | 20 | 235 | 0.007 | 5.8 | 5 | 3.46 | 0.63 | 0.9 | 2.55 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVE | 56G | 1.02 | 69.0 | 50 | 20 | 485 | 0.009 | 5.8 | 7 | 2.95 | 0.6 | 0.9 | 2.71 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVE | 57G | 3.37 | 67.8 | 50 | 20 | 666 | 0.007 | 5.8 | 9 | 2.63 | 0.57 | 0.9 | 7.98 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVE | 58G | 1.93 | 73.3 | 50 | 20 | 1218 | 0.01 | 5.8 | 12 | 2.29 | 0.54 | 0.9 | 3.98 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVE | 59G | 1.9 | 52.2 | 50 | 20 | 781 | 0.008 | 5.8 | 10 | 2.5 | 0.56 | 0.9 | 4.28 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVE | 60G | 9.88 | 74.0 | 50 | 20 | 961 | 0.009 | 5.8 | 11 | 2.39 | 0.55 | 0.9 | 21.25 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVE | 61G | 1.36 | 91.0 | 50 | 20 | 695 | 0.01 | 5.8 | 9 | 2.63 | 0.57 | 0.9 | 3.22 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVE | 62G | 1.22 | 91.0 | 50 | 20 | 580 | 0.01 | 5.8 | 8 | 2.77 | 0.59 | 0.9 | 3.04 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVE | 63G | 4.11 | 70.9 | 50 | 20 | 802 | 0.008 | 5.8 | 10 | 2.5 | 0.56 | 0.9 | 9.25 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVC | 1A | 11.66 | 78.9 | 50 | 20 | 1103 | 0.007 | 5.8 | 12 | 2.29 | 0.54 | 0.9 | 24.03 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVC | 2A | 4.08 | 74.0 | 50 | 20 | 697 | 0.01 | 5.8 | 9 | 2.63 | 0.57 | 0.9 | 9.66 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVC | 3A | 2.39 | 91.0 | 50 | 20 | 1547 | 0.011 | 5.8 | 14 | 2.13 | 0.53 | 0.9 | 4.58 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVC | 4A | 1.67 | 91.0 | 50 | 20 | 1260 | 0.01 | 5.8 | 13 | 2.21 | 0.54 | 0.9 | 3.32 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVC | 5A | 0.4 | 91.0 | 50 | 20 | 213 | 0.007 | 5.8 | 5 | 3.46 | 0.63 | 0.9 | 1.25 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVC | 6A | 0.78 | 91.0 | 50 | 20 | 335 | 0.01 | 5.8 | 5 | 3.46 | 0.63 | 0.9 | 2.43 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVC | 7A | 0.55 | 50.0 | 50 | 20 | 100 | 0.008 | 5.8 | 5 | 3.46 | 0.63 | 0.9 | 1.71 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |

Landmark Village

Proposed Condition TC-Calc Output File

| Project | Subarea | Area (acres) | %imp | Frequency | Soil Type | Length (ft) | Slope (ft/ft) | Isohyet (in.) | Tc-calculated (min.) | Intensity (in./hr) | Cu | Cd | Flowrate (c | Tc Equation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RVC | 8A | 1.52 | 15.8 | 50 | 20 | 400 | 0.005 | 5.8 | 7 | 2.95 | 0.6 | 0.9 | 4.04 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVC | 9B | 8.39 | 74.0 | 50 | 20 | 1014 | 0.01 | 5.8 | 11 | 2.39 | 0.55 | 0.9 | 18.05 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVC | 10B | 1.03 | 91.0 | 50 | 20 | 650 | 0.007 | 5.8 | 9 | 2.63 | 0.57 | 0.9 | 2.44 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVC | 11B | 0.74 | 91.0 | 50 | 20 | 602 | 0.007 | 5.8 | 8 | 2.77 | 0.59 | 0.9 | 1.84 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVC | 12B | 9.79 | 82.0 | 50 | 20 | 850 | 0.008 | 5.8 | 10 | 2.5 | 0.56 | 0.9 | 22.03 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVC | 13B | 1.34 | 91.0 | 50 | 20 | 840 | 0.007 | 5.8 | 11 | 2.39 | 0.55 | 0.9 | 2.88 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVC | 14B | 2.83 | 71.0 | 50 | 20 | 880 | 0.007 | 5.8 | 11 | 2.39 | 0.55 | 0.9 | 6.09 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVC | 15C | 3.54 | 15.0 | 50 | 20 | 560 | 0.008 | 5.8 | 8 | 2.77 | 0.59 | 0.9 | 8.83 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVW | 1A | 0.82 | 91.0 | 50 | 20 | 383 | 0.007 | 5.8 | 6 | 3.18 | 0.62 | 0.9 | 2.35 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVW | 2A | 3.21 | 74.0 | 50 | 20 | 335 | 0.01 | 5.8 | 5 | 3.46 | 0.63 | 0.9 | 10 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVW | 3A | 1.48 | 69.1 | 50 | 20 | 485 | 0.007 | 5.8 | 7 | 2.95 | 0.6 | 0.9 | 3.93 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVW | 4A | 3.34 | 63.7 | 50 | 20 | 550 | 0.007 | 5.8 | 8 | 2.77 | 0.59 | 0.9 | 8.33 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVW | 5B | 0.34 | 91.0 | 50 | 20 | 267 | 0.007 | 5.8 | 5 | 3.46 | 0.63 | 0.9 | 1.06 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVW | 6B | 1.21 | 74.0 | 50 | 20 | 250 | 0.007 | 5.8 | 5 | 3.46 | 0.63 | 0.9 | 3.77 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVW | 7B | 0.18 | 91.0 | 50 | 20 | 221 | 0.018 | 5.8 | 5 | 3.46 | 0.63 | 0.9 | 0.56 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVW | 8B | 0.2 | 91.0 | 50 | 20 | 225 | 0.018 | 5.8 | 5 | 3.46 | 0.63 | 0.9 | 0.62 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVW | 9B | 2.22 | 70.8 | 50 | 20 | 481 | 0.007 | 5.8 | 7 | 2.95 | 0.6 | 0.9 | 5.89 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVW | 10B | 1.33 | 76.5 | 50 | 20 | 462 | 0.007 | 5.8 | 7 | 2.95 | 0.6 | 0.9 | 3.53 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVW | 11B | 0.34 | 65.8 | 50 | 20 | 85 | 0.008 | 5.8 | 5 | 3.46 | 0.63 | 0.9 | 1.06 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVW | 12B | 3.54 | 16.0 | 50 | 20 | 1360 | 0.006 | 5.8 | 15 | 2.06 | 0.52 | 0.9 | 6.56 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVW | 12C | 0.87 | 91.0 | 50 | 20 | 1000 | 0.007 | 5.8 | 12 | 2.29 | 0.54 | 0.9 | 1.79 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVW | 13C | 3.6 | 65.4 | 50 | 20 | 597 | 0.007 | 5.8 | 8 | 2.77 | 0.59 | 0.9 | 8.97 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVW | 14C | 2.58 | 68.2 | 50 | 20 | 1147 | 0.008 | 5.8 | 12 | 2.29 | 0.54 | 0.9 | 5.32 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVW | 15C | 2.13 | 65.3 | 50 | 20 | 650 | 0.009 | 5.8 | 9 | 2.63 | 0.57 | 0.9 | 5.04 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVW | 16C | 0.99 | 91.0 | 50 | 20 | 466 | 0.007 | 5.8 | 7 | 2.95 | 0.6 | 0.9 | 2.63 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVW | 17C | 1.91 | 15.6 | 50 | 20 | 800 | 0.005 | 5.8 | 11 | 2.39 | 0.55 | 0.9 | 4.11 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVW | 18D | 1.93 | 74.0 | 50 | 20 | 517 | 0.011 | 5.8 | 7 | 2.95 | 0.6 | 0.9 | 5.12 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVW | 19D | 0.51 | 91.0 | 50 | 20 | 305 | 0.007 | 5.8 | 6 | 3.18 | 0.62 | 0.9 | 1.46 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVW | 20D | 0.38 | 91.0 | 50 | 20 | 310 | 0.007 | 5.8 | 6 | 3.18 | 0.62 | 0.9 | 1.09 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVW | 21D | 11 | 74.0 | 50 | 20 | 1570 | 0.009 | 5.8 | 15 | 2.06 | 0.52 | 0.9 | 20.39 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVW | 22D | 1.88 | 91.0 | 50 | 20 | 1200 | 0.008 | 5.8 | 13 | 2.21 | 0.54 | 0.9 | 3.74 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVW | 23D | 1.26 | 91.0 | 50 | 20 | 1071 | 0.009 | 5.8 | 12 | 2.29 | 0.54 | 0.9 | 2.6 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVW | 24D | 4.91 | 74.0 | 50 | 20 | 1000 | 0.01 | 5.8 | 11 | 2.39 | 0.55 | 0.9 | 10.56 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVW | 25D | 0.49 | 91.0 | 50 | 20 | 320 | 0.007 | 5.8 | 6 | 3.18 | 0.62 | 0.9 | 1.4 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVW | 26D | 1.11 | 91.0 | 50 | 20 | 220 | 0.01 | 5.8 | 5 | 3.46 | 0.63 | 0.9 | 3.46 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVW | 26.1D | 0.56 | 91.0 | 50 | 20 | 280 | 0.007 | 5.8 | 5 | 3.46 | 0.63 | 0.9 | 1.74 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVW | 27D | 1.02 | 91.0 | 50 | 20 | 340 | 0.007 | 5.8 | 6 | 3.18 | 0.62 | 0.9 | 2.92 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVW | 28D | 17.71 | 74.0 | 50 | 20 | 982 | 0.01 | 5.8 | 11 | 2.39 | 0.55 | 0.9 | 38.09 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVW | 29D | 4.06 | 74.0 | 50 | 20 | 637 | 0.01 | 5.8 | 8 | 2.77 | 0.59 | 0.9 | 10.12 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVW | 31E | 2.17 | 91.0 | 50 | 20 | 720 | 0.007 | 5.8 | 10 | 2.5 | 0.56 | 0.9 | 4.88 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVW | 32E | 0.7 | 91.0 | 50 | 20 | 385 | 0.019 | 5.8 | 5 | 3.46 | 0.63 | 0.9 | 2.18 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVW | 33E | 1.99 | 91.0 | 50 | 20 | 615 | 0.019 | 5.8 | 7 | 2.95 | 0.6 | 0.9 | 5.28 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVW | 34E | 2.44 | 91.0 | 50 | 20 | 880 | 0.01 | 5.8 | 10 | 2.5 | 0.56 | 0.9 | 5.49 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVW | 35E | 0.65 | 91.0 | 50 | 20 | 510 | 0.008 | 5.8 | 7 | 2.95 | 0.6 | 0.9 | 1.73 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVW | 36E | 0.26 | 91.0 | 50 | 20 | 180 | 0.01 | 5.8 | 5 | 3.46 | 0.63 | 0.9 | 0.81 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVW | 37E | 0.37 | 91.0 | 50 | 20 | 320 | 0.011 | 5.8 | 5 | 3.46 | 0.63 | 0.9 | 1.15 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVW | 38E | 0.77 | 91.0 | 50 | 20 | 460 | 0.013 | 5.8 | 6 | 3.18 | 0.62 | 0.9 | 2.2 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVW | 39E | 5.72 | 78.5 | 50 | 20 | 930 | 0.01 | 5.8 | 11 | 2.39 | 0.55 | 0.9 | 12.3 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVW | 39.1E | 0.78 | 91.0 | 50 | 20 | 550 | 0.01 | 5.8 | 8 | 2.77 | 0.59 | 0.9 | 1.94 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVW | 40E | 7.41 | 91.0 | 50 | 20 | 1050 | 0.019 | 5.8 | 10 | 2.5 | 0.56 | 0.9 | 16.67 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVW | 41E | 2.32 | 13.0 | 50 | 20 | 730 | 0.005 | 5.8 | 10 | 2.5 | 0.56 | 0.9 | 5.22 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVW | 42E | 1.04 | 13.1 | 50 | 20 | 400 | 0.005 | 5.8 | 7 | 2.95 | 0.6 | 0.9 | 2.76 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVW | 43G | 1.29 | 15.0 | 50 | 20 | 540 | 0.005 | 5.8 | 8 | 2.77 | 0.59 | 0.9 | 3.22 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| RVW | 44G | 1.94 | 9.8 | 50 | 20 | 140 | 0.05 | 5.8 | 5 | 3.46 | 0.63 | 0.9 | 6.04 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| CQT | 1A | 29.9 | 0.1 | 50 | 20 | 1150 | 0.0895 | 5.8 | 11 | 2.39 | 0.55 | 0.57 | 40.73 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| CQT | 2A | 6.4 | 0.1 | 50 | 20 | 630 | 0.27 | 5.8 | 6 | 3.18 | 0.62 | 0.63 | 12.82 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| CQT | 3B | 4.4 | 0.1 | 50 | 20 | 540 | 0.28 | 5.8 | 5 | 3.46 | 0.63 | 0.64 | 9.74 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| CQT | 4B | 19.6 | 0.1 | 50 | 20 | 1404 | 0.056 | 5.8 | 14 | 2.13 | 0.53 | 0.57 | 23.8 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| CQT | 5B | 6.94 | 0.1 | 50 | 20 | 765 | 0.21 | 5.8 | 7 | 2.95 | 0.6 | 0.62 | 12.69 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| CQT | 6B | 5.9 | 0.1 | 50 | 20 | 580 | 0.06 | 5.8 | 7 | 2.95 | 0.6 | 0.62 | 10.79 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| CQT | 7B | 13.3 | 0.3 | 50 | 20 | 860 | 0.06 | 5.8 | 9 | 2.63 | 0.57 | 0.67 | 23.44 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| CQT | 9C | 7.7 | 0.1 | 50 | 20 | 1050 | 0.28 | 5.8 | 8 | 2.77 | 0.59 | 0.61 | 13.01 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| CQT | 10C | 8.8 | 0.1 | 50 | 20 | 970 | 0.06 | 5.8 | 11 | 2.39 | 0.55 | 0.57 | 11.99 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| CQT | 11C | 11.8 | 0.8 | 50 | 20 | 1890 | 0.008 | 5.8 | 18 | 1.9 | 0.5 | 0.82 | 18.38 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| CQT | 12C | 2.2 | 0.1 | 50 | 20 | 1310 | 0.024 | 5.8 | 16 | 2 | 0.52 | 0.54 | 2.38 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| CQT | 13C | 7.5 | 0.8 | 50 | 20 | 2500 | 0.007 | 5.8 | 22 | 1.72 | 0.48 | 0.82 | 10.58 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |

# APPENDIX 4

# LACDPW MORA CALCULATIONS: EXISTING CONDITION

```
4LADEPTH.RDT
5   300  100A  50 YR River Village - Existing Condition - Newhall Ranch
5   300  111A  HYDROGRAPH AT OUTLET BASIN 100
6   300  100A  20  032.720A292 1400 00710                    G1
6   300  101A  20  0    99A29
6   300  102A  20  0    99A29
6   300  103A  20  0    99A29
6   300  104A  20  0    99A29
6   300  105A  20  0    99A29
6   300  106A  20  0    99A29
6   300  107A  20  0    99A29
6   300  108A  20  0    99A29
6   300  109A  20  0    99A29
6   300  110A  20  049.622A29
6   300  111A  20  0    99A29                             1  2
```

10-14-2009 SITE LICENSEE: PSOMAS AND ASSOCIATES 

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT 

MODIFIED RATIONAL METHOD HYDROLOGY

50 YR River Village - Existing Condition - Newhall Ranch STORM DAY 4

| LOCATION | | SUBAREA AREA | SUBAREA Q | TOTAL AREA | TOTAL Q | CONV TYPE | CONV LNGTH | CONV SLOPE | CONV SIZE | CONV Z | CONTROL Q | SOIL NAME | TC | RAIN ZONE | PCT IMPV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 300 | 100A | 33. | 30. | 33. | 30. | 2 | 1400. | 0.00710 | 0.00 | 0.00 | 0. | 20 | 20 | A29 | 0.00 |
| 300 | 101A | 0. | 0. | 33. | 25. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |
| 300 | 102A | 0. | 0. | 33. | 25. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |
| 300 | 103A | 0. | 0. | 33. | 25. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |
| 300 | 104A | 0. | 0. | 33. | 25. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |
| 300 | 105A | 0. | 0. | 33. | 25. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |
| 300 | 106A | 0. | 0. | 33. | 25. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |
| 300 | 107A | 0. | 0. | 33. | 25. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |
| 300 | 108A | 0. | 0. | 33. | 25. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |
| 300 | 109A | 0. | 0. | 33. | 25. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |
| 300 | 110A | 50. | 42. | 83. | 60. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 22 | A29 | 0.00 |
| 300 | 111A | 0. | 0. | 83. | 60. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |

HYDROGRAPH AT OUTLET BASIN 100

HYDROGRAPH AT 300 111A STORM DAY 4 REDUCTION FACTOR = 1.000

| TIME | Q | TIME | Q | TIME | Q | TIME | Q | TIME | Q |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0. | 100 | 1. | 200 | 1. | 300 | 1. | 400 | 1. |
| 500 | 1. | 600 | 1. | 700 | 2. | 800 | 2. | 900 | 2. |
| 1000 | 2. | 1050 | 3. | 1100 | 5. | 1110 | 6. | 1120 | 8. |
| 1130 | 11. | 1131 | 11. | 1132 | 12. | 1133 | 12. | 1134 | 13. |
| 1135 | 13. | 1136 | 13. | 1137 | 14. | 1138 | 15. | 1139 | 15. |
| 1140 | 16. | 1141 | 17. | 1142 | 18. | 1143 | 19. | 1144 | 20. |
| 1145 | 21. | 1146 | 22. | 1147 | 24. | 1148 | 25. | 1149 | 30. |
| 1150 | 34. | 1151 | 39. | 1152 | 43. | 1153 | 48. | 1154 | 49. |
| 1155 | 50. | 1156 | 51. | 1157 | 53. | 1158 | 54. | 1159 | 56. |
| 1160 | 57. | 1161 | 58. | 1162 | 59. | 1163 | 60. | 1164 | 60. |
| 1165 | 60. | 1166 | 60. | 1167 | 59. | 1168 | 58. | 1169 | 56. |
| 1170 | 55. | 1171 | 50. | 1172 | 45. | 1173 | 41. | 1174 | 36. |
| 1175 | 31. | 1176 | 29. | 1177 | 27. | 1178 | 25. | 1179 | 23. |
| 1180 | 22. | 1181 | 20. | 1182 | 18. | 1183 | 17. | 1184 | 16. |
| 1185 | 14. | 1186 | 13. | 1187 | 12. | 1188 | 12. | 1189 | 11. |
| 1190 | 10. | 1191 | 9. | 1192 | 9. | 1193 | 8. | 1194 | 8. |
| 1195 | 7. | 1196 | 7. | 1197 | 7. | 1198 | 6. | 1199 | 6. |
| 1200 | 6. | 1201 | 6. | 1202 | 5. | 1203 | 5. | 1204 | 5. |
| 1205 | 5. | 1206 | 5. | 1207 | 4. | 1208 | 4. | 1209 | 4. |
| 1210 | 4. | 1211 | 4. | 1212 | 4. | 1213 | 4. | 1214 | 4. |
| 1215 | 3. | 1216 | 3. | 1217 | 3. | 1218 | 3. | 1219 | 3. |
| 1220 | 3. | 1221 | 3. | 1222 | 3. | 1223 | 3. | 1224 | 3. |
| 1225 | 3. | 1226 | 3. | 1227 | 3. | 1228 | 3. | 1229 | 3. |
| 1230 | 3. | 1231 | 3. | 1232 | 3. | 1233 | 2. | 1234 | 2. |
| 1235 | 2. | 1236 | 2. | 1237 | 2. | 1238 | 2. | 1239 | 2. |
| 1240 | 2. | 1241 | 2. | 1242 | 2. | 1243 | 2. | 1244 | 2. |
| 1245 | 2. | 1246 | 2. | 1247 | 2. | 1248 | 2. | 1249 | 2. |
| 1250 | 2. | 1251 | 2. | 1252 | 2. | 1253 | 2. | 1254 | 2. |
| 1255 | 2. | 1256 | 2. | 1257 | 2. | 1258 | 2. | 1259 | 2. |
| 1260 | 2. | 1261 | 2. | 1262 | 2. | 1263 | 2. | 1264 | 2. |
| 1265 | 2. | 1266 | 2. | 1267 | 2. | 1268 | 2. | 1269 | 2. |
| 1270 | 2. | 1271 | 2. | 1272 | 2. | 1273 | 2. | 1274 | 2. |
| 1275 | 2. | 1276 | 2. | 1277 | 2. | 1278 | 2. | 1279 | 2. |
| 1280 | 2. | 1281 | 2. | 1282 | 2. | 1283 | 2. | 1284 | 2. |
| 1285 | 2. | 1286 | 2. | 1287 | 2. | 1288 | 2. | 1289 | 2. |
| 1290 | 2. | 1291 | 2. | 1292 | 2. | 1293 | 2. | 1294 | 2. |
| 1295 | 2. | 1296 | 2. | 1297 | 2. | 1298 | 2. | 1299 | 2. |
| 1300 | 2. | 1310 | 2. | 1320 | 1. | 1330 | 1. | 1340 | 1. |
| 1350 | 1. | 1360 | 1. | 1370 | 1. | 1380 | 1. | 1390 | 1. |
| 1400 | 1. | 1420 | 1. | 1440 | 1. | 1460 | 0. | 1500 | 0. |

Total Runoff = 5.870 Acre-Ft.
Peak Q = 60 CFS
Time to Peak Q = 1163 Minutes

```
4LADEPTH.RDT
5   300  200A  50 YR River Village - Existing Condition - Newhall Ranch
5   300  211A  HYDROGRAPH AT OUTLET BASIN 200
6   300  200A  20  017.317A292  800 01130                    G1
6   300  201A  20  0    99A29
6   300  202A  20  0    99A29
6   300  203A  20  0    99A29
6   300  204A  20  0    99A29
6   300  205A  20  0    99A29
6   300  206A  20  0    99A29
6   300  207A  20  0    99A29
6   300  208A  20  0    99A29
6   300  209A  20  0    99A29
6   300  210A  20  035.825A29
6   300  211A  20  0    99A29                             1  2
```

10-14-2009 SITE LICENSEE: PSOMAS AND ASSOCIATES 

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT 

MODIFIED RATIONAL METHOD HYDROLOGY

50 YR River Village - Existing Condition - Newhall Ranch STORM DAY 4

| LOCATION | SUBAREA AREA | SUBAREA Q | TOTAL AREA | TOTAL Q | CONV TYPE | CONV LNGTH | CONV SLOPE | CONV SIZE | CONV Z | CONTROL Q | SOIL NAME | TC | RAIN ZONE | PCT IMPV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 300 200A | 17. | 17. | 17. | 17. | 2 | 800. | 0.01130 | 0.00 | 0.00 | 0. | 20 | 17 | A29 | 0.00 |
| 300 201A | 0. | 0. | 17. | 16. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |
| 300 202A | 0. | 0. | 17. | 16. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |
| 300 203A | 0. | 0. | 17. | 16. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |
| 300 204A | 0. | 0. | 17. | 16. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |
| 300 205A | 0. | 0. | 17. | 16. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |
| 300 206A | 0. | 0. | 17. | 16. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |
| 300 207A | 0. | 0. | 17. | 16. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |
| 300 208A | 0. | 0. | 17. | 16. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |
| 300 209A | 0. | 0. | 17. | 16. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |
| 300 210A | 36. | 28. | 53. | 43. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 25 | A29 | 0.00 |
| 300 211A | 0. | 0. | 53. | 43. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |

HYDROGRAPH AT OUTLET BASIN 200

HYDROGRAPH AT 300 211A STORM DAY 4 REDUCTION FACTOR = 1.000

| TIME | Q | TIME | Q | TIME | Q | TIME | Q | TIME | Q |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0. | 100 | 1. | 200 | 1. | 300 | 1. | 400 | 1. |
| 500 | 1. | 600 | 1. | 700 | 1. | 800 | 1. | 900 | 1. |
| 1000 | 2. | 1050 | 2. | 1100 | 3. | 1110 | 4. | 1120 | 5. |
| 1130 | 8. | 1131 | 8. | 1132 | 8. | 1133 | 8. | 1134 | 9. |
| 1135 | 9. | 1136 | 9. | 1137 | 10. | 1138 | 10. | 1139 | 11. |
| 1140 | 11. | 1141 | 12. | 1142 | 12. | 1143 | 13. | 1144 | 14. |
| 1145 | 15. | 1146 | 16. | 1147 | 16. | 1148 | 17. | 1149 | 20. |
| 1150 | 23. | 1151 | 26. | 1152 | 30. | 1153 | 33. | 1154 | 35. |
| 1155 | 37. | 1156 | 38. | 1157 | 40. | 1158 | 41. | 1159 | 42. |
| 1160 | 42. | 1161 | 43. | 1162 | 42. | 1163 | 42. | 1164 | 42. |
| 1165 | 41. | 1166 | 40. | 1167 | 39. | 1168 | 38. | 1169 | 37. |
| 1170 | 35. | 1171 | 33. | 1172 | 30. | 1173 | 28. | 1174 | 24. |
| 1175 | 20. | 1176 | 16. | 1177 | 13. | 1178 | 10. | 1179 | 8. |
| 1180 | 7. | 1181 | 6. | 1182 | 6. | 1183 | 5. | 1184 | 5. |
| 1185 | 5. | 1186 | 4. | 1187 | 4. | 1188 | 4. | 1189 | 4. |
| 1190 | 3. | 1191 | 3. | 1192 | 3. | 1193 | 3. | 1194 | 3. |
| 1195 | 3. | 1196 | 3. | 1197 | 3. | 1198 | 3. | 1199 | 2. |
| 1200 | 2. | 1201 | 2. | 1202 | 2. | 1203 | 2. | 1204 | 2. |
| 1205 | 2. | 1206 | 2. | 1207 | 2. | 1208 | 2. | 1209 | 2. |
| 1210 | 2. | 1211 | 2. | 1212 | 2. | 1213 | 2. | 1214 | 2. |
| 1215 | 2. | 1216 | 2. | 1217 | 2. | 1218 | 2. | 1219 | 2. |
| 1220 | 2. | 1221 | 2. | 1222 | 2. | 1223 | 2. | 1224 | 1. |
| 1225 | 1. | 1226 | 1. | 1227 | 1. | 1228 | 1. | 1229 | 1. |
| 1230 | 1. | 1231 | 1. | 1232 | 1. | 1233 | 1. | 1234 | 1. |
| 1235 | 1. | 1236 | 1. | 1237 | 1. | 1238 | 1. | 1239 | 1. |
| 1240 | 1. | 1241 | 1. | 1242 | 1. | 1243 | 1. | 1244 | 1. |
| 1245 | 1. | 1246 | 1. | 1247 | 1. | 1248 | 1. | 1249 | 1. |
| 1250 | 1. | 1251 | 1. | 1252 | 1. | 1253 | 1. | 1254 | 1. |
| 1255 | 1. | 1256 | 1. | 1257 | 1. | 1258 | 1. | 1259 | 1. |
| 1260 | 1. | 1261 | 1. | 1262 | 1. | 1263 | 1. | 1264 | 1. |
| 1265 | 1. | 1266 | 1. | 1267 | 1. | 1268 | 1. | 1269 | 1. |
| 1270 | 1. | 1271 | 1. | 1272 | 1. | 1273 | 1. | 1274 | 1. |
| 1275 | 1. | 1276 | 1. | 1277 | 1. | 1278 | 1. | 1279 | 1. |
| 1280 | 1. | 1281 | 1. | 1282 | 1. | 1283 | 1. | 1284 | 1. |
| 1285 | 1. | 1286 | 1. | 1287 | 1. | 1288 | 1. | 1289 | 1. |
| 1290 | 1. | 1291 | 1. | 1292 | 1. | 1293 | 1. | 1294 | 1. |
| 1295 | 1. | 1296 | 1. | 1297 | 1. | 1298 | 1. | 1299 | 1. |
| 1300 | 1. | 1310 | 1. | 1320 | 1. | 1330 | 1. | 1340 | 1. |
| 1350 | 1. | 1360 | 1. | 1370 | 1. | 1380 | 1. | 1390 | 1. |
| 1400 | 1. | 1420 | 1. | 1440 | 1. | 1460 | 0. | 1500 | 0. |

Total Runoff = 4.027 Acre-Ft.
Peak Q = 43 CFS
Time to Peak Q = 1161 Minutes

```
4LADEPTH.RDT
5   300  400A  50 YR River Village - Existing Condition - Newhall Ranch
5   300  426A  HYDROGRAPH AT OUTLET BASIN 400
6   300  400B  20  018.424A294  155 01300                    G1
6   300  401B  20  0    99A29
6   300  402B  20  0    99A29
6   300  403B  20  0    99A29
6   300  404B  20  0    99A29
6   300  405B  20  038.929A292  920 00500
6   300  406B  20  0    99A29
6   300  407B  20  0    99A29
6   300  408C  20  015.3 8A292 1990 04800
6   300  409C  20  0    99A29
6   300  410C  20  044.319A29
6   300  411BC 20  0      A29
6   300  412B  20  0    99A29
6   300  413B  20  0    99A29
6   300  414B  20  0    99A29
6   300  415B  20  035.311A292 2430 01400
6   300  416B  20  0    99A29
6   300  417B  20  0    99A29
6   300  418B  20  0    99A29
6   300  419B  20  0    99A29
6   300  420A  20  034.425A293  600 01000
6   300  421AB 20  0      A29
6   300  422A  20  0    99A29
6   300  423A  20  0    99A29
6   300  424A  20  0    99A29
6   300  425A  20  039.921A29
6   300  426A  20  0    99A29                              1  2
```

10-14-2009 SITE LICENSEE: PSOMAS AND ASSOCIATES 

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT 

MODIFIED RATIONAL METHOD HYDROLOGY

50 YR River Village - Existing Condition - Newhall Ranch STORM DAY 4

| LOCATION | | SUBAREA AREA | SUBAREA Q | TOTAL AREA | TOTAL Q | CONV TYPE | CONV LNGTH | CONV SLOPE | CONV SIZE | CONV Z | CONTROL Q | SOIL NAME | TC | RAIN ZONE | PCT IMPV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 300 | 400B | 18. | 14. | 18. | 14. | 4 | 155. | 0.01300 | 2.00 | 0.00 | 0. | 20 | 24 | A29 | 0.00 |
| 300 | 401B | 0. | 0. | 18. | 14. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |
| 300 | 402B | 0. | 0. | 18. | 14. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |
| 300 | 403B | 0. | 0. | 18. | 14. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |
| 300 | 404B | 0. | 0. | 18. | 14. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |
| 300 | 405B | 39. | 27. | 57. | 41. | 2 | 920. | 0.00500 | 0.00 | 0.00 | 0. | 20 | 29 | A29 | 0.00 |
| 300 | 406B | 0. | 0. | 57. | 39. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |
| 300 | 407B | 0. | 0. | 57. | 39. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |
| 300 | 408C | 15. | 24. | 15. | 24. | 2 | 1990. | 0.04800 | 0.00 | 0.00 | 0. | 20 | 8 | A29 | 0.00 |
| 300 | 409C | 0. | 0. | 15. | 19. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |
| 300 | 410C | 44. | 41. | 59. | 58. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 19 | A29 | 0.00 |
| 300 | 411BC | 59. | 58. | 116. | 91. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 0 | A29 | 0.00 |
| 300 | 412B | 0. | 0. | 116. | 91. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |
| 300 | 413B | 0. | 0. | 116. | 91. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |
| 300 | 414B | 0. | 0. | 116. | 91. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |
| 300 | 415B | 35. | 47. | 151. | 127. | 2 | 2430. | 0.01400 | 0.00 | 0.00 | 0. | 20 | 11 | A29 | 0.00 |
| 300 | 416B | 0. | 0. | 151. | 108. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |
| 300 | 417B | 0. | 0. | 151. | 108. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |
| 300 | 418B | 0. | 0. | 151. | 108. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |
| 300 | 419B | 0. | 0. | 151. | 108. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |
| 300 | 420A | 34. | 26. | 34. | 26. | 3 | 600. | 0.01000 | 0.00 | 0.00 | 0. | 20 | 25 | A29 | 0.00 |
| 300 | 421AB | 151. | 108. | 185. | 133. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 0 | A29 | 0.00 |
| 300 | 422A | 0. | 0. | 185. | 133. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |
| 300 | 423A | 0. | 0. | 185. | 133. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |
| 300 | 424A | 0. | 0. | 185. | 133. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |
| 300 | 425A | 40. | 35. | 225. | 161. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 21 | A29 | 0.00 |
| 300 | 426A | 0. | 0. | 225. | 161. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |

HYDROGRAPH AT OUTLET BASIN 400

HYDROGRAPH AT 300 426A STORM DAY 4 REDUCTION FACTOR = 1.000

| TIME | Q | TIME | Q | TIME | Q | TIME | Q | TIME | Q |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0. | 100 | 3. | 200 | 3. | 300 | 4. | 400 | 4. |
| 500 | 4. | 600 | 4. | 700 | 4. | 800 | 5. | 900 | 5. |
| 1000 | 6. | 1050 | 8. | 1100 | 13. | 1110 | 14. | 1120 | 17. |
| 1130 | 24. | 1131 | 24. | 1132 | 25. | 1133 | 26. | 1134 | 27. |
| 1135 | 28. | 1136 | 29. | 1137 | 30. | 1138 | 31. | 1139 | 33. |
| 1140 | 34. | 1141 | 35. | 1142 | 37. | 1143 | 39. | 1144 | 40. |
| 1145 | 42. | 1146 | 45. | 1147 | 47. | 1148 | 50. | 1149 | 56. |
| 1150 | 61. | 1151 | 67. | 1152 | 74. | 1153 | 82. | 1154 | 88. |
| 1155 | 94. | 1156 | 102. | 1157 | 110. | 1158 | 118. | 1159 | 127. |
| 1160 | 134. | 1161 | 141. | 1162 | 148. | 1163 | 153. | 1164 | 157. |
| 1165 | 160. | 1166 | 161. | 1167 | 160. | 1168 | 158. | 1169 | 155. |
| 1170 | 148. | 1171 | 141. | 1172 | 134. | 1173 | 126. | 1174 | 119. |
| 1175 | 113. | 1176 | 107. | 1177 | 100. | 1178 | 93. | 1179 | 87. |
| 1180 | 81. | 1181 | 76. | 1182 | 72. | 1183 | 68. | 1184 | 64. |
| 1185 | 61. | 1186 | 58. | 1187 | 56. | 1188 | 53. | 1189 | 51. |
| 1190 | 49. | 1191 | 47. | 1192 | 45. | 1193 | 43. | 1194 | 41. |
| 1195 | 39. | 1196 | 37. | 1197 | 35. | 1198 | 33. | 1199 | 32. |
| 1200 | 30. | 1201 | 28. | 1202 | 27. | 1203 | 26. | 1204 | 24. |
| 1205 | 23. | 1206 | 22. | 1207 | 21. | 1208 | 20. | 1209 | 19. |
| 1210 | 18. | 1211 | 18. | 1212 | 17. | 1213 | 16. | 1214 | 16. |
| 1215 | 15. | 1216 | 14. | 1217 | 14. | 1218 | 13. | 1219 | 13. |
| 1220 | 12. | 1221 | 12. | 1222 | 12. | 1223 | 11. | 1224 | 11. |
| 1225 | 11. | 1226 | 10. | 1227 | 10. | 1228 | 10. | 1229 | 10. |
| 1230 | 9. | 1231 | 9. | 1232 | 9. | 1233 | 9. | 1234 | 9. |
| 1235 | 8. | 1236 | 8. | 1237 | 8. | 1238 | 8. | 1239 | 8. |
| 1240 | 8. | 1241 | 8. | 1242 | 7. | 1243 | 7. | 1244 | 7. |
| 1245 | 7. | 1246 | 7. | 1247 | 7. | 1248 | 7. | 1249 | 7. |
| 1250 | 7. | 1251 | 7. | 1252 | 6. | 1253 | 6. | 1254 | 6. |
| 1255 | 6. | 1256 | 6. | 1257 | 6. | 1258 | 6. | 1259 | 6. |
| 1260 | 6. | 1261 | 6. | 1262 | 6. | 1263 | 6. | 1264 | 6. |
| 1265 | 6. | 1266 | 6. | 1267 | 6. | 1268 | 6. | 1269 | 6. |
| 1270 | 5. | 1271 | 5. | 1272 | 5. | 1273 | 5. | 1274 | 5. |
| 1275 | 5. | 1276 | 5. | 1277 | 5. | 1278 | 5. | 1279 | 5. |
| 1280 | 5. | 1281 | 5. | 1282 | 5. | 1283 | 5. | 1284 | 5. |
| 1285 | 5. | 1286 | 5. | 1287 | 5. | 1288 | 5. | 1289 | 5. |
| 1290 | 5. | 1291 | 5. | 1292 | 5. | 1293 | 5. | 1294 | 5. |
| 1295 | 5. | 1296 | 5. | 1297 | 5. | 1298 | 5. | 1299 | 5. |
| 1300 | 5. | 1310 | 4. | 1320 | 4. | 1330 | 4. | 1340 | 4. |
| 1350 | 4. | 1360 | 4. | 1370 | 4. | 1380 | 4. | 1390 | 4. |
| 1400 | 4. | 1420 | 4. | 1440 | 3. | 1460 | 3. | 1500 | 3. |

Total Runoff = 16.926 Acre-Ft.
Peak Q = 161 CFS
Time to Peak Q = 1166 Minutes

```
4LADEPTH.RDT
5   300  500A  50 YR River Village - Existing Condition - Newhall Ranch
5   300  510A  HYDROGRAPH AT OUTLET BASIN 500
6   300  500A  20  026.520A292 1530 00590                    G1
6   300  501A  20  0    99A29
6   300  502A  20  0    99A29
6   300  503A  20  0    99A29
6   300  504A  20  0    99A29
6   300  505A  20  0    99A29
6   300  506A  20  0    99A29
6   300  507A  20  0    99A29
6   300  508A  20  0    99A29
6   300  509A  20  0    99A29
6   300  510A  20  040.025A29                             1  2
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10-14-2009 SITE LICENSEE: PSOMAS AND ASSOCIATES 

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT 

MODIFIED RATIONAL METHOD HYDROLOGY

50 YR River Village - Existing Condition - Newhall Ranch

| LOCATION | | SUBAREA AREA | SUBAREA Q | TOTAL AREA | TOTAL Q | CONV TYPE | CONV LNGTH | CONV SLOPE | CONV SIZE | CONV Z | CONTROL Q | SOIL NAME | TC | STORM DAY 4 RAIN ZONE | PCT IMPV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 300 | 500A | 26. | 23. | 26. | 23. | 2 | 1530. | 0.00590 | 0.00 | 0.00 | 0. | 20 | 20 | A29 | 0.00 |
| 300 | 501A | 0. | 0. | 26. | 19. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |
| 300 | 502A | 0. | 0. | 26. | 19. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |
| 300 | 503A | 0. | 0. | 26. | 19. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |
| 300 | 504A | 0. | 0. | 26. | 19. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |
| 300 | 505A | 0. | 0. | 26. | 19. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |
| 300 | 506A | 0. | 0. | 26. | 19. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |
| 300 | 507A | 0. | 0. | 26. | 19. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |
| 300 | 508A | 0. | 0. | 26. | 19. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |
| 300 | 509A | 0. | 0. | 26. | 19. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |
| 300 | 510A | 40. | 31. | 66. | 43. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 25 | A29 | 0.00 |

HYDROGRAPH AT OUTLET BASIN 500

HYDROGRAPH AT 300 510A STORM DAY 4 REDUCTION FACTOR = 1.000

| TIME | Q | TIME | Q | TIME | Q | TIME | Q | TIME | Q |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0. | 100 | 1. | 200 | 1. | 300 | 1. | 400 | 1. |
| 500 | 1. | 600 | 1. | 700 | 1. | 800 | 1. | 900 | 2. |
| 1000 | 2. | 1050 | 3. | 1100 | 4. | 1110 | 4. | 1120 | 6. |
| 1130 | 8. | 1131 | 8. | 1132 | 9. | 1133 | 9. | 1134 | 9. |
| 1135 | 10. | 1136 | 10. | 1137 | 10. | 1138 | 11. | 1139 | 11. |
| 1140 | 12. | 1141 | 12. | 1142 | 13. | 1143 | 14. | 1144 | 14. |
| 1145 | 15. | 1146 | 16. | 1147 | 17. | 1148 | 18. | 1149 | 21. |
| 1150 | 25. | 1151 | 28. | 1152 | 31. | 1153 | 34. | 1154 | 35. |
| 1155 | 36. | 1156 | 37. | 1157 | 37. | 1158 | 38. | 1159 | 38. |
| 1160 | 39. | 1161 | 40. | 1162 | 41. | 1163 | 42. | 1164 | 43. |
| 1165 | 43. | 1166 | 43. | 1167 | 43. | 1168 | 43. | 1169 | 43. |
| 1170 | 42. | 1171 | 41. | 1172 | 40. | 1173 | 39. | 1174 | 36. |
| 1175 | 33. | 1176 | 29. | 1177 | 26. | 1178 | 23. | 1179 | 21. |
| 1180 | 20. | 1181 | 19. | 1182 | 17. | 1183 | 16. | 1184 | 15. |
| 1185 | 14. | 1186 | 13. | 1187 | 13. | 1188 | 12. | 1189 | 11. |
| 1190 | 10. | 1191 | 10. | 1192 | 9. | 1193 | 9. | 1194 | 8. |
| 1195 | 8. | 1196 | 7. | 1197 | 7. | 1198 | 7. | 1199 | 6. |
| 1200 | 6. | 1201 | 6. | 1202 | 5. | 1203 | 5. | 1204 | 5. |
| 1205 | 5. | 1206 | 5. | 1207 | 4. | 1208 | 4. | 1209 | 4. |
| 1210 | 4. | 1211 | 4. | 1212 | 4. | 1213 | 4. | 1214 | 3. |
| 1215 | 3. | 1216 | 3. | 1217 | 3. | 1218 | 3. | 1219 | 3. |
| 1220 | 3. | 1221 | 3. | 1222 | 3. | 1223 | 3. | 1224 | 3. |
| 1225 | 3. | 1226 | 3. | 1227 | 3. | 1228 | 2. | 1229 | 2. |
| 1230 | 2. | 1231 | 2. | 1232 | 2. | 1233 | 2. | 1234 | 2. |
| 1235 | 2. | 1236 | 2. | 1237 | 2. | 1238 | 2. | 1239 | 2. |
| 1240 | 2. | 1241 | 2. | 1242 | 2. | 1243 | 2. | 1244 | 2. |
| 1245 | 2. | 1246 | 2. | 1247 | 2. | 1248 | 2. | 1249 | 2. |
| 1250 | 2. | 1251 | 2. | 1252 | 2. | 1253 | 2. | 1254 | 2. |
| 1255 | 2. | 1256 | 2. | 1257 | 2. | 1258 | 2. | 1259 | 2. |
| 1260 | 2. | 1261 | 2. | 1262 | 2. | 1263 | 2. | 1264 | 2. |
| 1265 | 2. | 1266 | 2. | 1267 | 2. | 1268 | 2. | 1269 | 2. |
| 1270 | 2. | 1271 | 2. | 1272 | 2. | 1273 | 1. | 1274 | 1. |
| 1275 | 1. | 1276 | 1. | 1277 | 1. | 1278 | 1. | 1279 | 1. |
| 1280 | 1. | 1281 | 1. | 1282 | 1. | 1283 | 1. | 1284 | 1. |
| 1285 | 1. | 1286 | 1. | 1287 | 1. | 1288 | 1. | 1289 | 1. |
| 1290 | 1. | 1291 | 1. | 1292 | 1. | 1293 | 1. | 1294 | 1. |
| 1295 | 1. | 1296 | 1. | 1297 | 1. | 1298 | 1. | 1299 | 1. |
| 1300 | 1. | 1310 | 1. | 1320 | 1. | 1330 | 1. | 1340 | 1. |
| 1350 | 1. | 1360 | 1. | 1370 | 1. | 1380 | 1. | 1390 | 1. |
| 1400 | 1. | 1420 | 1. | 1440 | 1. | 1460 | 1. | 1500 | 0. |

Total Runoff = 4.859 Acre-Ft.
Peak Q = 43 CFS
Time to Peak Q = 1164 Minutes

```
4LADEPTH.RDT
5 50300    1A  50 YR River Village - Newhall Ranch - Chiquito Existing
5 50300   17A  HYDROGRAPH AT OUTLET BASIN 600 and Chiquito site
6 50300    1A 020  0   6 8A292  890 26500                      G1
6 50300    2A 020  0   4 6A292  200 01000
6 50300    3A  20  0   2 5A294  275 01000
6 50300    4A  20  0  1210A294  385 02000
6 50300    5B  20  0   4 5A292  530 32100
6 50300    6B  20  0  2515A294  835 02200
6 50300    7AB 20  0      A29
6 50300    8A  20  0   2 5A294  320 02000
6 50300    9A  20  0   3 5A294  900 01000
6 50300   10C  20  0  3214A292 1750 01500
6 50300   11C  20  0  1611A292 2800 01000
6 50300   12AC020         A29
6 50300   13D  20 65  1017A292 2370 01800
6 50300   14D  20 65  1210A292 1250 03200
6 50300   15AD 20         A29
6 50300   16A  20  0  1223A29
6 50300   17A 020  0    99A29                            1  2
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10-14-2009 SITE LICENSEE: PSOMAS AND ASSOCIATES 

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT 

MODIFIED RATIONAL METHOD HYDROLOGY

50 YR River Village - Newhall Ranch - Chiquito Existing

| LOCATION | | SUBAREA AREA | SUBAREA Q | TOTAL AREA | TOTAL Q | CONV TYPE | CONV LNGTH | CONV SLOPE | CONV SIZE | CONV Z | CONTROL Q | SOIL NAME | TC | STORM RAIN ZONE | DAY 4 PCT IMPV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 50300 | 1A | 6. | 10. | 6. | 10. | 2 | 890. | 0.26500 | 0.00 | 0.00 | 0. | 20 | 8 | A29 | 0.00 |
| 50300 | 2A | 4. | 8. | 10. | 17. | 2 | 200. | 0.01000 | 0.00 | 0.00 | 0. | 20 | 6 | A29 | 0.00 |
| 50300 | 3A | 2. | 4. | 12. | 18. | 4 | 275. | 0.01000 | 2.00 | 0.00 | 0. | 20 | 5 | A29 | 0.00 |
| 50300 | 4A | 12. | 17. | 24. | 34. | 4 | 385. | 0.02000 | 2.00 | 0.00 | 0. | 20 | 10 | A29 | 0.00 |
| 50300 | 5B | 4. | 9. | 4. | 9. | 2 | 530. | 0.32100 | 0.00 | 0.00 | 0. | 20 | 5 | A29 | 0.00 |
| 50300 | 6B | 25. | 27. | 29. | 35. | 4 | 835. | 0.02200 | 2.00 | 0.00 | 0. | 20 | 15 | A29 | 0.00 |
| 50300 | 7AB | 29. | 34. | 53. | 68. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 0 | A29 | 0.00 |
| 50300 | 8A | 2. | 4. | 55. | 69. | 4 | 320. | 0.02000 | 2.75 | 0.00 | 0. | 20 | 5 | A29 | 0.00 |
| 50300 | 9A | 3. | 7. | 58. | 72. | 4 | 900. | 0.01000 | 3.00 | 0.00 | 0. | 20 | 5 | A29 | 0.00 |
| 50300 | 10C | 32. | 36. | 32. | 36. | 2 | 1750. | 0.01500 | 0.00 | 0.00 | 0. | 20 | 14 | A29 | 0.00 |
| 50300 | 11C | 16. | 21. | 48. | 40. | 2 | 2800. | 0.01000 | 0.00 | 0.00 | 0. | 20 | 11 | A29 | 0.00 |
| 50300 | 12AC | 48. | 29. | 106. | 78. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 0 | A29 | 0.00 |
| 50300 | 13D | 10. | 16. | 10. | 16. | 2 | 2370. | 0.01800 | 0.00 | 0.00 | 0. | 20 | 17 | A29 | 0.65 |
| 50300 | 14D | 12. | 25. | 22. | 32. | 2 | 1250. | 0.03200 | 0.00 | 0.00 | 0. | 20 | 10 | A29 | 0.65 |
| 50300 | 15AD | 22. | 30. | 128. | 107. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 0 | A29 | 0.00 |
| 50300 | 16A | 12. | 10. | 140. | 117. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 23 | A29 | 0.00 |
| 50300 | 17A | 0. | 0. | 140. | 117. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |

HYDROGRAPH AT OUTLET BASIN 600 and Chiquito site

HYDROGRAPH AT 50300 17A STORM DAY 4 REDUCTION FACTOR = 1.000

| TIME | Q | TIME | Q | TIME | Q | TIME | Q | TIME | Q |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0. | 100 | 4. | 200 | 4. | 300 | 4. | 400 | 5. |
| 500 | 5. | 600 | 5. | 700 | 6. | 800 | 6. | 900 | 7. |
| 1000 | 8. | 1050 | 10. | 1100 | 13. | 1110 | 15. | 1120 | 18. |
| 1130 | 23. | 1131 | 23. | 1132 | 24. | 1133 | 25. | 1134 | 25. |
| 1135 | 26. | 1136 | 27. | 1137 | 27. | 1138 | 28. | 1139 | 29. |
| 1140 | 30. | 1141 | 32. | 1142 | 33. | 1143 | 34. | 1144 | 36. |
| 1145 | 37. | 1146 | 39. | 1147 | 41. | 1148 | 44. | 1149 | 47. |
| 1150 | 51. | 1151 | 56. | 1152 | 63. | 1153 | 72. | 1154 | 82. |
| 1155 | 93. | 1156 | 102. | 1157 | 109. | 1158 | 114. | 1159 | 116. |
| 1160 | 117. | 1161 | 116. | 1162 | 113. | 1163 | 107. | 1164 | 101. |
| 1165 | 94. | 1166 | 89. | 1167 | 84. | 1168 | 80. | 1169 | 76. |
| 1170 | 73. | 1171 | 70. | 1172 | 67. | 1173 | 63. | 1174 | 61. |
| 1175 | 58. | 1176 | 57. | 1177 | 55. | 1178 | 54. | 1179 | 53. |
| 1180 | 52. | 1181 | 51. | 1182 | 50. | 1183 | 48. | 1184 | 47. |
| 1185 | 46. | 1186 | 44. | 1187 | 43. | 1188 | 41. | 1189 | 40. |
| 1190 | 38. | 1191 | 37. | 1192 | 35. | 1193 | 34. | 1194 | 33. |
| 1195 | 32. | 1196 | 30. | 1197 | 29. | 1198 | 28. | 1199 | 27. |
| 1200 | 26. | 1201 | 25. | 1202 | 24. | 1203 | 23. | 1204 | 23. |
| 1205 | 22. | 1206 | 21. | 1207 | 21. | 1208 | 20. | 1209 | 19. |
| 1210 | 19. | 1211 | 18. | 1212 | 18. | 1213 | 17. | 1214 | 17. |
| 1215 | 16. | 1216 | 16. | 1217 | 15. | 1218 | 15. | 1219 | 15. |
| 1220 | 14. | 1221 | 14. | 1222 | 14. | 1223 | 13. | 1224 | 13. |
| 1225 | 13. | 1226 | 13. | 1227 | 12. | 1228 | 12. | 1229 | 12. |
| 1230 | 12. | 1231 | 11. | 1232 | 11. | 1233 | 11. | 1234 | 11. |
| 1235 | 11. | 1236 | 11. | 1237 | 10. | 1238 | 10. | 1239 | 10. |
| 1240 | 10. | 1241 | 10. | 1242 | 10. | 1243 | 9. | 1244 | 9. |
| 1245 | 9. | 1246 | 9. | 1247 | 9. | 1248 | 9. | 1249 | 9. |
| 1250 | 9. | 1251 | 9. | 1252 | 9. | 1253 | 8. | 1254 | 8. |
| 1255 | 8. | 1256 | 8. | 1257 | 8. | 1258 | 8. | 1259 | 8. |
| 1260 | 8. | 1261 | 8. | 1262 | 8. | 1263 | 8. | 1264 | 8. |
| 1265 | 8. | 1266 | 7. | 1267 | 7. | 1268 | 7. | 1269 | 7. |
| 1270 | 7. | 1271 | 7. | 1272 | 7. | 1273 | 7. | 1274 | 7. |
| 1275 | 7. | 1276 | 7. | 1277 | 7. | 1278 | 7. | 1279 | 7. |
| 1280 | 7. | 1281 | 7. | 1282 | 7. | 1283 | 7. | 1284 | 7. |
| 1285 | 7. | 1286 | 7. | 1287 | 7. | 1288 | 6. | 1289 | 6. |
| 1290 | 6. | 1291 | 6. | 1292 | 6. | 1293 | 6. | 1294 | 6. |
| 1295 | 6. | 1296 | 6. | 1297 | 6. | 1298 | 6. | 1299 | 6. |
| 1300 | 6. | 1310 | 6. | 1320 | 6. | 1330 | 5. | 1340 | 5. |
| 1350 | 5. | 1360 | 5. | 1370 | 5. | 1380 | 5. | 1390 | 5. |
| 1400 | 5. | 1420 | 5. | 1440 | 4. | 1460 | 4. | 1500 | 4. |

Total Runoff = 17.108 Acre-Ft.
Peak Q = 117 CFS
Time to Peak Q = 1160 Minutes

# APPENDIX 5

# LACDPW MORA CALCULATIONS: EXISTING CONDITION - BURNED

```
4LADEPTH.RDT
5   300  100A  50 YR River Village - Existing Condition - Newhall Ranch
5   300  111A  HYDROGRAPH AT OUTLET BASIN 100 - BURNED
6   300  100A 198  032.720A292 1400 00710                     G1
6   300  101A 198  0    99A29
6   300  102A 198  0    99A29
6   300  103A 198  0    99A29
6   300  104A 198  0    99A29
6   300  105A 198  0    99A29
6   300  106A 198  0    99A29
6   300  107A 198  0    99A29
6   300  108A 198  0    99A29
6   300  109A 198  0    99A29
6   300  110A 198  049.622A29
6   300  111A 198  0    99A29                              1  2
```

10-20-2009 SITE LICENSEE: PSOMAS AND ASSOCIATES 

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT 

MODIFIED RATIONAL METHOD HYDROLOGY

50 YR River Village - Existing Condition - Newhall Ranch STORM DAY 4

| LOCATION | | SUBAREA AREA | SUBAREA Q | TOTAL AREA | TOTAL Q | CONV TYPE | CONV LNGTH | CONV SLOPE | CONV SIZE | CONV Z | CONTROL Q | SOIL NAME | TC | RAIN ZONE | PCT IMPV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 300 | 100A | 33. | 41. | 33. | 41. | 2 | 1400. | 0.00710 | 0.00 | 0.00 | 0. | 198 | 20 | A29 | 0.00 |
| 300 | 101A | 0. | 0. | 33. | 37. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 99 | A29 | 0.00 |
| 300 | 102A | 0. | 0. | 33. | 37. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 99 | A29 | 0.00 |
| 300 | 103A | 0. | 0. | 33. | 37. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 99 | A29 | 0.00 |
| 300 | 104A | 0. | 0. | 33. | 37. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 99 | A29 | 0.00 |
| 300 | 105A | 0. | 0. | 33. | 37. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 99 | A29 | 0.00 |
| 300 | 106A | 0. | 0. | 33. | 37. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 99 | A29 | 0.00 |
| 300 | 107A | 0. | 0. | 33. | 37. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 99 | A29 | 0.00 |
| 300 | 108A | 0. | 0. | 33. | 37. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 99 | A29 | 0.00 |
| 300 | 109A | 0. | 0. | 33. | 37. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 99 | A29 | 0.00 |
| 300 | 110A | 50. | 59. | 83. | 88. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 22 | A29 | 0.00 |
| 300 | 111A | 0. | 0. | 83. | 88. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 99 | A29 | 0.00 |

HYDROGRAPH AT OUTLET BASIN 100 - BURNED

HYDROGRAPH AT 300 111A STORM DAY 4 REDUCTION FACTOR = 1.000

| TIME | Q | TIME | Q | TIME | Q | TIME | Q | TIME | Q |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0. | 100 | 5. | 200 | 6. | 300 | 6. | 400 | 6. |
| 500 | 7. | 600 | 7. | 700 | 8. | 800 | 9. | 900 | 10. |
| 1000 | 12. | 1050 | 15. | 1100 | 19. | 1110 | 21. | 1120 | 23. |
| 1130 | 27. | 1131 | 27. | 1132 | 28. | 1133 | 28. | 1134 | 29. |
| 1135 | 29. | 1136 | 29. | 1137 | 30. | 1138 | 31. | 1139 | 31. |
| 1140 | 32. | 1141 | 33. | 1142 | 35. | 1143 | 36. | 1144 | 37. |
| 1145 | 38. | 1146 | 40. | 1147 | 42. | 1148 | 43. | 1149 | 49. |
| 1150 | 54. | 1151 | 60. | 1152 | 66. | 1153 | 72. | 1154 | 74. |
| 1155 | 75. | 1156 | 77. | 1157 | 79. | 1158 | 81. | 1159 | 83. |
| 1160 | 85. | 1161 | 86. | 1162 | 87. | 1163 | 88. | 1164 | 88. |
| 1165 | 87. | 1166 | 87. | 1167 | 85. | 1168 | 84. | 1169 | 82. |
| 1170 | 80. | 1171 | 74. | 1172 | 67. | 1173 | 61. | 1174 | 55. |
| 1175 | 50. | 1176 | 48. | 1177 | 45. | 1178 | 42. | 1179 | 40. |
| 1180 | 37. | 1181 | 35. | 1182 | 33. | 1183 | 31. | 1184 | 29. |
| 1185 | 28. | 1186 | 27. | 1187 | 25. | 1188 | 24. | 1189 | 24. |
| 1190 | 23. | 1191 | 22. | 1192 | 21. | 1193 | 20. | 1194 | 20. |
| 1195 | 19. | 1196 | 19. | 1197 | 18. | 1198 | 18. | 1199 | 17. |
| 1200 | 17. | 1201 | 17. | 1202 | 16. | 1203 | 16. | 1204 | 16. |
| 1205 | 16. | 1206 | 15. | 1207 | 15. | 1208 | 15. | 1209 | 15. |
| 1210 | 14. | 1211 | 14. | 1212 | 14. | 1213 | 14. | 1214 | 14. |
| 1215 | 13. | 1216 | 13. | 1217 | 13. | 1218 | 13. | 1219 | 13. |
| 1220 | 13. | 1221 | 13. | 1222 | 12. | 1223 | 12. | 1224 | 12. |
| 1225 | 12. | 1226 | 12. | 1227 | 12. | 1228 | 12. | 1229 | 12. |
| 1230 | 11. | 1231 | 11. | 1232 | 11. | 1233 | 11. | 1234 | 11. |
| 1235 | 11. | 1236 | 11. | 1237 | 11. | 1238 | 11. | 1239 | 11. |
| 1240 | 11. | 1241 | 11. | 1242 | 10. | 1243 | 10. | 1244 | 10. |
| 1245 | 10. | 1246 | 10. | 1247 | 10. | 1248 | 10. | 1249 | 10. |
| 1250 | 10. | 1251 | 10. | 1252 | 10. | 1253 | 10. | 1254 | 10. |
| 1255 | 10. | 1256 | 10. | 1257 | 10. | 1258 | 9. | 1259 | 9. |
| 1260 | 9. | 1261 | 9. | 1262 | 9. | 1263 | 9. | 1264 | 9. |
| 1265 | 9. | 1266 | 9. | 1267 | 9. | 1268 | 9. | 1269 | 9. |
| 1270 | 9. | 1271 | 9. | 1272 | 9. | 1273 | 9. | 1274 | 9. |
| 1275 | 9. | 1276 | 9. | 1277 | 9. | 1278 | 9. | 1279 | 9. |
| 1280 | 9. | 1281 | 9. | 1282 | 8. | 1283 | 8. | 1284 | 8. |
| 1285 | 8. | 1286 | 8. | 1287 | 8. | 1288 | 8. | 1289 | 8. |
| 1290 | 8. | 1291 | 8. | 1292 | 8. | 1293 | 8. | 1294 | 8. |
| 1295 | 8. | 1296 | 8. | 1297 | 8. | 1298 | 8. | 1299 | 8. |
| 1300 | 8. | 1310 | 8. | 1320 | 7. | 1330 | 7. | 1340 | 7. |
| 1350 | 7. | 1360 | 7. | 1370 | 6. | 1380 | 6. | 1390 | 6. |
| 1400 | 6. | 1420 | 6. | 1440 | 6. | 1460 | 2. | 1500 | 2. |

Total Runoff = 20.163 Acre-Ft.
Peak Q = 88 CFS
Time to Peak Q = 1163 Minutes

```
4LADEPTH.RDT
5   300  200A  50 YR River Village - Existing Condition - Newhall Ranch
5   300  211A  HYDROGRAPH AT OUTLET BASIN 200 - BURNED
6   300  200A 198  017.317A292  800 01130                    G1
6   300  201A 198  0    99A29
6   300  202A 198  0    99A29
6   300  203A 198  0    99A29
6   300  204A 198  0    99A29
6   300  205A 198  0    99A29
6   300  206A 198  0    99A29
6   300  207A 198  0    99A29
6   300  208A 198  0    99A29
6   300  209A 198  0    99A29
6   300  210A 198  035.825A29
6   300  211A 198  0    99A29                             1  2
```

10-20-2009 SITE LICENSEE: PSOMAS AND ASSOCIATES 

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT 

MODIFIED RATIONAL METHOD HYDROLOGY

50 YR River Village - Existing Condition - Newhall Ranch STORM DAY 4

| LOCATION | SUBAREA AREA | SUBAREA Q | TOTAL AREA | TOTAL Q | CONV TYPE | CONV LNGTH | CONV SLOPE | CONV SIZE | CONV Z | CONTROL Q | SOIL NAME | TC | RAIN ZONE | PCT IMPV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 300 200A | 17. | 23. | 17. | 23. | 2 | 800. | 0.01130 | 0.00 | 0.00 | 0. | 198 | 17 | A29 | 0.00 |
| 300 201A | 0. | 0. | 17. | 22. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 99 | A29 | 0.00 |
| 300 202A | 0. | 0. | 17. | 22. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 99 | A29 | 0.00 |
| 300 203A | 0. | 0. | 17. | 22. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 99 | A29 | 0.00 |
| 300 204A | 0. | 0. | 17. | 22. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 99 | A29 | 0.00 |
| 300 205A | 0. | 0. | 17. | 22. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 99 | A29 | 0.00 |
| 300 206A | 0. | 0. | 17. | 22. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 99 | A29 | 0.00 |
| 300 207A | 0. | 0. | 17. | 22. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 99 | A29 | 0.00 |
| 300 208A | 0. | 0. | 17. | 22. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 99 | A29 | 0.00 |
| 300 209A | 0. | 0. | 17. | 22. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 99 | A29 | 0.00 |
| 300 210A | 36. | 39. | 53. | 60. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 25 | A29 | 0.00 |
| 300 211A | 0. | 0. | 53. | 60. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 99 | A29 | 0.00 |

HYDROGRAPH AT OUTLET BASIN 200 - BURNED

HYDROGRAPH AT 300 211A STORM DAY 4 REDUCTION FACTOR = 1.000

| TIME | Q | TIME | Q | TIME | Q | TIME | Q | TIME | Q |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0. | 100 | 4. | 200 | 4. | 300 | 4. | 400 | 4. |
| 500 | 4. | 600 | 5. | 700 | 5. | 800 | 6. | 900 | 6. |
| 1000 | 8. | 1050 | 10. | 1100 | 12. | 1110 | 13. | 1120 | 15. |
| 1130 | 18. | 1131 | 18. | 1132 | 18. | 1133 | 19. | 1134 | 19. |
| 1135 | 19. | 1136 | 19. | 1137 | 20. | 1138 | 20. | 1139 | 21. |
| 1140 | 21. | 1141 | 22. | 1142 | 23. | 1143 | 23. | 1144 | 24. |
| 1145 | 26. | 1146 | 27. | 1147 | 28. | 1148 | 29. | 1149 | 33. |
| 1150 | 36. | 1151 | 40. | 1152 | 44. | 1153 | 49. | 1154 | 51. |
| 1155 | 53. | 1156 | 56. | 1157 | 57. | 1158 | 59. | 1159 | 60. |
| 1160 | 60. | 1161 | 60. | 1162 | 60. | 1163 | 60. | 1164 | 59. |
| 1165 | 58. | 1166 | 57. | 1167 | 55. | 1168 | 54. | 1169 | 52. |
| 1170 | 49. | 1171 | 47. | 1172 | 44. | 1173 | 41. | 1174 | 36. |
| 1175 | 31. | 1176 | 26. | 1177 | 22. | 1178 | 19. | 1179 | 18. |
| 1180 | 17. | 1181 | 16. | 1182 | 15. | 1183 | 14. | 1184 | 14. |
| 1185 | 13. | 1186 | 13. | 1187 | 13. | 1188 | 12. | 1189 | 12. |
| 1190 | 12. | 1191 | 11. | 1192 | 11. | 1193 | 11. | 1194 | 11. |
| 1195 | 10. | 1196 | 10. | 1197 | 10. | 1198 | 10. | 1199 | 10. |
| 1200 | 10. | 1201 | 9. | 1202 | 9. | 1203 | 9. | 1204 | 9. |
| 1205 | 9. | 1206 | 9. | 1207 | 9. | 1208 | 9. | 1209 | 9. |
| 1210 | 8. | 1211 | 8. | 1212 | 8. | 1213 | 8. | 1214 | 8. |
| 1215 | 8. | 1216 | 8. | 1217 | 8. | 1218 | 8. | 1219 | 8. |
| 1220 | 8. | 1221 | 8. | 1222 | 7. | 1223 | 7. | 1224 | 7. |
| 1225 | 7. | 1226 | 7. | 1227 | 7. | 1228 | 7. | 1229 | 7. |
| 1230 | 7. | 1231 | 7. | 1232 | 7. | 1233 | 7. | 1234 | 7. |
| 1235 | 7. | 1236 | 7. | 1237 | 7. | 1238 | 7. | 1239 | 7. |
| 1240 | 7. | 1241 | 7. | 1242 | 6. | 1243 | 6. | 1244 | 6. |
| 1245 | 6. | 1246 | 6. | 1247 | 6. | 1248 | 6. | 1249 | 6. |
| 1250 | 6. | 1251 | 6. | 1252 | 6. | 1253 | 6. | 1254 | 6. |
| 1255 | 6. | 1256 | 6. | 1257 | 6. | 1258 | 6. | 1259 | 6. |
| 1260 | 6. | 1261 | 6. | 1262 | 6. | 1263 | 6. | 1264 | 6. |
| 1265 | 6. | 1266 | 6. | 1267 | 6. | 1268 | 6. | 1269 | 6. |
| 1270 | 6. | 1271 | 6. | 1272 | 6. | 1273 | 6. | 1274 | 5. |
| 1275 | 5. | 1276 | 5. | 1277 | 5. | 1278 | 5. | 1279 | 5. |
| 1280 | 5. | 1281 | 5. | 1282 | 5. | 1283 | 5. | 1284 | 5. |
| 1285 | 5. | 1286 | 5. | 1287 | 5. | 1288 | 5. | 1289 | 5. |
| 1290 | 5. | 1291 | 5. | 1292 | 5. | 1293 | 5. | 1294 | 5. |
| 1295 | 5. | 1296 | 5. | 1297 | 5. | 1298 | 5. | 1299 | 5. |
| 1300 | 5. | 1310 | 5. | 1320 | 5. | 1330 | 5. | 1340 | 4. |
| 1350 | 4. | 1360 | 4. | 1370 | 4. | 1380 | 4. | 1390 | 4. |
| 1400 | 4. | 1420 | 4. | 1440 | 4. | 1460 | 2. | 1500 | 1. |

Total Runoff = 13.075 Acre-Ft.
Peak Q = 60 CFS
Time to Peak Q = 1159 Minutes

```
4LADEPTH.RDT
5   300  400A  50 YR River Village - Existing Condition - Newhall Ranch
5   300  426A  HYDROGRAPH AT OUTLET BASIN 400 - BURNED
6   300  400B 198  018.424A294  155 01300                    G1
6   300  401B 198  0    99A29
6   300  402B 198  0    99A29
6   300  403B 198  0    99A29
6   300  404B 198  0    99A29
6   300  405B 198  038.929A292  920 00500
6   300  406B 198  0    99A29
6   300  407B 198  0    99A29
6   300  408C 198  015.3 8A292 1990 04800
6   300  409C 198  0    99A29
6   300  410C 198  044.319A29
6   300  411BC198  0      A29
6   300  412B 198  0    99A29
6   300  413B 198  0    99A29
6   300  414B 198  0    99A29
6   300  415B 198  035.311A292 2430 01400
6   300  416B 198  0    99A29
6   300  417B 198  0    99A29
6   300  418B 198  0    99A29
6   300  419B 198  0    99A29
6   300  420A 198  034.425A293  600 01000
6   300  421AB198  0      A29
6   300  422A 198  0    99A29
6   300  423A 198  0    99A29
6   300  424A 198  0    99A29
6   300  425A 198  039.921A29
6   300  426A 198  0    99A29                            1  2
```

10-20-2009 SITE LICENSEE: PSOMAS AND ASSOCIATES 

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT 

MODIFIED RATIONAL METHOD HYDROLOGY

50 YR River Village - Existing Condition - Newhall Ranch STORM DAY 4

| LOCATION | | SUBAREA AREA | SUBAREA Q | TOTAL AREA | TOTAL Q | CONV TYPE | CONV LNGTH | CONV SLOPE | CONV SIZE | CONV Z | CONTROL Q | SOIL NAME | TC | RAIN ZONE | PCT IMPV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 300 | 400B | 18. | 20. | 18. | 20. | 4 | 155. | 0.01300 | 2.00 | 0.00 | 0. | 198 | 24 | A29 | 0.00 |
| 300 | 401B | 0. | 0. | 18. | 20. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 99 | A29 | 0.00 |
| 300 | 402B | 0. | 0. | 18. | 20. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 99 | A29 | 0.00 |
| 300 | 403B | 0. | 0. | 18. | 20. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 99 | A29 | 0.00 |
| 300 | 404B | 0. | 0. | 18. | 20. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 99 | A29 | 0.00 |
| 300 | 405B | 39. | 39. | 57. | 59. | 2 | 920. | 0.00500 | 0.00 | 0.00 | 0. | 198 | 29 | A29 | 0.00 |
| 300 | 406B | 0. | 0. | 57. | 56. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 99 | A29 | 0.00 |
| 300 | 407B | 0. | 0. | 57. | 56. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 99 | A29 | 0.00 |
| 300 | 408C | 15. | 31. | 15. | 31. | 2 | 1990. | 0.04800 | 0.00 | 0.00 | 0. | 198 | 8 | A29 | 0.00 |
| 300 | 409C | 0. | 0. | 15. | 26. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 99 | A29 | 0.00 |
| 300 | 410C | 44. | 56. | 59. | 81. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 19 | A29 | 0.00 |
| 300 | 411BC | 59. | 81. | 116. | 130. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 0 | A29 | 0.00 |
| 300 | 412B | 0. | 0. | 116. | 130. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 99 | A29 | 0.00 |
| 300 | 413B | 0. | 0. | 116. | 130. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 99 | A29 | 0.00 |
| 300 | 414B | 0. | 0. | 116. | 130. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 99 | A29 | 0.00 |
| 300 | 415B | 35. | 62. | 151. | 182. | 2 | 2430. | 0.01400 | 0.00 | 0.00 | 0. | 198 | 11 | A29 | 0.00 |
| 300 | 416B | 0. | 0. | 151. | 162. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 99 | A29 | 0.00 |
| 300 | 417B | 0. | 0. | 151. | 162. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 99 | A29 | 0.00 |
| 300 | 418B | 0. | 0. | 151. | 162. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 99 | A29 | 0.00 |
| 300 | 419B | 0. | 0. | 151. | 162. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 99 | A29 | 0.00 |
| 300 | 420A | 34. | 37. | 34. | 37. | 3 | 600. | 0.01000 | 0.00 | 0.00 | 0. | 198 | 25 | A29 | 0.00 |
| 300 | 421AB | 151. | 162. | 185. | 197. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 0 | A29 | 0.00 |
| 300 | 422A | 0. | 0. | 185. | 197. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 99 | A29 | 0.00 |
| 300 | 423A | 0. | 0. | 185. | 197. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 99 | A29 | 0.00 |
| 300 | 424A | 0. | 0. | 185. | 197. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 99 | A29 | 0.00 |
| 300 | 425A | 40. | 48. | 225. | 239. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 21 | A29 | 0.00 |
| 300 | 426A | 0. | 0. | 225. | 239. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 99 | A29 | 0.00 |

HYDROGRAPH AT OUTLET BASIN 400 - BURNED

HYDROGRAPH AT 300 426A STORM DAY 4 REDUCTION FACTOR = 1.000

| TIME | Q | TIME | Q | TIME | Q | TIME | Q | TIME | Q |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0. | 100 | 15. | 200 | 15. | 300 | 16. | 400 | 17. |
| 500 | 18. | 600 | 20. | 700 | 21. | 800 | 24. | 900 | 27. |
| 1000 | 32. | 1050 | 39. | 1100 | 50. | 1110 | 53. | 1120 | 59. |
| 1130 | 68. | 1131 | 69. | 1132 | 69. | 1133 | 70. | 1134 | 71. |
| 1135 | 73. | 1136 | 74. | 1137 | 75. | 1138 | 76. | 1139 | 78. |
| 1140 | 79. | 1141 | 81. | 1142 | 83. | 1143 | 85. | 1144 | 87. |
| 1145 | 90. | 1146 | 93. | 1147 | 96. | 1148 | 100. | 1149 | 106. |
| 1150 | 114. | 1151 | 122. | 1152 | 131. | 1153 | 141. | 1154 | 149. |
| 1155 | 159. | 1156 | 170. | 1157 | 181. | 1158 | 192. | 1159 | 202. |
| 1160 | 212. | 1161 | 220. | 1162 | 227. | 1163 | 234. | 1164 | 238. |
| 1165 | 239. | 1166 | 238. | 1167 | 235. | 1168 | 230. | 1169 | 224. |
| 1170 | 214. | 1171 | 204. | 1172 | 194. | 1173 | 184. | 1174 | 174. |
| 1175 | 166. | 1176 | 158. | 1177 | 149. | 1178 | 141. | 1179 | 133. |
| 1180 | 126. | 1181 | 120. | 1182 | 115. | 1183 | 110. | 1184 | 106. |
| 1185 | 102. | 1186 | 99. | 1187 | 95. | 1188 | 92. | 1189 | 89. |
| 1190 | 86. | 1191 | 83. | 1192 | 80. | 1193 | 77. | 1194 | 74. |
| 1195 | 71. | 1196 | 69. | 1197 | 66. | 1198 | 64. | 1199 | 62. |
| 1200 | 60. | 1201 | 58. | 1202 | 56. | 1203 | 55. | 1204 | 53. |
| 1205 | 52. | 1206 | 50. | 1207 | 49. | 1208 | 48. | 1209 | 47. |
| 1210 | 46. | 1211 | 45. | 1212 | 44. | 1213 | 43. | 1214 | 42. |
| 1215 | 41. | 1216 | 41. | 1217 | 40. | 1218 | 39. | 1219 | 39. |
| 1220 | 38. | 1221 | 38. | 1222 | 37. | 1223 | 37. | 1224 | 36. |
| 1225 | 36. | 1226 | 35. | 1227 | 35. | 1228 | 35. | 1229 | 34. |
| 1230 | 34. | 1231 | 33. | 1232 | 33. | 1233 | 33. | 1234 | 32. |
| 1235 | 32. | 1236 | 32. | 1237 | 32. | 1238 | 31. | 1239 | 31. |
| 1240 | 31. | 1241 | 30. | 1242 | 30. | 1243 | 30. | 1244 | 30. |
| 1245 | 30. | 1246 | 29. | 1247 | 29. | 1248 | 29. | 1249 | 29. |
| 1250 | 28. | 1251 | 28. | 1252 | 28. | 1253 | 28. | 1254 | 28. |
| 1255 | 28. | 1256 | 27. | 1257 | 27. | 1258 | 27. | 1259 | 27. |
| 1260 | 27. | 1261 | 27. | 1262 | 26. | 1263 | 26. | 1264 | 26. |
| 1265 | 26. | 1266 | 26. | 1267 | 26. | 1268 | 26. | 1269 | 25. |
| 1270 | 25. | 1271 | 25. | 1272 | 25. | 1273 | 25. | 1274 | 25. |
| 1275 | 25. | 1276 | 24. | 1277 | 24. | 1278 | 24. | 1279 | 24. |
| 1280 | 24. | 1281 | 24. | 1282 | 24. | 1283 | 24. | 1284 | 24. |
| 1285 | 23. | 1286 | 23. | 1287 | 23. | 1288 | 23. | 1289 | 23. |
| 1290 | 23. | 1291 | 23. | 1292 | 23. | 1293 | 23. | 1294 | 23. |
| 1295 | 22. | 1296 | 22. | 1297 | 22. | 1298 | 22. | 1299 | 22. |
| 1300 | 22. | 1310 | 21. | 1320 | 21. | 1330 | 20. | 1340 | 19. |
| 1350 | 19. | 1360 | 18. | 1370 | 18. | 1380 | 17. | 1390 | 17. |
| 1400 | 17. | 1420 | 16. | 1440 | 15. | 1460 | 12. | 1500 | 12. |

Total Runoff = 55.135 Acre-Ft.
Peak Q = 239 CFS
Time to Peak Q = 1165 Minutes

```
4LADEPTH.RDT
5   300  500A  50 YR River Village - Existing Condition - Newhall Ranch
5   300  510A  HYDROGRAPH AT OUTLET BASIN 500 - BURNED
6   300  500A 198  026.520A292 1530 00590                      G1
6   300  501A 198  0    99A29
6   300  502A 198  0    99A29
6   300  503A 198  0    99A29
6   300  504A 198  0    99A29
6   300  505A 198  0    99A29
6   300  506A 198  0    99A29
6   300  507A 198  0    99A29
6   300  508A 198  0    99A29
6   300  509A 198  0    99A29
6   300  510A 198  040.025A29                              1  2
```

10-20-2009 SITE LICENSEE: PSOMAS AND ASSOCIATES 

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT 

MODIFIED RATIONAL METHOD HYDROLOGY

50 YR River Village - Existing Condition - Newhall Ranch STORM DAY 4

| LOCATION | | SUBAREA AREA | SUBAREA Q | TOTAL AREA | TOTAL Q | CONV TYPE | CONV LNGTH | CONV SLOPE | CONV SIZE | CONV Z | CONTROL Q | SOIL NAME | TC | RAIN ZONE | PCT IMPV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 300 | 500A | 26. | 32. | 26. | 32. | 2 | 1530. | 0.00590 | 0.00 | 0.00 | 0. | 198 | 20 | A29 | 0.00 |
| 300 | 501A | 0. | 0. | 26. | 28. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 99 | A29 | 0.00 |
| 300 | 502A | 0. | 0. | 26. | 28. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 99 | A29 | 0.00 |
| 300 | 503A | 0. | 0. | 26. | 28. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 99 | A29 | 0.00 |
| 300 | 504A | 0. | 0. | 26. | 28. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 99 | A29 | 0.00 |
| 300 | 505A | 0. | 0. | 26. | 28. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 99 | A29 | 0.00 |
| 300 | 506A | 0. | 0. | 26. | 28. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 99 | A29 | 0.00 |
| 300 | 507A | 0. | 0. | 26. | 28. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 99 | A29 | 0.00 |
| 300 | 508A | 0. | 0. | 26. | 28. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 99 | A29 | 0.00 |
| 300 | 509A | 0. | 0. | 26. | 28. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 99 | A29 | 0.00 |
| 300 | 510A | 40. | 44. | 66. | 64. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 25 | A29 | 0.00 |

HYDROGRAPH AT OUTLET BASIN 500 - BURNED

HYDROGRAPH AT 300 510A STORM DAY 4 REDUCTION FACTOR = 1.000

| TIME | Q | TIME | Q | TIME | Q | TIME | Q | TIME | Q |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0. | 100 | 4. | 200 | 5. | 300 | 5. | 400 | 5. |
| 500 | 5. | 600 | 6. | 700 | 6. | 800 | 7. | 900 | 8. |
| 1000 | 10. | 1050 | 12. | 1100 | 15. | 1110 | 16. | 1120 | 18. |
| 1130 | 21. | 1131 | 21. | 1132 | 21. | 1133 | 22. | 1134 | 22. |
| 1135 | 22. | 1136 | 23. | 1137 | 23. | 1138 | 24. | 1139 | 24. |
| 1140 | 24. | 1141 | 25. | 1142 | 26. | 1143 | 27. | 1144 | 28. |
| 1145 | 29. | 1146 | 30. | 1147 | 31. | 1148 | 32. | 1149 | 36. |
| 1150 | 40. | 1151 | 44. | 1152 | 48. | 1153 | 52. | 1154 | 54. |
| 1155 | 55. | 1156 | 55. | 1157 | 56. | 1158 | 57. | 1159 | 59. |
| 1160 | 60. | 1161 | 61. | 1162 | 62. | 1163 | 63. | 1164 | 64. |
| 1165 | 64. | 1166 | 64. | 1167 | 64. | 1168 | 64. | 1169 | 63. |
| 1170 | 62. | 1171 | 61. | 1172 | 60. | 1173 | 58. | 1174 | 54. |
| 1175 | 50. | 1176 | 45. | 1177 | 41. | 1178 | 38. | 1179 | 36. |
| 1180 | 34. | 1181 | 32. | 1182 | 30. | 1183 | 29. | 1184 | 27. |
| 1185 | 26. | 1186 | 25. | 1187 | 23. | 1188 | 22. | 1189 | 22. |
| 1190 | 21. | 1191 | 20. | 1192 | 19. | 1193 | 19. | 1194 | 18. |
| 1195 | 17. | 1196 | 17. | 1197 | 16. | 1198 | 16. | 1199 | 15. |
| 1200 | 15. | 1201 | 15. | 1202 | 14. | 1203 | 14. | 1204 | 14. |
| 1205 | 14. | 1206 | 13. | 1207 | 13. | 1208 | 13. | 1209 | 13. |
| 1210 | 12. | 1211 | 12. | 1212 | 12. | 1213 | 12. | 1214 | 12. |
| 1215 | 11. | 1216 | 11. | 1217 | 11. | 1218 | 11. | 1219 | 11. |
| 1220 | 11. | 1221 | 10. | 1222 | 10. | 1223 | 10. | 1224 | 10. |
| 1225 | 10. | 1226 | 10. | 1227 | 10. | 1228 | 10. | 1229 | 10. |
| 1230 | 10. | 1231 | 9. | 1232 | 9. | 1233 | 9. | 1234 | 9. |
| 1235 | 9. | 1236 | 9. | 1237 | 9. | 1238 | 9. | 1239 | 9. |
| 1240 | 9. | 1241 | 9. | 1242 | 9. | 1243 | 9. | 1244 | 8. |
| 1245 | 8. | 1246 | 8. | 1247 | 8. | 1248 | 8. | 1249 | 8. |
| 1250 | 8. | 1251 | 8. | 1252 | 8. | 1253 | 8. | 1254 | 8. |
| 1255 | 8. | 1256 | 8. | 1257 | 8. | 1258 | 8. | 1259 | 8. |
| 1260 | 8. | 1261 | 8. | 1262 | 8. | 1263 | 8. | 1264 | 7. |
| 1265 | 7. | 1266 | 7. | 1267 | 7. | 1268 | 7. | 1269 | 7. |
| 1270 | 7. | 1271 | 7. | 1272 | 7. | 1273 | 7. | 1274 | 7. |
| 1275 | 7. | 1276 | 7. | 1277 | 7. | 1278 | 7. | 1279 | 7. |
| 1280 | 7. | 1281 | 7. | 1282 | 7. | 1283 | 7. | 1284 | 7. |
| 1285 | 7. | 1286 | 7. | 1287 | 7. | 1288 | 7. | 1289 | 7. |
| 1290 | 7. | 1291 | 7. | 1292 | 7. | 1293 | 7. | 1294 | 6. |
| 1295 | 6. | 1296 | 6. | 1297 | 6. | 1298 | 6. | 1299 | 6. |
| 1300 | 6. | 1310 | 6. | 1320 | 6. | 1330 | 6. | 1340 | 6. |
| 1350 | 5. | 1360 | 5. | 1370 | 5. | 1380 | 5. | 1390 | 5. |
| 1400 | 5. | 1420 | 5. | 1440 | 4. | 1460 | 2. | 1500 | 2. |

Total Runoff = 16.133 Acre-Ft.
Peak Q = 64 CFS
Time to Peak Q = 1164 Minutes

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4LADEPTH.RDT
5 50300    1A  50 YR River Village - Newhall Ranch - Chiquito Existing
5 50300   17A  HYDROGRAPH AT OUTLET BASIN 600 and Chiquito site
6 50300    1A 198  0   6 8A292  890 26500                      G1
6 50300    2A 198  0   4 6A292  200 01000
6 50300    3A 198  0   2 5A294  275 01000
6 50300    4A 198  0  1210A294  385 02000
6 50300    5B 198  0   4 5A292  530 32100
6 50300    6B 198  0  2515A294  835 02200
6 50300    7AB198  0      A29
6 50300    8A 198  0   2 5A294  320 02000
6 50300    9A 198  0   3 5A294  900 01000
6 50300   10C 198  0  3214A292 1750 01500
6 50300   11C 198  0  1611A292 2800 01000
6 50300   12AC198         A29
6 50300   13D 198 65  1017A292 2370 01800
6 50300   14D 198 65  1210A292 1250 03200
6 50300   15AD198         A29
6 50300   16A 198  0  1223A29
6 50300   17A 198  0    99A29                            1  2
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10-19-2009 SITE LICENSEE: PSOMAS AND ASSOCIATES 

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT 

MODIFIED RATIONAL METHOD HYDROLOGY

50 YR River Village - Newhall Ranch - Chiquito Existing

| LOCATION | | SUBAREA AREA | SUBAREA Q | TOTAL AREA | TOTAL Q | CONV TYPE | CONV LNGTH | CONV SLOPE | CONV SIZE | CONV Z | CONTROL Q | SOIL NAME | TC | STORM DAY 4 RAIN ZONE | PCT IMPV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 50300 | 1A | 6. | 13. | 6. | 13. | 2 | 890. | 0.26500 | 0.00 | 0.00 | 0. | 198 | 8 | A29 | 0.00 |
| 50300 | 2A | 4. | 10. | 10. | 21. | 2 | 200. | 0.01000 | 0.00 | 0.00 | 0. | 198 | 6 | A29 | 0.00 |
| 50300 | 3A | 2. | 5. | 12. | 24. | 4 | 275. | 0.01000 | 2.00 | 0.00 | 0. | 198 | 5 | A29 | 0.00 |
| 50300 | 4A | 12. | 22. | 24. | 45. | 4 | 385. | 0.02000 | 2.25 | 0.00 | 0. | 198 | 10 | A29 | 0.00 |
| 50300 | 5B | 4. | 11. | 4. | 11. | 2 | 530. | 0.32100 | 0.00 | 0.00 | 0. | 198 | 5 | A29 | 0.00 |
| 50300 | 6B | 25. | 37. | 29. | 47. | 4 | 835. | 0.02200 | 2.25 | 0.00 | 0. | 198 | 15 | A29 | 0.00 |
| 50300 | 7AB | 29. | 46. | 53. | 90. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 0 | A29 | 0.00 |
| 50300 | 8A | 2. | 5. | 55. | 93. | 4 | 320. | 0.02000 | 3.00 | 0.00 | 0. | 198 | 5 | A29 | 0.00 |
| 50300 | 9A | 3. | 8. | 58. | 96. | 4 | 900. | 0.01000 | 3.50 | 0.00 | 0. | 198 | 5 | A29 | 0.00 |
| 50300 | 10C | 32. | 49. | 32. | 49. | 2 | 1750. | 0.01500 | 0.00 | 0.00 | 0. | 198 | 14 | A29 | 0.00 |
| 50300 | 11C | 16. | 28. | 48. | 59. | 2 | 2800. | 0.01000 | 0.00 | 0.00 | 0. | 198 | 11 | A29 | 0.00 |
| 50300 | 12AC | 48. | 46. | 106. | 115. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 0 | A29 | 0.00 |
| 50300 | 13D | 10. | 17. | 10. | 17. | 2 | 2370. | 0.01800 | 0.00 | 0.00 | 0. | 198 | 17 | A29 | 0.65 |
| 50300 | 14D | 12. | 27. | 22. | 34. | 2 | 1250. | 0.03200 | 0.00 | 0.00 | 0. | 198 | 10 | A29 | 0.65 |
| 50300 | 15AD | 22. | 33. | 128. | 147. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 0 | A29 | 0.00 |
| 50300 | 16A | 12. | 14. | 140. | 160. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 23 | A29 | 0.00 |
| 50300 | 17A | 0. | 0. | 140. | 160. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 99 | A29 | 0.00 |

HYDROGRAPH AT OUTLET BASIN 600 and Chiquito site

HYDROGRAPH AT 50300 17A STORM DAY 4 REDUCTION FACTOR = 1.000

| TIME | Q | TIME | Q | TIME | Q | TIME | Q | TIME | Q |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0. | 100 | 10. | 200 | 11. | 300 | 11. | 400 | 12. |
| 500 | 12. | 600 | 13. | 700 | 15. | 800 | 16. | 900 | 18. |
| 1000 | 22. | 1050 | 26. | 1100 | 33. | 1110 | 36. | 1120 | 41. |
| 1130 | 47. | 1131 | 47. | 1132 | 48. | 1133 | 49. | 1134 | 49. |
| 1135 | 50. | 1136 | 51. | 1137 | 52. | 1138 | 53. | 1139 | 54. |
| 1140 | 55. | 1141 | 57. | 1142 | 58. | 1143 | 60. | 1144 | 62. |
| 1145 | 64. | 1146 | 67. | 1147 | 69. | 1148 | 72. | 1149 | 76. |
| 1150 | 81. | 1151 | 88. | 1152 | 97. | 1153 | 109. | 1154 | 121. |
| 1155 | 134. | 1156 | 145. | 1157 | 153. | 1158 | 158. | 1159 | 160. |
| 1160 | 160. | 1161 | 158. | 1162 | 153. | 1163 | 146. | 1164 | 139. |
| 1165 | 132. | 1166 | 126. | 1167 | 121. | 1168 | 117. | 1169 | 112. |
| 1170 | 108. | 1171 | 104. | 1172 | 99. | 1173 | 96. | 1174 | 92. |
| 1175 | 90. | 1176 | 88. | 1177 | 86. | 1178 | 85. | 1179 | 83. |
| 1180 | 81. | 1181 | 79. | 1182 | 77. | 1183 | 75. | 1184 | 72. |
| 1185 | 70. | 1186 | 68. | 1187 | 65. | 1188 | 63. | 1189 | 61. |
| 1190 | 59. | 1191 | 57. | 1192 | 55. | 1193 | 53. | 1194 | 52. |
| 1195 | 50. | 1196 | 48. | 1197 | 47. | 1198 | 45. | 1199 | 44. |
| 1200 | 43. | 1201 | 42. | 1202 | 41. | 1203 | 40. | 1204 | 39. |
| 1205 | 38. | 1206 | 37. | 1207 | 36. | 1208 | 35. | 1209 | 34. |
| 1210 | 34. | 1211 | 33. | 1212 | 32. | 1213 | 32. | 1214 | 31. |
| 1215 | 31. | 1216 | 30. | 1217 | 29. | 1218 | 29. | 1219 | 29. |
| 1220 | 28. | 1221 | 28. | 1222 | 27. | 1223 | 27. | 1224 | 26. |
| 1225 | 26. | 1226 | 26. | 1227 | 25. | 1228 | 25. | 1229 | 25. |
| 1230 | 24. | 1231 | 24. | 1232 | 24. | 1233 | 24. | 1234 | 23. |
| 1235 | 23. | 1236 | 23. | 1237 | 23. | 1238 | 22. | 1239 | 22. |
| 1240 | 22. | 1241 | 22. | 1242 | 22. | 1243 | 21. | 1244 | 21. |
| 1245 | 21. | 1246 | 21. | 1247 | 21. | 1248 | 20. | 1249 | 20. |
| 1250 | 20. | 1251 | 20. | 1252 | 20. | 1253 | 20. | 1254 | 20. |
| 1255 | 19. | 1256 | 19. | 1257 | 19. | 1258 | 19. | 1259 | 19. |
| 1260 | 19. | 1261 | 19. | 1262 | 18. | 1263 | 18. | 1264 | 18. |
| 1265 | 18. | 1266 | 18. | 1267 | 18. | 1268 | 18. | 1269 | 18. |
| 1270 | 18. | 1271 | 17. | 1272 | 17. | 1273 | 17. | 1274 | 17. |
| 1275 | 17. | 1276 | 17. | 1277 | 17. | 1278 | 17. | 1279 | 17. |
| 1280 | 17. | 1281 | 17. | 1282 | 17. | 1283 | 16. | 1284 | 16. |
| 1285 | 16. | 1286 | 16. | 1287 | 16. | 1288 | 16. | 1289 | 16. |
| 1290 | 16. | 1291 | 16. | 1292 | 16. | 1293 | 16. | 1294 | 16. |
| 1295 | 16. | 1296 | 15. | 1297 | 15. | 1298 | 15. | 1299 | 15. |
| 1300 | 15. | 1310 | 15. | 1320 | 14. | 1330 | 14. | 1340 | 13. |
| 1350 | 13. | 1360 | 13. | 1370 | 12. | 1380 | 12. | 1390 | 12. |
| 1400 | 12. | 1420 | 11. | 1440 | 11. | 1460 | 10. | 1500 | 10. |

Total Runoff = 37.567 Acre-Ft.
Peak Q = 160 CFS
Time to Peak Q = 1159 Minutes

# APPENDIX 6

# LACDPW MORA CALCULATIONS: PROPOSED CONDITION

```
4LADEPTH.RDT
5 50300    1A  50 YR River Village - Newhall Ranch - Chiquito Proposed
5 50300   15A  HYDROGRAPH AT OUTLET BASIN AREAs A
6 50300    1A 020  529.911A292 1220 01600                     G1
6 50300    2A 020  5 6.4 6A292  880 02700
6 50300    3B  20  5 4.4 5A292 1410 05300
6 50300    4B 020  519.614A292  760 00200
6 50300    5B 020  5 6.9 7A294  132 04000
6 50300    6B 020  5 5.9 7A29
6 50300    7B  20 3013.3 9A294  917 00200
6 50300    8AB020         A29
6 50300    9C 020  5 7.7 8A294  540 00400
6 50300   10C  20  5 8.811A294  250 00100
6 50300   11C  20 8011.818A294 1610 00100
6 50300   12C  20  5 2.216A294  360 00100
6 50300   13C  20 80 7.522A294  630 00100
6 50300   14AC020         A29
6 50300   15A 020  0    50A29                             1  2
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9-11-2008 SITE LICENSEE: PSOMAS AND ASSOCIATES PAGE 1

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT PROG FO601A

MODIFIED RATIONAL METHOD HYDROLOGY

50 YR River Village - Newhall Ranch - Chiquito Proposed STORM DAY 4

| LOCATION | | SUBAREA AREA | SUBAREA Q | TOTAL AREA | TOTAL Q | CONV TYPE | CONV LNGTH | CONV SLOPE | CONV SIZE | CONV Z | CONTROL Q | SOIL NAME | TC | RAIN ZONE | PCT IMPV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 50300 | 1A | 30. | 42. | 30. | 42. | 2 | 1220. | 0.01600 | 0.00 | 0.00 | 0. | 20 | 11 | A29 | 0.05 |
| 50300 | 2A | 6. | 12. | 36. | 38. | 2 | 880. | 0.02700 | 0.00 | 0.00 | 0. | 20 | 6 | A29 | 0.05 |
| 50300 | 3B | 4. | 9. | 4. | 9. | 2 | 1410. | 0.05300 | 0.00 | 0.00 | 0. | 20 | 5 | A29 | 0.05 |
| 50300 | 4B | 20. | 24. | 24. | 29. | 2 | 760. | 0.00200 | 0.00 | 0.00 | 0. | 20 | 14 | A29 | 0.05 |
| 50300 | 5B | 7. | 13. | 31. | 23. | 4 | 132. | 0.04000 | 2.00 | 0.00 | 0. | 20 | 7 | A29 | 0.05 |
| 50300 | 6B | 6. | 11. | 37. | 30. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 7 | A29 | 0.05 |
| 50300 | 7B | 13. | 24. | 50. | 54. | 4 | 917. | 0.00200 | 3.75 | 0.00 | 0. | 20 | 9 | A29 | 0.30 |
| 50300 | 8AB | 50. | 50. | 86. | 82. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 0 | A29 | 0.00 |
| 50300 | 9C | 8. | 13. | 8. | 13. | 4 | 540. | 0.00400 | 2.00 | 0.00 | 0. | 20 | 8 | A29 | 0.05 |
| 50300 | 10C | 9. | 12. | 17. | 25. | 4 | 250. | 0.00100 | 3.25 | 0.00 | 0. | 20 | 11 | A29 | 0.05 |
| 50300 | 11C | 12. | 20. | 29. | 45. | 4 | 1610. | 0.00100 | 4.00 | 0.00 | 0. | 20 | 18 | A29 | 0.80 |
| 50300 | 12C | 2. | 2. | 31. | 39. | 4 | 360. | 0.00100 | 3.75 | 0.00 | 0. | 20 | 16 | A29 | 0.05 |
| 50300 | 13C | 7. | 11. | 38. | 47. | 4 | 630. | 0.00100 | 4.00 | 0.00 | 0. | 20 | 22 | A29 | 0.80 |
| 50300 | 14AC | 38. | 46. | 124. | 109. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 0 | A29 | 0.00 |
| 50300 | 15A | 0. | 0. | 124. | 109. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 50 | A29 | 0.00 |

HYDROGRAPH AT OUTLET BASIN AREAs A

HYDROGRAPH AT 50300 15A STORM DAY 4 REDUCTION FACTOR = 1.000

| TIME | Q | TIME | Q | TIME | Q | TIME | Q | TIME | Q |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0. | 100 | 5. | 200 | 5. | 300 | 5. | 400 | 6. |
| 500 | 6. | 600 | 6. | 700 | 7. | 800 | 7. | 900 | 8. |
| 1000 | 10. | 1050 | 12. | 1100 | 16. | 1110 | 17. | 1120 | 20. |
| 1130 | 25. | 1131 | 26. | 1132 | 26. | 1133 | 27. | 1134 | 27. |
| 1135 | 28. | 1136 | 29. | 1137 | 30. | 1138 | 30. | 1139 | 31. |
| 1140 | 32. | 1141 | 33. | 1142 | 35. | 1143 | 36. | 1144 | 37. |
| 1145 | 39. | 1146 | 40. | 1147 | 42. | 1148 | 44. | 1149 | 46. |
| 1150 | 49. | 1151 | 52. | 1152 | 57. | 1153 | 64. | 1154 | 73. |
| 1155 | 82. | 1156 | 91. | 1157 | 98. | 1158 | 104. | 1159 | 108. |
| 1160 | 109. | 1161 | 109. | 1162 | 108. | 1163 | 106. | 1164 | 105. |
| 1165 | 104. | 1166 | 103. | 1167 | 102. | 1168 | 101. | 1169 | 100. |
| 1170 | 99. | 1171 | 97. | 1172 | 95. | 1173 | 93. | 1174 | 90. |
| 1175 | 87. | 1176 | 83. | 1177 | 79. | 1178 | 74. | 1179 | 69. |
| 1180 | 65. | 1181 | 60. | 1182 | 56. | 1183 | 52. | 1184 | 49. |
| 1185 | 45. | 1186 | 42. | 1187 | 40. | 1188 | 37. | 1189 | 35. |
| 1190 | 33. | 1191 | 31. | 1192 | 29. | 1193 | 28. | 1194 | 27. |
| 1195 | 25. | 1196 | 24. | 1197 | 23. | 1198 | 22. | 1199 | 21. |
| 1200 | 21. | 1201 | 20. | 1202 | 19. | 1203 | 19. | 1204 | 18. |
| 1205 | 17. | 1206 | 17. | 1207 | 16. | 1208 | 16. | 1209 | 16. |
| 1210 | 15. | 1211 | 15. | 1212 | 14. | 1213 | 14. | 1214 | 14. |
| 1215 | 14. | 1216 | 13. | 1217 | 13. | 1218 | 13. | 1219 | 13. |
| 1220 | 12. | 1221 | 12. | 1222 | 12. | 1223 | 12. | 1224 | 12. |
| 1225 | 11. | 1226 | 11. | 1227 | 11. | 1228 | 11. | 1229 | 11. |
| 1230 | 11. | 1231 | 11. | 1232 | 10. | 1233 | 10. | 1234 | 10. |
| 1235 | 10. | 1236 | 10. | 1237 | 10. | 1238 | 10. | 1239 | 10. |
| 1240 | 10. | 1241 | 10. | 1242 | 10. | 1243 | 9. | 1244 | 9. |
| 1245 | 9. | 1246 | 9. | 1247 | 9. | 1248 | 9. | 1249 | 9. |
| 1250 | 9. | 1251 | 9. | 1252 | 9. | 1253 | 9. | 1254 | 9. |
| 1255 | 9. | 1256 | 9. | 1257 | 9. | 1258 | 8. | 1259 | 8. |
| 1260 | 8. | 1261 | 8. | 1262 | 8. | 1263 | 8. | 1264 | 8. |
| 1265 | 8. | 1266 | 8. | 1267 | 8. | 1268 | 8. | 1269 | 8. |
| 1270 | 8. | 1271 | 8. | 1272 | 8. | 1273 | 8. | 1274 | 8. |
| 1275 | 8. | 1276 | 8. | 1277 | 8. | 1278 | 8. | 1279 | 8. |
| 1280 | 8. | 1281 | 8. | 1282 | 8. | 1283 | 7. | 1284 | 7. |
| 1285 | 7. | 1286 | 7. | 1287 | 7. | 1288 | 7. | 1289 | 7. |
| 1290 | 7. | 1291 | 7. | 1292 | 7. | 1293 | 7. | 1294 | 7. |
| 1295 | 7. | 1296 | 7. | 1297 | 7. | 1298 | 7. | 1299 | 7. |
| 1300 | 7. | 1310 | 7. | 1320 | 7. | 1330 | 6. | 1340 | 6. |
| 1350 | 6. | 1360 | 6. | 1370 | 6. | 1380 | 6. | 1390 | 6. |
| 1400 | 5. | 1420 | 5. | 1440 | 5. | 1460 | 5. | 1500 | 5. |

Total Runoff = 19.355 Acre-Ft.
Peak Q = 109 CFS
Time to Peak Q = 1160 Minutes

OFFSITE R -RVE 7A.DAT

```
4LADEPTH.RDT
5   300    1A  50 YR River Village - Newhall Ranch - OFFSITE RVE 1A-RVE 7A Proposed
5   300    8A  HYDROGRAPH AT OUTLET BASIN AREAs A
6   300    1A 097 0018.419A294  110 01000                    G1
6   300    2A 097 0038.922A292  915 00500
6   300    3B 097 0015.3 7A291 1930 04800
6   300    4B 097 0044.315A29
6   300    5AB097          A292  550 00180                  1
6   300    6A 097 0035.3 9A294  200 01300
6   300    7A 02010015.529A294 1500 00700
6   300    8A 020       99A29                             1  2
```

11- 1-2007 SITE LICENSEE: PSOMAS AND ASSOCIATES PAGE 1

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT PROG FO601A

MODIFIED RATIONAL METHOD HYDROLOGY

50 YR River Village - Newhall Ranch - OFFSITE RVE 1A-RVE 7A Pro STORM DAY 4

| LOCATION | | SUBAREA AREA | SUBAREA Q | TOTAL AREA | TOTAL Q | CONV TYPE | CONV LNGTH | CONV SLOPE | CONV SIZE | CONV Z | CONTROL Q | SOIL NAME | TC | RAIN ZONE | PCT IMPV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 300 | 1A | 18. | 22. | 18. | 22. | 4 | 110. | 0.01000 | 2.00 | 0.00 | 0. | 97 | 19 | A29 | 0.00 |
| 300 | 2A | 39. | 43. | 57. | 65. | 2 | 915. | 0.00500 | 0.00 | 0.00 | 0. | 97 | 22 | A29 | 0.00 |
| 300 | 3B | 15. | 32. | 15. | 32. | 1 | 1930. | 0.04800 | 0.00 | 0.00 | 0. | 97 | 7 | A29 | 0.00 |
| 300 | 4B | 44. | 61. | 59. | 73. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 97 | 15 | A29 | 0.00 |

CONFLUENCE Q'S

300 5A TA 1166 QA 61. QAB 110. QB 48. 300 5B TB 1160 QB 73. QBA 127. QA 55.

300 5AB TAB 1162 QAB 130. QA 59. QB 72.

| LOCATION | | SUBAREA AREA | SUBAREA Q | TOTAL AREA | TOTAL Q | CONV TYPE | CONV LNGTH | CONV SLOPE | CONV SIZE | CONV Z | CONTROL Q | SOIL NAME | TC | RAIN ZONE | PCT IMPV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 300 | 5AB | 59. | 73. | 116. | 130. | 2 | 550. | 0.00180 | 0.00 | 0.00 | 0. | 97 | 0 | A29 | 0.00 |
| 300 | 6A | 35. | 65. | 151. | 135. | 4 | 200. | 0.01300 | 3.75 | 0.00 | 0. | 97 | 9 | A29 | 0.00 |
| 300 | 7A | 15. | 23. | 166. | 156. | 4 | 1500. | 0.00700 | 4.50 | 0.00 | 0. | 20 | 29 | A29 | 1.00 |
| 300 | 8A | 0. | 0. | 166. | 152. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |

HYDROGRAPH AT OUTLET BASIN AREAs A

HYDROGRAPH AT 300 8A STORM DAY 4 REDUCTION FACTOR = 1.000

| TIME | Q | TIME | Q | TIME | Q | TIME | Q | TIME | Q |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0. | 100 | 4. | 200 | 4. | 300 | 5. | 400 | 5. |
| 500 | 5. | 600 | 5. | 700 | 6. | 800 | 6. | 900 | 7. |
| 1000 | 9. | 1050 | 11. | 1100 | 20. | 1110 | 23. | 1120 | 29. |
| 1130 | 37. | 1131 | 38. | 1132 | 39. | 1133 | 41. | 1134 | 42. |
| 1135 | 43. | 1136 | 44. | 1137 | 45. | 1138 | 46. | 1139 | 48. |
| 1140 | 49. | 1141 | 51. | 1142 | 53. | 1143 | 55. | 1144 | 57. |
| 1145 | 59. | 1146 | 61. | 1147 | 64. | 1148 | 67. | 1149 | 70. |
| 1150 | 74. | 1151 | 79. | 1152 | 86. | 1153 | 95. | 1154 | 105. |
| 1155 | 116. | 1156 | 126. | 1157 | 134. | 1158 | 140. | 1159 | 146. |
| 1160 | 150. | 1161 | 152. | 1162 | 152. | 1163 | 151. | 1164 | 149. |
| 1165 | 148. | 1166 | 148. | 1167 | 149. | 1168 | 150. | 1169 | 151. |
| 1170 | 152. | 1171 | 151. | 1172 | 149. | 1173 | 145. | 1174 | 141. |
| 1175 | 135. | 1176 | 130. | 1177 | 124. | 1178 | 119. | 1179 | 114. |
| 1180 | 109. | 1181 | 103. | 1182 | 98. | 1183 | 92. | 1184 | 87. |
| 1185 | 82. | 1186 | 77. | 1187 | 72. | 1188 | 68. | 1189 | 64. |
| 1190 | 60. | 1191 | 56. | 1192 | 53. | 1193 | 50. | 1194 | 47. |
| 1195 | 44. | 1196 | 42. | 1197 | 40. | 1198 | 38. | 1199 | 36. |
| 1200 | 34. | 1201 | 32. | 1202 | 31. | 1203 | 29. | 1204 | 28. |
| 1205 | 27. | 1206 | 25. | 1207 | 24. | 1208 | 23. | 1209 | 22. |
| 1210 | 21. | 1211 | 21. | 1212 | 20. | 1213 | 19. | 1214 | 19. |
| 1215 | 18. | 1216 | 17. | 1217 | 17. | 1218 | 16. | 1219 | 16. |
| 1220 | 15. | 1221 | 15. | 1222 | 15. | 1223 | 14. | 1224 | 14. |
| 1225 | 13. | 1226 | 13. | 1227 | 13. | 1228 | 12. | 1229 | 12. |
| 1230 | 12. | 1231 | 12. | 1232 | 11. | 1233 | 11. | 1234 | 11. |
| 1235 | 11. | 1236 | 10. | 1237 | 10. | 1238 | 10. | 1239 | 10. |
| 1240 | 10. | 1241 | 10. | 1242 | 9. | 1243 | 9. | 1244 | 9. |
| 1245 | 9. | 1246 | 9. | 1247 | 9. | 1248 | 9. | 1249 | 9. |
| 1250 | 8. | 1251 | 8. | 1252 | 8. | 1253 | 8. | 1254 | 8. |
| 1255 | 8. | 1256 | 8. | 1257 | 8. | 1258 | 8. | 1259 | 8. |
| 1260 | 8. | 1261 | 8. | 1262 | 8. | 1263 | 7. | 1264 | 7. |
| 1265 | 7. | 1266 | 7. | 1267 | 7. | 1268 | 7. | 1269 | 7. |
| 1270 | 7. | 1271 | 7. | 1272 | 7. | 1273 | 7. | 1274 | 7. |
| 1275 | 7. | 1276 | 7. | 1277 | 7. | 1278 | 7. | 1279 | 7. |
| 1280 | 7. | 1281 | 7. | 1282 | 7. | 1283 | 7. | 1284 | 7. |
| 1285 | 7. | 1286 | 6. | 1287 | 6. | 1288 | 6. | 1289 | 6. |
| 1290 | 6. | 1291 | 6. | 1292 | 6. | 1293 | 6. | 1294 | 6. |
| 1295 | 6. | 1296 | 6. | 1297 | 6. | 1298 | 6. | 1299 | 6. |
| 1300 | 6. | 1310 | 6. | 1320 | 6. | 1330 | 6. | 1340 | 5. |
| 1350 | 5. | 1360 | 5. | 1370 | 5. | 1380 | 5. | 1390 | 5. |
| 1400 | 5. | 1420 | 5. | 1440 | 4. | 1460 | 4. | 1500 | 4. |

Total Runoff = 21.503 Acre-Ft.
Peak Q = 152 CFS
Time to Peak Q = 1161 Minutes

**MORA INPUT SUMMARY TABLE - LANDMARK PROPOSED CONDITION**

| Line Number | Subarea | MORA Subarea Code | soil t | | | | | I Type | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| Line 1 | RVE-9B | 1A | 20 | 65 | 7.04 | 10 | A29 | 4 | 75 | 0.008 |
| | RVE-10B | 2B | 20 | 72 | 0.69 | 6 | A29 | 4 | 260 | 0.026 |
| | | 3AB | | | | | A29 | 4 | 40 | 0.008 |
| | | 4A | | | | | | | | |
| | | | | | | | | | | |
| LINE 2 | RVE -11C | 1A | 20 | 63.2 | 1.02 | 5 | A29 | | | |
| | RVE -12C | 2A | 20 | 65.9 | 0.63 | 5 | A29 | 4 | 45 | 0.008 |
| | RVE -13C | 3A | 20 | 66.0 | 0.87 | 5 | A29 | | | |
| | RVE -14C | 4A | 20 | 91.0 | 0.2 | 5 | A29 | 4 | 755 | 0.008 |
| | RVE -15C | 5A | 20 | 91.0 | 0.54 | 10 | A29 | | | |
| | RVE -16C | 6A | 20 | 64.2 | 2.78 | 10 | A29 | 4 | 10 | 0.008 |
| | RVE -17C | 7A | 20 | 68.8 | 5.17 | 8 | A29 | 4 | 15 | 0.008 |
| | RVE -18C | 8A | 20 | 91.0 | 0.66 | 11 | A29 | | | |
| | RVE -19C | 9A | 20 | 91.0 | 0.3 | 7 | A29 | 4 | 220 | 0.008 |
| | RVE-20C | 10A | 20 | 16.0 | 4.68 | 18 | A29 | 4 | 50 | 0.05 |
| | | 11A | | | | | | | | |
| | | | | | | | | | | |
| LINE 3 | RVE-21D | 1A | 20 | 64.2 | 1.82 | 7 | A29 | | | |
| | RVE-22D | 2A | 20 | 91.0 | 0.34 | 7 | A29 | 4 | 30 | 0.008 |
| | RVE-22.1D | 3A | 20 | 74.0 | 3.56 | 7 | A29 | 4 | 25 | 0.008 |
| | RVE-23D | 4A | 20 | 91.0 | 0.55 | 10 | A29 | | | |
| | RVE-24D | 5A | 20 | 91.0 | 0.77 | 12 | A29 | 4 | 180 | 0.008 |
| | RVE-25D | 6A | 20 | 91.0 | 0.21 | 5 | A29 | 4 | 35 | 0.008 |
| | RVE-26D | 7A | 20 | 74.0 | 5.09 | 11 | A29 | 4 | 45 | 0.008 |
| | RVE-27D | 8A | 20 | 91.0 | 0.95 | 13 | A29 | 4 | 10 | 0.01 |
| | RVE-28D | 9A | 20 | 72.8 | 1.78 | 11 | A29 | 4 | 185 | 0.02 |
| | RVE-29D | 10A | 20 | 14.4 | 2.08 | 11 | A29 | 4 | 760 | 0.01 |
| | | 11A | | | | | | | | |
| | | | | | | | | | | |
| LINE 4 | RVE-30E | 1A | 20 | 91.0 | 0.53 | 9 | A29 | 4 | 275 | 0.005 |
| | RVE-31E | 2A | 20 | 91.0 | 0.47 | 5 | A29 | 4 | | |
| | RVE-32E | 3A | 20 | 91.0 | 0.33 | 5 | A29 | 4 | 545 | 0.008 |
| | RVE-33E | 4B | 20 | 70.7 | 5.86 | 9 | A29 | 4 | 205 | 0.006 |
| | | 5AB | | | | | | 4 | 200 | 0.006 |
| | RVE-34E | 6A | 20 | 71.3 | 5.29 | 7 | A29 | 4 | 75 | 0.006 |
| | RVE-35E | 7A | 20 | 70.3 | 1.23 | 8 | A29 | 4 | 50 | 0.01 |
| | RVE-36E | 8A | 20 | 91.0 | 0.68 | 10 | A29 | 4 | 190 | 0.02 |
| | RVE-37E | 9A | 20 | 16.9 | 1.7 | 10 | A29 | 4 | 60 | 0.05 |
| | | 10A | | | | | | | | |
| | | | | | | | | | | |
| LINE 5 | RVE-38F | 1A | 20 | 91.0 | 0.25 | 6 | A29 | 4 | 60 | 0.009 |
| | RVE-39F | 2A | 20 | 74.0 | 2.03 | 6 | A29 | 4 | 37 | 0.009 |
| | RVE-40F | 3A | 20 | 91.0 | 0.05 | 5 | A29 | 4 | 565 | 0.009 |
| | RVE-41F | 4A | 20 | 67.0 | 1.79 | 9 | A29 | | | |
| | RVE-42F | 5A | 20 | 91.0 | 0.5 | 9 | A29 | 4 | 34 | 0.009 |
| | RVE-43F | 6A | 20 | 67.7 | 3.86 | 12 | A29 | 4 | 33 | 0.009 |
| | RVE-44F | 7A | 20 | 66.4 | 2.86 | 11 | A29 | 4 | 28 | 0.009 |
| | RVE-45F | 8A | 20 | 91.0 | 0.14 | 5 | A29 | 4 | 250 | 0.005 |
| | RVE-46F | 9A | 20 | 17.4 | 2.69 | 13 | A29 | 4 | 65 | 0.05 |
| | | 10A | 20 | | | | | | | |
| | | | | | | | | | | |
| LINE 6 | RVE-51G | 1A | 20 | 67.3 | 2.99 | 8 | | | | |
| | RVE-52G | 2A | 20 | 66.3 | 1.24 | 7 | A29 | 4 | 60 | 0.007 |
| | RVE-53G | 3A | 20 | 65.4 | 1.21 | 6 | | | | |
| | RVE-54G | 4A | 20 | 65.5 | 1.19 | 6 | A29 | 4 | 190 | 0.007 |
| | RVE-55G | 5A | 20 | 64.4 | 0.82 | 5 | A29 | 4 | 60 | 0.007 |
| | RVE-56G | 6A | 20 | 69.0 | 1.02 | 7 | A29 | 4 | 405 | 0.007 |
| | RVE-57G | 7A | 20 | 67.8 | 3.37 | 9 | A29 | 4 | 910 | 0.005 |
| | RVE-58G/59G | 8A | 20 | 73.3 | 3.83 | 12 | A29 | 4 | 15 | 0.005 |
| | RVE-60G | 9A | 20 | 74.0 | 9.88 | 11 | A29 | 4 | 70 | 0.005 |
| | RVE-61G | 10A | 20 | 91.0 | 1.36 | 9 | | | | |
| | RVE-62G | 11A | 20 | 91.0 | 1.22 | 8 | A29 | 4 | 870 | 0.006 |
| | RVE-63G | 12A | 20 | 70.9 | 4.11 | 10 | A29 | 4 | 1070 | 0.008 |
| | RVE-8A | 13B | 20 | 15 | 6.35 | 8 | A29 | 4 | 180 | 0.02 |
| | | 14AB | | | | | | | 370 | 0.03 |
| | | 15A | | | | | | | | |
| | | | | | | | | | | |
| LINE 7 | RVC-1A | 1A | 20 | 78.9 | 11.66 | 12 | A29 | 4 | 400 | 0.007 |
| | RVC-2A | 2A | 20 | 74 | 4.08 | 9 | A29 | 4 | 30 | 0.007 |
| | RVC-3A | 3A | 20 | 91 | 2.39 | 14 | | | | |

| Line Number | Subarea | MORA Subarea Code | soil type | impervious | area | Tc | Mass Curve | Channel Type | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| | RVC-4A | 4A | 20 | 91 | 1.67 | 13 | A29 | 4 | 110 | 0.007 |
| | RVC-5A | 5A | 20 | 91 | 0.4 | 5 | | | | |
| | RVC-6A | 6A | 20 | 91 | 0.78 | 5 | A29 | 4 | 35 | 0.007 |
| | RVC-7A | 7A | 20 | 50 | 0.55 | 5 | A29 | 4 | 810 | 0.006 |
| | RVC-8A | 8B | 20 | 15.8 | 1.52 | 7 | A29 | 4 | 450 | 0.01 |
| | | 9AB | | | | | | | 95 | 0.05 |
| | | 10A | | | | | | | | |
| | | | | | | | | | | |
| LINE 8 | RVE-15C | 1A | 20 | 15 | 3.54 | 8 | A29 | 4 | 450 | 0.01 |
| | | 2A | | | | | | | 350 | 0.01 |
| | | 3A | | | | | | | 200 | 0.05 |
| | | 4A | | | | | | | | |
| | | | | | | | | | | |
| LINE 9 | RVC-9B | 1A | 20 | 74.0 | 8.39 | 11 | A29 | 4 | 110 | 0.007 |
| | RVC-10B | 2A | 20 | 91.0 | 1.03 | 9 | | | | |
| | RVC-11B | 3A | 20 | 91.0 | 0.74 | 8 | A29 | 4 | 70 | 0.007 |
| | RVC-12B | 4A | 20 | 82.0 | 9.79 | 10 | A29 | 4 | 80 | 0.007 |
| | RVC-13B | 5A | 20 | 91.0 | 1.34 | 11 | | | | |
| | RVC-14B | 6A | 20 | 71.0 | 2.83 | 11 | A29 | 4 | 310 | 0.005 |
| | | 7A | | | | | | | 100 | 0.05 |
| | | 8A | | | | | | | | |
| | | | | | | | | | | |
| LINE 10 | RVW-1A | 1A | 20 | 91.0 | 0.8 | 6.0 | A29 | 4 | 30 | 0.005 |
| | RVW-2A | 2A | 20 | 74.0 | 3.2 | 5.0 | A29 | 4 | 270 | 0.01 |
| | RVW-3A | 3A | 20 | 69.1 | 1.5 | 7.0 | | | | |
| | RVW-4A | 4A | 20 | 63.7 | 3.3 | 8.0 | A29 | 4 | 210 | 0.01 |
| | | 5A | 20 | | | | | | 580 | 0.008 |
| | | 6A | 20 | | | | | | 160 | 0.05 |
| | | 7A | 20 | | | | | | | |
| | | | | | | | | | | |
| LINE 11 | RVW-5B | 1A | 20 | 91 | 0.34 | 5 | A29 | 4 | 25 | 0.007 |
| | RVW-6B | 2A | 20 | 74 | 1.21 | 5 | | | | |
| | RVW-7B | 3A | 20 | 91 | 0.18 | 5 | A29 | 4 | 35 | 0.007 |
| | RVW-8B | 4A | 20 | 91 | 0.2 | 5 | A29 | 4 | 460 | 0.007 |
| | RVW-9B | 5A | 20 | 70.8 | 2.22 | 7 | A29 | 4 | 40 | 0.007 |
| | RVW-10B | 6A | 20 | 76.5 | 1.33 | 7 | | | | |
| | RVW-11B | 7A | 20 | 65.8 | 0.34 | 5 | A29 | 4 | 45 | 0.007 |
| | RVW-12B | 8A | 20 | 16 | 3.54 | 15 | A29 | 4 | 195 | 0.05 |
| | | 9A | | | | | | | | |
| | | | | | | | | | | |
| LINE 12 | RVW-12C | 1A | 20 | 91 | 0.87 | 12 | A29 | 4 | 95 | 0.007 |
| | RVW-13C | 2A | 20 | 65.4 | 3.6 | 8 | A29 | 4 | 330 | 0.008 |
| | RVW-14C | 3A | 20 | 68.2 | 2.58 | 12 | A29 | 4 | 35 | 0.007 |
| | RVW-15C | 4A | 20 | 65.3 | 2.13 | 9 | A29 | 4 | 50 | 0.007 |
| | RVW-16C | 5A | 20 | 91 | 0.99 | 7 | A29 | 4 | 60 | 0.02 |
| | RVW-17C | 6A | 20 | 15.6 | 1.91 | 11 | A29 | 4 | 110 | 0.05 |
| | | 7A | | | | | | | | |
| | | | | | | | | | | |
| LINE 13 | RVW-18D | 1A | 20 | 74 | 1.93 | 7 | A29 | 4 | 185 | 0.008 |
| | RVW-19D | 2A | 20 | 91 | 0.51 | 6 | A29 | 4 | 15 | 0.008 |
| | RVW-20D | 3A | 20 | 91 | 0.38 | 6 | A29 | 4 | 1065 | 0.008 |
| | RVW-21D | 4A | 20 | 74 | 11 | 15 | A29 | 4 | 120 | 0.008 |
| | RVW-22D | 5A | 20 | 91 | 1.88 | 13 | A29 | 4 | 25 | 0.008 |
| | RVW-23D | 6A | 20 | 91 | 1.26 | 12 | A29 | 4 | 22 | 0.008 |
| | RVW-24D | 7A | 20 | 74 | 4.91 | 11 | A29 | 4 | 275 | 0.008 |
| | RVW-25D | 8A | 20 | 91 | 0.49 | 6 | A29 | 4 | 30 | 0.008 |
| | RVW-26.1D | 9A | 20 | 91 | 0.56 | 5 | A29 | 4 | 275 | 0.008 |
| | RVW-26D | 10A | 20 | 91 | 1.11 | 5 | A29 | 4 | 40 | 0.008 |
| | RVW-27D | 11A | 20 | 91 | 1.02 | 6 | A29 | 4 | 100 | 0.008 |
| | RVW-28D | 12A | 20 | 74 | 17.71 | 11 | | | | |
| | RVW-29D | 13A | 20 | 74 | 4.06 | 8 | A29 | 4 | 810 | 0.008 |
| | RVW-42E | 14B | 20 | 13.1 | 1.04 | 7 | A29 | 4 | 180 | 0.01 |
| | | 15AB | | | | | A29 | 4 | 125 | 0.05 |
| | | 16A | | | | | | | | |
| | | | | | | | | | | |
| LINE 14 | RVW-31E | 1A | 20 | 91 | 2.17 | 10 | A29 | 4 | 50 | 0.005 |
| | RVW-32E | 2A | 20 | 91 | 0.7 | 5 | A29 | 4 | 50 | 0.005 |
| | RVW-33E | 3A | 20 | 91 | 1.99 | 7 | A29 | 4 | 275 | 0.005 |
| | RVW-34E | 4B | 20 | 91 | 2.44 | 10 | A29 | 4 | 275 | 0.012 |
| | | 5AB | | | | | | | | |
| | | 6A | | | | | | | | |
| | RVW-35E | 7C | 20 | 91 | 0.65 | 7 | A29 | 4 | 60 | 0.007 |

| Line Number | Subarea | MORA Subarea Code | soil t | | | | | I Type | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| | RVW-36E | 8C | 20 | 91 | 0.26 | 5 | A29 | 4 | 80 | 0.007 |
| | | 9AC | | | | | | | 290 | 0.01 |
| | RVW-37E | 10A | 20 | 91 | 0.37 | 5 | | | | |
| | RVW-38E | 11A | 20 | 91 | 0.77 | 6 | A29 | 4 | 280 | 0.007 |
| | RVW-40E | 12A | 20 | 91 | 7.41 | 10 | A29 | 4 | 40 | 0.007 |
| | RVW-39E | 13D | 20 | 78.517483 | 5.72 | 11 | A29 | 4 | 500 | 0.005 |
| | RVW-41E/39.1E | 14D | 20 | 50 | 3.1 | 10 | | | | |
| | | 15AD | | | | | | | 100 | 0.05 |
| | | 16A | | | | | | | | |
| | | | | | | | | | | |
| LINE-15 | 43G | 1A | 20 | 15.0 | 1.29 | 8 | A29 | 4 | 500 | 0.007 |
| | 44G | 2B | 20 | 9.8 | 1.94 | 5 | A29 | 4 | 50 | 0.01 |
| | | 3AB | | | | | | | 70 | 0.05 |
| | | 4A | | | | | | | | |
| | | | | | | | | | | |

```
4LADEPTH.RDT
5 12134    1A  50 YR River Village - Newhall Ranch - Landmark  "Line 1"
5 12134    4A  HYDROGRAPH AT OUTLET Line 1
6 12134    1A 020 6507.210A294   75 00800                    G1

6 12134    2B  20 7200.606A294  260 02600
6 12134    3AB020          A294   40 00800                  1

6 12134    4A 020  0    99A29                               1  2
```

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT PROG FO601A

MODIFIED RATIONAL METHOD HYDROLOGY

50 YR River Village - Newhall Ranch - Landmark "Line 1" STORM DAY 4

| LOCATION | | SUBAREA AREA | SUBAREA Q | TOTAL AREA | TOTAL Q | CONV TYPE | CONV LNGTH | CONV SLOPE | CONV SIZE | CONV Z | CONTROL Q | SOIL NAME | TC | RAIN ZONE | PCT IMPV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12134 | 1A | 7. | 15. | 7. | 15. | 4 | 75. | 0.00800 | 2.00 | 0.00 | 0. | 20 | 10 | A29 | 0.65 |
| 12134 | 2B | 1. | 3. | 1. | 3. | 4 | 260. | 0.02600 | 2.00 | 0.00 | 0. | 20 | 6 | A29 | 0.72 |

CONFLUENCE Q'S

12134 3A TA 1154 QA 15. QAB 18. QB 3. 12134 3B TB 1154 QB 3. QBA 18. QA 15.

12134 3AB TAB 1154 QAB 18. QA 15. QB 3.

| LOCATION | | SUBAREA AREA | SUBAREA Q | TOTAL AREA | TOTAL Q | CONV TYPE | CONV LNGTH | CONV SLOPE | CONV SIZE | CONV Z | CONTROL Q | SOIL NAME | TC | RAIN ZONE | PCT IMPV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12134 | 3AB | 1. | 3. | 8. | 18. | 4 | 40. | 0.00800 | 2.00 | 0.00 | 0. | 20 | 0 | A29 | 0.00 |
| 12134 | 4A | 0. | 0. | 8. | 17. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |

HYDROGRAPH AT OUTLET Line 1

HYDROGRAPH AT 12134 4A STORM DAY 4 REDUCTION FACTOR = 1.000

| TIME | Q | TIME | Q | TIME | Q | TIME | Q | TIME | Q |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0. | 100 | 1. | 200 | 1. | 300 | 1. | 400 | 1. |
| 500 | 1. | 600 | 1. | 700 | 1. | 800 | 1. | 900 | 2. |
| 1000 | 2. | 1050 | 2. | 1100 | 3. | 1110 | 3. | 1120 | 4. |
| 1130 | 4. | 1131 | 5. | 1132 | 5. | 1133 | 5. | 1134 | 5. |
| 1135 | 5. | 1136 | 5. | 1137 | 5. | 1138 | 5. | 1139 | 6. |
| 1140 | 6. | 1141 | 6. | 1142 | 6. | 1143 | 6. | 1144 | 7. |
| 1145 | 7. | 1146 | 7. | 1147 | 8. | 1148 | 8. | 1149 | 9. |
| 1150 | 11. | 1151 | 13. | 1152 | 15. | 1153 | 16. | 1154 | 17. |
| 1155 | 17. | 1156 | 17. | 1157 | 16. | 1158 | 15. | 1159 | 14. |
| 1160 | 12. | 1161 | 10. | 1162 | 8. | 1163 | 6. | 1164 | 5. |
| 1165 | 5. | 1166 | 4. | 1167 | 4. | 1168 | 4. | 1169 | 3. |
| 1170 | 3. | 1171 | 3. | 1172 | 3. | 1173 | 3. | 1174 | 3. |
| 1175 | 3. | 1176 | 3. | 1177 | 3. | 1178 | 3. | 1179 | 3. |
| 1180 | 2. | 1181 | 2. | 1182 | 2. | 1183 | 2. | 1184 | 2. |
| 1185 | 2. | 1186 | 2. | 1187 | 2. | 1188 | 2. | 1189 | 2. |
| 1190 | 2. | 1191 | 2. | 1192 | 2. | 1193 | 2. | 1194 | 2. |
| 1195 | 2. | 1196 | 2. | 1197 | 2. | 1198 | 2. | 1199 | 2. |
| 1200 | 2. | 1201 | 2. | 1202 | 2. | 1203 | 2. | 1204 | 2. |
| 1205 | 2. | 1206 | 2. | 1207 | 2. | 1208 | 2. | 1209 | 2. |
| 1210 | 2. | 1211 | 2. | 1212 | 2. | 1213 | 2. | 1214 | 2. |
| 1215 | 2. | 1216 | 2. | 1217 | 2. | 1218 | 2. | 1219 | 2. |
| 1220 | 2. | 1221 | 2. | 1222 | 2. | 1223 | 2. | 1224 | 2. |
| 1225 | 2. | 1226 | 2. | 1227 | 2. | 1228 | 2. | 1229 | 2. |
| 1230 | 2. | 1231 | 2. | 1232 | 2. | 1233 | 2. | 1234 | 2. |
| 1235 | 2. | 1236 | 2. | 1237 | 2. | 1238 | 2. | 1239 | 1. |
| 1240 | 2. | 1241 | 2. | 1242 | 2. | 1243 | 1. | 1244 | 1. |
| 1245 | 1. | 1246 | 1. | 1247 | 1. | 1248 | 1. | 1249 | 1. |
| 1250 | 1. | 1251 | 1. | 1252 | 1. | 1253 | 1. | 1254 | 1. |
| 1255 | 1. | 1256 | 1. | 1257 | 1. | 1258 | 1. | 1259 | 1. |
| 1260 | 1. | 1261 | 1. | 1262 | 1. | 1263 | 1. | 1264 | 1. |
| 1265 | 1. | 1266 | 1. | 1267 | 1. | 1268 | 1. | 1269 | 1. |
| 1270 | 1. | 1271 | 1. | 1272 | 1. | 1273 | 1. | 1274 | 1. |
| 1275 | 1. | 1276 | 1. | 1277 | 1. | 1278 | 1. | 1279 | 1. |
| 1280 | 1. | 1281 | 1. | 1282 | 1. | 1283 | 1. | 1284 | 1. |
| 1285 | 1. | 1286 | 1. | 1287 | 1. | 1288 | 1. | 1289 | 1. |
| 1290 | 1. | 1291 | 1. | 1292 | 1. | 1293 | 1. | 1294 | 1. |
| 1295 | 1. | 1296 | 1. | 1297 | 1. | 1298 | 1. | 1299 | 1. |
| 1300 | 1. | 1310 | 1. | 1320 | 1. | 1330 | 1. | 1340 | 1. |
| 1350 | 1. | 1360 | 1. | 1370 | 1. | 1380 | 1. | 1390 | 1. |
| 1400 | 1. | 1420 | 1. | 1440 | 1. | 1460 | 1. | 1500 | 1. |

Total Runoff = 2.992 Acre-Ft.
Peak Q = 17 CFS
Time to Peak Q = 1154 Minutes

```
4LADEPTH.RDT
5 12134    1A  50 YR River Village - Newhall Ranch - Landmark  "Line 2"
5 12134    11A  HYDROGRAPH AT OUTLET Line 2
6 12134    1A 020 6301.005A29                                    G1
6 12134    2A 020 6600.605A294   45 00800
6 12134    3A 020 6600.805A29
6 12134    4A 020 9100.205A294  755 00800
6 12134    5A 020 9100.510A29
6 12134    6A 020 6402.810A294   10 00800
6 12134    7A 020 6905.108A294   15 00800
6 12134    8A 020 9100.611A29
6 12134    9A 020 9100.307A294  220 00800
6 12134   10A 020 1604.718A294   50 05000
6 12134   11A 020       99A29                               1  2
```

50 YR River Village - Newhall Ranch - Landmark "Line 2" STORM DAY 4

| LOCATION | | SUBAREA AREA | SUBAREA Q | TOTAL AREA | TOTAL Q | CONV TYPE | CONV LNGTH | CONV SLOPE | CONV SIZE | CONV Z | CONTROL Q | SOIL NAME | TC | RAIN ZONE | PCT IMPV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12134 | 1A | 1. | 3. | 1. | 3. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 5 | A29 | 0.63 |
| 12134 | 2A | 1. | 3. | 2. | 6. | 4 | 45. | 0.00800 | 2.00 | 0.00 | 0. | 20 | 5 | A29 | 0.66 |
| 12134 | 3A | 1. | 3. | 3. | 9. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 5 | A29 | 0.66 |
| 12134 | 4A | 0. | 0. | 3. | 9. | 4 | 755. | 0.00800 | 2.00 | 0.00 | 0. | 20 | 5 | A29 | 0.91 |
| 12134 | 5A | 0. | 0. | 3. | 8. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 10 | A29 | 0.91 |
| 12134 | 6A | 3. | 6. | 6. | 14. | 4 | 10. | 0.00800 | 2.00 | 0.00 | 0. | 20 | 10 | A29 | 0.64 |
| 12134 | 7A | 5. | 12. | 11. | 25. | 4 | 15. | 0.00800 | 2.25 | 0.00 | 0. | 20 | 8 | A29 | 0.69 |
| 12134 | 8A | 1. | 2. | 12. | 28. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 11 | A29 | 0.91 |
| 12134 | 9A | 0. | 0. | 12. | 28. | 4 | 220. | 0.00800 | 2.25 | 0.00 | 0. | 20 | 7 | A29 | 0.91 |
| 12134 | 10A | 5. | 6. | 17. | 33. | 4 | 50. | 0.05000 | 2.00 | 0.00 | 0. | 20 | 18 | A29 | 0.16 |
| 12134 | 11A | 0. | 0. | 17. | 33. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT PROG FO601A

MODIFIED RATIONAL METHOD HYDROLOGY

HYDROGRAPH AT 12134 11A

HYDROGRAPH AT 12134 11A STORM DAY 4 REDUCTION FACTOR = 1.000

| TIME | Q | TIME | Q | TIME | Q | TIME | Q | TIME | Q |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0. | 100 | 2. | 200 | 2. | 300 | 2. | 400 | 2. |
| 500 | 2. | 600 | 2. | 700 | 2. | 800 | 2. | 900 | 2. |
| 1000 | 3. | 1050 | 4. | 1100 | 5. | 1110 | 6. | 1120 | 7. |
| 1130 | 8. | 1131 | 8. | 1132 | 8. | 1133 | 8. | 1134 | 9. |
| 1135 | 9. | 1136 | 9. | 1137 | 9. | 1138 | 10. | 1139 | 10. |
| 1140 | 10. | 1141 | 11. | 1142 | 11. | 1143 | 12. | 1144 | 12. |
| 1145 | 13. | 1146 | 13. | 1147 | 14. | 1148 | 15. | 1149 | 16. |
| 1150 | 19. | 1151 | 22. | 1152 | 25. | 1153 | 28. | 1154 | 31. |
| 1155 | 32. | 1156 | 33. | 1157 | 33. | 1158 | 31. | 1159 | 28. |
| 1160 | 25. | 1161 | 21. | 1162 | 18. | 1163 | 15. | 1164 | 14. |
| 1165 | 12. | 1166 | 11. | 1167 | 10. | 1168 | 9. | 1169 | 8. |
| 1170 | 7. | 1171 | 6. | 1172 | 6. | 1173 | 6. | 1174 | 5. |
| 1175 | 5. | 1176 | 5. | 1177 | 5. | 1178 | 5. | 1179 | 5. |
| 1180 | 4. | 1181 | 4. | 1182 | 4. | 1183 | 4. | 1184 | 4. |
| 1185 | 4. | 1186 | 4. | 1187 | 4. | 1188 | 4. | 1189 | 4. |
| 1190 | 4. | 1191 | 4. | 1192 | 4. | 1193 | 3. | 1194 | 3. |
| 1195 | 3. | 1196 | 3. | 1197 | 3. | 1198 | 3. | 1199 | 3. |
| 1200 | 3. | 1201 | 3. | 1202 | 3. | 1203 | 3. | 1204 | 3. |
| 1205 | 3. | 1206 | 3. | 1207 | 3. | 1208 | 3. | 1209 | 3. |
| 1210 | 3. | 1211 | 3. | 1212 | 3. | 1213 | 3. | 1214 | 3. |
| 1215 | 3. | 1216 | 3. | 1217 | 3. | 1218 | 3. | 1219 | 3. |
| 1220 | 3. | 1221 | 3. | 1222 | 3. | 1223 | 3. | 1224 | 3. |
| 1225 | 3. | 1226 | 3. | 1227 | 3. | 1228 | 3. | 1229 | 3. |
| 1230 | 3. | 1231 | 2. | 1232 | 2. | 1233 | 2. | 1234 | 2. |
| 1235 | 2. | 1236 | 2. | 1237 | 2. | 1238 | 2. | 1239 | 2. |
| 1240 | 2. | 1241 | 2. | 1242 | 2. | 1243 | 2. | 1244 | 2. |
| 1245 | 2. | 1246 | 2. | 1247 | 2. | 1248 | 2. | 1249 | 2. |
| 1250 | 2. | 1251 | 2. | 1252 | 2. | 1253 | 2. | 1254 | 2. |
| 1255 | 2. | 1256 | 2. | 1257 | 2. | 1258 | 2. | 1259 | 2. |
| 1260 | 2. | 1261 | 2. | 1262 | 2. | 1263 | 2. | 1264 | 2. |
| 1265 | 2. | 1266 | 2. | 1267 | 2. | 1268 | 2. | 1269 | 2. |
| 1270 | 2. | 1271 | 2. | 1272 | 2. | 1273 | 2. | 1274 | 2. |
| 1275 | 2. | 1276 | 2. | 1277 | 2. | 1278 | 2. | 1279 | 2. |
| 1280 | 2. | 1281 | 2. | 1282 | 2. | 1283 | 2. | 1284 | 2. |
| 1285 | 2. | 1286 | 2. | 1287 | 2. | 1288 | 2. | 1289 | 2. |
| 1290 | 2. | 1291 | 2. | 1292 | 2. | 1293 | 2. | 1294 | 2. |
| 1295 | 2. | 1296 | 2. | 1297 | 2. | 1298 | 2. | 1299 | 2. |
| 1300 | 2. | 1310 | 2. | 1320 | 2. | 1330 | 2. | 1340 | 2. |
| 1350 | 2. | 1360 | 2. | 1370 | 2. | 1380 | 2. | 1390 | 2. |
| 1400 | 2. | 1420 | 2. | 1440 | 2. | 1460 | 2. | 1500 | 2. |

Total Runoff = 5.428 Acre-Ft.
Peak Q = 33 CFS
Time to Peak Q = 1156 Minutes

```
4LADEPTH.RDT
5 12134    1A  50 YR River Village - Newhall Ranch - Landmark  "Line 3"
5 12134   11A  HYDROGRAPH AT OUTLET Line 3
6 12134    1A 020 6401.807A29                                    G1
6 12134    2A 020 9100.307A294   30 00800
6 12134    3A 020 7403.507A29    25 00800
6 12134    4A 020 9100.510A29
6 12134    5A 020 9100.812A294  180 00800
6 12134    6A 020 9100.205A294   35 00800
6 12134    7A 020 7405.111A294   45 00800
6 12134    8A 020 9100.913A294   10 01000
6 12134    9A 020 7301.811A294  185 02000
6 12134   10A 020 1402.111A294  760 01000
6 12134   11A 020       99A29                               1  2
```

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT 

MODIFIED RATIONAL METHOD HYDROLOGY

50 YR River Village - Newhall Ranch - Landmark "Line 3" STORM DAY 4

| LOCATION | | SUBAREA AREA | SUBAREA Q | TOTAL AREA | TOTAL Q | CONV TYPE | CONV LNGTH | CONV SLOPE | CONV SIZE | CONV Z | CONTROL Q | SOIL NAME | TC | RAIN ZONE | PCT IMPV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12134 | 1A | 2. | 5. | 2. | 5. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 7 | A29 | 0.64 |
| 12134 | 2A | 0. | 0. | 2. | 5. | 4 | 30. | 0.00800 | 2.00 | 0.00 | 0. | 20 | 7 | A29 | 0.91 |
| 12134 | 3A | 3. | 8. | 5. | 13. | 4 | 25. | 0.00800 | 2.00 | 0.00 | 0. | 20 | 7 | A29 | 0.74 |
| 12134 | 4A | 0. | 0. | 5. | 13. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 10 | A29 | 0.91 |
| 12134 | 5A | 1. | 2. | 6. | 15. | 4 | 180. | 0.00800 | 2.00 | 0.00 | 0. | 20 | 12 | A29 | 0.91 |
| 12134 | 6A | 0. | 0. | 6. | 15. | 4 | 35. | 0.00800 | 2.00 | 0.00 | 0. | 20 | 5 | A29 | 0.91 |
| 12134 | 7A | 5. | 11. | 11. | 25. | 4 | 45. | 0.00800 | 2.25 | 0.00 | 0. | 20 | 11 | A29 | 0.74 |
| 12134 | 8A | 1. | 2. | 12. | 28. | 4 | 10. | 0.01000 | 2.25 | 0.00 | 0. | 20 | 13 | A29 | 0.91 |
| 12134 | 9A | 2. | 4. | 14. | 32. | 4 | 185. | 0.02000 | 2.00 | 0.00 | 0. | 20 | 11 | A29 | 0.73 |
| 12134 | 10A | 2. | 3. | 16. | 34. | 4 | 760. | 0.01000 | 2.50 | 0.00 | 0. | 20 | 11 | A29 | 0.14 |
| 12134 | 11A | 0. | 0. | 16. | 34. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT PROG FO601A

MODIFIED RATIONAL METHOD HYDROLOGY

HYDROGRAPH AT OUTLET Line 3

HYDROGRAPH AT 12134 11A STORM DAY 4 REDUCTION FACTOR = 1.000

| TIME | Q | TIME | Q | TIME | Q | TIME | Q | TIME | Q |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0. | 100 | 2. | 200 | 2. | 300 | 2. | 400 | 2. |
| 500 | 2. | 600 | 2. | 700 | 2. | 800 | 2. | 900 | 3. |
| 1000 | 3. | 1050 | 4. | 1100 | 5. | 1110 | 6. | 1120 | 7. |
| 1130 | 8. | 1131 | 9. | 1132 | 9. | 1133 | 9. | 1134 | 9. |
| 1135 | 9. | 1136 | 9. | 1137 | 10. | 1138 | 10. | 1139 | 10. |
| 1140 | 10. | 1141 | 11. | 1142 | 11. | 1143 | 11. | 1144 | 12. |
| 1145 | 12. | 1146 | 13. | 1147 | 14. | 1148 | 14. | 1149 | 15. |
| 1150 | 16. | 1151 | 18. | 1152 | 20. | 1153 | 24. | 1154 | 27. |
| 1155 | 30. | 1156 | 32. | 1157 | 34. | 1158 | 34. | 1159 | 33. |
| 1160 | 31. | 1161 | 29. | 1162 | 26. | 1163 | 23. | 1164 | 19. |
| 1165 | 16. | 1166 | 14. | 1167 | 12. | 1168 | 10. | 1169 | 9. |
| 1170 | 8. | 1171 | 8. | 1172 | 7. | 1173 | 7. | 1174 | 7. |
| 1175 | 6. | 1176 | 6. | 1177 | 6. | 1178 | 6. | 1179 | 6. |
| 1180 | 5. | 1181 | 5. | 1182 | 5. | 1183 | 5. | 1184 | 5. |
| 1185 | 5. | 1186 | 5. | 1187 | 5. | 1188 | 5. | 1189 | 4. |
| 1190 | 4. | 1191 | 4. | 1192 | 4. | 1193 | 4. | 1194 | 4. |
| 1195 | 4. | 1196 | 4. | 1197 | 4. | 1198 | 4. | 1199 | 4. |
| 1200 | 4. | 1201 | 4. | 1202 | 4. | 1203 | 4. | 1204 | 4. |
| 1205 | 4. | 1206 | 4. | 1207 | 3. | 1208 | 3. | 1209 | 3. |
| 1210 | 3. | 1211 | 3. | 1212 | 3. | 1213 | 3. | 1214 | 3. |
| 1215 | 3. | 1216 | 3. | 1217 | 3. | 1218 | 3. | 1219 | 3. |
| 1220 | 3. | 1221 | 3. | 1222 | 3. | 1223 | 3. | 1224 | 3. |
| 1225 | 3. | 1226 | 3. | 1227 | 3. | 1228 | 3. | 1229 | 3. |
| 1230 | 3. | 1231 | 3. | 1232 | 3. | 1233 | 3. | 1234 | 3. |
| 1235 | 3. | 1236 | 3. | 1237 | 3. | 1238 | 3. | 1239 | 3. |
| 1240 | 3. | 1241 | 3. | 1242 | 3. | 1243 | 3. | 1244 | 3. |
| 1245 | 3. | 1246 | 3. | 1247 | 3. | 1248 | 3. | 1249 | 3. |
| 1250 | 3. | 1251 | 3. | 1252 | 3. | 1253 | 3. | 1254 | 3. |
| 1255 | 3. | 1256 | 3. | 1257 | 3. | 1258 | 3. | 1259 | 3. |
| 1260 | 3. | 1261 | 3. | 1262 | 2. | 1263 | 2. | 1264 | 2. |
| 1265 | 2. | 1266 | 2. | 1267 | 2. | 1268 | 2. | 1269 | 2. |
| 1270 | 2. | 1271 | 2. | 1272 | 2. | 1273 | 2. | 1274 | 2. |
| 1275 | 2. | 1276 | 2. | 1277 | 2. | 1278 | 2. | 1279 | 2. |
| 1280 | 2. | 1281 | 2. | 1282 | 2. | 1283 | 2. | 1284 | 2. |
| 1285 | 2. | 1286 | 2. | 1287 | 2. | 1288 | 2. | 1289 | 2. |
| 1290 | 2. | 1291 | 2. | 1292 | 2. | 1293 | 2. | 1294 | 2. |
| 1295 | 2. | 1296 | 2. | 1297 | 2. | 1298 | 2. | 1299 | 2. |
| 1300 | 2. | 1310 | 2. | 1320 | 2. | 1330 | 2. | 1340 | 2. |
| 1350 | 2. | 1360 | 2. | 1370 | 2. | 1380 | 2. | 1390 | 2. |
| 1400 | 2. | 1420 | 2. | 1440 | 2. | 1460 | 2. | 1500 | 2. |

Total Runoff = 5.701 Acre-Ft.
Peak Q = 34 CFS
Time to Peak Q = 1157 Minutes

```
4LADEPTH.RDT
5 12134    1A  50 YR River Village - Newhall Ranch - Landmark  "Line 4"
5 12134   10A  HYDROGRAPH AT OUTLET Line 4
6 12134    1A 020 9100.509A294  275 00500                    G1
6 12134    2A 020 9100.505A29
6 12134    3A 020 9100.305A294  545 00800
6 12134    4B 020 7105.809A294  205 00600
6 12134    5AB020         A294  200 00600
6 12134    6A 020 7105.307A294   75 00600
6 12134    7A 020 7001.208A294   50 01000
6 12134    8A 020 9100.710A294  190 02000
6 12134    9A 020 1701.710A294   60 05000
6 12134   10A 020       99A29                            1  2
```

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT 

MODIFIED RATIONAL METHOD HYDROLOGY

50 YR River Village - Newhall Ranch - Landmark "Line 4" STORM DAY 4

| LOCATION | | SUBAREA AREA | SUBAREA Q | TOTAL AREA | TOTAL Q | CONV TYPE | CONV LNGTH | CONV SLOPE | CONV SIZE | CONV Z | CONTROL Q | SOIL NAME | TC | RAIN ZONE | PCT IMPV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12134 | 1A | 0. | 0. | 0. | 0. | 4 | 275. | 0.00500 | 0.00 | 0.00 | 0. | 20 | 9 | A29 | 0.91 |
| 12134 | 2A | 0. | 0. | 0. | 0. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 5 | A29 | 0.91 |
| 12134 | 3A | 0. | 0. | 0. | 0. | 4 | 545. | 0.00800 | 0.00 | 0.00 | 0. | 20 | 5 | A29 | 0.91 |
| 12134 | 4B | 6. | 14. | 6. | 14. | 4 | 205. | 0.00600 | 2.00 | 0.00 | 0. | 20 | 9 | A29 | 0.71 |
| 12134 | 5AB | 6. | 14. | 6. | 14. | 4 | 200. | 0.00600 | 2.00 | 0.00 | 0. | 20 | 0 | A29 | 0.00 |
| 12134 | 6A | 5. | 13. | 11. | 26. | 4 | 75. | 0.00600 | 2.50 | 0.00 | 0. | 20 | 7 | A29 | 0.71 |
| 12134 | 7A | 1. | 2. | 12. | 28. | 4 | 50. | 0.01000 | 2.25 | 0.00 | 0. | 20 | 8 | A29 | 0.70 |
| 12134 | 8A | 1. | 2. | 13. | 30. | 4 | 190. | 0.02000 | 2.00 | 0.00 | 0. | 20 | 10 | A29 | 0.91 |
| 12134 | 9A | 2. | 3. | 15. | 33. | 4 | 60. | 0.05000 | 2.00 | 0.00 | 0. | 20 | 10 | A29 | 0.17 |
| 12134 | 10A | 0. | 0. | 15. | 33. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT PROG FO601A

MODIFIED RATIONAL METHOD HYDROLOGY

HYDROGRAPH AT OUTLET Line 4

HYDROGRAPH AT 12134 10A STORM DAY 4 REDUCTION FACTOR = 1.000

| TIME | Q | TIME | Q | TIME | Q | TIME | Q | TIME | Q |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0. | 100 | 1. | 200 | 1. | 300 | 1. | 400 | 2. |
| 500 | 2. | 600 | 2. | 700 | 2. | 800 | 2. | 900 | 2. |
| 1000 | 3. | 1050 | 4. | 1100 | 5. | 1110 | 6. | 1120 | 7. |
| 1130 | 8. | 1131 | 8. | 1132 | 8. | 1133 | 9. | 1134 | 9. |
| 1135 | 9. | 1136 | 9. | 1137 | 9. | 1138 | 10. | 1139 | 10. |
| 1140 | 10. | 1141 | 11. | 1142 | 11. | 1143 | 12. | 1144 | 12. |
| 1145 | 13. | 1146 | 13. | 1147 | 14. | 1148 | 15. | 1149 | 16. |
| 1150 | 19. | 1151 | 22. | 1152 | 25. | 1153 | 29. | 1154 | 32. |
| 1155 | 33. | 1156 | 33. | 1157 | 32. | 1158 | 30. | 1159 | 27. |
| 1160 | 23. | 1161 | 19. | 1162 | 16. | 1163 | 13. | 1164 | 11. |
| 1165 | 10. | 1166 | 9. | 1167 | 8. | 1168 | 7. | 1169 | 7. |
| 1170 | 6. | 1171 | 6. | 1172 | 6. | 1173 | 6. | 1174 | 5. |
| 1175 | 5. | 1176 | 5. | 1177 | 5. | 1178 | 5. | 1179 | 5. |
| 1180 | 5. | 1181 | 4. | 1182 | 4. | 1183 | 4. | 1184 | 4. |
| 1185 | 4. | 1186 | 4. | 1187 | 4. | 1188 | 4. | 1189 | 4. |
| 1190 | 4. | 1191 | 4. | 1192 | 4. | 1193 | 4. | 1194 | 4. |
| 1195 | 4. | 1196 | 3. | 1197 | 3. | 1198 | 3. | 1199 | 3. |
| 1200 | 3. | 1201 | 3. | 1202 | 3. | 1203 | 3. | 1204 | 3. |
| 1205 | 3. | 1206 | 3. | 1207 | 3. | 1208 | 3. | 1209 | 3. |
| 1210 | 3. | 1211 | 3. | 1212 | 3. | 1213 | 3. | 1214 | 3. |
| 1215 | 3. | 1216 | 3. | 1217 | 3. | 1218 | 3. | 1219 | 3. |
| 1220 | 3. | 1221 | 3. | 1222 | 3. | 1223 | 3. | 1224 | 3. |
| 1225 | 3. | 1226 | 3. | 1227 | 3. | 1228 | 3. | 1229 | 3. |
| 1230 | 3. | 1231 | 3. | 1232 | 3. | 1233 | 2. | 1234 | 2. |
| 1235 | 2. | 1236 | 2. | 1237 | 2. | 1238 | 2. | 1239 | 2. |
| 1240 | 2. | 1241 | 2. | 1242 | 2. | 1243 | 2. | 1244 | 2. |
| 1245 | 2. | 1246 | 2. | 1247 | 2. | 1248 | 2. | 1249 | 2. |
| 1250 | 2. | 1251 | 2. | 1252 | 2. | 1253 | 2. | 1254 | 2. |
| 1255 | 2. | 1256 | 2. | 1257 | 2. | 1258 | 2. | 1259 | 2. |
| 1260 | 2. | 1261 | 2. | 1262 | 2. | 1263 | 2. | 1264 | 2. |
| 1265 | 2. | 1266 | 2. | 1267 | 2. | 1268 | 2. | 1269 | 2. |
| 1270 | 2. | 1271 | 2. | 1272 | 2. | 1273 | 2. | 1274 | 2. |
| 1275 | 2. | 1276 | 2. | 1277 | 2. | 1278 | 2. | 1279 | 2. |
| 1280 | 2. | 1281 | 2. | 1282 | 2. | 1283 | 2. | 1284 | 2. |
| 1285 | 2. | 1286 | 2. | 1287 | 2. | 1288 | 2. | 1289 | 2. |
| 1290 | 2. | 1291 | 2. | 1292 | 2. | 1293 | 2. | 1294 | 2. |
| 1295 | 2. | 1296 | 2. | 1297 | 2. | 1298 | 2. | 1299 | 2. |
| 1300 | 2. | 1310 | 2. | 1320 | 2. | 1330 | 2. | 1340 | 2. |
| 1350 | 2. | 1360 | 2. | 1370 | 2. | 1380 | 2. | 1390 | 1. |
| 1400 | 1. | 1420 | 1. | 1440 | 1. | 1460 | 1. | 1500 | 1. |

Total Runoff = 4.837 Acre-Ft.
Peak Q = 33 CFS
Time to Peak Q = 1155 Minutes

```
4LADEPTH.RDT
5 12134    1A  50 YR River Village - Newhall Ranch - Landmark  "Line 5"
5 12134   10A  HYDROGRAPH AT OUTLET Line 5
6 12134    1A 020 9100.306A294   60 00900                    G1
6 12134    2A 020 7402.006A294   37 00900
6 12134    3A 020 9100.105A294  565 00900
6 12134    4A 020 6701.809A29
6 12134    5A 020 9100.509A294   34 00900
6 12134    6A 020 6703.912A294   33 00900
6 12134    7A 020 6602.911A294   28 00900
6 12134    8A 020 9100.105A294  250 00500
6 12134    9A 020 1702.713A294   65 05000
6 12134   10A 020       99A29                          1  2
```

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT 

MODIFIED RATIONAL METHOD HYDROLOGY

50 YR River Village - Newhall Ranch - Landmark "Line 5" STORM DAY 4

| LOCATION | | SUBAREA AREA | SUBAREA Q | TOTAL AREA | TOTAL Q | CONV TYPE | CONV LNGTH | CONV SLOPE | CONV SIZE | CONV Z | CONTROL Q | SOIL NAME | TC | RAIN ZONE | PCT IMPV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12134 | 1A | 0. | 0. | 0. | 0. | 4 | 60. | 0.00900 | 0.00 | 0.00 | 0. | 20 | 6 | A29 | 0.91 |
| 12134 | 2A | 2. | 6. | 2. | 6. | 4 | 37. | 0.00900 | 2.00 | 0.00 | 0. | 20 | 6 | A29 | 0.74 |
| 12134 | 3A | 0. | 0. | 2. | 6. | 4 | 565. | 0.00900 | 2.00 | 0.00 | 0. | 20 | 5 | A29 | 0.91 |
| 12134 | 4A | 2. | 4. | 4. | 10. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 9 | A29 | 0.67 |
| 12134 | 5A | 0. | 0. | 4. | 10. | 4 | 34. | 0.00900 | 2.00 | 0.00 | 0. | 20 | 9 | A29 | 0.91 |
| 12134 | 6A | 4. | 8. | 8. | 17. | 4 | 33. | 0.00900 | 2.00 | 0.00 | 0. | 20 | 12 | A29 | 0.67 |
| 12134 | 7A | 3. | 6. | 11. | 23. | 4 | 28. | 0.00900 | 2.25 | 0.00 | 0. | 20 | 11 | A29 | 0.66 |
| 12134 | 8A | 0. | 0. | 11. | 23. | 4 | 250. | 0.00500 | 2.25 | 0.00 | 0. | 20 | 5 | A29 | 0.91 |
| 12134 | 9A | 3. | 4. | 14. | 27. | 4 | 65. | 0.05000 | 2.00 | 0.00 | 0. | 20 | 13 | A29 | 0.17 |
| 12134 | 10A | 0. | 0. | 14. | 27. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT PROG FO601A

MODIFIED RATIONAL METHOD HYDROLOGY

HYDROGRAPH AT OUTLET Line 5

HYDROGRAPH AT 12134 10A STORM DAY 4 REDUCTION FACTOR = 1.000

| TIME | Q | TIME | Q | TIME | Q | TIME | Q | TIME | Q |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0. | 100 | 1. | 200 | 1. | 300 | 1. | 400 | 1. |
| 500 | 2. | 600 | 2. | 700 | 2. | 800 | 2. | 900 | 2. |
| 1000 | 2. | 1050 | 3. | 1100 | 4. | 1110 | 5. | 1120 | 6. |
| 1130 | 7. | 1131 | 7. | 1132 | 7. | 1133 | 7. | 1134 | 7. |
| 1135 | 8. | 1136 | 8. | 1137 | 8. | 1138 | 8. | 1139 | 8. |
| 1140 | 9. | 1141 | 9. | 1142 | 9. | 1143 | 10. | 1144 | 10. |
| 1145 | 11. | 1146 | 11. | 1147 | 12. | 1148 | 12. | 1149 | 13. |
| 1150 | 15. | 1151 | 17. | 1152 | 20. | 1153 | 23. | 1154 | 25. |
| 1155 | 26. | 1156 | 27. | 1157 | 27. | 1158 | 27. | 1159 | 26. |
| 1160 | 24. | 1161 | 22. | 1162 | 19. | 1163 | 16. | 1164 | 13. |
| 1165 | 11. | 1166 | 9. | 1167 | 7. | 1168 | 7. | 1169 | 6. |
| 1170 | 6. | 1171 | 5. | 1172 | 5. | 1173 | 5. | 1174 | 5. |
| 1175 | 5. | 1176 | 4. | 1177 | 4. | 1178 | 4. | 1179 | 4. |
| 1180 | 4. | 1181 | 4. | 1182 | 4. | 1183 | 4. | 1184 | 4. |
| 1185 | 4. | 1186 | 3. | 1187 | 3. | 1188 | 3. | 1189 | 3. |
| 1190 | 3. | 1191 | 3. | 1192 | 3. | 1193 | 3. | 1194 | 3. |
| 1195 | 3. | 1196 | 3. | 1197 | 3. | 1198 | 3. | 1199 | 3. |
| 1200 | 3. | 1201 | 3. | 1202 | 3. | 1203 | 3. | 1204 | 3. |
| 1205 | 3. | 1206 | 3. | 1207 | 3. | 1208 | 3. | 1209 | 3. |
| 1210 | 2. | 1211 | 2. | 1212 | 2. | 1213 | 2. | 1214 | 2. |
| 1215 | 2. | 1216 | 2. | 1217 | 2. | 1218 | 2. | 1219 | 2. |
| 1220 | 2. | 1221 | 2. | 1222 | 2. | 1223 | 2. | 1224 | 2. |
| 1225 | 2. | 1226 | 2. | 1227 | 2. | 1228 | 2. | 1229 | 2. |
| 1230 | 2. | 1231 | 2. | 1232 | 2. | 1233 | 2. | 1234 | 2. |
| 1235 | 2. | 1236 | 2. | 1237 | 2. | 1238 | 2. | 1239 | 2. |
| 1240 | 2. | 1241 | 2. | 1242 | 2. | 1243 | 2. | 1244 | 2. |
| 1245 | 2. | 1246 | 2. | 1247 | 2. | 1248 | 2. | 1249 | 2. |
| 1250 | 2. | 1251 | 2. | 1252 | 2. | 1253 | 2. | 1254 | 2. |
| 1255 | 2. | 1256 | 2. | 1257 | 2. | 1258 | 2. | 1259 | 2. |
| 1260 | 2. | 1261 | 2. | 1262 | 2. | 1263 | 2. | 1264 | 2. |
| 1265 | 2. | 1266 | 2. | 1267 | 2. | 1268 | 2. | 1269 | 2. |
| 1270 | 2. | 1271 | 2. | 1272 | 2. | 1273 | 2. | 1274 | 2. |
| 1275 | 2. | 1276 | 2. | 1277 | 2. | 1278 | 2. | 1279 | 2. |
| 1280 | 2. | 1281 | 2. | 1282 | 2. | 1283 | 2. | 1284 | 2. |
| 1285 | 2. | 1286 | 2. | 1287 | 2. | 1288 | 2. | 1289 | 2. |
| 1290 | 2. | 1291 | 2. | 1292 | 2. | 1293 | 2. | 1294 | 2. |
| 1295 | 2. | 1296 | 2. | 1297 | 2. | 1298 | 2. | 1299 | 2. |
| 1300 | 2. | 1310 | 2. | 1320 | 2. | 1330 | 2. | 1340 | 2. |
| 1350 | 2. | 1360 | 1. | 1370 | 1. | 1380 | 1. | 1390 | 1. |
| 1400 | 1. | 1420 | 1. | 1440 | 1. | 1460 | 1. | 1500 | 1. |

Total Runoff = 4.254 Acre-Ft.
Peak Q = 27 CFS
Time to Peak Q = 1156 Minutes

```
4LADEPTH.RDT
5 12134    1A  50 YR River Village - Newhall Ranch - Landmark  "Line 6"
5 12134   15A  HYDROGRAPH AT OUTLET Line 6
6 12134    1A 020 6703.008A29                                    G1
6 12134    2A 020 6601.207A294   60 00700
6 12134    3A 020 6501.206A29
6 12134    4A 020 6601.206A294  190 00700
6 12134    5A 020 6500.805A294   60 00700
6 12134    6A 020 6901.007A294  405 00700
6 12134    7A 020 6803.409A294  910 00500
6 12134    8A 020 7303.812A294   15 00500
6 12134    9A 020 7409.911A294   70 00500
6 12134   10A 020 9101.409A29
6 12134   11A 020 9101.208A294  870 00600
6 12134   12A 020 7104.110A294 1070 00800
6 12134   13B 020 1606.408A294  180 02000
6 12134   14AB020         A294  370 03000
6 12134   15A 020       99A29                                1  2
```

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT 

MODIFIED RATIONAL METHOD HYDROLOGY

50 YR River Village - Newhall Ranch - Landmark "Line 6" STORM DAY 4

| LOCATION | | SUBAREA AREA | SUBAREA Q | TOTAL AREA | TOTAL Q | CONV TYPE | CONV LNGTH | CONV SLOPE | CONV SIZE | CONV Z | CONTROL Q | SOIL NAME | TC | RAIN ZONE | PCT IMPV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12134 | 1A | 3. | 7. | 3. | 7. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 8 | A29 | 0.67 |
| 12134 | 2A | 1. | 3. | 4. | 10. | 4 | 60. | 0.00700 | 2.00 | 0.00 | 0. | 20 | 7 | A29 | 0.66 |
| 12134 | 3A | 1. | 3. | 5. | 12. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 6 | A29 | 0.65 |
| 12134 | 4A | 1. | 3. | 6. | 15. | 4 | 190. | 0.00700 | 2.00 | 0.00 | 0. | 20 | 6 | A29 | 0.66 |
| 12134 | 5A | 1. | 3. | 7. | 17. | 4 | 60. | 0.00700 | 2.00 | 0.00 | 0. | 20 | 5 | A29 | 0.65 |
| 12134 | 6A | 1. | 3. | 8. | 20. | 4 | 405. | 0.00700 | 2.00 | 0.00 | 0. | 20 | 7 | A29 | 0.69 |
| 12134 | 7A | 3. | 7. | 11. | 26. | 4 | 910. | 0.00500 | 2.50 | 0.00 | 0. | 20 | 9 | A29 | 0.68 |
| 12134 | 8A | 4. | 8. | 15. | 32. | 4 | 15. | 0.00500 | 2.75 | 0.00 | 0. | 20 | 12 | A29 | 0.73 |
| 12134 | 9A | 10. | 21. | 25. | 50. | 4 | 70. | 0.00500 | 3.00 | 0.00 | 0. | 20 | 11 | A29 | 0.74 |
| 12134 | 10A | 1. | 3. | 26. | 52. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 9 | A29 | 0.91 |
| 12134 | 11A | 1. | 3. | 27. | 54. | 4 | 870. | 0.00600 | 3.00 | 0.00 | 0. | 20 | 8 | A29 | 0.91 |
| 12134 | 12A | 4. | 9. | 31. | 58. | 4 | 1070. | 0.00800 | 3.00 | 0.00 | 0. | 20 | 10 | A29 | 0.71 |
| 12134 | 13B | 6. | 11. | 6. | 11. | 4 | 180. | 0.02000 | 2.00 | 0.00 | 0. | 20 | 8 | A29 | 0.16 |
| 12134 | 14AB | 6. | 11. | 37. | 59. | 4 | 370. | 0.03000 | 2.50 | 0.00 | 0. | 20 | 0 | A29 | 0.00 |
| 12134 | 15A | 0. | 0. | 37. | 59. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT PROG FO601A

MODIFIED RATIONAL METHOD HYDROLOGY

HYDROGRAPH AT OUTLET Line 6

HYDROGRAPH AT 12134 15A STORM DAY 4 REDUCTION FACTOR = 1.000

| TIME | Q | TIME | Q | TIME | Q | TIME | Q | TIME | Q |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0. | 100 | 3. | 200 | 4. | 300 | 4. | 400 | 4. |
| 500 | 4. | 600 | 4. | 700 | 5. | 800 | 5. | 900 | 6. |
| 1000 | 7. | 1050 | 9. | 1100 | 11. | 1110 | 12. | 1120 | 15. |
| 1130 | 17. | 1131 | 18. | 1132 | 18. | 1133 | 18. | 1134 | 19. |
| 1135 | 19. | 1136 | 19. | 1137 | 20. | 1138 | 20. | 1139 | 21. |
| 1140 | 21. | 1141 | 22. | 1142 | 22. | 1143 | 23. | 1144 | 23. |
| 1145 | 24. | 1146 | 25. | 1147 | 26. | 1148 | 27. | 1149 | 29. |
| 1150 | 31. | 1151 | 33. | 1152 | 36. | 1153 | 40. | 1154 | 43. |
| 1155 | 47. | 1156 | 51. | 1157 | 54. | 1158 | 56. | 1159 | 58. |
| 1160 | 59. | 1161 | 59. | 1162 | 59. | 1163 | 59. | 1164 | 59. |
| 1165 | 58. | 1166 | 55. | 1167 | 52. | 1168 | 47. | 1169 | 42. |
| 1170 | 37. | 1171 | 33. | 1172 | 29. | 1173 | 26. | 1174 | 24. |
| 1175 | 21. | 1176 | 20. | 1177 | 18. | 1178 | 17. | 1179 | 16. |
| 1180 | 15. | 1181 | 15. | 1182 | 14. | 1183 | 13. | 1184 | 13. |
| 1185 | 13. | 1186 | 12. | 1187 | 12. | 1188 | 11. | 1189 | 11. |
| 1190 | 11. | 1191 | 11. | 1192 | 10. | 1193 | 10. | 1194 | 10. |
| 1195 | 10. | 1196 | 10. | 1197 | 10. | 1198 | 9. | 1199 | 9. |
| 1200 | 9. | 1201 | 9. | 1202 | 9. | 1203 | 9. | 1204 | 9. |
| 1205 | 8. | 1206 | 8. | 1207 | 8. | 1208 | 8. | 1209 | 8. |
| 1210 | 8. | 1211 | 8. | 1212 | 8. | 1213 | 8. | 1214 | 8. |
| 1215 | 8. | 1216 | 7. | 1217 | 7. | 1218 | 7. | 1219 | 7. |
| 1220 | 7. | 1221 | 7. | 1222 | 7. | 1223 | 7. | 1224 | 7. |
| 1225 | 7. | 1226 | 7. | 1227 | 7. | 1228 | 7. | 1229 | 7. |
| 1230 | 7. | 1231 | 7. | 1232 | 7. | 1233 | 6. | 1234 | 6. |
| 1235 | 6. | 1236 | 6. | 1237 | 6. | 1238 | 6. | 1239 | 6. |
| 1240 | 6. | 1241 | 6. | 1242 | 6. | 1243 | 6. | 1244 | 6. |
| 1245 | 6. | 1246 | 6. | 1247 | 6. | 1248 | 6. | 1249 | 6. |
| 1250 | 6. | 1251 | 6. | 1252 | 6. | 1253 | 6. | 1254 | 6. |
| 1255 | 6. | 1256 | 6. | 1257 | 6. | 1258 | 6. | 1259 | 6. |
| 1260 | 6. | 1261 | 6. | 1262 | 6. | 1263 | 5. | 1264 | 5. |
| 1265 | 5. | 1266 | 5. | 1267 | 5. | 1268 | 5. | 1269 | 5. |
| 1270 | 5. | 1271 | 5. | 1272 | 5. | 1273 | 5. | 1274 | 5. |
| 1275 | 5. | 1276 | 5. | 1277 | 5. | 1278 | 5. | 1279 | 5. |
| 1280 | 5. | 1281 | 5. | 1282 | 5. | 1283 | 5. | 1284 | 5. |
| 1285 | 5. | 1286 | 5. | 1287 | 5. | 1288 | 5. | 1289 | 5. |
| 1290 | 5. | 1291 | 5. | 1292 | 5. | 1293 | 5. | 1294 | 5. |
| 1295 | 5. | 1296 | 5. | 1297 | 5. | 1298 | 5. | 1299 | 5. |
| 1300 | 5. | 1310 | 5. | 1320 | 4. | 1330 | 4. | 1340 | 4. |
| 1350 | 4. | 1360 | 4. | 1370 | 4. | 1380 | 4. | 1390 | 4. |
| 1400 | 4. | 1420 | 4. | 1440 | 4. | 1460 | 3. | 1500 | 3. |

Total Runoff = 12.169 Acre-Ft.
Peak Q = 59 CFS
Time to Peak Q = 1160 Minutes

```
4LADEPTH.RDT
5 12134    1A  50 YR River Village - Newhall Ranch - Landmark  "Line 7"
5 12134   10A  HYDROGRAPH AT OUTLET Line 7
6 12134    1A 020 7911.712A294  400 00700                    G1
6 12134    2A 020 7404.109A294   30 00700
6 12134    3A 020 9102.414A29
6 12134    4A 020 9101.713A294  110 00700
6 12134    5A 020 9100.405A29    60 00700
6 12134    6A 020 9100.805A294   35 00700
6 12134    7A 020 5000.605A294  810 00600
6 12134    8B 020 1601.507A294  450 01000
6 12134    9AB020         A294   95 05000
6 12134   10A 020       99A29                            1  2
```

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT 

MODIFIED RATIONAL METHOD HYDROLOGY

50 YR River Village - Newhall Ranch - Landmark "Line 7" STORM DAY 4

| LOCATION | | SUBAREA AREA | SUBAREA Q | TOTAL AREA | TOTAL Q | CONV TYPE | CONV LNGTH | CONV SLOPE | CONV SIZE | CONV Z | CONTROL Q | SOIL NAME | TC | RAIN ZONE | PCT IMPV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12134 | 1A | 12. | 25. | 12. | 25. | 4 | 400. | 0.00700 | 2.25 | 0.00 | 0. | 20 | 12 | A29 | 0.79 |
| 12134 | 2A | 4. | 9. | 16. | 34. | 4 | 30. | 0.00700 | 2.50 | 0.00 | 0. | 20 | 9 | A29 | 0.74 |
| 12134 | 3A | 2. | 4. | 18. | 38. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 14 | A29 | 0.91 |
| 12134 | 4A | 2. | 4. | 20. | 42. | 4 | 110. | 0.00700 | 2.75 | 0.00 | 0. | 20 | 13 | A29 | 0.91 |
| 12134 | 5A | 0. | 0. | 20. | 42. | 4 | 60. | 0.00700 | 2.75 | 0.00 | 0. | 20 | 5 | A29 | 0.91 |
| 12134 | 6A | 1. | 3. | 21. | 44. | 4 | 35. | 0.00700 | 2.75 | 0.00 | 0. | 20 | 5 | A29 | 0.91 |
| 12134 | 7A | 1. | 3. | 22. | 45. | 4 | 810. | 0.00600 | 3.00 | 0.00 | 0. | 20 | 5 | A29 | 0.50 |
| 12134 | 8B | 1. | 2. | 1. | 2. | 4 | 450. | 0.01000 | 2.00 | 0.00 | 0. | 20 | 7 | A29 | 0.16 |
| 12134 | 9AB | 1. | 2. | 23. | 46. | 4 | 95. | 0.05000 | 2.00 | 0.00 | 0. | 20 | 0 | A29 | 0.00 |
| 12134 | 10A | 0. | 0. | 23. | 46. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT PROG FO601A

MODIFIED RATIONAL METHOD HYDROLOGY

HYDROGRAPH AT OUTLET Line 7

HYDROGRAPH AT 12134 10A STORM DAY 4 REDUCTION FACTOR = 1.000

| TIME | Q | TIME | Q | TIME | Q | TIME | Q | TIME | Q |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0. | 100 | 3. | 200 | 3. | 300 | 3. | 400 | 3. |
| 500 | 3. | 600 | 4. | 700 | 4. | 800 | 4. | 900 | 5. |
| 1000 | 6. | 1050 | 7. | 1100 | 9. | 1110 | 10. | 1120 | 11. |
| 1130 | 13. | 1131 | 13. | 1132 | 13. | 1133 | 14. | 1134 | 14. |
| 1135 | 14. | 1136 | 15. | 1137 | 15. | 1138 | 15. | 1139 | 15. |
| 1140 | 16. | 1141 | 16. | 1142 | 17. | 1143 | 17. | 1144 | 18. |
| 1145 | 18. | 1146 | 19. | 1147 | 20. | 1148 | 21. | 1149 | 22. |
| 1150 | 23. | 1151 | 25. | 1152 | 28. | 1153 | 31. | 1154 | 35. |
| 1155 | 40. | 1156 | 43. | 1157 | 45. | 1158 | 46. | 1159 | 46. |
| 1160 | 45. | 1161 | 43. | 1162 | 41. | 1163 | 39. | 1164 | 36. |
| 1165 | 33. | 1166 | 30. | 1167 | 26. | 1168 | 23. | 1169 | 20. |
| 1170 | 18. | 1171 | 16. | 1172 | 14. | 1173 | 13. | 1174 | 12. |
| 1175 | 12. | 1176 | 11. | 1177 | 11. | 1178 | 10. | 1179 | 10. |
| 1180 | 10. | 1181 | 9. | 1182 | 9. | 1183 | 9. | 1184 | 9. |
| 1185 | 8. | 1186 | 8. | 1187 | 8. | 1188 | 8. | 1189 | 8. |
| 1190 | 8. | 1191 | 7. | 1192 | 7. | 1193 | 7. | 1194 | 7. |
| 1195 | 7. | 1196 | 7. | 1197 | 7. | 1198 | 7. | 1199 | 7. |
| 1200 | 7. | 1201 | 6. | 1202 | 6. | 1203 | 6. | 1204 | 6. |
| 1205 | 6. | 1206 | 6. | 1207 | 6. | 1208 | 6. | 1209 | 6. |
| 1210 | 6. | 1211 | 6. | 1212 | 6. | 1213 | 6. | 1214 | 6. |
| 1215 | 6. | 1216 | 6. | 1217 | 6. | 1218 | 5. | 1219 | 5. |
| 1220 | 5. | 1221 | 5. | 1222 | 5. | 1223 | 5. | 1224 | 5. |
| 1225 | 5. | 1226 | 5. | 1227 | 5. | 1228 | 5. | 1229 | 5. |
| 1230 | 5. | 1231 | 5. | 1232 | 5. | 1233 | 5. | 1234 | 5. |
| 1235 | 5. | 1236 | 5. | 1237 | 5. | 1238 | 5. | 1239 | 5. |
| 1240 | 5. | 1241 | 5. | 1242 | 5. | 1243 | 5. | 1244 | 5. |
| 1245 | 5. | 1246 | 5. | 1247 | 5. | 1248 | 5. | 1249 | 5. |
| 1250 | 4. | 1251 | 4. | 1252 | 4. | 1253 | 4. | 1254 | 4. |
| 1255 | 4. | 1256 | 4. | 1257 | 4. | 1258 | 4. | 1259 | 4. |
| 1260 | 4. | 1261 | 4. | 1262 | 4. | 1263 | 4. | 1264 | 4. |
| 1265 | 4. | 1266 | 4. | 1267 | 4. | 1268 | 4. | 1269 | 4. |
| 1270 | 4. | 1271 | 4. | 1272 | 4. | 1273 | 4. | 1274 | 4. |
| 1275 | 4. | 1276 | 4. | 1277 | 4. | 1278 | 4. | 1279 | 4. |
| 1280 | 4. | 1281 | 4. | 1282 | 4. | 1283 | 4. | 1284 | 4. |
| 1285 | 4. | 1286 | 4. | 1287 | 4. | 1288 | 4. | 1289 | 4. |
| 1290 | 4. | 1291 | 4. | 1292 | 4. | 1293 | 4. | 1294 | 4. |
| 1295 | 4. | 1296 | 4. | 1297 | 4. | 1298 | 4. | 1299 | 4. |
| 1300 | 4. | 1310 | 4. | 1320 | 4. | 1330 | 3. | 1340 | 3. |
| 1350 | 3. | 1360 | 3. | 1370 | 3. | 1380 | 3. | 1390 | 3. |
| 1400 | 3. | 1420 | 3. | 1440 | 3. | 1460 | 3. | 1500 | 3. |

Total Runoff = 9.561 Acre-Ft.
Peak Q = 46 CFS
Time to Peak Q = 1158 Minutes

```
4LADEPTH.RDT
5 12134    1A  50 YR River Village - Newhall Ranch - Landmark  "Line 8"
5 12134    4A  HYDROGRAPH AT OUTLET Line 8
6 12134    1A 020 1503.508A294  450 01000                    G1
6 12134    2A 020       99A29
6 12134    3A 020       99A29
6 12134    4A 020       99A29                              1  2
```

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT
MODIFIED RATIONAL METHOD HYDROLOGY



50 YR River Village - Newhall Ranch - Landmark "Line 8"

STORM DAY 4

| LOCATION | | SUBAREA AREA | SUBAREA Q | TOTAL AREA | TOTAL Q | CONV TYPE | CONV LNGTH | CONV SLOPE | CONV SIZE | CONV Z | CONTROL Q | SOIL NAME | TC | RAIN ZONE | PCT IMPV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12134 | 1A | 3. | 5. | 3. | 5. | 4 | 450. | 0.01000 | 2.00 | 0.00 | 0. | 20 | 8 | A29 | 0.15 |
| 12134 | 2A | 0. | 0. | 3. | 5. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |
| 12134 | 3A | 0. | 0. | 3. | 5. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |
| 12134 | 4A | 0. | 0. | 3. | 5. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |

MODIFIED RATIONAL METHOD HYDROLOGY

HYDROGRAPH AT OUTLET Line 8

HYDROGRAPH AT 12134 4A STORM DAY 4 REDUCTION FACTOR = 1.000

| TIME | Q | TIME | Q | TIME | Q | TIME | Q | TIME | Q |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0. | 100 | 0. | 200 | 0. | 300 | 0. | 400 | 0. |
| 500 | 0. | 600 | 0. | 700 | 0. | 800 | 0. | 900 | 0. |
| 1000 | 0. | 1050 | 0. | 1100 | 0. | 1110 | 0. | 1120 | 1. |
| 1130 | 1. | 1131 | 1. | 1132 | 1. | 1133 | 1. | 1134 | 1. |
| 1135 | 1. | 1136 | 1. | 1137 | 1. | 1138 | 1. | 1139 | 1. |
| 1140 | 1. | 1141 | 1. | 1142 | 1. | 1143 | 1. | 1144 | 1. |
| 1145 | 1. | 1146 | 2. | 1147 | 2. | 1148 | 2. | 1149 | 2. |
| 1150 | 2. | 1151 | 3. | 1152 | 3. | 1153 | 4. | 1154 | 5. |
| 1155 | 5. | 1156 | 5. | 1157 | 5. | 1158 | 5. | 1159 | 4. |
| 1160 | 4. | 1161 | 3. | 1162 | 2. | 1163 | 2. | 1164 | 1. |
| 1165 | 1. | 1166 | 1. | 1167 | 1. | 1168 | 1. | 1169 | 1. |
| 1170 | 1. | 1171 | 1. | 1172 | 1. | 1173 | 0. | 1174 | 0. |
| 1175 | 0. | 1176 | 0. | 1177 | 0. | 1178 | 0. | 1179 | 0. |
| 1180 | 0. | 1181 | 0. | 1182 | 0. | 1183 | 0. | 1184 | 0. |
| 1185 | 0. | 1186 | 0. | 1187 | 0. | 1188 | 0. | 1189 | 0. |
| 1190 | 0. | 1191 | 0. | 1192 | 0. | 1193 | 0. | 1194 | 0. |
| 1195 | 0. | 1196 | 0. | 1197 | 0. | 1198 | 0. | 1199 | 0. |
| 1200 | 0. | 1201 | 0. | 1202 | 0. | 1203 | 0. | 1204 | 0. |
| 1205 | 0. | 1206 | 0. | 1207 | 0. | 1208 | 0. | 1209 | 0. |
| 1210 | 0. | 1211 | 0. | 1212 | 0. | 1213 | 0. | 1214 | 0. |
| 1215 | 0. | 1216 | 0. | 1217 | 0. | 1218 | 0. | 1219 | 0. |
| 1220 | 0. | 1221 | 0. | 1222 | 0. | 1223 | 0. | 1224 | 0. |
| 1225 | 0. | 1226 | 0. | 1227 | 0. | 1228 | 0. | 1229 | 0. |
| 1230 | 0. | 1231 | 0. | 1232 | 0. | 1233 | 0. | 1234 | 0. |
| 1235 | 0. | 1236 | 0. | 1237 | 0. | 1238 | 0. | 1239 | 0. |
| 1240 | 0. | 1241 | 0. | 1242 | 0. | 1243 | 0. | 1244 | 0. |
| 1245 | 0. | 1246 | 0. | 1247 | 0. | 1248 | 0. | 1249 | 0. |
| 1250 | 0. | 1251 | 0. | 1252 | 0. | 1253 | 0. | 1254 | 0. |
| 1255 | 0. | 1256 | 0. | 1257 | 0. | 1258 | 0. | 1259 | 0. |
| 1260 | 0. | 1261 | 0. | 1262 | 0. | 1263 | 0. | 1264 | 0. |
| 1265 | 0. | 1266 | 0. | 1267 | 0. | 1268 | 0. | 1269 | 0. |
| 1270 | 0. | 1271 | 0. | 1272 | 0. | 1273 | 0. | 1274 | 0. |
| 1275 | 0. | 1276 | 0. | 1277 | 0. | 1278 | 0. | 1279 | 0. |
| 1280 | 0. | 1281 | 0. | 1282 | 0. | 1283 | 0. | 1284 | 0. |
| 1285 | 0. | 1286 | 0. | 1287 | 0. | 1288 | 0. | 1289 | 0. |
| 1290 | 0. | 1291 | 0. | 1292 | 0. | 1293 | 0. | 1294 | 0. |
| 1295 | 0. | 1296 | 0. | 1297 | 0. | 1298 | 0. | 1299 | 0. |
| 1300 | 0. | 1310 | 0. | 1320 | 0. | 1330 | 0. | 1340 | 0. |
| 1350 | 0. | 1360 | 0. | 1370 | 0. | 1380 | 0. | 1390 | 0. |
| 1400 | 0. | 1420 | 0. | 1440 | 0. | 1460 | 0. | 1500 | 0. |

Total Runoff = 0.137 Acre-Ft.
Peak Q = 5 CFS
Time to Peak Q = 1154 Minutes

```
4LADEPTH.RDT
5 12134    1A  50 YR River Village - Newhall Ranch - Landmark  "Line 9"
5 12134   10A  HYDROGRAPH AT OUTLET Line 9
6 12134    1A 020 7408.411A294  110 00700                    G1
6 12134    2A 020 9101.009A29
6 12134    3A 020 9100.708A294   70 00700
6 12134    4A 020 8209.810A294   80 00700
6 12134    5A 020 9101.311A29
6 12134    6A 020 7102.811A294  310 00500
6 12134    7A 020       99A294  100 05000
6 12134    8A 020       99A29                             1  2
```

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT PROG FO601A

MODIFIED RATIONAL METHOD HYDROLOGY

50 YR River Village - Newhall Ranch - Landmark "Line 9" STORM DAY 4

| LOCATION | | SUBAREA AREA | SUBAREA Q | TOTAL AREA | TOTAL Q | CONV TYPE | CONV LNGTH | CONV SLOPE | CONV SIZE | CONV Z | CONTROL Q | SOIL NAME | TC | RAIN ZONE | PCT IMPV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12134 | 1A | 8. | 17. | 8. | 17. | 4 | 110. | 0.00700 | 2.00 | 0.00 | 0. | 20 | 11 | A29 | 0.74 |
| 12134 | 2A | 1. | 3. | 9. | 19. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 9 | A29 | 0.91 |
| 12134 | 3A | 1. | 3. | 10. | 22. | 4 | 70. | 0.00700 | 2.25 | 0.00 | 0. | 20 | 8 | A29 | 0.91 |
| 12134 | 4A | 10. | 23. | 20. | 45. | 4 | 80. | 0.00700 | 2.75 | 0.00 | 0. | 20 | 10 | A29 | 0.82 |
| 12134 | 5A | 1. | 2. | 21. | 47. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 11 | A29 | 0.91 |
| 12134 | 6A | 3. | 6. | 24. | 53. | 4 | 310. | 0.00500 | 3.25 | 0.00 | 0. | 20 | 11 | A29 | 0.71 |
| 12134 | 7A | 0. | 0. | 24. | 53. | 4 | 100. | 0.05000 | 2.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |
| 12134 | 8A | 0. | 0. | 24. | 53. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT PROG FO601A

MODIFIED RATIONAL METHOD HYDROLOGY

HYDROGRAPH AT 12134 8A

HYDROGRAPH AT 12134 8A STORM DAY 4 REDUCTION FACTOR = 1.000

| TIME | Q | TIME | Q | TIME | Q | TIME | Q | TIME | Q |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0. | 100 | 3. | 200 | 3. | 300 | 3. | 400 | 3. |
| 500 | 3. | 600 | 3. | 700 | 4. | 800 | 4. | 900 | 5. |
| 1000 | 6. | 1050 | 7. | 1100 | 9. | 1110 | 11. | 1120 | 13. |
| 1130 | 15. | 1131 | 15. | 1132 | 15. | 1133 | 15. | 1134 | 16. |
| 1135 | 16. | 1136 | 16. | 1137 | 17. | 1138 | 17. | 1139 | 18. |
| 1140 | 18. | 1141 | 19. | 1142 | 19. | 1143 | 20. | 1144 | 21. |
| 1145 | 22. | 1146 | 23. | 1147 | 24. | 1148 | 25. | 1149 | 27. |
| 1150 | 30. | 1151 | 34. | 1152 | 39. | 1153 | 44. | 1154 | 49. |
| 1155 | 52. | 1156 | 53. | 1157 | 53. | 1158 | 51. | 1159 | 50. |
| 1160 | 46. | 1161 | 42. | 1162 | 36. | 1163 | 31. | 1164 | 25. |
| 1165 | 21. | 1166 | 18. | 1167 | 16. | 1168 | 14. | 1169 | 13. |
| 1170 | 12. | 1171 | 12. | 1172 | 11. | 1173 | 11. | 1174 | 10. |
| 1175 | 10. | 1176 | 10. | 1177 | 10. | 1178 | 9. | 1179 | 9. |
| 1180 | 9. | 1181 | 9. | 1182 | 8. | 1183 | 8. | 1184 | 8. |
| 1185 | 8. | 1186 | 8. | 1187 | 8. | 1188 | 7. | 1189 | 7. |
| 1190 | 7. | 1191 | 7. | 1192 | 7. | 1193 | 7. | 1194 | 7. |
| 1195 | 7. | 1196 | 7. | 1197 | 7. | 1198 | 6. | 1199 | 6. |
| 1200 | 6. | 1201 | 6. | 1202 | 6. | 1203 | 6. | 1204 | 6. |
| 1205 | 6. | 1206 | 6. | 1207 | 6. | 1208 | 6. | 1209 | 6. |
| 1210 | 6. | 1211 | 6. | 1212 | 6. | 1213 | 6. | 1214 | 5. |
| 1215 | 5. | 1216 | 5. | 1217 | 5. | 1218 | 5. | 1219 | 5. |
| 1220 | 5. | 1221 | 5. | 1222 | 5. | 1223 | 5. | 1224 | 5. |
| 1225 | 5. | 1226 | 5. | 1227 | 5. | 1228 | 5. | 1229 | 5. |
| 1230 | 5. | 1231 | 5. | 1232 | 5. | 1233 | 5. | 1234 | 5. |
| 1235 | 5. | 1236 | 5. | 1237 | 5. | 1238 | 5. | 1239 | 5. |
| 1240 | 5. | 1241 | 5. | 1242 | 5. | 1243 | 5. | 1244 | 4. |
| 1245 | 4. | 1246 | 4. | 1247 | 4. | 1248 | 4. | 1249 | 4. |
| 1250 | 4. | 1251 | 4. | 1252 | 4. | 1253 | 4. | 1254 | 4. |
| 1255 | 4. | 1256 | 4. | 1257 | 4. | 1258 | 4. | 1259 | 4. |
| 1260 | 4. | 1261 | 4. | 1262 | 4. | 1263 | 4. | 1264 | 4. |
| 1265 | 4. | 1266 | 4. | 1267 | 4. | 1268 | 4. | 1269 | 4. |
| 1270 | 4. | 1271 | 4. | 1272 | 4. | 1273 | 4. | 1274 | 4. |
| 1275 | 4. | 1276 | 4. | 1277 | 4. | 1278 | 4. | 1279 | 4. |
| 1280 | 4. | 1281 | 4. | 1282 | 4. | 1283 | 4. | 1284 | 4. |
| 1285 | 4. | 1286 | 4. | 1287 | 4. | 1288 | 4. | 1289 | 4. |
| 1290 | 4. | 1291 | 4. | 1292 | 4. | 1293 | 4. | 1294 | 4. |
| 1295 | 4. | 1296 | 4. | 1297 | 4. | 1298 | 4. | 1299 | 4. |
| 1300 | 4. | 1310 | 3. | 1320 | 3. | 1330 | 3. | 1340 | 3. |
| 1350 | 3. | 1360 | 3. | 1370 | 3. | 1380 | 3. | 1390 | 3. |
| 1400 | 3. | 1420 | 3. | 1440 | 3. | 1460 | 3. | 1500 | 3. |

Total Runoff = 9.490 Acre-Ft.
Peak Q = 53 CFS
Time to Peak Q = 1156 Minutes

```
4LADEPTH.RDT
5 12134    1A  50 YR River Village - Newhall Ranch - Landmark  "Line 10"
5 12134    7A  HYDROGRAPH AT OUTLET Line 10
6 12134    1A 020 9100.806A294   30 00500                    G1
6 12134    2A 020 7403.205A294  270 01000
6 12134    3A 020 6901.507A29
6 12134    4A 020 6403.308A294  210 01000
6 12134    5A 020       99A294  580 00800
6 12134    6A 020       99A294  160 05000
6 12134    7A 020       99A29                              1  2
```

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT 

MODIFIED RATIONAL METHOD HYDROLOGY

50 YR River Village - Newhall Ranch - Landmark "Line 10" STORM DAY 4

| LOCATION | | SUBAREA AREA | SUBAREA Q | TOTAL AREA | TOTAL Q | CONV TYPE | CONV LNGTH | CONV SLOPE | CONV SIZE | CONV Z | CONTROL Q | SOIL NAME | TC | RAIN ZONE | PCT IMPV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12134 | 1A | 1. | 3. | 1. | 3. | 4 | 30. | 0.00500 | 2.00 | 0.00 | 0. | 20 | 6 | A29 | 0.91 |
| 12134 | 2A | 3. | 9. | 4. | 12. | 4 | 270. | 0.01000 | 2.00 | 0.00 | 0. | 20 | 5 | A29 | 0.74 |
| 12134 | 3A | 1. | 3. | 5. | 14. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 7 | A29 | 0.69 |
| 12134 | 4A | 3. | 7. | 8. | 21. | 4 | 210. | 0.01000 | 2.00 | 0.00 | 0. | 20 | 8 | A29 | 0.64 |
| 12134 | 5A | 0. | 0. | 8. | 21. | 4 | 580. | 0.00800 | 2.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |
| 12134 | 6A | 0. | 0. | 8. | 20. | 4 | 160. | 0.05000 | 2.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |
| 12134 | 7A | 0. | 0. | 8. | 20. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT PROG FO601A

MODIFIED RATIONAL METHOD HYDROLOGY

HYDROGRAPH AT OUTLET Line 10

HYDROGRAPH AT 12134 7A STORM DAY 4 REDUCTION FACTOR = 1.000

| TIME | Q | TIME | Q | TIME | Q | TIME | Q | TIME | Q |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0. | 100 | 1. | 200 | 1. | 300 | 1. | 400 | 1. |
| 500 | 1. | 600 | 1. | 700 | 1. | 800 | 1. | 900 | 2. |
| 1000 | 2. | 1050 | 2. | 1100 | 3. | 1110 | 3. | 1120 | 4. |
| 1130 | 4. | 1131 | 4. | 1132 | 5. | 1133 | 5. | 1134 | 5. |
| 1135 | 5. | 1136 | 5. | 1137 | 5. | 1138 | 5. | 1139 | 5. |
| 1140 | 6. | 1141 | 6. | 1142 | 6. | 1143 | 6. | 1144 | 6. |
| 1145 | 7. | 1146 | 7. | 1147 | 7. | 1148 | 8. | 1149 | 8. |
| 1150 | 9. | 1151 | 10. | 1152 | 11. | 1153 | 13. | 1154 | 15. |
| 1155 | 17. | 1156 | 19. | 1157 | 20. | 1158 | 20. | 1159 | 18. |
| 1160 | 16. | 1161 | 13. | 1162 | 11. | 1163 | 9. | 1164 | 7. |
| 1165 | 6. | 1166 | 5. | 1167 | 5. | 1168 | 5. | 1169 | 4. |
| 1170 | 4. | 1171 | 4. | 1172 | 4. | 1173 | 3. | 1174 | 3. |
| 1175 | 3. | 1176 | 3. | 1177 | 3. | 1178 | 3. | 1179 | 3. |
| 1180 | 3. | 1181 | 3. | 1182 | 3. | 1183 | 3. | 1184 | 3. |
| 1185 | 2. | 1186 | 2. | 1187 | 2. | 1188 | 2. | 1189 | 2. |
| 1190 | 2. | 1191 | 2. | 1192 | 2. | 1193 | 2. | 1194 | 2. |
| 1195 | 2. | 1196 | 2. | 1197 | 2. | 1198 | 2. | 1199 | 2. |
| 1200 | 2. | 1201 | 2. | 1202 | 2. | 1203 | 2. | 1204 | 2. |
| 1205 | 2. | 1206 | 2. | 1207 | 2. | 1208 | 2. | 1209 | 2. |
| 1210 | 2. | 1211 | 2. | 1212 | 2. | 1213 | 2. | 1214 | 2. |
| 1215 | 2. | 1216 | 2. | 1217 | 2. | 1218 | 2. | 1219 | 2. |
| 1220 | 2. | 1221 | 2. | 1222 | 2. | 1223 | 2. | 1224 | 2. |
| 1225 | 2. | 1226 | 2. | 1227 | 2. | 1228 | 2. | 1229 | 2. |
| 1230 | 2. | 1231 | 2. | 1232 | 2. | 1233 | 2. | 1234 | 2. |
| 1235 | 2. | 1236 | 2. | 1237 | 2. | 1238 | 2. | 1239 | 2. |
| 1240 | 2. | 1241 | 2. | 1242 | 2. | 1243 | 2. | 1244 | 2. |
| 1245 | 2. | 1246 | 2. | 1247 | 2. | 1248 | 2. | 1249 | 2. |
| 1250 | 2. | 1251 | 2. | 1252 | 2. | 1253 | 2. | 1254 | 1. |
| 1255 | 1. | 1256 | 1. | 1257 | 1. | 1258 | 1. | 1259 | 1. |
| 1260 | 1. | 1261 | 1. | 1262 | 1. | 1263 | 1. | 1264 | 1. |
| 1265 | 1. | 1266 | 1. | 1267 | 1. | 1268 | 1. | 1269 | 1. |
| 1270 | 1. | 1271 | 1. | 1272 | 1. | 1273 | 1. | 1274 | 1. |
| 1275 | 1. | 1276 | 1. | 1277 | 1. | 1278 | 1. | 1279 | 1. |
| 1280 | 1. | 1281 | 1. | 1282 | 1. | 1283 | 1. | 1284 | 1. |
| 1285 | 1. | 1286 | 1. | 1287 | 1. | 1288 | 1. | 1289 | 1. |
| 1290 | 1. | 1291 | 1. | 1292 | 1. | 1293 | 1. | 1294 | 1. |
| 1295 | 1. | 1296 | 1. | 1297 | 1. | 1298 | 1. | 1299 | 1. |
| 1300 | 1. | 1310 | 1. | 1320 | 1. | 1330 | 1. | 1340 | 1. |
| 1350 | 1. | 1360 | 1. | 1370 | 1. | 1380 | 1. | 1390 | 1. |
| 1400 | 1. | 1420 | 1. | 1440 | 1. | 1460 | 1. | 1500 | 1. |

Total Runoff = 3.042 Acre-Ft.
Peak Q = 20 CFS
Time to Peak Q = 1157 Minutes

```
4LADEPTH.RDT
5 12134    1A  50 YR River Village - Newhall Ranch - Landmark  "Line 11"
5 12134    9A  HYDROGRAPH AT OUTLET Line 11
6 12134    1A 020 9100.305A294   25 00700                    G1
6 12134    2A 020 7401.205A29
6 12134    3A 020 9100.205A294   35 00700
6 12134    4A 020 9100.205A294  460 00700
6 12134    5A 020 7102.207A294   40 00700
6 12134    6A 020 7601.307A29
6 12134    7A 020 6600.305A294   45 00700
6 12134    8A 020 1603.515A294  195 05000
6 12134    9A 020       99A29                            1  2
```

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT 

MODIFIED RATIONAL METHOD HYDROLOGY

50 YR River Village - Newhall Ranch - Landmark "Line 11" STORM DAY 4

| LOCATION | | SUBAREA AREA | SUBAREA Q | TOTAL AREA | TOTAL Q | CONV TYPE | CONV LNGTH | CONV SLOPE | CONV SIZE | CONV Z | CONTROL Q | SOIL NAME | TC | RAIN ZONE | PCT IMPV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12134 | 1A | 0. | 0. | 0. | 0. | 4 | 25. | 0.00700 | 0.00 | 0.00 | 0. | 20 | 5 | A29 | 0.91 |
| 12134 | 2A | 1. | 3. | 1. | 3. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 5 | A29 | 0.74 |
| 12134 | 3A | 0. | 0. | 1. | 3. | 4 | 35. | 0.00700 | 2.00 | 0.00 | 0. | 20 | 5 | A29 | 0.91 |
| 12134 | 4A | 0. | 0. | 1. | 3. | 4 | 460. | 0.00700 | 2.00 | 0.00 | 0. | 20 | 5 | A29 | 0.91 |
| 12134 | 5A | 2. | 5. | 3. | 8. | 4 | 40. | 0.00700 | 2.00 | 0.00 | 0. | 20 | 7 | A29 | 0.71 |
| 12134 | 6A | 1. | 3. | 4. | 10. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 7 | A29 | 0.76 |
| 12134 | 7A | 0. | 0. | 4. | 10. | 4 | 45. | 0.00700 | 2.00 | 0.00 | 0. | 20 | 5 | A29 | 0.66 |
| 12134 | 8A | 3. | 4. | 7. | 14. | 4 | 195. | 0.05000 | 2.00 | 0.00 | 0. | 20 | 15 | A29 | 0.16 |
| 12134 | 9A | 0. | 0. | 7. | 14. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT PROG FO601A

MODIFIED RATIONAL METHOD HYDROLOGY

HYDROGRAPH AT OUTLET Line 11

HYDROGRAPH AT 12134 9A STORM DAY 4 REDUCTION FACTOR = 1.000

| TIME | Q | TIME | Q | TIME | Q | TIME | Q | TIME | Q |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0. | 100 | 1. | 200 | 1. | 300 | 1. | 400 | 1. |
| 500 | 1. | 600 | 1. | 700 | 1. | 800 | 1. | 900 | 1. |
| 1000 | 1. | 1050 | 2. | 1100 | 2. | 1110 | 2. | 1120 | 3. |
| 1130 | 3. | 1131 | 3. | 1132 | 3. | 1133 | 3. | 1134 | 3. |
| 1135 | 4. | 1136 | 4. | 1137 | 4. | 1138 | 4. | 1139 | 4. |
| 1140 | 4. | 1141 | 4. | 1142 | 4. | 1143 | 5. | 1144 | 5. |
| 1145 | 5. | 1146 | 5. | 1147 | 6. | 1148 | 6. | 1149 | 7. |
| 1150 | 8. | 1151 | 10. | 1152 | 11. | 1153 | 13. | 1154 | 14. |
| 1155 | 14. | 1156 | 14. | 1157 | 13. | 1158 | 11. | 1159 | 10. |
| 1160 | 8. | 1161 | 7. | 1162 | 6. | 1163 | 6. | 1164 | 5. |
| 1165 | 5. | 1166 | 4. | 1167 | 4. | 1168 | 3. | 1169 | 3. |
| 1170 | 2. | 1171 | 2. | 1172 | 2. | 1173 | 2. | 1174 | 2. |
| 1175 | 2. | 1176 | 2. | 1177 | 2. | 1178 | 2. | 1179 | 2. |
| 1180 | 2. | 1181 | 2. | 1182 | 2. | 1183 | 2. | 1184 | 2. |
| 1185 | 2. | 1186 | 2. | 1187 | 2. | 1188 | 2. | 1189 | 2. |
| 1190 | 1. | 1191 | 1. | 1192 | 1. | 1193 | 1. | 1194 | 1. |
| 1195 | 1. | 1196 | 1. | 1197 | 1. | 1198 | 1. | 1199 | 1. |
| 1200 | 1. | 1201 | 1. | 1202 | 1. | 1203 | 1. | 1204 | 1. |
| 1205 | 1. | 1206 | 1. | 1207 | 1. | 1208 | 1. | 1209 | 1. |
| 1210 | 1. | 1211 | 1. | 1212 | 1. | 1213 | 1. | 1214 | 1. |
| 1215 | 1. | 1216 | 1. | 1217 | 1. | 1218 | 1. | 1219 | 1. |
| 1220 | 1. | 1221 | 1. | 1222 | 1. | 1223 | 1. | 1224 | 1. |
| 1225 | 1. | 1226 | 1. | 1227 | 1. | 1228 | 1. | 1229 | 1. |
| 1230 | 1. | 1231 | 1. | 1232 | 1. | 1233 | 1. | 1234 | 1. |
| 1235 | 1. | 1236 | 1. | 1237 | 1. | 1238 | 1. | 1239 | 1. |
| 1240 | 1. | 1241 | 1. | 1242 | 1. | 1243 | 1. | 1244 | 1. |
| 1245 | 1. | 1246 | 1. | 1247 | 1. | 1248 | 1. | 1249 | 1. |
| 1250 | 1. | 1251 | 1. | 1252 | 1. | 1253 | 1. | 1254 | 1. |
| 1255 | 1. | 1256 | 1. | 1257 | 1. | 1258 | 1. | 1259 | 1. |
| 1260 | 1. | 1261 | 1. | 1262 | 1. | 1263 | 1. | 1264 | 1. |
| 1265 | 1. | 1266 | 1. | 1267 | 1. | 1268 | 1. | 1269 | 1. |
| 1270 | 1. | 1271 | 1. | 1272 | 1. | 1273 | 1. | 1274 | 1. |
| 1275 | 1. | 1276 | 1. | 1277 | 1. | 1278 | 1. | 1279 | 1. |
| 1280 | 1. | 1281 | 1. | 1282 | 1. | 1283 | 1. | 1284 | 1. |
| 1285 | 1. | 1286 | 1. | 1287 | 1. | 1288 | 1. | 1289 | 1. |
| 1290 | 1. | 1291 | 1. | 1292 | 1. | 1293 | 1. | 1294 | 1. |
| 1295 | 1. | 1296 | 1. | 1297 | 1. | 1298 | 1. | 1299 | 1. |
| 1300 | 1. | 1310 | 1. | 1320 | 1. | 1330 | 1. | 1340 | 1. |
| 1350 | 1. | 1360 | 1. | 1370 | 1. | 1380 | 1. | 1390 | 1. |
| 1400 | 1. | 1420 | 1. | 1440 | 1. | 1460 | 1. | 1500 | 1. |

Total Runoff = 2.485 Acre-Ft.
Peak Q = 14 CFS
Time to Peak Q = 1154 Minutes

```
4LADEPTH.RDT
5 12134    1A  50 YR River Village - Newhall Ranch - Landmark  "Line 12"
5 12134    7A  HYDROGRAPH AT OUTLET Line 12
6 12134    1A 020 9100.912A294   95 00700                    G1
6 12134    2A 020 6503.008A294  330 00800
6 12134    3A 020 6802.012A294   35 00700
6 12134    4A 020 6502.109A294   50 00700
6 12134    5A 020 9101.007A294   60 02000
6 12134    6A 020 1601.911A294  110 05000
6 12134    7A 020       99A29                              1  2
```

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT 

MODIFIED RATIONAL METHOD HYDROLOGY

50 YR River Village - Newhall Ranch - Landmark "Line 12" STORM DAY 4

| LOCATION | | SUBAREA AREA | SUBAREA Q | TOTAL AREA | TOTAL Q | CONV TYPE | CONV LNGTH | CONV SLOPE | CONV SIZE | CONV Z | CONTROL Q | SOIL NAME | TC | RAIN ZONE | PCT IMPV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12134 | 1A | 1. | 2. | 1. | 2. | 4 | 95. | 0.00700 | 2.00 | 0.00 | 0. | 20 | 12 | A29 | 0.91 |
| 12134 | 2A | 3. | 7. | 4. | 9. | 4 | 330. | 0.00800 | 2.00 | 0.00 | 0. | 20 | 8 | A29 | 0.65 |
| 12134 | 3A | 2. | 4. | 6. | 13. | 4 | 35. | 0.00700 | 2.00 | 0.00 | 0. | 20 | 12 | A29 | 0.68 |
| 12134 | 4A | 2. | 4. | 8. | 17. | 4 | 50. | 0.00700 | 2.00 | 0.00 | 0. | 20 | 9 | A29 | 0.65 |
| 12134 | 5A | 1. | 3. | 9. | 20. | 4 | 60. | 0.02000 | 2.00 | 0.00 | 0. | 20 | 7 | A29 | 0.91 |
| 12134 | 6A | 2. | 3. | 11. | 23. | 4 | 110. | 0.05000 | 2.00 | 0.00 | 0. | 20 | 11 | A29 | 0.16 |
| 12134 | 7A | 0. | 0. | 11. | 23. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |

HYDROGRAPH AT OUTLET Line 12

HYDROGRAPH AT 12134 7A STORM DAY 4 REDUCTION FACTOR = 1.000

| TIME | Q | TIME | Q | TIME | Q | TIME | Q | TIME | Q |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0. | 100 | 1. | 200 | 1. | 300 | 1. | 400 | 1. |
| 500 | 1. | 600 | 1. | 700 | 2. | 800 | 2. | 900 | 2. |
| 1000 | 2. | 1050 | 3. | 1100 | 3. | 1110 | 4. | 1120 | 5. |
| 1130 | 6. | 1131 | 6. | 1132 | 6. | 1133 | 6. | 1134 | 6. |
| 1135 | 6. | 1136 | 6. | 1137 | 7. | 1138 | 7. | 1139 | 7. |
| 1140 | 7. | 1141 | 8. | 1142 | 8. | 1143 | 8. | 1144 | 9. |
| 1145 | 9. | 1146 | 9. | 1147 | 10. | 1148 | 11. | 1149 | 12. |
| 1150 | 14. | 1151 | 16. | 1152 | 18. | 1153 | 21. | 1154 | 22. |
| 1155 | 23. | 1156 | 23. | 1157 | 22. | 1158 | 21. | 1159 | 19. |
| 1160 | 17. | 1161 | 14. | 1162 | 12. | 1163 | 10. | 1164 | 8. |
| 1165 | 7. | 1166 | 6. | 1167 | 6. | 1168 | 5. | 1169 | 5. |
| 1170 | 5. | 1171 | 4. | 1172 | 4. | 1173 | 4. | 1174 | 4. |
| 1175 | 4. | 1176 | 4. | 1177 | 3. | 1178 | 3. | 1179 | 3. |
| 1180 | 3. | 1181 | 3. | 1182 | 3. | 1183 | 3. | 1184 | 3. |
| 1185 | 3. | 1186 | 3. | 1187 | 3. | 1188 | 3. | 1189 | 3. |
| 1190 | 3. | 1191 | 3. | 1192 | 3. | 1193 | 3. | 1194 | 3. |
| 1195 | 3. | 1196 | 2. | 1197 | 2. | 1198 | 2. | 1199 | 2. |
| 1200 | 2. | 1201 | 2. | 1202 | 2. | 1203 | 2. | 1204 | 2. |
| 1205 | 2. | 1206 | 2. | 1207 | 2. | 1208 | 2. | 1209 | 2. |
| 1210 | 2. | 1211 | 2. | 1212 | 2. | 1213 | 2. | 1214 | 2. |
| 1215 | 2. | 1216 | 2. | 1217 | 2. | 1218 | 2. | 1219 | 2. |
| 1220 | 2. | 1221 | 2. | 1222 | 2. | 1223 | 2. | 1224 | 2. |
| 1225 | 2. | 1226 | 2. | 1227 | 2. | 1228 | 2. | 1229 | 2. |
| 1230 | 2. | 1231 | 2. | 1232 | 2. | 1233 | 2. | 1234 | 2. |
| 1235 | 2. | 1236 | 2. | 1237 | 2. | 1238 | 2. | 1239 | 2. |
| 1240 | 2. | 1241 | 2. | 1242 | 2. | 1243 | 2. | 1244 | 2. |
| 1245 | 2. | 1246 | 2. | 1247 | 2. | 1248 | 2. | 1249 | 2. |
| 1250 | 2. | 1251 | 2. | 1252 | 2. | 1253 | 2. | 1254 | 2. |
| 1255 | 2. | 1256 | 2. | 1257 | 2. | 1258 | 2. | 1259 | 2. |
| 1260 | 2. | 1261 | 2. | 1262 | 2. | 1263 | 2. | 1264 | 2. |
| 1265 | 2. | 1266 | 2. | 1267 | 2. | 1268 | 2. | 1269 | 2. |
| 1270 | 2. | 1271 | 2. | 1272 | 2. | 1273 | 2. | 1274 | 2. |
| 1275 | 2. | 1276 | 2. | 1277 | 2. | 1278 | 2. | 1279 | 2. |
| 1280 | 2. | 1281 | 2. | 1282 | 2. | 1283 | 2. | 1284 | 2. |
| 1285 | 2. | 1286 | 2. | 1287 | 2. | 1288 | 2. | 1289 | 2. |
| 1290 | 2. | 1291 | 2. | 1292 | 2. | 1293 | 2. | 1294 | 2. |
| 1295 | 2. | 1296 | 2. | 1297 | 2. | 1298 | 2. | 1299 | 2. |
| 1300 | 2. | 1310 | 1. | 1320 | 1. | 1330 | 1. | 1340 | 1. |
| 1350 | 1. | 1360 | 1. | 1370 | 1. | 1380 | 1. | 1390 | 1. |
| 1400 | 1. | 1420 | 1. | 1440 | 1. | 1460 | 1. | 1500 | 1. |

Total Runoff = 3.650 Acre-Ft.
Peak Q = 23 CFS
Time to Peak Q = 1155 Minutes

```
4LADEPTH.RDT
5 12134    1A  50 YR River Village - Newhall Ranch - Landmark  "Line 13"
5 12134   16A  HYDROGRAPH AT OUTLET Line 13
6 12134    1A 020 7401.907A294  185 00800                    G1
6 12134    2A 020 9100.506A294   15 00800
6 12134    3A 020 9100.306A294 1065 00800
6 12134    4A 020 7411.015A294  120 00800
6 12134    5A 020 9101.813A294   25 00800
6 12134    6A 020 9101.312A294   22 00800
6 12134    7A 020 7404.911A294  275 00800
6 12134    8A 020 9100.506A294   30 00800
6 12134    9A 020 9100.505A294  275 00800
6 12134   10A 020 9101.105A294   40 00800
6 12134   11A 020 9101.006A294  100 00800
6 12134   12A 020 7417.711A29
6 12134   13A 020 7404.008A294  810 00800
6 12134   14B 020 1301.007A294  180 01000
6 12134   15AB020         A294  125 05000
6 12134   16A 020       99A29                             1  2
```

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT PROG FO601A

MODIFIED RATIONAL METHOD HYDROLOGY

50 YR River Village - Newhall Ranch - Landmark "Line 13" STORM DAY 4

| LOCATION | | SUBAREA AREA | SUBAREA Q | TOTAL AREA | TOTAL Q | CONV TYPE | CONV LNGTH | CONV SLOPE | CONV SIZE | CONV Z | CONTROL Q | SOIL NAME | TC | RAIN ZONE | PCT IMPV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12134 | 1A | 2. | 5. | 2. | 5. | 4 | 185. | 0.00800 | 2.00 | 0.00 | 0. | 20 | 7 | A29 | 0.74 |
| 12134 | 2A | 0. | 0. | 2. | 5. | 4 | 15. | 0.00800 | 2.00 | 0.00 | 0. | 20 | 6 | A29 | 0.91 |
| 12134 | 3A | 0. | 0. | 2. | 5. | 4 | 1065. | 0.00800 | 2.00 | 0.00 | 0. | 20 | 6 | A29 | 0.91 |
| 12134 | 4A | 11. | 20. | 13. | 24. | 4 | 120. | 0.00800 | 2.25 | 0.00 | 0. | 20 | 15 | A29 | 0.74 |
| 12134 | 5A | 2. | 4. | 15. | 28. | 4 | 25. | 0.00800 | 2.25 | 0.00 | 0. | 20 | 13 | A29 | 0.91 |
| 12134 | 6A | 1. | 2. | 16. | 30. | 4 | 22. | 0.00800 | 2.50 | 0.00 | 0. | 20 | 12 | A29 | 0.91 |
| 12134 | 7A | 5. | 11. | 21. | 40. | 4 | 275. | 0.00800 | 2.75 | 0.00 | 0. | 20 | 11 | A29 | 0.74 |
| 12134 | 8A | 0. | 0. | 21. | 40. | 4 | 30. | 0.00800 | 2.75 | 0.00 | 0. | 20 | 6 | A29 | 0.91 |
| 12134 | 9A | 0. | 0. | 21. | 40. | 4 | 275. | 0.00800 | 2.75 | 0.00 | 0. | 20 | 5 | A29 | 0.91 |
| 12134 | 10A | 1. | 3. | 22. | 41. | 4 | 40. | 0.00800 | 2.75 | 0.00 | 0. | 20 | 5 | A29 | 0.91 |
| 12134 | 11A | 1. | 3. | 23. | 43. | 4 | 100. | 0.00800 | 2.75 | 0.00 | 0. | 20 | 6 | A29 | 0.91 |
| 12134 | 12A | 18. | 38. | 41. | 80. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 11 | A29 | 0.74 |
| 12134 | 13A | 4. | 10. | 45. | 89. | 4 | 810. | 0.00800 | 3.50 | 0.00 | 0. | 20 | 8 | A29 | 0.74 |
| 12134 | 14B | 1. | 2. | 1. | 2. | 4 | 180. | 0.01000 | 2.00 | 0.00 | 0. | 20 | 7 | A29 | 0.13 |
| 12134 | 15AB | 1. | 2. | 46. | 89. | 4 | 125. | 0.05000 | 2.50 | 0.00 | 0. | 20 | 0 | A29 | 0.00 |
| 12134 | 16A | 0. | 0. | 46. | 89. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT PROG FO601A

MODIFIED RATIONAL METHOD HYDROLOGY

HYDROGRAPH AT OUTLET Line 13

HYDROGRAPH AT 12134 16A STORM DAY 4 REDUCTION FACTOR = 1.000

| TIME | Q | TIME | Q | TIME | Q | TIME | Q | TIME | Q |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0. | 100 | 5. | 200 | 5. | 300 | 6. | 400 | 6. |
| 500 | 6. | 600 | 7. | 700 | 7. | 800 | 8. | 900 | 9. |
| 1000 | 11. | 1050 | 13. | 1100 | 17. | 1110 | 19. | 1120 | 22. |
| 1130 | 26. | 1131 | 26. | 1132 | 27. | 1133 | 27. | 1134 | 28. |
| 1135 | 28. | 1136 | 29. | 1137 | 29. | 1138 | 30. | 1139 | 31. |
| 1140 | 31. | 1141 | 32. | 1142 | 33. | 1143 | 34. | 1144 | 35. |
| 1145 | 37. | 1146 | 38. | 1147 | 40. | 1148 | 42. | 1149 | 44. |
| 1150 | 47. | 1151 | 52. | 1152 | 59. | 1153 | 66. | 1154 | 74. |
| 1155 | 81. | 1156 | 86. | 1157 | 88. | 1158 | 89. | 1159 | 88. |
| 1160 | 86. | 1161 | 82. | 1162 | 77. | 1163 | 71. | 1164 | 65. |
| 1165 | 58. | 1166 | 52. | 1167 | 47. | 1168 | 42. | 1169 | 38. |
| 1170 | 35. | 1171 | 32. | 1172 | 29. | 1173 | 26. | 1174 | 24. |
| 1175 | 23. | 1176 | 21. | 1177 | 20. | 1178 | 20. | 1179 | 19. |
| 1180 | 18. | 1181 | 18. | 1182 | 17. | 1183 | 17. | 1184 | 16. |
| 1185 | 16. | 1186 | 16. | 1187 | 15. | 1188 | 15. | 1189 | 15. |
| 1190 | 14. | 1191 | 14. | 1192 | 14. | 1193 | 14. | 1194 | 13. |
| 1195 | 13. | 1196 | 13. | 1197 | 13. | 1198 | 13. | 1199 | 13. |
| 1200 | 12. | 1201 | 12. | 1202 | 12. | 1203 | 12. | 1204 | 12. |
| 1205 | 12. | 1206 | 12. | 1207 | 11. | 1208 | 11. | 1209 | 11. |
| 1210 | 11. | 1211 | 11. | 1212 | 11. | 1213 | 11. | 1214 | 11. |
| 1215 | 11. | 1216 | 10. | 1217 | 10. | 1218 | 10. | 1219 | 10. |
| 1220 | 10. | 1221 | 10. | 1222 | 10. | 1223 | 10. | 1224 | 10. |
| 1225 | 10. | 1226 | 10. | 1227 | 10. | 1228 | 10. | 1229 | 9. |
| 1230 | 9. | 1231 | 9. | 1232 | 9. | 1233 | 9. | 1234 | 9. |
| 1235 | 9. | 1236 | 9. | 1237 | 9. | 1238 | 9. | 1239 | 9. |
| 1240 | 9. | 1241 | 9. | 1242 | 9. | 1243 | 9. | 1244 | 9. |
| 1245 | 9. | 1246 | 9. | 1247 | 9. | 1248 | 8. | 1249 | 8. |
| 1250 | 8. | 1251 | 8. | 1252 | 8. | 1253 | 8. | 1254 | 8. |
| 1255 | 8. | 1256 | 8. | 1257 | 8. | 1258 | 8. | 1259 | 8. |
| 1260 | 8. | 1261 | 8. | 1262 | 8. | 1263 | 8. | 1264 | 8. |
| 1265 | 8. | 1266 | 8. | 1267 | 8. | 1268 | 8. | 1269 | 8. |
| 1270 | 8. | 1271 | 8. | 1272 | 8. | 1273 | 8. | 1274 | 8. |
| 1275 | 8. | 1276 | 8. | 1277 | 8. | 1278 | 7. | 1279 | 7. |
| 1280 | 7. | 1281 | 7. | 1282 | 7. | 1283 | 7. | 1284 | 7. |
| 1285 | 7. | 1286 | 7. | 1287 | 7. | 1288 | 7. | 1289 | 7. |
| 1290 | 7. | 1291 | 7. | 1292 | 7. | 1293 | 7. | 1294 | 7. |
| 1295 | 7. | 1296 | 7. | 1297 | 7. | 1298 | 7. | 1299 | 7. |
| 1300 | 7. | 1310 | 7. | 1320 | 7. | 1330 | 6. | 1340 | 6. |
| 1350 | 6. | 1360 | 6. | 1370 | 6. | 1380 | 6. | 1390 | 6. |
| 1400 | 6. | 1420 | 5. | 1440 | 5. | 1460 | 5. | 1500 | 5. |

Total Runoff = 17.864 Acre-Ft.
Peak Q = 89 CFS
Time to Peak Q = 1158 Minutes

```
4LADEPTH.RDT
5 12134    1A  50 YR River Village - Newhall Ranch - Landmark  "Line 14"
5 12134   16A  HYDROGRAPH AT OUTLET Line 14
6 12134    1A 020 9102.210A294   50 00500                    G1
6 12134    2A 020 9100.705A294   50 00500
6 12134    3A 020 9102.007A294  275 00500
6 12134    4A 020 9102.410A294  275 01200
6 12134    5AB020         A29
6 12134    6A 020       99A29
6 12134    7C 020 9100.607A294   60 00700
6 12134    8C 020 9100.305A294   80 00700
6 12134    9AC020         A29
6 12134   10A 020 9100.305A29
6 12134   11A 020 9100.706A294  280 00700
6 12134   12A 020 9107.410A294   40 00700
6 12134   13D 020 7805.711A294  500 00500
6 12134   14D 020 5003.110A29
6 12134   15AD020         A294  100 05000
6 12134   16A 020       99A29                            1  2
```

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT PROG FO601A

MODIFIED RATIONAL METHOD HYDROLOGY

50 YR River Village - Newhall Ranch - Landmark "Line 14" STORM DAY 4

| LOCATION | | SUBAREA AREA | SUBAREA Q | TOTAL AREA | TOTAL Q | CONV TYPE | CONV LNGTH | CONV SLOPE | CONV SIZE | CONV Z | CONTROL Q | SOIL NAME | TC | RAIN ZONE | PCT IMPV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12134 | 1A | 2. | 5. | 2. | 5. | 4 | 50. | 0.00500 | 2.00 | 0.00 | 0. | 20 | 10 | A29 | 0.91 |
| 12134 | 2A | 1. | 3. | 3. | 8. | 4 | 50. | 0.00500 | 2.00 | 0.00 | 0. | 20 | 5 | A29 | 0.91 |
| 12134 | 3A | 2. | 6. | 5. | 13. | 4 | 275. | 0.00500 | 2.00 | 0.00 | 0. | 20 | 7 | A29 | 0.91 |
| 12134 | 4A | 2. | 5. | 7. | 18. | 4 | 275. | 0.01200 | 2.00 | 0.00 | 0. | 20 | 10 | A29 | 0.91 |
| 12134 | 5AB | 0. | 0. | 7. | 18. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 0 | A29 | 0.00 |
| 12134 | 6A | 0. | 0. | 7. | 18. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |
| 12134 | 7C | 1. | 3. | 1. | 3. | 4 | 60. | 0.00700 | 2.00 | 0.00 | 0. | 20 | 7 | A29 | 0.91 |
| 12134 | 8C | 0. | 0. | 1. | 3. | 4 | 80. | 0.00700 | 2.00 | 0.00 | 0. | 20 | 5 | A29 | 0.91 |
| 12134 | 9AC | 1. | 3. | 8. | 20. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 0 | A29 | 0.00 |
| 12134 | 10A | 0. | 0. | 8. | 20. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 5 | A29 | 0.91 |
| 12134 | 11A | 1. | 3. | 9. | 23. | 4 | 280. | 0.00700 | 2.25 | 0.00 | 0. | 20 | 6 | A29 | 0.91 |
| 12134 | 12A | 7. | 17. | 16. | 39. | 4 | 40. | 0.00700 | 2.75 | 0.00 | 0. | 20 | 10 | A29 | 0.91 |
| 12134 | 13D | 6. | 13. | 6. | 13. | 4 | 500. | 0.00500 | 2.00 | 0.00 | 0. | 20 | 11 | A29 | 0.78 |
| 12134 | 14D | 3. | 6. | 9. | 18. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 10 | A29 | 0.50 |
| 12134 | 15AD | 9. | 18. | 25. | 57. | 4 | 100. | 0.05000 | 2.25 | 0.00 | 0. | 20 | 0 | A29 | 0.00 |
| 12134 | 16A | 0. | 0. | 25. | 57. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |

HYDROGRAPH AT OUTLET Line 14

HYDROGRAPH AT 12134 16A STORM DAY 4 REDUCTION FACTOR = 1.000

| TIME | Q | TIME | Q | TIME | Q | TIME | Q | TIME | Q |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0. | 100 | 3. | 200 | 3. | 300 | 3. | 400 | 4. |
| 500 | 4. | 600 | 4. | 700 | 4. | 800 | 5. | 900 | 5. |
| 1000 | 6. | 1050 | 8. | 1100 | 10. | 1110 | 12. | 1120 | 14. |
| 1130 | 16. | 1131 | 16. | 1132 | 16. | 1133 | 17. | 1134 | 17. |
| 1135 | 17. | 1136 | 18. | 1137 | 18. | 1138 | 19. | 1139 | 19. |
| 1140 | 20. | 1141 | 20. | 1142 | 21. | 1143 | 22. | 1144 | 22. |
| 1145 | 23. | 1146 | 25. | 1147 | 26. | 1148 | 27. | 1149 | 30. |
| 1150 | 34. | 1151 | 38. | 1152 | 43. | 1153 | 49. | 1154 | 53. |
| 1155 | 56. | 1156 | 57. | 1157 | 57. | 1158 | 55. | 1159 | 51. |
| 1160 | 46. | 1161 | 41. | 1162 | 35. | 1163 | 29. | 1164 | 25. |
| 1165 | 22. | 1166 | 19. | 1167 | 17. | 1168 | 16. | 1169 | 14. |
| 1170 | 14. | 1171 | 13. | 1172 | 12. | 1173 | 12. | 1174 | 11. |
| 1175 | 11. | 1176 | 11. | 1177 | 10. | 1178 | 10. | 1179 | 10. |
| 1180 | 10. | 1181 | 9. | 1182 | 9. | 1183 | 9. | 1184 | 9. |
| 1185 | 9. | 1186 | 8. | 1187 | 8. | 1188 | 8. | 1189 | 8. |
| 1190 | 8. | 1191 | 8. | 1192 | 8. | 1193 | 8. | 1194 | 7. |
| 1195 | 7. | 1196 | 7. | 1197 | 7. | 1198 | 7. | 1199 | 7. |
| 1200 | 7. | 1201 | 7. | 1202 | 7. | 1203 | 7. | 1204 | 7. |
| 1205 | 7. | 1206 | 7. | 1207 | 6. | 1208 | 6. | 1209 | 6. |
| 1210 | 6. | 1211 | 6. | 1212 | 6. | 1213 | 6. | 1214 | 6. |
| 1215 | 6. | 1216 | 6. | 1217 | 6. | 1218 | 6. | 1219 | 6. |
| 1220 | 6. | 1221 | 6. | 1222 | 6. | 1223 | 6. | 1224 | 6. |
| 1225 | 6. | 1226 | 6. | 1227 | 6. | 1228 | 6. | 1229 | 5. |
| 1230 | 5. | 1231 | 5. | 1232 | 5. | 1233 | 5. | 1234 | 5. |
| 1235 | 5. | 1236 | 5. | 1237 | 5. | 1238 | 5. | 1239 | 5. |
| 1240 | 5. | 1241 | 5. | 1242 | 5. | 1243 | 5. | 1244 | 5. |
| 1245 | 5. | 1246 | 5. | 1247 | 5. | 1248 | 5. | 1249 | 5. |
| 1250 | 5. | 1251 | 5. | 1252 | 5. | 1253 | 5. | 1254 | 5. |
| 1255 | 5. | 1256 | 5. | 1257 | 5. | 1258 | 5. | 1259 | 5. |
| 1260 | 5. | 1261 | 5. | 1262 | 5. | 1263 | 5. | 1264 | 5. |
| 1265 | 5. | 1266 | 5. | 1267 | 5. | 1268 | 4. | 1269 | 5. |
| 1270 | 4. | 1271 | 4. | 1272 | 4. | 1273 | 4. | 1274 | 4. |
| 1275 | 4. | 1276 | 4. | 1277 | 4. | 1278 | 4. | 1279 | 4. |
| 1280 | 4. | 1281 | 4. | 1282 | 4. | 1283 | 4. | 1284 | 4. |
| 1285 | 4. | 1286 | 4. | 1287 | 4. | 1288 | 4. | 1289 | 4. |
| 1290 | 4. | 1291 | 4. | 1292 | 4. | 1293 | 4. | 1294 | 4. |
| 1295 | 4. | 1296 | 4. | 1297 | 4. | 1298 | 4. | 1299 | 4. |
| 1300 | 4. | 1310 | 4. | 1320 | 4. | 1330 | 4. | 1340 | 4. |
| 1350 | 4. | 1360 | 4. | 1370 | 4. | 1380 | 3. | 1390 | 3. |
| 1400 | 3. | 1420 | 3. | 1440 | 3. | 1460 | 3. | 1500 | 3. |

Total Runoff = 10.475 Acre-Ft.
Peak Q = 57 CFS
Time to Peak Q = 1156 Minutes

```
4LADEPTH.RDT
5 12134    1A  50 YR River Village - Newhall Ranch - Landmark  "Line 15"
5 12134    4A  HYDROGRAPH AT OUTLET Line 2
6 12134    1A 020 1501.308A294  500 00700                    G1
6 12134    2B 020 1001.905A294   50 01000
6 12134    3AB020          A294   70 05000
6 12134    4A 020       99A29                              1  2
```

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT 

MODIFIED RATIONAL METHOD HYDROLOGY

50 YR River Village - Newhall Ranch - Landmark "Line 15" STORM DAY 4

| LOCATION | | SUBAREA AREA | SUBAREA Q | TOTAL AREA | TOTAL Q | CONV TYPE | CONV LNGTH | CONV SLOPE | CONV SIZE | CONV Z | CONTROL Q | SOIL NAME | TC | RAIN ZONE | PCT IMPV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12134 | 1A | 1. | 2. | 1. | 2. | 4 | 500. | 0.00700 | 2.00 | 0.00 | 0. | 20 | 8 | A29 | 0.15 |
| 12134 | 2B | 2. | 5. | 2. | 5. | 4 | 50. | 0.01000 | 2.00 | 0.00 | 0. | 20 | 5 | A29 | 0.10 |
| 12134 | 3AB | 2. | 5. | 3. | 6. | 4 | 70. | 0.05000 | 2.00 | 0.00 | 0. | 20 | 0 | A29 | 0.00 |
| 12134 | 4A | 0. | 0. | 3. | 5. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT PROG FO601A

MODIFIED RATIONAL METHOD HYDROLOGY

HYDROGRAPH AT OUTLET Line 15

HYDROGRAPH AT 12134 4A STORM DAY 4 REDUCTION FACTOR = 1.000

| TIME | Q | TIME | Q | TIME | Q | TIME | Q | TIME | Q |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0. | 100 | 1. | 200 | 1. | 300 | 1. | 400 | 1. |
| 500 | 1. | 600 | 1. | 700 | 1. | 800 | 1. | 900 | 1. |
| 1000 | 1. | 1050 | 1. | 1100 | 1. | 1110 | 1. | 1120 | 1. |
| 1130 | 1. | 1131 | 1. | 1132 | 1. | 1133 | 1. | 1134 | 1. |
| 1135 | 1. | 1136 | 1. | 1137 | 1. | 1138 | 1. | 1139 | 1. |
| 1140 | 1. | 1141 | 1. | 1142 | 1. | 1143 | 1. | 1144 | 1. |
| 1145 | 2. | 1146 | 2. | 1147 | 2. | 1148 | 2. | 1149 | 2. |
| 1150 | 3. | 1151 | 4. | 1152 | 5. | 1153 | 5. | 1154 | 5. |
| 1155 | 5. | 1156 | 4. | 1157 | 4. | 1158 | 3. | 1159 | 2. |
| 1160 | 2. | 1161 | 2. | 1162 | 2. | 1163 | 1. | 1164 | 1. |
| 1165 | 1. | 1166 | 1. | 1167 | 1. | 1168 | 1. | 1169 | 1. |
| 1170 | 1. | 1171 | 1. | 1172 | 1. | 1173 | 1. | 1174 | 1. |
| 1175 | 1. | 1176 | 1. | 1177 | 1. | 1178 | 1. | 1179 | 1. |
| 1180 | 1. | 1181 | 1. | 1182 | 1. | 1183 | 1. | 1184 | 1. |
| 1185 | 1. | 1186 | 1. | 1187 | 1. | 1188 | 1. | 1189 | 1. |
| 1190 | 1. | 1191 | 1. | 1192 | 1. | 1193 | 1. | 1194 | 1. |
| 1195 | 1. | 1196 | 1. | 1197 | 1. | 1198 | 1. | 1199 | 1. |
| 1200 | 1. | 1201 | 1. | 1202 | 1. | 1203 | 1. | 1204 | 1. |
| 1205 | 1. | 1206 | 1. | 1207 | 1. | 1208 | 1. | 1209 | 1. |
| 1210 | 1. | 1211 | 1. | 1212 | 1. | 1213 | 1. | 1214 | 1. |
| 1215 | 1. | 1216 | 1. | 1217 | 1. | 1218 | 1. | 1219 | 1. |
| 1220 | 1. | 1221 | 1. | 1222 | 1. | 1223 | 1. | 1224 | 1. |
| 1225 | 1. | 1226 | 1. | 1227 | 1. | 1228 | 1. | 1229 | 1. |
| 1230 | 1. | 1231 | 1. | 1232 | 1. | 1233 | 1. | 1234 | 1. |
| 1235 | 1. | 1236 | 1. | 1237 | 1. | 1238 | 1. | 1239 | 1. |
| 1240 | 1. | 1241 | 1. | 1242 | 1. | 1243 | 1. | 1244 | 1. |
| 1245 | 1. | 1246 | 1. | 1247 | 1. | 1248 | 1. | 1249 | 1. |
| 1250 | 1. | 1251 | 1. | 1252 | 1. | 1253 | 1. | 1254 | 1. |
| 1255 | 1. | 1256 | 1. | 1257 | 1. | 1258 | 1. | 1259 | 1. |
| 1260 | 1. | 1261 | 1. | 1262 | 1. | 1263 | 1. | 1264 | 1. |
| 1265 | 1. | 1266 | 1. | 1267 | 1. | 1268 | 1. | 1269 | 1. |
| 1270 | 1. | 1271 | 1. | 1272 | 1. | 1273 | 1. | 1274 | 1. |
| 1275 | 1. | 1276 | 1. | 1277 | 1. | 1278 | 1. | 1279 | 1. |
| 1280 | 1. | 1281 | 1. | 1282 | 1. | 1283 | 1. | 1284 | 1. |
| 1285 | 1. | 1286 | 1. | 1287 | 1. | 1288 | 1. | 1289 | 1. |
| 1290 | 1. | 1291 | 1. | 1292 | 1. | 1293 | 1. | 1294 | 1. |
| 1295 | 1. | 1296 | 1. | 1297 | 1. | 1298 | 1. | 1299 | 1. |
| 1300 | 1. | 1310 | 1. | 1320 | 1. | 1330 | 1. | 1340 | 1. |
| 1350 | 1. | 1360 | 1. | 1370 | 1. | 1380 | 1. | 1390 | 1. |
| 1400 | 1. | 1420 | 1. | 1440 | 1. | 1460 | 1. | 1500 | 1. |

Total Runoff = 2.050 Acre-Ft.
Peak Q = 5 CFS
Time to Peak Q = 1152 Minutes

# APPENDIX 7

# LACDPW MORA CALCULATIONS: PROPOSED CONDITION - BURNED

```
 4LADEPTH.RDT
 5 50300    1A  50 YR River Village - Newhall Ranch - Chiquito Proposed BURNED
 5 50300   15A  HYDROGRAPH AT OUTLET BASIN AREAs A
 6 50300    1A 198  538.011A292 1220 01600                    G1
 6 50300    2A 198  5 8.0 6A292  880 02700
 6 50300    3B 198  5 4.4 5A292 1410 05300
 6 50300    4B 198  519.614A292  760 00200
 6 50300    5B 198  5 6.9 7A294  132 04000
 6 50300    6B 198  5 5.9 7A29
 6 50300    7B 198 3013.3 9A294  917 00200
 6 50300    8AB198         A29
 6 50300    9C 198  5 7.7 8A294  540 00400
 6 50300   10C 198  5 8.811A294  250 00100
 6 50300   11C  20 8011.818A294 1610 00100
 6 50300   12C  20  5 2.216A294  360 00100
 6 50300   13C  20 80 7.522A294  630 00100
 6 50300   14AC020         A29
 6 50300   15A 020  0    50A29                             1  2

**NOTE**
        THE AREA FOR SUBAREAS 1A AND 2A HAVE BEEN INCREASED TO ACCOUNT FOR BURNED AND BULKED FLOWRATE.
        AREA 1A ACTUAL AREA IS 30.0 ACRES
        AREA 2A ACTUAL AREA IS 6.0 ACRES
```

11-11-2009 SITE LICENSEE: PSOMAS AND ASSOCIATES 

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT 

MODIFIED RATIONAL METHOD HYDROLOGY

50 YR River Village - Newhall Ranch - Chiquito Proposed BURNED

| LOCATION | | SUBAREA AREA | SUBAREA Q | TOTAL AREA | TOTAL Q | CONV TYPE | CONV LNGTH | CONV SLOPE | CONV SIZE | CONV Z | CONTROL Q | SOIL NAME | TC | STORM DAY 4 RAIN ZONE | PCT IMPV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 50300 | 1A | 38. | 68. | 38. | 68. | 2 | 1220. | 0.01600 | 0.00 | 0.00 | 0. | 198 | 11 | A29 | 0.05 |
| 50300 | 2A | 8. | 20. | 46. | 67. | 2 | 880. | 0.02700 | 0.00 | 0.00 | 0. | 198 | 6 | A29 | 0.05 |
| 50300 | 3B | 4. | 11. | 4. | 11. | 2 | 1410. | 0.05300 | 0.00 | 0.00 | 0. | 198 | 5 | A29 | 0.05 |
| 50300 | 4B | 20. | 31. | 24. | 38. | 2 | 760. | 0.00200 | 0.00 | 0.00 | 0. | 198 | 14 | A29 | 0.05 |
| 50300 | 5B | 7. | 16. | 31. | 34. | 4 | 132. | 0.04000 | 2.00 | 0.00 | 0. | 198 | 7 | A29 | 0.05 |
| 50300 | 6B | 6. | 14. | 37. | 42. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 7 | A29 | 0.05 |
| 50300 | 7B | 13. | 28. | 50. | 70. | 4 | 917. | 0.00200 | 4.25 | 0.00 | 0. | 198 | 9 | A29 | 0.30 |
| 50300 | 8AB | 50. | 65. | 96. | 127. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 0 | A29 | 0.00 |
| 50300 | 9C | 8. | 17. | 8. | 17. | 4 | 540. | 0.00400 | 2.25 | 0.00 | 0. | 198 | 8 | A29 | 0.05 |
| 50300 | 10C | 9. | 16. | 17. | 32. | 4 | 250. | 0.00100 | 3.50 | 0.00 | 0. | 198 | 11 | A29 | 0.05 |
| 50300 | 11C | 12. | 20. | 29. | 52. | 4 | 1610. | 0.00100 | 4.25 | 0.00 | 0. | 20 | 18 | A29 | 0.80 |
| 50300 | 12C | 2. | 2. | 31. | 46. | 4 | 360. | 0.00100 | 4.00 | 0.00 | 0. | 20 | 16 | A29 | 0.05 |
| 50300 | 13C | 7. | 11. | 38. | 54. | 4 | 630. | 0.00100 | 4.25 | 0.00 | 0. | 20 | 22 | A29 | 0.80 |
| 50300 | 14AC | 38. | 52. | 134. | 159. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 0 | A29 | 0.00 |
| 50300 | 15A | 0. | 0. | 134. | 159. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 50 | A29 | 0.00 |

**NOTE**

THE AREA FOR SUBAREAS 1A AND 2A HAVE BEEN INCREASED TO ACCOUNT FOR BURNED AND BULKED FLOWRATE.
AREA 1A ACTUAL AREA IS 30.0 ACRES
AREA 2A ACTUAL AREA IS 6.0 ACRES

HYDROGRAPH AT OUTLET BASIN AREAs A

HYDROGRAPH AT 50300 15A STORM DAY 4 REDUCTION FACTOR = 1.000

| TIME | Q | TIME | Q | TIME | Q | TIME | Q | TIME | Q |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0. | 100 | 10. | 200 | 11. | 300 | 11. | 400 | 12. |
| 500 | 12. | 600 | 13. | 700 | 14. | 800 | 16. | 900 | 18. |
| 1000 | 22. | 1050 | 26. | 1100 | 33. | 1110 | 36. | 1120 | 41. |
| 1130 | 47. | 1131 | 48. | 1132 | 48. | 1133 | 49. | 1134 | 50. |
| 1135 | 51. | 1136 | 52. | 1137 | 53. | 1138 | 54. | 1139 | 55. |
| 1140 | 56. | 1141 | 57. | 1142 | 59. | 1143 | 60. | 1144 | 62. |
| 1145 | 64. | 1146 | 66. | 1147 | 68. | 1148 | 71. | 1149 | 74. |
| 1150 | 77. | 1151 | 82. | 1152 | 90. | 1153 | 100. | 1154 | 112. |
| 1155 | 124. | 1156 | 136. | 1157 | 146. | 1158 | 153. | 1159 | 157. |
| 1160 | 159. | 1161 | 158. | 1162 | 156. | 1163 | 153. | 1164 | 150. |
| 1165 | 148. | 1166 | 146. | 1167 | 144. | 1168 | 141. | 1169 | 138. |
| 1170 | 134. | 1171 | 131. | 1172 | 127. | 1173 | 123. | 1174 | 118. |
| 1175 | 113. | 1176 | 107. | 1177 | 101. | 1178 | 95. | 1179 | 89. |
| 1180 | 84. | 1181 | 79. | 1182 | 74. | 1183 | 70. | 1184 | 66. |
| 1185 | 62. | 1186 | 59. | 1187 | 56. | 1188 | 53. | 1189 | 51. |
| 1190 | 49. | 1191 | 47. | 1192 | 45. | 1193 | 43. | 1194 | 42. |
| 1195 | 40. | 1196 | 39. | 1197 | 38. | 1198 | 37. | 1199 | 36. |
| 1200 | 35. | 1201 | 34. | 1202 | 33. | 1203 | 33. | 1204 | 32. |
| 1205 | 31. | 1206 | 31. | 1207 | 30. | 1208 | 29. | 1209 | 29. |
| 1210 | 28. | 1211 | 28. | 1212 | 28. | 1213 | 27. | 1214 | 27. |
| 1215 | 26. | 1216 | 26. | 1217 | 26. | 1218 | 25. | 1219 | 25. |
| 1220 | 25. | 1221 | 24. | 1222 | 24. | 1223 | 24. | 1224 | 24. |
| 1225 | 23. | 1226 | 23. | 1227 | 23. | 1228 | 23. | 1229 | 22. |
| 1230 | 22. | 1231 | 22. | 1232 | 22. | 1233 | 22. | 1234 | 21. |
| 1235 | 21. | 1236 | 21. | 1237 | 21. | 1238 | 21. | 1239 | 21. |
| 1240 | 20. | 1241 | 20. | 1242 | 20. | 1243 | 20. | 1244 | 20. |
| 1245 | 20. | 1246 | 20. | 1247 | 19. | 1248 | 19. | 1249 | 19. |
| 1250 | 19. | 1251 | 19. | 1252 | 19. | 1253 | 19. | 1254 | 19. |
| 1255 | 18. | 1256 | 18. | 1257 | 18. | 1258 | 18. | 1259 | 18. |
| 1260 | 18. | 1261 | 18. | 1262 | 18. | 1263 | 18. | 1264 | 18. |
| 1265 | 17. | 1266 | 17. | 1267 | 17. | 1268 | 17. | 1269 | 17. |
| 1270 | 17. | 1271 | 17. | 1272 | 17. | 1273 | 17. | 1274 | 17. |
| 1275 | 17. | 1276 | 17. | 1277 | 16. | 1278 | 16. | 1279 | 16. |
| 1280 | 16. | 1281 | 16. | 1282 | 16. | 1283 | 16. | 1284 | 16. |
| 1285 | 16. | 1286 | 16. | 1287 | 16. | 1288 | 16. | 1289 | 16. |
| 1290 | 15. | 1291 | 15. | 1292 | 15. | 1293 | 15. | 1294 | 15. |
| 1295 | 15. | 1296 | 15. | 1297 | 15. | 1298 | 15. | 1299 | 15. |
| 1300 | 15. | 1310 | 14. | 1320 | 14. | 1330 | 13. | 1340 | 13. |
| 1350 | 13. | 1360 | 12. | 1370 | 12. | 1380 | 12. | 1390 | 12. |
| 1400 | 11. | 1420 | 11. | 1440 | 11. | 1460 | 10. | 1500 | 10. |

Total Runoff = 37.255 Acre-Ft.
Peak Q = 159 CFS
Time to Peak Q = 1160 Minutes

```
4LADEPTH.RDT
5   300    1A  50 YR River Village - Newhall Ranch - OFFSITE RVE 1A-RVE 7A BURNED
5   300    8A  HYDROGRAPH AT OUTLET BASIN AREAs A
6   300    1A 199 0018.419A294  110 01000                    G1
6   300    2A 199 0038.922A292  915 00500
6   300    3B 199 0015.3 7A291 1930 04800
6   300    4B 199 0044.315A29
6   300    5AB199         A292  550 00180                   1
6   300    6A 199 0035.3 9A294  200 01300
6   300    7A  2010015.529A294 1500 00700
6   300    8A  20       99A29                              1  2
```

10-13-2009 SITE LICENSEE: PSOMAS AND ASSOCIATES PAGE 1

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT PROG FO601A

MODIFIED RATIONAL METHOD HYDROLOGY

50 YR River Village - Newhall Ranch - OFFSITE RVE 1A-RVE 7A BURNED STORM DAY 4

| LOCATION | | SUBAREA AREA | SUBAREA Q | TOTAL AREA | TOTAL Q | CONV TYPE | CONV LNGTH | CONV SLOPE | CONV SIZE | CONV Z | CONTROL Q | SOIL NAME | TC | RAIN ZONE | PCT IMPV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 300 | 1A | 18. | 26. | 18. | 26. | 4 | 110. | 0.01000 | 2.25 | 0.00 | 0. | 199 | 19 | A29 | 0.00 |
| 300 | 2A | 39. | 52. | 57. | 79. | 2 | 915. | 0.00500 | 0.00 | 0.00 | 0. | 199 | 22 | A29 | 0.00 |
| 300 | 3B | 15. | 37. | 15. | 37. | 1 | 1930. | 0.04800 | 0.00 | 0.00 | 0. | 199 | 7 | A29 | 0.00 |
| 300 | 4B | 44. | 73. | 59. | 89. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 199 | 15 | A29 | 0.00 |

CONFLUENCE Q'S

300 5A TA 1165 QA 75. QAB 144. QB 69.

300 5AB TAB 1162 QAB 160. QA 73.

300 5B TB 1160 QB 89. QBA 158. QA 69.

QB 87.

| LOCATION | | SUBAREA AREA | SUBAREA Q | TOTAL AREA | TOTAL Q | CONV TYPE | CONV LNGTH | CONV SLOPE | CONV SIZE | CONV Z | CONTROL Q | SOIL NAME | TC | RAIN ZONE | PCT IMPV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 300 | 5AB | 59. | 89. | 116. | 160. | 2 | 550. | 0.00180 | 0.00 | 0.00 | 0. | 199 | 0 | A29 | 0.00 |
| 300 | 6A | 35. | 76. | 151. | 171. | 4 | 200. | 0.01300 | 4.00 | 0.00 | 0. | 199 | 9 | A29 | 0.00 |
| 300 | 7A | 15. | 23. | 166. | 192. | 4 | 1500. | 0.00700 | 4.75 | 0.00 | 0. | 20 | 29 | A29 | 1.00 |
| 300 | 8A | 0. | 0. | 166. | 188. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |

HYDROGRAPH AT OUTLET BASIN AREAs A

HYDROGRAPH AT 300 8A STORM DAY 4 REDUCTION FACTOR = 1.000

| TIME | Q | TIME | Q | TIME | Q | TIME | Q | TIME | Q |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0. | 100 | 7. | 200 | 7. | 300 | 8. | 400 | 9. |
| 500 | 9. | 600 | 11. | 700 | 12. | 800 | 14. | 900 | 16. |
| 1000 | 20. | 1050 | 25. | 1100 | 35. | 1110 | 39. | 1120 | 46. |
| 1130 | 56. | 1131 | 57. | 1132 | 58. | 1133 | 60. | 1134 | 61. |
| 1135 | 62. | 1136 | 64. | 1137 | 65. | 1138 | 67. | 1139 | 69. |
| 1140 | 70. | 1141 | 72. | 1142 | 75. | 1143 | 77. | 1144 | 79. |
| 1145 | 82. | 1146 | 85. | 1147 | 88. | 1148 | 91. | 1149 | 95. |
| 1150 | 99. | 1151 | 105. | 1152 | 114. | 1153 | 124. | 1154 | 135. |
| 1155 | 147. | 1156 | 157. | 1157 | 166. | 1158 | 173. | 1159 | 180. |
| 1160 | 184. | 1161 | 187. | 1162 | 188. | 1163 | 188. | 1164 | 186. |
| 1165 | 184. | 1166 | 184. | 1167 | 185. | 1168 | 186. | 1169 | 187. |
| 1170 | 186. | 1171 | 185. | 1172 | 181. | 1173 | 176. | 1174 | 170. |
| 1175 | 163. | 1176 | 156. | 1177 | 149. | 1178 | 142. | 1179 | 136. |
| 1180 | 130. | 1181 | 124. | 1182 | 118. | 1183 | 111. | 1184 | 105. |
| 1185 | 99. | 1186 | 93. | 1187 | 88. | 1188 | 83. | 1189 | 79. |
| 1190 | 74. | 1191 | 70. | 1192 | 66. | 1193 | 63. | 1194 | 60. |
| 1195 | 57. | 1196 | 54. | 1197 | 52. | 1198 | 49. | 1199 | 47. |
| 1200 | 45. | 1201 | 44. | 1202 | 42. | 1203 | 40. | 1204 | 39. |
| 1205 | 38. | 1206 | 37. | 1207 | 35. | 1208 | 34. | 1209 | 33. |
| 1210 | 33. | 1211 | 32. | 1212 | 31. | 1213 | 30. | 1214 | 30. |
| 1215 | 29. | 1216 | 28. | 1217 | 28. | 1218 | 27. | 1219 | 27. |
| 1220 | 26. | 1221 | 26. | 1222 | 25. | 1223 | 25. | 1224 | 25. |
| 1225 | 24. | 1226 | 24. | 1227 | 23. | 1228 | 23. | 1229 | 23. |
| 1230 | 22. | 1231 | 22. | 1232 | 22. | 1233 | 22. | 1234 | 21. |
| 1235 | 21. | 1236 | 21. | 1237 | 21. | 1238 | 20. | 1239 | 20. |
| 1240 | 20. | 1241 | 20. | 1242 | 20. | 1243 | 19. | 1244 | 19. |
| 1245 | 19. | 1246 | 19. | 1247 | 19. | 1248 | 19. | 1249 | 18. |
| 1250 | 18. | 1251 | 18. | 1252 | 18. | 1253 | 18. | 1254 | 18. |
| 1255 | 17. | 1256 | 17. | 1257 | 17. | 1258 | 17. | 1259 | 17. |
| 1260 | 17. | 1261 | 17. | 1262 | 16. | 1263 | 16. | 1264 | 16. |
| 1265 | 16. | 1266 | 16. | 1267 | 16. | 1268 | 16. | 1269 | 16. |
| 1270 | 15. | 1271 | 15. | 1272 | 15. | 1273 | 15. | 1274 | 15. |
| 1275 | 15. | 1276 | 15. | 1277 | 15. | 1278 | 15. | 1279 | 15. |
| 1280 | 14. | 1281 | 14. | 1282 | 14. | 1283 | 14. | 1284 | 14. |
| 1285 | 14. | 1286 | 14. | 1287 | 14. | 1288 | 14. | 1289 | 14. |
| 1290 | 14. | 1291 | 13. | 1292 | 13. | 1293 | 13. | 1294 | 13. |
| 1295 | 13. | 1296 | 13. | 1297 | 13. | 1298 | 13. | 1299 | 13. |
| 1300 | 13. | 1310 | 12. | 1320 | 12. | 1330 | 11. | 1340 | 11. |
| 1350 | 10. | 1360 | 10. | 1370 | 9. | 1380 | 9. | 1390 | 9. |
| 1400 | 8. | 1420 | 8. | 1440 | 8. | 1460 | 7. | 1500 | 7. |

Total Runoff = 35.867 Acre-Ft.
Peak Q = 188 CFS
Time to Peak Q = 1162 Minutes

# APPENDIX 8
# LA COUNTY STANDARD SUSMP CALCULATIONS

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVE-8A**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 6.35 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.15 | |
| % of Project Pervious | 0.85 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 1.0 | |
| $A_p$ (Pervious Area) | 5.4 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.22 | 0.04246 | 67.6 | 37.6 | 0.15 | 656 | 0.011 |
| 2 | 67.6 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.3 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **3803.333** Cubic Ft.
**0.09** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVE-9B**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 7.04 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.66 | |
| % of Project Pervious | 0.34 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 4.6 | |
| $A_p$ (Pervious Area) | 2.4 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.628 | 0.121204 | 44.8 | 14.8 | 0.66 | 761 | 0.007 |
| 2 | 44.8 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.9 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **12036.5** Cubic Ft.
**0.28** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVE-11C**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 1.02 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.63 | |
| % of Project Pervious | 0.37 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 0.6 | |
| $A_p$ (Pervious Area) | 0.4 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.604 | 0.116572 | 23.1 | -6.9 | 0.63 | 238 | 0.017 |
| 2 | 23.1 | 0.218 | 0.1 | 0.604 | 0.131672 | 21.7 | -1.4 | 0.63 | 238 | 0.017 |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.14 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **1677.278** Cubic Ft.
**0.04** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVE-12C**

**PROJECT CHARACTERISTICS**

| | |
|---|---|
| $A_{Total}$ | 0.63 |
| Type of Development | Single family |
| Predominate Soil Type | 20 |
| % of Project Impervious | 0.66 |
| % of Project Pervious | 0.34 |
| % of project contributing undeveloped area | 0 |
| $A_I$ (Impervious Area) | 0.4 |
| $A_p$ (Pervious Area) | 0.2 |
| $A_u$ (Contrib Undeveloped upstream area) | 0 |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.828 | 0.159804 | 23.8 | -6.2 | 0.91 | 238 | 0.017 |
| 2 | 23.8 | 0.218 | 0.1 | 0.828 | 0.180504 | 22.4 | -1.5 | 0.91 | 238 | 0.017 |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.11 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **1077.13** Cubic Ft.
**0.02** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVE-13C**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 0.87 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.66 | |
| % of Project Pervious | 0.34 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 0.6 | |
| $A_p$ (Pervious Area) | 0.3 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.628 | 0.121204 | 28.7 | -1.3 | 0.66 | 303 | 0.007 |
| 2 | 28.7 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.11 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **1487.465** Cubic Ft.
**0.03** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVE-14C**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 0.2 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.91 | |
| % of Project Pervious | 0.09 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 0.2 | |
| $A_p$ (Pervious Area) | 0.0 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.828 | 0.159804 | 23.8 | -6.2 | 0.91 | 277 | 0.007 |
| 2 | 23.8 | 0.218 | 0.1 | 0.828 | 0.180504 | 22.4 | -1.5 | 0.91 | 277 | 0.007 |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.04 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **450.846** Cubic Ft.
**0.01** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVE-15C**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 0.54 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.91 | |
| % of Project Pervious | 0.09 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 0.5 | |
| $A_p$ (Pervious Area) | 0.0 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.828 | 0.159804 | 38.1 | 8.1 | 0.91 | 760 | 0.008 |
| 2 | 38.1 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.09 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **1217.284** Cubic Ft.
**0.03** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVE-16C**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 2.78 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.64 | |
| % of Project Pervious | 0.36 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 1.8 | |
| $A_p$ (Pervious Area) | 1.0 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.612 | 0.118116 | 44.9 | 14.9 | 0.64 | 771 | 0.008 |
| 2 | 44.9 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.33 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **4631.953** Cubic Ft.
**0.11** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVE-17C**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 5.17 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.69 | |
| % of Project Pervious | 0.31 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 3.6 | |
| $A_p$ (Pervious Area) | 1.6 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.652 | 0.125836 | 38.5 | 8.5 | 0.69 | 656 | 0.011 |
| 2 | 38.5 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.66 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **9177.112** Cubic Ft.
**0.21** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVE-18C**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 0.66 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.91 | |
| % of Project Pervious | 0.09 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 0.6 | |
| $A_p$ (Pervious Area) | 0.1 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.828 | 0.159804 | 42.2 | 12.2 | 0.91 | 969 | 0.009 |
| 2 | 42.2 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.11 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **1487.792** Cubic Ft.
**0.03** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVE-19C**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 0.3 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.91 | |
| % of Project Pervious | 0.09 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 0.3 | |
| $A_p$ (Pervious Area) | 0.0 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.828 | 0.159804 | 28.5 | -1.5 | 0.91 | 432 | 0.009 |
| 2 | 28.5 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.05 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **676.269** Cubic Ft.
**0.02** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVE-20C**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 4.68 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.16 | |
| % of Project Pervious | 0.84 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 0.7 | |
| $A_p$ (Pervious Area) | 3.9 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.228 | 0.044004 | 118.6 | 88.6 | 0.16 | 1749 | 0.005 |
| 2 | 118.6 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.21 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **2905.016** Cubic Ft.
**0.07** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVE-21D**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 1.82 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.64 | |
| % of Project Pervious | 0.36 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 1.2 | |
| $A_p$ (Pervious Area) | 0.7 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.612 | 0.118116 | 36.2 | 6.2 | 0.64 | 495 | 0.008 |
| 2 | 36.2 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.22 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **3032.429** Cubic Ft.
**0.07** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVE-22.1D**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 3.56 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.74 | |
| % of Project Pervious | 0.26 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 2.6 | |
| $A_p$ (Pervious Area) | 0.9 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.692 | 0.133556 | 34.3 | 4.3 | 0.74 | 538 | 0.01 |
| 2 | 34.3 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.48 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **6706.933** Cubic Ft.
**0.15** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVE-22D**

**PROJECT CHARACTERISTICS**

| | |
|---|---|
| $A_{Total}$ | 0.34 |
| Predominate Soil Type | 20 |
| % of Project Impervious | 0.91 |
| % of Project Pervious | 0.09 |
| % of project contributing undeveloped area | 0 |
| $A_I$ (Impervious Area) | 0.3 |
| $A_p$ (Pervious Area) | 0.0 |
| $A_u$ (Contrib Undeveloped upstream area) | 0 |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.828 | 0.159804 | 30.4 | 0.4 | 0.91 | 476 | 0.008 |
| 2 | 30.4 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.05 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **766.4382** Cubic Ft.
**0.02** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVE-23D**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 0.55 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.91 | |
| % of Project Pervious | 0.09 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 0.5 | |
| $A_p$ (Pervious Area) | 0.0 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.828 | 0.159804 | 38.9 | 8.9 | 0.91 | 794 | 0.008 |
| 2 | 38.9 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.09 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **1239.827** Cubic Ft.
**0.03** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVE-24D**

**PROJECT CHARACTERISTICS**

| | |
|---|---|
| $A_{Total}$ | 0.77 |
| Predominate Soil Type | 20 |
| % of Project Impervious | 0.91 |
| % of Project Pervious | 0.09 |
| % of project contributing undeveloped area | 0 |
| $A_I$ (Impervious Area) | 0.7 |
| $A_p$ (Pervious Area) | 0.1 |
| $A_u$ (Contrib Undeveloped upstream area) | 0 |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.828 | 0.159804 | 44.8 | 14.8 | 0.91 | 1099 | 0.009 |
| 2 | 44.8 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.12 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **1735.757** Cubic Ft.
**0.04** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVE-25D**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 0.21 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.91 | |
| % of Project Pervious | 0.09 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 0.2 | |
| $A_p$ (Pervious Area) | 0.0 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.828 | 0.159804 | 20.7 | -9.3 | 0.91 | 214 | 0.008 |
| 2 | 20.7 | 0.228 | 0.1 | 0.828 | 0.188784 | 18.9 | -1.7 | 0.91 | 214 | 0.008 |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.04 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **473.3883** Cubic Ft.
**0.01** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVE-26D**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 5.09 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.74 | |
| % of Project Pervious | 0.26 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 3.8 | |
| $A_p$ (Pervious Area) | 1.3 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.692 | 0.133556 | 46.5 | 16.5 | 0.74 | 1036 | 0.011 |
| 2 | 46.5 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.69 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **9589.407** Cubic Ft.
**0.22** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVE-27D**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 0.95 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.91 | |
| % of Project Pervious | 0.09 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 0.9 | |
| $A_p$ (Pervious Area) | 0.1 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.828 | 0.159804 | 48.8 | 18.8 | 0.91 | 1309 | 0.009 |
| 2 | 48.8 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.15 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **2141.519** Cubic Ft.
**0.05** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVE-28D**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 1.78 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.73 | |
| % of Project Pervious | 0.27 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 1.3 | |
| $A_p$ (Pervious Area) | 0.5 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.684 | 0.132012 | 45.6 | 15.6 | 0.73 | 867 | 0.007 |
| 2 | 45.6 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.24 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **3314.698** Cubic Ft.
**0.08** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVE-29D**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 2.08 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.14 | |
| % of Project Pervious | 0.86 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 0.3 | |
| $A_p$ (Pervious Area) | 1.8 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.212 | 0.040916 | 86.0 | 56.0 | 0.14 | 832 | 0.005 |
| 2 | 86.0 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.09 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **1200.514** Cubic Ft.
**0.03** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVE-30E**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 0.53 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.91 | |
| % of Project Pervious | 0.09 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 0.5 | |
| $A_p$ (Pervious Area) | 0.0 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.828 | 0.159804 | 35.8 | 5.8 | 0.91 | 689 | 0.009 |
| 2 | 35.8 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.09 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **1181.756** Cubic Ft.
**0.03** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVE-31E**

**PROJECT CHARACTERISTICS**

| | |
|---|---|
| $A_{Total}$ | 0.47 |
| Predominate Soil Type | 20 |
| % of Project Impervious | 0.91 |
| % of Project Pervious | 0.09 |
| % of project contributing undeveloped area | 0 |
| $A_I$ (Impervious Area) | 0.4 |
| $A_p$ (Pervious Area) | 0.0 |
| $A_u$ (Contrib Undeveloped upstream area) | 0 |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.828 | 0.159804 | 21.7 | -8.3 | 0.91 | 236 | 0.008 |
| 2 | 21.7 | 0.228 | 0.1 | 0.828 | 0.188784 | 19.9 | -1.8 | 0.91 | 236 | 0.008 |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.09 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **1059.488** Cubic Ft.
**0.02** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVE-32E**

**PROJECT CHARACTERISTICS**

| | |
|---|---|
| $A_{Total}$ | 0.33 |
| Predominate Soil Type | 20 |
| % of Project Impervious | 0.91 |
| % of Project Pervious | 0.09 |
| % of project contributing undeveloped area | 0 |
| $A_I$ (Impervious Area) | 0.3 |
| $A_p$ (Pervious Area) | 0.0 |
| $A_u$ (Contrib Undeveloped upstream area) | 0 |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.828 | 0.159804 | 15.5 | -14.5 | 0.91 | 109 | 0.006 |
| 2 | 15.5 | 0.267 | 0.1 | 0.828 | 0.221076 | 13.1 | -2.4 | 0.91 | 109 | 0.006 |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.07 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **743.8959** Cubic Ft.
**0.02** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVE-33E**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 5.86 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.71 | |
| % of Project Pervious | 0.29 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 4.2 | |
| $A_p$ (Pervious Area) | 1.7 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.668 | 0.128924 | 41.4 | 11.4 | 0.71 | 785 | 0.011 |
| 2 | 41.4 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.76 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **10657.17** Cubic Ft.
**0.24** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVE-34E**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 5.29 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.71 | |
| % of Project Pervious | 0.29 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 3.8 | |
| $A_p$ (Pervious Area) | 1.5 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.668 | 0.128924 | 35.1 | 5.1 | 0.71 | 557 | 0.011 |
| 2 | 35.1 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.69 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **9620.553** Cubic Ft.
**0.22** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVE-35E**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 1.23 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.7 | |
| % of Project Pervious | 0.3 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 0.9 | |
| $A_p$ (Pervious Area) | 0.4 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.66 | 0.12738 | 39.0 | 9.0 | 0.7 | 626 | 0.008 |
| 2 | 39.0 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.16 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **2210.126** Cubic Ft.
**0.05** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVE-36E**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 0.68 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.91 | |
| % of Project Pervious | 0.09 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 0.6 | |
| $A_p$ (Pervious Area) | 0.1 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.828 | 0.159804 | 38.6 | 8.6 | 0.91 | 808 | 0.009 |
| 2 | 38.6 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.11 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **1532.876** Cubic Ft.
**0.04** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVE-37E**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 1.7 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.17 | |
| % of Project Pervious | 0.83 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 0.3 | |
| $A_p$ (Pervious Area) | 1.4 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.236 | 0.045548 | 72.3 | 42.3 | 0.17 | 652 | 0.005 |
| 2 | 72.3 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.08 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **1092.267** Cubic Ft.
**0.03** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVE-38F**

**PROJECT CHARACTERISTICS**

| | |
|---|---|
| $A_{Total}$ | 0.25 |
| Predominate Soil Type | 20 |
| % of Project Impervious | 0.91 |
| % of Project Pervious | 0.09 |
| % of project contributing undeveloped area | 0 |
| $A_I$ (Impervious Area) | 0.2 |
| $A_p$ (Pervious Area) | 0.0 |
| $A_u$ (Contrib Undeveloped upstream area) | 0 |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.828 | 0.159804 | 26.2 | -3.8 | 0.91 | 361 | 0.009 |
| 2 | 26.2 | 0.206 | 0.1 | 0.828 | 0.170568 | 25.3 | -0.9 | 0.91 | 361 | 0.009 |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.04 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **563.5575** Cubic Ft.
**0.01** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVE-39F**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 2.03 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.74 | |
| % of Project Pervious | 0.26 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 1.5 | |
| $A_p$ (Pervious Area) | 0.5 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.692 | 0.133556 | 29.0 | -1.0 | 0.74 | 400 | 0.012 |
| 2 | 29.0 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.27 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **3824.459** Cubic Ft.
**0.09** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVE-40F**

**PROJECT CHARACTERISTICS**

| | |
|---|---|
| $A_{Total}$ | 0.05 |
| Predominate Soil Type | 20 |
| % of Project Impervious | 0.91 |
| % of Project Pervious | 0.09 |
| % of project contributing undeveloped area | 0 |
| $A_I$ (Impervious Area) | 0.0 |
| $A_p$ (Pervious Area) | 0.0 |
| $A_u$ (Contrib Undeveloped upstream area) | 0 |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.828 | 0.159804 | 12.3 | -17.7 | 0.91 | 71 | 0.007 |
| 2 | 12.3 | 0.297 | 0.1 | 0.828 | 0.245916 | 9.9 | -2.5 | 0.91 | 71 | 0.007 |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.01 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **112.7115** Cubic Ft.
**0.00** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVE-41F**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 1.79 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.67 | |
| % of Project Pervious | 0.33 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 1.2 | |
| $A_p$ (Pervious Area) | 0.6 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.636 | 0.122748 | 42.2 | 12.2 | 0.67 | 709 | 0.008 |
| 2 | 42.2 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.22 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **3099.403** Cubic Ft.
**0.07** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVE-42F**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 0.5 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.91 | |
| % of Project Pervious | 0.09 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 0.5 | |
| $A_p$ (Pervious Area) | 0.0 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.828 | 0.159804 | 36.3 | 6.3 | 0.91 | 663 | 0.007 |
| 2 | 36.3 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.08 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **1127.115** Cubic Ft.
**0.03** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVE-43F**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 3.86 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.68 | |
| % of Project Pervious | 0.32 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 2.6 | |
| $A_p$ (Pervious Area) | 1.2 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.644 | 0.124292 | 52.3 | 22.3 | 0.68 | 1117 | 0.008 |
| 2 | 52.3 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.48 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **6767.699** Cubic Ft.
**0.16** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVE-44F**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 2.86 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.66 | |
| % of Project Pervious | 0.34 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 1.9 | |
| $A_p$ (Pervious Area) | 1.0 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.628 | 0.121204 | 49.0 | 19.0 | 0.66 | 915 | 0.007 |
| 2 | 49.0 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.35 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **4889.828** Cubic Ft.
**0.11** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVE-45F**

**PROJECT CHARACTERISTICS**

| | |
|---|---|
| $A_{Total}$ | 0.14 |
| Predominate Soil Type | 20 |
| % of Project Impervious | 0.91 |
| % of Project Pervious | 0.09 |
| % of project contributing undeveloped area | 0 |
| $A_I$ (Impervious Area) | 0.1 |
| $A_p$ (Pervious Area) | 0.0 |
| $A_u$ (Contrib Undeveloped upstream area) | 0 |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.828 | 0.159804 | 15.8 | -14.2 | 0.91 | 118 | 0.007 |
| 2 | 15.8 | 0.259 | 0.1 | 0.828 | 0.214452 | 13.5 | -2.2 | 0.91 | 118 | 0.007 |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.03 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **315.5922** Cubic Ft.
**0.01** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVE-46F**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 2.68 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.17 | |
| % of Project Pervious | 0.83 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 0.5 | |
| $A_p$ (Pervious Area) | 2.2 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.236 | 0.045548 | 93.9 | 63.9 | 0.17 | 1120 | 0.005 |
| 2 | 93.9 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.12 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **1721.927** Cubic Ft.
**0.04** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVE-51G**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 2.99 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.67 | |
| % of Project Pervious | 0.33 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 2.0 | |
| $A_p$ (Pervious Area) | 1.0 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.636 | 0.122748 | 38.0 | 8.0 | 0.67 | 570 | 0.008 |
| 2 | 38.0 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.37 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **5177.215** Cubic Ft.
**0.12** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVE-52G**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 1.24 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.66 | |
| % of Project Pervious | 0.34 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 0.8 | |
| $A_p$ (Pervious Area) | 0.4 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.628 | 0.121204 | 35.1 | 5.1 | 0.66 | 460 | 0.007 |
| 2 | 35.1 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.15 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **2120.065** Cubic Ft.
**0.05** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVE-53G**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 1.21 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.65 | |
| % of Project Pervious | 0.35 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 0.8 | |
| $A_p$ (Pervious Area) | 0.4 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.62 | 0.11966 | 30.6 | 0.6 | 0.65 | 340 | 0.007 |
| 2 | 30.6 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.15 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **2042.42** Cubic Ft.
**0.05** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVE-54G**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 1.19 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.65 | |
| % of Project Pervious | 0.35 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 0.8 | |
| $A_p$ (Pervious Area) | 0.4 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.62 | 0.11966 | 30.7 | 0.7 | 0.65 | 344 | 0.007 |
| 2 | 30.7 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.14 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **2008.661** Cubic Ft.
**0.05** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVE-55G**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 0.82 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.64 | |
| % of Project Pervious | 0.36 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 0.5 | |
| $A_p$ (Pervious Area) | 0.3 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.612 | 0.118116 | 25.7 | -4.3 | 0.64 | 235 | 0.007 |
| 2 | 25.7 | 0.206 | 0.1 | 0.612 | 0.126072 | 24.9 | -0.9 | 0.64 | 235 | 0.007 |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.10 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **1366.259** Cubic Ft.
**0.03** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVE-56G**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 1.02 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.69 | |
| % of Project Pervious | 0.31 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 0.7 | |
| $A_p$ (Pervious Area) | 0.3 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.652 | 0.125836 | 34.2 | 4.2 | 0.69 | 485 | 0.009 |
| 2 | 34.2 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.13 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **1810.571** Cubic Ft.
**0.04** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVE-57G**

**PROJECT CHARACTERISTICS**

| | |
|---|---|
| $A_{Total}$ | 3.37 |
| Predominate Soil Type | 20 |
| % of Project Impervious | 0.68 |
| % of Project Pervious | 0.32 |
| % of project contributing undeveloped area | 0 |
| $A_I$ (Impervious Area) | 2.3 |
| $A_p$ (Pervious Area) | 1.1 |
| $A_u$ (Contrib Undeveloped upstream area) | 0 |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.644 | 0.124292 | 41.5 | 11.5 | 0.68 | 666 | 0.007 |
| 2 | 41.5 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.42 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **5908.587** Cubic Ft.
**0.14** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVE-58G**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 1.93 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.73 | |
| % of Project Pervious | 0.27 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 1.4 | |
| $A_p$ (Pervious Area) | 0.5 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.684 | 0.132012 | 51.3 | 21.3 | 0.73 | 1218 | 0.01 |
| 2 | 51.3 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.26 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **3594.027** Cubic Ft.
**0.08** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVE-59G**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 1.9 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.52 | |
| % of Project Pervious | 0.48 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 1.0 | |
| $A_p$ (Pervious Area) | 0.9 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.516 | 0.099588 | 49.3 | 19.3 | 0.52 | 781 | 0.008 |
| 2 | 49.3 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.19 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **2669.139** Cubic Ft.
**0.06** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVE-60G**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 9.88 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.74 | |
| % of Project Pervious | 0.26 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 7.3 | |
| $A_p$ (Pervious Area) | 2.6 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.692 | 0.133556 | 46.1 | 16.1 | 0.74 | 961 | 0.009 |
| 2 | 46.1 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **1.33 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **18613.62** Cubic Ft.
**0.43** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVE-61G**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 1.36 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.91 | |
| % of Project Pervious | 0.09 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 1.2 | |
| $A_p$ (Pervious Area) | 0.1 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.828 | 0.159804 | 35.4 | 5.4 | 0.91 | 695 | 0.01 |
| 2 | 35.4 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.22 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **3065.753** Cubic Ft.
**0.07** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVE-62G**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 1.22 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.91 | |
| % of Project Pervious | 0.09 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 1.1 | |
| $A_p$ (Pervious Area) | 0.1 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.828 | 0.159804 | 32.4 | 2.4 | 0.91 | 580 | 0.01 |
| 2 | 32.4 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.20 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **2750.161** Cubic Ft.
**0.06** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVE-63G**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 4.11 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.71 | |
| % of Project Pervious | 0.29 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 2.9 | |
| $A_p$ (Pervious Area) | 1.2 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.668 | 0.128924 | 43.7 | 13.7 | 0.71 | 802 | 0.008 |
| 2 | 43.7 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.53 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **7474.569** Cubic Ft.
**0.17** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVC-1A**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 11.66 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.79 | |
| % of Project Pervious | 0.21 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 9.2 | |
| $A_p$ (Pervious Area) | 2.4 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.732 | 0.141276 | 49.5 | 19.5 | 0.79 | 1103 | 0.007 |
| 2 | 49.5 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **1.66 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **23236.86** Cubic Ft.
**0.53** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVC-2A**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 4.08 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.74 | |
| % of Project Pervious | 0.26 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 3.0 | |
| $A_p$ (Pervious Area) | 1.1 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.692 | 0.133556 | 38.9 | 8.9 | 0.74 | 697 | 0.01 |
| 2 | 38.9 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.55 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **7686.598** Cubic Ft.
**0.18** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVC-3A**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 2.39 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.91 | |
| % of Project Pervious | 0.09 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 2.2 | |
| $A_p$ (Pervious Area) | 0.2 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.828 | 0.159804 | 51.4 | 21.4 | 0.91 | 1547 | 0.011 |
| 2 | 51.4 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.39 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **5387.61** Cubic Ft.
**0.12** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVC-4A**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 1.67 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.91 | |
| % of Project Pervious | 0.09 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 1.5 | |
| $A_p$ (Pervious Area) | 0.2 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.828 | 0.159804 | 47.2 | 17.2 | 0.91 | 1260 | 0.01 |
| 2 | 47.2 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.27 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **3764.564** Cubic Ft.
**0.09** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVC-5A**

**PROJECT CHARACTERISTICS**

| | |
|---|---|
| $A_{Total}$ | 0.4 |
| Predominate Soil Type | 20 |
| % of Project Impervious | 0.91 |
| % of Project Pervious | 0.09 |
| % of project contributing undeveloped area | 0 |
| $A_I$ (Impervious Area) | 0.4 |
| $A_p$ (Pervious Area) | 0.0 |
| $A_u$ (Contrib Undeveloped upstream area) | 0 |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.828 | 0.159804 | 21.0 | -9.0 | 0.91 | 213 | 0.007 |
| 2 | 21.0 | 0.228 | 0.1 | 0.828 | 0.188784 | 19.2 | -1.7 | 0.91 | 213 | 0.007 |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.08 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **901.692** Cubic Ft.
**0.02** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVC-6A**

**PROJECT CHARACTERISTICS**

| | |
|---|---|
| $A_{Total}$ | 0.78 |
| Predominate Soil Type | 20 |
| % of Project Impervious | 0.91 |
| % of Project Pervious | 0.09 |
| % of project contributing undeveloped area | 0 |
| $A_I$ (Impervious Area) | 0.7 |
| $A_p$ (Pervious Area) | 0.1 |
| $A_u$ (Contrib Undeveloped upstream area) | 0 |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.828 | 0.159804 | 24.9 | -5.1 | 0.91 | 335 | 0.01 |
| 2 | 24.9 | 0.21 | 0.1 | 0.828 | 0.17388 | 23.8 | -1.1 | 0.91 | 335 | 0.01 |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.14 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **1758.299** Cubic Ft.
**0.04** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVC-7A**

**PROJECT CHARACTERISTICS**

| | |
|---|---|
| $A_{Total}$ | 0.55 |
| Predominate Soil Type | 20 |
| % of Project Impervious | 0.5 |
| % of Project Pervious | 0.5 |
| % of project contributing undeveloped area | 0 |
| $A_I$ (Impervious Area) | 0.3 |
| $A_p$ (Pervious Area) | 0.3 |
| $A_u$ (Contrib Undeveloped upstream area) | 0 |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.5 | 0.0965 | 18.6 | -11.4 | 0.5 | 100 | 0.008 |
| 2 | 18.6 | 0.239 | 0.1 | 0.5 | 0.1195 | 16.6 | -2.0 | 0.5 | 100 | 0.008 |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.07 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **748.6875** Cubic Ft.
**0.02** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVC-8A**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 1.52 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.16 | |
| % of Project Pervious | 0.84 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 0.2 | |
| $A_p$ (Pervious Area) | 1.3 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.228 | 0.044004 | 58.1 | 28.1 | 0.16 | 400 | 0.005 |
| 2 | 58.1 | | | | | | | | | |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.07 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **943.5096** Cubic Ft.
**0.02** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVC-9B**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 8.39 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.74 | |
| % of Project Pervious | 0.26 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 6.2 | |
| $A_p$ (Pervious Area) | 2.2 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.692 | 0.133556 | 46.6 | 16.6 | 0.74 | 1014 | 0.01 |
| 2 | 46.6 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **1.13 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **15806.51** Cubic Ft.
**0.36** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVC-10B**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 1.03 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.91 | |
| % of Project Pervious | 0.09 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 0.9 | |
| $A_p$ (Pervious Area) | 0.1 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.828 | 0.159804 | 36.0 | 6.0 | 0.91 | 650 | 0.007 |
| 2 | 36.0 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.17 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **2321.857** Cubic Ft.
**0.05** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVC-11B**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 0.74 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.91 | |
| % of Project Pervious | 0.09 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 0.7 | |
| $A_p$ (Pervious Area) | 0.1 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.828 | 0.159804 | 34.7 | 4.7 | 0.91 | 602 | 0.007 |
| 2 | 34.7 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.12 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **1668.13** Cubic Ft.
**0.04** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVC-12B**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 9.79 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.82 | |
| % of Project Pervious | 0.18 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 8.0 | |
| $A_p$ (Pervious Area) | 1.8 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.756 | 0.145908 | 42.2 | 12.2 | 0.82 | 850 | 0.008 |
| 2 | 42.2 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **1.44 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **20149.88** Cubic Ft.
**0.46** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVC-13B**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 1.34 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.91 | |
| % of Project Pervious | 0.09 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 1.2 | |
| $A_p$ (Pervious Area) | 0.1 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.828 | 0.159804 | 40.7 | 10.7 | 0.91 | 840 | 0.007 |
| 2 | 40.7 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.22 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **3020.668** Cubic Ft.
**0.07** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVC-14B**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 2.83 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.71 | |
| % of Project Pervious | 0.29 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 2.0 | |
| $A_p$ (Pervious Area) | 0.8 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.668 | 0.128924 | 46.5 | 16.5 | 0.71 | 880 | 0.007 |
| 2 | 46.5 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.37 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **5146.723** Cubic Ft.
**0.12** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVC-15C**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 3.54 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.15 | |
| % of Project Pervious | 0.85 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 0.5 | |
| $A_p$ (Pervious Area) | 3.0 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.22 | 0.04246 | 65.4 | 35.4 | 0.15 | 560 | 0.008 |
| 2 | 65.4 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.15 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **2120.283** Cubic Ft.
**0.05** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVW-1A**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 0.82 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.91 | |
| % of Project Pervious | 0.09 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 0.7 | |
| $A_p$ (Pervious Area) | 0.1 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.828 | 0.159804 | 27.9 | -2.1 | 0.91 | 383 | 0.007 |
| 2 | 27.9 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.13 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **1848.469** Cubic Ft.
**0.04** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVW-2A**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 3.21 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.74 | |
| % of Project Pervious | 0.26 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 2.4 | |
| $A_p$ (Pervious Area) | 0.8 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.692 | 0.133556 | 27.3 | -2.7 | 0.74 | 335 | 0.01 |
| 2 | 27.3 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.43 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **6047.544** Cubic Ft.
**0.14** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVW-3A**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 1.48 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.69 | |
| % of Project Pervious | 0.31 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 1.0 | |
| $A_p$ (Pervious Area) | 0.5 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.652 | 0.125836 | 33.7 | 3.7 | 0.69 | 485 | 0.01 |
| 2 | 33.7 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.19 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **2627.104** Cubic Ft.
**0.06** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVW-4A**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 3.34 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.64 | |
| % of Project Pervious | 0.36 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 2.1 | |
| $A_p$ (Pervious Area) | 1.2 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.612 | 0.118116 | 38.8 | 8.8 | 0.64 | 550 | 0.007 |
| 2 | 38.8 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.40 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **5565.008** Cubic Ft.
**0.13** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVW-5B**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 0.34 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.91 | |
| % of Project Pervious | 0.09 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 0.3 | |
| $A_p$ (Pervious Area) | 0.0 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.828 | 0.159804 | 23.4 | -6.6 | 0.91 | 267 | 0.007 |
| 2 | 23.4 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.05 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **766.4382** Cubic Ft.
**0.02** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVW-6B**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 1.21 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.74 | |
| % of Project Pervious | 0.26 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 0.9 | |
| $A_p$ (Pervious Area) | 0.3 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.692 | 0.133556 | 24.9 | -5.1 | 0.74 | 250 | 0.007 |
| 2 | 24.9 | 0.21 | 0.1 | 0.692 | 0.14532 | 23.8 | -1.1 | 0.74 | 250 | 0.007 |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.18 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **2279.604** Cubic Ft.
**0.05** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVW-7B**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 0.18 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.91 | |
| % of Project Pervious | 0.09 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 0.2 | |
| $A_p$ (Pervious Area) | 0.0 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.828 | 0.159804 | 18.8 | -11.2 | 0.91 | 221 | 0.018 |
| 2 | 18.8 | 0.245 | 0.1 | 0.828 | 0.20286 | 16.6 | -2.2 | 0.91 | 221 | 0.018 |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.04 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **405.7614** Cubic Ft.
**0.01** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVW-8B**

**PROJECT CHARACTERISTICS**

| | |
|---|---|
| $A_{Total}$ | 0.2 |
| Predominate Soil Type | 20 |
| % of Project Impervious | 0.91 |
| % of Project Pervious | 0.09 |
| % of project contributing undeveloped area | 0 |
| $A_I$ (Impervious Area) | 0.2 |
| $A_p$ (Pervious Area) | 0.0 |
| $A_u$ (Contrib Undeveloped upstream area) | 0 |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.828 | 0.159804 | 19.0 | -11.0 | 0.91 | 225 | 0.018 |
| 2 | 19.0 | 0.239 | 0.1 | 0.828 | 0.197892 | 17.0 | -2.0 | 0.91 | 225 | 0.018 |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.04 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **450.846** Cubic Ft.
**0.01** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVW-9B**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 2.22 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.71 | |
| % of Project Pervious | 0.29 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 1.6 | |
| $A_p$ (Pervious Area) | 0.6 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.668 | 0.128924 | 34.8 | 4.8 | 0.71 | 481 | 0.007 |
| 2 | 34.8 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.29 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **4037.359** Cubic Ft.
**0.09** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVW-10B**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 1.33 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.77 | |
| % of Project Pervious | 0.23 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 1.0 | |
| $A_p$ (Pervious Area) | 0.3 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.716 | 0.138188 | 32.9 | 2.9 | 0.77 | 462 | 0.007 |
| 2 | 32.9 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.19 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **2592.582** Cubic Ft.
**0.06** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVW-11B**

**PROJECT CHARACTERISTICS**

| | |
|---|---|
| $A_{Total}$ | 0.34 |
| Predominate Soil Type | 20 |
| % of Project Impervious | 0.66 |
| % of Project Pervious | 0.34 |
| % of project contributing undeveloped area | 0 |
| $A_I$ (Impervious Area) | 0.2 |
| $A_p$ (Pervious Area) | 0.1 |
| $A_u$ (Contrib Undeveloped upstream area) | 0 |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.628 | 0.121204 | 15.3 | -14.7 | 0.66 | 85 | 0.008 |
| 2 | 15.3 | 0.267 | 0.1 | 0.628 | 0.167676 | 12.9 | -2.4 | 0.66 | 85 | 0.008 |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.06 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **581.3082** Cubic Ft.
**0.01** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVW-12B**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 3.54 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.16 | |
| % of Project Pervious | 0.84 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 0.6 | |
| $A_p$ (Pervious Area) | 3.0 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.228 | 0.044004 | 102.4 | 72.4 | 0.16 | 1360 | 0.006 |
| 2 | 102.4 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.16 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **2197.384** Cubic Ft.
**0.05** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVW-12C**

**PROJECT CHARACTERISTICS**

| | |
|---|---|
| $A_{Total}$ | 0.87 |
| Predominate Soil Type | 20 |
| % of Project Impervious | 0.91 |
| % of Project Pervious | 0.09 |
| % of project contributing undeveloped area | 0 |
| $A_I$ (Impervious Area) | 0.8 |
| $A_p$ (Pervious Area) | 0.1 |
| $A_u$ (Contrib Undeveloped upstream area) | 0 |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.828 | 0.159804 | 44.3 | 14.3 | 0.91 | 1000 | 0.007 |
| 2 | 44.3 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.14 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **1961.18** Cubic Ft.
**0.05** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVW-13C**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 3.6 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.65 | |
| % of Project Pervious | 0.35 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 2.3 | |
| $A_p$ (Pervious Area) | 1.3 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.62 | 0.11966 | 40.1 | 10.1 | 0.65 | 597 | 0.007 |
| 2 | 40.1 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.43 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **6076.62** Cubic Ft.
**0.14** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVW-14C**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 2.58 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.68 | |
| % of Project Pervious | 0.32 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 1.8 | |
| $A_p$ (Pervious Area) | 0.8 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.644 | 0.124292 | 52.9 | 22.9 | 0.68 | 1147 | 0.008 |
| 2 | 52.9 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.32 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **4523.488** Cubic Ft.
**0.10** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVW-15C**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 2.13 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.65 | |
| % of Project Pervious | 0.35 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 1.4 | |
| $A_p$ (Pervious Area) | 0.7 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.62 | 0.11966 | 40.4 | 10.4 | 0.65 | 650 | 0.009 |
| 2 | 40.4 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.26 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **3595.334** Cubic Ft.
**0.08** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVW-16C**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 0.99 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.91 | |
| % of Project Pervious | 0.09 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 0.9 | |
| $A_p$ (Pervious Area) | 0.1 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.828 | 0.159804 | 30.6 | 0.6 | 0.91 | 466 | 0.007 |
| 2 | 30.6 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.16 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **2231.688** Cubic Ft.
**0.05** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVW-17C**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 1.91 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.16 | |
| % of Project Pervious | 0.84 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 0.3 | |
| $A_p$ (Pervious Area) | 1.6 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.228 | 0.044004 | 81.3 | 51.3 | 0.16 | 800 | 0.005 |
| 2 | 81.3 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.08 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **1185.594** Cubic Ft.
**0.03** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVW-18D**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 1.93 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.74 | |
| % of Project Pervious | 0.26 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 1.4 | |
| $A_p$ (Pervious Area) | 0.5 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.692 | 0.133556 | 33.3 | 3.3 | 0.74 | 517 | 0.011 |
| 2 | 33.3 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.26 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **3636.062** Cubic Ft.
**0.08** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVW-19D**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 0.51 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.91 | |
| % of Project Pervious | 0.09 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 0.5 | |
| $A_p$ (Pervious Area) | 0.0 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.828 | 0.159804 | 25.0 | -5.0 | 0.91 | 305 | 0.007 |
| 2 | 25.0 | 0.21 | 0.1 | 0.828 | 0.17388 | 23.9 | -1.1 | 0.91 | 305 | 0.007 |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.09 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **1149.657** Cubic Ft.
**0.03** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVW-20D**

**PROJECT CHARACTERISTICS**

| | |
|---|---|
| $A_{Total}$ | 0.38 |
| Predominate Soil Type | 20 |
| % of Project Impervious | 0.91 |
| % of Project Pervious | 0.09 |
| % of project contributing undeveloped area | 0 |
| $A_I$ (Impervious Area) | 0.3 |
| $A_p$ (Pervious Area) | 0.0 |
| $A_u$ (Contrib Undeveloped upstream area) | 0 |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.828 | 0.159804 | 25.2 | -4.8 | 0.91 | 310 | 0.007 |
| 2 | 25.2 | 0.21 | 0.1 | 0.828 | 0.17388 | 24.1 | -1.1 | 0.91 | 310 | 0.007 |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.07 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **856.6074** Cubic Ft.
**0.02** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVW-21D**

**PROJECT CHARACTERISTICS**

| | |
|---|---|
| $A_{Total}$ | 11 |
| Predominate Soil Type | 20 |
| % of Project Impervious | 0.74 |
| % of Project Pervious | 0.26 |
| % of project contributing undeveloped area | 0 |
| $A_I$ (Impervious Area) | 8.1 |
| $A_p$ (Pervious Area) | 2.9 |
| $A_u$ (Contrib Undeveloped upstream area) | 0 |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.692 | 0.133556 | 58.4 | 28.4 | 0.74 | 1570 | 0.009 |
| 2 | 58.4 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **1.48 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **20723.67** Cubic Ft.
**0.48** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVW-22D**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 1.88 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.91 | |
| % of Project Pervious | 0.09 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 1.7 | |
| $A_p$ (Pervious Area) | 0.2 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.828 | 0.159804 | 47.5 | 17.5 | 0.91 | 1200 | 0.008 |
| 2 | 47.5 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.30 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **4237.952** Cubic Ft.
**0.10** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVW-23D**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 1.26 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.91 | |
| % of Project Pervious | 0.09 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 1.1 | |
| $A_p$ (Pervious Area) | 0.1 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.828 | 0.159804 | 44.2 | 14.2 | 0.91 | 1071 | 0.009 |
| 2 | 44.2 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.20 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **2840.33** Cubic Ft.
**0.07** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVW-24D**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 4.91 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.74 | |
| % of Project Pervious | 0.26 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 3.6 | |
| $A_p$ (Pervious Area) | 1.3 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.692 | 0.133556 | 46.3 | 16.3 | 0.74 | 1000 | 0.01 |
| 2 | 46.3 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D * I_X * A_{Total} * (1.008333 ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.66 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac}) * [(A_I)(0.9) + (A_p + A_u)(C_u)]$

**$V_{m+}$** **9250.293** Cubic Ft.
**0.21** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVW-25D**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 0.49 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.91 | |
| % of Project Pervious | 0.09 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 0.4 | |
| $A_p$ (Pervious Area) | 0.0 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.828 | 0.159804 | 25.5 | -4.5 | 0.91 | 320 | 0.007 |
| 2 | 25.5 | 0.21 | 0.1 | 0.828 | 0.17388 | 24.4 | -1.1 | 0.91 | 320 | 0.007 |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.09 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **1104.573** Cubic Ft.
**0.03** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVW-26.1D**

**PROJECT CHARACTERISTICS**

| | |
|---|---|
| $A_{Total}$ | 0.56 |
| Predominate Soil Type | 20 |
| % of Project Impervious | 0.91 |
| % of Project Pervious | 0.09 |
| % of project contributing undeveloped area | 0 |
| $A_I$ (Impervious Area) | 0.5 |
| $A_p$ (Pervious Area) | 0.1 |
| $A_u$ (Contrib Undeveloped upstream area) | 0 |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.828 | 0.159804 | 23.9 | -6.1 | 0.91 | 280 | 0.007 |
| 2 | 23.9 | 0.214 | 0.1 | 0.828 | 0.177192 | 22.7 | -1.2 | 0.91 | 280 | 0.007 |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.10 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **1262.369** Cubic Ft.
**0.03** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVW-26D**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 1.11 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.91 | |
| % of Project Pervious | 0.09 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 1.0 | |
| $A_p$ (Pervious Area) | 0.1 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.828 | 0.159804 | 20.3 | -9.7 | 0.91 | 220 | 0.01 |
| 2 | 20.3 | 0.233 | 0.1 | 0.828 | 0.192924 | 18.4 | -1.9 | 0.91 | 220 | 0.01 |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.22 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **2502.195** Cubic Ft.
**0.06** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVW-27D**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 1.02 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.91 | |
| % of Project Pervious | 0.09 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 0.9 | |
| $A_p$ (Pervious Area) | 0.1 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.828 | 0.159804 | 26.3 | -3.7 | 0.91 | 340 | 0.007 |
| 2 | 26.3 | 0.206 | 0.1 | 0.828 | 0.170568 | 25.4 | -0.9 | 0.91 | 340 | 0.007 |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.18 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **2299.315** Cubic Ft.
**0.05** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVW-28D**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 17.71 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.74 | |
| % of Project Pervious | 0.26 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 13.1 | |
| $A_p$ (Pervious Area) | 4.6 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.692 | 0.133556 | 45.9 | 15.9 | 0.74 | 982 | 0.01 |
| 2 | 45.9 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **2.38 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **33365.11** Cubic Ft.
**0.77** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVW-29D**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 4.06 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.74 | |
| % of Project Pervious | 0.26 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 3.0 | |
| $A_p$ (Pervious Area) | 1.1 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.692 | 0.133556 | 37.3 | 7.3 | 0.74 | 637 | 0.01 |
| 2 | 37.3 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.55 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **7648.918** Cubic Ft.
**0.18** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVW-31E**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 2.17 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.91 | |
| % of Project Pervious | 0.09 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 2.0 | |
| $A_p$ (Pervious Area) | 0.2 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.828 | 0.159804 | 37.8 | 7.8 | 0.91 | 720 | 0.007 |
| 2 | 37.8 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.35 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **4891.679** Cubic Ft.
**0.11** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVW-32E**

**PROJECT CHARACTERISTICS**

| | |
|---|---|
| $A_{Total}$ | 0.7 |
| Predominate Soil Type | 20 |
| % of Project Impervious | 0.91 |
| % of Project Pervious | 0.09 |
| % of project contributing undeveloped area | 0 |
| $A_I$ (Impervious Area) | 0.6 |
| $A_p$ (Pervious Area) | 0.1 |
| $A_u$ (Contrib Undeveloped upstream area) | 0 |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.828 | 0.159804 | 24.4 | -5.6 | 0.91 | 385 | 0.019 |
| 2 | 24.4 | 0.21 | 0.1 | 0.828 | 0.17388 | 23.4 | -1.0 | 0.91 | 385 | 0.019 |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.12 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **1577.961** Cubic Ft.
**0.04** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVW-33E**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 1.99 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.91 | |
| % of Project Pervious | 0.09 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 1.8 | |
| $A_p$ (Pervious Area) | 0.2 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.828 | 0.159804 | 30.6 | 0.6 | 0.91 | 615 | 0.019 |
| 2 | 30.6 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.32 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **4485.918** Cubic Ft.
**0.10** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVW-34E**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 2.44 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.91 | |
| % of Project Pervious | 0.09 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 2.2 | |
| $A_p$ (Pervious Area) | 0.2 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.828 | 0.159804 | 39.7 | 9.7 | 0.91 | 880 | 0.01 |
| 2 | 39.7 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.39 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **5500.321** Cubic Ft.
**0.13** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVW-35E**

**PROJECT CHARACTERISTICS**

| | |
|---|---|
| $A_{Total}$ | 0.65 |
| Predominate Soil Type | 20 |
| % of Project Impervious | 0.91 |
| % of Project Pervious | 0.09 |
| % of project contributing undeveloped area | 0 |
| $A_I$ (Impervious Area) | 0.6 |
| $A_p$ (Pervious Area) | 0.1 |
| $A_u$ (Contrib Undeveloped upstream area) | 0 |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.828 | 0.159804 | 31.4 | 1.4 | 0.91 | 510 | 0.008 |
| 2 | 31.4 | | | | | | | | | |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.10 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **1465.25** Cubic Ft.
**0.03** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVW-36E**

**PROJECT CHARACTERISTICS**

| | |
|---|---|
| $A_{Total}$ | 0.26 |
| Predominate Soil Type | 20 |
| % of Project Impervious | 0.91 |
| % of Project Pervious | 0.09 |
| % of project contributing undeveloped area | 0 |
| $A_I$ (Impervious Area) | 0.2 |
| $A_p$ (Pervious Area) | 0.0 |
| $A_u$ (Contrib Undeveloped upstream area) | 0 |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.828 | 0.159804 | 18.4 | -11.6 | 0.91 | 180 | 0.01 |
| 2 | 18.4 | 0.245 | 0.1 | 0.828 | 0.20286 | 16.3 | -2.1 | 0.91 | 180 | 0.01 |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.05 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **586.0998** Cubic Ft.
**0.01** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVW-37E**

**PROJECT CHARACTERISTICS**

| | |
|---|---|
| $A_{Total}$ | 0.37 |
| Predominate Soil Type | 20 |
| % of Project Impervious | 0.91 |
| % of Project Pervious | 0.09 |
| % of project contributing undeveloped area | 0 |
| $A_I$ (Impervious Area) | 0.3 |
| $A_p$ (Pervious Area) | 0.0 |
| $A_u$ (Contrib Undeveloped upstream area) | 0 |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.828 | 0.159804 | 24.0 | -6.0 | 0.91 | 320 | 0.011 |
| 2 | 24.0 | 0.214 | 0.1 | 0.828 | 0.177192 | 22.8 | -1.3 | 0.91 | 320 | 0.011 |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.07 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **834.0651** Cubic Ft.
**0.02** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVW-38E**

**PROJECT CHARACTERISTICS**

| | |
|---|---|
| $A_{Total}$ | 0.77 |
| Predominate Soil Type | 20 |
| % of Project Impervious | 0.91 |
| % of Project Pervious | 0.09 |
| % of project contributing undeveloped area | 0 |
| $A_I$ (Impervious Area) | 0.7 |
| $A_p$ (Pervious Area) | 0.1 |
| $A_u$ (Contrib Undeveloped upstream area) | 0 |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.828 | 0.159804 | 28.0 | -2.0 | 0.91 | 460 | 0.013 |
| 2 | 28.0 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.12 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **1735.757** Cubic Ft.
**0.04** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVW-39.1E**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 0.41 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.91 | |
| % of Project Pervious | 0.09 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 0.4 | |
| $A_p$ (Pervious Area) | 0.0 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.828 | 0.159804 | 31.6 | 1.6 | 0.91 | 550 | 0.01 |
| 2 | 31.6 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.07 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **924.2343** Cubic Ft.
**0.02** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVW-39E**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 5.72 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.79 | |
| % of Project Pervious | 0.21 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 4.5 | |
| $A_p$ (Pervious Area) | 1.2 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.732 | 0.141276 | 43.4 | 13.4 | 0.79 | 930 | 0.01 |
| 2 | 43.4 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.81 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **11399.22** Cubic Ft.
**0.26** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVW-40E**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 7.41 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.91 | |
| % of Project Pervious | 0.09 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 6.7 | |
| $A_p$ (Pervious Area) | 0.7 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.828 | 0.159804 | 39.6 | 9.6 | 0.91 | 1050 | 0.019 |
| 2 | 39.6 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **1.19 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **16703.84** Cubic Ft.
**0.38** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVW-41E**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 2.32 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.13 | |
| % of Project Pervious | 0.87 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 0.3 | |
| $A_p$ (Pervious Area) | 2.0 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.204 | 0.039372 | 82.4 | 52.4 | 0.13 | 730 | 0.005 |
| 2 | 82.4 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.09 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **1288.505** Cubic Ft.
**0.03** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVW-42E**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 1.04 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.13 | |
| % of Project Pervious | 0.87 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 0.1 | |
| $A_p$ (Pervious Area) | 0.9 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.204 | 0.039372 | 61.6 | 31.6 | 0.13 | 400 | 0.005 |
| 2 | 61.6 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.04 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **577.6056** Cubic Ft.
**0.01** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVW-43G**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 1.29 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.15 | |
| % of Project Pervious | 0.85 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 0.2 | |
| $A_p$ (Pervious Area) | 1.1 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.22 | 0.04246 | 68.5 | 38.5 | 0.15 | 540 | 0.005 |
| 2 | 68.5 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.06 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **772.6455** Cubic Ft.
**0.02** Acre ft

**SUSMP CALCULATIONS**

PROJECT: **LANDMARK VILLAGE**
SUB-BASIN NUMBER **RVW-44G**

**PROJECT CHARACTERISTICS**

| | | |
|---|---|---|
| $A_{Total}$ | 1.94 | |
| Predominate Soil Type | 20 | |
| % of Project Impervious | 0.1 | |
| % of Project Pervious | 0.9 | |
| % of project contributing undeveloped area | 0 | |
| $A_I$ (Impervious Area) | 0.2 | |
| $A_p$ (Pervious Area) | 1.7 | |
| $A_u$ (Contrib Undeveloped upstream area) | 0 | |

TABLE FOR $T_c$ ITERATIONS

| Iteration No. | Initial Tc (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D*I_X$ (in/hr | Calculated Tc (min) | Difference (min) | Imp. | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 0.193 | 0.1 | 0.18 | 0.03474 | 29.0 | -1.0 | 0.1 | 140 | 0.05 |
| 2 | 29.0 | | | 0 | 0 | #DIV/0! | #DIV/0! | | | #DIV/0! |
| 3 | | | | | | | | | | |
| | | | | | | | | | | |

Acceptable Tc Value 30.0 Minutes. Use 30 min max for Tc.

**Peak Mitigation Flow Rate $Q_{pm}$**

$Q_{pm} = C_D*I_X*A_{Total}*(1.008333ft^3\text{-hour/acre-inches-second})$

**$Q_{PM}$** **0.07 cfs.**

**Mitigation Volume Calculations - $V_m$**

$V_m = 2722.5(\text{Cu Ft/Ac})*[(A_I)(0.9) + (A_p+A_u)(C_u)]$

**$V_{m+}$** **950.697** Cubic Ft.
**0.02** Acre ft

# APPENDIX 9
# GEOSYNTEC MEMORANDUM

## Stormwater Treatment Control
## BMP Sizing

Geosyntec consultants

2566 Overland Avenue, Suite 670
Los Angeles, California 90064
PH 310.839.6040
FAX 310.839.6041
www.geosyntec.com

# Memorandum

| | |
|---|---|
| Date: | 22 October 2009 |
| To: | Nicholas Khoo, Erik Winata, John Vlassis, and Ross Barker, Psomas |
| Copy to: | Fred MacMurdo, Newhall Land |
| From: | Lisa Austin, Nichole Dunn and Aaron Poresky, Geosyntec Consultants |
| Subject: | Landmark Village - Evaluation of Stormwater Treatment Control BMP Sizing |

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The purpose of this memorandum is to verify that the treatment control BMPs shown on the *Newhall Ranch - Landmark Village Drainage Concept Vesting Tentative Tract Map No. 53108 SUSMP Plan* (Rev: April 2008) prepared by Psomas are consistent with the *Landmark Village Water Quality Technical Report* (Geosyntec, March 2008).

## TREATMENT CONTROL BMPS

The stormwater treatment control BMPs for the Landmark Village Project consist of one extended detention (ED) basin, eleven bioretention areas, one vegetated swale, and two modular wetlands. The ED basin, identified as BMP-8, will provide treatment for 57 acres (21%) of the project development area; the 11 bioretention areas will provide treatment for 204 acres (75%) of the project development area; the vegetated swale will provide treatment for 3.54 acres (~1.5%) of the project development area; and two modular wetlands will provide treatment for 2.6 acres (~1%) of the project development area.

The applicable sizing criterion for the project's ED basin and bioretention areas is the capture and treatment of 80 percent of the average annual runoff volume, with a drawdown time of 48 hours for the ED basin. This sizing criterion utilizes historical rainfall data with continuous simulation modeling and is consistent with volume-based sizing criterion #2 from the SUSMP Manual. The applicable sizing criterion for the Project's vegetated swale and modular wetlands uses a rainfall intensity based on SUSMP Appendix A, with a minimum of 0.3 inches per hour, which meets and exceeds flow-based sizing criterion #1 from the SUSMP Manual.

## VERIFICATION OF BMP SIZING

To verify that the treatment BMPs provided on the *Newhall Ranch - Landmark Village Drainage Concept Vesting Tentative Tract Map No. 53108 SUSMP Plan* (Rev: April 2008) are adequately sized, catchment delineations, catchment characteristics, and water quality volume and flow calculations were reviewed.

The ED basin for the Project is listed in Table 1 below along with its tributary area, Newhall Land volume, and the volume of the basin provided on the Drainage Concept SUSMP Plan. As shown in Table 1, the basin volume provided is greater than the minimum mitigation volume for 80% capture and is consistent with the sizing in the *Landmark Village Water Quality Technical Report*.

**Table 1: Extended Detention Basin Sizing Results**

| BMP ID | Tributary Area ID(s) | Tributary Area (acres) | Catchment Imperviousness (%) [1] | Newhall Land Basin Volume Required[2] (ac-ft) | Basin Volume Provided[3] (ac-ft) |
|---|---|---|---|---|---|
| BMP-8 | RVC-1A, RVC-2A, RVC-3A, RVC-4A, RVC-5A, RVC-6A, RVC-7A, RVC-9B, RVC-10B, RVC-11B, RVC-12B, RVC-13B, RVC-14B, RVW-1A, RVW-2A, RVW-3A, RVW-4A, RVW-5B, RVW-6B, RVW-7B, RVW-8B, RVW-9B, RVW-10B, RVW-11B, RVW-12B, RVW-17C, RVW-12C, RVW-13C, RVW-14C, RVW-15C, RVW-16C, RVW-43G | 57 | 76 | 4.6 | 5.06 |

[1] Im -based values per the *Landmark Village Tentative Tract Map 53108 Drainage Concept* (Psomas, April 2008).
[2] Basin sized using SWMM catchment-specific modeling results to capture and treat 80% of annual average runoff. Design volume does not account for additional storage needed for sediment storage and freeboard.
[3] Basin sizing per the *Newhall Ranch - Landmark Village Vesting Tentative Tract Map 53108 Drainage Concept SUSMP Plan* (Psomas, April 2008).

The bioretention area BMPs for the Project are listed in Table 2 below along with their tributary area, Newhall Land required volume and area, and the area provided on the Drainage Concept

SUSMP Plan. As shown in Table 2, the bioretention areas provided are equal to or greater than the minimum mitigation area for 80% capture and are consistent with the sizing in the *Landmark Village Water Quality Technical Report*.

**Table 2: Bioretention Sizing Results**

| BMP ID | Tributary Area ID(s) | Tributary Area (acres) | Catchment Imperviousness (%) [1] | Newhall Land Volume Required [2] (acre-ft) | Newhall Land Area Required [3] (acre) | Area Provided [4] (acre) |
|---|---|---|---|---|---|---|
| BMP-1 | RVE-20C, RVE-9B | 11.7 | 46 | 0.39 | 0.26 | 1.18 |
| BMP-2 | RVE-11C, RVE-12C, RVE-13C, RVE-14C, RVE-15C, RVE-16C, RVE-17C, RVE-18C, RVE-19C, RVE-29D | 14.3 | 62 | 0.58 | 0.38 | 0.63 |
| BMP-3 | RVE-21D, RVE-22.1D, RVE-22D, RVE-23D, RVE-24D, RVE-25D, RVE-26D, RVE-27D, RVE-28D, RVE-37E | 16.8 | 70 | 0.74 | 0.49 | 0.54 |
| BMP-4 | RVE-30E, RVE-31E, RVE-32E, RVE-33E, RVE-34E, RVE-35E, RVE-36E, RVE-46F | 17.1 | 65 | 0.71 | 0.48 | 1.08 |
| BMP-5 | RVC-8A, RVE-38F, RVE-39F, RVE-40F, RVE-41F, RVE-42F, RVE-43F, RVE-44F, RVE-45F | 13.0 | 64 | 0.54 | 0.36 | 0.41 |

| BMP ID | Tributary Area ID(s) | Tributary Area (acres) | Catchment Imperviousness (%) [1] | Newhall Land Volume Required [2] (acre-ft) | Newhall Land Area Required [3] (acre) | Area Provided [4] (acre) |
|---|---|---|---|---|---|---|
| BMP-6/BMP-7 | RVC-1A, RVC-2A, RVC-3A, RVC-4A, RVC-5A, RVC-6A, RVC-7A, RVC-9B, RVC-10B, RVC-11B, RVC-12B, RVC-13B, RVC-14B, RVW-1A, RVW-2A, RVW-3A, RVW-4A, RVW-5B, RVW-6B, RVW-7B, RVW-8B, RVW-9B, RVW-10B, RVW-11B, RVW-12B, RVW-17C, RVW-12C, RVW-13C, RVW-14C, RVW-15C, RVW-16C, RVW-43G | 77.2 | 72 | 3.45 | 2.30 | 2.73 |
| BMP-9 | RVW-32E, RVW-37E, RVW-38E, RVW-40E, RVW-42F | 9.6 | 83 | 0.47 | 0.32 | 0.34 |
| BMP-10 | RVW-39.1E, RVW-39E, RVW-41E | 8.5 | 61 | 0.34 | 0.23 | 0.68 |
| BMP-11/BMP-12 | RVE-51G, RVE-52G, RVE-53G, RVE-54G, RVE-55G, RVE-56G, RVE-57G, RVE-58G, RVE-59G, RVE-63G | 19.8 | 67 | 0.84 | 0.56 | 0.81 |
| BMP-14 | RVE-60G | 9.9 | 74 | 0.45 | 0.30 | 0.30 |
| BMP-17 | RVE-8A | 6.4 | 15 | 0.13 | 0.09 | 0.20 |

[1] Im -based values per the *Landmark Village Tentative Tract Map 53108 Drainage Concept* (Psomas, April 2008).
[2] Bioretention volume based on maximum bioretention depth of 18 inches.
[3] Bioretention area sized to capture and treat 80% of annual average runoff.
[4] Bioretention area per the *Newhall Ranch - Landmark Village Vesting Tentative Tract Map 53108 Drainage Concept SUSMP Plan* (Psomas, April 2008).

The Newhall Land Area Required is the wetted BMP area illustrated in Figure 1 below. The Newhall Land Area Required is equivalent to the total footprint required when the bioretention

side slopes are vertical. Figure 2 below illustrates a bioretention cross section that has sloped side walls; this figure illustrates the increase the total area required with side slopes.

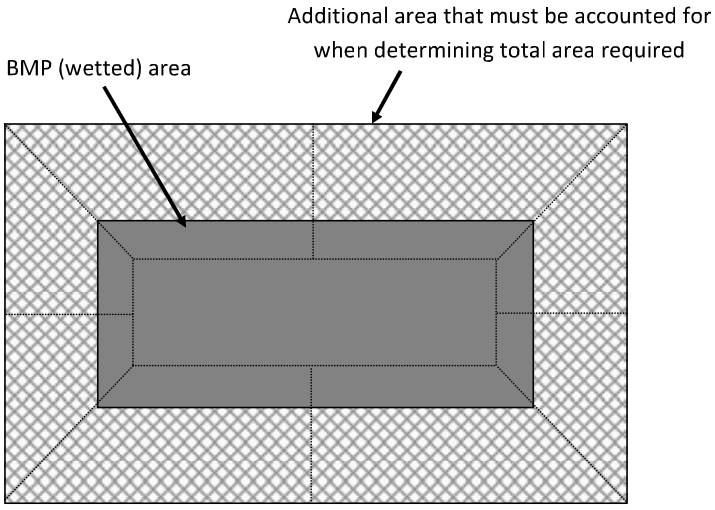



**Figure 1: Plan view of a rectangular shaped Bioretention facility, illustrating BMP "wetted" area**

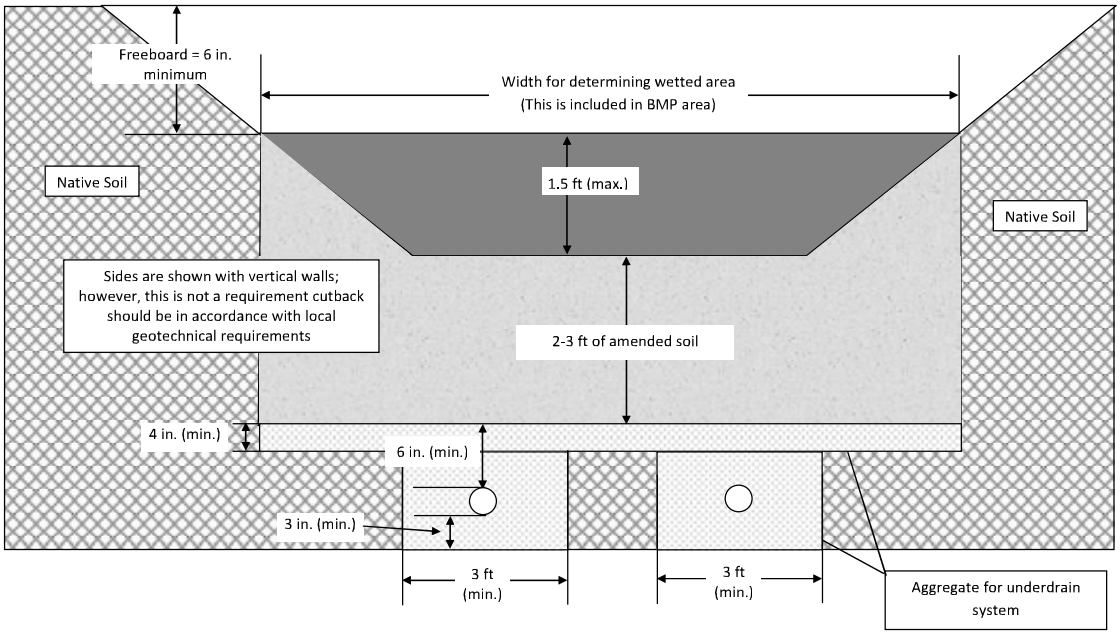



**Figure 2: Bioretention area cross-section schematic, shown with side slopes above ground level and vertical walls below ground level**

The vegetated swale for the Project is listed in Table 3 below, along with the tributary area, the design flow rate, and the design dimensions provided, including longitudinal slope, length, bottom width and side slopes. The rainfall intensity used in the sizing calculation was 0.359 in/hr, which meets or exceeds the 0.3 in/hr Newhall Land minimum flow-based sizing criteria. Swale design criterion is based on a 10-minute retention time. As shown in Table 3, the vegetated swale design achieves the 10-minute retention time criterion when sized with rainfall intensities, which meet or exceed the Newhall Land flow-based sizing criteria, and this design is consistent with the sizing in the *Landmark Village Water Quality Technical Report*.

**Table 3: Vegetated Swale Sizing Results**

| BMP ID | Tributary Area RVE-15C (acres) | Catchment Imper-viousness [1] (%) | Newhall Land Design Flow Rate[2] (cfs) | Swale Dimensions Provided [3] | | | | Achieves 10-min retention time [4] |
|---|---|---|---|---|---|---|---|---|
| | | | | Longi-tudinal Slope (%) | Length (ft) | Bottom Width (ft) | Side Slopes (H:V) | |
| BMP-13 | 3.54 | 15 | 0.31 | 1 | 330 | 3 | 4:1 | yes |

[1] Im -based values per the *Landmark Village Tentative Tract Map 53108 Drainage Concept* (Psomas, April 2008).

[2] Design flow rate using a rainfall intensity based on Los Angeles County SUSMP Manual Appendix A, with a minimum of 0.3 in/h .

[3] Swale dimensions per the *Newhall Ranch - Landmark Village Vesting Tentative Tract Map 53108 Drainage Concept SUSMP Plan* (Psomas, April 2008).

[4] Assumes a head feed swale configuration and a Manning's n of 0.25.

The modular wetlands for the Project are listed in Table 4 below, along with the tributary area, the design flow rate, and the number of units required and provided at each location. Rainfall intensities used in the sizing calculations were 0.359 in/hr for BMP-15 and 0.339 in/hr for BMP-16, depending on catchment area, which in all cases meets or exceeds the 0.3 in/hr Newhall Land criteria. Modular wetlands design criteria are based on a MWS-Linear Curb and Grate Type Modular Wetlands™ system with outer dimensions of 22' x 5' x 4.8' providing a peak treatment capacity of 0.27 cfs.

**Table 4: Modular Wetland Sizing Results**

| BMP ID | Tributary Area ID(s) | Tributary Area (acres) | Catchment Imperviousness (%) [1] | Newhall Land Design Flow Rate[2] (cfs) | Newhall Land Design Flow Rate (gpm) | Number of Units Required |
|---|---|---|---|---|---|---|
| BMP-15 | RVE-62G | 1.22 | 91 | 0.37 | 165 | 2 |
| BMP-16 | RVE-61G | 1.36 | 91 | 0.38 | 173 | 2 |

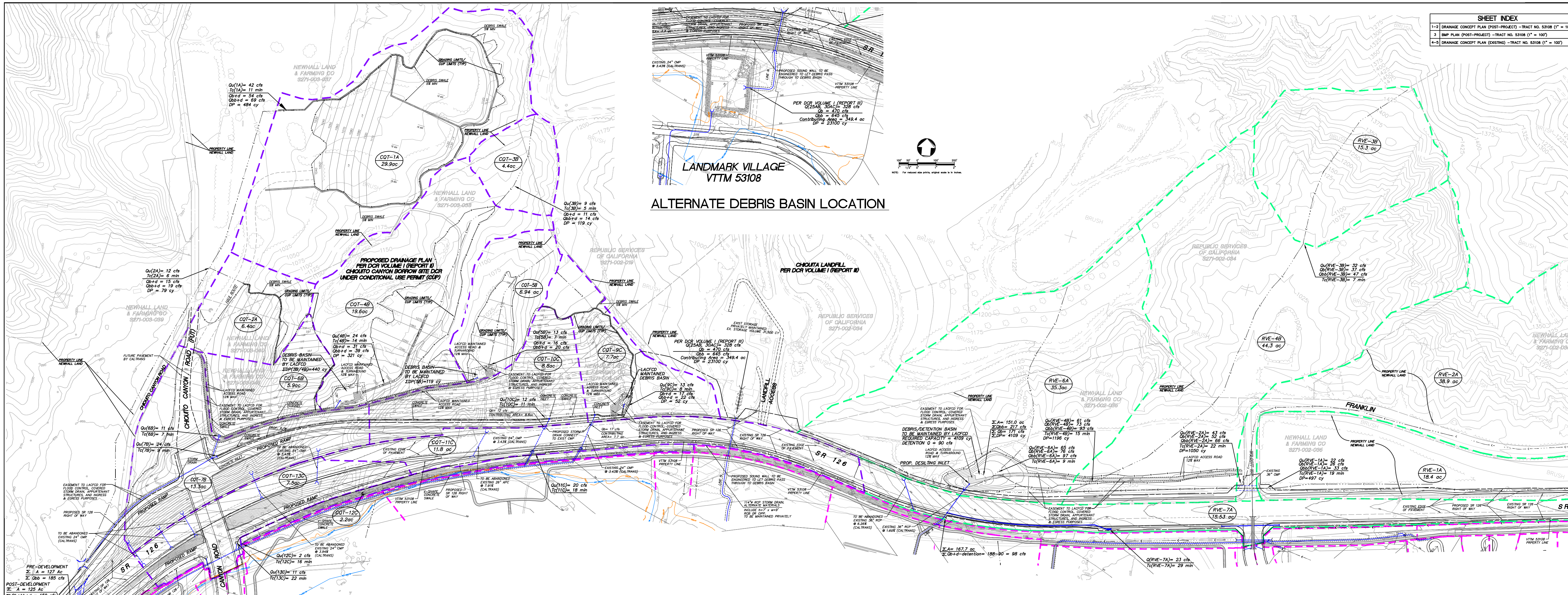
[1] Im -based values per the *Landmark Village Tentative Tract Map 53108 Drainage Concept* (Psomas, April 2008).

[2] Design flow rate using a rainfall intensity based on Los Angeles County SUSMP Manual Appendix A, with a minimum of 0.3 in/hr per Newhall Land criteria.

[3] Number of units required based on using a MWS-Linear Curb and Grate Type modular wetland system with a peak treatment capacity of 0.27 cfs (121 gpm) with outer dimensions of 22' x 5' x 4.8' to treat area specified per the *Newhall Ranch - Landmark Village Vesting Tentative Tract Map 53108 Drainage Concept SUSMP Plan* (Psomas, April 2008).

As shown in Table 4, the modular wetland units will meet or exceed the Newhall Land sizing criteria and are consistent with the sizing in the *Landmark Village Water Quality Technical Report*.

# APPENDIX 10
# DRAINAGE CONCEPT EXHIBITS




## SHEET INDEX

| | |
|---|---|
| 1-2 | DRAINAGE CONCEPT PLAN (POST-PROJECT) -TRACT NO. 53108 (1" = 100') |
| 3 | BMP PLAN (POST-PROJECT) -TRACT NO. 53108 (1" = 100') |
| 4-5 | DRAINAGE CONCEPT PLAN (EXISTING) -TRACT NO. 53108 (1" = 100') |

## DRAINAGE CONCEPT NOTES:

1. HYDROLOGY INFORMATION AND STORM DRAIN ALIGNMENTS SHOWN ARE NOT NECESSARILY APPROVED.
2. ALL STREET DRAINAGE REQUIREMENTS WILL COMPLY WITH THE SATISFACTION OF THE DEPARTMENT OF PUBLIC WORKS.
3. DEDICATION OF THE NECESSARY EASEMENTS FOR THE STORM DRAIN SYSTEM SHOWN WILL BE TO THE SATISFACTION OF THE DEPARTMENT OF PUBLIC WORKS.
4. PAVED VEHICULAR ACCESS WILL BE PROVIDED TO ALL INLETS, OUTLETS AND BASINS TO THE SATISFACTION OF THE DEPARTMENT OF PUBLIC WORKS.
5. APPROVAL OF THE DRAINAGE CONCEPT DOES NOT CONSTITUTE DETERMINATION THAT THE OFFSITE IMPROVEMENTS ARE REQUIRED WITHIN THE MEANING OF GOVERNMENT CODE SECTION 66462.5, (EXCEPT AS NOTED).
6. DELINEATE THE FLOOD HAZARD AREA AND DEDICATE TO THE COUNTY OF LOS ANGELES THE RIGHT TO RESTRICT BUILDING WITHIN THAT AREA ON THE FINAL MAP.
7. THE PROPOSED WATER QUALITY BASIN, SWALES, DEBRIS BASINS AND STORM DRAIN FACILITIES WILL BE MAINTAINED PUBLICLY. UNLESS OTHERWISE SHOWN. ALSO, PROPOSED DRAINAGE FACILITIES WITHIN CALTRANS R/W SHALL BE MAINTAINED BY CALTRANS
8. BECAUSE THE WATER QUALITY BASIN, AND SWALES PROVIDE AN OUTLET, AND NO PERCOLATION CONSIDERED, A 7-DAY PERCOLATION TEST WILL NOT BE REQUIRED.
9. FLOODWAY MAP WILL BE AMENDED AS PART OF THE RIVER ANALYSIS BY PACE ENGINEERING; PER DCR VOLUME V OF V.
10. CLOMR UNDER PREPARATION BY PACE; PER DCR VOLUME V OF V.
11. WHEN DUPLICATE DATA SHOWN ON BOTH TABLE & PLAN, PLAN DATA SHOWN FOR INFORMATIONAL PURPOSES ONLY.
12. ALL RIVER SWALES TO HAVE EMERGENCY OVERFLOW SPILLWAY FOR FLOOD DISCHARGE.
13. ENCROACHMENT INTO EXISTING MAIN LINE FLOODWAY AND FEMA ZONE "A" WILL BE MITIGATED.
14. AN ASSESSMENT DISTRICT SHALL BE FORMED TO FINANCE THE FUTURE ONGOING MAINTENANCE AND CAPITAL REPLACEMENT OF ALL DRAINAGE DEVICES/SYSTEMS IDENTIFIED BY THE PUBLIC WORKS. THE SUBDIVIDER SHALL DEPOSIT THE FIRST YEAR'S TOTAL ASSESSMENT BASED ON THE PUBLIC WORKS ENGINEERING REPORT. THIS WILL FUND THE FIRST YEAR'S MAINTENANCE AFTER THE FACILITIES ARE ACCEPTED. THE SECOND AND SUBSEQUENT YEARS' ASSESSMENT WILL BE COLLECTED THROUGH THE PROPERTY TAX BILL. THIS IS REQUIRED TO THE SATISFACTION OF THE DEPARTMENT OF PUBLIC WORKS.

PROJECT SITE

VICINITY MAP
NOT TO SCALE

## LEGEND:

| | |
|---|---|
| Q | Q unburned/develop |
| Qd | Q developed |
| Qb | Q burned |
| Qbb | Q burned+bulked |
| DP | DEBRIS PRODUCTION |

## DRAINAGE DESIGN CRITERIA:

1. 50-YEAR 24-HOUR ISOHYET: 5.8
2. SOIL TYPE: 020
3. DESIGN STORM: 50 YEAR RETURN PERIOD
4. PERCENT IMPERVIOUS VALUES: SINGLE FAMILY - 58%, MULTI-FAMILY - 74%, COMMERCIAL - 91%, SCHOOL - 82%, OPEN SPACE - 0%, PARK - 15%, ROADWAY - 91%
5. DPA= 09
6. BULK FACTOR= 1.27

IS CONCEPTUALLY APPROVED

LEGAL DESCRIPTION:

PARCELS 14, 15, 16, 17 OF PARCEL MAP NO. 24500-01 PMB 293-34 / 67, RECORDS OF LOS ANGELES COUNTY.

REGISTERED PROFESSIONAL ENGINEER ERIK WINATA No. C-67285 Exp. 09/30/10 CIVIL STATE OF CALIFORNIA

PSOMAS
28470 Avenue Stanford, Suite 300
Santa Clarita, CA 91355-1460
(661) 219-6000 (661) 775-2718 (FAX)

ERIK WINATA R.C.E. NO. C67285 DATE

DESIGNED : NSK/EW/JJ
DRAFTED : TC/MH
CHECKED : EW/RB/JV

OWNER/DEVELOPER :
NEWHALL RANCH
23823 WEST VALENCIA BOULEVARD
VALENCIA, CALIFORNIA 91335
TELEPHONE: (661) 255-4000
REPRESENTATIVE : MR. FRED MACMURDO

# OFFSITE TRIBUTARY AREA

REV: NOVEMBER 12, 2009
DATE: SEPT. 15, 2004

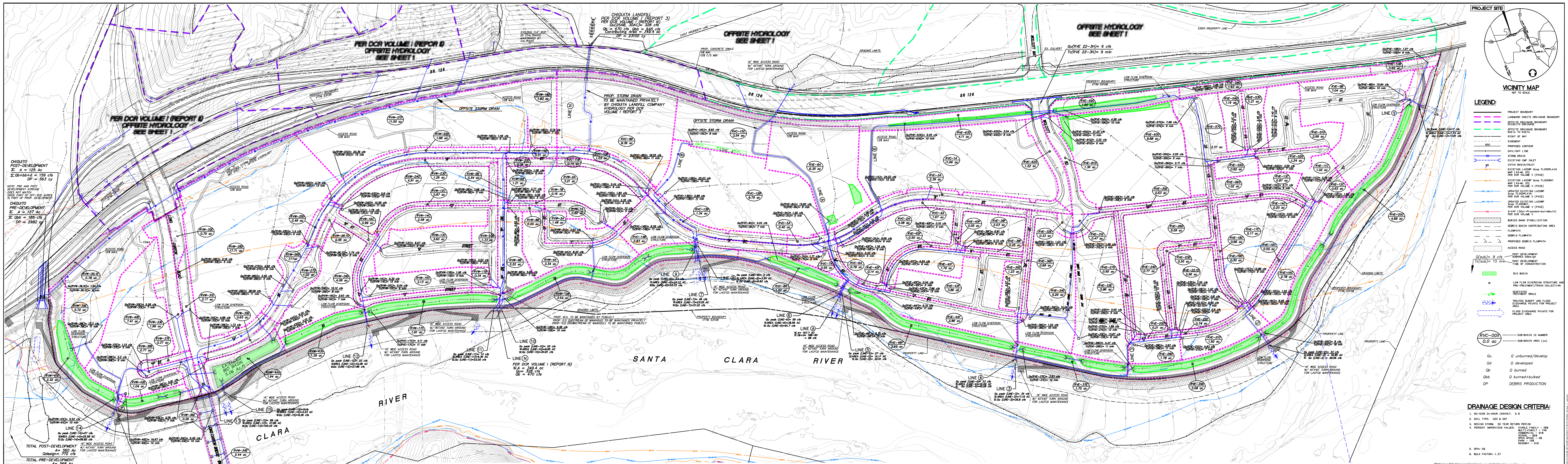
# DRAINAGE CONCEPT PLAN FOR VESTING TENTATIVE TRACT MAP NO. 53108
# NEWHALL RANCH - LANDMARK VILLAGE

IN THE UNINCORPORATED AREA OF THE COUNTY OF LOS ANGELES STATE OF CALIFORNIA

PROJECT NO. 1NRC0107.08
SHEET 1 OF 5

RV062-01

Plotted - 11/12/2009 9:57:02 AM :: Saved - 11/11/2009 3:02:06 PM :: V:\Newhall\PRODDATA\53108-MP\ENGR\MASTDES\VTTM\PI\RV062-01.dwg :: ewinata




## SPECIAL WATER QUALITY NOTES:

1. LOCATION, SIZE AND NUMBER OF WATER QUALITY BASIN, SWALES AND FITER STRIP ARE APPROXIMATE. SIZES ARE DEPENDENT ON THE AMOUNT OF WATER QUALITY TREATMENT PROVIDED IN UPSTREAM PROJECTS.
2. DEPENDING ON WATER QUALITY FACILITY SIZE, DURING FINAL DESIGN, ANY EXCESS LOT AREA CAN BE INCORPORATED INTO ADJACENT LOTS AND THEIR LAND USE.
3. THE WATER QUALITY BASIN, SWALES AND FILTER STRIP SHALL BE DEDICATED TO THE PUBLIC WHEN COMPLETED AND ACCEPTED.
4. OTHER DEPARTMENT APPROVED EQUIVALENT BMPS MAY BE SUBSTITUTED AS APPROPRIATE DURING FINAL DESIGN.

## DRAINAGE CONCEPT NOTES:

1. HYDROLOGY INFORMATION AND STORM DRAIN ALIGNMENTS SHOWN ARE NOT NECESSARILY APPROVED.
2. ALL STREET DRAINAGE REQUIREMENTS WILL COMPLY WITH THE SATISFACTION OF THE DEPARTMENT OF PUBLIC WORKS.
3. DEDICATION OF THE NECESSARY EASEMENTS FOR THE STORM DRAIN SYSTEM SHOWN WILL BE TO THE SATISFACTION OF THE DEPARTMENT OF PUBLIC WORKS.
4. PAVED VEHICULAR ACCESS WILL BE PROVIDED TO ALL INLETS, OUTLETS AND BASINS TO THE SATISFACTION OF THE DEPARTMENT OF PUBLIC WORKS.
5. APPROVAL OF THE DRAINAGE CONCEPT DOES NOT CONSTITUTE DETERMINATION THAT THE OFFSITE IMPROVEMENTS ARE REQUIRED WITHIN THE MEANING OF GOVERNMENT CODE SECTION 66462.5, (EXCEPT AS NOTED).
6. DELINEATE THE FLOOD HAZARD AREA AND DEDICATE TO THE COUNTY OF LOS ANGELES THE RIGHT TO RESTRICT BUILDING WITHIN THAT AREA ON THE FINAL MAP.
7. THE PROPOSED WATER QUALITY BASIN, SWALES, DEBRIS BASINS AND STORM DRAIN FACILITIES WILL BE MAINTAINED PUBLICLY. UNLESS OTHERWISE SHOWN. ALSO, PROPOSED DRAINAGE FACILITIES WITHIN CALTRANS R/W SHALL BE MAINTAINED BY CALTRANS
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## DRAINAGE DESIGN CRITERIA:

1. 50-YEAR 24-HOUR ISOHYET: 5.8
2. SOIL TYPE: 020 & 097
3. DESIGN STORM: 50 YEAR RETURN PERIOD
4. PERCENT IMPERVIOUS VALUES: SINGLE FAMILY - 58%, MULTI-FAMILY - 74%, COMMERCIAL - 91%, SCHOOL - 82%, OPEN SPACE - 0%, PARK - 15%, ROADWAY - 91%
5. DPA= 09
6. BULK FACTOR= 1.27

IS CONCEPTUALLY APPROVED

# HYDROLOGY PLAN

## LANDMARK PROJECT AREA

REV: NOVEMBER 12, 2009
DATE: SEPT. 15, 2004

LEGAL DESCRIPTION:
PARCELS 14, 15, 16, 17 OF PARCEL MAP NO. 24500-01 PMB 293-34 / 67, RECORDS OF LOS ANGELES COUNTY.

REGISTERED PROFESSIONAL ENGINEER ERIK WINATA No. C-67285 Exp. 09/30/10 CIVIL STATE OF CALIFORNIA

PSOMAS
28470 Avenue Stanford, Suite 300
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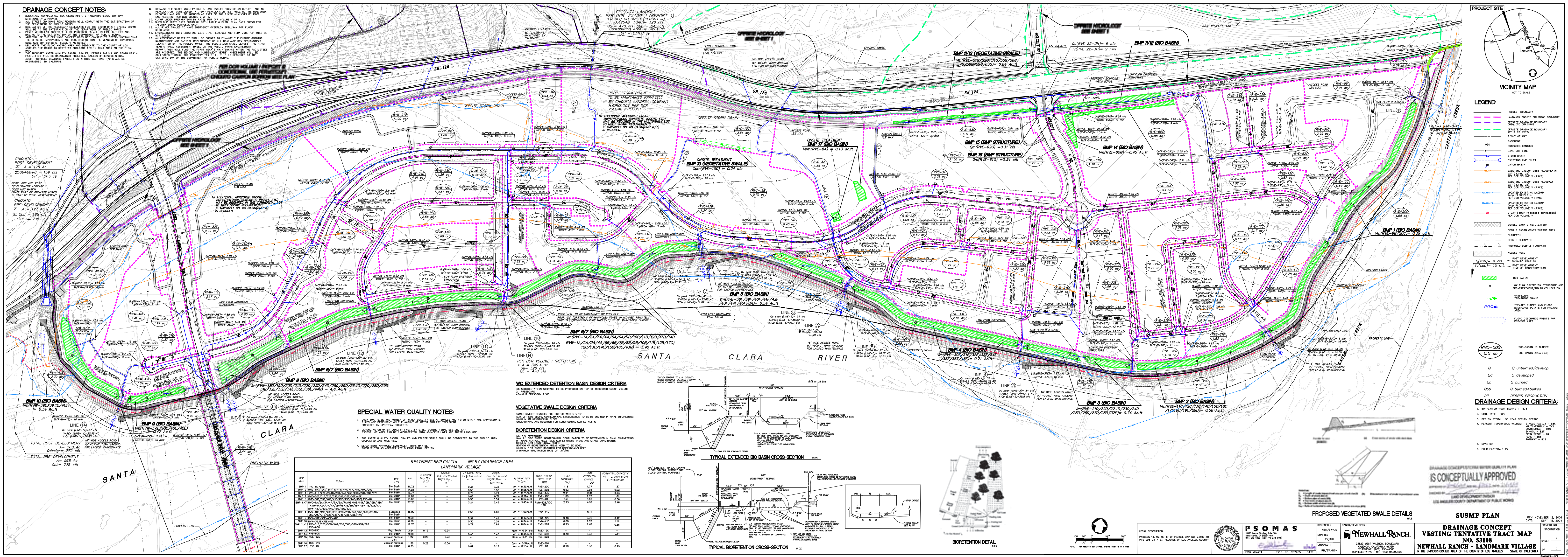
(661) 219-6000 (661) 775-2718 (FAX)
ERIK WINATA R.C.E. NO. C67285 DATE

DESIGNED: EW/NSK/JJ
DRAFTED: PY/MH
CHECKED: RB/EW/JV

OWNER/DEVELOPER:
NEWHALL RANCH
23823 WEST VALENCIA BOULEVARD
VALENCIA, CALIFORNIA 91335
TELEPHONE: (661) 255-4000
REPRESENTATIVE: MR. FRED MACMURDO

DRAINAGE CONCEPT
VESTING TENTATIVE TRACT MAP
NO. 53108
NEWHALL RANCH - LANDMARK VILLAGE
IN THE UNINCORPORATED AREA OF THE COUNTY OF LOS ANGELES STATE OF CALIFORNIA

PROJECT NO. 1NRC0107.08
SHEET 2 OF 5
RV062-02



DRAINAGE CONCEPT NOTES:
SPECIAL WATER QUALITY NOTES:
SANTA CLARA RIVER
CASTAIC CREEK
SR 126
VICINITY MAP
LEGEND:
DRAINAGE DESIGN CRITERIA
TYPICAL EXTENDED BIO BASIN CROSS-SECTION
TYPICAL BIORETENTION CROSS-SECTION
BIORETENTION DETAIL
PROPOSED VEGETATED SWALE DETAILS
N.T.S.
IS CONCEPTUALLY APPROVED
SUSMP PLAN
REV: NOVEMBER 12, 2009
DATE: SEPT. 15, 2004
LEGAL DESCRIPTION:
PARCELS 14, 15, 16, 17 OF PARCEL MAP NO. 24500-01
PMB 293-34 / 67, RECORDS OF LOS ANGELES COUNTY.
PSOMAS
28470 Avenue Stanford, Suite 300
Santa Clarita, CA 91355-1460
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ERIK WINATA R.C.E. NO. C67285 DATE
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NEWHALL RANCH
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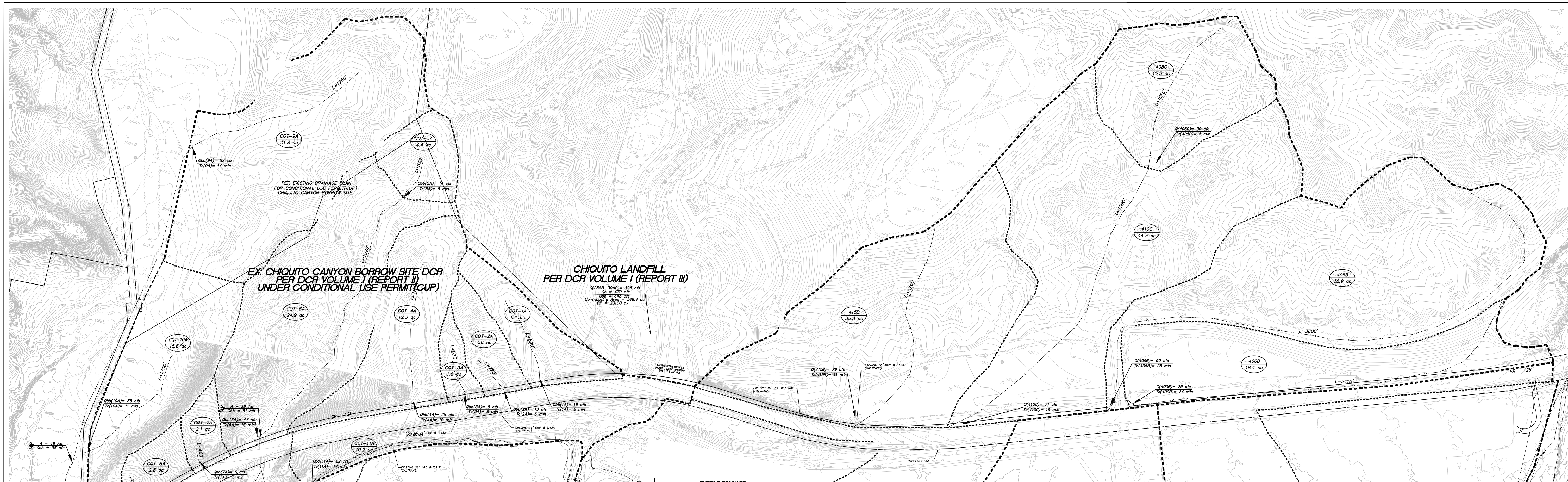
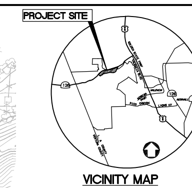
DRAINAGE CONCEPT
VESTING TENTATIVE TRACT MAP
NO. 53108
NEWHALL RANCH - LANDMARK VILLAGE
IN THE UNINCORPORATED AREA OF THE COUNTY OF LOS ANGELES STATE OF CALIFORNIA
PROJECT NO. 1NRC0107.08
SHEET 3 OF 5
RV062-03




**VICINITY MAP**
NOT TO SCALE

**LEGEND:**

- 110A — SUB-BASIN NUMBER
- 7.3 ac — SUB-BASIN AREA (ac)
- PROJECT BOUNDARY
- SUB-BASIN BOUNDARY
- DRAINAGE AREA BOUNDARY
- PROPERTY LINE
- EASEMENT
- PROPOSED CONTOUR
- DAYLIGHT LINE
- STORM DRAIN
- EXISTING CMP INLET
- CATCH BASIN
- EXISTING LACDWP Qcap FLOODPLAIN MAP (43-ML 23) PER DCR VOLUME V (PACE)
- EXISTING LACDWP Qcap FLOODWAY MAP (43-ML 23) PER DCR VOLUME V (PACE)
- UPDATED EXISTING LACDWP Qcap FLOODPLAIN. PER DCR VOLUME V (PACE)
- UPDATED EXISTING LACDWP Qcap FLOODWAY. PER DCR VOLUME V (PACE)
- Q-CAP (50yr-Proposed-burn&bulk) PER DCR VOLUME V
- BURIED BANK STABILIZATION
- DEBRIS BASIN CONTRIBUTING AREA
- FLOWPATH
- DEBRIS FLOWPATH
- Q(sub)= 9 cfs — EXISTING SUBAREA Q(burned + bulked)
- Tc(sub)= 15 min — EXISTING TIME OF CONCENTRATION

Q Qunburned/develop
Qd Qdeveloped
Qb Qburned
Qbb Qburned+bulked
Qbb Qburned+bulked

**DRAINAGE DESIGN CRITERIA:**

1. 50-YEAR 24-HOUR ISOHYET: 5.8
2. SOIL TYPE: 020
3. DESIGN STORM: 50 YEAR RETURN PERIOD
4. PERCENT IMPERVIOUS VALUES: SINGLE FAMILY - 58%
   MULTI-FAMILY - 74%
   COMMERCIAL - 91%
   SCHOOL - 82%
   OPEN SPACE - 0%
   PARK - 15%
   ROADWAY - 91%
5. DPA= 09
6. BULK FACTOR= 1.27

**EXISTING DRAINAGE**

| | INCREMENTAL SUB-BASINS | | | | | CUMULATIVE SUB-BASINS | |
|---|---|---|---|---|---|---|---|
| SUB-BASIN NUMBER | TIME OF CONCENTRATION (minutes) | SUB-BASIN AREA (acres) | Q (cfs) | Qb (cfs) | Qbb (cfs) | SUB-BASIN AREA (acres) | CUM. PEAK Qbb (cfs) |
| 100A | 22 | 32.7 | 30 | 41 | 52 | — | — |
| 110A | 20 | 49.6 | 42 | 58 | 74 | 82.3 | 112 |
| 200A | 17 | 17.3 | 17 | 23 | 29 | — | — |
| 210A | 24 | 35.8 | 28 | 39 | 50 | 53.1 | 76 |
| 400B | 24 | 18 4 | 14 | 20 | 25 | — | — |
| 405A | 28 | 38.9 | 27 | 39 | 50 | — | — |
| 408C | 8 | 15.3 | 24 | 31 | 39 | — | — |
| 410C | 19 | 44.3 | 41 | 56 | 71 | — | — |
| 415B | 11 | 35.3 | 47 | 62 | 79 | — | — |
| 420A | 24 | 34.4 | 26 | 37 | 47 | — | — |
| 425A | 20 | 39.9 | 35 | 48 | 61 | 226.5 | 304 |
| 500A | 20 | 26.5 | 23 | 32 | 41 | — | — |
| 510A | 24 | 40.0 | 31 | 44 | 53 | 66.5 | 81 |
| 620A | 22 | 12 4 | 10 | 14 | 18 | 12 4 | 18 |
| | | | | | SUBTOTAL | 440.8 | 591 |
| | | | | | CHIQUITO | 127.3 | 185 |
| | | | | | TOTAL | 568.1 | 776 |

**EXISTING CHIQUITO PROJECT DRAINAGE**

| | | INCREMENTAL SUB-BASINS — 50-YEAR STORM EVENT | | | | |
|---|---|---|---|---|---|---|
| SUB-BASIN NUMBER | TIME OF CONCENTRATION (minutes) | SUB-BASIN AREA (acres) | Qu (cfs) | Qb (cfs) | Qbb (cfs) | DEBRIS PRODUCTION (cy) |
| CQT-1A | 8 | 6.1 | 10 | 13 | 16 | 165 |
| CQT-2A | 6 | 3.6 | 8 | 10 | 13 | 97 |
| CQT-3A | 5 | 1.8 | 4 | 5 | 6 | 49 |
| CQT-4A | 10 | 12.3 | 17 | 22 | 28 | 332 |
| CQT-5A | 5 | 4.4 | 9 | 11 | 14 | 119 |
| CQT-6A | 15 | 24.9 | 27 | 37 | 47 | 672 |
| CQT-7A | 5 | 2.1 | 4 | 5 | 6 | 57 |
| CQT-8A | 5 | 2.8 | 7 | 8 | 10 | 76 |
| CQT-9A | 14 | 31 8 | 36 | 49 | 62 | 859 |
| CQT-10A | 11 | 15.6 | 21 | 28 | 36 | 421 |
| CQT-11A | 17 | 10.2 | 16 | 17 | 22 | 54 |
| CQT-12A | 10 | 11.7 | 25 | 27 | 34 | 81 |
| SUBTOTAL (PEAK FLOW) | | 127.3 | 107 | 146 | 185 | 2982 |

DRAINAGE CONCEPT/SUSMP/WATER QUALITY PLAN
IS CONCEPTUALLY APPROVED
LAND DEVELOPMENT DIVISION
LOS ANGELES COUNTY DEPARTMENT OF PUBLIC WORKS

100' 50' 0' 100' 200'
1" 1/2" 0" 1" 2"
NOTE: For reduced size prints, original scale is in inches.

**EXISTING AREAS OFFSITE**

REV: NOVEMBER 12, 2009
DATE: SEPT 15, 2004

LEGAL DESCRIPTION:
PARCELS 14, 15, 16, 17 OF PARCEL MAP NO. 24500-01 PMB 293-34 / 67, RECORDS OF LOS ANGELES COUNTY.

REGISTERED PROFESSIONAL ENGINEER ERIK WINATA No. C-67285 Exp. 09/30/10 CIVIL STATE OF CALIFORNIA

PSOMAS
11444 West Olympic Boulevard, Suite 750
West Los Angeles, CA 90064-1549
(310) 954-3700 (310) 954-3777 (FAX)

ERIK WINATA R.C.E. NO. C67285 DATE

DESIGNED: NSK/EW/RB
DRAFTED: AC/ML
CHECKED: EW/RB

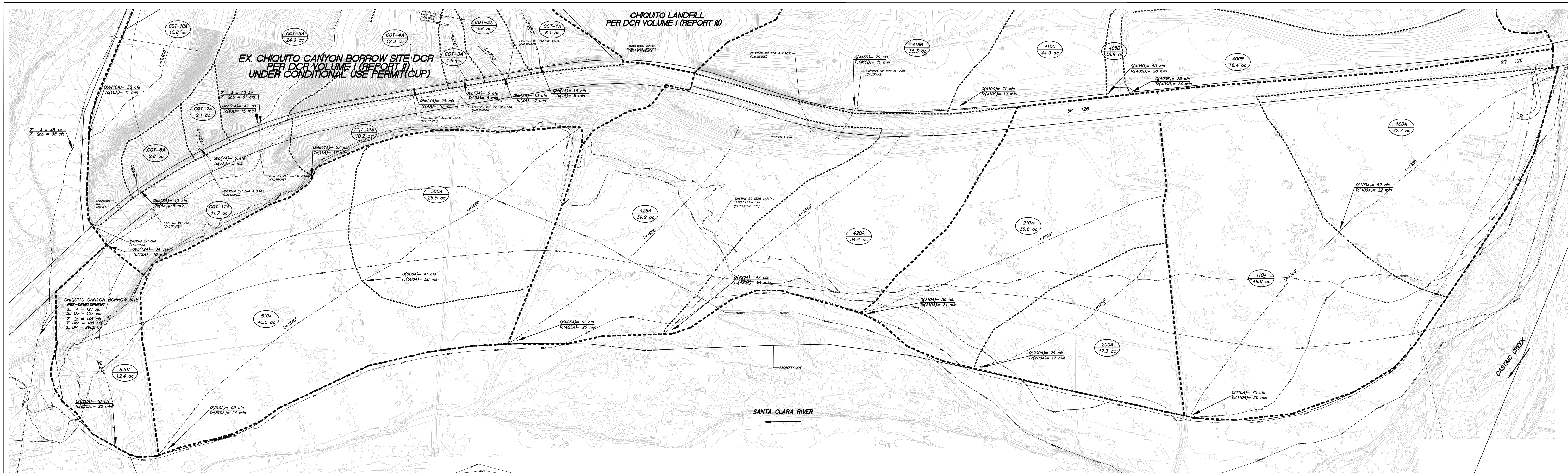
OWNER/DEVELOPER:
NEWHALL RANCH
23823 WEST VALENCIA BOULEVARD
VALENCIA, CALIFORNIA 91335
TELEPHONE: (661) 255-4000
REPRESENTATIVE: MR. DAVID CROWDER

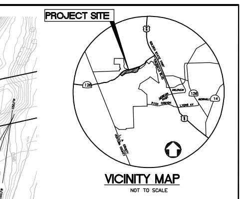
**EXISTING DRAINAGE PLAN FOR VESTING TENTATIVE TRACT MAP NO. 53108**
**NEWHALL RANCH - LANDMARK VILLAGE**
IN THE UNINCORPORATED AREA OF THE COUNTY OF LOS ANGELES STATE OF CALIFORNIA

PROJECT NO. 1NRC0107.08
SHEET 4 OF 5

RV062-04

Plotted - 11/12/2009 10:25:41 AM :: Saved - 11/11/2009 3:16:16 PM :: V:\Newhall\PRODDATA\53108-MP\ENGR\MASTDES\VTTM\PI\RV062-04.dwg :: ewinata




**VICINITY MAP**

NOT TO SCALE

## LEGEND:

| | |
|---|---|
| 110A | SUB-BASIN NUMBER |
| 007.3 ac | SUB-BASIN AREA (ac) |
| | PROJECT BOUNDARY |
| | SUB-BASIN BOUNDARY |
| | DRAINAGE AREA BOUNDARY |
| | RIGHT OF WAY |
| | EASEMENT |
| 950 | PROPOSED CONTOUR |
| | DAYLIGHT LINE |
| SD | STORM DRAIN |
| | EXISTING CMP INLET |
| | CATCH BASIN |
| X50. FP | EXISTING LACDWP Qcap FLOODPLAIN MAP (43-ML 23) PER DCR VOLUME V (PACE) |
| X50. FW | EXISTING LACDWP Qcap FLOODWAY MAP (43-ML 23) PER DCR VOLUME V (PACE) |
| REV. X50. FP | UPDATED EXISTING LACDWP Qcap FLOODPLAIN. PER DCR VOLUME V (PACE) |
| REV X50. FW | UPDATED EXISTING LACDWP Qcap FLOODWAY. PER DCR VOLUME V (PACE) |
| Q50 | Q-CAP (50yr-Proposed-burn&bulk) PER DCR VOLUME V |
| | BURIED BANK STABILIZATION |
| | DEBRIS BASIN CONTRIBUTING AREA |
| | FLOWPATH |
| | DEBRIS FLOWPATH |
| Q(sub)= 9 cfs | EXISTING SUBAREA Q(burned + bulked) |
| Tc(sub)= 15 min | EXISTING TIME OF CONCENTRATION |

| | |
|---|---|
| Q | Qunburned/develop |
| Qd | Qdeveloped |
| Qb | Qburned |
| Qbb | Qburned+bulked |
| Qbb | Qburned+bulked |

## DRAINAGE DESIGN CRITERIA:

1. 50-YEAR 24-HOUR ISOHYET: 5.8
2. SOIL TYPE: 020
3. DESIGN STORM: 50 YEAR RETURN PERIOD
4. PERCENT IMPERVIOUS VALUES: SINGLE FAMILY - 58%, MULTI-FAMILY - 74%, COMMERCIAL - 91%, SCHOOL - 82%, OPEN SPACE - 0%, PARK - 15%, ROADWAY - 91%
5. DPA= 09
6. BULK FACTOR= 1.27

100' 50' 0' 100' 200'

NOTE: For reduced size prints, original scale is in inches.

## EXISTING DRAINAGE

| | INCREMENTAL SUB-BASINS | | | | | CUMULATIVE SUB-BASINS | |
|---|---|---|---|---|---|---|---|
| SUB-BASIN NUMBER | TIME OF CONCENTRATION (minutes) | SUB-BASIN AREA (acres) | Q (cfs) | Qb (cfs) | Qbb (cfs) | SUB-BASIN AREA (acres) | Qbb (cfs) |
| 100A | 22 | 32.7 | 30 | 41 | 52 | -- | -- |
| 110A | 20 | 49.6 | 42 | 58 | 74 | 82.3 | 112 |
| 200A | 17 | 17.3 | 17 | 23 | 29 | -- | -- |
| 210A | 24 | 35.8 | 28 | 39 | 50 | 53.1 | 76 |
| 400B | 24 | 18 4 | 14 | 20 | 25 | -- | -- |
| 405A | 28 | 38.9 | 27 | 39 | 50 | -- | -- |
| 408C | 8 | 15.3 | 24 | 31 | 39 | -- | -- |
| 410C | 19 | 44.3 | 41 | 56 | 71 | -- | -- |
| 415B | 11 | 35.3 | 47 | 62 | 79 | -- | -- |
| 420A | 24 | 34.4 | 26 | 37 | 47 | -- | -- |
| 425A | 20 | 39.9 | 35 | 48 | 61 | 226.5 | 304 |
| 500A | 20 | 26.5 | 23 | 32 | 41 | -- | -- |
| 510A | 24 | 40.0 | 31 | 44 | 53 | 66.5 | 81 |
| 620A | 22 | 12.4 | 10 | 14 | 18 | 12.4 | 18 |
| | | | | | SUBTOTAL | 440 8 | 591 |
| | | | | | CHIQUITO | 127.3 | 185 |
| | | | | | TOTAL | 568.1 | 776 |

## EXISTING CHIQUITO PROJECT DRAINAGE

| | | INCREMENTAL SUB-BASINS 50-YEAR STORM EVENT | | | | |
|---|---|---|---|---|---|---|
| SUB-BASIN NUMBER | TIME OF CONCENTRATION (minutes) | SUB-BASIN AREA (acres) | Qu (cfs) | Qb (cfs) | Qbb (cfs) | DEBRIS PRODUCTION (cy) |
| CQT-1A | 8 | 6.1 | 10 | 13 | 16 | 165 |
| CQT-2A | 6 | 3.6 | 8 | 10 | 13 | 97 |
| CQT-3A | 5 | 1.8 | 4 | 5 | 6 | 49 |
| CQT-4A | 10 | 12.3 | 17 | 22 | 28 | 332 |
| CQT-5A | 5 | 4.4 | 9 | 11 | 14 | 119 |
| CQT-6A | 15 | 24.9 | 27 | 37 | 47 | 672 |
| CQT-7A | 5 | 2.1 | 4 | 5 | 6 | 57 |
| CQT-8A | 5 | 2.8 | 7 | 8 | 10 | 76 |
| CQT-9A | 14 | 31.8 | 36 | 49 | 62 | 859 |
| CQT-10A | 11 | 15.6 | 21 | 28 | 36 | 421 |
| CQT-11A | 17 | 10.2 | 16 | 17 | 22 | 54 |
| CQT-12A | 10 | 11.7 | 25 | 27 | 34 | 81 |
| SUBTOTAL | | 127.3 | 107 | 146 | 185 | 2982 |

IS CONCEPTUALLY APPROVED

# EXISTING AREAS ON-SITE

REV: NOVEMBER 12, 2009
DATE: SEPT 15, 2004

LEGAL DESCRIPTION:

PARCELS 14, 15, 16, 17 OF PARCEL MAP NO. 24500-01 PMB 293-34 / 67, RECORDS OF LOS ANGELES COUNTY.

REGISTERED PROFESSIONAL ENGINEER ERIK WINATA No. C-67285 Exp. 09/30/10 CIVIL STATE OF CALIFORNIA

PSOMAS
28470 Avenue Stanford, Suite 300
Santa Clarita, CA 91355
(661) 219-6000 (661) 775-2718 (FAX)
ERIK WINATA R.C.E. NO. C67285 DATE

DESIGNED : NSK/EW/JJ
DRAFTED : AC/ML
CHECKED : EW/RB

OWNER/DEVELOPER :
NEWHALL RANCH
23823 WEST VALENCIA BOULEVARD
VALENCIA, CALIFORNIA 91335
TELEPHONE: (661) 255-4000
REPRESENTATIVE : MR. FRED MACMURDO

# EXISTING DRAINAGE PLAN FOR VESTING TENTATIVE TRACT MAP NO. 53108

## NEWHALL RANCH - LANDMARK VILLAGE

IN THE UNINCORPORATED AREA OF THE COUNTY OF LOS ANGELES STATE OF CALIFORNIA

PROJECT NO. 1NRC0107.08

SHEET 5 OF 5

RV062-05

# REPORT II

## OFF-SITE BORROW AREAS
## (UNDER CONDITIONAL USE PERMIT)
## DRAINAGE CONCEPT REPORT

PSOMAS

# OFF-SITE BORROW AREAS
# (UNDER CONDITIONAL USE PERMIT)
# REVISED DRAINAGE CONCEPT REPORT

**November 2009**

# OFF-SITE BORROW AREAS
# (UNDER CONDITIONAL USE PERMIT)
# REVISED DRAINAGE CONCEPT REPORT

Psomas Project No: 1NRC010708
Prepared: November 2009

Prepared for:

**NEWHALL LAND**
23823 W. Valencia Blvd.
Valencia, CA 91355-2194
Telephone: (661) 255-4000

Prepared by:

**PSOMAS**
28480 Avenue Stanford, Suite 200
Santa Clarita, California 91355
Telephone: (661) 219-6000
Fax: (661) 775-2718

11/12/09

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Proposed Condition Results
Baseline Hydrology Comparison

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## APPENDICES

1. **LACDPW Hydrology Data**
2. **Existing Condition TC Calculations**
3. **Proposed Condition TC Calculations**
4. **Existing Condition LACDPW MORA Calculations**
5. **Proposed Condition LACDPW MORA Calculations**
6. **Erosion and Sediment Control BMP Fact Sheets**
7. **Hydrology Exhibits for Chiquito Canyon Borrow Site**
8. **Hydrology Exhibits for Adobe Canyon Borrow Site**

# 1.0 Introduction

**NOTE: This Drainage Report was conceptuall lopment Division, Los Angeles County Department of Public Work on July 5, 2007. A revision of this drainage report is needed for consistency with revised proposed grading on Adobe Canyon borrow site and Chiquito Canyon borrow site since approval on July 5, 2007.**

## *Project Background*

Psomas has been retained by the Newhall Land Co. to prepare a drainage concept report for the two off-site borrow areas associated with the Tentative Tract Map No. 53108 for the proposed Landmark Village development. The borrow areas are under a Conditional Use Permit (CUP), not part of the tentative tract map itself. The Chiquito Canyon borrow site is located north of Landmark Village, just north of SR 126. The Adobe Canyon borrow site is located south of Landmark Village, just south of the Santa Clara River.

## *Purpose and Scope*

The project falls under the jurisdiction of the Los Angeles County Department of Public Works (LACDPW). The purpose of this drainage concept report is:

- To meet Los Angeles County Land Development requirements in support of the tentative tract map submittal, allowing final design and construction to proceed in a timely manner;
- To determine the proposed development's impact to existing hydrologic conditions;
- To provide sufficient detailed information to support detailed hydraulic design of storm drainage facilities; and
- To document that the Los Angeles County Standard Urban Stormwater Mitigation Plan (SUSMP) requirements will be met.

It should be noted that detailed storm drain and debris basin analyses is beyond the scope of this drainage concept.

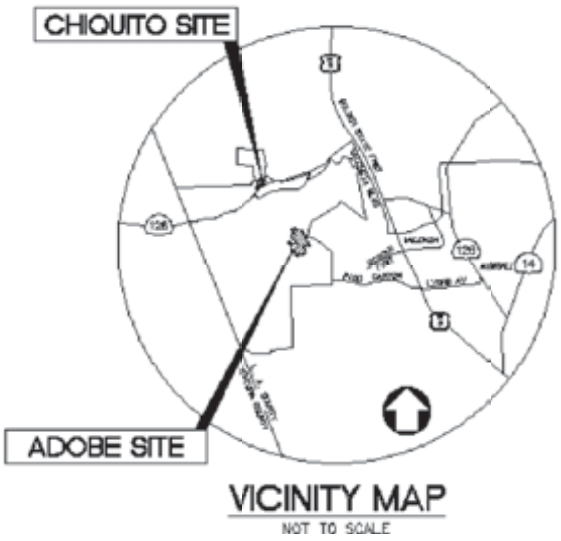



Figure 1. Location Map

## 2.0 Hydrology

### *General Approach*

The watershed for each borrow site area was divided into several sub-basins that were identified and characterized for both existing and proposed conditions. Computer modeling was used to estimate the runoff for the 50-year storm events. The analysis considered with the additional bulking factors where appropriate to size sediment/debris facilities.

For the Chiquito Canyon site proposed condition, a combination of burned hydrology, and burned and bulked hydrology was considered for the discharges from the site, since sediment-trapping devices will be installed at the downstream end of the project for certain areas only. Debris basins are not planned for sub-basins CQT-9A and CQT-10A for the following reasons: the existing condition generates more debris than the proposed condition, the sub-basins drain directly to Chiquito Canyon, the improvements are temporary in nature,(i.e. a borrow site for constructing the proposed development) a -basins.

### *Data Sources*

The primary sources of data were the *LACDPW Hydrology/ Sedimentation Manual and Appendices* (LACDPW 1991, 1992, 1993, 2002) and the LA County *Standard Urban Stormwater Mitigation Plan* (March 2000). Other key sources included the *TC (v1.0),* and *MORA (v7.2)* manuals and the Newhall Ranch Specific Plan Master Hydrology and Drainage Concept, Sikand December 1999 (appended for reference).

### *Watershed Characteristics*

The Chiquito borrow site is bounded by SR 126 on the south, Chiquito Canyon on the west, and the Chiquito Landfill on the east. The total drainage area for the site encompasses approximately 73 acres and flows predominantly south to existing culverts under SR 126; a small portion drains west to Chiquito Canyon. The majority of the area is undeveloped land with steep to moderate slopes.

The Adobe borrow site is located south of the Santa Clara River and is bounded by Long Canyon to the west and the proposed Mesas East development to the east. The total drainage area for the site is about 214 acres and flows generally northwest and westerly. The majority of the land is undeveloped with steep to moderate slopes.

The soil of the two watersheds is classified by Los Angeles County to be Type 020 & 097, as shown on the figure (LACDPW 1-H1.43) included in Appendix 1. The figure also shows that the drainage areas of the two sites are associated with Debris Potential Area (DPA) numbers 08 and 09. As previously discussed, the proposed use of sediment trapping devices preclude the necessity of bulking factors in the proposed condition for the storm drain system leaving Chiquito borrow site. The peak bulking factor curves and peak debris production rates used in the analysis are included in Appendix 1 (LACDPW P2 & P5).

The Chiquito and Adobe borrow sites are located in Los Angeles County's Rainfall Isohyets 5.8, as shown on the aforementioned figure in Appendix 1.

The drainage area for the Chiquito site consists of twelve (12) sub-basins that independently drain toward the Santa Clara River, as shown on the Existing Condition Hydrology Map included with this report. The sub-basins drain southwesterly on site, ultimately tributary to the Santa Clara River.

The drainage area for the Adobe site consists of eight (8) sub-basins that independently drain toward the Santa Clara River, as shown on the Existing Condition Hydrology Map included with this report. The sub-basins drain northwesterly on site, ultimately tributary to the Santa Clara River.

The *LACDPW TC (TC_calc_depth.xls, June2002)* program was used to calculate the time of concentration for each sub area. The *LACDPW MORA (v7.2)* computer program was used for the *Modified Rational Method* calculations and calculation of peak runoff rates and hydrographs. The TC calculations and MORA program output are provided in Appendix 2-3 and 4-5, respectively. In accordance with LACDPW requirements, the 50-year burned-a -bulked storm event was used as the main design storm in the analysis.

In the tables that follow, the following abbreviations apply:

$Q_u$ = Runoff, Unburned and Unbulked
$Q_b$ = Burned Runoff

$Q_{bb}$ = Burned and Bulked Runoff
$Q_{b+d}$ = Burned and Developed Runoff
$Q_{bb+d}$ = Burned and Bulked and Developed Runoff
$Q_{design}$ = Runoff Value Used for Design

### *Existing Condition Results*

Existing condition hydrology results for the Capital Flood storm event are summarized in Tables 1a and 1b below.

**Table 1a: Existing Condition Hydrology Summary – Chiquito Site**

| Sub basins | Area (Ac) | 50-Year Storm Event | | | |
|---|---|---|---|---|---|
| | | Time of Conc. (min) | $Q_u$ (cfs) | $Q_b$ (cfs) | $Q_{bb}$ (cfs) |
| CQT-1A | 6.1 | 8 | 10 | 13 | 16 |
| CQT-2A | 3.6 | 6 | 8 | 10 | 13 |
| CQT-3A | 1.8 | 5 | 4 | 5 | 6 |
| CQT-4A | 12.3 | 10 | 17 | 22 | 28 |
| CQT-5A | 4.4 | 5 | 9 | 11 | 14 |
| CQT-6A | 24.9 | 15 | 27 | 37 | 47 |
| CQT-7A | 2.1 | 5 | 4 | 5 | 6 |
| CQT-8A | 2.8 | 5 | 7 | 8 | 10 |
| CQT-9A | 31.8 | 14 | 36 | 49 | 62 |
| CQT-10A | 15.6 | 11 | 21 | 28 | 36 |
| CQT-11A | 10.2 | 17 | 16 | 17 | 22 |
| CQT-12A | 11.7 | 10 | 25 | 27 | 34 |
| Total | **127.3** | | 107 | 146 | **185** |

**Table 1b: Existing Condition Hydrology Summary – Adobe Site**

| Sub basins | Area (Ac) | 50-Year Storm Event | | | |
|---|---|---|---|---|---|
| | | Time of Conc. (min) | $Q_u$ (cfs) | $Q_b$ (cfs) | $Q_{bb`}$ (cfs) |
| ADB-1A | 35.8 | 9 | 67 | 77 | 105 |
| ADB-2A | 40.0 | 10 | 71 | 82 | 112 |
| ADB-3A | 24.0 | 11 | 40 | 47 | 64 |
| ADB-4B | 16.7 | 11 | 28 | 32 | 44 |
| ADB-5B | 39.9 | 16 | 53 | 63 | 86 |
| ADB-7C | 27.4 | 12 | 53 | 51 | 69 |
| ADB-8C | 12.9 | 10 | 21 | 26 | 36 |
| ADB-9C | 16.6 | 8 | 33 | 38 | 52 |
| Total | **213.3** | | 359 | 416 | **568** |

### *Post-Project Condition Results*

The post-project condition hydrologic analysis was based on the preliminary concept drainage plan prepared by Psomas, included with this report. The post-project (developed) Condition Drainage Concept Map is also included with this report. Post-development drainage patterns do not significantly differ from the aforementioned existing characteristics.

As with the existing condition analysis, the *LACDPW TC* program was used to calculate the time of concentration, and the *LACDPW MORA* computer program was used to calculate the peak runoff rates and hydrographs. The calculations and program output are provided in Appendix 3 and 5 respectively. In accordance with the *LACDPW Hydrology/Sedimentation Appendix*, imperviousness coefficients are as follows:

**Table 2: Land Use Impervious Values**

| Land Use | Percent Imperviousness |
|---|---|
| Open Space/Natural | 0% |
| Borrow Site Grading | 0% |

Post-project condition hydrology results for the 50-year storm event are summarized in Table 3a and 3b.

**Table 3a: Post-Project Condition Hydrology Summary – Chiquito Site**

| Sub basins | Area (Ac) | 50-Year Storm Event | | | | |
|---|---|---|---|---|---|---|
| | | Time of Conc. (min) | $Q_u$ (cfs) | $Q_{b+d}$ (cfs) | $Q_{bb+d}$ (cfs) | $Q_{design}$ [A] (cfs) |
| CQT-1A | 29.9 | 11 | 42 | 54 | 69 | 69 |
| CQT-2A | 6.4 | 6 | 12 | 15 | 19 | 19 |
| CQT-3B | 4.4 | 5 | 9 | 11 | 14 | 11 |
| CQT-4B | 19.6 | 14 | 24 | 31 | 39 | 31 |
| CQT-5B | 6.94 | 7 | 13 | 16 | 20 | 16 |
| CQT-6B | 5.9 | 7 | 11 | 14 | 18 | 14 |
| CQT-7B | 13.3 | 9 | 24 | 28 | 35 | 28 |
| CQT-9C | 7.7 | 8 | 13 | 17 | 22 | 17 |
| CQT-10C | 8.8 | 11 | 12 | 16 | 20 | 16 |
| CQT-11C | 11.8 | 18 | 20 | - | - | 20 |
| CQT-12C | 2.2 | 16 | 2 | - | - | 2 |
| CQT-13C | 7.5 | 22 | 11 | - | - | 11 |
| Total | **124.4** | | 109 | 159 | 202 | **159**[A] |

*Notes*

*A. Burned flows for Subareas CQT-3B, CQT-4B, CQT-5B, CQT-7B, CQT-9C Burned and bulked flows for Subareas CQT-1A and, CQT-2A, Developed flows for Subareas CQT-11C , CQT-12C and CQT-13C*

**Table 3b: Post-Project Condition Hydrology Summary – Adobe Site**

| Sub basins | Area (Ac) | 50-Year Storm Event | | | | |
|---|---|---|---|---|---|---|
| | | Time of Conc. (min | $Q_u$ (cfs) | $Q_{b+d}$ (cfs) | $Q_{bb+d}$ (cfs) | $Q_{design}$[A](cfs) |
| ADB-1A | 25.2 | 9 | 47 | 54 | 74 | 54 |
| ADB-2A | 46.8 | 9 | 87 | 92 | 103 | 92 |
| ADB-3A | 25.5 | 10 | 45 | 49 | 58 | 49 |
| ADB-4A | 23.5 | 11 | 39 | 39 | 39 | 39 |
| ADB-5B | 14.24 | 8 | 28 | 33 | 44 | 44 |
| ADB-6B | 40.7 | 21 | 46 | 53 | 69 | 69 |
| ADB-7C | 17 | 10 | 30 | 35 | 47 | 47 |
| ADB-8C | 6.6 | 5 | 17 | 19 | 26 | 26 |
| ADB-9C | 15.1 | 6 | 36 | 38 | 46 | 46 |
| Total | **214.6** | | **376** | **409** | **498** | **466** |

*Notes*

*A. Burned and Developed flow for Sub-basins 1A thru 4A, plus Burned and Bulked and Developed flow for the remaining Sub-basins.*

## *Baseline Hydrology Comparison*

A comparison of existing and proposed peak flow rates are provided as Table 4a and 4b. In accordance with Los Angeles County hydrology method, existing condition burned and bulked flow is assessed with proposed condition flow burned, unbulked due to the proposed addition of debris facilities where needed.

**Table 4a: Existing vs. Proposed Condition Hydrology Comparison Summary – Chiquito Site**

| 50-Year Storm Event | | | | | | |
|---|---|---|---|---|---|---|
| Sub area | Area (Ac) | | | $Q_{50}$ (cfs) | | |
| | Exist.[A] | Prop.[B] | Diff. | Exist[C]. | Prop.[D] | Diff. |
| **Total Study Area** | **127** | **124** | **-3** | **185** | **159** | **-26** |

*Notes*

*A. Drainage tributary area includes portion of Newhall Ranch – Landmark Village Tract 53108.*

*B. Drainage tributary area reduced because a portion of the area is accounted for in the on-site hydrology study for Newhall Ranch - Landmark Village Tract 53108.*

*C. Burned and bulked flow*

*D. Burned and Developed flow for Sub-basins 1/4A,5A,6A, plus Burned and Bulked and Developed flow for Sub-basins 9A,10A, plus Developed flow for Sub-basins 7/8A,11A,12A*

**Table 4b: Existing vs. Proposed Condition Hydrology Comparison Summary – Adobe Site**

| 50-Year Storm Event | | | | | | |
|---|---|---|---|---|---|---|
| Sub area | Area (Ac) | | | $Q_{50}$ (cfs) | | |
| | Exist. | Prop. | Diff. | Exist[A]. | Prop.[B] | Diff. |
| Total Study Area | 213.3 | 214.6 | +1.3 | 568 | 466 | -102 |

*Notes*

*A. Burned and bulked flow*

*B. Burned and Developed flow for Sub-basins 1A thru 4A, plus Burned and Bulked and Developed flow for the remaining Sub-basins.*

## 3.0 Standard Urban Stormwater Mitigation Plan (SUSMP)

Instead of volume- or flow-based Treatment Control BMPs, the Los Angeles County Standard Urban Stormwater Mitigation Plan (SUSMP) requirements will be met by Erosion and Sediment Control BMPs, which decrease the potential of slopes and channels to erode and impact stormwater runoff. LA County SUSMP guidelines specify BMPs such as the following:

- Conveying runoff safely from the tops of slopes and stabilizing disturbed slopes
- Utilizing natural drainage systems to the maximum extent practicable (MEP)
- Stabilizing permanent channel crossings
- Vegetating slopes with native or drought tolerant vegetation
- Installing energy dissipators, such as riprap, at the outlets of new storm drains, culverts, conduits, or channels that enter unlined channels in accordance with applicable specifications to minimize erosion

As shown on the Drainage Concept Exhibits, both temporary and permanent Erosion and Sediment Control BMPs have been incorporated into the two sites. Temporary BMPs will be implemented during the 'construction phase' of the site, while permanent BMPs will be implemented upon completion of construction. Potential erosion and sediment control BMP options are summarized in the following table; however, BMPs will be finalized during the completion of the Construction Stormwater Pollution Prevention Plan (SWPPP).

**Table 5: Potential Temporary and Permanent Erosion/Sediment Control BMP Options**

| BMP | Fact Sheet # [A] | Temporary | Permanent |
|---|---|---|---|
| Scheduling | EC-1 | X | |
| Hydraulic Mulch [B] | EC-3 | X | X |
| Hydroseeding [B] | EC-4 | X | X |
| Soil Binders | EC-5 | X | |
| Geotextiles and Mats | EC-7 | X | |
| Earth Dikes and Drainage Swales | EC-9 | X | X |
| Velocity Dissipation Devices | EC-10 | X | X |
| Slope Drains | EC-11 | X | X |
| Silt Fence | SE-1 | X | |
| Desilting (Sediment) Basin | SE-2 | X | X |
| Sediment Trap | SE-3 | X | |
| Check Dams | SE-4 | X | X |
| Gravel Bag Berm | SE-6 | X | |
| Street Sweeping and Vacuuming | SE-7 | X | |
| Sandbag Barrier | SE-8 | X | |
| Straw Bale Barrier | SE-9 | X | |
| Storm Drain Inlet Protection | SE-10 | X | |
| Wind Erosion Control | WE-1 | X | |

| | | | |
|---|---|---|---|
| Stabilized Construction Entrance/Exit | TC-1 | X | |
| Stabilized Construction Roadway | TC-2 | X | |
| Entrance/Outlet Tire Wash | TC-3 | X | |

*A. CASQA, 2003.*
*B. Requires BMP monitoring plan until vegetation is permanently established.*

BMP fact sheets for the above Sediment and Erosion Control BMPs are included in Appendix 6. Final selection and detailed design of these BMPs is beyond the scope of this report. However, the report and exhibits show that erosion and sediment control SUSMP requirements can be met.

## 4.0 Limitations

This report was prepared to comply with the guidelines established by the County of Los Angeles and their representatives. Evaluation of the appropriateness of these guidelines and the accuracy of the County data were beyond the scope of this work.

Usage of the report is limited to address the purpose and scope previously defined by the project owner, Newhall Land. Psomas shall not be held responsible for any unauthorized application of this report and the contents herein.

The opinions represented in this report have been derived in accordance with current standards of civil engineering practice. No other warranty is expressed or implied.

## 5.0 References

California Stormwater Quality Association, *Stormwater Best Management Practice Handbook – Construction* (January 2003)

Los Angeles County Department of Public Works, *LACDPW Hydrology/ S*
)

Los Angeles County Department of Public Works, *LACDPW TC v1.0 Manual, TC_calc_depth.xls* (December 1991, June 2002)

Los Angeles County Department of Public Works, *LACDPW Modified Rational Method, MORA (MORA) v7.2 Manual* (September 2002)

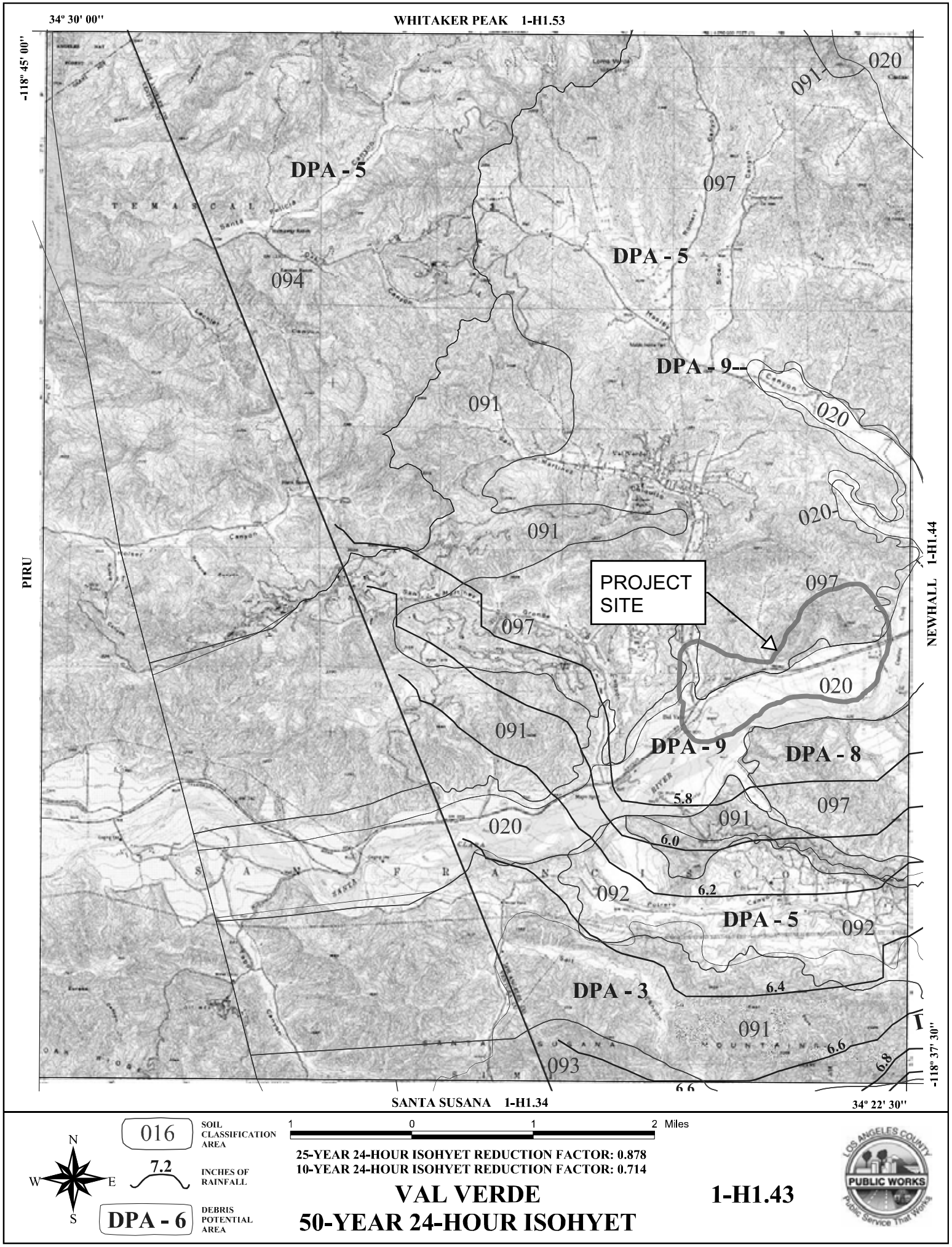
Los Angeles Regional Water Quality Control Board, *Standard Urban Stormwater Mitigation Plan for Los Angeles County and Cities in Los Angeles County* (March 2000)

Newhall Ranch, Newhall Ranch Specific Plan Master Hydrology and Drainage Concept (Sikand, December, 1999)

# APPENDICES

# APPENDIX 1

# LACDPW HYDROLOGY DATA

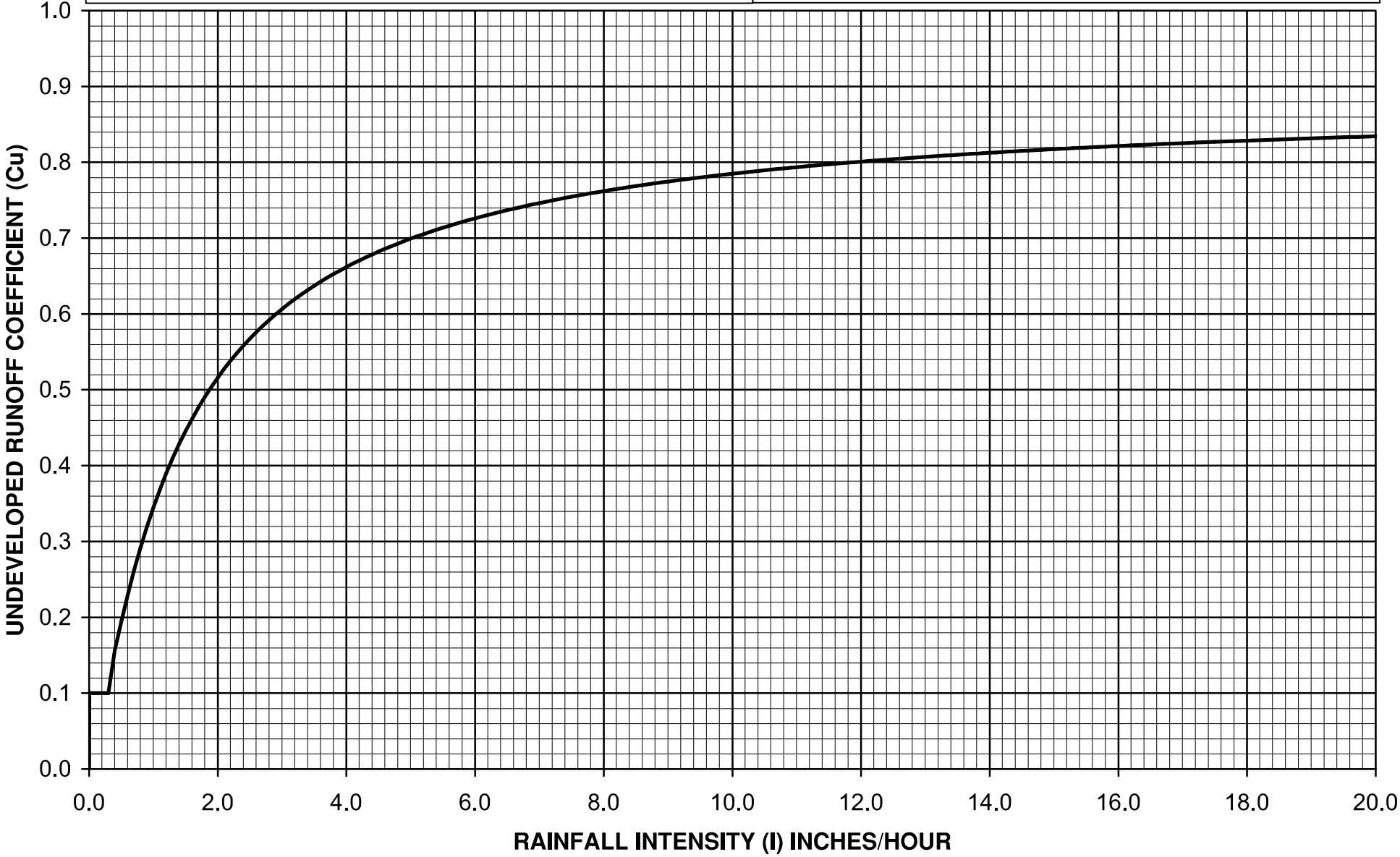

34° 30' 00"
WHITAKER PEAK 1-H1.53
-118° 45' 00"
PIRU
NEWHALL 1-H1.44
-118° 37' 30"
SANTA SUSANA 1-H1.34
34° 22' 30"
DPA - 5
DPA - 5
DPA - 9
DPA - 9
DPA - 8
DPA - 5
DPA - 3
PROJECT SITE
091
020
097
094
092
093
5.8
6.0
6.2
6.4
6.6
6.8
6.6
SANTA SUSANA MOUNTAINS
SAN FERNANDO
016
SOIL CLASSIFICATION AREA
7.2
INCHES OF RAINFALL
DPA - 6
DEBRIS POTENTIAL AREA
N
W
E
S
1 0 1 2 Miles
25-YEAR 24-HOUR ISOHYET REDUCTION FACTOR: 0.878
10-YEAR 24-HOUR ISOHYET REDUCTION FACTOR: 0.714
VAL VERDE
50-YEAR 24-HOUR ISOHYET
1-H1.43
LOS ANGELES COUNTY
PUBLIC WORKS
Public Service That Works

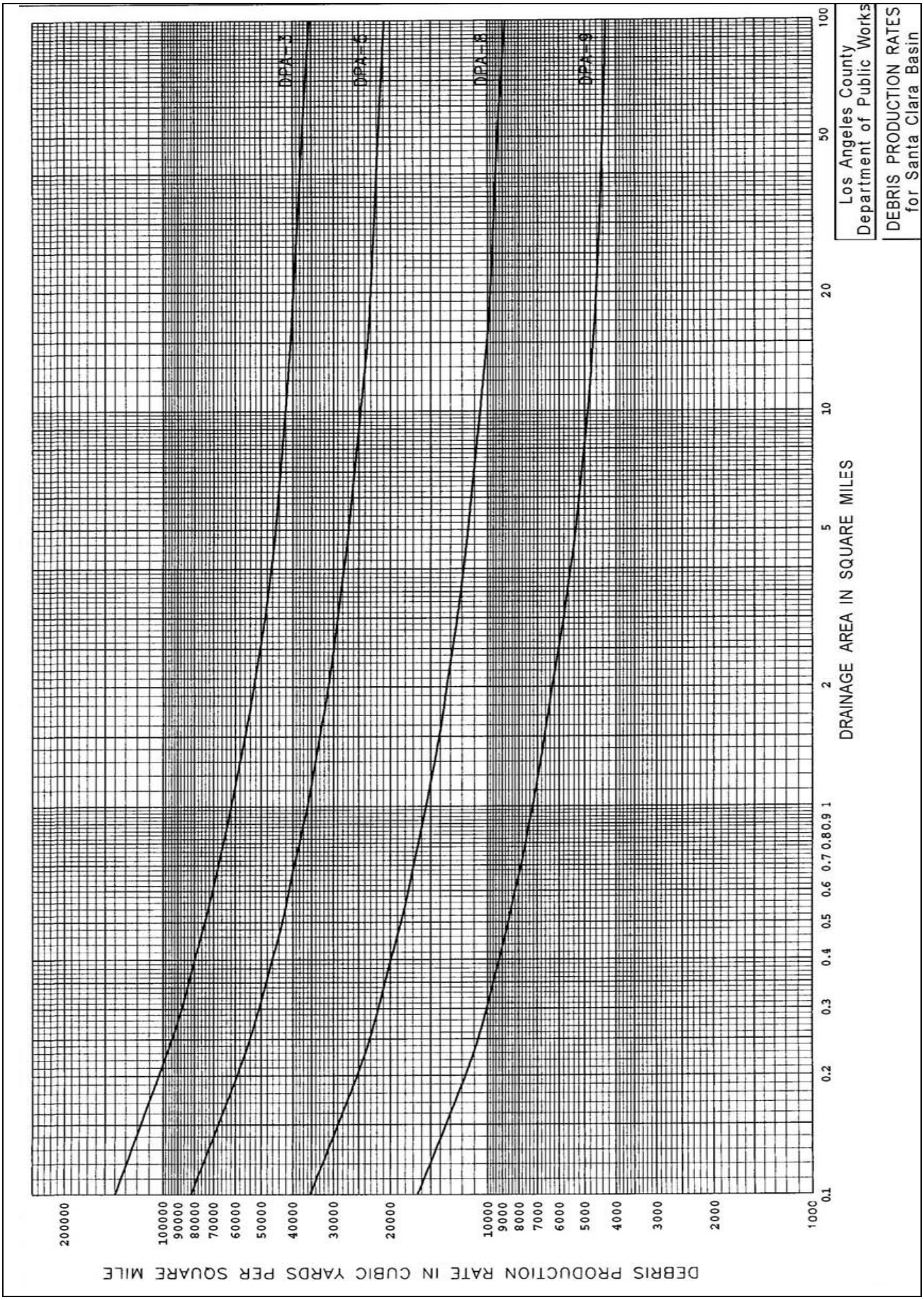
$C_D = (0.9 * IMP) + (1.0 - IMP) * C_U$

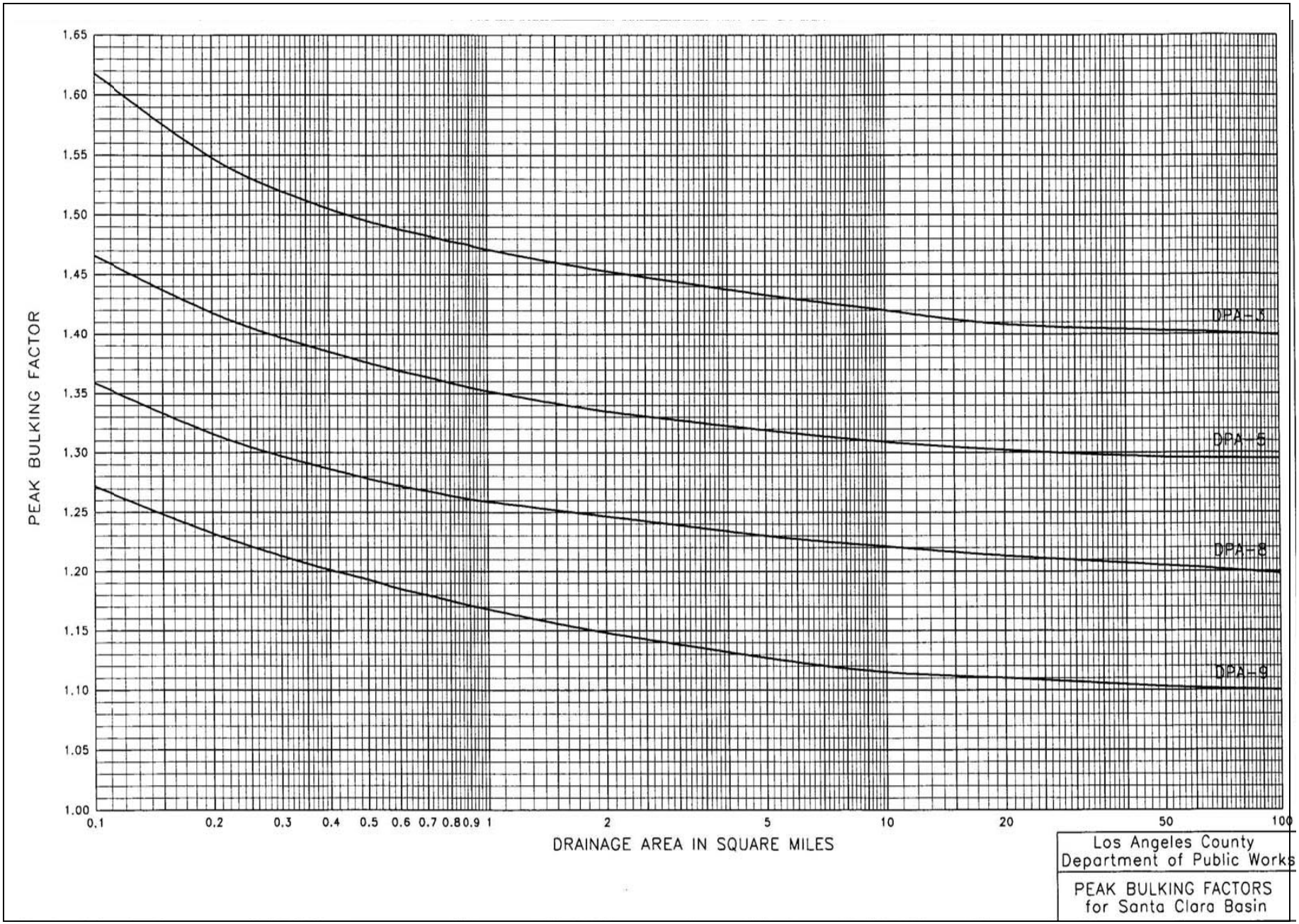
Where: $C_D$ = Developed Runoff Coefficient
IMP = Proportion Impervious
$C_U$ = Undeveloped runoff coefficient

Los Angeles County Department of Public Works

# RUNOFF COEFFICIENT CURVE
# SOIL TYPE NO. 020




DEBRIS PRODUCTION RATE IN CUBIC YARDS PER SQUARE MILE
200000
100000
90000
80000
70000
60000
50000
40000
30000
20000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
DPA-1
DPA-2
DPA-3
DPA-4
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
2
5
10
20
50
100
DRAINAGE AREA IN SQUARE MILES
Los Angeles County
Department of Public Works
DEBRIS PRODUCTION RATES
for Santa Clara Basin


PEAK BULKING FACTOR
1.65
1.60
1.55
1.50
1.45
1.40
1.35
1.30
1.25
1.20
1.15
1.10
1.05
1.00
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
2
5
10
20
50
100
DRAINAGE AREA IN SQUARE MILES
DPA-3
DPA-5
DPA-8
DPA-9
Los Angeles County
Department of Public Works
PEAK BULKING FACTORS
for Santa Clara Basin

# APPENDIX 2

# TC CALCULATIONS:
# EXISTING CONDITION

Chiquito Borrow Site
Existing Condition
TC Data File

| Project | Subarea | Area | %imp | Frequency | Soil Type | Length | Slope | Isohyet |
|---|---|---|---|---|---|---|---|---|
| Area (E) | 1A | 35.8 | 0 | 2 | 20 | 1755 | 0.614 | 2.2 |
| Area (E) | 2A | 40 | 0 | 2 | 20 | 1035 | 0.059 | 2.2 |
| Area (E) | 3A | 24 | 0 | 2 | 20 | 1095 | 0.046 | 2.2 |
| Area (E) | 1B | 16.7 | 0 | 2 | 20 | 1560 | 0.138 | 2.2 |
| Area (E) | 2B | 39.9 | 0 | 2 | 20 | 2490 | 0.092 | 2.2 |
| Area (E) | 1C | 27.4 | 0 | 2 | 20 | 1985 | 0.217 | 2.2 |
| Area (E) | 1D | 12.9 | 0 | 2 | 20 | 1450 | 0.221 | 2.2 |
| Area (E) | 1E | 16.6 | 0 | 2 | 20 | 1110 | 0.270 | 2.2 |
| Area (E) | 1A | 35.8 | 0 | 5 | 20 | 1755 | 0.614 | 3.4 |
| Area (E) | 2A | 40 | 0 | 5 | 20 | 1035 | 0.059 | 3.4 |
| Area (E) | 3A | 24 | 0 | 5 | 20 | 1095 | 0.046 | 3.4 |
| Area (E) | 1B | 16.7 | 0 | 5 | 20 | 1560 | 0.138 | 3.4 |
| Area (E) | 2B | 39.9 | 0 | 5 | 20 | 2490 | 0.092 | 3.4 |
| Area (E) | 1C | 27.4 | 0 | 5 | 20 | 1985 | 0.217 | 3.4 |
| Area (E) | 1D | 12.9 | 0 | 5 | 20 | 1450 | 0.221 | 3.4 |
| Area (E) | 1E | 16.6 | 0 | 5 | 20 | 1110 | 0.270 | 3.4 |
| Area (E) | 1A | 35.8 | 0 | 10 | 20 | 1755 | 0.614 | 4.1 |
| Area (E) | 2A | 40 | 0 | 10 | 20 | 1035 | 0.059 | 4.1 |
| Area (E) | 3A | 24 | 0 | 10 | 20 | 1095 | 0.046 | 4.1 |
| Area (E) | 1B | 16.7 | 0 | 10 | 20 | 1560 | 0.138 | 4.1 |
| Area (E) | 2B | 39.9 | 0 | 10 | 20 | 2490 | 0.092 | 4.1 |
| Area (E) | 1C | 27.4 | 0 | 10 | 20 | 1985 | 0.217 | 4.1 |
| Area (E) | 1D | 12.9 | 0 | 10 | 20 | 1450 | 0.221 | 4.1 |
| Area (E) | 1E | 16.6 | 0 | 10 | 20 | 1110 | 0.270 | 4.1 |
| Area (E) | 1A | 35.8 | 0 | 25 | 20 | 1755 | 0.614 | 5.1 |
| Area (E) | 2A | 40 | 0 | 25 | 20 | 1035 | 0.059 | 5.1 |
| Area (E) | 3A | 24 | 0 | 25 | 20 | 1095 | 0.046 | 5.1 |
| Area (E) | 1B | 16.7 | 0 | 25 | 20 | 1560 | 0.138 | 5.1 |
| Area (E) | 2B | 39.9 | 0 | 25 | 20 | 2490 | 0.092 | 5.1 |
| Area (E) | 1C | 27.4 | 0 | 25 | 20 | 1985 | 0.217 | 5.1 |
| Area (E) | 1D | 12.9 | 0 | 25 | 20 | 1450 | 0.221 | 5.1 |
| Area (E) | 1E | 16.6 | 0 | 25 | 20 | 1110 | 0.270 | 5.1 |
| Area (E) | 1A | 35.8 | 0 | 50 | 20 | 1755 | 0.614 | 5.8 |
| Area (E) | 2A | 40 | 0 | 50 | 20 | 1035 | 0.059 | 5.8 |
| Area (E) | 3A | 24 | 0 | 50 | 20 | 1095 | 0.046 | 5.8 |
| Area (E) | 1B | 16.7 | 0 | 50 | 20 | 1560 | 0.138 | 5.8 |
| Area (E) | 2B | 39.9 | 0 | 50 | 20 | 2490 | 0.092 | 5.8 |
| Area (E) | 1C | 27.4 | 0 | 50 | 20 | 1985 | 0.217 | 5.8 |
| Area (E) | 1D | 12.9 | 0 | 50 | 20 | 1450 | 0.221 | 5.8 |
| Area (E) | 1E | 16.6 | 0 | 50 | 20 | 1110 | 0.270 | 5.8 |
| Area (E) | 1A | 35.8 | 0 | 100 | 20 | 1755 | 0.614 | 6.5 |
| Area (E) | 2A | 40 | 0 | 100 | 20 | 1035 | 0.059 | 6.5 |
| Area (E) | 3A | 24 | 0 | 100 | 20 | 1095 | 0.046 | 6.5 |
| Area (E) | 1B | 16.7 | 0 | 100 | 20 | 1560 | 0.138 | 6.5 |
| Area (E) | 2B | 39.9 | 0 | 100 | 20 | 2490 | 0.092 | 6.5 |
| Area (E) | 1C | 27.4 | 0 | 100 | 20 | 1985 | 0.217 | 6.5 |
| Area (E) | 1D | 12.9 | 0 | 100 | 20 | 1450 | 0.221 | 6.5 |
| Area (E) | 1E | 16.6 | 0 | 100 | 20 | 1110 | 0.270 | 6.5 |
| Area (E) | 1A | 35.8 | 0 | 500 | 20 | 1755 | 0.614 | 8.2 |
| Area (E) | 2A | 40 | 0 | 500 | 20 | 1035 | 0.059 | 8.2 |
| Area (E) | 3A | 24 | 0 | 500 | 20 | 1095 | 0.046 | 8.2 |
| Area (E) | 1B | 16.7 | 0 | 500 | 20 | 1560 | 0.138 | 8.2 |
| Area (E) | 2B | 39.9 | 0 | 500 | 20 | 2490 | 0.092 | 8.2 |
| Area (E) | 1C | 27.4 | 0 | 500 | 20 | 1985 | 0.217 | 8.2 |
| Area (E) | 1D | 12.9 | 0 | 500 | 20 | 1450 | 0.221 | 8.2 |
| Area (E) | 1E | 16.6 | 0 | 500 | 20 | 1110 | 0.270 | 8.2 |

Chiquito Borrow Site
Existing Condition
TC Calculation Results

| Project | Subarea | Area (acres) | %imp | Frequency | Soil Type | Length (ft) | Slope (ft/ft) | Isohyet (in. | Tc-calculat | Intensity (ir | Cu | Cd | Flowrate (c | Tc Equation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Area (E) | 1A | 35.8 | 0 | 2 | 20 | 1755 | 0.614 | 2.2 | 30 | 0.57 | 0.22 | 0.22 | 4.49 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| Area (E) | 2A | 40 | 0 | 2 | 20 | 1035 | 0.059 | 2.2 | 30 | 0.57 | 0.22 | 0.22 | 5.02 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| Area (E) | 3A | 24 | 0 | 2 | 20 | 1095 | 0.046 | 2.2 | 30 | 0.57 | 0.22 | 0.22 | 3.01 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| Area (E) | 1B | 16.7 | 0 | 2 | 20 | 1560 | 0.138 | 2.2 | 30 | 0.57 | 0.22 | 0.22 | 2.09 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| Area (E) | 2B | 39.9 | 0 | 2 | 20 | 2490 | 0.092 | 2.2 | 30 | 0.57 | 0.22 | 0.22 | 5 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| Area (E) | 1C | 27.4 | 0 | 2 | 20 | 1985 | 0.217 | 2.2 | 30 | 0.57 | 0.22 | 0.22 | 3.44 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| Area (E) | 1D | 12.9 | 0 | 2 | 20 | 1450 | 0.221 | 2.2 | 30 | 0.57 | 0.22 | 0.22 | 1.62 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| Area (E) | 1E | 16.6 | 0 | 2 | 20 | 1110 | 0.27 | 2.2 | 30 | 0.57 | 0.22 | 0.22 | 2.08 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| Area (E) | 1A | 35.8 | 0 | 5 | 20 | 1755 | 0.614 | 3.4 | 20 | 1.06 | 0.36 | 0.36 | 13.66 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| Area (E) | 2A | 40 | 0 | 5 | 20 | 1035 | 0.059 | 3.4 | 22 | 1.01 | 0.35 | 0.35 | 14.14 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| Area (E) | 3A | 24 | 0 | 5 | 20 | 1095 | 0.046 | 3.4 | 25 | 0.95 | 0.33 | 0.33 | 7.52 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| Area (E) | 1B | 16.7 | 0 | 5 | 20 | 1560 | 0.138 | 3.4 | 26 | 0.93 | 0.32 | 0.32 | 4.97 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| Area (E) | 2B | 39.9 | 0 | 5 | 20 | 2490 | 0.092 | 3.4 | 30 | 0.87 | 0.31 | 0.31 | 10.76 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| Area (E) | 1C | 27.4 | 0 | 5 | 20 | 1985 | 0.217 | 3.4 | 29 | 0.89 | 0.31 | 0.31 | 7.56 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| Area (E) | 1D | 12.9 | 0 | 5 | 20 | 1450 | 0.221 | 3.4 | 22 | 1.01 | 0.35 | 0.35 | 4.56 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| Area (E) | 1E | 16.6 | 0 | 5 | 20 | 1110 | 0.27 | 3.4 | 17 | 1.14 | 0.37 | 0.37 | 7 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| Area (E) | 1A | 35.8 | 0 | 10 | 20 | 1755 | 0.614 | 4.1 | 15 | 1.46 | 0.44 | 0.44 | 23 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| Area (E) | 2A | 40 | 0 | 10 | 20 | 1035 | 0.059 | 4.1 | 17 | 1.38 | 0.42 | 0.42 | 23.18 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| Area (E) | 3A | 24 | 0 | 10 | 20 | 1095 | 0.046 | 4.1 | 19 | 1.31 | 0.41 | 0.41 | 12.89 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| Area (E) | 1B | 16.7 | 0 | 10 | 20 | 1560 | 0.138 | 4.1 | 20 | 1.28 | 0.4 | 0.4 | 8.55 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| Area (E) | 2B | 39.9 | 0 | 10 | 20 | 2490 | 0.092 | 4.1 | 30 | 1.05 | 0.36 | 0.36 | 15.08 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| Area (E) | 1C | 27.4 | 0 | 10 | 20 | 1985 | 0.217 | 4.1 | 22 | 1.22 | 0.39 | 0.39 | 13.04 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| Area (E) | 1D | 12.9 | 0 | 10 | 20 | 1450 | 0.221 | 4.1 | 17 | 1.38 | 0.42 | 0.42 | 7.48 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| Area (E) | 1E | 16.6 | 0 | 10 | 20 | 1110 | 0.27 | 4.1 | 13 | 1.56 | 0.45 | 0.45 | 11.65 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| Area (E) | 1A | 35.8 | 0 | 25 | 20 | 1755 | 0.614 | 5.1 | 12 | 2.02 | 0.52 | 0.52 | 37.6 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| Area (E) | 2A | 40 | 0 | 25 | 20 | 1035 | 0.059 | 5.1 | 13 | 1.94 | 0.51 | 0.51 | 39.58 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| Area (E) | 3A | 24 | 0 | 25 | 20 | 1095 | 0.046 | 5.1 | 14 | 1.88 | 0.5 | 0.5 | 22.56 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| Area (E) | 1B | 16.7 | 0 | 25 | 20 | 1560 | 0.138 | 5.1 | 15 | 1.82 | 0.49 | 0.49 | 14.89 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| Area (E) | 2B | 39.9 | 0 | 25 | 20 | 2490 | 0.092 | 5.1 | 23 | 1.49 | 0.44 | 0.44 | 26.16 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| Area (E) | 1C | 27.4 | 0 | 25 | 20 | 1985 | 0.217 | 5.1 | 16 | 1.76 | 0.48 | 0.48 | 23.15 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| Area (E) | 1D | 12.9 | 0 | 25 | 20 | 1450 | 0.221 | 5.1 | 13 | 1.94 | 0.51 | 0.51 | 12.76 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| Area (E) | 1E | 16.6 | 0 | 25 | 20 | 1110 | 0.27 | 5.1 | 10 | 2.2 | 0.53 | 0.53 | 19.36 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| Area (E) | 1A | 35.8 | 0 | 50 | 20 | 1755 | 0.614 | 5.8 | 11 | 2.39 | 0.55 | 0.55 | 47.06 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| Area (E) | 2A | 40 | 0 | 50 | 20 | 1035 | 0.059 | 5.8 | 12 | 2.29 | 0.54 | 0.54 | 49.46 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| Area (E) | 3A | 24 | 0 | 50 | 20 | 1095 | 0.046 | 5.8 | 12 | 2.29 | 0.54 | 0.54 | 29.68 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| Area (E) | 1B | 16.7 | 0 | 50 | 20 | 1560 | 0.138 | 5.8 | 13 | 2.21 | 0.54 | 0.54 | 19.93 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| Area (E) | 2B | 39.9 | 0 | 50 | 20 | 2490 | 0.092 | 5.8 | 20 | 1.8 | 0.49 | 0.49 | 35.19 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| Area (E) | 1C | 27.4 | 0 | 50 | 20 | 1985 | 0.217 | 5.8 | 14 | 2.13 | 0.53 | 0.53 | 30.93 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| Area (E) | 1D | 12.9 | 0 | 50 | 20 | 1450 | 0.221 | 5.8 | 11 | 2.39 | 0.55 | 0.55 | 16.96 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| Area (E) | 1E | 16.6 | 0 | 50 | 20 | 1110 | 0.27 | 5.8 | 9 | 2.63 | 0.57 | 0.57 | 24.89 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| Area (E) | 1A | 35.8 | 0 | 100 | 20 | 1755 | 0.614 | 6.5 | 9 | 2.94 | 0.6 | 0.6 | 63.15 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| Area (E) | 2A | 40 | 0 | 100 | 20 | 1035 | 0.059 | 6.5 | 10 | 2.8 | 0.59 | 0.59 | 66.08 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| Area (E) | 3A | 24 | 0 | 100 | 20 | 1095 | 0.046 | 6.5 | 11 | 2.68 | 0.58 | 0.58 | 37.31 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| Area (E) | 1B | 16.7 | 0 | 100 | 20 | 1560 | 0.138 | 6.5 | 12 | 2.57 | 0.57 | 0.57 | 24.46 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| Area (E) | 2B | 39.9 | 0 | 100 | 20 | 2490 | 0.092 | 6.5 | 18 | 2.12 | 0.53 | 0.53 | 44.83 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| Area (E) | 1C | 27.4 | 0 | 100 | 20 | 1985 | 0.217 | 6.5 | 12 | 2.57 | 0.57 | 0.57 | 40.14 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| Area (E) | 1D | 12.9 | 0 | 100 | 20 | 1450 | 0.221 | 6.5 | 10 | 2.8 | 0.59 | 0.59 | 21.31 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| Area (E) | 1E | 16.6 | 0 | 100 | 20 | 1110 | 0.27 | 6.5 | 8 | 3.11 | 0.61 | 0.61 | 31.49 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| Area (E) | 1A | 35.8 | 0 | 500 | 20 | 1755 | 0.614 | 8.2 | 7 | 4.18 | 0.67 | 0.67 | 100.26 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| Area (E) | 2A | 40 | 0 | 500 | 20 | 1035 | 0.059 | 8.2 | 8 | 3.92 | 0.66 | 0.66 | 103.49 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| Area (E) | 3A | 24 | 0 | 500 | 20 | 1095 | 0.046 | 8.2 | 9 | 3.71 | 0.65 | 0.65 | 57.88 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| Area (E) | 1B | 16.7 | 0 | 500 | 20 | 1560 | 0.138 | 8.2 | 9 | 3.71 | 0.65 | 0.65 | 40.27 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| Area (E) | 2B | 39.9 | 0 | 500 | 20 | 2490 | 0.092 | 8.2 | 13 | 3.12 | 0.61 | 0.61 | 75.94 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| Area (E) | 1C | 27.4 | 0 | 500 | 20 | 1985 | 0.217 | 8.2 | 10 | 3.53 | 0.64 | 0.64 | 61.9 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| Area (E) | 1D | 12.9 | 0 | 500 | 20 | 1450 | 0.221 | 8.2 | 8 | 3.92 | 0.66 | 0.66 | 33.37 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| Area (E) | 1E | 16.6 | 0 | 500 | 20 | 1110 | 0.27 | 8.2 | 6 | 4.49 | 0.68 | 0.68 | 50.68 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |

# Landmark Village - Newhall Ranch
## Chiquito Canyon
## Existing Drainage Condition

| Subarea | Area (Ac) | Calcs Tc (min) | $I_{50}$ (in/hr) | Cu | Cd | $Q_{50}$ (cfs) | Area Undeveloped (Ac) | K (1) | $Q_{50b}$ (cfs) (2) | $Q_{50bb}$ (cfs) (3) | DP (cy) (4) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | |
| CQT-1A | 6.10 | 8 | 2.77 | 0.59 | 0.59 | 9.97 | 6.1 | 0.61 | 12.67 | 16.09 | 165 |
| CQT-2A | 3.60 | 6 | 3.18 | 0.62 | 0.62 | 7.10 | 3.6 | 0.60 | 8.83 | 11.22 | 97 |
| CQT-3A | 1.80 | 5 | 3.46 | 0.63 | 0.63 | 3.92 | 1.8 | 0.60 | 4.85 | 6.16 | 49 |
| CQT-4A | 12.30 | 10 | 2.50 | 0.56 | 0.56 | 17.22 | 12.3 | 0.62 | 22.41 | 28.46 | 332 |
| CQT-5A | 4.40 | 5 | 3.46 | 0.63 | 0.63 | 9.59 | 4.4 | 0.60 | 11.86 | 15.07 | 119 |
| CQT-6A | 24.90 | 15 | 2.06 | 0.52 | 0.52 | 26.67 | 24.9 | 0.63 | 35.81 | 45.48 | 672 |
| CQT-7A | 2.10 | 5 | 3.46 | 0.63 | 0.63 | 4.58 | 2.1 | 0.60 | 5.66 | 7.19 | 57 |
| CQT-8A | 2.80 | 5 | 3.46 | 0.63 | 0.63 | 6.10 | 2.8 | 0.60 | 7.55 | 9.59 | 76 |
| CQT-9A | 31.80 | 14 | 2.13 | 0.53 | 0.53 | 35.90 | 31.8 | 0.63 | 47.78 | 60.68 | 859 |
| CQT-10A | 15.60 | 11 | 2.39 | 0.55 | 0.55 | 20.51 | 15.6 | 0.62 | 26.89 | 34.15 | 421 |
| CQT-11A | 10.20 | 17 | 1.95 | 0.51 | 0.90 | 17.90 | 2.0 | 0.63 | 17.90 | 17.90 | 54 |
| CQT-12A | 11.70 | 10 | 2.50 | 0.56 | 0.90 | 26.33 | 3.0 | 0.62 | 26.33 | 26.33 | 81 |
| **Total** | **127.3** | | | | | **107.0** | | | **146.0** | **185.0** | **2981** |

(1) - K = Burn Factor from Appendix G-2, K = 0.677*( I ^-0.102)
(2) - Qb = A*I*(1-K)+K*Qu
(3) - Qbb = 1.27*Qb
(4) - DP = A*27 cy (Zone 9)

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Adobe Borrow Site
EX Condition
TC Data File

| Project | Subarea | Area | %imp | Frequency | Soil Type | Length | Slope | Isohyet |
|---|---|---|---|---|---|---|---|---|
| ADB | 1A | 35.8 | 0 | 50 | 97 | 1755 | 0.614 | 5.8 |
| ADB | 2A | 40 | 0 | 50 | 97 | 1035 | 0.059 | 5.8 |
| ADB | 3A | 24 | 0 | 50 | 97 | 1095 | 0.046 | 5.8 |
| ADB | 4B | 16.7 | 0 | 50 | 97 | 1560 | 0.138 | 5.8 |
| ADB | 5B | 39.9 | 0 | 50 | 97 | 2490 | 0.092 | 5.8 |
| ADB | 6C | 27.4 | 0 | 50 | 97 | 1985 | 0.217 | 5.8 |
| ADB | 7C | 12.9 | 0 | 50 | 97 | 1450 | 0.221 | 5.8 |
| ADB | 8C | 16.6 | 0 | 50 | 97 | 1110 | 0.270 | 5.8 |

Landmark Village
EX Condition
TC Calculation Results

| Project | Subarea | Area (acres) | %imp | Frequency | Soil Type | Length (ft) | Slope (ft/ft | Isohyet (in.) | Tc-calculated (min.) | Intensity (in./hr) | Cu | Cd | Flowrate (c | Tc Equation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ADB | 1A | 35.8 | 0 | 50 | 97 | 1755 | 0.614 | 5.8 | 9 | 2.63 | 0.71 | 0.71 | 66.85 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| ADB | 2A | 40 | 0 | 50 | 97 | 1035 | 0.059 | 5.8 | 10 | 2.5 | 0.71 | 0.71 | 71 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| ADB | 3A | 24 | 0 | 50 | 97 | 1095 | 0.046 | 5.8 | 11 | 2.39 | 0.7 | 0.7 | 40.15 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| ADB | 4B | 16.7 | 0 | 50 | 97 | 1560 | 0.138 | 5.8 | 11 | 2.39 | 0.7 | 0.7 | 27.94 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| ADB | 5B | 39.9 | 0 | 50 | 97 | 2490 | 0.092 | 5.8 | 16 | 2 | 0.67 | 0.67 | 53.47 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| ADB | 6C | 27.4 | 0 | 50 | 97 | 1985 | 0.217 | 5.8 | 12 | 2.29 | 0.69 | 0.69 | 43.29 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| ADB | 7C | 12.9 | 0 | 50 | 97 | 1450 | 0.221 | 5.8 | 10 | 2.5 | 0.71 | 0.71 | 22.9 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| ADB | 8C | 16.6 | 0 | 50 | 97 | 1110 | 0.27 | 5.8 | 8 | 2.77 | 0.72 | 0.72 | 33.11 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |

# Landmark Village - Newhall Ranch
## Adobe Canyon
## Existing Drainage Condition

| Subarea | Area (Ac) | Calcs Tc (min) | $I_{50}$ (in/hr) | Cu | Cd | $Q_{50}$ (cfs) | Area Undeveloped (Ac) | K (1) | $Q_{50b}$ (cfs) (2) | $Q_{50bb}$ (cfs) (3) | DP (cy) (4) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | |
| 1A | 35.8 | 9 | 2.63 | 0.71 | 0.71 | 66.85 | 35.8 | 0.61 | 77 | 105 | 1933 |
| 2A | 40.0 | 10 | 2.50 | 0.71 | 0.71 | 71.00 | 40.0 | 0.62 | 82 | 112 | 2160 |
| 3A | 24.0 | 11 | 2.39 | 0.70 | 0.70 | 40.15 | 24.0 | 0.62 | 47 | 64 | 1296 |
| 4B | 16.7 | 11 | 2.39 | 0.70 | 0.70 | 27.94 | 16.7 | 0.62 | 32 | 44 | 902 |
| 5B | 39.9 | 16 | 2.00 | 0.67 | 0.67 | 53.47 | 39.9 | 0.63 | 63 | 86 | 2155 |
| 7C | 27.4 | 12 | 2.29 | 0.69 | 0.69 | 43.29 | 27.4 | 0.62 | 51 | 69 | 1480 |
| 8C | 12.9 | 10 | 2.50 | 0.71 | 0.71 | 22.90 | 12.9 | 0.62 | 26 | 36 | 697 |
| 9C | 16.6 | 8 | 2.77 | 0.72 | 0.72 | 33.11 | 16.6 | 0.61 | 38 | 52 | 896 |
| **Total** | **213.3** | | | | | **359** | | | **417** | **567** | **11518** |

(1) - K = Burn Factor from Appendix G-2, K = 0.677*( I ^-0.102)
(2) - Qb = A*I*(1-K)+K*Qu
(3) - Qbb = 1.36*Qb
(4) - DP = A * 54 cy (Zone 8)

# APPENDIX 3

# TC CALCULATIONS:
# PROPOSED CONDITION

Chiquito Borrow Site
Proposed Condition
TC Data File

| Project | Subarea | Area | %imp | Frequency | Soil Type | Length | Slope | Isohyet |
|---|---|---|---|---|---|---|---|---|
| CQT | 1A | 29.90 | 0.05 | 50 | 20 | 1,150 | 0.0895 | 5.8 |
| CQT | 2A | 6.40 | 0.05 | 50 | 20 | 630 | 0.2700 | 5.8 |
| CQT | 3B | 4.40 | 0.05 | 50 | 20 | 540 | 0.2800 | 5.8 |
| CQT | 4B | 19.60 | 0.10 | 50 | 20 | 1,404 | 0.0560 | 5.8 |
| CQT | 5B | 6.94 | 0.05 | 50 | 20 | 765 | 0.2100 | 5.8 |
| CQT | 6B | 5.90 | 0.05 | 50 | 20 | 580 | 0.0600 | 5.8 |
| CQT | 7B | 13.30 | 0.30 | 50 | 20 | 860 | 0.0600 | 5.8 |
| CQT | 9C | 7.70 | 0.05 | 50 | 20 | 1,050 | 0.2800 | 5.8 |
| CQT | 10C | 8.80 | 0.05 | 50 | 20 | 970 | 0.0600 | 5.8 |
| CQT | 11C | 11.80 | 0.80 | 50 | 20 | 1,890 | 0.0080 | 5.8 |
| CQT | 12C | 2.20 | 0.05 | 50 | 20 | 1,310 | 0.0240 | 5.8 |
| CQT | 13C | 7.50 | 0.80 | 50 | 20 | 2,500 | 0.0070 | 5.8 |

Landmark Village
Proposed Condition
Tc Calculation Results

| Project | Subarea | Area (acres) | %imp | Frequency | Soil Type | Length (ft) | Slope (ft/ft | Isohyet (in.) | Tc-calculated (min.) | Intensity (in./hr) | Cu | Cd | Flowrate (c | Tc Equation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CQT | 1A | 29.9 | 0.05 | 50 | 20 | 1150 | 0.0895 | 5.8 | 11 | 2.39 | 0.55 | 0.57 | 40.73 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| CQT | 2A | 6.4 | 0.05 | 50 | 20 | 630 | 0.27 | 5.8 | 6 | 3.18 | 0.62 | 0.63 | 12.82 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| CQT | 3B | 4.4 | 0.05 | 50 | 20 | 540 | 0.28 | 5.8 | 5 | 3.46 | 0.63 | 0.64 | 9.74 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| CQT | 4B | 19.6 | 0.1 | 50 | 20 | 1404 | 0.056 | 5.8 | 14 | 2.13 | 0.53 | 0.57 | 23.8 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| CQT | 5B | 6.94 | 0.05 | 50 | 20 | 765 | 0.21 | 5.8 | 7 | 2.95 | 0.6 | 0.62 | 12.69 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| CQT | 6B | 5.9 | 0.05 | 50 | 20 | 580 | 0.06 | 5.8 | 7 | 2.95 | 0.6 | 0.62 | 10.79 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| CQT | 7B | 13.3 | 0.3 | 50 | 20 | 860 | 0.06 | 5.8 | 9 | 2.63 | 0.57 | 0.67 | 23.44 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| CQT | 9C | 7.7 | 0.05 | 50 | 20 | 1050 | 0.28 | 5.8 | 8 | 2.77 | 0.59 | 0.61 | 13.01 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| CQT | 10C | 8.8 | 0.05 | 50 | 20 | 970 | 0.06 | 5.8 | 11 | 2.39 | 0.55 | 0.57 | 11.99 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| CQT | 11C | 11.8 | 0.8 | 50 | 20 | 1890 | 0.008 | 5.8 | 18 | 1.9 | 0.5 | 0.82 | 18.38 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| CQT | 12C | 2.2 | 0.05 | 50 | 20 | 1310 | 0.024 | 5.8 | 16 | 2 | 0.52 | 0.54 | 2.38 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| CQT | 13C | 7.5 | 0.8 | 50 | 20 | 2500 | 0.007 | 5.8 | 22 | 1.72 | 0.48 | 0.82 | 10.58 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |

## Landmark Village - Newhall Ranch
## Chiquito Canyon
## Proposed Drainage Condition

| Subarea | Area (Ac) | Calcs Tc (min) | $I_{50}$ (in/hr) | Cu | Cd | $Q_{50}$ (cfs) | Area Undeveloped (Ac) | K (1) | $Q_{50b}$ (cfs) (2) | $Q_{50bb}$ (cfs) (3) | $Q_{50b}+Q_d$ (cfs) | $Q_{50bb}+Q_d$ (cfs) | DP (cy) (4) | DP BASIN (cy) | $Q_{50design}$ (cfs) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | |
| 1A | 29.9 | 11 | 2.39 | 0.55 | 0.57 | 41 | 17.9 | 0.62 | 31.46 | 39.95 | 48 | 56 | 484 | | 56 |
| 2A | 6.4 | 6 | 3.18 | 0.62 | 0.63 | 13 | 2.9 | 0.60 | 7.22 | 9.17 | 14 | 16 | 79 | 563 | 16 |
| 3B | 4.4 | 5 | 3.46 | 0.63 | 0.64 | 10 | 4.4 | 0.60 | 11.95 | 15.18 | 12 | 15 | 119 | | 12 |
| 4B | 19.6 | 14 | 2.13 | 0.53 | 0.57 | 24 | 11.9 | 0.63 | 18.52 | 23.52 | 28 | 33 | 321 | 440 | 28 |
| 5B | 6.9 | 7 | 2.95 | 0.6 | 0.62 | 13 | 4.6 | 0.61 | 10.51 | 13.35 | 15 | 18 | 125 | 125 | 15 |
| 6B | 5.9 | 7 | 2.95 | 0.6 | 0.62 | 11 | 0.0 | 0.61 | 0.00 | 0.00 | 11 | 11 | 0 | | 11 |
| 7B | 13.3 | 9 | 2.63 | 0.57 | 0.67 | 23 | 0.0 | 0.61 | 0.00 | 0.00 | 23 | 23 | 0 | | 23 |
| 9C | 7.7 | 8 | 2.77 | 0.59 | 0.61 | 13 | 1.9 | 0.61 | 4.09 | 5.20 | 14 | 15 | 52 | 52 | 14 |
| 10C | 8.8 | 11 | 2.39 | 0.55 | 0.57 | 12 | 0.0 | 0.62 | 0.00 | 0.00 | 12 | 12 | 0 | | 12 |
| 11C | 11.8 | 18 | 1.9 | 0.5 | 0.82 | 18 | 0.0 | 0.63 | 0.00 | 0.00 | 18 | 18 | 0 | | 18 |
| 12C | 2.2 | 16 | 2 | 0.52 | 0.54 | 2 | 0.0 | 0.63 | 0.00 | 0.00 | 2 | 2 | 0 | | 2 |
| 13C | 7.5 | 22 | 1.72 | 0.48 | 0.82 | 11 | 0.0 | 0.64 | 0.00 | 0.00 | 11 | 11 | 0 | | 11 |
| **Total** | **124.4** | | | | | **190** | | | **84** | **106** | **208** | **230** | **1181** | **1181** | **219** |

(1) - K = Burn Factor from Appendix G-2, K = 0.677*( I ^-0.102)
(2) - Qb = A*I*(1-K)+K*Qu
(3) - Qbb = 1.27*Qb
(4) - DP = A*27 cy (Zone 9)

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ADOBE Borrow Site
Proposed Condition
TC Data File

| Project | Subarea | Area | %imp | Frequency | Soil Type | Length | Slope | Isohyet |
|---|---|---|---|---|---|---|---|---|
| ADB | 1A | 25.2 | 0 | 50 | 97 | 1280 | 0.150 | 5.8 |
| ADB | 2A | 46.8 | 0 | 50 | 97 | 1130 | 0.110 | 5.8 |
| ADB | 3A | 25.5 | 0 | 50 | 97 | 1080 | 0.050 | 5.8 |
| ADB | 4A | 23.5 | 0 | 50 | 97 | 1140 | 0.052 | 5.8 |
| ADB | 5B | 14.24 | 0 | 50 | 97 | 915 | 0.087 | 5.8 |
| ADB | 6B | 40.7 | 0 | 50 | 97 | 2680 | 0.030 | 5.8 |
| ADB | 7C | 17 | 0 | 50 | 97 | 1440 | 0.150 | 5.8 |
| ADB | 8C | 6.6 | 0 | 50 | 97 | 415 | 0.150 | 5.8 |
| ADB | 9C | 15.1 | 0 | 50 | 97 | 710 | 0.150 | 5.8 |

ADOBE CANYON
Proposed Condition
TC Calculation Results

| Project | Subarea | Area (acres) | %imp | Frequency | Soil Type | Length (ft) | Slope (ft/ft | Isohyet (in.) | Tc-calculated (min.) | Intensity (in./hr) | Cu | Cd | Flowrate (c | Tc Equation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ADB | 1A | 25.2 | 0 | 50 | 97 | 1280 | 0.15 | 5.8 | 9 | 2.63 | 0.71 | 0.71 | 47.06 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| ADB | 2A | 46.8 | 0 | 50 | 97 | 1130 | 0.11 | 5.8 | 9 | 2.63 | 0.71 | 0.71 | 87.39 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| ADB | 3A | 25.5 | 0 | 50 | 97 | 1080 | 0.05 | 5.8 | 10 | 2.5 | 0.71 | 0.71 | 45.26 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| ADB | 4A | 23.5 | 0 | 50 | 97 | 1140 | 0.052 | 5.8 | 11 | 2.39 | 0.7 | 0.7 | 39.32 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| ADB | 5B | 14.24 | 0 | 50 | 97 | 915 | 0.087 | 5.8 | 8 | 2.77 | 0.72 | 0.72 | 28.4 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| ADB | 6B | 40.7 | 0 | 50 | 97 | 2680 | 0.03 | 5.8 | 21 | 1.76 | 0.64 | 0.64 | 45.84 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| ADB | 7C | 17 | 0 | 50 | 97 | 1440 | 0.15 | 5.8 | 10 | 2.5 | 0.71 | 0.71 | 30.18 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| ADB | 8C | 6.6 | 0 | 50 | 97 | 415 | 0.15 | 5.8 | 5 | 3.46 | 0.75 | 0.75 | 17.13 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |
| ADB | 9C | 15.1 | 0 | 50 | 97 | 710 | 0.15 | 5.8 | 6 | 3.18 | 0.74 | 0.74 | 35.53 | Tc=(10)^-0.507*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 |

## Landmark Village - Newhall Ranch
## Adobe Canyon
## Proposed Drainage Condition

| Subarea | Area (Ac) | Calcs Tc (min) | $I_{50}$ (in/hr) | Cu | Cd | $Q_{50}$ (cfs) | Area Undeveloped (Ac) | K (1) | $Q_{50b}$ (cfs) (2) | $Q_{50bb}$ (cfs) (3) | $Q_{50b}+Q_d$ (cfs) | $Q_{50bb}+Q_d$ (cfs) | DP (cy) (4) | DP BASIN (cy) | $Q_{50design}$ (cfs) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | |
| ADB-1A | 25.2 | 9 | 2.63 | 0.71 | 0.71 | 47 | 25.2 | 0.61 | 54 | 74 | 54 | 74 | 1361 | | 54 |
| ADB-2A | 46.8 | 9 | 2.63 | 0.71 | 0.71 | 87 | 14.2 | 0.61 | 31 | 42 | 92 | 103 | 767 | | 92 |
| ADB-3A | 25.5 | 10 | 2.50 | 0.71 | 0.71 | 45 | 12.78 | 0.62 | 26 | 36 | 49 | 58 | 690 | | 49 |
| ADB-4A | 23.5 | 11 | 2.39 | 0.70 | 0.70 | 39 | 0.0 | 0.62 | 0 | 0 | 39 | 39 | 0 | 2818 | 39 |
| ADB-5B | 14.24 | 8 | 2.77 | 0.72 | 0.72 | 28 | 14.2 | 0.61 | 33 | 44 | 33 | 44 | 769 | | 44 |
| ADB-6B | 40.7 | 21 | 1.76 | 0.64 | 0.64 | 46 | 32.0 | 0.64 | 43 | 59 | 53 | 69 | 1730 | | 69 |
| ADB-7C | 17 | 10 | 2.50 | 0.71 | 0.71 | 30 | 17.0 | 0.62 | 35 | 47 | 35 | 47 | 918 | | 47 |
| ADB-8C | 6.6 | 5 | 3.46 | 0.75 | 0.75 | 17 | 6.6 | 0.60 | 19 | 26 | 19 | 26 | 356 | | 26 |
| ADB-9C | 15.1 | 6 | 3.18 | 0.74 | 0.74 | 36 | 8.3 | 0.60 | 22 | 30 | 38 | 46 | 447 | | 46 |
| **Total** | **214.6** | | | | | **376.11** | | | **264** | **359** | **412** | **506** | **7038** | **2818** | **466** |

(1) - K = Burn Factor from Appendix G-2, K = 0.677*( I ^-0.102)
(2) - Qb = A*I*(1-K)+K*Qu
(3) - Qbb = 1.36*Qb
(4) - DP = A*54 cy (Zone 8)

V:\Newhall\PRODDATA\53108-MP\ENGR\DOCS\Drainage Concept Reports\Borrow Site Hydrology Report\Adobe Canyon Borrow Site\[Adobe_HYDRO_prop.xls]Qbb

# APPENDIX 4

# LACDPW MORA CALCULATIONS: EXISTING CONDITION

```
4LADEPTH.RDT
5 50300    1A  50 YR River Village - Newhall Ranch - Chiquito Existing
5 50300   17A  HYDROGRAPH AT OUTLET BASIN 600 and Chiquito site
6 50300    1A 020  0   6 8A292  890 26500                      G1
6 50300    2A 020  0   4 6A292  200 01000
6 50300    3A  20  0   2 5A294  275 01000
6 50300    4A  20  0  1210A294  385 02000
6 50300    5B  20  0   4 5A292  530 32100
6 50300    6B  20  0  2515A294  835 02200
6 50300    7AB 20  0      A29
6 50300    8A  20  0   2 5A294  320 02000
6 50300    9A  20  0   3 5A294  900 01000
6 50300   10C  20  0  3214A292 1750 01500
6 50300   11C  20  0  1611A292 2800 01000
6 50300   12AC020         A29
6 50300   13D  20 65  1017A292 2370 01800
6 50300   14D  20 65  1210A292 1250 03200
6 50300   15AD 20         A29
6 50300   16A  20  0  1223A29
6 50300   17A 020  0    99A29                            1  2
```

10-14-2009 SITE LICENSEE: PSOMAS AND ASSOCIATES 

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT 

MODIFIED RATIONAL METHOD HYDROLOGY

50 YR River Village - Newhall Ranch - Chiquito Existing

| LOCATION | | SUBAREA AREA | SUBAREA Q | TOTAL AREA | TOTAL Q | CONV TYPE | CONV LNGTH | CONV SLOPE | CONV SIZE | CONV Z | CONTROL Q | SOIL NAME | TC | STORM RAIN ZONE | DAY 4 PCT IMPV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 50300 | 1A | 6. | 10. | 6. | 10. | 2 | 890. | 0.26500 | 0.00 | 0.00 | 0. | 20 | 8 | A29 | 0.00 |
| 50300 | 2A | 4. | 8. | 10. | 17. | 2 | 200. | 0.01000 | 0.00 | 0.00 | 0. | 20 | 6 | A29 | 0.00 |
| 50300 | 3A | 2. | 4. | 12. | 18. | 4 | 275. | 0.01000 | 2.00 | 0.00 | 0. | 20 | 5 | A29 | 0.00 |
| 50300 | 4A | 12. | 17. | 24. | 34. | 4 | 385. | 0.02000 | 2.00 | 0.00 | 0. | 20 | 10 | A29 | 0.00 |
| 50300 | 5B | 4. | 9. | 4. | 9. | 2 | 530. | 0.32100 | 0.00 | 0.00 | 0. | 20 | 5 | A29 | 0.00 |
| 50300 | 6B | 25. | 27. | 29. | 35. | 4 | 835. | 0.02200 | 2.00 | 0.00 | 0. | 20 | 15 | A29 | 0.00 |
| 50300 | 7AB | 29. | 34. | 53. | 68. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 0 | A29 | 0.00 |
| 50300 | 8A | 2. | 4. | 55. | 69. | 4 | 320. | 0.02000 | 2.75 | 0.00 | 0. | 20 | 5 | A29 | 0.00 |
| 50300 | 9A | 3. | 7. | 58. | 72. | 4 | 900. | 0.01000 | 3.00 | 0.00 | 0. | 20 | 5 | A29 | 0.00 |
| 50300 | 10C | 32. | 36. | 32. | 36. | 2 | 1750. | 0.01500 | 0.00 | 0.00 | 0. | 20 | 14 | A29 | 0.00 |
| 50300 | 11C | 16. | 21. | 48. | 40. | 2 | 2800. | 0.01000 | 0.00 | 0.00 | 0. | 20 | 11 | A29 | 0.00 |
| 50300 | 12AC | 48. | 29. | 106. | 78. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 0 | A29 | 0.00 |
| 50300 | 13D | 10. | 16. | 10. | 16. | 2 | 2370. | 0.01800 | 0.00 | 0.00 | 0. | 20 | 17 | A29 | 0.65 |
| 50300 | 14D | 12. | 25. | 22. | 32. | 2 | 1250. | 0.03200 | 0.00 | 0.00 | 0. | 20 | 10 | A29 | 0.65 |
| 50300 | 15AD | 22. | 30. | 128. | 107. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 0 | A29 | 0.00 |
| 50300 | 16A | 12. | 10. | 140. | 117. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 23 | A29 | 0.00 |
| 50300 | 17A | 0. | 0. | 140. | 117. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |

HYDROGRAPH AT OUTLET BASIN 600 and Chiquito site

HYDROGRAPH AT 50300 17A STORM DAY 4 REDUCTION FACTOR = 1.000

| TIME | Q | TIME | Q | TIME | Q | TIME | Q | TIME | Q |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0. | 100 | 4. | 200 | 4. | 300 | 4. | 400 | 5. |
| 500 | 5. | 600 | 5. | 700 | 6. | 800 | 6. | 900 | 7. |
| 1000 | 8. | 1050 | 10. | 1100 | 13. | 1110 | 15. | 1120 | 18. |
| 1130 | 23. | 1131 | 23. | 1132 | 24. | 1133 | 25. | 1134 | 25. |
| 1135 | 26. | 1136 | 27. | 1137 | 27. | 1138 | 28. | 1139 | 29. |
| 1140 | 30. | 1141 | 32. | 1142 | 33. | 1143 | 34. | 1144 | 36. |
| 1145 | 37. | 1146 | 39. | 1147 | 41. | 1148 | 44. | 1149 | 47. |
| 1150 | 51. | 1151 | 56. | 1152 | 63. | 1153 | 72. | 1154 | 82. |
| 1155 | 93. | 1156 | 102. | 1157 | 109. | 1158 | 114. | 1159 | 116. |
| 1160 | 117. | 1161 | 116. | 1162 | 113. | 1163 | 107. | 1164 | 101. |
| 1165 | 94. | 1166 | 89. | 1167 | 84. | 1168 | 80. | 1169 | 76. |
| 1170 | 73. | 1171 | 70. | 1172 | 67. | 1173 | 63. | 1174 | 61. |
| 1175 | 58. | 1176 | 57. | 1177 | 55. | 1178 | 54. | 1179 | 53. |
| 1180 | 52. | 1181 | 51. | 1182 | 50. | 1183 | 48. | 1184 | 47. |
| 1185 | 46. | 1186 | 44. | 1187 | 43. | 1188 | 41. | 1189 | 40. |
| 1190 | 38. | 1191 | 37. | 1192 | 35. | 1193 | 34. | 1194 | 33. |
| 1195 | 32. | 1196 | 30. | 1197 | 29. | 1198 | 28. | 1199 | 27. |
| 1200 | 26. | 1201 | 25. | 1202 | 24. | 1203 | 23. | 1204 | 23. |
| 1205 | 22. | 1206 | 21. | 1207 | 21. | 1208 | 20. | 1209 | 19. |
| 1210 | 19. | 1211 | 18. | 1212 | 18. | 1213 | 17. | 1214 | 17. |
| 1215 | 16. | 1216 | 16. | 1217 | 15. | 1218 | 15. | 1219 | 15. |
| 1220 | 14. | 1221 | 14. | 1222 | 14. | 1223 | 13. | 1224 | 13. |
| 1225 | 13. | 1226 | 13. | 1227 | 12. | 1228 | 12. | 1229 | 12. |
| 1230 | 12. | 1231 | 11. | 1232 | 11. | 1233 | 11. | 1234 | 11. |
| 1235 | 11. | 1236 | 11. | 1237 | 10. | 1238 | 10. | 1239 | 10. |
| 1240 | 10. | 1241 | 10. | 1242 | 10. | 1243 | 9. | 1244 | 9. |
| 1245 | 9. | 1246 | 9. | 1247 | 9. | 1248 | 9. | 1249 | 9. |
| 1250 | 9. | 1251 | 9. | 1252 | 9. | 1253 | 8. | 1254 | 8. |
| 1255 | 8. | 1256 | 8. | 1257 | 8. | 1258 | 8. | 1259 | 8. |
| 1260 | 8. | 1261 | 8. | 1262 | 8. | 1263 | 8. | 1264 | 8. |
| 1265 | 8. | 1266 | 7. | 1267 | 7. | 1268 | 7. | 1269 | 7. |
| 1270 | 7. | 1271 | 7. | 1272 | 7. | 1273 | 7. | 1274 | 7. |
| 1275 | 7. | 1276 | 7. | 1277 | 7. | 1278 | 7. | 1279 | 7. |
| 1280 | 7. | 1281 | 7. | 1282 | 7. | 1283 | 7. | 1284 | 7. |
| 1285 | 7. | 1286 | 7. | 1287 | 7. | 1288 | 6. | 1289 | 6. |
| 1290 | 6. | 1291 | 6. | 1292 | 6. | 1293 | 6. | 1294 | 6. |
| 1295 | 6. | 1296 | 6. | 1297 | 6. | 1298 | 6. | 1299 | 6. |
| 1300 | 6. | 1310 | 6. | 1320 | 6. | 1330 | 5. | 1340 | 5. |
| 1350 | 5. | 1360 | 5. | 1370 | 5. | 1380 | 5. | 1390 | 5. |
| 1400 | 5. | 1420 | 5. | 1440 | 4. | 1460 | 4. | 1500 | 4. |

Total Runoff = 17.108 Acre-Ft.
Peak Q = 117 CFS
Time to Peak Q = 1160 Minutes

```
4LADEPTH.RDT
5 50300    1A  50 YR River Village - Newhall Ranch - Chiquito Existing
5 50300   17A  HYDROGRAPH AT OUTLET BASIN 600 and Chiquito site
6 50300    1A 198  0   6 8A292  890 26500                      G1
6 50300    2A 198  0   4 6A292  200 01000
6 50300    3A 198  0   2 5A294  275 01000
6 50300    4A 198  0  1210A294  385 02000
6 50300    5B 198  0   4 5A292  530 32100
6 50300    6B 198  0  2515A294  835 02200
6 50300    7AB198  0      A29
6 50300    8A 198  0   2 5A294  320 02000
6 50300    9A 198  0   3 5A294  900 01000
6 50300   10C 198  0  3214A292 1750 01500
6 50300   11C 198  0  1611A292 2800 01000
6 50300   12AC198         A29
6 50300   13D 198 65  1017A292 2370 01800
6 50300   14D 198 65  1210A292 1250 03200
6 50300   15AD198         A29
6 50300   16A 198  0  1223A29
6 50300   17A 198  0    99A29                            1  2
```

10-19-2009 SITE LICENSEE: PSOMAS AND ASSOCIATES 

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT 

MODIFIED RATIONAL METHOD HYDROLOGY

50 YR River Village - Newhall Ranch - Chiquito Existing

| LOCATION | | SUBAREA AREA | SUBAREA Q | TOTAL AREA | TOTAL Q | CONV TYPE | CONV LNGTH | CONV SLOPE | CONV SIZE | CONV Z | CONTROL Q | SOIL NAME | TC | STORM DAY 4 RAIN ZONE | PCT IMPV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 50300 | 1A | 6. | 13. | 6. | 13. | 2 | 890. | 0.26500 | 0.00 | 0.00 | 0. | 198 | 8 | A29 | 0.00 |
| 50300 | 2A | 4. | 10. | 10. | 21. | 2 | 200. | 0.01000 | 0.00 | 0.00 | 0. | 198 | 6 | A29 | 0.00 |
| 50300 | 3A | 2. | 5. | 12. | 24. | 4 | 275. | 0.01000 | 2.00 | 0.00 | 0. | 198 | 5 | A29 | 0.00 |
| 50300 | 4A | 12. | 22. | 24. | 45. | 4 | 385. | 0.02000 | 2.25 | 0.00 | 0. | 198 | 10 | A29 | 0.00 |
| 50300 | 5B | 4. | 11. | 4. | 11. | 2 | 530. | 0.32100 | 0.00 | 0.00 | 0. | 198 | 5 | A29 | 0.00 |
| 50300 | 6B | 25. | 37. | 29. | 47. | 4 | 835. | 0.02200 | 2.25 | 0.00 | 0. | 198 | 15 | A29 | 0.00 |
| 50300 | 7AB | 29. | 46. | 53. | 90. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 0 | A29 | 0.00 |
| 50300 | 8A | 2. | 5. | 55. | 93. | 4 | 320. | 0.02000 | 3.00 | 0.00 | 0. | 198 | 5 | A29 | 0.00 |
| 50300 | 9A | 3. | 8. | 58. | 96. | 4 | 900. | 0.01000 | 3.50 | 0.00 | 0. | 198 | 5 | A29 | 0.00 |
| 50300 | 10C | 32. | 49. | 32. | 49. | 2 | 1750. | 0.01500 | 0.00 | 0.00 | 0. | 198 | 14 | A29 | 0.00 |
| 50300 | 11C | 16. | 28. | 48. | 59. | 2 | 2800. | 0.01000 | 0.00 | 0.00 | 0. | 198 | 11 | A29 | 0.00 |
| 50300 | 12AC | 48. | 46. | 106. | 115. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 0 | A29 | 0.00 |
| 50300 | 13D | 10. | 17. | 10. | 17. | 2 | 2370. | 0.01800 | 0.00 | 0.00 | 0. | 198 | 17 | A29 | 0.65 |
| 50300 | 14D | 12. | 27. | 22. | 34. | 2 | 1250. | 0.03200 | 0.00 | 0.00 | 0. | 198 | 10 | A29 | 0.65 |
| 50300 | 15AD | 22. | 33. | 128. | 147. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 0 | A29 | 0.00 |
| 50300 | 16A | 12. | 14. | 140. | 160. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 23 | A29 | 0.00 |
| 50300 | 17A | 0. | 0. | 140. | 160. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 99 | A29 | 0.00 |

HYDROGRAPH AT OUTLET BASIN 600 and Chiquito site

HYDROGRAPH AT 50300 17A STORM DAY 4 REDUCTION FACTOR = 1.000

| TIME | Q | TIME | Q | TIME | Q | TIME | Q | TIME | Q |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0. | 100 | 10. | 200 | 11. | 300 | 11. | 400 | 12. |
| 500 | 12. | 600 | 13. | 700 | 15. | 800 | 16. | 900 | 18. |
| 1000 | 22. | 1050 | 26. | 1100 | 33. | 1110 | 36. | 1120 | 41. |
| 1130 | 47. | 1131 | 47. | 1132 | 48. | 1133 | 49. | 1134 | 49. |
| 1135 | 50. | 1136 | 51. | 1137 | 52. | 1138 | 53. | 1139 | 54. |
| 1140 | 55. | 1141 | 57. | 1142 | 58. | 1143 | 60. | 1144 | 62. |
| 1145 | 64. | 1146 | 67. | 1147 | 69. | 1148 | 72. | 1149 | 76. |
| 1150 | 81. | 1151 | 88. | 1152 | 97. | 1153 | 109. | 1154 | 121. |
| 1155 | 134. | 1156 | 145. | 1157 | 153. | 1158 | 158. | 1159 | 160. |
| 1160 | 160. | 1161 | 158. | 1162 | 153. | 1163 | 146. | 1164 | 139. |
| 1165 | 132. | 1166 | 126. | 1167 | 121. | 1168 | 117. | 1169 | 112. |
| 1170 | 108. | 1171 | 104. | 1172 | 99. | 1173 | 96. | 1174 | 92. |
| 1175 | 90. | 1176 | 88. | 1177 | 86. | 1178 | 85. | 1179 | 83. |
| 1180 | 81. | 1181 | 79. | 1182 | 77. | 1183 | 75. | 1184 | 72. |
| 1185 | 70. | 1186 | 68. | 1187 | 65. | 1188 | 63. | 1189 | 61. |
| 1190 | 59. | 1191 | 57. | 1192 | 55. | 1193 | 53. | 1194 | 52. |
| 1195 | 50. | 1196 | 48. | 1197 | 47. | 1198 | 45. | 1199 | 44. |
| 1200 | 43. | 1201 | 42. | 1202 | 41. | 1203 | 40. | 1204 | 39. |
| 1205 | 38. | 1206 | 37. | 1207 | 36. | 1208 | 35. | 1209 | 34. |
| 1210 | 34. | 1211 | 33. | 1212 | 32. | 1213 | 32. | 1214 | 31. |
| 1215 | 31. | 1216 | 30. | 1217 | 29. | 1218 | 29. | 1219 | 29. |
| 1220 | 28. | 1221 | 28. | 1222 | 27. | 1223 | 27. | 1224 | 26. |
| 1225 | 26. | 1226 | 26. | 1227 | 25. | 1228 | 25. | 1229 | 25. |
| 1230 | 24. | 1231 | 24. | 1232 | 24. | 1233 | 24. | 1234 | 23. |
| 1235 | 23. | 1236 | 23. | 1237 | 23. | 1238 | 22. | 1239 | 22. |
| 1240 | 22. | 1241 | 22. | 1242 | 22. | 1243 | 21. | 1244 | 21. |
| 1245 | 21. | 1246 | 21. | 1247 | 21. | 1248 | 20. | 1249 | 20. |
| 1250 | 20. | 1251 | 20. | 1252 | 20. | 1253 | 20. | 1254 | 20. |
| 1255 | 19. | 1256 | 19. | 1257 | 19. | 1258 | 19. | 1259 | 19. |
| 1260 | 19. | 1261 | 19. | 1262 | 18. | 1263 | 18. | 1264 | 18. |
| 1265 | 18. | 1266 | 18. | 1267 | 18. | 1268 | 18. | 1269 | 18. |
| 1270 | 18. | 1271 | 17. | 1272 | 17. | 1273 | 17. | 1274 | 17. |
| 1275 | 17. | 1276 | 17. | 1277 | 17. | 1278 | 17. | 1279 | 17. |
| 1280 | 17. | 1281 | 17. | 1282 | 17. | 1283 | 16. | 1284 | 16. |
| 1285 | 16. | 1286 | 16. | 1287 | 16. | 1288 | 16. | 1289 | 16. |
| 1290 | 16. | 1291 | 16. | 1292 | 16. | 1293 | 16. | 1294 | 16. |
| 1295 | 16. | 1296 | 15. | 1297 | 15. | 1298 | 15. | 1299 | 15. |
| 1300 | 15. | 1310 | 15. | 1320 | 14. | 1330 | 14. | 1340 | 13. |
| 1350 | 13. | 1360 | 13. | 1370 | 12. | 1380 | 12. | 1390 | 12. |
| 1400 | 12. | 1420 | 11. | 1440 | 11. | 1460 | 10. | 1500 | 10. |

Total Runoff = 37.567 Acre-Ft.
Peak Q = 160 CFS
Time to Peak Q = 1159 Minutes

```
4LADEPTH.RDT
5 50300    1A  50 YR River Village - Newhall Ranch - ADOBE Existing
5 50300   11A  HYDROGRAPH AT OUTLET BASIN AREAs A, B, And c
6 50300    1A 097  035.809A292 1755 61400                      G1
6 50300    2A 097  0  4010A292 1035 05900
6 50300    3A  97  0  2411A292  890 34000
6 50300    4B  97  016.711A292 1560 13800
6 50300    5B  97  039.916A292 2490 09200
6 50300    6AB097          A29
6 50300    7C 097  027.412A292  720 01300
6 50300    8C 097  012.710A292 1250 01200
6 50300    9C 097  016.6 8A292 1150 01000
6 50300   10AC097          A29
6 50300   11A 097  0    99A29                            1  2
```

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT
MODIFIED RATIONAL METHOD HYDROLOGY


50 YR River Village - Newhall Ranch - ADOBE Existing

| LOCATION | | SUBAREA AREA | SUBAREA Q | TOTAL AREA | TOTAL Q | CONV TYPE | CONV LNGTH | CONV SLOPE | CONV SIZE | CONV Z | CONTROL Q | SOIL NAME | TC | STORM DAY 4 RAIN ZONE | PCT IMPV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 50300 | 1A | 36. | 67. | 36. | 67. | 2 | 1755. | 0.61400 | 0.00 | 0.00 | 0. | 97 | 9 | A29 | 0.00 |
| 50300 | 2A | 40. | 71. | 76. | 136. | 2 | 1035. | 0.05900 | 0.00 | 0.00 | 0. | 97 | 10 | A29 | 0.00 |
| 50300 | 3A | 24. | 40. | 100. | 171. | 2 | 890. | 0.34000 | 0.00 | 0.00 | 0. | 97 | 11 | A29 | 0.00 |
| 50300 | 4B | 17. | 28. | 17. | 28. | 2 | 1560. | 0.13800 | 0.00 | 0.00 | 0. | 97 | 11 | A29 | 0.00 |
| 50300 | 5B | 40. | 53. | 57. | 80. | 2 | 2490. | 0.09200 | 0.00 | 0.00 | 0. | 97 | 16 | A29 | 0.00 |
| 50300 | 6AB | 57. | 77. | 157. | 240. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 97 | 0 | A29 | 0.00 |
| 50300 | 7C | 27. | 43. | 27. | 43. | 2 | 720. | 0.01300 | 0.00 | 0.00 | 0. | 97 | 12 | A29 | 0.00 |
| 50300 | 8C | 13. | 23. | 40. | 61. | 2 | 1250. | 0.01200 | 0.00 | 0.00 | 0. | 97 | 10 | A29 | 0.00 |
| 50300 | 9C | 17. | 34. | 57. | 60. | 2 | 1150. | 0.01000 | 0.00 | 0.00 | 0. | 97 | 8 | A29 | 0.00 |
| 50300 | 10AC | 57. | 58. | 214. | 287. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 97 | 0 | A29 | 0.00 |
| 50300 | 11A | 0. | 0. | 214. | 287. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 97 | 99 | A29 | 0.00 |

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT
MODIFIED RATIONAL METHOD HYDROLOGY
HYDROGRAPH AT OUTLET BASIN AREAs A, B, And c



HYDROGRAPH AT 50300 11A STORM DAY 4 REDUCTION FACTOR = 1.000

| TIME | Q | TIME | Q | TIME | Q | TIME | Q | TIME | Q |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0. | 100 | 3. | 200 | 3. | 300 | 3. | 400 | 3. |
| 500 | 4. | 600 | 4. | 700 | 4. | 800 | 4. | 900 | 5. |
| 1000 | 6. | 1050 | 10. | 1100 | 21. | 1110 | 28. | 1120 | 40. |
| 1130 | 54. | 1131 | 55. | 1132 | 57. | 1133 | 59. | 1134 | 60. |
| 1135 | 62. | 1136 | 64. | 1137 | 66. | 1138 | 68. | 1139 | 71. |
| 1140 | 73. | 1141 | 76. | 1142 | 79. | 1143 | 83. | 1144 | 87. |
| 1145 | 91. | 1146 | 96. | 1147 | 101. | 1148 | 107. | 1149 | 115. |
| 1150 | 126. | 1151 | 140. | 1152 | 160. | 1153 | 184. | 1154 | 212. |
| 1155 | 238. | 1156 | 260. | 1157 | 275. | 1158 | 284. | 1159 | 287. |
| 1160 | 284. | 1161 | 273. | 1162 | 257. | 1163 | 238. | 1164 | 218. |
| 1165 | 199. | 1166 | 183. | 1167 | 170. | 1168 | 157. | 1169 | 146. |
| 1170 | 135. | 1171 | 125. | 1172 | 114. | 1173 | 105. | 1174 | 97. |
| 1175 | 90. | 1176 | 83. | 1177 | 77. | 1178 | 72. | 1179 | 66. |
| 1180 | 62. | 1181 | 57. | 1182 | 53. | 1183 | 49. | 1184 | 46. |
| 1185 | 43. | 1186 | 40. | 1187 | 37. | 1188 | 35. | 1189 | 33. |
| 1190 | 31. | 1191 | 29. | 1192 | 27. | 1193 | 26. | 1194 | 24. |
| 1195 | 23. | 1196 | 22. | 1197 | 21. | 1198 | 19. | 1199 | 18. |
| 1200 | 17. | 1201 | 17. | 1202 | 16. | 1203 | 15. | 1204 | 14. |
| 1205 | 14. | 1206 | 13. | 1207 | 13. | 1208 | 12. | 1209 | 12. |
| 1210 | 11. | 1211 | 11. | 1212 | 10. | 1213 | 10. | 1214 | 10. |
| 1215 | 10. | 1216 | 9. | 1217 | 9. | 1218 | 9. | 1219 | 9. |
| 1220 | 8. | 1221 | 8. | 1222 | 8. | 1223 | 8. | 1224 | 8. |
| 1225 | 8. | 1226 | 7. | 1227 | 7. | 1228 | 7. | 1229 | 7. |
| 1230 | 7. | 1231 | 7. | 1232 | 7. | 1233 | 7. | 1234 | 6. |
| 1235 | 6. | 1236 | 6. | 1237 | 6. | 1238 | 6. | 1239 | 6. |
| 1240 | 6. | 1241 | 6. | 1242 | 6. | 1243 | 6. | 1244 | 6. |
| 1245 | 6. | 1246 | 6. | 1247 | 6. | 1248 | 6. | 1249 | 5. |
| 1250 | 5. | 1251 | 5. | 1252 | 5. | 1253 | 5. | 1254 | 5. |
| 1255 | 5. | 1256 | 5. | 1257 | 5. | 1258 | 5. | 1259 | 5. |
| 1260 | 5. | 1261 | 5. | 1262 | 5. | 1263 | 5. | 1264 | 5. |
| 1265 | 5. | 1266 | 5. | 1267 | 5. | 1268 | 5. | 1269 | 5. |
| 1270 | 5. | 1271 | 5. | 1272 | 5. | 1273 | 5. | 1274 | 5. |
| 1275 | 5. | 1276 | 5. | 1277 | 5. | 1278 | 5. | 1279 | 5. |
| 1280 | 5. | 1281 | 5. | 1282 | 4. | 1283 | 4. | 1284 | 4. |
| 1285 | 4. | 1286 | 4. | 1287 | 4. | 1288 | 4. | 1289 | 4. |
| 1290 | 4. | 1291 | 4. | 1292 | 4. | 1293 | 4. | 1294 | 4. |
| 1295 | 4. | 1296 | 4. | 1297 | 4. | 1298 | 4. | 1299 | 4. |
| 1300 | 4. | 1310 | 4. | 1320 | 4. | 1330 | 4. | 1340 | 4. |
| 1350 | 4. | 1360 | 4. | 1370 | 3. | 1380 | 3. | 1390 | 3. |
| 1400 | 3. | 1420 | 3. | 1440 | 3. | 1460 | 3. | 1500 | 3. |

Total Runoff = 20.132 Acre-Ft.
Peak Q = 287 CFS
Time to Peak Q = 1159 Minutes

# APPENDIX 5

# LACDPW MORA CALCULATIONS
# PROPOSED CONDITION

```
4LADEPTH.RDT
5 50300    1A  50 YR River Village - Newhall Ranch - Chiquito Proposed
5 50300   15A  HYDROGRAPH AT OUTLET BASIN AREAs A
6 50300    1A 020  529.911A292 1220 01600                     G1
6 50300    2A 020  5 6.4 6A292  880 02700
6 50300    3B  20  5 4.4 5A292 1410 05300
6 50300    4B 020  519.614A292  760 00200
6 50300    5B 020  5 6.9 7A294  132 04000
6 50300    6B 020  5 5.9 7A29
6 50300    7B  20 3013.3 9A294  917 00200
6 50300    8AB020         A29
6 50300    9C 020  5 7.7 8A294  540 00400
6 50300   10C  20  5 8.811A294  250 00100
6 50300   11C  20 8011.818A294 1610 00100
6 50300   12C  20  5 2.216A294  360 00100
6 50300   13C  20 80 7.522A294  630 00100
6 50300   14AC020         A29
6 50300   15A 020  0    50A29                             1  2
```

9-11-2008 SITE LICENSEE: PSOMAS AND ASSOCIATES PAGE 1

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT PROG FO601A

MODIFIED RATIONAL METHOD HYDROLOGY

50 YR River Village - Newhall Ranch - Chiquito Proposed STORM DAY 4

| LOCATION | | SUBAREA AREA | SUBAREA Q | TOTAL AREA | TOTAL Q | CONV TYPE | CONV LNGTH | CONV SLOPE | CONV SIZE | CONV Z | CONTROL Q | SOIL NAME | TC | RAIN ZONE | PCT IMPV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 50300 | 1A | 30. | 42. | 30. | 42. | 2 | 1220. | 0.01600 | 0.00 | 0.00 | 0. | 20 | 11 | A29 | 0.05 |
| 50300 | 2A | 6. | 12. | 36. | 38. | 2 | 880. | 0.02700 | 0.00 | 0.00 | 0. | 20 | 6 | A29 | 0.05 |
| 50300 | 3B | 4. | 9. | 4. | 9. | 2 | 1410. | 0.05300 | 0.00 | 0.00 | 0. | 20 | 5 | A29 | 0.05 |
| 50300 | 4B | 20. | 24. | 24. | 29. | 2 | 760. | 0.00200 | 0.00 | 0.00 | 0. | 20 | 14 | A29 | 0.05 |
| 50300 | 5B | 7. | 13. | 31. | 23. | 4 | 132. | 0.04000 | 2.00 | 0.00 | 0. | 20 | 7 | A29 | 0.05 |
| 50300 | 6B | 6. | 11. | 37. | 30. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 7 | A29 | 0.05 |
| 50300 | 7B | 13. | 24. | 50. | 54. | 4 | 917. | 0.00200 | 3.75 | 0.00 | 0. | 20 | 9 | A29 | 0.30 |
| 50300 | 8AB | 50. | 50. | 86. | 82. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 0 | A29 | 0.00 |
| 50300 | 9C | 8. | 13. | 8. | 13. | 4 | 540. | 0.00400 | 2.00 | 0.00 | 0. | 20 | 8 | A29 | 0.05 |
| 50300 | 10C | 9. | 12. | 17. | 25. | 4 | 250. | 0.00100 | 3.25 | 0.00 | 0. | 20 | 11 | A29 | 0.05 |
| 50300 | 11C | 12. | 20. | 29. | 45. | 4 | 1610. | 0.00100 | 4.00 | 0.00 | 0. | 20 | 18 | A29 | 0.80 |
| 50300 | 12C | 2. | 2. | 31. | 39. | 4 | 360. | 0.00100 | 3.75 | 0.00 | 0. | 20 | 16 | A29 | 0.05 |
| 50300 | 13C | 7. | 11. | 38. | 47. | 4 | 630. | 0.00100 | 4.00 | 0.00 | 0. | 20 | 22 | A29 | 0.80 |
| 50300 | 14AC | 38. | 46. | 124. | 109. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 0 | A29 | 0.00 |
| 50300 | 15A | 0. | 0. | 124. | 109. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 50 | A29 | 0.00 |

HYDROGRAPH AT OUTLET BASIN AREAs A

HYDROGRAPH AT 50300 15A STORM DAY 4 REDUCTION FACTOR = 1.000

| TIME | Q | TIME | Q | TIME | Q | TIME | Q | TIME | Q |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0. | 100 | 5. | 200 | 5. | 300 | 5. | 400 | 6. |
| 500 | 6. | 600 | 6. | 700 | 7. | 800 | 7. | 900 | 8. |
| 1000 | 10. | 1050 | 12. | 1100 | 16. | 1110 | 17. | 1120 | 20. |
| 1130 | 25. | 1131 | 26. | 1132 | 26. | 1133 | 27. | 1134 | 27. |
| 1135 | 28. | 1136 | 29. | 1137 | 30. | 1138 | 30. | 1139 | 31. |
| 1140 | 32. | 1141 | 33. | 1142 | 35. | 1143 | 36. | 1144 | 37. |
| 1145 | 39. | 1146 | 40. | 1147 | 42. | 1148 | 44. | 1149 | 46. |
| 1150 | 49. | 1151 | 52. | 1152 | 57. | 1153 | 64. | 1154 | 73. |
| 1155 | 82. | 1156 | 91. | 1157 | 98. | 1158 | 104. | 1159 | 108. |
| 1160 | 109. | 1161 | 109. | 1162 | 108. | 1163 | 106. | 1164 | 105. |
| 1165 | 104. | 1166 | 103. | 1167 | 102. | 1168 | 101. | 1169 | 100. |
| 1170 | 99. | 1171 | 97. | 1172 | 95. | 1173 | 93. | 1174 | 90. |
| 1175 | 87. | 1176 | 83. | 1177 | 79. | 1178 | 74. | 1179 | 69. |
| 1180 | 65. | 1181 | 60. | 1182 | 56. | 1183 | 52. | 1184 | 49. |
| 1185 | 45. | 1186 | 42. | 1187 | 40. | 1188 | 37. | 1189 | 35. |
| 1190 | 33. | 1191 | 31. | 1192 | 29. | 1193 | 28. | 1194 | 27. |
| 1195 | 25. | 1196 | 24. | 1197 | 23. | 1198 | 22. | 1199 | 21. |
| 1200 | 21. | 1201 | 20. | 1202 | 19. | 1203 | 19. | 1204 | 18. |
| 1205 | 17. | 1206 | 17. | 1207 | 16. | 1208 | 16. | 1209 | 16. |
| 1210 | 15. | 1211 | 15. | 1212 | 14. | 1213 | 14. | 1214 | 14. |
| 1215 | 14. | 1216 | 13. | 1217 | 13. | 1218 | 13. | 1219 | 13. |
| 1220 | 12. | 1221 | 12. | 1222 | 12. | 1223 | 12. | 1224 | 12. |
| 1225 | 11. | 1226 | 11. | 1227 | 11. | 1228 | 11. | 1229 | 11. |
| 1230 | 11. | 1231 | 11. | 1232 | 10. | 1233 | 10. | 1234 | 10. |
| 1235 | 10. | 1236 | 10. | 1237 | 10. | 1238 | 10. | 1239 | 10. |
| 1240 | 10. | 1241 | 10. | 1242 | 10. | 1243 | 9. | 1244 | 9. |
| 1245 | 9. | 1246 | 9. | 1247 | 9. | 1248 | 9. | 1249 | 9. |
| 1250 | 9. | 1251 | 9. | 1252 | 9. | 1253 | 9. | 1254 | 9. |
| 1255 | 9. | 1256 | 9. | 1257 | 9. | 1258 | 8. | 1259 | 8. |
| 1260 | 8. | 1261 | 8. | 1262 | 8. | 1263 | 8. | 1264 | 8. |
| 1265 | 8. | 1266 | 8. | 1267 | 8. | 1268 | 8. | 1269 | 8. |
| 1270 | 8. | 1271 | 8. | 1272 | 8. | 1273 | 8. | 1274 | 8. |
| 1275 | 8. | 1276 | 8. | 1277 | 8. | 1278 | 8. | 1279 | 8. |
| 1280 | 8. | 1281 | 8. | 1282 | 8. | 1283 | 7. | 1284 | 7. |
| 1285 | 7. | 1286 | 7. | 1287 | 7. | 1288 | 7. | 1289 | 7. |
| 1290 | 7. | 1291 | 7. | 1292 | 7. | 1293 | 7. | 1294 | 7. |
| 1295 | 7. | 1296 | 7. | 1297 | 7. | 1298 | 7. | 1299 | 7. |
| 1300 | 7. | 1310 | 7. | 1320 | 7. | 1330 | 6. | 1340 | 6. |
| 1350 | 6. | 1360 | 6. | 1370 | 6. | 1380 | 6. | 1390 | 6. |
| 1400 | 5. | 1420 | 5. | 1440 | 5. | 1460 | 5. | 1500 | 5. |

Total Runoff = 19.355 Acre-Ft.
Peak Q = 109 CFS
Time to Peak Q = 1160 Minutes

```
 4LADEPTH.RDT
 5 50300    1A  50 YR River Village - Newhall Ranch - Chiquito Proposed BURNED
 5 50300   15A  HYDROGRAPH AT OUTLET BASIN AREAs A
 6 50300    1A 198  538.011A292 1220 01600                    G1
 6 50300    2A 198  5 8.0 6A292  880 02700
 6 50300    3B 198  5 4.4 5A292 1410 05300
 6 50300    4B 198  519.614A292  760 00200
 6 50300    5B 198  5 6.9 7A294  132 04000
 6 50300    6B 198  5 5.9 7A29
 6 50300    7B 198 3013.3 9A294  917 00200
 6 50300    8AB198         A29
 6 50300    9C 198  5 7.7 8A294  540 00400
 6 50300   10C 198  5 8.811A294  250 00100
 6 50300   11C  20 8011.818A294 1610 00100
 6 50300   12C  20  5 2.216A294  360 00100
 6 50300   13C  20 80 7.522A294  630 00100
 6 50300   14AC020         A29
 6 50300   15A 020  0    50A29                             1  2

**NOTE**
        THE AREA FOR SUBAREAS 1A AND 2A HAVE BEEN INCREASED TO ACCOUNT FOR BURNED AND BULKED FLOWRATE.
        AREA 1A ACTUAL AREA IS 30.0 ACRES
        AREA 2A ACTUAL AREA IS 6.0 ACRES
```

11-11-2009 SITE LICENSEE: PSOMAS AND ASSOCIATES 

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT 

MODIFIED RATIONAL METHOD HYDROLOGY

50 YR River Village - Newhall Ranch - Chiquito Proposed BURNED

| LOCATION | | SUBAREA AREA | SUBAREA Q | TOTAL AREA | TOTAL Q | CONV TYPE | CONV LNGTH | CONV SLOPE | CONV SIZE | CONV Z | CONTROL Q | SOIL NAME | TC | STORM DAY 4 RAIN ZONE | PCT IMPV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 50300 | 1A | 38. | 68. | 38. | 68. | 2 | 1220. | 0.01600 | 0.00 | 0.00 | 0. | 198 | 11 | A29 | 0.05 |
| 50300 | 2A | 8. | 20. | 46. | 67. | 2 | 880. | 0.02700 | 0.00 | 0.00 | 0. | 198 | 6 | A29 | 0.05 |
| 50300 | 3B | 4. | 11. | 4. | 11. | 2 | 1410. | 0.05300 | 0.00 | 0.00 | 0. | 198 | 5 | A29 | 0.05 |
| 50300 | 4B | 20. | 31. | 24. | 38. | 2 | 760. | 0.00200 | 0.00 | 0.00 | 0. | 198 | 14 | A29 | 0.05 |
| 50300 | 5B | 7. | 16. | 31. | 34. | 4 | 132. | 0.04000 | 2.00 | 0.00 | 0. | 198 | 7 | A29 | 0.05 |
| 50300 | 6B | 6. | 14. | 37. | 42. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 7 | A29 | 0.05 |
| 50300 | 7B | 13. | 28. | 50. | 70. | 4 | 917. | 0.00200 | 4.25 | 0.00 | 0. | 198 | 9 | A29 | 0.30 |
| 50300 | 8AB | 50. | 65. | 96. | 127. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 198 | 0 | A29 | 0.00 |
| 50300 | 9C | 8. | 17. | 8. | 17. | 4 | 540. | 0.00400 | 2.25 | 0.00 | 0. | 198 | 8 | A29 | 0.05 |
| 50300 | 10C | 9. | 16. | 17. | 32. | 4 | 250. | 0.00100 | 3.50 | 0.00 | 0. | 198 | 11 | A29 | 0.05 |
| 50300 | 11C | 12. | 20. | 29. | 52. | 4 | 1610. | 0.00100 | 4.25 | 0.00 | 0. | 20 | 18 | A29 | 0.80 |
| 50300 | 12C | 2. | 2. | 31. | 46. | 4 | 360. | 0.00100 | 4.00 | 0.00 | 0. | 20 | 16 | A29 | 0.05 |
| 50300 | 13C | 7. | 11. | 38. | 54. | 4 | 630. | 0.00100 | 4.25 | 0.00 | 0. | 20 | 22 | A29 | 0.80 |
| 50300 | 14AC | 38. | 52. | 134. | 159. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 0 | A29 | 0.00 |
| 50300 | 15A | 0. | 0. | 134. | 159. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 50 | A29 | 0.00 |

**NOTE**

THE AREA FOR SUBAREAS 1A AND 2A HAVE BEEN INCREASED TO ACCOUNT FOR BURNED AND BULKED FLOWRATE.
AREA 1A ACTUAL AREA IS 30.0 ACRES
AREA 2A ACTUAL AREA IS 6.0 ACRES

HYDROGRAPH AT OUTLET BASIN AREAs A

HYDROGRAPH AT 50300 15A STORM DAY 4 REDUCTION FACTOR = 1.000

| TIME | Q | TIME | Q | TIME | Q | TIME | Q | TIME | Q |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0. | 100 | 10. | 200 | 11. | 300 | 11. | 400 | 12. |
| 500 | 12. | 600 | 13. | 700 | 14. | 800 | 16. | 900 | 18. |
| 1000 | 22. | 1050 | 26. | 1100 | 33. | 1110 | 36. | 1120 | 41. |
| 1130 | 47. | 1131 | 48. | 1132 | 48. | 1133 | 49. | 1134 | 50. |
| 1135 | 51. | 1136 | 52. | 1137 | 53. | 1138 | 54. | 1139 | 55. |
| 1140 | 56. | 1141 | 57. | 1142 | 59. | 1143 | 60. | 1144 | 62. |
| 1145 | 64. | 1146 | 66. | 1147 | 68. | 1148 | 71. | 1149 | 74. |
| 1150 | 77. | 1151 | 82. | 1152 | 90. | 1153 | 100. | 1154 | 112. |
| 1155 | 124. | 1156 | 136. | 1157 | 146. | 1158 | 153. | 1159 | 157. |
| 1160 | 159. | 1161 | 158. | 1162 | 156. | 1163 | 153. | 1164 | 150. |
| 1165 | 148. | 1166 | 146. | 1167 | 144. | 1168 | 141. | 1169 | 138. |
| 1170 | 134. | 1171 | 131. | 1172 | 127. | 1173 | 123. | 1174 | 118. |
| 1175 | 113. | 1176 | 107. | 1177 | 101. | 1178 | 95. | 1179 | 89. |
| 1180 | 84. | 1181 | 79. | 1182 | 74. | 1183 | 70. | 1184 | 66. |
| 1185 | 62. | 1186 | 59. | 1187 | 56. | 1188 | 53. | 1189 | 51. |
| 1190 | 49. | 1191 | 47. | 1192 | 45. | 1193 | 43. | 1194 | 42. |
| 1195 | 40. | 1196 | 39. | 1197 | 38. | 1198 | 37. | 1199 | 36. |
| 1200 | 35. | 1201 | 34. | 1202 | 33. | 1203 | 33. | 1204 | 32. |
| 1205 | 31. | 1206 | 31. | 1207 | 30. | 1208 | 29. | 1209 | 29. |
| 1210 | 28. | 1211 | 28. | 1212 | 28. | 1213 | 27. | 1214 | 27. |
| 1215 | 26. | 1216 | 26. | 1217 | 26. | 1218 | 25. | 1219 | 25. |
| 1220 | 25. | 1221 | 24. | 1222 | 24. | 1223 | 24. | 1224 | 24. |
| 1225 | 23. | 1226 | 23. | 1227 | 23. | 1228 | 23. | 1229 | 22. |
| 1230 | 22. | 1231 | 22. | 1232 | 22. | 1233 | 22. | 1234 | 21. |
| 1235 | 21. | 1236 | 21. | 1237 | 21. | 1238 | 21. | 1239 | 21. |
| 1240 | 20. | 1241 | 20. | 1242 | 20. | 1243 | 20. | 1244 | 20. |
| 1245 | 20. | 1246 | 20. | 1247 | 19. | 1248 | 19. | 1249 | 19. |
| 1250 | 19. | 1251 | 19. | 1252 | 19. | 1253 | 19. | 1254 | 19. |
| 1255 | 18. | 1256 | 18. | 1257 | 18. | 1258 | 18. | 1259 | 18. |
| 1260 | 18. | 1261 | 18. | 1262 | 18. | 1263 | 18. | 1264 | 18. |
| 1265 | 17. | 1266 | 17. | 1267 | 17. | 1268 | 17. | 1269 | 17. |
| 1270 | 17. | 1271 | 17. | 1272 | 17. | 1273 | 17. | 1274 | 17. |
| 1275 | 17. | 1276 | 17. | 1277 | 16. | 1278 | 16. | 1279 | 16. |
| 1280 | 16. | 1281 | 16. | 1282 | 16. | 1283 | 16. | 1284 | 16. |
| 1285 | 16. | 1286 | 16. | 1287 | 16. | 1288 | 16. | 1289 | 16. |
| 1290 | 15. | 1291 | 15. | 1292 | 15. | 1293 | 15. | 1294 | 15. |
| 1295 | 15. | 1296 | 15. | 1297 | 15. | 1298 | 15. | 1299 | 15. |
| 1300 | 15. | 1310 | 14. | 1320 | 14. | 1330 | 13. | 1340 | 13. |
| 1350 | 13. | 1360 | 12. | 1370 | 12. | 1380 | 12. | 1390 | 12. |
| 1400 | 11. | 1420 | 11. | 1440 | 11. | 1460 | 10. | 1500 | 10. |

Total Runoff = 37.255 Acre-Ft.
Peak Q = 159 CFS
Time to Peak Q = 1160 Minutes

```
4LADEPTH.RDT
5 50300    1A  50 YR River Village - Newhall Ranch - ADOBE Proposed
5 50300   12A  HYDROGRAPH AT OUTLET BASIN AREAs A, B, and C
6 50300    1A 020  025.2 9A292 1390 05750                      G1
6 50300    2A 020  046.8 9A292  160 05000
6 50300    3A  20  025.510A292  550 05000
6 50300    4A  20  023.511A292 1000 03000
6 50300    5B  20  014.2 8A292 2680 03000
6 50300    6B  20  040.721A29
6 50300    7AB020          A29
6 50300    8C 020  017.010A292  740 01500
6 50300    9C 020  0 6.605A292 1300 01500
6 50300   10C 020  015.1 6A292 1100 01500
6 50300   11AC020          A29
6 50300   12A 020  0    99A29                             1  2
```

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT PROG FO601A

MODIFIED RATIONAL METHOD HYDROLOGY

50 YR River Village - Newhall Ranch - ADOBE Proposed STORM DAY 4

| LOCATION | | SUBAREA AREA | SUBAREA Q | TOTAL AREA | TOTAL Q | CONV TYPE | CONV LNGTH | CONV SLOPE | CONV SIZE | CONV Z | CONTROL Q | SOIL NAME | TC | RAIN ZONE | PCT IMPV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 50300 | 1A | 25. | 38. | 25. | 38. | 2 | 1390. | 0.05750 | 0.00 | 0.00 | 0. | 20 | 9 | A29 | 0.00 |
| 50300 | 2A | 47. | 71. | 72. | 99. | 2 | 160. | 0.05000 | 0.00 | 0.00 | 0. | 20 | 9 | A29 | 0.00 |
| 50300 | 3A | 25. | 36. | 97. | 133. | 2 | 550. | 0.05000 | 0.00 | 0.00 | 0. | 20 | 10 | A29 | 0.00 |
| 50300 | 4A | 23. | 31. | 120. | 161. | 2 | 1000. | 0.03000 | 0.00 | 0.00 | 0. | 20 | 11 | A29 | 0.00 |
| 50300 | 5B | 14. | 23. | 14. | 23. | 2 | 2680. | 0.03000 | 0.00 | 0.00 | 0. | 20 | 8 | A29 | 0.00 |
| 50300 | 6B | 41. | 36. | 55. | 47. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 21 | A29 | 0.00 |
| 50300 | 7AB | 55. | 47. | 175. | 202. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 0 | A29 | 0.00 |
| 50300 | 8C | 17. | 24. | 17. | 24. | 2 | 740. | 0.01500 | 0.00 | 0.00 | 0. | 20 | 10 | A29 | 0.00 |
| 50300 | 9C | 7. | 15. | 24. | 26. | 2 | 1300. | 0.01500 | 0.00 | 0.00 | 0. | 20 | 5 | A29 | 0.00 |
| 50300 | 10C | 15. | 29. | 39. | 38. | 2 | 1100. | 0.01500 | 0.00 | 0.00 | 0. | 20 | 6 | A29 | 0.00 |
| 50300 | 11AC | 39. | 30. | 214. | 232. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 0 | A29 | 0.00 |
| 50300 | 12A | 0. | 0. | 214. | 232. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 20 | 99 | A29 | 0.00 |

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT
MODIFIED RATIONAL METHOD HYDROLOGY
HYDROGRAPH AT OUTLET BASIN AREAs A, B, and c



HYDROGRAPH AT 50300 12A STORM DAY 4 REDUCTION FACTOR = 1.000

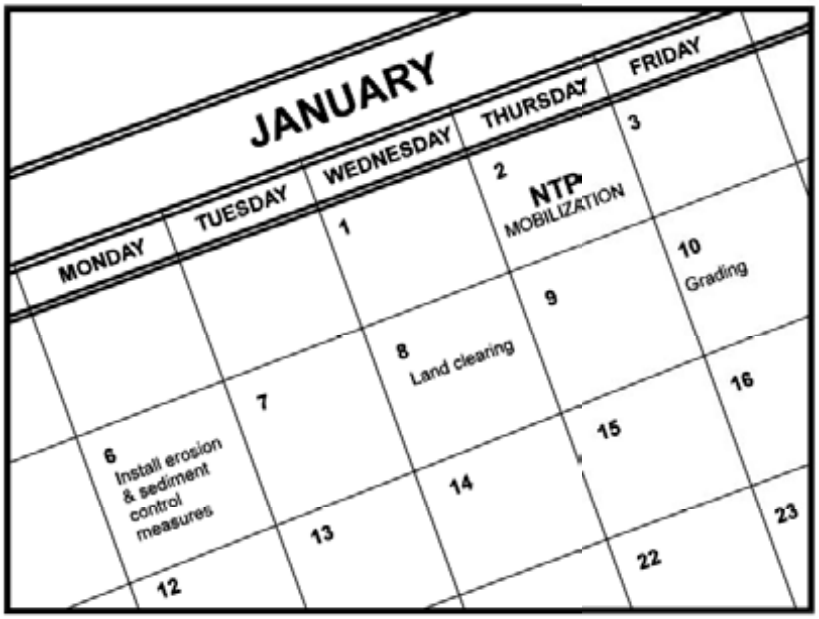
| TIME | Q | TIME | Q | TIME | Q | TIME | Q | TIME | Q |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0. | 100 | 3. | 200 | 3. | 300 | 3. | 400 | 4. |
| 500 | 4. | 600 | 4. | 700 | 4. | 800 | 5. | 900 | 5. |
| 1000 | 6. | 1050 | 8. | 1100 | 13. | 1110 | 15. | 1120 | 21. |
| 1130 | 30. | 1131 | 31. | 1132 | 32. | 1133 | 33. | 1134 | 34. |
| 1135 | 36. | 1136 | 37. | 1137 | 38. | 1138 | 40. | 1139 | 42. |
| 1140 | 43. | 1141 | 46. | 1142 | 48. | 1143 | 51. | 1144 | 54. |
| 1145 | 57. | 1146 | 61. | 1147 | 65. | 1148 | 70. | 1149 | 78. |
| 1150 | 87. | 1151 | 98. | 1152 | 112. | 1153 | 132. | 1154 | 153. |
| 1155 | 176. | 1156 | 199. | 1157 | 216. | 1158 | 227. | 1159 | 232. |
| 1160 | 231. | 1161 | 225. | 1162 | 212. | 1163 | 196. | 1164 | 178. |
| 1165 | 161. | 1166 | 144. | 1167 | 129. | 1168 | 117. | 1169 | 107. |
| 1170 | 95. | 1171 | 85. | 1172 | 75. | 1173 | 67. | 1174 | 59. |
| 1175 | 54. | 1176 | 49. | 1177 | 45. | 1178 | 42. | 1179 | 39. |
| 1180 | 36. | 1181 | 34. | 1182 | 32. | 1183 | 30. | 1184 | 28. |
| 1185 | 26. | 1186 | 25. | 1187 | 23. | 1188 | 22. | 1189 | 21. |
| 1190 | 20. | 1191 | 19. | 1192 | 18. | 1193 | 17. | 1194 | 16. |
| 1195 | 16. | 1196 | 15. | 1197 | 14. | 1198 | 14. | 1199 | 13. |
| 1200 | 13. | 1201 | 12. | 1202 | 12. | 1203 | 11. | 1204 | 11. |
| 1205 | 11. | 1206 | 10. | 1207 | 10. | 1208 | 10. | 1209 | 9. |
| 1210 | 9. | 1211 | 9. | 1212 | 9. | 1213 | 8. | 1214 | 8. |
| 1215 | 8. | 1216 | 8. | 1217 | 8. | 1218 | 8. | 1219 | 7. |
| 1220 | 7. | 1221 | 7. | 1222 | 7. | 1223 | 7. | 1224 | 7. |
| 1225 | 7. | 1226 | 7. | 1227 | 7. | 1228 | 7. | 1229 | 6. |
| 1230 | 6. | 1231 | 6. | 1232 | 6. | 1233 | 6. | 1234 | 6. |
| 1235 | 6. | 1236 | 6. | 1237 | 6. | 1238 | 6. | 1239 | 6. |
| 1240 | 6. | 1241 | 6. | 1242 | 6. | 1243 | 6. | 1244 | 6. |
| 1245 | 5. | 1246 | 5. | 1247 | 5. | 1248 | 5. | 1249 | 5. |
| 1250 | 5. | 1251 | 5. | 1252 | 5. | 1253 | 5. | 1254 | 5. |
| 1255 | 5. | 1256 | 5. | 1257 | 5. | 1258 | 5. | 1259 | 5. |
| 1260 | 5. | 1261 | 5. | 1262 | 5. | 1263 | 5. | 1264 | 5. |
| 1265 | 5. | 1266 | 5. | 1267 | 5. | 1268 | 5. | 1269 | 5. |
| 1270 | 5. | 1271 | 5. | 1272 | 5. | 1273 | 5. | 1274 | 5. |
| 1275 | 5. | 1276 | 5. | 1277 | 5. | 1278 | 5. | 1279 | 5. |
| 1280 | 5. | 1281 | 4. | 1282 | 4. | 1283 | 4. | 1284 | 4. |
| 1285 | 4. | 1286 | 4. | 1287 | 4. | 1288 | 4. | 1289 | 4. |
| 1290 | 4. | 1291 | 4. | 1292 | 4. | 1293 | 4. | 1294 | 4. |
| 1295 | 4. | 1296 | 4. | 1297 | 4. | 1298 | 4. | 1299 | 4. |
| 1300 | 4. | 1310 | 4. | 1320 | 4. | 1330 | 4. | 1340 | 4. |
| 1350 | 4. | 1360 | 4. | 1370 | 4. | 1380 | 4. | 1390 | 3. |
| 1400 | 3. | 1420 | 3. | 1440 | 3. | 1460 | 3. | 1500 | 3. |

Total Runoff = 16.302 Acre-Ft.
Peak Q = 232 CFS
Time to Peak Q = 1159 Minutes

# APPENDIX 6

# EROSION AND SEDIMENT CONTROL BMP FACT SHEETS

# Scheduling EC-1




## Objectives

| | | |
|---|---|---|
| EC | Erosion Control | ☑ |
| SE | Sediment Control | ☒ |
| TR | Tracking Control | ☒ |
| WE | Wind Erosion Control | ☒ |
| NS | Non-Stormwater Management Control | |
| WM | Waste Management and Materials Pollution Control | |

**Legend:**

☑ **Primary Objective**

☒ **Secondary Objective**

## Targeted Constituents

| | |
|---|---|
| Sediment | ☑ |
| Nutrients | |
| Trash | |
| Metals | |
| Bacteria | |
| Oil and Grease | |
| Organics | |

## Potential Alternatives

None

## Description and Purpose

Scheduling is the development of a written plan that includes sequencing of construction activities and the implementation of BMPs such as erosion control and sediment control while taking local climate (rainfall, wind, etc.) into consideration. The purpose is to reduce the amount and duration of soil exposed to erosion by wind, rain, runoff, and vehicle tracking, and to perform the construction activities and control practices in accordance with the planned schedule.

## Suitable Applications

Proper sequencing of construction activities to reduce erosion potential should be incorporated into the schedule of every construction project especially during rainy season. Use of other, more costly yet less effective, erosion and sediment control BMPs may often be reduced through proper construction sequencing.

## Limitations

- Environmental constraints such as nesting season prohibitions reduce the full capabilities of this BMP.

## Implementation

- Avoid rainy periods. Schedule major grading operations during dry months when practical. Allow enough time before rainfall begins to stabilize the soil with vegetation or physical means or to install sediment trapping devices.
- Plan the project and develop a schedule showing each phase of construction. Clearly show how the rainy season relates to soil

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disturbing and re-stabilization activities. Incorporate the construction schedule into the SWPPP.

- Include on the schedule, details on the rainy season implementation and deployment of:
  - Erosion control BMPs
  - Sediment control BMPs
  - Tracking control BMPs
  - Wind erosion control BMPs
  - Non-stormwater BMPs
  - Waste management and materials pollution control BMPs
- Include dates for activities that may require non-stormwater discharges such as dewatering, sawcutting, grinding, drilling, boring, crushing, blasting, painting, hydro-demolition, mortar mixing, pavement cleaning, etc.
- Work out the sequencing and timetable for the start and completion of each item such as site clearing and grubbing, grading, excavation, paving, foundation pouring utilities installation, etc., to minimize the active construction area during the rainy season.
  - Sequence trenching activities so that most open portions are closed before new trenching begins.
  - Incorporate staged seeding and re-vegetation of graded slopes as work progresses.
  - Schedule establishment of permanent vegetation during appropriate planting time for specified vegetation.
- Non-active areas should be stabilized as soon as practical after the cessation of soil disturbing activities or one day prior to the onset of precipitation.
- Monitor the weather forecast for rainfall.
- When rainfall is predicted, adjust the construction schedule to allow the implementation of soil stabilization and sediment treatment controls on all disturbed areas prior to the onset of rain.
- Be prepared year round to deploy erosion control and sediment control BMPs. Erosion may be caused during dry seasons by un-seasonal rainfall, wind, and vehicle tracking. Keep the site stabilized year round, and retain and maintain rainy season sediment trapping devices in operational condition.
- Apply permanent erosion control to areas deemed substantially complete during the project's defined seeding window.

## Costs

Construction scheduling to reduce erosion may increase other construction costs due to reduced economies of scale in performing site grading. The cost effectiveness of scheduling techniques should be compared with the other less effective erosion and sedimentation controls to achieve a cost effective balance.

### Inspection and Maintenance

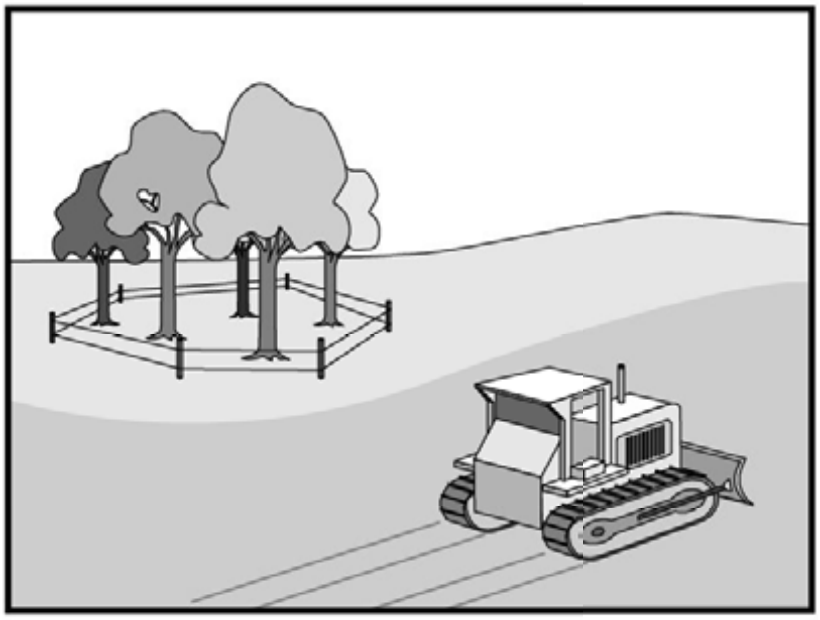
- Verify that work is progressing in accordance with the schedule. If progress deviates, take corrective actions.
- Amend the schedule when changes are warranted.
- Amend the schedule prior to the rainy season to show updated information on the deployment and implementation of construction site BMPs.

### References

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities Developing Pollution Prevention Plans and Best Management Practices (EPA 832-R-92-005), U.S. Environmental Protection Agency, Office of Water, September 1992.

# Preservation Of Existing Vegetation EC-2



## Objectives

| | | |
|---|---|---|
| EC | Erosion Control | ☑ |
| SE | Sediment Control | |
| TR | Tracking Control | |
| WE | Wind Erosion Control | |
| NS | Non-Stormwater Management Control | |
| WM | Waste Management and Materials Pollution Control | |

**Legend:**

☑ **Primary Objective**

☒ **Secondary Objective**

## Targeted Constituents

| | |
|---|---|
| Sediment | ☑ |
| Nutrients | |
| Trash | |
| Metals | |
| Bacteria | |
| Oil and Grease | |
| Organics | |

## Potential Alternatives

None

## Description and Purpose

Carefully planned preservation of existing vegetation minimizes the potential of removing or injuring existing trees, vines, shrubs, and grasses that protect soil from erosion.

## Suitable Applications

Preservation of existing vegetation is suitable for use on most projects. Large project sites often provide the greatest opportunity for use of this BMP. Suitable applications include the following:

- Areas within the site where no construction activity occurs, or occurs at a later date. This BMP is especially suitable to multi year projects where grading can be phased.
- Areas where natural vegetation exists and is designated for preservation. Such areas often include steep slopes, watercourse, and building sites in wooded areas.
- Areas where local, state, and federal government require preservation, such as vernal pools, wetlands, marshes, certain oak trees, etc. These areas are usually designated on the plans, or in the specifications, permits, or environmental documents.
- Where vegetation designated for ultimate removal can be temporarily preserved and be utilized for erosion control and sediment control.

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# EC-2 Preservation Of Existing Vegetation

## Limitations

- Requires forward planning by the owner/developer, contractor, and design staff.
- Limited opportunities for use when project plans do not incorporate existing vegetation into the site design.
- For sites with diverse topography, it is often difficult and expensive to save existing trees while grading the site satisfactory for the planned development.

## Implementation

The best way to prevent erosion is to not disturb the land. In order to reduce the impacts of new development and redevelopment, projects may be designed to avoid disturbing land in sensitive areas of the site (e.g., natural watercourses, steep slopes), and to incorporate unique or desirable existing vegetation into the site's landscaping plan. Clearly marking and leaving a buffer area around these unique areas during construction will help to preserve these areas as well as take advantage of natural erosion prevention and sediment trapping.

Existing vegetation to be preserved on the site must be protected from mechanical and other injury while the land is being developed. The purpose of protecting existing vegetation is to ensure the survival of desirable vegetation for shade, beautification, and erosion control. Mature vegetation has extensive root systems that help to hold soil in place, thus reducing erosion. In addition, vegetation helps keep soil from drying rapidly and becoming susceptible to erosion. To effectively save existing vegetation, no disturbances of any kind should be allowed within a defined area around the vegetation. For trees, no construction activity should occur within the drip line of the tree.

### *Timing*

- Provide for preservation of existing vegetation prior to the commencement of clearing and grubbing operations or other soil disturbing activities in areas where no construction activity is planned or will occur at a later date.

### *Design and Layout*

- Mark areas to be preserved with temporary fencing. Include sufficient setback to protect roots.
  - Orange colored plastic mesh fencing works well.
  - Use appropriate fence posts and adequate post spacing and depth to completely support the fence in an upright position.
- Locate temporary roadways, stockpiles, and layout areas to avoid stands of trees, shrubs, and grass.
- Consider the impact of grade changes to existing vegetation and the root zone.
- Maintain existing irrigation systems where feasible. Temporary irrigation may be required.
- Instruct employees and subcontractors to honor protective devices. Prohibit heavy equipment, vehicular traffic, or storage of construction materials within the protected area.

## Costs

There is little cost associated with preserving existing vegetation if properly planned during the project design, and these costs may be offset by aesthetic benefits that enhance property values. During construction, the cost for preserving existing vegetation will likely be less than the cost of applying erosion and sediment controls to the disturbed area. Replacing vegetation inadvertently destroyed during construction can be extremely expensive, sometimes in excess of $10,000 per tree.

## Inspection and Maintenance

During construction, the limits of disturbance should remain clearly marked at all times. Irrigation or maintenance of existing vegetation should be described in the landscaping plan. If damage to protected trees still occurs, maintenance guidelines described below should be followed:

- Verify that protective measures remain in place. Restore damaged protection measures immediately.
- Serious tree injuries shall be attended to by an arborist.
- Damage to the crown, trunk, or root system of a retained tree shall be repaired immediately.
- Trench as far from tree trunks as possible, usually outside of the tree drip line or canopy. Curve trenches around trees to avoid large roots or root concentrations. If roots are encountered, consider tunneling under them. When trenching or tunneling near or under trees to be retained, place tunnels at least 18 in. below the ground surface, and not below the tree center to minimize impact on the roots.
- Do not leave tree roots exposed to air. Cover exposed roots with soil as soon as possible. If soil covering is not practical, protect exposed roots with wet burlap or peat moss until the tunnel or trench is ready for backfill.
- Cleanly remove the ends of damaged roots with a smooth cut.
- Fill trenches and tunnels as soon as possible. Careful filling and tamping will eliminate air spaces in the soil, which can damage roots.
- If bark damage occurs, cut back all loosened bark into the undamaged area, with the cut tapered at the top and bottom and drainage provided at the base of the wood. Limit cutting the undamaged area as much as possible.
- Aerate soil that has been compacted over a trees root zone by punching holes 12 in. deep with an iron bar, and moving the bar back and forth until the soil is loosened. Place holes 18 in. apart throughout the area of compacted soil under the tree crown.
- Fertilization
  - Fertilize stressed or damaged broadleaf trees to aid recovery.
  - Fertilize trees in the late fall or early spring.

- Apply fertilizer to the soil over the feeder roots and in accordance with label instructions, but never closer than 3 ft to the trunk. Increase the fertilized area by one-fourth of the crown area for conifers that have extended root systems.

- Retain protective measures until all other construction activity is complete to avoid damage during site cleanup and stabilization.

## References

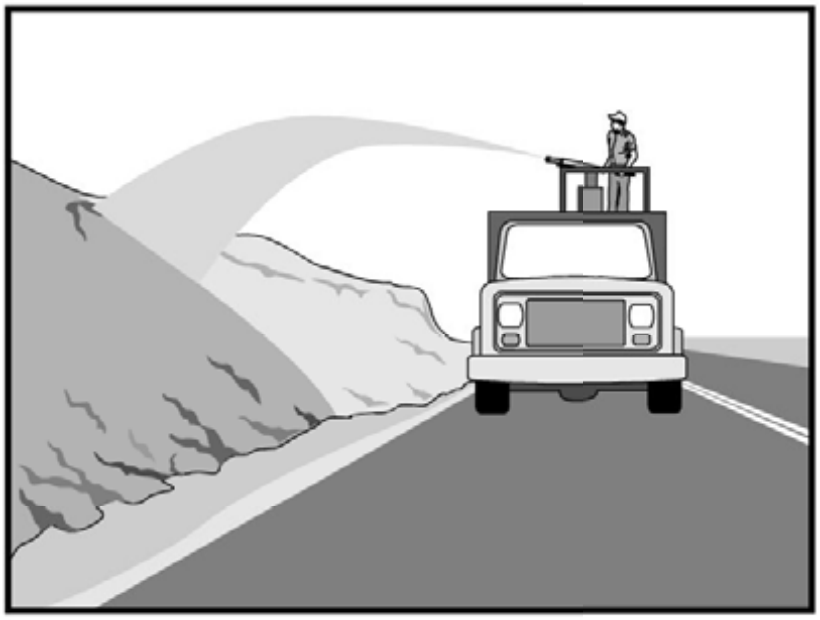
County of Sacramento Tree Preservation Ordinance, September 1981.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

Water Quality Management Plan for The Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.

# Hydraulic Mulch EC-3



| Objectives | | |
|---|---|---|
| EC | Erosion Control | ☑ |
| SE | Sediment Control | |
| TR | Tracking Control | |
| WE | Wind Erosion Control | ☒ |
| NS | Non-Stormwater Management Control | |
| WM | Waste Management and Materials Pollution Control | |

**Legend:**
☑ **Primary Objective**
☒ **Secondary Objective**

| Targeted Constituents | |
|---|---|
| Sediment | ☑ |
| Nutrients | |
| Trash | |
| Metals | |
| Bacteria | |
| Oil and Grease | |
| Organics | |

**Potential Alternatives**

EC-4 Hydroseeding
EC-5 Soil Binders
EC-6 Straw Mulch
EC-7 Geotextiles and Mats
EC-8 Wood Mulching

## Description and Purpose

Hydraulic mulch consists of applying a mixture of shredded wood fiber or a hydraulic matrix, and a stabilizing emulsion or tackifier with hydro-mulching equipment, which temporarily protects exposed soil from erosion by raindrop impact or wind.

## Suitable Applications

Hydraulic mulch is suitable for soil disturbed areas requiring temporary protection until permanent stabilization is established, and disturbed areas that will be re-disturbed following an extended period of inactivity.

## Limitations

Wood fiber hydraulic mulches are generally short lived and need 24 hours to dry before rainfall occurs to be effective. May require a second application in order to remain effective for an entire rainy season.

## Implementation

- Prior to application, roughen embankment and fill areas by rolling with a crimping or punching type roller or by track walking. Track walking shall only be used where other methods are impractical.
- To be effective, hydraulic matrices require 24 hours to dry before rainfall occurs.
- Avoid mulch over spray onto roads, sidewalks, drainage channels, existing vegetation, etc.

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- Paper based hydraulic mulches alone shall not be used for erosion control.

### *Hydraulic Mulches*

Wood fiber mulch can be applied alone or as a component of hydraulic matrices. Wood fiber applied alone is typically applied at the rate of 2,000 to 4,000 lb/acre. Wood fiber mulch is manufactured from wood or wood waste from lumber mills or from urban sources.

### *Hydraulic Matrices*

Hydraulic matrices include a mixture of wood fiber and acrylic polymer or other tackifier as binder. Apply as a liquid slurry using a hydraulic application machine (i.e., hydro seeder) at the following minimum rates, or as specified by the manufacturer to achieve complete coverage of the target area: 2,000 to 4,000 lb/acre wood fiber mulch, and 5 to 10% (by weight) of tackifier (acrylic copolymer, guar, psyllium, etc.)

### *Bonded Fiber Matrix*

Bonded fiber matrix (BFM) is a hydraulically applied system of fibers and adhesives that upon drying forms an erosion resistant blanket that promotes vegetation, and prevents soil erosion. BFMs are typically applied at rates from 3,000 lb/acre to 4,000 lb/acre based on the manufacturer's recommendation. A biodegradable BFM is composed of materials that are 100% biodegradable. The binder in the BFM should also be biodegradable and should not dissolve or disperse upon re-wetting. Typically, biodegradable BFMs should not be applied immediately before, during or immediately after rainfall if the soil is saturated. Depending on the product, BFMs typically require 12 to 24 hours to dry and become effective.

## Costs

Average cost for installation of wood fiber mulch is $900/acre. Average cost for installation of BFM is $5,500/acre.

## Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Areas where erosion is evident shall be repaired and BMPs re-applied as soon as possible. Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require re-application of BMPs.
- Maintain an unbroken, temporary mulched ground cover throughout the period of construction when the soils are not being reworked.

## References

Controlling Erosion of Construction Sites Agricultural Information #347, U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS) (formerly Soil Conservation Service – SCS).

Guides for Erosion and Sediment Control in California, USDA Soils Conservation Service, January 1991.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

Sedimentation and Erosion Control, An Inventory of Current Practices Draft, US EPA, April 1990.

Soil Erosion by Water, Agriculture Information Bulletin #513, U.S. Department of Agriculture, Soil Conservation Service.

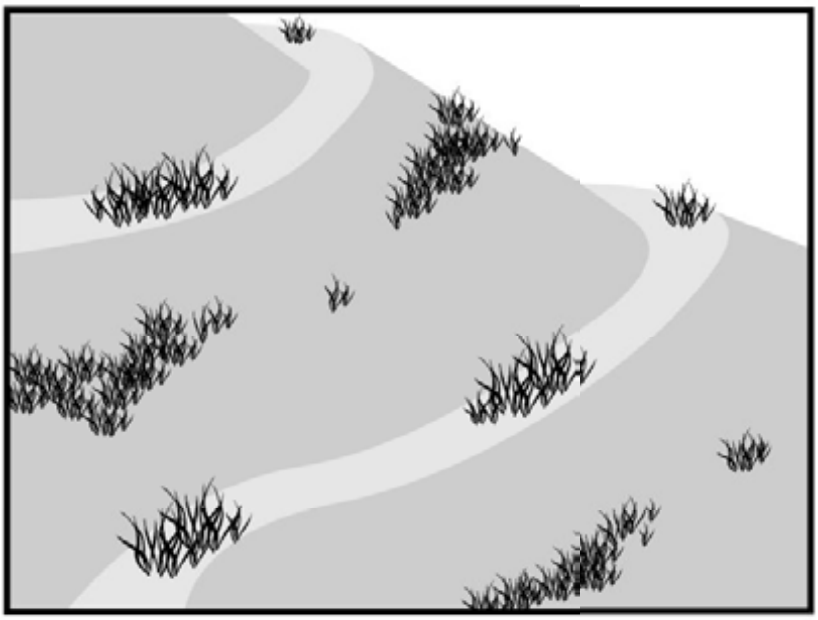
Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Guidance Document: Soil Stabilization for Temporary Slopes, State of California Department of Transportation (Caltrans), November 1999

Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.

# Hydroseeding EC-4



| Objectives | | |
|---|---|---|
| EC | Erosion Control | ☑ |
| SE | Sediment Control | |
| TR | Tracking Control | |
| WE | Wind Erosion Control | ☒ |
| NS | Non-Stormwater Management Control | |
| WM | Waste Management and Materials Pollution Control | |

**Legend:**
☑ **Primary Objective**
☒ **Secondary Objective**

| Targeted Constituents | |
|---|---|
| Sediment | ☑ |
| Nutrients | |
| Trash | |
| Metals | |
| Bacteria | |
| Oil and Grease | |
| Organics | |

**Potential Alternatives**

EC-3 Hydraulic Mulch
EC-5 Soil Binders
EC-6 Straw Mulch
EC-7 Geotextiles and Mats
EC-8 Wood Mulching

## Description and Purpose

Hydroseeding typically consists of applying a mixture of wood fiber, seed, fertilizer, and stabilizing emulsion with hydro-mulch equipment, to temporarily protect exposed soils from erosion by water and wind.

## Suitable Applications

Hydroseeding is suitable for soil disturbed areas requiring temporary protection until permanent stabilization is established, and disturbed areas that will be re-disturbed following an extended period of inactivity.

## Limitations

- Hydroseeding may be used alone only when there is sufficient time in the season to ensure adequate vegetation establishment and coverage to provide adequate erosion control. Otherwise, hydroseeding must be used in conjunction with mulching (i.e., straw mulch).
- Steep slopes are difficult to protect with temporary seeding.
- Temporary seeding may not be appropriate in dry periods without supplemental irrigation.
- Temporary vegetation may have to be removed before permanent vegetation is applied.
- Temporary vegetation is not appropriate for short term inactivity.

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## Implementation

In order to select appropriate hydroseeding mixtures, an evaluation of site conditions shall be performed with respect to:

- Soil conditions
- Site topography
- Season and climate
- Vegetation types
- Maintenance requirements
- Sensitive adjacent areas
- Water availability
- Plans for permanent vegetation

The local office of the U.S.D.A. Natural Resources Conservation Service (NRCS) is an excellent source of information on appropriate seed mixes.

The following steps shall be followed for implementation:

- Avoid use of hydroseeding in areas where the BMP would be incompatible with future earthwork activities and would have to be removed.
- Hydroseeding can be accomplished using a multiple step or one step process. The multiple step process ensures maximum direct contact of the seeds to soil. When the one step process is used to apply the mixture of fiber, seed, etc., the seed rate shall be increased to compensate for all seeds not having direct contact with the soil.
- Prior to application, roughen the area to be seeded with the furrows trending along the contours.
- Apply a straw mulch to keep seeds in place and to moderate soil moisture and temperature until the seeds germinate and grow.
- All seeds shall be in conformance with the California State Seed Law of the Department of Agriculture. Each seed bag shall be delivered to the site sealed and clearly marked as to species, purity, percent germination, dealer's guarantee, and dates of test. The container shall be labeled to clearly reflect the amount of Pure Live Seed (PLS) contained. All legume seed shall be pellet inoculated. Inoculant sources shall be species specific and shall be applied at a rate of 2 lb of inoculant per 100 lb seed.
- Commercial fertilizer shall conform to the requirements of the California Food and Agricultural Code. Fertilizer shall be pelleted or granular form.
- Follow up applications shall be made as needed to cover weak spots and to maintain adequate soil protection.
- Avoid over spray onto roads, sidewalks, drainage channels, existing vegetation, etc.

## Costs

Average cost for installation and maintenance may vary from as low as $300 per acre for flat slopes and stable soils, to $1600 per acre for moderate to steep slopes and/or erosive soils.

| Hydroseeding | | Installed Cost per Acre |
|---|---|---|
| High Density | Ornamentals | $400 - $1600 |
| | Turf Species | $350 |
| | Bunch Grasses | $300 - $1300 |
| Fast Growing | Annual | $350 - $650 |
| | Perennial | $300 - $800 |
| Non-Competing | Native | $300 - $1600 |
| | Non-Native | $400 - $500 |
| Sterile | Cereal Grain | $500 |

Source: Caltrans Guidance for Soil Stabilization for Temporary Slopes, Nov. 1999

## Inspection and Maintenance

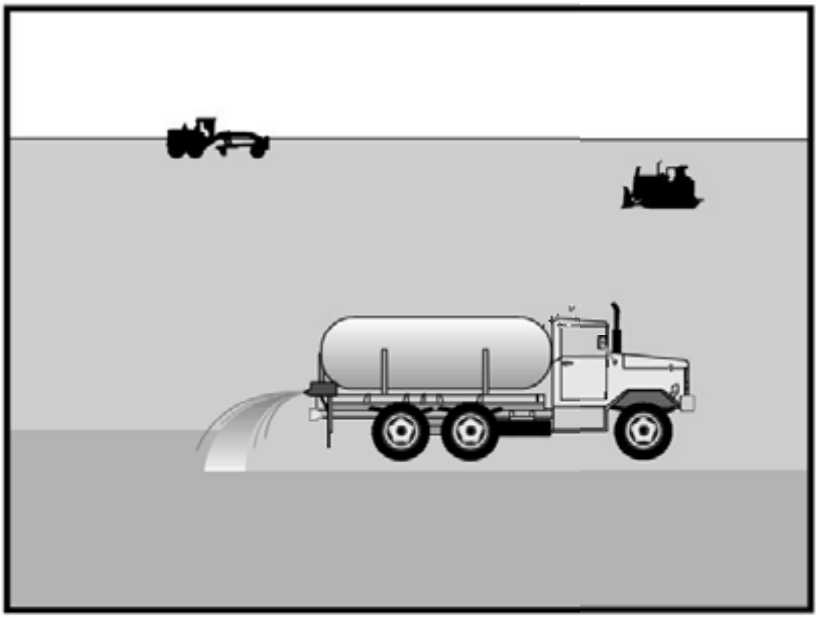
- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Areas where erosion is evident shall be repaired and BMPs re-applied as soon as possible. Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require re-application of BMPs.
- Where seeds fail to germinate, or they germinate and die, the area must be re-seeded, fertilized, and mulched within the planting season, using not less than half the original application rates.
- Irrigation systems, if applicable, should be inspected daily while in use to identify system malfunctions and line breaks. When line breaks are detected, the system must be shut down immediately and breaks repaired before the system is put back into operation.
- Irrigation systems shall be inspected for complete coverage and adjusted as needed to maintain complete coverage.

## References

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Guidance Document: Soil Stabilization for Temporary Slopes, State of California Department of Transportation (Caltrans), November 1999.

# Soil Binders EC-5



| Objectives | | |
|---|---|---|
| EC | Erosion Control | ☑ |
| SE | Sediment Control | |
| TR | Tracking Control | |
| WE | Wind Erosion Control | ☒ |
| NS | Non-Stormwater Management Control | |
| WM | Waste Management and Materials Pollution Control | |

**Legend:**
☑ **Primary Objective**
☒ **Secondary Objective**

| Targeted Constituents | |
|---|---|
| Sediment | ☑ |
| Nutrients | |
| Trash | |
| Metals | |
| Bacteria | |
| Oil and Grease | |
| Organics | |

**Potential Alternatives**

EC-3 Hydraulic Mulch
EC-4 Hydroseeding
EC-6 Straw Mulch
EC-7 Geotextiles and Mats
EC-8 Wood Mulching

## Description and Purpose

Soil binders consist of applying and maintaining a soil stabilizer to exposed soil surfaces. Soil binders are materials applied to the soil surface to temporarily prevent water induced erosion of exposed soils on construction sites. Soil binders also prevent wind erosion.

## Suitable Applications

Soil binders are typically applied to disturbed areas requiring short term temporary protection. Because soil binders can often be incorporated into the work, they are a good alternative to mulches in areas where grading activities will soon resume. Soil binders are also suitable for use on stockpiles.

## Limitations

- Soil binders are temporary in nature and may need reapplication.
- Soil binders require a minimum curing time until fully effective, as prescribed by the manufacturer. Curing time may be 24 hours or longer. Soil binders may need reapplication after a storm event.
- Soil binders will generally experience spot failures during heavy rainfall events. If runoff penetrates the soil at the top of a slope treated with a soil binder, it is likely that the runoff will undercut the stabilized soil layer and discharge at a point further down slope.

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- Soil binders do not hold up to pedestrian or vehicular traffic across treated areas.
- Soil binders may not penetrate soil surfaces made up primarily of silt and clay, particularly when compacted.
- Some soil binders may not perform well with low relative humidity. Under rainy conditions, some agents may become slippery or leach out of the soil.
- Soil binders may not cure if low temperatures occur within 24 hours of application.
- The water quality impacts of soil binders are relatively unknown and some may have water quality impacts due to their chemical makeup.
- A sampling and analysis plan must be incorporated into the SWPPP as soil binders could be a source of non-visible pollutants.

## Implementation

### *General Considerations*

- Regional soil types will dictate appropriate soil binders to be used.
- A soil binder must be environmentally benign (non-toxic to plant and animal life), easy to apply, easy to maintain, economical, and should not stain paved or painted surfaces. Soil binders should not pollute stormwater.
- Some soil binders may not be compatible with existing vegetation.
- Performance of soil binders depends on temperature, humidity, and traffic across treated areas.
- Avoid over spray onto roads, sidewalks, drainage channels, existing vegetation, etc.

### *Selecting a Soil Binder*

Properties of common soil binders used for erosion control are provided on Table 1 at the end of this BMP. Use Table 1 to select an appropriate soil binder. Refer to WE-1, Wind Erosion Control, for dust control soil binders.

Factors to consider when selecting a soil binder include the following:

- Suitability to situation - Consider where the soil binder will be applied, if it needs a high resistance to leaching or abrasion, and whether it needs to be compatible with any existing vegetation. Determine the length of time soil stabilization will be needed, and if the soil binder will be placed in an area where it will degrade rapidly. In general, slope steepness is not a discriminating factor for the listed soil binders.
- Soil types and surface materials - Fines and moisture content are key properties of surface materials. Consider a soil binder's ability to penetrate, likelihood of leaching, and ability to form a surface crust on the surface materials.
- Frequency of application - The frequency of application can be affected by subgrade conditions, surface type, climate, and maintenance schedule. Frequent applications could

lead to high costs. Application frequency may be minimized if the soil binder has good penetration, low evaporation, and good longevity. Consider also that frequent application will require frequent equipment clean up.

### *Plant-Material Based (Short Lived) Binders*

Guar: Guar is a non-toxic, biodegradable, natural galactomannan based hydrocolloid treated with dispersant agents for easy field mixing. It should be mixed with water at the rate of 11 to 15 lb per 1,000 gallons. Recommended minimum application rates are as follows:

**Application Rates for Guar Soil Stabilizer**

| Slope (H:V): | Flat | 4:1 | 3:1 | 2:1 | 1:1 |
|---|---|---|---|---|---|
| lb/acre: | 40 | 45 | 50 | 60 | 70 |

Psyllium: Psyllium is composed of the finely ground muciloid coating of plantago seeds that is applied as a dry powder or in a wet slurry to the surface of the soil. It dries to form a firm but rewettable membrane that binds soil particles together but permits germination and growth of seed. Psyllium requires 12 to 18 hours drying time. Application rates should be from 80 to 200 lb/acre, with enough water in solution to allow for a uniform slurry flow.

Starch: Starch is non-ionic, cold water soluble (pre-gelatinized) granular cornstarch. The material is mixed with water and applied at the rate of 150 lb/acre. Approximate drying time is 9 to 12 hours.

### *Plant-Material Based (Long Lived) Binders*

Pitch and Rosin Emulsion: Generally, a non-ionic pitch and rosin emulsion has a minimum solids content of 48%. The rosin should be a minimum of 26% of the total solids content. The soil stabilizer should be non-corrosive, water dilutable emulsion that upon application cures to a water insoluble binding and cementing agent. For soil erosion control applications, the emulsion is diluted and should be applied as follows:

- For clayey soil: 5 parts water to 1 part emulsion
- For sandy soil: 10 parts water to 1 part emulsion

Application can be by water truck or hydraulic seeder with the emulsion and product mixture applied at the rate specified by the manufacturer.

### *Polymeric Emulsion Blend Binders*

Acrylic Copolymers and Polymers: Polymeric soil stabilizers should consist of a liquid or solid polymer or copolymer with an acrylic base that contains a minimum of 55% solids. The polymeric compound should be handled and mixed in a manner that will not cause foaming or should contain an anti-foaming agent. The polymeric emulsion should not exceed its shelf life or expiration date; manufacturers should provide the expiration date. Polymeric soil stabilizer should be readily miscible in water, non-injurious to seed or animal life, non-flammable, should provide surface soil stabilization for various soil types without totally inhibiting water infiltration, and should not re-emulsify when cured. The applied compound should air cure within a maximum of 36 to 48 hours. Liquid copolymer should be diluted at a rate of 10 parts water to 1 part polymer and the mixture applied to soil at a rate of 1,175 gallons/acre.

Liquid Polymers of Methacrylates and Acrylates: This material consists of a tackifier/sealer that is a liquid polymer of methacrylates and acrylates. It is an aqueous 100% acrylic emulsion blend of 40% solids by volume that is free from styrene, acetate, vinyl, ethoxylated surfactants or silicates. For soil stabilization applications, it is diluted with water in accordance with manufacturer's recommendations, and applied with a hydraulic seeder at the rate of 20 gallons/acre. Drying time is 12 to 18 hours after application.

Copolymers of Sodium Acrylates and Acrylamides: These materials are non-toxic, dry powders that are copolymers of sodium acrylate and acrylamide. They are mixed with water and applied to the soil surface for erosion control at rates that are determined by slope gradient:

| Slope Gradient (H:V) | lb/acre |
|---|---|
| Flat to 5:1 | 3.0 – 5.0 |
| 5:1 to 3:1 | 5.0 – 10.0 |
| 2:2 to 1:1 | 10.0 – 20.0 |

Poly-Acrylamide and Copolymer of Acrylamide: Linear copolymer polyacrylamide is packaged as a dry flowable solid. When used as a stand alone stabilizer, it is diluted at a rate of 11lb/1,000 gal of water and applied at the rate of 5.0 lb/acre.

Hydro-Colloid Polymers: Hydro-Colloid Polymers are various combinations of dry flowable poly-acrylamides, copolymers and hydro-colloid polymers that are mixed with water and applied to the soil surface at rates of 55 to 60 lb/acre. Drying times are 0 to 4 hours.

### *Cementitious-Based Binders*

Gypsum: This is a formulated gypsum based product that readily mixes with water and mulch to form a thin protective crust on the soil surface. It is composed of high purity gypsum that is ground, calcined and processed into calcium sulfate hemihydrate with a minimum purity of 86%. It is mixed in a hydraulic seeder and applied at rates 4,000 to 12,000 lb/acre. Drying time is 4 to 8 hours.

### *Applying Soil Binders*

After selecting an appropriate soil binder, the untreated soil surface must be prepared before applying the soil binder. The untreated soil surface must contain sufficient moisture to assist the agent in achieving uniform distribution. In general, the following steps should be followed:

- Follow manufacturer's written recommendations for application rates, pre-wetting of application area, and cleaning of equipment after use.
- Prior to application, roughen embankment and fill areas.
- Consider the drying time for the selected soil binder and apply with sufficient time before anticipated rainfall. Soil binders should not be applied during or immediately before rainfall.
- Avoid over spray onto roads, sidewalks, drainage channels, sound walls, existing vegetation, etc.

- Soil binders should not be applied to frozen soil, areas with standing water, under freezing or rainy conditions, or when the temperature is below 40°F during the curing period.
- More than one treatment is often necessary, although the second treatment may be diluted or have a lower application rate.
- Generally, soil binders require a minimum curing time of 24 hours before they are fully effective. Refer to manufacturer's instructions for specific cure time.
- For liquid agents:
  - Crown or slope ground to avoid ponding.
  - Uniformly pre-wet ground at 0.03 to 0.3 gal/yd² or according to manufacturer's recommendations.
  - Apply solution under pressure. Overlap solution 6 to 12 in.
  - Allow treated area to cure for the time recommended by the manufacturer; typically at least 24 hours.
  - Apply second treatment before first treatment becomes ineffective, using 50% application rate.
  - In low humidities, reactivate chemicals by re-wetting with water at 0.1 to 0.2 gal/yd².

## Costs

Costs vary according to the soil stabilizer selected for implementation. The following are approximate costs:

| Soil Binder | Cost per Acre |
|---|---|
| Plant-Material Based (Short Lived) Binders | $400 |
| Plant-Material Based (Long Lived) Binders | $1,200 |
| Polymeric Emulsion Blend Binders | $400 (1) |
| Cementitious-Based Binders | $800 |

(1) $1,200 for Acrylic polymers and copolymers

Source: Caltrans Guidance for Soil Stabilization for Temporary Slopes, Nov. 1999

## Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Areas where erosion is evident shall be repaired and BMPs re-applied as soon as possible. Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require re-application of BMPs.
- Reapply the selected soil binder as needed to maintain effectiveness.

## References

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

Sedimentation and Erosion Control, An Inventory of Current Practices Draft, US EPA, April 1990.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Guidance Document: Soil Stabilization for Temporary Slopes, State of California Department of Transportation (Caltrans), November 1999.

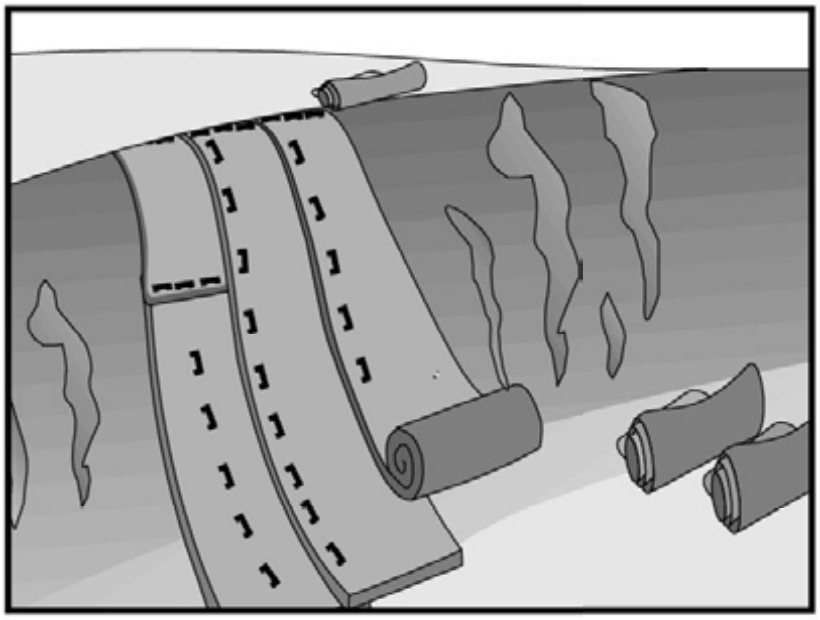
Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

**Table 1 Properties of Soil Binders for Erosion Control**

| Evaluation Criteria | Binder Type | | | |
|---|---|---|---|---|
| | Plant Material Based (Short Lived) | Plant Material Based (Long Lived) | Polymeric Emulsion Blends | Cementitious-Based Binders |
| Relative Cost | Low | Low | Low | Low |
| Resistance to Leaching | High | High | Low to Moderate | Moderate |
| Resistance to Abrasion | Moderate | Low | Moderate to High | Moderate to High |
| Longevity | Short to Medium | Medium | Medium to Long | Medium |
| Minimum Curing Time before Rain | 9 to 18 hours | 19 to 24 hours | 0 to 24 hours | 4 to 8 hours |
| Compatibility with Existing Vegetation | Good | Poor | Poor | Poor |
| Mode of Degradation | Biodegradable | Biodegradable | Photodegradable/ Chemically Degradable | Photodegradable/ Chemically Degradable |
| Labor Intensive | No | No | No | No |
| Specialized Application Equipment | Water Truck or Hydraulic Mulcher | Water Truck or Hydraulic Mulcher | Water Truck or Hydraulic Mulcher | Water Truck or Hydraulic Mulcher |
| Liquid/Powder | Powder | Liquid | Liquid/Powder | Powder |
| Surface Crusting | Yes, but dissolves on rewetting | Yes | Yes, but dissolves on rewetting | Yes |
| Clean Up | Water | Water | Water | Water |
| Erosion Control Application Rate | Varies (1) | Varies (1) | Varies (1) | 4,000 to 12,000 lbs/acre |

(1) See Implementation for specific rates.

# Geotextiles and Mats EC-7



## Objectives

| | | |
|---|---|---|
| EC | Erosion Control | ☑ |
| SE | Sediment Control | |
| TR | Tracking Control | |
| WE | Wind Erosion Control | 3 |
| NS | Non-Stormwater Management Control | |
| WM | Waste Management and Materials Pollution Control | |

**Legend:**

☑ **Primary Objective**

☒ **Secondary Objective**

## Targeted Constituents

| | |
|---|---|
| Sediment | ☑ |
| Nutrients | |
| Trash | |
| Metals | |
| Bacteria | |
| Oil and Grease | |
| Organics | |

## Potential Alternatives

EC-3 Hydraulic Mulch

EC-4 Hydroseeding

EC-5 Soil Binders

EC-6 Straw Mulch

EC-8 Wood Mulching

## Description and Purpose

Mattings of natural materials are used to cover the soil surface to reduce erosion from rainfall impact, hold soil in place, and absorb and hold moisture near the soil surface. Additionally, matting may be used to stabilize soils until vegetation is established.

## Suitable Applications

Mattings are commonly applied on short, steep slopes where erosion hazard is high and vegetation will be slow to establish. Mattings are also used on stream banks where moving water at velocities between 3 ft/s and 6 ft/s are likely to wash out new vegetation, and in areas where the soil surface is disturbed and where existing vegetation has been removed Matting may also be used when seeding cannot occur (e.g., late season construction and/or the arrival of an early rain season). Erosion control matting should be considered when the soils are fine grained and potentially erosive. These measures should be considered in the following situations.

- Steep slopes, generally steeper than 3:1 (H:V)
- Slopes where the erosion potential is high
- Slopes and disturbed soils where mulch must be anchored
- Disturbed areas where plants are slow to develop
- Channels with flows exceeding 3.3 ft/s

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- Channels to be vegetated
- Stockpiles
- Slopes adjacent to water bodies of Environmentally Sensitive Areas (ESAs)

## Limitations

- Properly installed mattings provide excellent erosion control but do so at relatively high cost. This high cost typically limits the use of mattings to areas of concentrated channel flow and steep slopes.
- Mattings are more costly than other BMP practices, limiting their use to areas where other BMPs are ineffective (e.g. channels, steep slopes).
- Installation is critical and requires experienced contractors. The contractor should install the matting material in such a manner that continuous contact between the material and the soil occurs.
- Geotextiles and Mats may delay seed germination, due to reduction in soil temperature.
- Blankets and mats are generally not suitable for excessively rocky sites or areas where the final vegetation will be mowed (since staples and netting can catch in mowers).
- Blankets and mats must be removed and disposed of prior to application of permanent soil stabilization measures.
- Plastic sheeting is easily vandalized, easily torn, photodegradable, and must be disposed of at a landfill.
- Plastic results in 100% runoff, which may cause serious erosion problems in the areas receiving the increased flow.
- The use of plastic should be limited to covering stockpiles or very small graded areas for short periods of time (such as through one imminent storm event) until alternative measures, such as seeding and mulching, may be installed.
- Geotextiles, mats, plastic covers, and erosion control covers have maximum flow rate limitations; consult the manufacturer for proper selection.
- Not suitable for areas that have heavy foot traffic (tripping hazard) – e.g., pad areas around buildings under construction.

## Implementation

### *Material Selection*

Organic matting materials have been found to be effective where re-vegetation will be provided by re-seeding. The choice of matting should be based on the size of area, side slopes, surface conditions such as hardness, moisture, weed growth, and availability of materials.

The following natural and synthetic mattings are commonly used:

***Geotextiles***

- Material should be a woven polypropylene fabric with minimum thickness of 0.06 in., minimum width of 12 ft and should have minimum tensile strength of 150 lbs (warp), 80 lbs (fill) in conformance with the requirements in ASTM Designation: D 4632. The permittivity of the fabric should be approximately 0.07 $sec^{-1}$ in conformance with the requirements in ASTM Designation: D4491. The fabric should have an ultraviolet (UV) stability of 70 percent in conformance with the requirements in ASTM designation: D4355. Geotextile blankets must be secured in place with wire staples or sandbags and by keying into tops of slopes to prevent infiltration of surface waters under geotextile. Staples should be made of minimum 11 gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.

- Geotextiles may be reused if they are suitable for the use intended.

***Plastic Covers***

- Plastic sheeting should have a minimum thickness of 6 mils, and must be keyed in at the top of slope and firmly held in place with sandbags or other weights placed no more than 10 ft apart. Seams are typically taped or weighted down their entire length, and there should be at least a 12 in. to 24 in. overlap of all seams. Edges should be embedded a minimum of 6 in. in soil.

- All sheeting must be inspected periodically after installation and after significant rainstorms to check for erosion, undermining, and anchorage failure. Any failures must be repaired immediately. If washout or breakages occur, the material should be re-installed after repairing the damage to the slope.

***Erosion Control Blankets/Mats***

- Biodegradable rolled erosion control products (RECPs) are typically composed of jute fibers, curled wood fibers, straw, coconut fiber, or a combination of these materials. In order for an RECP to be considered 100% biodegradable, the netting, sewing or adhesive system that holds the biodegradable mulch fibers together must also be biodegradable.

  - **Jute** is a natural fiber that is made into a yarn that is loosely woven into a biodegradable mesh. It is designed to be used in conjunction with vegetation and has longevity of approximately one year. The material is supplied in rolled strips, which should be secured to the soil with U-shaped staples or stakes in accordance with manufacturers' recommendations.

  - **Excelsior** (curled wood fiber) blanket material should consist of machine produced mats of curled wood excelsior with 80 percent of the fiber 6 in. or longer. The excelsior blanket should be of consistent thickness. The wood fiber must be evenly distributed over the entire area of the blanket. The top surface of the blanket should be covered with a photodegradable extruded plastic mesh. The blanket should be smolder resistant without the use of chemical additives and should be non-toxic and non-injurious to plant and animal life. Excelsior blankets should be furnished in rolled strips, a minimum of 48 in. wide, and should have an average weight of 0.8 $lb/yd^2$, ±10 percent, at the time of manufacture. Excelsior blankets must be secured in place with wire staples. Staples

should be made of minimum 11 gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.

- **Straw blanket** should be machine produced mats of straw with a lightweight biodegradable netting top layer. The straw should be attached to the netting with biodegradable thread or glue strips. The straw blanket should be of consistent thickness. The straw should be evenly distributed over the entire area of the blanket. Straw blanket should be furnished in rolled strips a minimum of 6.5 ft wide, a minimum of 80 ft long and a minimum of 0.5 lb/yd². Straw blankets must be secured in place with wire staples. Staples should be made of minimum 11 gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.

- **Wood fiber blanket** is composed of biodegradable fiber mulch with extruded plastic netting held together with adhesives. The material is designed to enhance re-vegetation. The material is furnished in rolled strips, which must be secured to the ground with U-shaped staples or stakes in accordance with manufacturers' recommendations.

- **Coconut fiber blanket** should be a machine produced mat of 100 percent coconut fiber with biodegradable netting on the top and bottom. The coconut fiber should be attached to the netting with biodegradable thread or glue strips. The coconut fiber blanket should be of consistent thickness. The coconut fiber should be evenly distributed over the entire area of the blanket. Coconut fiber blanket should be furnished in rolled strips with a minimum of 6.5 ft wide, a minimum of 80 ft. long and a minimum of 0.5 lb/yd². Coconut fiber blankets must be secured in place with wire staples. Staples should be made of minimum 11 gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.

- **Coconut fiber mesh** is a thin permeable membrane made from coconut or corn fiber that is spun into a yarn and woven into a biodegradable mat. It is designed to be used in conjunction with vegetation and typically has longevity of several years. The material is supplied in rolled strips, which must be secured to the soil with U-shaped staples or stakes in accordance with manufacturers' recommendations.

- **Straw coconut fiber blanket** should be machine produced mats of 70 percent straw and 30 percent coconut fiber with a biodegradable netting top layer and a biodegradable bottom net. The straw and coconut fiber should be attached to the netting with biodegradable thread or glue strips. The straw coconut fiber blanket should be of consistent thickness. The straw and coconut fiber should be evenly distributed over the entire area of the blanket. Straw coconut fiber blanket should be furnished in rolled strips a minimum of 6.5 ft wide, a minimum of 80 ft long and a minimum of 0.5 lb/yd². Straw coconut fiber blankets must be secured in place with wire staples. Staples should be made of minimum 11 gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.

- Non-biodegradable RECPs are typically composed of polypropylene, polyethylene, nylon or other synthetic fibers. In some cases, a combination of biodegradable and synthetic fibers is used to construct the RECP. Netting used to hold these fibers together is typically non-biodegradable as well.

- **Plastic netting** is a lightweight biaxially oriented netting designed for securing loose mulches like straw or paper to soil surfaces to establish vegetation. The netting is photodegradable. The netting is supplied in rolled strips, which must be secured with U-shaped staples or stakes in accordance with manufacturers' recommendations.

- **Plastic mesh** is an open weave geotextile that is composed of an extruded synthetic fiber woven into a mesh with an opening size of less than ¼ in. It is used with re-vegetation or may be used to secure loose fiber such as straw to the ground. The material is supplied in rolled strips, which must be secured to the soil with U-shaped staples or stakes in accordance with manufacturers' recommendations.

- **Synthetic fiber with netting** is a mat that is composed of durable synthetic fibers treated to resist chemicals and ultraviolet light. The mat is a dense, three dimensional mesh of synthetic (typically polyolefin) fibers stitched between two polypropylene nets. The mats are designed to be re-vegetated and provide a permanent composite system of soil, roots, and geomatrix. The material is furnished in rolled strips, which must be secured with U-shaped staples or stakes in accordance with manufacturers' recommendations.

- **Bonded synthetic fibers** consist of a three dimensional geomatrix nylon (or other synthetic) matting. Typically it has more than 90 percent open area, which facilitates root growth. It's tough root reinforcing system anchors vegetation and protects against hydraulic lift and shear forces created by high volume discharges. It can be installed over prepared soil, followed by seeding into the mat. Once vegetated, it becomes an invisible composite system of soil, roots, and geomatrix. The material is furnished in rolled strips that must be secured with U-shaped staples or stakes in accordance with manufacturers' recommendations.

- **Combination synthetic and biodegradable RECPs** consist of biodegradable fibers, such as wood fiber or coconut fiber, with a heavy polypropylene net stitched to the top and a high strength continuous filament geomatrix or net stitched to the bottom. The material is designed to enhance re-vegetation. The material is furnished in rolled strips, which must be secured with U-shaped staples or stakes in accordance with manufacturers' recommendations.

### *Site Preparation*

- Proper site preparation is essential to ensure complete contact of the blanket or matting with the soil.
- Grade and shape the area of installation.
- Remove all rocks, clods, vegetation or other obstructions so that the installed blankets or mats will have complete, direct contact with the soil.
- Prepare seedbed by loosening 2 to 3 in. of topsoil.

### *Seeding*

Seed the area before blanket installation for erosion control and revegetation. Seeding after mat installation is often specified for turf reinforcement application. When seeding prior to blanket

installation, all check slots and other areas disturbed during installation must be re-seeded. Where soil filling is specified, seed the matting and the entire disturbed area after installation and prior to filling the mat with soil.

Fertilize and seed in accordance with seeding specifications or other types of landscaping plans. When using jute matting on a seeded area, apply approximately half the seed before laying the mat and the remainder after laying the mat. The protective matting can be laid over areas where grass has been planted and the seedlings have emerged. Where vines or other ground covers are to be planted, lay the protective matting first and then plant through matting according to design of planting.

### *Check Slots*

Check slots are made of glass fiber strips, excelsior matting strips or tight folded jute matting blanket or strips for use on steep, highly erodible watercourses. The check slots are placed in narrow trenches 6 to 12 in. deep across the channel and left flush with the soil surface. They are to cover the full cross section of designed flow.

### *Laying and Securing Matting*

- Before laying the matting, all check slots should be installed and the friable seedbed made free from clods, rocks, and roots. The surface should be compacted and finished according to the requirements of the manufacturer's recommendations.
- Mechanical or manual lay down equipment should be capable of handling full rolls of fabric and laying the fabric smoothly without wrinkles or folds. The equipment should meet the fabric manufacturer's recommendations or equivalent standards.

### *Anchoring*

- U-shaped wire staples, metal geotextile stake pins, or triangular wooden stakes can be used to anchor mats and blankets to the ground surface.
- Wire staples should be made of minimum 11 gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.
- Metal stake pins should be 0.188 in. diameter steel with a 1.5 in. steel washer at the head of the pin, and 8 in. in length.
- Wire staples and metal stakes should be driven flush to the soil surface.

### *Installation on Slopes*

Installation should be in accordance with the manufacturer's recommendations. In general, these will be as follows:

- Begin at the top of the slope and anchor the blanket in a 6 in. deep by 6 in. wide trench. Backfill trench and tamp earth firmly.
- Unroll blanket down slope in the direction of water flow.
- Overlap the edges of adjacent parallel rolls 2 to 3 in. and staple every 3 ft.

- When blankets must be spliced, place blankets end over end (shingle style) with 6 in. overlap. Staple through overlapped area, approximately 12 in. apart.
- Lay blankets loosely and maintain direct contact with the soil. Do not stretch.
- Staple blankets sufficiently to anchor blanket and maintain contact with the soil. Staples should be placed down the center and staggered with the staples placed along the edges. Steep slopes, 1:1 (H:V) to 2:1 (H:V), require a minimum of 2 staples/yd². Moderate slopes, 2:1 (H:V) to 3:1 (H:V), require a minimum of 1 ½ staples/yd².

***Installation in Channels***

Installation should be in accordance with the manufacturer's recommendations. In general, these will be as follows:

- Dig initial anchor trench 12 in. deep and 6 in. wide across the channel at the lower end of the project area.
- Excavate intermittent check slots, 6 in. deep and 6 in. wide across the channel at 25 to 30 ft intervals along the channels.
- Cut longitudinal channel anchor trenches 4 in. deep and 4 in. wide along each side of the installation to bury edges of matting, whenever possible extend matting 2 to 3 in. above the crest of the channel side slopes.
- Beginning at the downstream end and in the center of the channel, place the initial end of the first roll in the anchor trench and secure with fastening devices at 12 in. intervals. Note: matting will initially be upside down in anchor trench.
- In the same manner, position adjacent rolls in anchor trench, overlapping the preceding roll a minimum of 3 in.
- Secure these initial ends of mats with anchors at 12 in. intervals, backfill and compact soil.
- Unroll center strip of matting upstream. Stop at next check slot or terminal anchor trench. Unroll adjacent mats upstream in similar fashion, maintaining a 3 in. overlap.
- Fold and secure all rolls of matting snugly into all transverse check slots. Lay mat in the bottom of the slot then fold back against itself. Anchor through both layers of mat at 12 in. intervals, then backfill and compact soil. Continue rolling all mat widths upstream to the next check slot or terminal anchor trench.
- Alternate method for non-critical installations: Place two rows of anchors on 6 in. centers at 25 to 30 ft. intervals in lieu of excavated check slots.
- Staple shingled lap spliced ends a minimum of 12 in. apart on 12 in. intervals.
- Place edges of outside mats in previously excavated longitudinal slots; anchor using prescribed staple pattern, backfill, and compact soil.
- Anchor, fill, and compact upstream end of mat in a 12 in. by 6 in. terminal trench.

- Secure mat to ground surface using U-shaped wire staples, geotextile pins, or wooden stakes.
- Seed and fill turf reinforcement matting with soil, if specified.

***Soil Filling (if specified for turf reinforcement)***

- Always consult the manufacturer's recommendations for installation.
- Do not drive tracked or heavy equipment over mat.
- Avoid any traffic over matting if loose or wet soil conditions exist.
- Use shovels, rakes, or brooms for fine grading and touch up.
- Smooth out soil filling just exposing top netting of mat.

***Temporary Soil Stabilization Removal***

- Temporary soil stabilization removed from the site of the work must be disposed of if necessary.

**Costs**

Relatively high compared to other BMPs. Biodegradable materials: $0.50 - $0.57/yd². Permanent materials: $3.00 - $4.50/yd². Staples: $0.04 - $0.05/staple. Approximate costs for installed materials are shown below:

| Rolled Erosion Control Products | | Installed Cost per Acre |
|---|---|---|
| Biodegradable | Jute Mesh | $6,500 |
| | Curled Wood Fiber | $10,500 |
| | Straw | $8,900 |
| | Wood Fiber | $8,900 |
| | Coconut Fiber | $13,000 |
| | Coconut Fiber Mesh | $31,200 |
| | Straw Coconut Fiber | $10,900 |
| Non-Biodegradable | Plastic Netting | $2,000 |
| | Plastic Mesh | $3,200 |
| | Synthetic Fiber with Netting | $34,800 |
| | Bonded Synthetic Fibers | $50,000 |
| | Combination with Biodegradable | $32,000 |

Source: Caltrans Guidance for Soil Stabilization for Temporary Slopes, Nov. 1999

***Inspection and Maintenance***

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season, and at two-week intervals during the non-rainy season.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.

- Areas where erosion is evident shall be repaired and BMPs reapplied as soon as possible. Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require reapplication of BMPs.
- If washout or breakage occurs, re-install the material after repairing the damage to the slope or channel.
- Make sure matting is uniformly in contact with the soil.
- Check that all the lap joints are secure.
- Check that staples are flush with the ground.
- Check that disturbed areas are seeded.

## References

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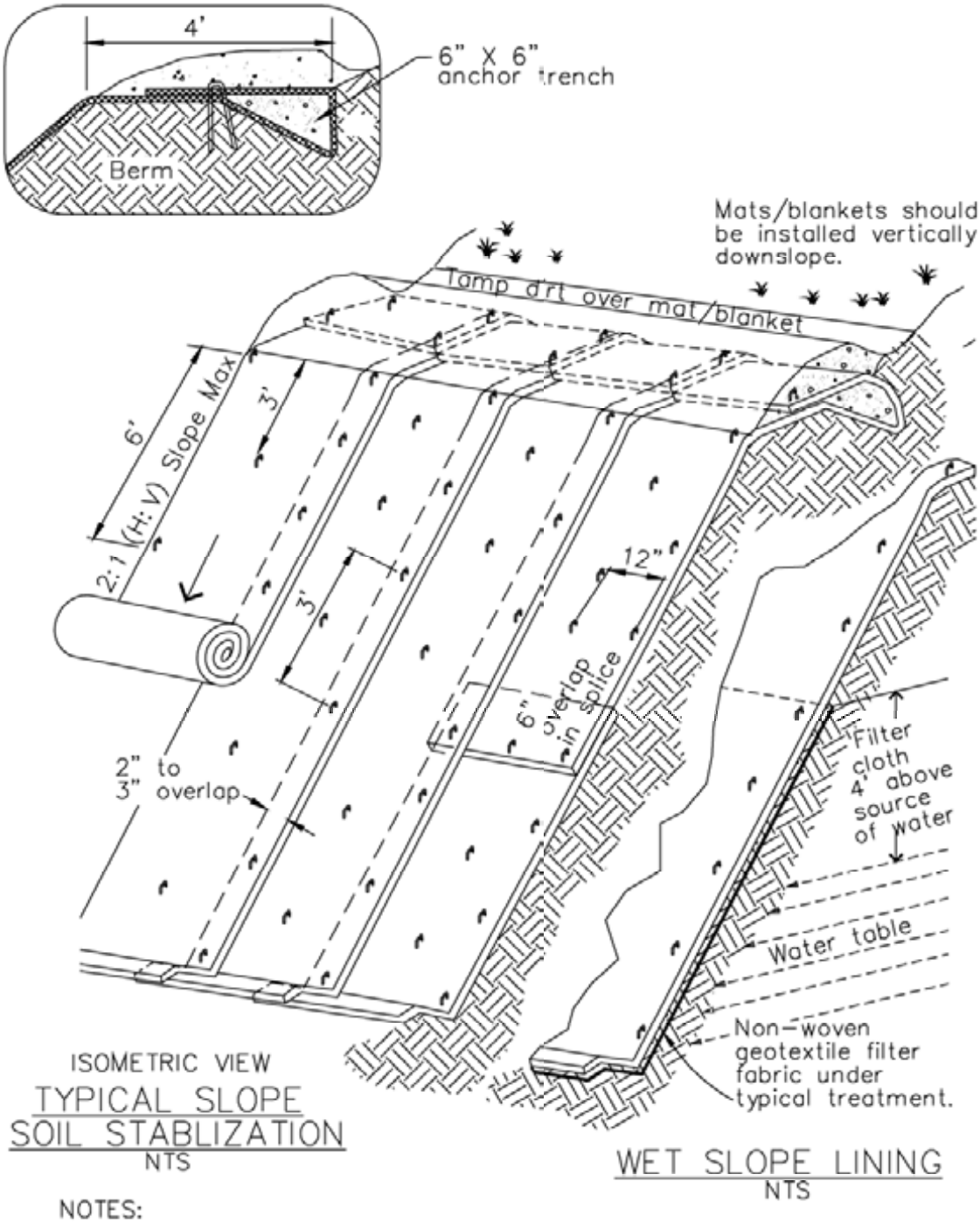



ISOMETRIC VIEW

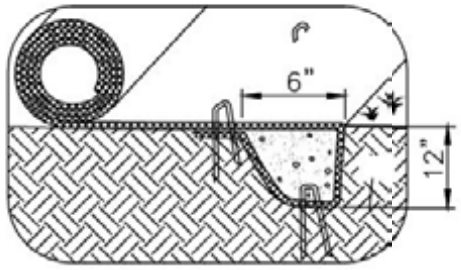
TYPICAL SLOPE
SOIL STABLIZATION
NTS

WET SLOPE LINING
NTS

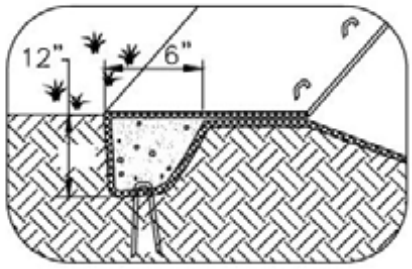
NOTES:

1. Slope surface shall be free of rocks, clods, sticks and grass. Mats/blankets shall have good soil contact.
2. Lay blankets loosely and stake or staple to maintain direct contact with the soil. Do not stretch.
3. Install per manufacturer's recommendations

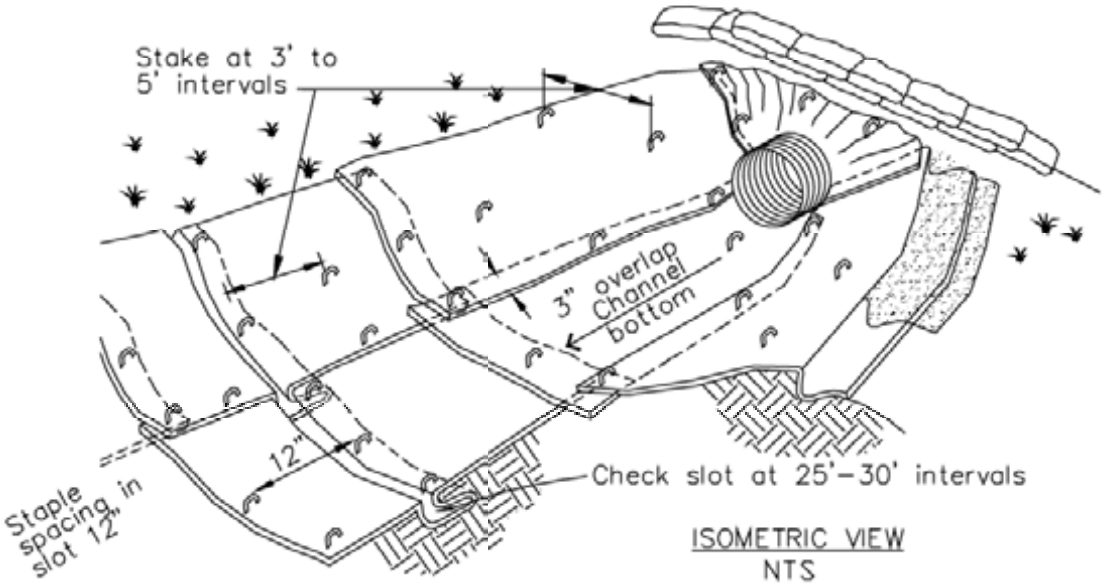
TYPICAL INSTALLATION DETAIL



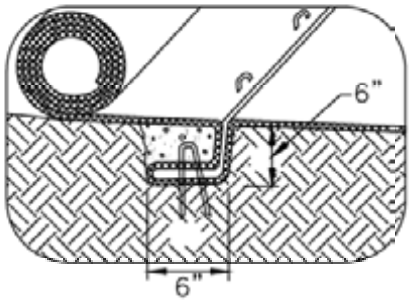

INITIAL CHANNEL ANCHOR TRENCH
NTS



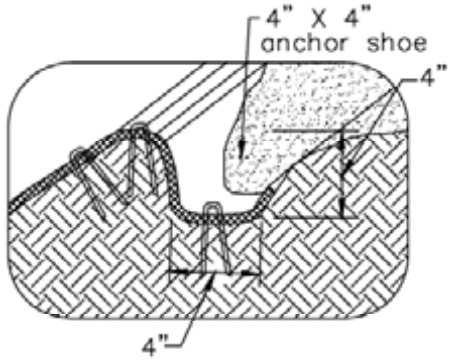

TERMINAL SLOPE AND CHANNEL ANCHOR TRENCH
NTS




ISOMETRIC VIEW
NTS




INTERMITTENT CHECK SLOT
NTS

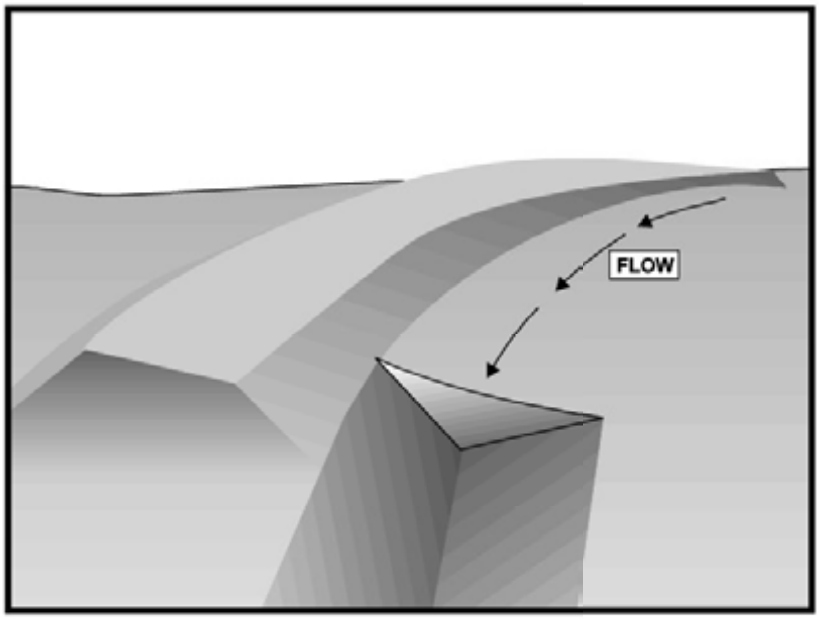



LONGITUDINAL ANCHOR TRENCH
NTS

NOTES:
1. Check slots to be constructed per manufacturers specifications.
2. Staking or stapling layout per manufacturers specifications.
3. Install per manufacturer's recommendations

TYPICAL INSTALLATION DETAIL

# Earth Dikes and Drainage Swales EC-9




| Objectives | | |
|---|---|---|
| EC | Erosion Control | ☑ |
| SE | Sediment Control | |
| TR | Tracking Control | |
| WE | Wind Erosion Control | |
| NS | Non-Stormwater Management Control | |
| WM | Waste Management and Materials Pollution Control | |

**Legend:**
☑ **Primary Objective**
☒ **Secondary Objective**

| Targeted Constituents | |
|---|---|
| Sediment | ☑ |
| Nutrients | |
| Trash | |
| Metals | |
| Bacteria | |
| Oil and Grease | |
| Organics | |

**Potential Alternatives**

None

## Description and Purpose

An earth dike is a temporary berm or ridge of compacted soil used to divert runoff or channel water to a desired location. A drainage swale is a shaped and sloped depression in the soil surface used to convey runoff to a desired location. Earth dikes and drainage swales are used to divert off site runoff around the construction site, divert runoff from stabilized areas and disturbed areas, and direct runoff into sediment basins or traps.

## Suitable Applications

Earth dikes and drainage swales are suitable for use, individually or together, where runoff needs to be diverted from one area and conveyed to another.

- Earth dikes and drainage swales may be used:
  - To convey surface runoff down sloping land
  - To intercept and divert runoff to avoid sheet flow over sloped surfaces
  - To divert and direct runoff towards a stabilized watercourse, drainage pipe or channel
  - To intercept runoff from paved surfaces
  - Below steep grades where runoff begins to concentrate
  - Along roadways and facility improvements subject to flood drainage

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- At the top of slopes to divert runon from adjacent or undisturbed slopes
- At bottom and mid slope locations to intercept sheet flow and convey concentrated flows
- Divert sediment laden runoff into sediment basins or traps

## Limitations

Dikes should not be used for drainage areas greater than 10 acres or along slopes greater than 10 percent. For larger areas more permanent drainage structures should be built. All drainage structures should be built in compliance with local municipal requirements.

- Earth dikes may create more disturbed area on site and become barriers to construction equipment.
- Earth dikes must be stabilized immediately, which adds cost and maintenance concerns.
- Diverted stormwater may cause downstream flood damage.
- Dikes should not be constructed of soils that may be easily eroded.
- Regrading the site to remove the dike may add additional cost.
- Temporary drains and swales or any other diversion of runoff should not adversely impact upstream or downstream properties.
- Temporary drains and swales must conform to local floodplain management requirements.
- Earth dikes/drainage swales are not suitable as sediment trapping devices.
- It may be necessary to use other soil stabilization and sediment controls such as check dams, plastics, and blankets, to prevent scour and erosion in newly graded dikes, swales, and ditches.

## Implementation

The temporary earth dike is a berm or ridge of compacted soil, located in such a manner as to divert stormwater to a sediment trapping device or a stabilized outlet, thereby reducing the potential for erosion and offsite sedimentation. Earth dikes can also be used to divert runoff from off site and from undisturbed areas away from disturbed areas and to divert sheet flows away from unprotected slopes.

An earth dike does not itself control erosion or remove sediment from runoff. A dike prevents erosion by directing runoff to an erosion control device such as a sediment trap or directing runoff away from an erodible area. Temporary diversion dikes should not adversely impact adjacent properties and must conform to local floodplain management regulations, and should not be used in areas with slopes steeper than 10%.

Slopes that are formed during cut and fill operations should be protected from erosion by runoff. A combination of a temporary drainage swale and an earth dike at the top of a slope can divert runoff to a location where it can be brought to the bottom of the slope (see EC-11, Slope Drains). A combination dike and swale is easily constructed by a single pass of a bulldozer or grader and

compacted by a second pass of the tracks or wheels over the ridge. Diversion structures should be installed when the site is initially graded and remain in place until post construction BMPs are installed and the slopes are stabilized.

Diversion practices concentrate surface runoff, increasing its velocity and erosive force. Thus, the flow out of the drain or swale must be directed onto a stabilized area or into a grade stabilization structure. If significant erosion will occur, a swale should be stabilized using vegetation, chemical treatment, rock rip-rap, matting, or other physical means of stabilization. Any drain or swale that conveys sediment laden runoff must be diverted into a sediment basin or trap before it is discharged from the site.

***General***

- Care must be applied to correctly size and locate earth dikes, drainage swales. Excessively steep, unlined dikes, and swales are subject to erosion and gully formation.
- Conveyances should be stabilized.
- Use a lined ditch for high flow velocities.
- Select flow velocity based on careful evaluation of the risks due to erosion of the measure, soil types, overtopping, flow backups, washout, and drainage flow patterns for each project site.
- Compact any fills to prevent unequal settlement.
- Do not divert runoff onto other property without securing written authorization from the property owner.
- When possible, install and utilize permanent dikes, swales, and ditches early in the construction process.
- Provide stabilized outlets.

***Earth Dikes***

Temporary earth dikes are a practical, inexpensive BMP used to divert stormwater runoff. Temporary diversion dikes should be installed in the following manner:

- All dikes should be compacted by earth moving equipment.
- All dikes should have positive drainage to an outlet.
- All dikes should have 2:1 or flatter side slopes, 18 in. minimum height, and a minimum top width of 24 in. Wide top widths and flat slopes are usually needed at crossings for construction traffic.
- The outlet from the earth dike must function with a minimum of erosion. Runoff should be conveyed to a sediment trapping device such as a Sediment Trap (SE-3) or Sediment Basin (SE-2) when either the dike channel or the drainage area above the dike are not adequately stabilized.

- Temporary stabilization may be achieved using seed and mulching for slopes less than 5% and either rip-rap or sod for slopes in excess of 5%. In either case, stabilization of the earth dike should be completed immediately after construction or prior to the first rain.
- If riprap is used to stabilize the channel formed along the toe of the dike, the following typical specifications apply:

| Channel Grade | Riprap Stabilization |
|---|---|
| 0.5-1.0% | 4 in. Rock |
| 1.1-2.0% | 6 in. Rock |
| 2.1-4.0% | 8 in. Rock |
| 4.1-5.0% | 8 in. -12 in. Riprap |

- The stone riprap, recycled concrete, etc. used for stabilization should be pressed into the soil with construction equipment.
- Filter cloth may be used to cover dikes in use for long periods.
- Construction activity on the earth dike should be kept to a minimum.

***Drainage Swales***

Drainage swales are only effective if they are properly installed. Swales are more effective than dikes because they tend to be more stable. The combination of a swale with a dike on the downhill side is the most cost effective diversion.

Standard engineering design criteria for small open channel and closed conveyance systems should be used (see the local drainage design manual). Unless local drainage design criteria state otherwise, drainage swales should be designed as follows:

- No more than 5 acres may drain to a temporary drainage swale.
- Place drainage swales above or below, not on, a cut or fill slope.
- Swale bottom width should be at least 2 ft
- Depth of the swale should be at least 18 in.
- Side slopes should be 2:1 or flatter.
- Drainage or swales should be laid at a grade of at least 1 percent, but not more than 15 percent.
- The swale must not be overtopped by the peak discharge from a 10-year storm, irrespective of the design criteria stated above.
- Remove all trees, stumps, obstructions, and other objectionable material from the swale when it is built.
- Compact any fill material along the path of the swale.

- Stabilize all swales immediately. Seed and mulch swales at a slope of less than 5 percent, and use rip-rap or sod for swales with a slope between 5 and 15 percent. For temporary swales, geotextiles and mats (EC-7) may provide immediate stabilization.
- Irrigation may be required to establish sufficient vegetation to prevent erosion.
- Do not operate construction vehicles across a swale unless a stabilized crossing is provided.
- Permanent drainage facilities must be designed by a professional engineer (see the local drainage design criteria for proper design).
- At a minimum, the drainage swale should conform to predevelopment drainage patterns and capacities.
- Construct the drainage swale with a positive grade to a stabilized outlet.
- Provide erosion protection or energy dissipation measures if the flow out of the drainage swale can reach an erosive velocity.

### Costs

- Cost ranges from $15 to $55 per ft for both earthwork and stabilization and depends on availability of material, site location, and access.
- Small dikes: $2.50 - $6.50/linear ft; Large dikes: $2.50/yd$^3$.
- The cost of a drainage swale increases with drainage area and slope. Typical swales for controlling internal erosion are inexpensive, as they are quickly formed during routine earthwork.

### Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Inspect ditches and berms for washouts. Replace lost riprap, damaged linings or soil stabilizers as needed.
- Inspect channel linings, embankments, and beds of ditches and berms for erosion and accumulation of debris and sediment. Remove debris and sediment and repair linings and embankments as needed.
- Temporary conveyances should be completely removed as soon as the surrounding drainage area has been stabilized or at the completion of construction

### References

Erosion and Sediment Control Handbook, S.J. Goldman, K. Jackson, T.A. Bursetynsky, P.E., McGraw Hill Book Company, 1986.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

National Association of Home Builders (NAHB). Stormwater Runoff & Nonpoint Source Pollution Control Guide for Builders and Developers. National Association of Home Builders, Washington, D.C., 1995

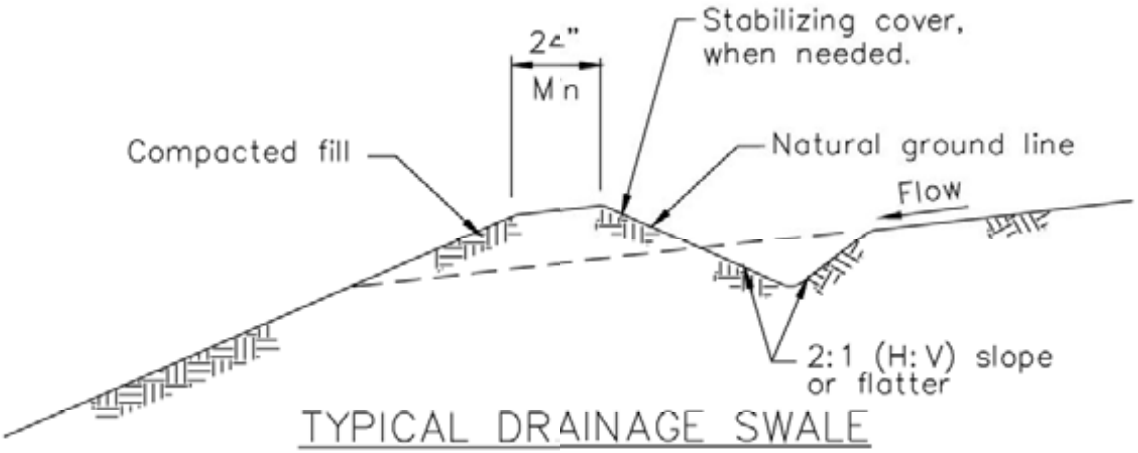
National Management Measures to Control Nonpoint Source Pollution from Urban Areas, United States Environmental Protection Agency, 2002.

Southeastern Wisconsin Regional Planning Commission (SWRPC). Costs of Urban Nonpoint Source Water Pollution Control Measures. Technical Report No. 31. Southeastern Wisconsin Regional Planning Commission, Waukesha, WI. 1991

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

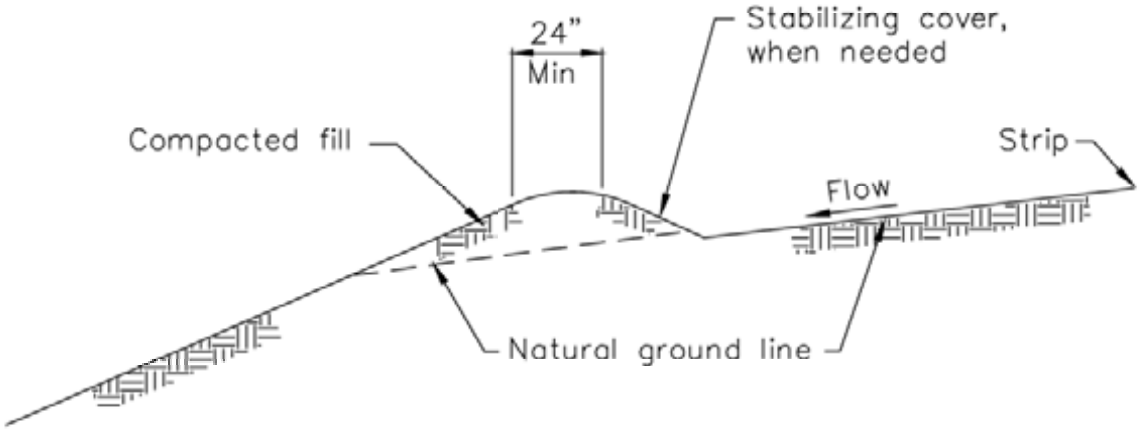
Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.




TYPICAL DRAINAGE SWALE
NOT TO SCALE

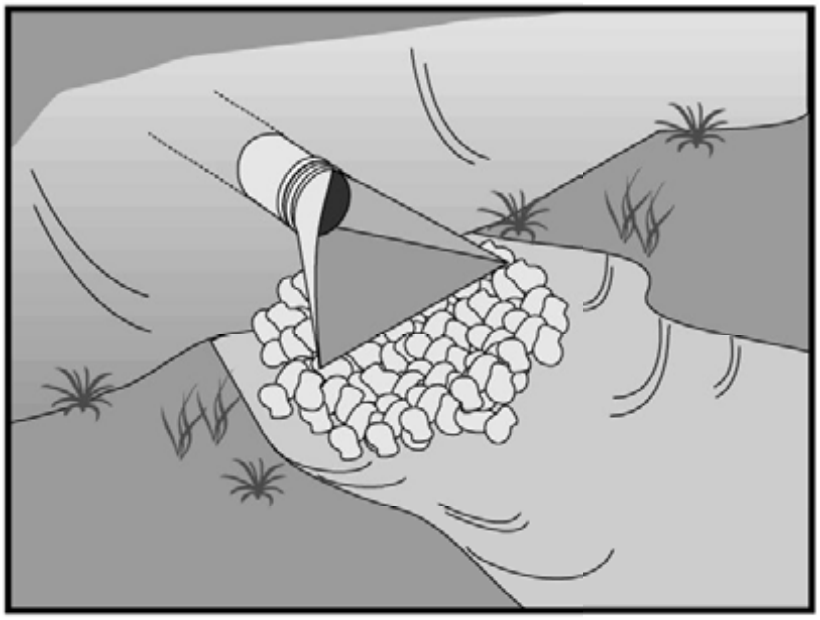
NOTES:

1. Stabilize inlet, outlets and slopes.
2. Properly compact the subgrade.




TYPICAL EARTH DIKE
NOT TO SCALE

# Velocity Dissipation Devices EC-10



| Objectives | | |
|---|---|---|
| EC | Erosion Control | ☑ |
| SE | Sediment Control | |
| TR | Tracking Control | |
| WE | Wind Erosion Control | |
| NS | Non-Stormwater Management Control | |
| WM | Waste Management and Materials Pollution Control | |

**Legend:**
☑ **Primary Objective**
☒ **Secondary Objective**

| Targeted Constituents | |
|---|---|
| Sediment | ☑ |
| Nutrients | |
| Trash | |
| Metals | |
| Bacteria | |
| Oil and Grease | |
| Organics | |

**Potential Alternatives**

None

## Description and Purpose

Outlet protection is a physical device composed of rock, grouted riprap, or concrete rubble, which is placed at the outlet of a pipe or channel to prevent scour of the soil caused by concentrated, high velocity flows.

## Suitable Applications

Whenever discharge velocities and energies at the outlets of culverts, conduits, or channels are sufficient to erode the next downstream reach. This includes temporary diversion structures to divert runon during construction.

- These devices may be used at the following locations:
  - Outlets of pipes, drains, culverts, slope drains, diversion ditches, swales, conduits, or channels.
  - Outlets located at the bottom of mild to steep slopes.
  - Discharge outlets that carry continuous flows of water.
  - Outlets subject to short, intense flows of water, such as flash floods.
  - Points where lined conveyances discharge to unlined conveyances

## Limitations

- Large storms or high flows can wash away the rock outlet protection and leave the area susceptible to erosion.

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- Sediment captured by the rock outlet protection may be difficult to remove without removing the rock.
- Outlet protection may negatively impact the channel habitat.
- Grouted riprap may break up in areas of freeze and thaw.
- If there is not adequate drainage, and water builds up behind grouted riprap, it may cause the grouted riprap to break up due to the resulting hydrostatic pressure.

## Implementation

### *General*

Outlet protection is needed where discharge velocities and energies at the outlets of culverts, conduits or channels are sufficient to erode the immediate downstream reach. This practice protects the outlet from developing small eroded pools (plange pools), and protects against gully erosion resulting from scouring at a culvert mouth.

### *Design and Layout*

As with most channel design projects, depth of flow, roughness, gradient, side slopes, discharge rate, and velocity should be considered in the outlet design. Compliance to local and state regulations should also be considered while working in environmentally sensitive streambeds. General recommendations for rock size and length of outlet protection mat are shown in the rock outlet protection figure in this BMP and should be considered minimums. The apron length and rock size gradation are determined using a combination of the discharge pipe diameter and estimate discharge rate: Select the longest apron length and largest rock size suggested by the pipe size and discharge rate. Where flows are conveyed in open channels such as ditches and swales, use the estimated discharge rate for selecting the apron length and rock size. Flows should be same as the culvert or channel design flow but never the less than the peak 5 year flow for temporary structures planned for one rainy season, or the 10 year peak flow for temporary structures planned for two or three rainy seasons.

- There are many types of energy dissipaters, with rock being the one that is represented in the attached figure.
- Best results are obtained when sound, durable, and angular rock is used.
- Install riprap, grouted riprap, or concrete apron at selected outlet. Riprap aprons are best suited for temporary use during construction. Grouted or wired tied rock riprap can minimize maintenance requirements.
- Rock outlet protection is usually less expensive and easier to install than concrete aprons or energy dissipaters. It also serves to trap sediment and reduce flow velocities.
- Carefully place riprap to avoid damaging the filter fabric.
    - Stone 4 in. to 6 in. may be carefully dumped onto filter fabric from a height not to exceed 12 in.
    - Stone 8 in. to 12 in. must be hand placed onto filter fabric, or the filter fabric may be covered with 4 in. of gravel and the 8 in. to 12 in. rock may be dumped from a height not to exceed 16 in.

- Stone greater than 12 in. shall only be dumped onto filter fabric protected with a layer of gravel with a thickness equal to one half the $D_{50}$ rock size, and the dump height limited to twice the depth of the gravel protection layer thickness.

- For proper operation of apron: Align apron with receiving stream and keep straight throughout its length. If a curve is needed to fit site conditions, place it in upper section of apron.

- Outlets on slopes steeper than 10 percent should have additional protection.

## Costs

Costs are low if material is readily available. If material is imported, costs will be higher. Average installed cost is $150 per device.

## Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.

- Inspect BMPs subjected to non-stormwater discharges daily while non-stormwater discharges occur.

- Inspect apron for displacement of the riprap and damage to the underlying fabric. Repair fabric and replace riprap that has washed away. If riprap continues to wash away, consider using larger material.

- Inspect for scour beneath the riprap and around the outlet. Repair damage to slopes or underlying filter fabric immediately.

- Temporary devices should be completely removed as soon as the surrounding drainage area has been stabilized or at the completion of construction.

## References

County of Sacramento Improvement Standards, Sacramento County, May 1989.

Erosion and Sediment Control Handbook, S.J. Goldman, K. Jackson, T.A. Bursztynsky, P.E., McGraw Hill Book Company, 1986.

Handbook of Steel Drainage & Highway Construction, American Iron and Steel Institute, 1983.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

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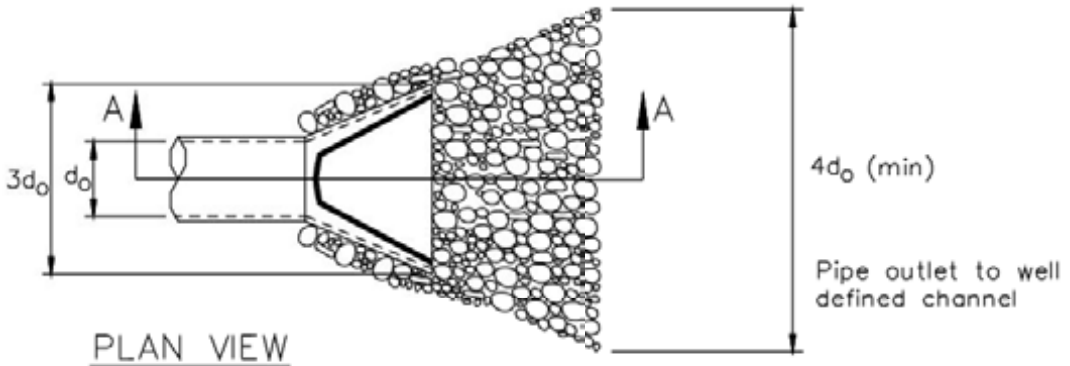
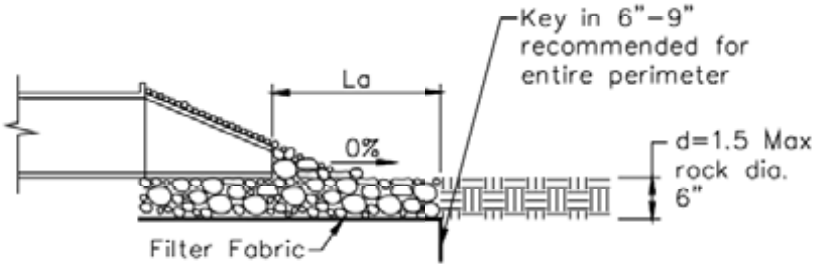



PLAN VIEW

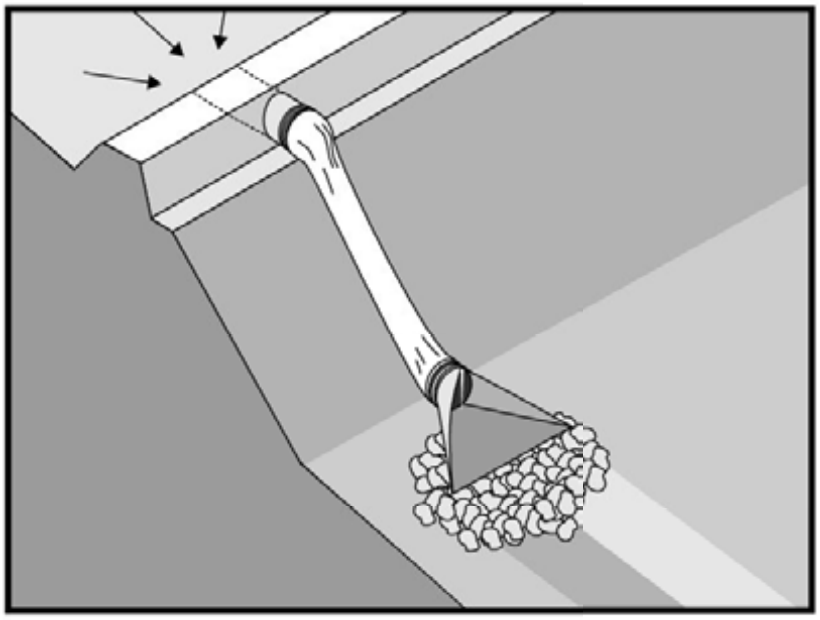



SECTION A–A

| Pipe Diameter inches | Discharge ft³/s | Apron Length, La ft | Rip Rap $D_{50}$ Diameter Min inches |
|---|---|---|---|
| 12 | 5 | 10 | 4 |
| | 10 | 13 | 6 |
| 18 | 10 | 10 | 6 |
| | 20 | 16 | 8 |
| | 30 | 23 | 12 |
| | 40 | 26 | 16 |
| 24 | 30 | 16 | 8 |
| | 40 | 26 | 8 |
| | 50 | 26 | 12 |
| | 60 | 30 | 16 |

For larger or higher flows consult a Registered Civil Engineer
Source: USDA - SCS

# Slope Drains EC-11



| Objectives | | |
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**Legend:**
☑ **Primary Objective**
☒ **Secondary Objective**

| Targeted Constituents | |
|---|---|
| Sediment | ☑ |
| Nutrients | |
| Trash | |
| Metals | |
| Bacteria | |
| Oil and Grease | |
| Organics | |

**Potential Alternatives**

EC-9 Earth Dike, Drainage Swales

## Description and Purpose

A slope drain is a pipe used to intercept and direct surface runoff or groundwater into a stabilized watercourse, trapping device, or stabilized area. Slope drains are used with earth dikes and drainage ditches to intercept and direct surface flow away from slope areas to protect cut or fill slopes.

## Suitable Applications

- Where concentrated flow of surface runoff must be conveyed down a slope in order to prevent erosion.
- Drainage for top of slope diversion dikes or swales.
- Drainage for top of cut and fill slopes where water can accumulate.
- Emergency spillway for a sediment basin.

## Limitations

Installation is critical for effective use of the pipe slope drain to minimize potential gully erosion.

- Maximum drainage area per slope drain is 10 acres. (For large areas use a paved chute, rock lined channel, or additional pipes.)
- Severe erosion may result when slope drains fail by overtopping, piping, or pipe separation.

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  - During large storms, pipe slope drains may become clogged or over charged, forcing water around the pipe and causing extreme slope erosion.
  - If the sectional downdrain is not sized correctly, the runoff can spill over the drain sides causing gully erosion and potential failure of the structure.

- Dissipation of high flow velocities at the pipe outlet is required to avoid downstream erosion.

## Implementation

### *General*

The slope drain is applicable for any construction site where concentrated surface runoff can accumulate and must be conveyed down the slope in order to prevent erosion. The slope drain is effective because it prevents the stormwater from flowing directly down the slope by confining all the runoff into an enclosed pipe or channel. Due to the time lag between grading slopes and installation of permanent stormwater collection systems and slope stabilization measures, temporary provisions to intercept runoff are sometimes necessary. Particularly in steep terrain, slope drains can protect unstabilized areas from erosion.

### *Installation*

The slope drain may be a rigid pipe, such as corrugated metal, a flexible conduit, or a lined terrace drain with the inlet placed on the top of a slope and the outlet at the bottom of the slope. This BMP typically is used in combination with a diversion control, such as an earth dike or drainage swale at the top of the slope.

The following criteria must be considered when siting slope drains.

- Permanent structures included in the project plans can often serve as construction BMPs if implemented early. However, the permanent structure must meet or exceed the criteria for the temporary structure.
- Inlet structures must be securely entrenched and compacted to avoid severe gully erosion.
- Slope drains must be securely anchored to the slope and must be adequately sized to carry the capacity of the design storm and associated forces.
- Outlets must be stabilized with riprap, concrete or other type of energy dissipator, or directed into a stable sediment trap or basin. See EC-10, Velocity Dissipation Devices.
- Debris racks are recommended at the inlet. Debris racks located several feet upstream of the inlet can usually be larger than racks at the inlet, and thus provide enhanced debris protection and less plugging.
- Safety racks are also recommended at the inlet and outlet of pipes where children or animals could become entrapped.
- Secure inlet and surround with dikes to prevent gully erosion and anchor pipe to slope.
- When using slope drains, limit drainage area to 10 acres per pipe. For larger areas, use a rock lined channel or a series of pipes.

- Size to convey at least the peak flow of a 10-year storm. The design storm is conservative due to the potential impact of system failures.
- Maximum slope generally limited to 2:1 (H:V) as energy dissipation below steeper slopes is difficult.
- Direct surface runoff to slope drains with interceptor dikes. See BMP EC-9, Earth Dikes and Drainage Swales. Top of interceptor dikes should be 12 in. higher than the top of the slope drain.
- Slope drains can be placed on or buried underneath the slope surface.
- Recommended materials include both metal and plastic pipe, either corrugated or smooth wall. Concrete pipe can also be used.
- When installing slope drains:
  - Install slope drains perpendicular to slope contours.
  - Compact soil around and under entrance, outlet, and along length of pipe.
  - Securely anchor and stabilize pipe and appurtenances into soil.
  - Check to ensure that pipe connections are watertight.
  - Protect area around inlet with filter cloth. Protect outlet with riprap or other energy dissipation device. For high energy discharges, reinforce riprap with concrete or use reinforced concrete device.
  - Protect outlet of slope drains using a flared end section when outlet discharges to a flexible energy dissipation device.
  - A flared end section installed at the inlet will improve flow into the slope drain and prevent erosion at the pipe entrance. Use a flared end section with a 6 in. minimum toe plate to help prevent undercutting. The flared section should slope towards the pipe inlet.

***Design and Layout***

The capacity for temporary drains should be sufficient to convey at least the peak runoff from a 10-year rainfall event. The pipe size may be computed using the Rational Method or a method established by the local municipality. Higher flows must be safely stored or routed to prevent any offsite concentration of flow and any erosion of the slope. The design storm is purposely conservative due to the potential impacts associated with system failures.

As a guide, temporary pipe slope drains should not be sized smaller than shown in the following table:

| Minimum Pipe Diameter (Inches) | Maximum Drainage Area (Acres) |
|---|---|
| 12 | 1.0 |
| 18 | 3.0 |
| 21 | 5.0 |
| 24 | 7.0 |
| 30 | 10.0 |

Larger drainage areas can be treated if the area can be subdivided into areas of 10 acres or less and each area is treated as a separate drainage. Drainage areas exceeding 10 acres must be designed by a Registered Civil Engineer and approved by the agency that issued the grading permit.

***Materials:***

Soil type, rainfall patterns, construction schedule, local requirements, and available supply are some of the factors to be considered when selecting materials. The following types of slope drains are commonly used:

- **Rigid Pipe:** This type of slope drain is also known as a pipe drop. The pipe usually consists of corrugated metal pipe or rigid plastic pipe. The pipe is placed on undisturbed or compacted soil and secured onto the slope surface or buried in a trench. Concrete thrust blocks must be used when warranted by the calculated thrust forces. Collars should be properly installed and secured with metal strappings or watertight collars.

- **Flexible Pipe**: The flexible pipe slope drain consists of a flexible tube of heavy-duty plastic, rubber, or composite material. The tube material is securely anchored onto the slope surface. The tube should be securely fastened to the metal inlet and outlet conduit sections with metal strappings or watertight collars.

- **Section Downdrains**: The section downdrain consists of pre-fabricated, section conduit of half round or third round material. The sectional downdrain performs similar to a flume or chute. The pipe must be placed on undisturbed or compacted soil and secured into the slope.

- **Concrete-lined Terrace Drain:** This is a concrete channel for draining water from a terrace on a slope to the next level. These drains are typically specified as permanent structures and, if installed early, can serve as slope drains during construction, which should be designed according to local drainage design criteria.

## Costs

- Cost varies based on pipe selection and selected outlet protection.

| Corrugated Steel Pipes, Per Foot | |
|---|---|
| Size | Supplied and Installed Cost (No Trenching Included) |
| 12" | $19.60 per LF |
| 15" | $22.00 |
| 18" | $26.00 |
| 24" | $32.00 |
| 30" | $50.00 |
| **PVC Pipes, Per Foot** | |
| Size | Supplied and Installed Cost (No Trenching Included) |
| 12" | $24.50 |
| 14" | $49.00 |
| 16" | $51.00 |
| 18" | $54.00 |
| 20" | $66.00 |
| 24" | $93.00 |
| 30" | $130.00 |

## Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Inspect BMPs subjected to non-stormwater discharges daily while non-stormwater discharges occur.
- Inspect outlet for erosion and downstream scour. If eroded, repair damage and install additional energy dissipation measures. If downstream scour is occurring, it may be necessary to reduce flows being discharged into the channel unless other preventative measures are implemented.
- Insert inlet for clogging or undercutting. Remove debris from inlet to maintain flows. Repair undercutting at inlet and if needed, install flared section or rip rap around the inlet to prevent further undercutting.
- Inspect pipes for leakage. Repair leaks and restore damaged slopes.
- Inspect slope drainage for accumulations of debris and sediment.
- Remove built up sediment from entrances and outlets as required. Flush drains if necessary; capture and settle out sediment from discharge.

- Make sure water is not ponding onto inappropriate areas (e.g., active traffic lanes, material storage areas, etc.).
- Pipe anchors must be checked to ensure that the pipe remains anchored to the slope. Install additional anchors if pipe movement is detected.

## References

Draft – Sedimentation and Erosion Control, An Inventory of Current Practices, U.S.E.P.A., April 1990.

National Association of Home Builders (NAHB). Stormwater Runoff & Nonpoint Source Pollution Control Guide for Builders and Developers. National Association of Home Builders, Washington, D.C., 1995

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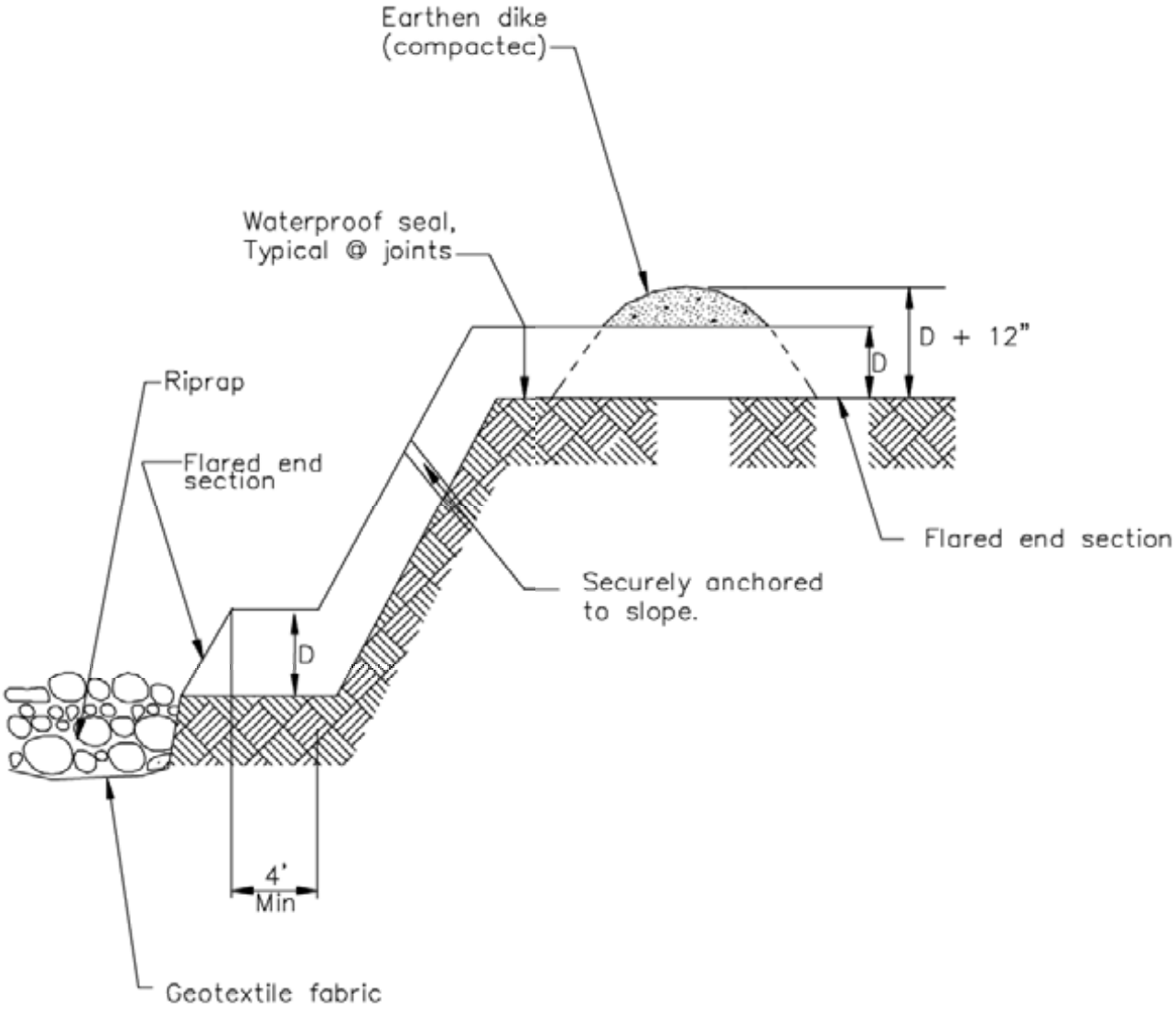
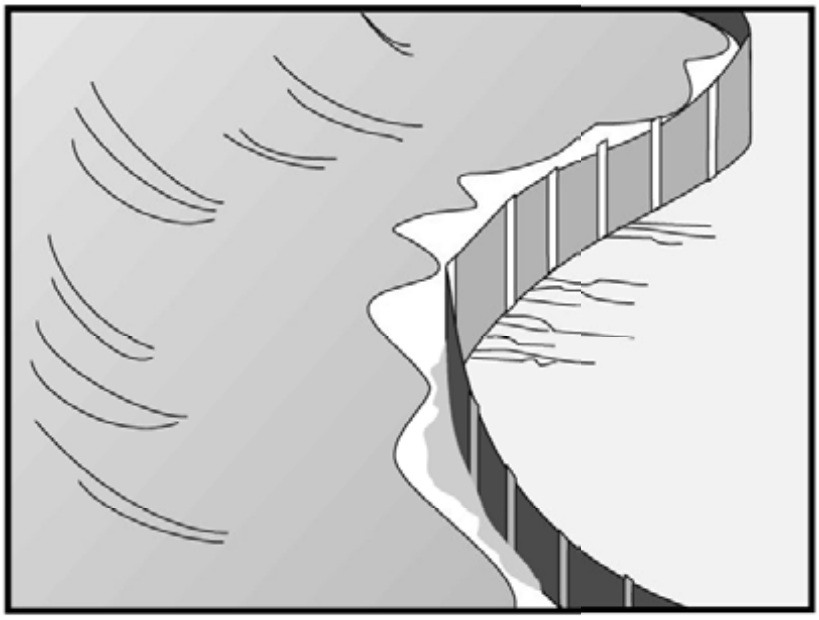
Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.




TYPICAL SLOPE DRAIN
NOT TO SCALE

# Silt Fence SE-1



## Objectives

| | | |
|---|---|---|
| EC | Erosion Control | ☑ |
| SE | Sediment Control | |
| TR | Tracking Control | |
| WE | Wind Erosion Control | |
| NS | Non-Stormwater Management Control | |
| WM | Waste Management and Materials Pollution Control | |

**Legend:**

☑ **Primary Objective**

☒ **Secondary Objective**

## Targeted Constituents

| | |
|---|---|
| Sediment | ☑ |
| Nutrients | |
| Trash | |
| Metals | |
| Bacteria | |
| Oil and Grease | |
| Organics | |

## Potential Alternatives

SE-5 Fiber Rolls

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

SE-9 Straw Bale Barrier

## Description and Purpose

A silt fence is made of a filter fabric that has been entrenched, attached to supporting poles, and sometimes backed by a plastic or wire mesh for support. The silt fence detains sediment-laden water, promoting sedimentation behind the fence.

## Suitable Applications

Silt fences are suitable for perimeter control, placed below areas where sheet flows discharge from the site. They should also be used as interior controls below disturbed areas where runoff may occur in the form of sheet and rill erosion. Silt fences are generally ineffective in locations where the flow is concentrated and are only applicable for sheet or overland flows. Silt fences are most effective when used in combination with erosion controls. Suitable applications include:

- Along the perimeter of a project.
- Below the toe or down slope of exposed and erodible slopes.
- Along streams and channels.
- Around temporary spoil areas and stockpiles.
- Below other small cleared areas.

## Limitations

- Do not use in streams, channels, drain inlets, or anywhere flow is concentrated.

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- Do not use in locations where ponded water may cause flooding.
- Do not place fence on a slope, or across any contour line. If not installed at the same elevation throughout, silt fences will create erosion.
- Filter fences will create a temporary sedimentation pond on the upstream side of the fence and may cause temporary flooding. Fences not constructed on a level contour will be overtopped by concentrated flow resulting in failure of the filter fence.
- Improperly installed fences are subject to failure from undercutting, overlapping, or collapsing.
  - Not effective unless trenched and keyed in.
  - Not intended for use as mid-slope protection on slopes greater than 4:1 (H:V).
  - Do not allow water depth to exceed 1.5 ft at any point.

## Implementation

### *General*

A silt fence is a temporary sediment barrier consisting of filter fabric stretched across and attached to supporting posts, entrenched, and, depending upon the strength of fabric used, supported with plastic or wire mesh fence. Silt fences trap sediment by intercepting and detaining small amounts of sediment-laden runoff from disturbed areas in order to promote sedimentation behind the fence.

Silt fences are preferable to straw bale barriers in many cases. Laboratory work at the Virginia Highway and Transportation Research Council has shown that silt fences can trap a much higher percentage of suspended sediments than can straw bales. While the failure rate of silt fences is lower than that of straw bale barriers, there are many instances where silt fences have been improperly installed. The following layout and installation guidance can improve performance and should be followed:

- Use principally in areas where sheet flow occurs
- Don't use in streams, channels, or anywhere flow is concentrated. Don't use silt fences to divert flow.
- Don't use below slopes subject to creep, slumping, or landslides.
- Select filter fabric that retains 85% of soil by weight, based on sieve analysis, but that is not finer than an equivalent opening size of 70.
- Install along a level contour, so water does not pond more than 1.5 ft at any point along the silt fence.
- The maximum length of slope draining to any point along the silt fence should be 200 ft or less.
- The maximum slope perpendicular to the fence line should be 1:1.

- Provide sufficient room for runoff to pond behind the fence and to allow sediment removal equipment to pass between the silt fence and toes of slopes or other obstructions. About 1200 ft² of ponding area should be provided for every acre draining to the fence.
- Turn the ends of the filter fence uphill to prevent stormwater from flowing around the fence.
- Leave an undisturbed or stabilized area immediately down slope from the fence where feasible.
- Silt fences should remain in place until the disturbed area is permanently stabilized.

***Design and Layout***

Selection of a filter fabric is based on soil conditions at the construction site (which affect the equivalent opening size (EOS) fabric specification) and characteristics of the support fence (which affect the choice of tensile strength). The designer should specify a filter fabric that retains the soil found on the construction site yet that it has openings large enough to permit drainage and prevent clogging. The following criteria is recommended for selection of the equivalent opening size:

1. If 50 percent or less of the soil, by weight, will pass the U.S. Standard Sieve No. 200, select the EOS to retain 85 % of the soil. The EOS should not be finer than EOS 70.
2. For all other soil types, the EOS should be no larger than the openings in the U.S. Standard Sieve No. 70 except where direct discharge to a stream, lake, or wetland will occur, then the EOS should be no larger than Standard Sieve No. 100.

To reduce the chance of clogging, it is preferable to specify a fabric with openings as large as allowed by the criteria. No fabric should be specified with an EOS smaller than U.S. Standard Sieve No. 100. If 85% or more of a soil, by weight, passes through the openings in a No. 200 sieve, filter fabric should not be used. Most of the particles in such a soil would not be retained if the EOS was too large and they would clog the fabric quickly if the EOS were small enough to capture the soil.

The fence should be supported by a plastic or wire mesh if the fabric selected does not have sufficient strength and bursting strength characteristics for the planned application (as recommended by the fabric manufacturer). Filter fabric material should contain ultraviolet inhibitors and stabilizers to provide a minimum of six months of expected usable construction life at a temperature range of 0 °F to 120 °F.

- Layout in accordance with attached figures.
- For slopes steeper than 2:1 (H:V) and that contain a high number of rocks or large dirt clods that tend to dislodge, it may be necessary to install additional protection immediately adjacent to the bottom of the slope, prior to installing silt fence. Additional protection may be a chain link fence or a cable fence.
- For slopes adjacent to sensitive receiving waters or Environmentally Sensitive Areas (ESAs), silt fence should be used in conjunction with erosion control BMPs.

### *Materials*

- Silt fence fabric should be woven polypropylene with a minimum width of 36 in. and a minimum tensile strength of 100 lb force. The fabric should conform to the requirements in ASTM designation D4632 and should have an integral reinforcement layer. The reinforcement layer should be a polypropylene, or equivalent, net provided by the manufacturer. The permittivity of the fabric should be between 0.1 $sec^{-1}$ and 0.15 $sec^{-1}$ in conformance with the requirements in ASTM designation D4491.

- Wood stakes should be commercial quality lumber of the size and shape shown on the plans. Each stake should be free from decay, splits or cracks longer than the thickness of the stake or other defects that would weaken the stakes and cause the stakes to be structurally unsuitable.

- Staples used to fasten the fence fabric to the stakes should be not less than 1.75 in. long and should be fabricated from 15 gauge or heavier wire. The wire used to fasten the tops of the stakes together when joining two sections of fence should be 9 gauge or heavier wire. Galvanizing of the fastening wire will not be required.

- There are new products that may use prefabricated plastic holders for the silt fence and use bar reinforcement instead of wood stakes. If bar reinforcement is used in lieu of wood stakes, use number four or greater bar. Provide end protection for any exposed bar reinforcement.

### *Installation Guidelines*

Silt fences are to be constructed on a level contour. Sufficient area should exist behind the fence for ponding to occur without flooding or overtopping the fence.

- A trench should be excavated approximately 6 in. wide and 6 in. deep along the line the proposed silt fence.

- Bottom of the silt fence should be keyed-in a minimum of 12 in.

- Posts should be spaced a maximum of 6 ft apart and driven securely into the ground a minimum of 18 in. or 12 in. below the bottom of the trench.

- When standard strength filter fabric is used, a plastic or wire mesh support fence should be fastened securely to the upslope side of posts using heavy–duty wire staples at least 1 in. long. The mesh should extend into the trench. When extra-strength filter fabric and closer post spacing are used, the mesh support fence may be eliminated. Filter fabric should be purchased in a long roll, then cut to the length of the barrier. When joints are necessary, filter cloth should be spliced together only at a support post, with a minimum 6 in. overlap and both ends securely fastened to the post.

- The trench should be backfilled with compacted native material.

- Construct silt fences with a setback of at least 3 ft from the toe of a slope. Where a silt fence is determined to be not practicable due to specific site conditions, the silt fence may be constructed at the toe of the slope, but should be constructed as far from the toe of the slope as practicable. Silt fences close to the toe of the slope will be less effective and difficult to maintain.

- Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/3 the height of the barrier; in no case should the reach exceed 500 ft.

### Costs

- Average annual cost for installation and maintenance (assumes 6 month useful life): $7 per lineal foot ($850 per drainage acre). Range of cost is $3.50 - $9.10 per lineal foot.

### Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Repair undercut silt fences.
- Repair or replace split, torn, slumping, or weathered fabric. The lifespan of silt fence fabric is generally 5 to 8 months.
- Silt fences that are damaged and become unsuitable for the intended purpose should be removed from the site of work, disposed of, and replaced with new silt fence barriers.
- Sediment that accumulates in the BMP must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height. Sediment removed during maintenance may be incorporated into earthwork on the site or disposed at an appropriate location.
- Silt fences should be left in place until the upstream area is permanently stabilized. Until then, the silt fence must be inspected and maintained.
- Holes, depressions, or other ground disturbance caused by the removal of the silt fences should be backfilled and repaired.

### References

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

National Management Measures to Control Nonpoint Source Pollution from Urban Areas, United States Environmental Protection Agency, 2002.

Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, Work Group-Working Paper, USEPA, April 1992.

Sedimentation and Erosion Control Practices, and Inventory of Current Practices (Draft), UESPA, 1990.

Southeastern Wisconsin Regional Planning Commission (SWRPC). Costs of Urban Nonpoint Source Water Pollution Control Measures. Technical Report No. 31. Southeastern Wisconsin Regional Planning Commission, Waukesha, WI. 1991

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

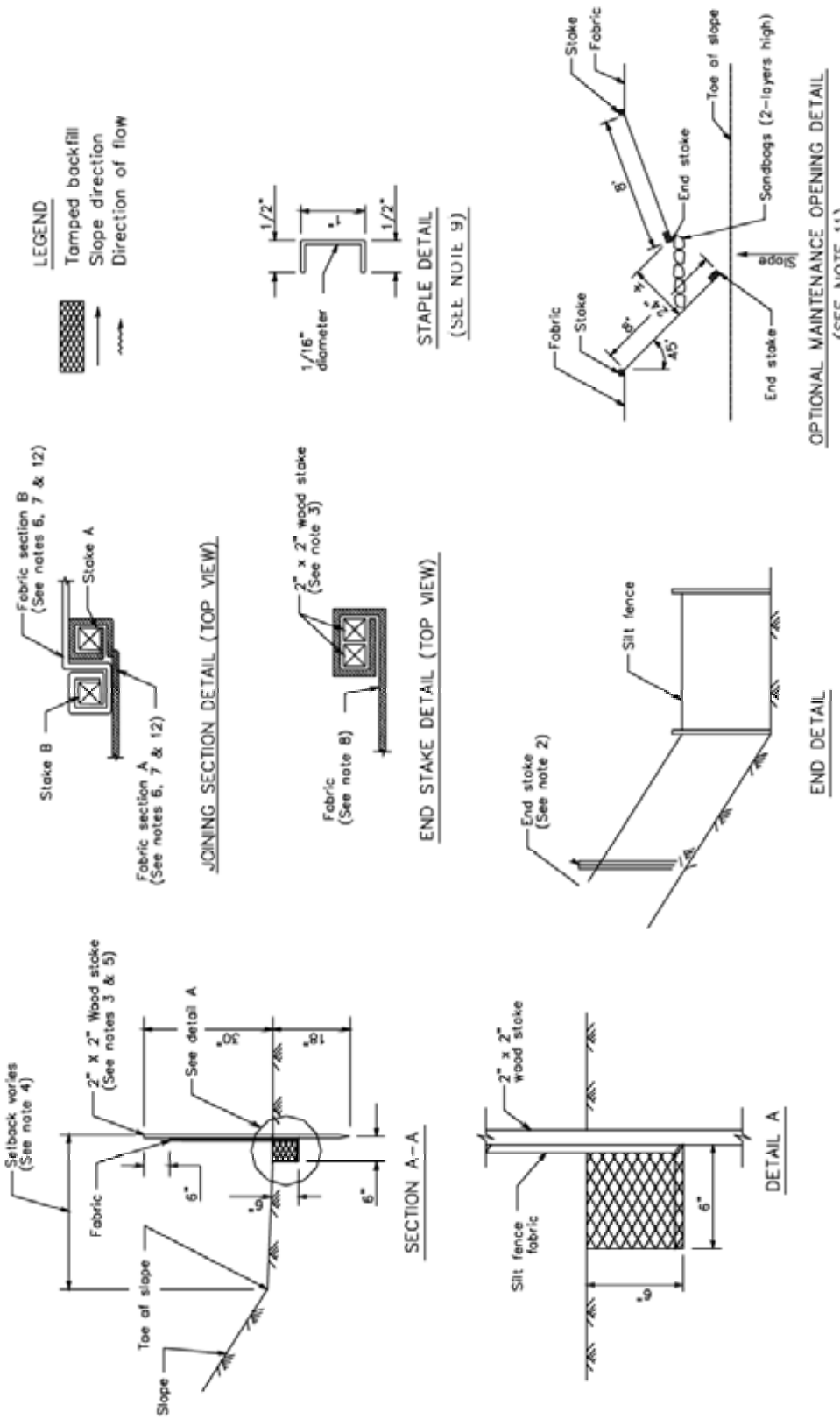
Stormwater Management Manual for The Puget Sound Basin, Washington State Department of Ecology, Public Review Draft, 1991.

U.S. Environmental Protection Agency (USEPA). Stormwater Management for Industrial Activities: Developing Pollution Prevention Plans and Best Management Practices. U.S. Environmental Protection Agency, Office of Water, Washington, DC, 1992.

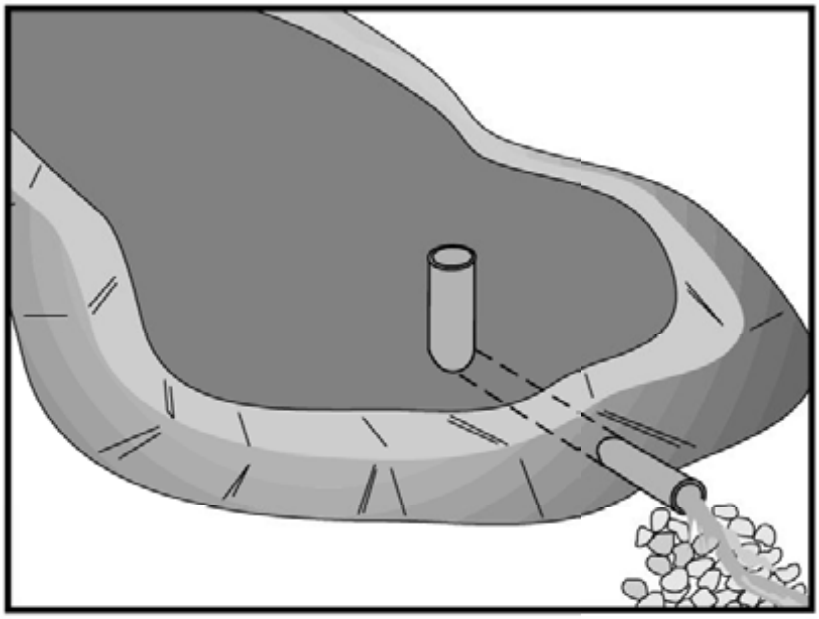
Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.

NOTES

1. Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/3 the height of the linear barrier, in no case shall the reach length exceed 500'.
2. The last 8'-0" of fence shall be turned up slope.
3. Stake dimensions are nominal.
4. Dimension may vary to fit field condition.
5. Stakes shall be spaced at 8'-0" maximum and shall be positioned on downstream side of fence.
6. Stakes to overlap and fence fabric to fold around each stake one full turn. Secure fabric to stake with 4 staples.
7. Stakes shall be driven tightly together to prevent potential flow-through of sediment at joint. The tops of the stakes shall be secured with wire.
8. For end stake, fence fabric shall be folded around two stakes one full turn and secured with 4 staples.
9. Minimum 4 staples per stake. Dimensions shown are typical.
10. Cross barriers shall be a minimum of 1/3 and a maximum of 1/2 the height of the linear barrier.
11. Maintenance openings shall be constructed in a manner to ensure sediment remains behind silt fence.
12. Joining sections shall not be placed at sump locations.
13. Sandbag rows and layers shall be offset to eliminate gaps.


LEGEND
Tamped backfill
Slope direction
Direction of flow
1/2"
1"
1/2"
1/16" diameter
STAPLE DETAIL
(SEE NOTE 9)
Stake
Fabric
Toe of slope
8'
End stake
Sandbags (2-layers high)
Slope
Fabric
Stake
8"
4"
45°
End stake
OPTIONAL MAINTENANCE OPENING DETAIL
(SEE NOTE 11)
Fabric section B
(See notes 6, 7 & 12)
Stake A
Stake B
Fabric section A
(See notes 6, 7 & 12)
JOINING SECTION DETAIL (TOP VIEW)
2" x 2" wood stake
(See note 3)
Fabric
(See note 8)
END STAKE DETAIL (TOP VIEW)
Silt fence
End stake
(See note 2)
END DETAIL
Setback varies
(See note 4)
2" X 2" Wood stake
(See notes 3 & 5)
See detail A
10"
10"
Fabric
6"
6"
Toe of slope
Slope
SECTION A-A
2" x 2"
wood stake
Silt fence
fabric
6"
DETAIL A

# Sediment Basin SE-2



| Objectives | | |
|---|---|---|
| EC | Erosion Control | |
| SE | Sediment Control | ☑ |
| TR | Tracking Control | |
| WE | Wind Erosion Control | |
| NS | Non-Stormwater Management Control | |
| WM | Waste Management and Materials Pollution Control | |

**Legend:**
☑ **Primary Objective**
☒ **Secondary Objective**

| Targeted Constituents | |
|---|---|
| Sediment | ☑ |
| Nutrients | |
| Trash | ☑ |
| Metals | |
| Bacteria | |
| Oil and Grease | |
| Organics | |

**Potential Alternatives**

SE-3 Sediment Trap (for smaller areas)

## Description and Purpose

A sediment basin is a temporary basin formed by excavation or by constructing an embankment so that sediment-laden runoff is temporarily detained under quiescent conditions, allowing sediment to settle out before the runoff is discharged.

## Suitable Applications

Sediment basins may be suitable for use on larger projects with sufficient space for constructing the basin. Sediment basins should be considered for use:

- Where sediment-laden water may enter the drainage system or watercourses
- On construction projects with disturbed areas during the rainy season
- At the outlet of disturbed watersheds between 5 acres and 75 acres
- At the outlet of large disturbed watersheds, as necessary
- Where post construction detention basins are required
- In association with dikes, temporary channels, and pipes used to convey runoff from disturbed areas

## Limitations

Sediment basins must be installed only within the property limits and where failure of the structure will not result in loss of life, damage to homes or buildings, or interruption of use or service of

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public roads or utilities. In addition, sediment basins are attractive to children and can be very dangerous. Local ordinances regarding health and safety must be adhered to. If fencing of the basin is required, the type of fence and its location should be shown in the SWPPP and in the construction specifications.

- Generally, sediment basins are limited to drainage areas of 5 acres or more, but not appropriate for drainage areas greater than 75 acres.
- Sediment basins may become an "attractive nuisance" and care must be taken to adhere to all safety practices. If safety is a concern, basin may require protective fencing.
- Sediment basins designed according to this handbook are only practically effective in removing sediment down to about the medium silt size fraction. Sediment-laden runoff with smaller size fractions (fine silt and clay) may not be adequately treated unless chemical treatment is used in addition to the sediment basin.
- Sites with very fine sediments (fine silt and clay) may require longer detention times for effective sediment removal.
- Basins with a height of 25 ft or more or an impounding capacity of 50 ac-ft or more must obtain approval from Division of Safety of Dams.
- Standing water may cause mosquitoes or other pests to breed.
- Basins require large surface areas to permit settling of sediment. Size may be limited by the available area.

## Implementation

### *General*

A sediment basin is a controlled stormwater release structure formed by excavation or by construction of an embankment of compacted soil across a drainage way, or other suitable location. It is intended to trap sediment before it leaves the construction site. The basin is a temporary measure with a design life of 12 to 28 months in most cases and is to be maintained until the site area is permanently protected against erosion or a permanent detention basin is constructed.

Sediment basins are suitable for nearly all types of construction projects. Whenever possible, construct the sediment basins before clearing and grading work begins. Basins should be located at the stormwater outlet from the site but not in any natural or undisturbed stream. A typical application would include temporary dikes, pipes, and/or channels to divert runoff to the basin inlet.

Many development projects in California will be required by local ordinances to provide a stormwater detention basin for post-construction flood control, desilting, or stormwater pollution control. A temporary sediment basin may be constructed by rough grading the post-construction control basins early in the project.

Sediment basins trap 70-80 % of the sediment that flows into them if designed according to this handbook. Therefore, they should be used in conjunction with erosion control practices such as

temporary seeding, mulching, diversion dikes, etc., to reduce the amount of sediment flowing into the basin.

***Planning***

To improve the effectiveness of the basin, it should be located to intercept runoff from the largest possible amount of disturbed area. The best locations are generally low areas. Drainage into the basin can be improved by the use of earth dikes and drainage swales (see BMP EC-9). The basin must not be located in a stream but it should be located to trap sediment-laden runoff before it enters the stream. The basin should not be located where its failure would result in the loss of life or interruption of the use or service of public utilities or roads.

- Construct before clearing and grading work begins when feasible.
- Do not locate in a stream.
- Basin sites should be located where failure of the structure will not cause loss of life, damage to homes or buildings, or interruption of use or service of public roads or utilities.
- Large basins are subject to state and local dam safety requirements.
- Limit the contributing area to the sediment basin to only the runoff from the disturbed soil areas. Use temporary concentrated flow conveyance controls to divert runoff from undisturbed areas away from the sediment basin.
- The basin should be located: (1) by excavating a suitable area or where a low embankment can be constructed across a swale, (2) where post-construction (permanent) detention basins will be constructed, and (3) where the basins can be maintained on a year-round basis to provide access for maintenance, including sediment removal and sediment stockpiling in a protected area, and to maintain the basin to provide the required capacity.

***Design***

Sediment basins must be designed in accordance with Section A of the State of California NPDES General Permit for Stormwater Discharges Associated with Construction Activities (General Permit) where sediment basins are the only control measure proposed for the site. If there is insufficient area to construct a sediment basin in accordance with the General Permit requirements, then the alternate design standards specified herein may be used.

Sediment basins designed per the General Permit shall be designed as follows:

*Option 1:*

Pursuant to local ordinance for sediment basin design and maintenance, provided that the design efficiency is as protective or more protective of water quality than Option 3.

OR

*Option 2:*

Sediment basin(s), as measured from the bottom of the basin to the principal outlet, shall have at least a capacity equivalent to 3,600 cubic feet (133 $yd^3$) of storage per acre draining into the sediment basin. The length of the basin shall be more than twice the width of the basin. The

length is determined by measuring the distance between the inlet and the outlet; and the depth must not be less than 3 ft nor greater than 5 ft for safety reasons and for maximum efficiency.

OR

*Option 3:*
Sediment basin(s) shall be designed using the standard equation:

$$As=1.2Q/Vs \quad \text{(Eq. 1)}$$

Where:

As = Minimum surface area for trapping soil particles of a certain size

Vs = Settling velocity of the design particle size chosen

Q = C I A

Where

Q = Discharge rate measured in cubic feet per second

C = Runoff coefficient

I = Precipitation intensity for the 10-year, 6-hour rain event

A = Area draining into the sediment basin in acres

The design particle size shall be the smallest soil grain size determined by wet sieve analysis, or the fine silt sized (0.01 mm [or 0.0004 in.]) particle, and the *Vs* used shall be 100 percent of the calculated settling velocity.

The length is determined by measuring the distance between the inlet and the outlet; the length shall be more than twice the dimension as the width; the depth shall not be less than 3 ft nor greater than 5 ft for safety reasons and for maximum efficiency (2 ft of sediment storage, 2 ft of capacity). The basin(s) shall be located on the site where it can be maintained on a year-round basis and shall be maintained on a schedule to retain the 2 ft of capacity.

OR

*Option 4:*
The use of an equivalent surface area design or equation, provided that the design efficiency is as protective or more protective of water quality than Option 3.

Other design considerations are:

- The volume of the settling zone should be sized to capture runoff from a 2-year storm or other appropriate design storms specified by the local agency. A detention time of 24 to 40 hours should allow 70 to 80 % of sediment to settle.
- The basin volume consists of two zones:
  - A sediment storage zone at least 1 ft deep.
  - A settling zone at least 2 ft deep.
- The length to settling depth ratio (L/SD) should be less than 200.
- Sediment basins are best used in conjunction with erosion controls. Sediment basins that will be used as the only means of treatment, without upstream erosion and sediment controls, must be designed according to the four options required by the General Permit (see Options 1-4 above). Sediment basins that are used in conjunction with upstream erosion and sediment controls should be designed to have a capacity equivalent to 67 $yd^3$ of sediment storage per acre of contributory area.
- The length of the basin should be more than twice the width of the basin; the length should be determined by measuring the distance between the inlet and the outlet.
- The depth must be no less than 3 ft.
- Basins with an impounding levee greater than 4.5 ft tall, measured from the lowest point to the impounding area to the highest point of the levee, and basins capable of impounding more than 35,000 $ft^3$, should be designed by a Registered Civil Engineer. The design should include maintenance requirements, including sediment and vegetation removal, to ensure continuous function of the basin outlet and bypass structures.
- Basins should be designed to drain within 72 hours following storm events. If a basin fails to drain within 72 hours, it must be pumped dry.
- Sediment basins, regardless of size and storage volume, should include features to accommodate overflow or bypass flows that exceed the design storm event.
  - Include an emergency spillway to accommodate flows not carried by the principal spillway. The spillway should consist of an open channel (earthen or vegetated) over undisturbed material (not fill) or constructed of a non-erodible riprap.
  - The spillway control section, which is a level portion of the spillway channel at the highest elevation in the channel, should be a minimum of 20 ft in length.
- Rock or vegetation should be used to protect the basin inlet and slopes against erosion.
- A forebay, constructed upstream of the basin may be provided to remove debris and larger particles.

- The outflow from the sediment basin should be provided with velocity dissipation devices (see BMP EC-10) to prevent erosion and scouring of the embankment and channel.
- Basin inlets should be located to maximize travel distance to the basin outlet.
- The principal outlet should consist of a corrugated metal, high density polyethylene (HDPE), or reinforced concrete riser pipe with dewatering holes and an anti-vortex device and trash rack attached to the top of the riser, to prevent floating debris from flowing out of the basin or obstructing the system. This principal structure should be designed to accommodate the inflow design storm.
- A rock pile or rock-filled gabions can serve as alternatives to the debris screen; although the designer should be aware of the potential for extra maintenance involved should the pore spaces in the rock pile clog.
- The outlet structure should be placed on a firm, smooth foundation with the base securely anchored with concrete or other means to prevent floatation.
- Attach riser pipe (watertight connection) to a horizontal pipe (barrel). Provide anti-seep collars on the barrel.
- Cleanout level should be clearly marked on the riser pipe.
- Proper hydraulic design of the outlet is critical to achieving the desired performance of the basin. The outlet should be designed to drain the basin within 24 to 72 hours (also referred to as "drawdown time"). The 24-hour limit is specified to provide adequate settling time; the 72-hour limit is specified to mitigate vector control concerns.
- The two most common outlet problems that occur are: (1) the capacity of the outlet is too great resulting in only partial filling of the basin and drawdown time less than designed for; and (2) the outlet clogs because it is not adequately protected against trash and debris. To avoid these problems, the following outlet types are recommended for use: (1) a single orifice outlet with or without the protection of a riser pipe, and (2) perforated riser. Design guidance for single orifice and perforated riser outlets follow:
  - *Flow Control Using a Single Orifice At The Bottom Of The Basin (Figure 1)*: The outlet control orifice should be sized using the following equation:

$$a = \frac{2A(H-Ho)^{0.5}}{3600CT(2g)^{0.5}} = \frac{(7x10^{-5})A(H-Ho)^{0.5}}{CT} \qquad \text{(Eq. 2)}$$

where:

a = area of orifice ($ft^2$)

A = surface area of the basin at mid elevation ($ft^2$)

C = orifice coefficient

T = drawdown time of full basin (hrs)

g = gravity (32.2 ft/s²)

H = elevation when the basin is full (ft)

Ho = final elevation when basin is empty (ft)

With a drawdown time of 40 hours, the equation becomes:

$$a = \frac{(1.75x10^{-6})A(H - Ho)^{0.5}}{C} \qquad \text{(Eq. 3)}$$

- *Flow Control Using Multiple Orifices (see Figure2):*

$$a_t = \frac{2A(h_{max})}{3600CT(2g[h_{max} - h_{centroid\ of\ orifices}])^{0.5}} \qquad \text{(Eq. 4)}$$

With terms as described above except:

$a_t$ = total area of orifices

$h_{max}$ = maximum height from lowest orifice to the maximum water surface (ft)

$h_{centroid\ of\ orifices}$ = height from the lowest orifice to the centroid of the orifice configuration (ft)

Allocate the orifices evenly on two rows; separate the holes by 3x hole diameter vertically, and by 120 degrees horizontally (refer to Figure 2).

Because basins are not maintained for infiltration, water loss by infiltration should be disregarded when designing the hydraulic capacity of the outlet structure.

Care must be taken in the selection of "C"; 0.60 is most often recommended and used. However, based on actual tests, GKY (1989), "Outlet Hydraulics of Extended Detention Facilities for Northern Virginia Planning District Commission", recommends the following:

C = 0.66 for thin materials; where the thickness is equal to or less than the orifice diameter, or

C = 0.80 when the material is thicker than the orifice diameter

***Installation***

- Securely anchor and install an anti-seep collar on the outlet pipe/riser and provide an emergency spillway for passing major floods (see local flood control agency).
- Areas under embankments must be cleared and stripped of vegetation.
- Chain link fencing should be provided around each sediment basin to prevent unauthorized entry to the basin or if safety is a concern.

## Costs

Average annual costs for installation and maintenance (2 year useful life) are:

- Basin less than 50,000 ft³: Range, $0.24 - $1.58/ft³. Average, $0.73 per ft³. $400 - $2,400, $1,200 average per drainage acre.
- Basin size greater than 50,000 ft³: Range, $0.12 – $0.48/ft³. Average, $0.36 per ft³. $200 - $800, $600 average per drainage acre.

## Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Examine basin banks for seepage and structural soundness.
- Check inlet and outlet structures and spillway for any damage or obstructions. Repair damage and remove obstructions as needed.
- Check inlet and outlet area for erosion and stabilize if required.
- Check fencing for damage and repair as needed.
- Sediment that accumulates in the BMP must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when sediment accumulation reaches one-half the designated sediment storage volume. Sediment removed during maintenance may be incorporated into earthwork on the site or disposed of at appropriate locations.
- Remove standing water from basin within 72 hours after accumulation.
- BMPs that require dewatering shall be continuously attended while dewatering takes place. Dewatering BMPs shall be implemented at all times during dewatering activities.
- To minimize vector production:
  - Remove accumulation of live and dead floating vegetation in basins during every inspection.
  - Remove excessive emergent and perimeter vegetation as needed or as advised by local or state vector control agencies.

## References

A Current Assessment of Urban Best Management Practices: Techniques for Reducing Nonpoint Source Pollution in the Coastal Zones, Metropolitan Washington Council of Governments, March 1992.

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Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

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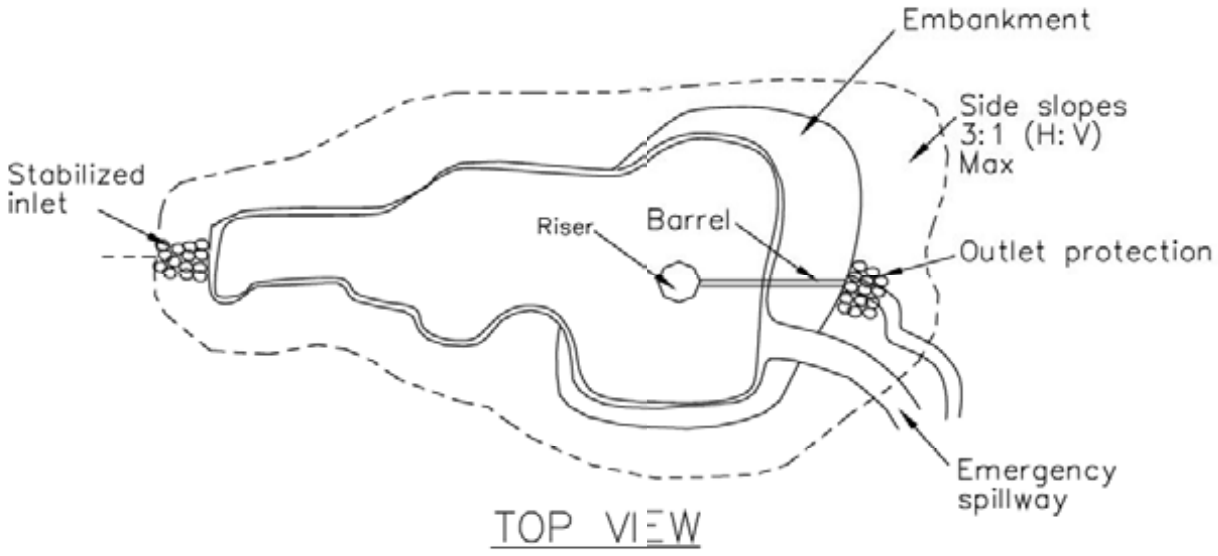
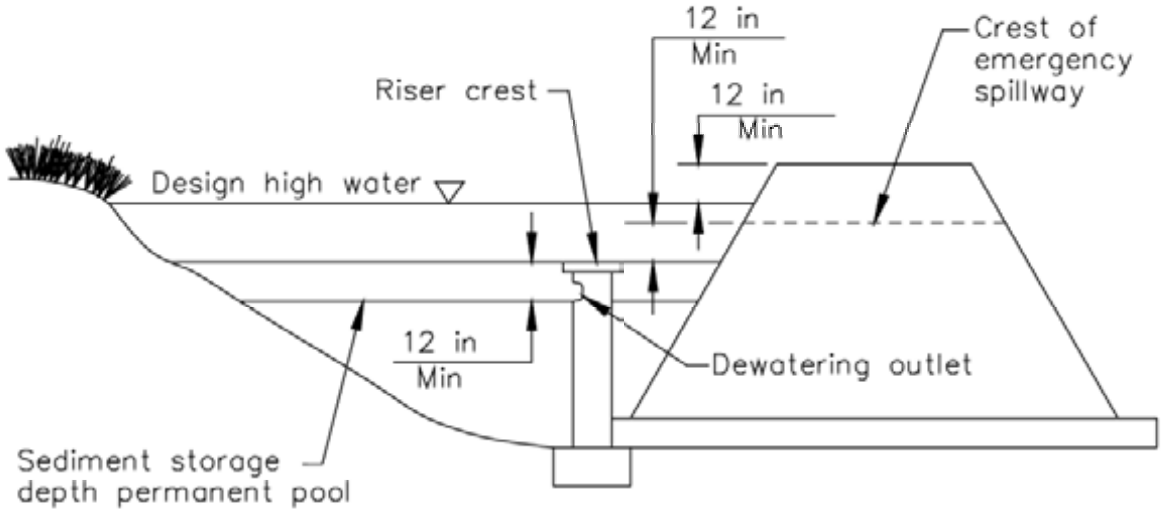



TOP VIEW




SIDE VIEW

NOTE:
This outlet provides no drainage for permanent pool.

FIGURE 1: TYPICAL TEMPORARY SEDIMENT BASIN
SINGLE ORIFICE DESIGN
NOT TO SCALE

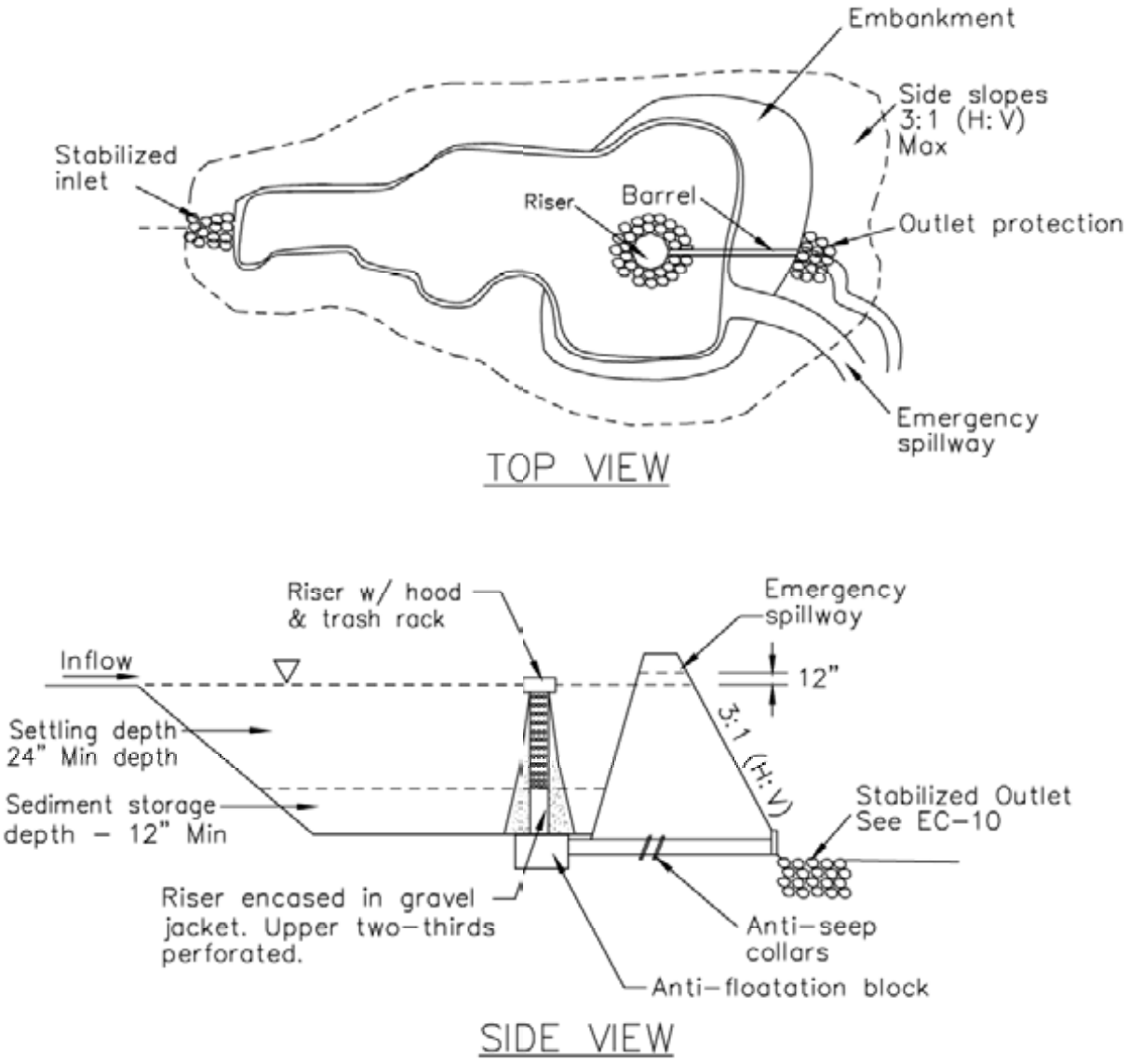



FIGURE 2: TYPICAL TEMPORARY SEDIMENT BASIN

MULTIPLE ORIFICE DESIGN

NOT TO SCALE

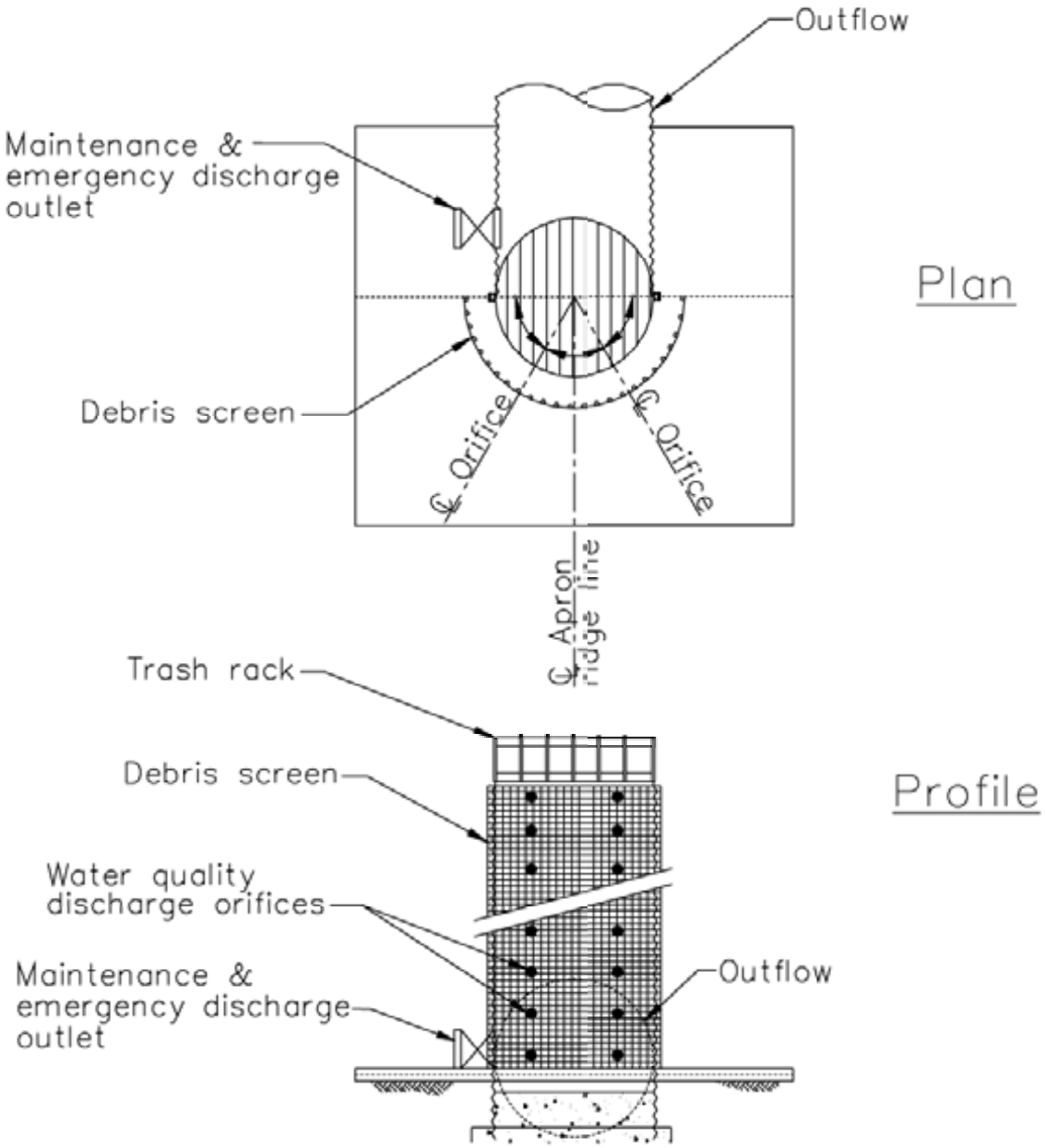
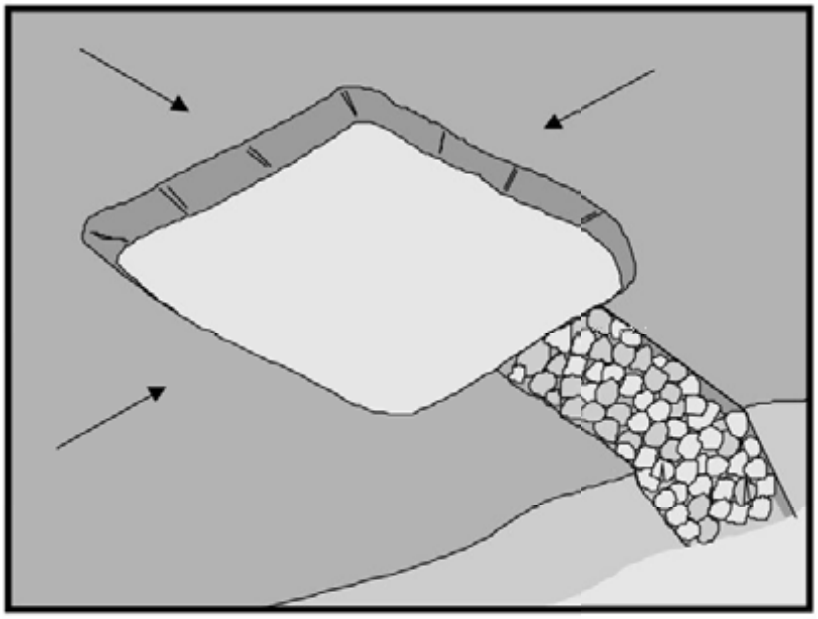



FIGURE 3: MULTIPLE ORIFICE OUTLET RISER

NOT TO SCALE

# Sediment Trap SE-3



## Objectives

| | | |
|---|---|---|
| EC | Erosion Control | |
| SE | Sediment Control | ☑ |
| TR | Tracking Control | |
| WE | Wind Erosion Control | |
| NS | Non-Stormwater Management Control | |
| WM | Waste Management and Materials Pollution Control | |

**Legend:**

☑ **Primary Objective**

☒ **Secondary Objective**

## Targeted Constituents

| | |
|---|---|
| Sediment | ☑ |
| Nutrients | |
| Trash | ☑ |
| Metals | |
| Bacteria | |
| Oil and Grease | |
| Organics | |

## Potential Alternatives

SE-2 Sediment Basin (for larger areas)

## Description and Purpose

A sediment trap is a containment area where sediment-laden runoff is temporarily detained under quiescent conditions, allowing sediment to settle out or before the runoff is discharged. Sediment traps are formed by excavating or constructing an earthen embankment across a waterway or low drainage area.

## Suitable Applications

Sediment traps should be considered for use:

- At the perimeter of the site at locations where sediment-laden runoff is discharged offsite.
- At multiple locations within the project site where sediment control is needed.
- Around or upslope from storm drain inlet protection measures.
- Sediment traps may be used on construction projects where the drainage area is less than 5 acres. Traps would be placed where sediment-laden stormwater may enter a storm drain or watercourse. SE-2, Sediment Basins, must be used for drainage areas greater than 5 acres.
- As a supplemental control, sediment traps provide additional protection for a water body or for reducing sediment before it enters a drainage system.

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## Limitations

- Requires large surface areas to permit infiltration and settling of sediment.
- Not appropriate for drainage areas greater than 5 acres.
- Only removes large and medium sized particles and requires upstream erosion control.
- Attractive and dangerous to children, requiring protective fencing.
- Conducive to vector production.
- Should not be located in live streams.

## Implementation

### *Design*

A sediment trap is a small temporary ponding area, usually with a gravel outlet, formed by excavation or by construction of an earthen embankment. Its purpose is to collect and store sediment from sites cleared or graded during construction. It is intended for use on small drainage areas with no unusual drainage features and projected for a quick build-out time. It should help in removing coarse sediment from runoff. The trap is a temporary measure with a design life of approximately six months to one year and is to be maintained until the site area is permanently protected against erosion by vegetation and/or structures.

Sediment traps should be used only for small drainage areas. If the contributing drainage area is greater than 5 acres, refer to SE-2, Sediment Basins, or subdivide the catchment area into smaller drainage basins.

Sediment usually must be removed from the trap after each rainfall event. The SWPPP should detail how this sediment is to be disposed of, such as in fill areas onsite, or removal to an approved offsite dump. Sediment traps used as perimeter controls should be installed before any land disturbance takes place in the drainage area.

Sediment traps are usually small enough that a failure of the structure would not result in a loss of life, damage to home or buildings, or interruption in the use of public roads or utilities. However, sediment traps are attractive to children and can be dangerous. The following recommendations should be implemented to reduce risks:

- Install continuous fencing around the sediment trap or pond. Consult local ordinances regarding requirements for maintaining health and safety.
- Restrict basin side slopes to 3:1 or flatter.

Sediment trap size depends on the type of soil, size of the drainage area, and desired sediment removal efficiency (see SE-2, Sediment Basin). As a rule of thumb, the larger the basin volume the greater the sediment removal efficiency. Sizing criteria are typically established under the local grading ordinance or equivalent. The runoff volume from a 2-year storm is a common design criteria for a sediment trap. The sizing criteria below assume that this runoff volume is 0.042 acre-ft/acre (0.5 in. of runoff). While the climatic, topographic, and soil type extremes make it difficult to establish a statewide standard, the following criteria should trap moderate to high amounts of sediment in most areas of California:

- Locate sediment traps as near as practical to areas producing the sediment.
- Trap should be situated according to the following criteria: (1) by excavating a suitable area or where a low embankment can be constructed across a swale, (2) where failure would not cause loss of life or property damage, and (3) to provide access for maintenance, including sediment removal and sediment stockpiling in a protected area.
- Trap should be sized to accommodate a settling zone and sediment storage zone with recommended minimum volumes of 67 $yd^3$/acre and 33 $yd^3$/acre of contributing drainage area, respectively, based on 0.5 in. of runoff volume over a 24-hour period. In many cases, the size of an individual trap is limited by available space. Multiple traps or additional volume may be required to accommodate specific rainfall, soil, and site conditions.
- Traps with an impounding levee greater than 4.5 ft tall, measured from the lowest point to the impounding area to the highest point of the levee, and traps capable of impounding more than 35,000 $ft^3$, should be designed by a Registered Civil Engineer. The design should include maintenance requirements, including sediment and vegetation removal, to ensure continuous function of the trap outlet and bypass structures.
- The outlet pipe or open spillway must be designed to convey anticipated peak flows.
- Use rock or vegetation to protect the trap outlets against erosion.
- Fencing should be provided to prevent unauthorized entry.

***Installation***

Sediment traps can be constructed by excavating a depression in the ground or creating an impoundment with a small embankment. Sediment traps should be installed outside the area being graded and should be built prior to the start of the grading activities or removal of vegetation. To minimize the area disturbed by them, sediment traps should be installed in natural depressions or in small swales or drainage ways. The following steps must be followed during installation:

- The area under the embankment must be cleared, grubbed, and stripped of any vegetation and root mat. The pool area should be cleared.
- The fill material for the embankment must be free of roots or other woody vegetation as well as oversized stones, rocks, organic material, or other objectionable material. The embankment may be compacted by traversing with equipment while it is being constructed.
- All cut-and-fill slopes should be 3:1 or flatter.
- When a riser is used, all pipe joints must be watertight.
- When a riser is used, at least the top two-thirds of the riser should be perforated with 0.5 in. diameter holes spaced 8 in. vertically and 10 to 12 in. horizontally. See SE-2, Sediment Basin.
- When an earth or stone outlet is used, the outlet crest elevation should be at least 1 ft below the top of the embankment.

- When crushed stone outlet is used, the crushed stone used in the outlet should meet AASHTO M43, size No. 2 or 24, or its equivalent such as MSHA No. 2. Gravel meeting the above gradation may be used if crushed stone is not available.

## Costs

Average annual cost per installation and maintenance (18 month useful life) is $0.73 per $ft^3$ ($1,300 per drainage acre). Maintenance costs are approximately 20% of installation costs.

## Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Inspect outlet area for erosion and stabilize if required.
- Inspect trap banks for seepage and structural soundness, repair as needed.
- Inspect outlet structure and spillway for any damage or obstructions. Repair damage and remove obstructions as needed.
- Inspect fencing for damage and repair as needed.
- Inspect the sediment trap for area of standing water during every visit. Corrective measures should be taken if the BMP does not dewater completely in 72 hours or less to prevent vector production.
- Sediment that accumulates in the BMP must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the trap capacity. Sediment removed during maintenance may be incorporated into earthwork on the site or disposed of at an appropriate location.
- Remove vegetation from the sediment trap when first detected to prevent pools of standing water and subsequent vector production.
- BMPs that require dewatering shall be continuously attended while dewatering takes place. Dewatering BMPs shall be implemented at all times during dewatering activities.

## References

Brown, W., and T. Schueler. The Economics of Stormwater BMPs in the Mid-Atlantic Region. Prepared for Chesapeake Research Consortium, Edgewater, MD, by the Center for Watershed Protection, Ellicott City, MD, 1997.

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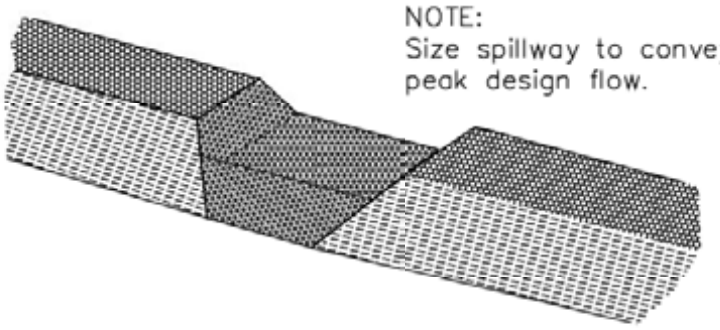
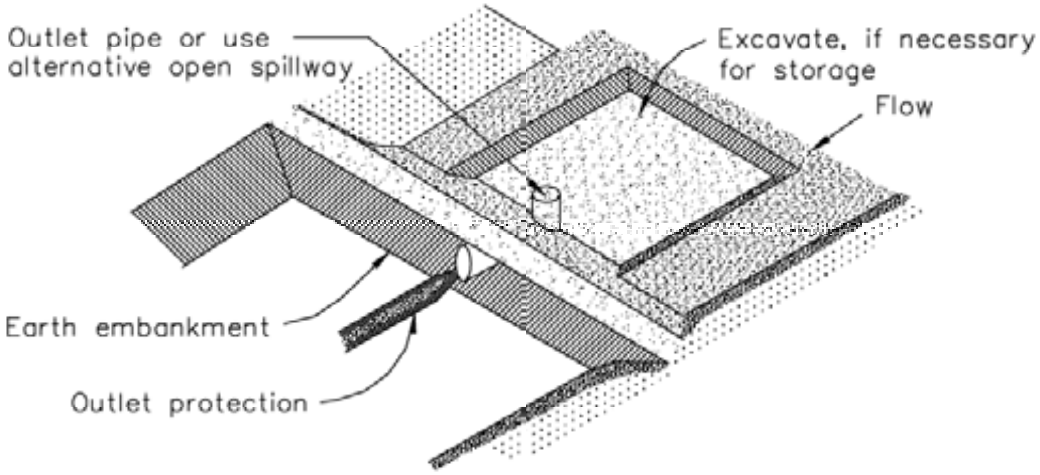
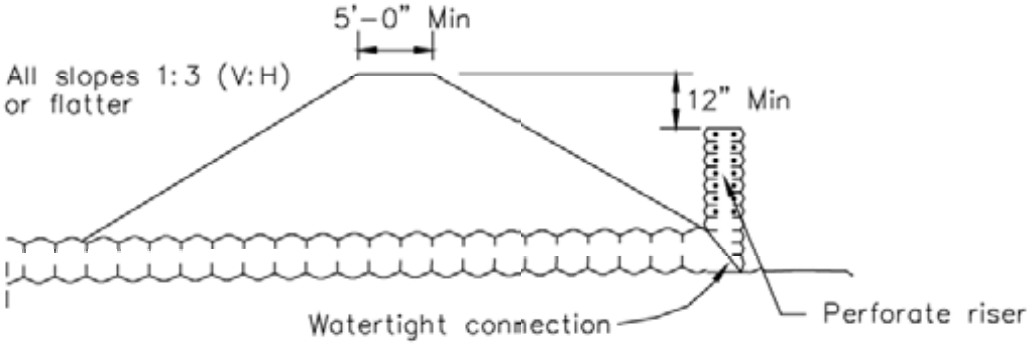



TYPICAL OPEN SPILLWAY

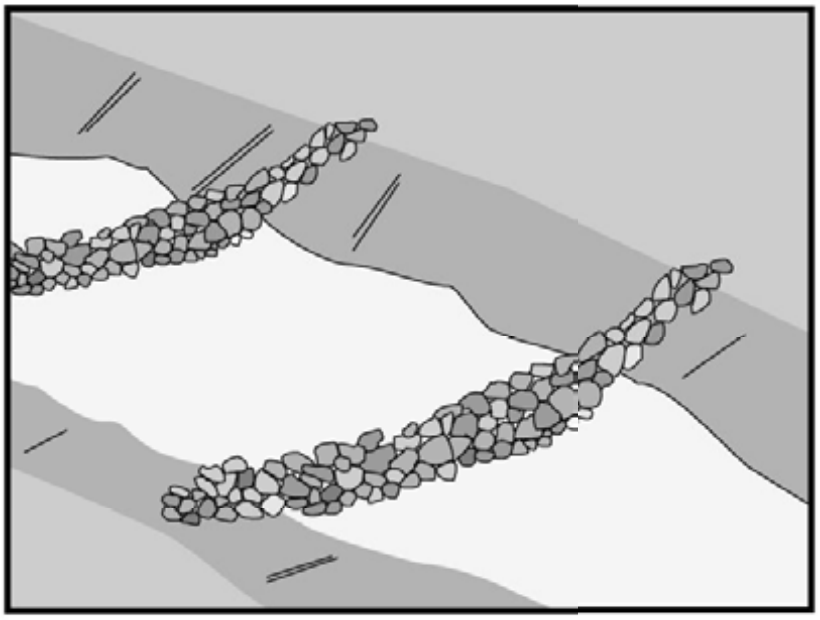



EMBANKMENT SECTION THRU RISER

TYPICAL SEDIMENT TRAP
NOT TO SCALE

# Check Dams SE-4



## Objectives

| | | |
|---|---|---|
| EC | Erosion Control | ☒ |
| SE | Sediment Control | ☑ |
| TR | Tracking Control | |
| WE | Wind Erosion Control | |
| NS | Non-Stormwater Management Control | |
| WM | Waste Management and Materials Pollution Control | |

**Legend:**

☑ **Primary Objective**

☒ **Secondary Objective**

## Targeted Constituents

| | |
|---|---|
| Sediment | ☑ |
| Nutrients | |
| Trash | |
| Metals | |
| Bacteria | |
| Oil and Grease | |
| Organics | |

## Potential Alternatives

SE-5 Fiber Rolls

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

## Description and Purpose

A check dam is a small barrier constructed of rock, gravel bags, sandbags, fiber rolls, or reusable products, placed across a constructed swale or drainage ditch. Check dams reduce the effective slope of the channel, thereby reducing the velocity of flowing water, allowing sediment to settle and reducing erosion.

## Suitable Applications

Check dams may be appropriate in the following situations:

- To promote sedimentation behind the dam.
- To prevent erosion by reducing the velocity of channel flow in small intermittent channels and temporary swales.
- In small open channels that drain 10 acres or less.
- In steep channels where stormwater runoff velocities exceed 5 ft/s.
- During the establishment of grass linings in drainage ditches or channels.
- In temporary ditches where the short length of service does not warrant establishment of erosion-resistant linings.

## Limitations

- Not to be used in live streams or in channels with extended base flows.

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- Not appropriate in channels that drain areas greater than 10 acres.
- Not appropriate in channels that are already grass-lined unless erosion is expected, as installation may damage vegetation.
- Require extensive maintenance following high velocity flows.
- Promotes sediment trapping which can be re-suspended during subsequent storms or removal of the check dam.

## Implementation

### *General*

Check dams reduce the effective slope and create small pools in swales and ditches that drain 10 acres or less. Reduced slopes reduce the velocity of stormwater flows, thus reducing erosion of the swale or ditch and promoting sedimentation. Use of check dams for sedimentation will likely result in little net removal of sediment because of the small detention time and probable scour during longer storms. Using a series of check dams will generally increase their effectiveness. A sediment trap (SE-3) may be placed immediately upstream of the check dam to increase sediment removal efficiency.

### *Design and Layout*

Check dams work by decreasing the effective slope in ditches and swales. An important consequence of the reduced slope is a reduction in capacity of the ditch or swale. This reduction in capacity must be considered when using this BMP, as reduced capacity can result in overtopping of the ditch or swale and resultant consequences. In some cases, such as a "permanent" ditch or swale being constructed early and used as a "temporary" conveyance for construction flows, the ditch or swale may have sufficient capacity such that the temporary reduction in capacity due to check dams is acceptable. When check dams reduce capacities beyond acceptable limits, there are several options:

- Don't use check dams. Consider alternative BMPs.
- Increase the size of the ditch or swale to restore capacity.

Maximum slope and velocity reduction is achieved when the toe of the upstream dam is at the same elevation as the top of the downstream dam. The center section of the dam should be lower than the edge sections so that the check dam will direct flows to the center of the ditch or swale.

Check dams are usually constructed of rock, gravel bags, sandbags, and fiber rolls. A number of products manufactured specifically for use as check dams are also being used, and some of these products can be removed and reused. Check dams can also be constructed of logs or lumber, and have the advantage of a longer lifespan when compared to gravel bags, sandbags, and fiber rolls. Straw bales can also be used for check dams and can work if correctly installed; but in practice, straw bale check dams have a high failure rate. Check dams should not be constructed from straw bales or silt fences, since concentrated flows quickly wash out these materials.

Rock check dams are usually constructed of 8 to 12 in. rock. The rock is placed either by hand or mechanically, but never just dumped into the channel. The dam must completely span the ditch

or swale to prevent washout. The rock used must be large enough to stay in place given the expected design flow through the channel.

Log check dams are usually constructed of 4 to 6 in. diameter logs. The logs should be embedded into the soil at least 18 in. Logs can be bolted or wired to vertical support logs that have been driven or buried into the soil.

Gravel bag and sandbag check dams are constructed by stacking bags across the ditch or swale, shaped as shown in the drawings at the end of this fact sheet.

Manufactured products should be installed in accordance with the manufacturer's instructions.

If grass is planted to stabilize the ditch or swale, the check dam should be removed when the grass has matured (unless the slope of the swales is greater than 4%).

The following guidance should be followed for the design and layout of check dams:

- Install the first check dam approximately 16 ft from the outfall device and at regular intervals based on slope gradient and soil type.
- Check dams should be placed at a distance and height to allow small pools to form between each check dam.
- Backwater from a downstream check dam should reach the toes of the upstream check dam.
- A sediment trap provided immediately upstream of the check dam will help capture sediment. Due to the potential for this sediment to be resuspended in subsequent storms, the sediment trap must be cleaned following each storm event.
- High flows (typically a 2-year storm or larger) should safely flow over the check dam without an increase in upstream flooding or damage to the check dam.
- Where grass is used to line ditches, check dams should be removed when grass has matured sufficiently to protect the ditch or swale.
- Gravel bags may be used as check dams with the following specifications:

### *Materials*

Gravel bags used for check dams should conform to the requirements of SE-6, Gravel Bag Berms. Sandbags used for check dams should conform to SE-8, Sandbag Barrier. Fiber rolls used for check dams should conform to SE-5, Fiber Rolls. Straw bales used for check dams should conform to SE-9, Straw Bale Barrier.

### *Installation*

- Rock should be placed individually by hand or by mechanical methods (no dumping of rock) to achieve complete ditch or swale coverage.
- Tightly abut bags and stack according to detail shown in the figure at the end of this section. Gravel bags and sandbags should not be stacked any higher than 3 ft.
- Fiber rolls and straw bales must be trenched in and firmly staked in place.

## Costs

Cost consists of only installation costs if materials are readily available. If material must be imported, costs may increase. For material costs, see SE-5, SE-6, SE-8 and SE-9.

## Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Replace missing rock, bags, bales, etc. Replace bags or bales that have degraded or have become damaged.
- If the check dam is used as a sediment capture device, sediment that accumulates in the BMP must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height. Sediment removed during maintenance may be incorporated into earthwork on the site or disposed at an appropriate location.
- If the check dam is used as a grade control structure, sediment removal is not required as long as the system continues to control the grade.
- Remove accumulated sediment prior to permanent seeding or soil stabilization.
- Remove check dam and accumulated sediment when check dams are no longer needed.

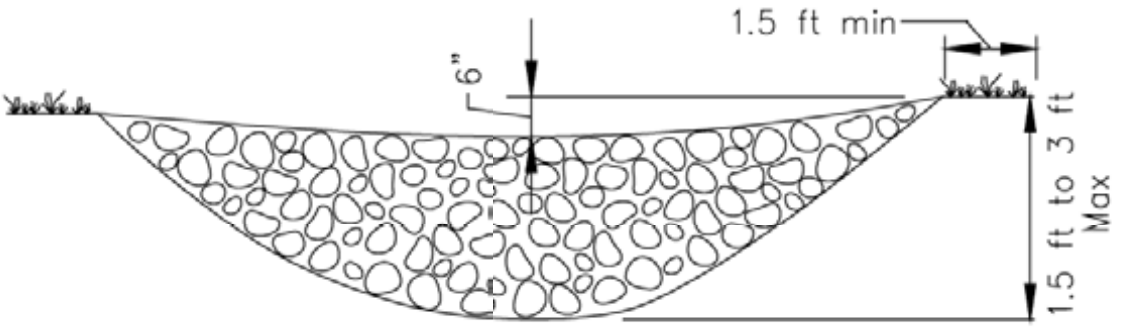
## References

Draft – Sedimentation and Erosion Control, and Inventory of Current Practices, USEPA, April 1990.

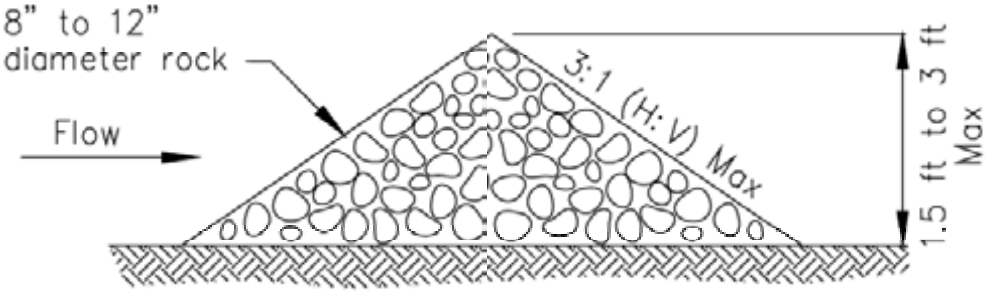
Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

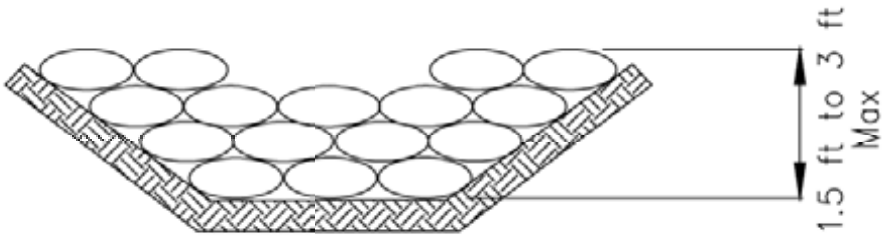



ELEVATION



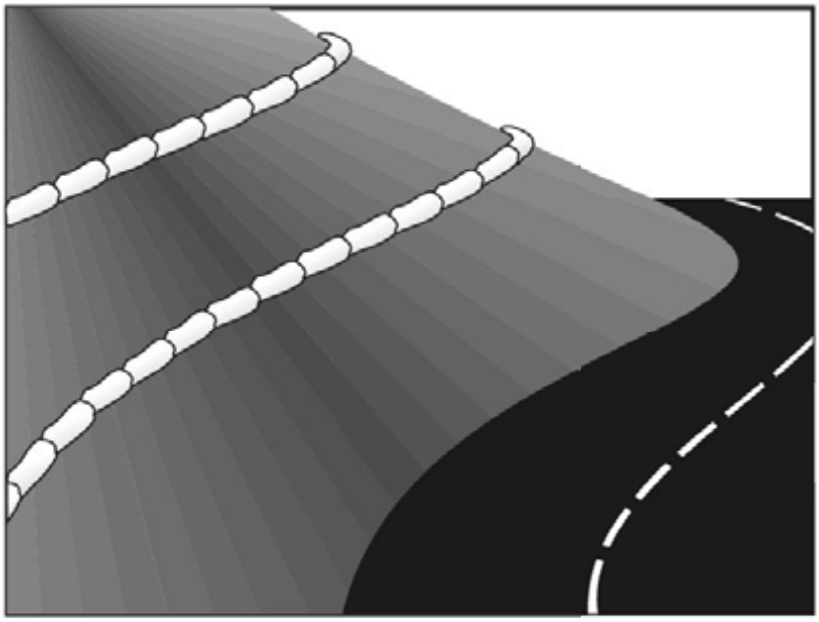

TYPICAL ROCK CHECK DAM SECTION

ROCK CHECK DAM
NOT TO SCALE




GRAVEL BAG CHECK DAM ELEVATION
NOT TO SCALE

# Gravel Bag Berm SE-6



## Objectives

| | | |
|---|---|---|
| EC | Erosion Control | ☒ |
| SE | Sediment Control | ☑ |
| TR | Tracking Control | |
| WE | Wind Erosion Control | |
| NS | Non-Stormwater Management Control | |
| WM | Waste Management and Materials Pollution Control | |

**Legend:**

☑ **Primary Objective**

☒ **Secondary Objective**

## Targeted Constituents

| | |
|---|---|
| Sediment | ☑ |
| Nutrients | |
| Trash | |
| Metals | |
| Bacteria | |
| Oil and Grease | |
| Organics | |

## Potential Alternatives

SE-1 Silt Fence

SE-5 Fiber Roll

SE-8 Sandbag Barrier

SE-9 Straw Bale Barrier

## Description and Purpose

A gravel bag berm is a series of gravel-filled bags placed on a level contour to intercept sheet flows. Gravel bags pond sheet flow runoff, allowing sediment to settle out, and release runoff slowly as sheet flows, preventing erosion.

## Suitable Applications

Gravel bag berms may be suitable:

- As a linear sediment control measure:
  - Below the toe of slopes and erodible slopes
  - As sediment traps at culvert/pipe outlets
  - Below other small cleared areas
  - Along the perimeter of a site
  - Down slope of exposed soil areas
  - Around temporary stockpiles and spoil areas
  - Parallel to a roadway to keep sediment off paved areas
  - Along streams and channels
- As linear erosion control measure:

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- Along the face and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow
- At the top of slopes to divert runoff away from disturbed slopes
- As check dams across mildly sloped construction roads

## Limitations

- Gravel berms may be difficult to remove.
- Removal problems limit their usefulness in landscaped areas.
- Gravel bag berm may not be appropriate for drainage areas greater than 5 acres.
- Runoff will pond upstream of the filter, possibly causing flooding if sufficient space does not exist.
- Degraded gravel bags may rupture when removed, spilling contents.
- Installation can be labor intensive.
- Berms may have limited durability for long-term projects.
- When used to detain concentrated flows, maintenance requirements increase.

## Implementation

### *General*

A gravel bag berm consists of a row of open graded gravel–filled bags placed on a level contour. When appropriately placed, a gravel bag berm intercepts and slows sheet flow runoff, causing temporary ponding. The temporary ponding provides quiescent conditions allowing sediment to settle. The open graded gravel in the bags is porous, which allows the ponded runoff to flow slowly through the bags, releasing the runoff as sheet flows. Gravel bag berms also interrupt the slope length and thereby reduce erosion by reducing the tendency of sheet flows to concentrate into rivulets, which erode rills, and ultimately gullies, into disturbed, sloped soils. Gravel bag berms are similar to sand bag barriers, but are more porous.

### *Design and Layout*

- Locate gravel bag berms on level contours.
  - Slopes between 20:1 and 2:1 (H:V): Gravel bags should be placed at a maximum interval of 50 ft (a closer spacing is more effective), with the first row near the slope toe.
  - Slopes 2:1 (H:V) or steeper: Gravel bags should be placed at a maximum interval of 25 ft (a closer spacing is more effective), with the first row placed the slope toe.
- Turn the ends of the gravel bag barriers up slope to prevent runoff from going around the berm.
- Allow sufficient space up slope from the gravel bag berm to allow ponding, and to provide room for sediment storage.

- For installation near the toe of the slope, consider moving the gravel bag barriers away from the slope toe to facilitate cleaning. To prevent flows behind the barrier, bags can be placed perpendicular to a berm to serve as cross barriers.
- Drainage area should not exceed 5 acres.
- In Non-Traffic Areas:
  - Height = 18 in. maximum
  - Top width = 24 in. minimum for three or more layer construction
  - Top width = 12 in. minimum for one or two layer construction
  - Side slopes = 2:1 or flatter
- In Construction Traffic Areas:
  - Height = 12 in. maximum
  - Top width = 24 in. minimum for three or more layer construction.
  - Top width = 12 in. minimum for one or two layer construction.
  - Side slopes = 2:1 or flatter.
- Butt ends of bags tightly
- On multiple row, or multiple layer construction, overlapp butt joints of adjacent row and row beneath.
- Use a pyramid approach when stacking bags.

### *Materials*

- ***Bag Material:*** Bags should be woven polypropylene, polyethylene or polyamide fabric or burlap, minimum unit weight of 4 ounces/yd$^2$, Mullen burst strength exceeding 300 lb/in$^2$ in conformance with the requirements in ASTM designation D3786, and ultraviolet stability exceeding 70% in conformance with the requirements in ASTM designation D4355.
- ***Bag Size:*** Each gravel-filled bag should have a length of 18 in., width of 12 in., thickness of 3 in., and mass of approximately 33 lbs. Bag dimensions are nominal, and may vary based on locally available materials.
- ***Fill Material:*** Fill material should be 0.5 to 1 in. Class 2 aggregate base, clean and free from clay, organic matter, and other deleterious material, or other suitable open graded, non-cohesive, porous gravel.

## Costs

Gravel filter: Expensive, since off-site materials, hand construction, and demolition/removal are usually required. Material costs for gravel bags are average of $2.50 per empty gravel bag. Gravel costs range from $20-$35 per yd$^3$.

## Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Gravel bags exposed to sunlight will need to be replaced every two to three months due to degrading of the bags.
- Reshape or replace gravel bags as needed.
- Repair washouts or other damage as needed.
- Sediment that accumulates in the BMP must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height. Sediment removed during maintenance may be incorporated into earthwork on the site or disposed at an appropriate location.
- Remove gravel bag berms when no longer needed. Remove sediment accumulation and clean, re-grade, and stabilize the area. Removed sediment should be incorporated in the project or disposed of.

## References

Handbook of Steel Drainage and Highway Construction, American Iron and Steel Institute, 1983.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Pollution Plan Handbook, First Edition, State of California, Department of Transportation Division of New Technology, Materials and Research, October 1992.

# Street Sweeping and Vacuuming SE-7

| Objectives | | |
|---|---|---|
| EC | Erosion Control | |
| SE | Sediment Control | ☒ |
| TR | Tracking Control | ☑ |
| WE | Wind Erosion Control | |
| NS | Non-Stormwater Management Control | |
| WM | Waste Management and Materials Pollution Control | |

**Legend:**
☑ **Primary Objective**
☒ **Secondary Objective**

| Targeted Constituents | |
|---|---|
| Sediment | ☑ |
| Nutrients | |
| Trash | ☑ |
| Metals | |
| Bacteria | |
| Oil and Grease | ☑ |
| Organics | |

**Potential Alternatives**

None

## Description and Purpose

Street sweeping and vacuuming includes use of self-propelled and walk-behind equipment to remove sediment from streets and roadways, and to clean paved surfaces in preparation for final paving. Sweeping and vacuuming prevents sediment from the project site from entering storm drains or receiving waters.

## Suitable Applications

Sweeping and vacuuming are suitable anywhere sediment is tracked from the project site onto public or private paved streets and roads, typically at points of egress. Sweeping and vacuuming are also applicable during preparation of paved surfaces for final paving.

## Limitations

Sweeping and vacuuming may not be effective when sediment is wet or when tracked soil is caked (caked soil may need to be scraped loose).

## Implementation

- Controlling the number of points where vehicles can leave the site will allow sweeping and vacuuming efforts to be focused, and perhaps save money.
- Inspect potential sediment tracking locations daily.
- Visible sediment tracking should be swept or vacuumed on a daily basis.

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- Do not use kick brooms or sweeper attachments. These tend to spread the dirt rather than remove it.
- If not mixed with debris or trash, consider incorporating the removed sediment back into the project

## Costs

Rental rates for self-propelled sweepers vary depending on hopper size and duration of rental. Expect rental rates from $58/hour (3 yd³ hopper) to $88/hour (9 yd³ hopper), plus operator costs. Hourly production rates vary with the amount of area to be swept and amount of sediment. Match the hopper size to the area and expect sediment load to minimize time spent dumping.

## Inspection and Maintenance

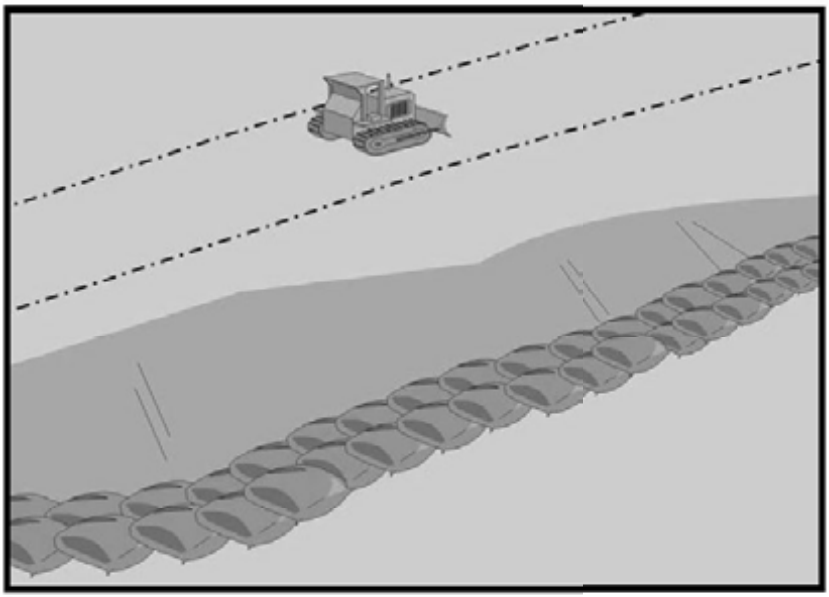
- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- When actively in use, points of ingress and egress must be inspected daily.
- When tracked or spilled sediment is observed outside the construction limits, it must be removed at least daily. More frequent removal, even continuous removal, may be required in some jurisdictions.
- Be careful not to sweep up any unknown substance or any object that may be potentially hazardous.
- Adjust brooms frequently; maximize efficiency of sweeping operations.
- After sweeping is finished, properly dispose of sweeper wastes at an approved dumpsite.

## References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Labor Surcharge and Equipment Rental Rates, State of California Department of Transportation (Caltrans), April 1, 2002 – March 31, 2003.

# Sandbag Barrier SE-8



## Objectives

| | | |
|---|---|---|
| EC | Erosion Control | ☒ |
| SE | Sediment Control | ☑ |
| TR | Tracking Control | |
| WE | Wind Erosion Control | |
| NS | Non-Stormwater Management Control | |
| WM | Waste Management and Materials Pollution Control | |

**Legend:**

☑ **Primary Objective**

☒ **Secondary Objective**

## Description and Purpose

A sandbag barrier is a series of sand-filled bags placed on a level contour to intercept sheet flows. Sandbag barriers pond sheet flow runoff, allowing sediment to settle out.

## Suitable Applications

Sandbag barriers may be suitable:

- As a linear sediment control measure:
  - Below the toe of slopes and erodible slopes
  - As sediment traps at culvert/pipe outlets
  - Below other small cleared areas
  - Along the perimeter of a site
  - Down slope of exposed soil areas
  - Around temporary stockpiles and spoil areas
  - Parallel to a roadway to keep sediment off paved areas
  - Along streams and channels
- As linear erosion control measure:
  - Along the face and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow

## Targeted Constituents

| | |
|---|---|
| Sediment | ☑ |
| Nutrients | |
| Trash | |
| Metals | |
| Bacteria | |
| Oil and Grease | |
| Organics | |

## Potential Alternatives

SE-1 Silt Fence

SE-5 Fiber Rolls

SE-6 Gravel Bag Berm

SE-9 Straw Bale Barrier

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- At the top of slopes to divert runoff away from disturbed slopes
- As check dams across mildly sloped construction roads

## Limitations

- It is necessary to limit the drainage area upstream of the barrier to 5 acres.
- Degraded sandbags may rupture when removed, spilling sand.
- Installation can be labor intensive.
- Barriers may have limited durability for long-term projects.
- When used to detain concentrated flows, maintenance requirements increase.
- Burlap should not be used for sandbags.

## Implementation

### *General*

A sandbag barrier consists of a row of sand-filled bags placed on a level contour. When appropriately placed, a sandbag barrier intercepts and slows sheet flow runoff, causing temporary ponding. The temporary ponding provides quiescent conditions allowing sediment to settle. While the sand-filled bags are porous, the fine sand tends to quickly plug with sediment, limiting the rate of flow through the barrier. If a porous barrier is desired, consider SE-1, Silt Fence, SE-5, Fiber Rolls, SE-6, Gravel Bag Berms, or SE-9, Straw Bale Barriers. Sandbag barriers also interrupt the slope length and thereby reduce erosion by reducing the tendency of sheet flows to concentrate into rivulets which erode rills, and ultimately gullies, into disturbed, sloped soils. Sandbag barriers are similar to ground bag berms, but less porous.

### *Design and Layout*

- Locate sandbag barriers on a level contour.
  - Slopes between 20:1 and 2:1 (H:V): Sandbags should be placed at a maximum interval of 50 ft (a closer spacing is more effective), with the first row near the slope toe.
  - Slopes 2:1 (H:V) or steeper: Sandbags should be placed at a maximum interval of 25 ft (a closer spacing is more effective), with the first row placed near the slope toe.
- Turn the ends of the sandbag barrier up slope to prevent runoff from going around the barrier.
- Allow sufficient space up slope from the barrier to allow ponding, and to provide room for sediment storage.
- For installation near the toe of the slope, consider moving the barrier away from the slope toe to facilitate cleaning. To prevent flow behind the barrier, sandbags can be placed perpendicular to the barrier to serve as cross barriers.
- Drainage area should not exceed 5 acres.

- Stack sandbags at least three bags high.
- Butt ends of bags tightly.
- Overlapp butt joints of row beneath with each successive row.
- Use a pyramid approach when stacking bags.
- In non-traffic areas
  - Height = 18 in. maximum
  - Top width = 24 in. minimum for three or more layer construction
  - Side slope = 2:1 or flatter
- In construction traffic areas
  - Height = 12 in. maximum
  - Top width = 24 in. minimum for three or more layer construction.
  - Side slopes = 2:1 or flatter.

***Materials***

- ***Sandbag Material:*** Sandbag should be woven polypropylene, polyethylene or polyamide fabric, minimum unit weight of 4 ounces/yd², Mullen burst strength exceeding 300 lb/in² in conformance with the requirements in ASTM designation D3786, and ultraviolet stability exceeding 70% in conformance with the requirements in ASTM designation D4355. Use of burlap may not acceptable in some jurisdictions.
- ***Sandbag Size:*** Each sand-filled bag should have a length of 18 in., width of 12 in., thickness of 3 in., and mass of approximately 33 lbs. Bag dimensions are nominal, and may vary based on locally available materials.
- ***Fill Material:*** All sandbag fill material should be non-cohesive, Class 1 or Class 2 permeable material free from clay and deleterious material.

## Costs

Sandbag barriers are more costly, but typically have a longer useful life than other barriers. Empty sandbags cost $0.25 - $0.75. Average cost of fill material is $8 per yd³. Pre-filled sandbags are more expensive at $1.50 - $2.00 per bag.

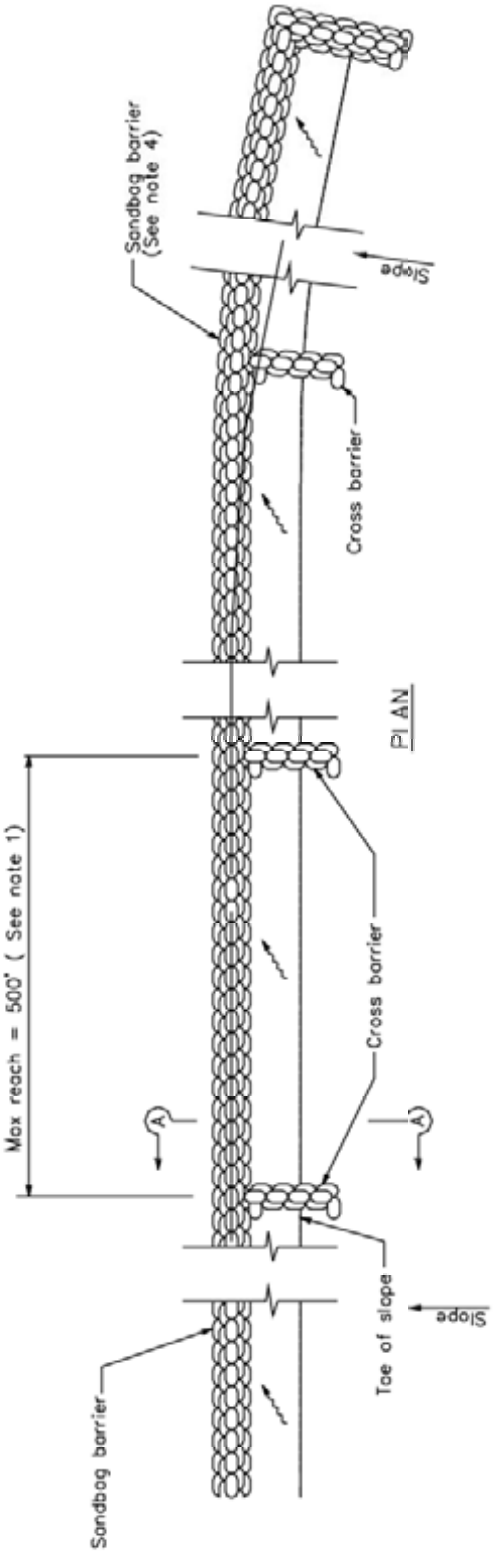
## Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Sandbags exposed to sunlight will need to be replaced every two to three months due to degradation of the bags.
- Reshape or replace sandbags as needed.

- Repair washouts or other damage as needed.
- Sediment that accumulates in the BMP must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height. Sediment removed during maintenance may be incorporated into earthwork on the site or disposed at an appropriate location.
- Remove sandbags when no longer needed. Remove sediment accumulation, and clean, re-grade, and stabilize the area.

## References

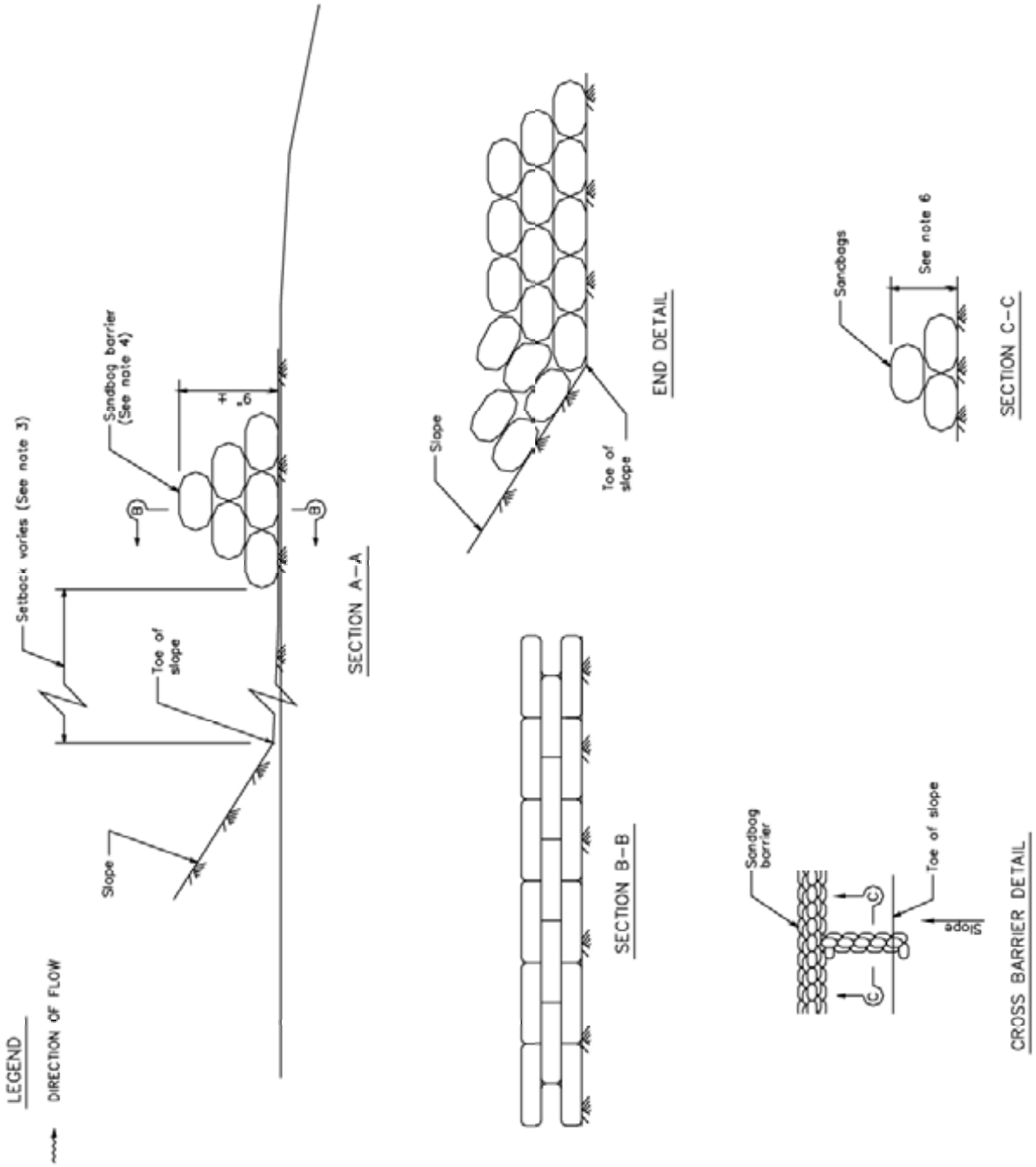
Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.



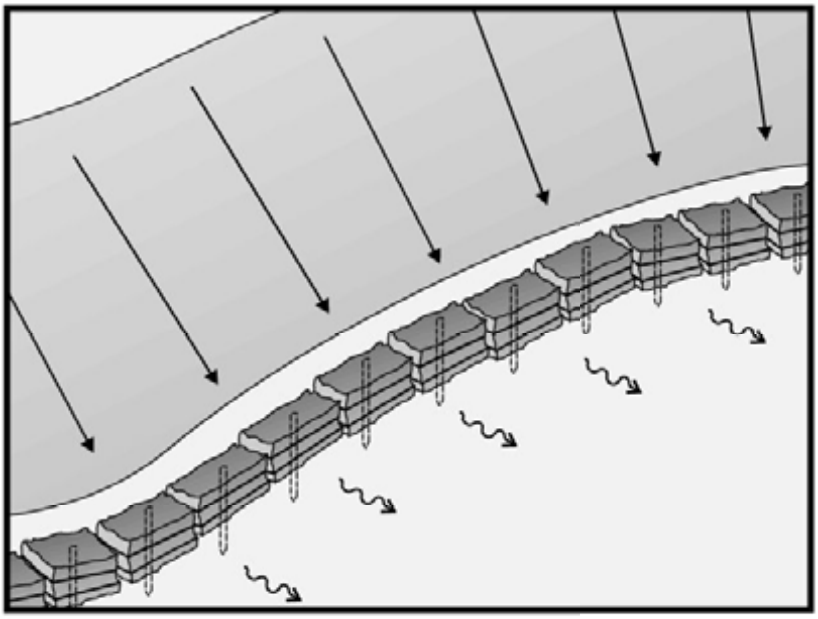

SANDBAG BARRIER

NOTES

1. Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/2 the height of the linear barrier. In no case shall the reach length exceed 500'.
2. Place sandbags tightly.
3. Dimension may vary to fit field condition.
4. Sandbag barrier shall be a minimum of 3 bags high.
5. The end of the barrier shall be turned up slope.
6. Cross barriers shall be a min of 1/2 and a max of 2/3 the height of the linear barrier.
7. Sandbag rows and layers shall be staggered to eliminate gaps.


LEGEND
DIRECTION OF FLOW
Setback varies (See note 3)
Sandbag barrier (See note 4)
H
Toe of slope
Slope
B
B
SECTION A–A
Slope
Toe of slope
END DETAIL
SECTION B–B
Sandbags
See note 6
SECTION C–C
Sandbag barrier
C
C
Toe of slope
Slope
CROSS BARRIER DETAIL

# Straw Bale Barrier SE-9



## Objectives

| | | |
|---|---|---|
| EC | Erosion Control | ☒ |
| SE | Sediment Control | ☑ |
| TR | Tracking Control | |
| WE | Wind Erosion Control | |
| NS | Non-Stormwater Management Control | |
| WM | Waste Management and Materials Pollution Control | |

**Legend:**

☑ **Primary Objective**

☒ **Secondary Objective**

## Targeted Constituents

| | |
|---|---|
| Sediment | ☑ |
| Nutrients | |
| Trash | |
| Metals | |
| Bacteria | |
| Oil and Grease | |
| Organics | |

## Potential Alternatives

SE-1 Silt Fence

SE-5 Fiber Rolls

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

## Description and Purpose

A straw bale barrier is a series of straw bales placed on a level contour to intercept sheet flows. Straw bale barriers pond sheet- flow runoff, allowing sediment to settle out.

## Suitable Applications

Straw bale barriers may be suitable:

- As a linear sediment control measure:
  - Below the toe of slopes and erodible slopes
  - As sediment traps at culvert/pipe outlets
  - Below other small cleared areas
  - Along the perimeter of a site
  - Down slope of exposed soil areas
  - Around temporary stockpiles and spoil areas
  - Parallel to a roadway to keep sediment off paved areas
  - Along streams and channels
- As linear erosion control measure:
  - Along the face and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow

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- At the top of slopes to divert runoff away from disturbed slopes
- As check dams across mildly sloped construction roads

## Limitations

Straw bale barriers:

- Are not to be used for extended periods of time because they tend to rot and fall apart
- Are suitable only for sheet flow on slopes of 10 % or flatter
- Are not appropriate for large drainage areas, limit to one acre or less
- May require constant maintenance due to rotting
- Are not recommended for concentrated flow, inlet protection, channel flow, and live streams
- Cannot be made of bale bindings of jute or cotton
- Require labor-intensive installation and maintenance
- Cannot be used on paved surfaces
- Should not to be used for drain inlet protection
- Should not be used on lined ditches
- May introduce undesirable non-native plants to the area

## Implementation

### *General*

A straw bale barrier consists of a row of straw bales placed on a level contour. When appropriately placed, a straw bale barrier intercepts and slows sheet flow runoff, causing temporary ponding. The temporary ponding provides quiescent conditions allowing sediment to settle. Straw bale barriers also interrupt the slope length and thereby reduce erosion by reducing the tendency of sheet flows to concentrate into rivulets, which erode rills, and ultimately gullies, into disturbed, sloped soils.

Straw bale barriers have not been as effective as expected due to improper use. These barriers have been placed in streams and drainage ways where runoff volumes and velocities have caused the barriers to wash out. In addition, failure to stake and entrench the straw bale has allowed undercutting and end flow. Use of straw bale barriers in accordance with this BMP should produce acceptable results.

### *Design and Layout*

- Locate straw bale barriers on a level contour.
  - Slopes up to 10:1 (H:V): Straw bales should be placed at a maximum interval of 50 ft (a closer spacing is more effective), with the first row near the toe of slope.
  - Slopes greater than 10:1 (H:V): Not recommended.

- Turn the ends of the straw bale barrier up slope to prevent runoff from going around the barrier.
- Allow sufficient space up slope from the barrier to allow ponding, and to provide room for sediment storage.
- For installation near the toe of the slope, consider moving the barrier away from the slope toe to facilitate cleaning. To prevent flow behind the barrier, sand bags can be placed perpendicular to the barrier to serve as cross barriers.
- Drainage area should not exceed 1 acre, or 0.25 acre per 100 ft of barrier.
- Maximum flow path to the barrier should be limited to 100 ft.
- Straw bale barriers should consist of two parallel rows.
  - Butt ends of bales tightly
  - Stagger butt joints between front and back row
  - Each row of bales must be trenched in and firmly staked
- Straw bale barriers are limited in height to one bale laid on its side.
- Anchor bales with either two wood stakes or four bars driven through the bale and into the soil. Drive the first stake towards the butt joint with the adjacent bale to force the bales together.
- See attached figure for installation details.

***Materials***

- ***Straw Bale Size:*** Each straw bale should be a minimum of 14 in. wide, 18 in. in height, 36 in. in length and should have a minimum mass of 50 lbs. The straw bale should be composed entirely of vegetative matter, except for the binding material.
- ***Bale Bindings:*** Bales should be bound by steel wire, nylon or polypropylene string placed horizontally. Jute and cotton binding should not be used. Baling wire should be a minimum diameter of 14 gauge. Nylon or polypropylene string should be approximately 12 gauge in diameter with a breaking strength of 80 lbs force.
- ***Stakes:*** Wood stakes should be commercial quality lumber of the size and shape shown on the plans. Each stake should be free from decay, splits or cracks longer than the thickness of the stake, or other defects that would weaken the stakes and cause the stakes to be structurally unsuitable. Steel bar reinforcement should be equal to a #4 designation or greater. End protection should be provided for any exposed bar reinforcement.

## Costs

Straw bales cost $5 - $7 each. Adequate labor should be budgeted for installation and maintenance.

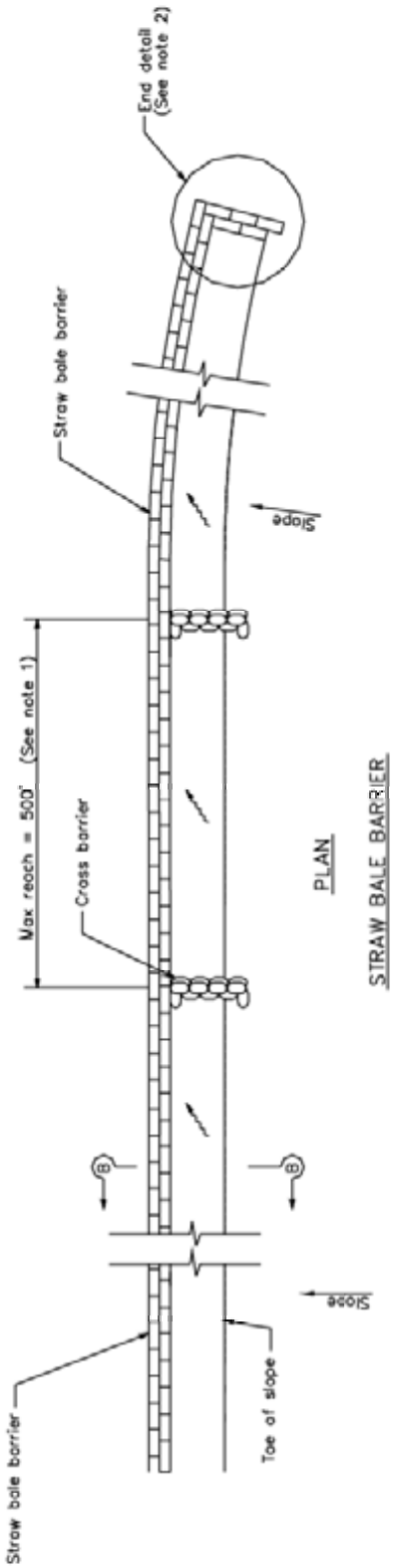
## Inspection and Maintenance

***Maintenance***

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Straw bales degrade, especially when exposed to moisture. Rotting bales will need to be replaced on a regular basis.
- Replace or repair damaged bales as needed.
- Repair washouts or other damages as needed.
- Sediment that accumulates in the BMP must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height. Sediment removed during maintenance may be incorporated into earthwork on the site or disposed at an appropriate location.
- Remove straw bales when no longer needed. Remove sediment accumulation, and clean, re-grade, and stabilize the area. Removed sediment should be incorporated in the project or disposed of.

## References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.




PLAN

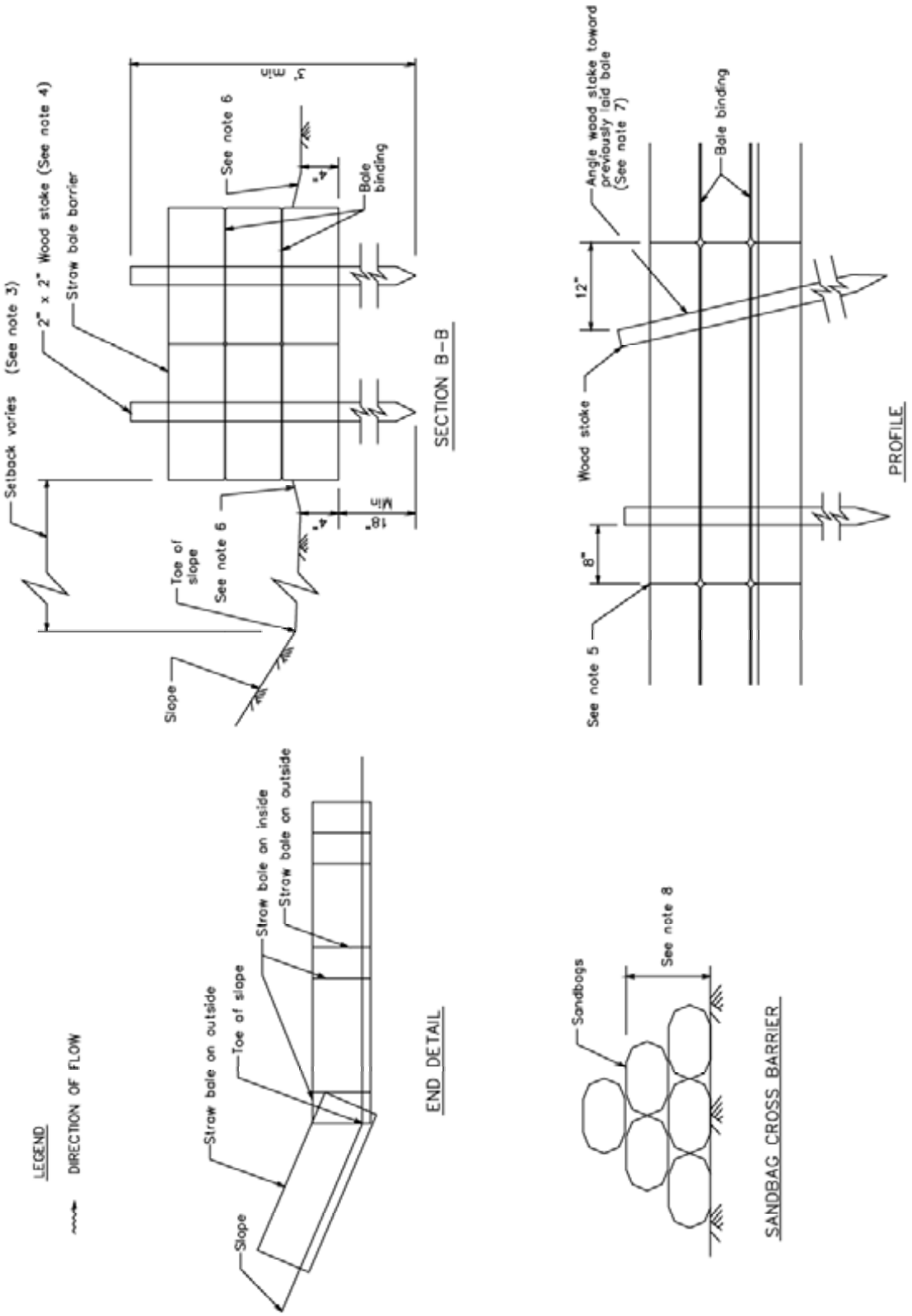
STRAW BALE BARRIER

LEGEND

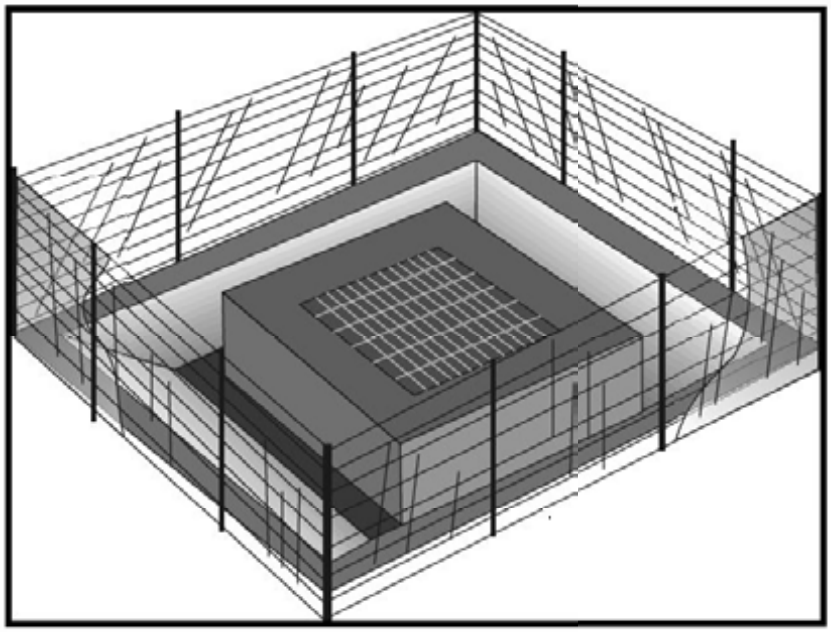
DIRECTION OF FLOW

NOTES

1. Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/2 the height of the linear barrier. In no case shall the reach length exceed 500'.
2. The end of barrier shall be turned up slope.
3. Dimension may vary to fit field condition.
4. Stake dimensions are nominal.
5. Place straw bales tightly together.
6. Tamp embedment spoils against sides of installed bales.
7. Drive angled wood stake before vertical stake to ensure tight abutment to adjacent bale.
8. Sandbag cross barriers should be a min of 1/2 and a max of 2/3 the height of the linear barrier.
9. Sandbag rows and layers should be offset to eliminate gaps.


Setback varies (See note 3)
2" x 2" Wood stake (See note 4)
Straw bale barrier
See note 6
Bale binding
Min. 4"
Min. 18"
Toe of slope
See note 6
Slope
SECTION B-B
Angle wood stake toward previously laid bale (See note 7)
Bale binding
12"
Wood stake
8"
See note 5
PROFILE
LEGEND
DIRECTION OF FLOW
Straw bale on outside
Toe of slope
Straw bale on inside
Straw bale on outside
Slope
END DETAIL
Sandbags
See note 8
SANDBAG CROSS BARRIER

# Storm Drain Inlet Protection SE-10



| Objectives | | |
|---|---|---|
| EC | Erosion Control | |
| SE | Sediment Control | ☑ |
| TR | Tracking Control | |
| WE | Wind Erosion Control | |
| NS | Non-Stormwater Management Control | |
| WM | Waste Management and Materials Pollution Control | |

**Legend:**
☑ **Primary Objective**
☒ **Secondary Objective**

| Targeted Constituents | |
|---|---|
| Sediment | ☑ |
| Nutrients | |
| Trash | ☑ |
| Metals | |
| Bacteria | |
| Oil and Grease | |
| Organics | |

**Potential Alternatives**

SE-1 Silt Fence
SE-5 Fiber Rolls
SE-6 Gravel Bag Berm
SE-8 Sandbag Barrier
SE-9 Straw Bale Barrier

## Description and Purpose

Storm drain inlet protection consists of a sediment filter or an impounding area around or upstream of a storm drain, drop inlet, or curb inlet. Storm drain inlet protection measures temporarily pond runoff before it enters the storm drain, allowing sediment to settle. Some filter configurations also remove sediment by filtering, but usually the ponding action results in the greatest sediment reduction.

## Suitable Applications

Every storm drain inlet receiving sediment-laden runoff should be protected.

## Limitations

- Drainage area should not exceed 1 acre.
- Straw bales, while potentially effective, have not produced in practice satisfactory results, primarily due to improper installation.
- Requires an adequate area for water to pond without encroaching into portions of the roadway subject to traffic.
- Inlet protection usually requires other methods of temporary protection to prevent sediment-laden stormwater and non-stormwater discharges from entering the storm drain system.
- Sediment removal may be difficult in high flow conditions or if runoff is heavily sediment laden. If high flow conditions are

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expected, use other onsite sediment trapping techniques in conjunction with inlet protection.

- Frequent maintenance is required.
- For drainage areas larger than 1 acre, runoff should be routed to a sediment-trapping device designed for larger flows. See BMPs SE-2, Sediment Basin, and SE-3, Sediment Traps.
- Excavated drop inlet sediment traps are appropriate where relatively heavy flows are expected, and overflow capability is needed.

## Implementation

### *General*

Large amounts of sediment may enter the storm drain system when storm drains are installed before the upslope drainage area is stabilized, or where construction is adjacent to an existing storm drain. In cases of extreme sediment loading, the storm drain itself may clog and lose a major portion of its capacity. To avoid these problems, it is necessary to prevent sediment from entering the system at the inlets.

Inlet control measures presented in this handbook should not be used for inlets draining more than one acre. Runoff from larger disturbed areas should be first routed through SE-2, Sediment Basin or SE-3, Sediment Trap. Different types of inlet protection are appropriate for different applications depending on site conditions and the type of inlet. Inlet protection methods not presented in this handbook should be approved by the local stormwater management agency.

### *Design and Layout*

Identify existing and planned storm drain inlets that have the potential to receive sediment-laden surface runoff. Determine if storm drain inlet protection is needed and which method to use.

- Limit upstream drainage area to 1 acre maximum. For larger drainage areas, use SE-2, Sediment Basin, or SE-3, Sediment Trap, upstream of the inlet protection device.
- The key to successful and safe use of storm drain inlet protection devices is to know where runoff will pond or be diverted.
  - Determine the acceptable location and extent of ponding in the vicinity of the drain inlet. The acceptable location and extent of ponding will influence the type and design of the storm drain inlet protection device.
  - Determine the extent of potential runoff diversion caused by the storm drain inlet protection device. Runoff ponded by inlet protection devices may flow around the device and towards the next downstream inlet. In some cases, this is acceptable; in other cases, serious erosion or downstream property damage can be caused by these diversions. The possibility of runoff diversions will influence whether or not storm drain inlet protection is suitable; and, if suitable, the type and design of the device.
- The location and extent of ponding, and the extent of diversion, can usually be controlled through appropriate placement of the inlet protection device. In some cases, moving the

inlet protection device a short distance upstream of the actual inlet can provide more efficient sediment control, limit ponding to desired areas, and prevent or control diversions.

- Four types of inlet protection are presented below. However, it is recognized that other effective methods and proprietary devices exist and may be selected.
  - Filter Fabric Fence: Appropriate for drainage basins with less than a 5% slope, sheet flows, and flows under 0.5 cfs.
  - Excavated Drop Inlet Sediment Trap An excavated area around the inlet to trap sediment (SE-3).
  - Gravel bag barrier: Used to create a small sediment trap upstream of inlets on sloped, paved streets. Appropriate for sheet flow or when concentrated flow may exceed 0.5 cfs, and where overtopping is required to prevent flooding.
  - Block and Gravel Filter: Appropriate for flows greater than 0.5 cfs.
- Select the appropriate type of inlet protection and design as referred to or as described in this fact sheet.
- Provide area around the inlet for water to pond without flooding structures and property.
- Grates and spaces around all inlets should be sealed to prevent seepage of sediment-laden water.
- Excavate sediment sumps (where needed) 1 to 2 ft with 2:1 side slopes around the inlet.

***Installation***

- ***DI Protection Type 1 - Filter Fabric Fence*** - The filter fabric fence (Type 1) protection is shown in the attached figure. Similar to constructing a silt fence; see BMP SE-1, Silt Fence. Do not place filter fabric underneath the inlet grate since the collected sediment may fall into the drain inlet when the fabric is removed or replaced.
  1. Excavate a trench approximately 6 in. wide and 6 in. deep along the line of the silt fence inlet protection device.
  2. Place 2 in. by 2 in. wooden stakes around the perimeter of the inlet a maximum of 3 ft apart and drive them at least 18 in. into the ground or 12 in. below the bottom of the trench. The stakes must be at least 43 in.
  3. Lay fabric along bottom of trench, up side of trench, and then up stakes. See SE-1, Silt Fence, for details. The maximum silt fence height around the inlet is 24 in.
  4. Staple the filter fabric (for materials and specifications, see SE-1, Silt Fence) to wooden stakes. Use heavy-duty wire staples at least 1 in. in length.
  5. Backfill the trench with gravel or compacted earth all the way around.
- ***DI Protection Type 2 - Excavated Drop Inlet Sediment Trap*** - The excavated drop inlet sediment trap (Type 2) is shown in the attached figures. Install filter fabric fence in

accordance with DI Protection Type 1. Size excavated trap to provide a minimum storage capacity calculated at the rate 67 $yd^3$/acre of drainage area.

- ***DI Protection Type 3 - Gravel bag*** - The gravel bag barrier (Type 3) is shown in the figures. Flow from a severe storm should not overtop the curb. In areas of high clay and silts, use filter fabric and gravel as additional filter media. Construct gravel bags in accordance with SE-6, Gravel Bag Berm. Gravel bags should be used due to their high permeability.

  1. Use sand bag made of geotextile fabric (not burlap) and fill with 0.75 in. rock or 0.25 in. pea gravel.
  2. Construct on gently sloping street.
  3. Leave room upstream of barrier for water to pond and sediment to settle.
  4. Place several layers of sand bags – overlapping the bags and packing them tightly together.
  5. Leave gap of one bag on the top row to serve as a spillway. Flow from a severe storm (e.g., 10 year storm) should not overtop the curb.

- ***DI Protection Type 4 – Block and Gravel Filter*** - The block and gravel filter (Type 4) is shown in the figures. Block and gravel filters are suitable for curb inlets commonly used in residential, commercial, and industrial construction.

  1. Place hardware cloth or comparable wire mesh with 0.5 in. openings over the drop inlet so that the wire extends a minimum of 1 ft beyond each side of the inlet structure. If more than one strip is necessary, overlap the strips. Place filter fabric over the wire mesh.
  2. Place concrete blocks lengthwise on their sides in a single row around the perimeter of the inlet, so that the open ends face outward, not upward. The ends of adjacent blocks should abut. The height of the barrier can be varied, depending on design needs, by stacking combinations of blocks that are 4 in., 8 in., and 12 in. wide. The row of blocks should be at least 12 in. but no greater than 24 in. high.
  3. Place wire mesh over the outside vertical face (open end) of the concrete blocks to prevent stone from being washed through the blocks. Use hardware cloth or comparable wire mesh with 0.5 in. opening.
  4. Pile washed stone against the wire mesh to the top of the blocks. Use 0.75 to 3 in.

## Costs

- Average annual cost for installation and maintenance (one year useful life) is $200 per inlet.

## Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.

- Filter Fabric Fences. If the fabric becomes clogged, torn, or degrades, it should be replaced. Make sure the stakes are securely driven in the ground and are in good shape (i.e., not bent, cracked, or splintered, and are reasonably perpendicular to the ground). Replace damaged stakes.

- Gravel Filters. If the gravel becomes clogged with sediment, it must be carefully removed from the inlet and either cleaned or replaced. Since cleaning gravel at a construction site may be difficult, consider using the sediment-laden stone as fill material and put fresh stone around the inlet. Inspect bags for holes, gashes, and snags, and replace bags as needed. Check gravel bags for proper arrangement and displacement.

- Sediment that accumulates in the BMP must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height. Sediment removed during maintenance may be incorporated into earthwork on the site ore disposed at an appropriate location.

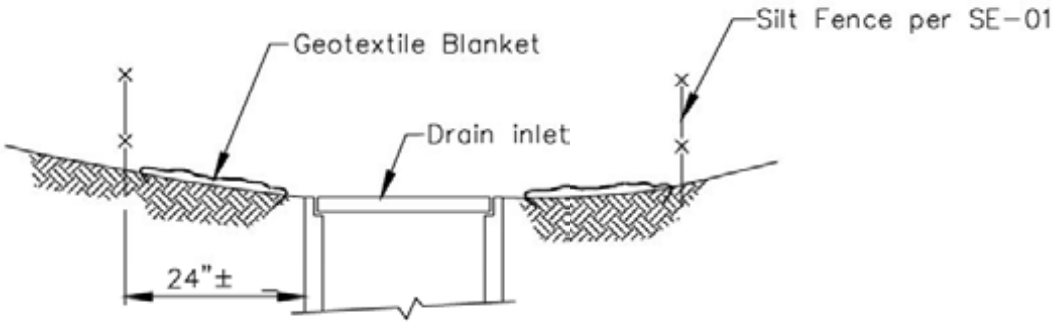
- Remove storm drain inlet protection once the drainage area is stabilized.

  - Clean and regrade area around the inlet and clean the inside of the storm drain inlet as it must be free of sediment and debris at the time of final inspection.

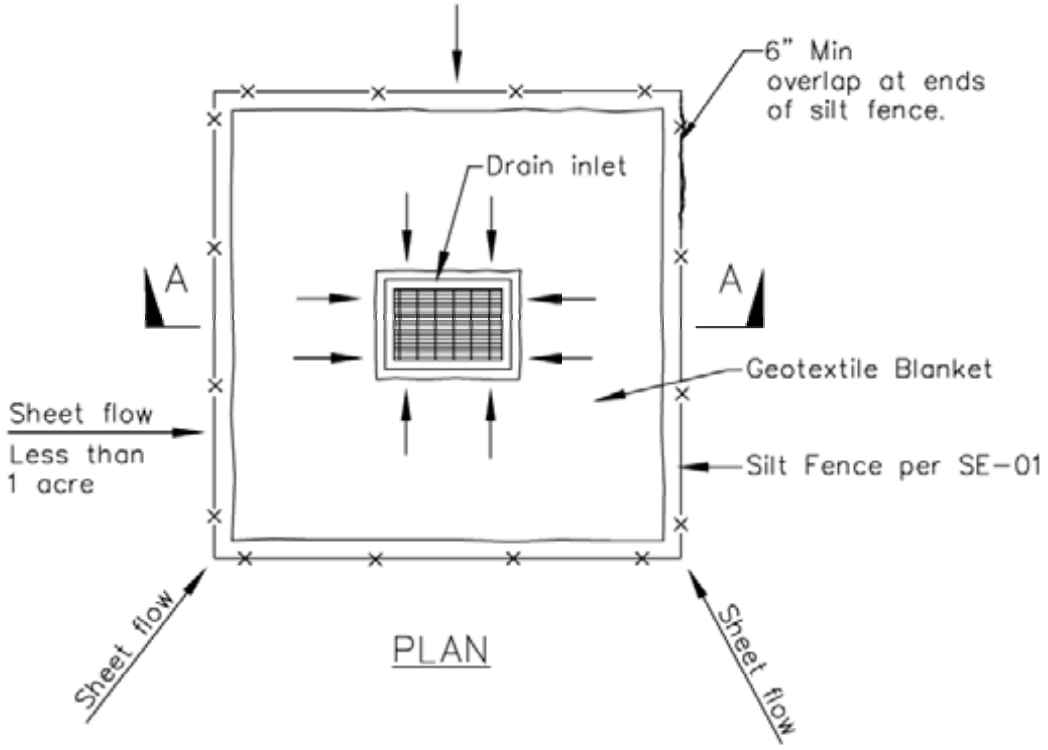
## References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management Manual for The Puget Sound Basin, Washington State Department of Ecology, Public Review Draft, 1991.




SECTION A–A

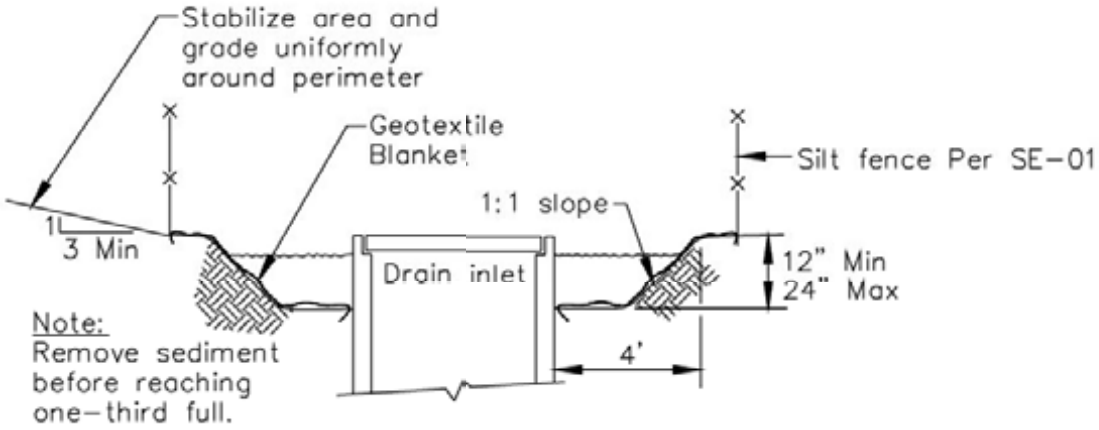



PLAN

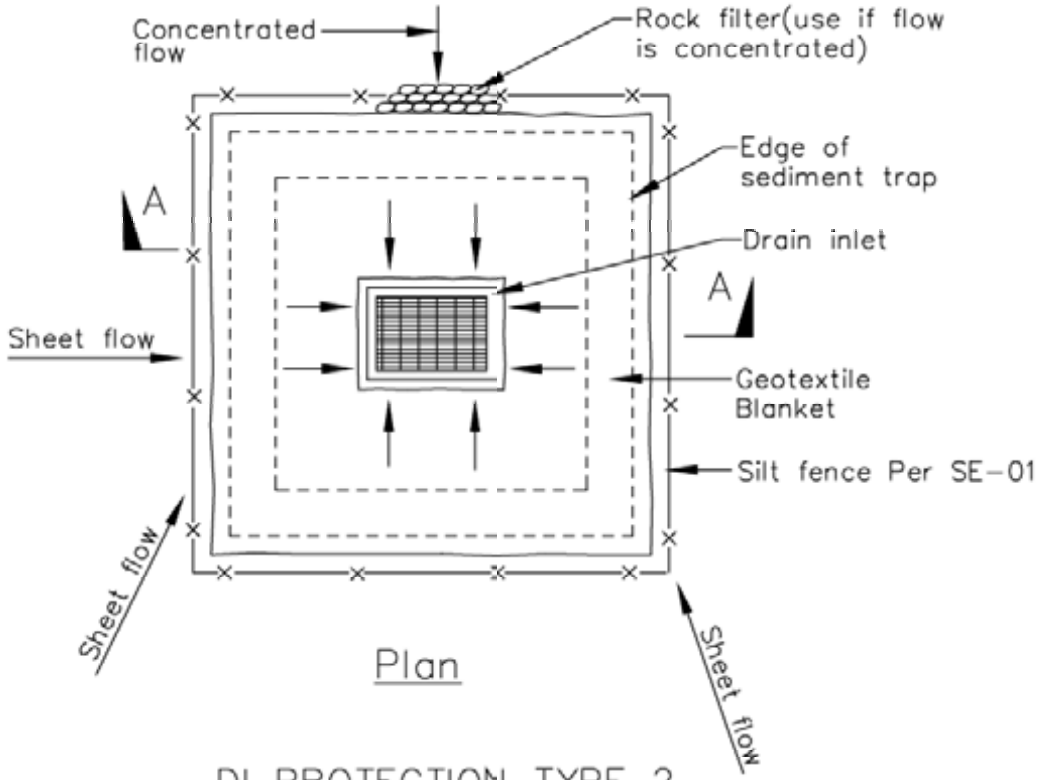
DI PROTECTION TYPE 1
NOT TO SCALE

NOTES:

1. For use in areas where grading has been completed and final soil stabilization and seeding are pending.
2. Not applicable in paved areas.
3. Not applicable with concentrated flows.



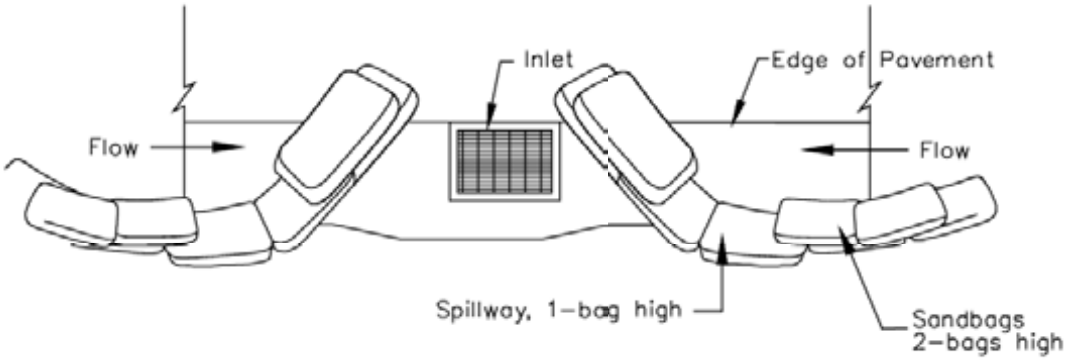

Section A-A



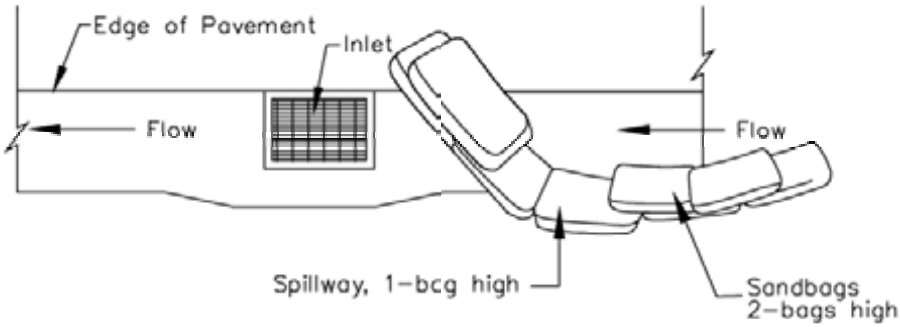

Plan

DI PROTECTION TYPE 2
NOT TO SCALE

Notes
1. For use in cleared and grubbed and in graded areas.
2. Shape basin so that longest inflow area faces longest length of trap.
3. For concentrated flows, shape basin in 2:1 ratio with length oriented towards direction of flow.




TYPICAL PROTECTION FOR INLET ON SUMP

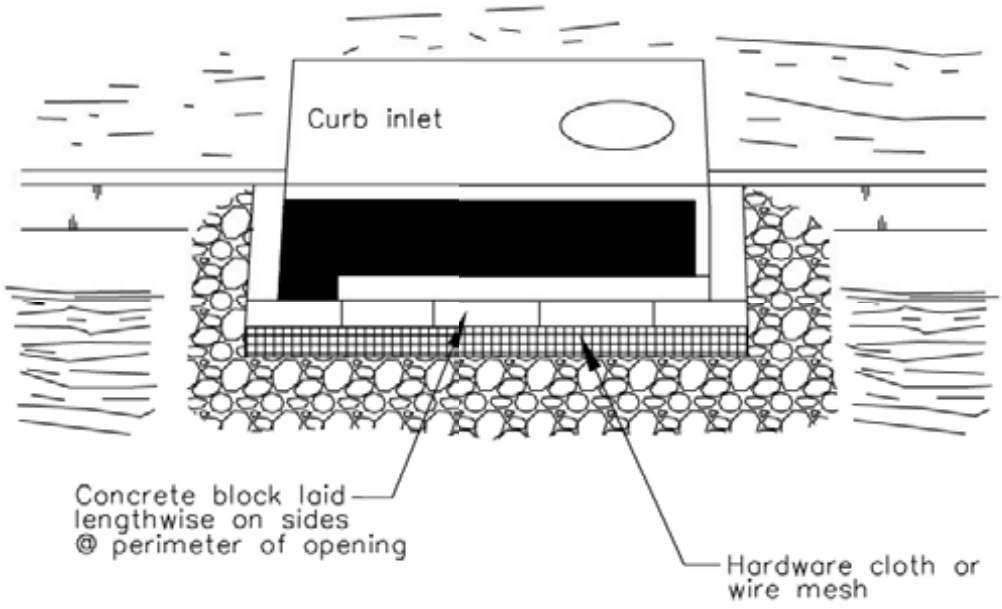


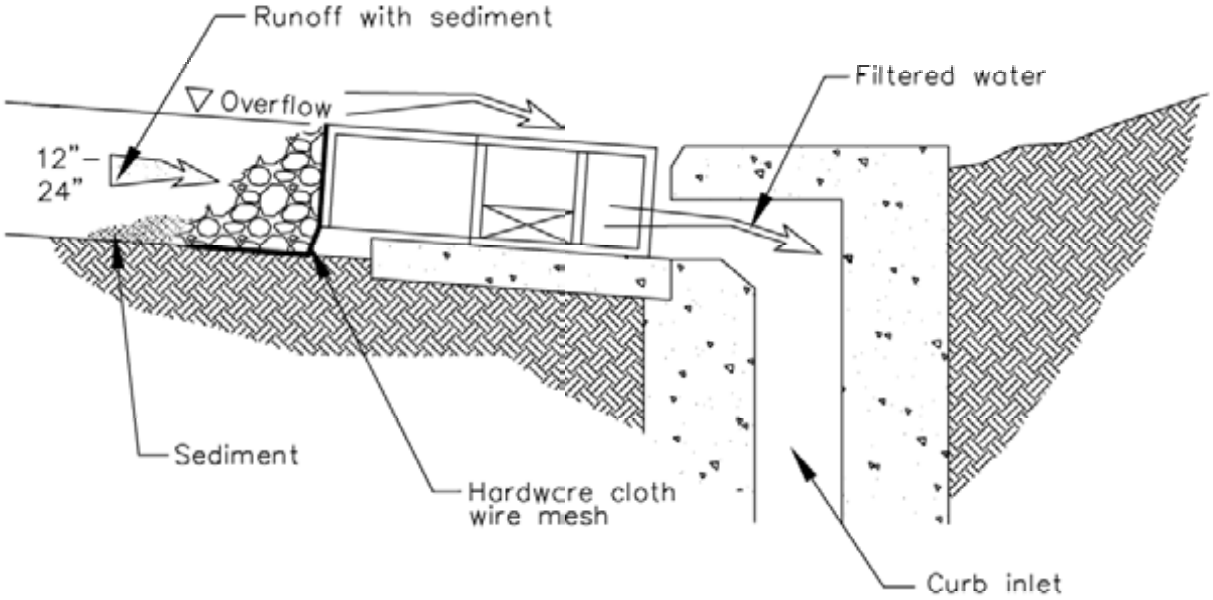

TYPICAL PROTECTION FOR INLET ON GRADE

NOTES:

1. Intended for short-term use.
2. Use to inhibit non-storm water flow.
3. Allow for proper maintenance and cleanup.
4. Bags must be removed after adjacent operation is completed
5. Not applicable in areas with high silts and clays without filter fabric.

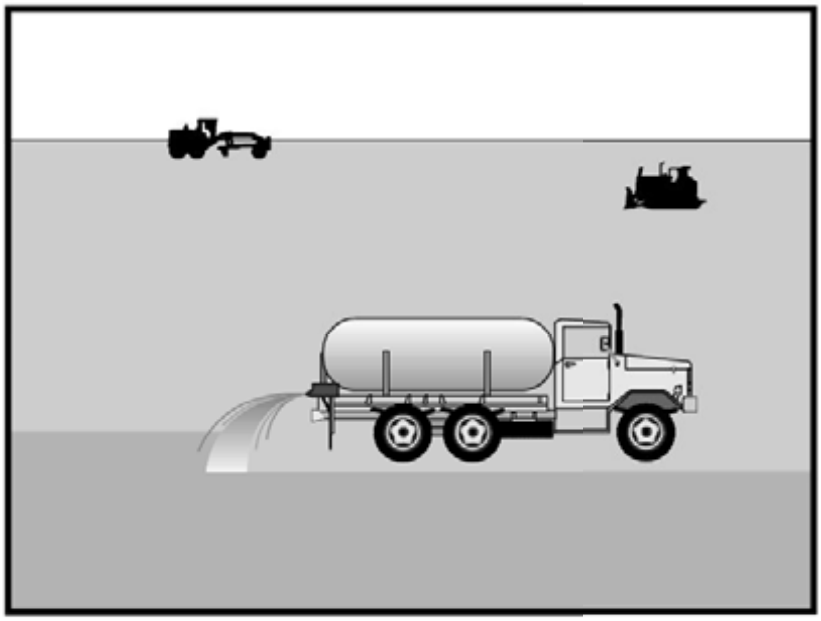
DI PROTECTION TYPE 3
NOT TO SCALE




DI PROTECTION – TYPE 4
NOT TO SCALE

# Wind Erosion Control WE-1



## Objectives

| | | |
|---|---|---|
| EC | Erosion Control | |
| SE | Sediment Control | ☒ |
| TC | Tracking Control | |
| WE | Wind Erosion Control | ☑ |
| NS | Non-Stormwater Management Control | |
| WM | Waste Management and Materials Pollution Control | |

**Legend:**

☑ **Primary Objective**

☒ **Secondary Objective**

## Targeted Constituents

| | |
|---|---|
| Sediment | ☑ |
| Nutrients | |
| Trash | |
| Metals | |
| Bacteria | |
| Oil and Grease | |
| Organics | |

## Potential Alternatives

None

## Description and Purpose

Wind erosion or dust control consists of applying water or other dust palliatives as necessary to prevent or alleviate dust nuisance generated by construction activities. Covering small stockpiles or areas is an alternative to applying water or other dust palliatives.

## Suitable Applications

Wind erosion control BMPs are suitable during the following construction activities:

- Construction vehicle traffic on unpaved roads
- Drilling and blasting activities
- Sediment tracking onto paved roads
- Soils and debris storage piles
- Batch drop from front-end loaders
- Areas with unstabilized soil
- Final grading/site stabilization

## Limitations

- Watering prevents dust only for a short period and should be applied daily (or more often) to be effective.
- Over watering may cause erosion.

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- Oil or oil-treated subgrade should not be used for dust control because the oil may migrate into drainageways and/or seep into the soil.
- Effectiveness depends on soil, temperature, humidity, and wind velocity.
- Chemically treated sub grades may make the soil water repellant, interfering with long-term infiltration and the vegetation/re-vegetation of the site. Some chemical dust suppressants may be subject to freezing and may contain solvents and should be handled properly.
- Asphalt, as a mulch tack or chemical mulch, requires a 24-hour curing time to avoid adherence to equipment, worker shoes, etc. Application should be limited because asphalt surfacing may eventually migrate into the drainage system.
- In compacted areas, watering and other liquid dust control measures may wash sediment or other constituents into the drainage system.

## Implementation

### *General*

California's Mediterranean climate, with short wet seasons and long hot dry seasons, allows the soils to thoroughly dry out. During these dry seasons, construction activities are at their peak, and disturbed and exposed areas are increasingly subject to wind erosion, sediment tracking and dust generated by construction equipment.

Dust control, as a BMP, is a practice that is already in place for many construction activities. Los Angeles, the North Coast, and Sacramento, among others, have enacted dust control ordinances for construction activities that cause dust to be transported beyond the construction project property line.

Recently, the State Air Resources Control Board has, under the authority of the Clean Air Act, started to address air quality in relation to inhalable particulate matter less than 10 microns (PM-10). Approximately 90 percent of these small particles are considered to be dust. Existing dust control regulations by local agencies, municipal departments, public works department, and public health departments are in place in some regions within California.

Many local agencies require dust control in order to comply with local nuisance laws, opacity laws (visibility impairment) and the requirements of the Clean Air Act. The following are measures that local agencies may have already implemented as requirements for dust control from contractors:

- Construction and Grading Permits: Require provisions for dust control plans.
- Opacity Emission Limits: Enforce compliance with California air pollution control laws.
- Increase Overall Enforcement Activities: Priority given to cases involving citizen complaints.
- Maintain Field Application Records: Require records of dust control measures from contractor;
- Stormwater Pollution Prevention Plan: (SWPPP): Integrate dust control measures into SWPPP.

### *Dust Control Practices*

Dust control BMPs generally stabilize exposed surfaces and minimize activities that suspend or track dust particles. The following table shows dust control practices that can be applied to site conditions that cause dust. For heavily traveled and disturbed areas, wet suppression (watering), chemical dust suppression, gravel asphalt surfacing, temporary gravel construction entrances, equipment wash-out areas, and haul truck covers can be employed as dust control applications. Permanent or temporary vegetation and mulching can be employed for areas of occasional or no construction traffic. Preventive measures would include minimizing surface areas to be disturbed, limiting onsite vehicle traffic to 15 mph, and controlling the number and activity of vehicles on a site at any given time.

| SITE CONDITION | DUST CONTROL PRACTICES | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Permanent Vegetation | Mulching | Wet Suppression (Watering) | Chemical Dust Suppression | Gravel or Asphalt | Silt Fences | Temporary Gravel Construction Entrances/Equipment Wash Down | Haul Truck Covers | Minimize Extent of Disturbed Area |
| Disturbed Areas not Subject to Traffic | X | X | X | X | X | | | | X |
| Disturbed Areas Subject to Traffic | | | X | X | X | | X | | X |
| Material Stock Pile Stabilization | | | X | X | | X | | | X |
| Demolition | | | X | | | | X | X | |
| Clearing/ Excavation | | | X | X | | X | | | X |
| Truck Traffic on Unpaved Roads | | | X | X | X | | X | X | |
| Mud/Dirt Carry Out | | | | | X | | X | | |

Additional preventive measures include:

- Schedule construction activities to minimize exposed area (EC-1, Scheduling).
- Quickly stabilize exposed soils using vegetation, mulching, spray-on adhesives, calcium chloride, sprinkling, and stone/gravel layering.
- Identify and stabilize key access points prior to commencement of construction.
- Minimize the impact of dust by anticipating the direction of prevailing winds.
- Direct most construction traffic to stabilized roadways within the project site.
- Water should be applied by means of pressure-type distributors or pipelines equipped with a spray system or hoses and nozzles that will ensure even distribution.
- All distribution equipment should be equipped with a positive means of shutoff.
- Unless water is applied by means of pipelines, at least one mobile unit should be available at all times to apply water or dust palliative to the project.

- If reclaimed waste water is used, the sources and discharge must meet California Department of Health Services water reclamation criteria and the Regional Water Quality Control Board requirements. Non-potable water should not be conveyed in tanks or drain pipes that will be used to convey potable water and there should be no connection between potable and non-potable supplies. Non-potable tanks, pipes, and other conveyances should be marked, "NON-POTABLE WATER - DO NOT DRINK."
- Materials applied as temporary soil stabilizers and soil binders also generally provide wind erosion control benefits.
- Pave or chemically stabilize access points where unpaved traffic surfaces adjoin paved roads.
- Provide covers for haul trucks transporting materials that contribute to dust.
- Provide for wet suppression or chemical stabilization of exposed soils.
- Provide for rapid clean up of sediments deposited on paved roads. Furnish stabilized construction road entrances and vehicle wash down areas.
- Stabilize inactive construction sites using vegetation or chemical stabilization methods.
- Limit the amount of areas disturbed by clearing and earth moving operations by scheduling these activities in phases.

For chemical stabilization, there are many products available for chemically stabilizing gravel roadways and stockpiles. If chemical stabilization is used, the chemicals should not create any adverse effects on stormwater, plant life, or groundwater.

## Costs

Installation costs for water and chemical dust suppression are low, but annual costs may be quite high since these measures are effective for only a few hours to a few days.

## Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and at two-week intervals in the non-rainy season to verify continued BMP implementation.
- Check areas protected to ensure coverage.
- Most dust control measures require frequent, often daily, or multiple times per day attention.

## References

Best Management Practices and Erosion Control Manual for Construction Sites, Flood Control District of Maricopa County, Arizona, September 1992.

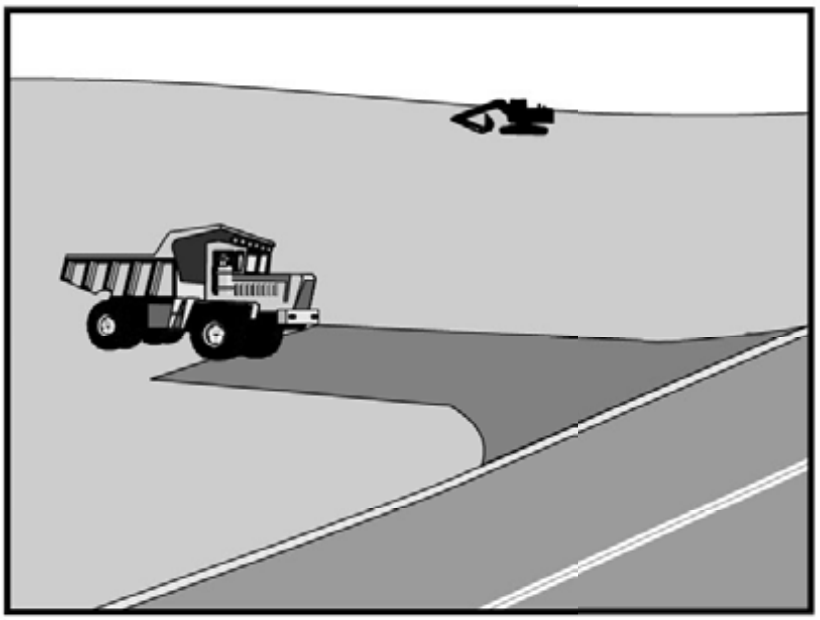
California Air Pollution Control Laws, California Air Resources Board, 1992.

Caltrans, Standard Specifications, Sections 10, "Dust Control"; Section 17, "Watering"; and Section 18, "Dust Palliative".

Prospects for Attaining the State Ambient Air Quality Standards for Suspended Particulate Matter (PM10), Visibility Reducing Particles, Sulfates, Lead, and Hydrogen Sulfide, California Air Resources Board, April 1991.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

# Stabilized Construction Entrance/Exit TC-1



## Description and Purpose

A stabilized construction access is defined by a point of entrance/exit to a construction site that is stabilized to reduce the tracking of mud and dirt onto public roads by construction vehicles.

## Suitable Applications

Use at construction sites:

- Where dirt or mud can be tracked onto public roads.
- Adjacent to water bodies.
- Where poor soils are encountered.
- Where dust is a problem during dry weather conditions.

## Limitations

- Entrances and exits require periodic top dressing with additional stones.
- This BMP should be used in conjunction with street sweeping on adjacent public right of way.
- Entrances and exits should be constructed on level ground only.
- Stabilized construction entrances are rather expensive to construct and when a wash rack is included, a sediment trap of some kind must also be provided to collect wash water runoff.

## Objectives

| | | |
|---|---|---|
| EC | Erosion Control | ☒ |
| SE | Sediment Control | ☒ |
| TC | Tracking Control | ☑ |
| WE | Wind Erosion Control | |
| NS | Non-Stormwater Management Control | |
| WM | Waste Management and Materials Pollution Control | |

**Legend:**

☑ **Primary Objective**

☒ **Secondary Objective**

## Targeted Constituents

| | |
|---|---|
| Sediment | ☑ |
| Nutrients | |
| Trash | |
| Metals | |
| Bacteria | |
| Oil and Grease | |
| Organics | |

## Potential Alternatives

None

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# Stabilized Construction Entrance/Exit TC-1

## Implementation

### *General*

A stabilized construction entrance is a pad of aggregate underlain with filter cloth located at any point where traffic will be entering or leaving a construction site to or from a public right of way, street, alley, sidewalk, or parking area. The purpose of a stabilized construction entrance is to reduce or eliminate the tracking of sediment onto public rights of way or streets. Reducing tracking of sediments and other pollutants onto paved roads helps prevent deposition of sediments into local storm drains and production of airborne dust.

Where traffic will be entering or leaving the construction site, a stabilized construction entrance should be used. NPDES permits require that appropriate measures be implemented to prevent tracking of sediments onto paved roadways, where a significant source of sediments is derived from mud and dirt carried out from unpaved roads and construction sites.

Stabilized construction entrances are moderately effective in removing sediment from equipment leaving a construction site. The entrance should be built on level ground. Advantages of the Stabilized Construction Entrance/Exit is that it does remove some sediment from equipment and serves to channel construction traffic in and out of the site at specified locations. Efficiency is greatly increased when a washing rack is included as part of a stabilized construction entrance/exit.

### *Design and Layout*

- Construct on level ground where possible.
- Select 3 to 6 in. diameter stones.
- Use minimum depth of stones of 12 in. or as recommended by soils engineer.
- Construct length of 50 ft minimum, and 30 ft minimum width.
- Rumble racks constructed of steel panels with ridges and installed in the stabilized entrance/exit will help remove additional sediment and to keep adjacent streets clean.
- Provide ample turning radii as part of the entrance.
- Limit the points of entrance/exit to the construction site.
- Limit speed of vehicles to control dust.
- Properly grade each construction entrance/exit to prevent runoff from leaving the construction site.
- Route runoff from stabilized entrances/exits through a sediment trapping device before discharge.
- Design stabilized entrance/exit to support heaviest vehicles and equipment that will use it.
- Select construction access stabilization (aggregate, asphaltic concrete, concrete) based on longevity, required performance, and site conditions. Do not use asphalt concrete (AC) grindings for stabilized construction access/roadway.

- If aggregate is selected, place crushed aggregate over geotextile fabric to at least 12 in. depth, or place aggregate to a depth recommended by a geotechnical engineer. A crushed aggregate greater than 3 in. but smaller than 6 in. should be used.
- Designate combination or single purpose entrances and exits to the construction site.
- Require that all employees, subcontractors, and suppliers utilize the stabilized construction access.
- Implement SE-7, Street Sweeping and Vacuuming, as needed.
- All exit locations intended to be used for more than a two-week period should have stabilized construction entrance/exit BMPs.

## Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMPs are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect local roads adjacent to the site daily. Sweep or vacuum to remove visible accumulated sediment.
- Remove aggregate, separate and dispose of sediment if construction entrance/exit is clogged with sediment.
- Keep all temporary roadway ditches clear.
- Check for damage and repair as needed.
- Replace gravel material when surface voids are visible.
- Remove all sediment deposited on paved roadways within 24 hours.
- Remove gravel and filter fabric at completion of construction.

## Costs

Average annual cost for installation and maintenance may vary from $1,200 to $4,800 each, averaging $2,400 per entrance. Costs will increase with addition of washing rack, and sediment trap. With wash rack, costs range from $1,200 - $6,000 each, averaging $3,600 per entrance.

## References

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

National Management Measures to Control Nonpoint Source Pollution from Urban Areas, USEPA Agency, 2002.

Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, Work Group Working Paper, USEPA, April 1992.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

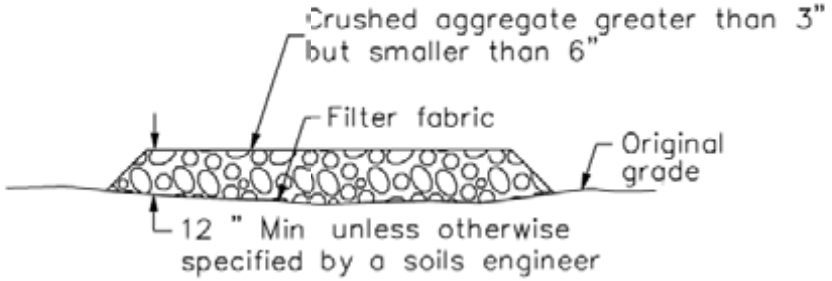
Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

Virginia Erosion and Sedimentation Control Handbook, Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation, 1991.

Guidance Specifying Management Measures for Nonpoint Pollution in Coastal Waters, EPA 840-B-9-002, USEPA, Office of Water, Washington DC, 1993.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.

# Stabilized Construction Entrance/Exit TC-1




SECTION B–B
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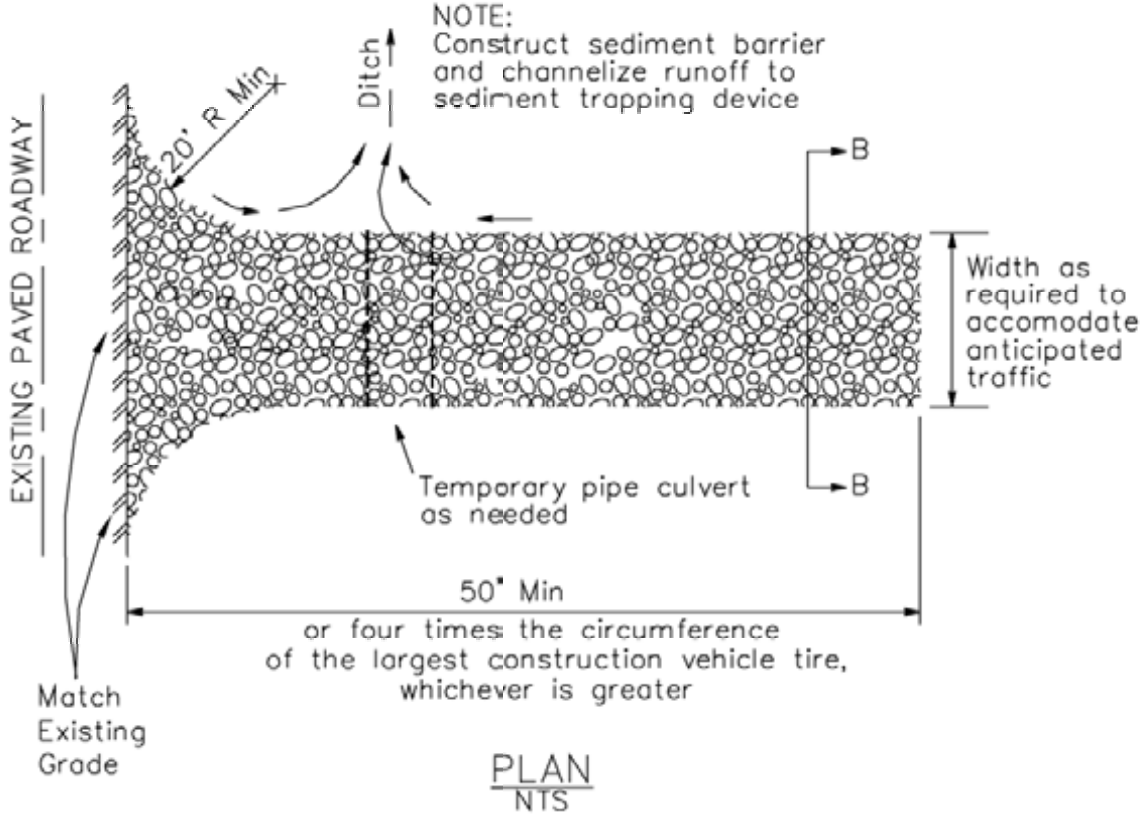


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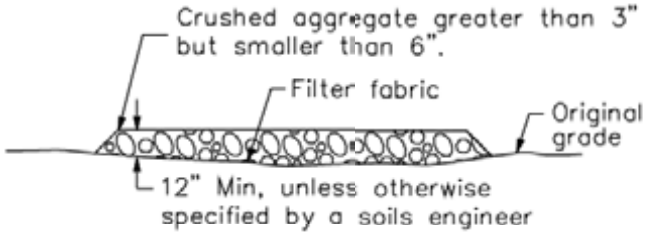
# Stabilized Construction Entrance/Exit TC-1

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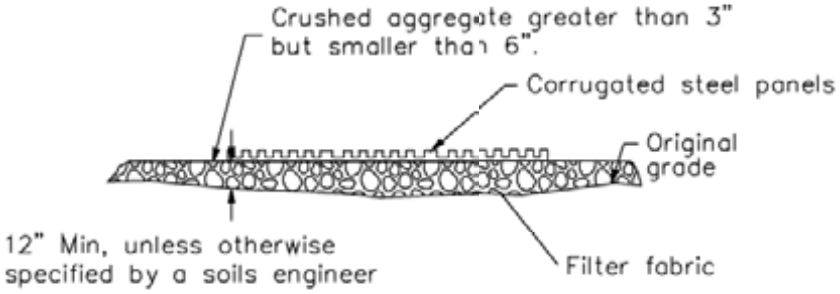


SECTION A–A
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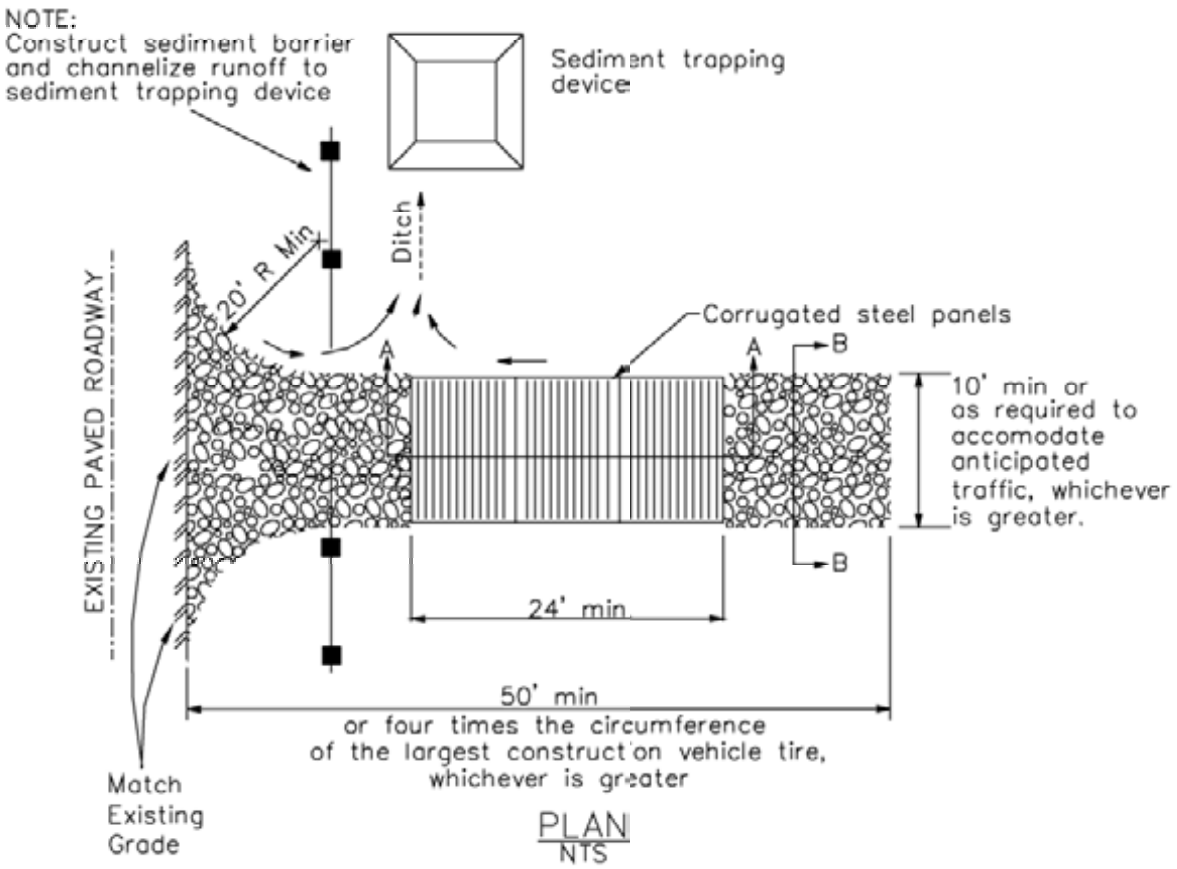


PLAN
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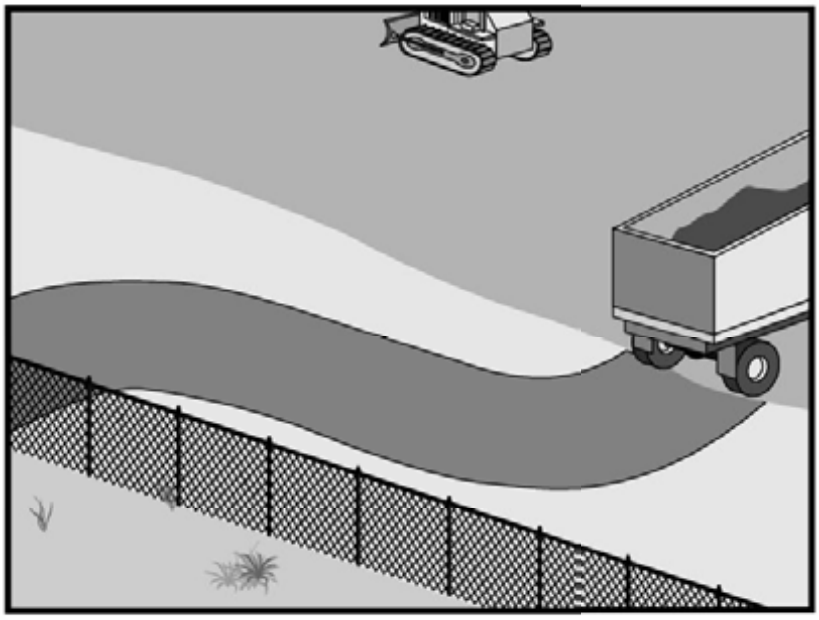
# Stabilized Construction Roadway TC-2



## Objectives

| | | |
|---|---|---|
| EC | Erosion Control | ☒ |
| SE | Sediment Control | ☒ |
| TC | Tracking Control | ☑ |
| WE | Wind Erosion Control | |
| NS | Non-Stormwater Management Control | |
| WM | Waste Management and Materials Pollution Control | |

**Legend:**

☑ **Primary Objective**

☒ **Secondary Objective**

## Targeted Constituents

| | |
|---|---|
| Sediment | ☑ |
| Nutrients | |
| Trash | |
| Metals | |
| Bacteria | |
| Oil and Grease | |
| Organics | |

## Potential Alternatives

None

## Description and Purpose

Access roads, subdivision roads, parking areas, and other onsite vehicle transportation routes should be stabilized immediately after grading, and frequently maintained to prevent erosion and control dust.

## Suitable Applications

This BMP should be applied for the following conditions:

- Temporary Construction Traffic:
  - Phased construction projects and offsite road access
  - Construction during wet weather
- Construction roadways and detour roads:
  - Where mud tracking is a problem during wet weather
  - Where dust is a problem during dry weather
  - Adjacent to water bodies
  - Where poor soils are encountered

## Limitations

- The roadway must be removed or paved when construction is complete.

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- Certain chemical stabilization methods may cause stormwater or soil pollution and should not be used. See WE-1, Wind Erosion Control.
- Management of construction traffic is subject to air quality control measures. Contact the local air quality management agency.
- Materials will likely need to be removed prior to final project grading and stabilization.
- Use of this BMP may not be applicable to very short duration projects.

## Implementation

### *General*

Areas that are graded for construction vehicle transport and parking purposes are especially susceptible to erosion and dust. The exposed soil surface is continually disturbed, leaving no opportunity for vegetative stabilization. Such areas also tend to collect and transport runoff waters along their surfaces. During wet weather, they often become muddy quagmires that generate significant quantities of sediment that may pollute nearby streams or be transported offsite on the wheels of construction vehicles. Dirt roads can become so unstable during wet weather that they are virtually unusable.

Efficient construction road stabilization not only reduces onsite erosion but also can significantly speed onsite work, avoid instances of immobilized machinery and delivery vehicles, and generally improve site efficiency and working conditions during adverse weather

### *Installation/Application Criteria*

Permanent roads and parking areas should be paved as soon as possible after grading. As an alternative where construction will be phased, the early application of gravel or chemical stabilization may solve potential erosion and stability problems. Temporary gravel roadway should be considered during the rainy season and on slopes greater than 5%.

Temporary roads should follow the contour of the natural terrain to the maximum extent possible. Slope should not exceed 15%. Roadways should be carefully graded to drain transversely. Provide drainage swales on each side of the roadway in the case of a crowned section or one side in the case of a super elevated section. Simple gravel berms without a trench can also be used.

Installed inlets should be protected to prevent sediment laden water from entering the storm sewer system (SE-10, Storm Drain Inlet Protection). In addition, the following criteria should be considered.

- Road should follow topographic contours to reduce erosion of the roadway.
- The roadway slope should not exceed 15%.
- Chemical stabilizers or water are usually required on gravel or dirt roads to prevent dust (WE-1, Wind Erosion Control).
- Properly grade roadway to prevent runoff from leaving the construction site.
- Design stabilized access to support heaviest vehicles and equipment that will use it.

- Stabilize roadway using aggregate, asphalt concrete, or concrete based on longevity, required performance, and site conditions. The use of cold mix asphalt or asphalt concrete (AC) grindings for stabilized construction roadway is not allowed.
- Coordinate materials with those used for stabilized construction entrance/exit points.
- If aggregate is selected, place crushed aggregate over geotextile fabric to at least 12 in. depth. A crushed aggregate greater than 3 in. but smaller than 6 in. should be used.

## Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, impact weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.
- Keep all temporary roadway ditches clear.
- When no longer required, remove stabilized construction roadway and re-grade and repair slopes.
- Periodically apply additional aggregate on gravel roads.
- Active dirt construction roads are commonly watered three or more times per day during the dry season.

## Costs

Gravel construction roads are moderately expensive, but cost is often balanced by reductions in construction delay. No additional costs for dust control on construction roads should be required above that needed to meet local air quality requirements.

## References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Coastal Nonpoint Pollution Control Program; Program Development and Approval Guidance, Working Group, Working Paper; USEPA, April 1992.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

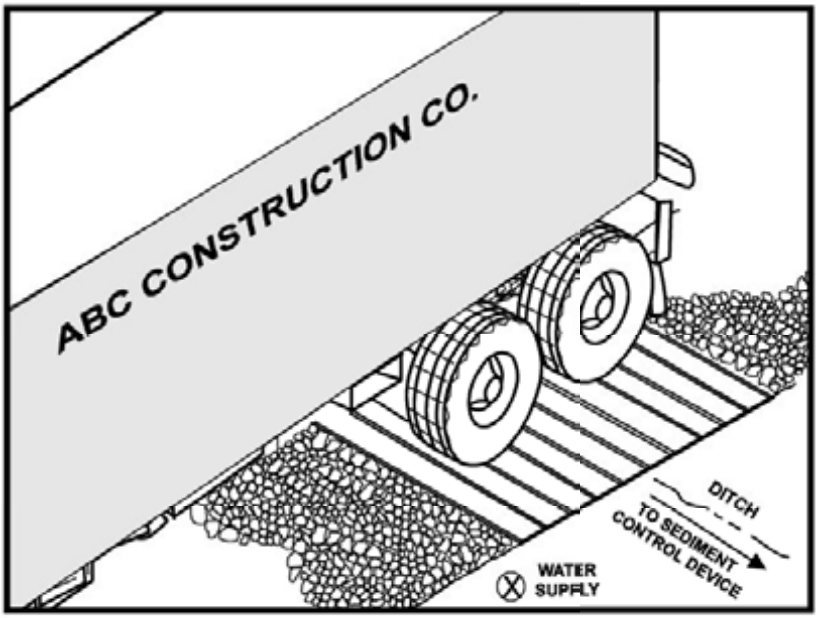
Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

Virginia Erosion and Sedimentation Control Handbook, Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation, 1991.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.

# Entrance/Outlet Tire Wash TC-3




## Objectives

| | | |
|---|---|---|
| EC | Erosion Control | |
| SE | Sediment Control | ☒ |
| TC | Tracking Control | ☑ |
| WE | Wind Erosion Control | |
| NS | Non-Stormwater Management Control | |
| WM | Waste Management and Materials Pollution Control | |

**Legend:**

☑ **Primary Objective**

☒ **Secondary Objective**

## Targeted Constituents

| | |
|---|---|
| Sediment | ☑ |
| Nutrients | |
| Trash | |
| Metals | |
| Bacteria | |
| Oil and Grease | |
| Organics | |

## Potential Alternatives

TC-1 Stabilized Construction Entrance/Exit

## Description and Purpose

A tire wash is an area located at stabilized construction access points to remove sediment from tires and under carriages and to prevent sediment from being transported onto public roadways.

## Suitable Applications

Tire washes may be used on construction sites where dirt and mud tracking onto public roads by construction vehicles may occur.

## Limitations

- The tire wash requires a supply of wash water.
- A turnout or doublewide exit is required to avoid having entering vehicles drive through the wash area.
- Do not use where wet tire trucks leaving the site leave the road dangerously slick.

## Implementation

- Incorporate with a stabilized construction entrance/exit. See TC-1, Stabilized Construction Entrance/Exit.
- Construct on level ground when possible, on a pad of coarse aggregate greater than 3 in. but smaller than 6 in. A geotextile fabric should be placed below the aggregate.
- Wash rack should be designed and constructed/manufactured for anticipated traffic loads.

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- Provide a drainage ditch that will convey the runoff from the wash area to a sediment trapping device. The drainage ditch should be of sufficient grade, width, and depth to carry the wash runoff.
- Use hoses with automatic shutoff nozzles to prevent hoses from being left on.
- Require that all employees, subcontractors, and others that leave the site with mud caked tires and undercarriages to use the wash facility.
- Implement SC-7, Street Sweeping and Vacuuming, as needed.

## Costs

Costs are low for installation of wash rack.

## Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur.
- Remove accumulated sediment in wash rack and/or sediment trap to maintain system performance.
- Inspect routinely for damage and repair as needed.

## References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

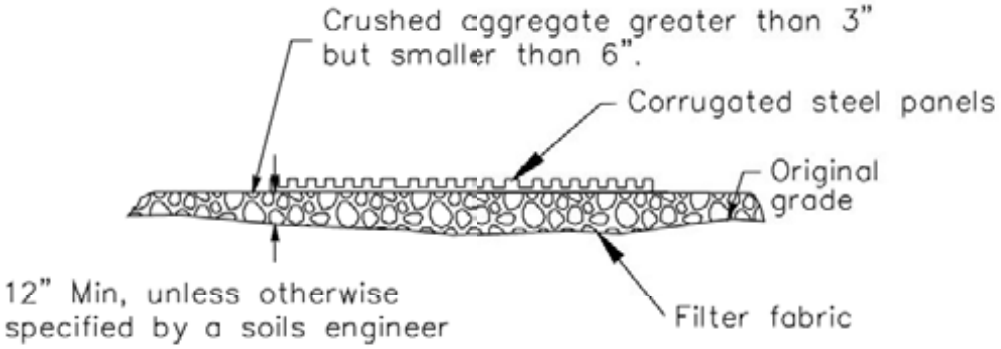
Coastal Nonpoint Pollution Control Program; Program Development and Approval Guidance, Working Group, Working Paper; USEPA, April 1992.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

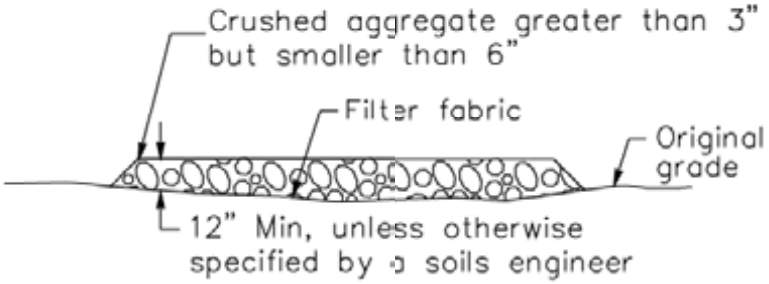
Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

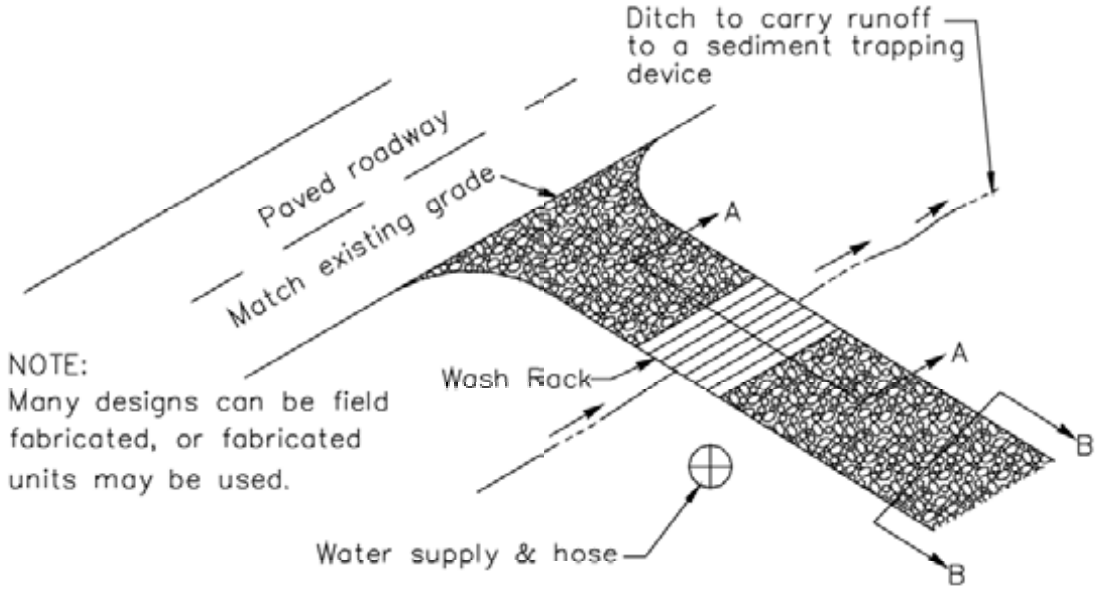
# Entrance/Outlet Tire Wash TC-3




SECTION A–A
NOT TO SCALE



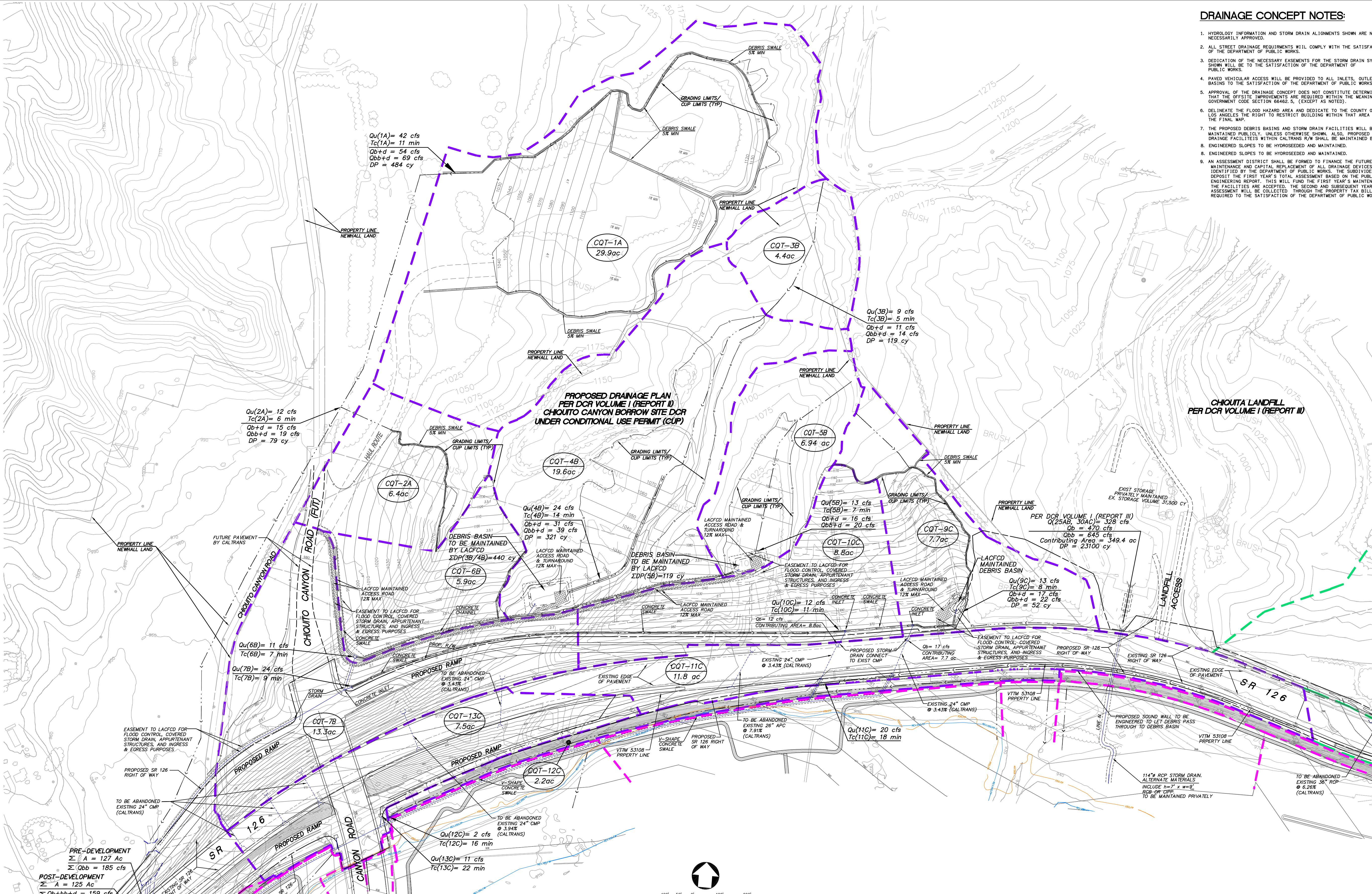

SECTION B–B
NTS




TYPICAL TIRE WASH
NOT TO SCALE

# APPENDIX 7

# HYDROLOGY EXHIBITS
# CHIQUITO CANYON BORROW SITE




## DRAINAGE CONCEPT NOTES:

1. HYDROLOGY INFORMATION AND STORM DRAIN ALIGNMENTS SHOWN ARE NOT NECESSARILY APPROVED.
2. ALL STREET DRAINAGE REQUIRMENTS WIIL COMPLY WITH THE SATISFACTION OF THE DEPARTMENT OF PUBLIC WORKS.
3. DEDICATION OF THE NECESSARY EASEMENTS FOR THE STORM DRAIN SYSTEM SHOWN WILL BE TO THE SATISFACTION OF THE DEPARTMENT OF PUBLIC WORKS.
4. PAVED VEHICULAR ACCESS WILL BE PROVIDED TO ALL INLETS, OUTLETS AND BASINS TO THE SATISFACTION OF THE DEPARTMENT OF PUBLIC WORKS.
5. APPROVAL OF THE DRAINAGE CONCEPT DOES NOT CONSTITUTE DETERMINATION THAT THE OFFSITE IMPROVEMENTS ARE REQUIRED WITHIN THE MEANING OF GOVERNMENT CODE SECTION 66462.5, (EXCEPT AS NOTED).
6. DELINEATE THE FLOOD HAZARD AREA AND DEDICATE TO THE COUNTY OF LOS ANGELES THE RIGHT TO RESTRICT BUILDING WITHIN THAT AREA ON THE FINAL MAP.
7. THE PROPOSED DEBRIS BASINS AND STORM DRAIN FACILITIES WILL BE MAINTAINED PUBLICLY. UNLESS OTHERWISE SHOWN. ALSO, PROPOSED DRAINGE FACILITEIS WITHIN CALTRANS R/W SHALL BE MAINTAINED BY CALTRANS
8. ENGINEERED SLOPES TO BE HYDROSEEDED AND MAINTAINED.
8. ENGINEERED SLOPES TO BE HYDROSEEDED AND MAINTAINED.
9. AN ASSESSMENT DISTRICT SHALL BE FORMED TO FINANCE THE FUTURE ONGOING MAINTENANCE AND CAPITAL REPLACEMENT OF ALL DRAINAGE DEVICES/SYSTEMS IDENTIFIED BY THE DEPARTMENT OF PUBLIC WORKS. THE SUBDIVIDER SHALL DEPOSIT THE FIRST YEAR'S TOTAL ASSESSMENT BASED ON THE PUBLIC WORKS ENGINEERING REPORT. THIS WILL FUND THE FIRST YEAR'S MAINTENANCE AFTER THE FACILITIES ARE ACCEPTED. THE SECOND AND SUBSEQUENT YEARS' ASSESSMENT WILL BE COLLECTED THROUGH THE PROPERTY TAX BILL. THIS IS REQUIRED TO THE SATISFACTION OF THE DEPARTMENT OF PUBLIC WORKS.

PROJECT SITE

VICINITY MAP

NOT TO SCALE

## LEGEND:

CQT-5A — SUB-BASIN NUMBER
4.4 ac — SUB-BASIN AREA (ac)

EXISTING LOT LINE
EXISTING EASEMENT
EXISTING CONTOUR
DAYLIGHT LINE
SUB-BASIN BOUNDARY
DRAINAGE AREA BOUNDARY
RIGHT OF WAY/PROPERTY LINE
EASEMENT
PROPOSED CONTOUR
PROPOSED STORM DRAIN
EXISTING STORM DRAIN CULVERT
DEBRIS CHANNEL (5% MIN)
EXISTING FLOWPATH
PROPOSED DEBRIS CHANNEL FLOWPATH
(8.6 ac) UNDEVELOPED PORTION OF SUBAREA
Qu(sub)= 9 cfs — PROPOSED SUBAREA Q (unburned)
Tc(sub)= 15 min — PROPOSED TIME OF CONCENTRATION
PAVED ACCESS ROAD-24FT WIDE

| | | |
|---|---|---|
| Qu | = | UNDEVELOPED Q |
| Qd | = | DEVELOPED Q |
| Qb | = | BURNED Q |
| Qbb | = | BURNED+BULKED Q |
| Qb+d | = | BURNED & DEVELOPED Q |
| Qbb+d | = | BURNED & BULKED & DEVELOPED Q |
| DP | = | DEBRIS PRODUCTION |
| Qcap | = | FULL FLOW CAPACITY |
| SCE | = | SOUTHERN CALIFORNIA EDISON |

## NOTES:

A BURNED FLOW FOR SUBAREAS CQT-3B,CQT-4B,CQT-6B,CQT-5B,CQT-9C BURNED AND BULKED FLOW FOR SUBAREAS CQT-1A and, CQT-2A, DEVELOP FLOW FOR SUBAREAS CQT-7B, CQT-10C, CQT-11C , CQT-12C AND CQT-13C

B DRAINAGE TRIBUTARY AREA IS LESS THAN IN EXISTING CONDITION BECAUSE THE AREA SOUTH OF SR-126 IS PART OF LANDMARK VILLAGE DEVELOPMENT TRACT 53108 IN THE PROPOSED CONDITION.

C AREAS CQT-1A AND CQT-2A DRAIN DIRECTLY TO CHIQUITO CANYON. EXISTING CONDITION IS MAINTAINED.

K = Burn Factor from Appendix G-2, K=0.677*(1^-0.102)

Qb = A*I*(1-K)+K*Qu

Qbb = 1.27*Qb

DP = A*27 cy (DPA Zone 9)

NOTE: For reduced size prints, original scale is in inches.

**PROJECT AREA**

REV: NOVEMBER 12, 2009
DATE: SEPT 15, 2004

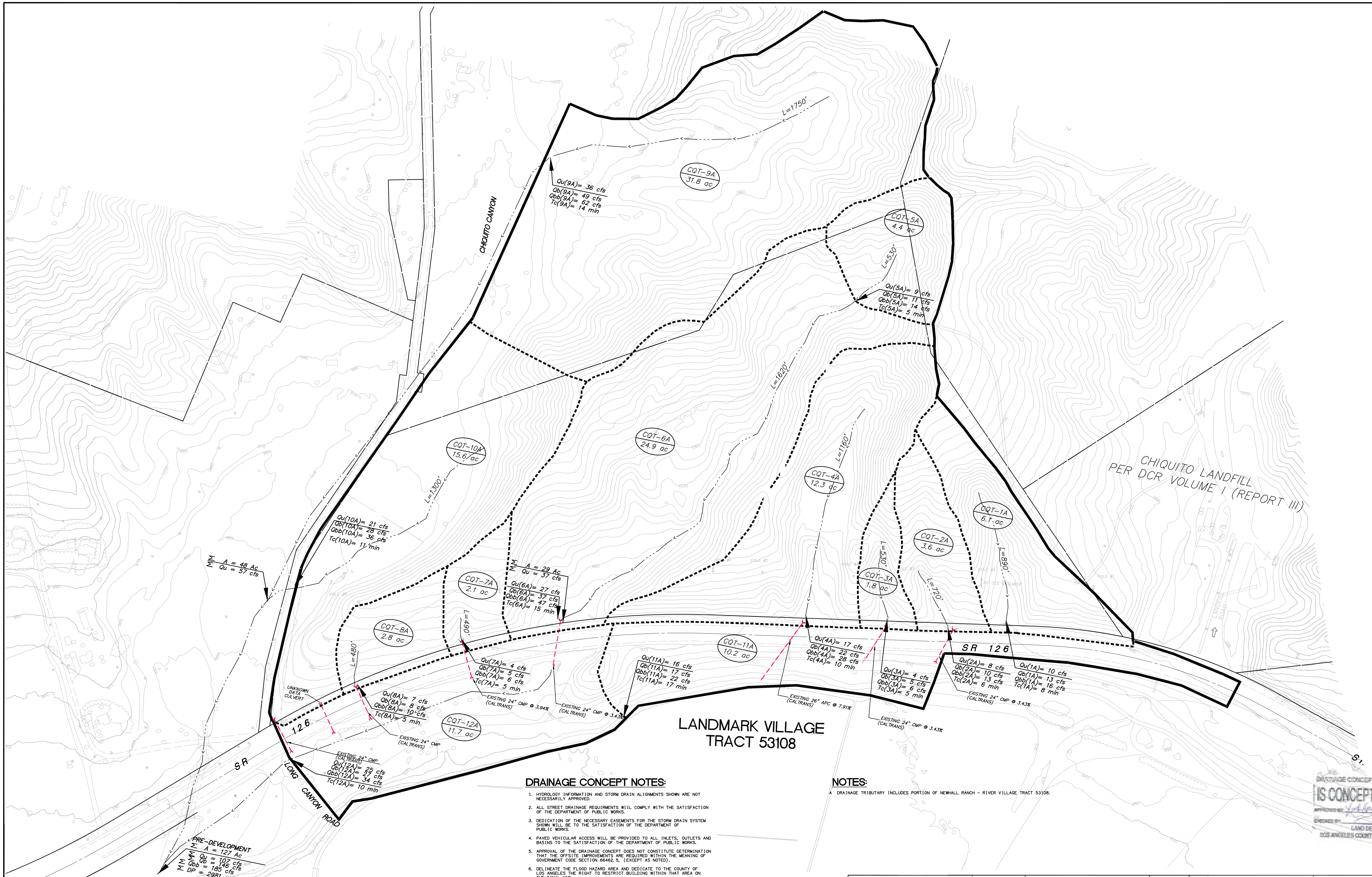
| LEGAL DESCRIPTION: | | | | | |
|---|---|---|---|---|---|
| PARCELS 14, 15, 16, 17 OF PARCEL MAP NO. 24500-01 PMB 293-34 / 67, RECORDS OF LOS ANGELES COUNTY. | REGISTERED PROFESSIONAL ENGINEER ERIK WINATA No. C-67285 Exp. 09/30/10 CIVIL STATE OF CALIFORNIA | PSOMAS 28470 Avenue Stanford, Suite 300 Santa Clarita, CA 91355 (661) 219-6000 (661) 775-2718 (FAX) ERIK WINATA R.C.E. NO. C-67285 DATE | DESIGNED : NSK DRAFTED : NSK CHECKED : EW/RB | OWNER/DEVELOPER : NEWHALL RANCH 23823 WEST VALENCIA BOULEVARD VALENCIA, CALIFORNIA 91335 TELEPHONE: (661) 255-4000 REPRESENTATIVE : MR. FRED MACMURDO | PROJECT NO. 1NRC0107.08 SHEET 1 OF 2 |

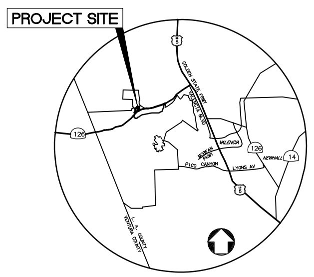
**PROPOSED DRAINAGE PLAN FOR CONDITIONAL USE PERMIT (CUP) CHIQUITO CANYON BORROW SITE**

IN THE UNINCORPORATED AREA OF THE COUNTY OF LOS ANGELES STATE OF CALIFORNIA

RV067-01

Plotted: 11/12/09 09:09:15 V:\Newhall\PRODDATA\53108-MP\ENGR\EXHIBV\PL\RV067-01.dwg ewinata




**VICINITY MAP**
NOT TO SCALE

## LEGEND:

- CQT-5A / 4.4 ac — SUB-BASIN NUMBER / SUB-BASIN AREA (ac)
- EXISTING LOT LINE
- EXISTING EASEMENT
- EXISTING CONTOUR
- DAYLIGHT LINE
- SUB-BASIN BOUNDARY
- DRAINAGE AREA BOUNDARY
- RIGHT OF WAY/PROPERTY LINE
- EASEMENT
- EXISTING STORM DRAIN CULVERT
- EXISTING FLOWPATH
- Qu(sub)= 9 cfs — EXISTING SUB-BASIN Q (unburned)
- Tc(sub)= 15 min — EXISTING TIME OF CONCENTRATION

QU = UNDEVELOPED Q
Qb = BURNED Q
Qbb = BURNED+BULKED Q
DP = DEBRIS PRODUCTION

K = Burn Factor from Appendix G-2, K=0.677*(1^-0.102)
Qb = A*I*(1-K)+K*Qu
Qbb = 1.27*Qb
DP = A*27 cy (DPA Zone 9)

## DRAINAGE DESIGN CRITERIA:

1. 50-YEAR 24-HOUR ISOHYET: 5.8
2. SOIL TYPE: 020
3. DESIGN STORM: 50 YEAR RETURN PERIOD
4. PERCENT IMPERVIOUS VALUES: SINGLE FAMILY - 42%, MULTI-FAMILY - 68%, COMMERCIAL - 92%, SCHOOL - 82%, OPEN SPACE - 0%, PARK - 15%, ROADWAY - 100%
5. DPA= 09
6. BULK FACTOR= 1.27

## DRAINAGE CONCEPT NOTES:

1. HYDROLOGY INFORMATION AND STORM DRAIN ALIGNMENTS SHOWN ARE NOT NECESSARILY APPROVED.
2. ALL STREET DRAINAGE REQUIRMENTS WIIL COMPLY WITH THE SATISFACTION OF THE DEPARTMENT OF PUBLIC WORKS.
3. DEDICATION OF THE NECESSARY EASEMENTS FOR THE STORM DRAIN SYSTEM SHOWN WILL BE TO THE SATISFACTION OF THE DEPARTMENT OF PUBLIC WORKS.
4. PAVED VEHICULAR ACCESS WILL BE PROVIDED TO ALL INLETS, OUTLETS AND BASINS TO THE SATISFACTION OF THE DEPARTMENT OF PUBLIC WORKS.
5. APPROVAL OF THE DRAINAGE CONCEPT DOES NOT CONSTITUTE DETERMINATION THAT THE OFFSITE IMPROVEMENTS ARE REQUIRED WITHIN THE MEANING OF GOVERNMENT CODE SECTION 66462.5, (EXCEPT AS NOTED).
6. DELINEATE THE FLOOD HAZARD AREA AND DEDICATE TO THE COUNTY OF LOS ANGELES THE RIGHT TO RESTRICT BUILDING WITHIN THAT AREA ON THE FINAL MAP.

## NOTES:

A DRAINAGE TRIBUTARY INCLUDES PORTION OF NEWHALL RANCH - RIVER VILLAGE TRACT 53108.

DRAINAGE CONCEPT/STORM WATER QUALITY PLAN IS CONCEPTUALLY APPROVED
LAND DEVELOPMENT DIVISION
LOS ANGELES COUNTY DEPARTMENT OF PUBLIC WORKS

REV: NOVEMBER 12, 2009
DATE: SEPT 15, 2004

LEGAL DESCRIPTION:
PARCELS 14, 15, 16, 17 OF PARCEL MAP NO. 24500-01 PMB 293-34 / 67, RECORDS OF LOS ANGELES COUNTY.

REGISTERED PROFESSIONAL ENGINEER ERIK WINATA No. C-67285 Exp. 09/30/10 CIVIL STATE OF CALIFORNIA

PSOMAS
28470 Avenue Stanford, Suite 300
Santa Clarita, CA 91355
(661) 219-6000 (661) 775-2718 (FAX)
ERIK WINATA R.C.E. NO. C-67285 DATE

DESIGNED : JY/SW/EW
DRAFTED : AC/ML
CHECKED : MG/RB

OWNER/DEVELOPER :
NEWHALL RANCH
23823 WEST VALENCIA BOULEVARD
VALENCIA, CALIFORNIA 91335
TELEPHONE: (661) 255-4000
REPRESENTATIVE : MR. FRED MACMURDO

# EXISTING DRAINAGE PLAN FOR CONDITIONAL USE PERMIT (CUP) CHIQUITO CANYON BORROW SITE

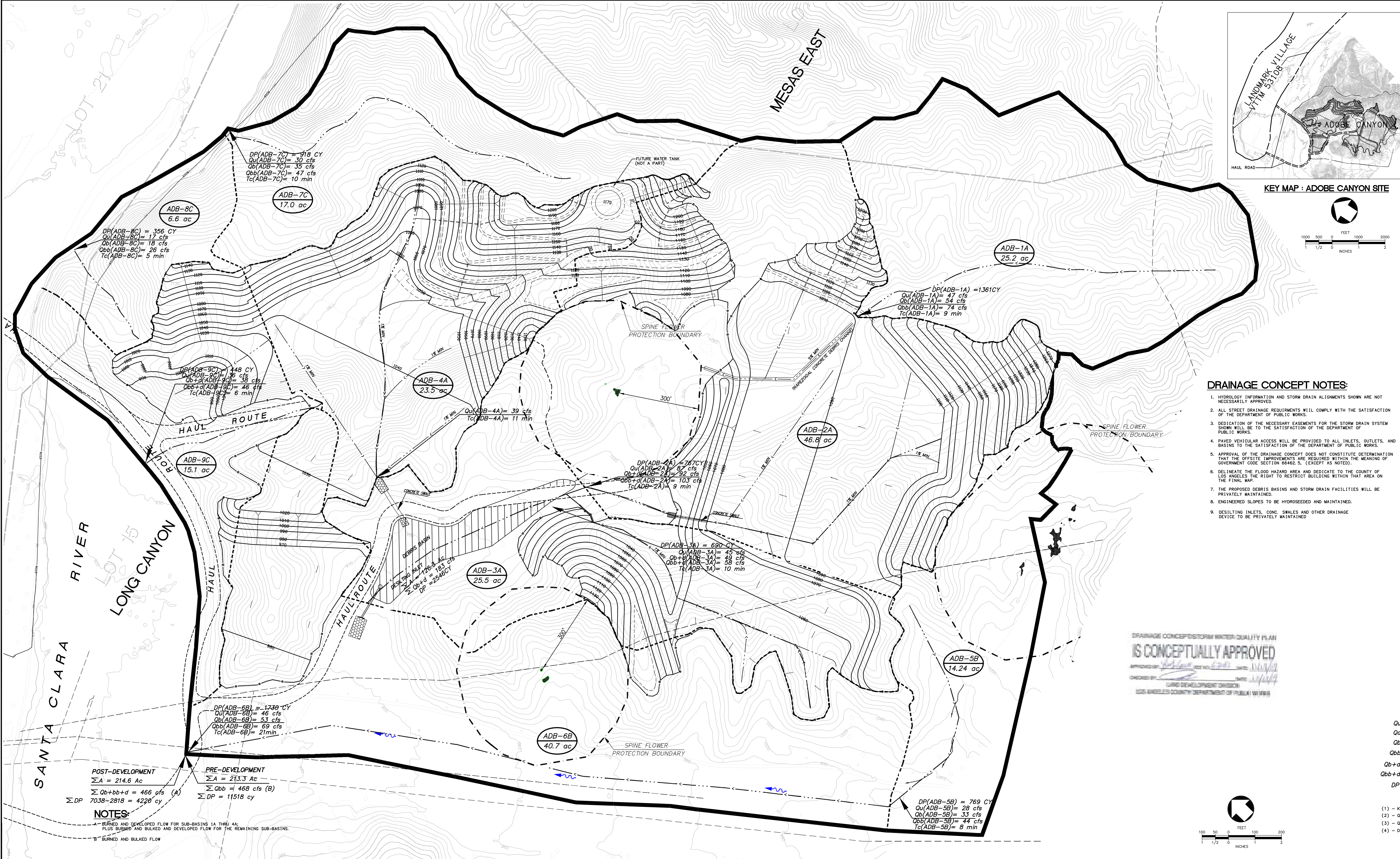
IN THE UNINCORPORATED AREA OF THE COUNTY OF LOS ANGELES STATE OF CALIFORNIA

PROJECT NO. 1NRC0107.08
SHEET 2 OF 2

RV067-02

# APPENDIX 8

# HYDROLOGY EXHIBITS
# ADOBE CANYON BORROW SITE




## NOTES:

A BURNED AND DEVELOPED FLOW FOR SUB-BASINS 1A THRU 4A; PLUS BURNED AND BULKED AND DEVELOPED FLOW FOR THE REMAINING SUB-BASINS.

B BURNED AND BULKED FLOW

## DRAINAGE CONCEPT NOTES:

1. HYDROLOGY INFORMATION AND STORM DRAIN ALIGNMENTS SHOWN ARE NOT NECESSARILY APPROVED.
2. ALL STREET DRAINAGE REQUIRMENTS WIIL COMPLY WITH THE SATISFACTION OF THE DEPARTMENT OF PUBLIC WORKS.
3. DEDICATION OF THE NECESSARY EASEMENTS FOR THE STORM DRAIN SYSTEM SHOWN WILL BE TO THE SATISFACTION OF THE DEPARTMENT OF PUBLIC WORKS.
4. PAVED VEHICULAR ACCESS WILL BE PROVIDED TO ALL INLETS, OUTLETS, AND BASINS TO THE SATISFACTION OF THE DEPARTMENT OF PUBLIC WORKS.
5. APPROVAL OF THE DRAINAGE CONCEPT DOES NOT CONSTITUTE DETERMINATION THAT THE OFFSITE IMPROVEMENTS ARE REQUIRED WITHIN THE MEANING OF GOVERNMENT CODE SECTION 66462.5, (EXCEPT AS NOTED).
6. DELINEATE THE FLOOD HAZARD AREA AND DEDICATE TO THE COUNTY OF LOS ANGELES THE RIGHT TO RESTRICT BUILDING WITHIN THAT AREA ON THE FINAL MAP.
7. THE PROPOSED DEBRIS BASINS AND STORM DRAIN FACILITIES WILL BE PRIVATELY MAINTAINED.
8. ENGINEERED SLOPES TO BE HYDROSEEDED AND MAINTAINED.
9. DESILTING INLETS, CONC. SWALES AND OTHER DRAINAGE DEVICE TO BE PRIVATELY MAINTAINED

## LEGEND:

ADB-1A / 26.0 ac — SUB-BASIN NUMBER / SUB-BASIN AREA (ac)

EXISTING PROPERTY LINE
EXISTING EASEMENT
EXISTING CONTOUR
DAYLIGHT LINE
CUT & FILL
FLOW LINE
BENCH
CONCRETE DEBRIS SWALE
HAUL ROUTE ACCESS ROAD
RIVER CORRIDOR-2003 (FORMERLY SEA 23)
FEMA
Q-CAP
DEBRIS TRIBUTARY LIMIT
SUB-BASIN BOUNDARY
DRAINAGE AREA BOUNDARY
RIGHT OF WAY
EASEMENT
PROPOSED CONTOUR
DAYLIGHT LINE
STORM DRAIN
EXISTING CMP INLET
FLOWPATH
DEBRIS FLOWPATH
DEBRIS BASIN
SPINE FLOWER
SPINE FLOWER PROTECTION BOUNDARY
COAST LIVE OAK (Quercus agrifolia)
VALLEY OAK (Quercus lobata)
SCRUB OAK (Quercus berberidifolia)
SOUTHERN CALIFORNIA BLACK WALNUT (Juglans californica)
HOLLYLEAF CHERRY (Prunus ilicifolia)
EXISTING TREE CANOPY

(8.6 ac) UNDEVELOPED PORTION OF SUBAREA

Qu(sub)= 9 cfs — PROPOSED SUBAREA Q(unburned)
Tc(sub)= 15 min — PROPOSED TIME OF CONCENTRATION

| | | |
|---|---|---|
| Qu | = | UNDEVELOPED Q |
| Qd | = | DEVELOPED Q |
| Qb | = | BURNED Q |
| Qbb | = | BURNED+BULKED Q |
| Qb+d | = | BURNED & DEVELOPED Q |
| Qbb+d | = | BURNED & BULKED & DEVELOPED Q |
| DP | = | DEBRIS PRODUCTION |

(1) - K = Burn Factor from Appendix G-2, K = 0.677*( I ^-0.102)
(2) - Qb = A*I*(1-K)+K*Qu
(3) - Qbb =1.36*Qb
(4) - DP = A*54 cy (Zone 8)

FEET 100 50 0 100 200
INCHES 1 1/2 0 1 2

REV: NOVEMBER 12, 2009
DATE: SEPT 15, 2004

NEWHALL RANCH.

LEGAL DESCRIPTION:

PARCELS 14, 15, 16, 17 OF PARCEL MAP NO. 24500-01 PMB 293-34 / 67, RECORDS OF LOS ANGELES COUNTY.

REGISTERED PROFESSIONAL ENGINEER ERIK WINATA No. C-67285 Exp. 09/30/10 CIVIL STATE OF CALIFORNIA


PSOMAS
28470 Avenue Stanford, Suite 300
Santa Clarita, CA 91355-1460
(661) 219-6000 (661) 775-2718 (FAX)
ERIK WINATA R.C.E. NO. C-67285 DATE


DESIGNED : EW/NSK
DRAFTED : AC/ML
CHECKED : MG/RB

OWNER/DEVELOPER :
NEWHALL RANCH.
23823 WEST VALENCIA BOULEVARD
VALENCIA, CALIFORNIA 91335
TELEPHONE: (661) 255-4000
REPRESENTATIVE : MR. FRED MACMURDO

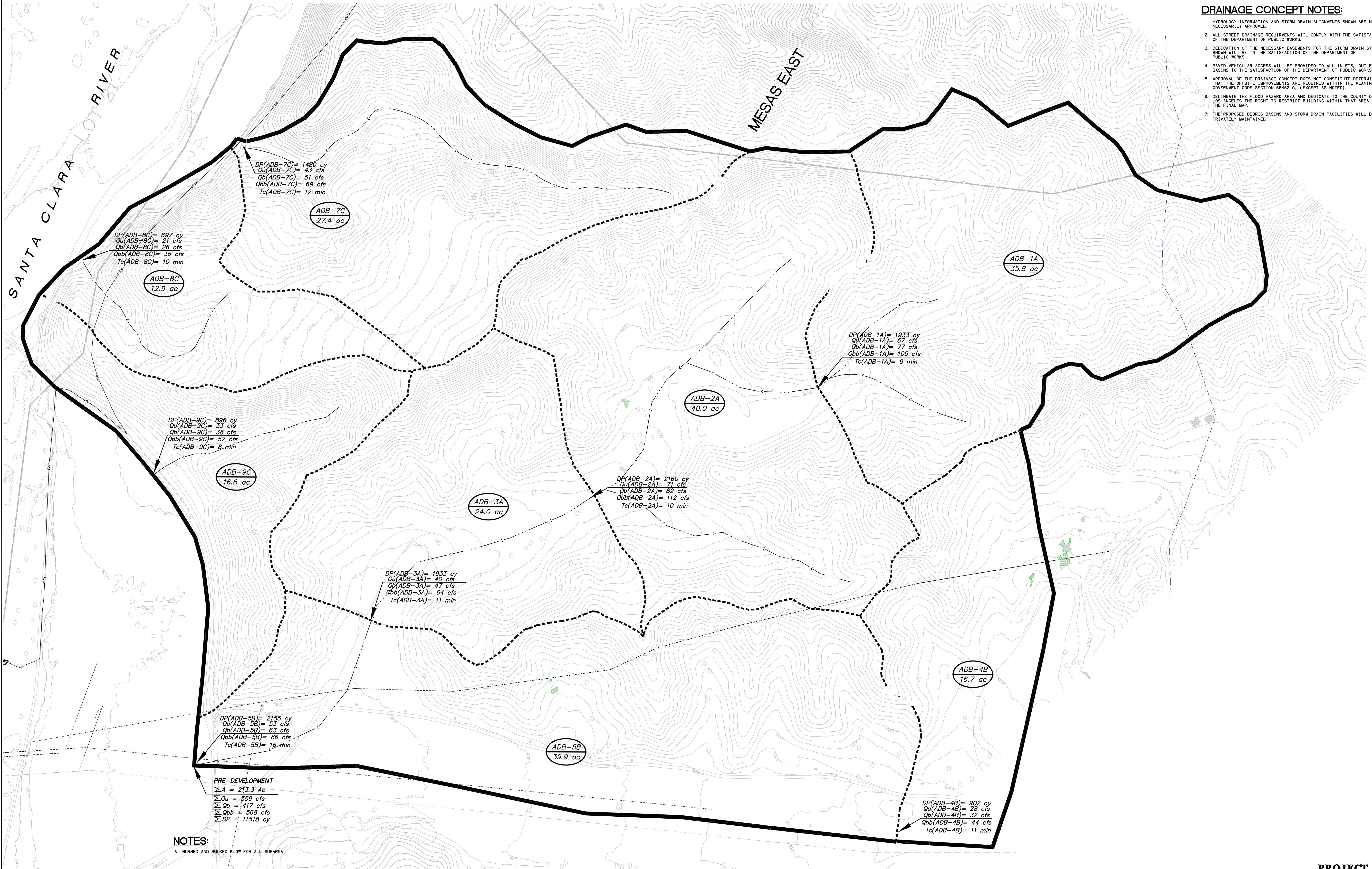
# DRAINAGE CONCEPT PLAN FOR CONDITIONAL USE PERMIT (CUP) ADOBE CANYON BORROW SITE

IN THE UNINCORPORATED AREA OF THE COUNTY OF LOS ANGELES STATE OF CALIFORNIA

PROJECT NO. 1NRC0107.08
SHEET 1 OF 2

RV068-01

Plotted: 10/17/08 16:04:17 V:\Newhall\PRODDATA\53108-MP\ENGR\EXHIB\PL\RV068-01.dwg nkhoo




## NOTES:

A BURNED AND BULKED FLOW FOR ALL SUBAREA

## DRAINAGE CONCEPT NOTES:

1. HYDROLOGY INFORMATION AND STORM DRAIN ALIGNMENTS SHOWN ARE NOT NECESSARILY APPROVED.
2. ALL STREET DRAINAGE REQUIRMENTS WIIL COMPLY WITH THE SATISFACTION OF THE DEPARTMENT OF PUBLIC WORKS.
3. DEDICATION OF THE NECESSARY EASEMENTS FOR THE STORM DRAIN SYSTEM SHOWN WILL BE TO THE SATISFACTION OF THE DEPARTMENT OF PUBLIC WORKS.
4. PAVED VEHICULAR ACCESS WILL BE PROVIDED TO ALL INLETS, OUTLETS AND BASINS TO THE SATISFACTION OF THE DEPARTMENT OF PUBLIC WORKS.
5. APPROVAL OF THE DRAINAGE CONCEPT DOES NOT CONSTITUTE DETERMINATION THAT THE OFFSITE IMPROVEMENTS ARE REQUIRED WITHIN THE MEANING OF GOVERNMENT CODE SECTION 66462.5, (EXCEPT AS NOTED).
6. DELINEATE THE FLOOD HAZARD AREA AND DEDICATE TO THE COUNTY OF LOS ANGELES THE RIGHT TO RESTRICT BUILDING WITHIN THAT AREA ON THE FINAL MAP.
7. THE PROPOSED DEBRIS BASINS AND STORM DRAIN FACILITIES WILL BE PRIVATELY MAINTAINED.

PROJECT SITE

VICINITY MAP

NOT TO SCALE

## LEGEND:

ADB-1A 35.8 ac — SUB-BASIN NUMBER; SUB-BASIN AREA (ac)

SUB-BASIN BOUNDARY

DRAINAGE AREA BOUNDARY

RIGHT OF WAY

EASEMENT

950 PROPOSED CONTOUR

DAYLIGHT LINE

SD STORM DRAIN

EXISTING CMP INLET

FLOWPATH

DEBRIS FLOWPATH

RIVER CORRIDOR-2003 (FORMERLY SEA 23)

FEMA

Q-CAP

DEBRIS TRIBUTARY LIMIT

SPINE FLOWER

COAST LIVE OAK (Quercus agrifolia)

VALLEY OAK (Quercus lobata)

SCRUB OAK (Quercus berberidifolia)

SOUTHERN CALIFORNIA BLACK WALNUT (Juglans californica)

HOLLYLEAF CHERRY (Prunus ilicifolia)

EXISTING TREE CANOPY

Qu(sub)= 9 cfs — EXISTING SUB-BASIN Q(unburned)

Tc(sub)= 15 min — EXISTING TIME OF CONCENTRATION

QU = UNDEVELOPED Q

Qb = BURNED Q

Qbb = BURNED+BULKED Q

DP = DEBRIS PRODUCTION

K = Burn Factor from Appendix G-2, K=0.677*(1^-0.102)

Qb = A*I*(1-K)+K*Qu

Qbb = 1.36*Qb

DP = A*54 cy (DPA Zone 8)

DRAINAGE CONCEPT/STORM WATER QUALITY PLAN IS CONCEPTUALLY APPROVED

LAND DEVELOPMENT DIVISION

LOS ANGELES COUNTY DEPARTMENT OF PUBLIC WORKS

FEET 100 50 0 100 200

INCHES 1 1/2 0 1 2

# PROJECT AREA

REV: NOVEMBER 12, 2009

DATE: SEPT 15, 2004

LEGAL DESCRIPTION:

PARCELS 14, 15, 16, 17 OF PARCEL MAP NO. 24500-01 PMB 293-34 / 67, RECORDS OF LOS ANGELES COUNTY.

REGISTERED PROFESSIONAL ENGINEER ERIK WINATA No. C-67285 Exp. 09/30/10 CIVIL STATE OF CALIFORNIA

PSOMAS

28470 Avenue Stanford, Suite 300
Santa Clarita, CA 91355-1460
(661) 219-6000 (661) 775-2718 (FAX)

ERIK WINATA R.C.E. NO. C-67285 DATE

DESIGNED : JY/SW/EW

DRAFTED : AC/ML

CHECKED : MG/RB

OWNER/DEVELOPER :

NEWHALL RANCH

23823 WEST VALENCIA BOULEVARD
VALENCIA, CALIFORNIA 91335
TELEPHONE: (661) 255-4000
REPRESENTATIVE : MR. FRED MACMURDO

# EXISTING DRAINAGE PLAN FOR CONDITIONAL USE PERMIT (CUP) ADOBE CANYON BORROW SITE

IN THE UNINCORPORATED AREA OF THE COUNTY OF LOS ANGELES STATE OF CALIFORNIA

PROJECT NO. 1NRC0107.08

SHEET 2 OF 2

RV068-02

NEWHALL RANCH

Plotted: 10/17/08 15:31:56

# REPORT III

## OFF-SITE CHIQUITO LANDFILL DRAINAGE CONCEPT REPORT

# NOTE

**Off-site Chiquita Landfill Drainage Concept Report was conceptually approved by Land Development Division, Los Angeles County Department of Public Works on 07/05/07. There are no changes made since the approval of this report.**

PSOMAS

DRAINAGE CONCEPT/STORM WATER QUALITY PLAN
IS CONCEPTUALLY APPROVED
APPROVED BY: [signature] RCE NO. 67363 DATE: 11/29/06
CHECKED BY: [signature] DATE: 11/29/06
LOS ANGELES COUNTY DEPARTMENT OF PUBLIC WORKS
LAND DEVELOPMENT DIVISION

# OFF-SITE CHIQUITO LANDFILL DRAINAGE CONCEPT

Psomas Project No: 1NRCO10708

November 17, 2006

Prepared for:

RECEIVED
NOV 20
PROCESSING CENTER
LAND DEVELOPMENT DIVISION

**NEWHALL LAND**
23823 W. Valencia Blvd.
Valencia, CA 91355-2194
Telephone: (661) 255-4000

Prepared by:

**PSOMAS**
28470 Avenue Stanford, Suite 300
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REGISTERED PROFESSIONAL ENGINEER
ERIK WINATA
No. 67285
EXP. 9/30/10
CIVIL
STATE OF CALIFORNIA
11/12/09

REGISTERED PROFESSIONAL ENGINEER
ROSS WILLIAM BARKER
No. C 32799
Exp. 6/30/08
CIVIL
STATE OF CALIFORNIA

11/17/2006

Ross W. Barker, P.E. R.C.E. No. C32799 Exp. Date 06-30-08

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# 1.0 Introduction

## *Project Background*

Psomas has been retained by the Newhall Land Co. to prepare a drainage concept report for the landfill area associated with the Tentative Tract Map No. 53108 for the proposed Landmark Village development. The landfill area is under a Conditional Use Permit (CUP), not part of the tentative tract map itself. The Chiquito landfill site is located north of Landmark Village, just north of SR 126.

## *Purpose and Scope*

The project falls under the jurisdiction of the Los Angeles County Department of Public Works (LACDPW). The purpose of this drainage concept report is:

- To meet Los Angeles County Land Development requirements in support of the tentative tract map submittal, allowing final design and construction to proceed in a timely manner;
- To determine the runoff for existing hydrologic conditions;
- To provide sufficient detailed information to support debris basin facilities,

It should be noted that detailed storm drain and debris basin analyses is beyond the scope of this drainage concept.

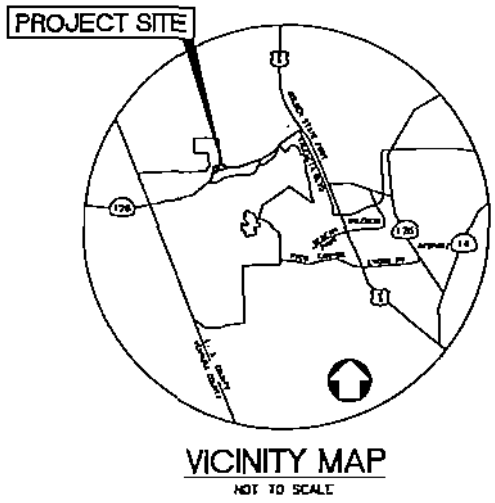



Figure 1. Location Map

## 2.0 Hydrology

### *General Approach*

The watershed for the landfill area was divided into several sub-basins that were identified and characterized for existing conditions. Computer modeling was used to estimate the runoff for the 50-year storm events. The sub-basins drain southwesterly on site, ultimately tributary to the Santa Clara River. The analysis considered with the additional bulking factors where appropriate to size sediment/debris facilities.

### *Data Sources*

The primary sources of data were the *LACDPW Hydrology/ Sedimentation Manual and Appendices* (LACDPW 1991, 1992, 1993, 2002) and the Los Angeles County *Standard Urban Stormwater Mitigation Plan* (March 2000). Other key sources included the *TC (v1.0),* and *MORA (v7.2)* manuals and the Newhall Ranch Specific Plan Master Hydrology and Drainage Concept, Sikand, December 1999 (appended for reference).

### *Watershed Characteristics*

The Chiquito landfill site is bounded by SR 126 on the south, Chiquito borrow site on the west, and the existing Post Office site and Parcel Map 18108 on the east. The total drainage area for the site encompasses approximately 349 acres and flows predominantly south toward SR 126. The majority of the area is undeveloped land with steep to moderate slopes.

The soil of the landfill site is classified by Los Angeles County to be Type 020. The drainage area of the site is associated with Debris Potential Area (DPA) number 05. The peak bulking factor curves and peak debris production rates used in the analysis are included in Appendix D (LACDPW P2 & P5).

The Chiquito Landfill site is located in Los Angeles County's Rainfall Isohyets 5.8.

The *LACDPW TC (TC_calc_depth.xls, June2002)* program was used to calculate the time of concentration for each sub area. The *LACDPW MORA (v7.2)* computer program was used for the *Modified Rational Method* calculations and calculation of peak runoff rates and hydrographs. The TC calculations and MORA program output for clear and burned flow condition are provided in Appendix 1, 2 and 3, respectively. In accordance with LACDPW requirements, the 50-year burned; bulked storm event was used as the main design storm in the analysis.

### *Existing Condition Results*

Existing condition hydrology results for the Capital Flood storm event are summarized in Tables 1 and 2 below.

**Table 1**
**Existing Condition Hydrology Summary – Chiquito Landfill Site**

| EXISTING CONDITION | | | | | | |
|---|---|---|---|---|---|---|
| INCREMENTAL SUB-BASINS | | | | | | |
| **Sub-Basin Number** | **Time of Concentration (Tc)** | **Sub-Basin Area (acres)** | **Q50 Unburned (cfs)** | **Q50 Burned (cfs)** | **Q50 Burned Bulked (cfs)** | **Debris Volume ($Yd^3$)** |
| 1A | 11 | 18.5 | 25 | 33 | - | - |
| 2A | 9 | 21.6 | 35 | 42 | - | - |
| 3A | 16 | 37.7 | 38 | 54 | - | - |
| 4A | 16 | 33.2 | 34 | 47 | - | - |
| 5A | 10 | 30.9 | 38 | 53 | - | - |
| 10A | 13 | 13.1 | 18 | 21 | - | - |
| 12A | 16 | 32.7 | 34 | 47 | - | - |
| 6B | 10 | 14.8 | 21 | 28 | - | - |
| 7B | 10 | 9.5 | 14 | 18 | - | - |
| 13B | 12 | 18.7 | 23 | 31 | - | - |
| 14B | 14 | 20.9 | 24 | 32 | - | - |
| 15B | 17 | 28.0 | 28 | 40 | - | - |
| 18C | 14 | 23.1 | 28 | 35 | - | - |
| 19C | 16 | 30.4 | 31 | 43 | - | - |
| 25C | 9 | 10.3 | 20 | 40 | - | - |
| TOTAL | --- | 349.4 | 328 | 470 | 645* | 23,100** |

** Bulking factor is taken form Hydrology/Sedimentation Appendix P-5*
*** Debris production rate is taken from P-2*

**Table 2**
**Land Use Impervious Values**

| Land Use | Percent Imperviousness |
|---|---|
| Open Space/Natural Landfill | 0% |
| | |

## 3.0 Standard Urban Stormwater Mitigation Plan (SUSMP)

Instead of volume- or flow-based Treatment Control BMPs, the Los Angeles County Standard Urban Stormwater Mitigation Plan (SUSMP) requirements will be met by Erosion and Sediment Control BMPs, which decrease the potential of slopes and channels to erode and impact stormwater runoff. Los Angeles County SUSMP guidelines specify BMPs such as the following:

- Conveying runoff safely from the tops of slopes and stabilizing disturbed slopes
- Utilizing natural drainage systems to the maximum extent practicable (MEP)
- Stabilizing permanent channel crossings
- Vegetating slopes with native or drought tolerant vegetation
- Installing energy dissipators, such as riprap, at the outlets of new storm drains, culverts, conduits, or channels that enter unlined channels in accordance with applicable specifications to minimize erosion

Final selection and detailed design of these BMPs is beyond the scope of this report. However, the report and exhibits show that erosion and sediment control SUSMP requirements can be met.

## 4.0 Limitations

This report was prepared to comply with the guidelines established by the County of Los Angeles and their representatives. Evaluation of the appropriateness of these guidelines and the accuracy of the County data were beyond the scope of this work.

Usage of the report is limited to address the purpose and scope previously defined by the project owner, Newhall Land. Psomas shall not be held responsible for any unauthorized application of this report and the contents herein.

The opinions represented in this report have been derived in accordance with current standards of civil engineering practice. No other warranty is expressed or implied.

## 5.0 References

Los Angeles County Department of Public Works, *LACDPW Hydrology/ Sedimentation Manual and Appendices* (1991, 1992, 1993, 2002)

Los Angeles County Department of Public Works, *LACDPW TC v1.0 Manual, TC_calc_depth.xls* (December 1991, June 2002)

Los Angeles County Department of Public Works, *LACDPW Modified Rational Method, MORA (MORA) v7.2 Manual* (September 2002)

Newhall Ranch, Newhall Ranch Specific Plan Master Hydrology and Drainage Concept (Sikand, December 1999)

# APPENDICES

# APPENDIX A

# TC CALCULATIONS: EXISTING CONDITION

| Project | Subarea | Area (acres | %imp | | | | |
|---|---|---|---|---|---|---|---|
| Landfill | 1A | 18.5 | | 7*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 | | | |
| Landfill | 2A | 21.6 | | 7*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 | | | |
| Landfill | 3A | 37.7 | | 7*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 | | | |
| Landfill | 4A | 33.2 | | 7*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 | | | |
| Landfill | 5A | 35.9 | | 7*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 | | | |
| Landfill | 10A | 13.1 | | 7*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 | | | |
| Landfill | 12A | 32.7 | | 7*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 | | | |
| Landfill | 6B | 14.8 | | 7*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 | | | |
| Landfill | 7B | 9.5 | | 7*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 | | | |
| Landfill | 13B | 18.7 | | 7*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 | | | |
| Landfill | 14B | 20.9 | | 7*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 | | | |
| Landfill | 15B | 29 | | 7*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 | | | |
| Landfill | 18C | 23.1 | | 7*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 | | | |
| Landfill | 19C | 30.4 | | 7*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 | | | |
| Landfill | 26C | 10.3 | | 7*(Cd*I)^-0.519*(L)^0.483*(S)^-0.135 | | | |

# APPENDIX B

# LACDPW MORA CALCULATIONS: EXISTING CONDITION CLEAR

MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 50

CHIQUITO LANDFILL HYDROLOGY - EXISTING Condition STORM DAY 4

| LOCATION | | SUBAREA AREA(Ac) | SUBAREA Q(CFS) | TOTAL AREA(Ac) | TOTAL Q(CFS) | CONV TYPE | CONV LNGTH(Ft) | CONV SLOPE | CONV SIZE(Ft) | CONV Z | CONTROL Q(CFS) | SOIL NAME | TC | RAIN ZONE | PCT IMPV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 300 | 1A | 18.5 | 25. | 18.5 | 25. | 2 | 1060. | .19300 | .00 | .00 | 0. | 20 | 11 | A29 | .00 |
| 300 | 2A | 21.6 | 33. | 40.1 | 56. | 2 | 900. | .05000 | .00 | .00 | 0. | 20 | 9 | A29 | .00 |
| 300 | 3A | 37.7 | 39. | 77.8 | 92. | 2 | 440. | .06800 | .00 | .00 | 0. | 20 | 16 | A29 | .00 |
| 300 | 4A | 33.2 | 34. | 111.0 | 125. | 0 | 0. | .00000 | .00 | .00 | 0. | 20 | 16 | A29 | .00 |
| 300 | 5A | 35.9 | 39. | 146.9 | 162. | 0 | 0. | .00000 | .00 | .00 | 0. | 20 | 15 | A29 | .00 |
| 300 | 6B | 14.8 | 21. | 14.8 | 21. | 2 | 940. | .11200 | .00 | .00 | 0. | 20 | 10 | A29 | .00 |
| 300 | 7B | 9.5 | 14. | 24.3 | 33. | 0 | 0. | .00000 | .00 | .00 | 0. | 20 | 10 | A29 | .00 |

CONFLUENCE Q'S

300 8A TA 1158 QA 162. QAB 194. QB 32. 300 8B TB 1156 QB 33. QBA 192. QA 159.
300 8AB TAB 1157 QAB 195. QA 162. QB 33.

| LOCATION | | SUBAREA AREA(Ac) | SUBAREA Q(CFS) | TOTAL AREA(Ac) | TOTAL Q(CFS) | CONV TYPE | CONV LNGTH(Ft) | CONV SLOPE | CONV SIZE(Ft) | CONV Z | CONTROL Q(CFS) | SOIL NAME | TC | RAIN ZONE | PCT IMPV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 300 | 8AB | 24.3 | 33. | 171.2 | 195. | 0 | 0. | .00000 | .00 | .00 | 0. | 20 | 0 | A29 | .00 |
| 300 | 9A | .0 | 0. | 171.2 | 195. | 2 | 1240. | .03600 | .00 | .00 | 0. | 20 | 99 | A29 | .00 |
| 300 | 10A | 13.1 | 16. | 184.3 | 205. | 2 | 1470. | .00800 | .00 | .00 | 0. | 20 | 13 | A29 | .00 |
| 300 | 11A | .0 | 0. | 184.3 | 184. | 0 | 0. | .00000 | .00 | .00 | 0. | 20 | 99 | A29 | .00 |
| 300 | 12A | 32.7 | 34. | 217.0 | 205. | 0 | 0. | .00000 | .00 | .00 | 0. | 20 | 16 | A29 | .00 |
| 300 | 13B | 18.7 | 23. | 18.7 | 23. | 2 | 1130. | .02700 | .00 | .00 | 0. | 20 | 12 | A29 | .00 |
| 300 | 14B | 20.9 | 24. | 39.6 | 43. | 2 | 1940. | .07500 | .00 | .00 | 0. | 20 | 14 | A29 | .00 |
| 300 | 15B | 29.0 | 29. | 68.6 | 66. | 2 | 860. | .07200 | .00 | .00 | 0. | 20 | 17 | A29 | .00 |
| 300 | 16B | .0 | 0. | 68.6 | 65. | 0 | 0. | .00000 | .00 | .00 | 0. | 20 | 99 | A29 | .00 |
| 300 | 17B | .0 | 0. | 68.6 | 65. | 0 | 0. | .00000 | .00 | .00 | 0. | 20 | 99 | A29 | .00 |
| 300 | 18C | 23.1 | 26. | 23.1 | 26. | 2 | 1480. | .12200 | .00 | .00 | 0. | 20 | 14 | A29 | .00 |
| 300 | 19C | 30.4 | 31. | 53.5 | 56. | 0 | 0. | .00000 | .00 | .00 | 0. | 20 | 16 | A29 | .00 |

CONFLUENCE Q'S

300 20B TB 1164 QB 65. QBC 112. QC 46. 300 20C TC 1158 QC 56. QCB 110. QB 55.
300 20BC TBC 1161 QBC 116. QB 63. QC 53.

| LOCATION | | SUBAREA AREA(Ac) | SUBAREA Q(CFS) | TOTAL AREA(Ac) | TOTAL Q(CFS) | CONV TYPE | CONV LNGTH(Ft) | CONV SLOPE | CONV SIZE(Ft) | CONV Z | CONTROL Q(CFS) | SOIL NAME | TC | RAIN ZONE | PCT IMPV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 300 | 20BC | 53.5 | 56. | 122.1 | 116. | 0 | 0. | .00000 | .00 | .00 | 0. | 20 | 0 | A29 | .00 |
| 300 | 21B | .0 | 0. | 122.1 | 116. | 2 | 570. | .00400 | .00 | .00 | 0. | 20 | 99 | A29 | .00 |
| 300 | 22B | .0 | 0. | 122.1 | 113. | 0 | 0. | .00000 | .00 | .00 | 0. | 20 | 99 | A29 | .00 |
| 300 | 23B | .0 | 0. | 122.1 | 113. | 0 | 0. | .00000 | .00 | .00 | 0. | 20 | 99 | A29 | .00 |
| 300 | 24B | .0 | 0. | 122.1 | 113. | 0 | 0. | .00000 | .00 | .00 | 0. | 20 | 99 | A29 | .00 |

CONFLUENCE Q'S

300 25A TA 1165 QA 205. QAB 318. QB 113. 300 25B TB 1165 QB 113. QBA 318. QA 205.
300 25AB TAB 1165 QAB 318. QA 205. QB 113.

| LOCATION | | SUBAREA AREA(Ac) | SUBAREA Q(CFS) | TOTAL AREA(Ac) | TOTAL Q(CFS) | CONV TYPE | CONV LNGTH(Ft) | CONV SLOPE | CONV SIZE(Ft) | CONV Z | CONTROL Q(CFS) | SOIL NAME | TC | RAIN ZONE | PCT IMPV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 300 | 25AB | 122.1 | 113. | 339.1 | 318. | 0 | 0. | .00000 | .00 | .00 | 0. | 20 | 0 | A29 | .00 |

Program Package Serial Number: 2033



MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 50

CHIQUITO LANDFILL HYDROLOGY - EXISTING Condition STORM DAY 4

| LOCATION | | SUBAREA AREA(Ac) | SUBAREA Q(CFS) | TOTAL AREA(Ac) | TOTAL Q(CFS) | CONV TYPE | CONV LNGTH(Ft) | CONV SLOPE | CONV SIZE(Ft) | CONV Z | CONTROL Q(CFS) | SOIL NAME | TC | RAIN ZONE | PCT IMPV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 300 | 26C | 10.3 | 16. | 10.3 | 16. | 2 | 1080. | .01600 | .00 | .00 | 0. | 20 | 9 | A29 | .00 |
| 300 | 27A | .0 | 0. | 339.1 | 318. | 0 | 0. | .00000 | .00 | .00 | 0. | 20 | 99 | A29 | .00 |
| 300 | 28A | .0 | 0. | 339.1 | 318. | 0 | 0. | .00000 | .00 | .00 | 0. | 20 | 99 | A29 | .00 |
| 300 | 29A | .0 | 0. | 339.1 | 318. | 0 | 0. | .00000 | .00 | .00 | 0. | 20 | 99 | A29 | .00 |

CONFLUENCE Q'S

300 30A TA 1165 QA 318. QAC 328. QC 10. 300 30C TC 1161 QC 13. QCA 285. QA 272.
300 30AC TAC 1165 QAC 328. QA 318. QC 10.

| LOCATION | | SUBAREA AREA(Ac) | SUBAREA Q(CFS) | TOTAL AREA(Ac) | TOTAL Q(CFS) | CONV TYPE | CONV LNGTH(Ft) | CONV SLOPE | CONV SIZE(Ft) | CONV Z | CONTROL Q(CFS) | SOIL NAME | TC | RAIN ZONE | PCT IMPV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 300 | 30AC | 10.3 | 13. | 349.4 | 328. | 0 | 0. | .00000 | .00 | .00 | 0. | 20 | 0 | A29 | .00 |
| 300 | 31A | .0 | 0. | 349.4 | 328. | 0 | 0. | .00000 | .00 | .00 | 0. | 20 | 99 | A29 | .00 |

# APPENDIX C

# LACDPW MORA CALCULATIONS: BURNED CONDITION

MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 50

CHIQUITO LANDFILL HYDROLOGY - EXISTING Condition STORM DAY 4

| LOCATION | | SUBAREA AREA(Ac) | SUBAREA Q(CFS) | TOTAL AREA(Ac) | TOTAL Q(CFS) | CONV TYPE | CONV LNGTH(Ft) | CONV SLOPE | CONV SIZE(Ft) | CONV Z | CONTROL Q(CFS) | SOIL NAME | TC | RAIN ZONE | PCT IMPV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 300 | 1A | 18.5 | 33. | 18.5 | 33. | 2 | 1060. | .19300 | .00 | .00 | 0. | 220 | 11 | A29 | .00 |
| 300 | 2A | 21.6 | 42. | 40.1 | 73. | 2 | 900. | .05000 | .00 | .00 | 0. | 220 | 9 | A29 | .00 |
| 300 | 3A | 37.7 | 54. | 77.8 | 125. | 2 | 440. | .06800 | .00 | .00 | 0. | 220 | 16 | A29 | .00 |
| 300 | 4A | 33.2 | 47. | 111.0 | 170. | 0 | 0. | .00000 | .00 | .00 | 0. | 220 | 16 | A29 | .00 |
| 300 | 5A | 35.9 | 53. | 146.9 | 222. | 0 | 0. | .00000 | .00 | .00 | 0. | 220 | 15 | A29 | .00 |
| 300 | 6B | 14.8 | 28. | 14.8 | 28. | 2 | 940. | .11200 | .00 | .00 | 0. | 220 | 10 | A29 | .00 |
| 300 | 7B | 9.5 | 18. | 24.3 | 44. | 0 | 0. | .00000 | .00 | .00 | 0. | 220 | 10 | A29 | .00 |

CONFLUENCE Q'S

300 8A TA 1157 QA 222. QAB 265. QB 43. 300 8B TB 1156 QB 44. QBA 263. QA 219.
300 8AB TAB 1157 QAB 265. QA 222. QB 43.

| LOCATION | | SUBAREA AREA(Ac) | SUBAREA Q(CFS) | TOTAL AREA(Ac) | TOTAL Q(CFS) | CONV TYPE | CONV LNGTH(Ft) | CONV SLOPE | CONV SIZE(Ft) | CONV Z | CONTROL Q(CFS) | SOIL NAME | TC | RAIN ZONE | PCT IMPV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 300 | 8AB | 24.3 | 44. | 171.2 | 265. | 0 | 0. | .00000 | .00 | .00 | 0. | 220 | 0 | A29 | .00 |
| 300 | 9A | .0 | 0. | 171.2 | 265. | 2 | 1240. | .03600 | .00 | .00 | 0. | 220 | 99 | A29 | .00 |
| 300 | 10A | 13.1 | 21. | 184.3 | 281. | 2 | 1470. | .00800 | .00 | .00 | 0. | 220 | 13 | A29 | .00 |
| 300 | 11A | .0 | 0. | 184.3 | 260. | 0 | 0. | .00000 | .00 | .00 | 0. | 220 | 99 | A29 | .00 |
| 300 | 12A | 32.7 | 47. | 217.0 | 294. | 0 | 0. | .00000 | .00 | .00 | 0. | 220 | 16 | A29 | .00 |
| 300 | 13B | 18.7 | 31. | 18.7 | 31. | 2 | 1130. | .02700 | .00 | .00 | 0. | 220 | 12 | A29 | .00 |
| 300 | 14B | 20.9 | 32. | 39.6 | 59. | 2 | 1940. | .07500 | .00 | .00 | 0. | 220 | 14 | A29 | .00 |
| 300 | 15B | 29.0 | 40. | 68.6 | 93. | 2 | 860. | .07200 | .00 | .00 | 0. | 220 | 17 | A29 | .00 |
| 300 | 16B | .0 | 0. | 68.6 | 92. | 0 | 0. | .00000 | .00 | .00 | 0. | 220 | 99 | A29 | .00 |
| 300 | 17B | .0 | 0. | 68.6 | 92. | 0 | 0. | .00000 | .00 | .00 | 0. | 220 | 99 | A29 | .00 |
| 300 | 18C | 23.1 | 35. | 23.1 | 35. | 2 | 1480. | .12200 | .00 | .00 | 0. | 220 | 14 | A29 | .00 |
| 300 | 19C | 30.4 | 43. | 53.5 | 77. | 0 | 0. | .00000 | .00 | .00 | 0. | 220 | 16 | A29 | .00 |

CONFLUENCE Q'S

300 20B TB 1163 QB 92. QBC 160. QC 68. 300 20C TC 1157 QC 77. QCB 154. QB 77.
300 20BC TBC 1161 QBC 163. QB 90. QC 73.

| LOCATION | | SUBAREA AREA(Ac) | SUBAREA Q(CFS) | TOTAL AREA(Ac) | TOTAL Q(CFS) | CONV TYPE | CONV LNGTH(Ft) | CONV SLOPE | CONV SIZE(Ft) | CONV Z | CONTROL Q(CFS) | SOIL NAME | TC | RAIN ZONE | PCT IMPV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 300 | 20BC | 53.5 | 77. | 122.1 | 163. | 0 | 0. | .00000 | .00 | .00 | 0. | 220 | 0 | A29 | .00 |
| 300 | 21B | .0 | 0. | 122.1 | 163. | 2 | 570. | .00400 | .00 | .00 | 0. | 220 | 99 | A29 | .00 |
| 300 | 22B | .0 | 0. | 122.1 | 160. | 0 | 0. | .00000 | .00 | .00 | 0. | 220 | 99 | A29 | .00 |
| 300 | 23B | .0 | 0. | 122.1 | 160. | 0 | 0. | .00000 | .00 | .00 | 0. | 220 | 99 | A29 | .00 |
| 300 | 24B | .0 | 0. | 122.1 | 160. | 0 | 0. | .00000 | .00 | .00 | 0. | 220 | 99 | A29 | .00 |

CONFLUENCE Q'S

300 25A TA 1164 QA 294. QAB 455. QB 160. 300 25B TB 1165 QB 160. QBA 452. QA 292.
300 25AB TAB 1164 QAB 455. QA 294. QB 160.

| LOCATION | | SUBAREA AREA(Ac) | SUBAREA Q(CFS) | TOTAL AREA(Ac) | TOTAL Q(CFS) | CONV TYPE | CONV LNGTH(Ft) | CONV SLOPE | CONV SIZE(Ft) | CONV Z | CONTROL Q(CFS) | SOIL NAME | TC | RAIN ZONE | PCT IMPV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 300 | 25AB | 122.1 | 160. | 339.1 | 455. | 0 | 0. | .00000 | .00 | .00 | 0. | 220 | 0 | A29 | .00 |



MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 50

CHIQUITO LANDFILL HYDROLOGY - EXISTING Condition STORM DAY 4

| LOCATION | | SUBAREA AREA(Ac) | SUBAREA Q(CFS) | TOTAL AREA(Ac) | TOTAL Q(CFS) | CONV TYPE | CONV LNGTH(Ft) | CONV SLOPE | CONV SIZE(Ft) | CONV Z | CONTROL Q(CFS) | SOIL NAME | TC | RAIN ZONE | PCT IMPV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 300 | 26C | 10.3 | 20. | 10.3 | 20. | 2 | 1080. | .01600 | .00 | .00 | 0. | 220 | 9 | A29 | .00 |
| 300 | 27A | .0 | 0. | 339.1 | 455. | 0 | 0. | .00000 | .00 | .00 | 0. | 220 | 99 | A29 | .00 |
| 300 | 28A | .0 | 0. | 339.1 | 455. | 0 | 0. | .00000 | .00 | .00 | 0. | 220 | 99 | A29 | .00 |
| 300 | 29A | .0 | 0. | 339.1 | 455. | 0 | 0. | .00000 | .00 | .00 | 0. | 220 | 99 | A29 | .00 |

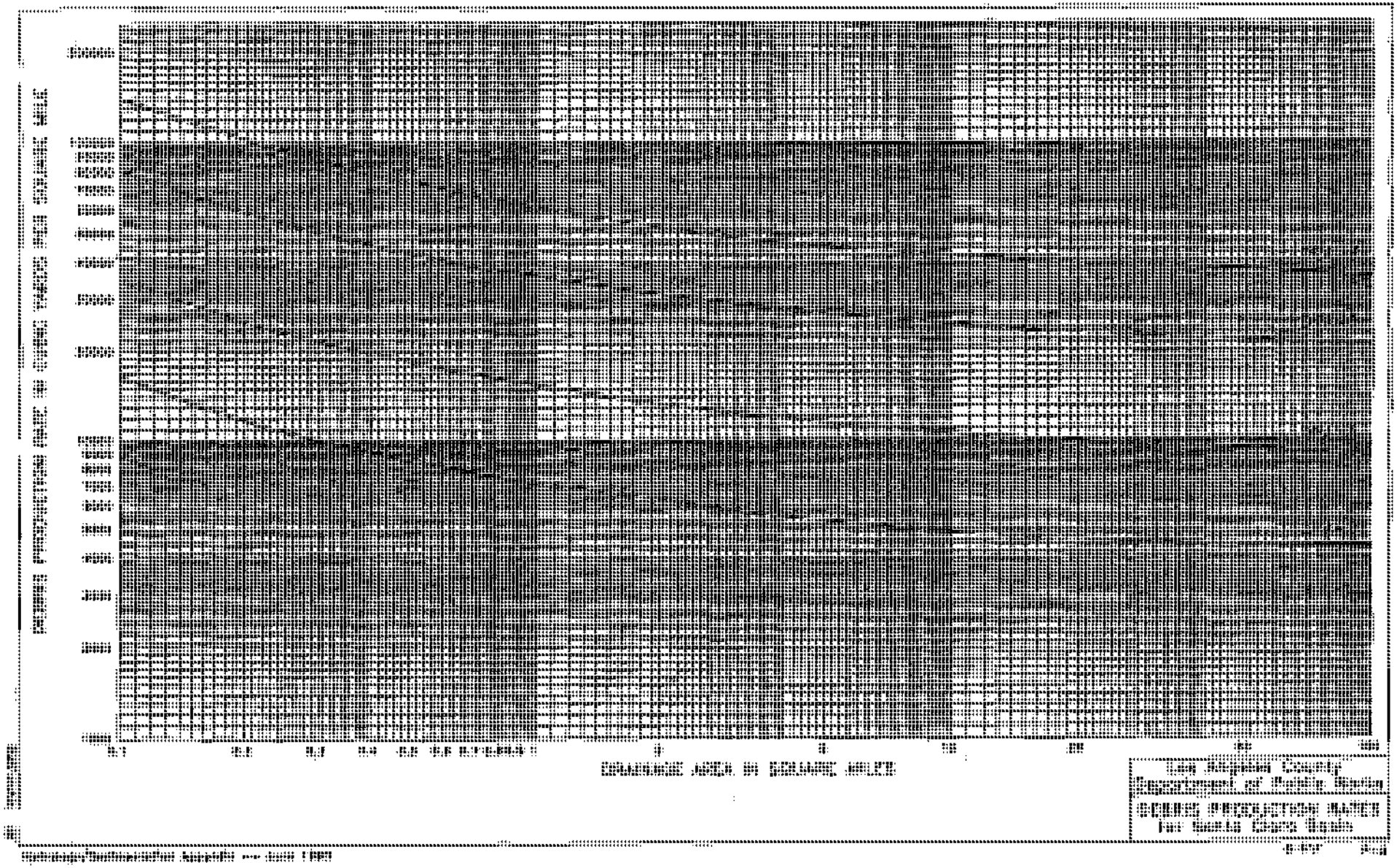
CONFLUENCE Q'S

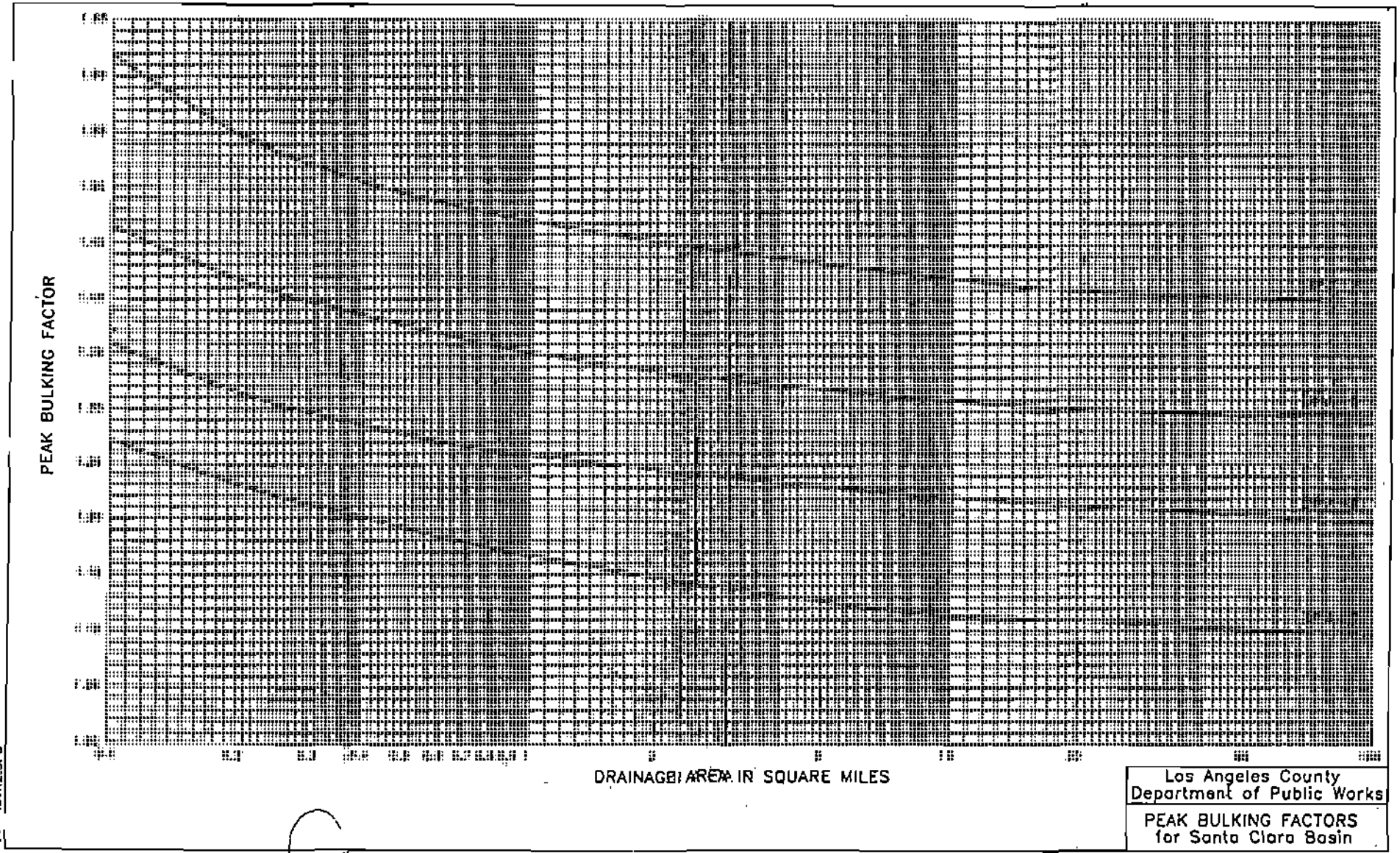
300 30A TA 1164 QA 455. QAC 470. QC 15. 300 30C TC 1161 QC 17. QCA 433. QA 416.
300 30AC TAC 1164 QAC 470. QA 455. QC 15.

| LOCATION | | SUBAREA AREA(Ac) | SUBAREA Q(CFS) | TOTAL AREA(Ac) | TOTAL Q(CFS) | CONV TYPE | CONV LNGTH(Ft) | CONV SLOPE | CONV SIZE(Ft) | CONV Z | CONTROL Q(CFS) | SOIL NAME | TC | RAIN ZONE | PCT IMPV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 300 | 30AC | 10.3 | 17. | 349.4 | 470. | 0 | 0. | .00000 | .00 | .00 | 0. | 220 | 0 | A29 | .00 |
| 300 | 31A | .0 | 0. | 349.4 | 470. | 0 | 0. | .00000 | .00 | .00 | 0. | 220 | 99 | A29 | .00 |

# APPENDIX D

# HYDROLOGY/SEDIMENTATION
# LA COUNTY MANUAL P-2, P-5



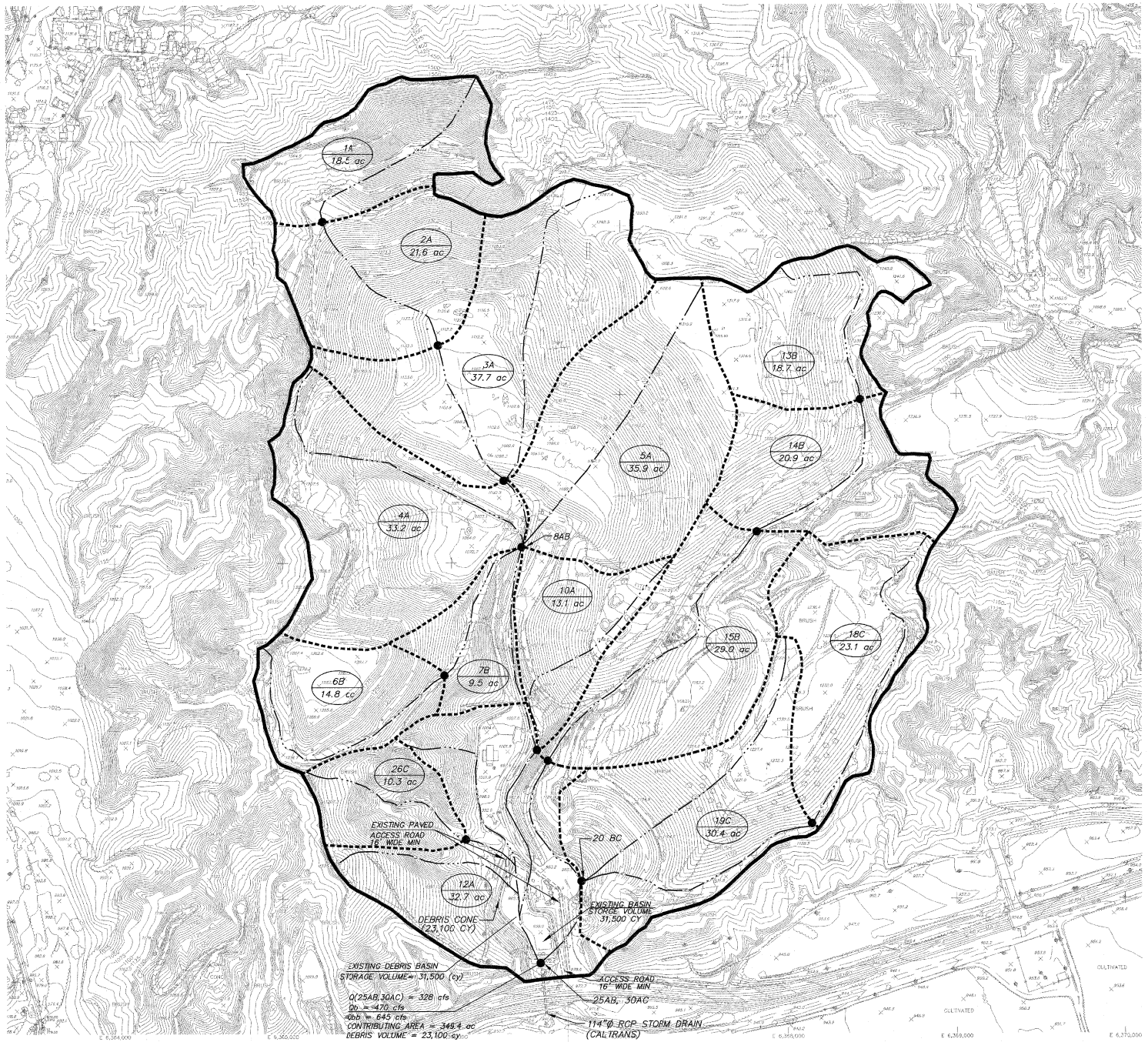



Los Angeles County
Department of Public Works

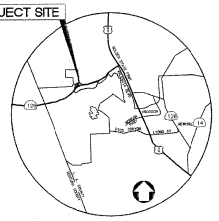
PEAK BULKING FACTORS
for Santa Clara Basin

PL :CVH2.SPG

# APPENDIX E
# HYDROLOGIC MAP




PROJECT SITE



VICINITY MAP

NOT TO SCALE

DEBRIS POTENTIAL AREA (DPA=5)

LEGEND:

4A / 4.4 ac — SUB-BASIN NUMBER / SUB-BASIN AREA (ac)

SUB-BASIN BOUNDARY

DRAINAGE AREA BOUNDARY

FLOWLINE/ROUTING REACH

CONCENTRATION POINT

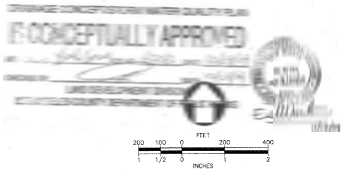
DRAINAGE CONCEPT/STORM WATER QUALITY PLAN
IS CONCEPTUALLY APPROVED
APPROVED BY: [signature] FOR NO. 67385 DATE: 11/29/06
CHECKED BY: _____ DATE: 11/29/06
LAND DEVELOPMENT DIVISION
LOS ANGELES COUNTY DEPARTMENT OF PUBLIC WORKS

**EXISTING CONDITION**

| SUB-BASIN NUMBER | INCREMENTAL SUB-BASINS: TIME OF CONCENTRATION (minutes) | SUB-BASIN AREA (acres) | Q50 UNBURNED (cfs) | Q50 BURNED (cfs) | Q50 BURNED + BULKED (cfs) | CUMULATIVE SUB-BASINS: A CUMULATIVE (cy) | DEBRIS PROD RATE (cy/sq mi) | DPV CUMULATIVE (cy) |
|---|---|---|---|---|---|---|---|---|
| 1A | 11 | 18.5 | 24 | 32 | 47 | 18.5 | 82,000 | 2,370 |
| 2A | 9 | 21.6 | 32 | 42 | 61 | 40.1 | 82,000 | 5,138 |
| 3A | 16 | 37.7 | 39 | 53 | 77 | 77.8 | 75,000 | 9,117 |
| 4A | 16 | 33.2 | 35 | 46 | 68 | 111.0 | 54,000 | 11,100 |
| 5A | 15 | 35.9 | 38 | 52 | 76 | 146.9 | 56,000 | 12,834 |
| 10A | 13 | 13.1 | 15 | 20 | 30 | 160.0 | 54,000 | 13,500 |
| 12A | 16 | 32.7 | 34 | 46 | 67 | 192.7 | 50,000 | 15,055 |
| 6B | 10 | 14.8 | 16 | 21 | 31 | 207.5 | 49,000 | 15,887 |
| 7B | 10 | 9.5 | 13 | 17 | 25 | 217.0 | 48,000 | 16,275 |
| 13B | 12 | 18.7 | 23 | 31 | 45 | 235.7 | 47,000 | 17,309 |
| 14B | 14 | 20.9 | 24 | 31 | 46 | 256.6 | 46,000 | 18,443 |
| 15B | 17 | 29.0 | 29 | 39 | 57 | 285.6 | 45,000 | 20,081 |
| 18C | 14 | 23.1 | 26 | 35 | 51 | 308.7 | 44,000 | 21,223 |
| 19C | 18 | 30.4 | 32 | 42 | 62 | 339.1 | 43,000 | 22,783 |
| 26C | 9 | 10.3 | 15 | 20 | 29 | 349.4 | 42,300 | 23,093 |
| TOTAL: | --- | 349.4 | 328 | 470 | 645* | 349.4 | --- | 23,100** |

* BULKING FACTOR IS TAKEN FROM HYDROLOGY/SEDIMENTATION APPENDIX, P-5

** DEBRIS PRODUCTION RATE IS TAKEN FROM P-2, DPA-5




**PROJECT AREA**

| | | | | | |
|---|---|---|---|---|---|
| ROSS W. BARKER No. C-32799 REN. 06/30/08 CIVIL STATE OF CALIFORNIA | **PSOMAS** 28470 Avenue Stanford, Suite 300 Santa Clarita, CA 91355 (661) 259-6040 (661) 775-2778 (FAX) 11-17-2006 ROSS W. BARKER R.C.E. NO. C32799 DATE | DESIGNED : AC/EW<br>DRAFTED : AC/ML<br>CHECKED : SW/MG/RB | OWNER/DEVELOPER : NEWHALL RANCH 23823 WEST VALENCIA BOULEVARD VALENCIA, CALIFORNIA 91355 TELEPHONE: (661) 255-4000 REPRESENTATIVE : MR. FRED MACMURDO | **EXISTING DRAINAGE PLAN FOR CHIQUITO LANDFILL** IN THE UNINCORPORATED AREA OF THE COUNTY OF LOS ANGELES STATE OF CALIFORNIA | PROJECT NO. 1NRC01070B<br>SHEET 1<br>OF 1 |

RVO90-01.dwg

The Complete
**Landmark Village**
**Tentative Tract Map 53108**
**Drainage Concept Report**
including appendices
is available on the attached CD.

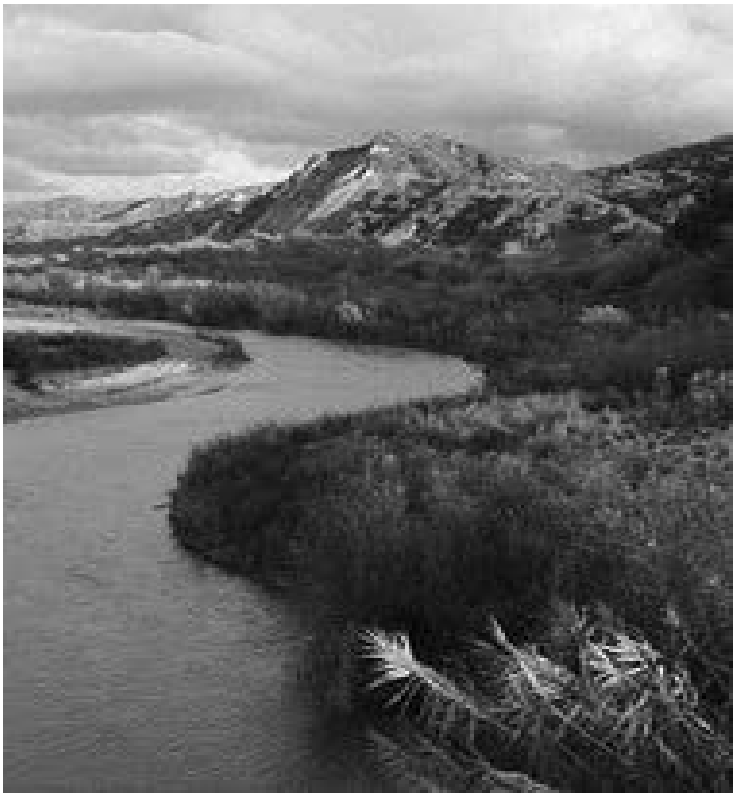
# APPENDIX F4.3

## Water Quality

# UPPER SANTA CLARA RIVER

# CHLORIDE TMDL RECONSIDERATION, ~~AND~~ CONDITIONAL SITE SPECIFIC OBJECTIVES FOR CHLORIDE, AND INTERIM WASTELOAD ALLOCATIONS FOR SULFATE AND TOTAL DISSOLVED SOLIDS

## STAFF REPORT



## CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD - LOS ANGELES REGION

**~~September, 30~~November 24 2008**

## Executive Summary

Chloride levels in the upper Santa Clara River (USCR) and in nearby groundwater basins have increased over the past three decades due to increased salt loadings from water imported into the Santa Clarita Valley and the increased number of self regenerating water softeners in the Santa Clarita Valley. Since the 1970s, growth in the Santa Clarita Valley has lead to chloride levels that exceed the water quality objective and impair beneficial uses for agricultural supply. Agriculture is the largest industry in the Santa Clara River Valley and the Regional Board has adopted a TMDL to restore the Santa Clara River to attain its beneficial uses.

This Staff Report discusses efforts under the Upper Santa Clara River Chloride TMDL to address these impairments with particular emphasis on the recent studies which have lead to a stakeholder developed plan for complying with the TMDL. The stakeholder plan, termed "Alternative Water Resources Management Plan" (AWRM) considers the results of key TMDL studies on the chloride sensitivity of crops and aquatic life and the interaction of groundwater and surface water in the USCR to fashion a plan that provides reduction of chloride loads from current levels, enhancement of water supplies for recycling and downstream uses, restoration of groundwater basins underlying the Upper Santa Clara River, and consideration of critical conditions such as a sustained drought. The AWRM requires a revision to existing water quality objectives for chloride, but it provides a significant reduction in chloride loading from current levels such that the most stringent beneficial uses are attained. During the critical condition of sustained drought, growers are provided alternative water to meet requirements and the chloride exported from the watershed still exceeds chloride into the watershed so that groundwater conditions will continue to improve.

The Regional Board first adopted a Total Maximum Daily Load (TMDL) for chloride in the USCR in 2000. The TMDL showed that chloride is loaded primarily into the Santa Clara River from Water Reclamation Plants serving residential, commercial and industrial users in the Santa Clarita Valley. The sources of the chloride which are loaded into the SCR are primarily chloride contained in the imported source water and chloride added by domestic uses, including self regenerating water softeners. As the Santa Clarita Valley has grown over the past decades, these TMDL source analyses also showed that the water quality objectives could not be met with source control alone, and that some type of advanced treatment would be necessary.

The identification of remedies for chloride impairments is challenging due to stakeholders with widely different interests in Los Angeles and Ventura Counties and potentially costly implementation measures. These factors lead to a remand of the TMDL from State Water Resources Control Board and after reconsideration by the Regional Board, the TMDL became effective on May 5, 2005. Key provisions of this TMDL include special studies to address scientific uncertainties and a consideration of site specific objectives by the Regional Board. This Staff Report summarizes the results of the special studies and discussions with stakeholders, which lead to an AWRM program to comply with the TMDL. This report considers the antidegradation and Water

Code Section 13241 requirements and recommends conditional site specific objectives to implement the AWRM.

Prior to completion of the special studies, the presumed implementation plan included two options: advanced treatment of effluent from the Saugus and Valencia water reclamation plants and disposal of brine in a new ocean outfall or disposal of effluent from the Saugus and Valencia water reclamation plants in a new ocean outfall. Both options entail construction of a pipeline from the Santa Clarita Valley WRPs and an ocean outfall. Concerns regarding the cost and feasibility of constructing this line lead caused controversy amongst stakeholders.

The TMDL Special Studies, all conducted in a facilitated stakeholder process in which stakeholders in scoping and reviewing the studies addressed three scientific uncertainties: 1) the levels of chloride required to support irrigation of salt sensitive crops; 2) the interaction of surface water and groundwater and the fate and transport of chloride in the USCR; 3) the effects of chloride on threatened and endangered fish in the USCR.

Regional Board staff finds that the work to date provides sufficient information on the chloride hazard threshold for salt-sensitive crops, the chloride threshold for endangered species, and the hydraulic and contaminant interactions between surface waters and groundwater basins in the USCR watershed to demonstrate that conditional site specific objectives can be combined with reverse osmosis technology to effectively reduce chloride loadings to the USCR and protect beneficial uses. Completion of the Literature Review and Evaluation (LRE) provided a scientifically defensible baseline to support a Water Quality Objective (WQO) of 117 milligrams per liter (mg/L) that is protective of agricultural supply beneficial use (AGR). The endangered species study shows that the chloride threshold for protection of salt sensitive agriculture is also protective of threatened and endangered species. The groundwater surface water interaction model shows that surface flows in the river recharge the Piru Basin with attendant chloride accumulation in that groundwater Basin. The AWRM consists of chloride source reduction actions and chloride load reduction through advanced treatment of the Valencia WRP effluent in conjunction with conditional site specific objectives. These source and load reductions mitigate the effect of any chloride accumulation in the groundwater basin.

The TMDL provides a ten-year schedule to attain compliance with the conditional SSOs. Key uncertainties at this point relate to identification of the optimum method for brine disposal. Several options, including deep-well injection in the vicinity of old oil fields in the Santa Clarita Valley, and drying and landfill disposal will be considered by the Santa Clarita Sanitation District of Los Angeles County in the first two years of the TMDL Implementation Plan. The recommended water quality objective changes before the Board are conditioned on implementation of the AWRM program; if the AWRM system is not built, the water quality objectives revert back to the current levels in the Basin Plan.

Staff's recommendation is to adopt the conditional site specific objectives for chloride. Staff finds that the costs of implementing the AWRM program will not increase monthly sewage rates substantially above the state average and median rates. Staff notes that the existing TMDL schedule can be accelerated by one year from 11 years to 10 years.

**List of Acronyms**

AGR – Agricultural Supply Beneficial Use
AWRM – Alternative Water Resources Management
BPA – Basin Plan Amendment
cfs – cubic feet per second
CLWA – Castaic Lake Water Agency
EIR – Environmental Impact Report
ESA – Extended Study Alternatives
ESP – Endangered Species Protection
GWR – Groundwater Recharge Beneficial Use
GSWI – Groundwater and Surface Water Interaction Model
LA – load allocation
LRE – Literature Review and Evaluation
LWA – Larry Walker Associates
MCL – Maximum Contaminant Level
MF/RO – microfiltration-reverse osmosis
MGD – million gallons per day
mg/L – milligrams per liter
NPDES – National Pollutant Discharge Elimination System
O&M – operation and maintenance
ppd – pounds per day
RARE – Rare and Endangered Species Habitat Beneficial Use
RO – Reverse Osmosis
SARI – Santa Ana Regional Interceptor
SB475 – Senate Bill 475
SCV – Santa Clarita Valley
SCVJSS – Santa Clarita Valley Joint Sewerage System
SCVSD – Santa Clarita Valley Sanitation District of Los Angeles County
SRWS – Self-Regenerating Water Softener
SSO- Site Specific Objective
SWP – State Water Project
SWRCB – State Water Resources Control Board
TAP – Technical Advisory Panel
TDS – Total Dissolved Solids
TMDL – Total Maximum Daily Load
USBR – United States Bureau of Reclamation
USCR – Upper Santa Clara River
USEPA – United States Environmental Protection Agency
USGS – United States Geological Survey
UWCD – United Water Conservation District
WLA – Wasteload Allocation
WQO – Water Quality Objective
WRP – Water Reclamation Plant

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# 1. Introduction

This staff report discusses the scientific and regulatory basis for proposed Basin Plan amendments to revise the Upper Santa Clara River Chloride Total Maximum Daily Load (TMDL) and establish conditional site-specific water quality objectives (SSOs) for chloride in reaches and groundwater basins in the Upper Santa Clara River watershed.

The Los Angeles Regional Water Quality Control Board (Regional Board) adopted a TMDL to address chloride impairments of the USCR on July 10, 2003 (Resolution 03-008). On May 6, 2004, the Regional Board amended the USCR chloride TMDL to revise the interim wasteload allocations (WLAs) and implementation schedule (Resolution 04-004). The amended TMDL was approved by the State Water Resources Control Board (State Board), Office of Administrative Law and United States Environmental Protection Agency (USEPA), and became effective on May 4, 2005.

At the time the TMDL was adopted and approved, there were key scientific uncertainties regarding the sensitivity of crops to chloride and the complex interactions between surface water and groundwater in the Upper Santa Clara River watershed. However, the TMDL found that the chloride sources are primarily imported source water from the State Water Project and chloride added by domestic uses, including self regenerating water softeners. These chloride sources are loaded into the USCR in effluent from the Saugus and Valencia Water Reclamation Plants (WRPs) that serve residents and industries in the Santa Clarita Valley. The TMDL recognized the possibility of revised chloride water quality objectives (WQOs) and included mandatory reconsiderations by the Regional Board to consider SSOs. The TMDL required the Santa Clarita Valley Sanitation District of Los Angeles County (SCVSD[1]) to implement special studies and actions to reduce chloride loadings from the Saugus and Valencia WRPs. The TMDL included the following special studies to be considered by the Regional Board:

- Literature Review and Evaluation (LRE) – review agronomic literature to determine a chloride threshold for salt sensitive crops.
- Extended Study Alternatives (ESA) – identify agricultural studies, including schedules and costs, to refine the chloride threshold.
- Endangered Species Protection (ESP) – review available literature to determine chloride sensitivities of endangered species in the USCR.
- Groundwater and Surface Water Interaction Study (GSWI) – determine chloride transport and fate from surface waters to groundwater basins underlying the USCR.

[1]Prior to 2005, the Santa Clarita Valley was historically served by the County Sanitation District Number 26 of Los Angeles County (Saugus WRP) and County Sanitation District Number 32 of Los Angeles County (Valencia WRP). Both of these Districts were collectively referred to as the County Sanitation Districts of Los Angeles County or CSDLAC in previous documents related to the Upper Santa Clara River Chloride TMDL. These two districts were merged into a single district, the Santa Clarita Valley Sanitation District of Los Angeles County or SCVSD as of July 1, 2005.

- Conceptual Compliance Measures – identify potential chloride control measures and costs based on different hypothetical WQO and final WLA scenarios.
- Site Specific Objectives and Antidegradation Analysis - consider a site-specific objective for chloride based on the results of the agricultural chloride threshold study and the GSWI.

The TMDL special studies were conducted in a facilitated stakeholder process in which stakeholders participated in scoping and reviewing the studies. This process has lead stakeholders to develop an alternative TMDL implementation plan that addresses chloride impairment of surface waters and degradation of groundwater. The alternative, termed Alternative Water Resources Management (AWRM) was first set forth by Upper Basin water purveyors and United Water Conservation District (UWCD), the management agency for groundwater resources in the Ventura County portions of Upper Santa Clara River watershed.

This Staff Report first presents a background on the TMDL, including regulatory history, the stakeholder collaborative process, a description of the watershed and the sources of chloride, and other salinity management programs in the state. The report then discusses the results and conclusions of the special studies which led to the development of the AWRM Program and proposed conditional SSOs. The AWRM Program and the proposed conditional SSOs needed to support the AWRM are then discussed. The report then discusses one of the special studies in detail, the Site Specific Objectives/ Antidegradation Analysis, which provides the regulatory basis for the conditional SSOs. Finally, the staff report reviews the alternatives for TMDL implementation based on the results of the special studies, provides staff's recommendation for conditional SSOs and TMDL revisions, and discusses how the recommended conditional SSOs and TMDL revisions would be implemented.

# 2. Background

This section provides background information on chloride issues in the USCR watershed.

## 2.1. Regulatory History

The Regional Board has adopted several resolutions that regulated chloride in the USCR, starting with Resolution 75-21 in 1975, which established WQOs throughout the region.

In 1990, the Regional Board adopted the Drought Policy, Resolution 90-04. This resolution was intended to provide short-term and temporary relief to dischargers who were unable to comply with limits for chloride due to the effects of drought on chloride levels in supply waters imported to the Region. The Regional Board temporarily reset limits on concentration of chloride at the lesser of: (i) 250 mg/L, or (ii) the chloride concentration of supply water plus 85 mg/L. The Regional Board renewed the Drought Policy in 1993 and again in 1995 because the chloride levels in supply waters remained higher than the chloride levels before the onset of the drought. The Regional Board did not revise the chloride WQOs in the Santa Clara River and Calleguas Creek because of the potential to affect present and anticipated agricultural beneficial uses.

In 1997, the Regional Board adopted the Chloride Policy, Resolution No. 97-02. The Chloride Policy revised the chloride objective for the Los Angeles River, Rio Hondo, and San Gabriel River. Due to concerns expressed about the potential for future adverse impacts to agricultural resources in Ventura County, WQOs for chloride in the Santa Clara River and Calleguas Creek were not revised. Rather, the chloride policy provided surface water interim limits of 190 mg/L in the Santa Clara River that extended for three years following approval of the amendment. The Regional Board did not revise the chloride WQOs in the Santa Clara River and Calleguas Creek because of the potential to affect existing and anticipated AGR. Similarly, the Regional Board did not revise the groundwater objectives for chloride.

The Regional Board first adopted a TMDL for chloride in the USCR in October 2002 (Resolution No. 2002-018). The TMDL showed that the chloride sources are primarily chloride contained in the imported source water from the State Water Project and chloride added by domestic uses, including self regenerating water softeners. These chloride sources are loaded into the USCR in effluent from the Saugus and Valencia WRPs that serve residents and industries in the Santa Clarita Valley. The TMDL source analysis also showed that the water quality objectives could not be met with source control alone, and that some type of advanced treatment would be necessary. The TMDL contained an 8-1/2 year implementation plan to attain chloride WQOs.

Because of differing stakeholder interests and potentially costly implementation measures, the State Board remanded the Chloride TMDL (State Board Resolution No. 2003-0014) to the Regional Board in February 2003 due to concerns about the duration of the interim effluent limits and concerns that the original implementation plan could have required the SCVSD to embark on planning and construction of an advanced treatment even though such studies might have demonstrated a need that could have been proved unnecessary in the end. The remand resolution also directs the Regional Board to consider an integrated solution for all water quality pollutants in the SCR basin on the Clean Water Act 303(d) list. The Regional Board revised the TMDL Implementation Plan to extend the interim wasteload allocations and final compliance date to 13 years after the TMDL effective date. It also included two additional special studies and several mandatory reconsiderations of the TMDL by the Regional Board. The Regional Board adopted the revised TMDL in July 2003 (Resolution No. 2003-008).

The TMDL was amended in 2004 (Resolution No. 04-004) to conform the interim wasteload allocations for the Saugus and Valencia WRPs to the effluent limits in 1994 Time Schedule Orders associated with National Pollutant Discharge Elimination System (NPDES) permits. In May 2004, the Regional Board and SCVSD signed a Settlement Agreement and Stipulation Concerning Chlorides in the UCSR. The Regional Board and SCVSD agreed that, if or when new or revised NPDES permits are subsequently issued to the Saugus or Valencia treatment plants prior to the date that a revised WQO or final wasteload allocations take effect in accordance with the Chloride TMDL Amendments, interim chloride effluent limitations reflecting the interim wasteload allocations in the TMDL, including any revisions thereto, will be included in the revised permits.

In 2006, the Regional Board reconsidered the TMDL and amended the TMDL schedule. The Board considered the results of the special studies to date and found it appropriate to accelerate the study period of the Implementation Plan based on the Literature Review and Evaluation, which showed that the range of chloride values protective of AGR and GWR beneficial uses was significantly smaller than originally anticipated.

In 2007, the Regional Board amended the Basin Plan to divide Reach 4 into two separate reaches. This action was based on historical and current water quality, flow, and land use data showing significant water quality differences between the western and eastern portions of Reach 4. Staff found that Reach 4 of the SCR contains unique hydrogeologic conditions due to the significant alterations to land uses and waste discharges within the USCR watershed that supported the separation of the reach into two separate reaches, 4A and 4B, divided at the confluence of Piru Creek.

This proposed action represents the second Regional Board reconsideration of the TMDL, which is scheduled 3-years after the TMDL effective date. Specifically, Tasks 10.a and 10.d of the TMDL Implementation Schedule state, “Preparation and Consideration of a Basin Plan Amendment (BPA) to revise the chloride objective by the Regional Board” and “Reconsideration of and action taken on the Chloride TMDL and Final Wasteload Allocations for the Upper Santa Clara River by the Regional Board.”

## 2.2. Stakeholder Collaborative Process

Based on the Chloride Agreement and Stipulation discussed in Section 2.1, the Regional Board and the SCVSD entered into a collaborative process in June of 2004 to implement the TMDL special studies. The Regional Board and SCVSD have set up a facilitated process to allow for stakeholder input and review of the special studies as they are developed. The SCVSD, Regional Board, facilitators, consultants and stakeholders attended Technical Working Group meetings on a monthly basis in the Cities of Santa Clarita, Fillmore, and Santa Paula to discuss the TMDL special studies as well as other planning issues regarding chloride impairments within the Santa Clara River. About thirty people who represent a wide range of stakeholder interests, including Municipalities, County government, agricultural interests, water purveyors, and environmental interests, attend the meetings. There is a website, www.santaclarariver.org, which updates activities and progress on the USCR Chloride TMDL.

Additionally, an independent technical advisory panel (TAP) of recognized agricultural experts was engaged to review the results of the LRE. The TAP issued a separate report, which provides technical guidance on the use of the LRE for policy development. The TAP report largely confirmed the results of the LRE. Both the TAP Report and LRE are available to the public on the website listed above.

Finally, Regional Board staff has been meeting with SCVSD' staff and representatives of the Upper Basin Water Purveyers, UWCD, and Ventura County Agricultural Water Quality Coalition, to explore the potential implementation actions and site specific objectives for the TMDL. This process has lead to development of the AWRM and the development of proposed conditional SSOs to support the AWRM and protect beneficial uses.

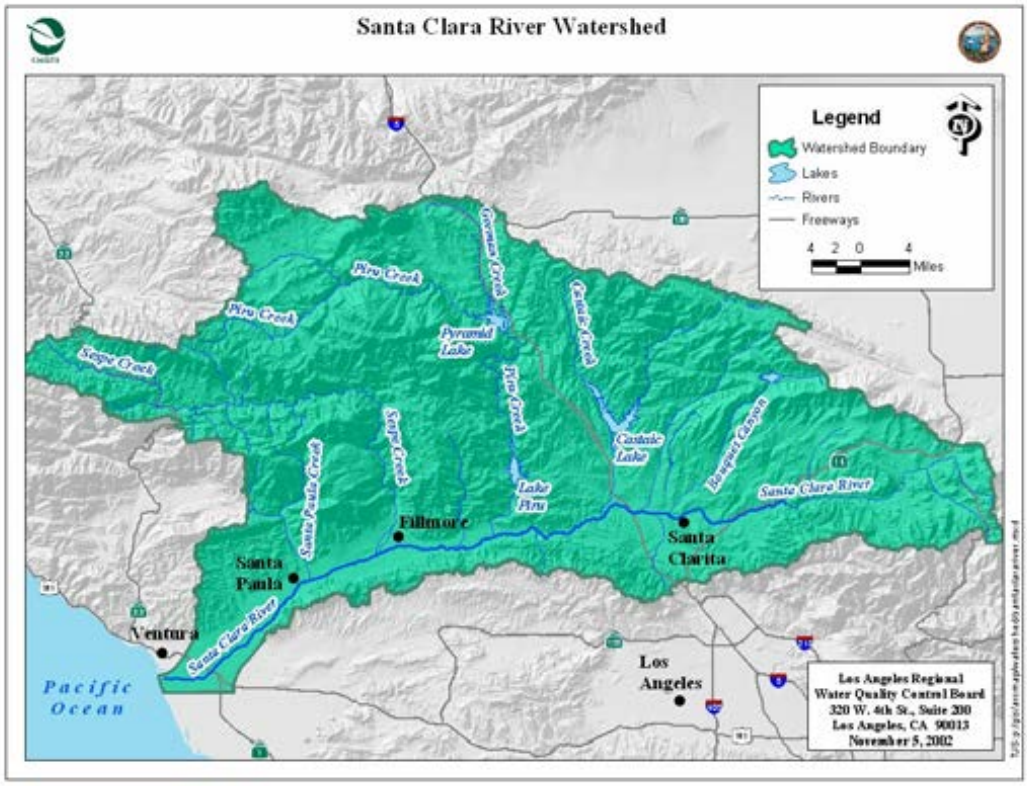
## 2.3. Environmental Setting

The Santa Clara River is the largest river system in Southern California that remains in a relatively natural state. The river originates on the northern slope of the San Gabriel Mountains in Los Angeles County, traverses Ventura County, and flows into the Pacific Ocean between the cities of San Buenaventura (Ventura) and Oxnard. Municipalities within the watershed include Santa Clarita, Newhall, Fillmore, Santa Paula, and Ventura (Figure 1).

Extensive patches of high quality riparian habitat exist along the length of the river and its tributaries. Two endangered fish, the unarmored stickleback and the steelhead trout, are resident in the river. One of the Santa Clara River's largest tributaries, Sespe Creek, is designated a wild trout stream by the state of California and a wild and scenic river by the United States Forest Service. Piru and Santa Paula Creeks, tributaries to the Santa Clara River, also support steelhead habitat. In addition, the river serves as an important wildlife corridor. The Santa Clara River drains to the Pacific Ocean through a lagoon that supports a large variety of wildlife.

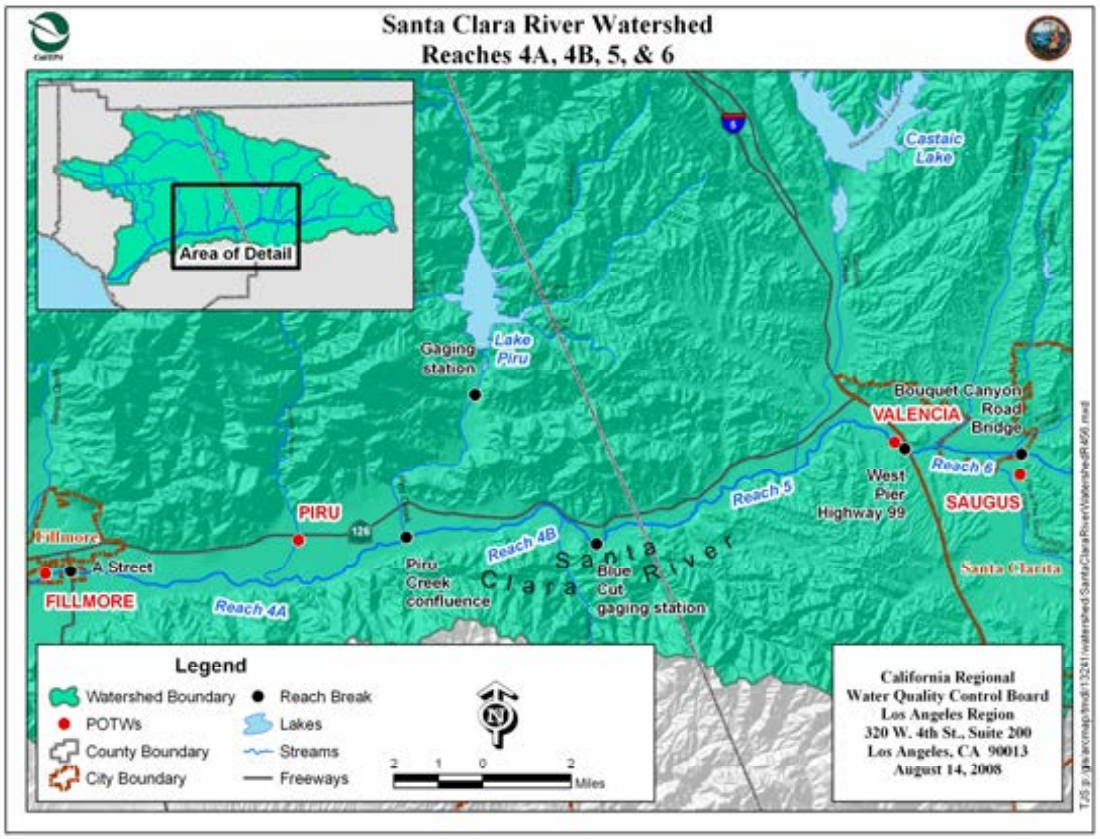
The predominant land uses in the Santa Clara River watershed include agriculture, open space, and residential uses. Revenue from the agricultural industry within the Santa Clara River watershed is estimated at over $700 million annually. Residential use is increasing rapidly both in the upper and lower watershed. The number of housing units in the watershed is estimated to increase by 187 percent from 1997 to 2025.

**Figure 1. Santa Clara River Watershed**




The upper reaches of the Santa Clara River include Reaches 5 and 6, which are located upstream of the Blue Cut gauging station, west of the Los Angeles - Ventura County line between the Cities of Fillmore and Santa Clarita. The upper boundary extends to Bouquet Canyon, upstream of the City of Santa Clarita. The portion of the river within Los Angeles County is generally described as the Upper Santa Clara River, and the portion within Ventura County is generally referred to as the Lower Santa Clara River. Two major point sources, the Saugus and Valencia WRPs, discharge to the USCR. Below Reach 5 are reaches 4A and 4B, divided at the confluence of Piru Creek (Figure 2).

**Figure 2. Santa Clara River Watershed Reaches 4A, 4B, 5, and 6**




## 2.4. Beneficial Uses and WQOs

Key beneficial uses and WQOs for the USCR are described in the Basin Plan and include agricultural supply (AGR), groundwater recharge (GWR) and rare and endangered species habitat (RARE). A full description of each of these beneficial uses is included in the Basin Plan. AGR is designated as existing or potential for all reaches of the Santa Clara River, including the USCR, except the headwaters. GWR is designated as an existing or potential beneficial use for the USCR. RARE is an existing and potential designated beneficial use for the upper reaches included in this TMDL. Two types of endangered and rare aquatic species are known to reside in the watershed: steelhead trout and unarmored three-spine stickleback.

The current WQO for chloride in Reaches 4A, 4B, 5 and 6 of the Santa Clara River is 100 milligrams per liter (mg/L). The groundwater quality objectives for the Santa Clara – Piru Creek area are: 200 mg/L chloride in the Upper area (above Lake Piru), 200 mg/L in the Lower area east of Piru Creek, and 100 mg/L west of Piru Creek.

## 2.5. Chloride Sources and Water Quality

This section summarizes chloride sources in the USCR watershed and projections of the effects of future growth and chloride reduction measures on the final WRPs effluent quality. Regional Board and SCVSD staff analyzed chloride sources in the USCR watershed in the 2002 Regional Board TMDL Staff Report and in the SCVSD's 2002, 2005, 2006 and 2007 chloride reports. These analyses utilized mass balance techniques to identify and quantify chloride loads from imported water and residential, commercial, and industrial sources.

The key findings from these reports include:

- The average chloride concentration in the USCR, as measured at the Blue Cut gauging station and at the Ventura/Los Angeles county line, was 131 mg/L in 2002 and 126 mg/L in 2003. The average chloride concentration at the Blue Cut gauging station frequently exceeds the WQO of 100 mg/L.

- The total chloride load from the Saugus and Valencia WRPs ranged from 23,500 pounds per day (ppd) to 28,500 ppd in 2001 through 2007.

- The WRP effluent chloride load is comprised of two main sources: chloride present in the imported water supply and chloride added by residents, businesses, and institutions in the Saugus and Valencia WRP service area. The chloride load added by users can be further divided into two parts: brine discharge from self-regenerating water softeners (SRWSs) and all other loads added by users. Excluding the imported chloride load that exists in the water supply, non-SRWS sources of chloride include: residential, commercial, industrial, infiltration, and wastewater disinfection. The two largest sources of chloride in the WRP effluent are the imported water supply and SRWSs, which have historically comprised from 37% to 45% and from 26% to 33% of the chloride in the WRP effluent, respectively.

- Municipal supply in Santa Clarita Valley (SCV) water supply is a blend of State Water Project (SWP) water and local groundwater. Over the past 30 years, chloride concentrations in water from the SWP ranged from 28 mg/L to 128 mg/L. The quantity of SWP water served by SCV water purveyors has increased from 41,768 acre-feet in 2002 to 47,205 acre-feet in 2004. The use of imported water has grown steadily. As reported by the Castaic Lake Water Agency (CLWA), the use of SWP water by SCV water purveyors is projected to grow to 69,500 acre-feet by 2015.

- The chloride loads from SRWSs increased markedly from 1997 to 2003, when a ban on residential SRWSs was struck down by legislative action in 1997. A prospective ban on installation of new SRWSs was reinstated in 2003. The SCVSD reported a sharp decline in residential SRWS chloride contribution from 66 mg/L in 2004 to 35 mg/L during the first half of 2007. This large change in chloride loading represents the removal or inactivation of roughly 2,200 SRWSs, from a high in 2004 of 6,800 to 4,600 by July of 2007.

- In 2006, The SCVSD and the City of Santa Clarita co-sponsored Senate Bill 475 (SB475), which is authored by Senator George Runner of the 17th Senate District. SB 475 provides the SCVSD with the authority to require removal all SRWS remaining in the Santa Clara Valley that were installed prior to SCVSD's 2003 ordinance. SB 475 also includes establishments of a phased voluntary and mandatory program to compensate residents for the reasonable value and cost of removal and disposal of SRWS. SB 475 was passed by the Legislature on August 31, 2006, and signed into law on September 22, 2006. The SCVSD has enacted a new ordinance on June 11, 2008 banning the use of existing SRWS, which will become effective on January 1, 2009, contingent upon voter approval by the qualified voters in the SCVSD's service area. This ordinance will be considered for voter approval by qualified voters in the district's service area in the November 2008 general election.

The relative magnitude of chloride loads from different sources is summarized below:

**Table 1. Relative Chloride Loadings to Saugus and Valencia WRPs Effluent by Source**

| Year | Water Supply | Ind. | Com. | Residential Non-SRWS | Residential SRWS | Inf. | Disinf. | Total Load |
|---|---|---|---|---|---|---|---|---|
| **2001** | 42% | 3% | 4% | 14% | 33% | 0% | 4% | 100% |
| **2002** | 45% | 2% | 3% | 13% | 29% | 0% | 8% | 100% |
| **2003** | 45% | 1% | 3% | 13% | 31% | 0% | 7% | 100% |
| **2004** | 41% | 1% | 3% | 14% | 33% | 0% | 8% | 100% |
| **2005** | 37% | 2% | 3% | 16% | 30% | 3% | 9% | 100% |
| **2006** | 42% | 2% | 3% | 18% | 26% | 0% | 9% | 100% |
| **2007 (through June)** | 43% | 2% | 4% | 17% | 26% | 0% | 8% | 100% |

Note: Ind. indicates Industrial, Com. indicates Commercial, Inf. indicates Infiltration, Disinf. indicates Disinfection

## 2.6. Future Growth

Presently, there is extensive residential growth planned for the USCR watershed over the next several decades. The population of the SCV is growing very rapidly. The City of Santa Clarita is projected to grow from 151,800 residents in 2000 to 243,104 residents in 2010. The SCVSD estimates effluent flow from wastewater treatment plants will grow from approximately 20 million gallons per day (MGD) presently to about ~~32~~ 34 MGD ~~in~~ by 2027~~30~~. The effects of this growth on the chloride levels in the Santa Clara River and underlying aquifers were investigated through GSWI Study (see Section 3.4).

The Landmark Village project site is located in unincorporated Los Angeles County, within the SCV. The project site is located along the SCR, immediately west of the confluence of Castaic Creek and the SCR. The county line forms the western

boundary. The SCR forms the southern boundary of the project site, while the northern project boundary is defined by State Route 126. The project applicant proposes to develop the 292.6-acre Landmark Village tract map site, located in the first phase of the Riverwood Village within the boundary of the approved Newhall Ranch Specific Plan. The Landmark Village tract map site proposes construction of 1,444 residential dwelling units, 1,033,000 square feet of mixed-use/commercial uses, a 9-acre elementary school, a 16-acre community park, public and private recreational facilities, trails, and road improvements. Several off-site project-related components would also be developed on an additional 679.2 acres of land. The project also includes a 6.8 MGD WRP (Newhall Ranch WRP) as associated facility (Impact Sciences, Inc., 2006).

Projections of future chloride loading to the USCR are dependent on several factors. Most importantly, the chloride contribution from the blended water supply varies greatly according to hydrologic conditions in Northern California because the salinity of SWP is dependent on the mix of fresh and brackish water in the San Francisco Bay – Delta which is the source of the water imported into the SCV. The timing and duration of future droughts are uncertain but based on review of more than thirty years of water quality data it is not unreasonable to conclude that California will experience several droughts within the next few decades.

Staff notes that growth within the SCV is accompanied by increasing demand for imported water and increasing chloride loads. In 1980, imported SWP comprised 1,125 acre-feet, approximately 5% of the total water supply to the SCV. By 1998, imported SWP comprised approximately 20,000 acre-feet, approximately 50% of the total water supply to the SCV.

Additionally, staff notes that the SCVSD's chloride report indicates that that chloride loading from non-SRWS residential sources in terms of ppd has been increasing. This increase is likely correlated with residential growth and increased residential wastewater flow and increased demand on water resources. The chloride load from non-SRWS residential sources increased from 3,562 ppd in 2002 to 4,272 ppd in 2006.

## 2.7. Salinity Management – Recent State and Regional Boards Actions

Water quality impairments by salts and chloride are a statewide issue. This section provides a brief overview of several current issues addressed by the State Board and the Central Valley, Santa Ana, and Los Angeles Regional Boards. It also reviews the status of salinity implementation activities in Northern California.

In the Central Valley region, salts in surface and ground water are largely derived from supply water from the SWP and the Delta Mendota Canal and from surface soil. Salinity impairments are exacerbated locally by other sources, such as discharges to land associated with municipal wastewater disposal. The Central Valley Regional Board has adopted several approaches for basin management within their jurisdiction. The Central Valley Regional Board established a policy to control groundwater degradation for the Tulare Basin, a policy to promote the maximum export of salt from the San Joaquin River

Basin, and a policy to control point source discharges to the Sacramento River Basin. At this time, salinity TMDL for the San Joaquin River has been developed to meet the objectives at Vernalis and a second phase of this TMDL is being developed for upstream stretches of the river. Further, the State Board may consider whether to adopt Cease and Desist Orders against the United States Bureau of Reclamation (USBR) and the Department of Water Resources with regard to their potential violation of conditions in their water right permits that require the USBR and the California Department of Water Resources to meet salinity standards in the Southern Delta.

In southern California, the USBR led a comprehensive regional salinity management study in support of the Southern California Water Recycling Projects Initiative. The study was conducted by CH2M Hill and identified a range of projected brine discharge volumes for Southern California. Some of the factors influencing this projected range are the salinity of imported water, the stringency of wastewater effluent regulation, and the level of seawater desalting. The study predicted a regional brine discharge volume ranging from 43.7 MGD to 2,011 MGD. In addition to predicting future brine discharge volumes, the study identified the location of existing and potential future brine/concentrate management facilities in southern California. These facilities include 86 pipelines, 113 wastewater treatment plants, 32 groundwater desalters, 9 seawater desalination facilities, and 9 major groundwater basins (with 91 sub-basins).

An established Southern California salinity management facility is the Arlington Desalter Facility and the Santa Ana Regional Interceptor (SARI). The Desalter, using Reverse Osmosis (RO) technology, produces up to 6 MGD of blended desalinized water, with another estimated 1 MGD of concentrated brine generated by the plant discharged to the SARI line. The SARI line, a regional brine line, is designed to convey 30 MGD of non-reclaimable wastewater from the upper Santa Ana River basin to the ocean for disposal, after treatment. The non-reclaimable wastewater consists of Desalter concentrate and industrial wastewater. Domestic wastewater is also received on a temporary basis. To date over 73 miles of the SARI line have been completed. The most recent extension (23 miles in length), the Temescal Valley Regional Interceptor line was completed in 2002. The upstream extension was completed in 1995 to the City of San Bernardino Wastewater Treatment Plant. The SARI also serves the Chino Basin area and the City of Riverside.

Desalinization treatment facilities have been planed in several regions of the state. The Northern California Salinity Coalition is planning RO treatment facilities to draw and treat water with a high salinity concentration from shallow aquifers in order to reduce net salt loading in groundwater basins of the Bay Area. The USBR proposed using RO to treat reused drainage water from an agricultural subsurface drainage system in the San Luis and Northerly Area of the Central Valley. Drainage will be collected from the fields and sent to one of 16 reuse areas to irrigate salt tolerant crops. The drainage from the reuse areas will then be collected and sent to Point Estero for ocean disposal or to a treatment facility.

Staff also notes that within the Region, the City of Los Angeles has implemented a RO facility at the Terminal Island Treatment Plant in order to meet local water quality targets. The facility processes 4.5 MGD and produces potable water for injection to the seawater barrier in the Dominguez Gap. The reverse osmosis effluent meets standards established by the Department of Health Services and is suitable not only for injecting into groundwater basins but also as boiler feed water for local industries.

In 2006, the Los Angeles Regional Board adopted the Calleguas Creek Watershed Salts TMDL based on a salts balance for that watershed. The Regional Board found that the water quality impairments and groundwater degradation in the Calleguas Creek watershed are due to a greater mass of salts imported to the watershed than exported from the watershed. The TMDL requires salt export throughout the watershed to achieve a salt balance, reduce salt load to surface and groundwater, and achieve and maintain water quality objectives for salts in the watershed. The Calleguas Creek watershed TMDL Implementation Plan is based on construction of a regional brine line and ocean outfall through which brines from the advanced treatment of degraded groundwater in the Calleguas Creek watershed are discharged directly to the ocean in compliance with the state Ocean Plan. The TMDL implementation plan also includes increased use of POTW effluent and advanced treated (reverse osmosis) groundwater for recycled water use. This plan has collateral benefits of increasing local sources of water supply in the watershed.

# 3. Results of TMDL Special Studies

This section describes the results of TMDL Special Studies and other chloride management activities in the USCR watershed, which were considered by staff in proposing TMDL revisions and conditional SSOs for the USCR watershed.

## 3.1. Literature Review and Evaluation

The first TMDL special study, the LRE, was completed in September 2005 and presented to the Regional Board on November 3, 2005. The LRE reviewed approximately 200 technical articles on the chloride and salinity sensitivities of avocado, strawberry and nursery plants. The LRE found a guideline concentration range for chloride sensitivity for avocado of 100 –117 mg/L. There is not sufficient technical literature to determine a guideline range for strawberry and nursery crops. The LRE concluded that a conservative guideline concentration for chloride hazard is 100-117 mg/L. The LRE was reviewed by an independent TAP and the majority TAP opinion concurred with the 100 –117 mg/L guideline concentration range. One minority TAP opinion advocated a higher guideline concentration and another minority TAP opinion recommended a maximum guideline concentration of 100 mg/L. As a supplement to the LRE, a memorandum on averaging period analysis was prepared by Newfields Agricultural and Environmental Resources (Newfields), in consultation with the TAP co-chairs, to determine what the applicable compliance averaging periods are for the LRE guideline concentration. The memorandum found that the minimum time between the beginning of exposure to chloride stress and signs of visible leaf chloride injury is between 2 and 9 weeks when high chloride concentrations are applied (at least 170 mg/L), and usually between 4 and 8 weeks. Based on an analysis of the literature and the receiving water variability, a three-month averaging period was recommended. (Newfields, 2008)

## 3.2. Extended Study Alternatives

This task provided an overview of the types of agricultural studies that are available to further define an appropriate threshold for protection of AGR in the Santa Clara River Watershed. The ESA evaluated study options ranging from surveys to field experiments and estimated a period of 2 to 10 years to develop adequate local data to define a site-specific threshold different from the threshold determined by the LRE. The ESA also documented the complexities of determining the effects of chloride on crop productivity under field conditions. Staff finds that the duration of time and the treatments proposed by the ESA might not be sufficient to address all the factors that may affect the chloride threshold level, and, absent a lengthy TMDL schedule extension, might not provide conclusive data to meet the TMDL requirements.

### 3.3. Endangered Species Protection

This task provided a review of technical literature regarding the chloride sensitivity of several endangered aquatic and riparian species to better understand the potential exposure and tolerance of these species to chlorides in the USCR. Special attention was given to resident species including Unarmored Three-Spine Stickleback, Steelhead Trout, Arroyo Toad, Red-Legged Frog and Cottonwood tree. Evaluation of overall toxicity data indicates that chloride concentrations for acute and chronic toxicity would be fully protective of Threatened and Endangered species in the USCR. Thus, the existing US EPA chronic chloride criteria of 230 mg/L can be considered to be fully protective of local biota. These conclusions indicate that endangered species can tolerate higher levels of chloride than salt-sensitive agricultural crops. The study results were reviewed by an independent TAP with the TAP finding the report supports the conclusion that the existing US EPA criteria are protective of threatened and endangered species in the Santa Clara River.

### 3.4. Groundwater and Surface Water Interaction Model

The GSWI model study was developed to determine the linkage between surface water and groundwater quality with respect to chloride and total dissolved solids (TDS) in the USCR. The model simulated historical water levels, flows, and concentrations and movement of chloride in surface water and groundwater in the USCR watershed from 1975 through 2005. The calibrated model was reviewed and approved as an appropriate and adequate modeling tool by the stakeholders and an independent GSWI TAP. The model was then used to assess the assimilative capacity of the surface water in Reaches 4, 5 and 6 and the groundwater basins underlying those reaches. The model was also used to determine the gradient of chloride concentrations from the Saugus and Valencia WRP outfalls to downstream receiving water stations and to assess the impacts of WRP effluent on underlying groundwater in the USCR. The model was then used to simulate future potential chloride impacts from 2007 to 2030 based on various combinations of high, intermediate and low reuse of recycled water from the with various levels of advanced treatment or SRWS removal rates. The results of the initial GSWI study are presented in a report entitled “Task 2B-1 Numerical Model Development and Scenario Results” (CH2M Hill, 2008; Geomatrix, 2008a).

Based on the model, none of the alternatives were predicted to comply with the existing chloride WQO of 100 mg/L at all times and at all locations (Table 2).

**Table 2. Attainment Frequencies of Compliance Options-Existing Water Quality Objective**

| Compliance Options | Surface Water at Blue Cut Reach 4B Surface Water WQO 100 mg/L | East Piru Basin Groundwater Reach 4B Surface Water WQO 100 mg/L | East Piru Basin Groundwater Reach 4B Ground-water WQO 200 mg/L | West Piru Basin Groundwater Reach 4A Surface Water WQO 100 mg/L | West Piru Basin Groundwater Reach 4A Ground-water WQO 100 mg/L |
|---|---|---|---|---|---|
| Advanced Treatment | 66.8 | 55.0 | 100.0 | 100.0 | 100.0 |
| Minimal Discharge | 65.5 | 62.1 | 100.0 | 100.0 | 100.0 |
| Zero Discharge | 63.8 | 68.3 | 100.0 | 100.0 | 100.0 |
| Alternate WRP Discharge Location | 48.9 | 46.1 | 100.0 | 100.0 | 100.0 |
| AWRM | 43.5 | 56.3 | 100.0 | 100.0 | 100.0 |

Note: Values represents percentage of days during simulation period that chloride is predicted to be equal to or less than the WQO concentration

Only the advanced treatment scenarios would produce surface water chloride concentrations less than the upper bound of the LRE chloride threshold of 120 mg/L (Table 3).

**Table 3. Attainment Frequencies of the Compliance Options-LRE Water Quality Objective**

| Compliance Options | Surface Water at Blue Cut Reach 4B Surface Water WQO 120 mg/L | East Piru Basin Groundwater Reach 4B Surface Water WQO 120 mg/L | East Piru Basin Groundwater Reach 4B Ground-water WQO 200 mg/L | West Piru Basin Groundwater Reach 4A Surface Water WQO 120 mg/L | West Piru Basin Groundwater Reach 4A Ground-water WQO 100 mg/L |
|---|---|---|---|---|---|
| Advanced Treatment | 99.0 | 99.6 | 100.0 | 100.0 | 100.0 |
| Minimal Discharge | 87.8 | 98.8 | 100.0 | 100.0 | 100.0 |
| Zero Discharge | 80.7 | 97.5 | 100.0 | 100.0 | 100.0 |
| Alternate WRP Discharge Location | 76.0 | 80.5 | 100.0 | 100.0 | 100.0 |
| AWRM | 88.0 | 93.0 | 100.0 | 100.0 | 100.0 |

Note: Values represents percentage of days during simulation period that chloride is predicted to be equal to or less than the WQO concentration

As a result, stakeholders in the USCR developed the AWRM Program, which increases chloride WQOs in certain groundwater basins and reaches of the USCR watershed, decreases the chloride objectives in the eastern Piru Basin, and results in an overall reduction in chloride loading as well as water supply benefits.

### 3.5. Conceptual Compliance Measures (AWRM)

The GSWI model was used to assess the ability of the AWRM to achieve compliance with proposed conditional SSOs under future water use scenarios within the USCR watershed. The model was based on design capacities at Valencia WRP and Saugus WRP of 27.6 MGD and 6.5 MGD, for a total system design capacity of 34.1 MGD by year 2027. The results of this effort are presented in a report entitled "Task 2B-2 Assessment of Alternatives for Compliance Options Using the Groundwater/Surface Water Interaction Model" (Geomatrix, 2008b). The model predicted that the AWRM could achieve proposed conditional SSOs for chloride under both drought and non-drought conditions (Table 4).

**Table 4. Attainment Frequencies of the AWRM Compliance Option for Revised WQO**

| Compliance Options | Reach 4B (at Blue Cut) Surface Water WQO 117 mg/L | Surface Water WQO 130 mg/L | Ground-water WQO 150 mg/L | Reach 5 Surface Water WQO 150 mg/L | Ground-water WQO 150 mg/L | Reach 6 Surface Water WQO 150 mg/L | Ground-water WQO 150 mg/L |
|---|---|---|---|---|---|---|---|
| AWRM Alternative | 99.9 | 99.2 | 100.0 | 98.3-99.7 | 100.0 | 98.6-99.7 | 100.0 |

Note: Values represents percentage of days during simulation period that chloride is predicted to be equal to or less than the WQO concentration

### 3.6. Site Specific Objectives and Antidegradation Analysis

The Site Specific Objectives and Antidegradation analysis has been completed and is included in a report entitled "Task 7 and 8 Report Site Specific Objective and Antidegradation Analysis" prepared by Larry Walker Associates (LWA). This report also presents the costs associated with the AWRM compliance alternatives identified in the GSWI reports. The report found that adoption of proposed conditional SSOs, when implemented with the AWRM Program, would be consistent with the state and federal antidegradation policies. The results of the SSO/Antidegradation analysis are discussed further in Sections 6 and 7.

# 4. Alternative Water Resources Management Program

The AWRM Program is a result of joint efforts of the Upper Basin Water Purveyors[2], Ventura County agricultural and water interests[3], and the SCVSD to find a regional watershed solution for compliance with the TMDL that benefits parties in both Los Angeles and Ventura Counties. The AWRM Program, which is described in detail in the GSWI Task 2B-2 Report (Geomatrix, 2008b), consists of advanced treatment for a portion of the recycled water from the SCVSD's Valencia WRP, constructing a well field in the eastern Piru basin to pump out higher chloride groundwater, discharging the blended pumped groundwater and advanced treated recycled water to Reach 4A at the western end of the Piru basin at a chloride concentration not to exceed 95 mg/L (Reach 4A WQO is 100 mg/L), and providing supplemental water and advanced treated recycled water to the river.

The objectives of the AWRM program are to lower chloride concentrations crossing the County Line, comply with conditional SSOs, protect agricultural water users in the eastern Piru basin, mitigate high-chloride groundwater in the eastern Piru basin, and maximize water resources in Ventura County. The key elements of the AWRM Program focus on reducing chloride in the water reclamation plant effluent through:

- SRWS removal
- Conversion of treated wastewater disinfection from chlorine injection to ultra-violet light disinfection
- Construction of 3 MGD microfiltration-reverse osmosis (MF/RO) facility at the Valencia WRP
- Brine disposal via deep well injection
- Groundwater extraction from the Piru Basin
- Discharges of blended MF/RO water and extracted groundwater in Reaches 4A and 4B

These facilities would typically be operated in two modes depending on the SCVSD's ability to comply with applicable water quality objectives, which is correlated to ~~the~~ chloride concentrations in the State Water Project (SWP) supply water (Figure 3~~2~~). During typical hydrologic cycles, when the supply water concentration is below 80 mg/l, the SCVSD WRPs would be able to comply with applicable water quality objectives a majority of the time without having to discharge ~~the~~ RO permeate produced at the Valencia WRP to the Santa Clara River. Under these conditions, the RO permeate

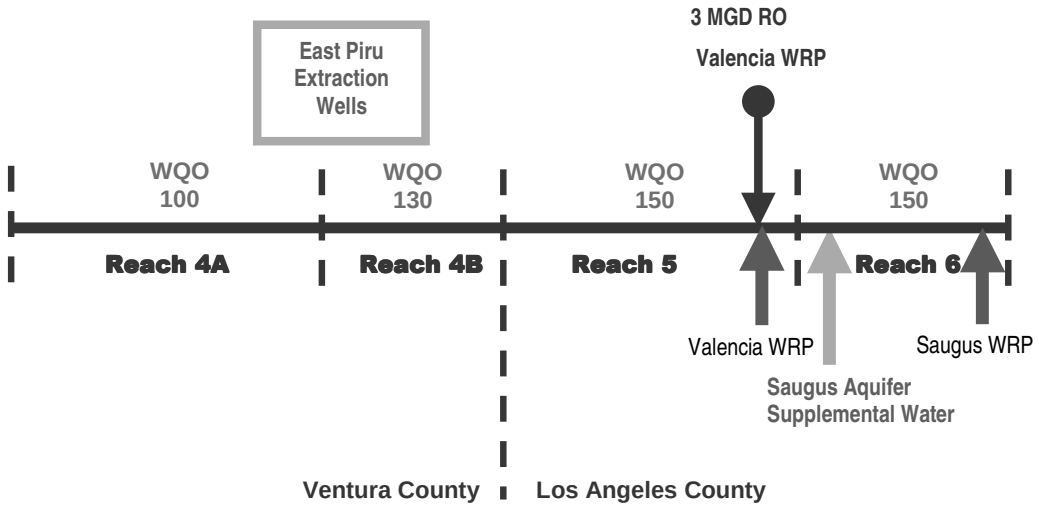
[2] The Upper Basin Water Purveyors are the Castaic Lake Water Agency, Valencia Water Company, Newhall County Water District, Los Angeles County Water Works District No. 36, and the Santa Clarita Water Division of the Castaic Lake Water Agency

[3] Represented by Ventura County Agricultural Water Quality Coalition (VCAWQC) and UWCD

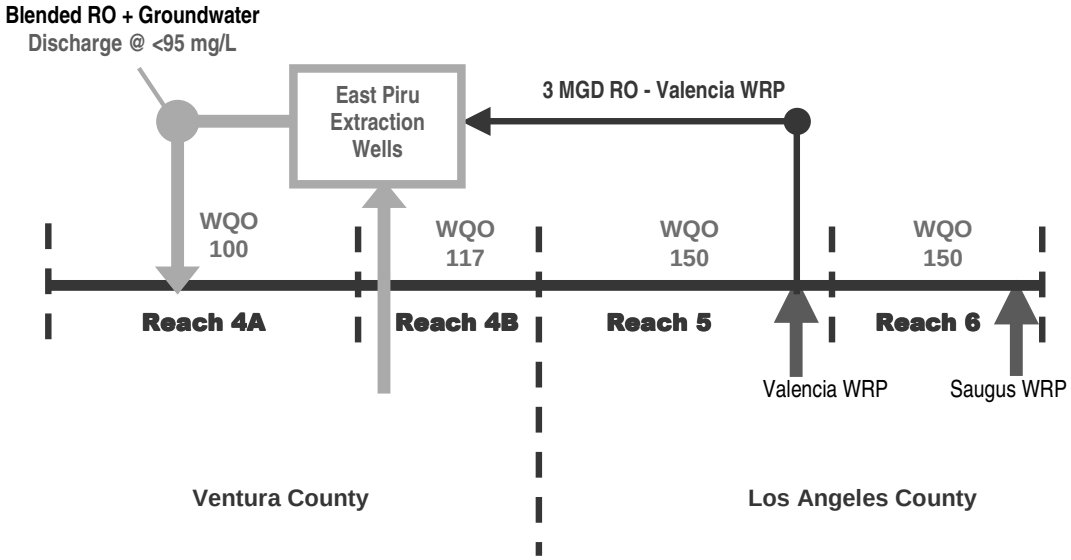
cwould be delivered to the extraction wells, blended with pumped groundwater, and discharged to Reach 4A for Ventura County water supply benefit. This option provides further water quality benefits for Ventura County because increased flows can mitigate sea water intrusion to the Oxnard Plain. During periods when the supply water concentration is above 80 mg/l, is typically when most, if not all of the RO permeate will be need to be discharged directly to 4B the Santa Clara River to comply with applicable water quality objectives. In addition some supplemental water would also be discharged as necessary to the Santa Clara River to reduce chloride concentrations in Reach 4B and comply with applicable water quality objectives.

**Figure 32. Schematic of AWRM Facilities**

**Typical AWRM facility operation to comply with WQOs, when SWP > 80 mg/L**




**Typical AWRM facility operation to comply with WQOs, when SWP < 80 mg/L**



Stakeholders have agreed upon the primary objectives for the uses of RO permeate from the MF/RO facility at the Valencia WRP. The primary objectives are prioritized as follows:

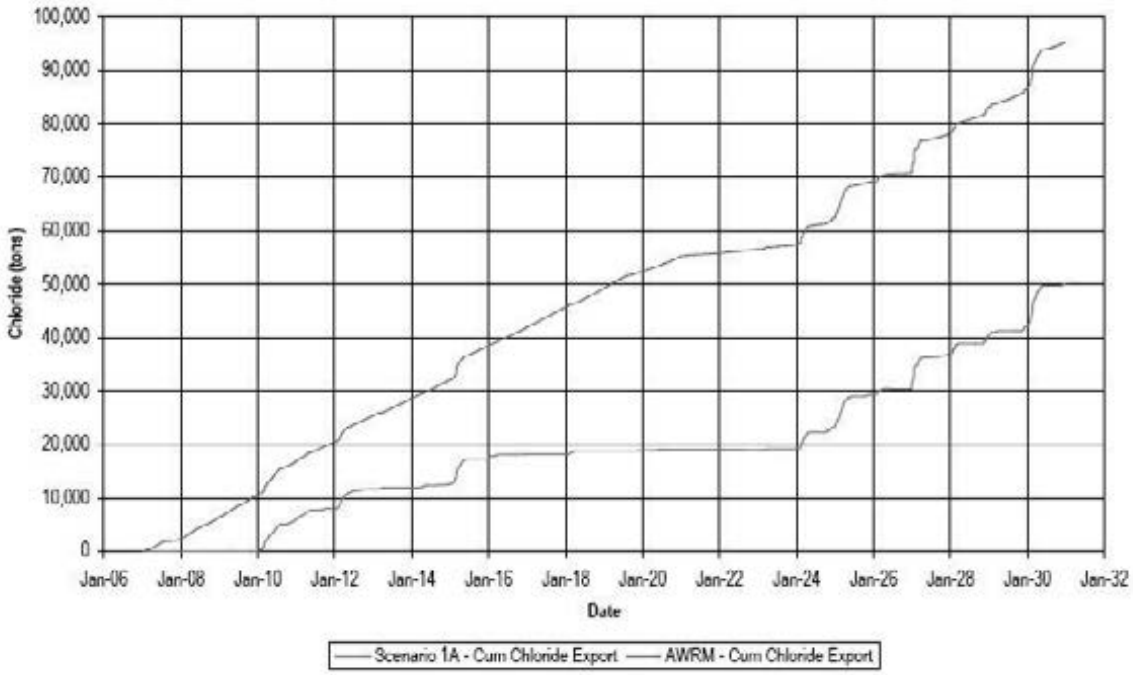
1) Compliance with conditional SSOs in the Santa Clara River at the County Line.
2) Provide alternative water supply to Camulos Ranch.
3) Achieve salt-balance in East Piru groundwater basin for past loading from surface water greater than 117 mg/L.
4) Achieve salt-balance in East Piru groundwater basin for any future loading from surface water greater than 117 mg/L.

The effects of the AWRM on surface water and groundwater have been evaluated using several tools. For Reaches 4B, 5, and 6 and the Piru basin, the primary tool was the GSWI model. Using the GSWI model, the AWRM has been shown to provide multiple water resource benefits, including:

- Increased flows in reaches 4A and downstream reaches of the USCR
- Improvement of groundwater quality in the Eastern Piru Basin
- Increased availability of irrigation and barrier water

The results of the GSWI model were used to calculate a mass balance to compare the predicted amount of salt exported under the AWRM compliance option with the predicted amount of salt exported under other compliance options to demonstrate the benefits to the East Piru Basin under the AWRM. Figure 4~~3~~ illustrates the cumulative salt export capabilities of the AWRM compliance option compared with the salt export capabilities of a maximum advanced treatment compliance option to meet the 100 mg/L chloride WQO (Scenario 1A).

**Figure 4~~3~~. Cumulative Chloride Mass Export from East Piru Groundwater Basin: AWRM Option vs. Advanced Treatment Option (Scenario 1A)**




Additionally, a study was prepared analyzing the effects of the AWRM Program in Ventura County (Bachman, 2008). The report found that the lowering of chloride concentrations in Reach 4B results in improved quality of water recharged to the East Piru Basin. Additionally, high chloride water that is pumped from the basin is recharged by lower chloride water during wet years. Using output from the GSWI model, UWCD's routing and percolation model was used to predict increased yield at the Freeman Diversion from implementation of the AWRM Program. The difference in yield at the Freeman Diversion between the Minimum Discharge option and the AWRM option is 11,500 AFY, which is approximately double the increased yield of 6,000 AFY when the permanent Freeman Diversion was constructed. This could result in a significant decrease in saline intrusion in the Oxnard Plain.

## 4.1. Conditional Site Specific Objectives to Support AWRM

The AWRM compliance option provides greater benefits than other potential scenarios and compliance options that have been identified. However, it will not result in compliance with the 100 mg/L water quality objectives at all times and in all locations for Reaches 4B, 5 and 6 of the USCR. Given the benefits of chloride reduction and protectiveness of the AWRM compliance option and in the context of achieving a salt balance for the watershed and protecting beneficial uses, staff proposes conditional SSOs that support the AWRM, while still being protective of beneficial uses (see Sections 5 and 6). Conditional SSOs for surface water and groundwater are presented in Tables 5 and 6. These conditional SSOs shall apply and supersede the existing regional water quality objectives of 100 mg/L only when chloride load reductions and/or chloride export

projects are in operation by the SCVSD according to the implementation provisions in Section 8 of the staff report.

**Table 5. Conditional SSOs for Surface Water to Support AWRM Program**

| Reach | Current Instantaneous Chloride Objective (mg/L) | Conditional Chloride SSO (mg/L)[a] | Averaging Period |
|---|---|---|---|
| 6 | 100 | 150 | 12-month~~Annual~~ |
| 5 | 100 | 150 | 12-month~~Annual~~ |
| 4B | 100 | 117 | 3-month |
| 4B Critical Conditions | 100 | 130[b] | 3-month[c] |

a. The conditional SSOs for chloride in the surface water of Reaches 4B, 5, and 6 shall apply and supersede the existing regional water quality objectives of 100 mg/L only when chloride load reductions and/or chloride export projects are in operation by SCVSD according to the implementation provisions in Section 8.

b. The conditional SSO for Reach 4B under critical condition applies, only if the following conditions and implementation requirements are met:

1. Water supply concentrations measured in Castaic Lake are ≥ 80 mg/L.
2. Salt-sensitive agricultural uses that are irrigated with surface water are provided supplemental water during periods when Reach 4B surface water exceeds 117 mg/L.
3. ~~Beginning~~ By May 4, 2020~~16~~, the 10-year cumulative net chloride loading above 117 mg/L ($CNCl_{117}$)[i] to Reach 4B of the SCR, calculated annually, from the SCVSD Water Reclamation Plants (WRPs) ~~is~~ shall be zero or less~~, where:~~.

[i] $CNCl_{117} = Cl_{(Above\ 117)} - Cl_{(Below\ 117)} - Cl_{(Export\ Ews)}$

Where:

$Cl_{(Above\ 117)}$ = [WRP Cl Load[1]/Reach 4B Cl Load[2]] * [Reach 4B Cl $Load_{>117}$[3]]

$Cl_{(Below\ 117)}$ = [WRP Cl Load[1]/Reach 4B Cl Load[2]] * [Reach 4B Cl $Load_{\leq 117}$[4]]

$Cl_{(Export\ EWs)}$ = Cl Load Removed by Extraction Wells

[1] WRP Cl Load is determined as the monthly average Cl concentration multiplied by the monthly average flow measured at the Valencia WRP.

[2] Reach 4B Cl Load is determined as the monthly average Cl concentration at SCVSD Receiving Water Station RF multiplied by the monthly average flow measured at USGS Gauging Station 11109000 (Las Brisas Bridge).

[3] Reach 4B Cl $Load_{>117}$ means the calculated Cl load to Reach 4B when monthly average Cl concentration is above 117 mg/L.

[4] Reach 4B Cl $Load_{<=117}$ means the calculated Cl load to Reach 4B when monthly average Cl concentration is below or equal to 117 mg/L.

4. The chief engineer of the SCVSD signs under penalty of perjury and submits to the Los Angeles Regional Water Quality Control Board (Regional Board) a letter documenting the fulfillment of conditions 1, 2, and 3.

c. The averaging period for the critical condition SSO may be reconsidered based on results of chloride trend monitoring after the alternative water resources management (AWRM) system is applied.

The conditional SSOs for chloride in Reach 4B are applied as 3 month rolling averages because there is salt-sensitive agriculture in the area of Reach 4B and the LRE supplemental study recommended a three-month averaging period for salt-sensitive crops (Newfields, 2008). The conditional SSOs for chloride in Reaches 5 and 6 are applied as 12-month~~annual~~ rolling averages since agriculture in these reaches is identified as non-salt sensitive. ~~Annual~~ Twelve-month averaging periods have been used historically in the Los Angeles Region and throughout California for salts objectives, and an 12-month~~annual~~ average would protect the groundwater recharge and non-salt sensitive agricultural beneficial uses in Reaches 5 and 6 (LWA, 2008).

**Table 6. Conditional SSOs for Groundwater to Support AWRM Program**

| Constituent | | Santa Clara--Bouquet & San Francisquito Canyons | | Castaic Valley | | Lower area east of Piru Creek[1] | |
|---|---|---|---|---|---|---|---|
| | | Conditional SSO (mg/L) | Current Objective (mg/L) | Conditional SSO (mg/L) | Current Objective (mg/L) | Conditional SSO (mg/L) | Current Objective (mg/L) |
| | Chloride | 150 | 100 | 150 | 150 | 150 | 200 |
| Averaging period | | ~~Annual~~12-month | None | 12-month | None | ~~Annual~~ 12-month | None |

[1] Applies only to San Pedro formation. Existing objective of 200 mg/L applies to shallow alluvium layer above San Pedro formation.

The conditional SSOs for chloride in groundwater in Santa Clara-Bouquet & San Francisquito Canyons, Castaic Valley, and the lower area east of Piru Creek (San Pedro formation) shall apply and supersede the existing regional water quality objectives ~~of 100 mg/L~~ only when chloride load reductions and/or chloride export projects are in operation by the SCVSD according to the implementation provisions in Section 8 of the staff report.

## 4.2. Conditional Wasteload Allocations to Support AWRM

The conditional WLAs for chloride for all point sources shall apply only when chloride load reductions and/or chloride export projects are in operation by the SCVSD according to the implementation provisions in Section 8 of the staff report. If these conditions are not met, WLAs are based on existing water quality objectives for chloride of 100mg/L.

Discharges to Reach 4B by the Saugus and Valencia WRPs will receive the concentration-based conditional wasteload allocations for chloride presented in Table 7.

**Table 7. Conditional Reach 4B Wasteload Allocations for chloride for Saugus and Valencia WRPs**

| Reach | Conditional Chloride SSO (mg/L)[a] | ~~Averaging Period~~ |
|---|---|---|
| 4B | 117 (3-month Average), 230 (Daily Maximum) | ~~3-month~~ |
| 4B Critical Conditions | 130[a] (3-month Average[b]), 230 (Daily Maximum) | ~~3-month~~[b] |

a. The Conditional WLA under critical conditions shall apply~~ies~~ only if the following conditions and implementation requirements are met:
   1. Water supply concentrations measured in Castaic Lake are ≥ 80 mg/L.
   2. Salt-sensitive agricultural uses that are irrigated with surface water are provided supplemental water during periods when Reach 4B surface water exceeds 117 mg/L.
   3. ~~Beginning~~ By May 4, ~~2016~~2020, the 10-year cumulative net chloride loading above 117 mg/L ($CNCl_{117}$)[i] to Reach 4B of the SCR, calculated annually, from the Saugus and Valencia WRPs ~~is~~ shall be zero or less~~, where:~~.

[i] $CNCl_{117} = Cl_{(Above\ 117)} - Cl_{(Below\ 117)} - Cl_{(Export\ Ews)}$

Where:

$Cl_{(Above\ 117)}$ = ([WRP Cl Load[1]/Reach 4B Cl Load[2]] * [Reach 4B Cl $Load_{>117}$[3]])
$Cl_{(Below\ 117)}$ = ([WRP Cl Load[1]/Reach 4B Cl Load[2]] * [Reach 4B Cl $Load_{\leq 117}$[4]])
$Cl_{(Export\ EWs)}$ = [Cl Load Removed by Extraction Wells]

[1] WRP Cl Load is determined as the as the monthly average Cl concentration multiplied by the monthly average flow measured at the Valencia WRP.
[2] Reach 4B Cl Load is determined as the monthly average Cl concentration at SCVSD Receiving Water Station RF multiplied by the monthly average flow measured at USGS Gauging Station 11109000 (Las Brisas Bridge).
[3] Reach 4B Cl $Load_{>117}$ means the calculated Cl load to Reach 4B when monthly average Cl concentration is above 117 mg/L.

[4] Reach 4B Cl Load$_{\leq 117}$ means the calculated Cl load to Reach 4B when monthly average Cl concentration is below or equal to 117 mg/L.

4. The chief engineer of the SCVSD signs under penalty of perjury and submits to the Regional Board a letter documenting the fulfillment of conditions 1, 2, and 3.

b. The averaging period for the critical condition WLA may be reconsidered based on results of chloride trend monitoring after the AWRM system is applied.

Beginning May 4, 2015, discharges to Reaches 5 and 6 by the Saugus and Valencia WRPs, will have conditional concentration-based and mass-based WLAs for chloride based on conditional SSOs (Table 8).

**Table 8. Conditional WLAs for Saugus and Valencia WRPs**

| WRP | Concentration-based Conditional WLA for Chloride ~~(12-month Average)~~ | Mass-based Conditional WLA for Chloride (12-month Average) |
|---|---|---|
| Saugus | 150 mg/L (12-month Average), 230 (Daily Maximum) | $Q_{Design}$*150 mg/L*8.34 |
| Valencia | 150 mg/L (12-month Average), 230 (Daily Maximum) | $Q_{Design}$*150 mg/L*8.34 – $AF_{RO}$ |

$AF_{RO}$ is the chloride mass loading adjustment factor for operation of RO facilities, where:

If RO facilities are operated at ≥ 50% ~~rated capacity~~Capacity Factor[a] in preceding 12 months

$$AF_{RO} = 0$$

If RO facilities are operated at < 50% Capacity Factor~~rated capacity~~[b] in preceding 12 months

$$AF_{RO} = (50\% \text{ Capacity Factor } \sout{\text{rated capacity}} - \%\text{RO Capacity}) * \textit{ChlorideLoadRO}^{c}$$

[a] ~~Rated capacity~~Capacity Factor is based on 3 MGD of recycled water treated with RO, 90% of the time.

[b] If operation of RO facilities at <50% ~~rated~~ capacity factor is the result of conditions that are outside the control of SCVSD, then under the discretion of the Executive Officer of the Regional Board, the $AF_{RO}$ may be set to 0.

[c] Chloride load reduction is based on operation of a ~~3 MGD~~ RO treatment plant treating 3 MGD of recycled water with chloride concentration of 50 mg/L + Water Supply Chloride. Assumes operational capacity factor of 90% and RO

membrane chloride rejection rate of 95%. Determination of chloride load based on the following:

$$ChlorideLoadRO = 90\% \times [(Q_{RO} \times C_{WRP} \times 8.34) \times r] \times \left( 30 Days / Month \right)$$

where:

$Q_{RO}$ = ~~RO Treatment Flow in MGD (~~3 MGD of recycled water treated with RO~~)~~
$C_{WRP}$ = Chloride Concentration in State Water Project + 50 mg/L
r = % RO chloride rejection (95% or 0.95)
8.34 = Conversion factor (ppd/(mg/L*MGD))

The GSWI model accounted for existing major and minor NPDES dischargers located within the model boundaries. The future modeling scenarios were based on:

- Projected flow for the Saugus and Valencia WRPs and chloride concentrations equal to conditional WLAs,
- projected flow for the Newhall WRP and a chloride concentration of 100 mg/L, and
- existing flow and chloride concentrations for the other major and minor NPDES dischargers.

The affect of assigning conditional WLAs to the Newhall WRP and the other major and minor NPDES discharges on net chloride loading was not modeled. Therefore, other major NPDES dischargers (as defined in Table 4-1 of the Basin Plan), including Newhall WRP, receive WLAs equal to 100 mg/L. The Newhall Ranch WRP already has a permit limit of 100 mg/L for chloride in Order No. R4-2007-0046 based on the current WQO. The Regional Board may consider assigning conditional WLAs for other major NPDES dischargers, including Newhall WRP, based on an analysis of the downstream increase in net chloride loading to surface water and groundwater as a result of implementation of conditional WLAs. The Regional Board may require chloride mass removal quantity that is proportional to mass based chloride removal required for the Valencia WRP in order to receive conditional WLAs.

Other minor NPDES dischargers (as defined in Table 4-1 of the Basin Plan) receive conditional WLAs. Minor discharges receive conditional WLAs without the additional analysis because, based on their flows, the impact of minor discharges is negligible compared to the WRPs.

~~Other NPDES discharges contribute a minor chloride load.~~ The conditional WLAs for minor~~these~~ point sources are presented in Table 9.

**Table 9. Conditional WLAs for Minor~~Other~~ NPDES Discharges**

| Reach | Concentration-based Conditional WLA for Chloride (mg/L) | ~~Averaging Period~~ |
|---|---|---|
| 6 | 150 (12-month Average), 230 (Daily Maximum) | ~~Annual~~ |
| 5 | 150 (12-month Average), 230 (Daily Maximum) | ~~Annual~~ |
| 4B | 117 (3-month Average), 230 (Daily Maximum) | ~~3-month~~ |

The WLA of 230 mg/L for daily maximum for chloride is to protect threatened and endangered species. The Endangered Species Protection study indicates that the existing US EPA chronic chloride criteria of 230 mg/L can be considered to be fully protective of local biota.

The final WLAs for TDS and sulfate are equal to existing surface water and groundwater quality objectives for TDS and sulfate in Tables 3-8 and 3-10 of the Basin Plan. The Regional Board may revise the final WLAs based on review of trend monitoring data as detailed in the monitoring section (Section 8.7) of this staff report.

### 4.3. Conditional Load Allocations to Support AWRM

The source analysis indicates nonpoint sources are not a major source of chloride. The conditional load allocations (LAs) for nonpoint sources are presented in Table 10.

**Table 10. Conditional LAs for Nonpoint Sources**

| Reach | Concentration-based Conditional LA for Chloride (mg/L) | ~~Averaging Period~~ |
|---|---|---|
| 6 | 150 (12-month Average), 230 (Daily Maximum) | ~~Annual~~ |
| 5 | 150 (12-month Average), 230 (Daily Maximum) | ~~Annual~~ |
| 4B | 117 (3-month Average), 230 (Daily Maximum) | ~~3-month~~ |

The conditional LAs shall apply only when chloride load reductions and/or chloride export projects are in operation by the SCVSD according to the implementation

provisions in Section 8 of the Staff Report. If these conditions are not met, LAs are based on existing water quality objectives of 100 mg/L.

The LA of 230 mg/L for daily maximum for chloride is to protect threatened and endangered species. The Endangered Species Protection study indicates that the existing US EPA chronic chloride criteria of 230 mg/L can be considered to be fully protective of local biota.

# 5. Water Code Section 13241 Analysis

In setting site specific objectives, Porter-Cologne section 13241 requires consideration of six factors relating to beneficial uses, economics, the environmental setting, water quality that can be reasonably attained, housing and the need for recycled water. Further, because some of these site specific objectives are greater than the existing water quality objectives, state and federal antidegradation provisions must be considered. These considerations were provided in the Task 7 and 8 Report (LWA, 2008) and are summarized below. Because the agricultural beneficial use of water has been determined to be the most sensitive use under the chloride TMDL, the 13241 analysis focused on salt sensitive agricultural uses. Based on an analysis of the Task 7 and 8 Report, staff concludes that the conditional SSOs, when implemented with the AWRM Program, will support beneficial uses and is in the best interests of the people of California.

## 5.1. Past, present, and probable future beneficial uses of water

Probable future beneficial uses of the surface waters in Reaches 4, 5, and 6 are likely to remain consistent with past and present uses with the exception of agriculture supply. Agricultural uses in Reaches 5 and 6 will likely decline over time due to increasing urbanization. Agricultural uses in Reaches 4A and 4B will likely remain constant.

The proposed conditional SSOs of 150 mg/L for surface and groundwater within Reaches 5 and 6 are protective of the AGR beneficial use because these waters are not currently and have not historically been used as an irrigation supply for salt-sensitive crops. Newhall Land and Farm is the only landowner with existing agricultural operations that could potentially be impacted by groundwater-surface water interactions within Reach 5 of the Santa Clara River. Newhall has not historically and does not plan in the future to cultivate salt-sensitive crops in Reaches 5 or 6 because of adverse climatic conditions. A number of commercial and wholesale nurseries are located in the Santa Clarita Valley along the Castaic Creek and South Fork tributaries and east of Reach 6, but these nurseries are not likely impacted by surface flows from the Santa Clara River. This situation is unlikely to change due to climatic conditions that impact the ability to grow salt sensitive crops and because the use of irrigation water for crops is anticipated to decline in Reaches 5 and 6 due to planned urban development.

When implemented with the AWRM compliance option, the proposed conditional SSOs of 117 mg/L during normal conditions and 130 mg/L during drought conditions in Reach 4B and the underlying groundwater will protect agricultural uses in the area. Local growers in this area irrigate crops primarily with groundwater from local aquifers fed by releases from Lake Piru and the Santa Clara River, as well as surface diversions from the Santa Clara River. Agricultural supply water originating from Lake Piru are unaffected by chloride levels in the Santa Clara River because Lake Piru is fed with State Water Project water and local runoff. Camulos Ranch is the only known avocado grower that irrigates crops using water originating from Reach 4B waters. The proposed

conditional SSOs in Reach 4B and the underlying groundwater are fully protective of agricultural uses in this area based on the result of the LRE for salt-sensitive crops (a 117 mg/L chloride threshold value) and supplemental water supply to Camulos during drought conditions.

## 5.2. Environmental characteristics

The environmental setting of the proposed conditional SSOs and TMDL conditional WLA revisions is presented in Section 2.3. The proposed conditional SSOs and TMDL revisions will impact reaches 4B, 5, and 6 of the Santa Clara River and the groundwater basins underlying those reaches. The proposed conditional SSOs, when implemented with the AWRM Program, will ensure protection of beneficial uses considering the environmental characteristics of and the water quality available to the USCR.

Surface flows in the USCR correspond to seasonal precipitation within the region. Portions of the river are perennial, but various reaches are ephemeral and intermittent and flow only during significant storm events. Base flow in the USCR is comprised of surfacing groundwater, discharges from the Saugus and Valencia WRPs, conservation releases of imported and local waters from reservoirs, and agricultural and urban runoff. Base flow in Reach 6 is largely dependent on discharges from the Saugus WRP. Base flows in Reaches 5 and 4B are dependent on Saugus and Valencia WRP discharges as well as rising ground water. Further downstream, in Reach 4A between the confluence at Piru Creek and Las Brisas, surface flow is typically present only during parts of the wet season, which varies by water year. This “dry gap” seasonally separates the upper Santa Clara River hydrologically from the lower river, which, during normal or below normal water years, impedes inter-reach migration and movement of aquatic life. The Vern Freeman Diversion, at the bottom of Reach 3, diverts up to 375 cubic feet per second (cfs) from the Santa Clara River to the El Rio and Saticoy spreading grounds, where the water recharges the underground aquifers and is distributed for agricultural irrigation.

The largest source of chloride to the Upper Santa Clara River is the water supply (see Section 2.5). Dry and critically dry periods affecting the Sacramento and San Joaquin River Valleys reduce fresh-water flow into the Sacramento-San Joaquin Delta and result in higher than normal chloride concentrations in the SWP supply within the California aqueduct system. Typically, water pumped through the Sacramento-San Joaquin Delta takes approximately 1 to 2 years to show up as deliverable SWP water sold by the Santa Clarita Valley wholesaler, CLWA, to local retail water purveyors, due to reservoir storage and turnover time. Salinity fluctuations in the SWP are reflected in both the imported water treated and delivered by the CLWA and the WRP effluent quality. The quality of the SWP water can be high enough to cause or contribute to exceedances of the current water quality objective.

The proposed conditional SSOs are more stringent than historical effluent limitations for the Saugus and Valencia WRPs and would result in improved water quality over existing conditions. In addition, the proposed conditional SSOs are below

the USEPA aquatic life chloride criteria, which according to the TES Study are protective of the most chloride-sensitive organisms for which data are available. Therefore, it is not expected that the proposed conditional SSOs will harm in-stream or riparian species or habitat.

## 5.3. Water quality conditions that could reasonably be achieved

A detailed discussion of the compliance options and water quality that can be achieved through different approaches to compliance is presented in the Task 2B-1 and Task 2B-2 Reports (Geomatrix, 2008a, CH2MHill 2008, and Geomatrix 2008b). As discussed in Section 5, the AWRM compliance strategy will result in compliance with the proposed conditional SSOs. Other compliance measures, such as large scale advanced treatment facilities, could achieve 100 mg/L in Reaches 5 and 6, but would not meet 100 mg/L during all times in Reach 4B. Given the technical constraints on large scale advanced treatment facilities and the environmental and water resource benefits of the AWRM, staff recommends the adoption of conditional SSOs. Implementation of the AWRM will protect beneficial uses, improve the water quality in the Eastern Piru groundwater basin through export of salts, and result in an overall salt balance in the watershed.

## 5.4. Economic Considerations

Costs of complying with the existing WQOs were compared with costs of complying with conditional SSOs, including with facility upgrades to the Saugus and Valencia WRPs and other AWRM actions and summarized below.

### 5.4.1 Compliance with existing WQOs

The costs of two advanced treatment alternatives were analyzed for compliance with existing WQOs. One alternative involves constructing a 3.6 MGD MF/RO facility at the Saugus and WRP and a 15.4 MF/RO facility at the Valencia WRP, so that the entire discharge at each plant meets 100 mg/L in all conditions. This alternative would require brine waste disposal through a pipeline and ocean outfall. A second alternative involves reducing the amount of discharge from each WRP, so that only the minimum amount of discharge necessary to maintain habitat complies with 100 mg/L under all conditions. In this alternative, approximately 6 MGD would be treated with MF/RO at both plants and the remaining balance of effluent would be disposed to a pipeline to the ocean. The estimated capital and operation and maintenance (O&M) costs for these treatment alternatives are in Table 11.

**Table 11: Costs for Advanced Treatment to Comply with Existing Objectives**

| Facility | Capital Cost | Annual O&M |
|---|---|---|
| Maximum Advanced Treatment | $118,000,000 | $~~8,79~~9,00,000 |
| Brine Disposal | $230,000,000 | $~~75~~500,000 |
| **Total Maximum Advanced Treatment and Brine Disposal** | **348,000,000** | **$9,~~72~~00,000** |
| Minimum Advanced Treatment | $~~49~~52,000,000 | $4,~~42~~00,000 |
| Ocean Discharge | $419,000,000 | 500,000 |
| **Total Minimum Advanced Treatment and Ocean Discharge** | **$~~468~~471,000,000** | **$4,~~97~~00,000** |

Assuming an interest rate of 5.5% and a period of 20 years, the combined present worth of the estimated Capital and O&M Costs for compliance by providing maximum advanced treatment and brine disposal is approximately $~~460~~ 470 Million and by providing minimum advanced treatment and ocean discharge is $~~524~~ 530 Million. Therefore, the range of costs for facilities required to comply with the existing water quality objectives is between $4~~76~~0 Million and $~~524~~ 530 Million.

### 5.4.2 Compliance with Conditional SSOs

Cost estimates were prepared for the various elements of the AWRM Program (Table 12). The costs of source control measures are based on SRWS removal and conversion of bleach-based disinfection processes at the WRPs to UV disinfection facilities. The AWRM program also includes construction and operation of a 3-MGD MF/RO facility at the Valencia WRP and brine waste disposal through deep well injection technology. During periods of extreme drought and prior to construction and operation of the MF/RO facility, the AWRM Program includes supplemental water from local water purveyors to reduce chloride levels in the surface water in Reach 4B. Costs for this element were estimated based on a need for approximately 30,000 acre-feet of supplemental water at an assumed cost of approximately $1,000 per acre-feet (based on discussions with local water purveyors) as well as infrastructure for conveyance of the supplemental water at a cost of approximately $7.5 Million. Finally, the costs of water supply facilities needed to achieve salt export from the Piru groundwater basin and blend groundwater with RO permeate include the costs of 10 groundwater extraction wells, a 12-mile RO permeate conveyance pipeline, and a 6-mile blended water supply pipeline.

**Table 12. Costs for AWRM Program**

| AWRM Element | Capital Cost | Present Worth O&M | TOTAL |
|---|---|---|---|
| Source Control Measures | $185,590,000 | $6,000,000 | $241,950,000 |
| Advanced Treatment and Brine Disposal | $78,400,000 | $44,200,000 | $122,600,000 |
| Supplemental Water | $37,500,000 | N/A | $37,500,000 |
| Ventura Water Supply Facilities | $70,100,000 | $3,600,000 | $73,700,000 |
| **TOTAL AWRM Program** | **$2041,1900,000** | **$53,8600,000** | **$2584,700,000** |

Note: All costs are as of September 2007

Assuming an interest rate of 5.5% and a period of 20 years, the combined present worth of the Capital and O&M cost for the AWRM facilities required to comply with the proposed site-specific objectives is estimated at approximately $2595 Million.

Amortizing the total costs at 5.5% per year for 20 years yields an annual cost estimate of $36.4005 per month per connection for maximum advanced treatment and brine disposal, $41.5507 for minimum advanced treatment and ocean discharge, and $20.3019.96 for the AWRM. Amortizing the total costs at 5.5% per year for 30 years yields an annual cost estimate of $29.6331.54 per month per connection for maximum advanced treatment and brine disposal, $34.9733.76 for minimum advanced treatment and ocean discharge, and $176.431 for AWRM. This rate analysis does not include additional costs related to procurement of bonds, provision for rate ramp-up periods, nor actual increased costs of project implementation that can occur in the field (e.g., construction change orders, increased cost of materials, and increased cost of construction).

Regional Board staff also reviewed the State Board report, Wastewater User Charge Survey Report F.Y. 2007-2008. This report is prepared annually by the State Board and summarizes and analyzes cost data from a survey of California wastewater agencies. The report shows that the monthly user charge for the City of Santa Clarita was $16.29 per month. The report also shows the statewide monthly service charge average is $33.82 per month and the median is $26.83 per month, with a high of $231.92. For Los Angeles County, the monthly service charge average is $23.90 per month and the median is $12.28 per month. For Ventura County, the monthly service charge average is $38.47 per month and the median is $35.35 per month. The rate will likely increase to a level similar to thenot substantially above the statewide average if applying the AWRM program, and to a level substantially higher than the statewide average if applying the other two options. Potential cost savings to community residents which could be acquired through funding programs to assist in the construction costs, and avoidance of additional treatment costs for other pollutants (i.e. future TMDL requirements) are not included.

## 5.5. The Need to Develop Housing

The proposed water quality objectives would not restrict the development of housing near the reaches of the Santa Clara River affected by the proposed conditional SSOs because they do not result in discharge requirements that affect housing or housing development. The proposed conditional SSOs and AWRM Program were developed based on projected population and housing growth in the Santa Clarita Valley. The GSWI model considered increased effluent flow from the WRPs and the effects of this growth on the chloride levels in the Santa Clara River and underlying aquifers. The proposed conditional SSOs will support water recycling and the use of the AWRM compliance option in the USCR. Both of these factors will provide water resources to support housing that may be lost with other compliance options.

## 5.6. The Need to Develop and Use Recycled Water

The proposed water quality objectives will support the expansion of recycled water uses in the Santa Clarita Valley consistent with the California's stated goal of increasing the use of recycled water to help meet the state's growing demand for potable water. The CLWA 2005 Urban Water Management Plan projects that water demand in the area will continue to increase, and that additional sources of water including recycled water will be necessary to meet projected demand. Recycled water use in CLWA's service area is projected to increase from 448 acre-feet per year (actual use in 2004) to 17,400 acre-feet per year by 2030. This 2030 figure represents 70% of the imported water portion of the ultimate wastewater flow projected for the Saugus and Valencia WRPs of approximately 34 MGD. The increased flow from the WRPs from current flows of 21 MGD to future flows of 34 MGD is expected to accommodate most of the increased recycled water demand in the watershed.

The proposed conditional SSOs will support the expansion of recycled water uses by protecting municipal supply. For groundwater recharge reuse projects, Maximum Contaminant Level (MCL) codified in California Administrative Code, Title 22 provide reasonable protection of groundwater quality for the beneficial use of municipal supply. The proposed groundwater objectives for chloride are below the Recommended Secondary Maximum Contaminant Levels for drinking water sources codified in Title 22. Given the demonstrated need to expand recycling in the USCR to meet the region's future water requirements, the proposed conditional SSOs are needed to ensure the required compliance mechanisms allow for the recycling to take place. Additionally, the proposed conditional SSOs are consistent with the secondary MCLs in Title 22 and will not result in water quality for chloride that exceeds these levels.

# 6. Antidegradation Analysis

State Board Resolution 68-16, “Statement of Policy with Respect to Maintaining High Quality Water” in California, known as the "Antidegradation Policy," protects surface and ground waters from degradation. It states that waters having quality that is better than that established in effective policies shall be maintained unless any change will be consistent with the maximum benefit to the people of the State, will not unreasonably affect present and anticipated beneficial uses, and will not result in water quality less than that prescribed in the policies.

The federal antidegradation policy (40 CFR 131.12) requires states to maintain and protect existing instream water uses and the water quality necessary to protect the existing uses (Tier I), maintain high quality waters unless the State finds after satisfaction of intergovernmental and public participation provisions of the states continuous planning process that allowing lowering water quality is necessary to accommodate important economic and social development (Tier II), and maintain and protect water quality in waters the state has designated as outstanding National resource waters (Tier III).

Adoption of proposed conditional SSOs, when implemented the AWRM Program, would be consistent with the state and federal antidegradation policies. Staff worked with stakeholders to develop a complete antidegradation analysis that is contained in the Task 7 and 8 report (LWA, 2008). The following contains a summary of the antidegradation analysis.

The proposed conditional site specific surface and groundwater objectives are protective of present and anticipated beneficial uses. The proposed conditional SSOs in Reaches 5 and 6 of 150 mg/L are protective of present and anticipated uses for irrigation of non-salt sensitive crops in the area, municipal supply, and aquatic life. The proposed conditional SSOs for Reach 4B, when implemented with the AWRM compliance option, are protective of the present and anticipated beneficial uses of these waters, including the most sensitive beneficial use, salt sensitive agriculture. The proposed SSO of 117 mg/L is within the LRE guidelines for protection of salt sensitive agricultural uses. The proposed SSO of 130 mg/L, which applies during critical conditions when source water is greater than 80 mg/L chloride, is protective when alternative water supplies are provided to salt sensitive agriculture uses (conditional SSO = 130 mg/L) and salt export projects as described in Section 8 are operated such that the net chloride loading above 117 mg/L is zero or less.

The proposed implementation activities, which will increase chloride export from the East Piru groundwater basin, will offset any increases in chloride discharges. If higher water quality objectives (130 mg/L) are in place in Reach 4B due to elevated concentrations in source water, the groundwater basin will be protected from degradation through the required salt export. The AWRM proposal will improve water quality in the basin over time and offset any increase in chloride concentrations that result from the

higher objective during some periods. The AWRM proposal was evaluated based on design capacities at Valencia WRP and Saugus WRP of 27.6 MGD and 6.5 MGD, for a total system design capacity of 34.1 MGD. If the capacity of the WRPs ever exceeds the current total system design capacity of 34.1 MGD, then the amount of water required for salt reduction and/or export should increase proportionally to the increase in the total system design capacity, and an additional antidegradation analysis should be conducted.

Under the AWRM Program, the blended extraction well and RO permeate discharge into Reach 4A will not exceed a chloride concentration of 95 mg/L. The current chloride WQO of 100 mg/L in Reaches 3 and 4A is within the LRE guidelines and will protect salt-sensitive agricultural uses. Therefore, the blended extraction well and RO permeate discharge into Reach 4A will not exceed the WQO of the receiving water at the point of discharge (Reach 4A) or in the reach downstream of the discharge point (Reach 3) and the designated beneficial uses for the reaches are still protected. This satisfies EPA's Tier 1 requirements in 40 CFR 131.12(a). Ongoing trend monitoring and additional modeling will determine whether the blended extraction well and RO permeate discharge would increase chloride concentrations in high quality waters downstream in Reaches 4A and 3 and in the Fillmore and Santa Paula groundwater basins. The GSWI model will be extended to the Freeman Diversion to assess the interaction of groundwater and surface water through the Piru, Fillmore, and Santa Paula groundwater basins and the overlying surface waters.

The proposed conditional SSOs and implementation of the AWRM are consistent with the maximum benefit to the people of the state and will result in social and economic benefits. It has been shown that AWRM Program will support water recycling and provide for additional water resources for agriculture and aquatic habitat. The GSWI model demonstrates that the AWRM compliance option results in benefits from the County Line to the area of seawater intrusion on the Oxnard Plain. The model shows that the ARWM option allows for more water diverted at the Freeman Diversion than conventional advanced treatment options, which then has a significant effect on saline intrusion in the Oxnard Plain. At the downstream end of the Piru basin, modeled surface water chloride concentrations are higher in the river about 40% of the time with the AWRM operating, but still in compliance with the existing water quality objective of 100 mg/L. Groundwater chloride concentrations in Piru Basin are improved by pumping and replacing groundwater with stormwater recharge during wet years when chloride concentrations are lower. As a result, surfacing groundwater from the Piru basin in Reach 4A may decrease over time as a result of the AWRM. The AWRM will also result in increased surface water flows in Reaches 3 and 4A as compared to other compliance options. Additionally, the proposed groundwater and surface water objectives for Reaches 5 and 6 will support the expansion of recycled water uses in the Santa Clarita Valley, which is consistent with the maximum public benefit and not unreasonably adverse to present and anticipated beneficial uses. Finally, in general, the AWRM compliance option has more water quality benefits to Ventura County than do the conventional advanced treatment based compliance options.

The proposed conditional SSOs will not result in water quality less than that prescribed in the policies. The proposed conditional SSOs comport with the Chloride Policy in Regional Board resolution 97-002 and its requirements for a watershed chloride reduction plan.

Finally, the proposed conditional SSOs will be implemented through NPDES permits, including effluent limits and required minimum salt export requirements. The effluent limits will ensure that the current performance of the WRPs continues at a minimum and will most likely require additional actions to achieve the water quality objectives. Additionally, receiving water limits will ensure that downstream water quality is not degraded as a result of wastes discharged. Finally, minimum salt export requirements will be included to ensure that excess salt loadings to the groundwater basin due to periods of elevated water supply concentrations are removed from the groundwater basin through pumping and export.

# 7. Alternatives Analysis and Staff Recommendation

Based on the results of the TMDL special studies, Regional Board staff analyzed two alternatives for Regional Board consideration. The first entails a TMDL based on the existing surface water Basin Plan objectives; the second alternative entails a TMDL based on a suite of site specific objectives for both surface water and groundwater underlying the Upper Santa Clara River to support the AWRM approach. Both alternatives rely on implementation of RO technology; however, the first alternative requires larger capacity RO facilities and ocean brine disposal while the second alternative requires smaller capacity RO facilities and no ocean disposal.

## 7.1. Alternative 1 - Maintain Current Basin Plan Objectives – No Action

Under this alternative, the Regional Board takes no action at this time to adopt SSOs or amend the TMDL Wasteload Allocations and Implementation Schedule. Staff notes several concerns with Alternative 1.

First, a key factor in implementation of RO is safe disposal of the resultant brine waste. Several options for brine disposal include ocean discharge, deep well injection, and drying and subsequent landfill disposal. Cost-effective brine disposal is based on several factors including the brine quantity generated and proximity to available disposal facilities. Because it requires larger capacity RO to meet more stringent objectives, the first alternative would require brine disposal via an ocean discharge. The second alternative, which requires smaller capacity RO, would enable disposal via deep well injection. Ocean disposal options generally provide greater capacity than disposal wells, but for the Santa Clarita Valley, would require construction of a large pipeline through two counties over 43-miles. Deep well injection involves retrofitting abandoned oil production wells or constructing new injection wells in areas near the Santa Clarita Valley and injecting the brine into stable geological formations. Local disposal of the smaller volumes brine associated with second alternative through deep well injection or landfilling is likely more cost effective and would likely have less environmental impacts than ocean disposal for this site. In particular, facilities for deep well injection are closer to the RO facilities than ocean disposal sites and therefore require a shorter pipeline. Further, the capacity limits the size of the RO plant so that electrical resources are lower than the first option.

Another concern with the first alternative is under an ocean disposal scenario, a pipeline and outfall could potentially be used for discharge of treated wastewater rather than the discharge of brine. If the SCVSD were to discharge wastewater directly to the Ocean, this option would reduce flows in the Upper Santa Clara River.

### 7.2. Alternative 2 - Adopt Conditional SSOs and Revised TMDL Conditional WLAs

Under this alternative, the Regional Board adopts a suite of site specific objectives that are conditioned on implementing a chloride balance that is based on advanced treatment of the Valencia WRP effluent to reduce chloride loading to the USCR by a level greater than any loading contributed by the Valencia WRP in excess of loading corresponding to 117 mg/L (see section 8.2). TMDL conditional WLAs for chloride are revised to reflect the conditional SSOs. In addition, interim WLAs for sulfate and TDS are included to facilitate the use of supplemental water to Reach 4B when chloride objectives exceed 117 mg/L.

The AWRM Program uses smaller-scale reverse osmosis to provide greater flexibility for disposal of brine generated by the reverse osmosis system. The AWRM Program also provides capability for aquifer restoration and resource conservation through blending the advanced treated wastewater with extracted groundwater from degraded underlying basin in the upper Santa Clara River. In order to implement an alternative implementation plan, conditional SSOs that are in excess of the existing WQOs for surface water are required. However, because the AWRM facilitates the feasibility of aquifer restoration, the groundwater WQOs can be more stringent. This alternative is analyzed in accordance with a salt balance in the Upper Santa Clara River Watershed.

### 7.3. Staff Recommendation

Staff recommends the adoption of Alternative 2- adopt conditional site specific objectives and revised TMDL conditional WLAs. The conditional site specific objectives will maintain beneficial uses and the implementation of the AWRM program will result in decreased salt loading to the USCR with fewer environmental and economic impacts than Alternative 1. Additional benefits in both water supply and water quality accrue in areas downstream of the USCR.

- Staff finds that the key technical issues of cumulative chloride impacts to groundwater have been addressed by GSWI. Details of staff's findings on the GSWI model are presented in Appendix I, "GSWI Study for the USCR Chloride TMDL – Staff Report."

- Staff find that the GSWI model has been adequately calibrated by 88 groundwater level, 50 groundwater chloride, 6 streamflow, and 12 surface-water quality target locations that are spatially distributed throughout the GSWI domain and it has been considered as an appropriate model for groundwater and surface water interaction modeling purposes.

- Staff finds that, based on the GWSI model, none of the simulated chloride concentrations derived from the proposed compliance options result in chloride concentrations less than the existing WQO of 100 mg/L in surface water at all

times over 24-year simulation periods (2007-2030) and at all locations in Reaches 4B, 5 and 6. All of the predicted chloride concentrations in groundwater for all compliance options consistently met the existing WQO of 200 mg/L in groundwater of the Piru Basin except the area between Blue Cut and SCR-RF monitoring locations.

- Staff finds that the model predicted high chloride concentrations of 350 mg/L or greater in the alluvial groundwater (thickness of 50-100 ft) in the areas between Blue Cut and receiving water station SCR-RF during drought periods for all proposed compliance options. The high chloride concentration in this area will migrate downstream through the pumping activity in the proposed extraction well locations for the AWRM compliance option and will affect the chloride concentration of the mixed water with RO and then will affect the chloride concentration in SCR in Reach 4A. Geomatrix has prepared a technical memo stating that there is no current or expected future use of the shallow groundwater for beneficial uses in this area (Geomatrix, 2008c). The memo states that groundwater production in Reach 4B for existing beneficial uses occurs downstream of Blue Cut area, where the aquifer has a greater saturated thickness, yields more water, and has lower chloride concentrations. The memo also states that the alluvial groundwater concentrations are predicted to quickly recover once the drought period has ended. Staff therefore recommends that the proposed SSOs of 150 mg/L be set for the deeper San Pedro Formation and that the existing WQOs of 200 mg/L be retained for the shallow alluvium layer.

- Staff finds that the predicted chloride concentrations in both groundwater and surface water at Blue Cut were generally related to concentrations of chloride in the discharges to the SCR from the Saugus and Valencia WRPs.

- Staff finds that the Advanced Treatment and Brine Disposal Compliance Option can not result in full attainment of the 100 mg/L WQO for the USCR at Blue Cut at all times and in all locations of the receiving water. In addition, other compliance options like conveying all recycled water discharges from the Valencia and Saugus WRPs to the ocean outfall (Zero Discharge Compliance Option), limiting discharges from the WRPs and conveying the balance of WRPs recycled water discharges to ocean outfall (Minimal Discharge Compliance Option), and moving the discharge location of WRPs to the beginning of Reach 7 near Lang gauge (Alternative WRP Discharge Location Compliance Option) are also not likely to achieve attainment of the existing 100 mg/L WQO at all times and all locations.

- Staff notes that an alternative compliance option is required to achieve the site specific objectives (SSOs) when the original proposed compliance options were not able to achieve the existing WQO of 100 mg/L. Staff also notes that the SSOs shall be carefully evaluated based on the GSWI model results of different averaging periods to ensure they are fully protective of the agricultural beneficial uses in the study area.

- Staff finds that the AWRM compliance option can produce better chloride concentrations than other proposed compliance options during drought periods and the salt export capability of the AWRM compliance option will help to substantially reduce the amount of chloride loading from salt-water intrusion in the Oxnard Plain.

- Staff finds that the AWRM compliance alternative will result in timely attainment of conditional SSOs and reduce the chloride load to the USCR and underlying groundwater basins during the TMDL implementation period. Staff further finds that the AWRM will help provide enough mass loading to protect the SCR downstream from sea water intrusion.

- Staff finds that the proposed conditional SSOs would be consistent with state and federal antidegradation policies. The antidegradation analysis shows that the Alternative Water Resources Management Plan, involving conditional SSOs that are less stringent than existing WQOs used in conjunction with advanced treatment and salt export, are protective of beneficial uses in the USCR.

- Staff finds that the proposed conditional SSOs considered section 13241 requirements including: (a) past, present, and probable future beneficial uses of water, (b) environmental characteristics of the hydrographic unit under consideration, (c) water quality conditions that could reasonably be achieved, (d) economic considerations, (e) the need for developing housing within the Region, and (f) the need to develop and use recycled water.

- Staff finds that the AWRM Program is consistent with the draft State Board Water Recycling Policy. A stakeholder draft of the policy was presented to the State Board on September 3, 2008. This draft policy states that salts from all sources should be managed on a basin-wide or sub basin-wide basis to attain water quality objectives and support beneficial uses through the development of regional salt management plans. The draft policy provides some specific requirements to be met in the salt management plans, including:

    1. Basin or sub basin-wide monitoring;

    2. Determination of all sources and loading of salts, the basin's assimilative capacity of salts, and fate and transport of salts;

    3. Implementation measures to manage salt loading on a sustainable basis;

    4. An antidegradation analysis demonstrating that projects included with the plan will satisfy State Board Resolution 68-16; and

    5. Water recycling and stormwater recharge/reuse goals and objectives.

Although no salt management plan has yet been developed for the Santa Clara River watershed, the AWRM program can serve as a basis for a future salt management plan. The AWRM Program elements have many similarities to the required salinity management plan elements. The AWRM Program was developed using the G~~W~~SWI model. Based on the total system design capacity of 34.1 MGD for the Saugus and Valencia WRPs and accommodated future growth, the GSWI model ~~, which~~ assessed the fate and transport of chloride from all sources in the surface waters and groundwater in the Santa Clara River watershed. The GSWI model also assessed water quality impacts associated with the planned recycled water uses in the future. Given that the AWRM program will eventually be implemented through various NPDES permits issued in the future, it also will involve a number of monitoring requirements to assess actual fate and transport of chloride during and after project implementation. While the GSWIM was developed specifically to assess the fate and transport of chloride, the evaluations and assessments will largely apply to other salts in the region, which behave similarly to chloride. The facilities that will be implemented through the AWRM (i.e., advanced treatment of wastewater, salt export facilities) will also remove and manage other salts. Hence, with some minor modifications and assessments, the AWRM program could be deemed a salinity management plan for the watershed, since it would provide for (1) watershed-wide monitoring, (2) determination of all sources, loading, fate and transport of salts, (3) salt management measures and implementation, (4) an antidegradation analysis; and (5) water recycling goals and objectives.

# 8. Implementation

The conditional SSOs proposed in Section 4.1 are conditioned on implementation of the AWRM program; if the AWRM system is not built, the water quality objectives revert back to the current levels in the Basin Plan (100 mg/L). These conditions comport with the Chloride Policy in Regional Board resolution 97-002 and its requirements for a watershed chloride reduction plan. The watershed chloride reduction plan will be implemented through NPDES permits for the Valencia WRP and a new NPDES permit for discharge into Reach 4A. The conditional site specific objectives for chloride in the USCR watershed shall apply and supersede the regional water quality objectives only when chloride load reductions and/or chloride export projects are in operation and reduce chloride loading in accordance with Table 13.

**Table 13. Watershed Chloride Reduction Plan**

| Water Supply Chloride[1] | Chloride Load Reductions[2] |
|---|---|
| 40 mg/L | 58,000 lbs per month |
| 50 mg/L | 64,000 lbs per month |
| 60 mg/L | 71,000 lbs per month |
| 70 mg/L | 77,000 lbs per month |
| 80 mg/L | 83,000 lbs per month |
| 90 mg/L | 90,000 lbs per month |
| 100 mg/L | 96,000 lbs per month |

[1] Based on measured chloride of the SWP water stored in Castaic Lake

[2] Chloride load reduction is based on operation of a ~~3 MGD~~ RO treatment plant treating 3 MGD of recycled water with chloride concentration of 50 mg/L + Water Supply Chloride. Assumes operational capacity factor of 90% and RO membrane chloride rejection rate of 95%. Determination of chloride load based on the following:

$$ChlorideLoad = 90\% \times [(Q_{RO} \times C_{WRP} \times 8.34) \times r] \times \left(30 Days / Month\right)$$

where r = % chloride rejection (95%)
$Q_{RO}$ = 3 MGD of recycled water treated with RO~~RO treatment flow (3 MGD)~~
$C_{WRP}$ = SWP Cl + 50 mg/L

## 8.1. Implementation of Reach 4B Conditional WLAs

The Saugus and Valencia WRP NPDES permits will have receiving water limits for the District's receiving water station, RF, located in Reach 4B of the Santa Clara River. The receiving water limits will be based on the Reach 4B conditional WLAs for chloride as presented in section 4.2.

## 8.2. Implementation of Reach 5 and 6 Conditional WLAs

Beginning May 4, 2015, Reach 5 and 6 conditional WLAs for the Saugus and Valencia WRPs (Table 5) will become effective. Prior to May 4, 2015, Saugus and Valencia WRPs will have interim WLAs for chloride equal to ~~the interim limits for chloride specified in order Nos. R4-2003-0143 and R4-2003-0145 as amended by order Nos. R4-2005-0031 and R4-2005-0032 (Table 14).~~ the interim limit for chloride specified in order No. R4-04-004.

**Table 14. Interim WLAs for Valencia and Saugus WRPs**

| Reach | Interim Chloride WLA (mg/L) | Interim Sulfate WLA (mg/L) | Interim TDS WLA (mg/L) | Averaging Period |
|---|---|---|---|---|
| 5 | [SWP] + 114 not to exceed 230 | 450 | 1000 | 12-month~~Annual~~ |
| 6 | [SWP] + 134 not to exceed 230 | 450 | 1000 | 12-month~~Annual~~ |

In addition, in order to support water recycling in the USCR, which is critical to the success of and stakeholder support for the AWRM Program, the Saugus and Valencia WRPs will receive interim WLAs for sulfate and TDS (Table 14). When the water reclamation requirements for these WRPs are renewed, they will likely contain limits based on groundwater WQOs. Current levels of sulfate and TDS in the WRP effluent will not meet limits based on existing WQOs. Instead the Saugus and Valencia WRPs must meet interim WLAs equal to 450 mg/L sulfate and 1000 mg/L TDS, which will apply for discharges to the Santa Clara River and recycled water uses from the Saugus Valencia WRPs. This will allow the SCVSD time to conduct special studies on the impacts of sulfate and TDS concentrations at these levels on groundwater quality and the potential for sulfate and TDS SSOs. These interim WLAs will expire on May 4, 2015 and will be replaced either with final WLAs based on the results of SSOs, if developed, or existing WQOs.

The interim WLAs are protective of beneficial uses and consistent with historical surface and groundwater objectives for basins underlying Reaches 5 and 6. A recent report prepared for the SCVSD used a weight of evidence approach to demonstrate that the interim WLAs for sulfate are protective of USCR aquatic life uses, including threatened and endangered fish and amphibians, and their prey organisms (Environ, 2008). The report states that the species mean acute value of the most acutely sulfate-sensitive invertebrate species was more than four times greater than the interim WLA of 450 mg/L. The report also states that the available toxicity data for sulfate confirm the relatively low sensitivity of fish, including threatened and endangered species in the USCR, to sulfate. Thus, protective values based on highly sensitive invertebrates will be additionally protective of TES fish and amphibians given their low sensitivity to ions.

Additionally, the interim WLAs are protective of groundwater recharge uses. These levels are consistent with the upper range of the secondary MCLs in Title 22.

### 8.3. Blended RO and Groundwater Discharge to Reach 4A

An NPDES permit and associated Monitoring and Reporting Program (MRP) will be required for any new discharge of the blend of RO-treated recycled water and extracted groundwater from the east Piru Basin, as contemplated in the AWRM Program. The Permittee shall submit a report of waste discharge and initiate an application to receive an NPDES permit for these facilities prior to their discharge to the SCR. Permit writers will consider ambient water quality when establishing permit limits to meet WQOs for Reach 4A.

### 8.4. Supplemental Water

Supplemental water released to Reach 6 of the Santa Clara River will require an NPDES permit. The AWRM contemplates the use of existing Saugus aquifer wells to deliver low chloride supplemental water directly to the USCR because infrastructure already exists and would not need to be constructed. These supplemental waters would be delivered through contractual arrangements between the SCVSD and the Upper Basin Water Purveyors and would be discharged directly to the USCR. However, although chloride concentrations in these alternative supplemental water wells are very low (20 to 42 mg/L), sulfate concentrations consistently exceed the existing surface water quality objective of 300 mg/L for Reach 6 and the TDS groundwater objectives of 700 mg/L for the groundwater basin underlying Reach 6.

Interim wasteload allocations (Table 12) are developed for sulfate and TDS for the dilution water discharges. These wasteload allocations would apply until then end of the TMDL Implementation period in order to allow (1) time for construction of infrastructure to connect the supplemental water to the Valencia WRP and be diluted with the RO permeate, or (2) time for the SCVSD to conduct additional special studies to provide adequate justification for SSOs for sulfate and TDS. If infrastructure to remove the direct discharge of supplemental water to the USCR is not constructed or if the Regional Board does not approve SSOs for sulfate and TDS, the interim WLAs would expire.

**Table 12. Interim WLAs for Reach 6 Supplemental Water Discharges**

| Reach | Interim Sulfate WLA (mg/L) | Interim TDS WLA (mg/L) | Averaging Period |
|---|---|---|---|
| 6 | 450 | 1000 | 12- |

| | |
|---|---|
| | month~~Annual~~ |

The interim WLAs are protective of beneficial uses and consistent with historical surface and groundwater objectives for Reach 6 (see discussion in section 8.2).

The final WLAs for TDS and sulfate are equal to existing surface water and groundwater quality objectives for TDS and sulfate in Tables 3-8 and 3-10 of the Basin Plan. The Regional Board may revise the final WLAs based on review of trend monitoring data as detailed in the monitoring section (Section 8.7) of this staff report.

## 8.5. Downstream Effects of TMDL Implementation

Implementation of the USCR Chloride TMDL, including implementation of AWRM and the discharge to Reach 4A of the blended RO permeate and pumped groundwater will not cause exceedances of surface water quality objectives for downstream reaches. The water discharged to Reach 4A will meet the WQO of 100 mg/L for Reaches 4A and 3. Furthermore, US EPA has established a TMDL for chloride in Reach 3 of the Santa Clara River (US EPA, 2003). The TMDL for Reach 3 sets a numeric target of 80 mg/L of chloride. The linkage analysis for the Reach 3 TMDL demonstrates that the numeric target of 80 mg/L will be attained if upstream discharges from Reach 4 have a chloride concentration of 100 mg/L.

Although the discharge to Reach 4A will have a concentration below the surface WQO of 100 mg/L, it will have a concentration greater than the existing chloride concentrations in Reach 4A and the Fillmore groundwater basin downstream. The average chloride concentration in Reach 4A is 59 mg/L, based on data collected from 1992 to 2006 downstream of the Fillmore Fish Hatchery. The GWSI model was used to calculate the average mass loading, average chloride concentration, and average flow from the discharge to 4A of blended RO permeate and extracted groundwater. This was compared with historic chloride concentration and flow data to determine the incremental increase in Reach 4A surface water chloride concentrations caused by the blended discharge. Depending on the flows and existing surface chloride concentrations, the discharge could increase chloride concentrations by up to 20 mg/L in Reach 4A

The increased concentrations in surface water could impact groundwater quality in the Fillmore Basin, depending on how much surface water recharges the groundwater. The average chloride concentration in the Fillmore Basin is 49 mg/L, 62 mg/L, and 46 mg/L based on data collected at wells V-0309, V-0340, and V-0342, respectively, located in the eastern portion of the Fillmore Basin from 1987 to 2006. Therefore, there is a potential to degrade water quality below existing ambient conditions in groundwater by implementation of the AWRM compliance option. The extent of this potential degradation needs to be further assessed through an evaluation of hydrology and the amount of surface water recharge that occurs in Reach 4A and downstream.

In addition, the potential increases in chloride concentrations in the Fillmore Basin, which is the water supply for the City of Fillmore, could impact the levels of chloride in Fillmore treatment plant effluent discharged to Reach 3.

Therefore, it is likely that an antidegradation analysis will be required during the permitting stage for the discharge to Reach 4A. The permit will require further evaluation of this discharge and any impacts on downstream uses, groundwater and surface water monitoring, and enforceable effluent limits. An initial antidegradation analysis is presented here. State and federal antidegradation requirements include the following conditions:

- The reduction in water quality will not unreasonably affect actual or potential beneficial uses.
- The proposed action is necessary to accommodate important economic or social development in the area.
- The reduction in water quality is consistent with maximum public benefit.
- Water quality will not increase above water quality objectives prescribed in the Basin Plan.

The current chloride WQO of 100 mg/L in Reaches 3 and 4A will protect the most sensitive beneficial use of the river's water, which is salt-sensitive agricultural use and has threshold value of 117 mg/L. Under the AWRM Program, the blended extraction well and RO permeate discharge into Reach 4A will not exceed a chloride concentration of 95 mg/L, and may be further adjusted downward as needed to protect water quality. Therefore, the blended extraction well and RO permeate discharge into Reach 4A will not exceed the water quality objective of the receiving water at the point of discharge or in the reach downstream of the discharge point.

Further water quality assessments will be used to determine whether the discharge to 4A would increase chloride concentrations in groundwater in the Fillmore and Santa Paula Basins. Responsible parties, including SCVSD and the ultimate permit holder for the 4A discharge, will be required to conduct chloride trend monitoring in the Fillmore Basin and in Reaches 3, 4A to evaluate impacts of compliance measures to downstream groundwater and surface water quality, including areas downstream of the Fillmore treatment plant. This TMDL shall be reconsidered if chloride trend monitoring indicates degradation of groundwater or surface water due to implementation of compliance measures.

The water quality analyses discussed above will be utilized in conjunction with an extension of the GSWI model to assess the interaction of groundwater and surface water and any potential impacts to downstream water quality by the AWRM option. Specifically, key stakeholders have agreed through a memorandum of understanding to extend the GSWI model through the Piru, Fillmore, and Santa Paula groundwater basins and the overlying surface waters to the Freeman Diversion. If the extended GSWI model results indicate the blended extraction well and RO permeate discharge as currently proposed by the AWRM option would cause an exceedance of water quality objectives,

the GSWIM will be utilized to determine the level of chloride in the blended extraction well and RO permeate discharge necessary to preclude such an exceedance.

The important social and economic benefits of the AWRM Program could warrant some degradation of the downstream reaches. It has been shown that AWRM Program will support water recycling and provide for additional water resources for agriculture and aquatic habitat. Additionally, chloride concentrations in the Santa Clara River will be lower at the Ventura-Los Angeles County Line, and will result in better-quality recharge to the east Piru basin. As a result, surfacing groundwater from the Piru basin in Reach 4A may decrease over time as a result of the AWRM. The AWRM will also result in increased surface water flows in Reaches 3 and 4A as compared to other compliance options. Finally, in general, the AWRM compliance option has more water quality benefits to Ventura County than do the conventional advanced treatment based compliance options.

It is important to note that any degradation in water quality can be averted by operating the extraction wells in the Piru basin in a manner that will not cause increases in the baseline water quality for the Fillmore and Santa Paula groundwater basins and surface water reaches (4A and 3). For example, the maximum concentration of the extraction well and RO permeate blend could be adjusted downward from 95 mg/L, as warranted based on GSWIM modeling.

The Reach 3 Chloride TMDL may be re-evaluated in the context of the findings of the Upper Santa Clara River Chloride TMDL studies, chloride trend monitoring, and the extended GSWI model results.

## 8.6. Implementation Schedule

The TMDL provides a ten-year schedule to attain compliance with the conditional SSOs and conditional wasteload allocations. Key uncertainties at this point relate to identification of the optimum method for brine disposal. Several options, including deep-well injection in the vicinity of old oil fields in the Santa Clarita Valley, and drying and landfill disposal will be considered by the SCVSD in the first two years of the TMDL Implementation Plan.

The Implementation schedule includes 6 years for implementation of compliance measures including planning, completing Environmental Impact Report, engineering design, and construction. The Regional Board will re-valuate the schedule to implement control measures needed to meet final conditional WLAs at year 6 (2011) and year 9.5 (2014) after the effective date of the TMDL.

## 8.7. Monitoring for the AWRM Program

NPDES Permittee will conduct TDS, chloride, and sulfate monitoring to ensure that water quality objectives are being met. This monitoring will be consistent with and at least equivalent to monitoring specified in existing permits.

The SCVSD will submit a monitoring plan to conduct chloride, TDS, and sulfate trend monitoring to ensure that the goal of chloride export in the watershed is being achieved, water quality objectives are being met, and downstream groundwater and surface water quality is not degraded due to implementation of compliance measures. The SCVSD monitoring plan shall include plans to monitor chloride, TDS, and sulfate in groundwater and identify representative wells to be approved by the Regional Board Executive Officer, in the following locations: (a) Shallow alluvium layer in east Piru Basin, (b) San Pedro Formation in east Piru Basin, and (c) groundwater basins under Reaches 5 and 6, which shall be equivalent or greater than existing groundwater monitoring required by NPDES permits for Saugus and Valencia WRPs. The monitoring plan shall also include a plan for chloride, TDS, and sulfate trend monitoring for surface water for Reaches 4B, 5 and 6. The monitoring plan shall include plans to monitor chloride, TDS, and sulfate at a minimum of once per quarter for groundwater and at a minimum of once per month for surface water. The plan should propose a monitoring schedule that extends beyond the completion date of this TMDL to evaluate impacts of compliance measures to downstream groundwater and surface water quality. This TMDL shall be reconsidered if chloride, TDS, and sulfate trend monitoring indicates degradation of groundwater or surface water due to implementation of compliance measures.

The Reach 4A permittee will submit a monitoring plan to conduct chloride, TDS, and sulfate trend monitoring to ensure that the goal of chloride export in the watershed is being achieved, water quality objectives are being met, and downstream groundwater and surface water quality is not degraded due to implementation of compliance measures. The Reach 4A permittee monitoring plan shall include plans to monitor chloride, TDS, and sulfate in groundwater and identify representative wells to be approved by the Regional Board Executive Officer in the following locations (a) Fillmore Basin, and (b) Santa Paula Basin. The monitoring plan shall also include a plan for chloride, TDS, and sulfate trend monitoring for surface water for Reaches 3 and 4A. The monitoring plan should include plans to monitor chloride, TDS, and sulfate at a minimum of once per quarter for groundwater and at a minimum of once per month for surface water. The plan should propose a monitoring schedule that shall extend beyond the completion date of this TMDL to evaluate impacts of compliance measures to downstream groundwater and surface water quality. This TMDL shall be reconsidered if chloride, TDS, and sulfate trend monitoring indicates degradation of groundwater or surface water due to implementation of compliance measures. ~~The SCVSD and Reach 4A Permittee will conduct chloride, sulfate, and TDS trend monitoring to ensure that the goal of chloride export in the watershed is being achieved, water quality objectives are being met, and downstream groundwater and surface water quality is not degraded due to implementation of compliance measures. Trend monitoring for groundwater shall be conducted by the SCVSD at the following locations measured at representative wells as determined by the Regional Board Executive Officer: (a) Shallow alluvium layer in east Piru Basin, (b) San Pedro Formation in east Piru Basin, and (c) groundwater basins under~~

~~Reaches 5 and 6, which shall be equivalent or greater than existing groundwater monitoring required by NPDES permits for Saugus and Valencia WRPs. Trend monitoring for groundwater shall be conducted by the Reach 4A Permittee at the following locations measured at representative wells as determined by the Regional Board Executive Officer: (a) Fillmore Basin, and (b) Santa Paula Basin. Chloride trend monitoring for surface water shall be conducted by the SCVSD for Reaches 4B, 5 and 6, while trend monitoring for surface water shall be conducted by the Reach 4A Permittee for Reaches 3 and 4A. Trend monitoring shall be conducted at a minimum of once per quarter for groundwater and at a minimum of once per month for surface water. Trend monitoring shall extend beyond the completion date of this TMDL to evaluate impacts of compliance measures to downstream groundwater and surface water quality. A monitoring plan shall be submitted by the SCVSD and Reach 4A Permittee to the Regional Board for Executive Officer approval within six months after the completion date of Task 10. Monitoring will begin one year after Executive Officer approval of the monitoring plan to allow time for the installation of any monitoring wells and/or surface water monitoring stations. Trend monitoring in Fillmore and Santa Paula Basins and in Reaches 3 and 4A will begin one year after Executive Officer approval of the monitoring plan and upon issuance of NPDES permit for the Reach 4A Permitee. This TMDL shall be reconsidered if chloride trend monitoring indicates degradation of groundwater or surface water due to implementation of compliance measures.~~

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**Interconnection Agreement Between County Sanitation Districts Nos. 26 and 32 of Los Angeles County and the Newhall Land and Farming Company**

CSD Contr#3868

# AGREEMENT

## BETWEEN COUNTY SANITATION DISTRICTS NOS. 26 AND 32 OF LOS ANGELES COUNTY AND THE NEWHALL LAND AND FARMING COMPANY REGARDING A PLAN FOR THE COORDINATION OF WASTEWATER MANAGEMENT FACILITIES RELATING TO THE NEWHALL RANCH SPECIFIC PLAN DEVELOPMENT

This Agreement is made and entered into this 9th day of January, 2002, by and between **County Sanitation Districts Nos. 26 and 32 of Los Angeles County** (collectively **Districts** and individually **District No. 26** or **District No. 32**, respectively), special districts organized and existing pursuant to the County Sanitation District Act, California Health and Safety Code Sections 4700 et seq., and **The Newhall Land and Farming Company (NLFC)**, a California limited partnership.

## RECITALS

1. NLFC owns land in unincorporated Los Angeles County adjacent to and west of the Districts and is proposing to construct a new development pursuant to the Newhall Ranch Specific Plan.

2. NLFC is currently planning, designing, and engineering the wastewater conveyance, treatment and disposal systems to serve the Newhall Ranch Specific Plan development.

3. A site for a new wastewater treatment plant within the proposed development area is identified in the Newhall Ranch Specific Plan.

4. NLFC has proposed the formation of a new county sanitation district to provide wastewater management services for the Newhall Ranch Specific Plan area pursuant to the County Sanitation District Act of 1923 and the Cortese-Knox-Hertzberg Reorganization Act of 2000.

5. The Districts currently provide wastewater management services for areas immediately adjacent to the Newhall Ranch Specific Plan area.

6. The Districts, together with all of the other County Sanitation Districts of Los Angeles County, are signatory to the "Amended Joint Administration Agreement," effective July 1, 1980, (JAA) providing for the joint management, administration and staffing of the signatory districts.



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7. The Districts are signatory to the "Joint Powers Agreement for a Regional Sewerage System in the Santa Clarita Valley," effective May 8, 1984, (SCVJSSA), which provides for the joint operation of the wastewater management facilities within the Districts.

8. There are benefits in coordinating the wastewater management services between the Districts and the areas that would be served by a new county sanitation district. To this end, NLFC and the Districts have previously entered into a Reimbursement Agreement to cover the expenses for joint planning of wastewater management facilities.

9. It is desirable to prepare a plan for coordinated wastewater management facilities prior to the formation of the new county sanitation district. This plan will serve as a "road map" for the formation of the new county sanitation district and its subsequent operation.

10. The anticipated total flow originating from within the boundaries of the new county sanitation district is 6.9 million gallons per day (mgd).

**NOW, THEREFORE**, in consideration of the promises and mutual covenants herein contained, the parties hereto agree as follows:

I. FORMATION AND GOVERNING AGREEMENTS

A. NLFC shall request that the Los Angeles County Board of Supervisors petition the Local Agency Formation Commission (LAFCO) to:

1. approve the formation of a new county sanitation district; and

2. use the terms of this Agreement as a guide for the preparation of the conditions of formation for the new county sanitation district; and

3. require, as conditions of the formation, that the new county sanitation district make formal application to the Districts:

a. to become signatory to the JAA, and

b. to enter into an agreement substantially similar to the existing SCVJSSA regarding the ownership and operation of wastewater management facilities in the Santa Clarita Valley.

NLFC shall be responsible for preparing and submitting any necessary documents requested by the Board of Supervisors to complete the petition for formation. The Districts shall provide assistance and information to LAFCO and NLFC as requested.

B. The agreement specified in Section I.A.3.b shall be functionally the same as the existing SCVJSSA attached as Exhibit A hereto, except that it shall contain the following modifications:

1. All existing and future treatment and disposal facilities and all existing and future conveyance facilities that carry wastewater from more than one District shall be jointly owned by all of the parties signatory to the modified SCVJSSA. These jointly owned facilities shall be referred to as the Santa Clarita Valley Joint Sewerage System (SCVJSS). The rights to use these facilities shall be on a first-come, first-serve basis, except as provided below:

   a. The new county sanitation district, at its own cost and expense, shall have the right to build and use up to 6.9 mgd of capacity at the site identified in the Newhall Ranch Specific Plan for the proposed Newhall Ranch Water Reclamation Plant (NRWRP).

   b. The new county sanitation district shall have limited rights to use capacity at the Valencia Water Reclamation Plant (VWRP), pursuant to Section II.

2. The cost of operating the jointly owned facilities shall be apportioned to each party on the basis of the number of sewage units, as that term is defined in the JAA, attributable to that party's use of the wastewater management facilities. Any costs not attributable to jointly owned facilities shall be the sole responsibility of the party that caused those costs to be incurred.

3. The decision to expand the capacity of the NRWRP shall only require the approval of one party to the modified SCVJSSA until the new county

sanitation district uses 6.9 mgd of capacity in the SCVJSS. After the new county sanitation district uses 6.9 mgd of capacity in the SCVJSS, the decision to expand the capacity of the NRWRP shall require majority approval.

II. INITIAL CONNECTION OF DISCHARGERS IN THE NEW COUNTY SANITATION DISTRICT

A. NLFC shall be allowed to connect parcels located within the new county sanitation district to the SCVJSSA with a discharge of up to 3,000 capacity units, upon compliance with all of the following conditions:

1. The new county sanitation district is formed.

2. The new county sanitation district becomes a party to both the JAA and modified SCVJSSA with the consent of the other parties thereto.

3. The new county sanitation district has enacted appropriate connection fee ordinances providing for the new county sanitation district to pay into the SCVJSS Capital Improvement Fund the same amount for each discharger within the new county sanitation district that District No. 32 would have paid into the SCVJSS Capital Improvement Fund if that discharger had been located within District No. 32.

4. The new county sanitation district and NLFC have executed an agreement pertaining to the initial management expenses pursuant to Section VIII.

5. NLFC conveys title to 21.5 acres of land to the new county sanitation district for siting the NRWRP.

B. In addition to the 3,000 capacity units allowed in Section II.A, NLFC shall be allowed to connect additional parcels with a discharge of up to 3,000 capacity units provided that:

1. The conditions of Section II.A are fulfilled.

2. An NPDES permit has been obtained for the initial 2 mgd stage of the NRWRP, pursuant to the terms of Section III of this Agreement.

## III. NEWHALL RANCH WATER RECLAMATION PLANT

A. NLFC will design and obtain necessary permits from the Regional Water Quality Control Board for, and fund construction of, the initial 2 mgd stage of the NRWRP, including any necessary agreements or facilities for effluent disposal.

B. The initial 2 mgd stage of the NRWRP will be designed and permitted to have an effluent disposal system independent of the existing Districts' facilities, discharging either directly to the river or other permitted place of discharge or reuse. When the initial 2 mgd stage of the NRWRP is designed and permitted, a plan will be put in place to guarantee the discharge of up to 6.9 mgd of effluent to be disposed or reused in a manner similar to the first 2 mgd. This plan will be subject to the review and approval of the Districts' Chief Engineer and General Manager (Chief Engineer). This plan will include an agreement with the reclaimed water purveying agency to take effluent from the NRWRP. The Districts will allow, under terms agreeable to the Districts, available reclaimed water from the VWRP to be taken by a reclaimed water purveying agency for use on Newhall Ranch.

C. Upon completion of the construction of the initial 2 mgd stage of the NRWRP and a successful demonstration of its operation, the NRWRP shall become a jointly owned facility of the Districts and the new county sanitation district, and the Districts and the new county sanitation district will assume ownership of and responsibility for the operation and maintenance of the NRWRP and for future expansions of the NRWRP.

D. NLFC agrees to compensate the SCVJSS for any costs incurred by the SCVJSS to make the initial 2 mgd stage of the NRWRP compliant with any of the permits required for the operation and maintenance thereof if, upon initial start up and operation, it is unable to meet its permit conditions or requirements. The SCVJSS shall be responsible for bringing the NRWRP into compliance with any future changes to permit conditions or requirements.

## IV. MANAGEMENT OF THE SANTA CLARITA VALLEY JOINT SEWERAGE SYSTEM

A. Upon acceptance of the initial 2 mgd stage of the NRWRP by the SCVJSS, the Chief Engineer shall have the right to divert flow from the Districts to the NRWRP as he deems necessary for the proper and economic operation of the NRWRP and the SCVJSS as a whole.

B. Upon the initial 2 mgd stage of the NRWRP becoming a SCVJSS facility, the SCVJSS shall be responsible for future expansions of the NRWRP except that the new county sanitation district will retain its right to construct up to 6.9 mgd of capacity at the NRWRP site at its own cost and expense pursuant to Section 1.B. The SCVJSS shall be relieved of this responsibility to construct additional capacity for the use of the new county sanitation district if insufficient disposal capacity exists for the proposed NRWRP expansion.

## V. CONVEYANCE FACILITIES

A. NLFC will design, fund, and construct a sewer system to collect and convey all of the wastewater to be generated within the new county sanitation district to the proposed NRWRP.

B. NLFC will design, fund, and construct all sewers, pumping plants, or force mains required to convey any flow generated within the new county sanitation district that will be treated at the VWRP.

C. The Chief Engineer will identify those sewers, pumping plants, and force mains that will be owned and operated by the new county sanitation district or the SCVJSS during the review of the design for the sewer system. Sewers that will be owned by the new county sanitation district or the SCVJSS will be designated trunk sewers. Generally, an individual district or the SCVJSS will assume ownership of and operation and maintenance responsibilities for any sewers 18 inches in diameter and larger. The design of all sewers, pumping plants, and force mains to be owned by the new county sanitation district or the SCVJSS shall be subject to the design review and approval of the Chief Engineer.

D. NLFC will be responsible for operation and maintenance of the local sewers, pumping plants, and force mains, or transfer these responsibilities to another party willing to assume that responsibility.

E. If, during the design review, the Chief Engineer determines that the trunk sewers, pumping plants, or force mains should be increased in size for uses other than those in the new county sanitation district, then NLFC shall construct these facilities with the increased capacity specified by the Chief Engineer, subject to the reimbursement provisions, below.

## VI. REIMBURSEMENT

A. NLFC shall be reimbursed for its costs for the design, permitting, and construction of the initial 2 mgd stage of the NRWRP and the conveyance system.

1. NLFC's reimbursable costs for the initial 2 mgd stage of the NRWRP shall be determined as follows:

   a. The costs for the construction shall be based on the amount approved by Chief Engineer.

   b. The costs for the design and planning (including permitting) shall be based on the amount of the construction contract and the allowance factors utilized under the State Revolving Fund (SRF) loan program.

   c. The costs for the site improvements shall be based upon the difference between the cost of the site improvements for all 21.5 acres and the cost to improve the site to accommodate a 6.9 mgd treatment facility.

2. The costs for the conveyance facilities related to upsizing requested by the Chief Engineer shall be based on the difference between the actual cost of the conveyance facilities as designed and constructed, and the Chief Engineer's determination of the estimated cost for design and construction of the conveyance facilities if upsizing had not been requested by the Chief Engineer.

3. The costs for the conveyance system not related to upsizing shall be based upon the difference between the actual cost of the conveyance system designed and constructed, excluding the cost of upsizing, as calculated in accordance with Section VI.A.2, and the Chief Engineer's determination of the estimated cost to design and construct a conveyance system to serve the initial stages of the Newhall Ranch Specific Plan development. The size of the conveyance system required to support the initial stages of the Newhall Ranch Specific Plan Development shall be determined by the parties hereto, including the new county sanitation district if already formed, following the completion of design.

4. The reimbursement of costs and expenses related to the construction of the initial 2 mgd stage of the NRWRP shall be in the form of:

   a. A cash payment equivalent to the amount of the connection fees paid for up to 3,000 capacity units connected pursuant to Section II.B during construction of the initial 2 mgd stage of the NRWRP. This payment shall be made at the time the NRWRP becomes a jointly owned facility of the new county sanitation district and the Districts pursuant to Section III.C.

   b. Credits to be applied against connection fees imposed by the new county sanitation district on connections made after the NRWRP becomes a jointly owned facility of the new county sanitation district and the Districts pursuant to Section III.C.

   For purposes of this Section, no credit or reimbursement shall be given for costs that were financed pursuant to Section VII of this Agreement.

5. The reimbursement for costs related to upsizing of the conveyance system requested by the Chief Engineer shall be, at the option of NLFC, in the form of either a credit to be applied against future connection fees imposed by the new county sanitation district or a cash payment.

6. The reimbursement for costs for conveyance facilities for the new county sanitation district not related to upsizing requested by the Chief Engineer

shall be in the form of a credit to be applied against future connection fees imposed by the new county sanitation district.

## VII. STATE REVOLVING FUND LOANS

NLFC and the Districts agree to cooperate and use their best efforts to obtain low interest State Revolving Fund (SRF) loans to fund construction of the initial 2 mgd stage of the NRWRP. NLFC shall guarantee repayment of debt service if the connection fee revenue in the new county sanitation district is insufficient to meet the annual debt repayment.

## VIII. INITIAL MANAGEMENT COSTS FOR THE NEW COUNTY SANITATION DISTRICT

NLFC agrees to pay the new county sanitation district for all costs related to operation of the new county sanitation district until the new county sanitation district begins collecting user fees adequate to fund its ongoing obligations. Terms for this agreement, including reimbursement, will be delineated in an agreement between NLFC and the new county sanitation district following its formation.

## IX. CHLORIDE CONTROL MEASURES

A. NLFC shall support the efforts of both the new county sanitation district and the Districts (i) to implement ordinances regarding the control of chlorides; (ii) to defend the ordinances regulating chlorides against any legal or political challenges; and (iii) to implement or change chloride related legislation or regulatory requirements. As part of its assistance, NLFC shall not unreasonably withhold approval for the Districts to utilize lands owned by NLFC for a chloride threshold evaluation study.

B. NLFC will use its best efforts to assist in providing information to residential and commercial properties in the new sanitation district concerning regulations and issues pertaining to the control of chlorides.

## X. FAILURE TO IMPLEMENT/COMPLY

A. If, following formation of the new county sanitation district, the new county sanitation district fails to make formal application to become signatory to the JAA, or refuses to sign the JAA, this Agreement shall terminate, except that NLFC shall

continue to be responsible for any cost or expense incurred by the Districts pursuant to the terms of the Reimbursement Agreement. If any of the other County Sanitation Districts of Los Angeles County refuse to allow the new county sanitation district to become a party to the JAA, this Agreement shall terminate, except that NLFC shall continue to be responsible for any cost or expense incurred by the Districts pursuant to the terms of the Reimbursement Agreement and the Districts shall continue to be responsible for reimbursing NLFC for any cost or expense incurred on behalf of the Districts pursuant to Section V.E of this Agreement.

B. If, following the formation of the new county sanitation district, the new county sanitation district fails to request that the Districts enter into an agreement substantially similar to the SCVJSSA or refuses to sign such an agreement, this Agreement shall terminate, except that NLFC shall continue to be responsible for any cost or expense incurred by the Districts pursuant to the terms of the Reimbursement Agreement. If the Districts refuse to enter into such an agreement with the new county sanitation district, this Agreement shall terminate, except that NLFC shall continue to be responsible for any cost or expense incurred by the Districts pursuant to the terms of the Reimbursement Agreement and Districts shall continue to be responsible for reimbursing NLFC for any upsizing cost or expense incurred on behalf of the Districts pursuant to Section V.E of this Agreement.

C. If NLFC fails to obtain an NPDES permit pursuant to the terms of Sections II and III of this Agreement, then NLFC shall pay to the Districts the full amount of the fees required to annex to District No. 32 any parcels that have been connected pursuant to Section II, and this Agreement shall terminate except that the Districts shall retain title to any lands transferred pursuant to Section II.

## XI. EXCLUSIVE REMEDY

The parties to this agreement understand and agree that if the Districts or the SCVJSSA are unable, for reasons beyond their control, to construct further stages of the NRWRP, NLFC's sole and exclusive remedy is to construct or request the new county sanitation district to construct any needed capacity for the Newhall Ranch Specific Plan development at the NRWRP.

## XII. ASSIGNMENT

Any of the parties may assign their interests in this Agreement to a third party with the approval of the other parties. This approval shall not be unreasonably withheld. NLFC hereby consents and approves any assignment by the Districts to any of the other County Sanitation Districts of Los Angeles County.

## XIII. INDEMNIFICATION

A. NLFC agrees that neither the Districts, nor any of their officers, directors, or employees shall be liable for any costs or expenses arising out of NLFC's performance of its duties under the terms of this Agreement including, but not limited to, the formation of the new county sanitation district, the transfer of property related to the siting of the NRWRP, and the design and permitting of the initial 2 mgd stage of the NRWRP. NLFC shall fully indemnify and hold the Districts harmless from any and all claims, actions, liabilities, costs or expenses arising out of NLFC's performance of this Agreement, including reasonable attorneys fees, losses and/or liabilities incurred by the Districts as a result thereof.

B. NLFC agrees that neither the Districts, nor the SCVJSSA, nor any of their officers, directors, or employees shall have any liability to NLFC or its successors or assigns or otherwise have any responsibility to NLFC if, after assuming ownership and operation of the NRWRP, the SCVJSS is unable, for reasons beyond its immediate control, to construct further expansions of the NRWRP. NLFC shall hold the Districts and the SCVJSS harmless from any and all costs, expenses, and/or losses resulting from NLFC's inability to develop its holdings within the new county sanitation district under such conditions.

C. The Districts agree that neither NLFC, nor any of its officers, directors, or employees shall be responsible for any claims, liability, demands or actions arising out of the operation of the NRWRP once the SCVJSS has assumed ownership. It is also understood and agreed that the Districts shall fully indemnify and hold NLFC harmless from any and all costs or expenses incurred, including reasonable attorneys fees, losses and/or liability attributable to any such claims resulting from the Districts' actions unless otherwise provided for in this Agreement.

XIV. MISCELLANEOUS

A. Entire Agreement. This Agreement (i) contains, and is intended as, a complete statement of all the terms of the arrangements of the parties with respect to the matters provided for herein; (ii) supersedes any previous agreements, written or oral, and understandings among the parties with regard to those matters; and (iii) cannot be changed or terminated orally. Notwithstanding the foregoing, the parties acknowledge that the provisions of any other valid mutual written agreements shall remain in full force and effect.

B. Waiver. Any party may waive compliance by the other party with respect to any provisions of this Agreement. No waiver of any provision shall be construed as a waiver of any other provision. No waiver shall be construed as an ongoing waiver with respect to subsequent events unless it expressly so provides. Any waiver must be in writing, signed by the waiving party and recite the provisions being waived.

C. Binding Effect. Subject to the terms and conditions elsewhere in this Agreement, this Agreement shall be binding upon and inure to the benefit of the parties and their respective successors and assigns. Except for rights created pursuant to the indemnity provisions of this Agreement, nothing in this Agreement shall create or be deemed to create any third party beneficiary rights of any person or entity not a party to this Agreement.

D. Duplicate Originals. This Agreement shall be executed in duplicate originals.

E. Further Assurances. Upon request by any party, the parties covenant, at any time and from time to time, to cooperate reasonably with each other and take all such further actions, including without limitation the execution and filing of additional instruments or documents, as may be reasonably necessary to carry out the intent, purposes and terms of this Agreement. Such cooperation shall be exercised in good faith with respect to any additional instruments or documents that may be necessary to carry out the intent, purposes, and terms of this Agreement, and any such additional instruments or documents shall be reviewed on their own merits, and not as a basis for the introduction of unrelated matters, nor require any additional consideration.

F. Applicable Law. This Agreement shall be construed in accordance with the laws of the State of California. Venue for any proceeding shall be the Superior Court of Los Angeles County.

G. Incorporation of Recitals. The Recitals to this Agreement are incorporated herein by this reference and are acknowledged by the parties to be true and correct.

H. Action By The Chief Engineer. Except as otherwise provided in this Agreement, the Chief Engineer shall have the authority to take all actions on behalf of the Districts in connection with any approvals or actions required of or by the Districts under this Agreement.

I. No Joint Venture. This Agreement does not constitute and shall not be construed as constituting a partnership or joint venture between the Districts and NLFC in any matter whatsoever.

J. Construction/Interpretation. The parties to this Agreement acknowledge that they have been represented by counsel in respect of the negotiation and drafting of this Agreement, and that no term, covenant or condition of this Agreement shall be construed or interpreted by reference to the extent to which either party participated in the drafting of the Agreement, or any party thereof.

K. Attorneys' Fees. In any action or proceeding arising under this Agreement, or to enforce the provisions of this Agreement, the parties shall bear their own attorneys' fees and costs.

L. Amendments in Writing/Cooperation. This Agreement may be amended or modified, but only in writing, duly executed by the parties to this Agreement. The parties shall cooperate in good faith with respect to any amendment or modification proposed in order to clarify the intent and application of this Agreement, and shall treat any such proposal on its own merits, and not as a basis for the introduction of unrelated matters.

M. Time of Essence. Time is of the essence in the performance of the provisions of this Agreement.

N. Notices. All notices, requests, demands, or other communications under this Agreement shall be in writing (except for any emergency notice, which must be followed by written notice as soon as reasonably possible but in no event more than twenty-four (24) hours from the oral notice) and sent to the addressees of each party. Notice will be sufficiently given for all purposes as follows:

*PERSONAL DELIVERY*: When personally delivered to the recipient. Notice is effective on delivery.

*FIRST-CLASS MAIL*: When mailed first-class to the last address of the recipient known to the party giving notice. Notice is effective five mail delivery days after it is deposited in a United States Postal Service office or mailbox.

*CERTIFIED MAIL*: When mailed certified mail, return receipt requested. Notice is effective on receipt, if a return receipt confirms delivery.

*OVERNIGHT DELIVERY*: When delivery by an overnight delivery service such as Federal Express, charged prepaid or charged to the sender's account. Notice is effective on delivery, if delivery is confirmed by the delivery service.

*FACSIMILE DELIVERY*: When transmitted by facsimile to a party's fax number, a written notice shall be contemporaneously sent by personal delivery, first-class mail, certified mail or overnight delivery. A facsimile notice is effective if received within the hours of 8:00 a.m. to 4:00 p.m. (local time of the recipient) during the business day and a transmission report is generated reflecting the accurate transmission of this facsimile. If a facsimile is received at any other time, it shall be deemed received the next business day. A "business day" shall be Monday through Friday except for any holiday recognized by the Districts.

Addresses for purpose of giving notice are as follows:

DISTRICTS:

Mr. James F. Stahl
Chief Engineer and General Manager
County Sanitation Districts of Los Angeles County
1955 Workman Mill Road
Whittier, CA 90601-1400
Post Office Box 4998
Whittier, CA 90607-4998
Facsimile No.: (562) 695-8660

COPY TO:

B. Richard Marsh, Esq.
Daniel V. Hyde, Esq.
Lewis, D'Amato, Brisbois & Bisgaard LLP
221 North Figueroa Street, Suite 1200
Los Angeles, CA 90012
Facsimile No.: (213) 250-7900

NLFC:

Steven Zimmer
Vice President
The Newhall Land and Farming Company
23823 Valencia Boulevard
Valencia, CA 91355
Facsimile No.: (661) 288-1052

**IN WITNESS HEREOF, THE NEWHALL LAND AND FARMING COMPANY AND COUNTY SANITATION DISTRICTS NOS. 26 AND 32 OF LOS ANGELES COUNTY** hereby cause this Agreement to be executed and agree to be bound by the terms and conditions set forth herein.

**THE NEWHALL LAND AND FARMING COMPANY (A CALIFORNIA LIMITED PARTNERSHIP)**

By: Newhall Management Limited Partnership, a California limited partnership, Its Managing General Partner

By: Newhall Management Corporation, a California corporation, Its Managing General Partner

By: _____
Its Vice President

By: _____
Its Assistant Secretary

**ATTEST:**

**COUNTY SANITATION DISTRICT NO. 26 OF LOS ANGELES COUNTY**

By: M. Alma Horvath
Secretary

By: Jo Anne Darcy
Chairperson, Board of Directors
JAN 0 9 2002

**APPROVED AS TO FORM:**
**LEWIS, D'AMATO, BRISBOIS & BISGAARD, LLP**

By: Daniel V. Hyde
District Counsel

**ATTEST:**

**COUNTY SANITATION DISTRICT NO. 32 OF LOS ANGELES COUNTY**

By: M Alma Horvath
Secretary

By: Jo Anne Darcy
Chairperson, Board of Directors
JAN 0 9 2002

**APPROVED AS TO FORM:**
**LEWIS, D'AMATO, BRISBOIS & BISGAARD, LLP**

By: Daniel V. Hyde
District Counsel

# APPENDIX A

Joint Powers Agreement for a Regional Sewerage System
in the Santa Clarita Valley

CCRSTR # 2694

JOINT POWERS AGREEMENT
FOR A REGIONAL SEWERAGE SYSTEM
IN THE SANTA CLARITA VALLEY

THIS AGREEMENT is made and entered into this 8th day of May, 1984 by and between

COUNTY SANITATION DISTRICT NO. 26 OF LOS ANGELES COUNTY, hereinafter referred to as "DISTRICT NO. 26", and

COUNTY SANITATION DISTRICT NO. 32 OF LOS ANGELES COUNTY, hereinafter referred to as "DISTRICT NO. 32".

WITNESSETH

WHEREAS, pursuant to the provisions of the County Sanitation District Act of 1923 (Chapter 3, Part 3, Division 5, of the Health and Safety Code of the State of California), DISTRICT NO. 26 and DISTRICT NO. 32, hereinafter referred to collectively as the "Districts", have heretofore acquired necessary lands and rights-of-way and have carried out the construction of a sewage collection and treatment system to serve certain areas in the Santa Clarita Valley; and

WHEREAS, the Districts and their potential areas for annexation and expansion lie in the same drainage basin; and

WHEREAS, the projected wastewater flow from future development in the drainage basin exceeds the existing capacity of the treatment plants in both Districts; and

WHEREAS, the nature of the land adjacent to the Saugus Water Reclamation Plant (District No. 26) limits the area available for construction of expanded treatment works; and

WHEREAS, the Valencia Water Reclamation Plant (District No. 32) site has suitable land adequate in size for the construction of a regional treatment plant that would meet the needs of both Districts; and

WHEREAS, the wastewater flows attributable to both Districts can be managed most efficiently and economically through the creation and operation of a regional sewerage system; and

WHEREAS, the Districts entered into an Interim Joint Sewage Disposal Agreement dated April 24, 1979, which provided for the short-term disposal needs of both Districts and provided for the preparation of a facilities plan to assist in the development of a long-term regional wastewater treatment and disposal plan; and

WHEREAS, the Districts prepared a facilities plan dated April 1980, setting forth the long-term needs and solutions for the provision of adequate wastewater conveyance, treatment, and disposal facilities for both Districts; and

WHEREAS, it is the intent of the Districts to jointly finance, construct, and operate the regional conveyance, treatment, and disposal facilities necessary to provide for the long-term needs of the Districts;

NOW, THEREFORE, it is hereby agreed as follows:

1. DEFINITIONS

As used in this Agreement, the following terms shall have the meanings herein set forth:

a. Capital Improvement Fund

A separate fund for which any monies deposited therein and any interest derived thereon are to be used exclusively for payment of capital facilities, either local sewerage facilities or Santa Clarita Valley Joint Sewerage System facilities, as hereinafter defined.

b. Capital Costs

All expenditures made for the acquisition of or addition to fixed assets and all allocations to a fund for such purposes.

c. Chief Engineer

The Chief Engineer and General Manager of District No. 26 and District 32 or his duly authorized deputy or agent.

d. Connection Fee Ordinance(s)

Connection fee ordinance(s) shall refer to the "Connection Fee Ordinance for County Sanitation District No. 26 of Los Angeles County" adopted January 12, 1984 and as thereafter amended; and to the "Connection Fee Ordinance for County Sanitation District No. 32 of Los Angeles County", adopted January 12, 1984 and as thereafter amended.

e. Local Costs

Costs expended for the acquisition, construction, repair, replacement, reconstruction, and operation and maintenance of local sewerage facilities, as hereinafter defined.

f. Local Sewerage Facilities

Those sewer lines or portions thereof, pumping plants, and other sewerage facilities utilized solely by one District, and which serve to benefit only that District, and which have not been defined as part of the Santa Clarita Valley Joint Sewerage System, as hereinafter defined.

g. Joint Costs

Costs expended for the acquisition, construction, repair, replacement, reconstruction, and operation and maintenance of the Santa Clarita Valley Joint Sewerage System, as hereinafter defined.

h. Operation and Maintenance

The operation and maintenance of, and the repair, replacement, and upkeep of all sewerage facilities inclusive of all expenses incidental thereto.

i. Santa Clarita Valley Joint Sewerage System

The system of wastewater collection, treatment, and disposal facilities that provides a benefit to more than one District, which will initially consist of the facilities defined in Exhibit I; and as those facilities may from time to time be modified or expanded.

j. Service Charge Ordinance(s)

Service Charge Ordinance(s) shall refer to the "1983 Service Charge Ordinance of County Sanitation District No. 26", adopted April 12, 1983, and as thereafter amended; and to the "1983 Service Charge Ordinance of County Sanitation District No. 32", adopted April 12, 1983, and as thereafter amended.

k. Sewage Unit

The average daily quantity of sewage flow and strength from a single family home measured in terms of flow, chemical oxygen demand, and suspended solids as defined in the Service Charge Ordinance.

l. Surcharge Revenue

The revenue derived from the Wastewater Treatment Surcharge Program as provided in the Wastewater Ordinance, as hereinafter defined.

m. Wastewater Ordinance

An ordinance providing for the administration of an industrial wastewater control system, for regulating sewer construction or use, for the imposition of a permit requirement for industrial wastewater dischargers, for the prohibition or pretreatment of industrial wastewaters, for the imposition of fees and charges for the distribution of revenue and for other methods of controlling and regulating the discharge of wastewaters, adopted April 1, 1972, as amended July 1, 1980 and as thereafter amended.

2. ESTABLISHMENT OF AND JOINT PARTICIPATION IN A REGIONAL SEWERAGE SYSTEM

The parties hereto shall participate jointly according to proportions hereinafter specified in the acquisition, construction, ownership, mainte-

nance, and operation of the system of main trunk sewers, pumping plants, treatment plants, and sanitation works herein referred to as the "Santa Clarita Valley Joint Sewerage System" including the parts heretofore acquired or which may hereafter be acquired and/or constructed; and to pay for such ownership, maintenance, and operation in the manner hereinafter specified.

District No. 26 and District No. 32, together with other County Sanitation Districts of Los Angeles County, entered into an Amended Joint Administration Agreement on July 1, 1980, providing for a single and centralized administrative organization. District No. 26 and District No. 32 agree that this Joint Powers Agreement shall be administered and executed pursuant to the provisions of said Amended Joint Administration Agreement.

All contracts for construction of Santa Clarita Valley Joint Sewerage System facilities shall be awarded and administered by the District in which the facilities will be located. However, no such contract shall be awarded without the approval of both Districts.

3. CAPITAL IMPROVEMENT FUND

Each District shall establish a capital improvement fund, hereinafter referred to as the "Local Capital Improvement Fund", which shall be solely owned and maintained by that District. The Districts shall also establish a capital improvement fund, hereinafter referred to as the "Joint Capital Improvement Fund," which shall be jointly owned and maintained by both Districts.

All connection fees, as provided for in the connection fee ordinances, shall be apportioned into local and joint shares. The allocation percentages for the local and joint shares shall be determined annually by the Chief Engineer and shall be based upon the percentages of the connection fee which are attributable to local and joint costs, respectively. The local share shall be deposited into the Local Capital Improvement Fund of the District which collected the funds and the joint share shall be deposited into the Joint Capital Improvement Fund. All interest shall remain with the capital improvement fund from which it was derived.

Any monies on deposit in the existing local capital improvement funds at the execution of this Agreement shall likewise be apportioned between the local and joint capital improvement funds established by this Agreement. The allocation percentages for this procedure shall be the same as those in effect at the time of execution of this Agreement.

No monies shall be withdrawn from the Joint Capital Improvement Fund without the approval of both Districts.

4. ALLOCATION OF COSTS ATTRIBUTABLE TO THE SANTA CLARITA VALLEY JOINT SEWERAGE SYSTEM

a. Operation and Maintenance

All costs for operations and maintenance which are attributable to the Santa Clarita Valley Joint Sewerage System shall be apportioned

to each District in the ratio that the number of sewage units originating from each District bears to the aggregate number of sewage units in both Districts. The Chief Engineer and General Manager shall determine annually the total number of sewage units attributable to each District.

b. Original Capital Construction

Each District agrees that certain facilities, described in Exhibit 2 hereof, would have been constructed irrespective of this Agreement. Both Districts agree to construct those same facilities and allocate costs for such facilities not funded through the Joint Capital Improvement Fund as set forth in Exhibit 2.

c. Expansion Capital

All capital costs for projects which increase the capacity of the Santa Clarita Valley Joint Sewerage System but do not provide a greater level of treatment or disposal shall be financed through the use of the Joint Capital Improvement Fund to the extent possible. If the cost of such a project exceeds the resources available in the Joint Capital Improvement Fund, the remaining cost shall be apportioned to each District in the ratio that the number of sewage units attributable to each District bears to the aggregate number of sewage units in both Districts.

d. Upgrade Capital

All capital costs for projects which provide a greater level of treatment or disposal but do not increase the capacity of the Santa Clarita Valley Joint Sewerage System shall be apportioned to each District in the ratio that the number of sewage units attributable to each District bears to the aggregate number of sewage units in both Districts. If the capacity of the Santa Clarita Valley Joint Sewerage System exceeds the requirements of both Districts at the time a contract for an upgrade capital project is awarded, the costs associated with the excess capacity shall be financed through the use of the Joint Capital Improvement Fund to the extent possible.

5. LOCAL SEWERAGE FACILITIES

All costs associated with local sewerage facilities shall be the responsibility of the District for whose benefit such costs are incurred, and shall not be allocated in any manner to the other District.

6. ALLOCATION OF REVENUES

a. Grants

All monies received as grants to be expended for capital projects associated with the Santa Clarita Valley Joint Sewerage System shall be apportioned to each District in the same ratio that the cost of

said projects is apportioned to each District as provided for in Article 4 hereof.

b. Joint Contract Revenue

All revenue which is derived from a Joint Contract for the disposal of sewage, brine, or industrial wastewater originating from outside of the Districts' boundaries, as hereinafter defined, shall be apportioned into joint and local shares based upon the ratio of the local and joint costs to the total costs incurred due to said contract. The allocation percentages shall be determined annually by the Chief Engineer. The local share of said revenue shall be given to the District which has incurred local costs in conjunction with the execution of said contract. The joint share shall be apportioned to each District according to the ratio of its obligation to pay for the operation and maintenance costs of the system as provided in Article 4 hereof.

c. Other Joint Revenues

All revenue received from the sale of sludge, effluent, surplus energy or other by-products or which otherwise arises out of the ownership or operation of any Santa Clarita Valley Joint Sewerage System facility shall be apportioned to each District according to the ratio of its obligation to pay for operation and maintenance cost of the system as provided for in Article 4 hereof.

d. Local Revenue

All other revenue including, but not limited to, ad valorem taxes, surcharge revenue derived pursuant to the Wastewater Ordinance, service charges, annexation fees, investment income, payments from local contracts as hereinafter defined, and local capital improvement fund monies shall remain with the District from which it originates.

7. DISPOSAL OF SEWAGE ORIGINATING OUTSIDE DISTRICTS

Each District undertakes and agrees that it will not permit or knowingly countenance the use of the Santa Clarita Valley Joint Sewerage System, directly or indirectly, for the disposal of sewage, brine, or industrial wastes originating outside of its territorial limits except in the manner, to the extent, and on the conditions agreed upon by both Districts. In the event, however, that the anticipated sewage units from said outside source do not exceed one-half of one percent (.5%) of the aggregate number of sewage units originating from both Districts, such agreement by both Districts shall not be required. Any disposal contract for which agreement is not required shall be considered a local contract and the sewage units received from such a contract shall be regarded as having originated from the District with which the contract is made for the purpose of determining the total number of sewage units attributable to that District.

Any disposal contract heretofore or hereafter entered into, for which the actual or anticipated sewage units exceeds one-half of one percent (0.5%)

of the aggregate number of sewage units originating from both Districts shall be considered a joint contract. The sewage units attributable to a joint contract shall be apportioned to each District in the ratio that the number of sewage units originating in each District bears to the aggregate number of sewage units originating in both Districts.

8. TITLE TO REAL PROPERTY

Fee title to real property required for the Santa Clarita Valley Joint Sewerage System for the use and benefit of both Districts shall be acquired by, and in the name of, the District in which the said real property is located, whether such acquisition is by purchase, condemnation, gift, or otherwise.

9. SETTLEMENT OF DISPUTE OR CONTROVERSY

Should any dispute or controversy arise in connection with the books, records, or accounts of either District pertaining to the Santa Clarita Valley Joint Sewerage System or in connection with the acquisition, construction, maintenance, operation, repair, reconstruction, or enlargement of the Santa Clarita Valley Joint Sewerage System, or in connection with any of the affairs or operation thereof, the Boards of Directors of the Districts shall appoint a mutually agreed upon arbitrator, and the determination of said arbitrator shall be binding and conclusive.

10. WITHDRAWAL

This Agreement and the Santa Clarita Valley Joint Sewerage System provided hereby shall continue in effect so long as it shall be in the interest of both Districts. If at any time it should cease to be in the interest of either District to continue as a party to this Agreement, and its Board of Directors shall so find and declare by resolution, it may withdraw herefrom and terminate its obligation hereunder after sixty (60) days notice in writing of its intention to do so, and by the full and complete discharge of all its debts and obligations hereunder for which it shall be or become liable up to the date of its withdrawal.

Disposition of all assets of the Santa Clarita Valley Joint Sewerage System shall be in proportion to the number of sewage units attributable to each District on the date of withdrawal.

11. EFFECTIVE DATE

This Agreement shall become effective on July 1, 1984.

12. TERMINATION OF PRIOR AGREEMENT

It is mutually agreed that, upon the effective date of this Agreement; the Interim Joint Sewage Disposal Agreement, dated April 24, 1979, shall terminate and be of no further force and effect but the parties to such Agreement shall nevertheless pay and discharge all obligations previously accrued thereunder.

IN WITNESS WHEREOF, the parties have executed this Agreement the date and year above set forth.

ATTEST:

By _____
Secretary

COUNTY SANITATION DISTRICT NO. 26
OF LOS ANGELES COUNTY

By _____
Chairman

ATTEST:

By _____
Secretary

COUNTY SANITATION DISTRICT NO. 32
OF LOS ANGELES COUNTY

By _____
Chairman

APPROVED AS TO FORM:

KNAPP, GROSSMAN & MARSH

By _____
B. Richard Marsh, Counsel
for County Sanitation Districts
of Los Angeles County

EXHIBIT 1

The following facilities shall be defined as being part of the Santa Clarita Valley Joint Sewerage System:

(1) Saugus Water Reclamation Plant

(2) Valencia Water Reclamation Plant

(3) District 26 Interceptor

(4) District 32 Main, Sections 1 and 2

(5) Saugus Water Reclamation Plant Waste Activated Sludge Force Main

EXHIBIT 2

Per Article 4b of this Agreement, the facilities to be constructed are as follows:

Saugus Water Reclamation Plant (WRP) Filtration and Chlorination Facilities (Existing plant to be upgraded to advanced treatment):

- Primary sedimentation tank
- Return sludge pumps
- Waste activated sludge pump
- Filters with filter feed and backwash pump stations
- Filter waste backwash recovery tanks
- Chlorine contact tank
- Chlorination/dechlorination systems
- Alum/Polymer systems and appurtenances
- Standby power
- High pressure effluent system
- Office/lab addition

Saugus WRP Waste Activated Sludge Force Main (will convey waste activated sludge to the Valencia WRP):

- An approximately 14,900 L.F. force main

Valencia WRP Stage III Expansion (3.0 mgd expansion of plant capacity to receive additional flow):

- Influent pumps and metering
- Primary sedimentation tanks
- Aeration tank
- Final clarifier
- Return activated sludge pumps
- Waste activated sludge pumps
- Filters with filter feed pump station
- Waste backwash decant tank
- Chlorination/dechlorination equipment
- Maintenance building
- Effluent discharge line with meter
- High pressure effluent and non-potable water systems

Saugus/Valencia Solids Processing Facilities (construction of sludge digestion and dewatering facilities to handle solids from both District 26 and District 32):

- Dissolved air flotation thickener
- Anaerobic digesters
- Digester cleaning decant facility with submersible pump
- Digested sludge holding tanks
- Frame plate filter press and appurtenances

EXHIBIT 2 (cont.)

Filtrate equalization tank
Energy recovery system
Truck Maintenance Facility
Sludge Hauling Trucks

The Districts further agree to allocate the costs of these facilities according to the following percentages:

| FACILITY | DISTRICT NO. 26 PERCENTAGE | DISTRICT NO. 32 PERCENTAGE |
|---|---|---|
| Saugus WRP Filtration and Chlorination Facilities | 100% | 0% |
| Saugus WRP Activated Sludge Force Main | 100% | 0% |
| Valencia WRP Stage III Expansion (2.0 mgd which is grant fundable) | 100% | 0% |
| Valencia WRP Stage III Expansion (1.0 mgd which is not grant fundable) | 55% | 45% |
| Anaerobic Digesters at Valencia WRP (7.0 mgd which is grant fundable) | 100% | 0% |
| Anaerobic Digesters at Valencia WRP (1.0 mgd which is not grant fundable) | 55% | 45% |
| Solids Processing Facility (excluding anaerobic digesters) | 60% | 40% |
| Draft Tubes for Existing Valencia WRP Digesters | 0% | 100% |

**Geosyntec Memorandum – LID Water Quality Analysis Results for Landmark Village dated May 17, 2011**

Geosyntec consultants

1111 Broadway, 6th Floor
Oakland, California 94607
PH 510.836.3034
FAX 510.836.3036
www.geosyntec.com

# Memorandum

Date: 17 May 2011

To: Matt Carpenter and Alex Herrell, Newhall Land

From: Lisa Austin, Aaron Poresky, and Kelly Havens, Geosyntec Consultants

Subject: LID Water Quality Analysis Results for Landmark Village

---

## BACKGROUND

As described in the Landmark Village Draft Environmental Impact Report (EIR) Section 4.3 Water Quality, and Appendix 4.3, Landmark Village Water Quality Technical Report, the *Newhall Ranch Specific Plan Sub-Regional Stormwater Mitigation Plan* (Geosyntec, 2008) sets forth the urban runoff management program that will be implemented for the Project. As indicated in the *Newhall Ranch Specific Plan Sub-Regional Stormwater Mitigation Plan*, Project Design Features (PDFs) incorporated into the Landmark Village Project (the Project) to address water quality and hydrologic impacts include site design, Low Impact Development (LID), source control, treatment control, and hydromodification control best management practices (BMPs). Most of these BMPs will promote infiltration and recharge groundwater.

Site design that will promote infiltration and groundwater recharge includes clustering development within the Newhall Ranch Specific Plan area into villages. Approximately 74 percent (10,145 acres) of the Specific Plan area will remain undeveloped Open Areas.

As indicated in *Newhall Ranch Specific Plan Sub-Regional Stormwater Mitigation Plan* and Landmark Village Draft EIR Section 4.3, Water Quality, LID BMPs that promote retention of urban runoff are included as PDFs, although the water quality modeling conducted for the impact analysis in the Draft EIR does not account for the stormwater runoff that would be retained in these BMPs. LID BMPs that meet the Project's LID BMP Performance Standard, discussed below, have been analyzed in order to quantify Project impacts with LID BMPs.

## LID BMP PERFORMANCE STANDARD

A LID BMP Performance Standard conceptually similar to the LID requirements in the Ventura County MS4 Permit has been developed for the Project. The LID BMP Performance Standard is illustrated in Figure 1 and described below:

> LID project design features (PDFs) shall be selected and sized to: (1) fully retain the volume of stormwater runoff produced from a 0.75 inch storm event; and (2) reduce the percentage of Effective Impervious Area (EIA) to five percent or less of the total project area within the vesting tentative tract map and associated off-site project area. Runoff from all EIA shall be subject to treatment control measures that are selected to address the pollutants of concern and are sized to capture and treat 80 percent of the average annual runoff volume.

This LID Performance Standard would be implemented on the Project as follows:

1. Institutional, commercial, multi-family residential, recreation, and park land use parcels would implement retention or biofiltration BMPs on-site to the extent feasible. Based on an assessment of feasibility, one of three BMP strategies would be applied as outlined below:
    a. *Infiltration feasible*: If it is feasible to infiltrate all of the developed area runoff produced from the 0.75 inch design storm (i.e., soil infiltration rates are at least 0.5 inches per hour, fill depth is less than 10 feet, and no infiltration geotechnical hazards exist (such as landslides and terrace escarpments)), infiltration BMPs would be used. Infiltration BMPs include bioretention (without an underdrain), permeable pavement, infiltration galleries, infiltration basins or trenches, or an equivalent infiltration BMP.
    b. *Bioinfiltration allowable when low infiltration rates or deep fill depths are present*: If the parcel has low soil infiltration rates (i.e., the soil infiltration rate is less than 0.5 inches per hour) or the depth of fill is greater than 10 feet, but no other technical infeasibility concerns exist, bioinfiltration BMPs would be used. Bioinfiltration facilities are similar to bioretention facilities with an underdrain, but they include storage below the underdrain to maximize the volume infiltrated. These facilities would retain a portion of the runoff from the LID design storm, then biofilter the remaining runoff from the design storm.
    c. *Infiltration is not allowable*: If infiltration is technically infeasible due to geotechnical hazards or a high ground water table, then biofiltration BMPs would be used. These BMPs would biofilter the runoff produced from the LID design storm from the developed area. No areas have been identified in the Landmark Village Project area where infiltration is not allowed in any quantity.
2. Runoff from roofs, patios, and walkways in single family residential parcels would be disconnected over landscaped areas designed to fully retain the volume of runoff from the LID design storm (0.75 inch storm event). Runoff from the remaining parcel area and that

which does not infiltrate in the landscaped area would flow through the storm drain system to the regional infiltration/biofiltration facilities.

3. Runoff from roadways would be retained or biofiltered in retention or biofiltration BMPs sized to capture the LID design storm volume or flow, per the guidance in US EPA's Managing Wet Weather with Green Infrastructure: Green Streets.
4. No more than 5% of the total Project area would be treated using conventional treatment methods that address the pollutants of concern. In this case, media filters (or equivalent BMPs that address the pollutants of concern) would be sized to capture and treat 80% of the average annual runoff volume from the allowable EIA.
5. Regional or sub-regional infiltration/biofiltration facilities would also be implemented. The regional or sub-regional facilities would be designed to incorporate a biofilter in the bottom of the facility, which would allow for infiltration if feasible, with detention storage above the biofilter. The regional facilities would infiltrate or biofilter the LID design storm volume that has not been retained or biofiltered on the parcels in the area tributary to the regional facility and would provide extended detention treatment for the additional runoff volume required to provide 80% capture and treatment of the average annual runoff volume per the *Newhall Ranch Specific Plan Sub-Regional Stormwater Mitigation* Plan treatment performance standard.

## METHODOLOGY

A load-based water quality model was used to estimate pollutant loads and concentrations in Project area stormwater runoff for certain pollutants of concern for pre-development conditions and post-development conditions with the LID BMPs described above. This model was coupled with hydrologic and hydraulic modules of USEPA SWMM v4.4h to quantify the volume reduction and capture efficiency of the BMPs.

Table 1 below provides a list of model inputs and the sources for these inputs. For further detail, see Appendix B of the *Landmark Village Water Quality Technical Report* (Draft EIR Appendix 4.3) and Attachment 1 to this memorandum.

**Table 1: Model Input Requirements and Assumptions**

| Model Input | Assumption/Source |
|---|---|
| Hourly long-term rainfall record | National Climatic Data Center (NCDC) Newhall (046162) and San Fernando (047762) rain gauge data from 1969-2008 |
| Green-Ampt soil parameters | Natural Resource Conservation Service Soil Data Mart<br>Table 5.5.5 – Handbook of Hydrology (Maidment, ed. 2003) |

<table>
<tr><th>Model Input</th><th>Assumption/Source</th></tr>
<tr><td>Land use-based imperviousness</td><td>LA County Hydrology Manual (LACDPW, 2006)</td></tr>
<tr><td>Land use-based stormwater runoff event mean concentrations</td><td>Los Angeles County 1994-2000 Integrated Receiving Water Impacts Report, 2000<br>Los Angeles County 2000-2001 Stormwater Monitoring Report, 2001<br>Ventura County Watershed Protection District<br>As analyzed for the Los Angeles Structural BMP Prioritization and Assessment Tool (LACDPW, City of Los Angeles, and Heal the Bay, 2008)</td></tr>
<tr><td>Volume and flow-based BMP design criteria</td><td>80% Capture of Average Annual Runoff Volume<br>(NRSP Sub-Regional SWMP (Geosyntec, 2008))</td></tr>
<tr><td>BMP selection criteria</td><td>Select and locate BMPs with a preference for infiltration.<br>Select BMPs to infiltrate the runoff volume from the 0.75-inch design storm to the extent feasible and biofilter the remaining fraction of the 80 percent capture volume.<br>Evaluate degree of feasibility of infiltration based on land use type, native soil infiltration rate, proposed cut and fill, depth to groundwater, presence of landslides that will remain after remedial grading, and other geotechnically- or ecologically-based constraints.</td></tr>
<tr><td>Volume reduction and LID BMPs analyzed quantitatively</td><td>Clustering (preservation of open space)<br>Hydrologic source controls<br>Distributed retention, bioinfiltration, and biofiltration BMPs<br>Regional infiltration, bioinfiltration, and biofiltration facilities<br>Media filters</td></tr>
<tr><td>Volume reduction modeling parameters</td><td>Hydrologic source controls: equal ratio of disconnected of rooftops and patios to landscaped areas receiving disconnection<br>Onsite BMPs:
<table>
<tr><th>Feasibility Constraint Category</th><th>Design infiltration rate (in/hr)</th></tr>
<tr><td>Category 1: Retention</td><td>0.38</td></tr>
<tr><td>Category 2: Bioinfiltration</td><td>0.25</td></tr>
</table>
Sub-regional Bioinfiltration/Biofiltration Facilities:
<table>
<tr><th>Facility Type</th><th>Design infiltration rate (in/hr)</th></tr>
<tr><td>Sub-regional Bioinfiltration Facilities (multiple)</td><td>0.25</td></tr>
<tr><td>Sub-regional Biofiltration Facility with biofiltration, extended detention and incidental infiltration</td><td>0.25</td></tr>
</table></td></tr>
</table>

| Model Input | Assumption/Source |
|---|---|
| LID BMP effluent quality | ASCE/USEPA (American Society of Civil Engineers Urban Water Resources Research Council and United States Environmental Protection Agency) 2011, International Stormwater Best Management Practices Database (www.bmpdatabase.org);<br>(Reanalysis of expanded database conducted January 2011) |

The land use areas analyzed are listed in Table 2 below and illustrated in Figure 2. These land use areas are for the revised project description included in the Final EIR.

**Table 2: Summary of Revised Land Use Program Analyzed**

| Land Use Designation | Landmark Village Project (Acres) |
|---|---|
| Commercial | 27.3 |
| Multi-Family | 82.9 |
| Open Space | 32.9 |
| Park | 10.1 |
| Recreation | 5.8 |
| Road | 41.6 |
| School | 9.7 |
| Single-Family[1] | 53.9 |
| Water Quality Facility | 10.1 |
| *Total* | *274.4* |
| Off-site Commercial (Water Tanks) | 8.0 |
| Off-site Road | 98.0 |
| Total Area | 380.4 |

## RESULTS

### LID Feasibility Screening for the Project Area

An assessment of infiltration feasibility was conducted to estimate, for the Project area, which one of three BMP strategies could be applied onsite and whether the sub-regional bioinfiltration/biofiltration facilities would allow for infiltration. The Project area was analyzed by the Project Geotechnical Consultant (Alan E. Seward, 2010) using geologic information, soils information, proposed remedial grading plans, final grades, and applicable feasibility criteria from the Los Angeles County LID Standards Manual. This analysis categorized project areas into three levels of infiltration feasibility:

1. Infiltration was considered to be feasible directly from the bottom of BMPs in locations where underlying soils infiltration rates were estimated to be greater than 0.5 inches per hour and the proposed depth of compacted fill was estimated to be less than 10 feet.
2. Infiltration was considered to be feasible through the use of dry wells in locations where underlying soils infiltration rates were estimated to be greater than 0.5 inches per hour and greater than 10 feet of separation was estimated to exist from the bottom of proposed fill to the seasonally high groundwater table.
3. Infiltration was considered to be partially feasible in the remaining areas. No hazards were identified that would preclude the use of some level of infiltration.

The results of this feasibility screening are illustrated in Figure 3. Figure 4 illustrates the LID BMPs for the Project area based on the feasibility screening.

## Project Impact Assessment for Modeled Pollutants of Concern

Table 3 below shows the predicted changes in stormwater runoff volume and mean annual loads for the modeled pollutants of concern for the Project area. Table 4 below shows the predicted changes in concentration in stormwater runoff for the Project area.

**Table 3: Predicted Average Annual Runoff Volume and Pollutant Loads**

| Parameter | Units | Existing Conditions | Developed Conditions with no BMPs | Developed Conditions w/ LID | Change w/LID |
|---|---|---|---|---|---|
| Volume | acre-ft | 130 | 384 | 261 | 131 |
| TSS | tons/yr | 37 | 38 | 12 | -25 |
| Total Phosphorus | lbs/yr | 548 | 490 | 193 | -355 |
| Nitrate-N + Nitrite-N | lbs/yr | 1,219 | 1,005 | 432 | -787 |
| Ammonia-N | lbs/yr | 215 | 525 | 147 | -68 |
| Total Nitrogen | lbs/yr | 2,137 | 3,118 | 1,277 | -860 |
| Chloride | tons/yr | 3.7 | 8.2 | 5.2 | 1.5 |
| Dissolved Copper | lbs/yr | 10 | 20 | 8 | -2 |
| Total Lead | lbs/yr | 4.5 | 8.4 | 3.0 | -1.5 |
| Dissolved Zinc | lbs/yr | 63 | 152 | 45 | -18 |
| Total Aluminum[1] | lbs/yr | 487 | 711 | 231 | -256 |

[1] *BMP effectiveness studies in the International Stormwater BMP database infrequently monitor aluminum; therefore, insufficient effluent data were available to model the removal effectiveness of treatment control BMPs for this water quality constituent. In order to estimate the reduction in total aluminum load and concentration, TSS removal was used as a surrogate.*

**Table 4: Predicted Average Annual Pollutant Concentrations**

| Parameter | Units | Existing Conditions | Developed Conditions with no BMPs | Developed Conditions w/ LID | Change w/LID |
|---|---|---|---|---|---|
| TSS | mg/L | 192 | 72 | 33 | -159 |
| Total Phosphorus | mg/L | 1.4 | 0.5 | 0.3 | -1.1 |
| Nitrate-N + Nitrite-N | mg/L | 3.0 | 1.0 | 0.6 | -2.4 |
| Ammonia-N | mg/L | 0.6 | 0.5 | 0.2 | -0.4 |
| Total Nitrogen | mg/L | 6 | 3 | 2 | -4 |
| Chloride | mg/L | 20 | 16 | 14 | -6 |
| Dissolved Copper | µg/L | 28 | 20 | 10 | -18 |
| Total Lead | µg/L | 12 | 8 | 4 | -8 |
| Dissolved Zinc | µg/L | 185 | 146 | 60 | -125 |
| Total Aluminum[1] | µg/L | 1282 | 678 | 323 | -959 |

[1]*BMP effectiveness studies in the International Stormwater BMP database infrequently monitor aluminum; therefore, insufficient effluent data were available to model the removal effectiveness of treatment control BMPs for this water quality constituent. In order to estimate the reduction in total aluminum load and concentration, TSS removal was used as a surrogate.*

While runoff volume is predicted to increase, the loads of all modeled constituents with the exception of chloride are predicted to decrease and the concentrations of all modeled constituents, including chloride, are predicted to decrease under proposed Project developed conditions with LID when compared to existing conditions. The increase in runoff volume can be explained by the increase in impervious cover associated with development of the site, as well as by the decrease in infiltration capacity of existing site soils associated with the compaction of site soils during construction. The change in concentrations can be attributed to the difference in concentrations observed in monitoring data from agricultural, open space, and un-treated transportation land uses (the existing condition for the site) compared with urban land uses (representative of post-development conditions) in combination with the reductions in concentration achieved in the LID and sub-regional bioinfiltration/biofiltration BMPs. Change in pollutant load is a function of the increase in runoff volume and the relative change in pollutant concentration; if the predicted reduction in pollutant concentration is small, then the predicted runoff load may increase.

The predicted average annual TSS, nutrients, and chloride concentrations in stormwater runoff from the total modeled Project area are compared to water quality criteria in Table 5 below. Concentrations of all modeled constituents are predicted to decrease and to be below the Basin Plan water quality objectives (WQOs) and total maximum daily load waste load allocation (TMDL WLAs) benchmark criteria because of the change in land uses and the implementation of LID, biofiltration, and treatment control BMPs. In addition, all predicted concentrations are within the observed ranges of concentrations within Santa Clara River Reach 5. Based on the

comprehensive LID implementation strategy, the predicted decrease in runoff concentrations, and the comparison with benchmark criteria and instream concentrations, water quality impacts related to TSS, nutrients, and chloride would be less-than-significant with the implementation of the proposed LID BMPs.

**Table 5: Comparison of Predicted Nitrogen Compound Concentrations for the Landmark Village Project Area with Water Quality Objectives, TMDLs, and Observed Concentrations in Santa Clara River Reach 5**

| Nutrient | Predicted Average Annual Concentration w/LID (mg/L) | Basin Plan Water Quality Objectives (narrative or mg/L) | Wasteload Allocations for MS4 Discharges into the Santa Clara River Reach 5 (mg/L) | Range of Observed[1] Concentrations in Santa Clara River Reach 5 (mg/L) | Average Wet Weather[2] Concentration at Station S29 (Days > 0.1") |
|---|---|---|---|---|---|
| TSS | 33 | Water shall not contain suspended or settleable material in concentrations that cause nuisance or adversely affect beneficial uses | NA | 32 – 51,200 | 1,060 |
| Total Phosphorus | 0.3 | Waters shall not contain biostimulatory substances in concentrations that promote aquatic growth to the extent that such growth causes nuisance or adversely affects beneficial uses | NA | 0.18 – 13.4 | 0.58 |
| Total Nitrogen | 2 | | NA | <0.04 – 46[6] | 4.4 |
| Nitrate-N + Nitrite-N | 0.6 | 5 | 6.8[3] | 0.5 – 4.8 | 0.9 |
| Ammonia-N | 0.2 | 2.2[4] | 1.75[5] | <0.005 – 1.1 | 0.20 |
| Chloride | 14 | 100 | 100 | 3 - 121 | 43 |

[1] *Range of concentrations observed in the Santa Clara River during wet weather (Stations S29, NR1, and NR3).*
[2] *Average concentration observed in wet weather monitoring data at Station S29 for all storm events greater than 0.1 inches.*
[3] *30-day average.*
[4] *4-day average, ELS present, 90th percentile pH and temperature pairing observed at USGS Monitoring Station 11108500.*
[5] *30-day average in Reach 5 below Valencia.*
[6] *Observed values for TKN (ammonia plus organic nitrogen).*

Comparison of the predicted runoff metal concentrations and the acute California Toxics Rule (CTR) criteria for dissolved copper, total lead, and dissolved zinc are shown in Table 6 below.

The comparison of the post-developed with LID condition to the benchmark CTR values shows that all of the trace metal concentrations are predicted to be below the benchmark water quality criteria. Predicted trace metals concentrations are within the range of observed concentrations in Santa Clara River Reach 5, except for dissolved zinc, which is slightly above the range of observed concentrations.

There is no CTR criterion for aluminum, although there is a National Ambient Water Quality Criteria (NAWQC) criterion (750 µg/L (acute) for a pH range of 6.5 to 9.0) in the form of acid soluble aluminum (USEPA, 1988). It is not possible to directly compare the predicted aluminum concentration to this criterion, as the available monitoring data used for modeling are for either dissolved aluminum or total aluminum. Acid soluble aluminum (which is operationally defined as the aluminum that passes through a 0.45 µm membrane filter after the sample has been acidified to a pH between 1.5 and 2.0 with nitric acid) represents the forms of aluminum toxic to aquatic life or that can be converted readily to toxic forms under natural conditions. The acid soluble measurement does not measure forms of aluminum that are included in total aluminum measurement, such as aluminum that is occluded in minerals, clays, and/or is strongly adsorbed to particulate matter, which are not toxic and are not likely to become toxic under natural conditions. The predicted mean total aluminum concentration (323 mg/L) is less than the NAWQC benchmark criterion for acid soluble aluminum, is predicted to decrease in the post-development condition, and is within the range of observed concentrations in Santa Clara River Reach 5.

Based on the comprehensive LID implementation strategy, the predicted decrease in runoff concentrations, and the comparison with benchmark objectives and instream concentrations, water quality impacts related to metals would be less-than-significant with the implementation of the proposed LID BMPs.

**Table 6: Comparison of Predicted Trace Metal Concentrations for the Landmark Village Project Area with Water Quality Criteria and Observed Concentrations in Santa Clara River Reach 5**

| Metal | Predicted Average Annual Concentration w/LID (µg/L) | California Toxics Rule Criteria[1] (µg/L) | Range of Observed[2] Concentrations in Santa Clara River Reach 5 (µg/L) | Average Wet Weather[3] Concentration at Station S29 (Days > 0.1") |
|---|---|---|---|---|
| Dissolved Copper | 10 | 32 | 3.3 – 22.6 | 7.3 |
| Total Lead | 4 | 260 | 0.6 – 40 | 18 |
| Dissolved Zinc | 60 | 250 | 3 – 37 | 19 |
| Total Aluminum | 323 | N/A | 131 – 19,650 | 5,500 |

*[1] Hardness = 250 mg/L, based on minimum observed value at USGS Station 11108500. Lead criteria is for total recoverable lead. There is no CTR criterion for aluminum.*

*[2] Range of concentrations observed in the Santa Clara River during wet weather (Stations S29, NR1, and NR3).*

*[3] Average concentration observed in wet weather monitoring data at Station S29 for all storm events greater than 0.1 inches.*

**Assessment of Potential Project Impacts on Instream Concentrations**

The potential for Project runoff to impact instream pollutant concentrations is a function of (1) the relative magnitudes of runoff volume and instream flow volume and (2) the relative magnitude of runoff concentrations and instream concentrations. The instream pollutant concentration with Project contributions can be calculated using a simple mass balance equation:

$$C_{IS} = \frac{V_O \times C_O + V_P \times C_P}{V_O + V_P}$$ Equation 1

Where:

$C_{IS}$ = Instream Concentration with Project Runoff

$V_O$ = Instream Volume Upstream of Project

$C_O$ = Instream Concentration Upstream of Project

$V_P$ = Volume of Runoff from Project Area

$C_P$ = Concentration of Runoff from Project Area

This relationship can also be expressed as:

$$C_{IS} = \frac{L_O + L_P}{V_O + V_P}$$ Equation 2

Where:

$L_O$ = Instream Constituent Load Upstream of Project

$L_P$ = Constituent Load in Runoff from Project Area

Based on these relationships, two universal conditions can be identified under which a Project would not increase instream concentration:

- **Condition 1:** If the concentration of a constituent in Project runoff ($C_P$) is less than the concentration of the constituent instream ($C_O$), then discharges from the Project would result in a reduction of the instream concentration of that constituent; it would be not be possible for the Project's discharges to cause an increase in the instream concentration. Two extreme cases can be used to demonstrate this statement:

  - First, given that $C_P$ is less than $C_O$, take the case where $V_P$ is much less than $V_O$ (e.g., the project size is small relative to the size of the watershed). In this case, the instream concentration would effectively equal $C_O$, although slightly less, indicating effectively no change in the instream concentration as a result of the project's discharges.
  - Given that $C_P$ is less than $C_O$, take the case where $V_P$ is much greater than $V_O$ (the project size is very large relative to the size of the watershed). In this case, the instream concentration would effectively equal $C_P$, indicating that the project would reduce instream concentration because $C_P$ is less than $C_O$.

- **Condition 2:** If the load of a constituent in Project runoff ($L_P$) decreases with development, but the volume of runoff from the Project increases ($V_P$), then the Project would be expected to result in a reduction of the instream concentration of that constituent regardless of instream volumes or concentrations. It would be impossible for the project to result in an increase in the instream concentration by reducing load but adding volume. In equation 2, this would effectively increase the numerator while reducing the denominator, which must cause the instream concentration to decrease.

The comparison of the post-developed with LID condition to the instream concentrations for the Landmark Village Project (**Error! Reference source not found.** and Table 6) shows that all pollutant concentrations, except dissolved zinc, are predicted to be below the average wet-weather instream concentration (Condition 1). On this basis, the Project would be expected to result in a reduction in the instream concentrations of these constituents.

Based on predicted changes in loads and volumes as a result of the Project with LID (Table 3), the average annual load of dissolved zinc is predicted to decrease with development, while runoff volumes are predicted to increase (Condition 2). On this basis, the Project would be expected to result in a reduction in the instream concentrations of dissolved zinc.

**Cumulative Impact Assessment for LID Implementation**

The *Landmark Village Water Quality Technical Report* evaluates cumulative impacts for the unincorporated area of Los Angeles County west of The Old Road to the Ventura County line. This geographic area includes the Newhall Ranch Specific Plan, Entrada, Legacy Village, and the remaining unbuilt portions of the Valencia Commerce Center. The LID Performance Standard described above will also be implemented by the other Specific Plan villages and the Entrada, Legacy Village, and Valencia Commerce Center projects.

The combined effect on modeled pollutant loads and concentrations of the NRSP, Entrada, Legacy Village, and the Valencia Commerce Center proposed projects are summarized in Tables 7 and 8 below, respectively. As shown in Table 7, when considered cumulatively, runoff

volumes and loads of Ammonia, dissolved copper, and chloride are predicted to increase from the NRSP, Entrada, Legacy Village, and Valencia Commerce Center projects, while pollutant loads are expected to decrease for TSS, total phosphorus, nitrate-N + nitrite-N, total nitrogen, total lead, dissolved zinc, and total aluminum. Pollutant concentrations from the combined projects are predicted to decrease for all modeled parameters (Table 8). Increases in pollutant loadings are not anticipated to be significant based on the fact that predicted pollutant concentrations are well below benchmark water quality standards and TMDL wasteload allocations and are within the range of observed concentrations in Santa Clara River Reach 5 (Table 9) with the exception of dissolved zinc. In the case of dissolved zinc, both the pollutant load and concentration are predicted to decrease with development.

**Table 7: Predicted Average Annual Combined Runoff Volume and Pollutant Loads for the NRSP, Legacy Village, Entrada, and Valencia Commerce Center Projects**

| Modeled Parameter | Units | Development Condition | | | Change |
|---|---|---|---|---|---|
| | | Existing | Developed with no BMPs | Developed with LID | |
| Volume | acre-ft | 1,500 | 4,900 | 3,400 | 1,900 |
| TSS | tons/yr | 650 | 650 | 340 | -310 |
| Total Phosphorus | lbs/yr | 5,500 | 4,300 | 1,800 | -3,700 |
| Nitrate-N + Nitrite-N | lbs/yr | 16,000 | 13,700 | 6,100 | -9,900 |
| Ammonia-N | lbs/yr | 1,900 | 7,500 | 2,100 | 200 |
| Total Nitrogen | lbs/yr | 25,000 | 44,000 | 19,000 | -6,000 |
| Chloride | tons/yr | 43 | 135 | 88 | 45 |
| Dissolved Copper | lbs/yr | 32 | 130 | 55 | 23 |
| Total Lead | lbs/yr | 42 | 102 | 40 | -2 |
| Dissolved Zinc | lbs/yr | 400 | 1,110 | 390 | -10 |
| Total Aluminum[1] | lbs/yr | 6,300 | 10,400 | 5,400 | -900 |

[1] *BMP effectiveness studies in the International Stormwater BMP database infrequently monitor aluminum; therefore, insufficient effluent data were available to model the removal effectiveness of treatment control BMPs for this water quality constituent. In order to estimate the reduction in total aluminum load and concentration, TSS removal was used as a surrogate.*

**Table 8: Predicted Average Annual Combined Pollutant Concentrations for the NRSP, Legacy Village, Entrada, and Valencia Commerce Center Projects**

| Modeled Parameter | Units | Development Condition | | | Change |
|---|---|---|---|---|---|
| | | Existing | Developed with no BMPs | Developed with LID | |
| TSS | mg/L | 330 | 100 | 70 | -260 |
| Total Phosphorus | mg/L | 1.4 | 0.3 | 0.2 | -1.2 |
| Nitrate-N + Nitrite-N | mg/L | 4.0 | 1.0 | 0.7 | -3.3 |
| Ammonia-N | mg/L | 0.5 | 0.6 | 0.2 | -0.3 |
| Total Nitrogen | mg/L | 6 | 3 | 2 | -4 |
| Chloride | mg/L | 22 | 20 | 19 | -3 |
| Dissolved Copper | µg/L | 8 | 10 | 6 | -2 |
| Total Lead | µg/L | 10 | 8 | 4 | -6 |
| Dissolved Zinc | µg/L | 100 | 80 | 40 | -60 |
| Total Aluminum[1] | µg/L | 1,580 | 780 | 590 | -990 |

[1] *BMP effectiveness studies in the International Stormwater BMP database infrequently monitor aluminum; therefore, insufficient effluent data were available to model the removal effectiveness of treatment control BMPs for this water quality constituent. In order to estimate the reduction in total aluminum load and concentration, TSS removal was used as a surrogate.*

**Table 9: Comparison of Predicted Pollutant Concentrations for the NRSP, Entrada, Legacy Village, and Valencia Commerce Center Projects with Water Quality Criteria and Observed Concentrations in Santa Clara River Reach 5**

| Modeled Parameter | Units | Predicted Average Annual Concentration | TMDL/ LA Basin Plan Water Quality Objectives | California Toxics Rule Criteria[1] | Wasteload Allocations for MS4 Discharges into the Santa Clara River Reach 5 | Range of Observed[2] Concentrations in Santa Clara River Reach 5 | Average Wet Weather[3] Concentration at Station S29 (Days > 0.1") |
|---|---|---|---|---|---|---|---|
| TSS | mg/L | 70 | Water shall not contain suspended or settleable material in concentrations that cause nuisance or adversely affect beneficial uses | NA | NA | 32 – 51,200 | 1,060 |
| Total Phosphorus | mg/L | 0.2 | Waters shall not contain biostimulatory substances in concentrations that promote | NA | NA | 0.18 – 13.4 | 0.58 |

| Modeled Parameter | Units | Predicted Average Annual Concentration | TMDL/ LA Basin Plan Water Quality Objectives | California Toxics Rule Criteria[1] | Wasteload Allocations for MS4 Discharges into the Santa Clara River Reach 5 | Range of Observed[2] Concentrations in Santa Clara River Reach 5 | Average Wet Weather[3] Concentration at Station S29 (Days > 0.1") |
|---|---|---|---|---|---|---|---|
| Total Nitrogen | mg/L | 2 | aquatic growth to the extent that such growth causes nuisance or adversely affects beneficial uses | NA | NA | <0.04 – 46[7] | 4.4 |
| Nitrate-N + Nitrite-N | mg/L | 0.7 | 5 | NA | 6.8[4] | 0.5 – 4.8 | 0.9 |
| Ammonia-N | mg/L | 0.2 | 2.0[5] | NA | 1.75[6] | <0.005 – 1.1 | 0.20 |
| Chloride | mg/L | 19 | 100 | NA | 100 | 3 - 121 | 43 |
| Dissolved Copper | µg/L | 6 | NA | 32 | NA | 3.3 – 22.6 | 7.3 |
| Total Lead | µg/L | 4 | NA | 260 | NA | 0.6 – 40 | 18 |
| Dissolved Zinc | µg/L | 40 | NA | 250 | NA | 3 – 37 | 19 |
| Total Aluminum | µg/L | 590 | NA | NA | NA | 131 – 19,650 | 5,500 |

[1] *Hardness = 250 mg/L, based on minimum observed value at USGS Station 11108500. Lead criteria is for total recoverable lead. There is no CTR criterion for aluminum.*
[2] *Range of concentrations observed in the Santa Clara River during wet weather (Stations S29, NR1, and NR3).*
[3] *Average concentration observed in wet weather monitoring data at Station S29 for all storm events greater than 0.1 inches.*
[4] *30-day average.*
[5] *4-day average, ELS present, 90th percentile pH and temperature pairing observed at USGS Monitoring Station 11108500.*
[6] *30-day average in Reach 5 below Valencia.*
[7] *Observed values for TKN (ammonia plus organic nitrogen).*

As discussed above, the anticipated quality of effluent expected from the Landmark Village Project's PDFs will not contribute concentrations of pollutants of concern that would be expected to cause or contribute to a violation of the water quality standards in the Project's receiving waters. Therefore, the Project's incremental effects on surface water quality are not expected to be significant.

The Landmark Village Project's surface runoff water quality, after PDFs, both during construction and post-development, is predicted to comply with adopted regulatory requirements that are designed by the LARWQCB to assure that regional development does not adversely affect water quality, including MS4 Permit and SUSMP requirements; Construction General Permit requirements; General Dewatering Permit requirements; and benchmark Basin Plan water quality objectives, CTR criteria, and TMDLs. Any future urban development occurring in the

Santa Clara River watershed must also comply with these requirements. By extrapolating the results of the direct and cumulative impact analysis in this topical response, it can be predicted that analysis of other proposed development combined with existing conditions would have similar water quality results. Therefore, cumulative impacts on surface water quality of receiving waters from the Project and future urban development in the Santa Clara Watershed are addressed through compliance with the MS4 Permit and SUSMP requirements; Construction General Permit requirements; General Dewatering Permit requirements; and benchmark Basin Plan water quality objectives, CTR criteria, and TMDLs, which are intended to be protective of beneficial uses of the receiving waters. Based on compliance with these requirements designed to protect beneficial uses, cumulative water quality impacts are mitigated to a level that is less than significant.

**Conclusion**

None of the modeled pollutants of concern are expected to adversely affect water quality in surface waters, unreasonably affect present or anticipated beneficial uses of such waters, result in water quality less than that prescribed in the Basin Plan, or significantly impact receiving waters due to the implementation of the comprehensive LID Implementation Plan. Therefore, potential impacts from the Landmark Village Project on receiving water quality are not expected to be significant.

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# LANDMARK VILLAGE LID PERFORMANCE STANDARD

**LID project design features (PDFs) shall be selected and sized to retain the volume of stormwater runoff produced from a 0.75 inch storm event to reduce the percentage of Effective Impervious Area (EIA) to 5 percent or less of the total project area within the vesting tentative map project and associated off-site project area. Runoff from all EIA shall be treated with treatment control measures that are selected to address the pollutants of concern and are sized to capture and treat 80 percent of the average annual runoff volume.**

**Institutional, Commercial, Multi-Family Residential, Recreation, and Park Land Uses**

Attempt to retain ¾" storm

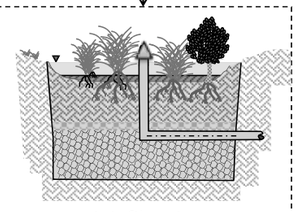
Assess infiltration feasibility

***Infiltration Feasible***
**Category 1: Retain**



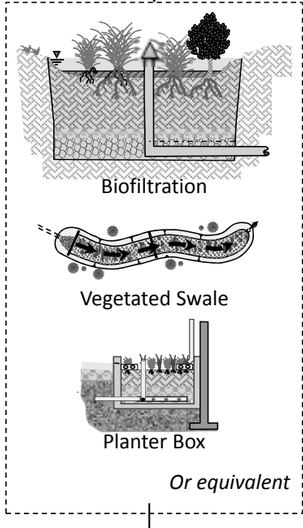

*Or equivalent*

***Infiltration infeasible due to marginal infiltration rate, otherwise feasible***
**Category 2: Bioinfiltrate**
**Retain as feasible, then biofilter**




*Or equivalent*

***Infiltration infeasible due to hazards (geotechnical, etc.)***
**Category 3: Biofilter**
**Or route to regional facility**




*Or equivalent*

**Single Family Residential**

Roofs, Patios and Walkways

**Hydrologic Source Controls**
Disconnect Roof Drains;
Disperse Impervious Areas to Retain 0.75" in Landscaped Areas

Remaining Area

**Roads**

**EPA Green Streets Manual**

Retain/biofilter as feasible per opportunities and constraints; Retain/biofilter remaining in Regional Facilities

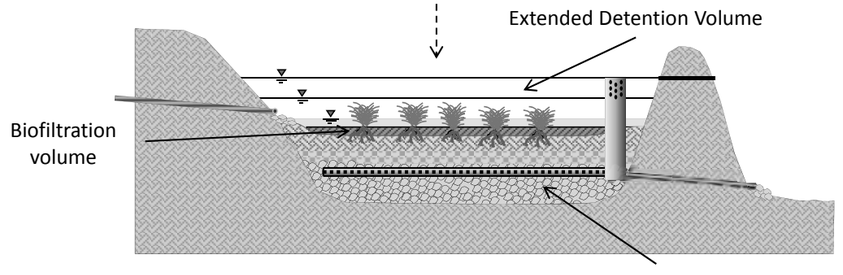
Allowable EIA

**Treatment**
**80% capture of runoff**

Media Filters
*or equivalent*

Underdrain Discharge (Category 2 and 3) and Bypassed Runoff

**Sub-regional Bioinfiltration / Biofiltration Facility**
**Retain or biofilter to the extent feasible, plus provide additional volume required for extended detention for 80% capture of all runoff**

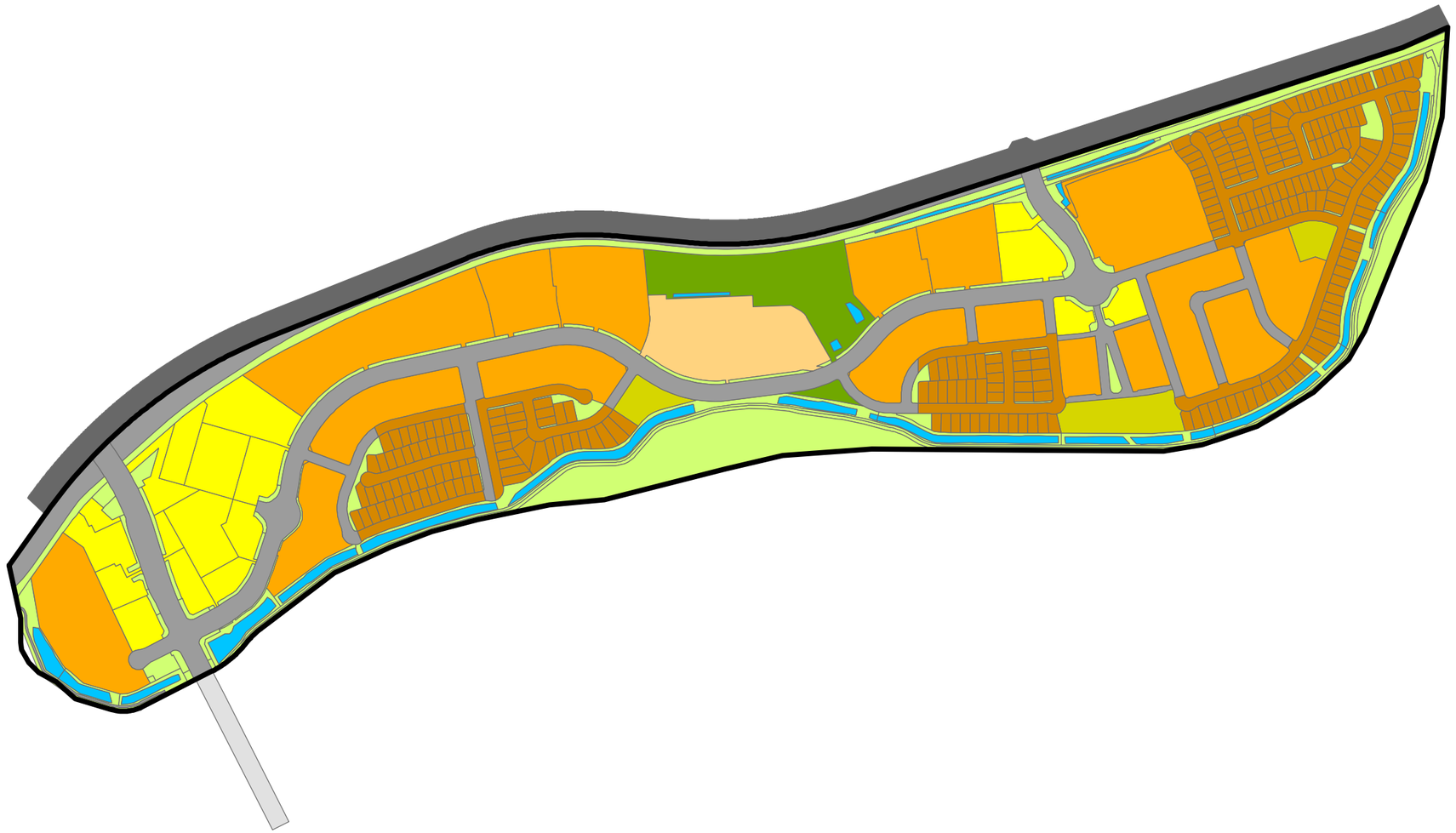



**Landmark Village LID Performance Standard**
Landmark Village LID Water Quality Assessment

Geosyntec consultants

**Figure 1**

N



1,000 500 0 1,000 Feet

**Legend**

- Landmark Project Boundary

**Model Land Use**

- Single-Family
- Multi-Family
- Commercial
- Recreation
- School
- Park
- Open Space
- Water Quality Facility
- Road
- Off-site Bridge
- Off-site SR-126 Right of Way

Not shown: Off-site Water Tanks

# Figure 2: Landmark Village Land Uses

May 2011

Geosyntec consultants

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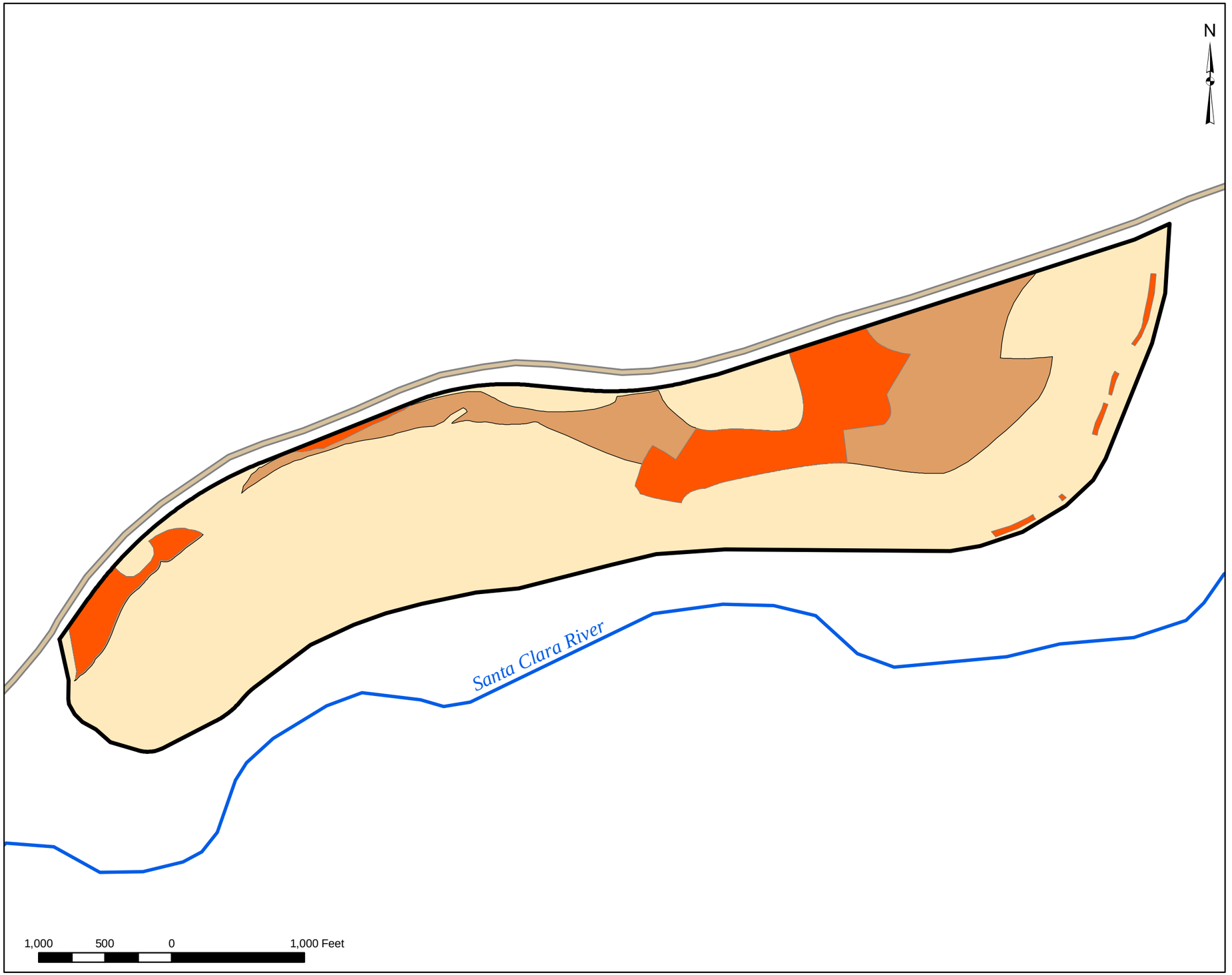
Prepared By: K. Havens



**Legend**

- Landmark Project Boundary
- Infiltration Feasible*
- Infiltration Feasible**
- Partial Infiltration Feasible

* Infiltration likely feasible directly from BMP bottom

** Infiltration likely feasible with supplemental dry well

# Figure 3: Landmark Village Infiltration Feasibility Summary

May 2011

Geosyntec consultants

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Prepared By: K. Havens

Note: Source: Alan E. Seward, 2010.

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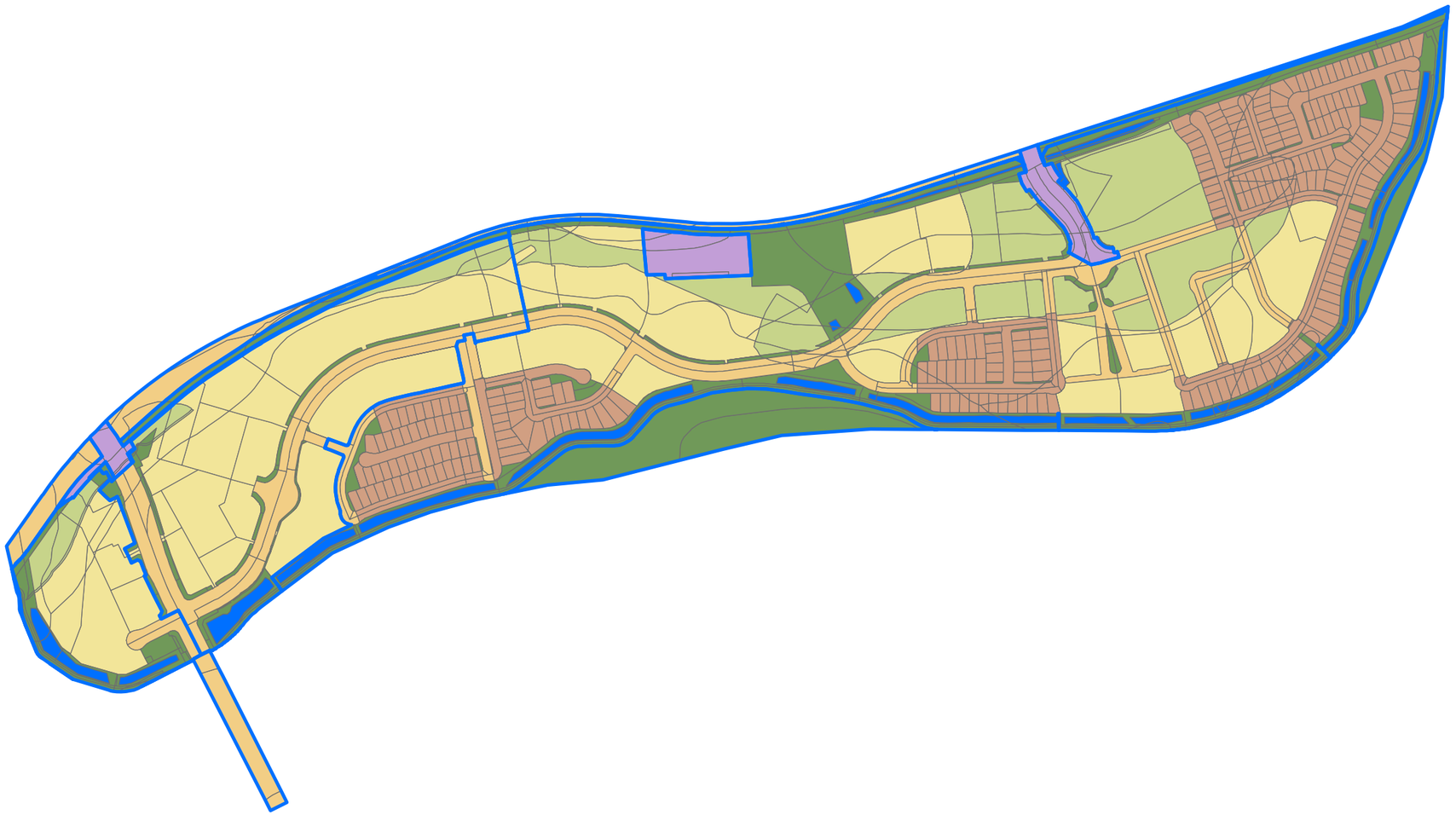

1,000 500 0 1,000 Feet

**Legend**

- Sub-regional and Treatment BMP Drainage Areas

**Parcel-based Treatment Category:**

- Open Space
- Category 1
- Category 2
- Green Streets
- Single-Family
- Treatment BMP
- Sub-regional Facility

# Figure 4: Landmark Village Treatment Map

Landmark Village
LID BMP WQ Modeling Update

May 2011

Geosyntec consultants

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Prepared By: K. Havens

# Attachment 1

# LID Water Quality Modeling Methodology

Addendum to *Appendix B of the Landmark Village Water Quality Technical Report (February 2008)*

## INTRODUCTION

The purpose of this attachment is to describe the changes to the water quality modeling methodology that have been made to quantify low impact development (LID) BMP implementation for the Landmark Village Project (Project) (i.e., the LID BMP Implementation Plan). Changes described in this attachment are discussed in comparison to the modeling methodology that is described in Appendix B of the Landmark Village Water Quality Technical Report (Landmark Village DEIR Appendix 4.3). This attachment addresses only the elements of the modeling methodology that have been updated, added, or clarified for the quantification of LID implementation for the Project.

This attachment is organized as follows:

- Section 1 provides an overview of the changes to the modeling methodology. This section also provides clarification of the rationales for the type of model employed for this analysis.
- Section 2 describes the updates made to model input parameters, as well as the updated approaches used to develop these input parameters.
- Section 3 describes the updates to the structure of the Monte Carlo model (i.e., the way the model is set up) to account for both on-parcel BMPs and sub-regional bioinfiltration/ biofiltration facilities. This section also provides an expanded discussion of the reliability of input parameters and assumptions.

## 1. MODEL OVERVIEW

### 1.1.1. Overview of Changes to Model Methodology

The overall modeling methodology has not changed substantively in comparison to the methodology described in Appendix B of the Landmark Village Water Quality Technical Report (WQTR). However, the structure of the model used to represent the Project (i.e., the way the model is set up) and some model inputs have changed to represent the LID Implementation Plan. Primary changes to the model structure and inputs include:

- Parcel-based BMPs were included in the model to account for volume reduction and treatment provided in parcel-based LID BMPs prior to draining to sub-regional bioinfiltration/ biofiltration facilities.

- The representations of sub-regional bioinfiltration facilities (previously called “Project Biobasins”) and the sub-regional biofiltration facility (previously called the “Project Extended Detention Basin”) were updated to reflect facility designs that include retention and biofiltration components which promote infiltration.

- BMP performance statistics were updated to support the simulation of the types of BMPs in the updated BMP plan using the latest version of the International BMP Database.

- The hydrology and hydraulic modeling approach used to develop hydrologic and hydraulic inputs to the Monte Carlo model (i.e., percent capture, percent volume reduction by storm event) was enhanced to more directly derive these estimates.

In addition, the model was updated to reflect the revised Project description and associated Project land use areas. The incorporation of these changes is described in further depth in Sections 2 and 3.

### 1.1.2. **Technical Basis for Modeling Methodology**

While the modeling methodology has not changed substantively, this section clarifies the technical basis and provides the rationale for the continued use of this methodology to evaluate Project stormwater quality impacts.

An empirical, pollutant loads model approach has been used to assess stormwater quality impacts associated with the proposed Project. This modeling approach was selected to meet the technical requirements of the water quality impact analysis based on an extensive review of available models and a review of the available datasets applicable to the Project.

A variety of modeling approaches are capable of meeting the technical requirements of this analysis. In general, models can be grouped into three categories:

- Stochastic (or probabilistic): this type of model utilizes observed statistical patterns to produce model estimates. This type of model generally relies on empirical observations, but does not necessarily ignore causal relationships.

- Deterministic (or mechanistic, physically-based): this type of model attempts to perfectly represent physical processes and mechanisms using closed form equations derived from physical phenomena. It is noted that because these models attempt to describe systems that are inherently complex and poorly defined, most deterministic models must rely in part on empirical observations to represent causal relationships.

- Hybrid: this type of model combines elements of stochastic and deterministic models to provide more reliable model estimates.

The modeling methodology used for the Project incorporates stochastic and empirical elements, and is therefore most accurately described as a hybrid approach. The approach uses an empirical, stochastic water quality estimation approach (Monte Carlo) to produce water quality and pollutant loading estimates. Inputs to this model are derived from empirical sources (Los Angeles County Land Use Monitoring Program and the ASCE International BMP Database) and deterministic modeling of hydrology and hydraulics (EPA SWMM4.4h). This approach makes use of robust land use and BMP monitoring datasets applicable to the project and incorporates important causal relationships in hydrologic and hydraulic response that can be reliably represented with deterministic methods. This approach is believed to be most appropriate to meet the technical requirements of the impact analysis for the Project-level analysis at the tract map scale.

The literature studies summarized below generally support the use of an empirically-based hybrid approach for the type of analysis required for the Project:

- Obropta et al. (2007) evaluated six deterministic models, three stochastic models, and three hybrid approaches. They concluded that *hybrid approaches show strong potential for reducing stormwater quality model prediction error and uncertainty* [improving the ability to assess] *best management practice design, land use change impact assessment* [and other applications].

- Charbeneau and Barrett (1998) evaluated different approaches for estimating stormwater pollutant loads based on a comparison of model results to observed land use monitoring data. They found that (1) the development of accurate physically-based models *remains a difficult and elusive goal*, and current understanding of processes *is not sufficient to accurately predict event loads*, (2) a simple empirical stochastic approach is generally as reliable or more reliable than more complicated mechanistic approaches, (3) the use of land use event mean concentrations (EMCs) is appropriate for planning purposes, (4) the land use EMC approach is most reliable when land use EMCs are used as a stochastic input parameter generated from a probabilistic distribution, and (5) stormwater volume is the single most important variable in predicting pollutant loads.

- The National Research Council's (NRC) 2008 report on *Urban Stormwater Management in the United States* generally supports these findings regarding the appropriate use of stormwater quality and quantity models.

Figure 1 provides an overview of the modeling methodology, with minor updates to support the updated BMP plan shown **in bold text**.

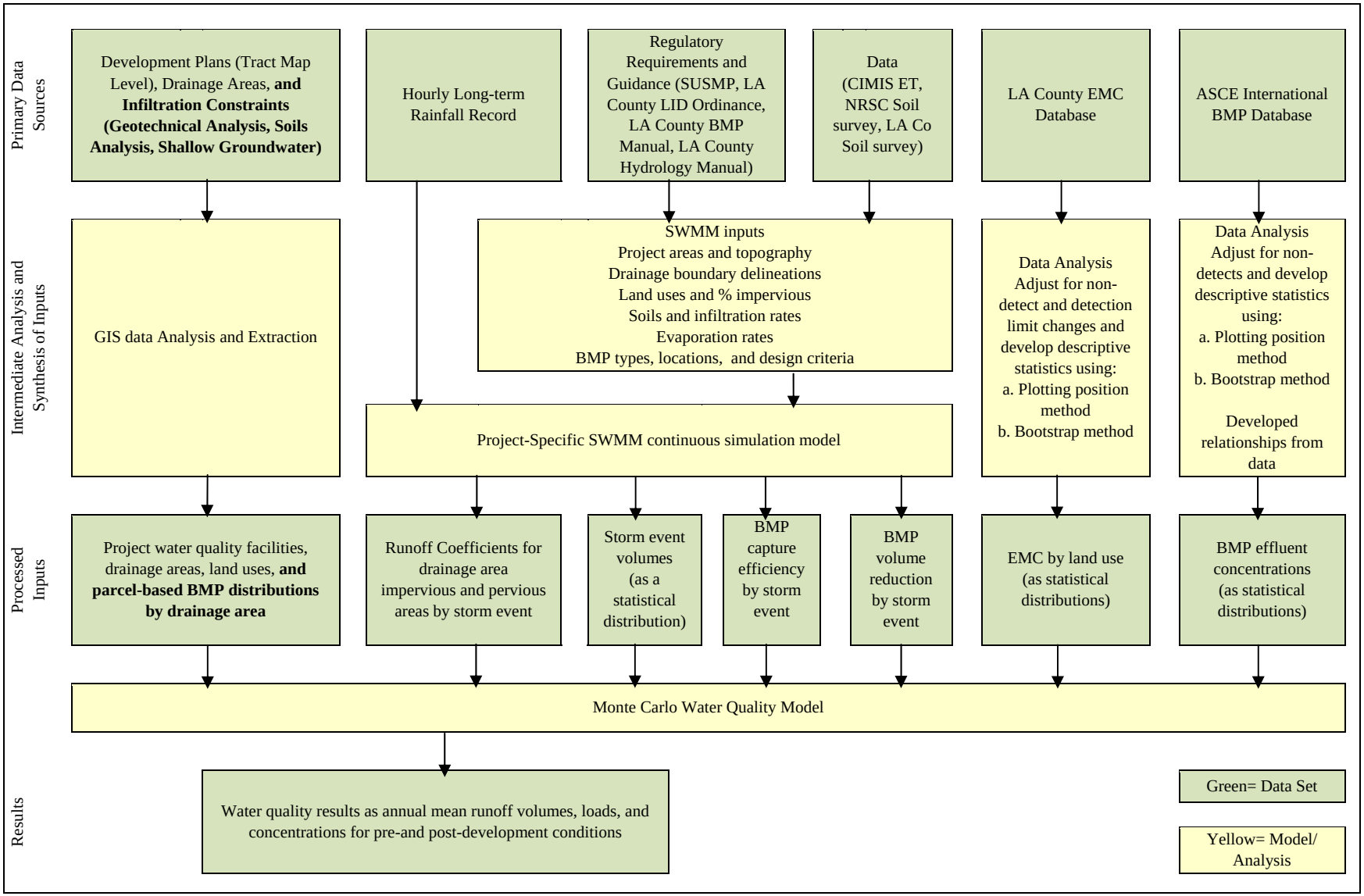


**Figure 1: Overview of Updated Water Quality Analysis Methodology (Updates in Bold)**

## 2. UPDATES TO MODEL INPUT PARAMETERS

### 2.1.1. Runoff Coefficients

As described in Appendix B of the Landmark Village WQTR, the Monte Carlo model uses runoff coefficients (derived from SWMM simulations of average drainage area soils conditions) as inputs to the modeling framework. Runoff coefficients for pervious portions of the Project area are based in part on the distribution of mapped soil properties in these areas. As a result of the change in Project development footprint, the distribution of soil properties changed slightly and triggered a re-analysis to develop runoff coefficients for pervious area. The updated soil distributions are presented in Table 1 below.

**Table 1: SWMM Runoff Block Modeled Soils Distribution by WQ Drainage Area**

| | Sub-regional Bioinfiltration Facility | | Sub-regional Biofiltration Facility[1] | | On-site Treatment (Media Filter or Equivalent) | | Off-site Swales | | Off-site Swales | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Soil Group** | **Acres** | **% Total** | **Acres** | **% Total** | **Acres** | **% Total** | **Acres** | **% Total** | **Acres** | **% Total** |
| HSG A | 43.3 | 21.3% | 2.0 | 3.5% | 0.8 | 10% | 0 | 0% | 0 | 0 |
| HSG B | 160.5 | 78.7% | 54.7 | 96.5% | 7.2 | 90% | 8.2 | 100% | 103.6 | 100% |
| *Total* | *203.8* | | *56.7* | | *8.0* | | *8.2* | | *103.6* | |

[1] Includes 2.4 acres of off-site bridge.

The derivation of soil parameter assumptions for each hydrologic soil group (HSG) is summarized in Table 2. Suction head and initial moisture deficit (IMD) were estimated based on the soil texture class reported in the most Natural Resources Conservation Service (NRCS) Soil Survey (No. 675) with guidance on SWMM input parameter selection provided by James and James (2000). The saturated hydraulic conductivity ($K_{sat}$) was estimated based on evaluation of the ranges of undisturbed $K_{sat}$ reported by the NRCS Soil Survey, the HSG reported by the NRCS Soil Survey with guidance on SWMM input parameter selection provided by James and James (2000), and the Los Angeles County Soil Type with infiltration characteristics described in the Los Angeles County Hydrology Manual (LA County, 2006). The preponderance of these soils data generally indicates that the project has relatively high infiltration capacity. Therefore, the assumed $K_{sat}$ was based on the high end of the range of recommended SWMM inputs for A and B soils from James and James (2000).

**Table 2: Green-Ampt Soil Parameters**

| Hydrologic Soil Group | Prevalent Soil Texture Class | Suction Head[1] (in) | IMD[1] (in/in) | Pre-Development $K_{sat}$ (in/hr) | Post-Development $K_{sat}$ (in/hr) |
|---|---|---|---|---|---|
| A | Loam | 8 | 0.30 | 0.45 | 0.34 |
| B | Loam | 8 | 0.30 | 0.30 | 0.23 |

[1] Estimated based on texture class from Rawls, et al., (1983)

Based the soil distributions summarized in Table 1 and soil parameter assumptions summarized in Table 2, average pervious runoff coefficients were generated for each modeled drainage area to each type of sub-regional bioinfiltration/biofiltration BMP. Runoff coefficients are presented in Table 3 below. Runoff coefficients based on guidance from the Los Angeles County Hydrology Manual are also included in this table for reference (LACDPW, 2006).

**Table 3: Runoff Coefficients by Water Quality Drainage Areas**

| WQ Drainage Area | Impervious Runoff Coefficient | | Undeveloped Pervious Runoff Coefficient | | Developed/Disturbed Pervious Runoff Coefficient | |
|---|---|---|---|---|---|---|
| | Model Methodology (used for WQ model) | LA County Hydrology Manual (for comparison purposes) | Model Methodology (used for WQ model) | LA County Hydrology Manual (for comparison purposes) | Model Methodology (used for WQ model) | LA County Hydrology Manual (for comparison purposes) |
| Sub-regional Bioinfiltration Facilities | 96.9 | 90 | 3 | 10 | 6 | 10 |
| Sub-regional Biofiltration Facility | 96.9 | 90 | 3 | 10 | 6 | 10 |
| On-site Treatment (Media filters or equivalent) | 96.9 | 90 | 3 | 10 | 6 | 10 |
| On-site Biofilter Swales | 96.9 | 90 | 3 | 10 | 6 | 10 |
| Off-site Biofilter Swales (or equivalent) | 96.9 | 90 | 3 | 10 | 6 | 10 |

### 2.1.2. **Revisions to Project Land Use**

Project land uses were determined from the Landmark Village Vesting Tentative Tract Map (VTTM #53108) and GIS analysis of this map (Psomas, April 2010) for the developed Project conditions, which have been revised for the Final Landmark Village EIR. In general, the assumptions regarding land use properties did not change, however, the revised land use plan

contains greater information about the types of roadways than was previously available, which required additional assumptions about the characteristic imperviousness and runoff quality from these areas, summarized below:

- For the purpose of analysis, roads adjacent to residential land uses were considered to be an integral part of single family detached land uses and assume all properties of this land use.

- Minor roads (private drives and access road) were grouped with major roads due to their proportionately small land area.

- Major roads were modeled using imperviousness and runoff quality associated with roads.

Developed conditions of the Project and associated off-site areas are summarized in Table 4.

Existing condition land uses have not changed since the previous model. Existing condition land uses can be found in Appendix B of Landmark Village WQTR.

**Table 4: Developed Conditions Project and Off-site Land Uses**

| Land Use | Development Area (acres) | | Impervious Fraction Modeled |
|---|---|---|---|
| | Project Site | Off-Site Impacts | |
| **Modeled** | | | |
| Commercial | 27.3 | 8.0[2] | 0.91 |
| Multi-Family | 82.9 | | 0.74 |
| Open Space | 32.9 | | 0.01 |
| Park | 10.1 | | 0.10 |
| Recreation | 5.8 | | 0.50 |
| Road | 41.6 | 98.0[3] | 0.91 |
| School | 9.7 | | 0.82 |
| Single-Family[1] | 53.9 | | 0.42 |
| Water Quality Facility | 10.1 | | 1.0 |
| **Not Modeled** | | | |
| Open Space | 18.2 | | NA |
| *Total* | *292.6* | *106.0* | |

[1] Residential roads are included in the single-family land use. The Roads land use includes major and minor roads. Minor roads are modeled assuming the composite imperviousness and EMC of their adjacent land use types.
[2] Off-site water tanks are modeled as a commercial land use.
[3] Off-site roads consist of 2.4 acres of off-site bridge to the south and 95.6 acres of SR-126 right of way to the north. Impervious fraction of SR-126 ROW based on delineation of tentative improvement plans; not land use-based fraction.

### 2.1.3. Distribution of Parcel-based LID BMPs for Multi-Family, Commercial, Institutional, Recreation, and Park Land Uses

The LID BMP performance standard for the Landmark Village Project includes parcel-based LID BMPs in multi-family, commercial, institutional, recreation, and park land uses. There are three categories of parcel-based BMPs (Category 1, 2, and 3), the application of which depends on infiltration feasibility constraints associated with each land use parcel. Infiltration feasibility was screened as follows to determine the distribution of Category 1, 2, and 3 parcel-based BMPs:

- Infiltration feasibility constraints were evaluated by Seward (2010) to determine areas where infiltration is likely feasible. This analysis yielded a shapefile of infiltration feasibility constraints which displays locations where infiltration is likely feasible (Category 1) and where infiltration is likely partially feasible (Category 2). No areas on the Landmark project were identified where infiltration is not feasible in any level or would be hazardous (Category 3). Criteria associated with these distinctions are described in the *Landmark Village LID Supplement.*

- The land use program described in the Landmark Village VTTM (Psomas, April 2010) was converted to a GIS shapefile and was geospatially overlain with the shapefile of infiltration constraints to determine the location(s) and area of each type of parcel-based treatment within each drainage area.

The resulting distribution of parcel-based BMPs is shown in Table 5.

### 2.1.4. Distribution of Single Family Residential Hydrologic Source Controls

The LID BMP Implementation Plan includes hydrologic source controls (HSCs) in single family detached (SFD) land uses. For the purpose of modeling, it was assumed that rooftops, patios, and walkways would be routed to pervious areas capable of managing the runoff from at least a 0.75 inch storm event.

An analysis of typical development plans was conducted to determine the portion of the impervious area in the SFD residential land use that is made up of rooftops, patios, and walkways. Based on the project VTTM land use break-down, an area-weighted lot-size of 5,025 sq-ft plus 2,250 sq-ft of residential roadway was evaluated. Based on this analysis, it was found that on average approximately 26 percent of SFD land use area is anticipated to be made up of roofs, patios and walkways.

### 2.1.5. Design of Sub-regional Bioinfiltration/Biofiltration Facilities

The LID BMP Plan includes sub-regional water quality facilities, which are proposed to manage runoff from portions of the Project that are not addressed by parcel-based BMPs as well as bypass and treated discharge from parcel-based BMPs and SFD HSCs.

The areas draining directly to sub-regional facilities and the total tributary area to sub-regional facilities are provided in Table 5 below. Sub-regional bioinfiltration facilities are distributed around the Project site and have individual drainage areas. Because all sub-regional bioinfiltration facilities will be designed to the same design and performance standards, all area draining to sub-regional bioinfiltration facilities was considered to be part of on WQ drainage area for the purpose of modeling.

**Table 5: Areas Draining to Parcel-based BMP Types within WQ Drainage Areas**

| | Category 1 | | Category 2 | | SFD HSC[1] | | Directly to WQ Facility | | *Total* | |
|---|---|---|---|---|---|---|---|---|---|---|
| **WQ Drainage Area** | **Area (Ac)** | **Imp (%)** | **Area (Ac)** | **Imp (%)** | **Area (Ac)** | **Imp (%)** | **Area (Ac)** | **Imp (%)** | **Area (Ac)** | **Imp (%)** |
| Sub-regional Bioinfiltration Facilities | 36.1 | 77.7 | 50.0 | 73.4 | 28.1 | 50.0 | 89.6 | 41.1 | 203.8 | 56.8 |
| Sub-regional Biofiltration Facility | 2.8 | 78.0 | 36.3 | 81.9 | 0 | 0 | 17.6 | 71.3 | 56.7 | 78.4 |
| On-Site Treatment (Media Filters or Equivalent) | No parcel-based BMPs | | | | | | 8.0 | 44.9 | 8.0 | 44.9 |
| On-site Biofilter Swales (or equivalent) | No parcel-based BMPs | | | | | | 8.2 | 91.0 | 8.2 | 91.0 |
| Off-site Biofilter Swales (or equivalent) | No parcel-based BMPs | | | | | | 103.6 | 91 | 103.6 | 91.0 |

1 - Includes single-family roofs, patios and sidewalks, draining to a pervious area with an equivalent square-footage.

### 2.1.6. **Updated BMP Performance Parameters**

As in the previous modeling methodology, the performance of project BMPs is estimated as a function of three factors: (1) the fraction of stormwater runoff receiving treatment (often referred to as percent of runoff captured, or simply percent capture); (2) the pollutant removal achieved in the BMP by virtue of infiltration and/or evapotranspiration (generically referred to as volume reduction); and (3) the pollutant removal achieved in the BMP by virtue of improved water quality. The performance parameters associated with these factors have been updated to reflect the LID BMP Plan as described in the sections below.

### 2.1.7. **BMP Capture Efficiency and Volume Reduction**

The Monte Carlo model utilizes event-by-event estimates of BMP capture efficiencies and volume reduction to describe the hydrologic and hydraulic performance of BMPs. These inputs were developed using SWMM simulations. While this approach has not fundamentally changed, slight changes were required to accommodate the LID BMP Plan including (a) the simulation of parcel-based BMPs that are “nested” within the drainage area of sub-regional facilities, (b) the

simulation of SFD HSCs that provide volume reduction from SFD land uses, and (c) the simulation of sub-regional bioinfiltration/ biofiltration facilities that combine infiltration and biofiltration elements in different proportions depending on infiltration feasibility in the location of the facility. The approaches for developing capture efficiency and volume reduction inputs for the Monte Carlo model for each of these BMP types are described in the sections below. These approaches make use of the SWMM Runoff block (hydrologic simulation module) and the SWMM Storage/Treatment block (hydraulic simulation module), both operated in continuous simulation mode for a period of 40 years.

#### 2.1.7.1. Parcel-based BMPs

Estimates of capture efficiency and volume reductions achieved by parcel-based BMPs were developed based on hydraulic representations of parcel-based BMPs in EPA SWMM4.4h (Storage/Treatment block), with spatially-averaged tributary catchments (Runoff block). A hypothetical spatially-averaged catchment representation was used because exact drainage areas and imperviousness for each parcel-based BMP are not available at this level of analysis (i.e., Tier 2, the tract map project scale). The hypothetical spatially-averaged catchment was assigned an area of one acre and an impervious fraction representative of the composite imperviousness of Project areas draining to parcel-based BMPs. This catchment was simulated in the SWMM Runoff block to produce a characteristic runoff hydrograph, which was routed through each type of parcel-based BMPs using the SWMM Storage/Treatment block. The reliability of the spatially-averaged catchment approach is discussed in Section 3.2.

The hydraulic representation of each type of parcel-based BMP was developed in the SWMM Storage/Treatment block based on a standard BMP profile formulated to result in the maximum feasible infiltration of the 0.75 inch design storm for each infiltration constraint condition. The standard profiles are primarily dependent on the design infiltration rate of underlying soil for each of the constraints categories. Based on an assessment of likely infiltration rates and allowable infiltration volumes (Seward, 2010), the design infiltration rates were selected as follows.

- **Category 1** areas are located in areas identified as having a natural, undisturbed infiltration rate of greater than 0.5 inches per hour and the potential to use direct infiltration or dry wells to infiltration. Direct infiltration was assumed to be feasible in areas with depth of fill less than 10 feet. Dry wells were assumed to be feasible in areas where the depth from the bottom of fill to seasonally-high groundwater is greater 10 feet. The design infiltration rate for this category of parcel-based BMP was selected by applying a reduction factor of 25 percent to the low end of estimated infiltration rate. The result is a design infiltration rate of **0.375 inches per hour**.
- **Category 2** areas are generally located in areas with natural, undisturbed infiltration rate of less than 0.5 inches per hour (Seward, 2010) and/or where depth of fill or separation from the bottom of fill to groundwater would not permit full infiltration of the design

storm volume. The design infiltration rate for this category of parcel-based BMP was selected by applying a reduction factor of 50 percent to the low end of estimated infiltration rate. The result is a design infiltration rate of **0.25 inches per hour**. This assumption considers physical limitations of infiltration into compacted and low permeability soils as well as hazards associated with introduction of excess water into fill structures.

Based on these design infiltration rates and the design goals for parcel-based BMPs described above, the geometric inputs to the SWMM hydraulic representations of parcel-based BMP are described in the Table 6 below.

**Table 6: SWMM Hydraulic Representation of Parcel-based BMPs**

| Parameter | Units | Parcel-based BMP Categories | |
|---|---|---|---|
| | | Category 1 | Category 2 |
| Surface Ponding Depth below Overflow | ft | 1.0 | 0.5 |
| Media Depth | ft | 1.5 | 1.5 |
| Design $K_{sat}$ of Amended Media | in/hr | 2.0 | 2.0 |
| Design $K_{sat}$ of Underlying Soil | in/hr | 0.375 | 0.25 |
| Thickness of Gravel Layer | ft | 0 | 1.5 |
| Height of Underdrain Invert Elevation above Bottom of BMP | ft | None | 1.5 |
| Depth of Retention Storage[1] | inches | 18.3 | 9.0 |
| BMP Footprint as Fraction of Impervious Area | ac/ac | 3.1% | 2.9% |
| Average Annual Capture Efficiency (Percent Capture) | - | 53% | 80% |
| Average Annual Volume Reduction of Captured Water (Percent Volume Reduction) | - | 100% | 41% |
| Average Annual Reduction in Runoff Volume | - | 53% | 33% |

[1] Retention storage depth is determined based on the equivalent depths of volume retained in ponding, media, and gravel (i.e. the full storage volume of Category 1 and, for Category 2, volume below underdrain), as well as additional retention storage in media.

The storm-by-storm capture efficiency and volume reduction estimated from the parcel-based BMP simulations was extracted from SWMM model output and used to represent the hydraulic performance of these BMPs in the Monte Carlo model.

### 2.1.7.2. SFD Hydrologic Source Controls

The effect of HSCs was simulated by routing runoff from impervious areas to pervious areas within the SWMM Runoff block (hydrologic simulation module) and tabulating the combined runoff coefficient from this area for each storm event. For the purpose of analysis, it was assumed that impervious areas would be routed over an equal amount of pervious area with

properties modified to represent amended soils in the areas receiving runoff. Table 7 provides the model parameters that were used to represent SFD HSCs.

**Table 7: SWMM Model Representation of Hydrologic Source Controls**

| Parameter | Units | Assumption | Basis of Assumption |
|---|---|---|---|
| Impervious to Pervious Ratio | ft | 1:1 | Based on typical available landscape area per tributary area, or equivalent HSC |
| Slope of Pervious Area | ft/ft | 0.05 | See Appendix B |
| Depression Storage of Pervious Area | inches | 0.5 | Based on soil amendments to 4 inch depth improving soil moisture storage capacity by 0.125 inches per inch; actual design of HSCs may vary |
| Manning's Surface Roughness of Pervious Area | - | 0.25 | See Appendix B (tables) |
| $K_{sat}$ of Pervious Area | in/hr | Based on drainage area average developed $K_{sat}$ | See Appendix B (tables) |
| Saturated Hydraulic Conductivity of Pervious Area ($K_{sat}$) | in/hr | Varies based on soil type | See Table 2 |
| Suction Head of Pervious Area | inches | 8.0 | See Table 2 |
| Initial Moisture Deficit of Pervious Area | in/in | 0.3 | See Table 2 |
| Runoff coefficient of impervious plus pervious area | - | 13.3 | Modeled in SWMM. Takes into account infiltration of runoff from impervious area in pervious area. |

The effect of HSCs was accounted in the Monte Carlo model by modifying the runoff coefficient of the areas being disconnected and receiving disconnection. The runoff coefficient of this area was tabulated from SWMM output for each storm event.

### 2.1.7.3. Sub-regional Bioinfiltration/Biofiltration Facilities

The hydraulic performance of each sub-regional bioinfiltration/biofiltration facility is dependent on characteristics of the tributary drainage area (including the amount of parcel-based BMPs and HSCs provided in the tributary drainage area), the volume of the facility, the underlying design infiltration rate, and the outlet control configuration. Therefore, to evaluate the capture efficiency and volume reduction performance of sub-regional facilities, drainage area hydrologic representations and facility hydraulic representations were developed for each facility.

***Drainage Area Representation for Sub-regional Facilities***

The drainage area representation used to evaluate sub-regional facilities was developed using the same approach described in Landmark Village WQTR Appendix B, with the exception that the effects of "nested" parcel-based BMPs and SFD HSCs were approximated by embedding

hydrologic elements in the drainage area representation to represent these BMPs (i.e., hydrologic BMP representations).

To approximately account for the effects of parcel-based BMPs in each sub-regional facility drainage area, “hydrologic representations” of parcel-based BMPs were used. These representations do not account for detailed hydraulic routing, but generally account for the effect of parcel-based BMPs on the overall volumetric response from the drainage area. These representations included increasing the depression storage of selected pervious and impervious areas, and routing impervious area runoff to these “sump” areas based on the distribution of Category 1 and 2 LID BMPs in each WQ drainage area described in Table 5.

To ensure that this representation provides a reasonably accurate approximation of the effects of parcel-based BMPs, the volume reductions resulting from this hydrologic representation were compared to the volume reductions resulting from the more detailed hydraulic representations described in Section 2.1.7.1. The pervious or impervious depression storage values used in the hydrologic representations were adjusted such that the average annual volume reductions due to depression storage losses (i.e., hydrologic representations of parcel-based BMPs) were equivalent to the average annual volume reductions achieved in the hydraulic representations of parcel-based BMP. The adjusted impervious or pervious depression storage depths used for the drainage area hydrologic representations of parcel-based BMP are reported in Table 8 below. The reliability of this approach is discussed in Section 3.2.

**Table 8: SWMM Hydrologic Model Representation of Parcel-based BMPs**

| SWMM Runoff Parameters | Units | Parcel-based LID BMP Type | |
|---|---|---|---|
| | | Category 1 | Category 2 |
| Depression storage, pervious | inches | 21 | 10 |
| Depression storage, impervious | inches | NA | NA |
| Imperviousness | % | 0 | 0 |
| Infiltration Rate | in/hr | 0.375 | 0.15 |
| Average Annual Reduction in Runoff Volume from Hydrologic Representation | - | 53% | 33% |
| Average Annual Reduction in Runoff Volume from Hydraulic Representation (See Table 6) | - | 53% | 33% |

The selected footprint areas of the parcel-based BMPs for these hydrologic representations were determined by scaling the footprint areas generated from the hydraulic parcel-based BMP representations based on the impervious fraction of the drainage area.

To represent the hydrologic effects of SFD HSCs in the sub-regional facility drainage area representation, the portions of the drainage area attributed to SFD rooftops, patios, and walkways

was routed over pervious landscape areas in a one-to-one ratio. Parameters used to represent this disconnection scenario are reported in Table 7.

***Hydraulic Representation of Sub-regional facilities***
Sub-regional bioinfiltration/biofiltration facilities were represented in the SWMM Storage/Treatment block based on the proposed designs of these facilities.

Designs were developed by first estimating the infiltration rate of soils underlying the proposed facility location and identifying any other constraints on infiltration (Table 9).

**Table 9: Sub-regional Facility Design Infiltration Rates**

| Facility Type | Assumed Design Infiltration Rate, inches per hour | Basis for Assumption |
|---|---|---|
| Sub-regional Bioinfiltration Facilities | 0.25 | Seward screening shows areas have infiltration rates greater than 0.5 in/hr. Factor of safety of 2 applied. |
| Sub-regional Biofiltration Facility | 0.25 | Seward screening shows areas have infiltration rates greater than 0.5 in/hr. Factor of safety of 2 applied. |
| On-site Treatment (Media filter of equivalent) | No infiltration assumed | Are may be treated by a variety of proprietary systems that do not promote infiltration. |
| On-site and Off-site Biofilter Swales | NA - Infiltration not modeled explicitly | Because designs of biofilter swales have not been developed for all areas, estimates of volume reductions expected in swales were derived from analysis of the International BMP Database. |

A standard profile for each sub-regional facility was then developed based on the portion of the facility volume that can be dedicated to infiltration and the portion of the facility volume that is treated and released. This is a function of the design infiltration rate of soil under the facility.

Finally, the geometry of the basins was determined via iterative model runs to meet the following criteria:

- Surface storage draws down in less than or equal to 48 hours (subsurface storage in the pore spaces of gravel and suction storage in media pores may persist for longer than 48 hours as this storage does not pose a risk related to vector control or habitat creation).

- The facility captures and retains or treats runoff volumes such that less than 20 percent of the baseline drainage area runoff volume “bypasses” the facility (i.e., is routed around the facility or flows through the facility without significant treatment). The baseline drainage area runoff volume is defined as the volume that would occur without parcel-based BMPs or SFD HSCs. Limiting the sub-regional facility bypass to 20 percent of the baseline volume ensures that the Project performance standard of 80 percent capture is achieved

on a drainage area basis, including the volume reduction effect of BMPs that are nested in the drainage area plus the volume reduction and treatment provided in the downstream sub-regional facility.

After an iterative solution was found that meets these criteria, the capture efficiency and volume reduction were tabulated for each storm event by post-processing SWMM model output. The estimated capture efficiency and volume reduction on a storm-by-storm basis were used to describe hydraulic performance of sub-regional facilities in the Monte Carlo model.

Sub-regional infiltration/ biofiltration facility type and geometries are listed in Table 10.

**Table 10: Sub-regional Bioinfiltration/Biofiltration Facility Geometry**

| **Parameter** | **Units** | **Sub-regional Bioinfiltration Facilities** | **Sub-regional Biofiltration Facility** |
|---|---|---|---|
| Facility Type | -- | Shallow vegetated basins with vegetated media filtration and gravel sump below underdrain | Basin-type BMP with extended detention, biofiltration, and incidental infiltration |
| Facility Volume | ac-ft | Varies by facility | 4.3 |
| Surface Ponding Depth below Overflow | ft | 1.5 | 6 |
| Surface Drawdown Time | hours | 9 | 48 |
| Assumed Design Saturated Hydraulic Conductivity ($K_{sat}$) of Underlying Soil | in/hr | 0.25 | 0.25 |
| Assumed Biofiltration Media Thickness | ft | 2 or greater | 1.5 or greater |
| Water Equivalent Retention Depth below Underdrain | ft | 0.5 | None |
| Subsurface Drawdown Time | hours | 24 | NA |

Table 12 reports long-term hydrologic performance of sub-regional facilities (capture efficiency and volume reduction) as well as the overall drainage area capture and volume reduction inclusive of volume reductions achieved in nested parcel-based BMPs, hydrologic source controls, and sub-regional facilities.

**Table 11: Sub-regional Facility Hydraulic Performance and Drainage Area Total Performance**

| WQ Drainage Area | Total Tributary Area | Composite % Imp | Sub-Regional Facility Capture Efficiency of Runoff Volume | Sub-Regional Facility Volume Reduction of Captured Water | Parcel-based Volume Reduction Upstream of Sub-regional Facility | Drainage Area Total Capture Efficiency | Drainage Area Total Volume Reduction |
|---|---|---|---|---|---|---|---|
| Sub-regional Bioinfiltration Facilities | 203.8 | 57% | 71% | 33% | 32% | 80% | 48% |
| Sub-regional Biofiltration Facility[1] | 56.7 | 78% | 74% | 16% | 24% | 80% | 34% |
| On-site Treatment (Media filter or equivalent) | 8.0 | 45% | 80% | 0% | 0% | 80% | 0% |
| Biofilter Swales (on-site) | 8.2 | 91% | 80% | 20% | 0% | 80% | 20% |
| Biofilter Swales (off-site) | 103.6 | 91% | 80% | 20% | 0% | 80% | 20% |

[1] Includes 2.4 acres of off-site roadway (bridge) that drains to this BMP.

### 2.1.8. **BMP Pollutant Removal**

The Monte Carlo model characterizes BMP pollutant removal as a function of BMP effluent quality (statistical distributions and irreducible concentration) derived from analysis of the International BMP Database (www.bmpdatabase.org). To support the updated BMP plan, the latest version of the BMP Database (obtained 1/13/2011) was queried and analyzed to produce effluent quality distributions characteristic of the types of BMPs included in the updated BMP plan. Project BMP types were matched to the most representative category of BMP in the BMP Database for the purpose of modeling (Table 12).

**Table 12: BMP Effluent Quality Performance Parameters**

| BMP Type | Facility Type | BMP has Treated Effluent? | BMP Database Category for Effluent Quality |
|---|---|---|---|
| Sub-regional Bioinfiltration Facilities | Infiltration and Biofiltration | Y | Media Filter |
| Sub-regional Biofiltration Facility | Extended detention, biofiltration and incidental infiltration | Y | Media filter plus detention basin treatment train |
| Media Filters or equivalent | Flow-based BMPs incorporating media filtration or equivalent treatment mechanisms | Y | Media Filter |
| Biofilter Swales (on- and off-site) | Biofilter Swales | Y | Biofilter |
| Parcel-based Category 1 LID BMPs | Infiltration | N | NA |
| Parcel-based Category 2 LID BMPs | Infiltration and Biofiltration | Y | Media Filter |
| SFD HSC | Infiltration and ET | N | NA |

NA – BMP does not have treated effluent.

Table 13 summarizes the number of data points (individual storm events) and percent non-detects for the pollutants and BMP types of interest for which sufficient data were available. Table 14 summarizes the log-normal statistics that were used in the water quality model, and Table 15 summarizes arithmetic descriptive statistics for those data sets. Table 16 summarizes the irreducible effluent concentration estimates used by for water quality modeling of the proposed condition. A full description of the statistical analysis methods and assumptions used to generate BMP descriptive statistics is contained in Appendix B of the Landmark Village WQTR Appendix B (February 2008). Note that because of a paucity of data in the BMP Database for some pollutants, no treatment was assumed for nitrite ($NO_2$), total aluminum, and chloride, so these constituents are not included on the following summary charts even though they were included in the model. Load reductions are still possible for these pollutants via volume reduction provided in BMPs.

**Table 13: Summary of Number of Data Points and Percent Non-Detects for BMP Effluent Concentration Data from the International BMP Database**

| BMP | | TSS | TP | NH3 | NO3 | TKN | Diss Cu | Tot Pb | Diss Zn |
|---|---|---|---|---|---|---|---|---|---|
| Media Filter | Count | 294 | 292 | 135 | 99 | 263 | 186 | 254 | 185 |
| | % ND | 9% | 8% | 39% | 3% | 3% | 7% | 30% | 21% |
| Detention Basin | Count | 509 | 258 | 85 | 93 | 178 | 173 | 197 | 174 |
| | % ND | 0% | 3% | 7% | 12% | 4% | 32% | 46% | 9% |
| Biofilter (Swale) | Count | 461 | 547 | 361 | 312 | 499 | 255 | 455 | 255 |
| | % ND | 2% | 2% | 15% | 0% | 0% | 3% | 35% | 10% |

**Table 14: International BMP Database Lognormal Statistics of BMP Effluent Concentrations**

| BMP | | TSS | TP | NH3 | NO3 | TKN | Diss Cu | Tot Pb | Diss Zn |
|---|---|---|---|---|---|---|---|---|---|
| Media Filter | Mean | 2.54 | -2.30 | -2.59 | -1.10 | -0.24 | 1.46 | 0.89 | 3.07 |
| | St. Dev | 1.24 | 1.06 | 1.27 | 1.15 | 1.01 | 1.15 | 1.26 | 1.12 |
| Detention Basin | Mean | 2.56 | -1.75 | -2.25 | -2.09 | -0.08 | 1.36 | 1.88 | 2.81 |
| | St. Dev | 1.25 | 1.23 | 0.92 | 1.66 | 1.39 | 0.95 | 1.19 | 1.03 |
| Media Filters plus Detention Basin Treatment Train[1] | Mean | 2.54 | -2.30 | -2.59 | -2.09 | -0.24 | 1.46 | 0.89 | 3.07 |
| | St. Dev | 1.24 | 1.06 | 1.27 | 1.66 | 1.01 | 1.15 | 1.26 | 1.12 |
| Biofilter (Swale) | Mean | 2.66 | -1.78 | -2.44 | -1.68 | -0.30 | 1.81 | 0.91 | 2.76 |
| | St. Dev | 1.06 | 1.17 | 1.37 | 1.01 | 0.94 | 0.69 | 1.36 | 1.05 |

1- MF/DB treatment train is based on lower of observed effluent quality between these two BMP categories. Treatment train effluent quality based on MF for all constituents except nitrate-nitrogen, which is based on DB.

**Table 15: International BMP Database Arithmetic Estimates of BMP Effluent Concentrations**

| BMP | | TSS | TP | NH3 | NO3 | TKN | Diss Cu | Tot Pb | Diss Zn |
|---|---|---|---|---|---|---|---|---|---|
| | *units* | *mg/L* | *mg/L* | *mg/L* | *mg/L* | *mg/L* | *ug/L* | *ug/L* | *ug/L* |
| Media Filter | Mean | 27.54 | 0.18 | 0.17 | 0.65 | 1.32 | 8.28 | 5.42 | 40.25 |
| | St. Dev | 52.86 | 0.26 | 0.34 | 1.08 | 1.77 | 13.65 | 10.75 | 63.56 |
| Detention Basin | Mean | 28.29 | 0.37 | 0.16 | 0.49 | 2.43 | 6.10 | 13.30 | 28.12 |
| | St. Dev | 54.70 | 0.69 | 0.19 | 1.90 | 5.95 | 7.41 | 23.40 | 38.68 |
| Media Filters plus Detention Basin Treatment Train[1] | Mean | 27.54 | 0.18 | 0.17 | 0.49 | 1.32 | 8.28 | 5.42 | 40.25 |
| | St. Dev | 52.86 | 0.26 | 0.34 | 1.90 | 1.77 | 13.65 | 10.75 | 63.56 |
| Biofilter (Swale) | Mean | 25.24 | 0.34 | 0.22 | 0.31 | 1.16 | 7.81 | 6.26 | 27.44 |
| | St. Dev | 36.53 | 0.58 | 0.52 | 0.41 | 1.39 | 6.14 | 14.39 | 38.72 |

1- MF/DB treatment train is based on lower of observed effluent quality between these two BMP categories. Treatment train effluent quality based on MF for all constituents except nitrate-nitrogen, which is based on DB.

**Table 16: International BMP Database Arithmetic Irreducible Effluent Concentration Estimates**

| BMP | TSS | TP | NH3 | NO3 | TKN | Diss Cu | Tot Pb | Diss Zn |
|---|---|---|---|---|---|---|---|---|
| | *mg/L* | *mg/L* | *mg/L* | *mg/L* | *mg/L* | *ug/L* | *ug/L* | *ug/L* |
| Media Filter | 1.49 | 0.03 | 0.01 | 0.01 | 0.24 | 0.99 | 0.20 | 1.35 |
| Detention Basin | 2.99 | 0.09 | 0.34 | 0.02 | 3.78 | 15.16 | 0.27 | 78.83 |
| Media Filters plus Detention Basin Treatment Train[1] | 1.49 | 0.03 | 0.01 | 0.02 | 0.24 | 0.99 | 0.20 | 1.35 |
| Biofilter (Swale) | 2.02 | 0.07 | 0.01 | 0.66 | 0.19 | 2.03 | 0.32 | 4.95 |

1- MF/DB treatment train is based on lower of observed effluent quality between these two BMP categories. Treatment train effluent quality based on MF for all constituents except nitrate-nitrogen, which is based on DB.

# 3. MONTE CARLO MODEL

## 3.1.1. Updates to Model Methodology

The Monte Carlo model framework used to simulated the LID BMP Implementation Plan is identical to that described in Appendix B of the Landmark Village WQTR, however, the model structure (i.e., the way the model is set up) has been modified somewhat to account for the volume and pollutant load reductions achieved through “nested” parcel-based BMPs and SFD HSCs upstream of sub-regional facilities. Accounting for these nested BMP requires another “loop” of pollutant load generation, removal and routing algorithms to be implemented in the model within each sub-regional facility drainage area for each simulated event. An overview of the revised model structure to account for “nested” BMPs is illustrated in Figure 2.

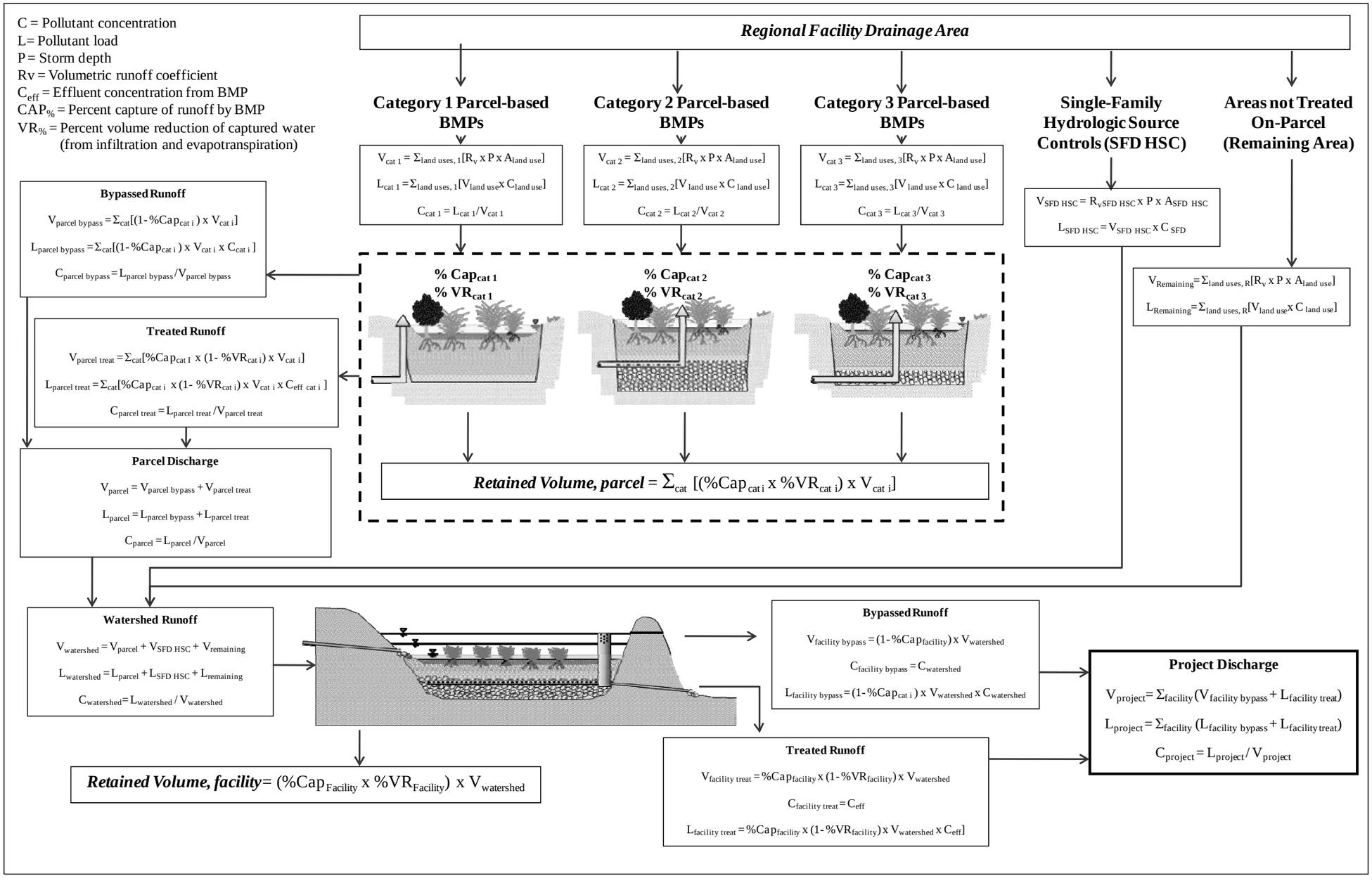


**Figure 2: Monte Carlo Model Schematic with Nested LID BMPs and Hydrologic Source Controls (Generalized Schematic)**

## 3.2.**Model Parameter Reliability and Assumptions**

This section discusses the reliability of new or revised model parameters and assumptions necessary to support the LID BMP Plan.

***Drainage Area Runoff Coefficients and Hydrologic Parameter Sensitivity***

The estimation of runoff coefficients is highly dependent on soil properties (i.e., infiltration potential) and less dependent on parameters such as evapotranspiration (ET) rates, slopes, and surface roughness. Soil properties are estimated as accurately as possible from available soils data, incorporating the latest soil survey conducted by the USDA NRCS as well as locally-developed infiltration relationships provided in the Los Angeles County Hydrology Manual (LACDPW, 2006). The resultant estimates of runoff coefficients that may somewhat overestimate or underestimate stormwater runoff.

Table 17 provides a comparison of assumed project runoff coefficients (developed from SWMM modeling) to applicable references.

**Table 17: Comparison of project runoff coefficients to applicable references**

| **Drainage Area Imperviousness** | **Project Runoff Coefficient Assumptions** (varies by drainage area; range provided) | **LA County Hydrology Manual** (Minimum Cu = 0.1) | **Ventura County Manual,** Silty Clay Soils (Soil Types 2 or 3) | **ASCE/WEF Manual of Practice 23/87** (3rd order polynomial) |
|---|---|---|---|---|
| Reference | Table 3 | LACDPW, 2006 | Ventura County, 2010 | ASCE/WEF, 1998 |
| 90% impervious, developed | 0.88 | 0.82 | 0.87 | 0.73 |
| 60% impervious, developed | 0.6 - 0.62 | 0.58 | 0.61 | 0.41 |
| 30% impervious, developed | 0.33 - 0.36 | 0.34 | 0.36 | 0.23 |
| 1% impervious, undeveloped | 0.03 - 0.07 | 0.11 | 0.11 | 0.05 |

Based on the comparison provided in Table 17, the assumed developed condition runoff coefficients are reasonably consistent with applicable references, although generally somewhat high. Assumed undeveloped condition runoff coefficients are generally lower than applicable references. The combined effect of these trends results in a somewhat higher estimate of impacts associated with the Project and somewhat higher estimate of absolute runoff volumes and associated pollutant loads in the proposed condition. As such, the assumed runoff coefficients are believed to be somewhat conservatively selected and reliable for the purpose of impact analysis.

***Parcel-based BMP Infiltration Feasibility Screening***

The types of parcel-based BMPs applied to commercial, multi-family, institutional, recreation and park land uses was determined based on infiltration feasibility constraints, as described in Section 2.1.3. The criteria used to categorize parcel-based treatment based on infiltration constraints are in agreement with the infiltration constraints listed in the *Ventura Technical Guidance Manual* (Ventura County, 2010), the *LA County LID Ordinance and Manual* (LACDPW, 2009), and the *LID BMP Design, Investigation and Reporting Requirements Administrative Manual* (LACDPW, 2011). Constraints were mapped as accurately as possible at the Tier 2 level of analysis. More detailed site investigation performed at later project phases may result in somewhat different distributions of parcel-based BMPs.

***Parcel-based BMP Infiltration Rates***

Infiltration rates beneath parcel-based BMP were assumed based on input from project geotechnical consultant (Seward, 2011) based on review of geologic information and proposed sources of fill material. While it is expected that infiltration rates may vary across the Project, the assumed values are believed to be representative of anticipated average conditions. Detailed designs will be supported by site-specific infiltration testing and will generally be based on the same design goals used to develop the parcel-based BMP designs simulated in this analysis.

***Parcel-based BMP Model Representations***

For the purpose of estimating the characteristic hydraulic performance (capture efficiencies and volume reductions) of parcel-based BMPs, detailed hydraulic representations were simulated to manage runoff from hypothetical spatially-averaged catchments. The spatially-averaged hypothetical approach provides representative and reliable estimates of hydraulic performance for two key reasons. First, the sizes of parcel-based BMPs scale linearly with tributary impervious area, there it is expected that the nearly identical capture efficiency and volume reduction (as a percent of total runoff volume) would be expected for catchments with a wide range of tributary area impervious fraction. Second, parcel-based BMP designs include significant “equalization storage” above their treatment layer, therefore the effect of catchment size (i.e., time of concentration) is not believed to be sensitive in the estimation of hydraulic performance. Therefore the use of a hypothetical, spatially-averaged catchment is appropriate to generate these inputs.

In order to size parcel-based BMPs for the purpose of analysis, BMP geometries were assumed based on the assumed underlying infiltration rate and the Project design goals for parcel-based BMPs. While the geometry assumed for this analysis is specific to a certain BMP design, the resulting performance parameters derived from this representation are reasonably representative of the hydraulic performance of a wide range of parcel-based BMPs provided that the Project design goals for parcel-based BMPs remain the same.

***Drainage Area Routing and Nested BMP Representations***

Each sub-regional facility drainage area includes areas treated by parcel-based BMPs and/or SFD HSCs. Because the exact location and detailed designs of these parcel-based BMPs and HSCs are not known at the Tier 2 level of analysis, it would be inappropriate to simulate detailed drainage area hydraulic routing to account for these nested BMPs. However, it would also be inappropriate to ignore the role of nested BMPs in the hydraulic performance of downstream region infiltration/ biofiltration facilities. The approach described in Section 2.1.7.3 balances these considerations to provide a reliable estimate of the hydraulic performance of sub-regional facilities that is consistent with the Project performance standards.

***Sub-regional Facility Infiltration Rates and Model Representations***

Infiltration rates in the locations of proposed sub-regional bioinfiltration/biofiltration facilities were estimated based on geologic information, soils data, and limited infiltration testing results available at the time of analysis. To account for uncertainty in these estimates, substantial factors of safety were applied. As such, it is believed that infiltration rates are somewhat conservatively selected for the purpose of this analysis and it is anticipated that higher design infiltration rates may be supported through site-specific analysis conducted at the time of the final hydrology report. Should detailed testing show infiltration rates are lower than assumed, additional design features such as dry wells and/or selectively graded fill material could be used to achieve at least the assumed design infiltration rate.

***BMP Effluent Statistics***

BMP effluent concentrations are based on studies contained in the most recent version of the International BMP Database. These studies are screened to remove data for undersized (i.e., inadequate design criteria) BMPs that are likely to have pollutant removal performance substantially less than the BMPs to be constructed for the Project. This screening is believed to improve the accuracy of BMP performance estimates; however, it is only intended to remove BMPs that are clearly unrepresentative in terms of sizing. The screening process is intended to include BMPs with adequate performance that may not be as well designed or maintained as the structural BMPs for the Project. It is anticipated that the BMPs for the Project will perform as well, if not better than, the projected performance based on the ASCE International BMP Database.

***Assumption of No Correlation between Model Parameters***

The water quality model randomly selects stormwater pollutant concentrations independent of the storm depth or antecedent dry period for each storm event modeled. The validity of the assumption of independence between variables is supported in Appendix B of the Landmark Village WQTR Appendix B. In general, no consistent level of correlation has been demonstrated between stormwater EMCs and rainfall depth or the antecedent dry period.

The assumption of independence of model parameters is believed to result in representative or somewhat conservative estimates post-developed runoff quality and loading, as well as somewhat conservative estimates of Project impacts. First, the empirical distribution of runoff EMCs implicitly includes events with a wide range of antecedent dry periods and event sizes. Therefore, the effects of antecedent dry period and storm depth are implicitly reflected in model estimates. Second, where weak correlations have been observed, concentrations tend to decrease with increasing storm depth. Because bypass from BMPs tends to occur more frequently in larger events and at the end of events, the assumption of no dependence would generally result in higher bypass concentrations, on average, than would be expected if these negative correlations were included. On these bases, random selection of stormwater pollutant concentrations, independent of storm depth and antecedent dry period, is believed to be the most reliable option for the modeling methodology at this level of analysis.

## 4. REFERENCES

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**Geosyntec Memorandum – Evaluation of Equivalency with Los Angeles County Low Impact Development Standards dated August 9, 2010**

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# Memorandum

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|---|---|
| Date: | 09 August 2010 |
| To: | Fred MacMurdo, Newhall Land |
| Copy to: | Mark Subbotin and Alex Herrell, Newhall Land |
| From: | Lisa Austin, Aaron Poresky, and Will Lewis, Geosyntec Consultants |
| Subject: | Landmark Village - Evaluation of Equivalency with Los Angeles County Low Impact Development Standards |

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The purpose of this memorandum is to evaluate the performance of the approved stormwater BMP plan (BMP plan) for the Landmark Village Project (Project) (Vesting Tentative Tract Map 53108) in comparison to the requirements of the *Los Angeles County LID Standards Manual* (*LID Standards Manual*) (Los Angeles County, 2009), and to identify potential modifications to the BMP plan, if necessary, to achieve performance equivalent to the *LID Standards Manual*.

## APPROVED BMP CONTROL PLAN

The stormwater treatment control BMPs planned for the Landmark Village Project are shown on *Landmark Village Tentative Tract Map 53108 Drainage Concept* (Psomas, 4/8/10). Treatment control BMPs consist of one extended detention (ED) basin, eleven bioretention areas, one vegetated swale, and two modular wetland units. The ED basin, identified as BMP-8, will provide treatment for 57 acres (21%) of the Project development area; the 11 bioretention areas will provide treatment for 204 acres (75%) of the Project development area; the vegetated swale will provide treatment for 3.5 acres (~1.5%) of the Project development area; and two modular wetlands will provide treatment for 2.6 acres (~1%) of the Project Development area.

These BMPs are designed per the requirements of the Newhall Ranch Sub-Regional Stormwater Mitigation Plan (NRSSMP) (Geosyntec, 2008). The applicable sizing criterion for the Project's ED basin and bioretention areas is the capture and treatment of 80 percent of the average annual runoff volume, with a drawdown time of 48 hours for the ED basin. This sizing criterion utilizes historical rainfall data with continuous simulation modeling and is consistent with volume-based sizing criterion #2 from the SUSMP Manual. The applicable sizing criterion for the Project's vegetated swale and modular wetlands uses a rainfall intensity based on SUSMP Appendix A,

with a minimum of 0.3 inches per hour, which meets or exceeds flow-based sizing criterion #1 from the SUSMP Manual.

## LID EQUIVALENCY

Los Angeles County's *LID Standards Manual* (Los Angeles County, 2009) outlines stormwater runoff quantity and quality control development principles, technologies, and design standards for achieving the LID Standards of the Los Angeles County LID Ordinance (Los Angeles County, 2008). An analysis was performed to determine whether the LID and treatment control BMPs included in the Project would provide equivalent or greater volume reductions on an average annual basis to that which would be achieved by BMPs designed per the specific requirements of the *LID Standards Manual*. A detailed description of the analysis methodology for evaluating equivalency to the *LID Standards Manual* is provided in Attachment A.

To determine whether LID equivalency would be achieved, a two tiered analysis was conducted. The first tier of the analysis divided the Project area into three categories: (1) open space areas (which inherently have no mitigation requirements under the *LID Standards Manual*), (2) areas where infiltration is potentially feasible, and (3) areas were infiltration is likely infeasible based on infiltration feasibility criteria specified by the *LID Standards Manual*. Infiltration infeasibility screening was conducted by Seward Engineering Geology, Inc. (Seward, 2010) based on criteria contained in the *LID Standards Manual*. See Figure 1 for an illustration of the Tier One infiltration feasibility screening results. The analysis was conducted using conservative assumptions for the *LID Standards Manual* screening criteria so as to categorize more area as being potentially feasible for infiltration than would likely be found to be feasible during the detailed design phase. In this sense, this analysis should result in a conservative (more stringent) evaluation of LID equivalency.

The Tier Two analysis involved:

1) Calculation of the volume reduction that would be achieved by well designed BMPs per the specific requirements of the *LID Standards Manual*, with consideration for the infiltration feasibility screening conducted in the Tier One analysis. Volume reductions were calculated for hypothetical BMPs designed specifically to infiltrate (for those areas where infiltration is potentially feasible) and hypothetical vegetated BMPs designed to treat and release (for those areas where infiltration is potentially infeasible). The latter would likely achieve some volume reduction through incidental infiltration and evapotranspiration. *LID Standards Manual* sizing criteria were considered in these calculations.

2) Calculation of the volume reductions achieved by the Project's BMPs. Volume reductions were based on the type of proposed BMPs and the applicable NRSSMP sizing criteria for these BMPs. Volume reductions included incidental losses in BMPs designed to treat and release stormwater in vegetated BMPs and infiltration from BMPs designed specifically to infiltrate.

3) Comparison of these values.

4) Identifying revisions to the Project BMP plan to ensure LID equivalency, if necessary.

Table 1 provides the assumptions and calculations used to estimate the average annual volume reduction that would be achieved by implementing well designed BMPs per the specific requirements of the *LID Standards Manual* (i.e., the *LID Standards Manual* performance standard) to the Project. The *LID Standards Manual* performance standard is calculated to be an average annual volume reduction of approximately 49 acre-feet per year.

**Table 1: LID Standards Manual Performance Standard Calculations**

| Feasibility Category | Open Space | Infiltration Feasible | Infiltration Infeasible | Total |
|---|---|---|---|---|
| Total Area, ac | 39 | 70 | 184 | **293** |
| Composite Imperviousness[1] | -- | 70% | 61% | **--** |
| Average Annual Runoff Volume, ac-ft/yr | -- | 69 | 161 | **230** |
| Average Annual Capture Efficiency of BMPs Designed per LID Standards Manual[2] | -- | 48% | 48% | |
| Average Annual Volume Reduction of Captured Water for Vegetated BMPs[3] | -- | 100% | 20% | |
| Performance Standard Average Annual Volume Reduction[4], ac-ft/yr | 0 | 33 | 16 | **49** |

[1] Composite imperviousness based on distribution of land uses within each analysis area

[2] Capture efficiency estimated through continuous simulation modeling of 40 years of precipitation, runoff and routing for a hypothetical volume-based BMP sized per the *LID Standards Manual*

[3] Volume reduction assumption for vegetated treat and release BMPs per discussion in Attachment A.

[4] Volume Reduction = Total Runoff Volume * Capture Efficiency * Volume Reduction of Captured Water

The NRSSMP requires that BMPs be designed to capture and treat 80 percent of average annual runoff volume (Geosyntec, 2008). Of this captured volume, the fraction retained in vegetated BMPs and lost to evapotranspiration and/or incidental infiltration is assumed to be 20 percent on average. This is the same assumption used for hypothetical vegetated BMPs in establishing the *LID Standards Manual* performance standard. Additional volume reductions can be achieved by

designing BMPs to infiltrate 100 percent of captured water, where feasible. This would be accomplished through selective grading below these BMPs (where fill thicknesses allow) to enhance infiltration rates or by routing treated discharge from these BMPs to dry wells to be infiltrated below the compacted fill layer. Design enhancements to promote infiltration would be incorporated into the Project plans in the final hydrology design phase.

The Project would be able to demonstrate equivalency to the *LID Standards Manual* by conditioning the BMP plan to provide infiltration of runoff from approximately 13 acres of commercial land use and 3 acres of multi-family land use, or infiltration of runoff from any another combination of land uses providing equivalent average annual volume reduction. Calculations describing this equivalency scenario are provided in Table 2.

**Table 2: Volume Reductions Achieved by Project BMPs**

| Volume Reduction Category | Vegetated Treat and Release BMPs Achieving Incidental Volume Reduction | BMPs Designed to Infiltrate Captured Water (Commercial and/or Multi-Family Land Uses)[5] | Total |
|---|---|---|---|
| Developed Land Uses Tributary to Project BMPs[1], ac | 237 | 16 | 253 |
| Composite Imperviousness of Developed Land Uses Tributary to Project BMPs[2] | 62% | 88% | |
| Total Runoff Volume from Developed Land Uses Tributary to Project BMPs , ac-ft/yr | 211 | 19 | |
| NRSSMP Capture Efficiency | 80% | 80% | |
| Volume Reduction of Captured Water Achieved by Project BMPs [3] | 20% | 100% | |
| **Average Annual Volume Reduction Achieved[4], ac-ft/yr** | **34** | **15** | **49** |
| **LID Standards Manual Performance Standard Volume Reduction, ac-ft/yr (from Table 1)** | | | **49** |

[1] Includes developed land uses only. Some open space land uses may be tributary to Project BMPs, however these land uses do not have an *LID Standards Manual* mitigation requirement. Not accounting for runoff from open space land uses in volume reduction calculations results in a conservative estimate of volume reduction achieved in Project BMPs.
[2] Composite imperviousness based on distribution of land uses within each analysis area
[3] Volume reduction assumption for vegetated treat and release BMPs per discussion in Attachment A.
[4] Volume Reduction = Total Runoff Volume * Capture Efficiency * Volume Reduction of Captured Water
[5] Scenario includes infiltration of runoff from 13 acres of commercial land use and 3 acres of multi-family land use; other configurations may be evaluated as part of final hydrology calculations to achieve equivalent volume reduction.

Table 3 provides the distribution of commercial and multi-family land uses within areas considered potentially feasible for infiltration. Based on the areas where infiltration BMPs are potentially feasible, it will be practicable to modify the BMP plan in the final hydrology design

phase to provide the additional infiltration necessary to provide LID equivalency. Alternative configurations could be employed to achieve equivalent volume reductions, such as (1) infiltrating runoff from a lesser area of commercial land use and compensating by infiltrating runoff from a greater area of multi-family land use, and/or (2) enhancing the volume reduction achieved in the vegetated treat and release BMPs.

**Table 3: Acreage of Commercial Land Use Potentially Feasible for Infiltration**

| Land Use | Surface Infiltration BMPs or Dry Wells Potentially Feasible, acre | Dry Wells Potentially Feasible, acre | Total, Infiltration Feasible, acre |
|---|---|---|---|
| Commercial/ Business Park | 8.7 | 5.2 | 13.9 |
| Multi-Family | 5.0 | 14.4 | 19.4 |

Note: Infiltration BMPs are potentially feasible in portions of other land uses not shown in this table.

Based on this analysis, the approved Project treatment control BMPs, with modifications to incorporate infiltration BMPs or to enhance the infiltration capacity of the treat and release vegetated BMPs during final hydrology design would result in equivalent average annual volume reduction to that which would be achieved by BMPs designed per the requirements of the *LID Standards Manual*, thus would be deemed to be equivalent to the intent and requirements of the *LID Standards Manual*.

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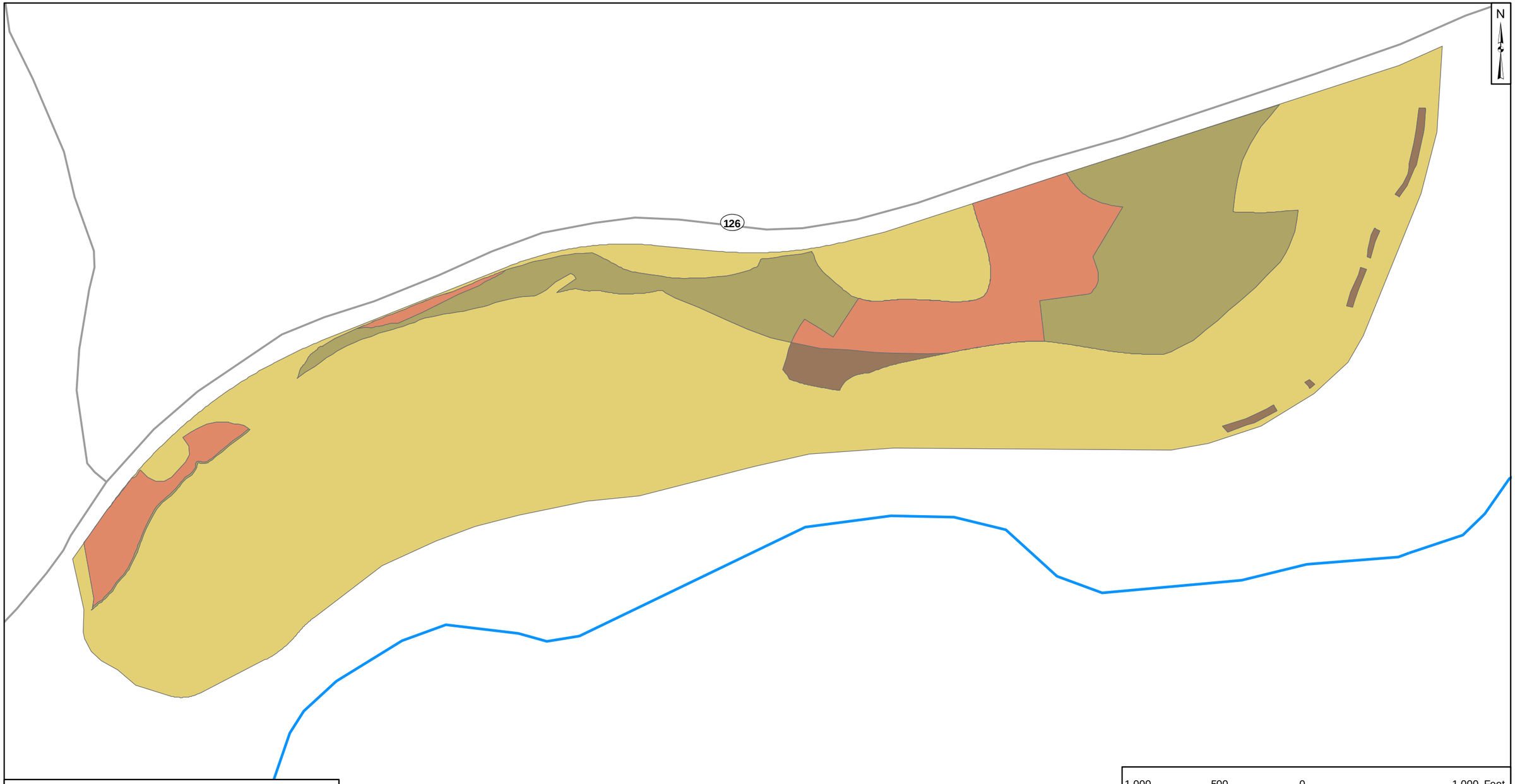


**Legend**

- Santa Clara River
- Major Road

**Infiltration BMP Feasibility**

- Dry Wells Potentially Feasible
- Dry Wells or Surface Infiltration Potentially Feasible
- Surface Infiltration Potentially Feasible
- Infiltration Likely Infeasible

1,000 500 0 1,000 Feet

**Infiltration Feasibility and BMP Screening**

Landmark Village LID Equivalency Analysis

Geosyntec consultants

Oakland | August 2010

Figure **1**

P:\GIS\Newhall\Projects\Landmark\Fig1_LID_Equiv_Analysis.mxd

# Attachment A

## LID Equivalency Analysis Methodology

## ANALYSIS OF EQUIVALENCY OF NEWHALL RANCH SUB-REGIONAL STORMWATER MANAGEMENT PLAN (NRSSMP) PROVISIONS TO *LID STANDARDS MANUAL* REQUIREMENTS

An approach has been developed to compare the provisions of the *Newhall Ranch Sub-Regional Stormwater Management Plan* (NRSSMP) (Geosyntec, 2008) to the requirements of the Los Angeles County *LID Standards Manual*. In this approach, the performance of BMPs design per the NRSSMP performance standard is compared to the performance of BMPs sized per the *LID Standards Manual* requirements. The approach is implemented through a two tiered analysis. The first tier of analysis involves spatial data processing to divide the Project area into analysis regions based on the proposed developed condition and *LID Standards Manual* infeasibility criteria. The second tier involves calculating the volumetric performance of BMPs design per the *LID Standards Manual*, considering feasibility screening completed in Tier One, and calculating the volumetric performance of BMPs designed per the NRSSMP performance standard, and comparing these values.

### Tier One Analysis Methodology

Tier One analysis utilizes spatial datasets and Geographic Information System (GIS) processing to divide the Project into analysis regions based on the *LID Standards Manual* infeasibility criteria listed below. A description of the steps in Tier One analysis follows.

#### *LID Standards Manual* Feasibility Criteria

LACDPW has developed a *LID Standards Manual* that outlines stormwater runoff quantity and quality control development principles, technologies, and design standards for achieving the LID Standards of Chapter 12.84. The *LID Standards Manual* requires that large scale residential and nonresidential development projects prioritize the selection of BMPs to treat stormwater pollutants, reduce stormwater runoff volume, and promote groundwater infiltration and stormwater reuse in an integrated approach to protecting water quality and managing water resources. The volumetric criterion associated with this requirement is the excess volume ($\Delta V$), defined as the post-developed runoff volume minus the pre-developed runoff volume for the 85th percentile storm event (0.75 inches for Los Angeles County).

The Manual states that BMPs should be implemented in the following order of preference:

- BMPs that promote infiltration.
- BMPs that store and beneficially use stormwater runoff.
- BMPs that utilize stormwater runoff for other water conservation uses including, but not limited to, BMPs that incorporate vegetation to promote pollutant removal and runoff volume reduction and integrate multiple uses, and BMPs that percolate runoff through engineered soil and allow it to discharge downstream slowly.

If compliance with the above LID requirements is technically infeasible, in whole or in part, the project must incorporate design features demonstrating compliance with the LID requirements to the maximum extent practicable. The LID goals of increasing groundwater recharge, enhancing water quality, and preventing degradation to downstream natural drainage courses will be considered by DPW in the determination of infeasibility. The *LID Standards Manual* outlines site conditions where infiltration may not be possible:

- Locations where seasonal high groundwater is within 10 feet of the surface.
- Within 100 feet of a groundwater well used for drinking water.
- Brownfield development sites or other locations where pollutant mobilization is a documented concern.
- Locations with potential geotechnical hazards as outlined in a report prepared and stamped by a licensed geotechnical engineer.
- Locations with natural, undisturbed soil infiltration rates of less than 0.5 inches per hour that do not support infiltration-based BMPs.
- Locations where infiltration could cause adverse impacts to biological resources.
- Development projects in which the use of infiltration BMPs would conflict with local, State or Federal ordinances or building codes.
- Locations where infiltration would cause health and safety concerns.

The *LID Standards Manual* outlines where storage and reuse of the $\Delta V$ may not be possible:

- Projects that would not provide sufficient irrigation or (where permitted) domestic grey water demand for use of stored runoff due to limited landscaping or extensive use of low water use plant palettes in landscaped areas.
- Projects that are required to use reclaimed water for irrigation of landscaping.
- Development projects in which the storage and reuse of stormwater runoff would conflict with local, State or Federal ordinances or building codes.
- Locations where storage facilities would cause potential geotechnical hazards as outlined in a report prepared and stamped by a licensed geotechnical engineer.
- Locations where storage facilities would cause health and safety concerns.

**Steps in Tier One**

***Establishing Areas with a ΔV>0***

Proposed land use datasets are queried for areas that will undergo development. Areas that will remain as open space or will be impacted by development but restored to open space conditions will inherently have a ΔV of 0 and are not considered further in the equivalency analysis. Water quality treatment features are considered as open space for screening purposes.

***Subdividing Areas with a ΔV>0 by Treatment Feasibility***

Developed land uses are subdivided into the following feasibility categories:

1. None of the infiltration screening factors listed in the *LID Standards Manual* apply, thus infiltration is potentially feasible.

2. Infiltration is infeasible based on the criteria listed in the *LID Standards Manual*, but storage and reuse may be feasible.

3. Both infiltration and storage and reuse are infeasible based on the criteria listed in the *LID Standards Manual*.

A series of spatial analyses are performed to identify areas within the Project boundary that meet the numeric or narrative infeasibility criteria, as described below.

***Establishing Areas Infeasible for Infiltration***

Areas With Seasonally High Groundwater

Spatial datasets representing contours of depth to seasonally high groundwater[1] less than or equal to 10 feet provided by the Project's geotechnical consultants are intersected with developed areas within the Project boundary to yield the area where infiltration is infeasible due to seasonally high groundwater.

Areas Within 100 feet of a Drinking Water Supply Well

Infiltration infeasibility due to proximity to water supply wells in the Project area are considered if drinking water supply wells are present.

[1] The elevation to which the ground or surface water can be expected to rise during a normal wet season.

Brownfield Development Sites Where Pollutant Mobilization is a Concern

Infiltration feasibility due to the presence of brownfields does not apply to Newhall Land projects as there are no known contaminated soils or groundwater areas within the project boundaries.

Areas Where Natural Soil Infiltration Rates are Less Than 0.5 inches per hour:

The project's geotechnical consultant performs a review of geologic formations and available permeability testing data. Based on this review, the project area is divided into three categories:

1. Areas where permeability testing indicates that the native soils have a permeability rate of greater than 0.5 in/hr,
2. Areas that have not been tested where geologic conditions indicate that native soils may have a permeability of greater than 0.5 in/hr, and
3. Areas where permeability testing at limited locations and geologic conditions indicates that native undisturbed soils likely have permeability rate less than 0.5 in/hr.

The first two categories are assumed to be feasible for infiltration. The third category is assumed to be infeasible for infiltration. The third category is intersected with areas to be developed within the project boundary to yield the area where infiltration is infeasible due to an undisturbed soil infiltration rate likely to be less than 0.5 inches per hour.

Areas Where Geotechnical Hazards are Outlined by a Licensed Geotechnical Engineer

Spatial datasets representing areas where infiltration of stormwater could potentially result in geotechnical hazards are prepared by the project's geotechnical consultants. The project geotechnical consultants consider factors including, but not limited to, presence of landslides that will be left partially or entirely in place after remedial grading, depth of fill, and proximity to cut and fill slopes. Methods and findings are documented in reports and exhibits prepared by the project geotechnical consultants.

Where Infiltration May Cause Adverse Impacts to Biological Resources

Infiltrating the excess volume ($\Delta V$) in some areas may lead to the creation of springs or seeps and/or unseasonal flows in ephemeral tributaries to the Santa Clara River. Spring/seeps and/or unseasonal flows may adversely impact ecosystems adapted to episodic precipitation and event-driven ephemeral flows. Infiltration infeasibility due to adverse impacts to biological resources may be considered if a sophisticated hydrogeologic analysis is available for the project that identifies the potential for the creation of springs or seeps in ephemeral channels within the project.

Areas Where the Use of Infiltration BMPS May Conflict with Building Codes

Current County guidance on setbacks for infiltration facilities includes:

- Property lines & Public Right of Way: 5 ft
- Any foundation: minimum of 15 ft or within a 1:1 plane drawn up from the bottom of foundation
- Face of any slope: minimum of 5 ft or H/2 (H is height of slope), unless otherwise recommended by a Soils Engineer and approved by Geotechnical and Materials Engineering Division.

It is anticipated that complete retention of the excess volume (ΔV) would not be feasible in some land uses due to these considerations. However, for this analysis, infiltration infeasibility due to potential conflict with building codes is not incorporated into spatial processing due to lack of detail in proposed development spatial data layers. It is expected that conflicts with building codes would be evaluated in the final hydrology study.

Areas Where Infiltration May Cause Health or Safety Concerns

At this time, no local, State, or Federal ordinances or statutes that may limit the feasibility of infiltration due to health and safety concerns have been identified. Therefore, infiltration feasibility due to health and safety is not considered in this analysis.

***Merging and Subtracting to Establish Areas Where Infiltration is Infeasible and Feasible***

All spatial datasets representing areas where infiltration is infeasible are merged in the order presented above and dissolved to represent a single surface representing areas with $\Delta V = 0$ (i.e., open space), areas where infiltration is potentially feasible, and areas where infiltration is potentially infeasible based on one or more screening criteria. Merging accounts for any overlapping areas and ensures that double counting does not occur when an area of infiltration feasibility or infeasibility within the developed areas of the project is established.

***Establishing Areas with Storage and Reuse Infeasibility***

Where infiltration is infeasible, the next priority is to store and use ΔV. As the Newhall Ranch projects are all required to use reclaimed water for irrigation of landscaping, storage and use of stormwater (rainwater harvesting) is not required per the feasibility criteria listed in the *LID Standards Manual*.

***LID Where Infiltration and Retention and Storage Are Infeasible***

Where both infiltration and harvesting are not feasible, ΔV must be treated in vegetated BMPs. The remaining water quality design volume may be treated in a non-vegetated BMP if necessary.

## Tier Two Analysis Methodology

The Tier Two analysis sets a performance standard for the project based on the *LID Standards Manual* requirements and compares the performance of project BMPs designed to the NRSSMP standards to the *LID Standards Manual* performance standard. The *LID Standards Manual* performance standard is set based on the estimated long term performance of properly designed LID BMPs per the *LID Standards Manual*, considering the feasibility criteria described above.

### LID Standards Manual Mitigation Volume Requirements Calculation

The *LID Standards Manual* prescribes the following six step method for computing the excess volume:

***Step 1: Determine Hydrologic Parameters***

A) Establish the area that will be disturbed and what areas will be left as open space.

B) Determine the length of flow path and calculate an average slope.

C) Identify soil type

***Step 2: Establish a Design Storm***

A) Identify the 85th percentile 24-hour runoff event.

***Step 3: Calculate Undeveloped Runoff Volume for the Area to be Disturbed***

A) Estimated using the LACDPW $T_c$ Calculator based on area, proportion of impervious area, soil type, associated rainfall isohyet, and flow path length and slope as inputs.

***Step 4: Calculate Developed Runoff Volume for the Area to be Disturbed:***

A) Estimated using the LACDPW $T_c$ Calculator based on area, proportion of impervious area, soil type, associated rainfall isohyet, and flow path length and slope as inputs.

***Step 5: Calculate Excess Runoff Volume (ΔV)***

A) Subtract undeveloped runoff volume from the developed runoff volume to establish ΔV.

***Step 6: Determine Water Quality Treatment Volume or Flow Rate***

A) Infiltrate, capture and reuse, or treat and release ΔV depending on feasibility criteria.

**Alternative Approach for Establishing LID Mitigation Volume Requirements**

The approach described above relies on values (i.e., length of flow path, slope, drainage patterns, etc.) that are not commonly available at a planning level. Therefore, a simplified approach utilizing runoff coefficients is employed for this stage of development planning as an alternative to the approach described above. Establishing runoff coefficients that would likely underestimate undeveloped runoff volume and overestimate developed runoff conditions would yield a $\Delta V$ greater than one established using the more site-specific LACDPW $T_c$ calculator, thus providing a conservative (high) estimate of the *LID Standards Manual* performance standard.

A runoff coefficient of 0.1 was selected for the calculation of runoff from undeveloped areas (LACDPW, 2006). This runoff coefficient is the minimum runoff coefficient recommended for undeveloped areas in Chapter 6 of the LACDPW Hydrology Manual. LACDPW Hydrology Manual equation 6.3.2 for determining developed runoff coefficients (Equation 1) was simplified by setting the undeveloped runoff coefficient to 0.10. The resulting equation (Equation 2) was used to estimate runoff volumes in the existing and proposed conditions:

LACDPW Hydrology Manual: $C_d = (0.9 \times Imp) + (1 - Imp) \times C_u$ (Eqn. 1)

Simplified equation where $C_u$=0.10 $C_d = (0.8 \times Imp + 0.1)$ (Eqn. 2)

Where:

($C_d$) = Developed runoff coefficient

($C_u$) = Undeveloped runoff coefficient

Imp = Percent impervious

The existing condition of the project is assumed to be entirely undeveloped. While some development exists within the project area (e.g., roads and oil extraction areas), this assumption has the effect of increasing the *LID Standards Manual* performance standard and is therefore conservative. The resulting excess runoff volume for the project can be calculated as:

$\Delta V = V_{proposed} - V_{existing}$

$= d*A*[(0.8*Imp + 0.1)] - d*A*(0.1) = d*A*0.8*Imp$ (Eqn. 3)

Where,

d = design storm depth = 0.75 inches

A = tributary area (acres)

Imp = impervious fraction (ranges from 0 to 1)

This equation reduces to:

$$\Delta V \text{ (ac-ft)} = 0.05*A*imp \qquad \text{(Eqn. 4)}$$

**Calculating Performance Associated with LID Standards Manual Mitigation Volume Requirements**

To provide a basis for establishing equivalency, the performance of BMPs designed per the requirements of the *LID Standards Manual* is estimated using a three-part process:

1. Estimate the total average annual runoff volume from developed regions of the project,

2. Divide this volume between areas where infiltration is feasible and infiltration is not feasible,

3. Compute the average annual volume reductions that would be expected for BMPs designed to the standards of the *LID Standards Manual* and apply these reductions to the total runoff volumes computed in (2).

Land use acreages, imperviousness and infeasibility categories tabulated from the Tier One analysis are used to complete the first two steps. The simplified runoff coefficient equations described above are used with an approximate annual average rainfall depth of 18 inches per year[2] to calculate the average annual runoff volumes for developed areas of the project.

In order to estimate the performance of BMPs designed per the requirements of the *LID Standards Manual*, continuous simulation of a hypothetical catchment was conducted. First, a hypothetical BMP was sized to the *LID Standards Manual* requirements (Eqn. 4) for a hypothetical developed catchment. Then USEPA Stormwater Management Model (SWMM) was used to simulate the performance of this BMP over 40 years of historic hourly precipitation records[2]. This analysis assumed a 48-hour drawdown time of the stored volume, which is consistent with the *Los Angeles County Stormwater BMP Design and Maintenance Manual* (LACDPW, 2009). Table 1 reports the SWMM input parameters used for this simulation.

**Table 1: SWMM Simulation Input Parameters**

| SWMM Parameters | Units | Values |
|---|---|---|
| Wet time step | seconds | 600 |
| Wet/dry time step | seconds | 600 |
| Dry time step | seconds | 14,400 |
| Precipitation | inches | 733 (Patched Newhall Gage, COOP 046162, 10/1/1968-10/1/2008)[2] |
| Impervious Manning's n | | 0.012 |

[2] Full discussion of inputs and methodology are contained in NRSP Sub-Regional SWMP, Appendix B (Geosyntec, 2008).

| SWMM Parameters | Units | Values |
|---|---|---|
| Hypothetical drainage area | acres | 1 |
| Shape | | Rectangular, 250 ft flow path length |
| Impervious fraction modeled | | 100% |
| Slope | ft/ft | 0.03 |
| Evaporation | in / mo | 60% of reference ET values for CIMIS Zone 14 |
| Depression storage, impervious | inches | 0.02, based on Table 5-14 in SWMM manual (James and James, 2000) |
| BMP Storage Volume | ac-ft | 0.05 = 1 ac*0.6*100%imp/12 (Eqn. 4) |
| BMP Storage Volume | cu-ft | 2,178 |
| Drawdown Rate | cfs | 0.0126 = 2,178 cu-ft/(48 hrs * 3600 sec/hr) |

The resulting capture efficiency (i.e., the fraction of average annual runoff that is captured and not immediately bypassed by the BMP) was estimated to be approximately 48 percent based on this hypothetical scenario. The assumed impervious fraction of 100 percent is not important for this analysis because both runoff volume and modeled BMP volume have approximately linear dependency on impervious fraction. Sensitivity analyses show that conducting the same analysis with a lower impervious fraction would tend to yield lower capture efficiency and therefore set a lower *LID Standards Manual* volumetric performance standard.

Of the volume "captured," a portion is expected to be retained and a portion is expected to be released to the downstream conveyance system. For infiltration BMPs, captured water is expected to be fully retained up to the design storm event, therefore the total average annual reduction of runoff volume will be equal to the capture efficiency. In areas where infiltration is infeasible, vegetated treatment BMPs may still achieve incidental volume reductions through soil soaking and drying processes (i.e., evapotranspiration) and slower infiltration (unless facilities have an impermeable liner). An analysis of the International BMP Database (Strecker et al., 2004) found that detention basins and biofilters (swale and filter strips) achieved average volume reductions of 30 to 38 percent of captured volume, respectively. This analysis likely included studies of BMPs underlain by highly infiltrative soils. For project areas where infiltration is not feasible, it is likely that incidental volume reduction achieved by vegetated BMPs would be significantly less than that indicated by the Strecker et al. (2004) study. Therefore, for areas of the Project where infiltration is not feasible, it is assumed that 20 percent of the volume captured in vegetated BMPs is retained and lost to either evapotranspiration or incidental infiltration. The remaining 80 percent of captured volume is assumed to be treated and released. These values are multiplied by the average annual capture efficiency to yield the total reduction in average annual runoff volume.

In summary, the *LID Standards Manual* volumetric performance standard is computed as:

$$VR = RV \times \%Cap \times \%VR$$

Where: VR = average annual volume reduction achieved by BMPs designed per the *LID Standards Manual*

RV = the average annual runoff volume without BMPs for developed areas of the Project, divided between areas where infiltration is feasible and areas where infiltration is infeasible

%Cap = long term average capture efficiency = 48% (from SWMM modeling results for hypothetical catchment presented above)

%VR = long term average volume reduction of captured water = 100% (where infiltration is feasible) and 20% (where infiltration is infeasible, derived from Strecker, et al., 2004)

Volume reductions are computed independently for areas where infiltration is likely feasible and where infiltration is likely infeasible. These values are summed to yield the total volumetric performance standard for the project:

$$VR_{PROJECT} = VR_{INF\ FEASIBLE} + VR_{INF\ INFEASIBLE}$$

$VR_{PROJECT}$ is expressed in units of acre-feet per year.

**Calculating Performance of Project BMPs**

The NRSSMP requires that BMPs be designed to capture and treat 80 percent of average annual runoff volume. Of this captured volume, the fraction retained in BMPs and lost to evapotranspiration and/or incidental infiltration is assumed to be 20 percent on average. This is the same assumption used in establishing the *LID Standards Manual* performance standard (see previous section). Where site-specific information and BMP designs are available, the volume reduction achieved by project BMPs is calculated by performing continuous simulations in SWMM that account for infiltration and evapotranspiration.

**Comparing Performance of Project BMPs to LID Standards Manual Performance Standard**

The Tier Two methodology allows for the direct comparison of the volumetric performance of project treatment control BMPs and the *LID Standards Manual* performance standard. In instances where the performance of project BMPs meets or exceeds the *LID Standards Manual* performance standard, the project is deemed equivalent to the intent and requirements of the *LID Standards Manual*. Where project BMPs achieve a portion of the *LID Standards Manual* performance standard, the project would need to be conditioned to achieve the remaining portion of the *LID Standards Manual* performance standard, as feasible, through additional BMPs or enhancements to proposed BMPs.

## REFERENCES

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**The Sanitation Districts' memorandum, along with the SCOPE letter and transcript of the oral testimony**

SANITATION DISTRICTS OF LOS ANGELES COUNTY

STEPHEN R. MAGUIN
*Chief Engineer and General Manager*

# Memorandum

**Date:** March 8, 2011

**To:** Supervisor Michael D. Antonovich, Mayor
Supervisor Gloria Molina
Supervisor Mark Ridley-Thomas
Supervisor Zev Yaroslavsky
Supervisor Don Knabe

**From:** Stephen R. Maguin SR Maguin
Chief Engineer and General Manager

**Subject:** **Response to SCOPE Letter and Testimony to the Board of Supervisors Regarding Formation of the Newhall Ranch Sanitation District (January 18, 2011 Board Agenda Item 25)**

On January 18, 2011, the Board of Supervisors (Board) approved a motion by Supervisor Antonovich directing the Sanitation Districts (Districts) to prepare a memorandum that responds to the issues raised by the testimony of Ms. Lynne Plambeck and Ms. Cam Noltemeyer of the Santa Clarita Organization for Planning and the Environment (SCOPE), and the letter from Ms. Plambeck dated January 13, 2011 (both documents are attached with issues numbered).

The memorandum presents background information on the proposed Newhall Ranch Development and the prior actions by the County and the Districts that provide context for the issues raised. SCOPE's issues are shown in bold followed by the Districts' response.

## I. Background

On March 23, 1999, and, again, on May 27, 2003, the Board certified the environmental documents (collectively, Newhall Ranch EIR) for the Newhall Ranch Specific Plan and Newhall Ranch Water Reclamation Plant (NRWRP). The certified Newhall Ranch EIR evaluated the NRWRP at a project level of detail, and the Board approved the NRWRP under Conditional Use Permit No. 94-087-(5). The NRWRP is to provide treatment of the wastewater generated within the Specific Plan area as well as produce recycled water for the Specific Plan area.

The environmental analysis of the NRWRP is found in Section 5.0 of the Newhall Ranch Revised Draft EIR (March 8, 1999) and Section 3.0 of the Newhall Ranch Revised Additional Analysis, Volume VIII (May 2003). Section 3.0 assessed and updated various NRWRP alternatives including the approved NRWRP site.

The Newhall Ranch EIR contained a mitigation measure (Mitigation Measure 5.0-52), also reflected in the adopted Mitigation Monitoring Plan, requiring formation of a county sanitation district for the Specific Plan area. To fulfill mitigation requirements and establish a logical plan for development of the new district and its infrastructure, the Newhall Land and Farming Company (NLFC) and Sanitation Districts Nos. 26 and 32, later consolidated as Santa Clarita Valley Sanitation District (SCVSD), entered into an agreement (Interconnection Agreement) dated January 9, 2002.

On December 13, 2005, the Board adopted the resolution of intent to form the county sanitation district to be known as the Newhall Ranch County Sanitation District (NRSD). The Board also approved an Addendum to the Newhall Ranch EIR and Additional Analysis, which evaluated the environmental effects of NRSD formation. The Addendum determined that formation of the NRSD would not result in new or substantially more severe environmental impacts than those discussed in the prior Newhall Ranch environmental documents.

Thereafter, the County initiated proceedings for the formation of the NRSD, pursuant to the Cortese-Knox-Hertzberg Local Government Reorganization Act of 2000. On June 14, 2006, the Local Agency Formation Commission (LAFCO) for Los Angeles County adopted a resolution approving formation of the NRSD. On July 27, 2006, LAFCO issued a Certificate of Completion for formation of the NRSD.

On January 18, 2011, the Board considered a resolution confirming formation of the NRSD within the scope of the previously certified Newhall Ranch EIR and Addendum. At the January 18, 2011 Board meeting, representatives from SCOPE expressed their concerns by oral testimony and a letter.

## II. Districts' Responses to SCOPE's Issues

1. "**Without the construction of the Sanitation plant as required by the Newhall Ranch Specific Plan, the public will bear the burden of the expensive clean up of chlorides required to comply with the Clean Water Act. This will entail a sharp increase in sewer fees to the general public."**

   Discharge of Newhall Ranch wastewater to the Valencia Water Reclamation Plant (VWRP) would be temporary until construction of the Newhall Ranch Water Reclamation Plant (NRWRP). The Newhall Ranch wastewater would neither add nor alleviate the SCVSD's financial burden to comply with the Upper Santa Clara River Chloride Total Maximum Daily load (Chloride TMDL).

   The Interconnection Agreement sets conditions under which the first 6,000 homes in Newhall Ranch may temporarily discharge wastewater to the VWRP. The conditions include payment of the standard SCVSD connection fee (fair share of the cost of the existing infrastructure) and transfer of title of the 22-acre NRWRP site to the NRSD. Newhall Ranch residents also would pay the SCVSD an annual service charge to recover the full cost of treating their wastewater at the VWRP. Temporary treatment of wastewater at the VWRP would not eliminate the need for the developer to construct the NRWRP. Prior to building more than 6,000 homes, the developer must construct the NRWRP.

   When operating at flows equal to or below the permitted plant capacity, compliance with the Chloride TMDL will depend on the chloride concentration in the treatment plant effluent. This concentration results from two primary sources: chloride concentration of the local water supply, and increased chloride concentration due to use of the water by the community. Local groundwater is the planned potable water source for the Specific Plan's Landmark and Mission Villages, the two developments whose wastewater might be temporarily treated at the VWRP under the Interconnection Agreement. The groundwater chloride levels for those communities are similar to that of the groundwater used by existing Santa Clarita Valley communities. Thus, no difference in chloride concentration is expected due to the water supply.

   Like Santa Clarita, Newhall Ranch will be a mixture of residential, commercial and industrial land uses. Use of automatic water softeners (AWS) was a significant chloride source for SCVSD wastewater prior to the 2008 ban on AWS. Per Specific Plan mitigation measure 5.0-52(b), the Newhall Ranch developer must request that NRSD ban AWS in Newhall Ranch. Districts' staff will also recommend that NRSD enact an AWS ban similar to the ban in the SCVSD. Consequently, the two communities are expected to produce similar increases in chloride concentrations due to use and similar overall wastewater chloride concentrations. Since final compliance will be determined by concentration, the addition of Newhall Ranch wastewater to the VWRP would neither add to nor alleviate the SCVSD's financial burden to comply with the Chloride TMDL.

2. **"…In addition, the agreement between the Santa Clarita Valley Sanitation District of Los Angeles County (SCV) and Newhall Land and Farming allows up to 6,000 capacity units to be treated at existing SCV wastewater treatment facilities as needed during construction of the Newhall Ranch Water Reclamation Plant. SCV has sufficient capacity to accommodate the use of its facilities." This statement cannot be made because the County is currently in the middle of analyzing the impacts for the first tract maps of Newhall Ranch. No certified EIR exists on either the Landmark tract or the Mission Village**

**tract, which comprise approximately 6,000 units. Further, there is not even a Development Monitoring System analysis for sewer capacity included in the Mission Village EIR as required by the Court Decision in 2003."**

Certification of an EIR is not required to estimate future flows and determine whether there is available capacity at existing treatment facilities. The 2003 Court Ruling by Judge Randall (Case Number S-1500-CV-239324, RDR) does not specify any requirements regarding a Development Monitoring System (DMS) analysis.

Wastewater flow projections for the two Newhall Ranch communities have been reviewed by the Districts. Estimates are 0.3 million gallons per day (mgd) for Landmark Village and 1.0 mgd for Mission Village (collectively 1.3 mgd). The Interconnection Agreement allows for temporary treatment at VWRP for up to 6,000 homes (about 1.6 mgd). The VWRP treated approximately 15 mgd in 2010 and currently has a capacity of 21.6 mgd (yielding 6.6 mgd of surplus capacity). Thus, the VWRP has sufficient capacity to accommodate the temporary use of its facilities as stated in the staff report for the January 18, 2011 Board agenda item. CEQA for the VWRP was addressed by the certified 2015 Santa Clarita Valley Joint Sewerage System Facilities Plan and EIR, which examined the environmental impacts of treating 27.6 mgd of wastewater at the VWRP.

The Newhall Ranch EIRs, certified by the Board in 1999 and 2003, evaluated the environmental impacts related to development of the Specific Plan, including construction of the NRWRP and the new sewage facilities to serve the Specific Plan area. At the project level, the County is in the process of completing further CEQA analysis for both Landmark Village and Mission Village. The CEQA compliance for Landmark Village is contained in the Landmark Village Draft EIR (November 2006), Final EIR (November 2007), and Recirculated Draft EIR (January 2010). CEQA compliance for Mission Village is contained in the Mission Village Draft EIR (October 2010). The EIRs contain a County DMS analysis and evaluate each project's wastewater conveyance/disposal effects including temporary wastewater treatment at the VWRP.

3. "**If the Sanitation Plant is not built in accordance with the mitigation requirements of the Newhall Ranch Specific Plan, the Plan cannot meet its requirements to provide non-potable water or to finance its own infrastructure expansion costs."**

   Temporary use of the VWRP for treatment of Newhall Ranch wastewater does not eliminate the Specific Plan requirement for the developer to construct the NRWRP and finance the new sewerage system. The temporary use of the VWRP addresses practical engineering considerations such as the need to build-up an adequate and steady flow of wastewater before start-up of the NRWRP. Whether Newhall Ranch wastewater is treated at the NRWRP or VWRP, the treated wastewater will be suitable for reuse and offsetting Newhall Ranch water demands.

4. "**Further, the Sanitation discharge permit granted by the Regional Water Quality Board required reverse osmosis treatment for the effluent from this plant. By attempting to evade this requirement, Newhall will put the added burden of removing salts from the Newhall Ranch effluent on the backs of the public."**

   Temporary use of the VWRP for treatment of Landmark Village and Mission Village wastewater does not eliminate the requirement for the developer to construct the NRWRP or finance the new sewerage system within the Specific Plan area. The developer must construct the NRWRP per the Specific Plan and must have it operating properly before the next phase after Landmark Village and Mission Village. As noted in the Item 1 response, temporary treatment of Landmark Village and Mission Village wastewater at the VWRP would neither add to nor alleviate the SCVSD's financial burden to comply with the Chloride TMDL.

   Temporarily treating wastewater from the first 6,000 Newhall Ranch homes at the VWRP is a practical engineering decision based on the need to build up an adequate, steady flow of wastewater before starting up

the NRWRP, especially the reverse osmosis units. Such an approach would match the slower pace of the development but would not eliminate the Specific Plan requirement for construction of the NRWRP.

5. "**The Santa Clarita Sanitation District's failure to meet the Clean Water TMDL standard for chloride of 100 mg/l in the Santa Clara River is a result in part due to the sharp and continuing increase in the use of imported State Water Project (SWP) water as seen by the chart below, (also supplied by the Sanitation Districts). This problem is aggravated by high levels of chlorides in the wells proposed to be used for these tracts, according to information found in both the Landmark and Mission Village DEIRs as indicated in the chart below. Therefore, if Newhall uses the Valencia treatment plant rather than building their own Sanitation Plant as required by the Specific Plan, the chloride levels in the effluent of that treatment plant will be substantially increased. Without the immediate construction of the Newhall Ranch Water Reclamation Plant, approved as an RO (reverse osmosis salt removal system) facility, the high chlorides in the wells proposed to be used by this project in the chart below and the additional imported Nickels water will add to this load."**

   Imported water did not cause the chloride standard to be exceeded. Effluent from the VWRP has exceeded 100 mgd/l since the 1970s despite the fact that imported water was not delivered to Santa Clarita Valley until the 1980s. Nonetheless, as noted in the Item 1 response, the chloride concentrations of Newhall Ranch and SCVSD wastewater are expected to be similar. Thus, temporary treatment of Newhall Ranch wastewater at the VWRP would not change the SCVSD's ability to comply with the Chloride TMDL.

   SCOPE implies that use of Nickel water[1] would contribute to increase the chloride load at the VWRP. While the Landmark Village and Mission Village projects are part of the potable water system for the entire Specific Plan, the projects do not rely on Nickel water to satisfy their potable water demands. As reported in the Newhall Ranch Revised Additional Analysis, Section 2.5, Water Resources (Volume VIII, May 2003), the Nickel water would only be needed in years when the Newhall Ranch agricultural water has been used, which is estimated to occur after approximately the 21st year of project construction. Therefore, the comment regarding use of Nickel water is not appropriate at this time.

6. **"How does a side agreement between the developer and the Sanitation Districts fit into the planning oversight purview of the Board of Supervisors? How can the Planning Department substantiate that sewer service complies with the County Development Monitoring System or is consistent with the general plan or specific plans if developers make side agreements with the Sanitation Districts?"**

   Formation of a new sanitation district was identified in the Specific Plan EIR as a mitigation measure. The Interconnection Agreement was developed to fulfill this Specific Plan requirement and establish a logical plan for the development and administration of the new district and its infrastructure. This agreement ensures that the developer provides the necessary land and infrastructure. The Interconnection Agreement was considered and approved by the Sanitation Districts Nos. 26 and 32 Boards at their January 9, 2002 meetings, which were open to the public. Further, this agreement was referenced in previous County and LAFCO resolutions supporting formation of the new sanitation district.

   As noted in the Item 2 response, the EIRs for both Landmark Village and Mission Village contain County DMS analysis. Moreover, the Newhall Ranch developer is required to build a new sewerage system to serve Newhall Ranch developments and, thus, the Specific Plan does not rely upon existing County sewerage facilities. The Districts and County have coordinated their efforts with regard to establishment of the new sanitation district and its sewerage conveyance system. This coordination enables the County to verify that the development is consistent with the County's General Plan and Specific Plan requirements.

[1] Nickel water refers to a source of potable water owned by NLFC that can be delivered to the Newhall Ranch development to supplement existing sources of potable water.

**7. "The agreement between the developer of the Newhall Ranch Project and the Sanitation District violates the conditions of the Newhall Ranch Specific Plan and puts the Santa Clarita Valley in jeopardy of continued non-compliance with the Clean Water Act Chloride TMDL. We therefore strongly object to this agreement and ask that the Board of Supervisors take action to rectify this issue."**

The Interconnection Agreement is not in conflict with the Specific Plan and does not impact the SCVSD's ability to comply with the Chloride TMDL. As noted in the Item 1 and 4 responses, temporary treatment of Landmark Village and Mission Village wastewater at the VWRP would not eliminate the need for the developer to construct the NRWRP and to finance the new sewerage system, nor would it impact compliance with the Chloride TMDL. As presented in the Item 2 response, the VWRP has available capacity for temporary treatment of Landmark Village and Mission Village wastewater. Thus, no negative impact to the SCVSD's sewerage system is expected, and this approach does not conflict with the Specific Plan's requirement for construction of the NRWRP.

**8. "The public should not have to pay the costs of bringing the chloride level into compliance with an increase to their sewer fees."**

By law, the users of the SCVSD's wastewater system must pay for Chloride TMDL compliance. As noted in the Item 1 and 4 responses, temporary treatment of Newhall Ranch wastewater would neither add to nor alleviate the SCVSD's financial burden to comply with the Chloride TMDL.

**9. "…but for the statement within the resolution that says that "The first 6,000 units of Newhall Ranch will be put through the Valencia Treatment Plant." That's not consistent with the Newhall Ranch that was passed for the formation of this, the Newhall Ranch sanitation plant."**

The temporary treatment of Landmark Village and Mission Village wastewater at VWRP does not conflict with Specific Plan's requirements as described in the Item 4 and 7 responses.

**10. "And we ask that that be struck from the staff report because it seems to be a backdoor way of getting those approved when there's no E.I.R. on that and it's not consistent with the Specific Plan."**

As noted in the Item 4 and 7 responses, temporary treatment of Landmark Village and Mission Village wastewater at the VWRP is not in conflict with the Specific Plan. Prior CEQA compliance was not required because temporary treatment at the VWRP was not proposed until the release of the Draft EIRs for both Landmark Village and Mission Village. Draft EIRs for both projects, including the Landmark Village Recirculated Draft EIR, have been the subject of extensive public review and comment as part of the County's environmental review process.

As stated in the Item 2 response, the environmental implications of the build-out of the VWRP to its capacity were assessed in the SCVSD's certified EIR for the 2015 Santa Clarita Valley Joint Sewerage System Facilities Plan. The Newhall Ranch EIR, evaluated the environmental impacts related to development of the Specific Plan, including construction of the NRWRP to a project level and the new sewerage facilities at a programmatic level to serve the Specific Plan. The County is in the process of completing further CEQA compliance at a project level for both Landmark Village and Mission Village.

**11. "The addendum itself that … was passed … for the formation on the Sanitation District specifically says that the wastewater treatment plant will be built in stages as the specific plan area is developed and will ultimately be sized to treat up to 6.8 million gallons. So it, too, is not consistent with what is being said in the Staff Report. So we wonder how the Sanitation District would have made an agreement like that that's in violation of your environmental documents and the Specific Plan."**

There is no inconsistency between the Staff Report and the Specific Plan. The fact that the Staff Report only addressed the temporary treatment of Newhall Ranch wastewater at the VWRP does not eliminate the Specific

Plan requirement for the developer to build the NRWRP and other sewerage infrastructure to serve the Specific Plan. For more information regarding consistency with the Specific Plan, see the Item 6 response. Regarding claims of violating CEQA, please see the Item 10 response.

12. **"Now we appear before you, and Newhall Land is claiming that they have this agreement with the Sanitation -- actually Santa Clarita Valley Sanitation District of Los Angeles County to allow these 6,000 units to be treated in our existing Santa Clarita wastewater facilities. Those facilities are not reverse osmosis plants. And if this is allowed, it will only create additional problem as far as the chlorides for our community. The reverse osmosis plant that is required with this Newhall Treatment Plant that will take care of chlorides. So definitely, they shouldn't be allowed to use any other treatment plant."**

    Discharge of Landmark Village and Mission Village wastewater to the VWRP will be temporary until construction and startup of the NRWRP. The Landmark Village and Mission Village wastewater would neither add to nor alleviate the SCVSD's financial burden to comply with the Chloride TMDL. For further explanation, see the Item 1 and 4 responses.

13. **"And it's a very, very expensive issue for our community. And we were promised that we would not be funding anything for the Newhall Ranch."**

    Temporary treatment of Landmark Village and Mission Village wastewater at the VWRP would neither add to nor alleviate the SCVSD's financial burden to comply with the Chloride TMDL as explained in the Item 1 and 4 responses.

14. **"And if that's what they're going to do, they have to have additional environmental analysis on it."**

    As noted in the Item 10 response, the EIRs for both Landmark Village and Mission Village evaluate wastewater disposal options including temporary treatment of Landmark Village and Mission Village wastewater at the VWRP. There will be no temporary treatment at the VWRP, unless and until the Board has considered and certified the project EIRs in accordance with CEQA.

Should you have any questions or concerns, please contact me, or Mr. Thomas J. LeBrun at (562) 908-4288, extension 2751 or via email at tlebrun@lacsd.org.

cc: Board of Directors – Santa Clarita Valley Sanitation District
Department of Public Works
Regional Planning Commission

SRM:TJL:ddg

WATER RECLAMATION
SOLID WASTE MANAGEMENT

# COUNTY SANITATION DISTRICTS
## OF LOS ANGELES COUNTY

1955 Workman Mill Road, Whittier, CA 90601-1400
Mailing Address: P.O. Box 4998, Whittier, CA 90607-4998
Telephone: (562) 699-7411, FAX: (562) 699-5422
www.lacsd.org

STEPHEN R. MAGUIN
*Chief Engineer and General Manager*

March 8, 2011

Board of Directors
Santa Clarita Valley Sanitation District
of Los Angeles County

Directors:

**Memorandum to Board of Supervisors – Newhall Ranch Sanitation District**

Enclosed is the memorandum requested by the Board of Supervisors regarding formation of the Newhall Ranch Sanitation District and responses to the issues raised by the Santa Clarita Organization for Planning and the Environment.

Please contact me should you have any questions.

Very truly yours,

Stephen R. Maguin

Stephen R. Maguin

SRM:TJL:ddg

Enclosure

DOC # 1800048

Recycled Paper

**SCOPE**
**Santa Clarita Organization for Planning and the Environment**
TO PROMOTE, PROTECT AND PRESERVE THE ENVIRONMENT, ECOLOGY AND QUALITY OF LIFE IN THE SANTA CLARITA VALLEY
POST OFFICE BOX 1182, SANTA CLARITA, CA 91386

1-13-11

Attn: Executive Office
LA County Board of Supervisors
500 W. Temple St.
Los Angeles, CA 90012

Re: Agenda Item # 25 – Inconsistency with Newhall Ranch Specific Plan
***Please copy to all Supervisors***

Dear Sirs:

It has come to our attention that, while the staff report for this agenda item correctly states the timeline of the formation of the Newhall Ranch Sanitation District, it also includes erroneous information and brings to light an agreement made between the Sanitation Districts and Newhall Land and Farming that is inconsistent with the Newhall Ranch Specific Plan. Further, it misinforms the Board as to the financial impacts of such an agreement.

We ask that the Supervisors, and particularly Mr. Antonovich, as our representative on the Board of Sanitation District 26 and 32, immediately investigate and set aside this agreement. We request that Board of Supervisors, as ultimate oversight authority for the approval and conformity of the Newhall Ranch Specific Plan, object to this agreement between the Newhall Land Co. and the Sanitation Districts. We request that the Board delay approval of this agenda item until this investigation is completed and the staff report is corrected.

We particularly object to these two sections of the staff report:

1. **"FISCAL IMPACT/FINANCING**

   It is anticipated that the operation and maintenance of the District and its facilities would be funded through the imposition of service charges, which would be collected on the tax roll, and construction of the facilities would be financed by the developer for the Newhall Ranch project."

1 **Without the construction of the Sanitation plant as required by the Newhall Ranch Specific Plan, the public will bear the burden of the expensive clean up of chlorides required to comply with the Clean Water Act. This will entail a sharp increase in sewer fees to the general public.**

2. **"IMPACT ON CURRENT SERVICES (OR PROJECTS)**

2 This project will not have an adverse impact on current sewage services because the District will build facilities to serve all new developments within the Newhall Ranch Specific Plan area. In addition, the agreement between the Santa Clarita Valley Sanitation District of Los Angeles County (SCV) and Newhall Land and

Farming allows up to 6,000 capacity units to be treated at existing SCV wastewater treatment facilities as needed during construction of the Newhall Ranch Water Reclamation Plant. SCV has sufficient capacity to accommodate the use of its facilities."

2 **This statement cannot be made because the County is currently in the middle of analyzing the impacts for the first tract maps of Newhall Ranch. No certified EIR exists on either the Landmark tract or the Mission Village tract, which comprise approximately 6000 units. Further, there is not even a Development Monitoring System analysis for sewer capacity included in the Mission Village EIR as required by the Court Decision in 2003.**

## Background

The Mitigation Monitoring Plan of the Newhall Ranch Specific Plan states that:
**SP 4.11-1** The proposed Specific Plan **SHALL**[1] implement a water reclamation plant in order to reduce to specific plan's demand for imported potable water, The Specific Plan **SHALL** install a distribution system to deliver non-potable reclaimed water to irrigate land uses suitable to accept reclaimed water, pursuant to the Los Angeles County Department of Health Standards. **Mitigation 4.11-8 requires Newhall to pay for the cost of water expansion** by paying for connection fees and **Mitigation 4.12-7** ensured the public would not have to pay for the development of Newhall Ranch by requiring that future tracts would have to be annexed into a sewer district.
**SP 4.12-2** A 5.8 to 6.9 mgd water reclamation plant **SHALL** be constructed on the Specific Plan site, pursuant to County, State, and Federal design standards, to serve the Newhall Ranch Specific Plan.
**SP 4-12-3** A Conceptual Backbone Sewer Plan **SHALL** be implemented pursuant to County, state and federal design standards.

Please note: The mitigation monitoring system does NOT say "may", it says, "**SHALL**".

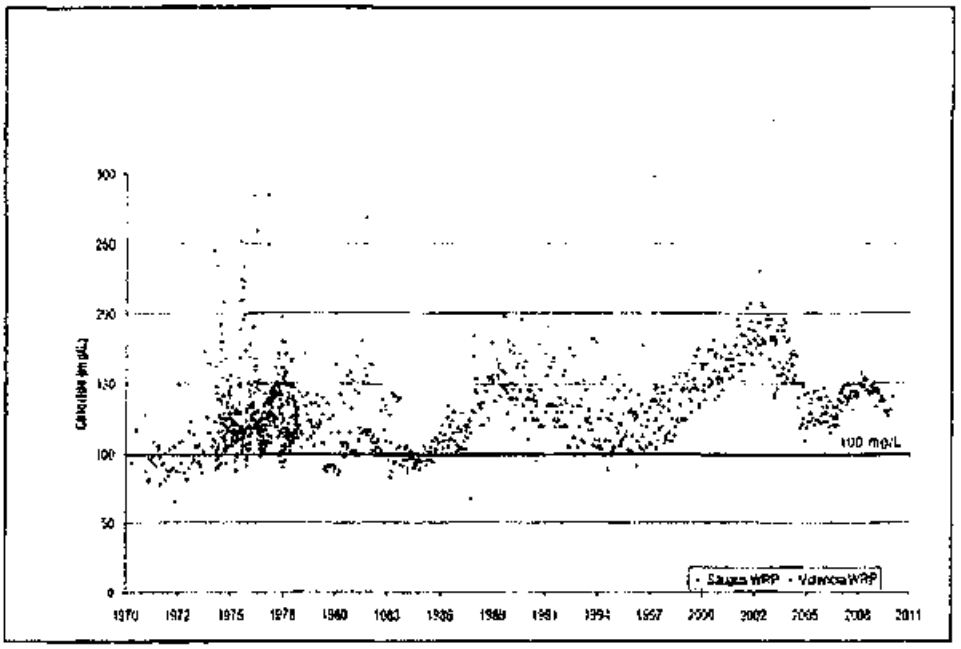
3 If the Sanitation Plant is not built in accordance with the mitigation requirements of the Newhall Ranch Specific Plan, the Plan cannot meet its requirements to provide non-potable water or to finance its own infrastructure expansion costs.

4 **Further, the Sanitation discharge permit granted by the Regional Water Quality Board required reverse osmosis treatment for the effluent from this plant. By attempting to evade this requirement, Newhall will put the added burden of removing salts from the Newhall Ranch effluent on the backs of the public.**

## The CHLORIDE issue

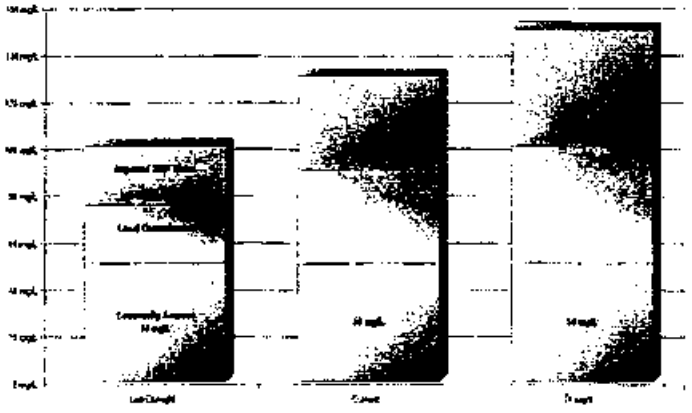
Currently the Sanitation Districts 26 and 32 in the Santa Clarita Valley do not comply with the Clean Water Act Act Total Maximum Daily Load (TMDL) effluent standard of 100 ugl for Cholride as indicated by the chart below supplied at a recent Sanitation District public hearing:

[1] Emphasis added to all "shalls" in this section




5 The Santa Clarita Sanitation Districts' failure to meet the Clean Water TMDL standard for chloride of 100mg/l in the Santa Clara River is a result in part due to the sharp and continuing increase in the use of imported State Water Project (SWP) water as seen by the chart below, (also supplied by the Sanitation Districts).

Chloride Sources During
Drought & Non-Drought Conditions



5 This problem is aggravated by high levels of chlorides in the well proposed to be used for these tracts, according to information found in both the Landmark and Mission Village DEIRs as indicated in the chart below. Therefore, if Newhall uses the Valencia treatment plant rather than building their own Sanitation Plant as required by the Specific Plan, the chloride levels in the effluent of that treatment plant will be substantially increased. Without the immediate construction of the Newhall Ranch Water Reclamation Plant, approved as an RO (reverse

osmosis salt removal system) facility, the high chlorides in the wells proposed to be used by this project in the chart below and the additional imported Nickels water will add to this load.

## Water Quality Constituents of Concern
### Secondary Standards:
**(from Mission Village DEIR Appendix F4.8)**

| Parameter | MCL | DLR | Units | E-14 | E-15 | E-16 | E-17 |
|---|---|---|---|---|---|---|---|
| Chloride | 250-500-600 | NA | mg/L | 75 | 68 | 69 | 74 |
| | pH 6.5 - 8.5 | NA | units | 7.5 | 7.7 | 7.3 | 7.4 |
| Specific Conductance (E.C.) | 900-1600-2,200 | NA | umho/cm | 1240 | 1290 | 1390 | 1360 |
| Sulfate | 250-500-600 | 0.5 | mg/L | 340 | 330 | 340 | 340 |
| Total Dissolved Solids (TDS) | 500-1000-1500 | NA | mg/L | 900 | 890 | 950 | 960 |

## Conclusion and Questions

How does a side agreement between the developer and the Sanitation Districts fit into the planning oversight purview of the Board of Supervisors? How can the Planning Department substantiate that sewer service complies with the County Development Monitoring System or is consistent with the general plan or specific plans if developers make side agreements with the Sanitation Districts? 6

The agreement between the developer of the Newhall Ranch Project and the Sanitation District violates the conditions of the Newhall Ranch Specific Plan and puts the Santa Clarita Valley in jeopardy of continued non-compliance with the Clean Water Act Chloride TMDL. We therefore strongly object to this agreement and ask that the Board of Supervisors take action to rectify this issue. 7

The public should not have to pay the costs of bringing the chloride level into compliance with an increase to their sewer fees. Thank you in advance for addressing these issues. 8

Sincerely,

Lynne Plambeck
President

**LYNNE PLAMBECK:** GOOD AFTERNOON. WHO WOULD YOU LIKE TO START? OKAY. MY NAME IS LYNN PLAMBECK, AND I'M HERE REPRESENTING SANTA CLARITA ORGANIZATION FOR PLANNING AND THE ENVIRONMENT. AND WE'RE CONCERNED ABOUT THIS AGENDA ITEM NOT FOR THE RESOLUTION ITSELF, WHICH IS PERFECTLY CORRECT, BUT FOR THE STATEMENT WITHIN THE RESOLUTION THAT SAYS THAT "THE FIRST 6,000 UNITS OF NEWHALL RANCH WILL BE PUT THROUGH THE VALENCIA TREATMENT PLANT." THAT'S NOT CONSISTENT WITH THE NEWHALL RANCH THAT WAS PASSED FOR THE FORMATION OF THIS, THE NEWHALL RANCH SANITATION PLANT. THE NEWHALL RANCH SANITATION PLANT IS SUPPOSED TO BE A REVERSE OSMOSIS PLANT, WHICH WILL HELP HANDLE THE CHLORIDE PROBLEM WHICH MAYOR ANTONOVICH, I KNOW YOU'RE WELL AWARE OF, AS YOU SIT ON OUR SANITATION DISTRICT AND HAD TO GO THROUGH ALL THOSE HEARINGS. SO OUR OBJECTION IS NOT TO THE RESOLUTION ITSELF, BUT TO THE FACT IN THE STAFF REPORT THAT SAYS THOSE FIRST 6,000 UNITS WILL GO THROUGH THE EXISTING VALENCIA TREATMENT PLANT, OR UP TO 6,000 UNITS. AND WE ASK THAT THAT BE STRUCK FROM THE STAFF REPORT BECAUSE IT SEEMS TO BE A BACKDOOR WAY OF GETTING THOSE APPROVED WHEN THERE'S NO E.I.R. ON THAT AND IT'S NOT CONSISTENT WITH THE SPECIFIC PLAN. THE ADDENDUM ITSELF THAT WAS PASSED FOR THE FORMATION IN 2005 AT L.A.F.C.O. FOR THE FORMATION OF THE SANITATION DISTRICT SPECIFICALLY SAYS THAT THE WASTEWATER TREATMENT PLANT WILL BE BUILT IN STAGES AS THE SPECIFIC PLAN AREA IS DEVELOPED AND WILL ULTIMATELY BE SIZED TO TREAT UP TO 6.8 MILLION GALLONS.

SO IT, TOO, IS NOT CONSISTENT WITH WHAT IS BEING SAID IN THE STAFF REPORT. SO WE WONDER HOW THE SANITATION DISTRICT WOULD HAVE MADE AN AGREEMENT LIKE THAT THAT'S IN VIOLATION OF YOUR ENVIRONMENTAL DOCUMENTS AND THE SPECIFIC PLAN. SO WE ASK YOU TO INVESTIGATE THAT. AND THEN FURTHER WE ASK THAT THIS INFORMATION THAT 6,000 UNITS IS GOING TO GO THROUGH THE VALENCIA TREATMENT PLANT BE STRUCK FROM THE STAFF REPORT. BECAUSE THE NEXT THING THAT WILL HAPPEN IS IT WILL SHOW UP IN THE TRACT MAPS AS THOUGH YOU HAD APPROVED IT. WE DID SEND LETTERS TO EACH SUPERVISOR'S OFFICE. WE'D LIKE TO RESUBMIT THOSE LETTERS AT THIS TIME. THANK YOU. ONLY ENOUGH FOR THE SUPERVISORS. I'M SORRY I DIDN'T PROVIDE IT FOR YOU. THAT'S ALL I HAVE TO SAY, EVEN THOUGH I HAVE 35 SECONDS LEFT.

**SUP. ANTONOVICH, MAYOR:** THANK YOU, LYNNE, GOOD JOKE.

**CAM NOLTEMEYER:** MY NAME IS CAM NOLTEMEYER, ALSO SPEAKING FOR SANTA CLARITA ORGANIZATION FOR PLANNING AND THE ENVIRONMENT. MAYOR ANTONOVICH, I KNOW YOU WERE AT A MEETING IN SANTA CLARITA ALONG WITH A COUPLE OF OUR COUNCIL MEMBERS WITH REGARD TO THE SANITATION DISTRICT TRYING TO PUT UPON THE TAXPAYERS 250 MILLION TO 500 MILLION FOR THE COST OF A REVERSE OSMOSIS TREATMENT PLANT TO REMOVE CHLORIDES TO MEET THE CLEAN WATER STANDARD. BECAUSE OF THAT, THERE WAS A LOT OF PUBLIC PROTEST, AND THAT MEETING DECISION HAS BEEN POSTPONED. AT THAT TIME,

THEY NOT ONLY WERE OBJECTING TO THE COST OF 250 TO 500 MILLION, BUT THEY WERE ALSO CONCERNED ABOUT THE FACT THAT THEY WERE FUNDING THE SANITATION DISTRICT FOR NEWHALL RANCH. AT THAT TIME, THE SANITATION DISTRICT MADE IT VERY CLEAR THAT THAT WOULDN'T HAPPEN. NOW WE APPEAR BEFORE YOU, AND NEWHALL LAND IS CLAIMING THAT THEY HAVE THIS AGREEMENT WITH THE SANITATION -- ACTUALLY SANTA CLARITA VALLEY SANITATION DISTRICT OF LOS ANGELES COUNTY TO ALLOW THESE 6,000 UNITS TO BE TREATED IN OUR EXISTING SANTA CLARITA WASTEWATER FACILITIES. THOSE FACILITIES ARE NOT REVERSE OSMOSIS PLANTS. AND IF THIS IS ALLOWED, IT WILL ONLY CREATE ADDITIONAL PROBLEM AS FAR AS THE CHLORIDES FOR OUR COMMUNITY. THE REVERSE OSMOSIS PLANT THAT IS REQUIRED WITH THIS NEWHALL TREATMENT PLANT, THAT WILL TAKE CARE OF CHLORIDES. SO DEFINITELY, THEY SHOULDN'T BE ALLOWED TO USE ANY OTHER TREATMENT PLANT. THEY CAN BUILD THIS PLANT, AND IT'S QUITE CLEAR IN THE DOCUMENTS WE HAVE HERE THAT THEY CAN BUILD THAT IN STAGES IN THE SAME WAY THEY ARE PLANNING TO BUILD THE HOUSES IN STAGES. SO WE DEFINITELY ARE OBJECTING TO ANY IDEA OF 6,000 UNITS OF NEWHALL RANCH BEING ALLOWED TO USE THE CURRENT SANITATION FACILITIES BECAUSE OF THE CHLORIDE ISSUE. AND IT'S A VERY, VERY EXPENSIVE ISSUE FOR OUR COMMUNITY. AND WE WERE PROMISED THAT WE WOULD NOT BE FUNDING ANYTHING FOR THE NEWHALL RANCH. I HAVE 31 SECONDS, BUT THAT IS ALL I HAVE FOR TODAY, THANK YOU.

14

**LYNNE PLAMBECK:** AND IF THAT'S WHAT THEY'RE GOING TO DO, THEY HAVE TO HAVE ADDITIONAL ENVIRONMENTAL ANALYSIS ON IT.

**SUP. ANTONOVICH, MAYOR:** OKAY.

**MARK DILLON:** MARK DILLON. GOOD AFTERNOON, SUPERVISORS. HERE SIMPLY TO SUPPORT YOUR STAFF AND THE ACTION HERE TODAY THAT IS BEFORE YOU. AND IF THERE ARE ANY QUESTIONS, I'M HERE TO ANSWER THOSE.

**SUP. ANTONOVICH, MAYOR:** OKAY, THANK YOU. THANK YOU. LET ME ASK DEPARTMENT OF PUBLIC WORKS? COULD YOU RESPOND TO THE NUMBER OF ISSUES THAT HAVE BEEN RAISED RELATIVE TO THIS PROPOSAL?

**SPEAKER:** TOM LE BRUN WITH THE SANITATION DISTRICT IS HERE WITH ME. HE MAY BE ABLE TO ANSWER THE QUESTIONS REGARDING THE CONCERNS REGARDING THE 6,000 UNITS.

**TOM LEBRUN:** THE SANTA CLARITA VALLEY BOARD APPROVED AN AGREEMENT WITH NEWHALL LAND AND FARMING IN 2002 WHICH ALLOWED UP TO 6,000 OF THE FIRST HOMES OF THE NEWHALL RANCH DEVELOPMENT TO GO THROUGH THE VALENCIA W.R.P. BUT IT REQUIRES THE NEWHALL COMPANY TO PAY THE SAME RATES THAT ANY OTHER DEVELOPER WOULD HAVE IN SANTA CLARITA SANTITATION DISTRICT, THAT BEING A CONNECTIONS FEE TO BUY INTO THE EXISTING SYSTEM,

AND THEN AN ANNUAL PAYMENT FOR THE COST TO OPERATE AND TREAT THE 6,000, THE WASTE FROM THE 6,000 HOMES. SO THAT AGREEMENT PREDATED SOME OF THE OTHER AGREEMENTS AND ACTIONS THAT THE BOARD AND L.A.F.C.O. HAVE TAKEN PREVIOUSLY. AND I THINK THAT WAS THE ONE QUESTION ABOUT WOULD THERE BE FUNDING BY SANTA CLARITA VALLEY RESIDENTS FOR NEWHALL RANCH? THE ANSWER IS NO. NEWHALL LAND AND FARMING WOULD HAVE TO PAY, JUST LIKE ANY OTHER DEVELOPMENT, TO USE THE VALENCIA W.R.P. I DON'T KNOW IF THERE WAS ANY OTHER SPECIFIC QUESTIONS ON --

**SUP. ANTONOVICH, MAYOR:** SO WHO PAYS FOR THE -- WHEN IT HAS TO BE ENLARGED, WHO PAYS FOR IT?

**TOM LE BRUN:** WHEN THE VALENCIA PLANT WOULD BE ENLARGED --

**SUP. ANTONOVICH, MAYOR:** THE NEW PROPOSAL, THE NEW DEVELOPMENT, IS THAT GOING TO HAVE A BUILT-IN FEE FOR EXPANSION OF THAT UNIT?

**TOM LE BRUN:** THE 6,000 HOMES WOULD USE UP SOME AVAILABLE CAPACITY IN SANTA CLARITA VALLEY. THIS IS A TEMPORARY ARRANGEMENT UNTIL THE NEWHALL RANCH W.R.P. IS CONSTRUCTED. THAT WOULD BE PAID FOR BY NEWHALL LAND AND FARMING. AND THEN THE FLOWS WOULD, INSTEAD OF BEING PUMPED TO VALENCIA, WOULD FLOW BY GRAVITY TO THE NEW TREATMENT PLANT AT THE COUNTY LINE.

**SUP. ANTONOVICH, MAYOR:** SO THEIR ADDITION IS NOT GOING TO MAXIMIZE THE CAPACITY, IT'S GOING TO USE EXISTING RESERVE CAPACITY SO WE DON'T HAVE TO BUILD A FUTURE ONE?

**TOM LE BRUN:** THAT IS CORRECT.

**SUP. ANTONOVICH, MAYOR:** AND THEY'RE GOING TO PAY A FEE TO USE THE EXISTING FACILITY WHILE THE NEW ONE'S BEING CONSTRUCTED?

**TOM LE BRUN:** THAT IS CORRECT.

**SUP. ANTONOVICH, MAYOR:** AND THE EXISTING FEE WILL PAY FOR ALL MAINTENANCE?

**TOM LE BRUN:** YES.

**SUP. ANTONOVICH, MAYOR:** IT WILL COVER THE MAINTENANCE.

**TOM LE BRUN:** THEY WILL PAY A FEE TO CONNECT, WHICH IS THE SAME THAT ANY DEVELOPER WOULD PAY ANYWHERE IN SANTA CLARITA VALLEY SANITATION DISTRICT, AND THEY WOULD HAVE TO PAY EVERY YEAR THE COST TO TREAT THE WASTE FROM THOSE 6,000 HOMES.

**SUP. ANTONOVICH, MAYOR:** WHAT ABOUT THE OTHER ISSUES THAT WERE RAISED?

**TOM LE BRUN:** I AM UNABLE TO TELL YOU BY MEMORY WHAT C.E.Q.A. COVERAGE THERE WAS IN 2002 WHEN THE AGREEMENT WAS PASSED. I JUST DO NOT HAVE THE ANSWER TO THAT. AND IN TERMS OF THE SPECIFIC COVERAGE IN THE NEWHALL SPECIFIC PLAN WITH THE ABILITY FOR THIS WASTEWATER TO TEMPORARILY GO TO THE VALENCIA PLANT, I AM UNAWARE OF THE DETAILS OF HOW THAT ISSUE'S COVERED IN THE NEWHALL RANCH SPECIFIC PLAN, THE E.I.R.

**SUP. ANTONOVICH, MAYOR:** COULD YOU ALSO REPORT TO THE BOARD ON THE POINTS THAT WERE RAISED AND THEIR TESTIMONY SO WE COULD HAVE THAT?

**TOM LE BRUN:** I'M SORRY, I DIDN'T HEAR YOU, SUPERVISOR.

**SUP. ANTONOVICH, MAYOR:** I WOULD LIKE YOU TO RESPOND TO THE BOARD IN A MEMO THE POINTS THAT WERE RAISED BY THE THREE SPEAKERS ON THIS ISSUE.

**TOM LE BRUN:** CERTAINLY.

**LYNNE PLAMBECK:** MR. MAYOR, COULD YOU SPECIFICALLY ASK HIM TO RESPOND TO WHO IS GOING TO PAY FOR THE COST OF THE CHLORIDES IN THE WATER? BECAUSE THERE IS NO REVERSE OSMOSIS.

**SUP. ANTONOVICH, MAYOR:** THAT'S ONE OF THE QUESTIONS THAT YOU RAISED, AND THAT WILL BE INCLUDED IN THAT REPORT.

**LYNNE PLAMBECK:** THANK YOU VERY MUCH.

**SUP. ANTONOVICH, MAYOR:** OKAY, THANK YOU. THANK YOU, THANK YOU. SO MOVED. SECONDED BY SUPERVISOR RIDLEY-THOMAS. WITHOUT OBJECTION, SO ORDERED. ITEM NO. 5. DAVID CZAMANSKE, LAURIE GOULD, CAMRON STONE, GLEN OWENS, AND CAROL, YOU'LL FOLLOW AFTER THE FIRST SPEAKER, OKAY? THAT'S THE ARTICLE FROM THE "WALL STREET JOURNAL." SO THE FIVE OF YOU ARE STILL HERE, RIGHT? COME ON UP AND TAKE YOUR SEAT. OKAY. YOU CAN GO IN THE ORDER YOU WANT.

**LAURIE GOULD:** I'M SPEAKING TO THE ESTABLISH A WORKING GROUP WITH COMMUNITY REPRESENTATIVES TO PROVIDE INPUT TO THE LOS ANGELES --

**SUP. ANTONOVICH, MAYOR:** GIVE YOUR NAME FOR THE RECORD, FIRST SO THAT WE CAN IDENTIFY YOU.

*Prepared for*

**Newhall Land**
25124 Springfield Court, 3rd Floor
Valencia, California 91355-1088

# LANDMARK VILLAGE
# WATER QUALITY TECHNICAL REPORT

*Prepared by*

Geosyntec consultants

engineers | scientists | innovators

1111 Broadway, 6th Floor
Oakland, California 94607

Project Number WW1349

September 2011

# Landmark Village
# Water Quality Technical Report

**Prepared for**

**Newhall Land**
**Valencia, California**

**Prepared by**

**Geosyntec Consultants**
**Oakland, California**

**September 2011**

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## Acronyms

ASCE: American Society of Civil Engineers
BAT: Best Available Technology
BCT: Best Conventional Technology
BMP: Best Management Practice
BOD: Biochemical Oxygen Demand
Cd: Cadmium
CACO3: Calcium Carbonate
CASQA: California Stormwater Quality Association
CDFG: California Department of Fish and Game
CEQA: California Environmental Quality Act
CLWA: Castaic Lake Water Agency
CNLM: Center for Natural Lands Management
CTR: California Toxics Rule

| | |
|---|---|
| Cu: | Copper |
| CWA: | Clean Water Act |
| CWP: | Center For Watershed Protection |
| DCIA: | Directly Connected Impervious Area |
| DDT: | Dichlorodiphenyltrichloroethane |
| DLWC: | Department of Land and Water Conservation |
| EIR: | Environmental Impact Report |
| EMC: | Event Mean Concentration |
| Ep: | Erosion Potential |
| ETo: | Reference Evapotranspiration Rate |
| FIB: | Fecal Indicator Bacteria |
| HOA: | Home Owners Association |
| IPM: | Integrated Pest Management |
| JPA: | Joint Powers Authority |
| LACDPW: | Los Angeles County Department of Public Works |
| LARWQCB: | Los Angeles Regional Water Control Board |
| LID: | Low Impact Development |
| LMD: | Local Maintenance District |
| LSAA: | Lake and Streambed Alteration Agreement |
| MBAS: | Methylene Blue Activated Substances |
| MEP: | Maximum Extent Practicable |
| MGD: | Million Gallons per Day |
| mg/L: | Milligrams per Liter |
| MPN: | Most Probable Number |
| MS4: | Municipal Separate Storm Sewer System |
| NCDC: | National Climatic Data Center |
| NPDES: | National Pollutant Discharge Elimination System |
| NRSP : | Newhall Ranch Specific Plan |
| NSWQ: | National Storm Water Quality Database |
| O&M: | Operations and Maintenance |
| PAH: | Polycyclic Aromatic Hydrocarbons |
| Pb: | Lead |
| PCB: | Polychlorinated Biphenyl |
| PDF: | Project Design Feature |
| PIPP: | Public Information and Participation Program |
| RMDP: | Resource Management and Development Plan |
| RWQCB: | Regional Water Quality Control Board |
| SAR: | Sodium Adsorption Ratio |
| SCR: | Santa Clara River |
| SEA: | Significant Ecological Area |
| SMA: | Special Management Area |
| SQMP: | Stormwater Quality Management Plan |

| | |
|---|---|
| SWMP: | Stormwater Mitigation Plan |
| SUSMP: | Standard Urban Stormwater Mitigation Plan |
| SWPPP: | Storm Water Pollution Prevention Plan |
| SWRCB: | State Water Resources Control Board |
| TDS: | Total Dissolved Solids |
| TKN: | Total Kjeldahl Nitrogen |
| TMDL: | Total Maximum Daily Load |
| TN: | Total Nitrogen |
| TP: | Total Phosphorus |
| TPH: | Total Petroleum Hydrocarbons |
| TRM: | Turf Reinforcement Mat |
| TSS: | Total Suspended Solids |
| USEPA: | United States Environmental Protection Agency |
| USGS: | United States Geological Survey |
| WEF: | Water Environment Federation |
| WDR: | Waste Discharge Requirements |
| WMA: | Watershed Management Area |
| WMC: | Watershed Management Committee |
| WRP: | Water Reclamation Plant |
| WQTR: | Water Quality Technical Report |
| Zn: | Zinc |

# 1 INTRODUCTION

This revised report, September 2011, addresses the potential impacts of the proposed Landmark Village Project (the Project), a portion of the Newhall Ranch Specific Plan, on water quality in the Project's receiving waters, the Santa Clara River. To evaluate impacts of the Project on water quality, pollutants of concern are identified based on regulatory and other considerations. Potential changes in water quality are addressed for pollutants of concern based on runoff water quality modeling, literature information, and professional judgment. Impacts take into account Project Design Features (PDFs) selected consistent with the Los Angeles County Municipal Separate Storm Sewer System (MS4) National Pollutant Discharge Elimination System (NPDES) Permit, including the Standard Urban Stormwater Mitigation Plan (SUSMP) requirements. The level of significance of impacts is evaluated using a weight of evidence approach considering significance criteria that include predicted runoff quality for proposed versus existing conditions, MS4 Permit and Construction General Permit requirements, and reference to receiving water quality benchmarks, including Total Maximum Daily Load (TMDL) wasteload allocations and water quality standards from the Basin Plan and California Toxics Rule.

This Landmark Village Water Quality Technical Report (WQTR) has been revised to, among other things, reflect the following LID Performance Standard, which has been adopted for the Newhall Ranch Specific Plan subregion:

> LID PDFs will be selected and sized to retain the volume of stormwater runoff produced from a 0.75 inch storm event to reduce the percentage of Effective Impervious Area (EIA) to 5 percent or less of the total project area within the Newhall Ranch Specific Plan. Runoff from all EIA will be treated with effective treatment control measures that are selected to address the pollutants of concern and are sized to capture and treat 80 percent of the average annual runoff volume. Compliance with the LID Performance Standard will be evaluated for each village within the Resource Management and Development Plan (RMDP) as part of the Tier 2 Water Quality Technical Report process. Each Tier 2 project must demonstrate that the LID Performance Standard is achieved cumulatively considering the retention volume provided by the project itself and all previous projects within the RMDP area.

Further detail on implementation of the LID Performance Standard is provided in Section 5.2 of this WQTR.

The report also assesses the potential for post-development stormwater runoff discharge rates, velocities, and durations to cause accelerated stream erosion and to impact stream habitat, and includes PDFs to address these potential impacts.

The purpose of this WQTR is to assess the Project's potential impacts on surface water and groundwater quality and hydrology in the receiving surface waters and to identify Project Design

Features for inclusion in the Project. Geosyntec Consultants has prepared a Newhall Ranch Specific Plan Sub-Regional Stormwater Mitigation Plan (NRSP Sub-Regional SWMP) (Geosyntec, 2008). This Landmark Village WQTR is an independent component of, and is consistent with, the framework for stormwater water quality and hydromodification management established by the NRSP Sub-Regional SWMP, serves as the Tier 2 project report for Landmark Village, and shows compliance with the tiered planning process established in the NRSP Sub-Regional SWMP.

The U.S. Army Corps of Engineers (Corps) and the California Department of Fish and Game (CDFG), as lead agencies, have prepared a joint Final Environmental Impact Statement/ Environmental Impact Report (EIS/EIR) for the Newhall Ranch Resource Management and Development Plan (RMDP) (SCH No. 200001125) (Corps and CDFG, 2010). The Newhall Ranch RMDP consists of those measures and project design features necessary to avoid, minimize and mitigate the adverse biological effects of improvements, facilities, and activities associated with implementation of the Newhall Ranch Specific Plan that will require federal and state permits and agreements from the Corps and CDFG. Essentially, the RMDP is the biological mitigation program for the Newhall Ranch Specific Plan. The RMDP has been prepared to plan, define, and govern the implementation of various avoidance, minimization and mitigation measures required for implementation of the Newhall Ranch Specific Plan, including onsite and offsite drainage facilities, bridges, building pads, roads, trails, and facilities associated with the approved Newhall Ranch WRP.

Potential hydrologic impacts related to stormwater volume and velocity from the 50 year storm event and the 50 year Capital Flood event are addressed in “Landmark Village Tentative Tract Map 53108 Drainage Concept” prepared by Psomas (Psomas, 2009) and the “Flood Technical Report” prepared by Pacific Advanced Civil Engineering, Inc. (PACE) for the Landmark Village Project (PACE, 2009). Potential biological impacts of the Landmark Village Project are addressed in the Landmark Village Final EIR, prepared by Impact Sciences, Inc. (Impact Sciences, 2011). An engineering analysis of streambed fluvial stability in the Santa Clara River also has been prepared by PACE (PACE, 2006).

The approved Newhall Ranch Specific Plan was the subject of extensive environmental review in the previously certified Newhall Ranch Program EIR (State Clearinghouse No. 1995011015) and related Revised Additional Analysis, Volume VIII (May 2003). The Specific Plan was assessed at the program level as part of the environmental analysis conducted for the Newhall Ranch Specific Plan. Portions of that analysis, including the certified Flood Section (Section 4.2 – Newhall Ranch Specific Plan EIR) and the certified Revised Additional Analysis (Section 2.3, Floodplain Modifications), have been used in the development of this Project WQTR.

# 2 ENVIRONMENTAL SETTING

## 2.1 Physical Setting

The Project site is located within the Newhall Ranch Specific Plan area, which is in an unincorporated portion of Los Angeles County, approximately 30 miles northwest of downtown Los Angeles. The site is in the Santa Clarita Valley, west of Interstate 5. The developed portion of the Project (tract map site) lies between the banks of the Santa Clara River to the south, SR-126 to the north, the confluence of Castaic Creek and the Santa Clara River to the east, and Chiquita Creek to the west (Figure 2-1). For the purposes of this report, the "Project developed area" refers to the proposed location of the Landmark Village development, while the "Project site" includes the tract map site, the borrow site and related haul routes, the Chiquito Canyon grading site, the utility corridor, and the potable and recycled water tank sites.

The Project impact boundary depicted on Figure 2-1 includes the developed portion of the Project (Landmark Village tract map site), as well as areas that will be temporarily disturbed during the construction phase of the Project, which includes the borrow site and other areas of grading, and areas where underground utilities will be installed.

The proposed tract map site lies on a flat terrace above the Santa Clara River. The majority of the tract map site is currently used for agricultural purposes and is subject to agricultural disking. Topography across the site is relatively flat, with elevations ranging from 800 feet to 960 feet above mean sea level (msl). Habitat on the Project site varies in quality from high biological value in riparian areas adjacent to the Santa Clara River channel, to highly disturbed habitat such as upland agricultural areas. According to the Antelope Valley Area Soil Survey (Soil Conservation Service 1970), nine soil types occur on the Project site: Sandy alluvial land, Metz sandy loam, Hanford sandy loam (0 to 2%), Hanford sandy loam (2 to 9%), Sorrento loam (0 to 2%), River wash, Saugus loam (30 to 50%), Castaic and Saugus soils, and Zamora loam.

Fill has been placed on the tract map site as a result of road construction, utility line placement, and agricultural activities. Fill also exists at various locations on both borrow sites, ranging from minor spill fills to large dumped fill pads associated with historical uses.

The proposed borrow site is characterized by sloping hillsides and adjacent agricultural use. The borrow site is dominated by coastal sage scrub and mixed chaparral, but also includes several small areas of non-native grassland and live oak woodland. Elevations on the borrow site range from approximately 920 feet (near the Santa Clara River) to 1260 feet above msl. The Chiquito Canyon grading site is dominated by agricultural/disturbed areas, non-native grassland and coastal sage scrub vegetation. Elevations at this grading site range from approximately 970 feet (near SR-126) to 1,190 feet above msl.

The drainage area that encompasses the tract map site consists of six sub-basins that independently drain toward the Santa Clara River (Psomas, 2009). There are currently no existing drainage or erosion/sedimentation control improvements located within the site other than minor agricultural drainage ditches and an insignificant amount of earthen bank protection along the Santa Clara River (PACE, 2009). A jurisdictional delineation of waters and streambeds was conducted in accordance with the Corps protocol in 2003 (Impact Sciences). The tract map site is generally bordered to the east by Castaic Creek, to the south by the Santa Clara River and to the west by Chiquito Canyon Creek. These drainages are under the jurisdiction of the Corps. The Chiquita Landfill area drains through an agricultural drain located in the central portion of the tract map site that is also under the jurisdiction of the Corps. There are no other drainage features within the Project boundaries that are under the jurisdiction of the Corps.

The Project lies downstream from two water reclamation plants. The Saugus Water Reclamation Plant (WRP) is located 5 miles upstream from the Project, across Bouquet Canyon Road at Soledad Canyon Road, and the Valencia Water Reclamation Plant is located 1.5 miles upstream, just north of Magic Mountain Parkway at the Old Road. Both treatment plants discharge treated wastewater into the Santa Clara River upstream from the Project.

## 2.2 Project Area Land Uses

The Project site is located within the Newhall Ranch Specific Plan (NRSP) area, which was approved by the Los Angeles County Board of Supervisors in May 2003. The Newhall Ranch Specific Plan is a comprehensive document that guides future development of the Newhall Ranch property and serves as the zoning for the entire Specific Plan area. The Specific Plan contains a conceptual development plan, development regulations, design guidelines, and implementation mechanisms consistent with the goals, objectives, and policies of the Los Angeles County General Plan and Santa Clarita Area Plan. The NRSP is a large, master-planned development including approximately 21,000 homes and 19,000 jobs, along with recreational and mixed uses and public facilities. A complete description of the land uses included in the NRSP can be found in the Newhall Ranch Specific Plan (SCH # 1995011015; May 2003).

The proposed Project is to develop the 292.6-acre Landmark Village tract map site, located within the boundary of the approved Newhall Ranch Specific Plan. To facilitate development of the Landmark Village tract map site, several off-site project-related components would be developed on an additional 750.9 acres of land that, for the most part, is within the approved Specific Plan boundary.[1] The land uses proposed as part of the project are consistent with the Newhall Ranch Specific Plan. The Land Use Plan contained within the NRSP designates the Landmark Village Project for single and multi-family residential, commercial, and recreational

[1] Portions of the proposed utility corridor, the proposed potable water tank site (located within the Valencia Commerce Center business park) and the proposed recycled water tank (located within the Valencia Industrial Center business park) are outside the boundary of the Newhall Ranch Specific Plan.

land uses. Existing land use in the developed portion of the Project area consists completely of agricultural production.

In response to comments received on the Landmark Village Recirculated Draft EIR (RDEIR) from CDFG, the County has directed the applicant to submit a revised Vesting Tentative Tract Map (revised project) that, among other design components, reflects an additional riparian buffer, or setback, that reduces impacts to riparian resources that fall within CDFG's jurisdiction. In response to the County's directive, the applicant has designed a revised project. Specific to CDFG's comments, the setback proposed by the applicant as part of its revised project occur along the west bank of Castaic Creek between SR-126 and the confluence of Castaic Creek and the Santa Clara River, and along the northern and southern banks of the Santa Clara River.

Key changes to the proposed project resulting from refinements made in response to CDFG's comments and at the County's direction are summarized as follows:

- Development Footprint: The size of the development footprint on the project tract map site would decrease by 16.9 acres (a 7 percent decrease in the development footprint).
- Bank Stabilization and Outlets: The linear feet of buried bank stabilization along portions of the Santa Clara River would decrease by 357 feet, from 18,600 to 18,243 feet. The number of outlets to the Santa Clara River would decrease from 13 to 9.
- Open Space: Within the open space project component, the total amount of open space would increase from approximately 65 to 76.7 acres, for an overall increase of 11.7 acres.

Other changes resulting from the key revisions to the proposed Project include the following:

- Residential: The total number of residential dwelling units would remain unchanged at 1,444 units. Within the residential project component, however, the number of single-family units would decrease from 308 to 270 units (a reduction of 38 units); the number of multi-family units would increase from 1,080 to 1,105 units (an increase of 25 units); and the number of mixed-use/multi-family units would increase from 56 to 69 units (an increase of 13 units). The range of single-family lot sizes would change from 4,500/5,500/6,000 square feet to 4,500/5,000/5,500 square feet, and the average density of residential development would change as follows: single-family density would increase from 6.3 to 7.3 units per acre (du/acre), multi-family density would decrease from 14.6 to 14.0 du/acre, and mixed-use/multi-family would increase from 9.5 to 16.8 du/acre.
- Mixed-Use/Commercial: While the total square footage of commercial space would remain unchanged at 1,033,000 square feet, the acres of mixed-use commercial area would decrease from 33.9 to 25.1 acres (a decrease of 8.8 acres, or 26 percent), and the average floor-to-area ratio (FAR) would increase from 0.7 to 0.9 (an increase of 0.2).

- Elementary School: The size of the elementary school lot would increase from 9.2 to 9.7 acres.
- Park and Ride: The size of the park-and-ride lot would decrease from 1.0 to 0.8 acres. [2]

The land use areas analyzed in this revised WQTR, which reflect the revised project design, are listed in Table 2-1 below and illustrated in Figure 2-2.

**Table 2-1: Summary of Revised Land Use Program Analyzed**

| Land Use Designation | Landmark Village Project (Acres) |
|---|---|
| Single-Family[1] | 53.9 |
| Multi-Family | 82.9 |
| Commercial[2] | 27.3 |
| School | 9.7 |
| Road[3] | 41.6 |
| Open Space | 51.2[4] |
| Park | 10.1 |
| Recreation | 5.8 |
| Water Quality Facility | 10.1 |
| *Total* | *292.6* |
| Off-Site Commercial (Water Tanks) | 8.0 |
| Off-Site Road[5] | 98.0 |
| Total Area | 398.6 |

1 16.7 acres of residential roads are included in the Single-Family land use category.
2 Commercial land use acreage includes Mixed-Use/Commercial, Fire Station, and Park and Ride land uses.
3 Road land use includes minor roads (private drives and access road) and major roads, and excludes 16.7 acres included in Single-Family, and 0.7 acres of Light Rail Reservation, which is included in Open Space.
4 18.5 acres of open space were not included in the water quality model.
5 Off-site roads consist of 2.4 acres of off-site bridge to the south and 95.6 acres of SR-126 right of way to the north.

The two sources of non-potable supplies needed to meet the Project's non-potable water demand (e.g., irrigation) are recycled water from the planned Newhall Ranch WRP and from the existing Valencia WRP. The Newhall Ranch WRP's treatment capacity is planned to be 6.8 mgd of wastewater generated by the Specific Plan, all of which ultimately would be treated at the Newhall Ranch WRP, and upon tertiary treatment, recycled for landscape irrigation purposes (except for wet winters periods when irrigation demands would be lower, requiring the discharge of unused recycled water to the Santa Clara River).

The Newhall Ranch WRP, to be located along the Santa Clara River in the western edge of the Specific Plan site, is planned to be constructed in stages as the Specific Plan is developed over time. In the interim, the Santa Clarita Valley Sanitation District (SCVSD) will treat the

2 The revised VTTM would not change the size of the proposed fire station lot; it would remain 1.3 acres in size.

wastewater from the first 6,000 residential dwelling units within the Specific Plan (up to 1.6 mgd) at the existing Valencia WRP as needed prior to construction/operation of the first phase of the Newhall Ranch WRP. The interim use of the Valencia WRP is contemplated by the 2002 Interconnection Agreement entered into between Newhall and the Sanitation District Nos. 26 and 32 (later consolidated as the SCVSD).

As proposed in the interim period, treated effluent from the Valencia WRP would be piped to the proposed chloride reduction facility adjacent to the Valencia WRP for demineralization (using reverse osmosis or equivalent). Treated effluent would be piped back to the Valencia WRP and blended with treated effluent so that up to approximately 6,000 units (approximately 1.6 mgd) of effluent generated by Newhall Ranch Specific Plan in the interim condition would be discharged at less than 100 mg/L for chloride. The brine by-product of the chloride reduction process would be piped within the Project's utility corridor north along The Old Road, west on Henry Mayo Drive and north on Commerce Center Drive to the brine disposal facility, located in the Valencia Commerce Center, just north of Castaic Creek. The piping necessary north of the utility corridor along Commerce Center Drive also would be installed within the existing roadway. The brine would be injected deep into the Pliocene Pico and Miocene Modelo formations at this location (the location of these facilities is shown on Figure 2-1). Piping needed to transport effluent from the demineralization facility to the injection wells would be sized to the satisfaction of the Sanitation District. The applicant has applied to the U.S. Environmental Protection Agency (USEPA) for approval to construct the brine injection facility.

The Newhall Ranch Revised Draft EIR (March 8, 1999) contains a project-level analysis of the potential significant environmental impacts associated with construction and operation of the approved Newhall Ranch WRP. This Landmark Village WQTR addresses the potential impacts of recycled water use for irrigation on groundwater quality and considers the potential cumulative impacts of WRP discharges on water quality and hydromodification in the Santa Clara River.

## 2.3 Associated Off-Site Project Components

In addition to the 292.6-acre tract map site, the Project also includes grading and/or development at off-site project locations.

### 2.3.1 Long Canyon Road Bridge

The Project includes construction of the Long Canyon Road Bridge. The bridge is intended as the primary bridge crossing over the Santa Clara River providing access to the central portions of the Newhall Ranch Specific Plan. The bridge will span approximately 1,050 feet over the Santa Clara River, with a width of approximately 100 feet. Support for the bridge will involve construction of 11 piers within the river corridor. Each pier will be spaced approximately 100 feet apart. Additionally, abutments and bank stabilization would be required on both sides of the bridge to protect against erosive forces.

### 2.3.2 Borrow Site

Site preparation would include a cut and fill grading operation with fill being imported to the tract map site from a borrow site located south of the tract map site. To elevate the Project development above the floodplain of the Santa Clara River, soil would be imported from a borrow site located within Adobe Canyon (Figure 2-1). The borrow site is located south of the Santa Clara River and is bounded by Long Canyon to the west. The total drainage area for the site is about 215 acres and flows generally northwest and westerly. The majority of the land is undeveloped with steep to moderate slopes.

The borrow site grading plan would excavate and reshape the hills and depressions forming the ridge separating Long and Adobe Canyons. Much of this work would occur along the top and bluffs of an unnamed plateau located just west of Sawtooth Ridge. This plateau ranges in elevation from a low of 1,130 feet at its northern most point to a high of 1,220 in the southeast, which is characterized by an increasingly steeper grade. The proposed grading plan would excavate the southeastern portion of this plateau, creating a gentler slope leading up to the top of the ridge. The resultant manufactured slope angle would range from 5:1 to 2:1 (horizontal/ vertical). The grading plan also would alter the western facing slope leading up to the plateau, creating a bench separated by two manufactured slopes stepping down the west-facing ridgeline defining Adobe Canyon at a 3:1 grade.

Additional earthwork is planned at the terminus of Adobe Canyon where a series of excavations will result in a manufactured slope approximately 100 feet in height at a relatively uniform 3:1 grade. A series of benches, swales and debris basins will also be constructed to collect, convey and release runoff in a controlled manner. The fill excavated from the Adobe Canyon area would be transported across the Santa Clara River to the tract map site using existing at-grade agricultural crossings. All of this area is within the development footprint approved with the Newhall Ranch Specific Plan.

Also in response to CDFG's comments, the revised project and related grading activities in Adobe Canyon have been modified to avoid impacts to spineflower. Specifically, a minimum of 300-foot buffer area has been established to ensure protection of the spineflower occurrence in the Adobe Canyon area, unless or until that area is authorized for take in the future as part of CDFG's issuance of the incidental take permit for the spineflower. The County will only approve a Landmark Village proposed project that is consistent with the CDFG-approved Final SCP (2010).

### 2.3.3 Chiquito Canyon Grading Site

To accommodate Project-necessitated improvements to SR-126 and debris basins for storm water flows that are collected by the Project storm drainage system, approximately 120 acres of land directly north of SR -126 and within Chiquito Canyon would be graded. The Conceptual Grading Plan would lower the area of the property near the intersection of Chiquito Canyon

Road with SR-126 by approximately 60 feet when compared to the existing elevation. Rather than a gradual incline that extends upward at an increasingly greater grade, the reshaped slope would approximate the grade of SR-126 for about 1,500 feet east of the intersection with Chiquito Canyon Road. At this point, the grading plan creates a manufactured slope that extends upward at a uniform 3:1 grade reaching a high of 1,160 feet above msl. A series of benches, swales and debris basins will also be constructed to collect, convey and release runoff in a controlled manner. The fill would be excavated from this area and placed as fill in the adjacent areas. All of this graded area is within the development footprint of the NRSP.

### 2.3.4 Water Tanks

Potable water would be conveyed to the tract map site from two separate water tank sites. One tank is proposed north of the SR-126 within the existing Valencia Commerce Center business park. The second potable water tank would be located within the borrow site, in an area to be graded as part of the proposed soil transfer. The Project would also implement a portion of the Specific Plan's recycled water storage and distribution system with the conversion of an existing potable water tank on Round Mountain (east the tract map site and east of Interstate 5 within the Valencia Industrial Center business park) to a recycled water tank. For the purpose of the impact analysis, the area for the water tanks and access roads to the tanks was estimated to be a total of eight acres.

### 2.3.5 State Route 126 Improvements

Improvements to State Route 126 (SR-126) would be constructed in conjunction with the project. A 95.6 acre portion of the SR-126 project, extending from just west of the intersection of Commerce Center Drive and SR-126 to the western edge of Landmark Village, including the widening of the Castaic Creek/SR-126 Bridge, has been included in the Project analysis. Along with the bridge deck widening, bridge abutments are to be widened to approximately 500 linear feet (LF) of creek length of reinforced concrete transitioning to soil cement through 50 LF of creek length of rip-rap.

### 2.3.6 Utility Corridor

The Project also includes a 110-acre utility corridor that runs parallel to SR–126, from the western boundary of the tract map site to the approved Newhall Ranch WRP near the Los Angeles County/Ventura County line, from the eastern boundary of the tract map site to the Old Road and then south to the Valencia WRP. The utility corridor would serve to extend municipal services to the site. The utilities will be placed underground and a maintenance access road and potential future trail would be constructed above ground. As the impact area for the maintenance access road and trail have not yet been determined, the impacts of these Project components are assessed qualitatively in this report.

## 2.4 Proposed Drainage Improvements – Project and Santa Clara River

The proposed improvements on the Project site that would occur in and adjacent to the Santa Clara River, including bank stabilization, storm drain outfalls and associated energy dissipaters, and construction of Long Canyon Road Bridge across the River are described below. At limited locations on the Project site, such as at outlet structures, access ramps, or bridge abutments, grouted rip-rap or reinforced concrete would be used to minimize erosion. Approximately 18,243 LF of the River and Creek bank would be provided with buried soil cement protection. This would include approximately 10,643 LF fronting the tract map site and 6,400 LF on the south bank downstream (west) of the Long Canyon Road Bridge. Additional buried bank stabilization would be constructed as part of the approved Newhall Ranch WRP and between The Old Road and the Santa Clara River (protecting the utility corridor). The bank protection between the Old Road and the Santa Clara River was approved as part of the Santa Clara River Natural River Management Plan (NRMP). Approximately 6,600 LF of Turf Reinforcement Mat (TRM) or similar bank stability protection would be provide along the southern edge of the utility corridor downstream or west of the tract map site. Additional flood protection improvements would include the Long Canyon Road Bridge abutments (including rip rap) and piers, the widening of the bridge abutments (including rip rap) of the SR 126/Castaic Creek Bridge, and the various outlet structures and energy dissipaters both on-site and off-site. Finally, the above flood control improvements may necessitate the need for dewatering activities. These activities would be subject to the applicable requirements of the LARWQCB.

### 2.4.1 Proposed Project Drainage Improvements

Runoff from the six off-site drainage areas that drain through or onto the developed portion of the Project site, as defined by the Psomas Landmark Village Drainage Concept Report (Psomas, 2009) would continue to flow through the Project site. Runoff from the developed portions of the Project would be channeled through the proposed stormwater conveyance system and would be discharged to the Santa Clara River through nine new outfalls after passing through the water quality treatment BMPs (see Section 5.3 for further detail). As required in the Los Angeles County Department of Public Works memorandum entitled, “Level of Flood Protection and Drainage Protection Standards,” all on-site drainage systems carrying runoff from developed areas are to be designed for the 25-year Design Storm (Urban Flood), while storm drains under major and secondary highways, open channels (main channels), debris carrying systems, and sumps will be designed for the Capital Flood.

### 2.4.2 Energy Dissipaters

To reduce storm flow velocities and prevent erosion at stormwater discharge points into the River, energy dissipaters consisting of either rip-rap or other larger reinforced concrete standard impact-type energy dissipaters would be constructed at the approximately nine storm drain outlets into the River, pursuant to the requirements of the Newhall Ranch Resource Management and Development Plan. These energy dissipaters would slow the rate of flow of runoff into the

River to prevent erosion of the stream channel. Additional dissipaters would be located at the outlet of Chiquito Creek and Long Canyon Creek.

### 2.4.3 Bank Stabilization

The Conceptual Backbone Drainage Plan of the Newhall Ranch Specific Plan provides drainage and flood control protection to developed uses while preserving the Santa Clara River as a natural resource. The Drainage Plan utilizes several criteria that are to be implemented by projects that develop within the Specific Plan area. The primary criteria are as follows:

> Flood corridor must allow for the passage of Los Angeles County Capital Flood discharge without the permanent removal of natural River vegetation (except at bridge crossings);
>
> The bank stabilization for the River will generally be established outside of the "waters of the United States" as defined by federal laws and regulations and as determined by the delineation completed by the Corps in August 1993;
>
> Where the Corps delineation width is insufficient to contain the Capital Flood flow, the flood corridor will be widened by an amount sufficient to carry the Capital Flood flow without the necessity of permanently removing vegetation or significantly increasing velocity; and
>
> Soil cement will occur only where necessary to protect against erosion adjacent to the proposed development. Where existing bluffs are determined to be stable and there is no adjacent proposed development, no bank protection will be built.

Most of the proposed bank protection would consist of buried soil cement to provide scour and freeboard flood control protection. Soil cement bank protection provides a stable riverbank protection material, in terms of both surface erosion and structural stability. Additionally, soil cement bank protection will be mostly buried. After installation, the bank area is revegetated with native vegetation.

## 2.5 Receiving Water Bodies and Beneficial Uses

### 2.5.1 Santa Clara River

The Project will discharge from its storm drain and water quality control facilities directly to Santa Clara River Reach 5[3], downstream of its confluence with Castaic Creek.

[3] The SCR is divided into reaches for purposes of establishing beneficial uses and water quality objectives. However, there are two reach classifications, one established by the Los Angeles Regional Water Quality Control Board (LARWQCB) and one established by the United States Environmental Protection Agency (USEPA). Both of these reach classifications are used by the LARWQCB and the USEPA in various documents, which at times is a source of confusion. This report will use the LARWQCB reach numbers.

The Water Quality Control Plan for the Los Angeles Region (Basin Plan) (LARWQCB, 1994, as amended) lists beneficial uses of major water bodies within this region (Table 2-2). Santa Clara River Reach 5 is listed and has specific beneficial uses assigned to it. As identified in Table 2-2, the existing beneficial uses of Santa Clara River Reach 5 include the following:

MUN*: Conditional potential municipal and domestic water supply

IND: Industrial activities that do not depend primarily on water quality

PROC: Industrial activities that depend primarily on water quality

AGR: Agricultural supply waters used for farming, horticulture, or ranching

GWR: Groundwater recharge for natural or artificial recharge of groundwater

FRSH: Natural or artificial maintenance of surface water quantity or quality

REC1: Water contact recreation involving body contact with water and ingestion is reasonably possible

REC2: Non-contact water recreation for activities in proximity to water, but not involving body contact

WARM: Warm freshwater habitat to support warm water ecosystems

WILD: Wildlife habitat waters that support wildlife habitats

RARE: Waters that support rare, threatened, or endangered species and associated habitats

WET: Wetland ecosystems

**Table 2-2: Beneficial Uses of Surface Receiving Waters**

| Water Body | MUN | IND | PROC | AGR | GWR | FRSH | REC1 | REC2 | WARM | WILD | RARE | WET[1] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Santa Clara River (Hydrologic Unit 403.51) | P* | E | E | E | E | E | E | E | E | E | E | E |

[1] Waterbodies designated as WET may have wetlands habitat associated with only a portion of the waterbody. Any regulatory action would require a detailed analysis of the area.

E – Existing beneficial use; P * – Asterixed MUN designations are conditional potential MUN designations[4].

Source: Water Quality Control Plan for the Los Angeles Region (Basin Plan) (LARWQCB, 1994, as amended)

The NRSP area is located within the Santa Clara River Hydrologic Basin and associated watershed, which is 1,634 square miles in area. The portion of the Santa Clara River watershed that is located generally upstream or east of the Ventura County/Los Angeles County jurisdictional line is approximately 640 square miles in size, and drains portions of the Los Padres National Forest from the north, the Angeles National Forest from the north and northeast, and the Santa Susana Mountains from the south and southeast. The Santa Clara River extends approximately 5.5 miles east to west across the NRSP area. The NRSP area comprises 2.9 percent of the Santa Clara River watershed upstream of the Los Angeles County/Ventura County line, 1.1 percent of the total Santa Clara River watershed, and approximately 58 percent of the 20,724-acre tributary drainage area. The Landmark Village project site comprises 972 gross acres within the 1,634 square-mile Santa Clara River Basin watershed.

The Santa Clara River (SCR) watershed drains an area in the Transverse mountain range of southern California. The SCR flows generally west from its headwaters near Acton to the Pacific Ocean near the City of Ventura, approximately 40 miles downstream of the Project location. The river exhibits some perennial flow in its eastern-most stretches within the Angeles National Forest, then flows intermittently westward within Los Angeles County. The principal tributaries of the upper river watershed in Los Angeles County are Castaic Creek, Bouquet Canyon Creek, San Francisquito Creek, and the South Fork of the Santa Clara River. Placerita Creek is a large tributary draining the western-most end of the San Gabriel Mountains; it joins the South Fork, which flows directly into the Santa Clara River. Castaic Creek is a south-trending creek that confluences with the Santa Clara River upstream and adjacent to the Project. Castaic Lake is a DWR-owned reservoir located on Castaic Creek. San Francisquito Canyon Creek is an intermittent stream in the watershed adjacent to Bouquet Canyon to the southeast. Elevations

[4] On December 5, 2001, the U.S. Federal District Court issued an order that effectively invalidated USEPA's requirement that the asterisked MUN designated uses (MUN* uses) in the Los Angeles Basin Plan be immediately enforced. See Order granting plaintiffs' motion for summary judgment and remanding action to USEPA, No. CV 00-08919 R(RZx), *City of Los Angeles et al. v. United States Environmental Protection Agency*, dated December 18, 2001. See also letter dated February 15, 2002, from Alexis Strauss, USEPA Region IX, to Celeste Cantu, Executive Director, California SWRCB: "…waters identified with an ("*") in Table 2-1 do not have an MUN as a designated use until such time as the State undertakes additional study and modifies its Basin Plan." USEPA also stated that this conditional use designation has no legal effect.

within the watershed range from sea level at the river mouth to 8,800 feet at the summit of Mount Pinos in the northwest corner of the watershed.

The principal sources of water contributing to the base flow of the Santa Clara River are: (a) groundwater from the Alluvial aquifer basin in Los Angeles County, which seeps into the riverbed near, and downstream of, Round Mountain (located just below the mouth of San Francisquito Creek); (b) tertiary-treated water discharged to the Santa Clara River from two existing Los Angeles County Sanitation District WRPs -- the Saugus WRP, located near Bouquet Canyon Road bridge, and the Valencia WRP, located immediately downstream of I-5 (for locations, see Figure 2-1); and (c) in some years, DWR-released flood flows from Castaic Lake into Castaic Creek during winter and spring months (CH2M Hill, 2005). The Saugus WRP has a permitted dry weather average design capacity of 6.5 million gallons per day (mgd) creating surface flows from the outfall to near Interstate 5. The Valencia WRP outfall is located immediately downstream of the Interstate 5 bridge and has a permitted dry weather average design capacity of 21.6 mgd, creating surface flows extending through the Project area and into the far eastern portion of Ventura County. The combined average treated discharge from both WRPs between January 2004 and June 2007 was approximately 20 mgd.

The reach of the SCR within and adjacent to the Project has multiple channels (braided). This kind of system is characterized by high sediment loads, high bank erodibility, and intense and intermittent runoff conditions. Combined with the relatively flat gradient of the SCR at this point (less than one percent), the SCR has a high potential to aggrade (deposit sediment) at low flow velocities (PACE, 2006a).

The following description of the physiography, climate, flows, and vegetation of the Santa Clara River are summarized primarily from Assessment of Potential Impacts Resulting from Cumulative Hydromodification Effects, Selected Reaches of the Santa Clara River, Los Angeles County, California (Balance Hydrologics, provided in Appendix F).

***Physiography***

The Santa Clara River flows through a complex, tectonically-active trough. Some of the most rapid rates of geologically-current uplift in the world are reported from the Ventura anticline and San Gabriel Mountains, just to the northwest and southeast, respectively, of the river. Slopes are very steep, with local relief of 3,000 to 4,000 feet being common. These faults bring harder, more resistant sedimentary rocks over softer and younger sedimentary formations, but all formations are fundamentally soft and erodible. On either side of the faults, sandstone and mudstones prevail. The northeastern and southeastern corners of the watershed are underlain by deeply-weathered granitic and schistose rocks, which produce sands that are coarser than those of other rock units when they weather and erode. The San Gabriel fault crosses the valley, bringing slightly more resistant rock to the surface and creating a local base level reflected as a slight rise or ‘bump’ on the river’s longitudinal profile.

Most geologic materials in the watershed decompose mainly to silts, clays, and sand, with some coarser materials. Most sediment moved by the Santa Clara River and its main tributaries is fine, with less than 5 percent bedload-sized material (>0.25 mm, or about 0.01 inches in diameter). Some gravels and cobbles do occur within the beds of the stream and in their alluvium. Nonetheless, both the bed and the sediment transported by the river tend to be finer than in most Southern California watersheds.

***Flows***

Downstream of the Valencia WRP, the SCR is perennial past the Los Angeles County/Ventura County line to approximately Rancho Camulos. Flows in the SCR can also be affected by groundwater dewatering operations or by diversions for agriculture or groundwater recharge. Throughout the Santa Clara River channel, there are complex surface water/groundwater interactions where both gaining and losing river segments are found. Downstream of the County line, however, the Santa Clara River flows through the Piru groundwater basin, which represents a "Dry Gap" where dry-season surface flows are interrupted and streamflow is lost to groundwater.

The SCR is underlain by several distinct alluvial groundwater basins in Ventura County—the Piru, Fillmore, and Santa Paula Basins. These basins are divided longitudinally by sills or ridges of bedrock that support areas of locally-high (shallow) groundwater, including the area upstream from the County line (above the Piru Basin), and upstream from the mouth of Sespe Creek (the transition between the Piru and Fillmore Basins). This locally-high groundwater sustains summer baseflow and riparian vegetation within the SCR corridor even through relatively dry climatic cycles.

Flows in the SCR, as in most southern California streams, are highly episodic. For the gaged period between 1953 and 1996, annual flow at the Los Angeles County/Ventura County line gage ranged between 253,000 acre-feet (1969) and 561 acre-feet (1961). Annual peak flows at the County line between 1953 and 1996 ranged from 68,800 cfs (1969) to 109 cfs (1960). Of note is that the second highest annual peak, 32,000 cfs in 1966, was less than half of the highest peak (68,800 in 1969). These large episodic events have a significant impact on the geomorphic characteristics of the Santa Clara River mainstem.

After studying the response of the river to several different anthropogenic and natural disturbances, Balance Hydrologics (2005) concluded that the Santa Clara River, as with many streams in semi-arid southern California, is highly episodic. Concepts of "normal" or "average" sediment-supply and flow conditions have limited value in this "flashy" environment, where episodic storm and wildfire events have enormous influence on sediment and storm flow conditions. In these streams, a large portion of the sediment movement events can occur in a matter of hours or days. Other perturbations which can potentially affect channel geometry appear to have transitory or minor manifestations. For example, effects on SCR channel width due to the 1980s levee construction was barely discernible by the first few years of the 21st

century, probably mostly due to morphologic compensation associated with the storm events in the mid- to late-1990s. As a result, channel morphology, stability, and character of the Santa Clara River is almost entirely determined by the "reset" events that occur within the watershed.

***Vegetation and Habitat Types***

Much of the watershed upstream of the Newhall Ranch Specific Plan area receives rainfall averaging about 18 to 25 inches per year. As throughout Southern California, rainfall in the Santa Clara watershed alternates between wet and dry periods, a variation that is central to understanding the geomorphic history of the watershed. Wet cycles tend to persist for several years, sometimes for periods of 6 or 8 years, during which rainfall, although variable, may average about 140 to 150 percent of the long-term average. For the woody riparian vegetation along the banks and on islands in the braided channels, these are crucial periods for establishment and growth. During dry cycles, the roots of the riparian vegetation must grow downward to the water table or perched zones, and where it cannot do so, this band of vegetation will die back.

The existing SCR channel contains a variety of vegetation types (Impact Sciences, 2003). The active SCR channel is mostly barren due to scouring by seasonal storm flows. However, vegetation types on the adjacent terraces vary based on elevation relative to the active channel bottom and the frequency of flooding. The following series of vegetation types occur along a vertical gradient from the channel bottom to the highest SCR terrace on the floodplain: emergent herbaceous, woody shrubs, and trees.

The Santa Clara River corridor at the Project site supports three general categories of habitat (Impact Sciences, 2003): (1) aquatic habitats, consisting of flowing or ponded water; (2) wetland habitats, consisting of emergent herbs rooted in ponded water or saturated soils along the margins of the active channel; and (3) riparian habitat, consisting of woody vegetation along the margins of the active channel and on the floodplain. Both year-round and seasonal aquatic habitats are provided and are subject to periodic disturbances from winter flood flows. These flows inundate areas that are dry most of the year. They also carry and deposit sediment, seeds, and organic debris; form new sandbars and destroy old ones; and erode stands of vegetation. New stands of vegetation are created where vegetation becomes established by seeds or buried stems. Thus, the aquatic habitats of the river are in a constant state of creation, development, disturbance, and destruction.

### 2.5.2 Tributaries to the Santa Clara River

Several tributaries drain into the Santa Clara River adjacent to the Landmark Village Project site, including Chiquito Canyon and Long Canyon, which enter the River downstream of the Project site, and Castaic Creek, which enters the River upstream of the Project site (Figure 2-1). Project runoff from the developed portion of the Project will not be discharged to the tributaries; all Project runoff will be discharged to the Santa Clara River after receiving treatment in the Project

PDFs. Construction phase activities (borrow sources and grading) will occur in areas that drain to Adobe Canyon, Long Canyon, and Chiquito Creek.

The Chiquito Canyon, Long Canyon, and Castaic Creek watersheds are characterized by both rugged and steeply developed foothills that have numerous smaller tributary canyons that dissect the watershed, connecting to the narrow alluvial valley associated with the main stem drainage. Approximately 90 percent or more of the watersheds' area consists of rugged foothill topography with the remainder being the narrow valley floor. Generally, the soils in the watersheds are characterized as silty clay loams from both the Castaic and Saugus formations. Also, the soils within the watersheds can be predominately classified as being in hydrologic soil group C (higher runoff potential) with exception of areas adjacent to the main stem drainages that are Type A (lower runoff potential) and Type B in the lower reaches.

The 4.85 square mile (3,106 acre) Chiquito Canyon watershed is a tributary to the northern bank of the Santa Clara River. Approximately 490 acres of Chiquito Canyon, or only 16% of the watershed area, is located within the NRSP boundary, with the majority being upstream of the NRSP boundary in the developed Val Verde community (PACE, 2006b). The upper portion of the drainage is aligned in a general west to east direction while the lower portion of the drainage flows in a north to south direction. The linear distance from the upper headwaters to the canyon mouth is approximately 28,318 feet, with an average overall slope of 0.031. The major natural main stem drainage course within the watershed has an average slope through the NRSP area of approximately 0.025. The topography for the watershed varies from a maximum elevation of 1,800 feet in the headwaters to a low elevation of 925 feet near the mouth of the canyon at the Santa Clara River valley. The area surrounding the upper channel in Chiquito Canyon within the Newhall Ranch project area is primarily comprised of agricultural land (URS, 2003). In contrast to the vegetation found in the upper portion of Chiquito Canyon within the project area, the vegetation found in the downstream portion of the drainage within the project area is quite diverse, supporting scalebroom scrub, coast live oak woodlands, and Great Basin scrub.

The two square mile (1,295 acre) Long Canyon watershed is also tributary to the southern bank of the Santa Clara River. Approximately 845 acres of Long Canyon, or 65% of the watershed area, is located within the NRSP boundary, with the remainder being upstream in the Legacy Village subregion (see Figure 2-1). The drainage in the headwaters is aligned in a general west to east direction. The distance from the upper headwaters to the canyon mouth is approximately 18,350 lineal feet, with an average overall slope of 0.052 (PACE, 2006b). The major natural main stem drainage course within the watershed has an average slope in the lower reaches of the watershed of approximately 0.11. The topography for the watershed varies from a maximum elevation of 2,600 feet in the headwaters to a low elevation of 930 feet near the mouth of the canyon at the Santa Clara River valley. Both sides of this watershed contain habitat types comprised primarily of coastal sage scrub, with small pockets of chamise chaparral, and grassland present (URS, 2003). Within the stream channel, there is a mixture of grassland,

elderberry scrub, live oak woodland, alluvial scrub, great basin scrub, mixed chaparral, and alluvial scrub.

The 8.7 square mile (5,555.3 acre) Castaic Creek watershed is a tributary located north of the Santa Clara River. The total length of the mainstem channel is approximately 36,819 feet, with an average overall slope of 3.7 percent. The maximum elevation difference from the headwaters to the mouth of the creek at the Santa Clara River is 1,378 feet. Generally, the soils in the watershed are characterized as Saugus loam and are predominately classified as being in hydrologic soil group "B" (lower runoff potential). The associated vegetative cover within the watershed varies, but primarily consists of California coastal sage scrub.

The Adobe Canyon borrow site is located south of the Landmark Village tract map site and east of Long Canyon on the south side of the river. Adobe Canyon is characterized by sloping hillsides and adjacent agricultural use. The borrow site is dominated by coastal sage scrub, but also includes areas of coastal sage chaparral scrub, non-native grassland, and live oak woodland. Elevations on the borrow site range from approximately 920 feet (near the river) rising to 1,260 feet above mean sea level further south.

## 2.6 Existing Receiving Water Quality

Due to the size of the study area and the highly variable nature of wet weather surface water quality in the Santa Clara River throughout the study area, it was not appropriate to summarize water quality data for a single timeframe or location in order to establish baseline water quality conditions. As discussed above, flows in the Santa Clara River are highly episodic in nature and this characteristic can affect surface water quality considerably. The data summarized below, however, is recent and provides an accurate and reasonable characterization of existing water quality conditions that exist in the Project area. Data collected by the USGS at the Los Angeles County/Ventura County line also summarized below provides historical perspective of water quality within the Santa Clara River at the downstream Project boundary.

The existing wet and dry weather surface water quality in the Project area was characterized from available water quality monitoring data obtained from the following four sources (see Figure 2-1 for monitoring locations):

1. Newhall Ranch Tributary Stormwater Monitoring. Two storm events were monitored in Potrero Canyon, San Martinez Grande Canyon, Middle Canyon, Chiquito Canyon, and an unnamed tributary in Long Canyon. This data is relevant in terms of characterizing the existing stormwater runoff within the Project area. Although limited, this data is relevant in terms of characterizing the existing stormwater runoff within the Santa Clara River tributaries within the NRSP area as the conditions within these watersheds have not been altered since 2000.

2. Newhall WRP. The Newhall Ranch is required to conduct pre-startup water quality monitoring at upstream and downstream locations from the outfall of the approved Newhall WRP. Wet and dry weather monitoring data were collected from two stations in the SCR from the spring of 2004 through 2007: one station is near the downstream boundary of the NRSP area near to the proposed WRP outfall location, and the second is about 2.5 miles further downstream. Additionally, dry weather monitoring has been conducted at three stations (RSW-001U, RSW-001D, RSW-002D) as required by the Newhall WRP NPDES Permit (LARWQCB, 2007). These stations are referred to below as the "Newhall WRP NPDES Stations."

3. LA County Monitoring. The County of Los Angeles conducts in-stream monitoring on the mainstem of the SCR at a mass emission station located at The Old Road, upstream of the Project area. Both dry weather and wet weather monitoring data are available. Wet weather monitoring data are available from November 2002 through February 2009. The LA County monitoring data are the most current and are the only source of wet weather monitoring in the SCR immediately upstream of the Project area.

4. USGS Monitoring. The USGS collected a large number of water quality data in the SCR near the County line from 1951 through 1995. These data provide a historical perspective of wet and dry weather water quality in the SCR immediately downstream from the Project area.

### 2.6.1 Wet Weather Water Quality Monitoring

***Wet Weather Monitoring Locations and Rainfall Conditions***

**NRSP Area Stormwater Monitoring.** Newhall Land conducted stormwater monitoring of tributary streams in the NRSP area to characterize the existing surface water quality during wet weather conditions (the monitoring data is provided in Appendix C). Stormwater samples were collected during two storm events in March 2001 at five monitoring locations (Stations A-E) shown on Figure 2-1. Three of the five monitoring stations were located at the mouths of SCR tributaries in Potrero Canyon (Sta. A), San Martinez Grande Canyon (Sta. B), and Middle Canyon (Sta. D). The other two monitoring stations were located on tributaries upstream from the mainstem of the SCR; one was just downstream of the community of Val Verde in Chiquito Canyon (Sta. E) and one was on an unnamed tributary in Long Canyon, 0.25 mile upstream of the 'Onion Field' (Sta. C). Aside from Station E, which is downgradient of existing residential development, the land uses in the areas tributary to the Stations A, B, C, and D are predominately open space with some agriculture and oil and gas operations.

Table 2-3 lists the rainfall depth and duration of the two monitored storm events. The first storm was a small event (0.2 inches) that was likely just large enough to result in stormwater runoff. The depth of the second event was larger than the median storm depth (0.6 inches) at the nearby National Climatic Data Center (NCDC) Newhall rain gauge (see location on Figure 2-1). The

median depth of 0.6 inches is based on a storm event analysis which identified 613 storms exceeding 0.1 inches that occurred from October 1968 to December 2008. The average storm duration for storms greater than 0.1" in the 40 year Newhall rain gauge record is 11.4 hours.

**Table 2-3: Depth and Duration of Storms Monitored at Project Site**

| Date | Depth (in)[1] | Duration (hours)[1] |
|---|---|---|
| 03/06/01 | 0.2 | 3 |
| 03/08/01 | 0.7 | 10 |

[1] Based on rainfall measured at the Newhall rain gauge.

**Newhall WRP Pre-Startup Monitoring.** Newhall Land has conducted pre-startup receiving water quality monitoring for the approved Newhall Ranch WRP at two locations in the SCR (see Figure 2-1):

- NR1 is located in the SCR 300 feet upstream of the WRP outfall location, and
- NR3 is located in the SCR approximately 7,500 feet downstream of the WRP outfall.

Five storms with rainfall depths ranging from 0.1 to 0.6 inch were sampled at NR1 and NR3 and one very large storm with a depth of 4.45 inches was sampled at NR3 (Table 2-4). Grab sampling methods were used. Table 2-4 shows the depths and durations of storm events monitored.

**Table 2-4: Depth and Duration of Storms Monitored for Newhall WRP**

| Date | Depth (in)[1] | Duration |
|---|---|---|
| 12/07/04 | 0.12 | 6 |
| 2/17/05[3] | 0.6 | 12 |
| 2/18/05[2,3] | 4.45 | 12 |
| 11/9/05 | 0.12 | 6 |
| 11/10/05[3] | 0.2 | 1 |
| 2/17/06 | 0.31 | 7 |

[1] Based on rainfall measured at the Newhall rain gauge.
[2] NR-3 only sampled
[3] Estimated due to lack of gauge data.

**LA County Department of Public Works Monitoring Data.** The Los Angeles County Department of Public Works (LACDPW) has conducted mass emission dry and wet weather monitoring in the Santa Clara River for seven seasons - from 2002 through 2009 (LACDPW, 2009). The monitoring station (S29) is located in the Santa Clara River at The Old Road (Figure 2-1). It is approximately two miles upstream from the eastern boundary of the NRSP area. The monitoring station is downstream of the Saugus WRP and the City of Santa Clarita and upstream of the Valencia WRP. The monitoring station is intended to provide long-term information about

water quality trends in areas with heterogeneous land uses and has a tributary area of 411 square miles.

Monitoring at the mass emission station included twenty-six storm events over 7 years. Composite samples were collected for most parameters; grab sampling was used for bacteria analyses. Table 2-5 lists the rainfall depths and durations of the twenty-six monitored storm events based on hourly rainfall measurements at the Newhall rain gauge. The storm event on 1/14/2006 was not included in the data summaries as it was less than 0.1", the minimum storm depth to generate runoff. The median of the twenty-five remaining storm events is 0.64", roughly equivalent to the median storm depth for the Newhall rain gauge from 1968 through 2008 (0.60 inches).

**Table 2-5: Depth and Duration of Storms Monitored by LACDPW at S29**

| Date | Rainfall Depth (inches)[1] | Storm Duration (hours)[1] |
|---|---|---|
| 11/8/2002 | 1.6 | 21 |
| 12/16/2002 | 1.9 | 5 |
| 2/11/03 | 8.0 | 32 |
| 3/15/03 | 2.0 | 16 |
| 10/31/2003 | 0.30 | 4 |
| 12/25/2003 | 1.80 | 14 |
| 1/1/2004 | 0.4 | 9 |
| 10/17/2004 | 0.64 | 7 |
| 10/26/2004 | 2.22 | 13 |
| 1/7/2005 | 9.99 | 92 |
| 10/17/2005 | 1.61 | 14 |
| 12/31/2005 | 0.6 | 4 |
| 1/14/2006[2] | 0.08 | 2 |
| 2/17/2006 | 0.32 | 7 |
| 12/9/2006 | 0.47 | 2 |
| 12/16/2006 | 0.12 | 2 |
| 1/30/2007 | 0.44 | 16 |
| 2/19/2007 | 0.24 | 5 |
| 2/22/2007 | 0.32 | 3 |
| 9/21/2007 | 0.98 | 16 |
| 11/29/2007 | 0.34 | 6 |
| 12/6/2007[3] | 0.43 | 48 |
| 11/26/2008 | 1.22 | 17 |

| Date | Rainfall Depth (inches)[1] | Storm Duration (hours)[1] |
|---|---|---|
| 12/15/2008 | 1.22 | 19 |
| 2/5/2009[4] | 2.2 | 40 |
| 2/13/2009[4] | 0.32 | 3 |

[1] Based on rainfall measured at the Newhall rain gauge

[2] This storm was not included in monitoring summary since it is <0.1"

[3] The Newhall gauge noted accumulations for this storm event. LA County recorded this storm with a depth of 0.43" and duration of 9 hours.

[4] The depths and durations for storms in 2009 are those recorded by LA County.

**USGS Water Quality Monitoring Data.** The US Geological Survey (USGS) has collected stream flow and water quality data at a number of locations in the SCR watershed (http://waterdata.usgs.gov/nwis). Among the largest data sets are flow and water quality data collected at USGS station 11108500 located on the Santa Clara River just downstream of the Los Angeles / Ventura County Line. This station is located approximately one mile downstream of the NRSP area (Figure 2-1), and downstream of both existing WRPs.

The USGS collected water quality data between April 1951 and October 1995. These data thus provide a historical perspective of water quality in the SCR within the NRSP area.

**Data presentation.** To facilitate interpretation, the wet weather water quality data were grouped into two categories depending on the depth of 2-day antecedent rainfall measured at the Newhall rain gauge:

1. ***0.1 – 1 inches.*** Rainfall depths that would likely produce runoff volumes characteristic of more frequent, smaller storm events.

2. ***> 1 inch***. Rainfall depths that would likely produce runoff volumes characteristic of larger, less frequent storm events.

***Selected General Constituents***

The selected general constituents examined were Total Suspended Solids (TSS), Total Dissolved Solids (TDS), Hardness and Chloride (see Section 4 for a discussion of pollutant selection). TSS is a measure of the particulate matter suspended in water. Total dissolved solids (TDS) are a measure of the dissolved cations and anions, primarily inorganic salts (calcium, magnesium, potassium, sodium, chlorides and sulfates). TDS is an impairing pollutant in Reach 3 of the SCR as listed in the State's 2006 303(d) list of impaired water bodies. High TDS levels can impair agricultural, municipal supply, and groundwater recharge beneficial uses.

Hardness and chloride are important components of TDS. Hardness is a measure of the polyvalent cations, primarily calcium and magnesium. It is expressed as an equivalent concentration of calcium carbonate ($CaCO_3$). Hardness measurements are important because the toxicity of metals (and the associated water quality objectives) is an inverse function of the

hardness. Chloride comprises a large proportion of the TDS and is responsible for impairments in its own right. High levels of chloride in Santa Clara River Reaches 3, 5, and 6 are causing impairment of listed beneficial uses for agricultural irrigation. Irrigation of salt sensitive crops, such as avocados and strawberries, with water containing elevated levels of chloride can result in reduced crop yields. A chloride TMDL was approved for these reaches in 2005.

Results for concentrations of TSS, TDS, chloride and hardness for the four datasets are listed in Table 2-6 through Table 2-9. Rather than measuring TDS, the USGS station has recorded specific conductance (that is, the extent to which the sample conducts an electric current), which is related to TDS concentration. TDS concentration can be estimated as 0.55 to 0.9 times the specific conductance (Sawyer et al, 1994).

**Table 2-6: Average Concentrations of General Constituents and Nutrients from Newhall Ranch Tributary Stormwater Monitoring, March 2001**

| Constituent | Site A Mouth of Potrero | Site B Mouth of San Martinez Grande | Site C Long Canyon Upstream of Onion Field | Site D Mouth of Middle Canyon | Site E Middle of Chiquito |
|---|---|---|---|---|---|
| TSS (mg/L) | 835 | 41,100 | 36,000 | 5,650 | 6,645 |
| TDS (mg/L) | 7,380 | 2,825 | 190 | 160 | 205 |
| Hardness (mg/L as CaCO3) | 2,225 | 1,205 | 147 | 59 | 107 |
| Chloride (mg/L) | 870 | 125 | 3 | 3 | 11 |

**Table 2-7: Newhall Ranch WRP Startup Wet Weather Water Quality Data for General Constituents and Nutrients in the Santa Clara River, 2004 - 2006**

| Constituent | 2-day Antecedent Rainfall (inches) | Sample Site | Minimum (mg/L) | Maximum (mg/L) | Average (mg/L) |
|---|---|---|---|---|---|
| TSS | 0.1 – < 1.0 | NR1 | 32 | 107 | 58 |
| | | NR3 | 32 | 235 | 112 |
| | ≥ 1.0 | NR3 | - | - | 43,360 |
| TDS | 0.1 – < 1.0 | NR1 | 622 | 1,136 | 855 |
| | | NR3 | 698 | 2,020 | 1,076 |
| | ≥ 1.0 | NR3 | - | - | 2,100 |
| Hardness (mg/L as $CaCO_3$) | 0.1 – < 1.0 | NR1 | 304 | 464 | 387 |
| | | NR3 | 352 | 670 | 475 |
| | ≥ 1.0 | NR3 | - | - | 832 |

- = no or insufficient data; NA – not applicable

**Table 2-8: LACDPW Stormwater Monitoring for Selected General Constituents at the SCR Mass Emission Station (S29) during 2002-2009**

| Constituent | 2-day Preceding Rainfall (inches) | No. of Samples | Minimum | Maximum | Average |
|---|---|---|---|---|---|
| TSS (mg/L) | 0.1 – < 1.0 | 14 | 26 | 2,202 | 729 |
| | ≥ 1.0 | 11 | 53 | 6,591 | 1,482 |
| TDS (mg/L) | 0.1 – < 1.0 | 14 | 130 | 732 | 419 |
| | ≥ 1.0 | 11 | 28 | 364 | 197 |
| Hardness (mg/L) | 0.1 – < 1.0 | 14 | 70 | 428 | 223 |
| | ≥ 1.0 | 11 | 15 | 170 | 101 |
| Chloride (mg/L) | 0.1 – < 1.0 | 14 | 16 | 118 | 60 |
| | ≥ 1.0 | 11 | 3 | 52 | 22 |

- = no or insufficient data; NA – not applicable

**Table 2-9: USGS Water Quality Data for Selected General Constituents in the Santa Clara River at the County Line during 1951 – 1995**

| Constituent | 2-day Preceding Rainfall (inches) | No. of Samples | No. of Detects | Minimum | Maximum | Average |
|---|---|---|---|---|---|---|
| TSS (mg/L) | 0.1 – < 1.0 | 10 | 10 | 248 | 4,730 | 2,291 |
| | ≥ 1.0 | 41 | 41 | 107 | 51,200 | 10,711 |
| Specific Conductance (uS/cm) | 0.1 – < 1.0 | 33 | 33 | 831 | 4,220 | 2,246 |
| | ≥ 1.0 | 42 | 42 | 637 | 3,240 | 1,309 |
| Hardness (mg/L) | 0.1 – < 1.0 | 27 | 27 | 270 | 1,500 | 773 |
| | ≥ 1.0 | 37 | 37 | 250 | 1,200 | 546 |
| Chloride (mg/L) | 0.1 – < 1.0 | 34 | 34 | 21 | 290 | 122 |
| | ≥ 1.0 | 39 | 39 | 14 | 192 | 61 |

**TSS**. It is generally expected that TSS concentrations in alluvial streams can be greatly elevated during storm runoff because of the combination of high sediment supply and a high capacity for instream transport and erosion. TSS concentrations in Table 2-6 to Table 2-9 are sometimes very high, due to the highly erodible, easily transportable, sandy alluvial soils and sediments. Highest TSS concentrations were measured at some of the tributary canyons (Table 2-6), but were also observed in the SCR (Table 2-8 and Table 2-9). These latter results show the capacity of high flows in the Santa Clara River for sediment transport and support the conclusion that large rainfall events result in a "reset" of the main channel. As concluded by Balance Hydrologics (2005), concepts of "normal" or "average" sediment-supply and flow conditions have limited value in this "flashy" environment, where episodic storm and wildfire events have enormous

influence on sediment and storm flow conditions. In the Santa Clara River, a large portion of sediment movement events can occur in a matter of hours or days.

Average and maximum concentrations are much higher in the larger storms than the smaller storms at the downstream sites on the SCR. This pattern is also evident in the upstream LACDPW station, to a lesser extent.

The water quality objective for TSS in the Basin Plan is a narrative standard, which states, "water shall not contain suspended or settleable material in concentrations that cause nuisance or adversely affect beneficial uses".

**TDS.** Stormwater monitoring data collected in the NRSP tributaries (Table 2-6) show greatly differing TDS levels among the five monitoring stations. Measured TDS concentrations were very high at Sites A and B, while TDS concentrations at the other three sites were low. It is highly unlikely that this is a land use effect. Elevated TDS levels in runoff at Site A and B is likely a result of the natural soil properties of the marine layers of the Pico Formation, and the high groundwater table conditions in these two canyons, suggesting that groundwater discharges to the streams contributed to the elevated TDS levels. These greatly differing dissolved solid (TDS) concentrations are also reflected in some of the components that make up the TDS (chloride and hardness) as described below.

Average concentrations of TDS in the Santa Clara River were moderate to high, ranging from 216 mg/L to 2,100 mg/L. Using an estimate of 0.64 times the specific conductance for the USGS data, the TDS concentrations at this station averaged around 1,400 mg/L for storm flows. The Basin Plan objective for TDS in Santa Clara River Reach 5 is 1,000 mg/L.

Much higher average concentrations were observed at the three downstream SCR stations (NR-1, NR-3, USGS) compared with the upstream LACDPW station, and this could be due to their location downstream of the tributaries represented by Sites A and B, with their much higher salt content.

TDS concentrations were generally lower in the larger storms, reflecting a dilution effect.

**Hardness**. Hardness is a measure of the multivalent cations in water, principally calcium, magnesium, strontium, iron, and manganese (Sawyer et al, 1994). These cations are capable of reacting with soap to form precipitates and with certain anions to form scale. The hardness in water is derived largely from contact with soil and rock formations, and affects the CTR values for certain metals as discussed above. Waters with a hardness concentration from 150 mg/L to 300 mg/L as $CaCO_3$ are considered hard; waters with a hardness concentration above 300 mg/L as $CaCO_3$ are considered very hard.

The stormwater monitoring data for hardness were analogous to the data for TDS. Hardness concentrations were very high at the tributary Sites A and B, and low to moderate at the other three tributary sites. High hardness at Sites A and B could be due to natural high levels of calcium and magnesium in the local soils and sedimentary formations (such as lime and gypsum deposits), and the high groundwater table conditions in these two canyons, suggesting again that groundwater discharges contributed to the elevated hardness levels.

In the SCR, average hardness values were greater downstream (NR3, NR1, USGS sites – Table 2-7, Table 2-9) than at the LACDPW station (Table 2-8). This is most likely due to the influence of tributary inflows of high hardness waters (such as measured at Sites A and B – Table 2-6), other groundwater inputs, and agricultural return flows that enter the Santa Clara River between these stations. However, the magnitude of hardness concentrations was somewhat inconsistent, with the USGS station (Table 2-9) showing higher average hardness concentrations than those measured at NR-1 and NR-3 (Table 2-7).

The average hardness concentration decreased with larger antecedent rainfall depth, as was found for TDS concentrations.

**Chloride.** Similar to TDS and hardness, monitoring data collected in the NRSP tributaries (Table 2-6) found very high chloride concentrations at Site A, high levels at Site B, and low concentrations at the remaining three sites.

As with the other dissolved ionic parameters (TDS and hardness) the average chloride concentrations at the LACDPW station (
Table 2-8) were lower than those measured at the downstream USGS site (Table 2-9).

Overall, the average chloride concentrations during recent stormwater monitoring were highly variable and ranged between 3 mg/L and 120 mg/L, with the exception of the very high chloride concentrations detected at the mouth of Potrero Canyon (Site A). Average chloride concentration at the USGS station was about 61 mg/L for storm flows. The Basin Plan objective for chloride is 100 mg/L.

***Nutrients***

The major nutrients nitrogen and phosphorus are described here. Phosphorus was measured as total phosphorus (TP) and sometimes as dissolved phosphorus. Dissolved phosphorus is the more bioavailable form of phosphorus compared to TP, which is often made up of a high proportion of particulate phosphorus. Nitrogen is measured variously as nitrate, nitrite, ammonia, and total Kjeldahl nitrogen (TKN). TKN is the measure of ammonia plus the organic forms of nitrogen. Nitrate, nitrite, and ammonia are the more bioavailable forms of nitrogen, and of these, nitrate (or nitrate + nitrite) has the higher concentration in natural waters and is more important than ammonia as a nutrient. Table 2-10 through Table 2-13 summarizes available data for these

nutrients. Only nitrate+nitrite (N) was measured in the Newhall Ranch Tributary Stormwater Monitoring.

**Table 2-10: Average Concentrations of Nitrate from Newhall Ranch Tributary Stormwater Monitoring in March 2001**

| Constituent | Site A Mouth of Potrero | Site B Mouth of San Martinez Grande | Site C Long Canyon Upstream of Onion Field | Site D Mouth of Middle Canyon | Site E Middle of Chiquito |
|---|---|---|---|---|---|
| Nitrate + Nitrite-N (mg/L) | 17.5 | 3.0 | 1.6 | 15.3 | 2.8 |

**Table 2-11: Newhall WRP Pre-Startup Wet Weather Water Quality Data for Selected Nutrients in the Santa Clara River during 2004 - 2006**

| Constituent | 2-day Antecedent Rainfall (inches) | Sample Site | No. of Samples | No. of Detects | Minimum (mg/L) | Maximum (mg/L) | Average (mg/L) |
|---|---|---|---|---|---|---|---|
| Total Phosphorus | 0.1 – < 1.0 | NR1 | 5 | 5 | 0.4 | 0.5 | 0.4 |
| | | NR3 | 5 | 5 | 0.3 | 0.7 | 0.4 |
| | ≥ 1.0 | NR3 | 1 | 1 | 13.4 | 13.4 | 13.4 |
| Nitrate as N | 0.1 – < 1.0 | NR1 | 5 | 5 | 1.9 | 4.8 | 3.2 |
| | | NR3 | 5 | 5 | 2.3 | 3.7 | 3.0 |
| | ≥ 1.0 | NR3 | 1 | 1 | 1.4 | 1.4 | 1.4 |
| Nitrite as N | 0.1 – < 1.0 | NR1 | 5 | 0 | <0.005 | <0.005 | <0.005 |
| | | NR3 | 5 | 0 | <0.005 | <0.005 | <0.005 |
| | ≥ 1.0 | NR3 | 1 | 0 | <0.005 | <0.005 | <0.005 |
| Ammonia as N | 0.1 – < 1.0 | NR1 | 5 | 4 | <0.005 | 0.3 | 0.2 |
| | | NR3 | 5 | 5 | 0.02 | 0.1 | 0.1 |
| | ≥ 1.0 | NR3 | 1 | 1 | 0.5 | 0.5 | 0.5 |
| TKN as N | 0.1 – < 1.0 | NR1 | 5 | 4 | <0.04 | 0.7 | 0.3 |
| | | NR3 | 5 | 4 | <0.04 | 0.6 | 0.4 |
| | ≥ 1.0 | NR3 | 1 | 1 | 46.0 | 46.0 | 46.0 |

- = no or insufficient data; NA – not applicable

**Table 2-12: LACDPW Stormwater Monitoring of Nutrients at the SCR Mass Emission Station (S29) during 2002-2005**

| Constituent | 2-day Preceding Rainfall (inches) | No. of Samples | No. of Detects | Minimum | Maximum | Average |
|---|---|---|---|---|---|---|
| Dissolved phosphorus (mg/L) | 0.1 – < 1.0 | 14 | 14 | 0.05 | 0.43 | 0.23 |
| | ≥ 1.0 | 11 | 11 | 0.10 | 0.45 | 0.26 |
| Total phosphorus (mg/L) | 0.1 – < 1.0 | 14 | 14 | 0.30 | 1.29 | 0.62 |
| | ≥ 1.0 | 11 | 11 | 0.18 | 0.94 | 0.54 |

| Constituent | 2-day Preceding Rainfall (inches) | No. of Samples | No. of Detects | Minimum | Maximum | Average |
|---|---|---|---|---|---|---|
| Nitrate-N (mg/L) | 0.1 – < 1.0 | 14 | 9 | <0.08 | 1.85 | 0.81 |
| | ≥ 1.0 | 11 | 9 | <0.08 | 1.36 | 0.74 |
| Nitrite-N (mg/L) | 0.1 – < 1.0 | 14 | 4 | <0.03 | 1.00 | 0.12 |
| | ≥ 1.0 | 11 | 3 | <0.03 | 0.87 | 0.13 |
| Ammonia-N (mg/L) | 0.1 – < 1.0 | 14 | 6 | <0.03 | 1.35 | 0.17 |
| | ≥ 1.0 | 11 | 8 | <0.03 | 1.09 | 0.23 |
| TKN as N (mg/L) | 0.1 – < 1.0 | 14 | 14 | 0.70 | 8.70 | 2.61 |
| | ≥ 1.0 | 11 | 11 | 0.45 | 31.7 | 4.32 |

- = no or insufficient data; NA – not applicable

**Table 2-13: USGS Water Quality Data for Selected Nutrients in the Santa Clara River at the County Line during 1951 to 1995**

| Constituent | 2-day Preceding Rainfall (inches) | No. of Samples | No. of Detects | Minimum | Maximum | Average |
|---|---|---|---|---|---|---|
| Dissolved phosphorus (mg/L) | 0.1 – < 1.0 | 3 | 3 | 0.35 | 0.66 | 0.46 |
| | ≥ 1.0 | 1 | 1 | 0.01 | 0.01 | 0.01 |
| Total phosphorus (mg/L) | 0.1 – < 1.0 | 5 | 5 | 0.81 | 1.8 | 1.28 |
| | ≥ 1.0 | 2 | 2 | 0.63 | 1.4 | 1.02 |
| Ammonia as N (mg/L) | 0.1 – < 1.0 | 3 | 3 | 0.03 | 0.39 | 0.16 |
| | ≥ 1.0 | 0 | 0 | - | - | - |
| Nitrate + Nitrite as N (mg/L) | 0.1 – < 1.0 | 7 | 7 | 0.87 | 4 | 2.1 |
| | ≥ 1.0 | 4 | 4 | 1.2 | 2 | 1.7 |
| TKN as N (mg/L) | 0.1 – < 1.0 | 1 | 1 | 0.64 | 0.64 | 0.64 |
| | ≥ 1.0 | 1 | 1 | 0.69 | 0.69 | 0.69 |
| Total Nitrogen (mg/L) | 0.1 – < 1.0 | 2 | 2 | 0.6 | 2.2 | 1.4 |
| | ≥ 1.0 | 2 | 2 | 3.5 | 4.4 | 4.0 |

- = no or insufficient data

**Phosphorus**. Recent wet weather monitoring showed somewhat consistent total phosphorus levels, averaging about 0.4 to 0.6 mg/L. An exception was the large storm sample (>1.0 inch) collected at station NR-3, which measured 13.4 mg/L. This was likely due the high concentration of total suspended solids measured during the same storm event, because total phosphorus is predominately found in the particulate-phase in stormwater runoff. Historical average total phosphorus concentrations at the USGS station were somewhat higher than recent results at 1.0 to 1.3 mg/L and appeared to be somewhat independent of storm event size. The Basin Plan water quality objective for phosphorus is a narrative standard, which states, “waters shall not contain biostimulatory substances in concentrations that promote aquatic growth to the extent that such growth causes nuisance of adversely affects beneficial uses”.

**Nitrogen**. Nitrate + nitrite-nitrogen was the only nutrient measured in the NRSP tributary stormwater monitoring. As shown in Table 2-10, measured nitrate-nitrogen concentrations were generally low (less than 3 mg/L as N) at three of the sites, and were elevated at Sites A and D (17.5 mg/L and 15.3 mg/L, respectively). High nitrate levels can be associated with runoff from agricultural areas and nurseries, or associated with excessive fertilization of landscaping in residential areas; however, Station E, which is downstream of residential development, showed relatively low nitrate concentrations.

Most of the more recent nitrate monitoring data summarized in Table 2-10, Table 2-11, and Table 2-12 were relatively low (averaging 0.8 to 3.0 mg/L). The average historical nitrate-N + nitrite-N concentrations at the USGS station were roughly similar, varying from 2.1 mg/L for lower storm flows to 1.7 mg/L for higher storm flows.

Average ammonia concentrations were low and ranged from 0.1 to 0.5 mg/L. The ammonia water quality objectives in the Santa Clara River Nitrogen Compounds TMDL range from 3.4 mg/L to 5.5 mg/L (one hour average) and 1.2 mg/L to 2.0 mg/L (30-day average).

Average total Kjeldahl nitrogen (TKN) concentrations generally ranged between the concentrations found for ammonia and nitrate (about 0.4 to 4.3 mg/L). One exception was the concentration found in the large storm at NR-3, which measured 46 mg/L. As with total phosphorus, the organic forms of nitrogen in stormwater runoff are generally in the particulate-phase, and this result correlated with the high levels of total phosphorus and suspended solids measured during this same event as described above.

***Selected Metals and Pesticides***

The metals cadmium (Cd), copper (Cu), lead (Pb), and zinc (Zn) can be toxic at high concentrations. They occur naturally in soils and sediments, and can be present in urban runoff. Aluminum is one of the more abundant elements in the earth's crust. The organophosphorous pesticides chlorpyrifos and diazinon are especially toxic to a number of aquatic organisms and in the past have been frequently detected downstream from urban and agricultural land uses. Cyanide is a highly toxic substance and originates from both man-made and natural sources.

Table 2-14 though Table 2-17 summarize the data for these metals and pesticides in the tributaries and the Santa Clara River. Cyanide was only measured at the LACDPW Mass Emission station. Available data for metals at the USGS station were very limited. For copper and lead, there were a considerable number of non-detects with very high detection limits. Therefore, comparison of the USGS data for copper, lead, and zinc with the recent monitoring information is considered inappropriate. Metals data were not collected in the one large storm event sampled for the Newhall Ranch WRP pre-startup monitoring; thus summarized data for this station represent storms less than one inch in depth.

**Table 2-14: Average Concentration of Metals from Newhall Ranch Tributary Stormwater Monitoring, March 2001**

| Constituent | Site A Mouth of Potrero | Site B Mouth of San Martinez Grande | Site C Long Canyon Upstream of Onion Field | Site D Mouth of Middle Canyon | Site E Middle of Chiquito Canyon |
|---|---|---|---|---|---|
| Total Copper (µg/L) | 15 | 175 | 170 | 10 | 70 |
| Total Lead (µg/L) | 6.1 | 54 | 95 | 8 | 37 |
| Total Zinc (µg/L) | 40 | 330 | 330 | 30 | 225 |
| Total Cadmium (µg/L) | 0.3 | 11.2 | 2.0 | 0.4 | 1.9 |

**Table 2-15: Newhall Ranch WRP Pre-Startup Wet Weather Water Quality Data for Metals and Pesticides in the Santa Clara River, 2004 - 2006**

| Constituent | 2-day Antecedent Rainfall (inches) | Sample Site | No. of Samples | No. of Detects | Minimum(µg/L) | Maximum (µg/L) | Average (µg/L) |
|---|---|---|---|---|---|---|---|
| Dissolved Aluminum (µg/L) | 0.1 – < 1.0 | NR1 | 1 | 1 | 27 | 27 | 27 |
| | | NR3 | 1 | 1 | 19 | 19 | 19 |
| Total Aluminum (µg/L) | 0.1 – < 1.0 | NR1 | 1 | 1 | 740 | 740 | 740 |
| | | NR3 | 1 | 1 | 770 | 770 | 770 |
| Dissolved Copper (µg/L) | 0.1 – < 1.0 | NR1 | 1 | 1 | 4.6 | 4.6 | 4.6 |
| | | NR3 | 1 | 1 | 3.6 | 3.6 | 3.6 |
| Total Copper (µg/L) | 0.1 – < 1.0 | NR1 | 2 | 2 | 4.6 | 5.2 | 4.9 |
| | | NR3 | 2 | 2 | 4.8 | 7.0 | 5.9 |
| Dissolved Lead (µg/L) | 0.1 – < 1.0 | NR1 | 1 | 0 | <0.07 | <0.07 | - |
| | | NR3 | 1 | 0 | <0.07 | <0.07 | - |
| Total Lead (µg/L) | 0.1 – < 1.0 | NR1 | 2 | 2 | 0.6 | 1.3 | 1.0 |
| | | NR3 | 2 | 2 | 0.6 | 0.9 | 0.8 |
| Dissolved Zinc (µg/L) | 0.1 – < 1.0 | NR1 | 1 | 1 | 12 | 12 | 12 |
| | | NR3 | 1 | 1 | 8.7 | 8.7 | 8.7 |
| Total Zinc (µg/L) | 0.1 – < 1.0 | NR1 | 2 | 2 | 13 | 22 | 18 |
| | | NR3 | 2 | 2 | 12 | 18 | 15 |
| Diazinon | 0.1 – < 1.0 | NR1 | 1 | 0 | <0.01 | <0.01 | <0.01 |
| | | NR3 | 1 | 0 | <0.01 | <0.01 | <0.01 |
| Chlorpyrifos | 0.1 – < 1.0 | NR1 | 1 | 0 | <0.6 | <0.6 | <0.6 |
| | | NR3 | 1 | 0 | <0.6 | <0.6 | <0.6 |

- = no or insufficient data; NA – not applicable

[1] Water Quality Standards are CTR acute criteria calculated with minimum measured hardness value for monitoring location.

**Table 2-16: LACDPW Stormwater Monitoring for Metals, Pesticides, and Cyanide at the SCR Mass Emission Station (S29) during 2002-2005**

| Constituent | 2-day Preceding Rainfall (inches) | No. of Samples | No. of Detects | Minimum | Maximum | Average |
|---|---|---|---|---|---|---|
| Dissolved aluminum (µg/L) | 0.1 – < 1.0 | 14 | 4 | <50 | 1,390 | 264 |
| | ≥ 1.0 | 11 | 4 | <50 | 3,680 | 420 |
| Total aluminum (µg/L) | 0.1 – < 1.0 | 14 | 14 | 383 | 18,000 | 5,770 |
| | ≥ 1.0 | 11 | 11 | 131 | 19,650 | 5,161 |
| Dissolved copper (µg/L) | 0.1 – < 1.0 | 14 | 14 | 3.3 | 11.5 | 6.4 |
| | ≥ 1.0 | 11 | 11 | 3.8 | 22.6 | 8.4 |
| Total copper (µg/L) | 0.1 – < 1.0 | 14 | 14 | 7.3 | 91.3 | 29.8 |
| | ≥ 1.0 | 11 | 11 | 9.4 | 53.3 | 31.1 |
| Dissolved lead (µg/L) | 0.1 – < 1.0 | 14 | 3 | <0.44 | 3.3 | 0.5 |
| | ≥ 1.0 | 11 | 8 | <0.44 | 12.5 | 2.4 |
| Total lead (µg/L) | 0.1 – < 1.0 | 14 | 14 | 1.4 | 39 | 8.6 |
| | ≥ 1.0 | 11 | 11 | 1.1 | 110 | 29.9 |
| Dissolved zinc (µg/L) | 0.1 – < 1.0 | 14 | 12 | <1 | 27 | 14 |
| | ≥ 1.0 | 11 | 11 | 12 | 37 | 24 |
| Total zinc (µg/L) | 0.1 – < 1.0 | 14 | 14 | 11 | 292 | 71 |
| | ≥ 1.0 | 11 | 11 | 42 | 353 | 126 |
| Dissolved cadmium (µg/L) | 0.1 – < 1.0 | 14 | 0 | <0.05 | <0.05 | <0.05 |
| | ≥ 1.0 | 11 | 1 | <0.05 | 0.74 | 0.10 |
| Total cadmium (µg/L) | 0.1 – < 1.0 | 14 | 8 | <0.05 | 3.47 | 0.53 |
| | ≥ 1.0 | 11 | 8 | <0.05 | 1.30 | 0.75 |
| Chlorpyrifos (µg/L) | 0.1 – < 1.0 | 14 | 0 | <0.02 | <0.02 | <0.02 |
| | ≥ 1.0 | 11 | 0 | <0.02 | <0.02 | <0.02 |
| Diazinon (µg/L) | 0.1 – < 1.0 | 14 | 3 | <0.003 | 0.41 | 0.04 |
| | ≥ 1.0 | 11 | 5 | <0.003 | 0.43 | 0.07 |
| Cyanide (µg/L) | 0.1 – < 1.0 | 14 | 4 | <0.005 | 0.01 | 0.003 |
| | ≥ 1.0 | 11 | 3 | <0.005 | 0.59 | 0.06 |

**Table 2-17: USGS Water Quality Data for Selected Metals, Pesticides and Indicator Bacteria in the Santa Clara River at the County Line during 1951 to 1995**

| Constituent | 2-day Preceding Rainfall (inches) | No. of Samples | No. of Detects | Minimum | Maximum | Average |
|---|---|---|---|---|---|---|
| Dissolved Copper (µg/L) | 0.1 – < 1.0 | 4 | 0 | - | - | - |
| | ≥ 1.0 | 0 | 0 | - | - | - |
| Total Copper (µg/L) | 0.1 – < 1.0 | 1 | 1 | 30 | 30 | 30 |
| | ≥ 1.0 | 0 | 0 | - | - | - |
| Dissolved Lead (µg/L) | 0.1 – < 1.0 | 39 | 4 | 1 | 23 | 7.8 |
| | ≥ 1.0 | 4 | 0 | - | - | - |
| Total Lead (µg/L) | 0.1 – < 1.0 | 3 | 0 | - | - | - |
| | ≥ 1.0 | 1 | 0 | - | - | - |
| Dissolved Zinc (µg/L) | 0.1 – < 1.0 | 4 | 1 | - | 10 | 10 |
| | ≥ 1.0 | 0 | 0 | - | - | - |
| Total Zinc (µg/L) | 0.1 – < 1.0 | 1 | 1 | 150 | 150 | 150 |
| | ≥ 1.0 | 0 | 0 | - | - | - |
| Diazinon (µg/L) | 0.1 – < 1.0 | 1 | 1 | 0.02 | 0.02 | 0.02 |
| | ≥ 1.0 | 0 | 0 | - | - | - |

- = no or insufficient data

**Metals.** Table 2-14 presents average total copper, lead, zinc, and cadmium concentrations measured in the NRSP tributary stormwater monitoring. Total copper, lead, and zinc measured at tributary Sites B and C were much higher than the concentrations measured at Sites A and D. Concentrations at Site E fell in the middle of the measured range. Elevated total metal concentrations are often associated with elevated TSS levels, although this trend is not evident in the tributary monitoring data. The average total copper concentrations at Sites B, C, and E were greater than the CTR acute copper criterion. The average total copper concentrations ranged from 10 µg/L to 175 µg/L; the CTR acute total copper criterion for a hardness concentration of greater than 400 mg/L is 52 µg/L. The average total lead and total zinc concentrations in all the tributaries were below the CTR acute criteria. The average total lead concentrations ranged from 6.1 µg/L to 95 µg/L; the CTR acute total lead criterion for a hardness concentration of greater than 400 mg/L is 480 µg/L. The average total zinc concentrations ranged from 30 µg/L to 330 µg/L; the CTR acute total zinc criterion for a hardness concentration of greater than 400 mg/L is 390 µg/L.

Concentrations of dissolved copper (3.6 to 8.4 µg/L) were below the CTR acute criteria for the average hardness of 250 mg/L (32 µg/L). Concentrations of total copper measured in the Santa Clara River (4.6 to 91 µg/L, total copper) exceeded the respective CTR acute criteria for the average hardness of 250 mg/L (33 µg/L, total copper) in 9 of 25 samples for the LACDPW station (there were no exceedances at other SCR stations). Concentrations of dissolved and total

lead measured in the Santa Clara River (<0.07 µg/L to 23 µg/L, dissolved lead; 0.8 to 110 µg/L, total lead) were well below the respective CTR acute criteria for the average hardness of 250 mg/L (170 µg/L, dissolved lead; 260 µg/L, total lead). Concentrations of dissolved zinc measured in the Santa Clara River (8.7 µg/L to 37 µg/L, dissolved zinc) were well below the respective CTR acute criteria for the average hardness of 250 mg/L (250 µg/L, dissolved zinc); concentrations of total zinc in the Santa Clara River range from 11 to 353 µg/L, with data from the LACDPW gauge exceeding the CTR criteria for an average hardness of 250 mg/L (260 µg/L, total zinc) in 2 of 25 samples (there were no exceedances at the other SCR stations).

Measured aluminum concentrations showed a very wide range of concentrations at the mass emission station (Table 2-16).

**Pesticides.** Data for pesticides are very limited. Chlorpyrifos was not detected at LACDPW station, and Diazinon was detected in about a third of samples (8/25) with an average concentration of 0.04 µg/L in small storms and 0.07 µg/L in larger storms (Table 2-16). Diazinon and Chlorpyrifos were not detected further downstream in the SCR during Newhall WRP wet weather sampling (Table 2-15) but were detected in the one wet weather sample taken in the historical USGS data (Table 2-17). The CTR acute criterion for diazinon is 0.17 µg/L. The diazinon criterion derived by the CDFG is 0.08 µg/L (Marshack, 2003).

**Cyanide.** Cyanide was detected in 7 of 25 samples collected at the LACDPW station. Concentrations observed at the LACDPW station were very low, exceeding the CTR criterion for freshwater acute aquatic of 22 µg/L in only one instance (Table 2-16).

### *Fecal Indicator Bacteria*

Pathogens such as viruses, bacteria, and protozoa that cause illness in humans are difficult to measure. Fecal indicator bacteria (FIB) such as Total Coliform, Fecal Coliform and Enterococci are commonly measured instead, and their presence indicates the presence of fecal contamination and the potential presence of associated pathogenic organisms. However, it does not indicate the source of the contamination and there are numerous natural and anthropogenic sources of pathogen indicators. Table 2-18 through 2-21 summarize FIB data for the four datasets. Averages are presented as geometric means.

**Table 2-18: Concentrations for Fecal Indicator Bacteria from Newhall Ranch Tributary Stormwater Monitoring, 2001**

| Constituent | Site A Mouth of Potrero | Site B Mouth of San Martinez Grande | Site C Long Canyon Upstream of Onion Field | Site D Mouth of Middle Canyon | Site E Middle of Chiquito |
|---|---|---|---|---|---|
| Total coliform (MPN/100ml) | 38,700 | >160,000 | 120,000 | >89,400 | >19,600 |
| Fecal coliform (MPN/100ml) | 3,300 | 590 | 4,200 | >19,600 | 19,600 |

NA – not applicable

**Table 2-19: Newhall Ranch WRP Startup Wet Weather Water Quality Data for Fecal Indicator Bacteria in the Santa Clara River, 2004 - 2006**

| Constituent | 2-day Antecedent Rainfall (inches) | Sample Site | No. of Samples | No. of Detects | Minimum | Maximum | Geometric Mean |
|---|---|---|---|---|---|---|---|
| Fecal coliform (MPN/100mL) | 0.1 – < 1.0 | NR1 | 5 | 4 | <1 | 900 | 87 |
| | | NR3 | 5 | 4 | <1 | 5,000 | 258 |
| | ≥ 1.0 | NR3 | 1 | 1 | ≥1,600 | ≥1,600 | ≥1,600 |
| Total coliform (MPN/100mL) | 0.1 – < 1.0 | NR1 | 5 | 4 | <1 | 1,600 | 284 |
| | | NR3 | 5 | 4 | <1 | 13,000 | 549 |
| | ≥ 1.0 | NR3 | 1 | 1 | ≥1,600 | ≥1,600 | ≥1,600 |

- = no or insufficient data; NA – not applicable

**Table 2-20: LACDPW Stormwater Monitoring for Fecal Indicator Bacteria at the SCR Mass Emission Station during 2002-2005**

| Constituent | 2-day Preceding Rainfall (inches) | No. of Samples | No. of Detects | Minimum | Maximum | Geometric Mean |
|---|---|---|---|---|---|---|
| Total coliform (MPN/100mL) | 0.1 – < 1.0 | 14 | 14 | 17,000 | 1,600,000 | 101,000 |
| | ≥ 1.0 | 11 | 11 | 50,000 | 500,000 | 198,000 |
| Fecal coliform (MPN/100mL) | 0.1 – < 1.0 | 14 | 14 | 230 | 300,000 | 7,000 |
| | ≥ 1.0 | 11 | 11 | 3,000 | 300,000 | 36,000 |
| Fecal Enterococci (MPN/100mL) | 0.1 – < 1.0 | 14 | 14 | 800 | 300,000 | 27,000 |
| | ≥ 1.0 | 11 | 11 | 9,000 | 500,000 | 68,000 |

[1] Represents the geomean of the data.

**Table 2-21: USGS Water Quality Data for Fecal Indicator Bacteria in the Santa Clara River at the County Line during 1951 - 1995**

| Constituent | 2-day Preceding Rainfall (inches) | No. of Samples | No. of Detects | Minimum | Maximum | Geo-mean |
|---|---|---|---|---|---|---|
| Fecal Coliform (CFU/100mL) | 0.1 – < 1.0 | 3 | 3 | 80 | 720 | 300 |
| | ≥ 1.0 | 1 | 1 | - | - | 2,700 |

- = no or insufficient data

Concentrations of total and fecal coliform bacteria in wet weather flows at all tributary monitoring stations, the Newhall Ranch WRP stations, and the County's mass emission station were highly variable and sometimes very high, consistent with other stormwater data throughout the region. Fecal coliform concentrations ranged from <1 Most Probable Number (MPN) per 100 milliliters (MPN/100 mL) to 300,000 MPN/100 mL. Average bacteria concentrations at the lower stations were significantly lower, but still elevated, more so during larger storms. In waters designated for water contact recreation (REC-1), the Basin Plan objective for fecal coliform is a log mean of 200/100 mL (based on a minimum of not less than 10 percent of total samples

during any 30-day period), nor shall more 10 percent of the total number of samples during any 30-day period exceed 400/100 mL.

***Summary***

Table 2-22 and Table 2-23 summarize the average values from wet weather monitoring data for all monitoring locations within the Project area.

**Table 2-22: Summary of Average Wet Weather Monitoring Data (2-Day Antecedent Rainfall of 0.1 - 1.0 in)**

| | **LACDPW Mass Emission Station** | **NRSP Area Tributary Monitoring** | | | | | **Newhall WRP Startup Monitoring** | | **USGS Wet Weather Monitoring** |
|---|---|---|---|---|---|---|---|---|---|
| **Constituent** | ***S29*** | ***Site A*** | ***Site B*** | ***Site C*** | ***Site D*** | ***Site E*** | ***NR1*** | ***NR3*** | ***USGS*** |
| *General and Conventional Parameters* | | | | | | | | | |
| TSS (mg/L) | 729 | 835 | 41,100 | 36,000 | 5,650 | 6,645 | 58 | 112 | 2,291 |
| TDS (mg/L) | 419 | 7,380 | 2,825 | 190 | 160 | 205 | 855 | 1,076 | 1,437 [1] |
| Hardness (mg/L) | 223 | 2,225 | 1,205 | 147 | 59 | 107 | 387 | 475 | 773 |
| Chloride (mg/L) | 59.6 | 870 | 125 | 3 | 3 | 11 | - | - | 122 |
| *Nutrients* | | | | | | | | | |
| Total P (mg/L) | 0.62 | - | - | - | - | - | 0.4 | 0.4 | 1.28 |
| Nitrate-N (mg/L) | 0.81 | 17.5[2] | 3.0[2] | 1.6[2] | 15.3[2] | 2.8[2] | 3.2 | 3.0 | 2.1[2] |
| Nitrite-N (mg/L) | 0.12 | - | - | - | - | - | <0.005 | <0.005 | - |
| Ammonia-N (mg/L) | 0.17 | - | - | - | - | - | 0.2 | 0.1 | 0.16 |
| TKN (mg/L) | 2.61 | - | - | - | - | - | 0.3 | 0.4 | 0.64 |
| *Metals and Pesticides* | | | | | | | | | |
| Dissolved copper (µg/L) | 6.4 | - | - | - | - | - | 4.6 | 3.6 | - |
| Total copper (µg/L) | 29.8 | 15 | 175 | 170 | 10 | 70 | 4.9 | 5.9 | 30 |
| Dissolved lead (µg/L) | 0.5 | - | - | - | - | - | <0.07 | <0.07 | 7.8 |
| Total lead (µg/L) | 8.6 | 6.1 | 53.5 | 95.2 | 7.6 | 36.8 | 1 | 0.8 | - |
| Dissolved zinc (µg/L) | 14 | - | - | - | - | - | 12 | 8.7 | 10 |
| Total zinc (µg/L) | 71 | 40 | 330 | 330 | 30 | 225 | 17.5 | 15 | 150 |

| Constituent | LACDPW Mass Emission Station | NRSP Area Tributary Monitoring | | | | | Newhall WRP Startup Monitoring | | USGS Wet Weather Monitoring |
|---|---|---|---|---|---|---|---|---|---|
| | *S29* | *Site A* | *Site B* | *Site C* | *Site D* | *Site E* | *NR1* | *NR3* | *USGS* |
| Dissolved aluminum (µg/L) | 264 | - | - | - | - | - | 27 | 19 | - |
| Total aluminum (µg/L) | 5,770 | - | - | - | - | - | 740 | 770 | - |
| Diazinon (µg/L) | 0.05 | - | - | - | - | - | <0.01 | <0.01 | 0.02 |
| Chlorpyrifos (µg/L) | <0.05 | - | - | - | - | - | <0.6 | <0.6 | - |
| Cyanide (mg/L) | <0.01 | - | - | - | - | - | - | - | - |
| *Indicator Bacteria* | | | | | | | | | |
| Fecal Coliform[3] MPN/100mL | 101,000 | 3,300 | 590 | 4,200 | >19,600 | 19,600 | 87 | 258 | 300 |
| Total Coliform[3] MPN/100mL | 7,000 | 38,700 | >160,000 | 120,000 | >89,400 | >19,600 | 284 | 549 | - |

[1] Derived from Specific Conductance

[2] Nitrate + Nitrite-N

[3] Bacteria averages are represented as Geometric Means

ND = non detected, - = no or insufficient data

**Table 2-23: Summary of Average Wet Weather Monitoring Data for 2-Day Precedent Rainfall of > 1 inch.**

| Constituent | USGS Wet Weather Monitoring | LACDPW SCR Mass Emission Station | Newhall WRP Startup Monitoring |
|---|---|---|---|
| | *11108500* | *S29* | *NR3* |
| *General and Conventional Parameters* | | | |
| TSS (mg/L) | 10,711 | 1,482 | 43,360 |
| TDS (mg/L) | 838[1] | 101 | 2,100 |
| Hardness (mg/L) | 546 | 197 | 832 |
| Chloride (mg/L) | 61 | 22 | - |
| *Nutrients* | | | |
| Total P (mg/L) | 1.02 | 0.54 | 13.4 |
| Nitrate-N (mg/L) | 1.7[2] | 0.74 | 1.4 |
| Nitrite-N (mg/L) | | 0.13 | ND |
| Ammonia-N (mg/L) | - | 0.23 | 0.5 |
| TKN (mg/L) | 0.69 | 4.32 | 46.0 |

| Constituent | USGS Wet Weather Monitoring<br>*11108500* | LACDPW SCR Mass Emission Station<br>*S29* | Newhall WRP Startup Monitoring<br>*NR3* |
|---|---|---|---|
| *Metals* | | | |
| Dissolved copper (µg/L) | - | 8.4 | - |
| Total copper (µg/L) | - | 31.1 | - |
| Dissolved lead (µg/L) | ND | 2.4 | - |
| Total lead (µg/L) | ND | 29.9 | - |
| Dissolved zinc (µg/L) | - | 24 | - |
| Total zinc (µg/L) | - | 126 | - |
| Dissolved aluminum (µg/L) | - | 420 | - |
| Total aluminum (µg/L) | - | 5,161 | - |
| *Indicator Bacteria* | | | |
| Fecal Coliform (MPN/100 mL) | 2,700 | 36,000 | ≥1600 |
| Total Coliform (MPN/100 mL) | - | 198,000 | ≥1600 |

[1] Derived from Specific Conductance

[2] Nitrate + Nitrite-N

ND = Not Detected in Sample, - = no or insufficient data

### 2.6.2 Dry Weather Water Quality Monitoring

Dry season base flows in the SCR through the NRSP area are perennial. Dry season base flows may include contributions from natural groundwater flows; however, discharges from the upstream Saugus and Valencia WRPs contribute the majority of base flow. Discharges from the WRPs during dry weather conditions are a source of impairing pollutants in downstream reaches, including chloride, TDS, and nitrogen compounds.

Dry weather water quality monitoring data in the SCR are available from four sources (see Figure 2-1 for locations):

LACDPW sampling at the SCR mass emission station

USGS Water Quality Monitoring

Newhall Ranch WRP pre-startup monitoring (2004-2007)

Newhall Ranch NPDES monitoring (2008-2009)

These sites were described above under Wet Weather Monitoring (Section 2.3.1). The LACDPW station is on the SCR above Newhall Ranch, while the Newhall Ranch WRP pre-startup monitoring stations are at the western boundary and downstream of the NRSP area. The USGS station is also below the NRSP area, and provides a historical perspective from samples collected between 1951 and 1995.

***General Constituents***

Tables 2-24 through 2-26 report summary statistics for dry weather monitoring of selected nutrients in the three datasets.

**Table 2-24: LACDPW Dry Weather Monitoring for Selected General Constituents at the SCR Mass Emission Station (S29) during 2002-2009**

| Constituent | No. of Samples | No. of Detects | Minimum | Maximum | Average |
|---|---|---|---|---|---|
| TSS (mg/L) | 15 | 15 | 1 | 1320 | 135 |
| Hardness (mg/L) | 15 | 15 | 330 | 510 | 411 |
| TDS (mg/L) | 15 | 15 | 696 | 942 | 806 |

**Table 2-25: Newhall WRP Pre-Startup Dry Weather Monitoring for Selected General Constituents in the SCR during 2004-2007**

| Constituent | Location | No. of Samples | No. of Detects | Min | Max | Average |
|---|---|---|---|---|---|---|
| TSS (mg/L; DL = 1 mg/L) | NR1 | 98 | 97 | <1 | 342 | 42 |
| | NR3 | 98 | 97 | <1 | 676 | 76 |
| Hardness (mg/L) | NR1 | 98 | 98 | 150 | 568 | 323 |
| | NR3 | 98 | 98 | 185 | 684 | 380 |
| TDS (mg/L) | NR1 | 98 | 98 | 504 | 2,806 | 853 |
| | NR3 | 98 | 98 | 576 | 1,396 | 930 |
| Chloride (mg/L) | NR1 | 48 | 48 | 97 | 130 | 116 |
| | NR3 | 48 | 48 | 102 | 140 | 122 |

**Table 2-26: Newhall WRP NPDES Dry Weather Monitoring for Selected General Constituents in the SCR during 2008-2009**

| Constituent | Location | No. of Samples | No. of Detects | Min | Max | Average |
|---|---|---|---|---|---|---|
| TSS (mg/L; DL = .5 mg/L) | RSW-001U | 4 | 4 | 3.8[1] | 36 | 18.1 |
| | RSW-002D | 4 | 4 | 2.7[1] | 33 | 17.6 |
| Hardness (mg/L) | RSW-001U | 4 | 4 | 187 | 338 | 257 |
| | RSW-002D | 4 | 4 | 189 | 335 | 256 |
| TDS (mg/L) | RSW-001U | 4 | 4 | 694 | 1,028 | 873 |
| | RSW-002D | 4 | 4 | 870 | 950 | 904 |
| Chloride (mg/L) | RSW-001U | 4 | 4 | 111 | 120 | 115 |
| | RSW-002D | 4 | 4 | 114 | 135 | 122 |

[1] Analyte was detected at a concentration below the reporting limit and above the laboratory method detection limit. Reported value is estimated; detected, but not quantified (DNQ).

**Table 2-27: USGS Dry Weather Water Quality Monitoring Data for Selected General Constituents in the SCR at the County Line during 1951-1995.**

| Constituent | No. of Samples | No. of Detects | Minimum | Maximum | Average |
|---|---|---|---|---|---|
| TSS (mg/L) | 73 | 73 | 7 | 5,980 | 349 |
| Hardness (mg/L) | 220 | 220 | 42 | 2,400 | 881 |
| Specific Conductance (uS/cm) | 383 | 383 | 925 | 7,620 | 2408 |
| Chloride (mg/L) | 355 | 355 | 30 | 585 | 140 |

**TSS.** Average concentrations of TSS appeared highly variable between the monitoring stations. The USGS dataset showed relatively high average concentrations, which may have included samples taken during times of higher erosion or larger dry weather flows. Differences may also be due to physical factors such as substrate material, local flow regime, and tributary influences.

**Hardness, TDS and Chloride.** The average concentrations of dissolved constituents, hardness, TDS, and chloride were more similar between the monitoring locations and times. However, the USGS County Line station again consistently recorded higher averages (approximately double) than the other stations. The data suggests that the water flowing in the SCR in the NRSP area during dry weather is hard and turbid, with moderate levels of other dissolved salts, including chloride.

*Nutrients*

Tables 2-27 through 2-29 report summary statistics for dry weather monitoring of selected nutrients in the three datasets.

**Table 2-28: LACDPW Dry Weather Monitoring of Nutrients at the SCR Mass Emission Station (S29) during 2002-2009**

| Constituent | No. of Samples | No. of Detects | Minimum | Maximum | Average |
|---|---|---|---|---|---|
| Dissolved phosphorus (mg/L) | 15 | 14 | <0.05 | 0.30 | 0.18 |
| Total phosphorus (mg/L) | 15 | 14 | <0.05 | 0.67 | 0.23 |
| Nitrate-N (mg/L) | 15 | 13 | <0.17 | 1.78 | 1.16 |
| Nitrite-N (mg/L) | 15 | 2 | <0.03 | 0.60 | 0.08 |
| Ammonia-N (mg/L) | 15 | 2 | <0.03 | 0.81 | 0.08 |
| TKN (mg/L) | 15 | 15 | 0.23 | 1.31 | 0.60 |

- = no or insufficient data

**Table 2-29: Newhall WRP Pre-Startup Dry Weather Monitoring for Selected Nutrients in the SCR during 2004-2007**

| Constituent | Location | No. of Samples | No. of Detects | Min | Max | Average |
|---|---|---|---|---|---|---|
| Total phosphorus (mg/L) | NR1 | 98 | 98 | 0.05 | 1.4 | 0.6 |
| | NR3 | 98 | 97 | <0.008 | 1.0 | 0.5 |
| Nitrate-N (mg/L) | NR1 | 98 | 98 | 0.97 | 4.9 | 2.4 |
| | NR3 | 98 | 97 | <0.01 | 5.1 | 2.4 |
| Nitrite-N (mg/L) | NR1 | 98 | 36 | <0.005 | 0.2 | <0.005 |
| | NR3 | 98 | 31 | <0.005 | 0.3 | <0.005 |
| Ammonia-N (mg/) | NR1 | 98 | 68 | <0.005 | 0.4 | 0.1 |
| | NR3 | 98 | 72 | <0.005 | 0.4 | 0.1 |
| TKN (mg/L) | NR1 | 95 | 89 | <0.04 | 3.4 | 0.7 |
| | NR3 | 95 | 91 | <0.04 | 1.5 | 0.7 |

**Table 2-30: Newhall WRP Pre-Startup Dry Weather Monitoring for Selected Nutrients in the SCR during 2008-2009**

| Constituent | Location | No. of Samples | No. of Detects | Min | Max | Average |
|---|---|---|---|---|---|---|
| Total phosphorus (mg/L) | RSW-001U | 4 | 4 | 0.22 | 0.64 | 0.4 |
| | RSW-002D | 4 | 4 | 0.22 | 0.67 | 0.4 |
| Nitrate-N (mg/L) | RSW-001U | 4 | 4 | 1.41 | 2.33 | 1.8 |
| | RSW-002D | 4 | 4 | 1.29 | 2.45 | 1.9 |
| Nitrite-N (mg/L) | RSW-001U | 4 | 3 | <0.01 | 0.21 | 0.07 |
| | RSW-002D | 4 | 3 | <0.01 | 0.22 | 0.07 |
| Ammonia-N (mg/) | RSW-001U | 4 | 3 | <0.03 | 0.06 | 0.04 |
| | RSW-001D | 4 | 2 | <0.03 | 0.07 | 0.03 |
| | RSW-002D | 4 | 3 | <0.03 | 0.1 | 0.05 |
| TKN (mg/L) | RSW-001U | 4 | 4 | 0.57[1] | 0.98 | 0.77 |
| | RSW-002D | 4 | 3 | <0.46 | 1.4 | 0.74 |

[1] Analyte was detected at a concentration below the reporting limit and above the laboratory method detection limit. Reported value is estimated; detected, but not quantified (DNQ).

**Table 2-31: USGS Dry Weather Water Quality Monitoring Data for Selected Nutrients in the Santa Clara River at the County Line during 1951 - 1995**

| Constituent | No. of Samples | No. of Detects | Minimum | Maximum | Average |
|---|---|---|---|---|---|
| Dissolved phosphorus (mg/L) | 48 | 48 | 0.12 | 2.4 | 1 |
| Total phosphorus (mg/L) | 64 | 64 | 0.23 | 5.9 | 1.13 |
| Ammonia as N (mg/L) | 41 | 41 | 0.01 | 0.62 | 0.18 |
| Nitrate + Nitrite as N (mg/L) | 47 | 47 | 1.8 | 7.5 | 4 |
| TKN as N (mg/L) | 20 | 20 | 0.08 | 1.3 | 0.83 |
| Total Nitrogen (mg/L) | 33 | 33 | 0.5 | 15 | 3.7 |

**Phosphorus and Nitrogen.** The average concentrations for all nutrients showed a very similar and simple pattern. Concentrations generally increased downstream and were higher in the historical dataset. Lower average values at the mass emission station could reflect its location above the Valencia WRP, and/or the low number of dry weather samples at this station. Higher average concentrations at the USGS gauge (Table 2-29) compared with the Newhall WRP startup monitoring data (Table 2-28) could be due to greater nutrient loading over its period of record due to historically greater WRP discharge concentrations and/or less responsible use of fertilizers, as well as the higher TSS, and hence particulate nutrients, observed at this site.

*Metals and Pesticides*

Tables 2-30 through 2-32 report summary statistics for dry weather monitoring of selected metals and pesticides for the three datasets.

**Table 2-32: LACDPW Dry Weather Monitoring for Metals and Pesticides at the SCR Mass Emission Station (S29) during 2002-2009**

| Constituent | No. of Samples | No. of Detects | Minimum | Maximum | Average |
|---|---|---|---|---|---|
| Dissolved copper (µg/L) | 15 | 15 | 0.99 | 3.8 | 2.4 |
| Total copper (µg/L) | 15 | 15 | 4.41 | 34 | 13 |
| Dissolved lead (µg/L) | 15 | 0 | <0.17 | <0.17 | <0.17 |
| Total lead (µg/L) | 15 | 13 | <0.17 | 8.2 | 1.3 |
| Dissolved zinc (µg/L) | 15 | 11 | <1 | 26 | 8 |
| Total zinc (µg/L) | 15 | 13 | <1 | 52 | 21 |
| Dissolved cadmium (µg/L) | 15 | 3 | <0.05 | 41 | 3 |
| Total cadmium (µg/L) | 15 | 4 | <0.05 | 72 | 5 |
| Dissolved aluminum (µg/L) | 15 | 0 | <100 | <100 | <100 |
| Total aluminum (µg/L) | 15 | 3 | <100 | 7500 | 566 |
| Chlorpyrifos (µg/L) | 15 | 0 | <0.05 | <0.05 | <0.05 |
| Diazinon (µg/L) | 15 | 1 | <0.01 | 0.23 | <0.01 |

- = no or insufficient data

**Table 2-33: Newhall WRP Pre-Startup Dry Weather Monitoring for Selected Metals, Pesticides in the SCR during 2004-2007.**

| Constituent | Location | No. of Samples | No. of Detects | Min | Max | Average |
|---|---|---|---|---|---|---|
| Dissolved copper (µg/L) | NR1 | 31 | 31 | 2.2 | 5.8 | 3.6 |
| | NR3 | 31 | 31 | 2.3 | 5.5 | 3.6 |
| Total copper (µg/L) | NR1 | 42 | 42 | 2.3 | 11 | 4.4 |
| | NR3 | 42 | 42 | 2.1 | 15 | 5.2 |
| Dissolved lead (µg/L) | NR1 | 31 | 8 | <0.05 | 0.7 | <0.05 |
| | NR3 | 31 | 7 | <0.05 | 0.6 | <0.05 |
| Total lead (µg/L) | NR1 | 42 | 38 | <0.05 | 4.6 | 0.6 |
| | NR3 | 42 | 39 | <0.05 | 5.8 | 0.9 |
| Dissolved zinc (µg/L) | NR1 | 31 | 31 | 7.8 | 22.2 | 14.1 |
| | NR3 | 31 | 31 | 5.4 | 18.6 | 11.8 |

| Constituent | Location | No. of Samples | No. of Detects | Min | Max | Average |
|---|---|---|---|---|---|---|
| Total zinc (µg/L) | NR1 | 42 | 42 | 8.5 | 30 | 16 |
| | NR3 | 42 | 42 | 7.8 | 51 | 17 |
| Dissolved aluminum (µg/L) | NR1 | 25 | 14 | <5 | 290 | 36 |
| | NR3 | 25 | 11 | <5 | 750 | 54 |
| Total aluminum (µg/L) | NR1 | 25 | 25 | 12 | 2100 | 325 |
| | NR3 | 25 | 25 | 49 | 3300 | 530 |
| Diazinon (µg/L)[1] | NR1 | 42 | 1 | <0.01 | 2 | <2 |
| | NR3 | 42 | 2 | <0.01 | 33.5 | <2 |

[1] Detection limits changed over time.

**Table 2-34: Newhall WRP Pre-Startup Dry Weather Monitoring for Selected Metals, Pesticides in the SCR during 2008-2009**

| Constituent | Location | No. of Samples | No. of Detects | Min | Max | Average |
|---|---|---|---|---|---|---|
| Total Copper (µg/L) | RSW-001U | 4 | 4 | 1.5 | 3.7 | 2.9 |
| | RSW-002D | 4 | 4 | 1.4 | 3.9 | 2.9 |
| Total Lead (µg/L) | RSW-001U | 4 | 4 | 0.05[1] | 0.54 | 0.29 |
| | RSW-002D | 4 | 4 | 0.06[1] | 0.46 | 0.28 |
| Total Zinc (µg/L) | RSW-001U | 4 | 4 | 11.5 | 15.2 | 13.5 |
| | RSW-002D | 4 | 4 | 9.3 | 14.5 | 12.7 |
| Total Aluminum (µg/L) | RSW-001U | 4 | 4 | 21 | 427 | 207 |
| | RSW-002D | 4 | 4 | 21 | 386 | 170 |
| Diazinon (µg/L) | RSW-001U | 4 | 0 | - | - | <0.002 |
| | RSW-002D | 4 | 0 | - | - | <0.002 |

[1] Analyte was detected at a concentration below the reporting limit and above the laboratory method detection limit. Reported value is estimated; detected, but not quantified (DNQ).

**Table 2-35: USGS Dry Weather Water Quality Monitoring Data for Selected Metals, Pesticides in the Santa Clara River at the County Line.**

| Constituent | No. of Samples | No. of Detects | Minimum | Maximum | Average |
|---|---|---|---|---|---|
| Dissolved copper (ug/L) | 40 | 13 | 1 | 5 | 1.8 |
| Total copper (ug/L) | 12 | 6 | 10 | 40 | 20 |
| Dissolved lead (ug/L) | 39 | 4 | 1 | 23 | 7.8 |
| Total lead (ug/L) | 30 | 0 | ND | ND | ND |
| Dissolved Zinc (ug/L) | 39 | 29 | 5 | 50 | 15.8 |
| Total zinc (ug/L) | 12 | 12 | 20 | 110 | 45 |

| Constituent | No. of Samples | No. of Detects | Minimum | Maximum | Average |
|---|---|---|---|---|---|
| Diazinon (ug/L) | 6 | 4 | 0.01 | 0.05 | 0.03 |

ND = non detected

**Metals.** Concentrations of heavy metals in dry weather flows were generally low and, for the most part, reasonably similar. Total metal concentrations are generally controlled by TSS concentrations, and this is reflected in the difference between the historical data collected at the USGS site with high TSS and the more recent data with low TSS. Therefore, the dissolved concentrations are more interesting to compare. Average dissolved copper concentrations were fairly similar and ranged from 1.8 – 4.2 µg/L. Average dissolved zinc concentrations were also fairly similar and ranged from 11 – 24 µg/L. Higher copper and zinc concentrations were observed at the upper SCR site, which may reflect its proximity to urban land uses; however, the data are too few to confidently assert a reason for these differences. Dissolved lead showed some large differences between the historical and more recent datasets, and this is likely due to difficulties in analyzing trace metals in the earlier dataset, and widespread use of leaded gasoline prior to 1995.

**Pesticides.** Diazinon was detected at the upstream LACDPW site and historically at the USGS site. The more extensive data set collected at the Newhall WRP start-up sites did not detect diazinon and this may be due to its recent phase-out by USEPA for residential uses.

***Fecal Indicator Bacteria***

Tables 2-36 through 2-39 report summary statistics for dry weather monitoring of fecal indicator bacteria (FIB) for the three datasets. The concentrations of indicator bacteria indicated highly variable but generally elevated FIB concentrations in the SCR. Average concentrations of total coliform and fecal coliform were similar between the USGS station and the WRP startup monitoring stations. The mass emission station recorded much greater average concentrations, which is likely an artifact of the small dataset.

**Table 2-36: LACDPW Dry Weather Monitoring at the SCR Mass Emission Station (S29) during 2002-2009**

| Constituent | No. of Samples | No. of Detects | Minimum | Maximum | Average |
|---|---|---|---|---|---|
| Total coliform (MPN/100mL) | 15 | 15 | 130 | 50000 | 3714 |
| Fecal coliform (MPN/100mL) | 15 | 15 | 20 | 5000 | 148 |
| Enterococci (MPN/100mL) | 15 | 14 | <20 | 1300 | 140 |

**Table 2-37: Newhall WRP Pre-Startup Dry Weather Monitoring for Indicator Bacteria in the SCR during 2004 – 2007**

| Constituent | Location | No. of Samples | No. of Detects | Min | Max | Average |
|---|---|---|---|---|---|---|
| Fecal coliform (CFU/100mL) | NR1 | 98 | 97 | <2 | 2300 | 158 |
| | NR3 | 98 | 97 | <2 | 3000 | 187 |
| Total coliform (MPN/100mL) | NR1 | 98 | 98 | 23 | 24,000 | 1227 |
| | NR3 | 98 | 98 | 23 | 24,000 | 1452 |

**Table 2-38: Newhall WRP Pre-Startup Dry Weather Monitoring for Indicator Bacteria in the SCR during 2008-2009**

| Constituent | Location | No. of Samples | No. of Detects | Min | Max | Average |
|---|---|---|---|---|---|---|
| Fecal coliform (MPN/100mL) | RSW-001U | 4 | 3 | <20 | 300 | 115 |
| | RSW-002D | 4 | 3 | <20 | 170 | 92 |
| Total coliform (MPN/100mL) | RSW-001U | 4 | 3 | <20 | 3000 | 1,827 |
| | RSW-002D | 4 | 3 | <20 | 3000 | 982 |

**Table 2-39: USGS Dry Weather Water Quality Monitoring Data for Indicator Bacteria in the Santa Clara River at the County Line during 1951-1995**

| Constituent | No. of Samples | No. of Detects | Minimum | Maximum | Average |
|---|---|---|---|---|---|
| Fecal coliform (CFU/100mL) | 46 | 46 | 25 | 980 | 250 |

***Summary***

Table 2-40 summarizes of all dry weather monitoring data available for the Santa Clara River in the NRSP area.

**Table 2-40: Summary of Average Dry Weather Monitoring Data in the Santa Clara River**

| | USGS Wet Weather Monitoring | SCR Mass Emission Station | Newhall WRP Startup Monitoring | | | | |
|---|---|---|---|---|---|---|---|
| **Constituent** | *11108500* | *S29* | *NR1* | *NR3* | *RSW-001U* | *RSW-001D* | *RSW-002D* |
| *General and Conventional Parameters* | | | | | | | |
| TSS (mg/L) | 349 | 135 | 42 | 76 | 18 | | 18 |
| Hardness (mg/L) | 881 | 411 | 323 | 380 | 257 | | 256 |
| TDS (mg/L) | 1541[1] | 806 | 853 | 930 | 873 | | 904 |
| Chloride (mg/L) | 140 | 114 | 116 | 122 | 115 | | 122 |
| Nutrients | | | | | | | |
| Total P (mg/L) | 1.13 | 0.18 | 0.6 | 0.5 | 0.40 | | 0.40 |
| Nitrate-N (mg/L) | 4[2] | 0.23 | 2.4 | 2.4 | 1.84 | | 1.86 |
| Nitrite-N (mg/L) | - | 1.16 | <0.005 | <0.005 | 0.07 | | 0.07 |
| Ammonia-N (mg/L) | 0.18 | 0.08 | 0.1 | 0.1 | 0.04 | 0.03 | 0.05 |
| TKN (mg/L) | 0.83 | 0.08 | 0.7 | 0.7 | 0.77 | | 0.74 |
| Metals | | | | | | | |
| Dissolved copper (µg/L) | 1.8 | 2.4 | 3.6 | 3.6 | | | |
| Total copper (µg/L) | 20 | 13 | 4.4 | 5.2 | 2.9 | | 2.9 |
| Dissolved lead (µg/L) | 7.8 | <0.17 | <0.05 | <0.05 | | | |
| Total lead (µg/L) | ND | 1.3 | 0.6 | 0.9 | 0.29 | | 0.28 |
| Dissolved zinc (µg/L) | 15.8 | 7.9 | 14.1 | 11.8 | | | |
| Total zinc (µg/L) | 45 | 21 | 16 | 17 | 13.5 | | 12.7 |
| Dissolved aluminum (µg/L) | - | 36 | 36 | 54 | | | |
| Total aluminum (µg/L) | - | 566 | 325 | 530 | 208 | | 170 |

ND = non detected, - = no or insufficient data

## 2.7 Groundwater

### 2.7.1 Groundwater Beneficial Uses

The Project area is within the Basin Plan's Castaic Valley and Saugus Aquifer subbasin of the Santa Clarita Valley Groundwater Basin, East Subbasin. Beneficial uses for groundwaters for this subbasin are shown in Table 2-37.

**Table 2-41: Beneficial Uses of Groundwaters**

| Groundwater Basin | MUN |
|---|---|
| DWR 4.07 - Eastern Santa Clara Sub-basin: Castaic Valley and Saugus Aquifer | E |

E-Existing Beneficial Use
MUN: Community, military, or individual water supply systems including, but not limited to, drinking water supply
Source: Water Quality Control Plan for the Los Angeles Region (Basin Plan) (LARWQCB, 1994 as amended)

### 2.7.2 Existing Groundwater Quality

The Project area lies at the western end of the upper Santa Clara River hydrologic area, as defined by the California Department of Water Resources (DWR). The Santa Clara River Valley East Groundwater Subbasin lies within this hydrologic area and is the source of essentially all local groundwater used for water supply in the Santa Clarita Valley. The local groundwater supplies are obtained from relatively young surficial alluvial deposits and from an older geologic unit (the Saugus Formation) that underlies the alluvium and adjoining areas. The alluvium and the Saugus Formation are underlain by bedrock units consisting of the Pico Formation in the Project area and other geologic units in the eastern and northern portions of the Santa Clarita Valley. These deep bedrock units yield little water and are not considered viable for groundwater development.

The alluvial sediments lie within the portion of the Valley occupied by the Santa Clara River and also are present in side canyons that contain tributaries to the River. The alluvium consists of extensively interlayered and interfingered mixtures of gravel and sand, with variable amounts of cobbles and boulders and minor amounts of silt and clay. Due to the unconsolidated to poorly consolidated condition of the alluvium, and its lack of cementation, the alluvium has relatively high permeability and porosity. The groundwater flow direction in the Alluvial aquifer follows the topography of the Valley and its tributaries. Groundwater recharge occurs in the eastern, northern, and southern portions of the Valley. Natural mechanisms for groundwater discharge occur at the west end of the Valley and consist of discharge to the Santa Clara River, subsurface outflow beneath the River, and evapotranspiration by deep-rooted vegetation.

The Saugus Formation is present beneath the Project and most of the Santa Clarita Valley area east of the NRSP area. The upper subunits of the Saugus Formation consist of terrestrial sediments deposited in stream channels, floodplains, and alluvial fans by ancestral drainage systems. The upper subunits are a source of groundwater supply in the Santa Clarita Valley because of their productive nature and their good water quality. Deeper subunits of the Saugus

Formation were deposited in a marine environment and are subsequently not used for water supplies because of their brackish water quality and fine-grained, low-permeability nature.

Faulting and folding of the Saugus Formation and the underlying bedrock units have created a bowl-shaped structure beneath the Santa Clarita Valley. The Saugus Formation and underlying bedrock generally dip downwards from the periphery of the Valley towards the deepest portion of the "bowl" beneath the central portion of the Valley. The thickness of the Saugus Formation also is controlled by the San Gabriel fault, which is present in the eastern and northern portions of the Valley. Because of its structure and its connection with the overlying Alluvial aquifer, groundwater flow in the Saugus Formation is generally towards the center of the bowl and also towards the western portion of the Santa Clara River. Like the Alluvial aquifer, the Saugus Formation is recharged in the eastern and other peripheral portions of the Santa Clarita Valley. Groundwater discharge from the Saugus Formation occurs at the west end of the Valley in the form of groundwater discharge into the overlying Alluvial aquifer, which in turn discharges to the River in the western end of the Valley.

**Alluvium.** In terms of the aquifer system, there is no convenient long-term record of water quality (*i.e.*, water quality data in one or more single wells that spans several decades and continues to the present). Thus, in order to examine a long-term record of water quality in the alluvium, individual records have been integrated from several wells completed in the same aquifer materials and in close proximity to each other to examine historical trends in general mineral groundwater quality throughout the basin (Luhdorff & Scalmanini, 2005). Based on these records of groundwater quality, wells within the alluvium have experienced historical fluctuations in general mineral content, as indicated by electrical conductivity (EC), which correlates with fluctuations of individual constituents that contribute to EC. However, the historic water quality data indicates that, on a long-term basis, there has not been a notable trend and, specifically, there has not been a decline in water quality within the alluvium.

Specific conductance within the alluvium exhibits a westward gradient, corresponding with the direction of groundwater flow in the alluvium. EC is lowest in the easternmost portion of the basin, and highest in the west, and generally exhibits an inverse correlation with precipitation and streamflow, with a stronger correlation in the easternmost portion of the basin where groundwater levels fluctuate the most. Wet periods have produced substantial recharge of higher quality (low EC) water, and dry periods have resulted in declines in groundwater levels, with a corresponding increase in EC (and individual contributing constituents) in the deeper parts of the alluvium.

The most notable groundwater quality issue in the alluvium is perchlorate contamination in a localized area situated about three miles east of the Project area. In 2002, one well (the Santa Clarita Water Division's Stadium Well), located near the former Whittaker-Bermite facility, was inactivated for municipal water supply due to detection of perchlorate slightly below the Notification Level. Since that time, a replacement well (Valley Center Well) has been drilled in

the non-impacted portion of the groundwater basin. In early 2005, perchlorate was detected in a second well, the Valencia Water Company's Well Q2. In October 2005, Well Q2 was returned to service with wellhead perchlorate treatment under a permit from the California DHS. On-going monitoring in the alluvium north of the Whittaker-Bermite site (an ammunition manufacturing site) has shown no detections of perchlorate in any other Alluvial municipal water supply wells in this area.

Table 2-42 summarizes average metals, general chemistry, and organic compounds data for three Alluvial aquifer wells located in and near the Project area (see Figure 2-1). One well is a municipal water supply well that belongs to the Valencia Water Company (E-15) and is located in the Valencia Commerce Center area, northeast of the Project boundary. Two Newhall Ranch agricultural Alluvial aquifer wells (C and B6) were monitored twice (once each in 2000 and 2001).

Laboratory testing indicates that all constituents tested were at acceptable levels for drinking water, for all tested wells, with the exception of sulfate and iron in the agricultural supply well B6. Specifically, the average sulfate concentration (360 mg/L) exceeded the Basin Plan objective of 350 mg/L and the average iron concentration (0.4 mg/L) exceeded the secondary drinking water standard of 0.3 mg/L in Alluvial Well B6.

Tests conducted for perchlorate at the Alluvial aquifer wells listed in Table 2-42 indicated "non-detect," meaning no perchlorate was detected. Furthermore, no organic contaminants have been detected in any Alluvial aquifer wells.

**Saugus Formation.** Similar to the Alluvial aquifer, groundwater quality in the Saugus Formation is a key factor in assessing that aquifer as a municipal and agricultural water supply. As with the Alluvial aquifer, long-term Saugus groundwater quality data is not sufficiently extensive (few wells) to permit any basin-wide analysis or assessment of pumping-related impacts on quality. Accordingly, EC has been chosen as an indicator of overall water quality, and records have been combined to produce a long-term depiction of water quality. Water quality in the Saugus Formation historically has not exhibited the precipitation-related fluctuations seen in the Alluvial aquifer, and based on the historical record over the last 50 years, groundwater quality in the Saugus Formation has exhibited a slight overall increase in EC.

Table 2-42 summarizes average metals, general chemistry, and organic compounds data for one Saugus aquifer well located near the Project location (see Figure 2-1). Saugus Well 206 is a municipal water supply well that belongs to the Valencia Water Company and is located in the RMDP project area. Laboratory testing indicates that all constituents tested were at acceptable levels for drinking water in Saugus Well 206.

As with the Alluvial aquifer, the most notable groundwater quality issue in the Saugus Formation is perchlorate contamination. Since 1997, five Saugus wells located near the former Whittaker-

Bermite facility (about two miles east of the Project location), including the recently closed Valencia Water Company (VWC) Well 201, have been inactivated for water supply service for varying periods of time due to the presence of perchlorate. Since that time, the Department of Public Health approved a Final Interim Remedial Action Plan for the containment and extraction of perchlorate from the groundwater, and the Castaic Lake Water Agency (CLWA), in partnership with other local retail purveyors and the City of Santa Clarita, completed construction of CLWA's Saugus Perchlorate Treatment Facility, a $13-million facility to treat perchlorate in groundwater emanating from the Whittaker-Bermite site. As a result, two of the previously inactivated Saugus wells have been placed back into service, and a replacement well for a third well has been drilled in the non-impacted portion of the groundwater basin. The Saugus wells, in combination with the reinstated Alluvial wells, collectively restore much of the temporarily lost well capacity, and an additional two wells will be drilled to restore the operational flexibility that existed prior to the detection of perchlorate. Specific to Well 201, VWC plans to actively seek remediation and restore the impacted well capacity in the near term.

**Table 2-42: Groundwater Monitoring Data**

| Parameter | Units | Basin Plan Objective / Maximum Contaminant Level | Average Concentration | | | |
|---|---|---|---|---|---|---|
| | | | Alluvial Well E-15 | Alluvial Well C | Alluvial Well B6 | Saugus Well 206 |
| Aluminum | µg/L | 1,000[2] | ND | ND | ND | ND |
| Arsenic | µg/L | 50[2] | n/a | ND | ND | n/a |
| Barium | mg/L | 1[2] | ND | 0.02 | 0.03 | ND |
| Beryllium | µg/L | 4[2] | ND | n/a | n/a | ND |
| Cadmium | µg/L | 5[2] | ND | ND | ND | ND |
| Chromium | µg/L | 50[2] | ND | ND | ND | ND |
| Copper | µg/L | 1,000[3] | ND | ND | ND | ND |
| Iron | mg/L | 0.3[3] | ND | 0.1 | **0.4** | ND |
| Manganese | µg/L | 50[3] | ND | ND | ND | ND |
| Mercury, Total | µg/L | 2[2] | n/a | ND | ND | n/a |
| Nickel | µg/L | 100[2] | ND | ND | ND | ND |
| Selenium | µg/L | 50[2] | n/a | ND | ND | n/a |
| Silver | µg/L | 100[3] | NA | ND | ND | n/a |
| Thallium | µg/L | 2[2] | NA | ND | ND | n/a |
| Zinc | µg/L | 5,000[3] | ND | ND | ND | ND |
| Alkalinity as CaCO3 | mg/L | -- | 226 | 255 | 295 | 221 |
| Boron | mg/L | 1.0[1] | 0.48 | 0.39 | 0.48 | n/a |
| Chloride | mg/L | 150[1] | 90 | 57 | 82 | 45 |
| Color | Color unit | 15[3] | ND | ND | 5 | ND |
| Cyanide, total | mg/L | 0.15[2] | n/a | ND | ND | n/a |
| Fluoride | mg/L | 2.0[2] | 0.8 | 0.7 | 0.8 | 0.2 |
| Hardness as CaCO3 | mg/L | -- | 499 | 410 | 510 | 464 |
| MBAS | mg/L | 0.5[3] | n/a | ND | ND | n/a |
| Nitrate as NO3 | mg/L | 45[1] | 18.5 | 9.5 | 10.6 | 20.9 |
| Nitrite as N | mg/L | 1[1] | ND | ND | ND | ND |
| Nitrate+Nitrite as N | mg/L | 10[1] | 3.6 | 2.1 | 2.4 | 4.7 |
| Odor | TON | 3[3] | 1.1 | ND | ND | 1 |

| Parameter | Units | Basin Plan Objective / Maximum Contaminant Level | Average Concentration | | | |
|---|---|---|---|---|---|---|
| | | | Alluvial Well E-15 | Alluvial Well C | Alluvial Well B6 | Saugus Well 206 |
| Specific Conductance | umhos/cm | 900-1600[3] | 1317 | 1150 | 1400 | 1158 |
| Sulfate | mg/L | 350[1] | 314 | 285 | **360** | 293 |
| TDS | mg/L | 1,000[1] | 969 | 760 | 950 | 861 |
| Turbidity | NTU | 5[3] | 0.4 | 0.35 | 1.4 | 0.2 |
| Volatile Organic Chemicals (VOCs) | µg/L | variable | ND | ND | ND | ND |
| Synthetic Organic Chemicals (SVOCs) | µg/L | variable | ND | ND | ND | ND |
| ***Key:*** **Bold** **Exceeds Standard** | | | | | | |

-- = no applicable basin plan objective or MCL
n/a = not analyzed
ND = none detected
[1] Los Angeles Basin Plan Regional Objectives for Groundwater (Table 3-10).
[2] California Department of Public Health Primary Drinking Water MCL (Title 22 CCR Table 64431-A and Table 64444-A).
[3] California Department of Public Health Secondary Drinking Water MCL (Title 22 CCR Table 64449-A and Table 64449-B).

# 3 REGULATORY SETTING

## 3.1 Clean Water Act

In 1972, the Federal Water Pollution Control Act [later referred to as the Clean Water Act (CWA)] was amended to require National Pollutant Discharge Elimination System (NPDES) permits for the discharge of pollutants to waters of the United States from any point source. In 1987, the CWA was amended to require that the United States Environmental Protection Agency (USEPA) establish regulations for permitting of municipal and industrial stormwater discharges under the NPDES permit program. The USEPA published final regulations regarding stormwater discharges on November 16, 1990. The regulations require that municipal separate storm sewer system (MS4) discharges to surface waters be regulated by a NPDES permit.

In addition, the CWA requires the States to adopt water quality standards for receiving water bodies and to have those standards approved by the USEPA. Water quality standards consist of designated beneficial uses for a particular receiving water body (e.g. wildlife habitat, agricultural supply, fishing etc.), along with water quality criteria necessary to support those uses. Water quality criteria are prescribed concentrations or levels of constituents – such as lead, suspended sediment, and fecal coliform bacteria – or narrative statements which represent the quality of water that support a particular use. Because California had not established a complete list of acceptable water quality criteria, USEPA established numeric water quality criteria for certain toxic constituents in receiving waters with human health or aquatic life designated uses in the form of the California Toxics Rule ("CTR") (40 CFR 131.38).

## 3.2 CWA Section 303(d) - TMDLs

When designated beneficial uses of a particular receiving water body are being compromised by water quality, Section 303(d) of the CWA requires identifying and listing that water body as "impaired". Once a water body has been deemed impaired, a Total Maximum Daily Load (TMDL) must be developed for the impairing pollutant(s). A TMDL is an estimate of the total load of pollutants from point, non-point, and natural sources that a water body may receive without exceeding applicable water quality standards (with a "factor of safety" included). Once established, the TMDL allocates the loads among current and future pollutant sources to the water body.

The Project would discharge runoff to Santa Clara River Reach 5. Table 3-1**,** 2010 CWA Section 303(d) Listings for the Santa Clara River Mainstem, lists the water quality impairments for the Santa Clara River mainstem, as reported in the 2010 CWA Section 303(d) list of water quality limited segments, including reaches upstream of the Project location. Reach 7 of the Santa Clara River (Bouquet Canyon Road to above Lang Gaging Station) is listed for coliform bacteria. Reach 6 (West Pier Highway 99 to Bouquet Canyon Road) is listed for coliform bacteria, chlorpyrifos, diazinon, toxicity, iron, and copper. Reach 5 is listed for coliform bacteria and iron.

Santa Clara River Reach 3, approximately 25 miles downstream of the Project location and below the Dry Gap in Reach 4, is listed for total dissolved solids (TDS) and toxicity. Santa Clara River Reach 1, approximately 30 miles downstream of the Project location, is listed for toxicity. The Santa Clara River estuary, located approximately 40 miles downstream of the Project location, is listed for coliform, chlorinated legacy pesticides, Toxaphene, toxicity, and nitrate-nitrogen.

The RWQCB has adopted nitrogen compounds (nitrate-nitrogen plus nitrite-nitrogen and ammonia), chloride, and indicator bacteria TMDLs in the Basin Plan. Table 3-2, 2010 CWA Section 303(d) List of Water Quality Limited Segments Being Addressed By EPA Approved TMDLs, lists the 2010 Section 303(d) List of Water Quality Limited Segments Being Addressed by EPA Approved TMDLs. The Indicator Bacteria TMDL, adopted by the Regional Board on July 8, 2010, must be submitted for review and approval to the SWRCB, the State Office of Administrative Law, and the USEPA. The wasteload allocations for stormwater discharges into Reach 5 of the Santa Clara River are summarized in Table 3-3, TMDL Wasteload Allocations for MS4 and Stormwater Sources to Santa Clara River Reach 5. Pollutant reductions are regulated through effluent limits prescribed in Publicly Owned Treatment Works (POTW) and minor point source NPDES Permits, BMPs required in NPDES MS4 Permits, and SWRCB Management Measures for non-point source discharges.

## 3.3 California Toxics Rule

The California Toxics Rule (40 C.F.R. §131.38) is a federal regulation issued by the USEPA that provides water quality criteria for toxic pollutants in waters with human health or aquatic life designated uses in California. Not all waters receiving flows from the NRSP area, such as the tributaries to the Santa Clara River, are specifically designated with human health or aquatic life uses. However, the Santa Clara River does have such designated uses, and the impact analysis in Section 7 of this report assumes that the Santa Clara River Reach 5 beneficial uses apply to all of the Project's receiving waters pursuant to the Basin Plan. Although CTR criteria do not apply directly to discharges of stormwater runoff, they can provide a useful benchmark to assess the potential impacts to the water quality of receiving waters from Project stormwater runoff discharges. Here, the freshwater aquatic life criteria are used as benchmarks to evaluate the potential impacts of stormwater runoff to the project's receiving waters. The CTR also contains human health criteria which are derived for drinking water sources and for fish consumption only. Since the human health criteria are less stringent than the aquatic life criteria for the pollutants of concern for the Project, the aquatic life criteria are used.

**Table 3-1: 2010 CWA Section 303(d) Listings for the Santa Clara River Mainstem**

| River Reach or Tributary | Geographic Description and Distance from Project to Upstream End of Reach | Pollutants | 303(d) List Proposed TMDL Completion | Potential Sources |
|---|---|---|---|---|
| 7 | Bouquet Canyon Rd to above Lang Gaging Station (5 miles upstream) | Coliform Bacteria | 2019[1] | Nonpoint and Point Sources |
| 6 | West Pier Hwy 99 to Bouquet Cyn Rd (Directly upstream of Project site) | Coliform Bacteria<br>Chlorpyrifos<br>Diazinon<br>Toxicity<br>Iron<br>Copper | 2019[2]<br>2019<br>2019<br>2019<br>2021<br>2021 | Source Unknown<br>Nonpoint and Point Sources<br>Source Unknown]<br>Source Unknown<br>Source Unknown<br>Nonpoint and Point Sources |
| 5 | Blue Cut Gaging Station to West Pier Hwy 99<br>(Project location) | High Coliform Count<br>Iron | 2019[1]<br>2021 | Nonpoint and Point Sources<br>Source Unknown |
| 3 | Freeman diversion dam to "A" street<br>(25 miles) | Total Dissolved Solids<br>Toxicity | 2015<br>2021 | Nonpoint and Point Sources<br>Source Unknown |
| 1 | Estuary to Highway 101 Bridge<br>(30 miles) | Toxicity | 2019 | Source Unknown |
| -- | Estuary<br>(40 miles) | ChemA[3]<br>Coliform<br>Toxaphene<br>Toxicity<br>Nitrate | 2019<br>2019<br>2019<br>2019<br>2021 | Source Unknown<br>Nonpoint Source<br>Nonpoint Source<br>Source Unknown<br>Source Unknown |

[1] Reach 3 is downstream of the Dry Gap in Reach 4.
[2] Indicator Bacteria TMDL adopted by LARWQCB in July 2010; not yet approved by SWRCB and USEPA.
[3] ChemA suite of chlorinated legacy pesticides include: Aldrin, chlordane, Dieldrin, Endosulfan I/II, Endrin, gamma-BHC, heptachlor, heptachlor epoxide, and Toxaphene.

**Table 3-2: 2010 CWA Section 303(d) List of Water Quality Limited Segments Being Addressed By EPA Approved TMDLs**

| Water Body Name | Pollutants | Potential Sources | US EPA Approved TMDL |
|---|---|---|---|
| Santa Clara River Reach 6 | Ammonia<br>Chloride | Nonpoint/Point Source<br>Nonpoint/Point Source | 2004<br>2005 |
| Santa Clara River Reach 5 | Chloride | Nonpoint/Point Source | 2005 |
| Santa Clara River Reach 3 | Ammonia<br>Chloride | Nonpoint/Point Source<br>Nonpoint/Point Source | 2002<br>2002 |

**Table 3-3: TMDL Wasteload Allocations for MS4 and Stormwater Sources to Santa Clara River Reach 5**

<table>
<tr><th>Impairing Pollutant</th><th colspan="3">Numeric Water Quality Objective</th><th>Wasteload Allocation</th></tr>
<tr><td>Chloride</td><td colspan="3">100 mg/L.</td><td>Wasteload allocations have been adopted for the Saugus WRP and the Valencia WRP. Other NPDES discharges contribute a minor chloride load. The wasteload allocation for these point sources is 100 mg/L.<br>The source analysis indicates that non-point sources are not a major source of chloride. The load allocations for non-point sources is 100 mg/L.</td></tr>
<tr><td rowspan="5">Nitrogen Compounds</td><td colspan="3">The numeric target for nitrogen in this TMDL is based on achieving the existing nitrogen water quality objective of 5 mg/L $NO_3$-N + $NO_2$-N. (Note: the numeric target that is used to calculate the wasteload allocations includes a 10% margin of safety; thus the numeric target is 4.5 mg/L $NO_3$-N + $NO_2$-N.)<br>The water quality objective for ammonia in Reach 5 used in the nitrogen compounds TMDL was based on temperature and pH for different River segments within the reach:</td><td rowspan="5">Concentration-based wasteloads are allocated to municipal, industrial and construction stormwater sources regulated under NPDES permits. For stormwater permittees discharging into Reach 5, the following wasteload allocations apply:<br>30-day average nitrate plus nitrite = 6.8 mg/L ($NO_3$-N+$NO_2$-N)<br>1-hour average ammonia = 5.2 mg/L ($NH_3$ as N)<br>30-day average ammonia = 1.75 mg/l ($NH_3$ as N)</td></tr>
<tr><td colspan="3">Ammonia Water Quality Objective (mg/L as N)[1]</td></tr>
<tr><td></td><td>1-hour average</td><td>30-day average</td></tr>
<tr><td>Reach 5 at County Line</td><td>3.4</td><td>1.2</td></tr>
<tr><td>Reach 5 below Valencia</td><td>5.5</td><td>2.0</td></tr>
<tr><td>Reach 5 above Valencia</td><td>4.8</td><td>2.0</td></tr>
</table>

<table>
<tr><th>Impairing Pollutant</th><th>Numeric Water Quality Objective</th><th>Wasteload Allocation</th></tr>
<tr>
<td>Indicator Bacteria (Resolution R10-006)</td>
<td>
Numeric Targets:
<table>
<tr><th>Constituent</th><th>SCR Reach 5 Requirement</th></tr>
<tr><td>E. Coli<br>(Single Sample)</td><td>235/100 mL</td></tr>
<tr><td>E. Coli<br>(Geometric Mean)</td><td>126/100 mL</td></tr>
</table>
</td>
<td>
Wasteload allocations are given in terms of allowable exceedance days. The numeric targets may not be exceeded more than the number of allowable exceedance days allotted in the tables below.<br>
Interim Allowable Exceedance Days<br>
(Enforceable 4 years after effective date of TMDL):
<table>
<tr><th>Time Period</th><th>Santa Clara River Reach 5</th></tr>
<tr><td>Dry Weather</td><td>17 allowable exceedance days of singe sample objectives.</td></tr>
<tr><td>Wet Weather</td><td>61 allowable exceedance days of singe sample objectives;</td></tr>
</table>
Allowable Exceedance Days<br>
(Dry Weather enforceable 11 years after effective date of TMDL; Wet Weather enforceable 17 years after effective date of TMDL):
<table>
<tr><th>Time Period</th><th>Santa Clara River Reach 5</th></tr>
<tr><td>Dry Weather</td><td>5 allowable exceedance days of singe sample objectives:<br>0 allowable exceedances of geometric mean objectives</td></tr>
<tr><td>Wet Weather</td><td>16 allowable exceedance days of singe sample objectives;<br>0 allowable exceedances of geometric mean objectives</td></tr>
</table>
</td>
</tr>
</table>

[1] The numeric targets are 10 percent smaller to incorporate a margin of safety.

Freshwater aquatic life criteria for certain metals in the CTR are expressed as a function of hardness because hardness, and/or water quality characteristics that are usually correlated with hardness, can reduce the toxicities of some metals [5]. The minimum wet weather hardness value of 250 mg/L as $CaCO_3$ from USGS station 11108500 was used to approximate CTR criteria for metals. This value is likely to be more representative of conditions in the Santa Clara River within the NRSP subregion than Los Angeles County's Station 29 based on the water quality data summarized in Section 2.7 above. As per requirements of their discharge permit, the Valencia WRP has a monitoring station just upstream of the NRSP subregion area. Monthly hardness values for the Santa Clara River at this station ranged from 326 to 360 mg/L as $CaCO_3$ in 2004. Other water quality comparisons to this station were not made due to lack of wet weather monitoring. The hardness value of 250 mg/L is a conservative estimate of wet weather hardness values that should occur in the NRSP subregion area, although higher values are likely to occur.

The CTR also establishes two types of aquatic life criteria: acute and chronic. Acute criteria represent the highest concentration of a pollutant to which aquatic life can be exposed for a short period of time without deleterious effects; chronic criteria equal the highest concentration to which aquatic life can be exposed for an extended period of time (four days) without deleterious effects. Due to the intermittent nature of stormwater runoff (especially in southern California), the acute criteria are considered to be more applicable to stormwater conditions than chronic criteria. For example, the average storm duration in the 38-year Newhall gage rainfall record is 11.3 hours. In this document, the acute CTR criteria are used as one type of benchmark to evaluate the potential ecological impacts of Project runoff on the receiving waters.

### 3.4 California Porter-Cologne Act

The federal CWA places the primary responsibility for the control of surface water pollution and for planning the development and use of water resources with the states, although it does establish certain guidelines for the states to follow in developing their programs and allows USEPA to withdraw control from states with inadequate implementation mechanisms.

[5] The toxicity of a chemical to an aquatic organism may vary according to attributes of the organism, chemical composition, and exposure environment, so that the chemical is more or less "bioavailable." Many chemicals exist in a variety of forms (chemical species), and such chemical speciation affects bioavailability because relative uptake rates can differ among chemical species and the relative concentrations of chemical species can differ among exposure conditions. Usually, metal toxicity is reduced by increased water hardness, which is composed of cations (primarily calcium and magnesium). In some cases, the apparent effect of hardness on toxicity might be partly due to complexation of the metal by higher concentrations of hydroxide and/or carbonate (increased pH and alkalinity) commonly associated with higher hardness. (USEPA, 2007a)

California‘s primary statute governing water quality and water pollution issues with respect to both surface waters and groundwater is the Porter-Cologne Water Quality Control Act of 1970 (Porter-Cologne Act). The Porter-Cologne Act grants the State Water Resource Control Board (SWRCB) and the Regional Water Quality Control Boards (RWQCBs) power to protect water quality and is the primary vehicle for implementation of California’s responsibilities under the federal Clean Water Act. The Porter-Cologne Act grants the SWRCB and the RWQCBs authority and responsibility to adopt plans and policies to regulate discharges of waste to surface and groundwater, to regulate waste disposal sites, and to require cleanup of discharges of hazardous materials and other pollutants. The Porter-Cologne Act also establishes reporting requirements for unintended discharges of any hazardous substance, sewage, or oil or petroleum product.

Each RWQCB must formulate and adopt a water quality control plan (Basin Plan) for its region. The Basin Plan must conform to the policies set forth in the Porter-Cologne Act and established by the SWRCB in its state water policy. To implement state and federal law, the Basin Plan establishes beneficial uses for surface and groundwaters in the region, and sets forth narrative and numeric water quality standards to protect those beneficial uses. The Porter-Cologne Act also provides that a RWQCB may include within its regional plan water discharge prohibitions applicable to particular conditions, areas, or types of waste.

## 3.5 Basin Plan

The applicable Basin Plan (LARWQCB, 1994, as amended) provides numeric and narrative criteria for a range of water quality constituents applicable to certain receiving water bodies and groundwater basins within the Los Angeles region. Specific criteria are provided for the larger, designated water bodies within the region, as well as general criteria or guidelines for ocean waters, bays and estuaries, inland surface waters, and groundwaters. Those waters not specifically listed (generally smaller tributaries) are assumed to have the same beneficial uses as the streams, lakes, or reservoirs to which they are tributary. In general, the narrative criteria require that degradation of water quality does not occur due to increases in pollutant loads that will adversely impact the designated beneficial uses of a water body. For example, the Los Angeles Basin Plan requires that “Inland surface waters shall not contain suspended or settleable solids in amounts which cause a nuisance or adversely affect beneficial uses as a result of controllable water quality factors.” Water quality criteria apply within receiving waters as opposed to applying directly to runoff; therefore, water quality criteria from the Basin Plan are utilized as benchmarks as one method to evaluate the potential ecological impacts of Project runoff on the receiving waters of the proposed Project. Table 2-2 above lists the beneficial uses of applicable receiving surface waters.

The Basin Plan also contains water quality criteria for groundwater basins. For example, the Basin Plan requires that “Groundwaters shall not contain taste or odor producing

substances in concentrations that cause nuisance or adversely affect beneficial uses." Table 2-37 above lists the beneficial uses of the applicable groundwater basin.

## 3.6 MS4 Permit

In 2001, the Los Angeles Regional Water Quality Control Board (LARWQCB, 2001) issued an NPDES Permit and Waste Discharge Requirements (Order No. 01-182) under the CWA and the Porter-Cologne Act for discharges of urban runoff in public storm drains in Los Angeles County. The Permittees are the Los Angeles County cities and the County (collectively "the Co-Permittees"). This permit regulates stormwater discharges from MS4s in the Project area. The NPDES permit details requirements for new development and significant redevelopment, including specific sizing criteria for treatment BMPs and flow control requirements.

To implement the requirements of the NPDES permit, the Co-permittees have established development planning guidance and control measures that control and mitigate stormwater quality and quantity impacts to receiving waters as a result of new development and redevelopment. They are also required to implement other municipal source detection and elimination programs, as well as maintenance measures.

### 3.6.1 Stormwater Quality Management Program

The MS4 Permit contains the following provisions for implementation of the Stormwater Quality Management Program (SQMP) by the Co-permittees:

- General Requirements – Each Permittee is required to implement the SQMP to comply with applicable storm water program requirements and implement additional controls where necessary to reduce the discharge of pollutants in stormwater to the "maximum extent practicable" (MEP).
- BMP Implementation – Permittees are required to implement the most effective combination of BMPs for stormwater/urban runoff pollution control.
- SQMP Revision – Permittees are required to revise the SQMP to comply with regional, watershed specific requirements, and/or wasteload allocations for implementation of TMDLs for impaired waterbodies.
- Responsibilities of the Principal Permittee – The responsibilities of the Los Angeles County Department of Public Works (as the Principal Permittee) include, but are not limited to, coordinating activities necessary to comply with the NPDES permit, providing personnel and fiscal resources for SQMP updates and annual reports and summaries of reports required under the SQMP, and implementing and evaluating results of a County-wide Monitoring Program.

- Responsibilities of Permittees – Each Permittee is required to comply with the requirements of the SQMP applicable to the discharges within its boundaries.
- Watershed Management Committees (WMCs) – WMCs are comprised of a voting representative from each Permittee within the Watershed Management Areas (WMAs). WMCs are required to facilitate efforts and exchange of information between Permittees, establish additional goals for WMAs, prioritize pollution control efforts, monitor implementation of tasks designated for the WMA, and assess the effectiveness of and recommend revisions to the SQMP.
- Legal Authority – Permittees are granted the necessary legal authority to prohibit non-storm water discharges to the storm drain system.
- The objective of the SQMP is to reduce pollutants in urban stormwater discharges to the "maximum extent practicable" in order to attain water quality objectives and to protect the beneficial uses of receiving waters in Los Angeles County. Special provisions are provided in the MS4 permit to facilitate implementation of the SQMP. These provisions include:
- BMP substitution – Substitution of site-specific BMPs is allowed provided the alternative BMP will meet or exceed pollutant reduction of the original BMP, the fiscal burden of the original BMP is substantially greater than the proposed alternative, and the alternative BMP will be implemented within a similar time period.
- Public Information and Participation Program (PIPP) – This requires the Permittee to identify how public education needs were determined, who is responsible for developing and implementing the program, and the method used to determine its effectiveness.
- Industrial/Commercial Facilities Control Program – This requires the Permittee to develop a plan for managing stormwater runoff from industrial and commercial facilities. This program will track, inspect, and ensure compliance at industrial and commercial facilities that are sources of pollutants in storm water.
- Development Planning Program – This requires the Permittee to implement a development-planning program that requires new development and redevelopment projects to minimize impacts from stormwater and urban runoff.
- Development Construction Program – This requires the Permittee to implement a program to control runoff from construction activity to minimize erosion and transportation of sediment and prevent non-stormwater discharges from equipment and vehicle washing.
- Public Agency Activities Program – This requires municipalities to evaluate existing public agency activities that have an impact on stormwater quality (such as vehicle maintenance, landscape maintenance and weed control, and

construction and maintenance of streets, roads, and flood control systems) and to develop a program to reduce stormwater impacts with a schedule for implementation.

- Illicit Connections and Illicit Discharges Elimination Program – This requires each Permittee to have a plan for finding and preventing illegal connections and discharges and a mechanism for enforcing against illegal connections and discharges.

### 3.6.2 Standard Urban Stormwater Mitigation Plan

On March 8, 2000, the development planning program requirements, including the Standard Urban Stormwater Mitigation Plan requirements (collectively, development planning program requirements, including Standard Urban Stormwater Mitigation Pan requirements, are referred to in this report as SUSMP requirements) were approved by the RWQCB as part of the MS4 program to address stormwater pollution from new construction and redevelopment. The SUSMP contains a list of minimum BMPs that must be employed to infiltrate or treat stormwater runoff, control peak flow discharge, and reduce the post-project discharge of pollutants from stormwater conveyance systems. The SUSMP defines, based upon land use type, the types of practices that must be included and issues that must be addressed as appropriate to the development type and size. Compliance with SUSMP requirements is used as one method to evaluate significance of project development impacts on surface water runoff.

Finalized in May 2000, the County of Los Angeles' "Manual for the Standard Urban Stormwater Mitigation Plan" details the requirements for new development and significant redevelopment BMPs (Los Angeles County, 2000) (the "SUSMP Manual"). The SUSMP Manual is a model guidance document for use by Permittees and individual project owners to select post-construction BMPs and otherwise comply with the SUSMP requirements. It addresses water quality and drainage issues by specifying design standards for structural or treatment control BMPs that infiltrate or treat stormwater runoff and control peak flow discharge. BMPs are defined in the SUSMP Manual and SUSMP requirements as any program, technology, process, sizing criteria, operational methods or measures, or engineered systems, which, when implemented, prevent, control, remove, or reduce pollution. Treatment BMP sizing criteria and design guidance are also contained in the MS4 Permit and in the SUSMP Manual.

One of the most important requirements within the SUSMP is the specific sizing criteria for stormwater treatment BMPs for new development and significant redevelopment projects. The SUSMP includes sizing criteria for both volume-based and flow-based BMPs. The sizing criteria options for volume-based BMPs, such as extended detention basins, are as follows:

- The 85th percentile 24-hour runoff event storm event determined as the maximized capture stormwater volume for the area, from the formula recommended in Urban Runoff Quality Management, Water Environment Federation (WEF) Manual of Practice No. 23/ASCE Manual of Practice No. 87 (WEF, 1998);

- The volume of annual runoff based on unit basin storage volume, to achieve 80% or more volume treatment by the method recommended in California Stormwater Best Management Practices Handbook – Industrial/Commercial (SWQTF, 1993);

- The volume of runoff produced from a 0.75 inch storm event, prior to its discharge to a stormwater conveyance system; or

- The volume of runoff produced from a historical-record based reference 24-hour rainfall criterion for "treatment" (0.75 inch average for the Los Angeles County Area) that achieves approximately the same reduction in pollutant loads and flows as achieved by mitigation of the 85th percentile, 24-hour runoff event.

Stormwater treatment facilities will be designed to meet or exceed the sizing standards contained in the SUSMP Manual. Volume-based treatment control BMPs for the Project will be sized to capture and treat 80 percent of the annual runoff volume, with a drawdown time of 48 hours. This methodology utilizes historical rainfall data with continuous simulation modeling to calculate the treatment volume for each treatment control BMP and is consistent with criteria 2 above.

Flow-based BMPs, such as vegetated swales, must be designed to infiltrate or treat the maximum flow rate generated from one of the following scenarios:

- The flow of runoff produced from a rain event equal to at least 0.2 inches per hour intensity,

- The flow of runoff produced from a rain event equal to at least two times the 85th percentile hourly rainfall intensity for Los Angeles County, or

- The flow of runoff produced from a rain event that will result in treatment of the same portion of runoff as treated using volumetric standards above.

Flow-based BMPs for the Project will be sized using a rainfall intensity of 0.3 inches per hour, which will result in treatment of the same portion of runoff as treated using volumetric standards above (criteria 3).

The preliminary sizing of the treatment control facilities is set forth in this document and the Landmark Village Drainage Concept Report (Psomas, 2006). Facility sizing will be finalized by the project engineer with the final hydrology study prior to issuance of a grading permit, which will be prepared and approved to ensure consistency with this analysis.

Also, the SUSMP includes general design specifications for individual priority project categories. These include:

- Single-Family Hillside Home
- 100,000 square foot commercial developments
- Restaurants
- Retail gasoline outlets
- Automotive repair shops
- Parking lots

For example, commercial developments must have properly designed loading and unloading dock areas, repair and maintenance bays, and vehicle equipment wash areas. Restaurants need to have properly designed equipment and accessory wash areas. Parking lots have to be properly designed to limit oil contamination and have regular maintenance of parking lot stormwater treatment systems (e.g., storm drain filters and biofilters). This document generally identifies potential locations for these types of improvements and preliminarily identifies appropriate BMPs.

The LARWQCB issued a letter in December 2006 that clarification the Board's compliance expectations for the development planning requirements in Part 4.D of the MS4 Permit (LARWQCB, 2006). Per the clarification letter, the three provisions in Part 4.D that are the essential requirements for compliance are to: (1) maximize the percentage of pervious surfaces to allow percolation of storm water into the ground; (2) minimize the quantity of storm water directed to impervious surfaces and the MS4; and (3) minimize pollution emanating from parking lots through the use of appropriate treatment control BMPs and good housekeeping practices.

The Project is required to incorporate appropriate SUSMP requirements into project plans as part of the development plan approval process for building and grading permits. This analysis will identify at a project level, and consistent with the framework, conclusions,

and requirements of the NRSP Sub-Regional Stormwater Mitigation Plan (Geosyntec Consultants, 2008), the design specifications related to treatment control BMPs and other project features associated with the Landmark Village project. Design of these BMPs will be finalized by the project engineer with the hydrology study prior to issuance of grading permits to ensure consistency with this analysis.

### 3.6.3 Hydromodification and Peak Flow Control

Part 4, Section D.1. of the MS4 Permit notes that increased volume, velocity, and discharge duration of stormwater runoff from developed areas may potentially accelerate downstream erosion and impair habitat-related beneficial uses in Natural Drainage Systems. As a result, Section D.1. of the Permit stipulates that Permittees shall control post-development peak storm water runoff discharge rates, velocities and durations in Natural Drainage Systems to prevent accelerated stream erosion and to protect stream habitat. Natural Drainage Systems are defined by the Permit to include the Santa Clara River.

Further, under Part 4, Section D.1 of the MS4 Permit, the County and its Co-permittees were required to develop and implement by February 1, 2005, numeric criteria for peak flow control in accordance with the findings of the Peak Discharge Impact Study analyzing the potential impacts on natural streams due to impervious development. The County of Los Angeles Department of Public Works and the Southern California Storm Water Monitoring Coalition had been conducting the study, but the study was not completed in time to meet the February 1$^{st}$ deadline. Therefore, on January 31, 2005, the County adopted and submitted to the LARWQCB an Interim Peak Flow Standard to be in effect until such time as a final standard can be adopted based on a completed study.

The adopted Los Angeles County Interim Peak Flow Standard was derived from a similar Interim Peak Flow Standard for Ventura County approved by the LARWQCB under the SUSMP requirements provisions of the MS4 Permit. The intent of the Interim Standard, as described by the County in the cover letter dated January 31, 2005, signed by Donald L. Wolfe transmitting the Interim Standard to Jonathan Bishop of the LARWQB, is to provide protection for natural streams to the extent supported by findings from the ongoing study, and consistent with practical construction practices.

The Interim Peak Flow Standard adopted by the County is:

*The Peak Flow Standard shall require that all post-development runoff from a 2-year, 24-hour storm shall not exceed the predevelopment peak flow rate, burned, from a 2-year, 24-hour storm when the predevelopment peak flow rate equals or exceeds five cubic feet per second. Discharge flow rates shall be calculated using the County of Los Angeles Modified Rational Method. The Peak Flow Standard shall also require that post-*

*development runoff from the 50-year capital storm shall not exceed the predevelopment peak flow rate, burned and bulked, from the 50-year capital storm.*

In its cover letter dated January 31, 2005, signed by Donald L. Wolfe, transmitting the Peak Flow Interim Standard to Jonathan Bishop of the LARWQB, the County notes that upon completion of the Peak Discharge Impact Study, new peak flow standards may be determined to be appropriate.

Per Section 4.D(9) of the MS4 Permit, the NRSP Sub-Regional Stormwater Mitigation Plan (Geosyntec Consultants, 2008) provides an alternative hydromodification control performance standard for the NRSP projects, including Landmark Village, which is sub-region specific and is based on hydrodynamic modeling and geomorphic assessment. The Landmark Village Project will be conditioned to require, as a project design feature, sizing and design of hydraulic features as necessary to control hydromodification impacts in accordance with the NSRP Sub-Regional Stormwater Mitigation Plan. See Section 5.4 below. Under Section 4.D(9) of the MS4 Permit, compliance with the NRSP Sub-Regional Stormwater Mitigation Plan hydromodification control performance standard is used to evaluate hydromodification impacts.

### 3.7 Construction Permits

Pursuant to the CWA Section 402(p), requiring regulations for permitting certain stormwater discharges, the State Water Resources Control Board (SWRCB) issued a statewide general NPDES Permit for stormwater discharges from construction sites [(NPDES No. CAR000002) Water Quality Order 2009-0009-DWQ, State Water Resources Control Board (SWRCB) National Pollutant Discharge Elimination System (NPDES) General Permit for Stormwater Discharges Associated with Construction Activity (adopted by the SWRCB on September 2, 2009)].

Under this Construction General Permit, discharges of stormwater from construction sites with a disturbed area of one or more acres are required to either obtain individual NPDES permits for stormwater discharges or to be covered by the Construction General Permit. Coverage under the Construction General Permit is accomplished by completing a construction site risk assessment to determine appropriate coverage level; preparing a Stormwater Pollution Prevention Plan (SWPPP), including site maps, a Construction Site Monitoring Program (CSMP), and sediment basin design calculations; for projects located outside of a Phase I or Phase II permit area, completing a post-construction water balance calculation for hydromodification controls; and completing a Notice of Intent. All of these documents must be electronically submitted to the SWRCB for General Permit coverage. The primary objective of the SWPPP is to identify and apply proper construction, implementation, and maintenance of BMPs to reduce or eliminate pollutants in stormwater discharges and authorized non-stormwater discharges from the construction site during construction. The SWPPP also outlines the monitoring and

sampling program required for the construction site to verify compliance with discharge Numeric Action Levels (NALs) set by the Construction General Permit.

## 3.8 General Waste Discharge Requirements for Dischargers of Groundwater From Construction and Project Dewatering

The Los Angeles Regional Water Quality Control Board has issued a General NPDES Permit and General Waste Discharge Requirements (WDRs) (Order No. R4-2008-0032, NPDES No. CAG994004) governing construction-related dewatering discharges within the Project development areas (the "General Dewatering Permit.") This permit addresses discharges from temporary dewatering operations associated with construction and permanent dewatering operations associated with development. The discharge requirements include provisions mandating notification, sampling and analysis, and reporting of dewatering and testing-related discharges. The General Dewatering Permit authorizes such construction-related activities so long as all conditions of the permit are fulfilled. Compliance with the requirements of the General Dewatering Permit is used as one method to evaluate Project construction-related impacts on surface water quality.

## 3.9 Discharge of Fill or Dredge Materials

Hydrologic conditions of concern addressed in this report include instream changes in sediment transport, erosion, and sedimentation, and ultimately channel stability. There is a nexus between these concerns and the stream, habitat, and species protection programs administered by the United States Army Corps of Engineers, California Department of Fish and Game and the U.S. Fish and Wildlife Service.

Section 404 of the Clean Water Act is a program that regulates the discharge of dredged and fill material into waters of the United States, including wetlands. Activities in waters of the United States that are regulated under this program include fill for development (including physical alterations to drainages to accommodate storm drainage, stabilization, and flood control improvements), water resource projects (such as dams and levees), infrastructure development (such as highways and airports), and conversion of wetlands to uplands for farming and forestry. USEPA has issued Section 404(b)(1) Guidelines (40 CFR 230) concerning the selection and use of disposal sites, including water quality aspects of such activities. Subpart C at Sections 230.20 through 230.25 contains water quality regulations applicable to dredge and fill activities. Among other topics, these guidelines address discharges that alter substrate elevation or contours, suspended particulates, water clarity, nutrients and chemical content, current patterns and water circulation, water fluctuations (including those that alter erosion or sediment rates), and salinity gradients.

Section 401 of the Clean Water Act requires that any person applying for a federal permit or license that may result in a discharge of pollutants into waters of the United States

must obtain a state water quality certification that the activity complies with all applicable water quality standards, limitations, and restrictions. Subject to certain limitations, no license or permit may be issued by a federal agency until the Section 401 certification has been granted. Further, no license or permit may be issued if certification has been denied. CWA Section 404 permits and authorizations are subject to section 401 certification by the RWQCBs.

This report does not analyze the habitat and wildlife impacts associated with physical alterations to waters of the United States proposed in conjunction with the Project, such as dredge, fill, or bed, bank or channel improvements or stabilization measures affecting waters of the U.S. The impacts associated with these physical alterations are analyzed in detail in the biota and floodplain modification sections of the Project EIR. As discussed in Section 4.4.2 below, this report analyzes the adverse impacts to natural drainage systems that may be caused by the Project's alteration of hydrologic conditions.

### 3.10 Lake or Streambed Alteration Agreement (LSAA)

The CDFG is responsible for conserving, protecting, and managing California's fish, wildlife, and native plant resources. To meet this responsibility, the law requires the proponent of a Project that may impact a river, stream, or lake to notify the CDFG before beginning the Project. This includes rivers or streams that flow at least periodically or permanently through a bed or channel with banks that support fish or other aquatic life and watercourses having a surface or subsurface flow that support or have supported riparian vegetation.

Section 1602 of the Fish and Game Code requires any person who proposes a Project that will substantially divert or obstruct the natural flow or substantially change the bed, channel, or bank of any river, stream, or lake or use materials from a streambed to notify the CDFG before beginning the Project. Similarly, under section 1602 of the Fish and Game Code, before any State or local governmental agency or public utility begins a construction Project that will: 1) divert, obstruct, or change the natural flow or the bed, channel, or bank of any river, stream, or lake; 2) use materials from a streambed; or 3) result in the disposal or deposition of debris, waste, or other material containing crumbled, flaked, or ground pavement where it can pass into any river, stream, or lake, it must first notify the CDFG of the proposed Project. If the CDFG determines that the Project may adversely affect existing fish and wildlife resources, a Lake or Streambed Alteration Agreement is required. In this case, on December 3, 2010, CDFG and the applicant entered into a Master Streambed Alteration Agreement (Notification No. 1600-2004-0016-R5).

As discussed above, this report does not analyze the habitat and wildlife impacts associated with physical alterations to waters of the United States proposed in conjunction with the Project, such as dredge, fill, or bed, bank or channel improvements

or stabilization measures affecting waters of the U.S. The impacts associated with these physical alterations are analyzed in detail in the biota and floodplain modification sections of the Project EIR. As discussed in Section 4.4.2 below, this report analyzes the adverse impacts to natural drainage systems that may be caused by the project's alteration of hydrologic conditions.

### 3.11 Los Angeles County Low Impact Development Ordinance and Manual

Chapter 12.84 of the Los Angeles County Municipal Code requires the use of low impact development ("LID") standards in development projects. This chapter applies to all development within the unincorporated area of the County after January 1, 2009, except for those developments that filed a complete discretionary or non-discretionary permit application with the Los Angeles County Department of Regional Planning, Public Works, or any County-controlled design control board, prior to January 1, 2009.

Chapter 12.84 requires that applicable development projects:

- Mimic undeveloped stormwater and urban runoff rates and volumes in any storm event up to and including the "50-year capital design storm event," as defined by LACDPW;
- Prevent pollutants of concern from leaving the development site in stormwater as the result of storms, up to and including a water quality design storm event; and
- Minimize hydromodification impacts to natural drainage systems.

To meet these standards, development projects that consist of five or more residential units, or nonresidential development, shall comply with the following:

- The excess volume ($\Delta V$, defined as the post-developed runoff volume minus the pre-developed runoff volume for the 85th percentile storm event) from each lot upon which such development is occurring shall be infiltrated at the lot level, or in the alternative, the excess volume from the entire development site, including streets and public right-of-way, shall be infiltrated in sub-regional facilities. The tributary area of a sub-regional facility shall be limited to five acres, but may be exceeded with approval of the Director of LACDPW. When infiltration of all excess volume is not technically feasible, on-site storage, reuse, or other water conservation uses of the excess volume is required and shall be implemented as authorized by the Director of LACDPW.

LACDPW has developed a LID Standards Manual that outlines stormwater runoff quantity and quality control development principles, technologies, and design standards for achieving the LID Standards of Chapter 12.84. The LID Standards Manual requires that large scale residential and nonresidential development projects prioritize the

selection of BMPs to treat stormwater pollutants, reduce stormwater runoff volume, and promote groundwater infiltration and stormwater reuse in an integrated approach to protecting water quality and managing water resources. The Manual states that BMPs should be implemented in the following order of preference:

- BMPs that promote infiltration.
- BMPs that store and beneficially use stormwater runoff.
- BMPs that utilize the runoff for other water conservation uses including, but not limited to, BMPs that incorporate vegetation to promote pollutant removal and runoff volume reduction and integrate multiple uses, and BMPs that percolate runoff through engineered soil and allow it to discharge downstream slowly.

If compliance with the above LID requirements is technically infeasible, in whole or in part, the project must incorporate design features demonstrating compliance with the LID requirements to the maximum extent practicable. The LID goals of increasing groundwater recharge, enhancing water quality, and preventing degradation to downstream natural drainage courses will be considered by DPW in the determination of infeasibility.

The LID Standards Manual outlines site conditions where infiltration may not be possible:

- Locations where seasonal high groundwater is within 10 feet of the surface.
- Within 100 feet of a groundwater well used for drinking water.
- Brownfield development sites or other locations where pollutant mobilization is a documented concern.
- Locations with potential geotechnical hazards as outlined in a report prepared and stamped by a licensed geotechnical engineer.
- Locations with natural, undisturbed soil infiltration rates of less than 0.5 inches per hour that do not support infiltration-based BMPs.
- Locations where infiltration could cause adverse impacts to biological resources.
- Development projects in which the use of infiltration BMPs would conflict with local, State or Federal ordinances or building codes.
- Locations where infiltration would cause health and safety concerns.

The LID Standards Manual outlines where storage and reuse of the $\Delta V$ may not be possible:

- Projects that would not provide sufficient irrigation or (where permitted) domestic grey water demand for use of stored runoff due to limited landscaping or extensive use of low water use plant palettes in landscaped areas.
- Projects that are required to use recycled water for irrigation of landscaping.
- Development projects in which the storage and reuse of stormwater runoff would conflict with local, state or federal ordinances or building codes.
- Locations where storage facilities would cause potential geotechnical hazards as outlined in a report prepared and stamped by a licensed geotechnical engineer.
- Locations where storage facilities would cause health and safety concerns.

The LID Standards Manual also contains drainage analysis requirements for hydromodification impacts to off-site property. The LID Standards Manual provides for the following exemptions from conducting a full analysis for hydromodification impacts, although project applicants must still demonstrate that the project mitigates for hydromodification impacts to the satisfaction of the Director of Public Works:

- Projects that disturb less than one acre.
- Less than 10,000 square feet of new impervious area.
- Projects that do not increase impervious area or decrease the infiltration capacity of pervious areas compared to pre-project conditions.
- Projects that are replacement, maintenance, or repair of an existing permitted flood control facility.
- Projects within a watershed or subwatershed where a geomorphically-based watershed study has been prepared that establishes that the potential for hydromodification impacts is not present based on appropriate assessment and evaluation of relevant factors, including: runoff characteristics, soil conditions, watershed size and conditions, channel conditions, and proposed levels of development within the watershed.
- Projects that discharge directly or via a storm drain into concrete or significantly hardened channels, which in turn discharge into a sump area under tidal influence, or other receiving water that is not susceptible to hydromodification impacts.
- Projects that have hydrologic control measures that include sufficient subregional, regional, in-stream control measures, or a combination thereof such that hydromodification will not occur.

# 4 POLLUTANTS OF CONCERN AND SIGNIFICANCE CRITERIA

## 4.1 Surface Water Pollutants of Concern

### 4.1.1 Pollutants of Concern

Pollutants of concern, as defined in the Los Angeles County SUSMP Manual, consist of any pollutants that exhibit one or more of the following characteristics: current loadings or historic deposits of the pollutant are impacting the beneficial uses of a receiving water, elevated levels of the pollutant are found in sediments of a receiving water and/or have the potential to bioaccumulate in organisms therein, or the detectable inputs of the pollutant are at concentrations or loads considered potentially toxic to humans and/or flora and fauna. The pollutants of concern for the water quality analysis are those that are anticipated or potentially could be generated by the Project at concentrations, based on water quality data collected in Los Angeles County from land uses that are the same as those proposed by the Project, that exhibit these characteristics. Identification of the pollutants of concern also considered Basin Plan beneficial uses and water quality objectives, CTR criteria, and current Section 303(d) listings and TMDLs in the Santa Clara River, as well as pollutants that have the potential to cause toxicity or bioaccumulate in the receiving waters. Appendix A lists the pollutants of concern, the basis for their selection, and the significance criteria that will be applied for each.

The following pollutants were chosen as pollutants of concern for purposes of evaluating water quality based upon the above considerations:

***Sediments (TSS and Turbidity)*:** Excessive erosion, transport, and deposition of sediment in surface waters are a significant form of pollution resulting in major water quality problems. Sediment imbalances impair waters' designated uses. Excessive sediment can impair aquatic life by filling interstitial spaces of spawning gravels, impairing fish food sources, filling rearing pools, and reducing beneficial habitat structure in stream channels. In addition, excessive sediment can cause taste and odor problems in drinking water supplies and block water intake structures.

***Nutrients (Phosphorus and Nitrogen (Nitrate+Nitrite-N, Ammonia-N, and Total Nitrogen))*:** Nutrients of concern include the inorganic forms of nitrogen (nitrate, nitrite and ammonia) and phosphorus. Organic forms of nitrogen are associated with vegetative matter such as particulates from sticks and leaves. Inorganic forms of nitrogen include nitrate, nitrite and ammonia. Total Nitrogen (TN) is a measure of all nitrogen present, including inorganic and particulate forms. Phosphorus can be measured as total phosphorus (TP) or as dissolved phosphorus. Dissolved phosphorus is the more bioavailable form of phosphorus. TP is often composed mostly of soil-related particulate phosphorus. There are several sources of nutrients in urban areas, mainly fertilizers in

runoff from lawns, pet wastes, failing septic systems, atmospheric deposition from industry and automobile emissions, and soil erosion. Nutrient over-enrichment is especially prevalent in agricultural areas where manure and fertilizer inputs to crops significantly contribute to nitrogen and phosphorus levels in streams and other receiving waters. Eutrophication due to excessive nutrient input can lead to changes in algae, benthic, and fish communities; extreme eutrophication can cause hypoxia or anoxia, resulting in fish kills. Surface algal scum, water discoloration, and the release of toxins from sediment can also occur.

Various downstream reaches of the Santa Clara River are identified as impaired by ammonia and nitrate- plus nitrite-nitrogen. Evidence of impairment includes low diversity of benthic macroinvertebrates and observations of excessive algae growth. A source analysis found that the majority of ammonia and nitrate/nitrite loads are from point sources; primarily water reclamation plants (WRPs) (LARWQCB, 2003). Sources from municipal storm sewers are considered a minor source, but have a potential to cause significant local effects on water quality (LARWQCB, 2003). TMDLs have been developed and adopted into the Basin Plan for nitrogen compounds, including nitrate/nitrite and ammonia.

***Trace Metals (Aluminum, Copper, Lead, and Zinc)*:** The primary sources of trace metals in stormwater are typically commercially available metals used in transportation (e.g. automobiles), buildings, and infrastructure. Metals are also found in fuels, adhesives, paints, and other coatings. Copper, lead, and zinc are the most prevalent metals typically found in urban runoff. Other trace metals, such as cadmium, chromium, and mercury, are typically either not detected in urban runoff or are detected at very low levels (LACDPW, 2000). Metals are of concern because of the potential for toxic effects on aquatic life and the potential for groundwater contamination. High metal concentrations can lead to bioaccumulation in fish and shellfish and affect the beneficial uses of receiving waters.

Aluminum has been identified by the Los Angeles County Department of Public Works as a constituent of concern for the Santa Clara River based on monitoring conducted at mass emission Station S29 (see Section 2.7 above). In stormwater, the majority of aluminum is in the particulate phase. Its presence in stormwater is mainly due to aluminosilicate minerals found in soils, because stormwater particles are largely composed of eroded soils. Aluminum is a large component of soils and is the third most common element in the earth's crust. The average aluminum soil content is about eight percent (or 80,000 mg/kg) and suspended sediments in rivers have total aluminum contents of a similar order of magnitude. Aluminosilicates include a wide range of minerals with varying properties; some are formed during the laying down of the earth's crust and some by weathering processes. They are highly insoluble and unreactive, although aluminum can be extracted and solubilized to some degree under acidic conditions. The amount of aluminum extracted will mainly depend on the type and

particle size of aluminosilicates present in the soil matrix. A study by Kobayashi and Kizu (2001) showed that only eight percent of aluminum remained in waters after passing through a 0.22 micron filter, supporting the assertion that the majority of aluminum is found in the insoluble, suspended fraction. According to the USEPA, aluminum is not considered a contaminant of potential concern to fish or aquatic organisms when surrounding soil pH is greater than 5.5 or when in solution of a pH above 5.5 (USEPA 2003) because aluminum solubility and resultant toxicity has been linked to pH values below this standard. In general, Project area soils are not expected to have a pH of less than 5.5. DeClerk and Singer (2003) compared historic (1945) pH levels of agricultural soils in Southern California to 2001 conditions and found that pH levels have actually risen, from approximately 7.2 in 1945 to nearly 8.0 in 2001. As the majority of the pre-development land use consists of agriculture or open space, it is safe to assume that soil pH levels within the Project area will be, for the most part, above 5.5. In addition, pH in stormwater runoff is not expected to be below 5.5, as mean runoff concentrations in the Los Angeles County stormwater monitoring data ranged from 6.5 for mixed and single-family residential land uses to 7.0 for commercial land uses. In urban areas, aluminum building materials are a minor source of aluminum, as the metal is coated in unreactive aluminum oxide.

***Chloride*:** High levels of chloride in Santa Clara River Reaches 3, 5 and 6 are causing impairment of listed beneficial uses for agricultural irrigation. Irrigation of salt sensitive crops, such as avocados and strawberries, with water containing elevated levels of chloride can result in reduced crop yields. Chloride levels in some areas exceed water quality standards associated with groundwater recharge. Chloride TMDLs have been developed and adopted into the Basin Plan. The major sources of elevated chloride are dry-weather discharges from WRPs, contributing about 70% of the chloride load. Minor point sources are dewatering operations, and uncontrolled swimming pool and water ride discharges.

***Pathogens (Bacteria, Viruses, and Protozoa)*** – Elevated pathogens are typically caused by the transport of domestic animal, wildlife, or human fecal wastes from the watershed. Runoff that flows over land such as urban runoff can mobilize pathogens, including bacteria and viruses. Even runoff from natural areas can contain pathogens (e.g., from wildlife). Other sources of pathogens in urban areas include pets, septic systems, and leaky sanitary sewer pipes. The presence of pathogens in runoff can impair receiving waters and contaminate drinking water sources. Elevated pathogens are typically caused by the transport of animal or human fecal wastes from the watershed. Historically fecal indicator bacteria (FIB), such as fecal coliform, have been used to indicate the presence of pathogens due to the difficulty of monitoring for pathogens directly. More recently, the scientific community has questioned the use of certain indicator organisms, as there are various confounding factors that affect the reliability of some FIB as pathogen indicators in stormwater runoff. Santa Clara River Reaches 5, 6, and 7 and the Santa Clara River

Estuary area identified as impaired by high fecal coliform counts from point and nonpoint sources. An Indicator Bacteria TMDL was approved by the LARWQCB for the Santa Clara River Estuary and Reaches 3, 5, 6, and 7 on July 8, 2010.

***Petroleum Hydrocarbons (Oil and Grease and PAHs)*:** The sources of oil, grease, and other petroleum hydrocarbons in urban areas include spillage fuels and lubricants, discharge of domestic and industrial wastes, atmospheric deposition, and runoff. Runoff can be contaminated by leachate from asphalt roads, wearing of tires, and deposition from automobile exhaust. Also, do-it-yourself auto mechanics may dump used oil and other automobile-related fluids directly into storm drains. Petroleum hydrocarbons, such as polycyclic aromatic hydrocarbons (PAHs), can bioaccumulate in aquatic organisms from contaminated water, sediments, and food and are toxic to aquatic life at low concentrations. Hydrocarbons can persist in sediments for long periods of time and result in adverse impacts on the diversity and abundance of benthic communities. Hydrocarbons can be measured as total petroleum hydrocarbons (TPH), oil and grease, or as individual groups of hydrocarbons, such as PAHs.

***Pesticides*:** Pesticides (including herbicides, insecticides and fungicides) are chemical compounds commonly used to control insects, rodents, plant diseases, and weeds. Excessive application of a pesticide in connection with agriculture cultivation or landscaping may result in runoff containing toxic levels of its active component. Pesticides may be classified as organochlorine pesticides or organophosphorus pesticides, the former being associated with persistent bioaccumulative pesticides (e.g., DDT and other legacy pesticides) which have been banned. The Santa Clara River estuary is listed as impaired for legacy pesticides. Organophosphorus pesticides include diazinon and chlorpyrifos whose uses also are being restricted by USEPA.

***Trash & Debris*:** Trash (such as paper, plastic, polystyrene packing foam, and aluminum materials) and biodegradable organic debris (such as leaves, grass cuttings, and food waste) are general waste products on the landscape that can be entrained in urban runoff. The presence of trash and debris may have a significant impact on the recreational value of a water body and aquatic habitat. Excess organic matter can create a high biochemical oxygen demand in a water body and thereby lower its water quality. Also, in areas where stagnant water exists, the presence of excess organic matter can promote septic conditions resulting in the growth of undesirable organisms and the release of odorous and hazardous compounds such as hydrogen sulfide.

***Methylene Blue Activated Substances (MBAS).*** MBAS are related to the presence of detergents in water. Positive results may indicate the presence of wastewater or be associated with urban runoff due to commercial and/or residential vehicle washing or other outdoor washing activities. Surfactants disturb the surface tension which negatively affects insects and can also harm the gills in aquatic life.

***Cyanide.*** Cyanide has been identified by the Los Angeles County Department of Public Works as a constituent of concern for the Santa Clara River based on monitoring conducted at mass emission Station S29 (LACDPW, 2005). Cyanide is used in electroplating, metallurgy, and mining. It is also used to make synthetic fibers, plastics, dyes, pharmaceuticals, and pesticides, including fumigants. In addition, cyanide serves as a chemical intermediate in various production processes. Natural cyanides are produced by certain bacteria, fungi, and algae, and they are present in a number of plants and foods as cyanogenic glycosides. Man-made cyanides typically enter the environment from metal finishing and organic chemical industries. Other sources include iron and steel works, municipal waste burning, cyanide-containing pesticides, road deicers, and vehicle exhaust.

***Bioaccumulation*:** Certain pollutants, such as pesticides, selenium and mercury, have a tendency to bioaccumulate. The Basin Plan and the CTR criteria set forth toxicity objectives for receiving water levels of substances that bioaccumulate in aquatic resources to prohibit concentrations of toxic substances that are harmful to human health and adversely affect beneficial uses.

### 4.1.2 Other Constituents

This section discusses other constituents that are listed in the Basin Plan, but for reasons explained below, are not pollutants of concern for the Project.

***BOD (Biochemical Oxygen Demand) and Dissolved Oxygen.*** Adequate levels of dissolved oxygen are necessary to support aquatic life. High levels of oxygen demanding substances discharged to receiving waters can depress oxygen levels to levels of concern. Oxygen demanding substances are compounds that can be biologically degraded through aerobic processes. The presence of oxygen demanding substances can deplete oxygen supplies in waters and can contribute to algal growth. Nutrients in fertilizers and food wastes in trash are examples of likely oxygen demanding compounds to be present on the Project site. Other biodegradable organic materials include human and animal waste and vegetative matter. Biodegradable pollutants are largely subsumed by the nutrients and trash and debris categories above, and therefore will not be discussed as a separate category.

***Chemical Constituents.*** Chemical constituents in excessive amounts in drinking water are harmful to human health. The Basin Plan objective for chemical constituents states: "Surface waters shall not contain concentrations of chemical constituents in amounts that adversely affect any designated beneficial use." As Santa Clara River Reach 5 is not designated with a municipal water supply designated use (see Section 2.5.1 above), chemical constituents are not a pollutant of concern for the Project.

***Temperature.*** Increase in temperature can result in lower dissolved oxygen levels, impairing habitat and other beneficial uses of receiving waters. Discharges of wastewater can also cause unnatural and/or rapid changes in temperature of receiving waters, which can adversely affect aquatic life. Elevated temperatures are typically associated with discharges of process wastewaters or non-contact cooling waters. As the beneficial uses in the receiving waters for the Project include warm freshwater habitat to support warm water ecosystems, temperatures of stormwater runoff from the Project are not of concern.

***Total Residual Chlorine.*** Total residual chlorine can be present in wastewater treatment plant discharges, or may be present in dry weather urban runoff from the emptying of swimming pools that have not been de-chlorinated. Chlorine is a strong oxidant and is therefore toxic to aquatic life. Municipal pools and private pools in areas served by a municipal sanitary system are required to be discharged into the sanitary system, and therefore, total residual chlorine will not be present in runoff from the Project.

***Color, Taste, and Odor.*** The Basin Plan contains narrative objectives for color, taste, or odor that cause a nuisance or adversely affect beneficial uses. Undesirable tastes and odors in water may be a nuisance and may indicate the presence of a pollutant(s). Odor associated with water can result from decomposition of organic matter or the reduction of inorganic compounds, such as sulfate. Other potential sources of odor causing substances, such as industrial processes, will not occur as part of the Project. Color in water may arise naturally, such as from minerals, plant matter, or algae, or may be caused by industrial pollutants. As the Project will contain no industrial uses, color-, taste-, or odor-producing substances are not pollutants of concern for the Project.

***Exotic Vegetation.*** Non-native (exotic) vegetation typically provides little habitat value and can out compete native vegetation that is more suitable habitat for aquatic and terrestrial organisms. The Basin Plan objective for exotic vegetation states: "Exotic vegetation shall not be introduced around stream courses to the extent that such growth causes nuisance or adversely affects designated beneficial uses." The potential for non-native plant species to impact natural drainages is analyzed in the Landmark Village Draft Environmental Impact Report Biota Section.

***Mineral Quality: TDS, Sulfate, Boron, and SAR.*** Mineral quality in natural waters is largely determined by the mineral assemblage of soils and rocks near the land surface. Elevated mineral concentrations could impact beneficial uses; however, the minerals listed in the Basin Plan, except chloride and nitrogen, are not believed to be constituents of concern due to the absence of river impairments and/or, as with TDS, anticipated post-development runoff concentrations well below the Basin Plan objectives (Table 4-1). Therefore, these constituents are not considered pollutants of concern for the Project.

**Table 4-1: Comparison of Mineral Basin Plan Objectives with Mean Measured Values in Los Angeles County**

| Mineral | Los Angeles Basin Plan Water Quality Objective for SCR Reach 5 (mg/L) | Range of Mean Concentration in Urban Runoff[1] (mg/L) |
|---|---|---|
| Total Dissolved Solids | 1000 | 53 - 226 |
| Sulfate | 400 | 7 - 35 |
| Boron | 1.5 | 0.16 – 0.25 |
| Sodium Absorption Ratio[2] | 10 | 0.4 – 1.9 |

[1] Source: LACDPW, 2000. Land uses include SFR, MFR, commercial, education, transportation, light industrial, and mixed residential.

[2] Sodium adsorption ratio (SAR) predicts the degree to which irrigation water tends to enter into cation-exchange reactions in soil.

***pH.*** The hydrogen ion activity of water (pH) is measured on a logarithmic scale, ranging from 0 to 14. While the pH of "pure" water at 25 ºC is 7.0, the pH of natural waters is usually slightly basic due to the solubility of carbon dioxide from the atmosphere. Aquatic organisms can be highly sensitive to pH. The Basin Plan objective for pH is:

"the pH of inland surface waters shall not be depressed below 6.5 or raised above 8.5 as a result of waste discharges. Ambient pH levels shall not be changed more than 0.5 units from natural conditions as a result of waste discharge."

Mean runoff concentrations in the Los Angeles County stormwater monitoring data ranged from 6.5 for mixed- and single-family residential land uses to 7.0 for commercial land use. Therefore, pH in the Santa Clara River is not expected to be affected by runoff discharges from the Project.

***PCBs.*** PCBs are highly toxic persistent chemicals that have been historically released into the environment from industrial uses, such as transformers, but are no longer produced in the United States. Due to their persistence, PCBs can still be detected in urban runoff due to historic industrial sources of these chemicals. The Project area did not historically include PCB-producing land uses. Therefore, PCBs are not a pollutant of concern for the Project.

***Radioactive Substances.*** Radioactive substances typically occur at very low concentrations in natural waters. Some activities such as mining or certain industrial activities (e.g., energy production, fuel reprocessing) can increase the amount of radioactive substances impairing beneficial uses. The Project will not have industrial or other activities that would be a source of any radioactive substances, and development will stabilize any naturally radioactive soils, though unlikely to be present in the Project area. Therefore, radioactive substances are not a pollutant of concern for the Project.

***Toxicity.*** Certain pollutants in stormwater runoff have the potential to be highly toxic to aquatic organisms resulting in effects such as impaired reproduction or mortality. The Basin Plan water quality objective for toxicity is:

"All surface waters shall be maintained free of toxic substances in concentrations that are toxic to, or that produce detrimental physiological responses in human, plant, animal, or aquatic life."

Toxicity in urban runoff could be caused by ammonia, trace metals, PAHs, or pesticides. These constituents are subsumed by the pollutant of concern categories above.

## 4.2 Groundwater Pollutants of Concern

The Project will allow for incidental infiltration of urban runoff to groundwater after receiving treatment in the Project PDFs, as well as incidental infiltration of irrigation water. Research conducted on the effects on groundwater from stormwater infiltration by Pitt *et al.* (1994) indicate that the potential for contamination due to infiltration is dependent on a number of factors including the local hydrogeology and the chemical characteristics of the pollutants of concern.

Chemical characteristics that influence the potential for groundwater impacts include high mobility (low absorption potential), high solubility fractions, and abundance in runoff, including dry weather flows. As a class of constituents, trace metals tend to adsorb onto soil particles and are filtered out by the soils. This has been confirmed by extensive data collected beneath stormwater detention/retention ponds in Fresno (conducted as part of the Nationwide Urban Runoff Program (Brown & Caldwell, 1984)) that showed that trace metals tended to be adsorbed in the upper few feet in the bottom sediments. Bacteria are also filtered out by soils. More mobile and soluble pollutants, such as chloride and nitrate, have a greater potential for impacting groundwater through infiltration.

### 4.2.1 Pollutants of Concern

The pollutants of concern for the groundwater quality analysis are those that are anticipated or potentially could be generated by the Project at concentrations, based on water quality data collected in Los Angeles County from land uses that are the same as those included in the Project, that exhibit these characteristics. Identification of the pollutants of concern for the Project considered proposed land uses as well as pollutants that have the potential to impair beneficial uses of the groundwaters below the Project. The Los Angeles Basin Plan contains numerical objectives for bacteria, mineral quality, nitrogen, and various toxic chemical compounds, and contains qualitative objectives for taste and odor.

Nitrate+nitrite-N was chosen as the pollutant of concern for purposes of evaluating groundwater quality impacts based upon the above considerations. High nitrate levels in drinking water can cause health problems in humans. Infants can develop methemoglobinemia (blue-baby syndrome). Human activities and land use practices can influence nitrogen concentrations in groundwaters. For example, irrigation water containing fertilizers can increase levels of nitrogen in groundwater.

### 4.2.2 Other Constituents

***Bacteria:*** The Basin Plan contains numeric criteria for bacteria in drinking water sources. As bacteria are removed through straining in soils (for example, as with septic tank discharges), incidental infiltration of runoff in the Project treatment PDFs is not expected to affect bacteria levels in groundwater. The WRP will include a disinfection process to reduce bacteria below levels of concern, and therefore bacteria in irrigation water are not expected to impact groundwater.

***Chemical Constituents and Radioactivity:*** Drinking water limits for inorganic and organic chemicals that can be toxic to human health in excessive amounts and radionuclides are contained in Title 22 of the California Code of Regulations. These chemicals and radionuclides are not expected to occur in the Project's runoff. Title 22 specifies California's Wastewater Reclamation Criteria (WRC) and the NRSP WRP's recycled water must meet or exceed these criteria. These criteria apply to the treatment processes; treatment performance standards, such as removal efficiencies and effluent water quality; process monitoring programs, including type and frequency of monitoring; facility operation plans; and necessary reliability features. Due to compliance with these criteria, chemical constituents and radionuclides are not expected to occur in irrigation water in amounts that would impact groundwater.

***Taste and Odor.*** The Basin Plan contains a narrative objective for taste and odor that cause a nuisance or adversely affect beneficial uses. Undesirable tastes and odors in groundwater may be a nuisance and may indicate the presence of a pollutant(s). Odor associated with water can result from natural processes, such as the decomposition of organic matter or the reduction of inorganic compounds, such as sulfate. Pollutants causing taste and odor issues are not expected to occur in stormwater or irrigation water in amounts that would impact groundwater. Other potential sources of odor causing substances, such as industrial processes, will not occur as part of the Project. Therefore, taste and odor-producing substances are not pollutants of concern for the Project.

***Mineral Quality: TDS, Sulfate, Chloride, and Boron.*** Mineral quality in groundwaters is largely influenced by the mineral assemblage of soils and rocks that it comes into contact with. Elevated mineral concentrations could impact beneficial uses; however, the minerals listed in the Basin Plan are not believed to be pollutants of concern due to the anticipated runoff concentrations and the expected mineral concentrations in Newhall

Ranch WRP irrigation water, which are below the Basin Plan groundwater objectives (Table 4-2).

As required by the CWA, the Newhall Ranch WRP discharge permit includes effluent limitations that are protective of receiving water quality and designated beneficial uses (LARWQCB, 2007). Effluent limits in the WDR were developed based on the most stringent of applicable technology-based and water quality-based standards, including Basin Plan surface and groundwater objectives, CTR criteria, and applicable TMDL wasteload allocations. Therefore, these constituents are not considered pollutants of concern for the Project.

**Table 4-2: Comparison of Basin Plan Mineral Groundwater Objectives with Mean Measured Values in Los Angeles County Urban Runoff and Anticipated Irrigation Water Quality**

| Mineral | Los Angeles Basin Plan Groundwater Quality Objective[1] (mg/L) | Range of Mean Concentrations in Urban Runoff[2] (mg/L) | Anticipated Average Concentration in Effluent from the NRSP WRP[3](mg/L) |
|---|---|---|---|
| Total Dissolved Solids | 1,000 | 53 – 237 | 790 |
| Sulfate | 350 | 7 – 35 | 165 |
| Chloride | 150 | 4 – 50 | <100 |
| Boron | 1.0 | 0.2 – 0.3 | 0.69 |

[1] Eastern Santa Clara-Castaic Valley

[2] Source: LACDPW, 2000. Includes all monitored land uses.

[3] Source: CH2M Hill, 2007.

## 4.3 Hydrologic Conditions of Concern (Hydromodification)

Urbanization modifies natural watershed and stream hydrologic and geomorphic processes by introducing increased volumes and duration of flow via increased runoff from impervious surfaces and drainage infrastructure. Several studies have evaluated affects of increased runoff associated with the introduction of impervious surfaces and drainage facilities on geomorphic processes (SCCWRP, 2005a; Geosyntec, 2002; Bledsoe & Watson, 2001; Booth, 1990; Hollis, 1975; Hammer, 1972). Potential changes to the hydrologic regime may include increases in runoff volumes, frequency of runoff events, long-term cumulative duration, as well as increased peak flows. Urbanization may also introduce dry weather flows where only wet weather flows existed prior to development. These changes are referred to as "hydromodification."

Hydromodification intensifies sediment transport and often leads to stream channel enlargement and loss of habitat and associated riparian species (SCCWRP, 2005a; Geosyntec, 2002; Bledsoe & Watson, 2001; MacRae, 1992; Booth, 1990). Under certain circumstances, development can also cause a reduction in the amount of sediment

supplied to the stream system, which can lead to stream channel incision and widening. These changes also have the potential to impact downstream channels and habitat integrity. A project that increases runoff due to impervious surfaces and traps sediment from upland watershed sources creates compounding effects.

A change to the Project site's hydrologic regime would be considered a condition of concern if the change could have a significant impact on downstream natural channels and habitat integrity, alone or in conjunction with impacts of other projects.

## 4.4 Significance Criteria and Thresholds for Significance

### 4.4.1 Surface Water Quality Significance Thresholds

Appendix A provides the criteria for evaluating the significance of a potential impact for each pollutant of concern. These criteria and the threshold for significance can be summarized as follows. The application of the criteria to a decision regarding significance requires an integrated or "weight of evidence" approach, rather than a decision based on any one of the individual criterion.

Thresholds of significance for surface water quality impacts have been developed based on a review of the MS4 Permit and the CEQA Guidelines, Appendix G. Significant adverse water quality impacts are presumed to occur if the proposed Project would:

- Create sizeable additional sources of polluted runoff to receiving waters that would result in exceedances of receiving water quality or substantially degrade water quality in receiving waters.
- Create sizeable additional sources of polluted runoff that would violate any water quality standards or waste discharge requirements for surface water runoff.
- Create sizeable additional sources of polluted construction site runoff (including polluted discharges associated with construction activities such as materials delivery, staging or storage, vehicle or equipment fueling, vehicle or equipment maintenance, waste handling, or hazardous materials handling or storage) that would violate any water quality standards or waste discharge requirements for surface water runoff or groundwater discharge.

This report analyzes whether sizeable additional sources of polluted runoff may result from the Project based on the results of water quality modeling and qualitative assessments that take into account water quality controls or BMPs that are considered Project Design Features (PDFs). Any increases in pollutant concentrations or loads in runoff resulting from the development of the Project site are considered an indication of a potentially significant adverse water quality impact. If loads and concentrations resulting from development are predicted to stay the same or to be reduced when compared with

existing conditions, it is concluded that the Project will not cause a significant adverse impact to the ambient water quality of the receiving waters for that pollutant.

If pollutant loads or concentrations are expected to increase, then for both the post-development and construction phases, potential impacts are assessed by evaluating compliance of the Project, including PDFs, with applicable regulatory requirements of the MS4 Permit, including SQMP and SUSMP requirements, the Construction General Permit, and the General Dewatering Permit. Further, post-development increases in pollutant loads and concentrations are evaluated by comparing the magnitude of the increase to relevant benchmarks, including receiving water TMDLs and receiving water quality objectives and criteria from the Basin Plan and CTR, as described below.

***Receiving Water Benchmarks.*** Comparison of post-development water quality concentrations in the runoff discharge with benchmark TMDL wasteload or load allocations for MS4 discharges establishes the likelihood that runoff would result in TMDL exceedances in receiving waters or would otherwise degrade receiving water quality.

Comparison of post-development water quality concentrations in the runoff discharge with benchmark numeric and narrative receiving water quality criteria as provided in the Basin Plan and the CTR facilitates analysis of the potential for runoff to result in exceedances of receiving water quality standards, adversely affect beneficial uses, or otherwise degrade receiving waters.

Water quality criteria are considered benchmarks for comparison purposes only, as such criteria apply within receiving waters as opposed to applying directly to runoff discharges. Narrative and numeric water quality objectives contained in the Basin Plan apply to the Project's receiving waters. Water quality criteria contained in the CTR provide concentrations that are not to be exceeded in receiving waters more than once in a three year period for those waters designated with aquatic life or human health related uses. Projections of runoff water quality are compared to the acute form of the CTR criteria (as discussed above), as stormwater runoff is associated with episodic events of limited duration, whereas chronic criteria apply to 4-day exposures which do not describe typical storm events in the Project area, which last 11 hours on average. If pollutant levels in runoff are not predicted to exceed receiving water benchmarks, it is one indication that no significant impacts will result from project development.

As there is no water quality objective or criteria for total aluminum in the Basin Plan or the CTR, the national water quality criteria recommended by the USEPA will be used for comparison (USEPA, 1988).

***MS4 Permit Requirements for New Development (SUSMP).*** Satisfaction of MS4 Permit requirements for new development, including SUSMP requirements and SQMP requirements, and satisfaction of construction-related requirements of the Construction General Permit and General Dewatering Permit establish compliance with water quality regulatory requirements applicable to stormwater runoff.

The MS4 Permit requires that the SQMP specify BMPs that will be implemented to reduce the discharge of pollutants in stormwater to the Maximum Extent Practicable. MS4 requirements are met when new development complies with the SUSMP requirements set forth in the MS4 Permit. Under the SUSMP requirements, the essential requirements for compliance are: (1) maximizing the percentage of pervious surfaces to allow percolation of storm water into the ground; (2) minimizing the quantity of stormwater directed to impervious surfaces and the MS4; and (3) minimizing pollution emanating from parking lots through the use of appropriate treatment control BMPs and good housekeeping practices. The effectiveness of stormwater treatment controls are primarily based on two factors - the amount of runoff that is captured by the controls and the selection of BMPs to address identified pollutants of concern. Selection and numerical sizing criteria for new development treatment controls are included in the MS4 Permit and the County SUSMP Manual. If the Project PDFs meet MS4 requirements, including sizing for treatment controls and other source control and site design BMPs consistent with the SUSMP requirements, it indicates that no significant impacts will occur as the result of MS4 Permit compliance.

***Construction General Permit and General Dewatering Permit.*** The Construction General Permit requires the development and implementation of a Storm Water Pollution Prevention Plan (SWPPP) that describes erosion and sediment control BMPs as well as material management/ non-stormwater BMPs that will be used during the construction phase of development. The General Dewatering Permit addresses discharges from permanent or temporary dewatering operations associated with construction and development and includes provisions mandating notification, sampling and analysis, and reporting of dewatering and testing-related discharges. To evaluate significance of construction phase Project water quality impacts, we evaluate whether water quality control is achieved by implementation of BMPs consistent with Best Available Technology Economically Achievable and Best Conventional Pollutant Control Technology (BAT/BCT), as required by the Construction General Permit and the General Dewatering Permit.

### 4.4.2 Significance Thresholds for Hydrologic Conditions of Concern (Hydromodification Impacts)

Thresholds of significance for evaluating hydrologic impacts and conditions of concern have been developed based on a review of the MS4 Permit and the CEQA Guidelines,

Appendix G. Significant adverse impacts to natural drainage systems created by altered hydrologic conditions of concern are presumed to occur if the proposed Project would:

- Substantially alter the existing drainage pattern of a natural drainage, stream, or river causing substantial erosion, siltation, or channel instability in a manner that substantially adversely affects beneficial uses; or
- Substantially increase the rates, velocities, frequencies, duration and/or seasonality of flows causing channel instability and harming sensitive habitats or species in natural drainages in a manner that substantially adversely affects beneficial uses.

### 4.4.3 Cumulative Impacts

CEQA requires the analysis of cumulative impacts of a project when the project's incremental effects may be significant when assessed along with the effects of past projects and the effects of other current projects, and the reasonably foreseeable effects of probable future projects. The discussion of cumulative impacts must reflect the potential severity of the impacts and their likelihood of occurrence, but the discussion and analysis need not provide as great a detail as is provided for the direct effects attributable to the Project alone. This report therefore analyzes the potential for cumulative water quality impacts, cumulative groundwater quality impacts and cumulative hydrologic impacts generally in accordance with the thresholds for direct impacts discussed in Sections 4.4.1 and 4.4.2 above, and Section 4.4.4 below. See Sections 7.7, 7.8, and 7.9 below.

The cumulative analysis of all surface water quality and hydrologic impacts in this report is based primarily on "adopted plans and projections" found in the Los Angeles County Department of Public Works adopted and approved Hydrology Manual, which have been verified by reference to approved plans, including the City of Santa Clarita and County of Los Angeles adopted General Plans, as well as available empirical data for the Santa Clara River. As required by CEQA, the focus of the cumulative impacts analysis for this Project will be on the Project's incremental contribution to significant adverse water quality and hydrologic impacts to the SCR, taking into account the reasonably foreseeable water quality and hydrologic impacts of other projects that may develop impervious surfaces and urban land uses within the SCR watershed in accordance with adopted general plans and related projections. The cumulative impacts analysis will consider the Project's incremental contribution to significant cumulative water quality and hydrologic impacts to the SCR in light of the water quality and hydrology impact mitigation achieved by certain of the PDFs. The analysis will also consider whether the Project, including PDFs, and future projects will comply with specific requirements in a previously approved ordinance, plan, or mitigation program (such as the Basin Plan, the CTR, the MS4 Permit, the Construction General Permit and the General Dewatering Permit) that have been adopted for the purpose of avoiding or substantially lessening the

cumulative water quality and hydrologic impact problems within the geographic area in which the Project is located.

### 4.4.4 Groundwater Quality Impacts

Thresholds of significance for evaluating the hydrologic and water quality impacts of the Project on groundwater have been developed based on CEQA Appendix G thresholds. Significant adverse impacts to groundwater are presumed to occur if the proposed Project would:

- Substantially deplete groundwater supplies or interfere substantially with groundwater recharge so as to cause a net deficit in aquifer volume or a lowering of the local groundwater table.
- Through changes in surface water runoff quality and quantity (including Project treatment PDFs), and changes in groundwater recharge, result in a violation of any groundwater quality standards or waste discharge requirements or otherwise substantially degrade water quality.

Groundwater quality is addressed in Sections 7.8.1 and 7.8.2. Groundwater quality benchmarks were compared with post-development runoff water quality to establish the likelihood that runoff would result in a degradation of groundwater quality. Groundwater recharge is addressed in Section 7.8.3. The hydrologic effects of the Project on groundwater were examined by comparison of historical and present levels of the underlying aquifer to determine the impact of development on aquifer volume.

# 5 POST DEVELOPMENT SURFACE WATER QUALITY AND HYDROMODIFICATION CONTROL PROJECT DESIGN FEATURES

Project Design Features (PDFs) for surface water quality and hydrologic impacts include site design, source control, low impact development (LID), treatment control, and hydromodification control BMPs that will be incorporated into the Project and are considered a part of the Project for impact analysis. Effective management of wet and dry weather runoff water quality begins with limiting increases in runoff pollutants and flows at the source. Site design, source control, and LID BMPs are practices designed to minimize surface runoff and the introduction of pollutants into runoff. Treatment control BMPs are designed to remove pollutants once they have been mobilized by rainfall and runoff. Hydromodification control BMPs are designed to control increases in post-development runoff flows and/or volumes. This section describes the post-development site design, source control, LID, treatment control, and hydromodification control PDFs for the Project.

## 5.1 SUSMP Requirements and Project Design Features

Table 5-1 summarizes the SUSMP requirements and the corresponding proposed PDFs that will be incorporated into the Project.

**Table 5-1: SUSMP Requirements and Corresponding Project Design Features**

| SUSMP Requirement[1] | Criteria/ Description | Corresponding Landmark Village PDFs |
|---|---|---|
| 1. Runoff Flow Control | • Control post-development peak stormwater runoff discharge rates, velocities, and duration in Natural Drainage Systems to prevent accelerated downstream erosion and to protect habitat related beneficial uses.[2]<br>• All post-development runoff from a 2-year, 24-hour storm shall not exceed the predevelopment peak flow rate, burned, from a 2-year, 24-hour storm when the predevelopment peak flow rate equals or exceeds five cfs. Discharge flow rates shall be calculated using the County of Los Angeles Modified Rational Method.<br>• Post-development runoff from the 50-year capital storm shall not exceed the predevelopment peak flow rate, burned and bulked, from the 50-year capital storm.<br>• Control peak flow discharge to provide stream channel and over bank flood protection, based on flow design criteria selected by the local agency. | • Hydromodification source controls include minimizing impervious surfaces through clustering development and using parcel-based LID BMPs, regional LID BMPs, and single family hydrologic source controls (HSCs) to disconnect impervious surfaces and reduce runoff volumes through evapotranspiration and infiltration.<br>• 50-year capital storm peak flow rate analysis is contained in the "Landmark Village Tentative Tract Map 53108 Drainage Concept", prepared by Psomas (Psomas, 2009) |

| SUSMP Requirement[1] | Criteria/ Description | Corresponding Landmark Village PDFs |
|---|---|---|
| 2. Conserve Natural Areas | • Concentrate or cluster development on portions of a site while leaving the remaining land in a natural undisturbed condition<br>• Limit clearing and grading of native vegetation at a site to the minimum amount needed to build lots, allow access, and provide fire protection<br>• Maximize trees and other vegetation at each site, planting additional vegetation, clustering tree areas, and promoting the use of native and/or drought tolerant plants<br>• Promote natural vegetation by using parking lot islands and other landscaped areas<br>• Preserve riparian areas and wetlands | • The NRSP clusters development into villages, including Landmark Village. Approximately 74% (10,145 acres) of the NRSP subregion will remain undeveloped.<br>• Approximately 71.3 acres (24%) of the 292.6 gross acre Landmark Village project tract map area would remain as trails, parks, vegetated slopes, open space, and water quality treatment BMPs. Additional landscaped areas would be provided in conjunction with the residential and commercial uses, resulting in approximately 36% of the tract map site being pervious.<br>• Existing site land use is agriculture, so little or no native vegetation is found in pre-development conditions.<br>• Site clearing and grading will be limited as necessary to allow development, allow access, and provide fire protection.<br>• Native and/or non-native/non-invasive vegetation will be utilized within the development.<br>• The final project stormwater system would include the use of parcel-based LID BMPs, including, but not limited to, infiltration, bioinfiltration, and biofiltration BMPs placed in common area landscaping in commercial, multi-family residential, institutional, recreational, and park areas, roadway median strips, and parking lot islands (where applicable) and regional infiltration/biofiltration facilities incorporating natural vegetation.<br>• Riparian buffers will be preserved along the Santa Clara River corridor by clustering development upland and away from the river. |
| 3. Minimize Stormwater Pollutants of Concern | • Minimize, to the maximum extent practicable, the introduction of pollutants of concern that may result in significant impacts generated from site runoff of directly connected impervious areas (DCIA) to the stormwater conveyance system as approved by the building official. | • LID BMPs would be selected to address the pollutants of concern for the project. These LID BMPs include infiltration, bioinfiltration, and biofiltration BMPs implemented at the parcel-scale, media filters units implemented in right-of-ways, USEPA Green Streets practices implemented in right-of-ways, as feasible, and regional infiltration/biofiltration facilities. These BMPs are designed to minimize introduction of pollutants to the Maximum Extent Practicable (MEP). |

| SUSMP Requirement[1] | Criteria/ Description | Corresponding Landmark Village PDFs |
|---|---|---|
| | | • The Project will include numerous source controls, including education programs, animal waste bag stations, street sweeping and catch basin cleaning, an Integrated Pest Management (IPM) Program for common area landscaping in commercial areas and multi-family residential areas, use of native and/or non-native/non-invasive climate appropriate vegetation, use of smart irrigation control, and installation of a car wash pad in multi-family residential areas.<br>• An education program will be implemented that includes both the education of residents and commercial businesses regarding water quality issues. Topics will include services that could affect water quality, such as carpet cleaners and others that may not properly dispose of cleaning wastes; community car washes; and residential car washing. The education program will emphasize animal waste management, such as the importance of cleaning up after pets and not feeding pigeons, seagulls, ducks, and geese.<br>• Landscape watering in common areas, commercial areas, multiple family residential areas, and in parks will use efficient recycled water irrigation technologies with centralized irrigation controls. |

| SUSMP Requirement[1] | Criteria/ Description | Corresponding Landmark Village PDFs |
|---|---|---|
| 4. Protect Slopes and Channels | Project plans must include BMPs consistent with local codes and ordinances and the SUSMP requirements to decrease the potential of slopes and/or channels from eroding and impacting stormwater runoff:<br>• Convey runoff safely from the tops of slopes and stabilize disturbed slopes<br>• Utilize natural drainage systems to the maximum extent practicable<br>• Control or reduce or eliminate flow to natural drainage systems to the maximum extent practicable<br>• Stabilize permanent channel crossings<br>• Vegetate slopes with native or drought tolerant vegetation<br>• Install energy dissipaters, such as riprap, at the outlets of new storm drains, culverts, conduits, or channels that enter unlined channels in accordance with applicable specifications to minimize erosion with the approval of all agencies with jurisdiction, e.g., the U.S. Army Corps of Engineers and the California Department of Fish and Game. | • There are no significant slopes or natural drainage channels within the developed portion of the Project in the post-developed condition.<br>• Natural slopes and native vegetation on slopes adjacent to the SCR will be preserved and/or, if impacted during construction, they will be restored and enhanced. Native plants will be used in all plant palettes placed on restored slopes.<br>• Project PDFs, parcel-based BMPs, regional LID BMPs, and Single Family HSCs, and USEPA Green Streets practices (hydrologic source controls), will reduce flows to natural channels through infiltration and evapotranspiration.<br>• The banks of the Santa Clara River at portions of this site will be stabilized primarily using buried bank stabilization per the Newhall Ranch Resource Management and Development Plan (RMDP). After the implementation of these measures and other flow control and volume reduction PDFs, the Santa Clara River will be capable of handling the expected flow volumes, velocities, and durations with no excess erosion. For a detailed description of bank stabilization see Section 2.3.3.<br>• All outlet points to the Santa Clara River will include energy dissipaters per the Newhall Ranch RMDP. For a detailed description of energy dissipation see Section 2.3.2. |
| 5. Provide Storm Drain System Stenciling and Signage | • All storm drain inlets and catch basins within the Project area must be stenciled with prohibitive language and/or graphical icons to discourage illegal dumping.<br>• Signs and prohibitive language and/or graphical icons, which prohibit illegal dumping, must be posted at public access points along channels and creeks within the Project area.<br>• Legibility of stencils and signs must be maintained. | • All storm drain inlets and water quality inlets will be stenciled or labeled.<br>• Signs will be posted in areas where dumping could occur.<br>• The County, a Landscape or Local Maintenance District (LMD), Home Owners Association (HOA), or other maintenance entity will maintain stencils and signs. |

| SUSMP Requirement[1] | Criteria/ Description | Corresponding Landmark Village PDFs |
|---|---|---|
| 6. Properly Design Outdoor Material Storage Areas | • Where proposed Project plans include outdoor areas for storage of materials that may contribute pollutants to the storm water conveyance system measures to mitigate impacts must be included. | • Pesticides, fertilizers, paints, and other hazardous materials used for maintenance of common areas, parks, commercial areas, and multifamily residential common areas will be kept in enclosed storage areas. |
| 7. Properly Design Trash Storage Areas | All trash containers must meet the following structural or treatment control BMP requirements:<br>• Trash container areas must have drainage from adjoining roofs and pavement diverter around the areas.<br>• Trash container areas must be screened or walled to prevent offsite transport of trash. | • All outdoor trash storage areas will be covered and isolated from stormwater runoff. |
| 8. Provide Proof of Ongoing BMP Maintenance | • Applicant required to provide verification of maintenance provisions through such means as may be appropriate, including, but not limited to legal agreements, covenants, and/or Conditional Use Permits. | • Depending on the type and location of the BMP, either the County, a Landscape or Local Maintenance District (LMD), or Home Owners Association (HOA) will be responsible for maintenance of regional BMPs. The County will have the right, but not the duty, to inspect and maintain the BMPs that are maintained by the HOA or LMD, at the expense of the HOA or LMD, if they are not being properly maintained.<br>• The HOA or commercial/business owners would be responsible for operation and maintenance of parcel-based BMPs such as bioretention placed in common area landscaping and parking lot islands.<br>• Home owners will be responsible for maintenance of HSCs on single family parcels. |

| SUSMP Requirement[1] | Criteria/ Description | Corresponding Landmark Village PDFs |
|---|---|---|
| 9. Design Standards for Structural or Treatment Control BMPs | • Post-construction Structural or Treatment Control BMPs shall be designed to mitigate (infiltrate or treat) stormwater runoff using either volumetric treatment control BMPs or flow-based treatment control BMPs sized per listed criteria (see section 3.6.2 above). | • LID and treatment control BMPs will be designed to meet or exceed the sizing standards in the Los Angeles County SUSMP requirements.<br>• Volume-based treatment control BMPs for the Project will be designed to capture 80 percent or more of the annual runoff volume per Criteria 2 of the MS4 Permit.<br>• Flow-based treatment control BMPs will be sized using Criteria 3, which will provide 80 percent capture of annual runoff volume per criteria of the MS4 Permit.<br>• The size of the facilities will be finalized during the design stage by the project engineer with the final hydrology study, which will be prepared and approved to ensure consistency with this analysis prior to issuance of a final grading permit.<br>• Types of LID and treatment control BMPs that would be employed include parcel-based BMPs, regional LID BMPs, single family HSCs, USEPA Green Streets practices, media filtration, and a combination thereof. |
| 10.B.1 Properly Design Loading/ Unloading Dock Areas (100,000 $ft^2$ Commercial Developments) | • Cover loading dock areas or design drainage to minimize run-on and runoff of stormwater<br>• Direct connections to storm drains from depressed loading docks (truck wells) are prohibited | • Loading dock areas will be covered or designed to preclude run-on and runoff.<br>• Direct connections to storm drains from depressed loading docks (truck wells) will be prohibited.<br>• Below grade loading docks for fresh food items will drain through a Treatment Control BMP applicable to the use, such as a catch basin insert.<br>• Loading docks will be kept in a clean and orderly condition through weekly sweeping and litter control, at a minimum and immediate cleanup of spills and broken containers without the use of water. |

| SUSMP Requirement[1] | Criteria/ Description | Corresponding Landmark Village PDFs |
|---|---|---|
| 10B.2. Properly Design Repair/ Maintenance Bays (100,000 $ft^2$ Commercial Developments) | • Repair/ maintenance bays must be indoors or designed in such a way that does not allow stormwater run-on or contact with stormwater runoff.<br>• Design a repair/maintenance bay drainage system to capture all wash water, leaks, and spills. Connect drains to a sump for collection and disposal. Direct connection of the repair/ maintenance bays to the storm drain system is prohibited. If required by local jurisdiction, obtain an Industrial Waste Discharge Permit. | • Commercial areas will not have repair/maintenance bays or the bays will comply with design requirements. |
| 10B.3. Properly Design Vehicle/ Equipment Wash Areas (100,000 $ft^2$ Commercial Developments) | • Self-contained and /or covered, equipped with a clarifier, or other pretreatment facility, and properly connected to a sanitary sewer. | • Areas for washing/steam cleaning of vehicles will be self-contained or covered with a roof or overhang; will be equipped with a wash racks and with the prior approval of the sewering agency; will be equipped with a clarifier or other pretreatment facility: and will be properly connected to a sanitary sewer. |
| 10.C.<br>Properly Design Equipment/ Accessory Wash Areas (Restaurants) | • Self-contained, equipped with a grease trap, and properly connected to a sanitary sewer.<br>• If the wash area is to be located outdoors, it must be covered, paved, have secondary containment, and be connected to the sanitary sewer. | • Food preparation areas shall have either contained areas or sinks, each with sanitary sewer connections for disposal of wash waters containing kitchen and food wastes.<br>• If located outside, the containment areas or sinks shall also be structurally covered to prevent entry of storm water. Adequate signs shall be provided and appropriately placed stating the prohibition of discharging wash water to the storm drain system. |
| 10.D. Properly design fueling area (Retail Gasoline Outlets) | • The fuel dispensing area must be covered with an overhanging roof structure or canopy. The cover's minimum dimensions must be equal to or greater than the area within the grade break. The cover must not drain onto the fuel dispensing area and the downspouts must be routed to prevent drainage across the fueling area.<br>• The fuel dispensing area must be paved with Portland cement concrete (or equivalent smooth impervious surface). The use of asphalt concrete shall be prohibited.<br>• The fuel dispensing areas must have a 2% to 4% slope to prevent ponding, and must be separated from the rest of the | • Retail gasoline outlets will comply with design requirements. |

| SUSMP Requirement[1] | Criteria/ Description | Corresponding Landmark Village PDFs |
|---|---|---|
| | site by a grade break that prevents run-on of urban runoff.<br>• At a minimum, the concrete fuel dispensing area must extend 6.5 feet (2.0 meters) from the corner of each fuel dispenser, or the length at which the hose and nozzle assembly may be operated plus 1 foot (0.3 meter), whichever is less. | |
| 10.E.1. Properly design fueling area (Automotive Repair Shops) | • See requirement 10.D. above. | • Automotive repair shop fueling areas will comply with design requirements. |
| 10.E.2. Properly design repair/ maintenance bays (Automotive Repair Shops) | • See requirement 10.B.2 above. | • Automotive repair shop repair/maintenance bays will comply with design requirements. |
| 10.E.3. Properly design vehicle/equipment wash areas (Automotive Repair Shops) | • Self-contained and/or covered, equipped with a clarifier, or other pretreatment facility, and properly connected to a sanitary sewer or to a permitted disposal facility. | • Automotive repair shop vehicle/equipment wash areas will comply with design requirements. |
| 10.E.4. Properly design loading/unloading dock areas (Automotive Repair Shops) | • See requirement 10.B.1. above. | • Automotive repair shop loading/unloading dock areas will comply with design requirements. |
| 10.F.1. Properly Design Parking Area (Parking Lots) | • Reduce impervious land coverage of parking areas<br>• Infiltrate runoff before it reaches the storm drain system<br>• Treat runoff before it reaches storm drain system | • Commercial, multi-family, institutional, recreational, and park parking lots would incorporate parcel-based LID BMPs located in islands to promote filtration and infiltration of runoff.<br>• Stormwater runoff from parking lots would be directed to LID BMPs, including infiltration, bioinfiltration, and biofiltration BMPs installed at the parcel scale and regional scale, and/or media filters in compliance with the LID Performance Standard. |

| SUSMP Requirement[1] | Criteria/ Description | Corresponding Landmark Village PDFs |
|---|---|---|
| 10.F.2 Properly Design to Limit Oil Contamination and Perform Maintenance (Parking Lots) | • Treat to remove oil and petroleum hydrocarbons at parking lots that are heavily used.<br>• Ensure adequate operation and maintenance of treatment systems particularly sludge and oil removal | • See above.<br>• Treatment of runoff in LID BMPs will be used to address oil and petroleum hydrocarbons from high-use parking lots.<br>• The Home Owners Associations or Business Owners will be responsible for operation and maintenance of LID BMPs that serve private parking lots. |
| 13. Limitation of Use of Infiltration BMPs | • Infiltration is limited based on design of BMP, pollutant characteristics, land use, soil conditions, and traffic.<br>• Appropriate conditions (groundwater >10 ft from grade) must exist to utilize infiltration to treat and reduce stormwater runoff for the Project. | • Per the LARWQCB Clarification Letter (LARWQCB, 2006), generally, the common pollutants in stormwater are filtered or adsorbed by soil, and unlike hydrophobic solvents and salts, do not cause groundwater contamination. In any case, infiltration of 1-2 inches of rainfall in semi-arid areas like Southern California where there is a high rate of evapo-transpiration, presents minimal risks. |

[1] SUSMP Requirements 10A (Single Family Hillside Home), 11 (Waiver), and 12 (Mitigation Funding) do not apply to the proposed Project and, therefore, are not listed in Table 5-1.

[2] This requirement is from Part 4, Section D.1 of the MS4 permit.

## 5.2 Site Design and LID BMPs

The purpose of site design and LID BMPs, to the extent feasible, is to mimic the pre-developed hydrologic regime. (See County of Los Angeles Low Impact Development Standards Manual, January 2009.) The primary goals of site design and LID BMPs are to maintain a landscape functionally equivalent to pre-development hydrologic conditions and to minimize the generation of pollutants of concern.

Site design and LID principles include:

***Minimize Impervious Area/Maximize Permeability*** – Principles include preserving natural open space, reducing impervious surfaces such as roads, using more permeable paving materials, reducing street widths, using minimal disturbance techniques during development to avoid soil compaction, reducing the land coverage of buildings by building taller and narrower footprints, minimizing the use of impervious materials such as decorative concrete in landscape design, and incorporating detention or infiltration into landscape design.

***Minimize Directly Connected Impervious Areas (DCIAs)*** – Minimizing DCIA can be achieved by directing runoff from impervious areas to vegetated areas (e.g., landscaped areas or vegetated treatment control BMPs) or to LID BMPs.

***Conserve Natural Areas*** – Conserving and protecting native soils, vegetation, and stream corridors helps to mimic the site's natural hydrologic regime. This may be accomplished by clustering development within portions of the site to conserve as much natural open space as possible, limiting the extent of clearing and grading of native vegetation, planting additional vegetation, using native and/or non-native/non-invasive vegetation in parking lot islands and other landscape areas, and preserving and/or restoring riparian areas and wetlands.

***Select Appropriate Building Materials*** – Use of appropriate building materials reduces the generation and discharge of pollutants of concern in runoff (and is therefore also a source control BMP).

***Protect Slopes and Channels*** – Protecting slopes and channels reduces the potential for erosion and preserves natural sediment supply.

### 5.2.1 NRSP Subregion LID Performance Standard

A LID Performance Standard conceptually similar to the LID requirements in the Ventura County NPDES MS4 Permit has been developed and quantified for the Project. The LID BMP Performance Standard is illustrated in Figure 5-1 and described below:

LID project design features (PDFs) shall be selected and sized to: (1) fully retain the volume of stormwater runoff produced from a 0.75 inch storm event; and (2) reduce the percentage of Effective Impervious Area (EIA) to five percent or less of the total project area within the vesting tentative tract map and associated off-site project area. Runoff from all EIA shall be subject to treatment control measures that are selected to address the pollutants of concern and are sized to capture and treat 80 percent of the average annual runoff volume.

This LID Performance Standard will be implemented as follows:

1. Institutional, commercial, multi-family residential, recreation, and park land use parcels would implement retention or biofiltration BMPs on-site to the extent feasible. Based on an assessment of feasibility, one of three BMP strategies would be applied as outlined below:

    a. *Infiltration feasible*: If it is feasible to infiltrate all of the developed area runoff produced from the 0.75 inch design storm (i.e., soil infiltration rates are at least 0.5 inches per hour, fill depth is less than 10 feet, and no infiltration geotechnical hazards exist (such as landslides and terrace

escarpments)), infiltration BMPs would be used. Infiltration BMPs include bioretention (without an underdrain) (Figure 5-2), permeable pavement (Figure 5-3), infiltration galleries (Figure 5-4), infiltration basins or trenches (Figure 5-5), or an equivalent infiltration BMP.

b. *Bioinfiltration allowable when infiltration rates or deep fill depths are present*: If the parcel has low soil infiltration rates (i.e., the soil infiltration rate is less than 0.5 inches per hour) or the depth of fill is greater than 10 feet, but no other technical infeasibility concerns exist, bioinfiltration BMPs would be used (Figure 5-6). Bioinfiltration facilities are similar to bioretention facilities with an underdrain, but they include storage below the underdrain to maximize the volume infiltrated. These facilities would retain a portion of the runoff from the design storm, then biofilter the remaining runoff from the design storm.

c. *Infiltration is not allowable*: If infiltration is technically infeasible due to geotechnical hazards or a high ground water table, then biofiltration BMPs would be used. These BMPs would biofilter the runoff produced from the design storm from the developed area. Biofiltration BMPs include vegetated swales (Figure 5-7), filter strips (Figure 5-8), and planter boxes (Figure 5-9).

2. Runoff from roofs, patios, and walkways in single family residential parcels would be distributed over landscaped areas designed to fully retain the volume of runoff from the 0.75 inch storm event (Figure 5-10). Runoff from the remaining parcel area and that which does not infiltrate in the landscaped area would flow through the storm drain system to the regional infiltration/biofiltration facilities.

3. Runoff from roadways would be retained or biofiltered in retention or biofiltration BMPs sized to capture the design storm volume or flow, per the guidance in U.S. Environmental Protection Agency's (USEPA) Managing Wet Weather with Green Infrastructure: Green Streets.

4. No more than 5% of the total project area would be treated using conventional treatment methods that address the pollutants of concern. In this case, media filters (or equivalent BMPs that address the pollutants of concern) would be

sized to capture and treat 80% of the average annual runoff volume from the allowable EIA.

5. Regional infiltration/biofiltration facilities also would be implemented. The regional facilities would be designed to incorporate a biofilter in the bottom of the facility, which would allow for infiltration if feasible, with detention storage above the biofilter. The regional facilities would infiltrate or biofilter the design storm volume that has not been retained or biofiltered on the parcels in the area tributary to the regional facility. They also would provide extended detention treatment for the additional runoff volume required to provide 80% capture and treatment of the average annual runoff volume per the Newhall Ranch Specific Plan Sub-Regional Stormwater Mitigation Plan treatment performance standard.

### 5.2.2 Consideration of Spatial Scale

Site design and LID BMP implementation for the Project occurs at different spatial scales of development. These spatial scales are listed below, from larger to smaller scale:

- Ranch scale – the Newhall Ranch Specific Plan sub-region;
- Village scale – the Landmark Village Project;
- Land use scale – single family residential, multi-family residential, commercial, education, parks, and roadways within the Landmark Village project, and
- Lot or parcel scale – individual lots or parcels within the Landmark Village project.

Table 5-2 below lists the site design and LID BMPs that will be implemented by the Project at each spatial scale.

**Table 5-2: Landmark Village Site Design and LID BMPs**

| Spatial Scale | Corresponding Site Design and LID BMP |
|---|---|
| Ranch Scale | The Newhall Ranch Specific Plan (NRSP) clusters development into villages. Approximately 74% (10,145 acres) of the NRSP subregion will remain undeveloped Open Areas. |
| | A system of Open Areas will weave through the NRSP area. The Open Areas include community parks, prominent ridges, bluffs, slopes, creek beds, and utility and trail system easements, and would often function as a transition between development areas and the Special Management Areas (SMAs), which include the Santa Clara River corridor as well as the Newhall Ranch High Country. The Open Areas are designed to protect significant landforms and natural resources, and to provide an opportunity to protect natural resources from the proposed development. |

| Spatial Scale | Corresponding Site Design and LID BMP |
|---|---|
| | The NRSP Land Use Plan designates a total of 5,159 acres for the River Corridor and High Country Special Management Areas (SMAs). These SMAs are designed to protect the existing natural resources within Los Angeles County's Significant Ecological Areas SEA 20 and SEA 23. |
| | The 976-acre River Corridor SMA is designed to protect the sensitive biological resources in SEA 23. The River Corridor SMA will be dedicated to the Center for Natural Lands Management, and the Center will assume responsibility for management of this area. |
| | The largest land use designation of the NRSP Land Use Plan is the approximately 4,185-acre High Country SMA/SEA 20. The High Country SMA/SEA 20 is located in the southern portion of the sub-region and includes oak savannahs, high ridgelines, and various canyon drainages including Salt Creek, a regionally significant wildlife corridor that provides an important habitat link to the Santa Clara River. The High Country SMA/SEA 20 will be dedicated in fee to the Newhall Ranch Joint Powers Authority (JPA) consisting of the County of Los Angeles, the City of Santa Clarita, and the Santa Monica Mountains Conservancy, and this JPA will assume responsibility for management of this area. |
| | As a result of approval of the NRSP, the 1,517-acre portion of the Salt Creek watershed situated in Ventura County, which is under the ownership of Newhall Land, will be dedicated to the JPA. This dedication area is west of Newhall Ranch, and will be managed in the same manner as the High Country SMA, discussed above. |
| | Two conservation easements have been granted to CDFG for the purpose of conserving populations of spineflower that occur on the NRSP area. |
| Landmark Village Scale | Impervious areas will be minimized by incorporating landscaped areas into each village, including Landmark Village. Approximately 71.3 acres (24%) of the 292.6 gross acre Landmark Village project tract map area would remain as trails, parks, vegetated slopes, open space, and water quality treatment BMPs. Additional landscaped areas would be provided in conjunction with the residential and commercial uses, resulting in approximately 36% of the tract map site being pervious. |
| | The Landmark Village stormwater treatment system would provide treatment control for 97% of post-development impervious surface via the use of parcel-based and sub-regional LID BMPs that provide for volume reduction through infiltration and evapotranspiration. See Figure 5-1 and Tables 5-3 through 5-5. |
| | In areas not subject to mass grading, the smallest site disturbance area possible will be delineated and flagged; temporary storage of construction equipment will be restricted in these areas to minimize soil compaction on site. Site clearing and grading will be limited to the footprint necessary to allow development, access, and provide fire protection. |
| | The Santa Clara River Corridor and Chiquita Canyon, Long Canyon and Castaic Creek will be largely preserved, and development impacts to these resources will be minimized. An average buffer (the distance between the existing riparian resources and the Regional River Trail) of 150 - 200 feet will be provided along the Santa Clara River corridor; additionally, commercial, residential, and mixed use development will be setback 100 feet from the Regional River Trail outside of the Santa Clara River SMA/SEA 23, which will further separate development from the Santa Clara River corridor. |

| Spatial Scale | Corresponding Site Design and LID BMP |
|---|---|
| | Natural slopes and native vegetation on slopes adjacent to the Santa Clara River will be restored and enhanced. |
| Land Use Scale | Streets, sidewalks, and parking lot aisles will be constructed to the minimum widths specified in the NRSP and in compliance with regulations for the Americans with Disabilities Act and safety requirements for fire and emergency vehicle access. |
| | Portions of the Santa Clara River Regional River Trail will incorporate granular materials, or other pervious materials. |
| | Native and/or non-native/non-invasive, climate-appropriate vegetation that requires less watering and chemical application will be utilized within the common area landscaping in commercial areas and multi-family residential areas. |
| | Impervious surfaces will be minimized in common area landscape design for commercial areas and multi-family residential areas. |
| | Landscape watering in common areas, commercial areas, multiple family residential areas, and parks will use efficient recycled water irrigation technologies with centralized irrigation controls. Efficient irrigation for common area irrigation systems will include a combination of the following techniques:<br>• Low volume irrigation systems will be used, including low volume sprinkler heads, drip emitters, and bubbler emitters, to minimize water use.<br>• "Smart" irrigation controllers will be installed to control the amount of time irrigation systems are operated each day. These may include satellite controlled sensors or other equally effective technology. |
| Lot Scale | Parcel-based LID BMPs (e.g., bioretention areas, porous pavement, swales) would manage runoff from commercial, multi-family residential, institutional, recreational, and park land uses and infiltrate, bioinfiltration, or biofilter this runoff, as feasible based on geotechnical conditions. These BMPs would be located in parking lot islands and other on-site landscaped areas. |
| | Home builders would be required to implement hydrologic source controls for rooftops, patios, and walkways to retain the LID design storm volume. Hydrologic source controls include but are not limited to directing rooftop runoff through landscaped areas, installing percolation trenches, and installing rain barrels. |

## 5.3 LID and Treatment Control BMPs

An assessment of infiltration feasibility was conducted to estimate, for the tract map area, which one of three on-site LID BMP strategies could be applied and whether proposed sub-regional bioinfiltration/biofiltration facilities would allow for infiltration. The tract map area was analyzed by the Project Geotechnical Consultant (Alan E. Seward, 2010) using geologic information, soils information, proposed remedial grading plans, final grades, and applicable feasibility criteria from the Los Angeles County LID Standards Manual. This analysis categorized project areas into three levels of infiltration feasibility:

1. Infiltration was considered to be feasible directly from the bottom of BMPs in locations where underlying soils infiltration rates were estimated to be greater than 0.5 inches per hour and the proposed depth of compacted fill was estimated to be less than 10 feet.
2. Infiltration was considered to be feasible through the use of dry wells in locations where underlying soils infiltration rates were estimated to be greater than 0.5 inches per hour and greater than 10 feet of separation was estimated to exist from the bottom of proposed fill to the seasonally high groundwater table.
3. Infiltration was considered to be partially feasible in the remaining areas. No hazards were identified that would preclude the use of some level of infiltration.

The results of this feasibility screening are illustrated in Figure 5-2. Figure 5-3 illustrates the LID BMPs for the Project area based on the feasibility screening. Approximately 97 percent of stormwater runoff from developed areas within the Project site would be routed to LID BMPs implemented at the parcel and regional scale (Figure 5-3). The remaining three percent would be treated in media filters or an equivalent treatment control BMPs that address pollutants of concern. Catch basin inserts and equivalent source control BMP also would be used in high-use parking lots to address trash. Collectively, the LID and treatment control PDFs would treat the pollutants of concern in runoff from the developed portion of the 292.6-gross-acre Landmark Village tract map area. Long Canyon Bridge would drain to a sub-regional biofiltration facility located within the tract map site. The off-site SR-126 expansion project would provide vegetated swale biofiltration for both the new and existing untreated roadway area. The utility corridor maintenance access road and potential future trail, as well as the water tank and access roads, would drain to infiltration or bioinfiltration BMPs (vegetated swale, filter strip, porous pavement, or bioretention). These LID BMPs would be designed to receive dry weather flows, small storm flows and the initial portion of large storm flows.

The proposed LID BMP and treatment control PDFs are summarized in Tables 5-3 through 5-5, are illustrated in Figures 5-4 through 5-14, and are described below. Project-related improvements at the borrow sites would not result in the introduction of impervious surfaces or any changes in drainage or hydrology characteristics. Therefore, all water quality potential impacts of runoff discharges from the borrow sites are limited to the construction phase pollutants.

- ***Parcel-based Infiltration BMPs:*** Parcel-based infiltration BMPs include bioretention (without an underdrain) (Figure 5-4), permeable pavement (Figure 5-5), infiltration galleries(Figure 5-6), infiltration basins or trenches (Figure 5-7), or an equivalent infiltration BMP.
- ***Parcel-based Bioinfiltration BMPs:*** Parcel-based bioinfiltration BMPs include bioretention (with an elevated underdrain) (Figure 5-8), vegetated swales (with

combined retention and treatment mechanisms), and other BMPs that are designed to retain a portion of the runoff from the LID design storm, then biofilter the remaining runoff from the design storm.

- ***Parcel-based Biofiltration BMPs*:** Parcel-based biofiltration BMPs provide for pollutant removal (e.g., filtration, adsorption, nutrient uptake) by filtering stormwater through the vegetation and soils. These BMPs include bioretention with underdrains, vegetated swales (Figure 5-9), filter strips (Figure 5-10), and planter boxes (Figure 5-11). In these BMPs, pore spaces and organic material in the soils help to retain water in the form of soil moisture and to promote the adsorption of pollutants (e.g., dissolved metals and petroleum hydrocarbons) into the soil matrix. Plants utilize soil moisture and promote the drying of the soil through evapotranspiration.
- ***Single Family Hydrologic Source Controls (Single Family HSCs)***: Runoff from roofs, patios, and walkways in single family residential parcels would be disconnected over landscaped areas designed to fully retain the volume of runoff from the LID design storm (0.75 inch storm event). Single Family HSCs would provide volume reduction by routing downspouts to landscaped areas (Figure 5-12), shallow percolation trenches, rain barrels or other equivalent means of retaining the LID design storm. Storage volume would be recovered via in infiltration and evapotranspiration.
- ***Sub-Regional/Regional Infiltration/Biofiltration Facilities***: Regional infiltration/ biofiltration facilities would be designed to incorporate a biofilter in the bottom of a regional basin, which would allow for infiltration if feasible, with detention storage above the biofilter (Figure 5-13). The regional facilities would infiltrate or biofilter the LID design storm volume that has not been retained or biofiltered on the parcels in the area tributary to the regional facility and would provide extended detention treatment for the additional runoff volume required to provide 80% capture and treatment of the average annual runoff volume per the Newhall Ranch Specific Plan Sub-Regional Stormwater Mitigation Plan treatment performance standard. The design of the facility would be tailored to soil and hydrogeologic conditions in the facility location.
- ***Media Filtration:*** Media filtration is typically comprised of a vault or catch basin that houses media designed to trap particulates and remove pollutants such as dissolved metals, nutrients, and hydrocarbons (Figure 5-14). During the filtering process, the treatment system also removes surface scum and floating oil and grease. Media may be contained in cartridges or be placed directly in a media bed configuration.

**Table 5-3: Parcel-based LID BMP Tributary Areas and Design Requirements**

| Parcel-based BMP Type | Tributary Area (acres) | Design Requirements |
|---|---|---|
| Category 1: Infiltration Feasible | 38.9 | Retention of runoff produced by design storm |
| Category 2: Bioinfiltration | 86.3 | Capture and biotreatment of runoff produced by design storm; partial infiltration |
| Single-Family Hydrologic Source Controls | 28.1 | Rooftops, patios, walkways routed to pervious areas capable of managing runoff from the 0.75 inch storm event. |
| Routed Directly to Sub-Regional BMPs or Treatment BMPs (Green Streets and Media Filters)[1] | 123.4 | See Design Requirements in Table 5-4 below |

[1] This represents the areas that are not directed to parcel-based BMPs prior to treatment in sub-regional BMPs or treatment BMPs. Other areas are treated by the specified parcel-based BMP prior to treatment in the sub-regional and treatment BMPs.

**Table 5-4: Sub-Regional BMP Tributary Areas and Design Requirements**

| Sub-Regional BMP Type | Tributary Area (acres) | Design Requirements |
|---|---|---|
| Sub-Regional Bioinfiltration Facilities | 203.8 | 80% capture of average annual volume from tributary area; retention of runoff required to meet LID Performance standard (after accounting for parcel-based retention) |
| Sub-Regional Biofiltration Facility | 56.7 | 80% capture of average annual volume from tributary area |

**Table 5-5: Treatment BMP Tributary Areas and Design Requirements**

| Treatment BMP Type | Tributary Area (acres) | Design Requirements |
|---|---|---|
| On-site Treatment (Media Filter or Equivalent) | 8.0 | 80% capture of average annual volume from tributary area |
| On-site Biofilter Swales (or Equivalent) | 8.2 | 80% capture of average annual volume from tributary area |
| Off-site Biofilter Swales | 103.6 | 80% capture of average annual volume from tributary area |

## 5.4 Hydromodification Control PDFs

Post-development flows will be directed to the Santa Clara River after treatment; no flows will be directed to tributaries to the Santa Clara River. A series of progressive hydromodification control measures will be used in the Project to prevent and control hydromodification impacts to the Santa Clara River:

- Avoid, to the extent possible, the need to mitigate for hydromodification impacts by preserving natural hydrologic conditions and protecting sensitive hydrologic features, sediment sources, and sensitive habitats.

- Minimize the effects of development through site design practices (e.g., reducing connected impervious surfaces) and implementation of stormwater volume-reducing LID BMPs (project-based hydrologic source control).

- Mitigate hydromodification impacts in-stream using geomorphically-based channel design.

### 5.4.1 Hydrologic Source Control

Disconnecting impervious areas from the drainage network and adjacent impervious areas is a key approach to protecting channel stability. Several hydrologic source controls will be included in the Project that will limit impervious area and disconnect imperviousness to avoid and minimize hydromodification impacts:

- Site design. Site design PDFs that help to reduce runoff volume from the Project include the clustering of development into village areas, leaving large amounts of undeveloped open space within the NRSP subregion (of which Landmark Village is a part); routing of stormwater runoff to vegetated areas and/or LID BMPs; use of native or non-native/non-invasive plants in landscaped areas; and the use of efficient irrigation systems in common area landscaped areas.
- LID BMPs. The Project's LID BMPs will also serve as hydromodification source control BMPs. Parcel-based and regional LID BMPs would provide volume reduction ranging from incidental volume reduction in biofiltration BMPs (via evaporation and infiltration) up to full volume reduction of captured water in infiltration BMPs where soil and hydrogeologic conditions permit. In addition these facilities will also receive and eliminate dry weather flows.

### 5.4.2 Geomorphically-Referenced Channel Design

The hydromodification management approach for the Santa Clara River incorporates "geomorphically-referenced " channel design as described in SCCWRP Technical Report 450 (SCCWRP, 2005a). The goal of this approach is to preserve the natural stream channel function to the maximum extent practicable while limiting instability in stream channel morphology.

The Project's development footprint will allow for the greatest freedom possible for "natural stream channel" activity. This includes establishing buffer zones and maintaining setbacks to allow for channel movement and adjustment to changes in energy

associated with runoff. The engineered structural elements that will be implemented where needed for Santa Clara River stability include energy dissipation and geomorphically-referenced bank stabilization, pursuant to the Newhall Ranch RMDP.

- *Energy Dissipation*. Energy dissipation at storm drain outfalls provides erosion protection in areas where discharges have the potential to cause localized stream erosion. Erosion protection will be provided at all storm drain outlets to the Santa Clara River.

- *Bank Stabilization*. The Project will include buried soil cement along the Santa Clara River and Castaic Creek adjacent to and downstream of the Project site. In total, approximately 18,243 linear feet (LF) of bank would be provided with buried soil cement protection. This would include approximately 10,643 feet fronting the tract map site and approximately 6,400 LF on the south bank downstream (west) of the Long Canyon Road Bridge. Additional buried bank stabilization would be constructed as part of the approved Newhall Ranch WRP and between The Old Road and the Santa Clara River to protect the utility corridor. The bank protection between The Old Road and the Santa Clara River was approved as part of the Santa Clara River Natural River Management Plan (NRMP).

  Most of the proposed bank protection would consist of buried soil cement to provide scour and freeboard flood control protection. Soil cement is a modern flood control technique used to protect against erosion while maintaining natural vegetation and soft banks. Soil cement will be buried below the existing banks of the Santa Clara River. Disturbed areas will then re-vegetated with native plant species, maintaining the natural habitat presently found along the River.

  Approximately 6,600 LF of Turf Reinforcement Mat (TRM) or similar bank stability protection would be provide along the southern edge of the utility corridor downstream or west of the tract map site. TRMs are designed to reinforce vegetation at the root and stem allowing vegetation to be used as erosion control in areas where flow conditions exceed the ability of natural vegetation to remain rooted. This includes applications with high slopes or stream banks where grouted rip-rap and concrete channels are aesthetically undesirable.

## 5.5 Operation and Maintenance

Depending on the type and location of the BMP, either the County, a Landscape Maintenance District (LMD), Geologic Hazard Abatement District (GHAD), Home Owners Association (HOA), or other similar government or quasi-government agency

will be responsible for maintenance of regional BMPs. LMD(s), GHAD(s), or other similar government or quasi-government agency would be formed prior to turnover of stormwater facilities, prior to the first home sale. The HOA or commercial/business owners would be responsible for operation and maintenance of parcel-based BMPs such as bioretention placed in common area landscaping or parking lot islands. Homeowners would be responsible for maintenance of HSCs on single family residential properties.

Maintenance and inspection agreements will be established as the stormwater facilities are approved and built. HOA maintenance agreements will incorporate a list of HOA responsibilities. The LMD(s), GHAD(s), or other similar government or quasi-government agency will have a mechanism and staffing to monitor, maintain, and enforce BMP maintenance. The County will have the right to inspect and maintain the BMPs that are maintained by the HOA, LMD, GHAD, or other similar agency at the expense of the HOA, LMD, GHAD, or other similar agency, if they are not being properly maintained.

Operation and maintenance activities will be conducted in compliance with maintenance requirements established in the Los Angeles County Stormwater BMP Design and Maintenance Manual.

# 6 WATER QUALITY ANALYSIS APPROACH

## 6.1 Model Description

A load-based water quality model was used to estimate pollutant loads and concentrations in Project area stormwater runoff for certain pollutants of concern for pre-development conditions and post-development conditions with the LID BMPs and treatment control measures described above. This model was coupled with hydrologic and hydraulic modules of USEPA SWMM v4.4h to quantify the volume reduction and capture efficiency of the BMPs.

Table 6-1 below provides a list of model inputs and the sources for these inputs. For further detail, see Appendix B and Appendix G to this report.

**Table 6-1: Water Quality Model Input Requirements and Assumptions**

| Model Input | Assumption/Source |
|---|---|
| Hourly long-term rainfall record | National Climatic Data Center (NCDC) Newhall (046162) and San Fernando (047762) rain gauge data from 1969-2008 |
| Green-Ampt soil parameters | Natural Resource Conservation Service Soil Data Mart<br>Table 5.5.5 – Handbook of Hydrology (Maidment, ed. 2003) |
| Land use-based imperviousness | LA County Hydrology Manual (LACDPW, 2006b) |
| Land use-based stormwater runoff event mean concentrations | Los Angeles County 1994-2000 Integrated Receiving Water Impacts Report, 2000<br>Los Angeles County 2000-2001 Stormwater Monitoring Report, 2001<br>Ventura County Watershed Protection District<br>As analyzed for the Los Angeles Structural BMP Prioritization and Assessment Tool (LACDPW, City of Los Angeles, and Heal the Bay, 2008) |
| Volume and flow-based BMP design criteria | 80% Capture of Average Annual Runoff Volume<br>(NRSP Sub-Regional SWMP (Geosyntec, 2008)) |
| BMP selection criteria | Select and locate BMPs with a preference for infiltration.<br>Select BMPs to infiltrate the runoff volume from the 0.75-inch design storm to the extent feasible and biofilter the remaining fraction of the 80 percent capture volume.<br>Evaluate degree of feasibility of infiltration based on land use type, native soil infiltration rate, proposed cut and fill, depth to groundwater, presence of landslides that will remain after remedial grading, and other geotechnically- or ecologically-based constraints. |
| Volume reduction and LID BMPs analyzed quantitatively | Clustering (preservation of open space)<br>Hydrologic source controls<br>Distributed retention, bioinfiltration, and biofiltration BMPs<br>Regional infiltration, bioinfiltration, and biofiltration facilities<br>Media filters |

<table>
<tr><th>Model Input</th><th>Assumption/Source</th></tr>
<tr><td>Volume reduction modeling parameters</td><td>Hydrologic source controls: equal ratio of disconnected of rooftops and patios to landscaped areas receiving disconnection<br>Onsite BMPs:
<table>
<tr><th>Feasibility Constraint Category</th><th>Design infiltration rate (in/hr)</th></tr>
<tr><td>Category 1: Retention</td><td>0.38</td></tr>
<tr><td>Category 2: Bioinfiltration</td><td>0.25</td></tr>
</table>
Sub-regional Bioinfiltration/Biofiltration Facilities:
<table>
<tr><th>Facility Type</th><th>Design infiltration rate (in/hr)</th></tr>
<tr><td>Sub-regional Bioinfiltration Facilities (multiple)</td><td>0.25</td></tr>
<tr><td>Sub-regional Biofiltration Facility with biofiltration, extended detention and incidental infiltration</td><td>0.25</td></tr>
</table></td></tr>
<tr><td>LID BMP effluent quality</td><td>ASCE/USEPA (American Society of Civil Engineers Urban Water Resources Research Council and United States Environmental Protection Agency) 2011, International Stormwater Best Management Practices Database (www.bmpdatabase.org);<br>(Reanalysis of expanded database conducted January 2011)</td></tr>
</table>

## 6.2 Pollutants Modeled

The appropriate form of data used to address water quality are flow composite storm event samples, which are a measure of the average water quality during the event. To obtain such data usually requires automatic samplers that collect data at a frequency that is proportionate to flow rate. The pollutants of concern for which there are sufficient flow composite sampling data in the Los Angeles County database are:

- Total Suspended Solids (sediment)
- Total Phosphorus
- Nitrate-Nitrogen, Nitrite-Nitrogen, Ammonia-Nitrogen, and Total Nitrogen
- Total Aluminum
- Dissolved Copper
- Total Lead
- Dissolved Zinc
- Chloride

The other pollutants of concern, such as pathogens, hydrocarbons, pesticides, and trash and debris, are not amenable to this type of sampling either because of short holding

times (e.g., pathogens), difficulties in obtaining a representative sample (e.g., hydrocarbons), or low detection levels (e.g., pesticides). These pollutants were addressed qualitatively using literature information and best professional judgment due to the lack of statistically reliable monitoring data for these pollutants (see Section 6.3 below).

## 6.3 Qualitative Impact Analysis

Post development stormwater runoff water quality impacts associated with the following pollutants of concern were addressed based on literature information and professional judgment because available data were not deemed sufficient for modeling:

- Turbidity
- Pathogens (Bacteria, Viruses, and Protozoa)
- Hydrocarbons (Oil and Grease, Polycyclic Aromatic Hydrocarbons)
- Pesticides
- Trash and Debris
- Methylene Blue Activated Substances (MBAS)
- Cyanide

Human pathogens are usually not directly measured in stormwater monitoring programs because of the difficulty and expense involved; rather, indicator bacteria such as fecal coliform or certain strains of *E. Coli* are measured. Unfortunately, these indicators are not very reliable measures of the presence of pathogens in stormwater, in part because stormwater tends to mobilize pollutants from many sources, some of which contain non-pathogenic bacteria. For this reason, and because holding times for bacterial samples are necessarily short, most stormwater programs do not collect flow-weighted composite samples that potentially could produce more reliable statistical estimates of concentrations. Fecal coliform or *E. Coli* are typically measured with grab samples, making it difficult to develop reliable EMCs. Total coliform and fecal bacteria (fecal coliform, fecal streptococcus, and fecal enterococci) were detected in stormwater samples tested in Los Angeles County at highly variable densities (or most probable number, MPN) ranging between several hundred to several million cells per 100 ml (LACDPW, 2000).

Hydrocarbons are difficult to measure because of laboratory interference effects and sample collection issues (hydrocarbons tend to coat sample bottles). Hydrocarbons are typically measured with single grab samples, making it difficult to develop reliable EMCs.

Pesticides in urban runoff are often at concentrations that are below detection limits for most commercial laboratories and therefore there are limited statistically reliable data available on pesticides in urban runoff. Pesticides were not detected in Los Angeles

County monitoring data for land use-based samples, except for diazinon and glyphosate which were detected in less than 15 percent and 7 percent of samples, respectively (LACDPW, 2000).

Turbidity, trash and debris, MBAS, and cyanide are not typically included in routine urban stormwater monitoring programs. Turbidity is not typically included in post-construction treatment control BMP effectiveness studies. Several studies conducted in the Los Angeles River basin have attempted to quantify trash generated from discrete areas, but the data represent relatively small areas or relatively short periods, or both. MBAS was included in the land use-based monitoring data, but not enough data is available for modeling purposes. Cyanide was not included in the Los Angeles County land use-based monitoring program.

Also addressed qualitatively are potential water quality impacts from runoff and dewatering discharges during construction (Section 7.4), potential water quality impacts due to pollutant bioaccumulation (Section 7.5), dry weather runoff water quality impacts (Section 7.6), and groundwater quality impacts (Section 7.8).

### 6.3.1 LID Performance Standard Retention Volume Conformance Analysis

The Project LID Performance Standard establishes minimum requirements for stormwater retention. An analysis was performed to demonstrate that the proposed LID BMP PDFs would provide retention volume equivalent to or greater than the Project LID Performance Standard retention volume. The following stepwise process was used to show conformance with the LID Performance Standard Retention Volume.

***Step 1: Calculate LID Performance Standard***

The retention volume required to meet the Project LID Performance Standard was calculated as described below:

- Tabulate non-jurisdictional project area (includes vesting tentative tract map and associated off-site project areas, minus the River Corridor).
- Calculate project total impervious area. This calculation was based on proposed land uses and average impervious rates for these land uses.
- Calculate project allowable impervious area. This was calculated as five percent of the total project area as described in the Project LID Performance Standard.
- Calculate the remaining impervious area as the difference between the total impervious area and the allowable impervious area

- Calculate runoff from the remaining impervious area for the first 0.75 inches of precipitation per the method described in the Ventura County Technical Guidance Manual (TGM):

    d. V (ac-ft) = Remaining Impervious Area (ac) × 0.75 inches × 0.95 runoff coefficient × (1ft/12 inches units conversion)

- The resulting retention storage volume is the LID Performance Standard retention volume that would apply to the Project. This performance standard is expressed in acre-feet.

***Step 2: Calculate Retention Volume in Land Use BMPs (Onsite)***

The retention volume provided in parcel-based LID BMPs was calculated based the application of the Project LID Performance Standard to the Project land uses and infiltration constraints (Figure 5-3), as follows:

- Categorize institutional, commercial, multi-family residential, recreation, and park land use parcels by the infiltration constraint category and calculate the area of each category of parcel-based LID BMPs. This analysis was conducted using spatial datasets characterizing infiltration feasibility factors, including depth to groundwater, natural, undisturbed soil infiltration rate, net depth of proposed cut and fill, and geotechnical hazards (see Appendix H). These datasets were overlain to characterize project areas based on the following criteria:
    - *Category 1 - Infiltration Feasible* – depth to seasonally high groundwater greater than 10 feet; net depth of fill less than 10 feet; natural, undisturbed infiltration rate greater than 0.5 inches per hour; and no identified geotechnical hazards related to infiltration of stormwater.
    - *Category 2 - Infiltration Partially Feasible* – depth to seasonally high groundwater greater than 10 feet and no identified geotechnical hazards related to infiltration of stormwater (any depth of fill or natural, undisturbed infiltration rate)
    - *Category 3 - Infiltration Infeasible* –depth to seasonally high groundwater less than 10 feet; geotechnical hazard identified that would preclude infiltration

- Calculate the retention volume per BMP area provided in parcel-based LID BMPs and sum the retention volume provided in all parcel-based LID BMPs.
    - *Category 1 - Infiltration Feasible – Infiltration BMPs*: Sum all volume provided in BMPs below the overflow elevation.

- *Category 2 - Infiltration Partially Feasible - Bioinfiltration BMPs*: Sum all volume provided below underdrains and retained in soil pores.
- *Category 3 - Infiltration Infeasible – Biofiltration BMPs:* Sum all volume retained in soil pores.

- Calculate acreage of single family detached land uses and calculate retention volume associated with infiltration and evapotranspiration by Single Family HSCs:
  - Estimate area of rooftops, patios, and walkways based on typical lot dimensions and setbacks.
  - Calculate volume of runoff from roofs, patios, and walkways for the first 0.75 inches of rainfall and tabulate this volume as retention storage.

***Step 3: Calculate Retention Volume in Regional Infiltration/Biofiltration Facilities***

Calculate the total storage volume provided in subregional infiltration/biofiltration facilities below the lowest discharge point.

- Retention volume in subregional bioinfiltration facilities was considered to include the volume of water in the rock layer below the facility underdrains and the volume of water retained in the pore space of biofiltration media.
- Retention volume in subregional biofiltration facilities was considered to include the volume retained in the pore space of biofiltration media.

***Step 4: Compare Total Retention Volume Provided to LID Performance Standard***

The total retention volume provided in parcel-based BMPs and regional LID BMPs (regional infiltration/biofiltration facilities) from Steps 2 and 3, respectively, was compared to the Project LID Performance Standard retention volume computed in Step 1. The Project is considered to meet the Project LID Performance Standard if the total retention storage volume provided is equal to or greater than the Project LID Performance Standard retention volume.

# 7 IMPACT ASSESSMENT

The modeled pollutant impact assessment is presented in Section 7.1 and the qualitative analyses of the remaining pollutants of concern follow in Section 7.2. Analyses of dry weather impacts and compliance with NPDES Permit requirements and construction-related requirements of the Construction General Permit and Dewatering General Permit follow the pollutant-by-pollutant impact assessment. Also included is a discussion of other considerations, including operation and maintenance, vector control, bioaccumulation, and hydrologic impacts. The analysis of cumulative impacts to surface water, groundwater, and hydromodification is also provided. A weight of evidence approach is employed using the various thresholds and significance criteria discussed in Section 4.4

## 7.1 Post Development Stormwater Runoff Impact Assessment for Modeled Pollutants of Concern

In this section, model results for each pollutant are evaluated in relation to the following significance criteria: (1) comparison of post-development versus pre-development stormwater quality concentrations and loads; (2) comparison with MS4 Permit, Construction General Permit, and General Dewatering Permit requirements for new development; and (3) evaluation in light of receiving water benchmarks. Pursuant to the third criterion, predicted runoff pollutant concentrations in the post-development condition, with runoff LID BMP and treatment control PDFs, are compared with benchmark receiving water quality criteria as provided in the Basin Plan and the CTR and TMDL wasteload allocations. The water quality criteria and wasteload allocations are considered benchmarks for comparison purposes only, since they do not apply directly to runoff from the Project, but the comparison provides useful information to evaluate potential impacts. A weight of evidence approach is employed in this analysis considering the various significance criteria.

Results from the water quality model for significance criterion 1 are reported in a series of tables, organized by constituent, showing predicted mean annual pollutant loads (lbs/yr) and mean annual concentrations. Projections are made for two conditions: (1) existing condition, and (2) developed condition with PDFs. Following the table comparing post-development and pre-development water quality loads and concentrations for each constituent is a table comparing the post-development (with PDFs) runoff quality to the benchmark water quality objectives and criteria and TMDL wasteload allocations for downstream reaches of the Santa Clara River. Water quality observed in the Santa Clara River is also included on these tables as a benchmark.

The area of the Project included in the model was limited to the developed portion of the Project. As no impervious surfaces will be added in the borrow areas and the utility

corridor and therefore there will be no change in runoff volume or pollutant loads and concentrations in the post-developed condition, these areas were not included in the model, but are included in the qualitative construction impact assessment.

### 7.1.1 Stormwater Runoff Volume

Table 7-1 shows the predicted changes in stormwater runoff mean annual volumes. Mean annual runoff volumes are expected to increase substantially with development. The increase can be explained by the increase in imperviousness associated with development of the site, as well as by the decrease in infiltration capacity of existing site soils associated with the compaction of site soils during construction. For modeling purposes, the existing agricultural land use was assumed to have an imperviousness of 15 percent to account for compaction by machinery and soil saturation due to irrigation. In contrast, single family residential land use is assumed to have an average imperviousness of 42 percent, multi-family residential land use is assumed to have an average imperviousness of 68 percent, and commercial land use is assumed to have an average imperviousness of 92 percent.

Project PDFs include site design, source control, LID, and treatment control BMPs in compliance with the SUSMP requirements. Most of the site design PDFs, especially the minimization of impervious area and the provision of 59.6 acres of trails, parks, and vegetated slopes and LID BMPs within the Project, reduce the impacts of the proposed development on increases in stormwater runoff volume. Based on the LID feasibility screening conducted for this analysis, the LID BMPs would reduce the average annual runoff volume by approximately 123 acre-feet per year.

**Table 7-1: Predicted Average Annual Stormwater Runoff Volumes**

| Site Conditions | Average Annual Stormwater Runoff Volume (acre-ft) |
|---|---|
| Existing | 130 |
| Developed with PDFs | 261 |
| Change | 131 |

Runoff volumes from the impervious areas within the off-site project components are likely to increase compared to the existing condition. The use of LID BMPs for these areas will minimize the increase in post-development runoff volumes.

### 7.1.2 TSS

*Comparison of Pre- and Post-Project Conditions*: Table 7-2 shows the predicted average annual TSS concentration and loads. TSS concentration is predicted to decrease as a result of the Project. This decrease can be attributed to higher EMCs observed in monitoring data from agricultural and open space land uses (the existing condition for the

site) compared with urban land uses (representative of post-development conditions). TSS load is also predicted to decrease with development despite increased runoff volumes.

**Table 7-2: Predicted Average Annual TSS Concentration and Load**

| Site Conditions | Average Annual TSS Concentration (mg/L) | Average Annual TSS Load (tons/yr) |
|---|---|---|
| Existing | 192 | 37 |
| Developed with PDFs | 33 | 12 |
| Change | -159 | -25 |

*Comparison with Water Quality Criteria*: The predicted average annual TSS concentration in stormwater runoff is compared with receiving water objectives and the range of observed concentrations in the Santa Clara River Reach 5 in Table 7-3. The predicted TSS load and concentration declines with development and is at the low end of the range of observed concentrations in Santa Clara River Reach 5.

**Table 7-3: Comparison of Predicted TSS Concentrations with Water Quality Criteria and Observed Concentrations in Santa Clara River Reach 5**

| Predicted Average Annual TSS Concentration (mg/L) | Los Angeles Basin Plan Water Quality Objectives | California Toxics Rule Criteria | Range of Observed[1] Concentrations in Santa Clara River Reach 5 (mg/L) | Average Wet Weather[2] Concentration at Station S29 (Days > 0.1") |
|---|---|---|---|---|
| 33 | Water shall not contain suspended or settleable material in concentrations that cause nuisance or adversely affect beneficial uses | NA | 32 – 51,200 | 1,060 |

[1] Range of concentrations observed in the Santa Clara River during wet weather (Stations S29, NR1, and NR3, see Section 2.7).

[2] Average concentration observed in wet weather monitoring data at Station S29 for all storm events greater than 0.1 inches.

NA – not applicable

TSS concentrations in runoff from the impervious areas in the off-site project components are likely to decrease compared to the existing condition, similarly to the modeled project area. The use of LID BMPs will further reduce the post-development runoff TSS concentrations and loads. The average TSS concentration in runoff treated in biofilters (bioretention and vegetated swales) reported in the International Stormwater BMP database is 30.7 mg/L, which is below the range of observed concentrations in Santa Clara River Reach 5.

Based on the comprehensive site design, source control, LID, and treatment control strategy, and the comparison with available in-stream data and Basin Plan benchmark objectives, the TSS in stormwater runoff from the Project will not cause a nuisance or adversely affect beneficial uses in the receiving waters.

### 7.1.3 Total Phosphorus

*Comparison of Pre- and Post-Project Conditions*: Table 7-4 shows the predicted average total phosphorus (TP) concentrations and annual loads. TP concentration and load are predicted to decrease post-development. Because much of the total phosphorus load is associated with sediments and the sediment load and concentrations are predicted to decrease with development, the TP concentration and annual TP load are also predicted to decrease.

**Table 7-4: Predicted Average Annual Total Phosphorus Concentration and Annual Load**

| Site Conditions | Average Annual Total Phosphorus Concentration (mg/L) | Average Annual Total Phosphorus Load (lbs/yr) |
|---|---|---|
| Existing | 1.4 | 548 |
| Developed with PDFs | 0.3 | 193 |
| Change | -1.1 | -355 |

*Comparison with Water Quality Criteria*: There are no numeric objectives for total phosphorus in the Basin Plan. A narrative objective for biostimulatory substances in the Basin Plan states: "waters shall not contain biostimulatory substances in concentrations that promote aquatic growth to the extent that such growth causes nuisance or adversely affects beneficial uses." The low predicted total phosphorus concentrations in Project stormwater discharges are not expected to promote (i.e., increase) algal growth and therefore comply with the narrative objective for biostimulatory substances in the Basin Plan. As shown in Table 7-5, the predicted total phosphorus concentration is at the low end of the range of observed concentrations in Santa Clara River Reach 5.

**Table 7-5: Comparison of Predicted Total Phosphorus Concentration with Water Quality Criteria and Observed Concentrations in Santa Clara River Reach 5**

| Predicted Average Annual Total Phosphorus Concentration (mg/L) | Los Angeles Basin Plan Water Quality Objectives | California Toxics Rule Criteria | Range of Observed[1] Concentrations in Santa Clara River Reach 5 (mg/L) | Average Wet Weather[2] Concentration at Station S29 (Days > 0.1") |
|---|---|---|---|---|
| 0.3 | Waters shall not contain biostimulatory substances in concentrations that promote aquatic growth to the extent that such growth causes nuisance or adversely affects beneficial uses | NA | 0.18 – 13.4 | 0.58 |

[1] Range of concentrations observed in the Santa Clara River during wet weather (Stations S29, NR1, and NR3, see Section 2.7).

[2] Average concentration observed in wet weather monitoring data at Station S29 for all storm events greater than 0.1 inches.

NA – not applicable

Total phosphorus loads and concentrations in post-development runoff from the off-site project components are likely to increase in comparison to open space runoff and to decrease in comparison to runoff from agricultural areas. The use of LID BMPs will minimize any potential increase in post-development runoff total phosphorus concentrations and loads. The average total phosphorus concentration in runoff treated in biofilters reported in the International Stormwater BMP database is 0.46 mg/L, which is within the range of observed concentrations in Santa Clara River Reach 5.

Based on the comprehensive site design, source control, LID, and treatment control strategy and the comparison with available in-stream monitoring data and Basin Plan benchmark objectives, potential impacts associated with total phosphorus are predicted to be less than significant.

### 7.1.4 Nitrogen Compounds

*Comparison of Pre- and Post-Project Conditions*: The predicted average nitrate-nitrogen plus nitrite-nitrogen, ammonia, and total nitrogen concentrations and annual loads are summarized in Table 7-6, Table 7-7, and Table 7-8, respectively. Average concentrations and loads of nitrate-nitrogen plus nitrite nitrogen, ammonia-nitrogen, and total nitrogen are predicted to decrease. The decrease in nitrogen loads and concentrations can be attributed to higher nitrite-, nitrate-, and ammonia-nitrogen EMCs observed in monitoring data from agricultural land use versus urbanized land uses, along with nitrogen reductions in the treatment control PDFs.

**Table 7-6: Predicted Average Annual Nitrate-N + Nitrite-N Concentration and Load**

| Site Conditions | Average Annual Nitrate+Nitrite-Nitrogen Concentration (mg/L) | Average Annual Nitrate+Nitrite-Nitrogen Load (lbs/yr) |
|---|---|---|
| Existing | 3.0 | 1,219 |
| Developed with PDFs | 0.6 | 432 |
| Change | -2.4 | -787 |

**Table 7-7: Predicted Average Annual Ammonia-N Concentration and Load**

| Site Conditions | Average Annual Ammonia-N Concentration (mg/L) | Average Annual Ammonia-N Load (lbs/yr) |
|---|---|---|
| Existing | 0.6 | 215 |
| Developed with PDFs | 0.2 | 147 |
| Change | -0.4 | -68 |

**Table 7-8: Predicted Average Annual Total Nitrogen-N Concentration and Load**

| Site Conditions | Average Annual Total Nitrogen Concentration (mg/L) | Average Annual Total Nitrogen Load (lbs/yr) |
|---|---|---|
| Existing | 6 | 2,137 |
| Developed with PDFs | 2 | 1,277 |
| Change | -4 | -860 |

*Comparison with Water Quality Criteria*: Predicted nitrogen compound concentrations are compared to Basin Plan objectives and observed concentrations in Table 7-8. The average annual stormwater concentration of ammonia is predicted to be considerably less than the concentration-based wasteload allocation for Santa Clara River Reach 5 and the Basin Plan objective, and within the range of observed concentrations. Likewise, the average annual stormwater concentration of nitrate-N plus nitrite-N is predicted to be considerably less than the TMDL wasteload allocation and the Basin Plan water quality objective and within the range of observed concentrations for this reach of the Santa Clara River.

There are no numeric objectives for total nitrogen in the Basin Plan. A narrative objective for biostimulatory substances in the Basin Plan states: "waters shall not contain biostimulatory substances in concentrations that promote aquatic growth to the extent that such growth causes nuisance or adversely affects beneficial uses." The low predicted total nitrogen concentrations in project stormwater discharges will not promote (i.e., increase) aquatic growth and therefore comply with the narrative objective for biostimulatory substances in the Basin Plan. As shown in Table 7-9, the predicted total

nitrogen concentration is within the range of observed concentrations in Santa Clara River Reach 5.

**Table 7-9: Comparison of Predicted Nitrogen Compound Concentrations with Water Quality Objectives, TMDLs, and Observed Concentrations in Santa Clara River Reach 5**

| Nutrient | Predicted Average Annual Concentration (mg/L) | Basin Plan Water Quality Objectives[1] (mg/L) | Wasteload Allocations for MS4 Discharges into the Santa Clara River Reach 5 (mg/L) | Range of Observed[2] Concentrations in Santa Clara River Reach 5 (mg/L) | Average Wet Weather[3] Concentration at Station S29 (Days > 0.1") |
|---|---|---|---|---|---|
| Nitrate-N + Nitrite-N | 0.6 | 5 | 6.8[4] | 0.5 – 4.8 | 0.9 |
| Ammonia-N | 0.2 | 2.2[5] | 1.75[6] | <0.005 – 1.1 | 0.20 |
| Total Nitrogen | 2 | Waters shall not contain biostimulatory substances in concentrations that promote aquatic growth to the extent that such growth causes nuisance or adversely affects beneficial uses | NA | <0.04 – 46[7] | 4.4 |

[1] There are no CTR criteria for nitrogen compounds.
[2] Range of concentrations observed in the Santa Clara River during wet weather (Stations S29, NR1, and NR3, see Section 2.3.1).
[3] Average concentration observed in wet weather monitoring data at Station S29 for all storm events greater than 0.1 inches.
[4] 30-day average.
[5] 4-day average, ELS present, 90$^{th}$ percentile pH and temperature pairing observed at USGS Monitoring Station 11108500.
[6] 30-day average in Reach 5 below Valencia.
[7] Observed values for TKN (ammonia plus organic nitrogen).

Nitrate-N plus nitrite-N and ammonia-nitrogen concentrations in post-development runoff from the off-site project components are likely to decrease or remain the same compared to open space and agricultural runoff concentrations, although loads are likely to increase due to the increase in runoff volume. The use of LID BMPs will minimize any potential increases in post-development runoff nitrate-N plus nitrite-N or ammonia-nitrogen loads. The average nitrate-N plus nitrite-N concentration in runoff treated in biofilters reported in the International Stormwater BMP database is 0.5 mg/L and the average ammonia-nitrogen concentration is 0.1 mg/L, which are considerably less than the TMDL wasteload allocations and Basin Plan water quality objectives, and are within the range of observed concentrations for Santa Clara River Reach 5.

Based on the comprehensive site design, source control, LID, and treatment control strategy, and the comparison with available in-stream monitoring data and benchmark Basin Plan objectives and wasteload allocations, potential impacts associated with nitrogen compounds are predicted to be less than significant.

### 7.1.5 Metals

*Comparison of Pre- and Post-Project Conditions*: Projected loads and concentrations for the trace metals copper, lead, zinc, and aluminum are presented in Tables 7-10 through 7-13. Except for aluminum and lead, the projections are for the dissolved form of the metal, as it is the dissolved form to which the CTR criteria apply. Due to consistently low concentrations of dissolved lead in the available stormwater runoff data, it was not possible to develop reliable EMC parameters for most land uses for modeling the dissolved fraction of lead. This constituent was therefore modeled as the total recoverable metal. Copper, lead, and zinc are the most prevalent metals typically found in urban runoff. Other trace metals, such as cadmium, chromium, and mercury, are typically not detected in urban runoff or are detected at very low levels (LACDPW, 2000).

Post-development dissolved copper, total lead, dissolved zinc, and total aluminum loads and concentrations are projected to decrease compared to pre-development conditions. These results can be explained by the difference in EMC values observed in representative monitoring data from the pre-developed agriculture and open space condition and the post-developed urban condition (see Appendix B, Table B-12).

Project PDFs include site design, source control, LID, and treatment control BMPs in compliance with the SUSMP requirements. Specific site design PDFs that will be implemented to minimize increases in trace metals include directing drainage from impervious areas to vegetated areas and the selection of building material for roof gutters and downspouts that do not include copper or zinc. Source control PDFs that target metals include education for property owners, BMP maintenance, and street sweeping private streets and parking lots. The LID and treatment control BMPs will also reduce trace metals in the runoff from the proposed development. Only the effects of the LID and treatment control PDFs are reflected in the model results.

**Table 7-10: Predicted Average Annual Dissolved Copper Concentration and Load**

| Site Conditions | Average Annual Dissolved Copper Concentration (µg/L) | Average Annual Dissolved Copper Load (lbs/yr) |
|---|---|---|
| Existing | 28 | 10 |
| Developed with PDFs | 10 | 8 |
| Change | -18 | -2 |

**Table 7-11: Predicted Average Total Lead Concentration and Annual Load**

| Site Conditions | Average Annual Total Lead Concentration (µg/L) | Average Annual Total Lead Load (lbs/yr) |
|---|---|---|
| Existing | 12 | 4.5 |
| Developed with PDFs | 4 | 3.0 |
| Change | -8 | -1.5 |

**Table 7-12: Predicted Average Annual Dissolved Zinc Concentration and Load**

| Site Conditions | Average Annual Dissolved Zinc Concentration (µg/L) | Average Annual Dissolved Zinc Load (lbs/yr) |
|---|---|---|
| Existing | 185 | 63 |
| Developed with PDFs | 60 | 45 |
| Change | -125 | -18 |

**Table 7-13: Predicted Average Annual Total Aluminum Concentration and Load**

| Site Conditions | Average Annual Total Aluminum Concentration (µg/L) | Average Annual Total Aluminum Load (lbs/yr) |
|---|---|---|
| Existing | 1282 | 487 |
| Developed with PDFs | 323 | 231 |
| Change | -959 | -256 |

1 BMP effectiveness studies in the International Stormwater BMP database infrequently monitor aluminum; therefore, insufficient effluent data were available to model the removal effectiveness of treatment control BMPs for this water quality constituent. In order to estimate the reduction in total aluminum load and concentration, TSS removal was used as a surrogate.

*Comparison with Water Quality Criteria*: A narrative objective for toxic substances in the Basin Plan states: "all waters shall be maintained free of toxic substances in concentrations that are toxic to, or that produce detrimental physiological responses in human, plant, animal, or aquatic life."

The CTR criteria are the applicable water quality objectives for protection of aquatic life. The CTR criteria are expressed for acute and chronic (4-day average) conditions; however, only acute conditions were considered to be applicable for stormwater discharges because the duration of stormwater discharge is consistently less than 4 days. The CTR criteria are calculated on the basis of the hardness of the receiving waters. Lower hardness concentrations result in lower, more stringent CTR criteria. The minimum hardness value (250 mg/L as $CaCO_3$) observed in the Santa Clara River at the USGS Station 11108500 during wet weather was used as a conservative estimate; the mean observed hardness value was 660 mg/L as $CaCO_3$.

For aluminum, the National Ambient Water Quality Criteria (NAWQC) acute criterion (750 µg/L for a pH range of 6.5 to 9.0) was used as a benchmark, as the CTR does not include aluminum. Although the NAWQC criterion is in the form of acid soluble aluminum (USEPA, 1988), the available monitoring data are for either dissolved aluminum or total aluminum. Acid soluble aluminum (which is operationally defined as the aluminum that passes through a 0.45 µm membrane filter after the sample has been acidified to a pH between 1.5 and 2.0 with nitric acid) represents the forms of aluminum toxic to aquatic life or that can be readily converted to toxic forms under natural conditions. The acid soluble measurement does not measure forms of aluminum, such as aluminum that is occluded in minerals, clays, and or is strongly sorbed to particulate matter, that are not toxic and are not likely to become toxic under natural conditions. As acid soluble aluminum data is not available, total aluminum has been used in order to be conservative.

Comparison of the predicted runoff metal concentrations and the acute CTR criteria for dissolved copper, total lead, and dissolved zinc and the NAWQC criterion for aluminum are shown in Table 7-14, along with the range of observed concentrations in Santa Clara River Reach 5. The comparison of the post-developed with PDFs condition to the benchmark CTR and NAWQC values shows that all of the trace metal concentrations are below the benchmark water quality criteria. The predicted trace metal concentrations are within the range of observed concentrations in Santa Clara River Reach 5 except for dissolved zinc, which is slightly higher.

**Table 7-14: Comparison of Predicted Trace Metal Concentrations with Water Quality Criteria and Observed Concentrations in Santa Clara River Reach 5**

| Metal | Predicted Average Annual Concentration (µg/L) | California Toxics Rule Criteria[1] (µg/L) | Range of Observed[2] Concentrations in Santa Clara River Reach 5 (µg/L) | Average Wet Weather[3] Concentration at Station S29 (Days > 0.1") |
|---|---|---|---|---|
| Dissolved Copper | 10 | 32 | 3.3 – 22.6 | 7.3 |
| Total Lead | 4 | 260 | 0.6 – 40 | 18 |
| Dissolved Zinc | 60 | 250 | 3 – 37 | 19 |
| Total Aluminum | 323 | N/A | 131 – 19,650 | 5,500 |

1 Hardness = 250 mg/L, based on minimum observed value at USGS Station 11108500. Lead criteria is for total recoverable lead. There is no CTR criterion for aluminum.

2 Range of concentrations observed in the Santa Clara River during wet weather (Stations S29, NR1, and NR3, see Section 2.7).

3 Average concentration observed in wet weather monitoring data at Station S29 for all storm events greater than 0.1 inches.

Trace metals (aluminum, copper, lead, and zinc) concentrations in post-development runoff from the off-site project components are likely to decrease in comparison to concentrations in runoff from agricultural areas and to increase in comparison to

concentrations in runoff from open space. Trace metal loads are likely to increase due to the increase in runoff volume. The use of LID BMPs will minimize any potential increases in post-development runoff trace metal loads. The average trace metals concentrations in runoff treated in biofilters reported in the International Stormwater BMP database are: 7.8 µg/L (dissolved copper), 9.6 µg/L (total lead), and 32.6 µg/L (dissolved zinc). No performance data is available in the International Stormwater BMP database for treatment of aluminum in biofilters. Trace metal concentrations in runoff from the off-site project components are expected to be below all benchmark water quality criteria.

Based on the comprehensive site design, source control, and treatment strategy and the comparison with the instream water quality monitoring data and benchmark water quality criteria, the Project will not have significant impacts resulting from trace metals.

### 7.1.6 Chloride

*Comparison of Pre- and Post-Project Conditions*: Table 7-15 shows the predicted average annual chloride concentration and load. Due to the conversion from agricultural to urban land-uses and the associated EMCs, annual chloride concentration is predicted to decrease when compared to the existing conditions, although the average annual chloride load is predicted to increase slightly due to increased runoff volume.

**Table 7-15: Predicted Average Annual Chloride Concentration and Load**

| Site Conditions | Average Annual Chloride Concentration (mg/L) | Average Annual Chloride Load (tons/yr) |
|---|---|---|
| Existing | 20 | 3.7 |
| Developed with PDFs | 14 | 5.2 |
| Change | -6 | 1.5 |

*Comparison with Water Quality Criteria*: The predicted chloride concentration in post-development Project runoff is compared to the Basin Plan water quality objective and the range of observed concentrations in Santa Clara River Reach 5 in Table 7-16. The predicted average annual chloride concentration in stormwater runoff from the Project area is at the low end of the range of observed concentrations for this pollutant and is well below the Santa Clara River Reach 5 Basin Plan water quality objective and the TMDL wasteload allocation for Santa Clara River Reach 5 (100 mg/L for both).

**Table 7-16: Comparison of Predicted Chloride Concentrations with Water Quality Criteria and Observed Concentrations in Santa Clara River Reach 5**

| Pollutant | Predicted Average Annual Concentration (mg/L) | SCR Reach 5 TMDL Wasteload Allocation & Basin Plan Water Quality Objective[1] (mg/L) | Range of Observed[2] Concentrations in Santa Clara River Reach 5 (mg/L) | Average Wet Weather[3] Concentration at Station S29 (Days > 0.1") |
|---|---|---|---|---|
| Chloride | 14 | 100 | 3 - 121 | 43 |

[1] There are no CTR criteria for chloride.

[2] Range of concentrations observed in the Santa Clara River during wet weather (Stations S29, NR1, and NR3, see Section 2.7).

[3] Average concentration observed in wet weather monitoring data at Station S29 for all storm events greater than 0.1 inches.

Chloride concentrations in post-development runoff from the off-site project components are likely to decrease or remain the same in comparison to runoff from open space and agricultural areas, although chloride loads are likely to increase due to increased runoff volumes. Similarly to the modeled areas, the average annual chloride concentration in stormwater runoff from the utility corridor and power substation are likely to be at the low end of the range of observed concentrations for chloride and well below the Santa Clara River Reach 5 Basin Plan water quality objective and the TMDL wasteload allocation for Santa Clara River Reach 5.

Based on the comprehensive site design, source control, LID, and treatment control strategy, and comparison with benchmark receiving water criteria and instream monitoring data, the Project is not expected to have significant water quality impacts resulting from chloride.

### 7.1.7 Assessment of Potential Project Impacts on Instream Concentrations

The potential for Project runoff to impact instream pollutant concentrations is a function of (1) the relative magnitudes of runoff volume and instream flow volume and (2) the relative magnitude of runoff concentrations and instream concentrations. The instream pollutant concentration with Project contributions can be calculated using a simple mass balance equation:

$$C_{IS} = \frac{V_O \times C_O + V_P \times C_P}{V_O + V_P}$$

Equation 1

Where:

$C_{IS}$ = Instream Concentration with Project Runoff
$V_O$ = Instream Volume Upstream of Project
$C_O$ = Instream Concentration Upstream of Project
$V_P$ = Volume of Runoff from Project Area

$C_P$ = Concentration of Runoff from Project Area

This relationship can also be expressed as:

$$C_{IS} = \frac{L_O + L_P}{V_O + V_P}$$ Equation 2

Where:

$L_O$ = Instream Constituent Load Upstream of Project
$L_P$ = Constituent Load in Runoff from Project Area

Based on these relationships, two universal conditions can be identified under which a Project would not increase instream concentration:

- **Condition 1:** If the concentration of a constituent in Project runoff ($C_P$) is less than the concentration of the constituent instream ($C_O$), then discharges from the Project would result in a reduction of the instream concentration of that constituent; it would be not be possible for the Project's discharges to cause an increase in the instream concentration. Two extreme cases can be used to demonstrate this statement:
    - First, given that $C_P$ is less than $C_O$, take the case where $V_P$ is much less than $V_O$ (e.g., the project size is small relative to the size of the watershed). In this case, the instream concentration would effectively equal $C_O$, although slightly less, indicating effectively no change in the instream concentration as a result of the project's discharges.
    - Given that $C_P$ is less than $C_O$, take the case where $V_P$ is much greater than $V_O$ (the project size is very large relative to the size of the watershed). In this case, the instream concentration would effectively equal $C_P$, indicating that the project would reduce instream concentration because $C_P$ is less than $C_O$.
- **Condition 2:** If the load of a constituent in Project runoff ($L_P$) decreases with development, but the volume of runoff from the Project increases ($V_P$), then the Project would be expected to result in a reduction of the instream concentration of that constituent regardless of instream volumes or concentrations. It would be impossible for the project to result in an increase in the instream concentration by reducing load but adding volume. In equation 2, this would effectively increase the numerator while reducing the denominator, which must cause the instream concentration to decrease.

The comparison of the post-developed with LID BMP PDFs to the instream concentrations for the Landmark Village Project (Table 7-3, Table 7-5, Table 7-9, Table

7-14, and Table 7-16) shows that all pollutant concentrations, except dissolved zinc, are predicted to be below the average wet-weather instream concentration (Condition 1). On this basis, the Project would be expected to result in a reduction in the instream concentrations of these constituents.

Based on predicted changes in loads and volumes as a result of the Project with LID (Table 7-14), the average annual load of dissolved zinc is predicted to decrease with development, while runoff volumes are predicted to increase (Condition 2). On this basis, the Project would be expected to result in a reduction in the instream concentrations of dissolved zinc.

## 7.2 Post Development Stormwater Impact Assessment for Pollutants and Basin Plan Criteria Addressed Without Modeling

### 7.2.1 Turbidity

Turbidity is a measure of suspended matter that interferes with the passage of light through the water or in which visual depth is restricted (Sawyer *et al.*, 1994). Turbidity may be caused by a wide variety of suspended materials, which range in size from colloidal to coarse dispersions, depending upon the degree of turbulence. In lakes or other waters existing under relatively quiescent conditions, most of the turbidity will be due to colloidal and extremely fine dispersions. In rivers under flood conditions, most of the turbidity will be due to relatively coarse dispersions. Erosion of clay and silt soils may contribute to in-stream turbidity (see discussion of hydromodification impacts in Section 7.9 below). Organic materials reaching rivers serve as food for bacteria, and the resulting bacterial growth and other microorganisms that feed upon the bacteria produce additional turbidity. Nutrients in runoff may stimulate the growth of algae, which also contributes to turbidity.

Discharges of turbid runoff are primarily of concern during the construction phase of development. Construction-related impacts are addressed in Section 7.4 below. The Construction Stormwater Pollution Prevention Plan must contain sediment and erosion control BMPs pursuant to the Construction General Permit, and those BMPs must effectively control erosion and discharge of sediment, along with other pollutants, per the Best Available Technology Economically Achievable and Best Conventional Pollutant Control Technology (BAT/BCT) standards[6]. Additionally, fertilizer control, non-visible

[6] BAT/BCT are Clean Water Act technology-based standards that are applicable to construction site stormwater discharges. Federal law specifies factors relating to the assessment of BAT including: age of the equipment and facilities involved; the process employed; the engineering aspects of the application of various types of control techniques; process changes; the cost of achieving effluent reduction; non-water quality environmental impacts (including energy requirements); and other factors as the Administrator deems appropriate. Clean Water Act §304(b)(2)(B). Factors relating to the assessment of BCT include: reasonableness of the relationship between the costs of attaining a reduction in effluent and the effluent

pollutant monitoring, and trash control BMPs in the SWPPP will combine to help control turbidity during the construction phase.

In the post-development condition, placement of impervious surfaces will serve to stabilize soils and to reduce the amount of erosion that may occur from the Project area during storm events, and will therefore decrease turbidity in the runoff (see also hydromodification impacts discussed in section 7.9 below). Project PDFs, including source controls (such as common area landscape management and common area litter control) and treatment control BMPs in compliance with the SUSMP requirements, will prevent or reduce the release of organic materials and nutrients (which might contribute to algal blooms) to receiving waters. As shown in Section 7.1 above, post-development nutrients in runoff are not expected to cause significant water quality impacts. Based on implementation of the Project PDFs and the construction-related controls outlined in Section 7.4, runoff discharges from the Project will not cause increases in turbidity which would result in adverse affects to beneficial uses in the receiving waters. Based on these considerations, the water quality impacts of the Project on turbidity are considered less than significant.

### 7.2.2 Pathogens

Pathogens are viruses, bacteria, and protozoa that can cause gastrointestinal and other illnesses in humans through body contact exposure. Identifying pathogens in water is difficult as the number of pathogens is fairly small, requiring sampling and filtering large volumes of water to obtain a reliable result. Traditionally, regulators have used fecal indicator bacteria (FIB), such as total and fecal coliform, enterococci, and *E. coli*, as indirect measures of the presence of pathogens, and by association, human illness risk. Early epidemiological studies (i.e., studies that investigate human illness occurrence versus environmental factors such as water quality) that linked swimming-associated gastrointestinal symptoms to *E. coli* or enterococci in swimming waters for sewage-dominated receiving waters led to the development of the current recreational water quality criteria (USEPA, 1986). In contrast to receiving waters subject to sanitary discharges, only a few epidemiological studies have evaluated the health effects of exposure to water bodies subject to discharges from storm drains and these studies focused on the effects of dry weather urban flows on recreational exposure (e.g., Haile et al, 1999 and Colford et al, 2005).

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reduction benefits derived; comparison of the cost and level of reduction of such pollutants from the discharge from publicly owned treatment works to the cost and level of reduction of such pollutants from a class or category of industrial sources; the age of the equipment and facilities involved; the process employed; the engineering aspects of the application of various types of control techniques; process changes; non-water quality environmental impact (including energy requirements); and other factors as the Administrator deems appropriate. Clean Water Act §304(b)(4)(B). The Administrator of USEPA has not issued regulations specifying BAT or BCT for construction site discharges.

***Santa Clara River Bacteria TMDL***

The LARWQCB approved a Basin Plan amendment on July 8, 2010, to incorporate a TMDL for Indicator Bacteria for the Santa Clara River Estuary and Reaches 3, 5, 6 and 7 of the Santa Clara River (Resolution #R10-006). The TMDL provides allowable exceedance day-based WLAs for MS4 dischargers for *E. coli* in Reaches 3, 5, 6 and 7, and for Fecal coliform, Enterococcus, and Total Coliform in the Santa Clara River Estuary. These WLAs are anticipated to be incorporated into the Los Angeles County MS4 Permit once the interim and final WLAs become effective, at which point they will become an enforceable permit provision.

The TMDL WLAs applicable to Reach 5 of the Santa Clara River are listed in Table 3-3. The Indicator Bacteria TMDL MS4 WLAs are applied in the form of allowable exceedance days. The TMDL implementation schedule deadlines applicable to Reach 5 are summarized in Table 7-16.

The Regional Board indicated in the TMDL implementation schedule that the Regional Board will reconsider the TMDL if, prior to four years after the effective date of the TMDL, one of the following occurs:

1) Monitoring or any voluntary local reference system studies justify a revision, or

2) USEPA publishes revised recommended bacteria criteria (expected in December 2012), or

3) The Regional Board adopts a separate Basin Plan amendment, suspending recreational uses in the Santa Clara River during high flows.

**Table 7-17: Indicator Bacteria TMDL Implementation Schedule and Tasks**

| Deadline | Task |
|---|---|
| 1 year after effective date of TMDL | Jurisdictions and agencies responsible for the MS4 WLAs must submit an in-stream bacteria water quality monitoring plan for the SCR watershed. The monitoring plan must be approved by the Executive Officer. |
| 6 months after monitoring plan approval by Executive Officer | Monitoring of SCR Watershed must begin. |
| 3 years after effective date of TMDL | Jurisdictions and agencies must submit a draft Implementation Plan outlining how to achieve compliance with the WLAs. |
| 4 years after effective date of TMDL | Interim MS4 WLAs apply. |
| 6 months after receipt of Regional Board comments on draft Implementation Plan | Jurisdictions and agencies must submit a final Implementation Plan and begin additional outfall monitoring. |

| Deadline | Task |
|---|---|
| 11 years after effective date of TMDL | SCR Reaches 3, 5, 6 and 7 must achieve compliance with final WLAs for geometric mean objectives and allowable exceedance days for single sample objectives for dry weather. |
| 17 years after effective date of TMDL | SCR Reaches 3, 5, 6 and 7 must achieve compliance with final WLAs for geometric mean objectives and allowable exceedance days for single sample objectives for wet weather. |

### *Factors That Affect FIB Concentrations*

There are various confounding factors that affect the reliability of FIB as pathogen indicators. One primary factor is that there are numerous natural or non-anthropogenic (or "zoonotic") sources of FIB in developed watersheds and their receiving water bodies, including birds and other wildlife, soils, and plant matter. Anthropogenic sources may include domesticated animals and pets, poorly functioning septic systems, sewer system overflows or spills, cross-connections between sewer and storm drains, and the utilization of outdoor areas or storm drains for human waste disposal by people without access to indoor sanitary facilities. All of these sources can contribute to the concentrations of FIB, but not all the sources may pose a comparable human health risk (USEPA, 2009).

A second confounding factor is that FIB can multiply in the field if the substrate, temperature, moisture, and nutrient conditions are suitable (MEC, 2004). This is one potential reason that FIB concentrations do not always correlate with pathogens. For example, in a field study conducted by Schroeder *et al.* (2002), pathogens (in the form of viruses, bacteria, or protozoa) were found to occur in 12 of 97 soil samples, but the samples that contained pathogens did not correlate with the samples containing concentrations of FIB. Numerous other researchers have reported that bacteria presence and even regrowth was observed in various substrates such as beach sands, wrack line (accumulation of kelp in the inter-tidal area of beaches), inter/sub-tidal sediments, and material deposited in storm drains (MEC, 2004). FIB monitoring in the Santa Ana River indicate that the ubiquity of sources and potential regrowth far exceed the human sources of fecal bacteria generated by the entire population in the watershed (Surbeck et al, 2008). Regrowth of bacteria downstream of a package treatment plant utilizing ultraviolet (UV) radiation to disinfect dry weather flows in Aliso Creek was considered a prime factor in the rapid rebound of FIB concentrations downstream of the plant (Andersen, 2005). Recent research also implicates storm drain biofilms as another urban source of FIB to receiving waters (Roberts and Kolb, 2009; Skinner et al, 2010)

A third confounding factor is that the persistence of FIB may differ from those of various pathogenic viruses, bacteria, and protozoa. Viruses, for instance, are small, low in number, and difficult to inactivate, while protozoa may form protective cysts that are resistant to destruction and render them dormant but capable of reactivating in the future.

Therefore, while some indicator bacteria may die off in the water column due to ultraviolet disinfection or other unfavorable environmental conditions (including predation and antagonism), pathogens occasionally may persist longer (Haile et. al., 1999). So while the previously two described factors may result in indicator bacteria resulting in false positive indications of public health risk, there may also be instances when indicator bacteria result in false negative indications.

### *Current Research Efforts to Improve Recreational Water Quality Criteria*

Given the concern about the adequacy of the current recreational water quality criteria, the USEPA is undergoing a comprehensive evaluation and revision of their current FIB-based recreational water quality criteria, with completion scheduled for December 2012. To help initiate this effort, USEPA gathered 43 experts to identify research priorities needed to refine the existing criteria and transition to new methods (USEPA, 2007b). The experts identified seven topics for research, including "scientifically defensible for applications in a wide variety of geographical locations and water types" and "protective of individuals exposed to recreational waters impacted by all sorts of pathogen sources including animal feces, stormwater, and sewage" (Boehm et al, 2009). In a similar effort focused on inland waters, the Water Environment Research Federation (WERF) convened an expert panel to recommend a research program that would also support USEPA's intended revision of the water quality criteria (WERF, 2009). These various research efforts are ongoing and the USEPA will consider all submitted data as part of their recreational water quality criteria revision process.

### *Epidemiological Studies*

Until recently, few epidemiological studies have tested the health effects of exposure to the receiving waters of direct and recent stormwater runoff, and these studies have found it difficult to link illness with stormwater sources. For instance, the Mission Bay epidemiological study (Colford *et al.*, 2005) found that "only skin rash and diarrhea were consistently elevated in swimmers versus non swimmers, the risk of illness was uncorrelated with levels of traditional water quality indicators, and State water quality thresholds were not predictive of swimming-related illnesses." Various other researchers, as part of USEPA's pathogen research program, are now conducting epidemiological studies nationwide at fresh and salt water beaches that receive wastewater and/or stormwater discharges. In southern California, the Southern California Coastal Water Research Project (SCCWRP) has been conducting a multi-year study of public health risks at marine beaches, with a final report that is scheduled for late 2011. Until these various studies are completed, however, there is no reliable documentation of the health effects caused by exposure to stormwater based on epidemiological studies.

### *Effects of Land Use and Runoff on FIB Concentrations*

Dry weather, non-storm stream flows from undeveloped watersheds tend to have lower concentrations of FIB than dry weather urban flows, although water quality standard exceedances still occur. For instance, a recent study by SCCWRP which monitored 15 unimpaired natural southern California streams weekly during dry weather for a year showed that about 18% of the samples exceeded daily and monthly bacterial indicator thresholds, although concentrations from these unimpaired streams were one to two orders of magnitude lower than levels found in developed watersheds (Tiefenthaler, *et al.*, 2009). The study reported an average of the geometric means for *E. coli* in dry weather flows in each stream of 41 MPN/100 mL. In comparison, the Santa Clara River Bacteria TMDL numeric target is 235 MPN/100 mL for any single sample and 126 MPN/100 mL for the geometric mean *E. coli* density. The Santa Clara River bacteria TMDL WLAs are based on this and other SCCWRP reference stream and reference beach datasets, in acknowledgement of natural sources.

During wet weather, stormwater runoff can mobilize indicator bacteria from a number of watershed and instream sources, and, therefore, indicator bacteria concentrations tend to increase. For example, median stormwater runoff monitoring results for the open space land use category, as summarized by Stein et. al. (2007), include *E. Coli* concentrations of about 5,400 MPN/100 mL from the 2001-2005 Los Angeles River Watershed Wet Weather Study, and 7,200 MPN/100 mL from the National Stormwater Quality Database (Pitt *et al.*, 2003). Similarly, median open space land use stormwater runoff monitoring results include *E. coli* concentrations of 5,400 MPN/100 mL from the Stein *et al.* (2007) study based on two flow-weighted average results, and 500 MPN/100 mL for fecal coliform from a 1994-2000 Los Angeles County (2000) study based on 21 grab samples. The Santa Clara River Bacteria TMDL has incorporated allowable exceedance days to account for the fact that recreational criteria, strictly applied, are frequently exceeded even at natural, undeveloped streams and beaches. The interim and final allowable exceedance days for Reach 5 of the Santa Clara River for wet and dry weather are listed in Table 3-3.

Land use type and condition also affect runoff concentrations, and most studies show higher FIB concentrations in urban runoff than in open space runoff. Runoff from residential land uses from the Los Angeles River Watershed Wet Weather Study had a median *E. coli* concentration of about 6,300 MPN/100 mL and about 8,300 from the National Stormwater Quality Database (Table 5-2, Stein et. al, 2007). The median value of four flow-weighted average results from the Stein et. al. (2007) study was about 6,100 MPN/100mL for *E. coli* for the low density residential land use site. These data represent urban areas that in general do not have source and treatment controls, and therefore are not indicative of runoff from the proposed Project.

Runoff from agricultural watersheds involving horticulture and row cropping is known to similarly contain relatively high concentrations of FIB. Data from a stormwater drain serving an agricultural watershed with predominantly row crops in Ventura County showed median fecal coliform levels (approximately 7,000 MPN/100 mL) similar to that found for general urban runoff (Ventura County, 2005). Agricultural land and open space areas likely share some of the same wildlife sources, but livestock may be present as well. These data indicate that wildlife, livestock, plants and/or soils can be a very important source of pathogens and/or FIB.

***Project Design Features that Address Pathogen Indicators***

The primary sources of pathogen indicators from the Project development would likely be sediment, pet wastes, wildlife, and regrowth in the storm drain itself. Other sources of pathogens and pathogen indicators, such as cross connections between sanitary and storm sewers, are unlikely given modern sanitary sewer installation methods and inspection and maintenance practices.

The levels of bacteria in runoff from the Project would be reduced by source controls, LID BMPs, and treatment controls. The most effective means of controlling specific bacteria sources, such as pet and other animal wastes, is through source control, specifically education of pet owners, education regarding feeding (and therefore attracting) of waterfowl near waterbodies, and providing products and disposal containers that encourage and facilitate cleaning up after pets. These BMPs are specified as project source controls in Table 5-1.

Although there are limited data on the effectiveness of different types of stormwater treatment to manage pathogen indicators, treatment processes that help reduce pathogen indicators include sunlight (ultraviolet light) degradation, sedimentation, and filtration.

Bioretention, a stormwater treatment BMP which provides filtration through amended soils, is an example of an effective BMP for addressing FIB. The City of Austin, Texas conducted a number of studies on the effectiveness of sedimentation/filtration treatment systems for treating stormwater runoff (City of Austin, 1990; CWP, 1996). Most of the structures were designed to treat one-half inch of runoff. Data from four sand filters indicated a range of removals from 37 percent to 83 percent for fecal coliform, and 25 percent to 81 percent for fecal streptococci. Research on the use of filtration to remove bacteria also has been conducted in Florida by the Southwest Florida Water Management District (Kurz, 1999). Significant reductions in total and fecal coliform bacteria and the other indicators were observed between inflow and outflow samples for sand filtration. Percent reductions were measured using flow-weighted sampling techniques. Total coliform bacteria removals were less than 70 percent, and fecal coliform bacteria reduction varied from 65 percent to 100 percent.

Similarly, where soil conditions are conducive to infiltration, LID practices and stormwater treatment facilities that allow for infiltration can reduce runoff volume and treat FIB by infiltration, which in turn reduces FIB loads. In a literature summary, USEPA reported typical pathogen removal for infiltration facilities as 65 to 100 percent (USEPA, 1993). These types of BMPs are specified for incorporation into the Project where feasible to meet the LID design standards specified in Section 5 of this report, which are based on achieving equivalent pollutant control and hydrologic control as specified the LID Ordinance and Manual and in the MS4 Permit/ SUSMP Manual requirements for treatment of volume or flow of stormwater.

In summary, stormwater discharges from the Project could potentially exceed the Basin Plan standard for FIB and therefore impacts from FIB may be significant prior to mitigation. However, the FIB concentrations in runoff from the Project would be reduced through the implementation of source and treatment control PDFs. The Project will incorporate a number of source controls specific to managing FIB, including education of pet owners, education regarding feeding (and therefore attracting) of waterfowl near waterbodies, and providing products and disposal containers that encourage and facilitate cleaning up after pets. The Project will not include septic systems and the sewer system will be designed to current standards which minimizes the potential for leaks. The Project development, consistent with the MS4 permit requirements, includes a comprehensive set of source, site design, LID, and treatment control PDFs, including infiltration facilities and bioretention, selected to manage pollutants of concern, including pathogen indicators. Furthermore, the Project will comply with all future MS4 Permit provisions incorporating the TMDL wasteload allocations and implementation plan. With these PDFs, the Project would not result in substantial changes in pathogen or FIB concentrations in receiving waters causing a violation of the water quality standards or waste discharge requirements or otherwise substantially degrade water quality in the receiving waters. Water quality impacts related to pathogens would be reduced to less-than-significant.

### 7.2.3 Hydrocarbons

Various forms of hydrocarbons (oil and grease) are common constituents associated with urban runoff; however, these constituents are difficult to measure and are typically measured with grab samples, making it difficult to develop reliable EMCs for modeling. Based on this consideration, hydrocarbons were not modeled but are addressed qualitatively.

Hydrocarbons are a broad class of compounds, most of which are non-toxic. Hydrocarbons are hydrophobic (low solubility in water), have the potential to volatilize, and most forms are biodegradable. A subset of hydrocarbons, Polynuclear Aromatic Hydrocarbons (PAHs) can be toxic depending on the concentration levels, exposure history, and sensitivity of the receptor organisms. Of particular concern are those PAH compounds associated with transportation-related sources.

Although the concentration of hydrocarbons in runoff is expected to increase slightly under post-development conditions due to the increase in roadways, driveways, parking areas, and vehicle use, the PDFs are expected to prevent appreciable increases in hydrocarbon concentrations from leaving the Project site. Source control PDFs that address petroleum hydrocarbons include educational materials on used oil programs, carpooling, and public transportation alternatives to driving; BMP maintenance; and street sweeping private streets. Although vehicle emissions and leaks are the primary source of hydrocarbons in urban areas, it is anticipated that vehicles in the proposed development will in general be well maintained and newer models which will help to limit emissions and leaks. Lastly, the parking lot LID BMP PDFs will adsorb the low levels of emulsified oils in stormwater runoff, preventing discharge of hydrocarbons and visible film in the discharge or the coating of objects in the receiving water.

The majority of PAHs in stormwater adsorb to the organic carbon fraction of particulates in the runoff, including soot carbon generated from vehicle exhaust (Ribes *et al.*, 2003). For example, a stormwater runoff study by Marslek et al. (1997) found that the dissolved-phase PAHs represented less than 11 percent of the total concentration of PAHs. Consequently, the LID BMP and treatment control PDFs, which are designed to treat pollutants through settling, filtration, and infiltration, will be effective at treating PAHs.

Los Angeles County conducted PAH analyses on 27 stormwater samples from a variety of land uses in the period 1994-2000 (LACDPW, 2000). For those land uses where sufficient samples were taken and were above detection levels to estimate statistics, the mean concentrations of individual PAH compounds ranged from 0.04 to 0.83 µg/L. The reported means were less than acute toxicity criteria available from the literature (Suter and Tsao, 1996). Moreover, the Los Angeles County data do not account for any treatment, whereas the treatment in the PDFs should result in a reduction in hydrocarbon concentrations inclusive of PAHs. This makes it very unlikely that impacts will occur to the receiving water due to hydrocarbon loads or concentrations. On this basis, the effect of the Project on petroleum hydrocarbon levels in the receiving waters post-development is considered less than significant.

During the construction phase of the Project, hydrocarbons in site runoff could result from construction equipment/vehicle fueling or spills. Construction related impacts are addressed in Section 7.4 below. However, pursuant to the Construction General Permit, the Construction Stormwater Pollution Prevention Plan must include BMPs that address proper handling of petroleum products on the construction site, such as proper petroleum product storage and spill response practices, and those BMPs must effectively prevent the release of hydrocarbons to runoff per the Best Available Technology Economically Achievable and Best Conventional Pollutant Control Technology standards. PAH that are adsorbed to sediment during the construction phase would be effectively controlled via

the erosion and sediment control BMPs. For these reasons, construction-related water quality impacts related to hydrocarbons are considered less than significant.

### 7.2.4 Pesticides

Pesticides can be of concern where past farming practices involved the application of persistent organochlorine pesticides. Legacy pesticides Chlordane, Dieldrin, DDT, and Toxaphene are of particular concern, as TMDLs have been established for these pesticides in the Santa Clara River estuary, approximately 40 miles downstream of the Project and this reach of the river. Historical pesticides should no longer be discharged in the watershed except in association with erosion of sediments to which these pollutants may have adhered in the past. Site development involves the importation of approximately 6,000,000 cubic yards of soil from non-agricultural areas, as well as required remedial grading which will stabilize soils and prevent their transport from the Project site, actually reducing the potential for discharge of sediments to which historical pesticides may have adsorbed in pre-development conditions.

In the post-developed condition, pesticides will be applied to common landscaped areas and residential lawns and gardens. Pesticides that have been commonly found in urban streams include the organophosphate pesticides chlorpyrifos and diazinon (Katznelson and Mumley, 1997). However, only 0 to 13% of the samples in the Los Angeles County database had detectable levels of diazinon (depending on the land use) while levels of chlorpyrifos were below detection limits for all land uses in all samples taken between 1994 and 2000 (LACDPW, 2000). Other pesticides presented in the database were seldom measured above detection limits. Furthermore, these data represent flows from areas without treatment controls, unlike the proposed Project, which does incorporate LID BMP and treatment control PDFs.

Diazinon and chlorpyrifos are two pesticides of concern due to their potential toxicity in receiving waters. The USEPA has banned all indoor uses of diazinon in 2002 and stopped all sales for all outdoor non-agricultural use in 2003 (USEPA, June, 2002)[7]. With no

[7] Changes to the use of chlorpyrifos include reductions in the residue tolerances for agricultural use, phases out nearly all indoor and outdoor residential uses, and also stops non-residential uses where children may be exposed. In Orange County, residential use accounts for around 90% of total chlorpyrifos (USEPA, June 2002). Retail sales of chlorpyrifos were stopped by December 31, 2001, and structural (e.g. construction) uses will be phased out by December 31, 2005. Some continued uses will be allowed, for example public health use for fire ant eradication and mosquito control will be permitted by professionals.

Permissible uses of diazinon will also be restricted. All indoor uses are prohibited (as of 12/2002) and retailers were required to end sales for indoor use on December, 2002. All outdoor non-agricultural uses were phased out by December 31, 2004. Therefore it is likely that the USEPA agreement will eliminate most of the use of diazinon within the NRSP area. The use of diazinon for many agricultural crops has been eliminated (USEPA 2001), while some use of this chemical will continue to be permitted for some agricultural activities.

agricultural uses planned for the proposed Project, diazinon would not be used at the proposed Project site. The USEPA has also phased out most indoor and outdoor residential uses of chlorpyrifos and has stopped all non-residential uses where children may be exposed. Use of chlorpyrifos in the proposed Project area is not expected, with the possible exception of emergency fire ant eradications until such time as reasonable alternative products are available and only with appropriate application practices in accordance with the golf course and landscape pesticide management program.

Diazinon had long been one of the most commonly used pesticides on the market (SFBRWQCB, 2005) before its use was phased-out. Although the U.S. Environmental Protection Agency's actions eliminated most urban diazinon uses by the end of 2004, phasing out diazinon likely has increased post-2004 reliance on alternative pesticides and encouraged new pesticides to enter the marketplace.

The San Francisco Regional Water Quality Control Board commissioned a study, Insecticide Market Trends and Potential Water Quality Implications, to evaluate pesticide use trends as they relate to water quality. In 2003, on the basis of current and projected pesticide use and possible water quality risks, the report considered the pesticide alternatives of potential concern for water quality to be pyrethrums; parathyroid's (bifenthrin, cyfluthrin, cypermethrin, deltamethrin, esfenvalerate, and permethrin); carbaryl; malathion; and imidacloprid (SFBRWQCB, 2003). A more recent study also identified lambda cyhalothrin (a pyrethroid) and fipronil among pesticides of interest (SFEP, 2005).

The water quality risks posed by a pesticide relate to the quantity of the pesticide used, its runoff characteristics, and its relative toxicity in water and sediment. As urban diazinon applications are phased out, the use of some alternatives may inadvertently pose new water quality risks. Given what is known about alternative pesticide use trends, pyrethroids may be the alternatives that pose the greatest concerns for water quality (SFBRWQCB, 2005). Although pyrethroids tend to be toxic to Ceriodaphnia dubia test organisms at concentrations in water comparable to diazinon, pyrethroids do not dissolve well in water but instead adhere well to surfaces, including particles in the environment (SFBRWQCB, 2005). At equilibrium, pyrethroid concentrations in sediment are reported to be about 3,000 times greater than dissolved concentrations in water (SFBRWQCB, 2005). Thus, BMPs targeting reductions and removal of sediment loads will be effective to reduce and remove pyrethroids as well.

Source control measures such as education programs for owners, occupants, and employees in the proper application, storage, and disposal of pesticides are the most promising strategies for controlling the pesticides that will be used post-development.

Structural treatment controls are less practical because of the variety of pesticides and wide range of chemical properties that affect their ability to treat these compounds. However, most pesticides, including historical pesticides that may be present at the site, are relatively insoluble in water and therefore tend to adsorb to the surfaces of sediment, which will be stabilized with development, or if eroded, will be settled or filtered out of the water column in the LID BMP and treatment control PDFs.

For common area landscaping in commercial areas, multi-family residential areas, and parks, an Integrated Pest Management (IPM) Program will be incorporated. The goal of an IPM is to keep pest levels at or below threshold levels, reducing risk and damage from pest presence, while eliminating the risk from the pest control methods used. IPM programs achieve these goals through the use of low risk management options by emphasizing use of natural biological methods and the appropriate use of selective pesticides. IPM programs also incorporate environmental consideration by implementing procedures that minimize intrusion and alteration of biodiversity in ecosystems.

While pesticides are subject to degradation, they vary in how long they maintain their ability to eradicate pests. Some break down almost immediately into nontoxic byproducts, while others can remain active for longer periods of time. While pesticides that degrade rapidly are less likely to adversely affect non-targeted organisms, in some instances it may be more advantageous to apply longer-lasting pesticides if it results in fewer applications or smaller amounts of pesticide use. As part of the Integrated Pest Management program, careful consideration will be made as to the appropriate type of pesticides for use on the Project site. While pesticide use is likely to occur due to maintenance of landscaped areas, particularly in the residential portions of the development, careful selection, storage and application of these chemicals for use in common areas per the IPM Program will help prevent adverse water quality impacts from occurring. Additionally, as discussed above, removal of sediments in the LID and treatment control PDFs will also remove sediment-adsorbed pesticides.

Based on the incorporation of site design, source control, LID, and treatment control BMPs pursuant to SUSMP requirements and the use of an Integrated Pest Management Program, potential post-development impacts associated with pesticides are expected to be less than significant.

Transport of legacy pesticides adsorbed to existing site sediments may be a concern during the construction phase of development. Construction-related impacts are addressed in Section 7.4 below. The Construction Stormwater Pollution Prevention Plan must contain sediment and erosion control BMPs pursuant to the Construction General Permit, and those BMPs must effectively control erosion and the discharge of sediment along with other pollutants per the BAT/BCT standards. Based on these sediment

controls, construction-related impacts associated with pesticides are expected to be less than significant.

### 7.2.5 Trash and Debris

Urban development tends to generate significant amounts of trash and debris. Trash refers to any human-derived materials including paper, plastics, metals, glass and cloth. Debris is defined as any organic material transported by stormwater, including leaves, twigs, and grass clippings (DLWC, 1996). Debris can be associated with the natural condition. Trash and debris can be characterized as material retained on a 5-mm mesh screen. It contributes to the degradation of receiving waters by imposing an oxygen demand, attracting pests, disturbing physical habitats, clogging storm drains and conveyance culverts and mobilizing nutrients, pathogens, metals, and other pollutants that may be attached to the surface. Sources of trash in developed areas can be both accidental and intentional. During wet weather events, gross debris deposited on paved surfaces can be transported to storm drains, where it eventually can be discharged to receiving waters. Trash and debris can also be mobilized by wind and transported directly into waterways, imposing an oxygen demand on the water body as organic matter decomposes.

Urbanization could significantly increase trash and debris loads if left unchecked. However, the PDFs, including source control, LID BMP, and treatment control PDFs, will minimize the adverse impacts of trash and debris. Source controls such as street sweeping, public education, fines for littering, and storm drain stenciling can be effective in reducing the amount of trash and debris that is available for mobilization during wet and dry weather events. Common area litter control will include a litter patrol, covered trash receptacles, emptying of trash receptacles in a timely fashion, and noting trash violations by tenants/homeowners or businesses and reporting the violations to the owner/HOA for investigation. Catch basin inserts will be provided for high use parking lots. The PDFs will remove or prevent the release of floating materials, including solids, liquids, foam, or scum, from runoff discharges and will prevent impacts on dissolved oxygen in the receiving water due to decomposing debris. Based on these considerations, post-development trash and debris is not expected to significantly impact the receiving waters of the Project.

During the construction phase, there is potential for an increase in trash and debris loads due to lack of proper contractor good housekeeping practices at the construction site. Per the Construction General Permit, the SWPPP for the site will include BMPs for trash control (catch basin inserts, good housekeeping practices, etc.). Compliance with the Permit Requirements and inclusion of these BMPs, meeting BAT/BCT, included in the SWPPP will mitigate impacts from trash and debris to a level less than significant. See Section 7.4 below for a full discussion of Construction Related Impacts.

### 7.2.6 Methylene Blue Activated Substances (MBAS)

MBAS, which is related to the presence of detergents in runoff, may be incidentally associated with urban development due to commercial and/or residential vehicle washing or other outdoor washing activities. Surfactants disturb the surface tension which affects insects and can affect gills in aquatic life.

The presence of soap in Project runoff will be controlled through the source control PDFs, including a public education program on residential and charity car washing, and the provision of a car wash pad connected to sanitary sewer in the multi-family residential areas. Other sources of MBAS, such as cross connections between sanitary and storm sewers, are unlikely given modern sanitary sewer installation methods and inspection and maintenance practices. Therefore, MBAS are not expected to significantly impact the receiving waters of the Project.

### 7.2.7 Cyanide

The information on cyanide levels in urban stormwater is relatively sparse. The incidence of detection of cyanide in urban stormwater is relatively low, except in some special cases. In the Nationwide Urban Runoff Project (NURP), cyanide was detected in runoff from four cities out of a total of 15 cities that participated in the monitoring program (USEPA 1983). Overall, cyanide was detected in 23 percent of the urban runoff samples collected (16 out of a total of 71 samples), at concentrations ranging from 2 to 33 µg/L (Cole *et al.* 1984). Of the 71 samples, only 3 percent (i.e., 2) exceeded the freshwater acute guideline of 22 µg/L (USEPA 1983). The predominant sources of cyanides found in urban runoff samples were reported to be products of gasoline combustion and anti-caking ingredients in road salts (Cole *et al.* 1984).

A review of highway runoff (Colman 2001) suggested that deicing salts are the main source of cyanide in highway runoff. It has been estimated that approximately two million pounds of sodium ferrocyanide, which is used as an anticaking agent in road salts during the winter in the northeastern United States, are washed off from roads into streams and storm sewers (USEPA 1981; Gaffney *et al.* 1987). Information on the quality of snow packs and snow melt support the premise that deicing salts are the major source of cyanide in stormwater. For example, concentrations of cyanide in snow packs ranged up to 314 µg/L in Milwaukee and Syracuse (Novotny *et al.* 1999). An urban stream receiving snow melt in Milwaukee had an average cyanide concentration of 31 µg/L (<2 – 45 µg/L). Two urban streams in Syracuse had average cyanide concentrations of 8 µg/L (<2 – 27 µg/L) and 48 µg/L (<2 – 167 µg/L), respectively. Reconsidering the NURP findings, three of the four cities which detected cyanide are within the snowbelt, and may have used deicing salts containing anti-caking agents. One (Austin, Texas) presumably does not.

In contrast to these relatively high concentrations associated with deicing salts, runoff from cities which do not use deicing salts or from northern cities outside the snow season has lower concentrations of cyanides. The City of Fresno NURP study (Brown & Caldwell, 1984) found undetectable cyanide (< 10 µg/L) in 19 grab samples of stormwater runoff from four watersheds with different land uses. Highway runoff from three urban sites in Michigan had average cyanide concentrations ranging from 5.8 – 9.3 µg/L. Samples were collected from June through October, which was outside the season where deicing salts might be used. Traffic volumes were high and ranged from 40,000 to 120,000 vehicles per day.

It is highly probable that the reported concentrations which exceed the freshwater acute guideline in urban stormwater are associated with the use of deicing salts containing the de-caking agent ferrocyanide. In situations where deicing salts are not being used, and where vehicle exhaust may be the dominant source, concentrations are much less (e.g., typically < 10 µg/L), even with high traffic volumes. Anti-caking agents will not be a source of cyanide in urban stormwater in the Project, and the forgoing discussion suggests that concentrations in stormwater runoff from the Project may reach concentrations of magnitude of approximately 10 µg/L, but are highly unlikely to exceed the acute CTR criteria of 22 µg/L.

The detectable concentrations observed in the Santa Clarita River at the mass emission station S29 (average of 10 µg/L) may be in part due to untreated urban stormwater runoff from the City of Santa Clarita. However, other sources are likely to be more significant. A potential source is cyanide from burnt catchments. For example, cyanide concentrations in run-off obtained from an area that had been burned in a wildfire that occurred in Tennessee and North Carolina averaged 49 µg/L (Barber *et al.* 2003). Higher cyanide concentrations were reported in runoff from a wild fire that occurred in New Mexico, with an average value of 80 µg/L.

In addition to the expected relatively low level of cyanide in untreated stormwater, cyanide in runoff from the Project would be readily removed by biological uptake, degradation by microorganisms, and by volatilization in the LID BMP and treatment control PDFs. Therefore cyanide is not expected to significantly impact the receiving waters of the Project.

## 7.3 New Development Regulatory Compliance

### 7.3.1 MS4 Permit Requirements for New Development as Defined in the SUSMP

PDFs include site design, source control, LID, and treatment control BMPs in compliance with the SUSMP requirements, as described in Section 5.1 and summarized in Table 5-1. LID BMP and treatment control PDFs will treat runoff from the entire urban portion of

the Project. Sizing criteria contained in the MS4 Permit and the SUSMP requirements will be met for all treatment control BMPs.

In summary, the proposed site design, source control, LID, and treatment control PDFs have been selected based on:

- effectiveness for addressing pollutants of concern in Project runoff, resulting in insignificant water quality impacts;
- sizing and outlet design consistent with the MS4 Permit and SUSMP requirements;
- additional design guidance consistent with the County of Los Angeles Department of Public Works Stormwater Best Management Practice Design and Maintenance Manual, other literature, and best professional judgment;
- hydrologic and water quality modeling to verify performance;
- meeting mean annual percent capture criteria contained in the California BMP New Development Manual; and
- providing specific O&M requirements to inspect and maintain the facilities.

On this basis, the proposed PDFs meet the MS4 Permit requirements for new development.

### 7.3.2 LID Performance Standard Retention Volume Conformance Analysis

The results of the LID Performance Standard retention volume conformance analysis demonstrate that the project exceeds the Project LID Performance Standard retention volume requirements (Table 7-18).

**Table 7-18: LID Performance Standard Conformance Calculations**

| **Step 1: Calculate LID Performance Standard** [1] | |
|---|---|
| Project Area, ac | 293 |
| Project Impervious Area, ac | 169 |
| Allowable Effective Impervious Area,% of project | 5% |
| Allowable Effective Impervious Area, ac | 15 |
| Remaining Impervious Area, ac | 155 |
| Runoff from Remaining Impervious Acre for 0.75 inch Storm, ac-ft | 9.2 |

| Step 2: Calculate Retention Volume in Parcel-based BMPs | | | | | |
|---|---|---|---|---|---|
| **Land Use Treatment Categories** | **Area, acres** | **Impervious Area, acres** | **BMP Area, acres** | **BMP Ret Depth, inches** | **BMP Retention Volume, ac-ft** |
| Category 1 | 40.0 | 31.1 | 1.2 | 18.3 | 1.9 |
| Category 2 | 87.6 | 67.4 | 2.7 | 9.0 | 2.0 |
| Category 3 | 0.0 | 0.0 | 0.0 | 1.8 | 0.0 |
| Single Family HSCs | 16.8 | 8.4 | 8.4 | 0.75 | 0.5 |
| Parcel-based Total, ac-ft | | | | | 4.4 |

| Step 3: Calculate Retention Volume in Sub-Regional Infiltration/Biofiltration Facilities | |
|---|---|
| **Sub-Regional Infiltration/ Biofiltration Facilities** | **BMP Retention Volume[2], ac-ft** |
| Sub-regional Bioinfiltration Facilities | 4.9 |
| Sub-regional Biofiltration Facility | 0.1 |
| Sub-Regional Facility Total, ac-ft | 5.0 |

| Step 4: Compare Total Retention Volume to LID Performance Standard Retention Volume | |
|---|---|
| Total Volume Reduction achieved, ac-ft | 9.4 |
| LID Performance Standard Retention Volume, ac-ft | 9.2 |
| Surplus Retention Volume Provided, ac-ft | 0.2 |

[2] Volume below lowest surface discharge, ac-ft

### 7.3.3 Los Angeles County LID Manual Requirements

Volume reductions provided by the Project's LID BMPs exceed the County LID Manual volume reduction requirements. A simple comparison of the volumetric retention requirements associated with the Project's LID Performance Standard and the County LID Manual's standard shows that the Project would achieve volume reductions exceeding those required by the County LID Manual. The project's LID BMPs are designed to fully retain the volume of stormwater runoff produced from a 0.75 inch storm event. The LID Manual requires that the excess volume (defined as the post-developed runoff volume minus the pre-developed runoff volume for the 0.75 inch storm event) be retained.

The Project LID Performance Standard allows impervious area up to 5 percent of the project area to be treated in media filters or equivalent where it is not feasible or practicable to implement infiltration, bioinfiltration, or biofiltration BMPs. The County LID Manual requires BMPs to be selected to infiltrate where feasible, but recognizes feasibility constraints that would limit infiltration. The result is that conformance with the Project LID Performance standard results in selection of BMPs that meet the BMP selection criteria of the County LID Manual and results in BMP sizes that are slightly larger than would be required to meet the sizing criteria of the County LID Manual.

## 7.4 Construction-Related Impacts

The potential impacts of construction activities, construction materials, and non-stormwater runoff on water quality during the construction phase are primarily due to sediment (TSS and turbidity) and certain non-sediment related pollutants. Construction-related activities that are primarily responsible for sediment releases are related to exposing previously stabilized soils to potential mobilization by rainfall/runoff and wind. Such activities include removal of vegetation from the site, grading of the site, and trenching for infrastructure improvements. Environmental factors that affect erosion include topographic, soil, and rainfall characteristics. Non sediment-related pollutants that are also of concern during construction relate to construction materials and non-stormwater flows and include construction materials (e.g., paint, stucco, etc); chemicals, liquid products, and petroleum products used in building construction or the maintenance of heavy equipment; and concrete-related pollutants.

Construction impacts due to Project development will be minimized through compliance with the Construction General Permit. This permit requires the discharger to perform a risk assessment for the proposed development (with differing requirements based upon the determined level) and to prepare and implement a Storm Water Pollution Prevention Plan (SWPPP), which must include erosion and sediment control BMPs that will meet or exceed measures required by the determined risk level of the Construction General Permit, as well as BMPs that control the other potential construction-related pollutants. A Construction Site Monitoring Program that identifies monitoring and sampling requirements during construction is a required component of the SWPPP. Preliminary analysis indicates that the Project will most likely be categorized as a Risk Level 2. BMPs required by the Construction General Permit will be incorporated assuming this level of risk; if final design analysis indicates that the Project will fall under Risk Level 3, the additional Level 3 permit requirements will be implemented as necessary.

### 7.4.1 Erosion and Sediment Control BMPs to be Implemented during Construction

Erosion control BMPs are designed to prevent erosion, whereas sediment controls are designed to trap or filter sediment once it has been mobilized. A SWPPP will be developed as required by, and in compliance with, the Construction General Permit and the City of Santa Clarita Standard Conditions. The General Permit requires the SWPPP to include BMPs to be selected and implemented based on the determine project risk level to effectively control erosion and sediment to the BAT/BCT. The following types of BMPs will be implemented as needed during construction:

***Erosion Control***

- Physical stabilization through hydraulic mulch, soil binders, straw mulch, bonded and stabilized fiber matrices, compost blankets, and erosion control blankets (i.e., rolled erosion control products).
- Limiting the area and duration (<14 days) of exposure of disturbed soils.
- Soil roughening of graded areas (through track walking, scarifying, sheepsfoot rolling, or imprinting) to slow runoff, enhance infiltration, and reduce erosion.
- Vegetative stabilization through temporary seeding and mulching to establish interim vegetation.
- Wind erosion (dust) control through the application of water or other dust palliatives as necessary to prevent and alleviate dust nuisance.

***Sediment Control***

- Perimeter protection to prevent sediment discharges (silt fences, fiber rolls, gravel bag berms, sand bag barriers, and compost socks).
- Storm drain inlet protection.
- Sediment capture and drainage control through sediment traps and sediment basins.
- Velocity reduction through check dams, sediment basins, and outlet protection/velocity dissipation devices.
- Reduction in off-site sediment tracking through stabilized construction entrance/exit, construction road stabilization, and entrance /exit tire wash.
- Slope interruption at permit-prescribed intervals (fiber rolls, gravel bag berms, sand bag berms, compost socks, biofilter bags).

***Waste and Materials Management***

- Management of the following types of materials, products, and wastes: solid, liquid, sanitary, concrete, hazardous and equipment-related wastes. Management measures include covered storage and secondary containment for material storage areas, secondary containment for portable toilets, covered dumpsters, dedicated and lined concrete washout/waste areas, proper application of chemicals, and proper disposal of all manners of wastes.
- Protection of soil, landscaping and construction material stockpiles through covers, the application of water or soil binders, and perimeter control measures.

- A spill response and prevention program will be incorporated as part of the SWPPP and spill response materials will be available and conspicuously located at all times on-site.

***Non-Stormwater Management***

- BMPs or good housekeeping practices to reduce or limit pollutants at their source before they are exposed to stormwater, including such measures as: water conservation practices, vehicle and equipment cleaning and fueling practices, and street sweeping. All such measures will be recorded and maintained as part of the project SWPPP.
- If construction dewatering or discharges from other specific construction activities such as water line testing, and sprinkler system testing are required, comply with the requirements of the Los Angeles RWQCB's General Waste Discharge Requirements (WDRs) under Order No. R4-2008-0032 (NPDES No. CAG994004) governing construction-related dewatering discharges.

***Training and Education***

- Inclusion of General Permit defined "Qualified SWPPP Developers" (QSD) and "Qualified SWPPP Practitioners" (QSP). QSDs and QSPs shall have required certifications and shall attend State Board sponsored training.
- Training of individuals responsible for SWPPP implementation and permit compliance, including contractors and subcontractors.
- Signage (bilingual, if appropriate) to address SWPPP-related issues (such as site cleanup policies, BMP protection, washout locations, etc).

***Inspections, Maintenance, Monitoring, and Sampling***

- Performing routine site inspections and inspections before, during (for storm events > 0.5 inches), and after storm events.
- Preparing and implementing Rain Event Action Plans (REAPs) prior to any storm event with 50% probability of producing 0.5 inches of rainfall, including performing required preparatory procedures and site inspections.
- Implementing maintenance and repairs of BMPs as indicated by routine, storm-event, and REAP inspections.
- Implementation of the Construction Site Monitoring Plan for non-visible pollutants, if a leak or spill is detected.
- Sampling of discharge points for turbidity and pH, at minimum, three times per qualifying storm event and recording and retention of results.

### 7.4.2 Construction BMP Implementation

During Project construction, BMPs will be implemented in compliance with the Construction General Permit and the general waste discharge requirements in the Dewatering General WDRs. The Project will reduce or prevent erosion and sediment transport and transport of other potential pollutants from the project site during the construction phase through implementation of BMPs meeting BAT/BCT in order to prevent or minimize environmental impacts and to ensure that discharges during the project construction phase will not cause or contribute to any exceedance of water quality standards in the receiving waters. All discharges from qualifying storm events will be sampled for turbidity and pH and results will be compared to Numeric Action Levels (250 NTU and 6.5-8.5, respectively) to ensure that BMPs are functioning as intended. If discharge sample results fall outside of these action levels, a review of causative agents and the existing site BMPs will be undertaken, and maintenance and repair on existing BMPs will be performed and/or additional BMPs will be provided to ensure that future discharges meet these criteria.

The construction-phase BMPs will assure effective control of not only sediment discharge, but also of pollutants associated with sediments, such as nutrients, heavy metals, and certain pesticides, including legacy pesticides. In addition, compliance with BAT/BCT requires that BMPs used to control construction water quality are updated over time as new water quality control technologies are developed and become available for use. Therefore, compliance with the BAT/BCT performance standard ensures mitigation of construction water quality impacts over time.

### 7.4.3 Compliance with Construction Permit and Construction Impacts

Prior to the issuance of preliminary or precise grading permits, the landowner or subsequent project applicant will provide the City Engineer with evidence that a Notice of Intent (NOI) has been filed with the State Water Resources Control Board. Such evidence will consist of a copy of the NOI stamped by the State Water Resources Control Board or Regional Water Quality Control Board, or a letter from either agency stating that the NOI has been filed and a copy of the site's applicable Waste Discharge identification (WDID) number.

Construction on the Project site may require dewatering. For example, dewatering may be needed if water has been standing on site and needs to be removed for construction, vector control, or other reasons. Further, dewatering may be necessary if groundwater is encountered during grading, or to allow discharges associated with testing of water lines, sprinkler systems and other facilities. In general, the Construction General Permit authorizes construction dewatering activities and other construction-related non-stormwater discharges as long as they (a) comply with Section III.C of the General Permit; (b) do not cause or contribute to violation of any water quality standards, (c) do

not violate any other provisions of the General Permit, (d) do not require a non-stormwater permit as issued by some RWQCBs, and (e) are not prohibited by a Basin Plan provision.

An additional Project Design Feature will be implemented to protect receiving waters from dewatering and construction related non-stormwater discharges. Such discharges will be implemented in compliance with the Los Angeles RWQCB's General Waste Discharge Requirements (WDRs) under Order No. R4-2008-0032 (NPDES No. CAG994004) governing construction-related dewatering discharges within the Project development areas. Typical BMPs for construction dewatering include infiltration of clean groundwater; on-site treatment using suitable treatment technologies; on-site or transport offsite for sanitary sewer discharge with local sewer district approval; or use of a sedimentation bag for small volumes of localized dewatering. Compliance with these WDRs constitutes a PDF, further assuring that the impacts of these discharges are not significant.

On this basis, the impact of Project construction-related runoff is considered less than significant.

### 7.5 Pollutant Bioaccumulation

Certain pollutants have the potential to accumulate in BMP vegetation and soils, potentially increasing the risk of exposure to wildlife and the food chain. Factors that could affect the extent of potential bioaccumulation include:

- The bioavailability of the pollutant;
- Conditions in the soils (*e.g.*, pH, acid-volatile sulfide concentration, organic content) that affect the form and bioavailability of the pollutant;
- The efficiency by which pollutants in the soils enter the plant community, the storage of these pollutants in plant tissues that are edible, and the utilization of the plants as a food source by animals;
- The type of habitats, organisms attracted to these habitats, and their feeding habits; and
- System design and maintenance.

The primary pollutants of concern with regard to bioaccumulation are mercury and selenium. However, as indicated by the water quality monitoring conducted by Los Angeles County at the Santa Clara River mass emission station S29 (LACDPW, 2005), selenium and mercury are not naturally present at levels of concern in this watershed.

Since these pollutants would not be introduced by the Project, bioaccumulation of selenium and mercury is not expected.

The potential for bioaccumulation impacts from the Project's LID and treatment control facilities, including bioretention, vegetated swales, and sub-regional infiltration/biofiltration basins, would be minimal. Since the tributary areas to the BMPs are largely impervious, very little coarse solids and associated pollutants are expected to be generated. The vegetation in the facilities would trap sediments and pollutants in the soils, which contain bacteria that metabolize and transform trace metals, thereby reducing the potential for these pollutants to enter the food chain. The facilities do not provide open water areas and are not likely to attract waterfowl.

Bioaccumulation of pollutants in the Santa Clara River would not be significant due to the low predicted concentrations of pollutants such as trace metals, which are predicted to be below the benchmark CTR criteria in the treated runoff. Also, sediments in the Santa Clara River are transported downstream in the wet season by storm flows, and therefore do not accumulate.
On this basis, the potential for bioaccumulation and adverse effects on waterfowl and other species is considered less than significant.

## 7.6 Dry Weather Runoff

Pollutants in dry weather flows could also be of concern because dry weather flow conditions occur throughout a large majority of the year, and because some of the TMDLs in downstream reaches of the Santa Clara River are applicable for dry weather conditions (e.g., nutrients and chloride).

Dry weather flows are typically low in sediment because the flows are relatively low and coarse suspended sediment tends to settle out or is filtered out by vegetation. As a consequence, pollutants that tend to be associated with suspended solids (e.g., phosphorus, some bacteria, some trace metals, and some pesticides) are typically found in very low concentrations in dry weather flows. The focus of the following discussion is therefore on constituents that tend to be dissolved, e.g., nitrate and trace metals, or constituents that are so small as to be effectively transported, e.g., pathogens and oil and grease.

In order to minimize the potential generation and transport of dissolved constituents, landscaping in public and common areas will utilize drought tolerant vegetation that requires little watering and chemical application. Landscape watering in common areas, commercial areas, multiple family residential areas, and in parks will use efficient irrigation technology utilizing evapotranspiration sensors to minimize excess watering.

In addition, educational programs and distribution of materials (source controls) will emphasize appropriate car washing locations (at commercial car washing facilities or the car wash pad in the multi-family residential areas) and techniques (minimizing usage of soap and water), encourage low impact landscaping and appropriate watering techniques, appropriate swimming pool dechlorination and discharge procedures, and discourage driveway and sidewalk washing. Illegal dumping will be discouraged by stenciling storm drain inlets and posting signs that illustrate the connection between the storm drain system and the receiving waters and natural systems downstream.

The LID BMPs will provide treatment for and infiltrate dry weather flows and small storm events. Water cleansing is a natural function of vegetation, offering a range of treatment mechanisms. Sedimentation of particulates is the major removal mechanism. However the performance is enhanced as plant materials allow pollutants to come in contact with vegetation and soils containing bacteria that metabolize and transform pollutants, especially nutrients and trace metals. Plants also take up nutrients in their root system. Pathogens would be removed through infiltration. Any oil and grease will be effectively adsorbed by the vegetation and soil within the LID BMPs. Dry weather flows and small storm flows will infiltrate in the LID BMPs.

The LID and treatment control PDFs will infiltrate or evapotranspire all expected dry weather runoff (see Section 7.9.2 below). It is expected that no dry weather discharge will occur to the Santa Clara River from the Project. Based on source control PDFs reducing the amount of dry weather runoff and treatment control PDFs capturing and treating the dry weather runoff that does occur, the impact from dry weather flows is considered less than significant.

## 7.7 Summary of Surface Water Quality Impacts

### 7.7.1 Direct Impacts

With the exception of runoff volume and chloride load (but not concentration), concentrations and loads of modeled constituents are predicted to decrease under proposed conditions when compared to existing conditions. Furthermore, modeled pollutant concentrations in runoff from developed areas with PDFs are below all benchmark water quality objectives and criteria and TMDL wasteload allocations for the Santa Clara River, are addressed by a comprehensive site design, source control, LID, and treatment control strategy, and compliance with MS4 Permit, Construction General Permit, and General De-Watering Permit requirements. In-stream concentrations of all modeled constituents are not predicted to increase under proposed conditions.

Concentrations of hydrocarbons are expected to increase, while concentrations of pathogens, pesticides, and trash and debris may or may not increase under proposed conditions when compared to existing conditions. None of the qualitatively assessed

constituents are expected to significantly impact receiving waters due to the implementation of a comprehensive site design, source control, LID, and treatment control strategy in compliance with the MS4 Permit, Construction General Permit, and General De-Watering Permit requirements. Therefore potential impacts from the Project on receiving water quality are not expected to be significant.

### 7.7.2 Cumulative Impacts

This section defines the geographic area of potential impact for the cumulative impacts analysis, and evaluates impacts from probable future projects together with the incremental effects of the proposed Project to determine effects on water quality and hydromodification within this geographic area. The model results presented below are used in addition to consideration of the other projects reflected in adopted plans and projections for areas tributary to Santa Clara River Reach 5 to get a better overall assessment of cumulative water quality effects on the Santa Clara River.

The geographic area for evaluating cumulative impacts includes the unincorporated area of Los Angeles County west of The Old Road to the Ventura County line. This geographic area includes the Newhall Ranch subregion, the Entrada project area, the Legacy Village project area, and the Valencia Commerce Center, as well as existing development in the Six Flags Magic Mountain area and the existing Valencia Water Reclamation Plant.

The proposed Entrada South Project (VTTM 53295) site is located west of Interstate 5 and the Old Road, south of Six Flags Magic Mountain Theme Park, north of the existing community of Westridge, and east of the boundary of the Newhall Ranch Specific Plan and the pending Mission Village, Vesting Tentative Tract Map 61105 (Figure 2-1). The Entrada South project proposes a total of 1,640 units including 408 single-family residences and 1,232 multi-family residences. The project will also include commercial areas, totaling 726,000 square feet of development, interchangeable for office or retail development, an elementary school, private drives, public facilities, a park, two private recreation centers, and natural and manufactured open space areas throughout.

The proposed Entrada North (VTTM 71377) project site is located northeast of the NRSP area and immediately west of Interstate 5 (Figure 2-1). A portion of the Entrada North project is located at the southwest corner of the intersection of Interstate 5 (I-5) and State Route 126 (SR-126) (at Castaic Junction) and the remaining portion lies north of Magic Mountain Parkway, west of I-5. The Entrada North project site lies east and north of the Six Flags Magic Mountain Theme Park. The Entrada North project proposes development of multi-family residential units and commercial/retail uses on approximately 454 gross acres.

The proposed Legacy Village project is located south of the NRSP area, bordering the Mission Village and Homestead Village projects within the NRSP, and north of the community of Stevenson Ranch. The 1,763 acre Legacy Village project proposes construction of residential areas and commercial space. Over 1,050 acres of open space will be incorporated into the Legacy Village project, including 25 acres of parks, recreational sites, and trails.

The remaining unbuilt portions of the Valencia Commerce Center in VTTM 18108 are located approximately one-half mile upstream of the confluence of Castaic Creek and the Santa Clara River. Approximately 4 million square feet of building floor area will be developed over the next five to ten years. Additionally, bank stabilization improvements to Castaic Creek and Hasley Creek would be constructed in conjunction with these remaining phases of the Commerce Center.

The NRSP LID Performance Standard described in Section 5 above would be implemented by the Entrada, Legacy Village, and Valencia Commerce Center projects, as well as the full suite of site design and source control BMPs, to address pollutants of concern in stormwater runoff and dry weather discharges from the proposed projects. Urban runoff from the Magic Mountain Theme Park and the Valencia WRP currently drains to the Santa Clara River and will continue to do so in proposed conditions without any anticipated change to stormwater management controls.

The combined effect on modeled pollutant loads and concentrations of the NRSP, Entrada South, Entrada North, Legacy Village, and the Valencia Commerce Center proposed projects are summarized in Tables 7-19 and 7-20 below, respectively. As shown in Table 7-19, when considered cumulatively, runoff volumes and loads of ammonia, dissolved copper, dissolved aluminum, and chloride are predicted to increase from the NRSP, Entrada, Legacy Village, and Valencia Commerce Center projects, while pollutant loads are expected to decrease for TSS, total phosphorus, nitrate-N + nitrite-N, total nitrogen, total lead, dissolved zinc, and total aluminum. Pollutant concentrations from the combined projects are predicted to decrease for all modeled parameters (Table 7-20). Increases in pollutant loadings are not anticipated to be significant based on the fact that predicted pollutant concentrations are well below benchmark water quality standards and TMDL wasteload allocations and are primarily within the range of observed concentrations in Santa Clara River Reach 5 (Table 7-21).

**Table 7-19: Predicted Average Annual Combined Runoff Volume and Pollutant Loads for the NRSP, Legacy Village, Entrada, and Valencia Commerce Center Projects**

| Modeled Parameter | Units | Development Condition | | Change |
|---|---|---|---|---|
| | | Existing | Developed w/ PDFs | |
| Volume | acre-ft | 1,245 | 3,968 | 2,723 |
| Total Suspended Solids | tons | 483 | 302 | -181 |
| Nitrate-N + Nitrite-N | tons | 5.4 | 3.3 | -2.1 |
| Total Kjeldahl Nitrogen | tons | 5.2 | 9.6 | 4.4 |
| Total Nitrogen | tons | 10.6 | 12.9 | 2.3 |
| Total Phosphorus | tons | 1.3 | 1.5 | 0.2 |
| Total Aluminum | lbs | 4,030 | 7,396 | 3,366 |
| Dissolved Aluminum | lbs | 732 | 1,508 | 776 |
| Dissolved Copper | lbs | 39 | 99 | 60 |
| Total Lead | lbs | 37 | 77 | 40 |
| Dissolved Zinc | lbs | 477 | 670 | 193 |
| Chloride | tons | 44 | 93 | 49 |

**7-20: Predicted Average Annual Combined Pollutant Concentrations for the NRSP, Legacy Village, Entrada, and Valencia Commerce Center Projects**

| Modeled Parameter | Units | Development Condition | | Change |
|---|---|---|---|---|
| | | Existing | Developed w/ PDFs | |
| Total Suspended Solids | mg/L | 285 | 56 | -229 |
| Nitrate-N + Nitrite-N | mg/L | 3.2 | 0.6 | -2.6 |
| Total Kjeldahl Nitrogen | mg/L | 3.1 | 1.8 | -1.3 |
| Total Nitrogen | mg/L | 6.3 | 2.4 | -3.9 |
| Total Phosphorus | mg/L | 0.8 | 0.3 | -0.5 |
| Total Aluminum | ug/L | 1,191 | 685 | -506 |
| Dissolved Aluminum | ug/L | 216 | 140 | -76 |
| Dissolved Copper | ug/L | 12 | 9 | -3 |
| Total Lead | ug/L | 11 | 7 | -4 |
| Dissolved Zinc | ug/L | 141 | 62 | -79 |
| Chloride | mg/L | 26 | 17 | -9 |

**Table 7-21**: **Comparison of Predicted Pollutant Concentrations for the NRSP, Entrada, Legacy Village, and Commerce Center 26363 Projects with Water Quality Criteria and Observed Concentrations in Santa Clara River Reach 5**

| Modeled Parameter | Units | Predicted Average Annual Concentration | TMDL/ Basin Plan Water Quality Objectives | California Toxics Rule Criteria[1] | Wasteload Allocations for MS4 Discharges into the Santa Clara River Reach 5 | Range of Observed[2] Concentrations in Santa Clara River Reach 5 |
|---|---|---|---|---|---|---|
| Total Suspended Solids | mg/L | 56 | Water shall not contain suspended or settleable material in concentrations that cause nuisance or adversely affect beneficial uses | NA | NA | 32 – 6,591 |
| Nitrate-N + Nitrite-N | mg/L | 0.6 | 5 | NA | 6.8[3] | 0.5 – 4.8 |
| Total Ammonia | mg/L | 0.5 | 2.2[4] | NA | 1.75[5] | <0.005 – 1.1 |
| Total Nitrogen | mg/L | 2.4 | Waters shall not contain biostimulatory substances in concentrations that promote aquatic growth to the extent that such growth causes nuisance or adversely affects beneficial uses | NA | NA | <0.04 – 46[6] |
| Total Phosphorus | mg/L | 0.3 | | NA | NA | 0.18 – 13.4 |
| Dissolved Copper | µg/L | 9 | NA | 32 | NA | 3.3 – 22.6 |
| Total Lead | µg/L | 7 | NA | 260 | NA | 0.6 – 40 |
| Dissolved Zinc | µg/L | 62 | NA | 250 | NA | 3 – 37 |
| Total Aluminum | µg/L | 685 | NA | 750 | NA | 131 – 19,650 |
| Chloride | mg/L | 17 | 100 | NA | 100 | 3 - 121 |

[1] Hardness = 250 mg/L, based on minimum observed value at USGS Station 11108500. Lead criteria is for total recoverable lead. NAWQC aluminum criteria for pH 6.5 – 9.0.

[2] Range of concentrations observed in the Santa Clara River during wet weather (Stations S29, NR1, and NR3, see Section 2.3.1).

[3] 30-day average.

[4] 4-day average, ELS present, 90$^{th}$ percentile pH and temperature pairing observed at USGS Monitoring Station 11108500.

[5] 30-day average in Reach 5 below Valencia.

[6] Observed values for TKN (ammonia plus organic nitrogen).

NA – not applicable

As discussed above, the anticipated quality of effluent expected from the Landmark Village PDFs will not contribute concentrations of pollutants of concern that would be expected to cause or contribute to a violation of the water quality standards in the Project's receiving waters. Therefore, the Project's incremental effects on surface water quality are not expected to be significant.

The Landmark Village Project's surface runoff water quality, after PDFs, both during construction and post-development, is predicted to comply with adopted regulatory requirements that are designed by the LARWQCB to assure that regional development does not adversely affect water quality, including MS4 Permit and SUSMP requirements; Construction General Permit and General Dewatering Permit requirements; and benchmark Basin Plan water quality objectives, CTR criteria, and TMDLs. Any future urban development occurring in the Santa Clara River watershed must also comply with these requirements. By extrapolating the results of the direct and cumulative impact analysis modeling done for this Water Quality Technical Report, it can be predicted that analysis of other proposed development combined with existing conditions would have similar water quality results. Therefore, cumulative impacts on surface water quality of receiving waters from the Project and future urban development in the Santa Clara Watershed are addressed through compliance with the MS4 Permit and SUSMP requirements; Construction General Permit and General Dewatering Permit requirements; and benchmark Basin Plan water quality objectives, CTR criteria, and TMDLs, which are intended to be protective of beneficial uses of the receiving waters. Based on compliance with these requirements designed to protect beneficial uses, cumulative water quality impacts are mitigated to a level that is less than significant.

***Impacts of Newhall Ranch Wastewater on Santa Clara River Water Quality and Hydrology***

Wastewater generated by the Specific Plan build-out will be treated in the Newhall Ranch Water Reclamation Plant (WRP). The water quality and hydrologic impacts associated with the discharge of tertiary treated recycled water to the Santa Clara River were previously analyzed at the project-level in the Newhall Ranch Specific Plan Revised Draft EIR (Impact Sciences, 1999) as well as the Newhall Ranch Specific Plan Revised Additional Analysis (Impact Sciences, 2003).

The Newhall Ranch WRP treatment facility is further described in the individual NPDES Permit and Waste Discharge Requirements (WDRs) for the Newhall Ranch WRP (Order No. R4-2007-0046, effective October 27, 2007). Treatment at the WRP will consist of screening, activated sludge secondary treatment with membrane bioreactors, nitrification/denitrification, ultraviolet disinfection, and partial reverse osmosis. The initial design capacity of the WRP would be 2 million gallons per day (MGD) to accommodate the initial phases of the Newhall Ranch Specific Plan and would be

incrementally increased to 6.8 MGD to accommodate the sewage generated by the build-out of Specific Plan.

Treated effluent from the Newhall Ranch WRP would be used to supply distribution of recycled water throughout the Specific Plan area in the form of irrigation of landscaping and other approved uses. In an average rainfall year, all tertiary treated wastewater from the Newhall Ranch WRP would be recycled for irrigation and other non-potable uses, except in the wet weather months. During these months in average rainfall years, approximately 286 to 1,025 acre-feet of tertiary-treated wastewater would not be needed to meet estimated non-potable demand and, therefore, would be discharged to the Santa Clara River. During years 1 and 2 of the Newhall Ranch WRP operation, the WRP would operate at a maximum of 2 MGD, with an estimated average discharge flow rate of 0.2 MGD during the five month period of November through March. No sooner than year 3, the WRP would be expanded to 6.8 MGD, with an approximate average discharge flowrate of 0.6 MGD during this five month wet period. Therefore, discharge periods would coincide with peak wet months when dilution capacity is maximal (i.e., instream flows are highest). The average November through March instream flowrate at USGS station 11109000 (Newhall Bridge, approximately 2.5 miles downstream of the County line), is 188 cfs (121 mgd) based on measured average daily flow data for water years 1977-2006. Newhall WRP effluent would represent less than one percent of this average volume.

Order No. R4-2007-0046, NPDES Permit No. CA0064556 serves as the NPDES Permit for point source discharges from the Newhall Ranch WRP, pursuant to Section 402 of the federal Clean Water Act and Chapter 5.5, Division 7 of the California Water Code. The Order also serves as the Waste Discharge Requirements for the new Newhall Sanitation District with respect to discharges to the Santa Clara River, pursuant to Article 4, Chapter 4, of the California Water Code. Specifically, the Order specifies limitations and discharge requirements for the Newhall Ranch WRP, including discharge prohibitions, technology-based and water quality-based effluent limitations, receiving water limitations, and other provisions such as monitoring and reporting requirements.

The NPDES Permit contains effluent limitations that control the amount of conventional, non-conventional, and toxic pollutants discharged to the receiving waters. These effluent limits are a combination of technology-based limits (per 40 C.F.R. section 122.44(a)) and water quality-based limits (per 40 C.F.R. section 122.44(d)). Concentration-based effluent limitations contained in the NPDES Permit are listed in Table 7-22 below. Mass-based effluent limitations contained in the draft permit, but not listed in Table 7-22, are derived by multiplying the proposed concentration limitation by the permitted flow of 2.0 mgd. These mass-based limits would be modified accordingly as the phased plant upgrades approach completion following an anti-degradation analysis demonstration

conducted by Newhall Land, and upon certification and approval of increased treatment plant capacity.

Additional water quality-based effluent limits are included in the permit for toxicity in the WRP effluent and for temperature, pH, dissolved oxygen, fecal coliform, turbidity, toxicity, and other pollutants in the receiving water. Groundwater-based effluent limitations are included for coliform bacteria, chemical constituents, radionuclides, nitrate-N + nitrite-N, and taste or odor producing substances.

Title 22 of the California Code of Regulations (title 22) specifies California's Wastewater Reclamation Criteria (WRC) and all recycled water in California must meet or exceed these criteria to assure protection of receiving water quality. These criteria apply to the treatment processes; treatment performance standards, such as removal efficiencies and effluent water quality; process monitoring programs, including type and frequency of monitoring; facility operation plans; and necessary reliability features. The Newhall Ranch WRP discharges would be required to comply with the WRC through the issuance of a separate order.

As is discussed in the draft Newhall Ranch WRP NPDES Permit Fact Sheet (page F-14), the Upper Santa Clara River chloride wasteload allocations (WLAs) are expressed on a concentration basis derived from and equivalent to the existing water quality objective for Reaches 5 and 6 of the Santa Clara River, thereby providing direct protection for agricultural supply, the most sensitive beneficial use. Under the TMDL Implementation Plan, a special study was conducted to confirm that the concentration-based WLA of 100 mg/L chloride is protective of this beneficial use. A concentration-based WLA also accommodates future growth and provides beneficial uses protection from chloride loads that were in place at the time of the TMDL development. Protection of beneficial uses from additional chloride loads that were not assigned wasteload allocations is provided by using the WLAs as effluent limits in permits for new and future sources, such as the Newhall Ranch WRP.

## 7-22: Effluent Limitations in the Newhall Ranch WRP NPDES Permit

| Parameter | Units | Effluent Limitations | | |
|---|---|---|---|---|
| | | Average Monthly | Average Weekly | Maximum Daily |
| Biochemical Oxygen Demand 5-day @ 20°C | mg/L | 20 | 30 | 45 |
| Total Suspended Solids | mg/L | 15 | 40 | 45 |
| pH | standard unit | 6.5 - 8.5 (instantaneous minimum and maximum) | | |
| Settleable solids | mL/L | 0.1 | - | 0.3 |
| Oil and Grease | mg/L | 10 | - | 15 |
| Total dissolved solids | mg/L | 1,000 | - | - |
| Chloride | mg/L | 100 [1] | - | - |
| Sulfate | mg/L | 400 | - | - |
| Boron | mg/L | 1.5 | - | - |
| Total ammonia ($NH_3$ as N) | mg/L | 1.93 [2] | - | 3.87 [3] |
| Nitrate-N + Nitrite-N | mg/L | 5 | - | - |
| Nitrite-N | mg/L | 0.9 | - | - |
| Detergents (as MBAS) | mg/L | 0.5 | - | - |
| Total residual chlorine | mg/L | - | - | 0.1 |
| Antimony | µg/L | 6 | - | - |
| Arsenic | µg/L | 10 | - | - |
| Copper | µg/L | 22 | - | 44 |
| Lead | µg/L | 13 | - | 26 |
| Mercury | µg/L | 0.051 | - | 0.10 |
| Nickel | µg/L | 100 | - | - |
| Selenium | µg/L | 4.1 | - | 8.2 |
| Zinc | µg/L | 5,000 | - | - |
| Cyanide | µg/L | 4.2 | - | 8.5 |
| Acrylonitrile | µg/L | 0.66 | | 1.3 |
| Tetrachloroethylene | µg/L | 5 | - | - |
| Bis(2-ethylhexyl)phthalate | µg/L | 4 | - | - |
| p-Dischlorobenzene (1,4-Dichlorobenzene) | µg/L | 5 | - | - |
| Lindane | µg/L | 0.2 | - | - |
| 4,4-DDE | µg/L | 0.00059 | - | - |
| Iron | µg/L | 300 | - | - |

[1] This is the water quality objective for chloride in the current Basin Plan. This effluent limitation is consistent with the assumptions of the Chloride TMDL for the Santa Clara River, Resolution No. 2002-018, Amendment to the Water Quality Control Plan for the Los Angeles Region to Include a TMDL for Chloride in the Santa Clara River (Chloride TMDL) and applies immediately. However, if a chloride site-specific objective (Chloride SSO) is adopted for the reach of the Santa Clara River in which Newhall Ranch WRP will discharge, then the permit may be reopened by the Los Angeles RWQCB to make the necessary changes, following USEPA approval of the Chloride SSO.

[2] This is the monthly average effluent limit calculated according to the Implementation Plan for ammonia in the Basin Plan, which specifies how to translate the Ammonia WQO into a final effluent limit, consistent with the assumptions of the Santa Clara River Nitrogen Compounds TMDL, Resolution No. 03-011.

[3] This is the daily maximum effluent limit calculated according to the Implementation Plan for ammonia in the Basin Plan, which specifies how to translate the Ammonia WQO into a final effluent limit, consistent with the assumptions of the Santa Clara River Nitrogen Compounds TMDL, Resolution No. 03-011.

Further stated in the Newhall Ranch WRP NPDES Permit Fact Sheet (page F-14), the Staff Report for the TMDL, dated August 21, 2002, states: "[a] concentration-based target accommodates future growth by allowing increased mass as long as it is accompanied by additional flow…. " The Fact Sheet finds that water quality would not be degraded if concentration-based wasteload allocations that are equivalent to the water quality objectives are assigned to new facilities at the end of pipe. The Fact Sheet also states that studies regarding the effect of additional chloride load on groundwater basins underlying the Upper Santa Clara River are underway and scheduled for completion by November 2007 (Fact Sheet page F-15). Initial results from these studies show that discharges at effluent limits of 100 mg/L chloride would not degrade groundwater quality. Results from these studies may be used to revise the effluent limits through modification of the NPDES permits for all dischargers discharging at 100 mg/L if necessary.

Similarly, concentration-based effluent limitations contained in the NPDES Permit for nitrogen compounds, established per the *Santa Clara River Nitrogen Compounds TMDL*, are protective of water quality in the Santa Clara River.

Water quality-based effluent limitations are included in the NPDES Permit for pathogen indicator bacteria as follows:

- E. Coli density shall not exceed 126/100 mL (geometric mean) or 235/100 mL (single sample);
- Fecal coliform density shall not exceed 200/100mL (geometric mean) or 400/100 mL (single sample).

These receiving water limitations are based on Resolution No. 01-018, Amendment to the Water Quality Control Plan for the Los Angeles Region to Update the Bacteria Objectives for Water Bodies Designated for Water Contact Recreation, and, therefore, are protective of beneficial uses in the Santa Clara River.

Based on required compliance with State and Federal water quality requirements, as discussed and analyzed in the project-level analysis contained in the Newhall Ranch Specific Plan Program EIR and the information above, and the implementation of previously adopted Mitigation Measures SP-5.0-52 through 5.0-56, which are related to the construction and operation of the WRP, no significant impacts related to discharge of Newhall Ranch recycled water would occur on Santa Clara River water quality or hydrology.

During an interim period until the first phase of the Newhall Ranch WRP is constructed, the Santa Clara Valley Sanitation District (SCVSD) will treat the wastewater from the

first 6,000 homes within the Specific Plan (up to 1.6 mgd) at the existing Valencia WRP as needed pursuant to the terms of a 2002 Interconnection Agreement. The wastewater from the first 6,000 homes within the Specific Plan is expected to produce wastewater chloride concentrations similar to those in the existing SCVSD service area; therefore, the interim discharge of wastewater from the Valencia WRP would not impact SCVSD's ability to comply with the adopted chloride TMDL. In addition, SCVSD has sufficient capacity to accommodate the interim use of its facilities. Newhall also has voluntarily agreed to incorporate interim chloride reduction treatment at the Valencia WRP to confirm compliance with the chloride TMDL. On that basis, no significant impacts related to the interim discharge of Newhall Ranch recycled water from the Valencia WRP would occur on the Santa Clara River water quality or hydrology.

## 7.8 Groundwater Impacts

### 7.8.1 Direct Groundwater Quality Impacts

Discharge from the Project's developed areas to groundwater will occur in three ways: (1) through general infiltration of irrigation water, (2) through incidental infiltration of urban runoff in the proposed treatment control PDFs after treatment, and (3) through infiltration of urban runoff, after treatment in the Project PDFs, in the Santa Clara River, which is the primary recharge zone for groundwater in the Santa Clara Valley. Groundwater quality will be fully protected through implementation of the Project's site design, source control, and treatment control PDFs prior to discharge of Project runoff to groundwater.

Per the LARWQCB Clarification Letter (LARWQCB, 2006), generally, the common pollutants in stormwater are filtered or adsorbed by soil, and unlike hydrophobic solvents and salts, do not cause groundwater contamination. In any case, infiltration of one to two inches of rainfall in semi-arid areas like Southern California where there is a high rate of evapotranspiration presents minimal risks.

The pollutant of concern with respect to groundwater is nitrate-N plus nitrite-N. The Basin Plan groundwater quality objective for nitrate-nitrogen plus nitrite-nitrogen is 10 mg/L (which is more stringent than the objective for nitrate-nitrogen alone (10 mg/L) and for nitrite-nitrogen alone (1 mg/L)). The predicted nitrate-nitrogen plus nitrite-nitrogen concentration in runoff after treatment in the PDFs is 0.6 mg/L, which is well below the groundwater quality objective.

Treated effluent from the Newhall Ranch WRP will be used to supply distribution of recycled water throughout the Specific Plan area in the form of irrigation of landscaping and other approved uses. The effluent limitation contained in the Newhall Ranch WRP Permit for nitrate-N plus nitrite-N is 5 mg/L and the limitation for nitrite-N is 0.9 mg/L (average monthly). As the Basin Plan groundwater quality objective for nitrate-nitrogen

plus nitrite-nitrogen is 10 mg/L or 1 mg/L for nitrite-nitrogen, the Newhall Ranch WRP irrigation water supply that will serve the Project will be well below the groundwater quality objectives.

On this basis, the potential for the Project to adversely affect groundwater quality is considered less than significant.

### 7.8.2 Cumulative Groundwater Quality Impacts

As discussed above, the anticipated quality of runoff discharges from the Project's developed areas and irrigation to groundwater will not contribute loads or concentrations of pollutants of concern that would be expected to cause or contribute to a violation of the groundwater quality standards. By extrapolating these results to existing and proposed development throughout the watershed and based on a review of adapted plans and projections, it is concluded that no adverse cumulative effects would occur to groundwaters. Therefore, the Project's incremental effects on groundwater quality are not expected to be significant.

The Project's discharges to groundwater, after PDFs, both during construction and post-development, is predicted to comply with adopted regulatory requirements that are designed by the LARWQCB to assure that regional development does not adversely affect water quality, including MS4 Permit and SUSMP requirements; Construction General Permit and General Dewatering Permit requirements; and benchmark Basin Plan groundwater quality objectives. Any future urban development occurring in the Santa Clara River watershed must also comply with these requirements. Therefore, cumulative impacts on groundwater quality from the proposed Project and future urban development in the Santa Clara Watershed are addressed through compliance with the MS4 Permit and SUSMP requirements, Construction General Permit requirements, General Dewatering Permit requirements, and benchmark Basin Plan groundwater quality objectives, which are intended to be protective of beneficial uses of the groundwater. Based on compliance with these requirements designed to protect beneficial uses, cumulative groundwater quality impacts are mitigated to a level that is less than significant.

### 7.8.3 Groundwater Recharge Impacts

***Direct Project Impacts***

In a groundwater basin, the effect of urbanization on recharge to underlying groundwater is dependent on land uses, water uses, vegetative cover, and geologic conditions. Groundwater recharge from undeveloped lands occurs from precipitation alone, whereas areas that are developed for agricultural or urban land uses receive both precipitation and irrigation of vegetative cover. In an urban area, groundwater recharge occurs directly beneath irrigated lands and in drainages whose bottoms are not paved or cemented. A

memorandum prepared by CH2M Hill entitled "Effect of Urbanization on Aquifer Recharge in the Santa Clarita Valley" (Appendix E) discusses the general effects of urbanization on groundwater recharge and the specific effects in the Santa Clarita Valley.

Currently the site is irrigated agricultural land. As a result, in the existing condition recharge occurs within the Project site from irrigation and precipitation. On one hand, development of the site will introduce impervious surface over approximately 61 percent of the tract map site, which will tend to reduce recharge. In addition, development of agricultural lands will eliminate agricultural irrigation as a source of recharge. On the other hand, development of the site will increase runoff volume discharged after treatment to the Santa Clara River, whose channel is predominantly natural and consists of vegetation and coarse-grained sediments (rather than concrete). The porous nature of the sands and gravels forming the streambed will allow for significant infiltration to occur to the underlying groundwater. Also, the Project will introduce landscaping, irrigation, and PDFs designed to infiltrate runoff. These project effects will increase groundwater recharge from the Project. On balance, it is unlikely that the Project will result in a significant change in groundwater recharge in the project vicinity. Based on the above discussion, the Project's impact on groundwater recharge is considered less than significant.

***Cumulative Impacts***

Increased urbanization in the Santa Clarita Valley has resulted in the irrigation of previously undeveloped lands. The effect of irrigation is to maintain higher soil moisture levels during the summer than would exist if no irrigation were occurring. Consequently, a greater percentage of the fall/winter precipitation recharges groundwater beneath irrigated land parcels than beneath undeveloped land parcels. In addition, urbanization in the Santa Clarita Valley has occurred in part because of the importation of State Water Project (SWP) water, which began in 1980. SWP water use has increased steadily, reaching nearly 44,500 acre-feet (AF) in 2003. Two-thirds of this water is used outdoors, and a portion of this water eventually infiltrates to groundwater. The other one-third is used indoors and is subsequently routed to local water reclamation plants (WRPs) and then to the Santa Clara River (after treatment). A portion of this water flows downstream out of the basin, and a portion infiltrates to groundwater.

Records show that groundwater levels and the amount of groundwater in storage were similar in both the late 1990s and the early 1980s, despite a significant increase in the urbanized area during these two decades. This long-term stability of groundwater levels is attributed in part to the significant volume of natural recharge that occurs in the streambeds, which do not contain paved, urban land areas. On a long term historical basis, groundwater pumping volumes have not increased due to urbanization, compared with pumping volumes during the 1950s and 1960s when water was used primarily for agriculture. Also, the importation of SWP water is another process that contributes to

recharge in the Valley. In summary, urbanization has been accompanied by long-term stability in pumping and groundwater levels, plus the addition of imported SWP water to the Valley, which together have not reduced recharge to groundwater, nor depleted the amount of groundwater that is in storage within the Valley.

Based on the above discussion, the cumulative impact on groundwater recharge is considered less than significant.

## 7.9 Hydromodification Impacts

Development typically increases impervious surfaces on formerly undeveloped (or less developed) landscapes, reducing the capture and infiltration of rainfall. The result is that, as a watershed develops, a larger percentage of rainfall becomes runoff during any given storm. In addition, runoff reaches the stream channel more efficiently due to the development of storm drain systems, so that, if no controls are implemented, the peak discharge rates for rainfall events and floods are higher for an equivalent event than they were prior to development. Further, the introduction of irrigation and other dry weather flows can change the seasonality of runoff reaching natural receiving waters. These changes, in turn, affect the stability and habitat of natural drainages, including the physical and biological character of these drainages. This process, termed "hydromodification" (SCCWRP, 2005a) is addressed in this section.

Significant adverse hydromodification impacts are presumed to occur if the proposed Project would:

- Substantially alter the existing drainage pattern of a natural drainage, stream, or river causing substantial erosion, siltation, or channel instability; or
- Substantially increase the rates, velocities, frequencies, duration and/or seasonality of flows causing channel instability and harming sensitive habitats or species in natural drainages in a manner that substantially adversely affects beneficial uses.

All flows from those areas of the Project that will be developed with impervious surface with potential for altering drainage patterns will be discharged directly to the Santa Clara River. Therefore, this analysis addresses the potential for hydromodification impacts to the Santa Clara River as a result of the proposed Project. The impervious surfaces associated with the proposed water tanks are very minor and will not alter drainage patterns, and therefore no potential for hydromodification impacts exists from these areas of the Project.

The physical alteration of natural drainages, such as bank protection, energy dissipaters, and bridge abutments, are not impacts created by changes in runoff seasonality, volume,

duration, or flow associated with development. Instead, these types of alterations are physical alterations to the stream bed and bank, with associated effects on stream habitat and species. These types of effects are analyzed in the Landmark Village Draft EIR and more specifically the biological chapter of the EIR for this Project.

### 7.9.1 Wet Weather Flows

***Direct Impacts to the Santa Clara River***

The Project proposes development of approximately 80 percent (233 acres) of the 292.6 acre tract map site; the remaining 59.6 acres would be used for trails, parks, and vegetated slopes and water quality BMPs. Overall, approximately 61 percent (178.4 acres) of the tract map area would be impervious and 39 percent (114.2 acres) would be vegetated. The size of the Project in comparison to both the 1,618 square mile total watershed area and the expected total impervious area in the watershed in the existing conditions and at build-out is small. It is estimated, based on the land use data provided by LACDPW, that the proposed Project will comprise 0.5 percent of the total impervious area in the watershed encompassing the Project location at ultimate planned build-out for the watershed. See Section 4.4.3 above for information regarding adopted plans and projection used to derive build-out assumptions for the watershed.

A series of progressive hydromodification control measures will be used in the Project to prevent and control hydromodification impacts to the Santa Clara River:

- Avoid, to the extent possible, the need to mitigate for hydromodification impacts by preserving natural hydrologic conditions and protecting sensitive hydrologic features, sediment sources, and sensitive habitats.

- Minimize the effects of development through site design practices (e.g., reducing connected impervious surfaces and providing river buffers) and implementation of stormwater volume-reducing BMPs (project-based hydrologic source control).

- Mitigate hydromodification impacts in-stream using a geomorphically-based approach (e.g., buried soil cement bank stabilization).

*Project-based Hydrologic Source Control*

Disconnecting impervious areas from the drainage network and adjacent impervious areas is a key approach to protecting channel stability. Several hydrologic source controls will be included in the Project that will limit impervious area and disconnect imperviousness:

*Site design.* Site design will help to reduce the increase in runoff volume, including the clustering of NRSP development into village areas, including the Landmark Village, the preservation of 70 percent of the NRSP area in open space, and 59.6 acres (20 percent) of the Project in trails, slopes, and LID BMPs; routing of impervious area runoff to vegetated areas; use of native and/or non-native, non-invasive mostly drought tolerate plants in landscaped areas; and the use of efficient irrigation systems in common area landscaped areas. These measures will help to protect the stability of the Santa Clara River and to avoid and minimize direct impacts to the River.

*LID BMPs and Treatment Controls*. The Project's LID BMPs and treatment control will also serve as hydromodification source control BMPs. Vegetated BMPS such as vegetated swales, filter strips, and bioretention areas with underdrains can provide volume reduction on the order of 20 to 30 percent through infiltration and evaporation. If site conditions are suitable, all water captured in the LID BMPs would be effectively removed from the project's stormwater discharges. Collectively, these LID BMPs are expected to provide significant reduction in wet weather runoff. In addition, these facilities will also receive and eliminate dry weather flows.

*Geomorphically-Referenced Channel Design*

The hydromodification management approach for the Santa Clara River will incorporate "geomorphically-referenced river engineering" as described in SCCWRP Technical Report 450 (SCCWRP, 2005a). The goal of this approach is to preserve the appearance of the natural stream channel to the maximum extent practicable while maintaining stability in stream channel morphology. The Project's development footprint will allow for the greatest freedom possible for "natural stream channel" activity. This includes establishing buffer zones and maintaining setbacks to allow for channel movement and adjustment to changes in energy associated with runoff. The engineered structural elements that will be implemented where needed for the Santa Clara River include energy dissipation and bank stabilization.

*Energy Dissipation*. Energy dissipation at storm drain outfalls provides erosion protection in areas where discharges have the potential to cause localized stream erosion. Erosion protection will be provided at all storm drain outlets to the Santa Clara River.

*Bank Stabilization*. The Project will include buried soil cement along the Santa Clara River and Castaic Creek adjacent to and downstream of the Project site where necessary to protect against flooding and erosion pursuant to Federal Emergency Management Administration (FEMA) and Los Angeles County Department of Public Works' requirements. In total, approximately 18,600 LF of bank would be provided with buried soil cement protection. This would include approximately 11,000 feet fronting the tract map site and approximately 6,400 LF on the south bank downstream (west) of the Long

Canyon Road Bridge. The alignment was selected so that bank protection along the river would generally be excavated from non-jurisdictional upland areas adjacent to the river. Installing bank protection in non-jurisdictional areas reduces and/or avoids impacts to the river, and has the potential to create new riverbed areas, allows for channel movement and adjustment to changes in energy associated with runoff, and increases riparian habitat.

Additional buried bank stabilization would be constructed as part of the approved Newhall Ranch Water Reclamation Plant (WRP) and between the Old Road and the Santa Clara River (protecting the utility corridor). The bank protection between the Old Road and the Santa Clara River was approved as part of the Santa Clara River Natural River Management Plan (NRMP).

Approximately 6,600 LF of Turf Reinforcement Mat (TRM) or similar bank stability protection would be provide along the southern edge of the utility corridor downstream or west of the tract map site. TRMs are designed to reinforce vegetation at the root and stem allowing vegetation to be used as erosion control in areas where flow conditions exceed the ability of natural vegetation to remain rooted. This includes applications with high slopes or stream banks where grouted rip-rap and concrete channels are aesthetically undesirable.

*Conclusion*

In summary, although Project runoff volumes, flow rates, and durations will increase, potential impacts of hydromodification (i.e., the potential to cause erosion, siltation, or channel instability) will be minimized by the Project PDFs. The Project's site design and LID BMP PDFs will minimize increases in runoff volume from the development area, the preferred method for controlling hydromodification impacts from new development (SCCWRP, 2005a).

Potential instream impacts of increased volumes, rates, and flow durations will be managed and mitigated with energy dissipaters at the discharge points to the Santa Clara River and the River banks will be protected with vegetated buried bank stabilization primarily in non-jurisdictional upland areas adjacent to the river. This type of technique is the preferred approach for bank stabilization (SCCWRP, 2005a).

For these reasons, the wet weather direct hydromodification impacts of the Project with PDFs on the Santa Clara River are considered less than significant.

***Cumulative Impacts***

As identified in the MS4 Permit, increased volume, velocity, and discharge duration of stormwater runoff from the cumulative existing and future developed areas in watersheds

of natural drainages, including the Santa Clara River, has the potential to accelerate downstream erosion and impair stream habitat. Given the very large size of the Santa Clara River watershed, the contribution of the Project to cumulative hydromodification impacts to the Santa Clara River is difficult to assess quantitatively. Therefore, a qualitative assessment that references total predicted development per adopted General Plans and projections for the Santa Clara River watershed is provided below.

*Effect of Watershed Impervious Area*

The limited hydromodification impact research to date has focused on empirical evidence of channel failures in relationship to directly connected impervious area (DCIA) or total impervious area. However, more recent research has established the importance of size of watershed, channel slope and materials, and climatic and precipitation patterns (SCCWRP 2005a, Balance Hydrologics 2005 (provided in Appendix F)). Impervious area that drains directly to a storm drain system and then to the receiving water is considered "directly connected," whereas impervious area that drains through vegetation or to infiltration facilities is considered "disconnected."

Booth and Jackson (1997) reported finding a correlation between loss of channel stability and increases in DCIA. In Washington State, streams were found to display the onset of degradation when the DCIA increases to ten percent or more, and a lower imperviousness of five percent was found to cause significant degradation in sensitive watersheds (Booth and Jackson, 1997). The Center for Watershed Protection (Schuler and Holland, 2000) described the impacts of urbanization on stream channels and established thresholds based on total imperviousness within the tributary drainage area. It states "a threshold for urban stream stability exists at about 10 percent imperviousness." It further states that a "sharp threshold in habitat quality exists at approximately 10 percent to 15 percent imperviousness." These studies, however, addressed changes in a very different climatic region than Southern California.

Geosyntec's work in the San Francisco Bay area's Santa Clara Valley (Geosyntec 2004) also evaluated the relationship between imperviousness and stream channel degradation in an area that had predominately directly connected impervious areas. Geosyntec found similar results to those published by Booth and Schuler, where channel erosion was observed at approximately six to nine percent imperviousness for two separate watershed systems. More recent studies conducted by Geosyntec in this same watershed area showed that levels as low as two to three percent total imperviousness could lead to stream channel degradation, depending on channel characteristics. This region also has different climatic characteristics than Southern California.

Although physical degradation of stream channels in semi-arid climates of California may be detectable when watershed imperviousness is between three and five percent, not

all streams will respond in the same manner (SCCWRP, 2005b). Management strategies need to account for differences in stream type, stage of channel adjustment, current and expected amount of basin imperviousness, and existing or planned hydromodification control strategies.

The absolute measure of watershed imperviousness that could cause stream instability in the Santa Clara River depends on many factors, including watershed area, land cover, and soil type; development impervious area and connectedness; reduced sediment yield; longitudinal slope of the river; channel geometry; and local boundary materials, such as bed and bank material properties and vegetation characteristics. Based on land use data provided by the County of Los Angeles (see Section 4.4.3 above), the estimated cumulative level of percent impervious area at build-out in the Santa Clara River watershed upstream from the NRSP area is nine percent.

*Effect of Catchment Drainage Area*

The Southern California Coastal Water Research Project (SCCWRP) found signs of hydromodification impacts in Southern California streams when watershed percent imperviousness was around two to three percent for streams with a catchment drainage area of less than five square miles ($mi^2$) (SCCWRP, 2005a). Recognizing that their findings were based on the type and size of catchments that were measured, the researchers in the SCCWRP study attempted to develop a framework by which their results could be extended to other stream types. They developed a classification system based on watershed characteristics, stream channel characteristics (including level of vegetative development), and stream channel resistance, and suggested these features could be important in selecting management strategies and approaches to control hydromodification impacts. The Level 1 classification is based on watershed characteristics that include the size, shape, and topography of the watershed.

The catchment drainage area (CDA) is stated to be the most obvious differentiator among watersheds, as this is likely to have the greatest effect on runoff. The SCCWRP study focused on small watersheds (< 5 $mi^2$), whereas the CDA of the Santa Clara River at the Los Angeles County line, near the western edge of the NRSP area (the Upper Watershed), is about 640 $mi^2$. Based on the differences in CDA, the SCCWRP findings with respect to CDA would not be applicable to the Santa Clara River. Information in the SCCWRP report, based in part on the work of Zielinski (2002), suggests that smaller watersheds are more responsive and sensitive to changes in land use, whereas larger watersheds (> 30 $mi^2$) were said to be less responsive to land use changes. Geosyntec's work in the San Francisco Bay area found significant hydromodification impacts on streams of watersheds that were 40 $mi^2$ in size; however, this is still substantially smaller than the Santa Clara River watershed at the Los Angeles County line. Given the large CDA for the Santa Clara River, the river is likely less responsive to potential

hydromodification effects, but channel morphology must still be examined to determine the level and potential significance of Santa Clara River response.

*Application to the Santa Clara River*

Balance Hydrologics assessed the potential effects of the planned cumulative urbanization within the Santa Clara River upstream of the County line (the upper watershed) on channel morphology by examining historical changes in the Santa Clara River channel pattern in response to different types of major disturbance using historical rainfall and other relevant records and aerial channel photography (Balance Hydrologics, 2005 (provided in Appendix F)). The findings of this analysis are summarized below.

The Santa Clara River is a dynamic, episodic system. Understanding the magnitude of geomorphic change over the course of recent history in response to natural and human disturbances in the watershed is a key factor in assessing the potential response to future urbanization within the watershed.

For example, the report examines the construction of Castaic Dam in the 1974 (affecting approximately 30 percent of the Santa Clara River watershed above Castaic Creek), which cut off a significant supply of sediment to the Santa Clara River. This change, however, does not appear to have had an effect on the channel dimensions of the Santa Clara River mainstem. The width of the active corridor as well as the general form of the channel are generally consistent before and after construction of the dam. It appears that the Santa Clara River had enough buffering capacity to absorb this change. The report finds that the depletion of sediment supply to the mainstem, which would typically be expected to cause erosive effects, did not, in fact, result in those effects, perhaps because reductions in sediment were offset by additional available sediment stored in the basin in the upper watershed as a result of movement along the San Gabriel fault.

Similarly, the report examines the amount of vegetation within the Santa Clara River corridor, which appears to have generally increased since the 1960s, likely due to the increase in available summer flows due to the Valencia and Saugus Water Reclamation Plants' discharges. However, this vegetation does not seem to provide enough erosion resistance to maintain a "stable" channel capable of withstanding regular 're-sets', large events that completely alter the form of the Santa Clara River channel which occur at intervals averaging about a decade, or much less than the expected lifetime of the riparian woodlands which do get established. Despite heavy vegetation on the channel banks near the NRSP area and in areas of ground-water upwelling, the stream still responds to large events by a general widening and/or shift of the active channel within the River corridor.

After studying the response of the river to several different anthropogenic and natural disturbances, the report concludes that the Santa Clara River, as with many streams in

semi-arid southern California, is highly episodic. Concepts of "normal" or "average" sediment-supply and flow conditions have limited value in this "flashy" environment, where episodic storm and wildfire events have enormous influence on sediment and storm flow conditions. In these streams, a large portion of the sediment movement events can occur in a matter of hours or days. Other perturbations which can potentially affect channel geometry appear to have transitory or minor manifestations. For example, effects on the channel width due to the 1980s levee construction were barely discernible by the first few years of the 21st century, probably mostly due to morphologic compensation associated with the storm events in the mid- to late-1990s. As a result, channel morphology, stability, and character of the Santa Clara River is almost entirely determined by the "reset" events that occur within the watershed.

*Fluvial Study*

Additional study of the Santa Clara River has been performed by Pacific Advanced Civil Engineering, Inc., who prepared a comprehensive fluvial analysis for Santa Clara River through the NRSP area (PACE, 2006) for LACDPW. A river fluvial analysis is the study of the river bed and bank sediment movement over time and as a result of flow in the river and changes in the tributary watershed.

The fluvial analysis had three distinct components:

1. Analysis of long term trends of river bed and bank sediment build-up (aggredation) or removal (degradation) was performed. More than 80 years of available historic topographic mapping of the river indicated no real trend of aggredation or degradation in the study reach.

2. General (capital storm event) aggredation/degradation calculations were performed to determine the expected fluvial response of the river to the LACDPW design storm event (>140,000 cfs). US Army Corps of Engineers computer modeling software (SAM) was used to evaluate existing and proposed project conditions. Only minor variations in the fluvial response were shown in the modeling.

3. Local aggredation/degradation resulting from river curvature, bridges, river bed material, and various other components were considered and estimates of aggredation and degradation were calculated.

To complete the fluvial analysis, long term, general, and local aggredation/degradation components were added together to obtain the total aggredation/degradation for each river section within the study reach.

One of the purposes for the fluvial analysis, which has been approved by LACDPW, was to provide a level of understanding of the Santa Clara River Newhall Ranch reach fluvial mechanics related to existing conditions and proposed NRSP development conditions to identify any potential project impacts. The fluvial analysis showed very little change between the pre- and post-development conditions and therefore concluded that there is no potential adverse impact to the fluvial mechanics of the river.

*Conclusion*

As discussed above, the Project will include a number of hydrologic source control PDFs that will substantially lessen any potential contribution to cumulative hydromodification impacts to the Santa Clara River. In addition, it is presumed that all future development within the NRSP, Legacy, and Entrada sub-regions will implement hydromodification controls consistent with the NRSP Sub-regional Stormwater Mitigation Plan. Further, other future projects within the watershed reflected in adopted plans and projections will implement hydromodification controls to meet flow criteria that will be adopted by the LACDPW under Part 4, § D.1 of the MS4 Permit. These measures are designed to mitigate and prevent direct and cumulative hydromodification impacts.

Within the Santa Clara River watershed, major perturbations (urbanization, dam construction, levee construction, decadal changes in climate, and increases in woody vegetation) do not appear to have had a significant impact on the geomorphic expression of the Santa Clara River. Large "re-set" events (those which are typically not as affected by increases in impervious area) have episodically completely altered the form of the Santa Clara River channel. These events, occurring on average once every ten years, are a dominant force in defining channel characteristics. The geomorphic dominance of "re-set" events determines the geomorphic character of the Santa Clara River and the Santa Clara River's response to anthropogenic perturbations, including hydromodification impacts associated with development, is expected to be minimal in light of the "re-set" driven nature of the Santa Clara River channel. Due to these episodic "re-sets," "unraveling" of the Santa Clara River mainstem due to hydromodification associated with cumulative urban development within the watershed, as is seen in many smaller southern California watersheds, is not expected to occur. The "re-set" events appear to adequately buffer changes that may occur in short-term sediment transport between re-set events.

Based upon the above discussion, that the Project includes hydromodification controls as Project Design Features, that future development projects within the watershed will control flow in compliance with the regional program, and that large-scale changes naturally occur in the Santa Clara River in response to major episodic events, the Project's contribution to cumulative hydromodification impacts to the Santa Clara River will be less than significant and consistent with the requirements of the MS4 permit.

### 7.9.2 Dry Weather Runoff

***Direct Impacts***

It is predicted that all dry weather flows will be infiltrated or removed by evapotranspiration in the LID BMP PDFs, which also provide hydrologic source control. As a result, no appreciable change in seasonality of flows is anticipated to result from development. Based on comprehensive site planning, source control, LID, and treatment control strategy and the water balance analysis, the impact of the projects within the Newhall Ranch subregion on dry weather water quality and seasonality of flow in the tributaries and the River is considered less than significant.

# 8 CONCLUSIONS

This section summarizes the potential effects, if any, of the proposed Landmark Village Project on water quality and hydromodification in Santa Clara River Reach 5.

## 8.1 Water Quality Impacts

The following are the conclusions regarding the significance of impacts for the pollutants of concern under wet and dry weather conditions:

- ***Sediments*:** MS4 Permit, Construction General Permit, Dewatering General Permit, and SUSMP-compliant BMPs will be incorporated into the Project to address sediment in both the construction phase and post-development. Mean total suspended solids concentration and load are predicted to be less in the post-development condition than in the existing conditions. Turbidity in stormwater runoff will be controlled through implementation of a Construction SWPPP and will be permanently reduced through the stabilization of erodible soils with development. On this basis, the impact of the Project on sediments is considered less than significant.
- ***Nutrients (Phosphorus and Nitrogen (Nitrate-N+Nitrite-N, Ammonia-N, and Total Nitrogen))***: MS4 Permit, Construction General Permit, Dewatering General Permit, and SUSMP-compliant BMPs will be incorporated into the Project to address nutrients in both the construction phase and post-development. Total phosphorus, nitrate-nitrogen plus nitrite-nitrogen, ammonia-nitrogen, and total nitrogen concentrations and loads are predicted to decrease in the post-developed condition and to be within the range of observed values in Santa Clara River Reach 5. Nitrate-N plus nitrite-N and ammonia-N concentrations are predicted to decrease with development to a point well below Basin Plan objectives and TMDL wasteload allocations. The predicted total nutrient concentrations are not expected to cause increased algal growth. On this basis, the impact of the Project on nutrients is considered less than significant.
- ***Trace Metals*:** MS4 Permit, Construction General Permit, General Dewatering Permit, and SUSMP-compliant BMPs will be incorporated into the Project to address trace metals in both the construction phase and post-development. The mean loads and concentrations of dissolved copper, total lead, and dissolved zinc, and total aluminum are predicted to decrease with Project development. Mean concentrations of dissolved copper, total lead, dissolved zinc, and total aluminum are predicted to be below benchmark Basin Plan objectives, CTR criteria, and the NAWQC criterion for aluminum. Cadmium is not expected to be present at significant levels in Project runoff. On this basis, the impact of the Project on trace metals is considered less than significant.

- ***Chloride*:** MS4 Permit, Construction General Permit, Dewatering General Permit, and SUSMP-compliant BMPs will be incorporated into the Project to address chloride loads (via volume reduction) in both the construction phase and post-development. The mean concentration of chloride is predicted to decrease with development, while the average annual load is predicted to increase. The predicted concentration is well below the Los Angeles Basin Plan objective and the TMDL wasteload allocation and is within the range of observed values in Santa Clara River Reach 5. On this basis, the impact of the Project on chloride is considered less than significant.
- ***Pesticides*:** Pesticides in runoff may or may not increase in the post-development phase as a result of landscape applications. Proposed pesticide management practices, including source control, removal with sediments in LID BMP and treatment control PDFs, and advanced irrigation controls, in compliance with the requirements of the MS4 Permit and the SUSMP Manual, will minimize the presence of pesticides in runoff. During the construction phase of the Project, erosion and sediment control BMPs implemented per General Construction Permit and General De-Watering Permit requirements will prevent pesticides associated with sediment from being discharged. Final site stabilization will limit mobility of legacy pesticides that may be present in pre-development conditions. On this basis, the impact of the Project on pesticides is considered less than significant.
- ***Pathogens*:** Post-development pathogen sources include both natural and anthropogenic sources. The natural sources include bird and mammal excrement. Anthropogenic sources include leaking septic and sewer systems and pet wastes. The Project will not include septic systems and the sewer system will be designed to current standards which minimizes the potential for leaks. Thus pet wastes are the primary source of concern. The PDFs will include source controls, LID BMPs, and treatment controls which in combination should help to reduce pathogen indicator levels in post-construction stormwater runoff. Pathogens are not expected to occur at elevated levels during the construction-phase of the Project. On this basis, the Projects impact on pathogen and pathogen indicators is considered less than significant.
- ***Hydrocarbons*:** Hydrocarbon concentrations will likely increase in post-development because of vehicular emissions and leaks. In stormwater runoff, hydrocarbons are often associated with soot particles that can combine with other solids in the runoff. Such materials are subject to treatment in the proposed LID BMPs and treatment control PDFs. Source control BMPs incorporated in compliance with the MS4 Permit and the SUSMP requirements will also minimize the presence of hydrocarbons in runoff. During the construction phase of the Project, pursuant to the Construction General Permit, the Construction Stormwater Pollution Prevention Plan must include BMPs that address proper

handling of petroleum products on the construction site, such as proper petroleum product storage and spill response practices, and those BMPs must effectively prevent the release of hydrocarbons to runoff per the Best Available Technology Economically Achievable and Best Conventional Pollutant Control Technology standards. On this basis, the impact of the Project on hydrocarbons is considered less than significant.

- ***Trash and debris*:** Trash and debris in runoff are likely to increase in post-development if left unchecked. However, the Project PDFs, including source control and treatment BMPs incorporated in compliance with the MS4 Permit and the SUSMP requirements, will minimize the adverse impacts of trash and debris. Source controls such as street sweeping, public education, fines for littering, covered trash receptacles, and storm drain stenciling are effective in reducing the amount of trash and debris that is available for mobilization during wet weather. Trash and debris will be captured in catch basin inserts in high use parking lots and in the LID BMP and treatment control PDFs. During the construction phase of the Project, PDFs implemented per Construction General Permit and General De-Watering Permit requirements will remove trash and debris through the use of BMPs such as catch basin inserts and by general good housekeeping practices. Trash and debris are not expected to significantly impact receiving waters due to the implementation of the Project PDFs.
- ***Methylene Blue Activated Substances (MBAS):*** In the post-development phase, the presence of soap in runoff from the Project will be controlled through the source control PDFs, including a public education program on residential and charity car washing and the provision of a centralized car wash area directed to sanitary sewer in the multi-family residential areas. Other sources of MBAS, such as cross connections between sanitary and storm sewers, are unlikely given modern sanitary sewer installation methods and inspection and maintenance practices. During the construction phase of the Project, equipment and vehicle washing will not use soaps or any other MBAS sources. Therefore, MBAS are not expected to significantly impact the receiving waters of the proposed Project.
- ***Cyanide:*** In addition to the expected relatively low level of cyanide in untreated stormwater, cyanide in runoff from the Project would be readily removed by biological uptake, degradation by microorganisms, and by volatilization in the LID BMP and treatment control PDFs. Therefore cyanide is not expected to significantly impact the receiving waters of the Project.
- ***Bioaccumulation*:** In the literature, the primary pollutants that are of concern with regard to bioaccumulation are mercury and selenium. However, selenium and mercury are not of concern in the Project's watershed, so bioaccumulation of selenium and mercury is also not expected to result either during the construction or post-development Project phases. On this basis, the potential for

bioaccumulation in the Project PDFs or in the Santa Clara River and adverse effects on waterfowl and other species is considered less than significant.

- ***Construction Impacts:*** Construction impacts on water quality are generally caused by soil disturbance and subsequent suspended solids discharge. These impacts will be minimized through implementation of construction BMPs that will meet or exceed measures required by the Construction General Permit, as well as BMPs that control the other potential construction-related pollutants (e.g., petroleum hydrocarbons and metals). A SWPPP specifying BMPs for the site that meet or exceed Best Available Technology economically achievable/Best Conventional Pollutant Control Technology standards will be developed as required by, and in compliance with, the Construction General Permit and Los Angeles County Standard Conditions. Erosion control BMPs, including but not limited to hydro-mulch, erosion control blankets, stockpile stabilization, and other physical soil stabilization techniques will be implemented to prevent erosion, whereas sediment controls, including but not limited to silt fencing, sedimentation ponds, and secondary containment on stockpiles will be implemented to trap sediment and prevent discharge. Non-stormwater and construction waste and materials management BMPs, such as vehicle and equipment fueling and washing BMPs; nonvisible pollutant monitoring; and BMPs to manage materials, products, and solid, sanitary, concrete, hazardous, and hydrocarbon wastes will also be deployed to protect construction site runoff quality. On this basis, the construction-related impact of the project on water quality is considered less than significant.
- ***Regulatory Requirements:*** The proposed Project satisfies MS4 Permit requirements for new development, including SUSMP requirements and SQMP requirements, satisfies the LID requirements of the Los Angeles County LID Manual and the Newhall Ranch Sub-Regional Stormwater Mitigation Plan, and satisfies construction-related requirements of the Construction General Permit and General Dewatering Permit, and therefore complies with water quality regulatory requirements applicable to stormwater runoff.

## 8.2 Groundwater Impacts

- ***Groundwater Quality Impacts (Nitrate-N+Nitrite-N)***: MS4 Permit, Construction General Permit, Dewatering General Permit, and SUSMP-compliant BMPs will be incorporated into the Project to address nutrients in both the construction phase and post-development. Nitrate-nitrogen plus nitrite-nitrogen concentrations are predicted to decrease in the post-developed condition. The predicted nitrate-nitrogen plus nitrite-nitrogen concentration in stormwater runoff after treatment in the Project PDFs and in irrigation water is well below the groundwater quality objective. On this basis, the potential for adversely affecting groundwater quality is considered less than significant.

- ***Groundwater Recharge Impacts***: Project stormwater runoff will be discharged to the Santa Clara River after treatment, whose channel is predominantly natural and consists of vegetation and coarse-grained sediments (rather than concrete). The porous nature of the sands and gravels forming the streambed will allow for significant infiltration to occur to the underlying groundwater. Also, irrigation water is predicted to be fully infiltrated during dry weather, which will increase groundwater recharge from the Project. On this basis, the Project's impact on groundwater recharge is considered less than significant

## 8.3 Hydromodification Impacts

The following are the conclusions regarding the significance of impacts for hydromodification impacts under wet- and dry-weather conditions:

- ***Wet Weather Project Impacts***: Although the Project's runoff volumes, flow rates, and durations will increase, potential impacts of hydromodification (i.e., the potential to cause erosion, siltation, or channel instability) will be avoided, minimized, and mitigated by the Project PDFs in the following ways:
    - Project site design PDFs, especially open space retention and efficient irrigation will avoid and/or minimize increases in runoff volume from the development area, the preferred method for controlling hydromodification impacts from new development (SCCWRP, 2005a).
    - Concentrated flows will be mitigated with energy dissipaters at the discharge points to the Santa Clara River and the Santa Clara River banks will be protected by geomorphically-referenced engineering techniques, primarily with vegetated buried bank stabilization in non-jurisdictional upland areas adjacent to the river. This type of stabilization technique is the preferred approach for bank stabilization (SCCWRP, 2005a).

  For these reasons, direct hydromodification impacts of the Project on the Santa Clara River is considered less than significant.

- ***Cumulative Hydromodification Impacts***: The Project contributes only 0.5 percent of the total potential impervious surface at build out within the watershed, the Project includes hydromodification controls as Project Design Features, future development projects within the watershed will control flow in compliance with the sub-regional program, and large-scale changes naturally occur in the Santa Clara River in response to major episodic events, therefore, the Project's contribution to cumulative hydromodification impacts to the Santa Clara River will be less than significant and consistent with the requirements of the MS4 permit.

- ***Dry Weather Hydromodification Impacts***: It is predicted that all dry weather flows will be removed in the treatment control PDFs, which also provide hydrologic source control. As a result, no appreciable change in seasonality of flows is anticipated to result from development. Based on the comprehensive site planning, source control, LID, and treatment control strategy and that no dry weather flows are predicted to be discharges to the Santa Clara River, the impact of the Project on dry weather water quality and seasonality of flow in the Santa Clara River is considered less than significant.

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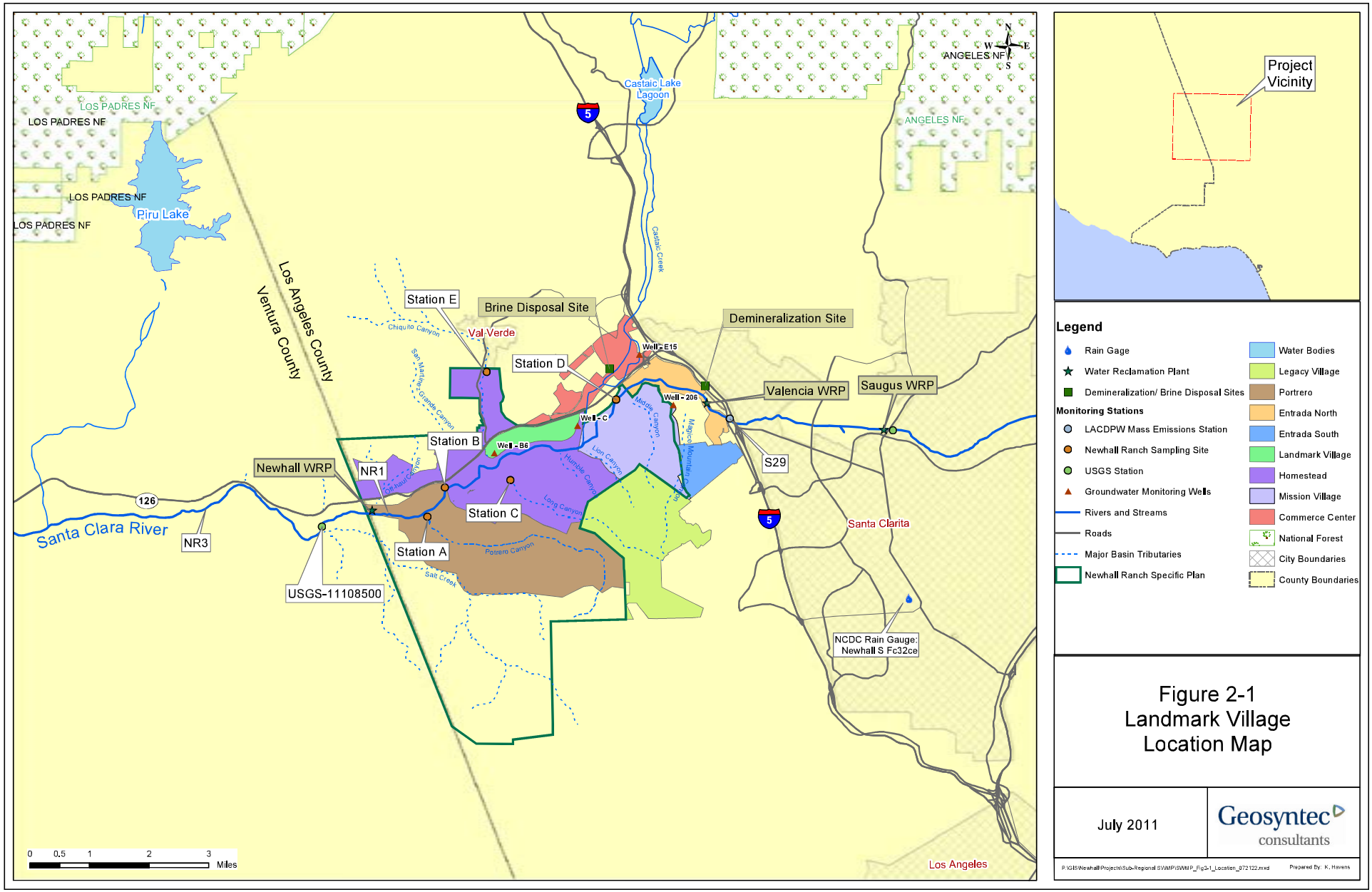


# Figure 2-1
# Landmark Village
# Location Map

July 2011

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Prepared By: K. Havens

**Legend**

- Landmark Project Boundary

**Model Land Use**

- Single-Family
- Multi-Family
- Commercial
- Recreation
- School
- Park
- Open Space
- Water Quality Facility
- Road
- Off-site Bridge
- Off-site SR-126 Right of Way

Not shown: Off-site Water Tanks

# Figure 2-2: Landmark Village Project Land Uses

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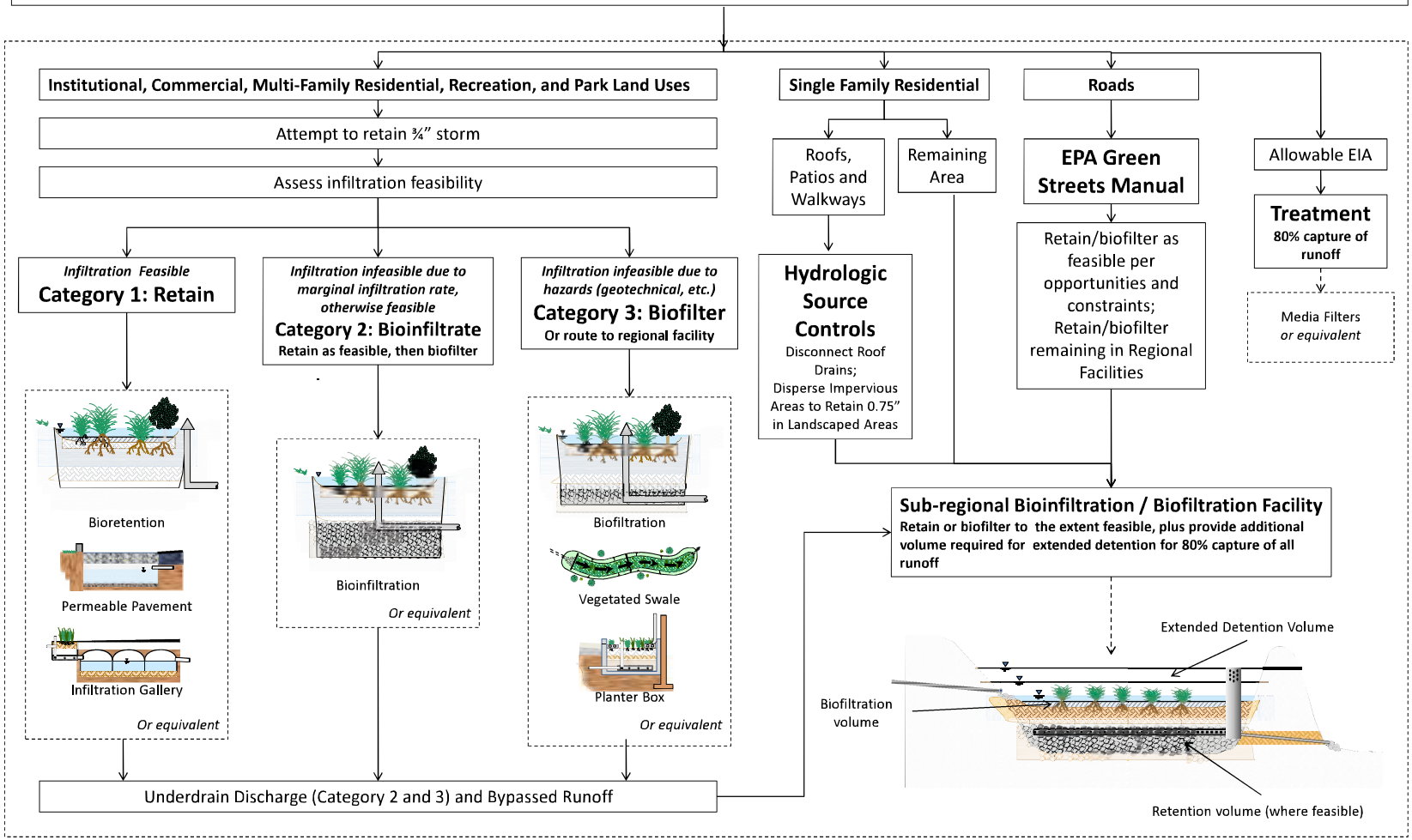
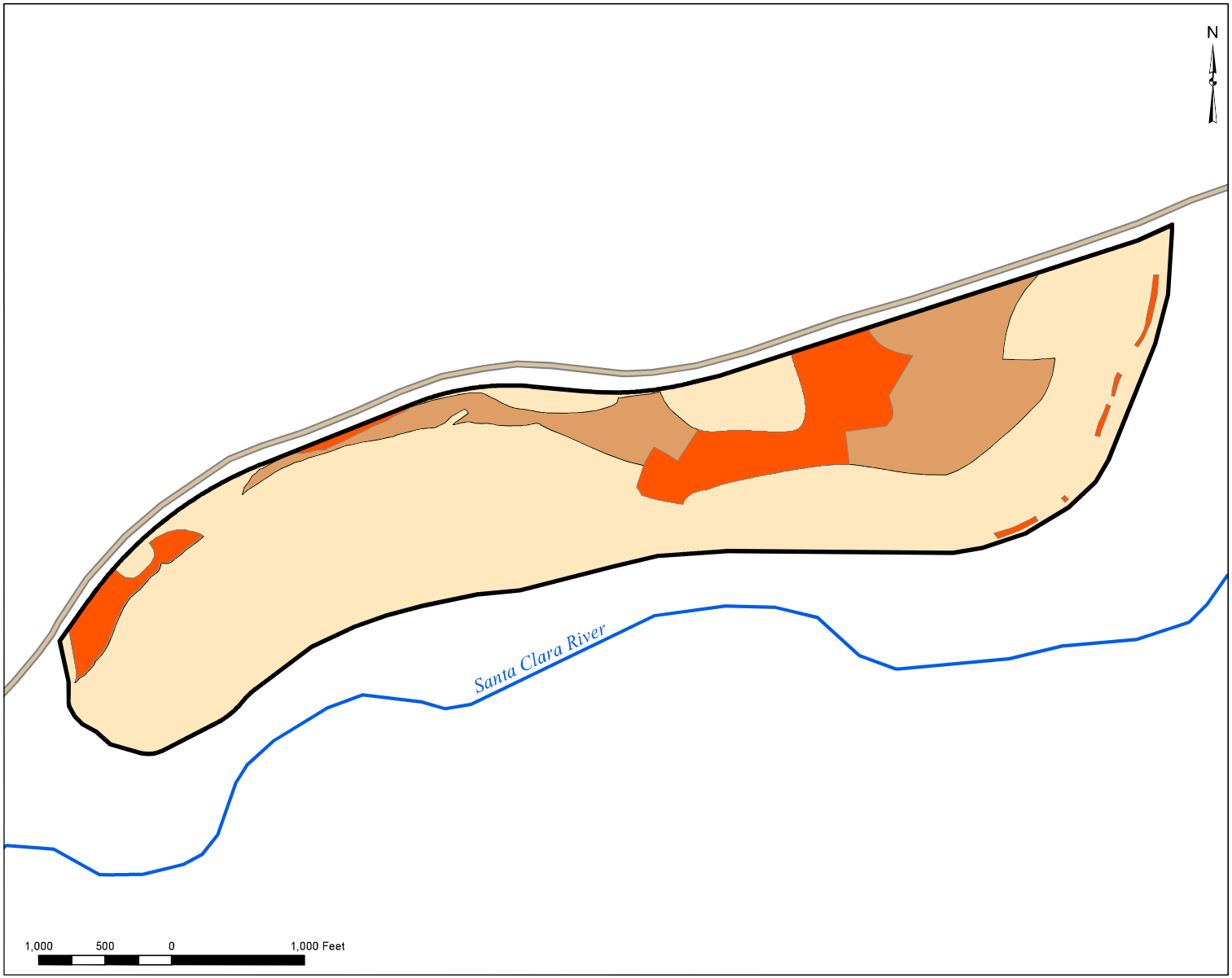
Prepared By: K. Havens

# LANDMARK VILLAGE LID PERFORMANCE STANDARD

**LID project design features (PDFs) shall be selected and sized to retain the volume of stormwater runoff produced from a 0.75 inch storm event to reduce the percentage of Effective Impervious Area (EIA) to 5 percent or less of the total project area within the vesting tentative map project and associated off-site project area. Runoff from all EIA shall be treated with treatment control measures that are selected to address the pollutants of concern and are sized to capture and treat 80 percent of the average annual runoff volume.**




| | | |
|---|---|---|
| **Landmark Village LID Performance Standard**<br>Landmark Village LID Water Quality Assessment | Geosyntec consultants | **Figure 5-1** |



**Legend**

- Landmark Project Boundary
- Infiltration Feasible*
- Infiltration Feasible**
- Partial Infiltration Feasible

* Infiltration likely feasible directly from BMP bottom

** Infiltration likely feasible with supplemental dry well

Figure 5-2:
Landmark Village
Regional Facilities and
Infiltration Feasibility Constraints

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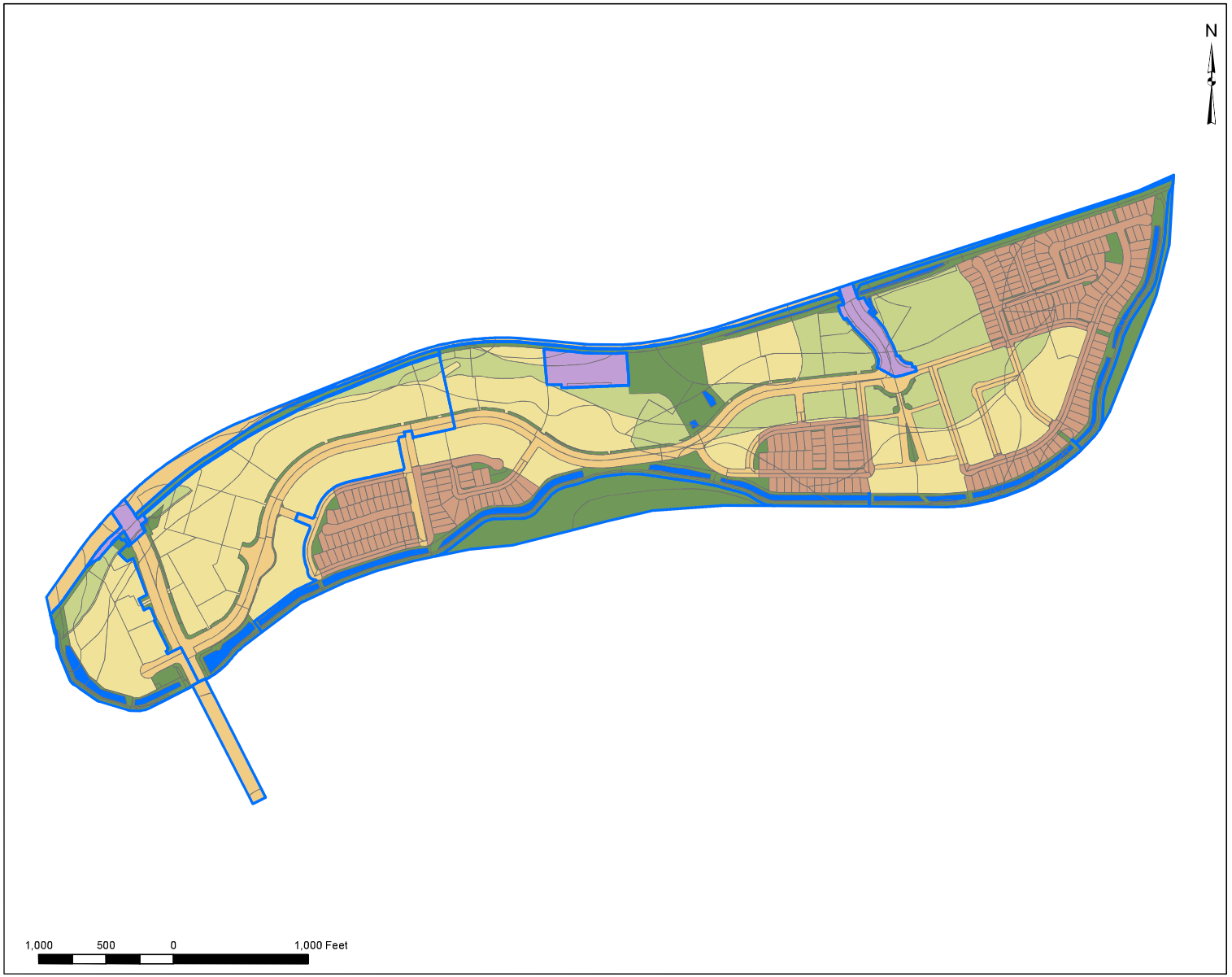
Prepared By: K. Havens

Note: Source: Alan E. Seward, 2010.



**Legend**

- Sub-regional and Treatment BMP Drainage Areas

**Parcel-based Treatment Category:**

- Open Space
- Category 1
- Category 2
- Green Streets
- Single-Family
- Treatment BMP
- Sub-regional Facility

# Figure 5-3: Landmark Village Distributed BMP Model Categories

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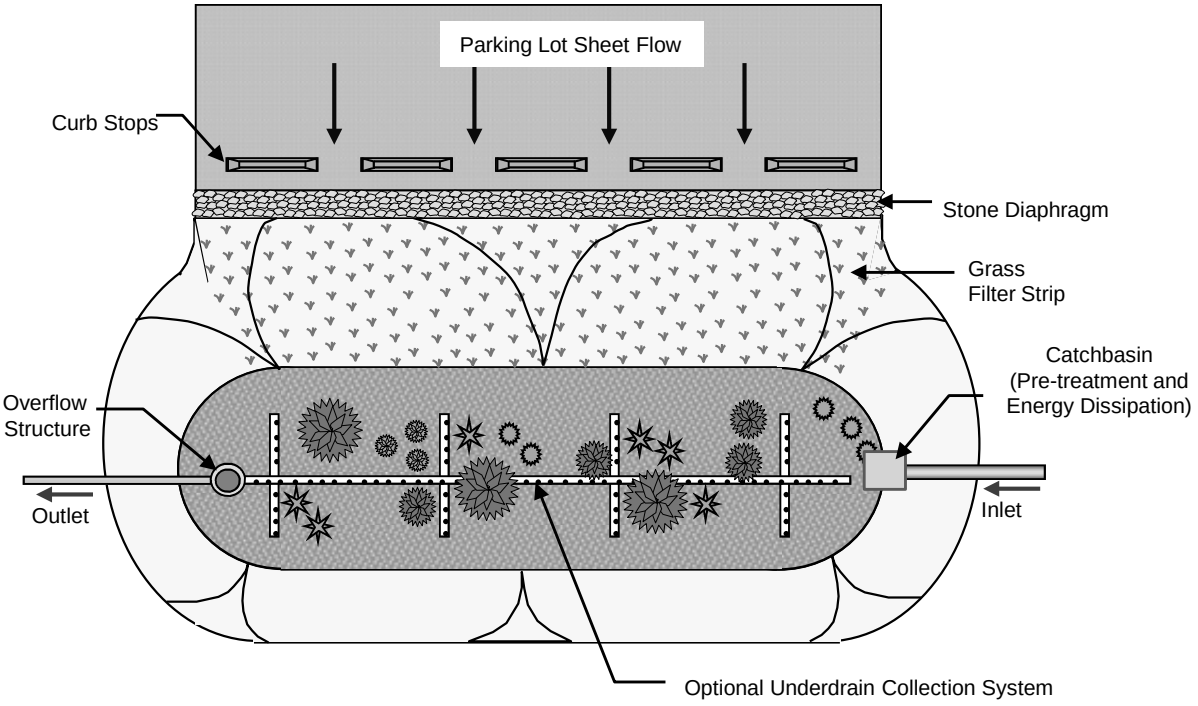
Prepared By: K. Havens

# Plan View

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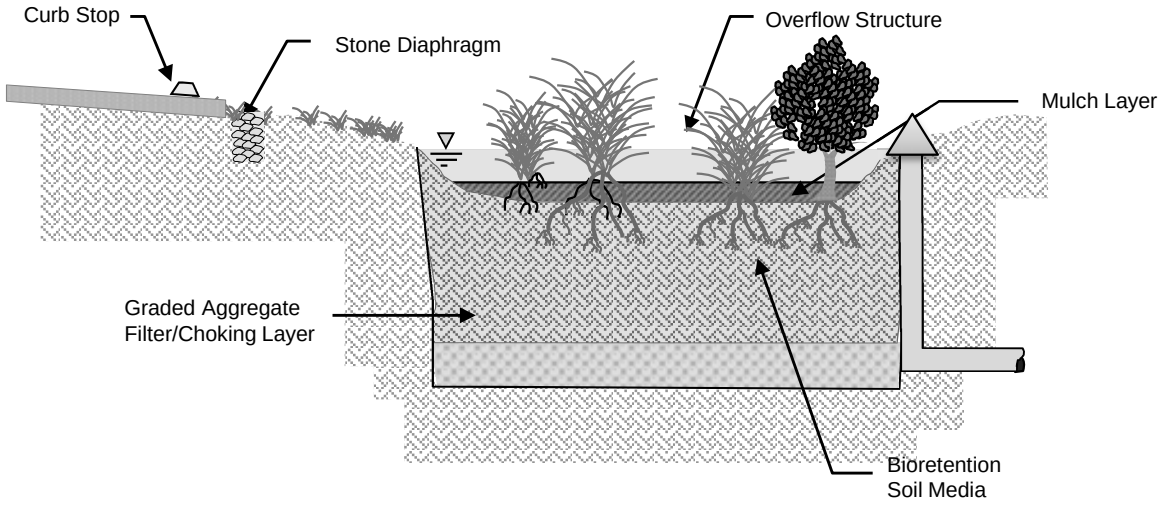


**Conceptual Illustration of a Bioretention Facility**

Landmark Village

Geosyntec consultants

Figure 5-4

Oakland | July 2011

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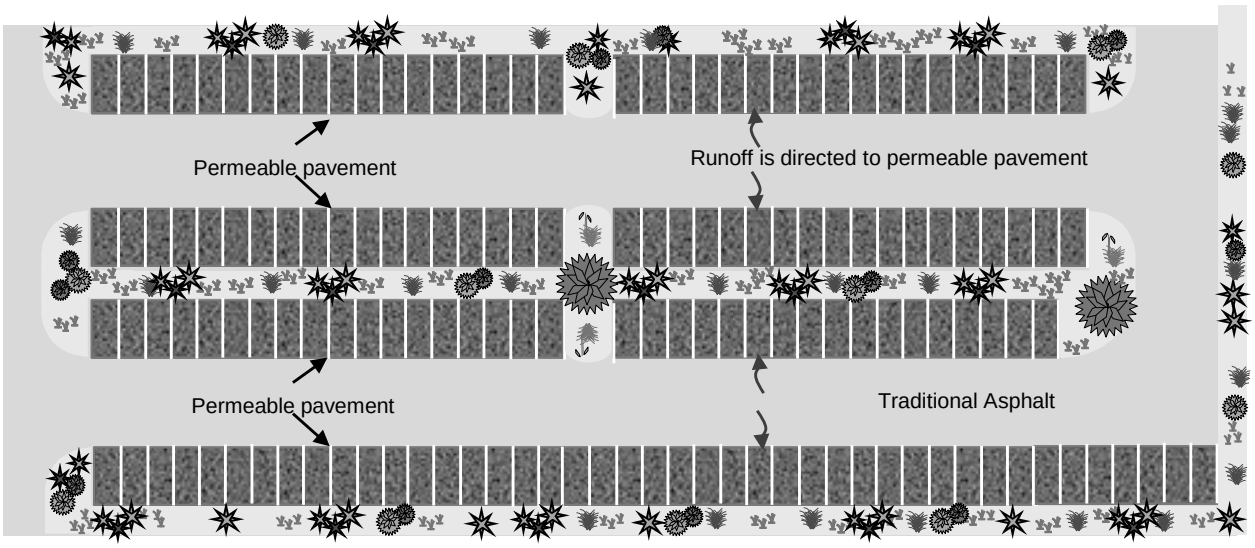
# Plan View

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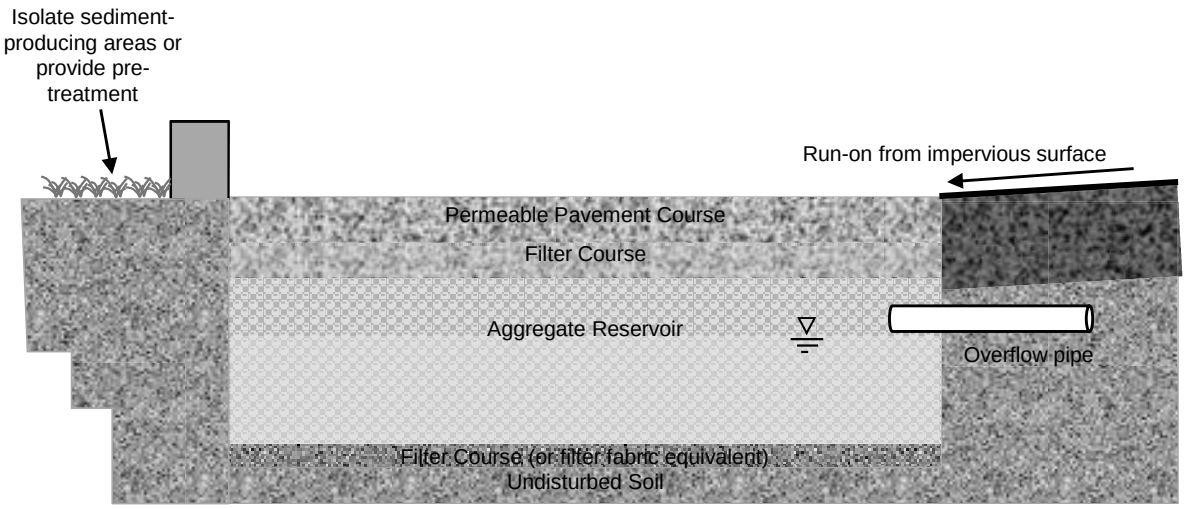


**Conceptual Illustration of Permeable Pavement**

Landmark Village

Geosyntec consultants

Figure 5-5

Oakland | July 2011

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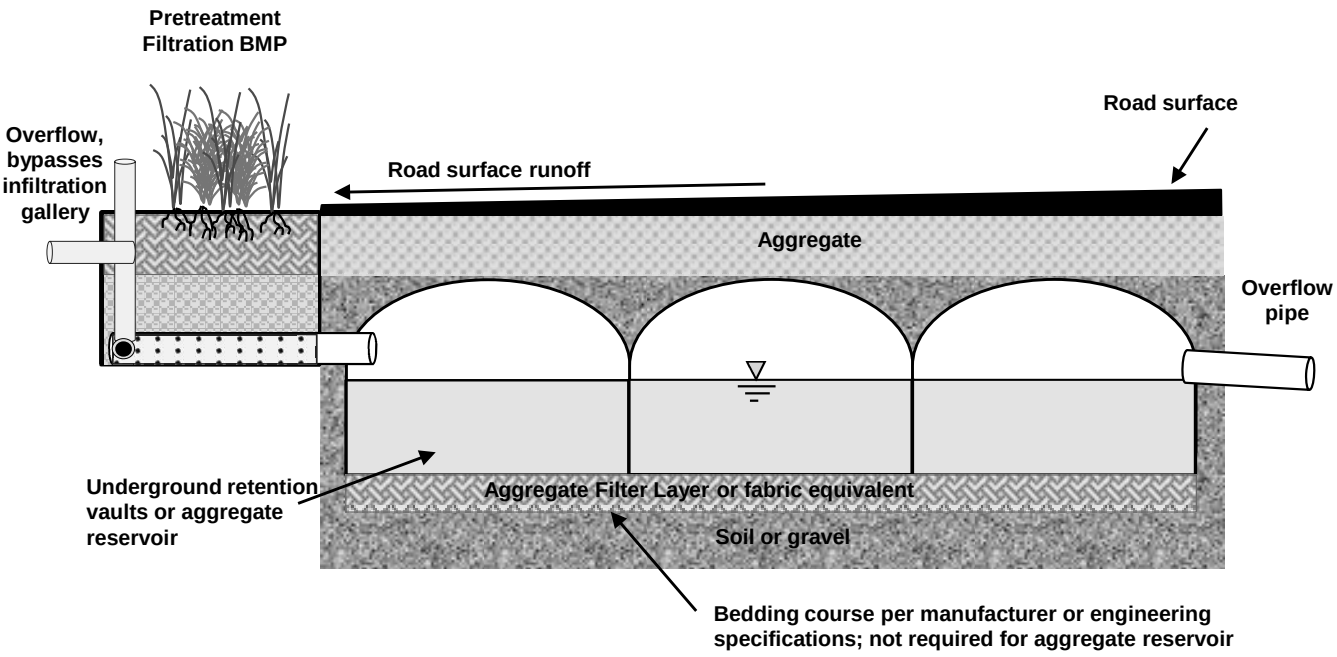


**Conceptual Illustration of an Infiltration Gallery**

Landmark Village

Geosyntec consultants

Figure 5-6

Oakland | July 2011

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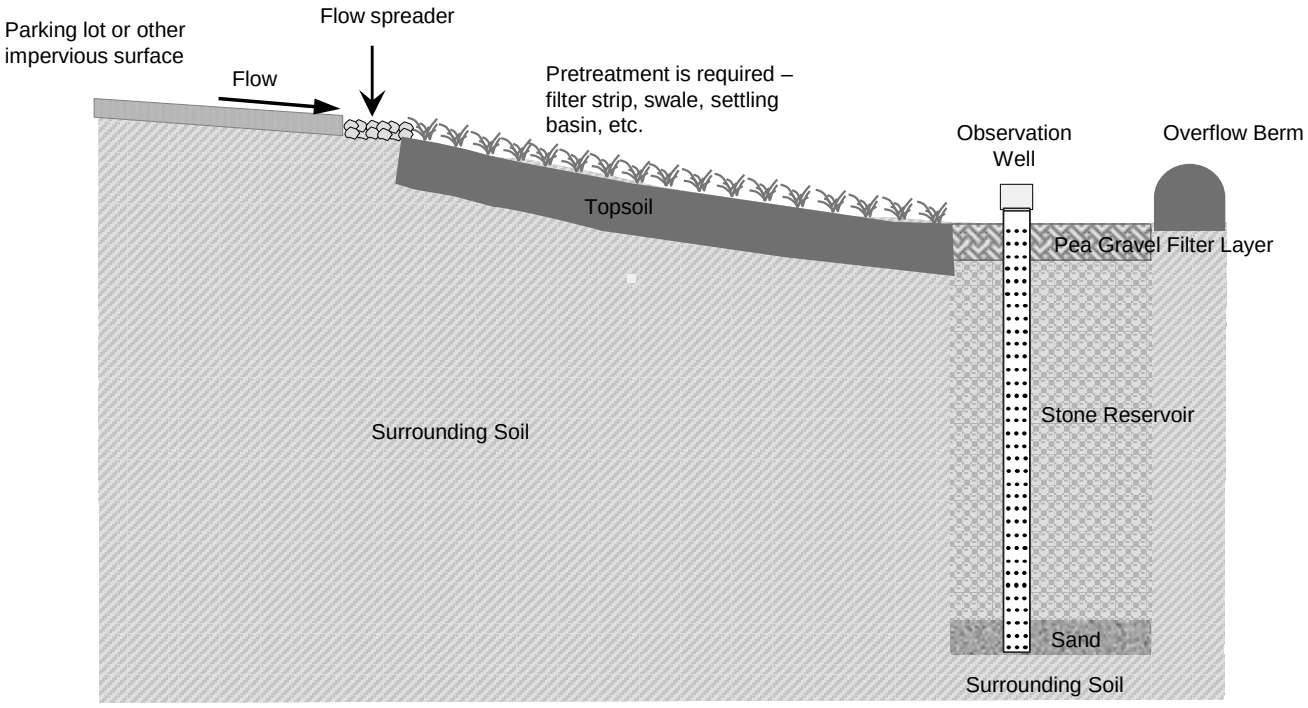


**Conceptual Illustration of an Infiltration Trench**

Landmark Village

Geosyntec consultants

Figure 5-7

Oakland | July 2011

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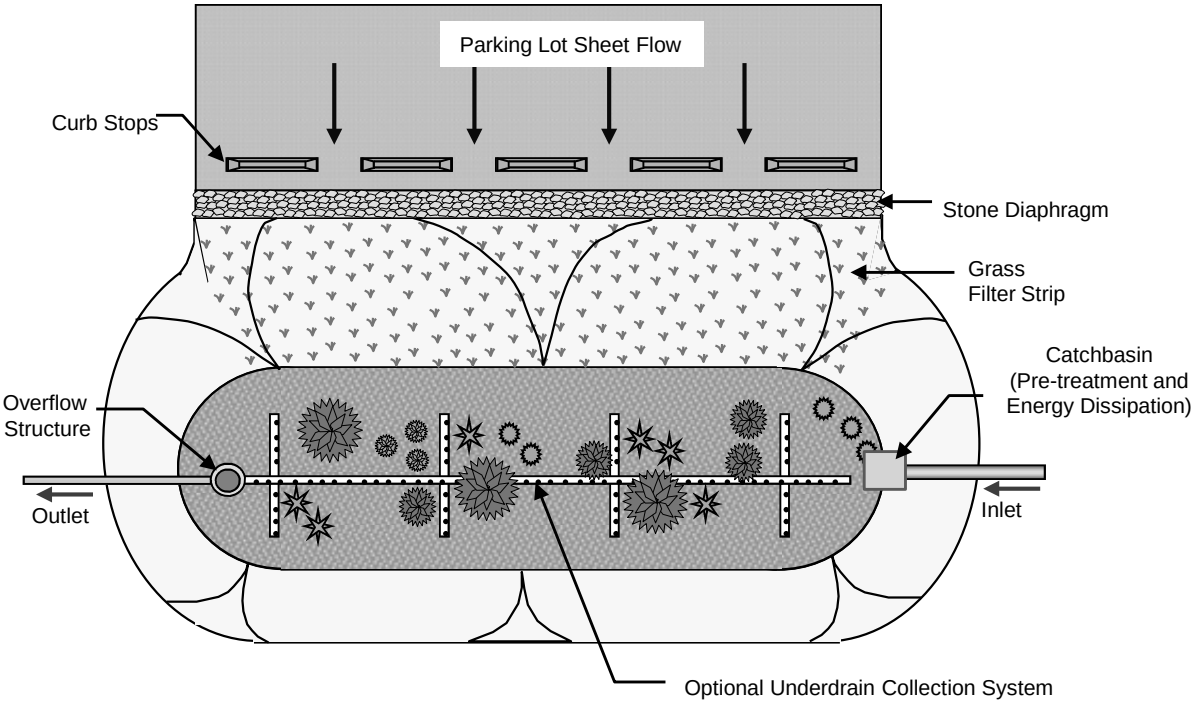
# Plan View

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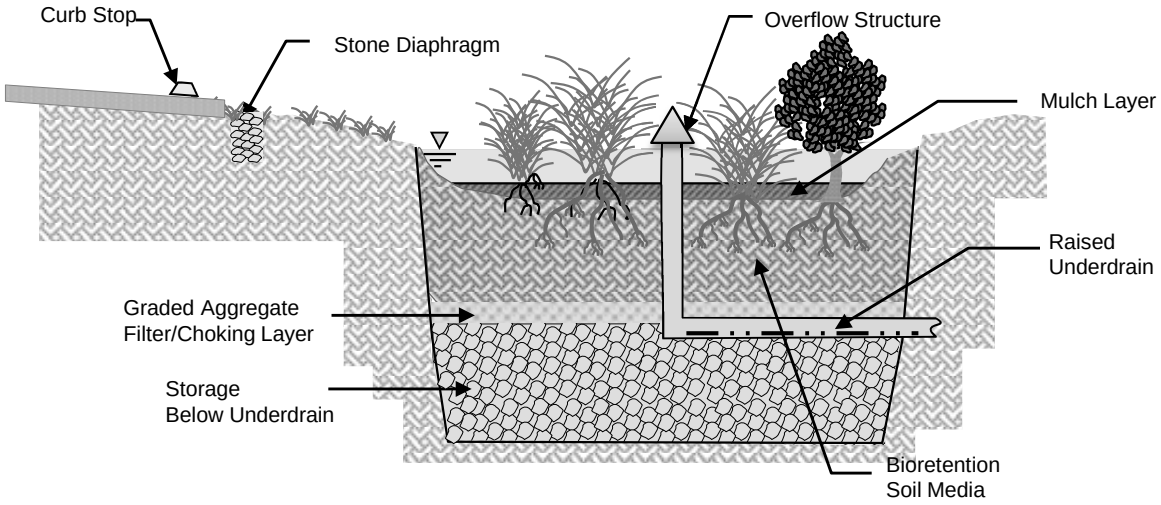


**Conceptual Illustration of a Bioinfiltration Facility**

Landmark Village

Geosyntec consultants

Figure 5-8

Oakland | July 2011

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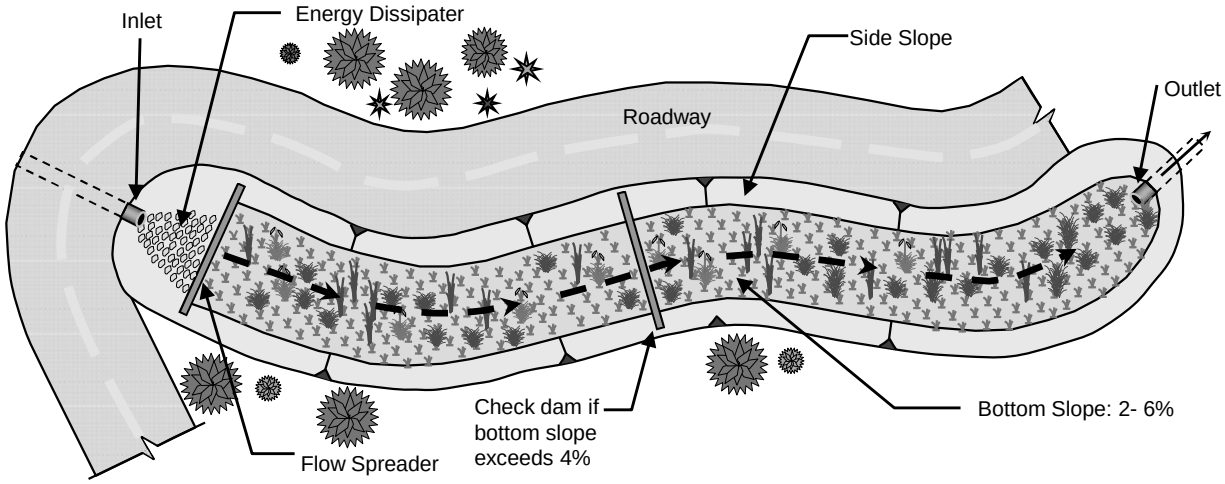
# Plan View

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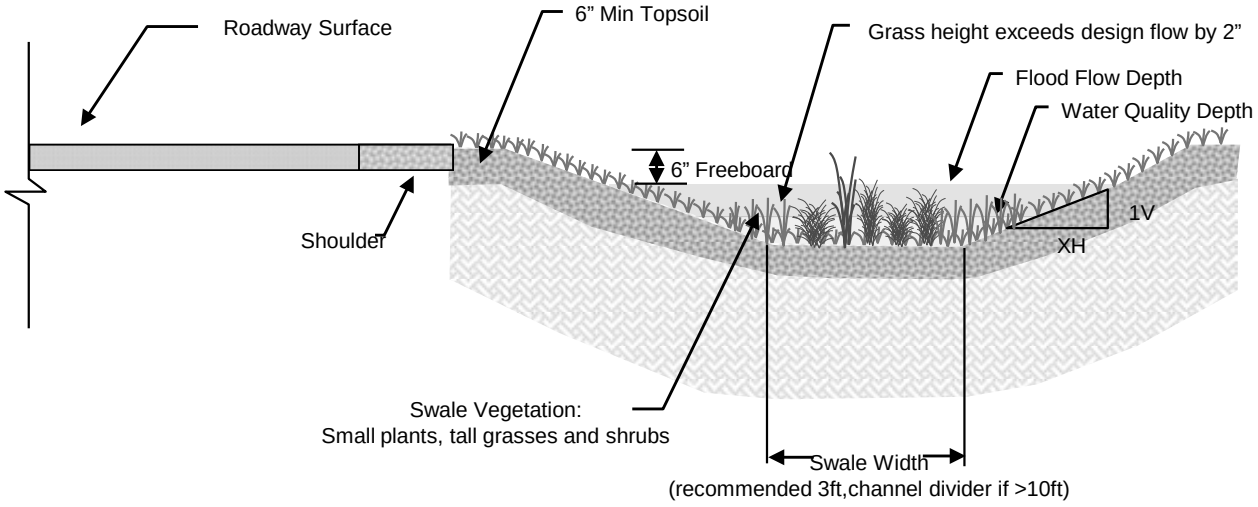


**Conceptual Illustration of a Vegetated Swale**

Landmark Village

Geosyntec consultants

Figure 5-9

Oakland | July 2011

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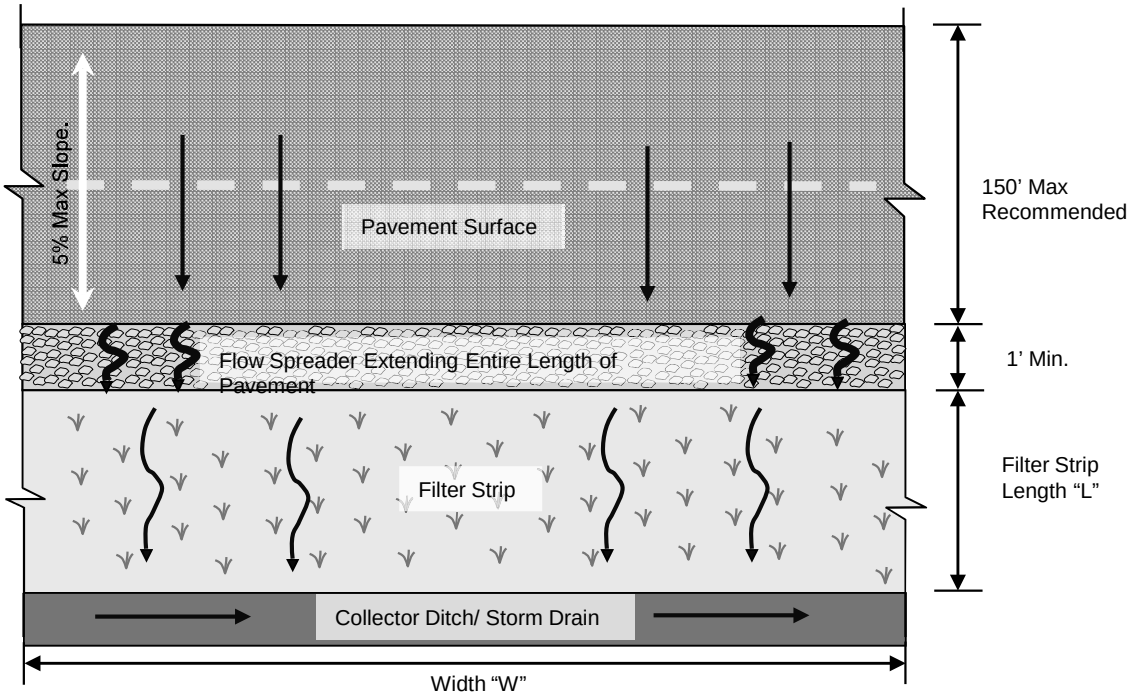


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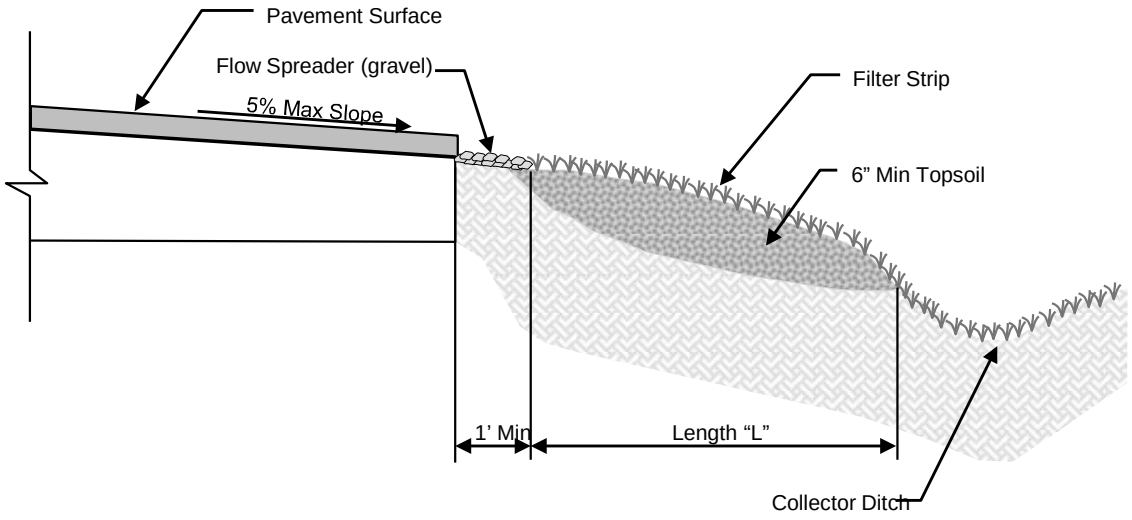


**Conceptual Illustration of a Vegetated Filter Strip**

Landmark Village

Geosyntec consultants

Figure 5-10

Oakland | July 2011

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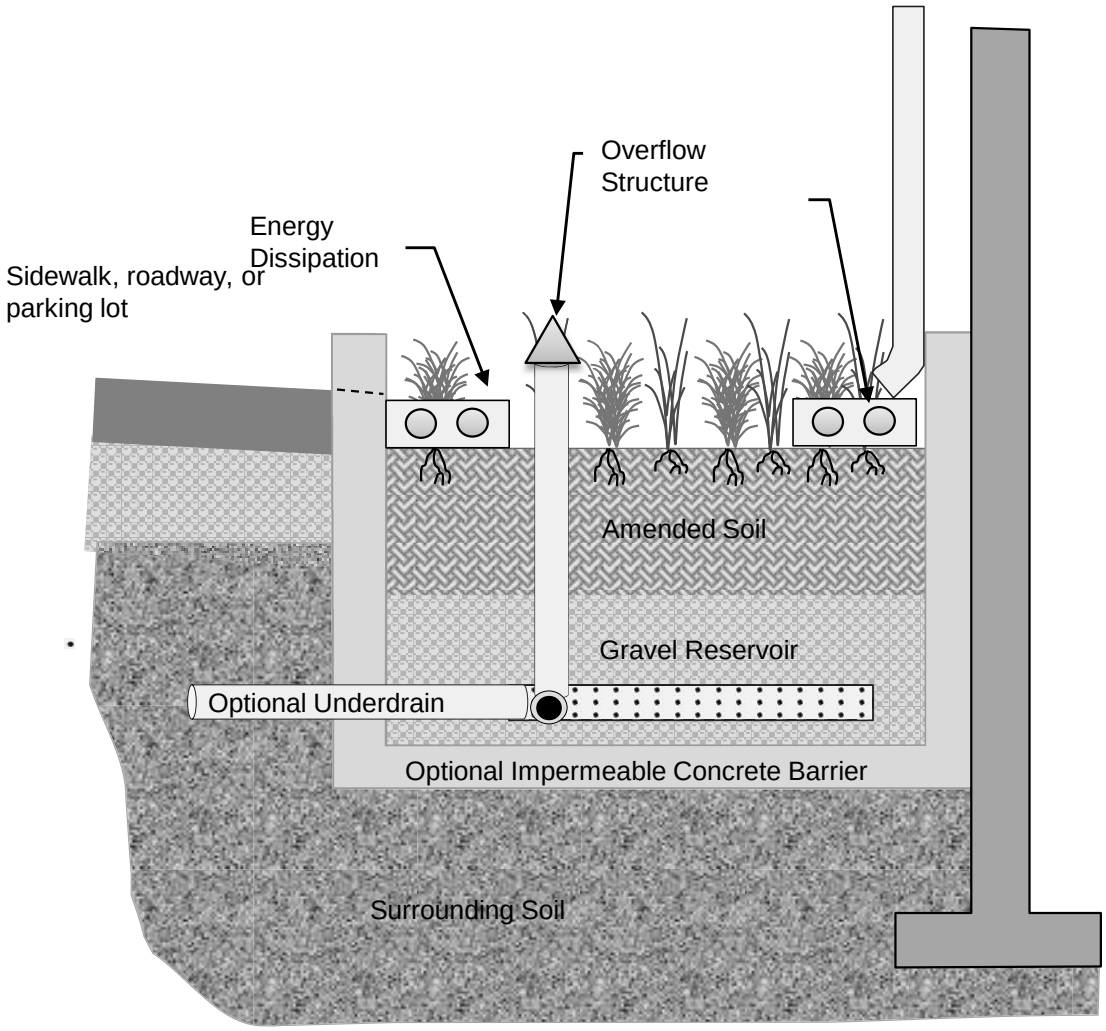


**Conceptual Illustration of a Planter Box**

Landmark Village

Geosyntec consultants

Figure 5-11

Oakland | July 2011

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## Examples of Roof Dispersion

Landmark Village

Geosyntec consultants

Figure 5-12

Oakland | July 2011

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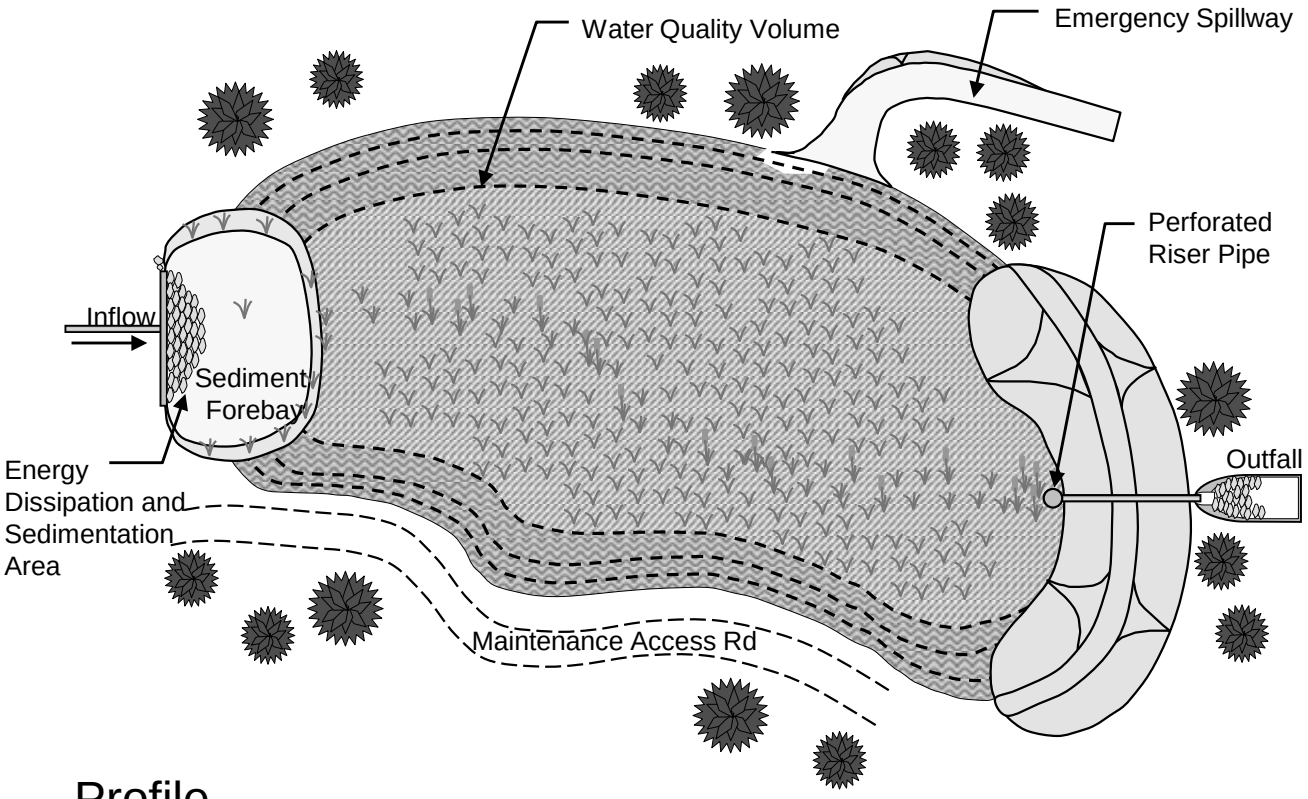
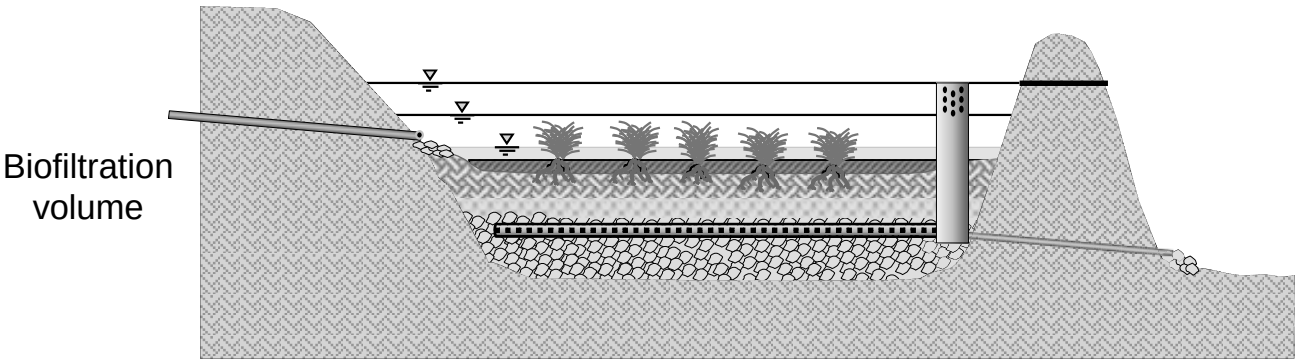
## Plan View




## Profile




**Conceptual Illustration of a Regional Infiltration/Biofiltration Facility**
Landmark Village

Geosyntec consultants

Figure 5-13

Oakland | July 2011

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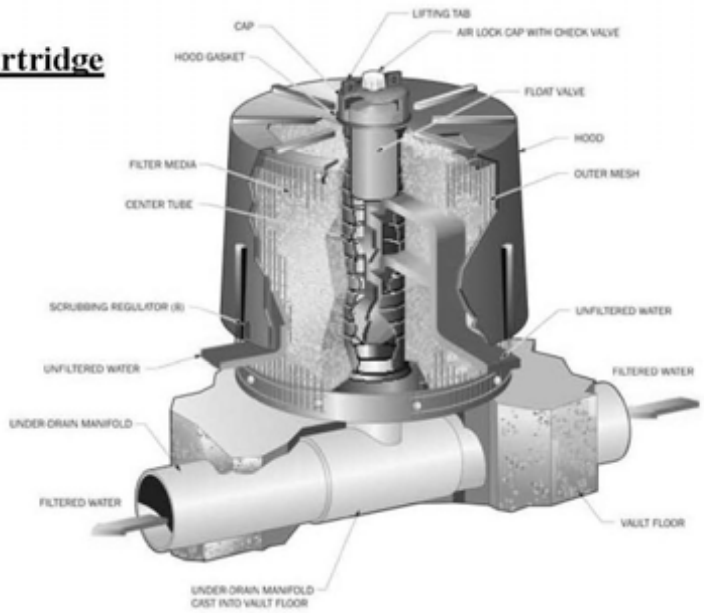
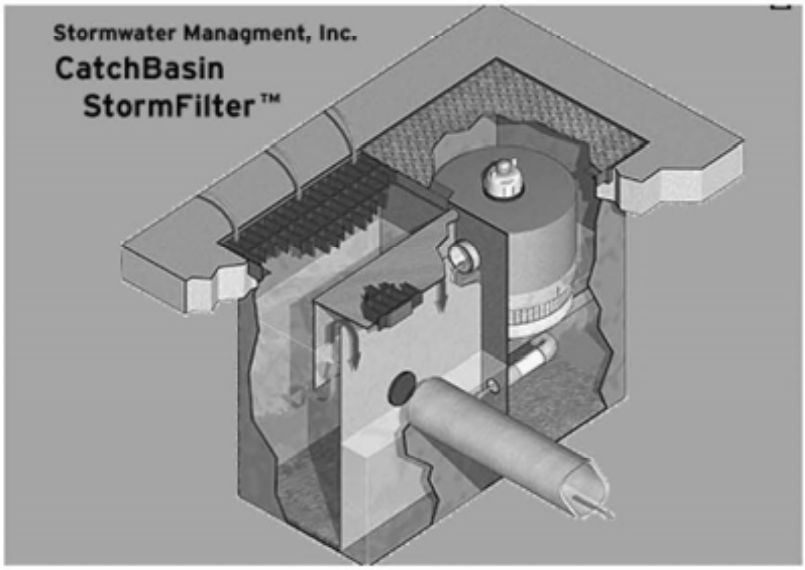
## StormFilter Media Cartridge




## Example configuration of Catch Basin Storm Filter




**Conceptual Illustration of a Media Filter**

Landmark Village

Geosyntec consultants

Figure 5-14

Oakland | July 2011

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# Landmark Village Water Quality Technical Report Appendices

## (A) Pollutants of Concern

## (B) Modeling Parameters & Methodology

## (C) Newhall Ranch Stormwater Monitoring Data

## (D) "Review of Bacteria Data from Southern California Watersheds"

## (E) "Effect of Urbanization on Groundwater Recharge in the Santa Clarita Valley"

## (F) "Assessment of Potential Impacts Resulting from Cumulative Hydromodification Effects, Selected Reaches of the Santa Clara River, Los Angeles County, California"

## (G) LID Water Quality Modeling Methodology

## (H) Geologic/Geotechnical Report, Assessment of Infiltration Parameters

# A. POLLUTANTS OF CONCERN

## A.1. Pollutants of Concern

| Pollutant of Concern [(1)] | Rationale for Selection / Exclusion | Significance Criteria |
|---|---|---|
| Sediment: Total Suspended Solids (TSS) & Turbidity | 1. Sediment is a common component of stormwater, and can be a pollutant. Sediment can be detrimental to aquatic life (primary producers, benthic invertebrates, and fish) by interfering with photosynthesis, respiration, growth, reproduction, and oxygen exchange in water bodies. Sediment can transport other pollutants that are attached to it including nutrients, trace metals, and hydrocarbons. Sediment is the primary component of total suspended solids (TSS), a common water quality analytical parameter (CASQA, 2003).<br>2. Turbidity is a measure of suspended matter that interferes with the passage of light through the water or in which visual depth is restricted. Turbidity may be caused by a wide variety of suspended materials, which range in size from colloidal to coarse dispersions, depending upon the degree of turbulence. In lakes or other waters existing under relatively quiescent conditions, most of the turbidity will be due to colloidal and extremely fine dispersions. In rivers under flood conditions, most of the turbidity will be due to relatively coarse dispersions. Erosion of clay and silt soils may contribute to in-stream turbidity. Organic materials reaching rivers serve as food for bacteria, and the resulting bacterial growth and other microorganisms that feed upon the bacteria produce additional turbidity. Nutrients in runoff may stimulate the growth of algae, which may also contribute to turbidity. Discharges of turbid runoff are primarily of concern during the construction phase of development. | 1. Narrative objective in the Basin Plan: "Water shall not contain suspended or settleable material in concentrations that cause nuisance or adversely affect beneficial uses."<br>2. Basin Plan objective for turbidity: "Waters shall be free of changes in turbidity that cause nuisance or adversely affect beneficial uses. Increases in natural turbidity attributable to controllable water quality factors shall not exceed the following limits:<br>Natural Turbidity — Max Increase<br>0-50 NTU — 20%<br>> 50 NTU — 10%<br>Allowable zones of dilution within which higher concentrations may be tolerated may be defined for each discharge in specific Water Discharge Requirements." |

| **Pollutant of Concern [(1)]** | **Rationale for Selection / Exclusion** | **Significance Criteria** |
|---|---|---|
| Nutrients: Ammonia, Nitrite, Nitrate, Total Nitrogen, and Total Phosphorus | 1. Nutrients including nitrogen and phosphorus are the major plant nutrients used for fertilizing landscapes, and are often found in stormwater. These nutrients can result in excessive or accelerated growth of vegetation, such as algae, resulting in impaired use of water in lakes and other sources of water supply. For example, nutrients have led to a loss of water clarity in Lake Tahoe. In addition, un-ionized ammonia (one of the nitrogen forms) can be toxic to fish (CASQA, 2003). | 1. Basin Plan standards for ammonia: "In order to protect aquatic life, ammonia concentrations in receiving waters shall not exceed the values listed for the corresponding in-stream conditions in Tables 3-1 to 3-4." The criterion for ammonia in Tables 3-1 to 3-4 varies with pH and temperature; the criterion is lower for lower pH and temperature. The basin plan amendment for updated ammonia standards (dated 04/02, effective July 15, 2003) will be used.<br>2. Basin Plan surface water standards for nitrogen: "Waters shall not exceed 10 mg/L nitrogen as nitrate-nitrogen plus nitrite-nitrogen ($NO_3$-N + $NO_2$-N), 45 mg/L as nitrate ($NO_3$), 10 mg/L as nitrate-nitrogen ($NO_3$-N), or 1 mg/L as nitrite-nitrogen ($NO_2$-N) or as otherwise designated in Table 3-8." Table 3-8 lists Santa Clara River Reach 5 with a water quality objective of 5 mg/L nitrate-N + nitrite-N.<br>3. Basin Plan groundwater standards for nitrogen: "Ground waters shall not exceed 10 mg/L nitrogen as nitrate-nitrogen plus nitrite-nitrogen ($NO_3$-N + $NO_2$-N), 45 mg/L as nitrate ($NO_3$), 10 mg/L as nitrate-nitrogen ($NO_3$-N), or 1 mg/L as nitrite-nitrogen ($NO_2$-N)."<br>4. Resolution 03-011 (LARWQCB, 08/2003) promulgates Nitrogen Compounds TMDLs for Santa Clara River Reach 5. The numeric target for NO3-N + NO2-N in the Nitrogen Compounds TMDL was based on achieving the existing water quality objective of 5 mg/L NO3-N + NO2-N. The numeric target that was used to calculate the wasteload allocations included a 10% margin of safety; thus the numeric target is 4.5 mg/L NO3-N + NO2-N (30-day average).<br>The water quality objectives for ammonia in Reach 5 used in the Nitrogen Compounds TMDL are: |

| **Pollutant of Concern** [(1)] | **Rationale for Selection / Exclusion** | **Significance Criteria** |
|---|---|---|
| | | TMDL Ammonia Water Quality Objective (mg/L as N)<br>1-hr average / 30-day average<br>Reach 5 at County Line 3.4 / 1.2<br>Reach 5 below Valencia 5.5 / 2.0<br>Reach 5 above Valencia 4.8 / 2.0<br>5. Narrative objective for biostimulatory substances in the Basin Plan: "Waters shall not contain biostimulatory substances in concentrations that promote algal growth to the extent that such growth causes nuisance or adversely affects beneficial uses." |
| Trace metals: Aluminum, Copper, Lead, and Zinc | 1. Trace metals are commonly found in stormwater. Many of the artificial surfaces of the urban environment (e.g., galvanized metal, paint, automobiles, or preserved wood) contain metals, which enter stormwater as the surfaces corrode, flake, dissolve, decay, or leach. Over half the trace metal load carried in stormwater is associated with sediments. Metals are of concern because they can be toxic to aquatic organisms, can bioaccumulate (accumulate to toxic levels in aquatic animals such as fish), and have the potential to contaminate drinking water supplies (CASQA, 2003).<br>2. Aluminum has been identified by the DPW as a constituent of concern for the Santa Clara River based on monitoring conducted at mass emission station S29 (LACDPW, 2005). | 1. Narrative objective in the Basin Plan: "All waters shall be maintained free of toxic substances in concentrations that are toxic to, or that produce detrimental physiological responses in human, plant, animal, or aquatic life. …"<br>2. The CTR criteria are the applicable water quality objectives for protection of aquatic life (40 CFR §131.38). The CTR criteria are expressed for acute and chronic (4-day average) conditions; however, only acute conditions are applicable for stormwater discharges because the duration of stormwater discharge is typically less than 4 days in the Project area.<br>3. CTR criteria are determined on the basis of hardness in the receiving water. In application of criteria to the Landmark Village project, a hardness value of 250 mg/L based on the minimum observed value at USGS monitoring station will be used. |

| **Pollutant of Concern [(1)]** | **Rationale for Selection / Exclusion** | **Significance Criteria** |
|---|---|---|
| | | 4. CTR criteria at 250 mg/L hardness are as follows:<br>a. Dissolved copper – 32 µg/L.<br>b. Total lead – 260 µg/L.<br>c. Dissolved zinc – 250 µg/L.<br>5. The CTR does not include aluminum. The NAWQC contains an acute criterion for acid soluble aluminum (750 µg/L for a pH range of 6.5 to 9.0). |
| Chloride | 1. Resolution No. R03-008, Amendment to the Water Quality Control Plan (Basin Plan) for the Los Angeles Region to Incorporate a Total Maximum Daily Load for Chloride in the Upper Santa Clara River (07/03) states: Elevated chloride concentrations are causing impairments of the water quality objective in Reach 5 and Reach 6 of the Santa Clara River. This objective was set to protect all beneficial uses; agricultural beneficial uses have been determined to be most sensitive, and not currently attained at the downstream end of Reach 5 and Reach 6 in the Upper Santa Clara River. Irrigation of salt sensitive crops such as avocados and strawberries with water containing elevated levels of chloride results in reduced crop yields. Chloride levels in groundwater are also rising. | 1. The Basin Plan chloride objective for Reach 5 of the Santa Clara River is 100 mg/L.<br>2. The TMDL wasteload allocation for MS4 discharges into Santa Clara River Reach 5 is 100 mg/L. |

| **Pollutant of Concern** [(1)] | **Rationale for Selection / Exclusion** | **Significance Criteria** |
|---|---|---|
| Pathogens (Bacteria, Viruses, and Protozoa) | 1. Bacteria and viruses are common contaminants of stormwater. For separate storm drain systems, sources of these contaminants include animal excrement and sanitary sewer overflow. High levels of indicator bacteria in stormwater have led to the closure of beaches, lakes, and rivers to contact recreation such as swimming (CASQA, 2003).<br>2. Fecal and total coliform are frequently monitored indicator organisms of pathogens.<br>3. Human-related activities can increase coliform concentrations.<br>4. Concentrations of coliform in stormwater also can be elevated due to the presence of coliform bacteria from natural sources. | 1. Basin Plan objectives are based on the designated uses of the water body. Santa Clara River Reach 5 is listed with a REC1 beneficial use. Resolution No. 01-018 (LARWQCB, 2001) amended the Basin Plan objectives for bacteria in waters with a contact recreation beneficial use. These standards for freshwaters are<br><u>Geometric Mean</u> <u>Single Sample</u><br>E. coli ≤ 126/100 mL ≤ 235/100 mL<br>fecal coliform ≤ 200/100 mL ≤ 400/100 mL |
| Petroleum Hydrocarbons: Oil & Grease and Polycyclic Aromatic Hydrocarbons (PAHs) | 1. Oil and grease includes a wide array of hydrocarbon compounds, some of which are toxic to aquatic organisms at low concentrations. Sources of oil and grease include leakage, spills, cleaning and sloughing associated with vehicle and equipment engines and suspensions, leaking and breaks in hydraulic systems, restaurants, and waste oil disposal (CASQA, 2003).<br>2. Hydrocarbons are hydrophobic (low solubility in water), have the potential to volatilize, and most forms are biodegradable. A subset of hydrocarbons, Polynuclear Aromatic Hydrocarbons (PAHs) can be toxic depending on the concentration levels, exposure history, and sensitivity of the receptor organisms. Of particular concern are those PAH compounds associated with transportation-related sources.<br>3. Petroleum hydrocarbons are ubiquitous, and used in a wide variety of applications. Potential sources are generally expected to increase with urban development and potentially during construction of the Project. | 1. Narrative objective in the Basin Plan for oil & grease: "Waters shall not contain oils, greases, waxes, or other materials in concentrations that result in a visible film or coating on the surface of the water or on objects in the water, that cause nuisance or that otherwise adversely affect beneficial uses."<br>2. PAHs are a class of compounds. CTR values for individual PAHs are available for protection of human health only. There are no regulatory standards for PAHs for the protection of aquatic health. |

| **Pollutant of Concern** [(1)] | **Rationale for Selection / Exclusion** | **Significance Criteria** |
|---|---|---|
| Pesticides | 1. Pesticides (including herbicides, fungicides, rodenticides, and insecticides) have been repeatedly detected in stormwater at toxic levels, even when pesticides have been applied in accordance with label instructions. As pesticide use has increased, so too have concerns about adverse effects of pesticides on the environment and human health. Accumulation of these compounds in simple aquatic organisms, such as plankton, provides an avenue for biomagnification through the food web, potentially resulting in elevated levels of toxins in organisms that feed on them, such as fish and birds (CASQA, 2003).<br>2. Pesticides loads may be present in runoff from developed areas due to pesticide use for urban landscaping. | 1. Narrative objective in the Basin Plan: "Waters designated for use as domestic or municipal supply (MUN) shall not contain concentrations of pesticides in excess of the limiting concentrations specified in … Title 22 of the California Code of Regulations …." Title 22 contains maximum contaminant levels for a range of pesticides.<br>2. CTR lists numeric objectives for some, but not all pesticides. There are no CTR criteria for diazinon and chlorpyrifos, but these pesticides, along with other toxic legacy pesticides such as Chlordane, Dieldrin, DDT, and Toxaphene, are now banned from most residential uses. |

| **Pollutant of Concern** [(1)] | **Rationale for Selection / Exclusion** | **Significance Criteria** |
|---|---|---|
| Trash and Debris | 1. Gross Pollutants (trash, debris, and floatables) may include heavy metals, pesticides, and bacteria in stormwater. Typically resulting from an urban environment, industrial sites and construction sites, trash and floatables may create an aesthetic "eye sore" in waterways. Gross pollutants also include plant debris (such as leaves and lawn-clippings from landscape maintenance), animal excrement, street litter, and other organic matter. Such substances may harbor bacteria, viruses, vectors, and depress the dissolved oxygen levels in streams, lakes, and estuaries sometimes causing fish kills (CASQA, 2003).<br>2. During the construction phase, there is potential for an increase in trash and debris loads due to lack of proper contractor good housekeeping practices at the construction site. | 1. Basin Plan narrative floating material objective: "Waters shall not contain floating materials, including solids, liquids, foams, and scum, in concentrations that cause a nuisance or adversely affect beneficial uses."<br>2. Basin Plan narrative settleable materials objective: "Waters shall not contain suspended or settleable material in concentrations that cause nuisance or adversely affect beneficial uses."<br>3. Basin Plan narrative Biochemical Oxygen Demand (BOD5) objective: "Waters shall be free of substances that result in increases in the BOD which adversely affect beneficial uses."<br>4. Basin Plan objectives for dissolved oxygen (DO): "At a minimum (see specifics below), the mean annual dissolved oxygen concentration of all waters shall be greater than 7 mg/L, and no single determination shall be less than 5.0 mg/L, except when natural conditions cause lesser concentrations.<br>The dissolved oxygen concentration of all surface waters designated as WARM shall not be depressed below 5 mg/L as a result of waste discharges." |
| MBAS (Methylene blue activated substances) | 1. MBAS are related to the presence of detergents in water. Positive results may indicate the presence of wastewater or be associated with urban runoff due to commercial and/or residential vehicle washing or other outdoor washing activities. Surfactants disturb the surface tension which affects insects and can affect gills in aquatic life. | 1. Basin Plan objective for MBAS: "Waters shall not have MBAS concentrations greater than 0.5 mg/L in water designated (MUN)." |
| Cyanide | 1. Cyanide has been identified by the Los Angeles County Department of Public Works as a constituent of concern for the Santa Clara River based on monitoring conducted at mass emission Station S29 | 1. The CTR criteria are the applicable water quality objectives for protection of aquatic life (40 CFR 131.38). The CTR criteria are expressed for acute and chronic (4-day average) |

| Pollutant of Concern [1] | Rationale for Selection / Exclusion | Significance Criteria |
|---|---|---|
| | (LACDPW, 2005). Cyanide is used in electroplating, metallurgy, and gold mining. It is also used to make synthetic fibers, plastics, dyes, pharmaceuticals, and pesticides, including fumigants. In addition, cyanide serves as a chemical intermediate in various production processes. Natural cyanides are produced by certain bacteria, fungi, and algae, and they are present in a number of plants and foods as cyanogenic glycosides. Man-made cyanides typically enter the environment from metal finishing and organic chemical industries. Other sources include iron and steel works, municipal waste burning, cyanide-containing pesticides, road deicers, and vehicle exhaust. | conditions; however, only acute conditions are applicable for stormwater discharges because the duration of stormwater discharge is typically less than 4 days in the Project area. CTR freshwater aquatic life protection acute criteria is 22 µg/L. |
| Bioaccumulation | 1. Some pollutants of concern in stormwater runoff, such as metals or pesticides, have the potential to bioaccumulate in aquatic organisms potentially affecting the health of those organism or other species higher up the food chain. | 1. Although bioaccumulation is not a pollutant, it is a condition of concern. The Basin Plan objective for bioaccumulation is: "Toxic pollutants shall not be present at levels that would bioaccumulate in aquatic life to levels which are harmful to aquatic life or human health." |
| Oxygen, Dissolved & BOD (Biochemical oxygen demand) | 1. Adequate DO levels are required to support aquatic life. Depressed levels may lead to anaerobic conditions.<br>2. BOD can result in decreased dissolved oxygen levels affecting beneficial uses such as habitat designations.<br>3. DO & BOD are correlated to nutrients and other organic compounds and are subsumed by those categories. | 1. Basin Plan objective for dissolved oxygen: "The dissolved oxygen content of all surface waters designated as WARM shall not be depressed below 5 mg/L as a result of waste discharges."<br>2. Basin Plan objective for BOD: "Waters shall be free of substances that result in increases in the BOD which adversely affect beneficial uses." |

| **Pollutant of Concern [(1)]** | **Rationale for Selection / Exclusion** | **Significance Criteria** |
|---|---|---|
| Biostimulatory substances | 1. Biostimulatory substances include excess nutrients and other compounds that stimulate aquatic growth resulting in impaired aesthetics and water quality impairments such as lowered dissolved oxygen values.<br>2. Biostimulatory substances are correlated to nutrients and other organic compounds and are subsumed by those categories. | 1. Basin Plan objectives for biostimulatory substances: "Waters shall not contain biostimulatory substances in concentrations that promote aquatic growth to the extent that such growth causes nuisance of adversely affects beneficial uses." |
| Chemical Pollutants | 3. Chemical pollutants in excessive amounts in drinking water are harmful to human health.<br>4. The chemical pollutants referenced under this water quality objective, such as trace metals and nitrate, are either subsumed by the categories above, or are not found in urban runoff (e.g., fluoride). | 2. Basin Plan objectives for chemical Pollutants: "Surface waters shall not contain concentrations of chemical Pollutants in amounts that adversely affect any designated beneficial use." |
| Temperature | 1. Elevated temperatures are typically associated with discharges of process wastewaters or non-contact cooling waters. Increase in temperature can result in lower dissolved oxygen levels impairing habitat and other beneficial uses of receiving waters. Stormwater runoff from the Project site is expected to cool somewhat during treatment in structural BMPs and will be diluted in the receiving water. As the beneficial uses in the receiving waters for the Project include warm freshwater habitat to support warm water ecosystems, any increase in temperature resulting from stormwater runoff from the project is expected to be less than significant. | 1. Basin Plan objectives for temperature: "For waters designated WARM, water temperature shall not be altered by more than 5 ºF above the natural temperature. At no time shall these WARM-designated waters be raised above 80 ºF as a result of waste discharges". |

| **Pollutant of Concern [(1)]** | **Rationale for Selection / Exclusion** | **Significance Criteria** |
|---|---|---|
| Total Residual Chlorine | 1. Municipal pools and private pools in areas served by a municipal sanitary system are required to be discharged into the sanitary system. Chlorine disinfection will not take place on the project site and there will not be any sources of elemental chlorine. Chloride sources (e.g. fertilizers or other compounds with salts) are evaluated separately. Therefore, total residual chlorine will not be present in runoff from the project. | 1. Basin Plan objectives for total residual chlorine: "Chlorine residual shall not be present in surface water discharges at concentrations that exceed 0.1 mg/L and shall not persist in receiving waters at any concentration that causes impairment for beneficial uses". |
| Color, Taste, and Odor | 1. Undesirable tastes and odors in water may be a nuisance and may indicate the presence of a pollutant(s). Odor associated with water can result from decomposition of organic matter or the reduction of inorganic compounds, such as sulfate. Other potential sources of odor causing substances, such as industrial processes, will not occur as part of the project. Color in water may arise naturally, such as from minerals, plant matter, or algae, or may be caused by industrial pollutants.<br>2. The Project will contain no heavy industrial uses. Commercial areas of the project are not expected to be a significant source of pollutants that might impart color or odor to stormwater flows from the Project area. Source controls are expected to reduce the amount of plant material and BMPs will reduce sediment which could contribute to color or odor nuisances. Therefore, color-, taste-, or odor-producing substances are not pollutants of concern for the project. | 1. Basin Plan objective for color: "Waters shall be free of coloration that causes nuisance or adversely affects beneficial uses".<br>2. Basin Plan objectives for taste and odor: "Ground waters shall not contain taste or odor-producing substances in concentration that cause nuisance or adversely affect beneficial uses". |

| **Pollutant of Concern [(1)]** | **Rationale for Selection / Exclusion** | **Significance Criteria** |
|---|---|---|
| Exotic Vegetation | 1. Exotic vegetation typically provides little habitat value and can out compete native vegetation that is more suitable habitat for aquatic and terrestrial organisms.<br>2. The landscape management plan will not use exotic vegetation, and undesirable invasive vegetation will be eradicated to the extent possible. Therefore, exotic vegetation is not a pollutant of concern for the Project. | 1. Basin Plan objective for exotic vegetation: "Exotic vegetation shall not be introduced around stream courses to the extent that such growth causes nuisance or adversely affects designated beneficial uses." |
| Mineral Quality (TDS, Boron, Sulfate, Sodium Absorption Ratio - SAR) | 1. LACDPW stormwater monitoring data arithmetic mean concentrations for TDS, sulfate, and boron for urban land uses are below the water quality objectives for minerals. Calculated SAR values are 0.6 for SF residential and 1.9 for commercial based on LACDPW data. The minerals listed in the Basin Plan, except chloride and nitrogen, are not believed to be pollutants of concern due to the absence of river impairments and /or anticipated runoff concentrations below the Basin Plan objectives | 1. Basin Plan objectives for minerals:<br>Reach 5<br>TDS (mg/L) 1000<br>Sulfate (mg/L) 400<br>Boron (mg/L) 1.5<br>SAR (mg/L) 10 |
| pH | 1. Mean runoff concentrations in the Los Angeles County stormwater monitoring data ranged from 6.5 for mixed- and single-family residential land uses to 7.0 for commercial land use. Therefore, pH in the Santa Clara River is not expected to be affected by runoff discharges from the project. | 1. Basin Plan objective for pH: "the pH of inland waters shall not be depressed below 6.5 or raised above 8.5 as a result of waste discharges. Ambient pH levels shall not be changed more than 0.5 units from natural conditions as a result of waste discharge." |

| Pollutant of Concern [(1)] | Rationale for Selection / Exclusion | Significance Criteria |
|---|---|---|
| PCBs | 1. PCBs are highly toxic persistent chemicals that have been historically released into the environment from industrial uses, such as transformers. Due to their persistence, PCBs can still be detected in urban runoff due to historic industrial sources of these chemicals.<br>2. The project area did not historically include PCB-producing land uses and industrial land uses are not included in the proposed project. Therefore, PCBs are not a pollutant of concern for the project. | 1. Basin Plan narrative regarding PCBs: "The purposeful discharge of PCBs to waters of the Region, or at locations where the waste can subsequently reach waters of the Region, is prohibited. Pass-through or uncontrollable discharges to waters of the Region, or at locations where the waste can subsequently reach waters of the Region, are limited to 70 pg/L (30 day average) for protection of human health and 14 ng/L and 30 ng/L (daily average) to protect aquatic life in inland fresh waters and estuarine waters respectively". |
| Radioactive Substances | 1. Some activities such as mining or industrial activities can increase the amount of radioactive substances impairing beneficial uses.<br>2. The project will not have industrial or other activities that would be a source of any radioactive substances, and development will stabilize any naturally radioactive soils, though unlikely to be present in the project area. Therefore, radioactive substances are not a pollutant of concern for the project. | 1. Basin Plan narrative objective for radioactive substances: "Radionuclides shall not be present in concentrations that are deleterious to human, plant, animal, or aquatic life or that result in the accumulation of radionuclides in the food web to an extent that presents a hazard to human, plant, animal, or aquatic life". |

1. The pollutants of concern for the water quality analysis are those that are anticipated or potentially could be generated by the project at concentrations, based on water quality data collected in Los Angeles County from land uses that are the same as those included in the Project, that current loadings or historic deposits of the pollutant are impacting the beneficial uses of a receiving water, elevated levels of the pollutant are found in sediments of a receiving water and/or have the potential to bioaccumulate in organisms therein, or the detectable inputs of the pollutant are at concentrations or loads considered potentially toxic to humans and/or flora and fauna.

## A.2. References

California Association of Stormwater Quality Agencies (CASQA), 2003. *Stormwater Best Management Practices Handbook New Development & Redevelopment*.

Los Angeles Regional Water Quality Control Board, 1995. Water Quality Control Plan Los Angeles Region Basin Plan for the Coastal Watersheds of Los Angeles and Ventura Counties.

Los Angeles Regional Water Quality Control Board, October, 25th, 2001. Resolution 01-018: Amendment to the Water Quality Control Plan for the Los Angeles Region to Update the Bacteria Objectives for Water Bodies Designated for Water Contact Recreation

Los Angeles Regional Water Quality Control Board, July, 10th, 2003. Resolution R03-008 Revision of interim waste load allocations for chloride in the Amendment to the Water Quality Control Plan for the Los Angeles Region to include a TMDL for Chloride in the Upper Santa Clara River.

Los Angeles Regional Water Quality Control Board, August, 7th, 2003. Resolution R03-011 Amendment to the Water Quality Control Plan for the Los Angeles Region to include a TMDL for Nitrogen Compounds in the Santa Clara River.

US Environmental Protection Agency California Toxics Rule (CTR), 40 C.F.R. §131.38.

# APPENDIX B
# WATER QUALITY MODEL METHODOLOGY

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# B. WATER QUALITY MODEL METHODOLOGY

## B.1. Model Description

### B.1.1. Model Overview

The model used to assess stormwater quality impacts associated with the proposed Newhall Ranch Landmark Village sub-division is an empirical, volume-based pollutant loads model. This type of loadings model is generally applicable in the planning and evaluation stages of a project. The model was developed to assess the potential impact of development on water quality and to evaluate the effectiveness of the structural Best Management Practices (BMPs) that will treat storm water runoff as part of the project storm water treatment system. Two project conditions were evaluated with the water quality model:

1. Pre-development
2. Post-development with treatment BMPs

Measured runoff volumes and water quality characteristics of storm water are highly variable. To account for this variability, a statistical modeling approach was used to estimate the volume of storm water, the concentration of pollutants in storm water, and the overall pollutant load (total mass of pollutants) in storm water runoff. A statistical description of storm water provides an indication of the average characteristics and variability of the water quality parameters of storm water. It does not forecast runoff characteristics for specific storms or monitoring periods.

The statistical model is based on relatively simple rainfall/runoff relationships and estimated concentrations in storm water runoff. The volume of storm water runoff is estimated using a modification to the Rational Formula, an empirical expression that relates runoff volume to the rainfall depth and the basin characteristics such as imperviousness, and soils infiltration characteristics. The pollutant concentration in storm water runoff is represented by an expected average pollutant concentration, called the event mean concentrations (EMC). The EMCs are estimated from available monitoring data from, and are strongly dependent on the land-use type.

The flow chart in Figure B-1 provides an overview of the modeling methodology.

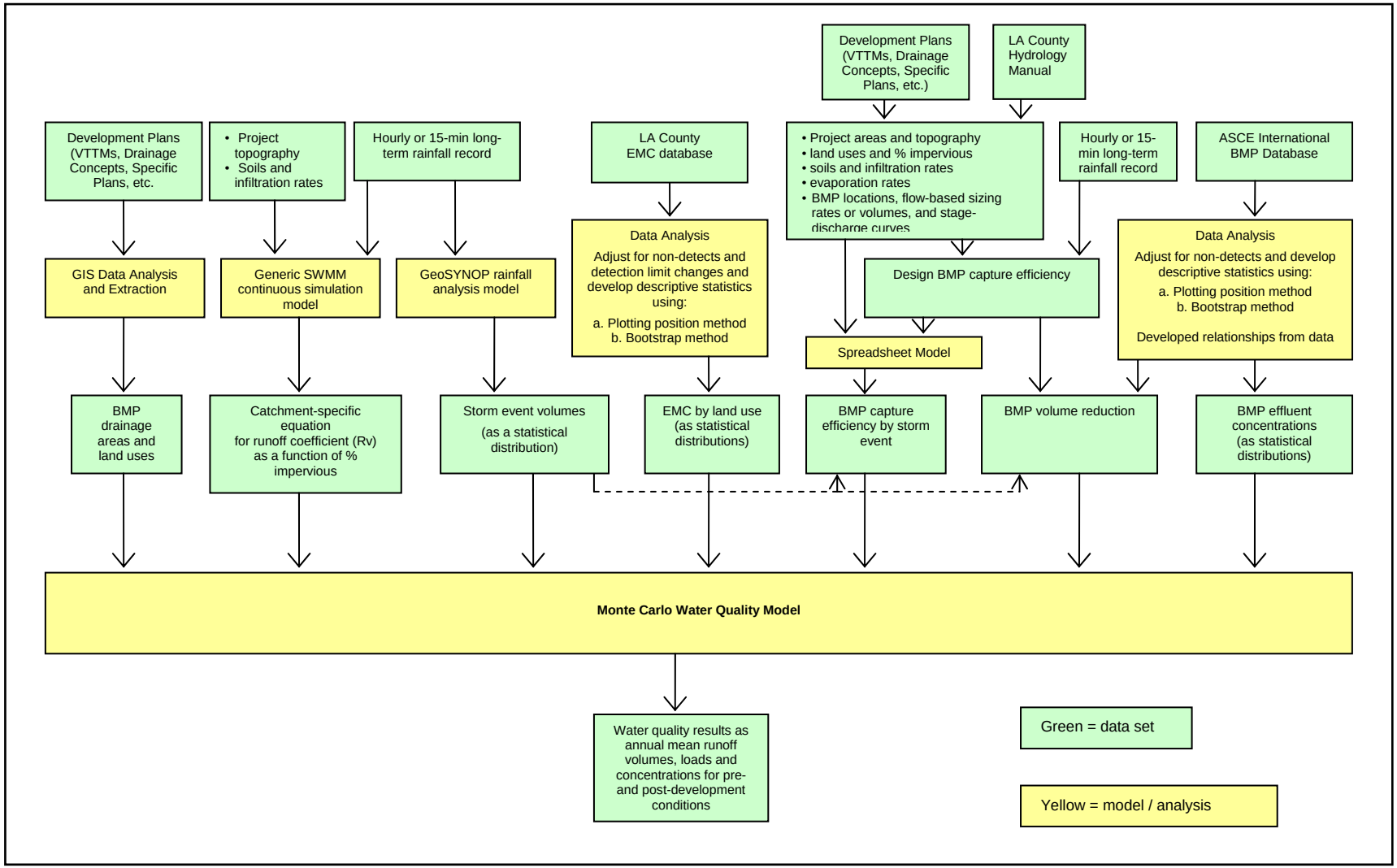


**Figure B-1: Overview of Water Quality Analysis Methodology**

The model does not incorporate the hydraulics or hydrology of the site, which would be more appropriate for design stages and requires additional data and more sophisticated modeling. The model includes water quality benefits achieved by structural BMPs but not source control BMPs because data is generally not available or conclusive for the latter. Model results are presented for average annual runoff volumes, pollutant loads, and pollutant concentrations.

As with all environmental modeling, the precision of results is heavily dependent on how well the hydrologic, water quality and BMP effectiveness data describe the actual site characteristics. Local and regional data are used to the fullest extent possible to help minimize errors in predictions, but such data are limited and traditional calibration and verification of the model is not feasible. It is important to note that the predictions of relative differences should be more accurate than absolute values.

### B.1.2. Model Assumptions

The water quality modeling methodology requires that some assumptions are made for both the model input parameters and the way the modeling calculations are carried out. Section B.2.6 discusses the assumptions that were made in specifying the model parameters and Section B.3.4 discusses the assumptions regarding the modeling approach. Section B.4 discusses model accuracy.

## B.2. Model Input Parameters

Many parameters that can affect pollutant loads and concentrations vary spatially and may not be adequately represented by stormwater monitoring data collected at discrete locations. Examples include source concentrations, topography, soil type, and rainfall characteristics all of which can influence the buildup and mobilization of pollutants. The following model parameters represent the best data currently available for representation of existing and developed site conditions in the water quality model.

### B.2.1. Storm Events

Rainfall analysis was conducted with data from the National Climatic Data Center (NCDC) Newhall rain gauge (station number 046162), located in the town of Newhall, California. Figure B-2 shows the location of the Newhall gauge in relation to the Newhall Ranch Landmark Village Project area. This gauge is located approximately 7 miles from the project. The gauge elevation of 1,243 ft above mean sea level (AMSL) is comparable to the Landmark Village Project area elevation of approximately 1,000-1,200 ft AMSL.

While the period of record rainfall data collected at the Newhall rain gauge is quite long (35 years), there are still some gaps in the record. In order to improve the characterization of rainfall at the project site, estimates of the missing rainfall data were made through correlation of the Newhall rain gauge with the San Fernando rain gauge (NCDC station number 047762) which is located approximately 5 miles away (south and slightly east).

The Castaic Junction gauge monitored by the Los Angeles County Department of Public Works (LACDPW) is located closer to the Project; however, the usable period of record at this gauge is limited to approximately 12 years which is considered too short to produce significant results in long-term simulation.

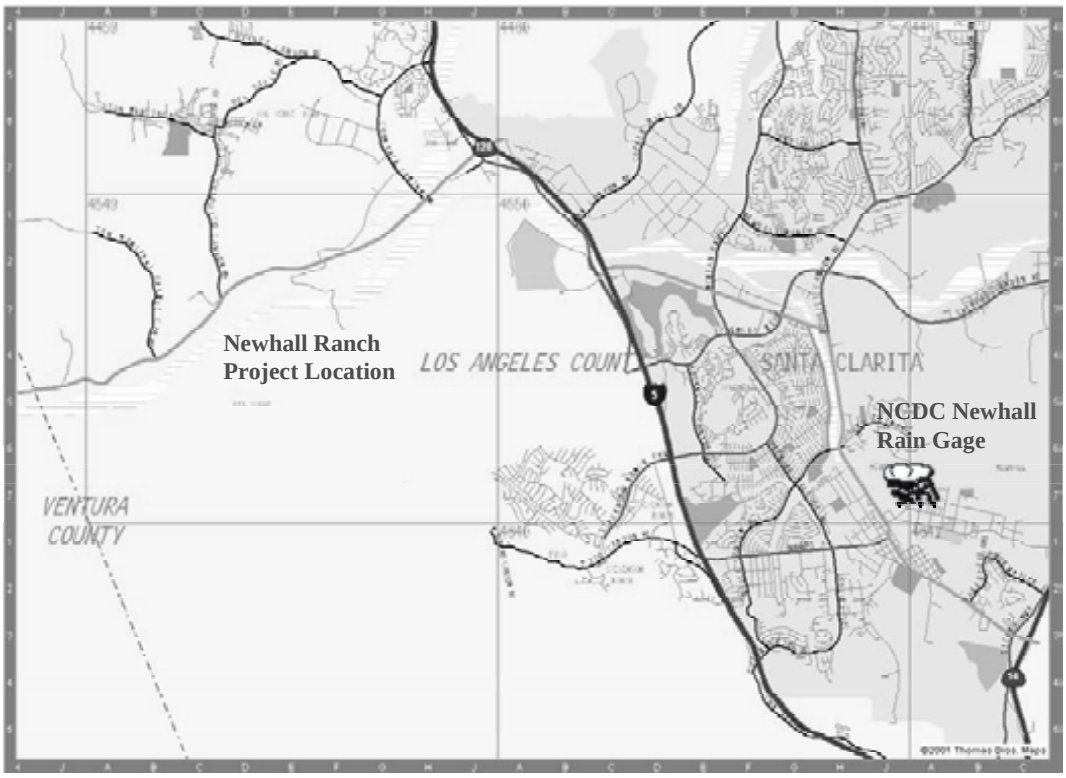


**Figure B-2: Location of Newhall Rain Gauge in the Vicinity of the Project Area**

First a comparison of daily rainfall totals was made from the available data to assess the similarity in rainfall amounts between the two stations. Daily data from 1969 to 2003 was screened to keep only the 24-hour totals with measured rainfall at both stations, which eliminated missing data at either station. Correlation of the 24-hour rainfall totals is shown in Figure B-3.

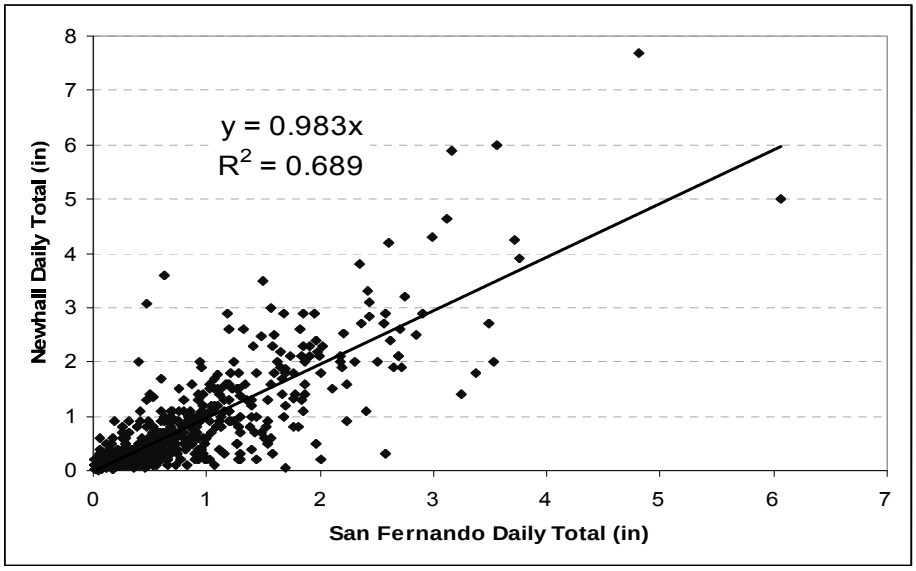


**Figure B-3: Correlation of 24-hour Totals between Newhall & San Fernando Gauges**

The correlation is reasonably strong considering that the comparison is between the daily accumulations, i.e. a storm could result in appreciable rainfall at one gauge and little rainfall at the other. This comparison indicates that daily precipitation depths are similar between the two gauges. Another comparison was made using only months with a complete rainfall record and measured rainfall at both stations (Figure B-4). This monthly correlation was much stronger due to the longer comparison period, and indicated slightly higher rainfall amounts at the Newhall gauge compared to the San Fernando gauge.

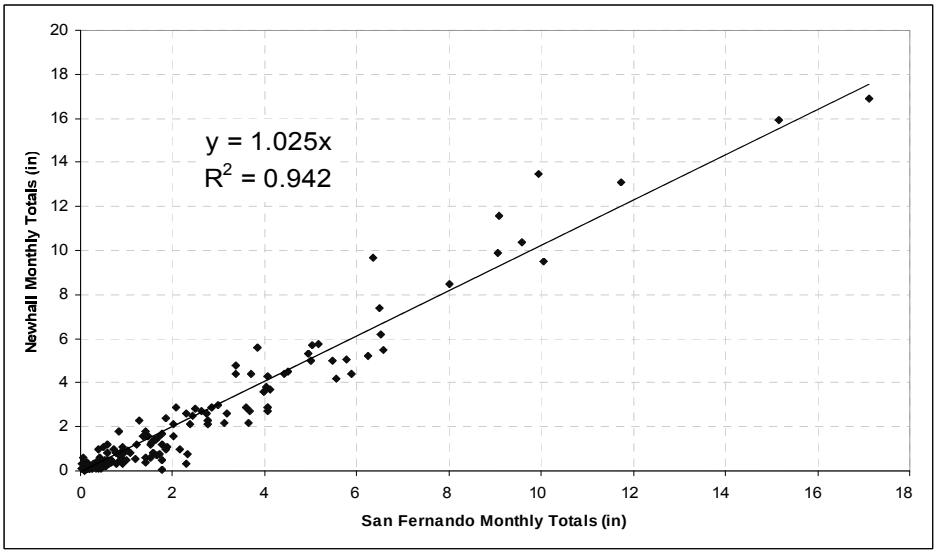


**Figure B-4: Correlation of Monthly Totals Newhall & San Fernando Gauges**

Based on the relationship developed through the monthly comparison, a multiplier of 1.025 was applied to the hourly rainfall data from the San Fernando gauge to fill in the missing periods of

rainfall data at the Newhall gauge. Values were rounded to the nearest 1/100 inch after the adjustment.

Rainfall analysis was conducted for all storm events and for the storms that are expected to contribute to stormwater runoff (storms > 0.1 inches). The rainfall data were analyzed using a code similar in performance to EPA's Synoptic Rainfall Analysis Program (SYNOP). The customized code (GeoSYNOP) was used as it facilitates filling in missing periods of data and is more robust when handling the date and time of storms. GeoSYNOP subdivides the rainfall record into discrete events separated by a dry inter-event period, which in this case was set to a minimum of 6 hours. Small rainfall events whose depth was less than or equal to 0.10 inches were deleted from the record as such events tend to produce little if any runoff (USEPA, 1989; Schueler, 1987). For the Newhall gauge, a total of 538 storm events (> 0.1 inches) were segregated from the continuous data. Storm statistics for the full (all the storms) and the trimmed (storms > 0.1 inch) data sets are shown in Table B-1.

**Table B-1: Analysis Results for the Actual and Filled Newhall Rainfall Data**

| Storms | Newhall Gauge 1969 – 2003 | Original Record | Augmented Record[1] |
|---|---|---|---|
| | Total Missing Records (days): | 427 | 52 |
| All Storms | Average annual rainfall (in): | 17.4 | 18.8 |
| | Total number of storms: | 840 | 890 |
| | Average number of storms per year: | 24.0 | 25.4 |
| | Average storm volume (in): | 0.72 | 0.74 |
| | Average storm duration (hrs): | 6.87 | 7.35 |
| | Average storm intensity (in/hr): | 0.103 | 0.101 |
| Storms >0.1 inch | Average annual rainfall (in): | 16.2 | 17.9 |
| | Total number of storms: | 493 | 538 |
| | Average number of storms per year: | 14.1 | 15.4 |
| | Average storm volume (in): | 1.15 | 1.16 |
| | Average storm duration (hrs): | 11.0 | 11.5 |
| | Average storm intensity (in/hr): | 0.107 | 0.105 |

1- Augmented record includes adjusted data from San Fernando gauge to fill gaps in Newhall gauge record.

### B.2.2. Runoff Coefficients

One of the most variable parameters is the runoff coefficient, which is a function of the percent impervious. Novotny and Olem (1994), when discussing the Rational Formula, state "...the runoff coefficient is the most important task of the entire calculation." The following describes how the runoff coefficients were estimated in the model.

#### B.2.2.1. SWMM Runoff Coefficient Modeling Parameters

The Water Quality model uses a linear equation to estimate a runoff coefficient for sub-basins as a function of the percent impervious. The format of this equation is described as:

Runoff Coefficient = Slope × % Impervious + Intercept

The appropriate slope and intercept to define the runoff coefficient equation may be taken from region-specific data, regulatory guidance or developed using hydrologic models. The Los Angeles County Standard Urban Stormwater Mitigation Plan (SUSMP) Manual and the LA County Hydrology Manual use the following equation to calculate developed runoff coefficient:

$$C_D = (0.9 \times \text{Imperviousness}) + (1.0 - \text{Imperviousness}) \times C_U$$

Where: $C_D$ = Developed Runoff Coefficient

Imperviousness = Proportion Impervious (0 to 1)

$C_U$ = Undeveloped Runoff Coefficient

The undeveloped runoff coefficient ($C_U$) in this equation is a function of soil type and rainfall intensity. For most soils found in LA County area and the range of intensities associated with water quality storms, $C_U$ may be assumed to equal 0.1. Substituting this value into the equation above yields:

Runoff Coefficient = 0.008 × % Impervious + 0.1

*Note: This equation was <u>not</u> used in water quality modeling. It was only used as a basis for comparison with project-specific runoff coefficient equations developed as described below.*

As the Landmark Village Project area contains a variety of soil conditions, continuous simulation modeling, using the Storm Water Management Model (SWMM), was conducted to determine the appropriate slope and intercept parameters to use in the linear runoff coefficient equation. Key parameters for the SWMM model are shown in Table B-2.

**Table B-2: SWMM Runoff Module Parameters**

| SWMM Runoff Parameters | Units | Values |
|---|---|---|
| Wet time step | seconds | 600 |
| Wet/dry time step | seconds | 600 |
| Dry time step | seconds | 14,400 |
| Impervious Manning's n | | 0.012 |
| Pervious Manning's n | | 0.25 |
| Drainage area modeled for Rv determination | acres | 10 (Actual project areas sub-divided by hydrologic soil groups and normalized to 10 acre catchments) |
| Shape | | Rectangular, 500 ft flow path length for pervious areas, 250 ft flow path length for impervious area. |
| Impervious Fractions Modeled | | 0%, 33.3%, and 100%. See Table B-3 for specific runoff block dimensions. |
| Slope | ft/ft | 0.02, project area is relatively flat. |
| Evaporation | in/month | 80% of reference ET values contained in |

| SWMM Runoff Parameters | Units | Values |
|---|---|---|
| | | Table B-5 were used for the existing site conditions to reflect existing uses and the post-development project condition. |
| Soil properties / infiltration | | Green-Ampt soil parameters as contained in Table B-4. |
| Depression storage, impervious | inches | 0.02, based on Table 5-14 in SWMM manual (James and James, 2000). |
| Depression storage, pervious | inches | 0.06, based on Table 5-14 in SWMM manual (James and James, 2000). |

Runoff path lengths will affect ET and runoff volumes. As the path length increases, ET and infiltration increase and runoff decreases. For consistency in model runs three scenarios were modeled as shown in Table B-3 with consistent runoff path lengths for pervious surfaces and impervious surfaces. Rectangular catchments were assumed, thus the catchment width for input to SWMM was calculated as the catchment area divided by the total path length. As only one width may be assigned for each catchment, modeled impervious fractions were chosen specifically to result in consistent runoff path lengths for pervious and impervious surfaces. Maintaining consistent path lengths ensures that the results of SWMM can be well-approximated by a linear trendline.

**Table B-3: SWMM Runoff Block Modeled Percent Impervious Values**

| Area (ac) | % Impervious | SWMM Width (ft) | Pervious Flow Length (ft) | Pervious Flow Length (ft) |
|---|---|---|---|---|
| 10 | 0 | 871 | 500 | 0 |
| 10 | 33.3 | 581 | 500 | 250 |
| 10 | 100 | 1742 | 0 | 250 |

Some soils in the vicinity of the project area have been classified as sandy-loam soils deposited by the Santa Clara River (R.T. Frankian & Associates, 2001). Soils in the Landmark Village Project area were conservatively modeled with infiltrative capacity comparable to silt-loam soils, resulting in little surface runoff for the existing condition and a conservative estimate for the developed condition when further reducing the hydraulic conductivity by 25 percent to account for compaction. The Green-Ampt soils properties used for the SWMM modeling are shown in Table B-4.

**Table B-4: Green-Ampt Soil Parameters**

| Soil Texture Class | Suction Head (cm) | Ks (cm/hr) | Suction Head (in) | Ks (in/hr) |
|---|---|---|---|---|
| Silt Loam – Existing Condition | 16.68 | 0.68 | 6.57 | 0.27 |
| Silt Loam – Developed Condition | 16.68 | 0.51 | 6.57 | 0.20 |

Soil properties estimated from information contained in Table 5.5.5 of the Handbook of Hydrology (Maidment, ed. 2003)

Reference ET values for estimating actual ET rates was taken from Figure B-5 produced by the California Department of Water Resources. The Landmark Village Project site is located in zone 14. Reference ET values for zone 14 are reproduced in Table B-5.

Existing site conditions consist of agricultural row crops, both irrigated and dry farming. To represent average existing site conditions, 80% of the reference ET values were used to reflect dry farming crops with lower water requirements and irrigated farming with slightly higher evapotranspiration rates. Eighty percent of the reference ET values were also used to simulate the landscaped areas in the post-development condition.

**Table B-5: Evaporation Parameters for Hydrology Model (from CA ET map)**

| Month | Evapotranspiration Rates | | | 80% |
|---|---|---|---|---|
| | Inch / day | Days / month | Inch / Month | Inch / Month |
| January | 0.05 | 1.24 | 1.55 | 1.24 |
| February | 0.08 | 1.79 | 2.24 | 1.79 |
| March | 0.12 | 2.98 | 3.72 | 2.98 |
| April | 0.17 | 4.08 | 5.1 | 4.08 |
| May | 0.22 | 5.46 | 6.82 | 5.46 |
| June | 0.26 | 6.24 | 7.8 | 6.24 |
| July | 0.28 | 6.94 | 8.68 | 6.94 |
| August | 0.25 | 6.2 | 7.75 | 6.2 |
| September | 0.19 | 4.56 | 5.7 | 4.56 |
| October | 0.13 | 3.22 | 4.03 | 3.22 |
| November | 0.07 | 1.68 | 2.1 | 1.68 |
| December | 0.05 | 1.24 | 1.55 | 1.24 |
| | Total | 45.63 | 57.04 | 45.63 |

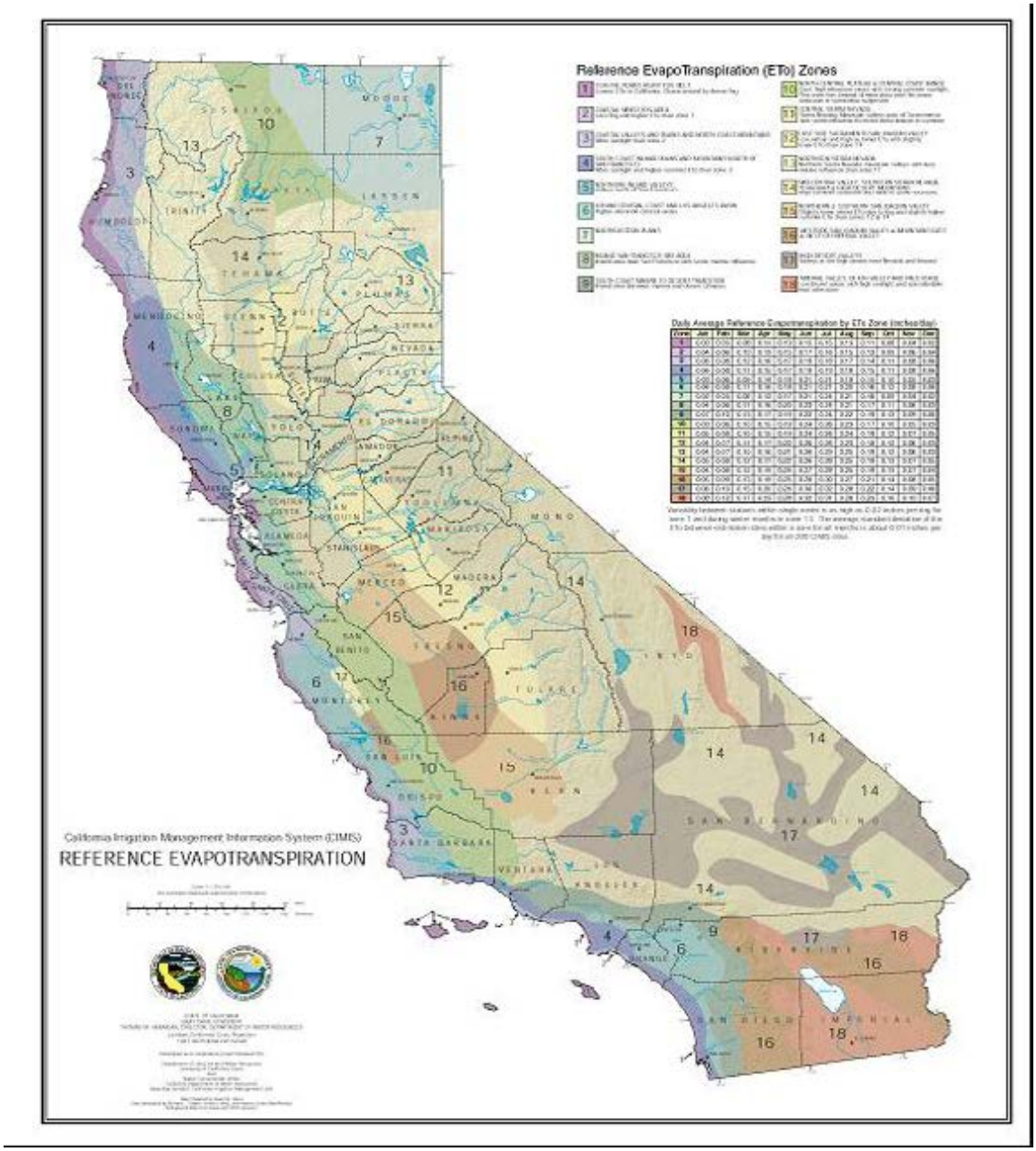


**Figure B-5: Reference ET for CA Zones**

### B.2.2.2. SWMM Runoff Coefficient Results

Using the model input parameters described above, runoff coefficient equations have been developed for all modeled watersheds. Figure B-6 and Figure B-7 display the SWMM results (as diamonds) and the best fit line for existing and developed project conditions, respectively.

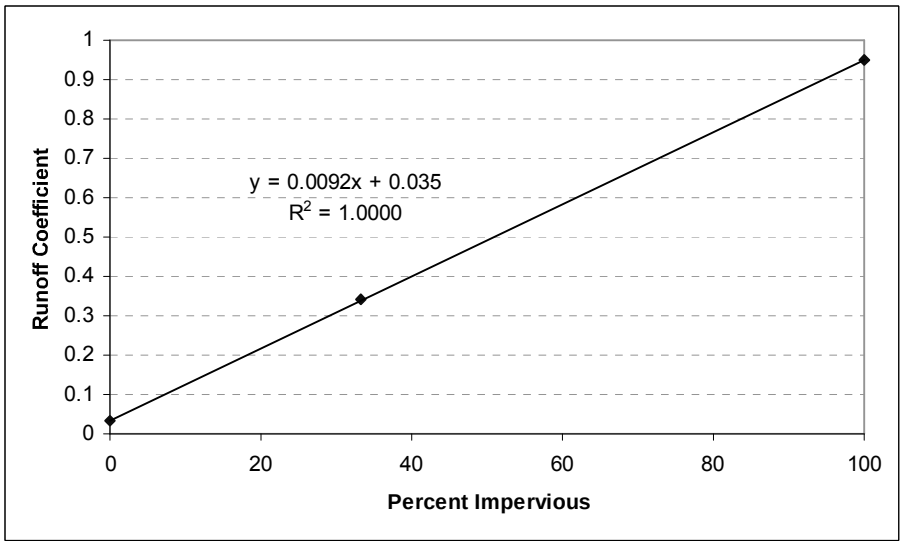


**Figure B-6: Existing Conditions Runoff Coefficient Equation**

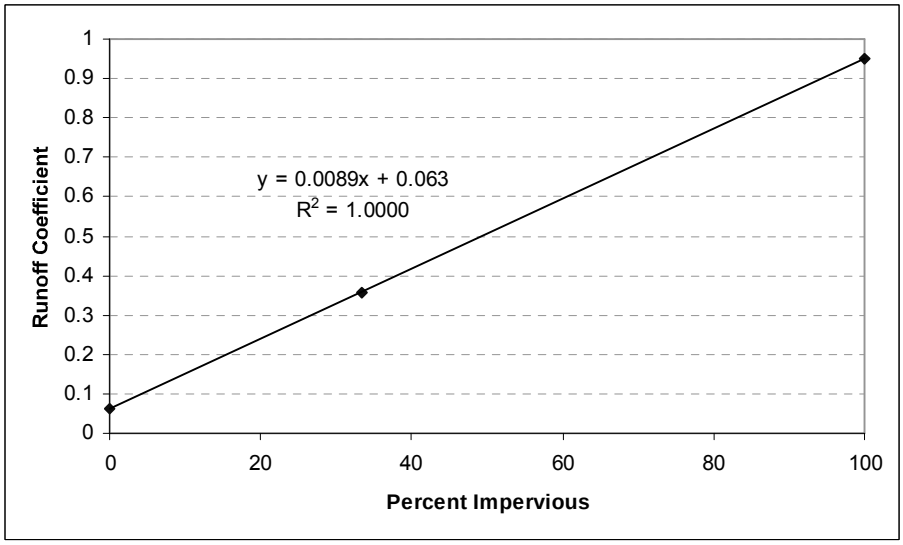


**Figure B-7: Developed Conditions Runoff Coefficient Equation**

The intercept was rounded to three decimal places resulting in the following equations used to estimate runoff coefficients in the water quality model as a function of imperviousness

- Existing Conditions: Runoff Coefficient = 0.0092 × % Impervious + 0.035
- Developed Conditions: Runoff Coefficient = 0.0089 × % Impervious + 0.063

### B.2.3. Land Use & Treatment BMPs

The delineation of land uses and areas within Landmark Village were determined from the Vesting Tentative Tract Map No. 53108 for the developed Project conditions. The existing and developed conditions of the Project and associated off-site areas are summarized in Table B-6 and Table B-7, respectively.

Included in the water quality analysis are 103.6 acres of off-site project areas. The section of State Route 126 (SR126) adjacent to the Landmark Village Project area will undergo widening, which will increase the area of this section of SR126 from 72.8 to 95.6 acres. Four water tanks and access roads will be located near the project. The required area for the water tanks was conservatively estimated at 2 acres per tank and access road, as detailed information is not yet available. Modeled areas for SR126 for existing and developed conditions are shown in Table B-6 and Table B-7, respectively.

**Table B-6: Existing Conditions Project & Off-site Areas**

| Land Use | Development Area (Acres) | | |
|---|---|---|---|
| | Project Site | Off-Site | |
| | | SR126 | Water Tanks |
| Row Crops | 292.6 | | |
| Roads | | 72.8 | |
| Open Space | | 22.8 | 8 |
| Total | 292.6 | 95.6 | 8 |

**Table B-7: Developed Conditions Project & Off-site Areas**

| Land Use | Development Area (Acres) | | |
|---|---|---|---|
| | Project Site | Off-Site | |
| | | SR126 | Water Tanks |
| Single family | 50 | | |
| Multi-family | 60.7 | | |
| Apartments | 21 | | |
| Commercial | 36.5 | | 8 |
| Elementary School | 9 | | |
| Parks | 16.1 | | |
| Recreation Centers | 5.2 | | |
| Trails & Misc. | 38.3 | | |
| Roads | 55.8 | 95.6 | |
| Total | 292.6 | 95.6 | 8 |

Table B-8 provides the modeled land uses and percent impervious values used to represent the existing and developed project and off-site conditions. The modeled land uses were based on the most representative land use within the available data sets (see Section B.2.4). If a representative land use was not available from the monitored land uses (Section B.2.4), then a conservative land use was used. For example, the water tanks and associated access roads will have very low

traffic and are not expected to result in appreciable pollutant loads in stormwater runoff. The commercial land use, while expected to be very conservative for representing the water tanks and access roads, is believed to most closely simulate these types of land uses and was therefore selected to represent runoff from these areas.

**Table B-8: Modeled Land Uses, Percent Imperviousness, & Data Source**

| Land Use | Modeled Percent Impervious | Modeled Land Use |
|---|---|---|
| Row Crops | 15% | Agriculture |
| Single family | 42% | Single Family Residential |
| Multi-family | 68% | Multi-family Residential |
| Apartments | 68% | Multi-family Residential |
| Commercial | 92% | Commercial |
| Elementary School | 82% | Education |
| Parks | 15% | Open Space |
| Recreation Centers | 15% | Open Space |
| Trails & Misc. | 5% | Open Space |
| Roads | 100% | Transportation |

[1] Percent impervious values are based on the LA County Hydrology Manual.

Stormwater runoff from all developed areas within the Landmark Village Project will be routed to bioretention areas, vegetated swales, and/or extended detention basin treatment control BMPs. Catch basin inserts will also be used in high use parking lots. The off-site SR-126 expansion Project will provide vegetated swale treatment for both the new and existing untreated roadway area. The utility corridor maintenance access road and potential future trail, as well as the water tanks and access roads, will drain to biofiltration treatment (vegetated swale or filter strip) or bioretention treatment. The extended detention basin, vegetated swales, and bioretention areas will be designed to operate off-line, receiving dry weather flows, small storm flows, and the initial portion of large storm flows from a low-flow diversion structure in the storm drain. The effectiveness of treatment BMPs is evaluated without taking site design and source control BMPs into account. Therefore, the analysis is conservative in that it understates water quality controls.

### B.2.4. Stormwater Runoff Pollutant Concentrations

Stormwater monitoring data collected by LACDPW was used to derive estimates of pollutant concentrations in runoff from urban land uses. The existing conditions of the Landmark Village Project site contain agricultural uses. Stormwater monitoring data collected by Ventura County was used to estimate stormwater pollutant concentrations for agricultural land use.

### B.2.4.1. Los Angeles County Monitoring Data

Recent and regional land-use based stormwater quality monitoring data was collected through the LA County Stormwater Monitoring Program. This program was initiated with the goal of providing technical data and information to support effective watershed stormwater quality management programs in Los Angeles County. Specific objectives of this project included monitoring and assessing pollutant concentrations from specific land uses and watershed areas. In order to achieve this objective, the County undertook an extensive stormwater sampling project that included 8 land use stations and 5 mass emission stations (located at the mouths of major streams and rivers), which were tested for 82 water quality constituents. These data are presented in *Los Angeles County 1994-2000 Integrated Receiving Water Impacts Report, 2000* and *Los Angeles County 2000-2001 Stormwater Monitoring Report, 2001*.

Stormwater quality for the Newhall Ranch and the Landmark Village sub-division was estimated based on the recent EMC data collected by LA County (LA County, 2000). These data were used because of the relatively close location to the project site and because the monitored land uses were representative of the proposed land uses for the Newhall Ranch Project. The monitored land uses stations are listed in Table B-9 with a brief description of the site and when the monitoring data were collected.

**Table B-9: LA County Land Use Monitoring Stations Available for Water Quality Modeling**

| Station Name | # | Modeled Land Use | Site Description[1] | Years Monitoring Conducted |
|---|---|---|---|---|
| Santa Monica Pier | S08 | Commercial | The monitoring site is located near intersection of Appian Way and Moss Avenue in Santa Monica. The storm drain discharges below the Santa Monica Pier. Drainage area is approximately 81 acres. The Santa Monica Mall and Third St. Promenade dominate the watershed with remaining land uses consisting of office buildings, small shops, restaurants, hotels and high-density apartments. | 1995-1999 |
| Sawpit Creek | S11 | Open Space (& Parks) | Located in Los Angeles River watershed in City of Monrovia. The monitoring station is Sawpit Creek, downstream of Monrovia Creek. Sawpit Creek is a natural watercourse at this location. Drainage area is approximately 3300 acres. | 1995-2001 |
| Project 620 | S18 | Single Family Residential | Located in the Los Angeles River watershed in the City of Glendale. The monitoring station is at the intersection of Glenwood Road and Cleveland Avenue. Land use is predominantly high-density, single-family residential. Drainage area is approximately 120 acres. | 1995-2001 |
| Project 1202 | S24 | Light Industrial | Located in the Dominguez Channel/Los Angeles Harbor Watershed in the City of | 1995-2001 |

| Station Name | # | Modeled Land Use | Site Description[1] | Years Monitoring Conducted |
|---|---|---|---|---|
| | | | Carson. The monitoring station is near the intersection of Wilmington Avenue and 220th Street. The overall watershed land use is predominantly industrial. | |
| Dominguez Channel | S23 | Freeway (Roadways) | Located within the Dominguez Channel/Los Angeles Harbor watershed in Lennox, near LAX. The monitoring station is near the intersection of 116th Street and Isis Avenue. Land use is predominantly transportation and includes areas of LAX and Interstate 105. | 1995-2001 |
| Project 474 | S25 | Education (Schools) | Located in Los Angeles River watershed in the Northridge section of the City of Los Angeles. The monitoring station is located along Lindley Avenue, one block south of Nordoff Street. The station monitors runoff from the California State University of Northridge. Drainage area is approximately 262 acres. | 1997-2001 |
| Project 404 | S26 | Multi-Family Residential | Located in Los Angeles River watershed in City of Arcadia. The monitoring station is located along Duarte Road, between Holly Ave and La Cadena Ave. Drainage area is approximately 214 acres. | 1997-2001 |

1) Los Angeles County 1999-2000 Draft Stormwater Monitoring Report (Los Angeles County, 2000)

### B.2.4.2. Ventura County Monitoring Data

As part of its NPDES permit, the Ventura County Flood Control District conducts monitoring to determine the water quality of stormwater runoff from areas with specific land uses. One monitoring station, Wood Road at Revolon Slough (site A-1), drains the approximately 350 acre Oxnard Agricultural Plain, which is comprised almost entirely of agricultural land (primarily row crops), including a small number of farm residences and ancillary farm facilities for equipment maintenance and storage. Data from the Wood Road station was used to estimate pollutant concentrations in stormwater runoff for agricultural land use.

Land use runoff sampling for the Ventura County stormwater monitoring program originally began during the 1992/93 monitoring season, with up to several samples collected at each site during each storm season. For the A-1 site, the period of record begins during the 1996/97 storm season, and continues through the 2003/04 season. All land use monitoring sites are equipped with automated monitoring equipment, including flowmeters (with area-velocity probes and level sensors) and refrigerated auto-samplers which enable the collection of flow-weighted composite samples. Stormwater quality monitoring data for the agricultural land use site was provided by Mark Davis of the Ventura County Watershed Protection District. This information was extracted from their newly-constructed water quality database, which contains monitoring data for their land use, mass emission, and receiving water monitoring sites.

### B.2.4.3. Data Analysis for Derivation of Land Use EMCs

The County of Los Angeles Department of Public Works (LACDPW) has monitored stormwater runoff quality from various land uses throughout the County on an annual basis beginning in 1995 through 2001. For each year of monitoring several storm event mean concentrations (EMCs) are reported and included in the County's annual water quality report to the Los Angeles Regional Water Quality Control Board. The convention for dealing with the censored data (e.g., data only known to be below the analytical detection limit) is to substitute ½ of the detection limit for all non-detects. L.A. County has followed this convention when providing summary arithmetic statistics of the stormwater monitoring data. This method tends to introduce bias into the estimate of the mean and standard deviation and the summary statistics are not believed to be robust or adequately account for non-detects. To further complicate matters, the detection limit for dissolved copper and total lead has changed during the period stormwater monitoring was conducted by LACDPW.

In an effort to provide more reliable and accurate estimates of land use EMCs for the Landmark Village water quality modeling, a robust method of estimating descriptive statistics for censored data with multiple detection limits was employed. The plotting position method described in Helsel and Cohn (1988) was used to estimate censored values using the distribution of uncensored values. Descriptive statistics were then estimated using the parametric bootstrap method suggested by Singh, Singh, and Engelhardt (1997).

***Example Data Set***

To illustrate the statistical methods used to obtain land use EMCs, the LACDPW stormwater monitoring data collected for total lead from the transportation land use station is used. The data were collected from 01/1996 to 04/2001. At the beginning of March 1997 the detection limit for total lead changed from 10 to 5 μg/L. Table B-10 describes the data according to the number of censored and uncensored values in the example data set.

**Table B-10. Number of Censored and Uncensored Data Points in the Total Lead Transportation Land Use Data Set**

| Total Lead EMC Data for Transportation Land Use | |
|---|---|
| Uncensored | 37 |
| Censored < 10 μg/L | 2 |
| Censored < 5 μg/L | 38 |
| Total Data Count | 77 |

Prior to applying the plotting position method, it is necessary to check the normality of the data. Figure B-8 shows histograms and probability plots of the transportation land use total lead data above detection limits in normal and lognormal space. As indicated in the figure, the data tends to follow a lognormal distribution, a finding that is common with many pollutants in stormwater.

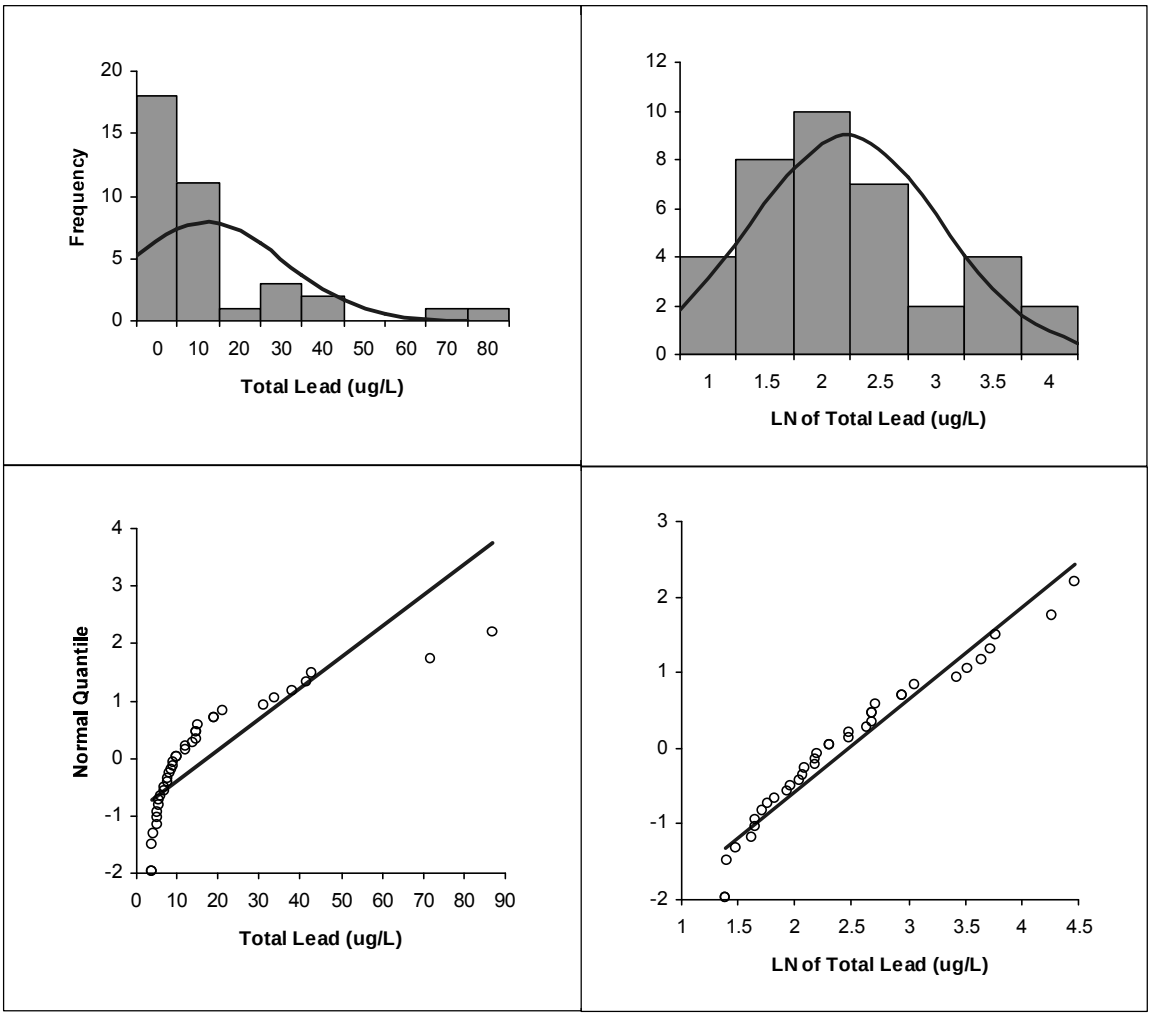


**Figure B-8: Histograms and Probability Plots of Transportation Total Lead Data in Arithmetic and Lognormal Space**

To verify the visual check that the data are lognormally distributed, the Shapiro-Wilk goodness-of-fit test was used (Royston, 1992). In this test, if $p > 0.1$, the null hypothesis that the log data follow a normal distribution cannot be rejected. For this example data set, the p-value of the log-transformed uncensored data is 0.293, which indicates that lognormal distribution is a good approximation of the distribution of the data set.

### *Method for Dealing with Multiple Detection Limits*

To account for the multiple detection limits in the censored data sets, a regression on order statistics (ROS) method was employed. ROS is a category of robust methods for estimating descriptive statistics of censored data sets that utilize the normal scores for the order statistics (Shumway et al. 2002). The plotting position method by Hirsch and Stendinger (1987) (summarized by Helsel and Cohn, 1988) was the ROS method used. In this method, plotting positions are based on conditional probabilities and ranks, where the ranks of the censored (below detection) and uncensored data (above detection) related to each detection limit are ranked independently. The method is summarized in the equations below.

After plotting positions for the censored and uncensored values have been calculated, the uncensored values are plotted against the z-statistic corresponding to the plotting position and the best-fit line of the known data points is derived. Using this line and the plotting positions for the uncensored data, the values for the uncensored data are extrapolated. Figure B-9 illustrates the results of the application of the plotting position method on the total lead data for transportation land use.

$$pe_j = pe_{j+1} + \frac{A_j}{(A_j + B_j)} \times (1 - pe_{j+1}) \quad (1)$$

Where:

$A_j$ = the number of uncensored observations above the j detection limit and below the j +1 detection limit.

$B_j$ = the number of censored and uncensored observations less than or equal to the j detection limit.

$pe_j$ = the probability of exceeding the j threshold for j = m, m -1, … 2, 1 where m is the number of thresholds; by convention $pe_{m+1} = 0$.

Equation 2 was used for plotting the uncensored data and equation 3 was used for plotting the censored data; the plotting positions of the data were calculated using the Weibull plotting position formula.

$$p(i) = (1 - pe_j) + \frac{(pe_j - pe_{j+1}) \times r}{(A_j + 1)} \quad (2)$$

Where:

p(i) = the plotting position of the uncensored i data point.

r = the rank of the $i^{th}$ observation of the $A_j$ observations above the j detection limit.

$$pc(i) = \frac{(1 - pe_j) \times r}{(n_j + 1)} \quad (3)$$

Where:

pc(i) = the plotting position of the censored i data point.

r = the rank of the $i^{th}$ observation of the $n_j$ censored values below the j detection limit.

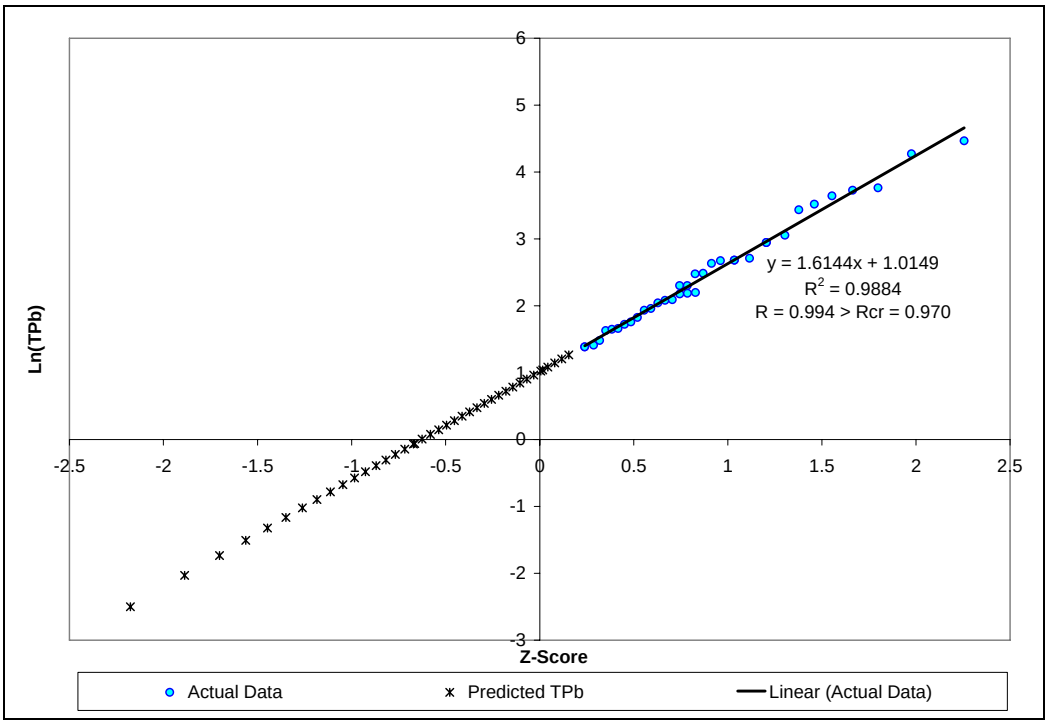


**Figure B-9: Probability Plot of the Uncensored and Predicted (Censored) Total Lead Transportation EMCs**

***Method for Calculating Descriptive Statistics***

After the censored data are estimated (or for datasets without non-detects), descriptive statistics were computed using the bootstrap method (Singh et al. 1997). The bootstrap method samples from the data set with replacement several thousand times and calculates the desired descriptive statistics from the sampled data. The steps of the bootstrap estimation method are described below.

1. Take a sample of size *n* with replacement (the sampled data point remains in the data set for subsequent sampling) from the existing data set (Singh et al. recommends n be the same size as the original data set, this recommendation was followed for the analysis) and compute the descriptive statistic, $\theta_i$, from the sampled data.
2. Repeat Step 1 independently N times (10,000 for this analysis) each time calculating a new estimate for $\theta_i$.
3. Calculate the bootstrap estimate $\theta_B$ by averaging the $\theta_i$'s for i=1 to N

Fundamentally, the bootstrap procedure is based on the Central Limit Theorem (CLT), which suggests that even when the underlying population distribution is non-normal, averaging produces a distribution more closely approximated with normal distribution than the sampled distribution (Devore 1995). Figure B-10 compares the total lead data after estimating censored values using the ROS method described prior to applying the bootstrap method with bootstrapped means of the ROS data. Note the bootstrap means are more normally distributed than the original data and the central tendency of the data is centered near 8 ug/L.

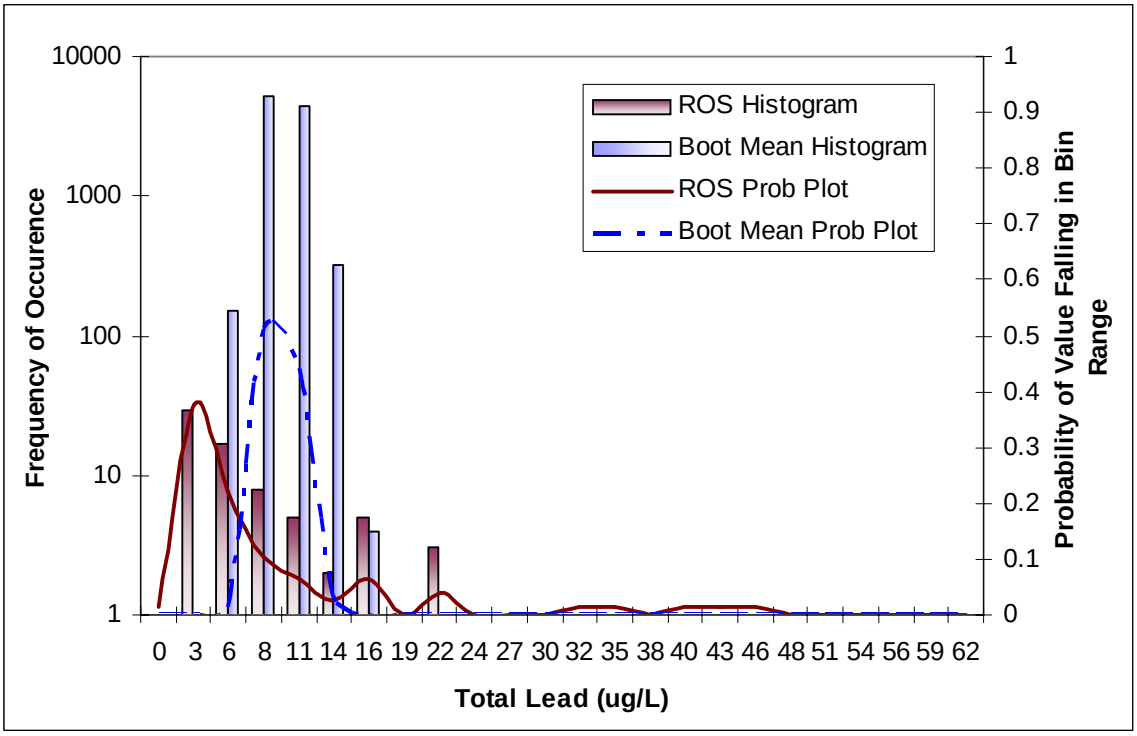


**Figure B-10: Comparison of the Distribution of ROS Method Total Lead Data and the Bootstrap Means of the ROS Data.**

The majority of the LACDPW stormwater monitoring for the pollutant land use combinations analyzed fit a lognormal distribution. The data that did not statistically fit the lognormal distribution were more closely approximated with a lognormal distribution than a normal distribution. The bootstrap method was applied differently depending on the distributional fit of the data. If the pollutant EMC data for a particular land use fit a lognormal distribution according to the Shapiro-Wilk goodness-of-fit test, the log-transformed data were bootstrapped and an estimate of the mean and standard deviation were obtained in log space and then converted to arithmetic space. The assumption of lognormality was more stringently applied than normal by using an alpha significance value of 0.1. This was done to improve the estimate of the standard deviation when the hypothesis of lognormality is rejected. When analyzing data in log space there is a tendency to overestimate the standard deviation for relatively symmetric data and underestimate the standard deviation for severely skewed data. For datasets that did not fit the lognormal distribution, the raw data were bootstrapped to obtain the mean and standard deviation statistics. Bootstrapping the data in arithmetic space assumes no distribution in those instances when a distribution could not be confirmed through goodness-of-fit testing.

***Conclusions***

The plotting position method for multiple detection limits has been used in conjunction with the bootstrap procedure for calculating the descriptive statistics used to represent pollutant EMC distributions in the water quality model. If the uncensored data were determined to be lognormally distributed with less than 50% of the data below the detection limit (censored), the bootstrap procedure was coupled with lognormal theory (i.e., data were log transformed prior to the bootstrap analysis). Otherwise, the original data plus the estimates of the censored data were analyzed in arithmetic space to calculate the arithmetic mean and standard deviation. Table B-11 summarizes the lognormal descriptive statistics, and Table B-12 summarizes the resulting arithmetic means. The latter data represent the land use specific pollutant EMCs in the Monte Carlo water quality model.

**Table B-11: Lognormal Statistics for Modeling Pollutants Concentrations from Land Uses.**

| Land Use | | TSS | TP | NH3 | NO3 | NO2 | TKN | Diss Cu | Tot Pb | Diss Zn | Cl |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Arithmetic Units | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | µg/L | µg/L | µg/L | mg/L |
| **Commercial** | Mean | 3.966 | -1.242 | -0.832 | -0.884 | -2.721 | 0.711 | 2.210 | 1.292 | 4.778 | 3.043 |
| | St. Dev | 0.609 | 0.680 | 1.218 | 0.635 | 1.060 | 0.804 | 0.685 | 1.389 | 0.703 | 1.226 |
| **Education** | Mean | 4.097 | -1.375 | -1.838 | -0.750 | -3.127 | 0.296 | 2.163 | 0.777 | 4.121 | 2.380 |
| | St. Dev | 0.923 | 0.515 | 1.111 | 0.626 | 1.177 | 0.604 | 0.733 | 0.891 | 0.531 | 1.264 |
| **Light Industrial** | Mean | 5.019 | -1.328 | -1.065 | -0.574 | -2.650 | 0.783 | 2.344 | 1.994 | 5.591 | 2.238 |
| | St. Dev | 0.741 | 0.828 | 0.957 | 0.828 | 0.667 | 0.694 | 0.764 | 1.041 | 0.769 | 0.590 |
| **Transportation** | Mean | 3.935 | -1.229 | -1.271 | -0.687 | -3.011 | 0.345 | 2.806 | 1.902 | 4.783 | 1.261 |
| | St. Dev | 0.834 | 0.992 | 0.608 | 0.749 | 1.056 | 0.654 | 1.116 | 0.631 | 1.040 | 0.998 |
| **Multi-Family Residential** | Mean | 3.144 | -1.788 | -1.208 | -0.180 | -2.932 | 0.346 | 1.768 | 0.812 | 3.965 | 2.124 |
| | St. Dev | 0.920 | 0.728 | 0.886 | 0.930 | 1.102 | 0.556 | 0.576 | 0.985 | 0.707 | 1.119 |
| **Single Family Residential** | Mean | 4.178 | -1.170 | -1.248 | -1.219 | -3.198 | 0.734 | 1.869 | 1.762 | 2.392 | 1.440 |
| | St. Dev | 1.026 | 0.640 | 0.964 | 1.274 | 1.191 | 0.747 | 0.783 | 0.997 | 1.085 | 0.570 |
| **Agriculture (Ventura County)** | Mean | 6.754 | 0.990 | 0.338 | 2.519 | -2.120 | 1.948 | 2.839 | 3.015 | 3.252 | 3.666 |
| | St. Dev | 0.551 | 0.469 | 0.712 | 0.460 | 0.000 | 0.380 | 0.536 | 0.763 | 0.847 | 0.689 |
| **Vacant / Open Space** | Mean | 3.342 | -3.060 | -3.075 | -0.033 | -3.976 | -0.458 | -2.573 | -1.246 | 1.293 [1] | 1.864 |
| | St. Dev | 1.859 | 1.064 | 0.811 | 0.548 | 0.459 | 0.784 | 1.505 | 1.616 | 1.312 | 0.226 |

1 – Dissolved zinc for open space was estimated from the total zinc analysis of LACDPW monitoring data. Four data points for dissolved and total zinc from the National Stormwater Quality Database gave an average ration of dissolved to total zinc of 50 percent. For the open space land uses the variation of dissolved zinc was assumed to equal that of total zinc (i.e. same standard deviation) and the lognormal mean was set to give an average concentration of 8.6 ug/L for the open space land use, half of the average total zinc concentration of 17.2 ug/L.

**Table B-12: Resulting Arithmetic Means from Lognormal Statistics for Modeling Pollutant Concentrations**

| Land Use | TSS | TP | NH3 | NO3 | NO2 | TKN | Diss Cu | Tot Pb | Diss Zn | Cl |
|---|---|---|---|---|---|---|---|---|---|---|
| | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | µg/L | µg/L | µg/L | mg/L |
| **Commercial** | 63.5 | 0.364 | 0.913 | 0.505 | 0.115 | 2.81 | 11.5 | 9.55 | 152 | 44.5 |
| **Education** | 92.1 | 0.289 | 0.295 | 0.575 | 0.088 | 1.61 | 11.4 | 3.23 | 70.9 | 24.0 |
| **Light Industrial** | 199 | 0.373 | 0.545 | 0.793 | 0.088 | 2.78 | 13.9 | 12.6 | 360 | 11.2 |
| **Transportation** | 72.4 | 0.478 | 0.338 | 0.666 | 0.086 | 1.75 | 30.8 | 8.17 | 205 | 5.80 |
| **Multi-Family Residential** | 35.4 | 0.218 | 0.442 | 1.29 | 0.098 | 1.65 | 6.92 | 3.66 | 67.7 | 15.6 |
| **Single Family Residential** | 110 | 0.381 | 0.457 | 0.665 | 0.083 | 2.75 | 8.81 | 9.57 | 19.7 | 4.97 |
| **Agriculture (Ventura County)** | 998 | 3.00 | 1.81 | 13.8 | 0.120 | 7.54 | 19.7 | 27.3 | 37.0 | 49.6 |
| **Vacant / Open Space** | 159 | 0.083 | 0.064 | 1.12 | 0.021 | 0.860 | 0.237 | 1.06 | 8.61 | 6.62 |

## B.2.5. Estimate of BMP Performance Parameters

BMP performance is a function of three factors: (1) the fraction of stormwater runoff receiving treatment (often referred to as percent of runoff captured, or simply percent capture); (2) the pollutant removal achieved in the unit by virtue of infiltration and/or evapotranspiration (generically referred to as volume reduction); and (3) the pollutant removal achieved in the treatment unit by virtue of improved water quality.

Capture efficiency calculations used to estimate results for the individual storms and volume reduction estimates are discussed in Section B.2.5.1. Pollutant removal estimates are described in Section B.2.5.2.

### B.2.5.1. BMP Capture Efficiency

The modeled structural BMPs were analyzed as flow or volume-based. Different methods were used to calculate the capture efficiency of each type of BMP as discussed below.

#### *B.2.5.1.1. Volume-based BMP Capture Efficiency*

The GeoSYNOP program provides descriptive statistics of storm events based upon analysis of hourly rainfall records. Included in these statistics is the dry time between storms. This information, along with the storm depths and drainage rates of the volume based BMPs, was used to estimate the percent capture of the volume-based BMPs for each storm in the period of record. The percent capture calculations for volume-based BMPs required the following steps.

**Step 1 – Estimate Runoff Volumes for Each Storm in the Period of Record Modeled**

The runoff volume for each storm in the period of record (538 storms) was calculated for the tributary area draining to each BMP.

**Step 2 – Determine the BMP Storage Capacity**

Next, the available storage capacity of the BMP was calculated for each storm. If the time from the preceding storm was equal to or larger than the drawdown time of the BMP (48 hours for DEDBs), then the BMP was considered empty at the time of the storm.

If the time between storms was less than the drawdown time, then the capture volume was calculated to account for the size of the previous storm and the dry period between storms. This is done in order to account for insufficient time for the BMPs to completely empty before the next storm arrived. If the volume of stormwater runoff to the BMP from the previous storm was larger than the storage capacity of the BMP, then the BMP was assumed to have filled completely and the initial storage capacity (*ISC*) in equation 4 is zero.

If the runoff volume (for a storm occurring less than the drawdown time prior to the storm of interest) was less than the storage capacity of the BMP, then the difference between the storage capacity of the BMP and the runoff volume from the previous storm was considered available to capture runoff from the next storm. This volume is then added to the storage capacity created from outflow from the basin during the time of the storms as shown in equation 4.

$$TC = ISC + [BV \times DD \times T] \quad (4)$$

Where:

- $TC$ = the treatment capacity ($ft^3$) of a volume-based BMP available to capture runoff over the duration of a storm
- $ISC$ = the remaining storage volume after previous event ($ft^3$), initial storage capacity for storm of interest
- $BV$ = the BMP volume ($ft^3$)
- $DD$ = the draw down rate of a volume-based BMP in percent per hour ($hr^{-1}$) [2.08% per hour for a 48 hour draw down time]
- $T$ = the storm duration (hr)

The above equation accounts for storage capacity that is created during emptying of the BMP while a storm occurs. That is, during long duration storms more runoff can be processed through the BMP than for a short storm of comparable rainfall intensities and runoff rates.

**Step 3 – Determine BMP Percent Captures for Storms**

The storage capacity estimated from step 2 is compared to the runoff volume estimate from step 1. If the storage capacity exceeds the storm runoff volume then the storm is considered to be completely (100%) captured. If the storage capacity is less than the runoff volume a volume of runoff equal to the storage capacity is considered treated by the BMP. The excess volume is assumed to bypass the BMP and enter the receiving water untreated.

### *B.2.5.1.2. Flow Based BMP Capture Efficiency*

Vegetated swales represent the type of flow based BMP implemented as part of the Landmark Village Project. Capture efficiency for flow based BMPs depends on whether the BMP is on-line or off-line. On-line BMPs are designed without bypass capacity. Off-line BMPs are designed with a diversion structure for flows up to the treatment capacity.

**Step 1 – Estimate the Depth of Runoff Captured on an Hourly Basis**

The percent capture estimate for each storm is made through comparison of the hourly rainfall data comprising the storm event to the design rainfall intensity of the flow-based BMP. For on-line BMPs, if the depth of rainfall for a given hour exceeds the design rainfall intensity, then no treatment is credited for that hour. For off-line BMPs, if the depth of rainfall for a given hour exceeds the design rainfall intensity, then no treatment is credited for the rainfall above the design intensity (0.3 inches per hour). If the design capacity (in inches per hour) of the BMP

meets or exceeds the depth of rainfall occurring in a given hour, then all of the resulting runoff during that hour is considered treated.

**Step 2 – Sum the Depth of Rainfall Capture for Each Storm Event**

The depth of rainfall captured for each hour of rainfall during the storm event is then summed to give the total depth of rainfall considered captured by the BMP for the storm of interest.

**Step 3 – Calculate the Percent Capture for Each Storm Event**

The depth of rainfall captured during a given storm event is divided by the total depth of the storm to give the percent capture for the storm event that is used in the water quality model input.

Note that because flow-based BMPs are designed based on rainfall intensity and because a non-variable runoff coefficient method is used to convert rainfall to runoff over each catchment, the runoff characteristics of the catchment do not need to be known to calculate capture efficiency at the design stage. Rather, capture efficiency is based on comparison to design rainfall intensity to measured rainfall intensity.

#### *B.2.5.1.3. BMP Capture Efficiency Results*

The estimated average capture efficiencies for the structural BMPs in the Landmark Village treatment system are shown in Table B-13 for swales, Table B-14 for bioretention BMPs, and Table B-15 for the extended detention basin. The capture efficiency methods described above were used to estimate the fraction of runoff captured by each BMP type for each storm in the period of record.

**Table B-13: BMP Percent Capture Estimate for Swales**

| Sizing Method | Design Precipitation Intensity (in/hr) | Estimated Capture Efficiency (%)[1] | Modeled Volume Reduction (%) |
|---|---|---|---|
| flow | 0.30 | 80 | 25 |

1 – Capture efficiency was calculated with hourly rainfall data for each storm as described above and reported as an annual average.

**Table B-14: BMP Percent Capture Estimate for Bioretention Areas**

| Sizing Method | Design Depth (in) | Estimated Capture Efficiency (%)[1] | Modeled Volume Reduction (%) |
|---|---|---|---|
| volume | Varies with imperviousness | 80 | 25 |

1 – The bioretention BMPs will be sized to capture and treat 80 percent of the stormwater runoff on an average annual basis. The volume reduction, on an average annual basis, was modeled as equivalent to swales.

**Table B-15: BMP Percent Capture Estimate for the Extended Detention Basin**

| Sizing Method | Tributary Area (ac)[1] | % Impervious | Runoff Coefficient | Estimated Capture Efficiency (%) [1] | Modeled Volume Reduction (%) |
|---|---|---|---|---|---|
| volume | 10.9 | 84 | 0.90 | 80 | 15 |

1 – The basin will be sized to capture and treat 80 percent of the stormwater runoff on an average annual basis. Continuous simulation modeling indicated a storage volume of approximately 1.1 acre-feet would be required for a design emptying time of 48 hours. If additional storage capacity is available in the water quality basin above that required for the current tributary area, additional areas may be routed to the basin to utilize the treatment capacity.

As Table B-13, Table B-14 and Table B-15 show, volume and flow-based treatment BMPs will be sized such that an overall capture efficiency of 80 percent or greater is achieved for the treatment of stormwater runoff from the Landmark Village Project on an average annual basis. Capture efficiency in the water quality analysis was conservatively modeled as 80 percent on an average annual basis although off-line swales are expected to exceed this value. In areas where sufficient space is available, volume-based BMPs may be 'oversized' and exceed the treatment goal of 80 percent capture.

#### *B.2.5.1.4. BMP Volume Reductions*

The volume reduction achieved by a BMP is a function of the capture efficiency and the fraction of captured stormwater runoff that is infiltrated, evaporated, or transpired by vegetation.

BMPs specifically designed to infiltrate stormwater runoff are not included in the stormwater management system. However, data in the International BMP Database have shown that as much as 30 percent of stormwater volume captured by dry extended detention basins and 35 percent captured by swales can be lost to infiltration (Strecker et al., 2004), which indicates that this may be an important mechanism that should be included in the water quality analysis. Volume reductions achieved were conservatively modeled as 10 percent for the detention basin[1] and 25 percent for swale and bioretention BMPs. Bioretention areas for the Landmark Village Project will use underdrains to minimize the required footprint area; therefore, volume reduction is modeled conservatively as equivalent to swales.

### B.2.5.2. BMP Pollutant Removal

Various data sources were examined to estimate the anticipated performance of the treatment BMPs. A comprehensive source of BMP performance information is the American Society of Civil Engineers (ASCE) International Stormwater BMP Database (ASCE/EPA, 2003, Strecker et al., 2001). The ASCE BMP database is comprised of carefully examined data from a peer-reviewed collection of studies that have monitored the effectiveness of a variety of BMPs in

[1] The average volume reduction was modeled as 10 percent as the basin will be lined to reduce infiltration and protect bank stability at the edge of the project in turn limiting the volumetric reduction of stormwater runoff.

treating water quality pollutants for a variety of land use types. The mean effluent water quality for treatment BMPs used for modeling purposes was based on values found in the International Stormwater BMP Database (ASCE/EPA, 2003). Recent work in characterizing BMP performance suggests that effluent quality rather than percent removal is more reliable in modeling stormwater treatment (Strecker et al. 2001).

To match site conditions, the BMP database studies were screened to exclude studies where BMP design or function was believed to result in significantly lower performance than the BMP design criteria that will be met for the Landmark Village BMPs. For example some of the detention basins studies had significantly lower maximum detention times than the 48 hour criteria for the water quality basins. The water quality data for detention basins with a drawdown time of less than 9 hours were excluded from the data set used to predict detention basin performance. Certain studies in the detention basins category were not considered comparable in function to the dry-extended detention basin that will be incorporated into the Landmark Village treatment system. Detention basins that were listed as either underground vaults or settling chambers were also excluded. All biofiltration (i.e. vegetated swales and filter strips) studies in the BMP database were deemed valid and were used in statistical analysis.

As with the estimation of land use EMCs, final effluent values to be used in modeling analysis were determined using a combination of regression-on-order statistics and the "bootstrap" method (see Section B.2.4.3).

Once the BMP sites had been screened for design criteria, the normality and lognormality of all BMP effluent sample data sets were tested using the Shapiro-Wilk goodness-of-fit test (Royston 1992). The majority of the pollutant data fit a lognormal distribution. The data that did not statistically fit the lognormal distribution were more closely approximated with a lognormal distribution than a normal distribution. The bootstrap method was applied differently depending on the distributional fit of the data. If the data fit a lognormal distribution, the log-transformed data were bootstrapped and an estimate of the mean and standard deviation were obtained in log space and then converted to arithmetic space. The assumption of lognormality was more stringently applied than normal by using an alpha significance value of 0.1. This was done to improve the estimate of the standard deviation when the assumption of lognormality fails. When analyzing data in log space there is a tendency to overestimate the standard deviation for relatively symmetric data and underestimate the standard deviation for severely skewed data. For datasets that did not fit the lognormal distribution, the raw data were bootstrapped to obtain mean and standard deviation values. Bootstrapping the data in arithmetic space assumes no distribution in those instances when a distribution could not be confirmed through goodness-of-fit testing.

Table B-16 shows the lognormal effluent quality descriptive statistics for detention basins and swales. These values were estimated using the above procedure on the ASCE/USEPA International BMP Database data (ASCE/EPA, 2003). Note that data were not available for nitrite or ammonia for detention basins. Removal was not simulated for these pollutants in the detention basin. Chloride removal was not simulated in the treatment BMPs as chloride is highly water soluble and is not a nutrient given to uptake by vegetation.

**Table B-16: Summary of Lognormal Effluent Quality Statistics & Arithmetic Mean Effluent Quality for Modeled BMPs.**

| Pollutant | Lognormal Modeling Parameters | | | | Arithmetic Means | |
|---|---|---|---|---|---|---|
| | Detention Basins | | Swales & Bioretention | | Detention Basins | Swales & Bioretention |
| | Mean | St Dev | Mean | St. Dev | | |
| **TSS** | 3.503 | 0.709 | 3.089 | 0.821 | 42.7 | 30.7 |
| **Total P** | -1.262 | 0.553 | -1.340 | 1.051 | 0.330 | 0.455 |
| **$NH_3$** | NA | NA | -3.363 | 1.064 | NA | 0.061 |
| **$NO_3$** | -0.346 | 0.671 | -1.394 | 1.108 | 0.886 | 0.459 |
| **$NO_2$** | NA | NA | -5.028 | 1.311 | NA | 0.015 |
| **TKN** | 0.460 | 0.522 | 0.336 | 0.593 | 1.81 | 1.67 |
| **Dissolved Cu** | 2.427 | 0.501 | 1.756 | 0.776 | 12.8 | 7.82 |
| **Total Pb** | 3.000 | 0.931 | 1.402 | 1.314 | 31.0 | 9.64 |
| **Dissolved Zn** | 3.786 | 0.705 | 3.231 | 0.714 | 56.5 | 32.6 |

NA - not available

### B.2.6. Model Parameter Reliability & Assumptions

The input parameters for the water quality model fall into the following five main categories:

- Rainfall data;
- Runoff Coefficients;
- Land Use data;
- Stormwater pollutant EMCs; and
- BMP performance estimates.

Each of the categories of input data is evaluated for accuracy in reflecting the project site conditions:

Rainfall Data: A limited period of record (about 12 years of hourly data) is available from the Castaic Junction gauge monitored by the LACDPW. The Castaic Junction gauge is nearer to the project site and consistently measures precipitation amounts lower than recorded at the Newhall gauge. However, the limited period of hourly data collected at the Castaic Gauge is insufficient for water quality modeling and the rainfall data collected at the Newhall gauge was used. The rainfall data from the Newhall gauge are believed to overestimate the average annual rainfall by about 3 inches per year resulting in a conservative estimate of stormwater runoff volumes and changes in average annual volumes resulting from development. The San Fernando gauge which was used to fill in missing periods in the Newhall gauge measures only slightly lower average rainfall depths than the Newhall gauge and the data used from this gauge were corrected to account for this small difference. Thus the use of San Fernando gauge data to fill gaps in the Newhall record results in a more accurate representation of actual rainfall and does not significantly bias estimates of runoff volume or concentration.

Runoff Coefficients: The estimation of runoff coefficients, described in Section B.2.2, is highly dependant on soil properties (i.e. infiltration potential) and less dependent on parameters such as ET rates, slopes, and surface roughness. Soil properties are estimated as accurately as possible from available data such as soil surveys and site specific geomorphology studies. The result is estimates for runoff coefficients that may somewhat overestimate or underestimate stormwater runoff. The net result on the water quality model is that this parameter is not conservatively estimated; however, it is estimated as accurately as the available information permits. When combined with the overestimate of average annual rainfall and land use percent impervious values (discussed below), stormwater runoff volumes are somewhat conservatively predicted.

Land Use Data: Land use data is generally considered a relatively accurate and quantifiable input parameter. The land use data for the developed conditions can be used to classify land use type and compute area. The percent impervious values used in the water quality model for the urban land uses in the developed project condition are based upon the values listed in the LA County Hydrology Manual (2006). The percent impervious values assigned to types of urban land uses may slightly overestimate imperviousness for some land uses because the Manual is intended for drainage and flood control analysis of large storm events. However on a whole the Hydrology Manual values are generally considered to be a fairly accurate quantification of impervious where detailed site designs are not available. The emphasis of modeling efforts described herein is to quantify imperviousness as accurately as possible without intentionally incorporating conservatism.

Stormwater Pollutant EMCs: Stormwater pollutant EMCs are estimated from monitoring data collected by the LACDPW from land use characterization stations and generally do not have site design and source control BMPs that will be implemented for the Landmark Village Project. Therefore the stormwater pollutant EMCs estimated from the LACDPW data are probably slightly conservative compared to the pollutant concentrations in stormwater runoff that will occur from the developed conditions of the project site.

BMP Capture Efficiency & Effluent Concentrations: Stormwater capture efficiency estimates were calculated in Excel spreadsheets to provide results on a storm-by-storm basis for input into the water quality model, to accurately reflect the anticipated performance of the structural stormwater BMPs.

BMP effluent concentrations are based on studies contained in the International BMP database. These studies are screened to remove data for undersized (i.e. inadequate design criteria) BMPs that are likely to have pollutant removal performance substantially less than the BMPs to be constructed for Landmark Village. This screening is believed to improve the accuracy of BMP performance estimates; however, it is only intended to remove BMPs that are clearly unrepresentative in terms of sizing. The screening process is intended to include BMPs with adequate performance that may not be as well designed or maintained as the structural BMPs that will be part of Landmark Village. It is anticipated that the BMPs for the Landmark Village Project will perform as well, if not slightly better than the projected performance based on the database. A major issue in the use of the International Database is representativeness for semi-

arid climates. In this respect the database contains sites from different climates, but does include a number of sites from semi-arid climates, including data for over 40 sites studied by Caltrans.

Conclusions: The runoff coefficient, land use type and area, land use percent imperviousness and BMP performance model input parameters are thought to be reasonably accurate representations of the site conditions and do not increase the conservativeness of the water quality model. The rainfall data and stormwater pollutant EMC estimates are believed to result in conservative estimates of stormwater runoff volumes, pollutant concentrations and therefore pollutant loads. Overall, the predevelopment model input parameters likely result in a slight underestimation of estimated loads and concentrations in the existing condition. The water quality estimates for the developed project condition are also believed to be conservative (i.e., tend to overestimate loads and concentrations) due to pollutant concentration estimates, and BMP performance estimates that in general do not include the benefits of site design or source control BMPs that are planned to be implemented in Landmark Village.

## B.3. Model Methodology

A Monte Carlo simulation method was used to develop the statistical description for storm water quality. In this approach, the storm water characteristics from a single rainfall event are first estimated. The rainfall depth was determined by randomly sampling from the historical rainfall depth frequency distribution. Similarly, an EMC was determined by randomly sampling from the frequency distribution of EMCs. The rainfall volume and EMC were used to determine runoff volume, pollutant concentration, and pollutant load of the single storm event. BMP volume reduction and performance (effluent quality), determined by randomly sampling from the developed frequency distributions, were used to calculate the pollutant removal resulting from treatment in the BMP system. This procedure was then repeated thousands of times (20,000), recording the volume, EMC and load from each randomly selected storm event, including treatment for the developed project condition. The statistics of these recorded results provide a description of the average characteristics and variability of the volume and water quality of storm water runoff.

- Total Suspended Solids (sediment)
- Total Phosphorus
- Ammonia
- Nitrate
- Nitrite
- Total Nitrogen[2]
- Dissolved Copper
- Total Lead
- Dissolved Zinc
- Chloride

[2] TKN is modeled, but the results are not reported. Total Nitrogen results are reported from the sum of nitrate, nitrite, and TKN.

The steps in the Monte Carlo Water Quality Model are as follows:

1. Develop a statistical description of the number of storm events per year, and randomly select a number $N_{storms}$.
2. Estimate the volume of storm runoff for each land use area from a randomly selected storm event.
3. Randomly select a pollutant concentration in storm runoff for each land-use area and each pollutant.
4. Calculate the total runoff volume, pollutant load, and concentration in runoff from the modeled portion of the project, for both existing and developed conditions.
5. Calculate a total annual pollutant load by repeating steps 2-4 $N_{storms}$ times, where $N_{storms}$ is the number of storms per year, randomly selected in step 1.
6. Repeat steps 1 - 6 a total of 20,000 times for each pollutant modeled, recording the estimated pollutant concentration and annual load for each iteration.
7. Develop a statistical representation (mean annual value) of the recorded storm water pollutant loads and concentrations.

Each of the seven steps is described below.

### B.3.1. Storms & Stormwater Runoff (steps 1 & 2)

#### Step 1 – Statistical Representation of Number of Storm Events per Year

*Number of Storms per Year*

The number of storm events per year was calculated for the 35 complete years in the available period of record from 1969 – 2003. The modeled average number of storm events per year (> 0.1 inches) was 15.4, with a standard deviation of 6.2. Figure B-11 illustrates a frequency histogram of the number of storm events per year at the Newhall gauge. The number of storm events per year was modeled with a normal distribution. In the simulation, the number of storms per year was determined by randomly sampling from the normal distribution and rounding to the nearest whole number, using the equation:

$$N_{storms} = 15.4 + 6.2\ R_N$$

where:

$R_N$ = a standard normal variant with a mean of 0 and a standard deviation of 1.

If the arbitrary number of storms per year was zero or negative, then the normal distribution was re-sampled until a positive number was obtained.

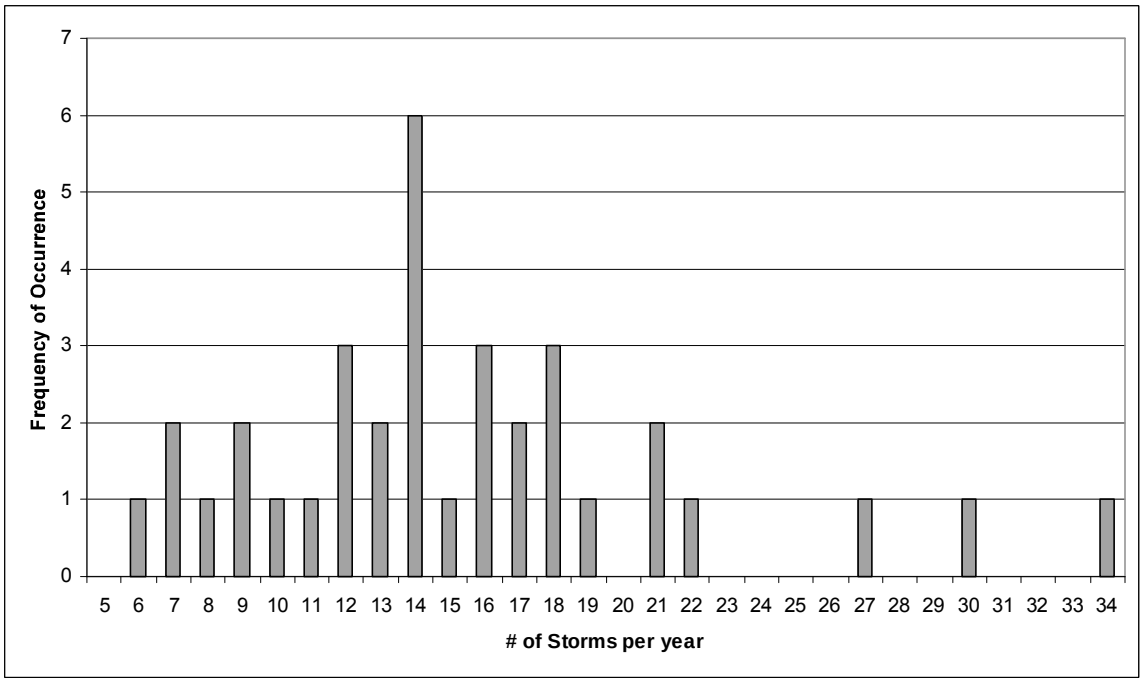


**Figure B-11: Distribution of Storms per Year at the Newhall Gauge**

**Step 2 – Estimate the Volume of Storm Runoff from a Storm Event.**

The runoff volume from each storm was estimated using the following equation:

$$V=R_v PA \quad (5)$$

where:

$V$ = the stormwater runoff volume ($ft^3$)

$P$ = the rainfall depth of the storm (ft)

$A$ = the drainage area ($ft^2$)

$R_v$ = the mean volumetric runoff coefficient, a unit-less value that is a function of the imperviousness of the drainage.

For sub-basins that contain multiple land-use types, the total stormwater runoff volume is determined as the sum of runoff from each land-use type:

$$V_{wshed} = \Sigma_{lu}\, V_{lu} = \Sigma_{lu}\, (R_{v\,lu}\, PA_{lu}) \quad (6)$$

where *lu* designates the land-use type. It is assumed that rain falls uniformly over all land-uses in the sub-basin.

The steps used to calculate the volume of runoff from a randomly selected storm event were:

**Step 2a** Obtain a rainfall depth by randomly sampling from the 538 storm events.

**Step 2b** For each land-use area calculate a runoff volume using equation (5). The same rainfall depth is applied to each land-use area.

**Step 2c** Sum the runoff volumes from each land-use area to obtain the total runoff from the watershed for a particular storm event with equation (6).

### B.3.2. Pollutant Loads & Concentrations (step 3 & 4)

**Step 3 – Estimate a Pollutant Concentration in Storm Runoff from Each Land Use Area**

*Runoff Concentration*

The distribution of land use-based pollutant concentration in storm runoff was developed based on the process described in Section B.2.4.3. For each storm event, stormwater EMCs were sampled randomly for each modeled land use and water quality parameter. The runoff concentration from each land-use area was evaluated with the expression:

$$C_{land-use} = \exp\left(\mu_{\ln x} + \sigma_{\ln x} R_N\right) \quad (7)$$

where:

$\mu_{\ln x}$ = the log-normal mean

$\sigma_{\ln x}$ = the log-normal standard deviation

$R_N$ = a standard normal random variable

**Step 4 – Calculate the Total Runoff Volume, Pollutant Load, and Pollutant Concentration in a Storm Event**

**Step 4A** - The total runoff volume in the watershed was calculated with equation (6) as discussed in Step 2:

$$V_{wshed} = V_{land-use1} + V_{land-use2} + \ldots + V_{land-usei} \quad (8)$$

where the same randomly selected rainfall event was used to calculate runoff volume in each of the land-use areas.

**Step 4B** - The total pollutant load from the watershed was calculated by:

$$L_{wshed} = V_{land-use1} C_{land-use1} + \ldots + V_{land-usei} C_{land-usei} \quad (9)$$

where the concentration in each individual land-use area was calculated with equation (7) discussed in step 3.

**Step 4C** - The average pollutant concentration in runoff from the entire watershed from a single storm event was calculated by dividing the total watershed load (Step 4B) by the total watershed runoff volume (Step 4A):

$$C_{wshed} = L_{wshed} / V_{wshed} \quad (10)$$

Model steps up to 4C (Eq 10) were used in the model calculations for catchments with and without modeled BMPs. The resulting values from Equation 9 and Equation 10 represent the

end model output for catchments without modeled BMPs and represent intermediate calculations for catchments with modeled BMPs

Catchments with treatment BMPs used additional calculations to determine the reduction in pollutant load and concentration achieved with treatment BMPs. The fraction of stormwater runoff receiving treatment was calculated for each storm event, using the capture efficiency associated with that event, as described in Section B.2.5. BMP performance was modeled using a randomly selected effluent concentration achieved within the BMP for each water quality pollutant.

**Step 4D** - The total pollutant load from watersheds with treatment BMPs was calculated by:

$$L_{wshed\_BMPs} = \left[Cap_{\%} \times V_{wshed} \times C_{eff} \times (1 - VR\%)\right] + \left[(1 - Cap_{\%}) \times V_{wshed} \times C_{wshed}\right] \quad (11)$$

where:

$Cap_{\%}$ is the volumetric percent capture of the BMP.

$C_{eff}$ is the randomly determined effluent concentration from the BMP. $C_{eff}$ was determined from sampling from the lognormal distribution described by the parameters contained in Table B-16.

$VR\%$ is the percent reduction in effluent volume achieved by the BMP (see Section B.2.5.1.3).

$V_{wshed}$ and $C_{wshed}$ were calculated per Steps 4A and 4C, respectively

**Step 4E** - The average pollutant concentration in runoff from the entire watershed with treatment from a single storm event was calculated by dividing the total watershed load with treatment by the total watershed runoff volume less the volume lost in BMPs:

$$C_{wshed\_BMPs} = L_{wshed\_BMPs} / V_{wshed\_BMPs} \quad (12)$$

where:

$$V_{wshed\_BMPs} = V_{wshed} \times \left[1 - (Cap_{\%} \times VR\%)\right] \quad (13)$$

The results of step 4D (Eq 11) and step 4E (Eq. 12) were used to compute model results for developed conditions with treatment.

Figure B-12 provides a diagrammatic representation of these water quality calculations.

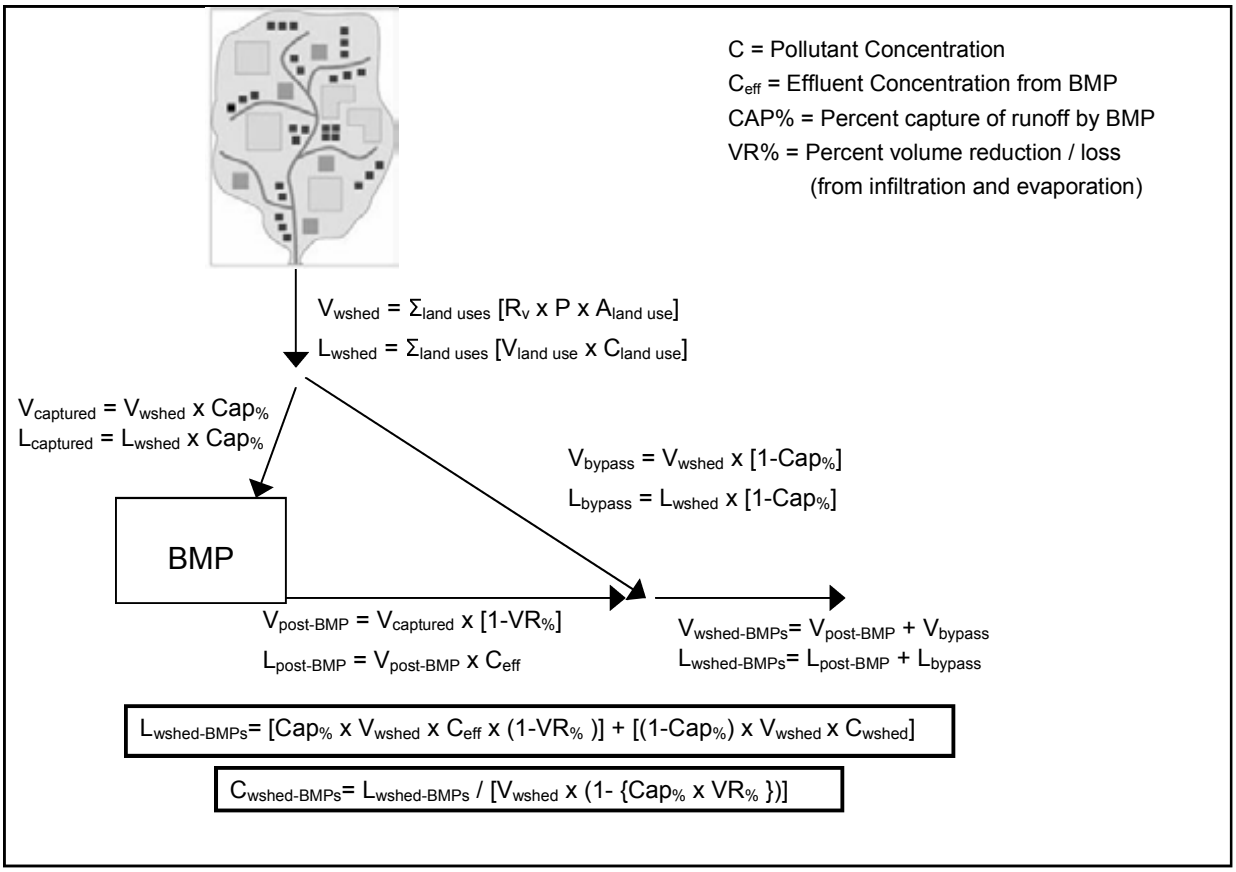


**Figure B-12: Diagrammatic representation of water quality calculations.**

### B.3.3. Annual Pollutant Loads, Concentrations, and Distributions (steps 5, 6, & 7)

#### Step 5 – Calculate a Total Annual Pollutant Load

The annual pollutant load is simply the sum of pollutant loads generated from all storms in a given year, based on the random selection described in Step 1. Therefore, steps 2-4 were repeated $N_{storms}$ times (where $N_{storms}$ was randomly selected per step 1), recording the total pollutant load from each randomly selected storm event. The individual storm loads were summed to obtain the total annual pollutant load.

#### Step 6 & 7 – Determine Distribution of Storm Concentration and Annual Loads

Steps 1-5 were repeated a total of 20,000 times, recording the pollutant concentration and annual load from each iteration. The resultant distributions can be used to present a frequency distribution for pollutant concentrations or loads using statistics calculated from the 20,000 Monte-Carlo iterations.

### B.3.4. Model Methodology Assumptions

The following five key assumptions are made for the Monte Carlo water quality modeling methodology:

1. The assumed probability distributions of model parameters;
2. The assumption of independence between model parameters (i.e. no correlation between randomly determined variables);
3. Assigning a Lower Limit to BMP Effluent Concentrations;
4. Limiting pollutant removals to pollutants with data; and
5. Modeling structural BMPs to only remove pollutants and not acting as a source.

The implications of each of these assumptions to the water quality projections are discussed below.

1) Distribution Assumptions: Probability distributions are assumed to represent the number of storms per year, stormwater pollutant concentrations, and BMP effluent concentrations. Observed rainfall data (i.e., storm frequency) and stormwater monitoring data are fit with either a normal or lognormal distribution using standard statistical procedures. The values of storms per year, rainfall depth, runoff pollutant concentration, and BMP effluent concentrations used in given iteration in the Monte Carlo analysis are governed by the selected distributions. Large samples of these estimated variables will approximate the assumed distributions, and will have the same mean and variance that was observed in the rainfall and monitoring data. The following describes the distributions for various input parameters.

*Storms per Year*: Figure B-11 shows the number of storms per year occurring at the Newhall rain gauge (augmented with data from the San Fernando gauge). The number of storms occurring per year at the Newhall gauge appears to lie between the normal and lognormal distributions. The normal distribution was used to determine the number of storms per year simulated in the water quality model, as use of the lognormal distribution would overestimate the average annual rainfall, as well as its variability, when the distribution of the data is not heavily skewed. As discussed in Section B.2.6, use of rainfall data collected at the Newhall gauge already tends to overestimate the average annual rainfall for the Project site. When using the normal distribution to randomly determine the number of storm per year, the resulting average annual rainfall output from the water quality model is typically in the range of 17.9 to 18.0 inches per year. This is in close agreement with the average annual rainfall from runoff producing storms of 17.9 inches determined directly from the rainfall data (see Table B-1).

*Stormwater Pollutant Concentrations*: The Shapiro-Wilk Test was used to determine the statistical distribution that best represents the raw stormwater runoff monitoring data collected in Los Angeles and Ventura Counties. In most instances the data were found to be log-normally distributed at a confidence level of 0.10. In some instances, the data were not well fit by either the normal or lognormal distributions, but were found to be more closely approximated by the log-normal distribution. For data sets with greater than 50 percent non-detects or that were not log-normally distributed according to the Shapiro-Wilk test, data were analyzed (ROS and

bootstrap) in arithmetic space as to not unreasonably overestimate the standard deviation of the data set. Since stormwater pollutant concentrations, in general, tend to be well approximated by the lognormal distribution (Helsel and Hirsh, 2002), the data sets that did not meet the lognormal criterion are still believed to belong to a log-normally distributed population, but the number of data points is too few to statistically confirm that this is the case. Therefore, simulations of stormwater concentrations in the water quality model were still conducted in lognormal space. This assumption is believed to result in a more accurate prediction than would the application of the normal distribution.

*BMP Effluent Concentrations*: Goodness-of-fit tests conducted on the raw BMP effluent monitoring data from the International BMP Database with the Shapiro-Wilk Test either resulted in (1) confirmation of the appropriateness of the lognormal distribution for the data; or (2) in the instances when the data did not meet the significance criteria of a p value > 0.1, that the data were more closely approximated with the lognormal distribution than the normal. The use of the lognormal distribution to represent BMP effluent concentrations results in higher average estimates of BMP effluent concentration. This is believed to be a more accurate estimation of BMP performance than use of the normal distribution, and is considered a more conservative assumption (leading if anything to higher than anticipated effluent concentrations).

2) Assumption of No Correlation between Model Parameters: The water quality model randomly samples for stormwater pollutant concentrations independent of the storm depth or antecedent dry period. The validity of this assumption is supported by analyses conducted by Environmental Defense Sciences (2002) who did not find a strong correlation between rainfall volume and event mean concentrations (EMCs) in the LA County data for the education land-use site. Data analyses for the single family residential land use were found to be weakly correlated ($R^2$ of $0.6 \pm 0.1$) for some pollutants with storm depth; however some pollutant showed little correlation between these variables. Where weak correlations were present, stormwater pollutant concentrations decreased with storm size.

Correlations between pollutant concentration and antecedent dry period were similarly variable. For the single family land use correlations between pollutant concentration and antecedent dry period were moderately significant for a few pollutants ($R^2$ of $0.8 \pm 0.03$), and weak for other pollutants. Correlations between pollutant concentration and antecedent dry period varied widely for the educational and multi-family land uses.

The results of these analyses indicated that no consistent level of correlation was determined between the stormwater EMCs and the rainfall depth or the antecedent dry period where a significant correlation was found to exist; most pollutants and land-uses showed weak correlations or no correlation. On this basis, stormwater pollutant concentrations are sampled independent of storm depth and antecedent dry period in the water quality model.

Effluent concentrations are considered more reliable estimator of treatment performance than percent removal (Strecker et al. 2001). BMP effluent concentrations were sampled independently of stormwater concentrations (i.e. influent concentration to the BMP) in the water

quality model. As with the pollutant EMCs, independent sampling of effluent concentrations preserves the mean and standard deviation in the monitoring data.

3) BMP Performance – Irreducible Pollutant Effluent Concentrations: When sampling from the lognormal distribution to estimate BMP performance with an effluent concentration it is possible to select values approaching or equal to zero. While well functioning BMPs are capable of achieving high rates of pollutant removal, it is generally accepted that BMPs cannot completely remove pollutants from the water column. In effect BMPs, at best, can achieve what is called an "irreducible pollutant concentration" (Schueler, 1996). In an effort to prevent overestimating BMP performance in the model, lower limits were set for the effluent concentrations of each modeled pollutant and BMP. The lowest observed effluent value in each pollutant data set was used as the irreducible pollutant effluent concentration in the water quality model.

4) BMP Performance – Limiting Pollutant Removal Estimates to Available Data: Table B-17 presents model parameters for estimating BMP pollutant effluent concentrations. Pollutant removal is only simulated for those pollutants with available data from the International BMP Database. In instances where data is not available for a parameter, no treatment is assumed for that parameter. This does not prevent the model from calculating load reductions of the pollutant as a result of hydrologic source control.

5) BMP Performance – BMPs are not a Source of Pollutants: In instances when the randomly determined BMP effluent concentration exceeds the modeled influent concentration, no pollutant removal occurs and the effluent concentration is modified to equal the influent concentration. This prevents BMPs from acting as a source of pollutants in the water quality modeling. The commitment to regular and effective maintenance of the stormwater BMPs provides support for this assumption.

Conclusions: The above assumptions are expected to improve the accuracy of the water quality model estimates. The net result for the model outputs are somewhat conservative estimates of pollutant loads and concentrations due to estimation of model input parameters that are not compromised by the model methodology.

## B.4. Model Reliability

Factors that affect model reliability include variability in environmental conditions and model error. To account for environmental variability, a statistical modeling approach was used that takes into account the observed variability in precipitation from storm to storm and from year to year. The model also takes into account the observed variability in water quality from storm to storm, and for different types of land uses. One way to express this variability is the coefficient of variation (COV) which is the ratio of the standard deviation of the variable to the mean value. Based on the statistical model, the range of COVs for pollutant loads was from 0.5 to 0.8 on an average annual basis, depending on the pollutant. This variability, or greater, is expected in typical storm water runoff.

Model error relates to the ability of the model to properly simulate the processes that affect storm water runoff, concentrations, and loads. Ideally model error is measured through calibration, but calibration is not feasible when considering a future condition. We are confident that the model is a reasonable reflection of storm water processes because the model relies largely on measured regional data. For example, the runoff water quality data are obtained from a comprehensive monitoring program conducted by LA County that has measured runoff concentrations from a variety of land use catchments and for a statistically reliable number of storm events. In addition parameter estimation is fairly conservative resulting in moderately conservative estimates of pollutant concentrations and loads.

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# APPENDIX C
# NEWHALL RANCH STORMWATER MONITORING DATA

# APPENDIX C - NEWHALL RANCH STORMWATER MONITORING DATA

March 6, 2000

| Newhall Ranch Monitoring Station | Hardness mg/L | Calcium mg/L | Magnesium mg/L | Potassium mg/L | Sodium mg/L | Alkalinity mg/L | Sulfate mg/L | Chloride mg/L | Nitrate mg/L | E.Coli MPN/100 mL | TDS mg/L |
|---|---|---|---|---|---|---|---|---|---|---|---|
| A-Mouth of Potrero | 2360 | 324 | 378 | 30 | 1360 | 400 | 3690 | 780 | 16.1 | 8160 | 7530 |
| B-Mouth of San Martinez | 1070 | 229 | 122 | 8 | 392 | 210 | 1520 | 130 | 2.8 | 3090 | 2690 |
| D-Mouth of Middle Canyon | 44 | 11 | 4 | 6 | 9 | 30 | 16 | 3 | 12.4 | 133 | 160 |
| E-Top of Chiquito Canyon | 61 | 18 | 4 | 8 | 13 | 40 | 37 | 9 | 2.6 | 213 | 150 |

| | Boron mg/L | Copper ug/L | Iron ug/L | Manganese ug/L | Zinc ug/L | Aluminum ug/L | Arsenic ug/L | Barium ug/L | Berylium ug/L | Cadmium ug/L | Chromium ug/L |
|---|---|---|---|---|---|---|---|---|---|---|---|
| A-Mouth of Potrero | 2.6 | 20 | 4770 | 880 | 50 | 4570 | 5 | 155 | 0.6 | 0.4 | 7 |
| B-Mouth of San Martinez | 0.8 | 150 | 51500 | 4230 | 300 | 44000 | 21 | 391 | 7 | 8.8 | 47 |
| D-Mouth of Middle Canyon | | 10 | 1290 | 350 | 30 | 2230 | | 136 | 0.4 | 0.4 | 2 |
| E-Top of Chiquito Canyon | | 40 | 11700 | 970 | 150 | 6280 | 3 | 210 | 1.4 | 1 | 10 |

| | Lead ug/L | Mercury ug/L | Nickel ug/L | Selenium ug/L | Total Coliform MPN/100ml | Fecal Coliform MPN/100ml | TSS mg/L | VS mg/L | pH |
|---|---|---|---|---|---|---|---|---|---|
| A-Mouth of Potrero | 8 | 0.01 | 22 | 12 | 50000 | 1600 | 1180 | 32800 | 8.2 |
| B-Mouth of San Martinez | 47.7 | 0.06 | 180 | 11 | 160000 | 1700 | 28000 | 40000 | 8 |
| C-1/2 Mile Upstream of Onion Field | | | | | 90000 | 11000 | | | |
| D-Mouth of Middle Canyon | 7.7 | 6 | | | >160000 | >160000 | 600 | 4100 | 7.5 |
| E-Top of Chiquito Canyon | 19.1 | | 25 | | 2400 | 2400 | 3490 | 9300 | 7.1 |

SS = suspended solids
VS = volatile solids

March 8, 2000

| Newhall Ranch Monitoring Station | Hardness mg/L | Calcium mg/L | Magnesium mg/L | Potassium mg/L | Sodium mg/L | Alkalinity mg/L | Sulfate mg/L | Chloride mg/L | Nitrate mg/L | E.Coli MPN/100 mL | TDS mg/L |
|---|---|---|---|---|---|---|---|---|---|---|---|
| A-Mouth of Potrero | 2090 | 266 | 347 | 39 | 1470 | 360 | 3700 | 960 | 18.8 | 6470 | 7230 |
| B-Mouth of San Martinez | 1340 | 304 | 142 | 10 | 413 | 210 | 1900 | 120 | 3.1 | 2430 | 2960 |
| C-1/2 Mile Upstream of Onion Field | 147 | 44 | 9 | 3 | 10 | 80 | 87 | 3 | 1.6 | 323 | 190 |
| D-Mouth of Middle Canyon | 73 | 21 | 5 | 6 | 10 | 40 | 17 | 3 | 18.1 | 162 | 160 |
| E-Top of Chiquito Canyon | 153 | 43 | 11 | 11 | 18 | 70 | 119 | 12 | 2.9 | 420 | 260 |

| | Boron mg/L | Copper ug/L | Iron ug/L | Manganese ug/L | Zinc ug/L | Aluminum ug/L | Arsenic ug/L | Barium ug/L | Berylium ug/L | Cadmium ug/L | Chromium ug/L |
|---|---|---|---|---|---|---|---|---|---|---|---|
| A-Mouth of Potrero | 2.9 | 10 | 2460 | 510 | 30 | 1580 | 5 | 94.4 | 0.3 | 0.2 | 4 |
| B-Mouth of San Martinez | 0.8 | 200 | 47500 | 5210 | 360 | 69700 | 27 | 573 | 20 | 13.6 | 70 |
| C-1/2 Mile Upstream of Onion Field | | 170 | 44600 | 6950 | 330 | 85100 | 13 | 2360 | 14 | 2 | 39 |
| D-Mouth of Middle Canyon | | | 1510 | 300 | 30 | 2300 | | 132 | 0.5 | 0.4 | 2 |
| E-Top of Chiquito Canyon | | 100 | 30700 | 2110 | 300 | 2360 | 6 | 470 | 4.4 | 2.7 | 27 |

| | Lead ug/L | Mercury ug/L | Nickel ug/L | Selenium ug/L | Total Coliform MPN/100ml | Fecal Coliform MPN/100ml | TSS mg/L | VS mg/L | pH | TOC mg/L | Diazinon ug/L |
|---|---|---|---|---|---|---|---|---|---|---|---|
| A-Mouth of Potrero | 4.2 | 0.03 | 15 | 12 | 30000 | 7000 | 490 | 850 | 8.2 | 21.2 | ND |
| B-Mouth of San Martinez | 59.2 | 0.24 | 330 | 11 | >160000 | 205 | 54200 | 1840 | 7.8 | 11.6 | ND |
| C-1/2 Mile Upstream of Onion Field | 95.2 | 0.45 | 103 | 4 | 160000 | 1600 | 36000 | 1460 | 8.1 | 9.4 | 4 |
| D-Mouth of Middle Canyon | 7.6 | 0.02 | 6 | | 50000 | 2400 | 10700 | 160 | 7.9 | 4 | ND |
| E-Top of Chiquito Canyon | 54.5 | 0.14 | 64 | 2 | >160000 | 160000 | 9800 | 750 | 8 | 15.5 | |

SS = suspended solids
VS = volatile solids

# APPENDIX D
# REVIEW OF BACTERIA DATA FROM SOUTHERN CALIFORNIA WATERSHEDS

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# REVIEW OF BACTERIA DATA FROM SOUTHERN CALIFORNIA WATERSHEDS

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## SUMMARY

Available data from Southern California watersheds demonstrate that both existing and EPA-recommended bacteria water quality criteria are routinely exceeded in fresh water creek and river flows, often by one or more orders of magnitude. Exceedances of criteria occur even for flows from largely natural, undeveloped watersheds with little human influence. Even in urbanized watersheds, there is strong evidence that the predominant source of indicator bacteria may be natural (not anthropogenic) – including, for example, bacteria from wildlife, birds, and regrowth within the environment, including sediments. Both measurement data and numerous literature sources have shown that both wet and dry weather bacteria concentrations frequently exceed objectives in creeks and rivers, and that bacteria concentrations rise dramatically during wet-weather periods.

Data from Orange County coastal watersheds indicate that although bacteria in storm water runoff may be elevated within urban storm drain systems, the level of development within these watersheds has little if any effect on the concentrations of indicator bacteria in the receiving waters. These results are consistent with data from other watersheds within Orange County and in other parts of Southern California. No clear trend is evident in bacteria concentrations over time, with concentrations remaining relatively steady, even in areas where land use characteristics have changed over time. Both the concentrations of bacteria in runoff and the impacts of elevated bacteria concentrations on downstream water quality appear to vary by site and with the size of the contributing stream, and thus are likely a function of the dominant sources of bacteria, local hydrologic conditions and climate, and other site-specific factors.

## INTRODUCTION

Flow Science was retained by The Irvine Company to review available data and information on the concentrations of indicator bacteria in storm water and dry weather runoff. The goals of this study were to evaluate variations in the concentrations of bacteria during both wet and dry conditions, variations in bacteria levels with the level of development in a watershed or drainage area, changes in bacteria levels over time or with changes in development or land use areas, and the sources of bacteria in runoff and in receiving waters.

In conducting the analysis, Flow Science utilized water quality criteria and thresholds to evaluate available data. These thresholds were obtained from the Water Quality Control Plan (Basin Plan) for the Santa Ana Region, which contains fecal coliform water quality objectives for inland surface waters that apply to the beneficial uses of water contact recreation (REC-1)[1] and non-water contact recreation (REC-2)[2], from proposed EPA water quality criteria, and from Title 17 "beach posting" thresholds. These thresholds are discussed in greater detail below.

Flow Science evaluated data on bacteria concentrations in Southern California. Data were available for watersheds along the Newport Coast, for inland watersheds, and from Los Angeles County. In addition, Flow Science reviewed literature and studies conducted by others.

## BACKGROUND: BACTERIA WATER QUALITY STANDARDS

The Basin Plan bacteria objectives currently contained in the Santa Ana Basin Plan were originally developed by the National Technical Advisory Committee (NTAC) to the Federal Water Pollution Control Administration in 1968.[3] These recommendations were based upon prospective

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[1] See Basin Plan at p. 4-6: "REC-1 Fecal coliform: log mean less than 200 organisms/100 mL based on five or more samples/30 day period, and not more than 10% of the samples exceed 400 organisms/100 mL for any 30-day period."

[2] See Basin Plan at p. 4-6: "REC-2 Fecal coliform: average less than 2000 organisms/100 mL and not more than 10% of samples exceed 4000 organisms/100 mL for any 30-day period."

[3] See *Water Quality Criteria, a Report of the National Technical Advisory Committee to the Secretary of the Interior*, Federal Water Pollution Control Administration: Washington, D.C., April 1, 1968, at p. 8 and p. 12:

"Surface waters should be suitable for use in "secondary contact" recreation – activities not involving significant risks of ingestion – without reference to official designation of recreation as a water use. For this purpose, in addition to aesthetic criteria, surface waters should be maintained in a condition to minimize potential health hazards by utilizing fecal coliform criteria. In the absence of local epidemiological experience, the Subcommittee recommends an average not exceeding 2,000 fecal coliforms per 100 ml and a maximum of 4,000 per 100 ml, except in specified mixing zones adjacent to outfalls."

epidemiological studies conducted by the United States Public Health Service in 1948, 1949, and 1950. These studies found an "epidemiologically detectable health effect" at levels of 2300 to 2400 coliforms per 100 ml at bathing beaches on Lake Michigan (at Chicago) and in the Ohio River. Later work conducted in the mid-1960s showed that approximately 18% of the coliforms present in the mid-1960s at the Ohio location belonged to the fecal coliform subgroup. The recreational contact water quality criteria suggested by the committee were based upon the fraction of coliforms present as fecal coliforms and a factor of safety of two.

The fecal coliform standards recommended in 1968 were adopted by many states and municipalities and remain in use in many locations (including in the Santa Ana Region). Several studies conducted since 1968 have questioned these criteria and recommended use of alternatives.[4] As early as 1972, a Committee formed by the National Academy of Science-National Academy of Engineers noted the deficiencies in the study design and data used to establish the recreational fecal coliform criteria, and stated that it could not recommend a recreational water quality criterion because of a paucity of valid epidemiological data (Committee on Water Quality Criteria, 1972).

In response to these concerns, EPA in 1972 initiated studies at marine and freshwater bathing beaches that were designed to correct the deficiencies in the earlier studies and analyses. These studies were conducted at sites contaminated either with pollution from multiple point sources (usually treated effluents that had been disinfected) or by effluents discharged from single point sources. The studies examined three bacterial indicators of fecal pollution (*E. coli*, enterococci, and fecal coliforms) and found that fecal coliform densities showed "little or no correlation" to gastrointestinal illness rates in swimmers. In contrast, a good correlation was found between swimming-associated gastrointestinal symptoms and either *E. coli* or enterococci in swimming waters (Dufour, 1984). Based on these studies, EPA in 1986 proposed section 304(a) criteria for full body contact recreation based upon *E. coli* and/or enterococci but noted that "it is not until their adoption as part of the State water quality standards that the criteria become regulatory" (USEPA, 1986).

EPA's current recommendations for bacteria water quality objectives (USEPA, 2003) include the use of *E. coli* and/or enterococci as the basis for water quality criteria to protect fresh recreational waters and the use of enterococci as the basis for marine water quality criteria. The EPA recommends that the use of fecal coliform be discontinued for both freshwater and marine

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"Fecal coliforms should be used as the indicator organism for evaluating the microbiological suitability of recreation waters. As determined by multiple-tube fermentation or membrane filter procedures and based on a minimum of not less than five samples taken over not more than a 30-day period, the fecal coliform content of primary contact recreation waters shall not exceed a log mean of 200/100 ml, nor shall more than 10 percent of total samples during any 30-day period exceed 400/100 ml."

[4] For a summary of these studies, see the discussion provided on pages 1-3 of the *Ambient Water Quality Criteria for Bacteria – 1986*, USEPA 440/5-84-001, January 1986.

waters. EPA's recommendations recognize that bacteria concentrations are quite variable and are best characterized in terms of a probability distribution. Because bacteria concentrations tend to follow log-normal distributions, EPA's current recommendations specify that compliance should be based upon geometric means computed with data collected over a long-term (e.g., 30 days, or seasonally) and "upper percentile values," clarifying that compliance should not be determined using "single sample maximum" values. Upper percentile values are calculated bacteria densities that are intended to correspond to a known geometric mean-based risk level, and are intended to be used to interpret any single measurement. EPA recommends that states acquire enough sample data to calculate site-specific upper percentile values to characterize water quality for waters where exposure is greatest (e.g., bathing beaches). EPA's recommended water quality criteria for freshwater and marine waters are presented in Tables 1 and 2.

**Table 1. Water quality criteria for bacteria recommended by EPA for fresh recreational waters**

| Risk level[a] [% of swimmers] | Geometric mean density [per 100 ml] | Upper Percentile Value Allowable Density [per 100 ml] | | | |
|---|---|---|---|---|---|
| | | $75^{th}$ percentile | $82^{nd}$ percentile | $90^{th}$ percentile | $95^{th}$ percentile |
| Enterococci criteria | | | | | |
| 0.8 | 33 | 62 | 79 | 107 | 151 |
| 0.9 | 42 | 79 | 100 | 137 | 193 |
| 1.0 | 54 | 101 | 128 | 175 | 247 |
| *E. coli* criteria | | | | | |
| 0.8 | 126 | 236 | 299 | 409 | 576 |
| 0.9 | 161 | 301 | 382 | 523 | 736 |
| 1.0 | 206 | 385 | 489 | 668 | 940 |

a) The risk level corresponds to the anticipated excess illness rate. For example, a risk level of 0.8% is believed to correspond to an illness rate of 8 gastrointestinal illnesses per 1,000 swimmers in excess of background illness rates.

**Table 2. Water quality criteria for enterococci recommended by EPA for marine recreational waters**

| Risk level[a] [% of swimmers] | Geometric mean density [per 100 ml] | Upper Percentile Value Allowable Density [per 100 ml] | | | |
|---|---|---|---|---|---|
| | | 75th percentile | 82nd percentile | 90th percentile | 95th percentile |
| 0.8 | 4 | 13 | 20 | 35 | 63 |
| 0.9 | 5 | 16 | 24 | 42 | 76 |
| 1.0 | 6 | 19 | 29 | 50 | 91 |
| 1.1 | 8 | 23 | 35 | 61 | 110 |
| 1.2 | 9 | 28 | 42 | 73 | 133 |
| 1.3 | 11 | 34 | 51 | 89 | 161 |
| 1.4 | 14 | 41 | 62 | 107 | 195 |
| 1.5 | 17 | 49 | 75 | 130 | 235 |
| 1.6 | 20 | 60 | 91 | 157 | 284 |
| 1.7 | 24 | 72 | 109 | 189 | 344 |
| 1.8 | 29 | 87 | 132 | 229 | 415 |
| 1.9 | 35 | 105 | 160 | 276 | 502 |

a) The risk level corresponds to the anticipated excess illness rate. For example, a risk level of 0.8% is believed to correspond to an illness rate of 8 gastrointestinal illnesses per 1,000 swimmers in excess of background illness rates.

The Santa Ana Region currently continues to utilize fecal coliform bacteria to assess water quality applicable to recreational beneficial uses. However, the Santa Ana Regional Board is currently conducting a triennial review of its Basin Plan, and is including an evaluation of recreational beneficial use designations and water quality objectives as part of the Basin Plan update process. We currently anticipate that the Santa Ana Regional Board will likely update fresh water bacteria water quality objectives; updated objectives may be consistent with the recommendations contained in EPA's November 2003 Implementation Guidance (see Tables 1 and 2).

## ADDITIONAL GUIDELINES FOR BACTERIA

Although not enforceable as water quality objectives, Orange County beaches and bays are "posted" and access may be restricted when exceedances of certain bacteria levels are observed. The "posting" levels are described in Title 17 of the California Code of Regulations, Section 7958 (Bacteriological Standards):

The minimum protective bacteriological standards for waters adjacent to public beaches and public water-contact sports areas shall be as follows:

(1) Based on a single sample, the density of bacteria in water from each sampling station at a public beach or public water contact sports area shall not exceed:

(A) 1,000 total coliform bacteria per 100 milliliters, if the ratio of fecal/total coliform

bacteria exceeds 0.1; or
(B) 10,000 total coliform bacteria per 100 milliliters; or
(C) 400 fecal coliform bacteria per 100 milliliters; or
(D) 104 enterococcus bacteria per 100 milliliters.

(2) Based on the mean of the logarithms of the results of at least five weekly samples during any 30-day sampling period, the density of bacteria in water from any sampling station at a public beach or public water contact sports area, shall not exceed:
(A) 1,000 total coliform bacteria per 100 milliliters; or
(B) 200 fecal coliform bacteria per 100 milliliters; or
(C) 35 enterococcus bacteria per 100 milliliters.

**COMPARISON LEVELS USED IN THIS REPORT**

Flow Science used the following numeric values in analyzing available bacteria data:

Fecal Coliform (from existing Santa Ana Basin Plan water quality standards and Title 17 beach "posting" requirements):
- Single Sample: 400 MPN (or CFU)/100mL[5].
- Geometric Mean: 200 MPN (or CFU)/100mL.

Enterococci (from EPA-recommended criteria):
- Single Sample: 247 MPN (or CFU)/100mL.
- Geometric Mean: 54 MPN (or CFU)/100mL.

Total Coliform (from Title 17 beach "posting" requirements):
- Single Sample: 10,000 MPN (or CFU)/100mL.
- Geometric mean: 1,000 MPN (or CFU)/100mL.

Enterococci criteria used by Flow Science in this report correspond to a proposed 1.0% acceptable risk level, 95$^{th}$ percentile, while fecal and total coliform criteria correspond to beach posting levels. Of course, the beach "posting" requirements apply at the beach, not in upstream freshwater flows, but the numeric values provide a useful threshold value against which data can be compared.

[5] Basin Plan specifies no more than 10% of single samples to exceed this value

## MONITORING DATA AND RESULTS

Flow Science examined data on bacteria concentrations from a variety of sources in the Santa Ana Region, including streams in coastal watersheds, the Santa Ana River, and inland streams. Data sources included:

- Bacteria concentrations in stream flows from Orange County coastal watersheds
- Bacteria concentrations in freshwater bodies in the Santa Ana region
- Bacteria concentration in runoff samples collected by the Los Angeles County Department of Public Works

Data from each of these sources are examined in greater detail below.

### Review of Data from Orange County Coastal Watersheds

Flow Science has reviewed data from Orange County samples collected between 1986 through 2004.[6] Figures for Orange County coastal watersheds are shown in Appendix A; watersheds and data collection locations are shown in Figures A1- 2. Figures A3, A4, and A5 present long-term geometric mean concentrations, calculated as the geometric mean concentration of all available samples (including both wet and dry weather samples) for the period of record, of enterococci, fecal coliforms, and total coliforms, respectively. As shown in Figure A3, long-term geometric mean concentrations of enterococci exceed EPA's proposed freshwater enterococci water quality criteria in all the coastal creeks for which data were available. Similarly, long-term geometric mean concentrations of fecal coliform in most Newport Coast creeks exceed existing Santa Ana Basin Plan REC-1 fecal coliform water quality criteria. Figures A6, A7, and A8 present long-term geometric mean concentrations of enterococci, fecal coliform, and total coliforms plotted against the percent of development within each watershed. There is no apparent correlation for any of the three indicator bacteria presented in these figures with amount of the watershed that has been developed. Note that Figures A6 through A8 utilize the current (2005) level of development for each watershed.[7]

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[6] Data were obtained from http://www.ocbeachinfo.com/downloads/data/index.htm on February 11 and March 22, 2005. For enterococci, data were available from March 30, 1999, through December 21, 2004. For fecal coliform and total coliform, data were available from January 7, 1986, through December 21, 2004. No data were available for *E. coli*.

[7] The area of watershed that was developed was initially established by PBS&J in 1999 (PBS&J, 1999). These values have been subsequently updated based on information received from The Irvine Company in 2005. Two watersheds experienced significant development between 1999 and 2005: the Crystal Cove Creek watershed increased from ~5% to ~70% developed, and the Muddy Creek watershed increased from ~1% to ~60% developed. The level of development within the other coastal watersheds remained approximately constant.

To facilitate analysis, individual samples were segregated as follows: wet-weather[8], summer dry-weather[9], and winter dry-weather.[10] As shown in Figure A9, wet weather samples exceed single sample threshold values most frequently, regardless of which indicator bacteria are sampled (72%, 61%, and 39% of wet-weather enterococci, fecal coliform, and total coliform samples, respectively, exceed single sample thresholds). Summer dry weather samples exceed thresholds less frequently than wet-weather samples, and winter-dry weather samples exceed thresholds least frequently. The single sample thresholds used to calculate the percent of samples in exceedance are 247, 400, and 10,000 MPN/100mL for enterococci, fecal coliform, and total coliform, respectively.

Figures A10 through A53 present the following information for each site: a) a time-series scatter plot of single sample concentrations of enterococci, fecal coliform, and total coliform for the wet and dry weather data, b) wet and dry weather cumulative distribution functions for each bacteria, and c) the percentage of individual samples that exceed corresponding thresholds in each month. From this analysis, the following conclusions may be reached:

1. Lowest geometric mean concentrations of each of the three bacteria (enterococci, fecal coliform, and total coliform) occurred at the Pelican Hill Waterfall station (watershed 95% developed, primarily golf course), and highest geometric mean concentrations of each bacteria occurred at the Emerald Bay Drain station (watershed 3% developed). In the Muddy Creek watershed, which experienced substantial development between 1999 and 2005 (see footnote 7), enterococci concentrations appear to have decreased as the watershed became more developed. Trends were less evident for fecal and total coliform levels. Similar patterns emerged in data from the Crystal Cove Creek watershed, the other watershed that experienced significant development between 1999 and 2005. Enterococci and fecal coliform concentrations appear to have decreased, while any trends in the total coliform record are unclear. These results indicate that bacteria concentrations in creeks may decline as the level of development increases, and bacteria concentrations in runoff from developed watersheds may be lower than runoff from creeks in less developed coastal areas.

2. No relationship was found between the percentage of the watershed developed and the long-term geometric mean bacteria concentrations (see Figures A6, A7 and A8).

3. The time series plots indicate that concentrations of indicator bacteria are not increasing over time. By visual inspection, bacteria concentrations may be

[8] "Wet-weather" samples are those samples that were collected within two days of a rainfall event greater than or equal to 0.1 inches as measured by the Newport Beach Harbor Station.

[9] "Summer dry-weather" samples are defined as samples collected from April-November, but not within two days of rainfall greater than or equal to 0.1 inches as measured by the Newport Beach Harbor Station.

[10] "Winter dry-weather" samples are defined as samples collected from December-March, but not within two days of rainfall greater than or equal to 0.1 inches as measured by the Newport Beach Harbor Station.

decreasing over the data record in five catchments (Pelican Point Creek, Muddy Creek, Emerald Bay Drain, El Morro Creek upstream station, and Crystal Cove Creek). At the remaining six stations, no apparent long-term trend in bacteria concentration is observed. Very little if any correlation is evident between long-term trends and percentage of watershed developed, as the apparent slight decrease in bacteria concentrations was observed in watersheds that range from 1-95% developed.

4. Although Figure A9 shows that taken as a whole, wet-weather samples have higher concentrations than dry-weather samples, data from some locations show the opposite trend. At Pelican Point Creek (95% developed), dry weather concentrations for enterococci and fecal coliform are higher than wet weather concentrations. At the Emerald Bay Drain (3% developed), fecal and total coliform dry weather concentrations are significantly greater than wet weather concentrations. At El Morro Creek (1% developed), Broadway Creek (25% developed), and Crystal Cove Creek upstream station (70% developed) there is no significant difference (by visual inspection of Figures A34-36, A50-52, and A38-40, respectively) between wet and dry weather bacteria concentration distributions.

5. The general observation that winter dry-weather samples on average contain fewer bacteria than summer dry-weather samples is evident in many of the scatter plots. Figures A10, A34, A38, A42, and A46 (presenting data from Pelican Point Creek, El Morro Creek, Crystal Cove Creek upstream, Crystal Cove Creek, and Buck Gully) illustrate this behavior most clearly.

These results are consistent with the results from an earlier study (PBS&J, 1999) in which long-term geometric mean concentrations of bacteriological data from November 1996-October 1999 were evaluated.

**Bacteria Concentrations in Inland Waters in the Santa Ana Region**

As part of the activities conducted by the Stormwater Quality Standards Task Force, CDM has compiled bacteriological data from several agencies within the Santa Ana Region (CDM, 2005). The CDM study included data collected and compiled by Orange County, the Regional Water Quality Control Board (Region 8), the Santa Ana Watershed Project Authority, the County of San Bernardino, the County of Riverside, the United States Environmental Protection Agency (EPA), the United States Geological Survey, and Orange County Coastkeeper. Select figures produced by CDM in this study are shown in Appendix B. CDM performed an overview analysis of all bacteria data collected, and reached the following broad-based and general conclusions:

1. Concentrations of indicator bacteria in samples collected from inland water bodies very frequently exceed existing Basin Plan fecal coliform water quality objectives and EPA-proposed *E. coli* criteria.

2. Bacteria concentrations in samples obtained from upstream, largely undisturbed areas are typically lower than those in samples from downstream areas affected by urbanized land uses. Concentrations in upstream samples are more frequently below water quality objectives and proposed criteria than downstream samples.

3. Winter dry-weather samples are more likely to meet objectives than summer dry-weather samples, consistent with results from the Orange County coastal watersheds.

CDM also conducted a detailed analysis of six sites[11] for which long-term data records were available. These six sites exhibited varying degrees of urbanization and channel modification. A map showing the locations of these six sites is shown in Appendix B as Figure B1. Detailed results from these stations are reproduced in Appendix B as Figures B2 through B13. Land use distributions for the areas tributary to the study sites are shown in Table 3.

**Table 3. Approximate land use distributions in the watersheds of CDM's six detailed study sites**

| Site | % Vacant | % Residential | % Commercial | % Industrial | % Other |
|---|---|---|---|---|---|
| **Chino Cr.[a]** | 3.2 | 61.3 | 16.7 | 9.7 | 9.1 |
| **Santa Ana Delhi Channel** | 0.9 | 52.4 | 26.0 | 9.2 | 11.5 |
| **Temescal Cr.** | 67.3 | 16.2 | 2.4 | 3.4 | 10.7 |
| **Santa Ana R. at Imperial Highway[b]** | - | - | - | - | - |
| **Santa Ana R. at MWD Crossing[c]** | - | - | - | - | - |
| **Icehouse Canyon Creek** | 100 | 0 | 0 | 0 | 0 |

a) Chino Creek land use data are for portion of watershed downstream of San Antonio Dam.
b) CDM concluded that any potential relationship between land use and bacteria concentrations in this reach of the Santa Ana River is likely masked by the interception of flows by Prado Dam; consequently, no data land use data were available in the CDM report for this site.
c) CDM did not include land use statistics for this station in its report. The report states that land use is "diverse…a combination of commercial, residential, industrial, and agricultural lands. The upper part of the watershed includes natural undeveloped lands…Residential land is dispersed throughout the contributing area."

11 The six sites examined by CDM include: Chino Creek at Schaeffer Avenue, the Santa Ana Delhi Channel, Temescal Creek at Lincoln Avenue, the Santa Ana River at Imperial Highway, the Santa Ana River at the Metropolitan Water District crossing, and Icehouse Canyon Creek in the Angeles National Forest.

By examining these sites in detail, CDM found the following:

1. In streams where flow rate data are available, high bacteria counts are in many cases but not always associated with high flow events (presumably caused by rainfall). Bacteria concentrations in samples collected from Chino Creek at Schaeffer Avenue (Figure B2) and the Santa Ana Delhi Channel (Figure B3) are frequently elevated and do not exhibit any apparent correlation with flow rate in the channel. In Temescal Creek (Figure B4) and the Santa Ana River at the MWD crossing (Figure B5), the data are widely scattered and patterns are difficult to detect. In the Santa Ana River at Imperial Highway (Figures B6-7), data show that bacteria levels are elevated during high flow events and the levels remain elevated for 1-2 days after the high flow has receded.

2. Bacteria concentrations appear to be decreasing over time at three locations (Chino Creek at Schaeffer Ave. (data record 2002-2004), Santa Ana River at MWD Crossing (data record 1984-2004), and Santa Ana River at Imperial Highway (data record 1981-2004)). At the other three locations, no long-term trends are apparent.

3. All sites except Icehouse Canyon Creek have regularly exceeded current or proposed water quality objectives. As mentioned previously, concentrations at the two Santa Ana River sites have shown a decreasing trend, and since 1998 most samples have been at or below objective levels. Icehouse Canyon Creek, at elevation 5,100 feet in the Angeles National Forest, has only one sample (of 40 total samples; a fecal coliform measurement of 9,400 MPN/100mL) in the data record that does not comply with existing or anticipated water quality objectives, indicating that runoff from remote, undeveloped, forested catchments at higher elevations may have significantly lower bacteria levels than runoff from lower elevation watersheds, including undeveloped watersheds at lower elevations. Figures B8-13 show, for each of the six sites, the percent of months in which single sample thresholds are exceeded when samples are classified as summer dry, winter dry, or wet-weather.

**Los Angeles County Monitoring Data**

Los Angeles County has prepared an Integrated Receiving Water Impacts Report (Los Angeles County, 2001), which includes bacteria concentrations measured in runoff collected downstream of catchments that exhibited primarily single land use types. Los Angeles County data for indicator bacteria for several major land use types are shown in Table 4 (adapted from Table 4-12 of the L.A. County report).

**Table 4. Bacteria concentration means, medians and coefficients of variation (C.V.) from Los Angeles County Land Use Sites**

| | Total Coliform | | | Fecal Coliform | | | Enterococcus | | |
|---|---|---|---|---|---|---|---|---|---|
| **Land Use Type** | **Mean** | **Median** | **CV[a]** | **Mean** | **Median** | **CV[a]** | **Mean** | **Median** | **CV[a]** |
| **Commercial** | 1,140,000 | 1,250,000 | 0.71 | 528,750 | 90,000 | 1.35 | 86,250 | 40,000 | 1.18 |
| **Vacant** | 9,187 | 2,200 | 1.25 | 1,397 | 500 | 2.60 | 679 | 500 | 0.98 |
| **High density S.F. residential** | 1,366,667 | 1,600,000 | 0.30 | 933,333 | 900,000 | 0.70 | 610,000 | 140,000 | 1.41 |
| **Transportation** | 692,500 | 600,000 | 0.82 | 328,750 | 205,000 | 1.22 | 32,000 | 32,000 | 0.65 |
| **Light industry** | 454,000 | 160,000 | 1.42 | 338,220 | 30,000 | 2.09 | 98,200 | 130,000 | 0.73 |

a) "CV" refers to "Coefficient of Variation", calculated by dividing the standard deviation by the mean.

The data shown in Table 4 demonstrate that significantly lower bacteria concentrations were observed in runoff from vacant land areas than in other land use types. These data were collected by Los Angeles County in Sawpit Creek, downstream of Monrovia Creek, in the City of Monrovia; this catchment is in the San Gabriel Mountains in a very steep, sparsely vegetated area far from the ocean. Low concentrations of indicator bacteria from the Sawpit Creek watershed are consistent with low concentrations in samples collected from Icehouse Canyon Creek, both mountainous, high elevation watersheds. These results differ from observations from the Orange County coastal watersheds, which indicate no relationship between percentage development in a watershed and bacteria concentrations. The differences are most likely due to differences in catchment characteristics, local climate, the numbers and types of wildlife present, or to other factors. In any case, both the mean and median concentrations observed for each Los Angeles County land use type exceeded applicable water quality thresholds.

Los Angeles County also measured bacteria concentrations in several "mass emission" stations. These stations were sited to capture runoff from major Los Angeles County watersheds that generally have heterogeneous land use, with the objective of estimating pollutant loads to the ocean and of identifying long-term trends in pollutant concentrations, where possible. The mass emission stations include Malibu Creek (watershed 6% impervious; measurement station near Malibu Canyon Road), Ballona Creek (watershed 45% impervious; measurement station between Sawtelle Boulevard and Sepulveda Boulevard in Los Angeles), the Los Angeles River (watershed 35% impervious; measurement station between Willow Street and Wardlow Road in Long Beach), and the San Gabriel River (watershed 30% impervious; measurement station below the San Gabriel River Parkway in Pico Rivera).

In addition to the land use data reported in Table 4, Los Angeles County reached a number of conclusions using data collected at these mass emission stations. The following conclusions are cited directly from the Los Angeles County report (2001):

- The Malibu Creek station appears to have consistently lower [bacteria] counts than other mass emission stations.

- Every wet weather mass emission bacteria sample taken exceeded the public health criteria for indicator bacteria. All of the dry weather bacteria samples taken for the low flow diversion projects exceeded the public health criteria. Most of the dry weather mass emission bacteria samples taken exceeded the public health criteria. Wet weather flows contained bacteria densities at much higher levels (three to four orders of magnitude) than dry weather flows.

- Except for 1996-97, densities observed during the first storm of each rainy season were not necessarily higher than during consecutive storm events, suggesting that there was no consistent "first-flush" effect in these watersheds. Peak densities were observed at different times each year. In 1995-96, the peak density at all four mass emission stations and one land use station coincided with the peak storm of the season.

- Except for somewhat lower [bacteria] densities at Malibu Creek, there was no seasonal or regional consistency in cell densities. There was a very wide range of densities for all stations.

Consistent with data from Orange County coastal watersheds, the Los Angeles County data show that samples collected during wet-weather exhibit significantly higher bacteria concentrations than samples collected during dry weather.

## ADDITIONAL DATA ON SOURCES AND CONCENTRATIONS OF BACTERIA IN RUNOFF

Numerous additional studies and data reports have shown a correlation between elevated bacteria concentrations and rainfall events in Southern California. This correlation is evident in data collected from a variety of environments. For example, elevated concentrations of indicator bacteria have been observed during wet weather conditions at Huntington Beach (Boehm et al.,2002; Kim et al., 2004; Reeves et al., 2004), and northern Orange County and Santa Cruz County (Dwight et al., 2004).

Several studies also indicate that runoff from undeveloped watersheds contains bacteria concentrations that exceed relevant water quality standards. For example, storm water runoff from the head of the Rose Creek watershed in the San Diego Region contains levels of indicator bacteria well in excess of water quality objectives, even though this area is non-urban, contains no sewer lines or lift stations, and is restricted from public access (Schiff and Kinney, 2001). Moore (2001) found that concentrations of indicator bacteria in San Juan Creek sampling stations reflecting rural land uses exceeded water quality criteria, and that rainfall events resulted in higher bacteria concentrations at both rural and urban sites than dry weather. (Moore (2001) also found that storm drains can be major sources of dry weather bacteria pollution.)

The level or type of development is not necessarily indicative of bacteria levels in runoff, or

of the presence of human-derived bacteria. In Mission Bay, a highly urbanized watershed, extensive efforts have been made to eliminate human sources of bacteria by repairing the sanitary sewer system and diverting dry weather flows to a local waste water treatment plant. Source tracking studies suggest that human sources contribute a minor fraction of the total fecal inputs to the Bay, and yet violations of water quality standards continue to occur (see Colford et al., 2005, and references therein). Pednekar et al. (2005) also found that changes in land use associated with the development of agricultural lands[12] within watersheds tributary to Newport Bay did not have a significant impact on bacteria loads, stating "The storm loading rate of coliform…appears to be unaffected by the dramatic shift away from agricultural land-use."

A number of studies have indicated that runoff from urban areas may not be the sole or even the primary source of elevated bacteria concentrations in receiving waters, but that such elevated levels may be caused by non-human sources, such as terrestrial wildlife and birds or even local sediments. Studies conducted at Huntington Beach have indicated that there may be many sources of indicator bacteria to the surf zone, including urban runoff, flow from adjacent wetlands, birds, and sediments (Grant et al., 2001). A recent study by Noblet et al. (2004) indicates that birds may be the source of high concentrations of indicator bacteria at the mouth of the Santa Ana River and in the nearby surf zone, and suggested that local sediments may be the source of fecal steroids, indicating the presence of fecal-associated material in the sediments. Another study by the Los Angeles Regional Water Quality Control Board (2004) erected a bird exclusion structure on Cabrillo Beach, and found that bacteria levels below the structure were reduced up to 60% compared to levels measured outside the structure, while exceedances of water quality standards were reduced by 65% below the structure. The Los Angeles Regional Board also reported that "high bacterial densities may be largely from the beach itself."

Other studies have provided additional evidence that the bacteria found in creeks may result from natural, not urban, sources. Orange County recently studied the efficacy of several best management practices (BMPs) for reducing bacteria concentrations in Aliso Creek, Orange County, California. Results of this study have been summarized by GeoSyntec (2005) (attached as Appendix C). The BMPs that were evaluated include 1) a multimedia filtration and UV sterilization system, and 2) wetland ponds. The study, which was conducted during dry weather, found that both BMPs greatly reduced concentrations of indicator bacteria[13], but that bacteria levels rebounded within a short distance downstream of the BMPs. In the case of the filtration/sterilization, the geometric mean concentration of fecal coliform increased from 317 cfu/100mL at the outlet of the BMP to

[12] Tributary creeks to Newport Bay studied by Pednekar et al. include the San Diego Creek (SDC) and the Santa Ana Delhi Channel (SAD). The SDC watershed remained between 52-60% developed over the study period. Agricultural land-use decreased from 34% to 2%, while commercial land-use increased from 1% to 10%, industrial land-use from 2% to 20%, and residential land-use from 11% to 25%. The SAD watershed remained between 88-92% developed over the study period. Agricultural and residential land-use decreased while commercial land-use increased from 3% to 15% and industrial land-use increased from 19% to 33%.

[13] In comparing influent and effluent, multimedia filtration/UV sterilization resulted in a 99.6% reduction in fecal coliform concentration; wetland ponds achieved a 90-99% reduction in fecal coliform concentrations.

2575 cfu/100mL in a natural channel at a distance of 35 feet downstream of the BMP. In the case of the wetland ponds, effluent was routed through a pipe approximately 200 feet long to the monitoring station, which recorded concentrations approximately two times greater than what could be accounted for based on mass-balance calculations. However, uncertainty in flow measurements, data variability, and the fact that ~37% of the flow is not intercepted by the wetlands indicate that regrowth is not the only possible explanation for the unexpectedly high bacteria concentrations at the pipe outlet.

The link between bacteria concentrations in rivers and streams and downstream water quality, including surf zone water quality, has been examined by a number of authors in addition to those cited above. PBS&J (1999) found that even though Newport coastal creek waters contained high concentrations of indicator bacteria, it did not appear that these waters had a significant impact on bacteria concentrations in the surf zone. Ahn et al. (2005) found that while storm water runoff from the Santa Ana River may lead to "very poor" surf zone water quality, the impact on the surf zone was generally confined to <5 km around the river outlet. Pednekar et al. (2005) studied bacteria concentrations in Newport Bay, California, and found that approximately 70% of the variability in the coliform record could be attributed to rainfall, implying that storm water runoff from the surrounding watershed is a primary source of coliform in Newport Bay. A difference in scale may account for the different conclusions reached by different studies – the Ahn et al. and Pednekar et al. studies found significant impacts on surf zone water quality by examining large creeks and rivers, while PBS&J's conclusion that creek water quality does not significantly affect surf zone water quality is based on a study of small to medium sized creeks – and clearly highlights the need for site-specific evaluations of bacterial water quality.

Presumably, the source of bacteria affects its pathogenicity and risk to human health, but data on human health risks from non-human source bacteria are scarce. Some studies (see, e.g., Schroeder et al., 2002) call into question whether the presence or concentration of indicator bacteria in urban runoff has any relationship with the possible presence of human pathogens. Schroeder et al. sampled paved and grass areas of parks, roofs, residential lawns, ponds, storm drains and similar surfaces to characterize the microbial community that may be present in urban water. Each sample was tested for indicator organisms (coliforms, fecal coliforms, *E. coli*, and enterococci), viruses (adenovirus, enterovirus, hepatitis A virus, and rotavirus), bacteria (enterohemorrhagic Escherichia coli, enterotoxigenic Escherichia coli, Shigella, Salmonella, and Staphylococcus aureus), and protozoa (Giardia lamblia and Cryptosporidium parvum). The study states found that although pathogens can be found in urban drainage, "there does not appear to be a relationship between the presence of pathogens and the concentration or presence of indicator organisms." Of particular note, a recent epidemiological study of health risks due to swimming in Mission Bay (Colford et al., 2005), where concentrations of indicator bacteria are believed to be predominantly from non-human sources, concluded that the risks of swimming-related illness were uncorrelated with exceedances of state water quality thresholds or with levels of indicator bacteria.

In conclusion, the available data from Southern California indicate that bacteria concentrations are often elevated in runoff from both urban and undeveloped watersheds,

particularly during wet weather conditions. The level of development appears to have little effect on bacteria concentrations in storm flows. There is no clear trend in bacteria concentrations over time, with concentrations remaining relatively steady, even in areas where land use characteristics have changed over time. Available data also indicate that multiple sources may contribute to high concentrations of indicator bacteria, including natural sources such as wildlife, birds, and sediments. Regrowth within the environment also occurs, resulting in elevated bacteria concentrations even downstream of the point where relatively bacteria-free flows enter natural channels or man-made conveyances. Finally, the impact of high bacteria concentrations on downstream water quality appears to vary by location and conditions.

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# APPENDIX A

# DATA FROM ORANGE COUNTY COASTAL CREEKS

**Figure A 1: Location of coastal catchments and surf zone areas along the Newport Coast.**

**Figure A 2: Additional detail on the catchment areas (information collated from the PBS&J report, 1999 and updated by The Irvine Company, 2005).**

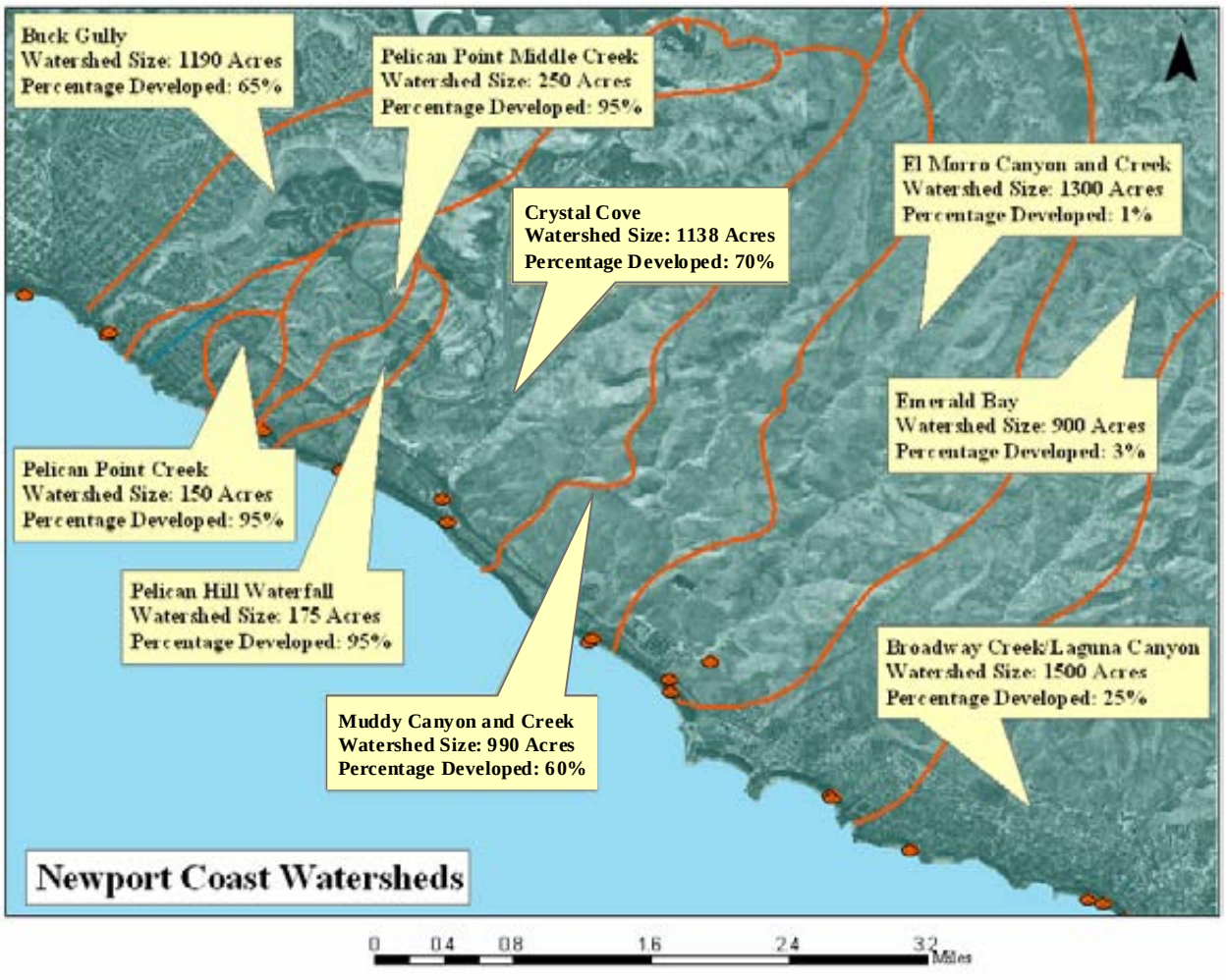


**Figure A 3: Long-term geometric mean concentration for enterococci (data from 3/30/99 to 12/21/04). Dashed line represents EPA's suggested 30-day geometric mean water quality criterion for enterococci corresponding to a 1.0% risk level.**

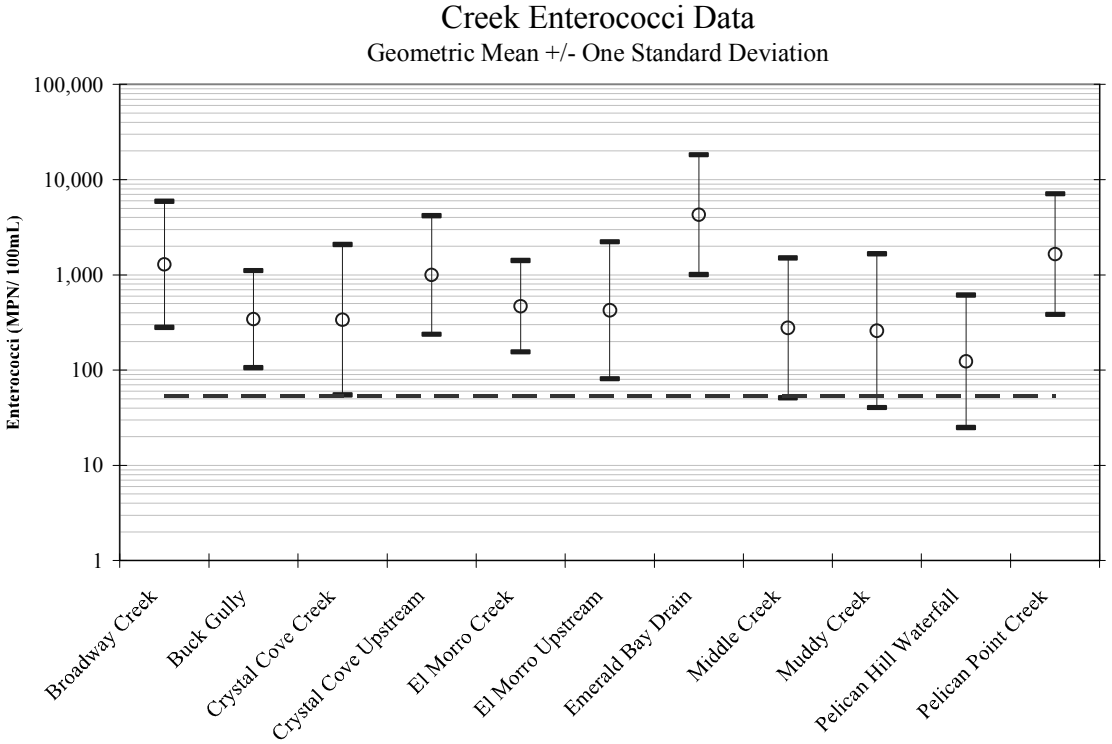



**Figure A 4: Long-term geometric mean fecal coliform concentrations (data from 1/7/86 to 12/21/04). Dashed line corresponds to the current Santa Ana Basin Plan water quality criterion for 30-day log mean (geometric mean) fecal coliform concentrations.**

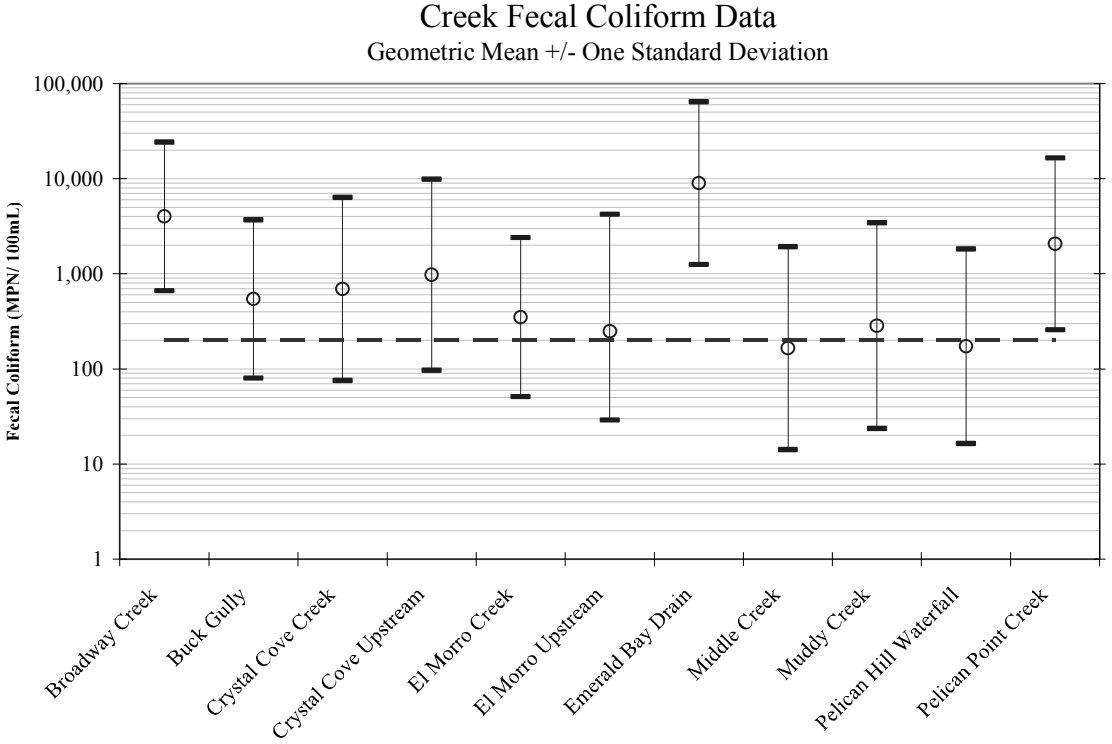


**Figure A 5: Long-term geometric mean concentrations for total coliform (data from 1/7/86 to 12/21/04)**

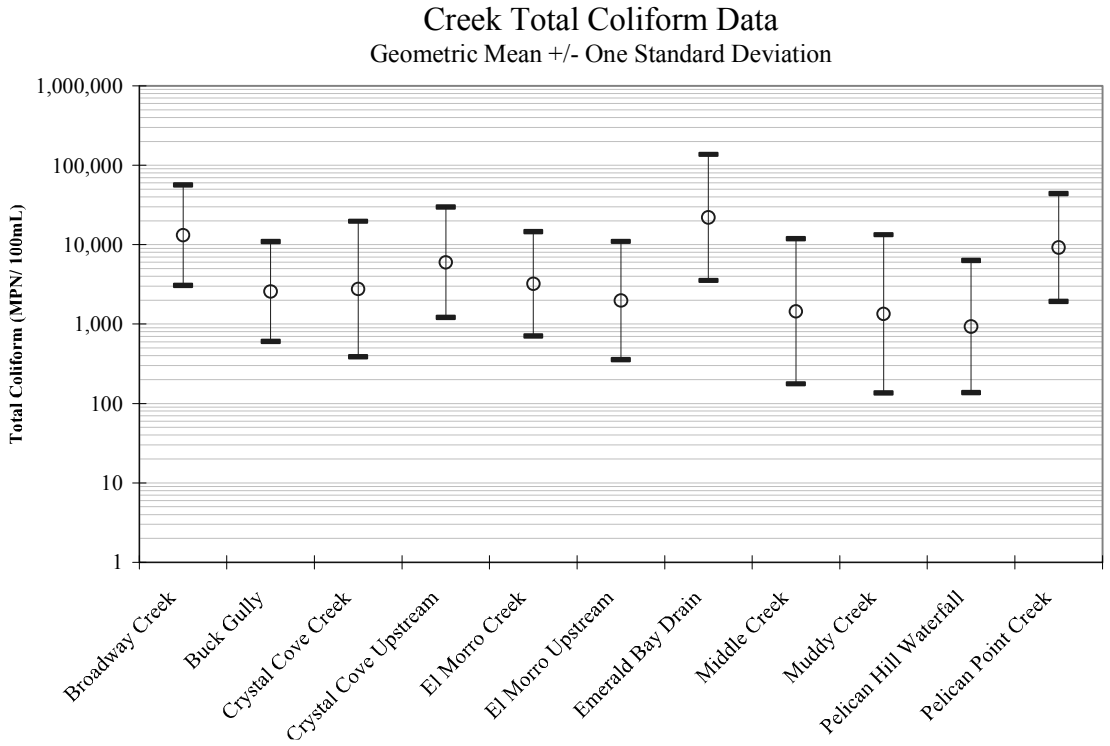



**Figure A 6: Relationship between % developed and the long-term geometric mean enterococci concentration (data from 3/30/99 to 12/21/04). Dashed line represents EPA's suggested 30-day geometric mean water quality criterion for enterococci corresponding to a 1.0% risk level.**

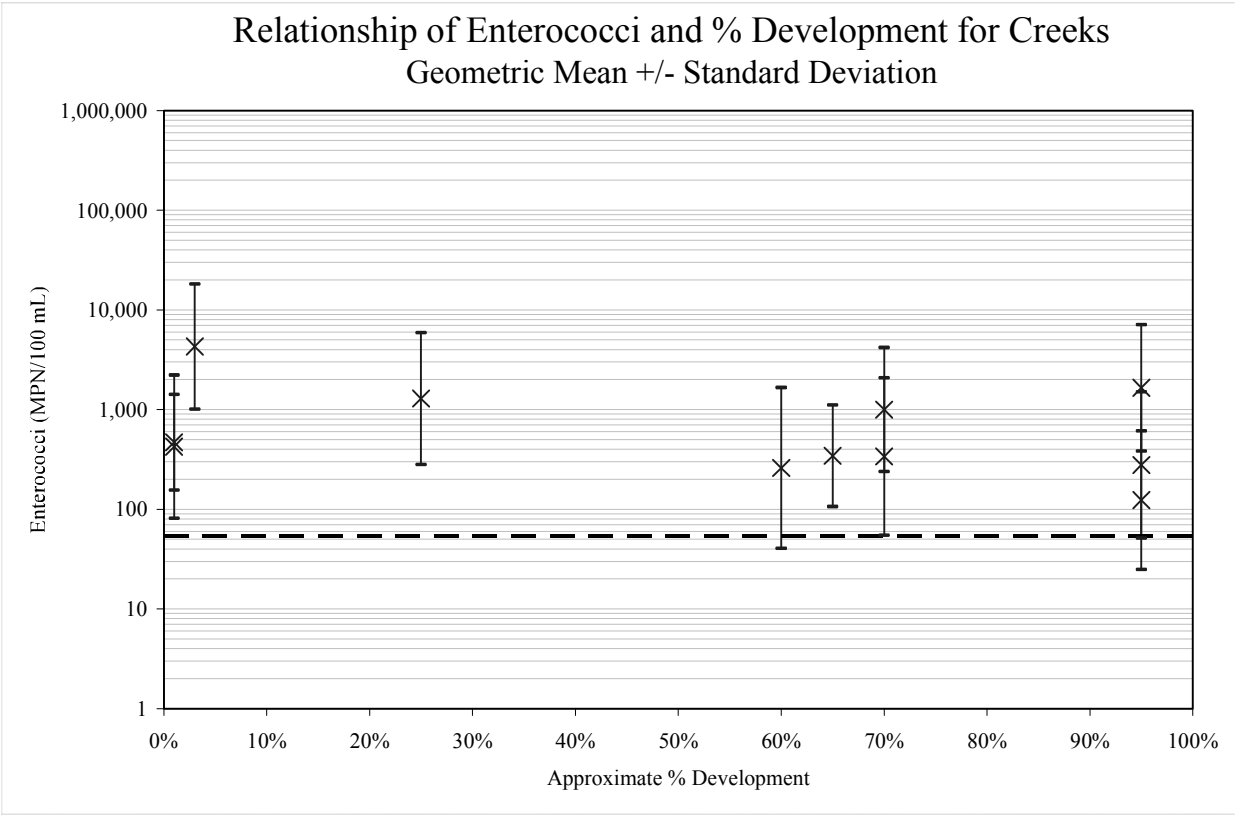


**Figure A 7: Relationship between % developed and the long-term geometric mean fecal coliform concentration (data from 1/7/86 to 12/21/04). Dashed line corresponds to the current Santa Ana Basin Plan water quality criterion for 30-day log mean (geometric mean) fecal coliform concentrations.**

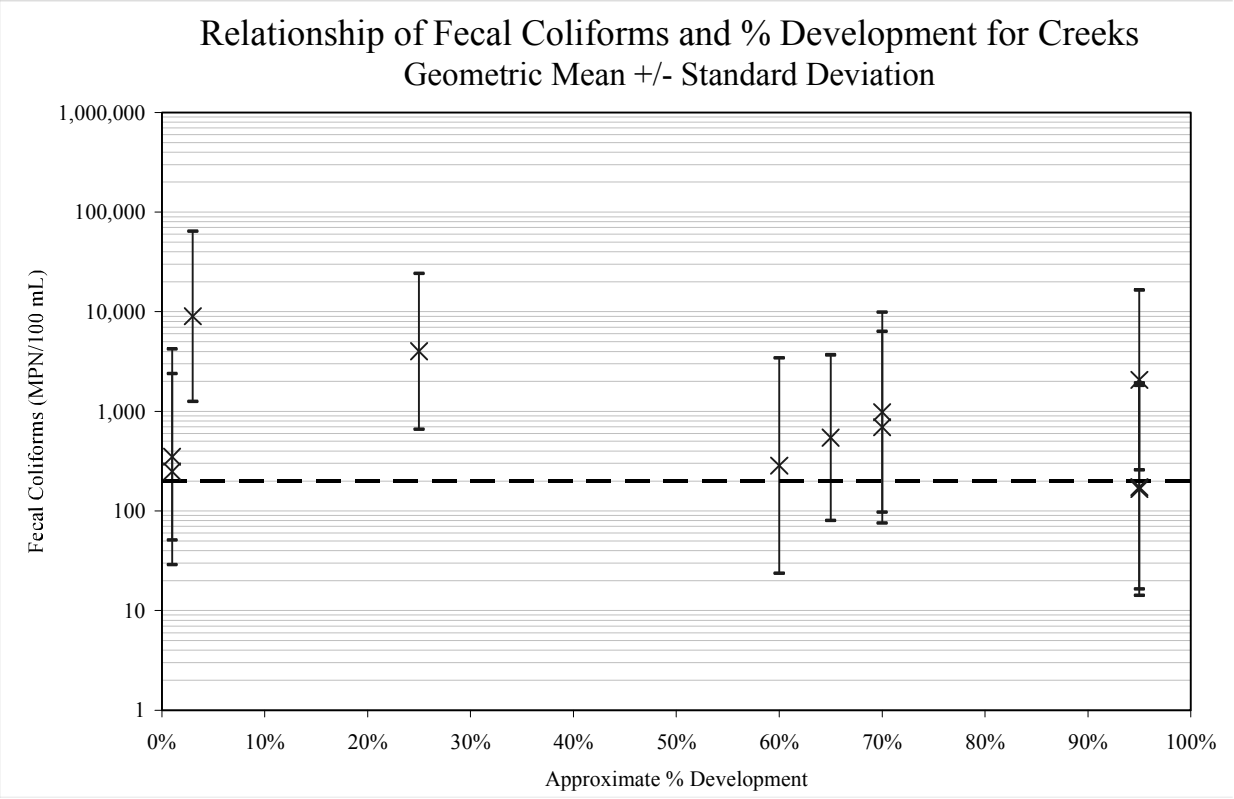


**Figure A 8: Relationship between % developed and the long-term geometric mean total coliform concentration (data from 1/7/86 to 12/21/04).**

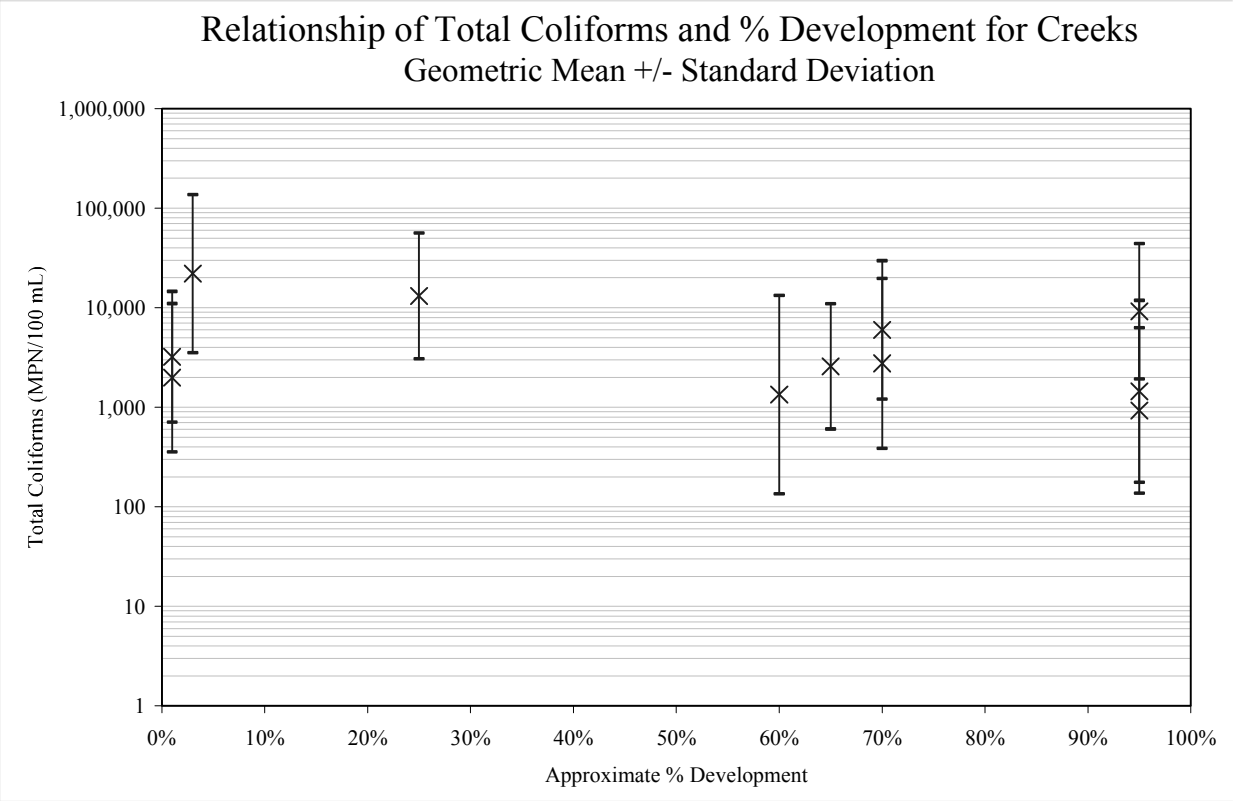


**Figure A 9: Percent of samples in exceedance of thresholds by weather type (data from 1/7/86 to 12/21/04 for total and fecal coliform and from 3/30/1999 to 12/21/04 for enterococci). "Wet" data are those within two days of rainfall totaling 0.1" or greater at Newport Harbor. "Summer Dry" samples were collected from April-November, but not within two days of 0.1" or more of rain. "Winter Dry" samples were collected from December-March, but not within two days of 0.1" or more of rain. Threshold values against which data were compared are 247, 400, and 10,000 MPN/100mL, for enterococci, fecal coliform, and total coliform, respectively.**

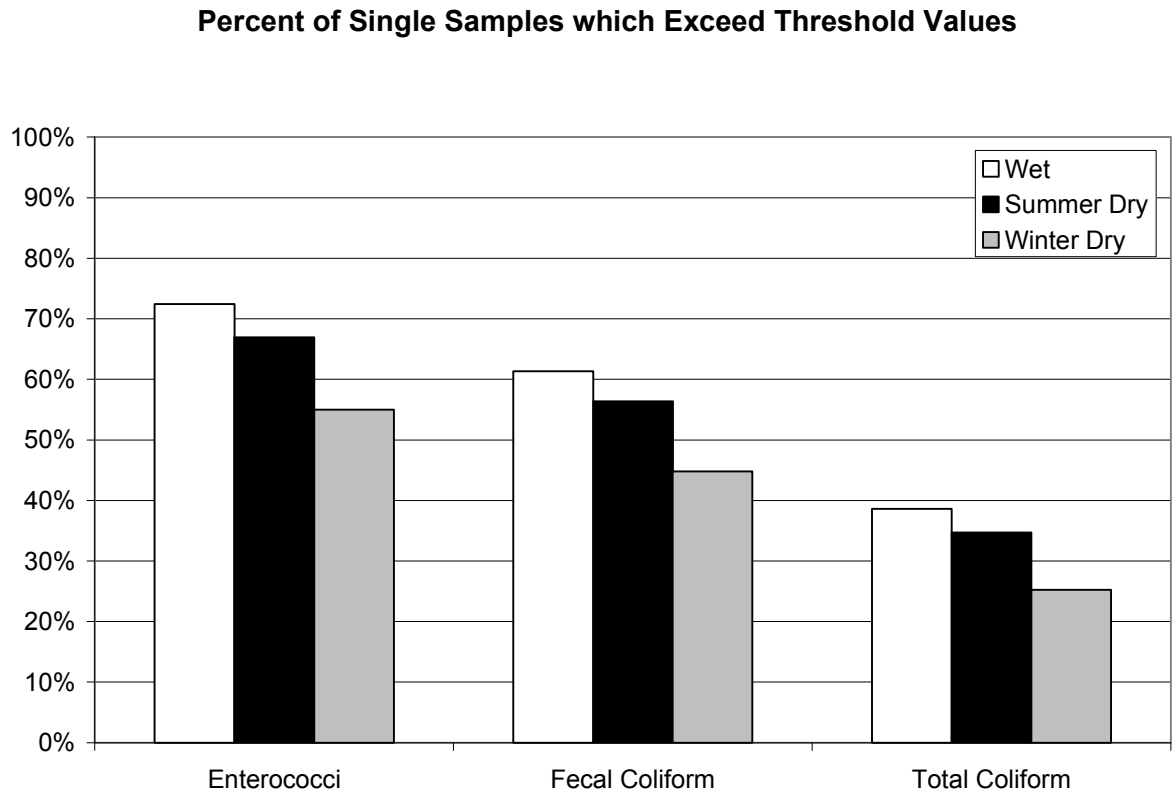
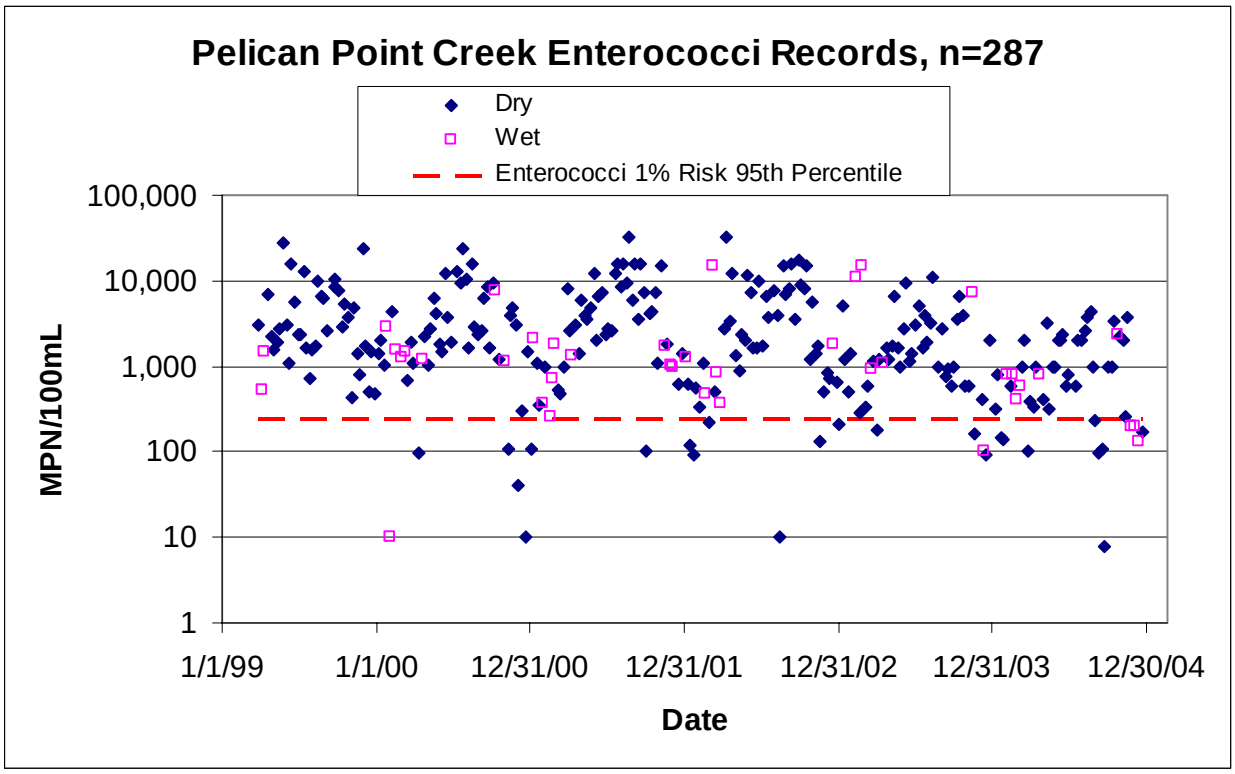


**Figure A 10: Pelican Point Creek enterococci data and corresponding cumulative frequency distribution**



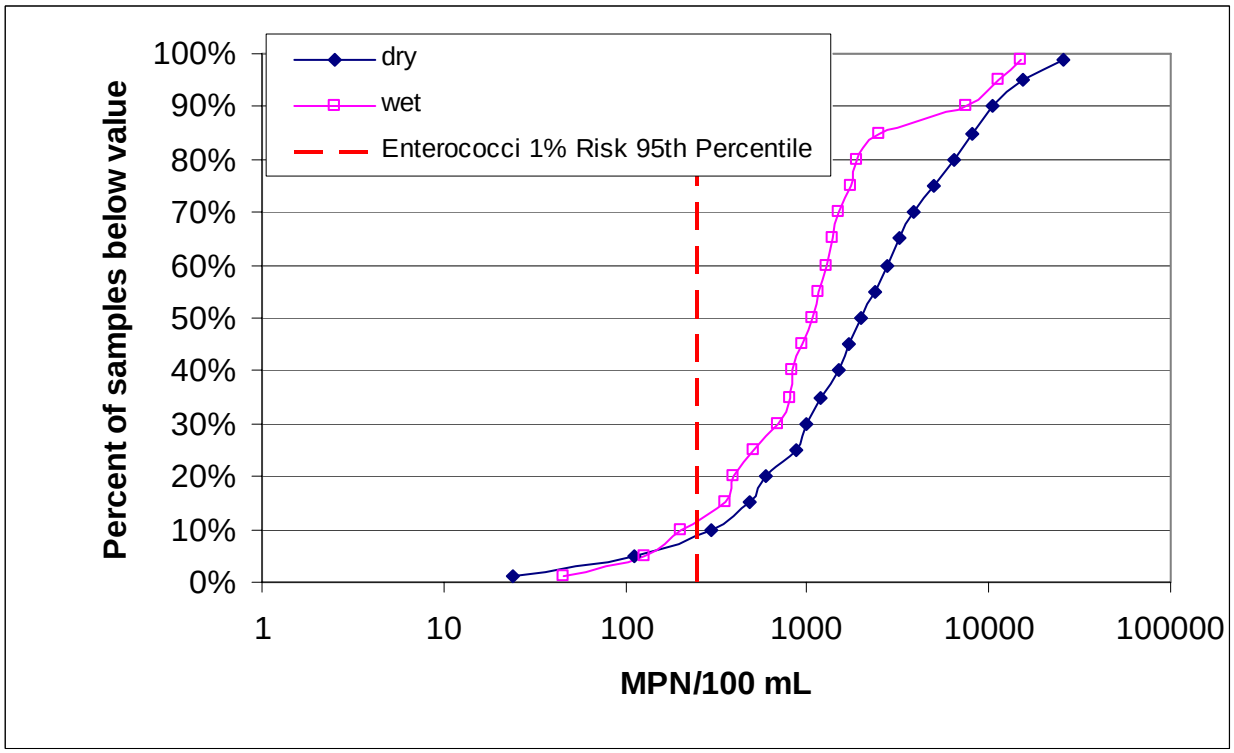
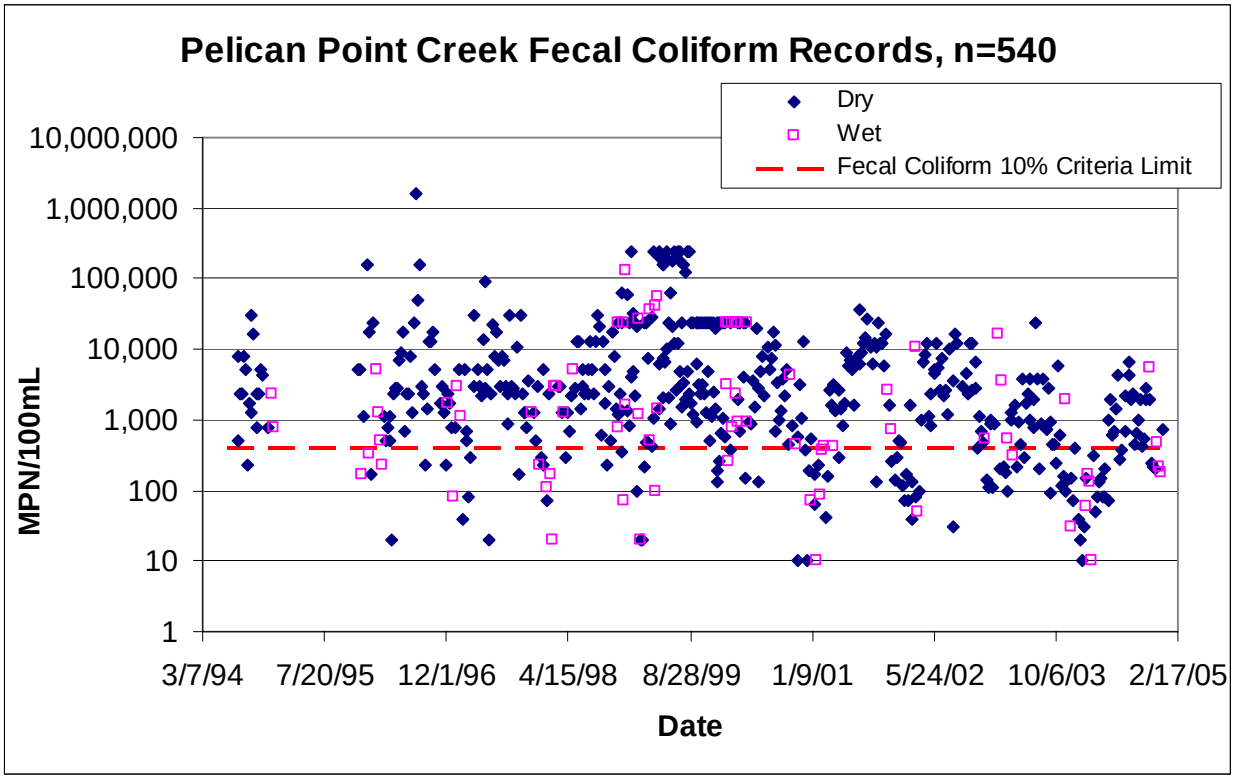



**Figure A 11: Pelican Point Creek fecal coliform data and corresponding cumulative frequency distribution**



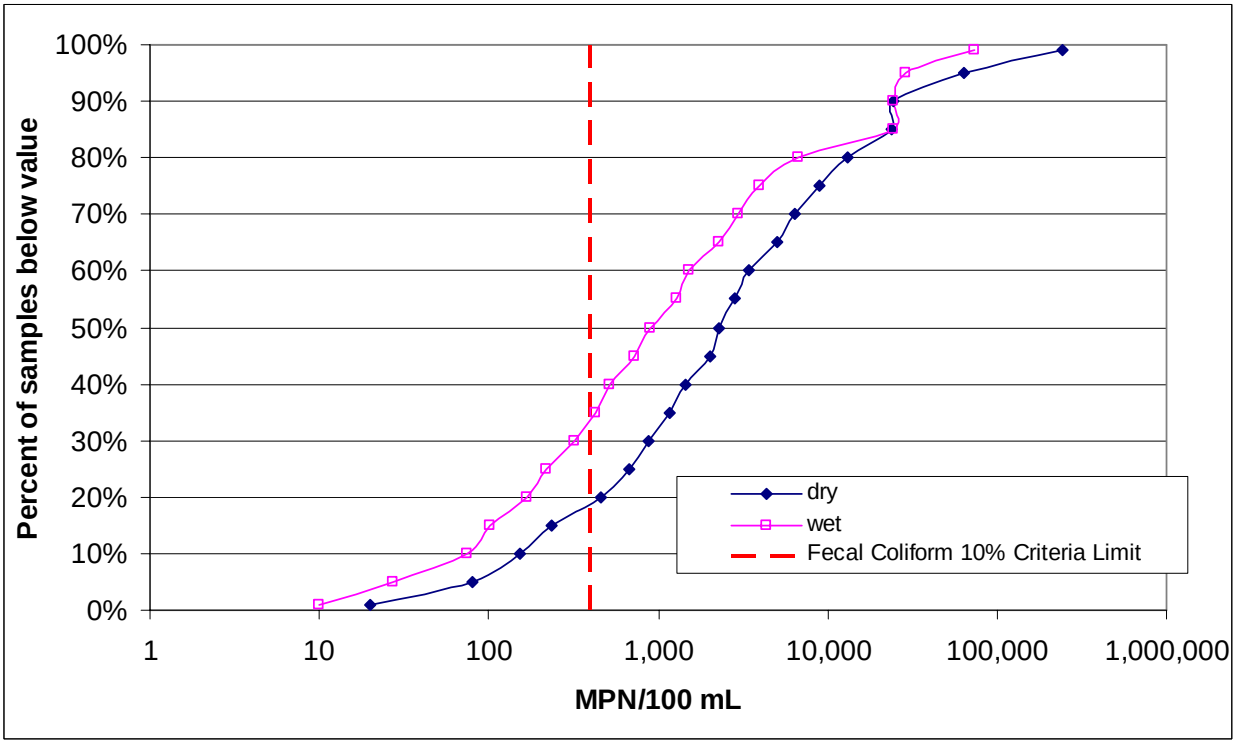
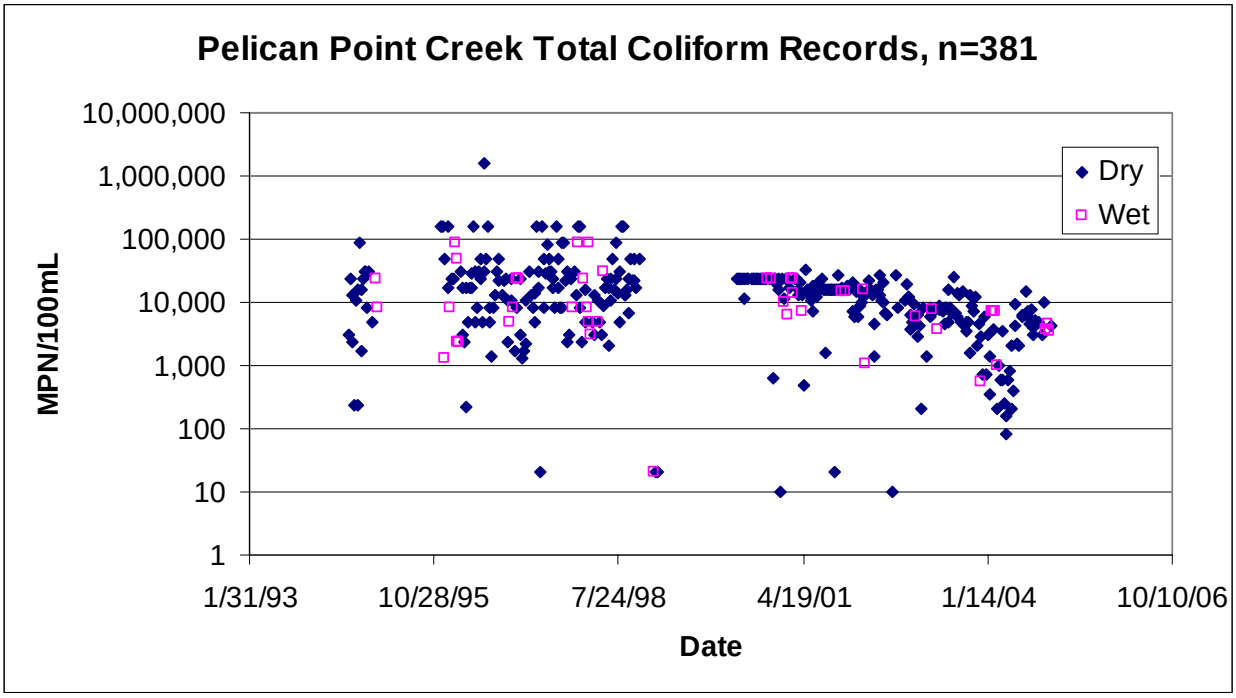



**Figure A 12: Pelican Point Creek total coliform data and corresponding cumulative frequency distribution**



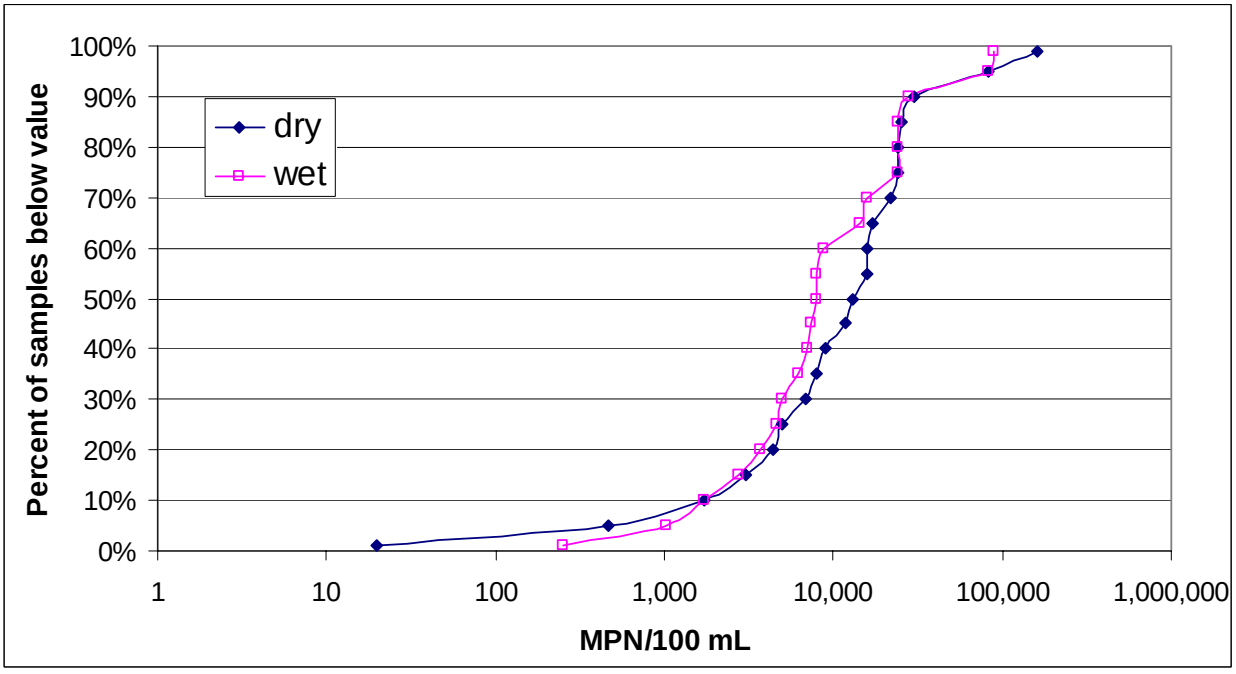



**Figure A 13: Percentage of samples from Pelican Point Creek which exceed thresholds, by month**

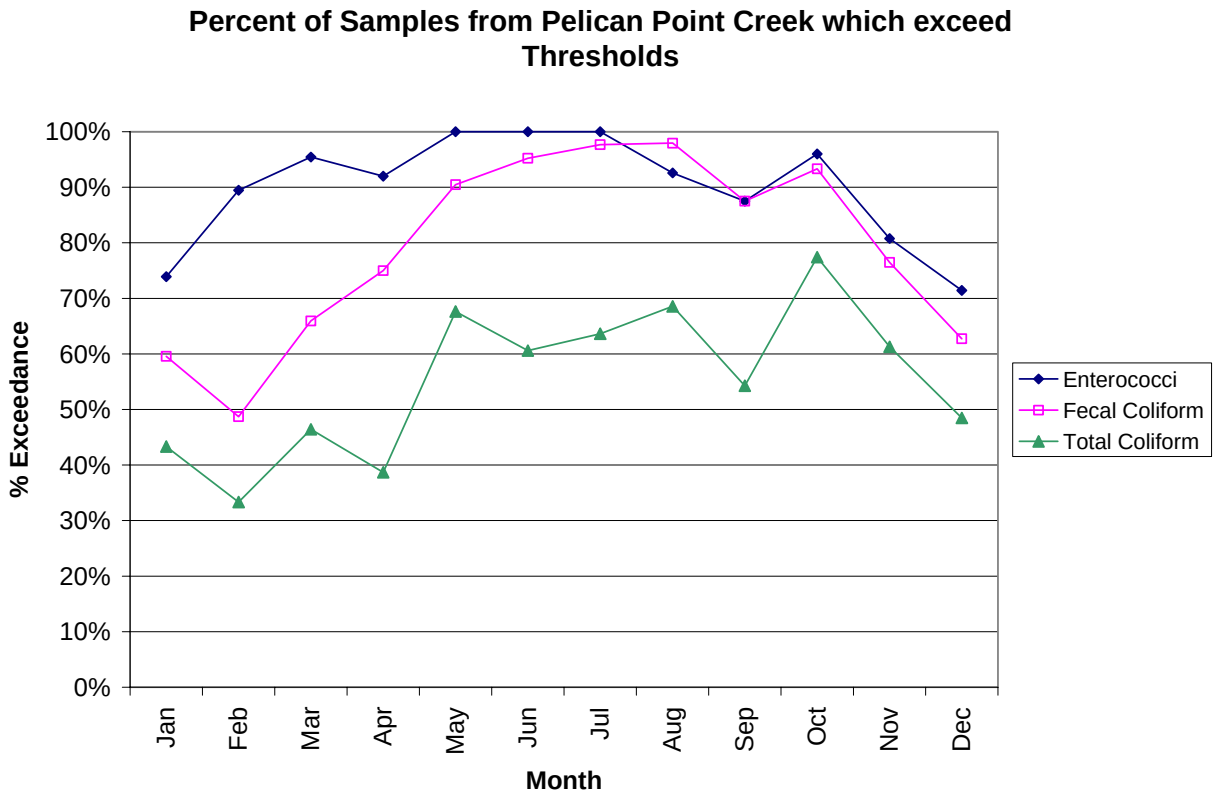
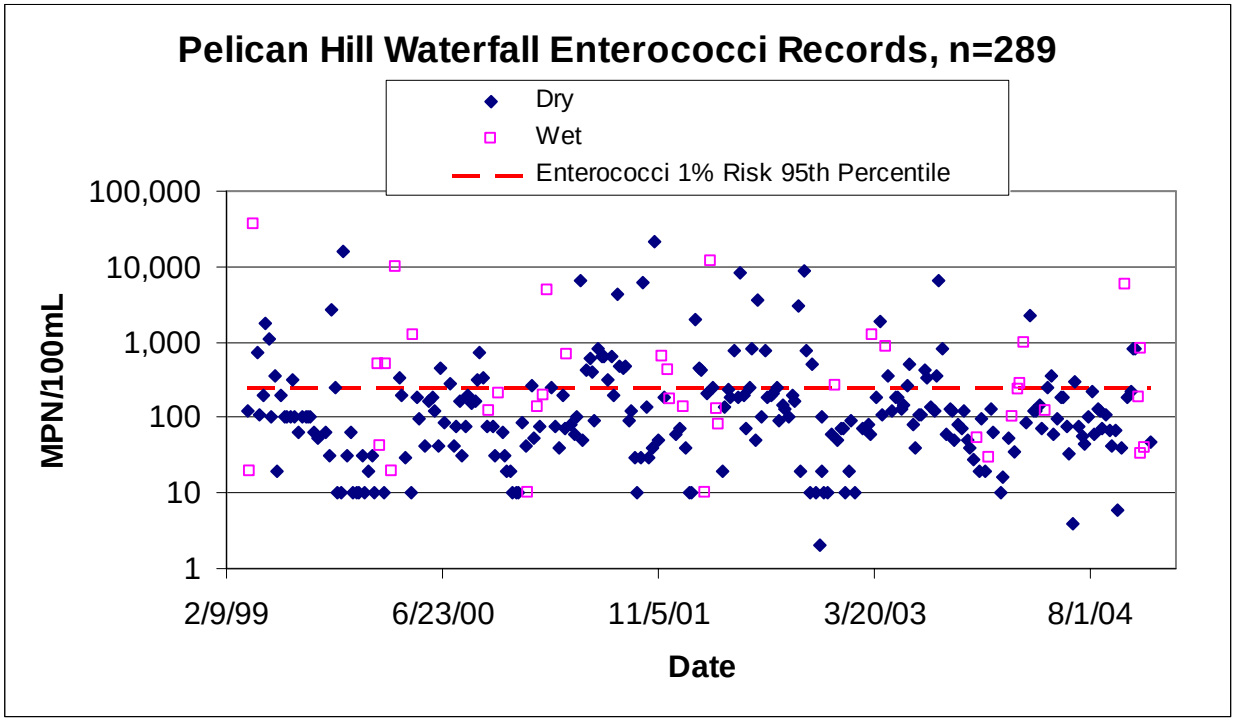


**Figure A 14: Pelican Hill Waterfall enterococci data and corresponding cumulative frequency distribution**



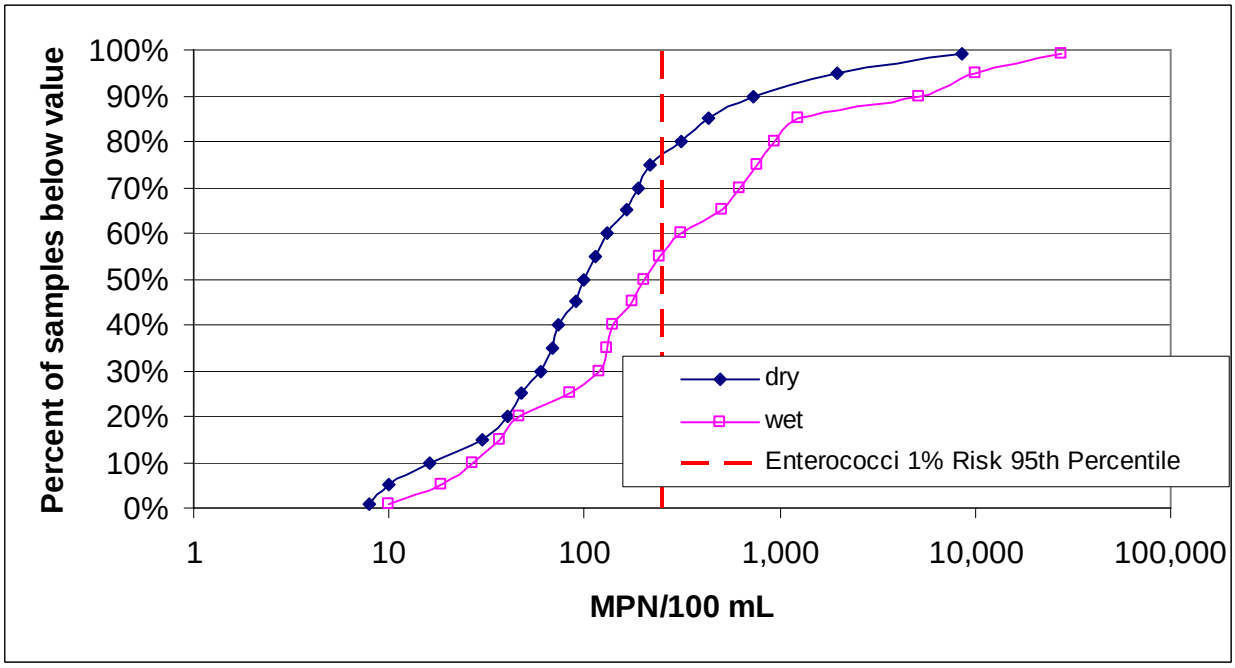
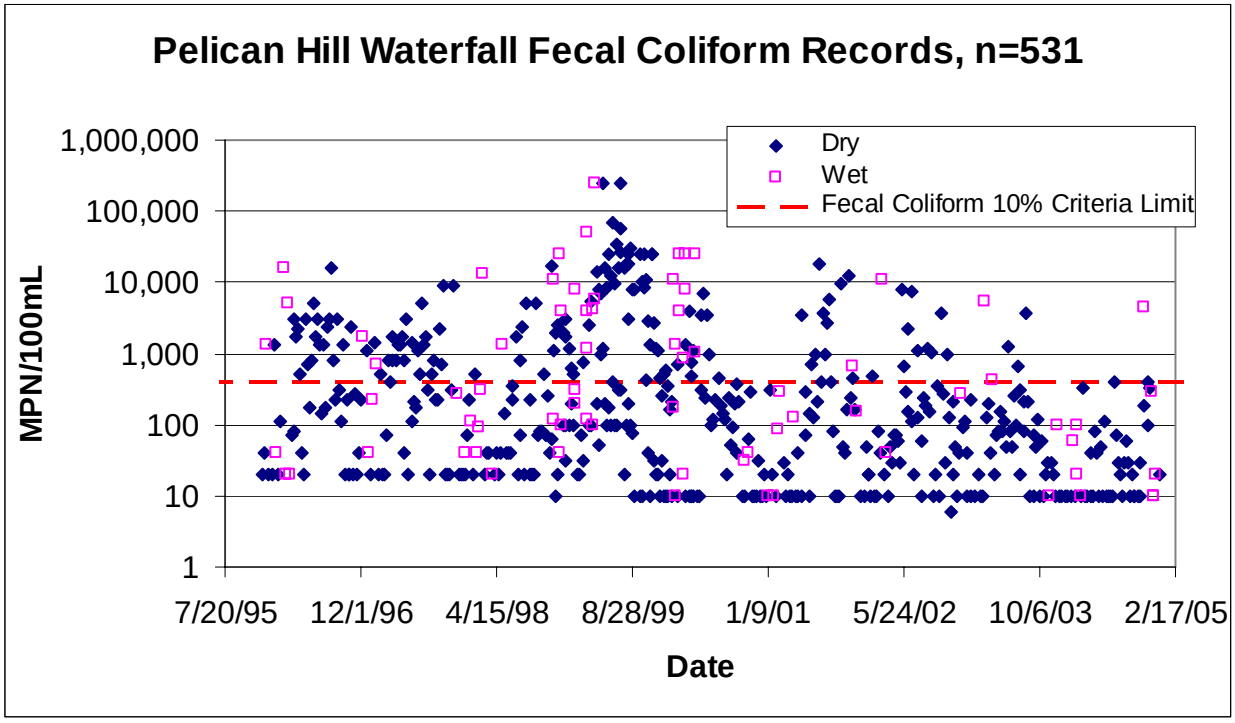



**Figure A 15: Pelican Hill Waterfall fecal coliform data and corresponding cumulative frequency distribution**



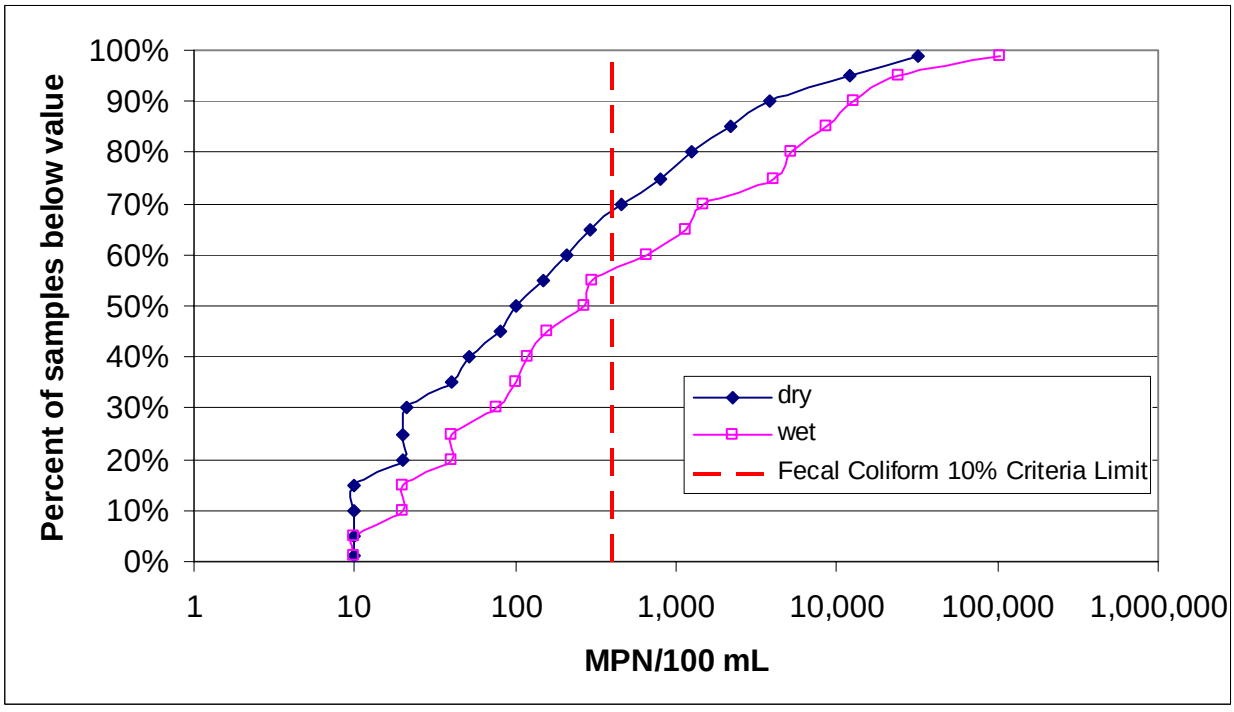
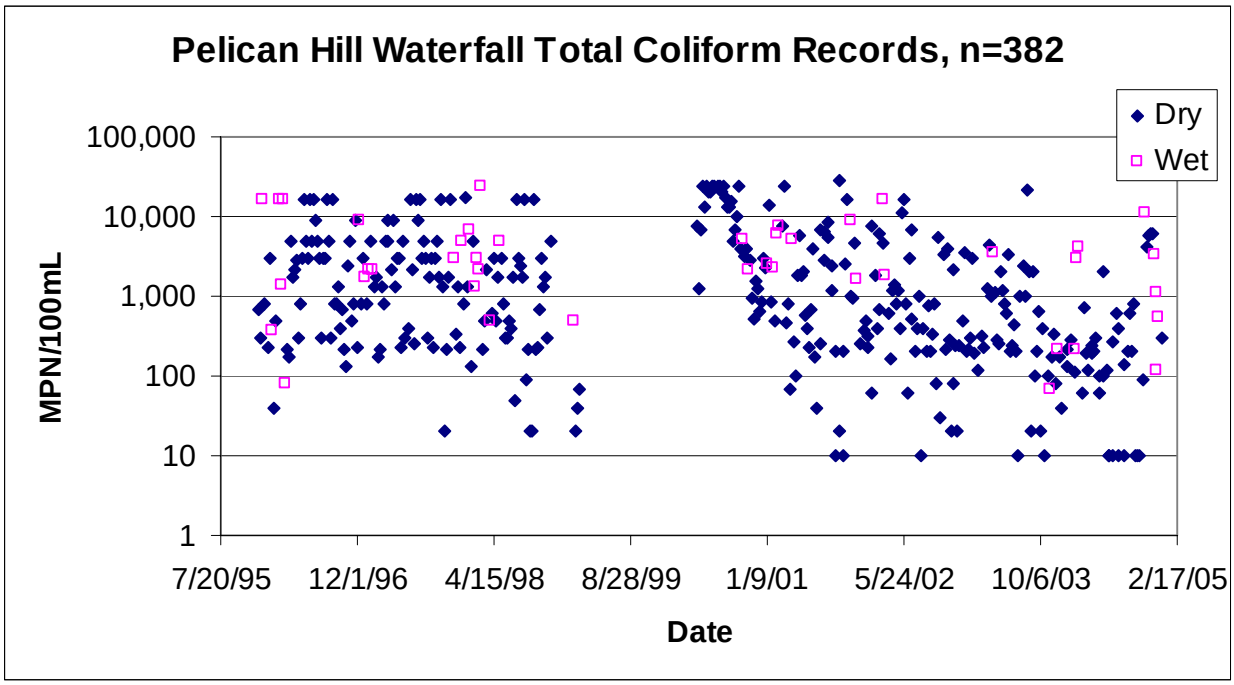



**Figure A 16: Pelican Hill Waterfall total coliform data and corresponding cumulative frequency distribution**



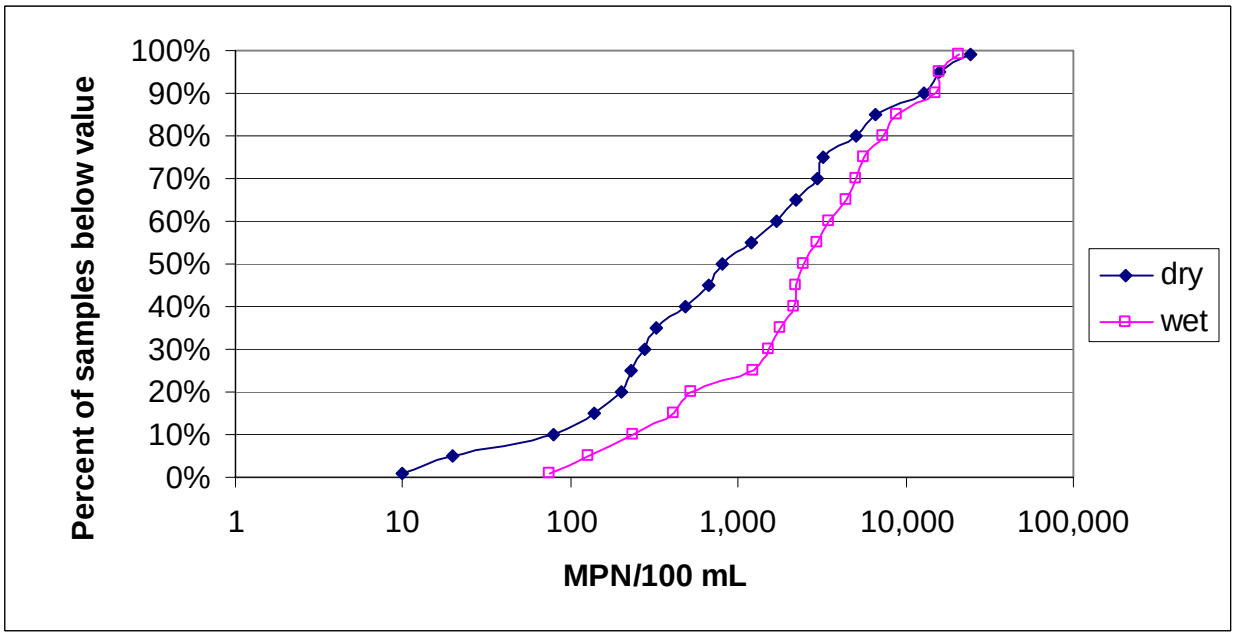



**Figure A 17: Percentage of samples from Pelican Hill Waterfall which exceed thresholds, by month**

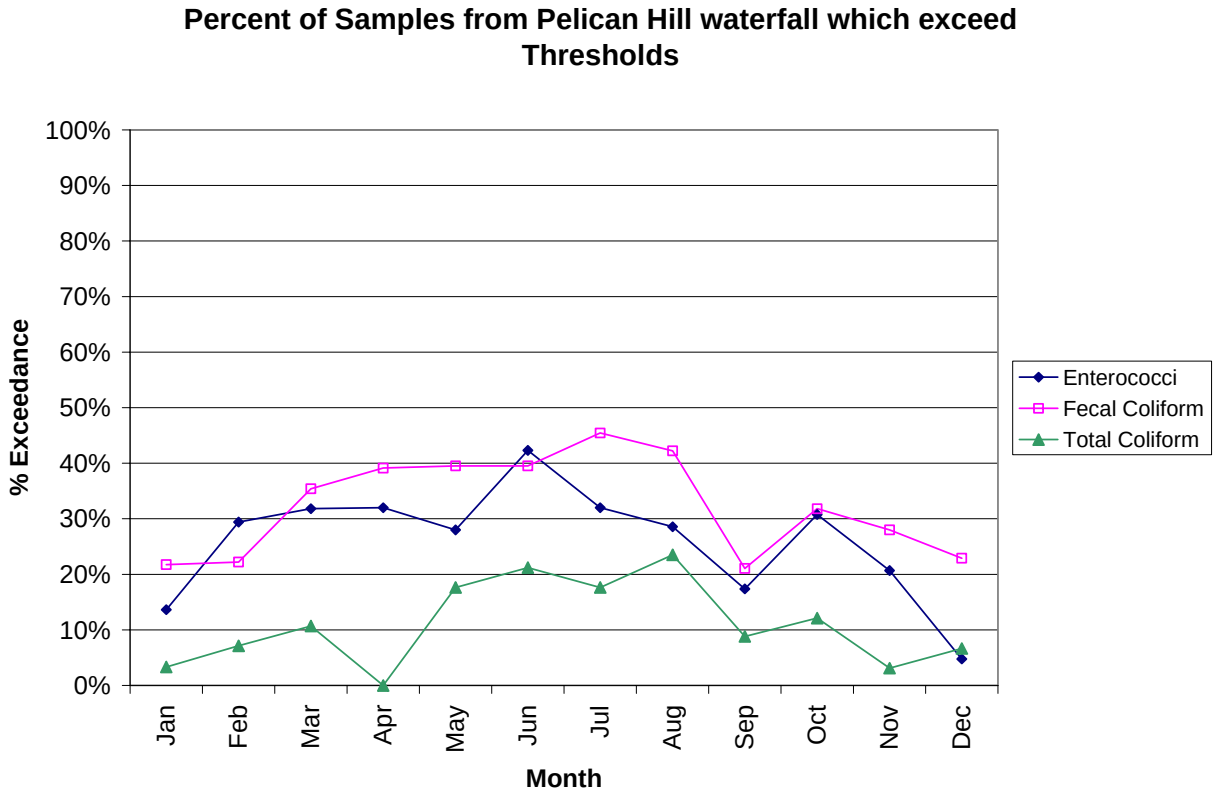
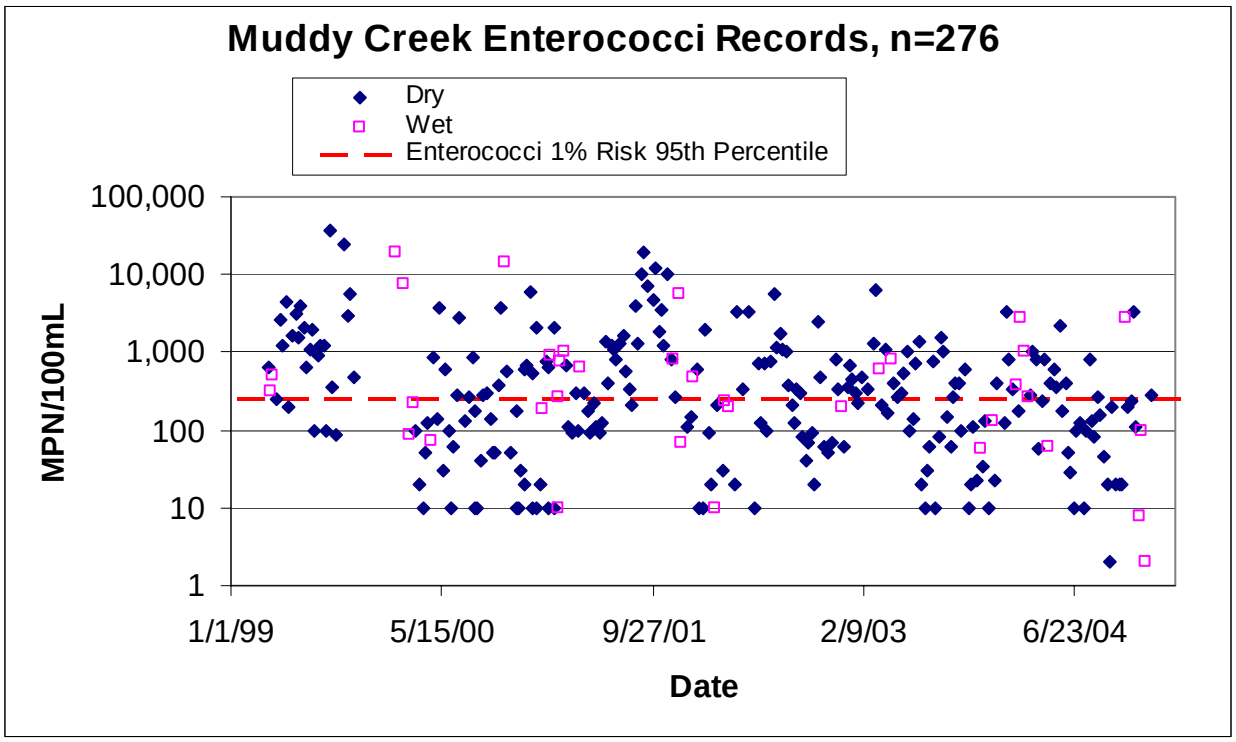


**Figure A 18: Muddy Creek enterococci data and corresponding cumulative frequency distribution**



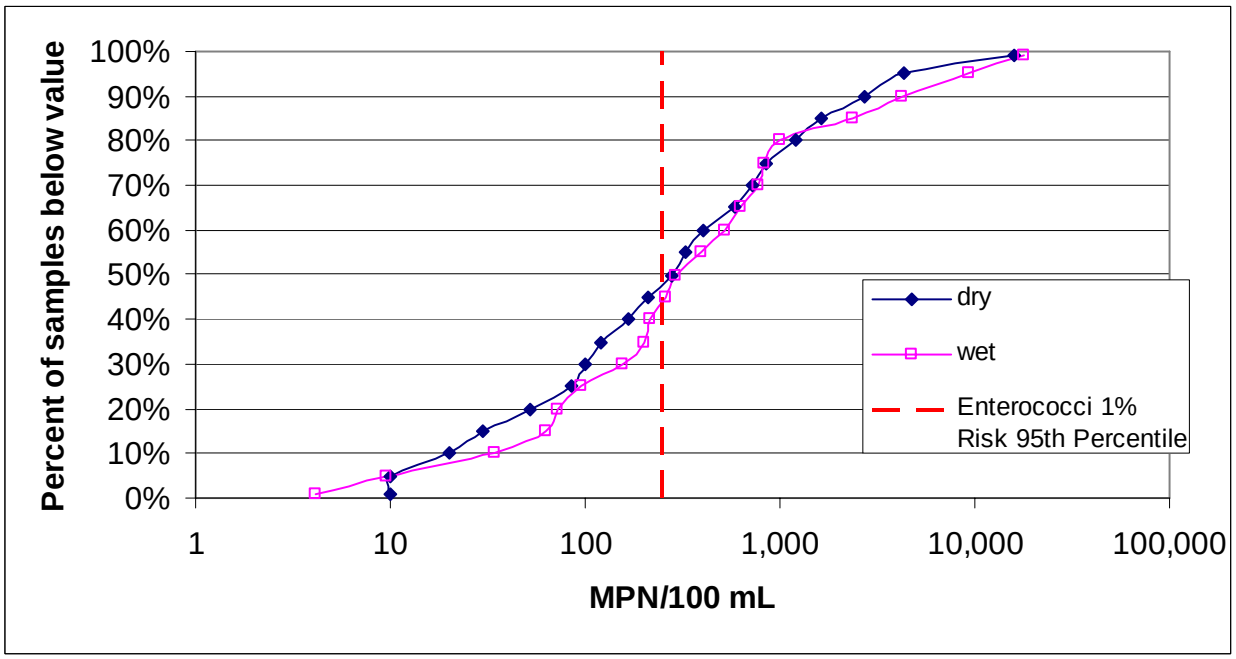
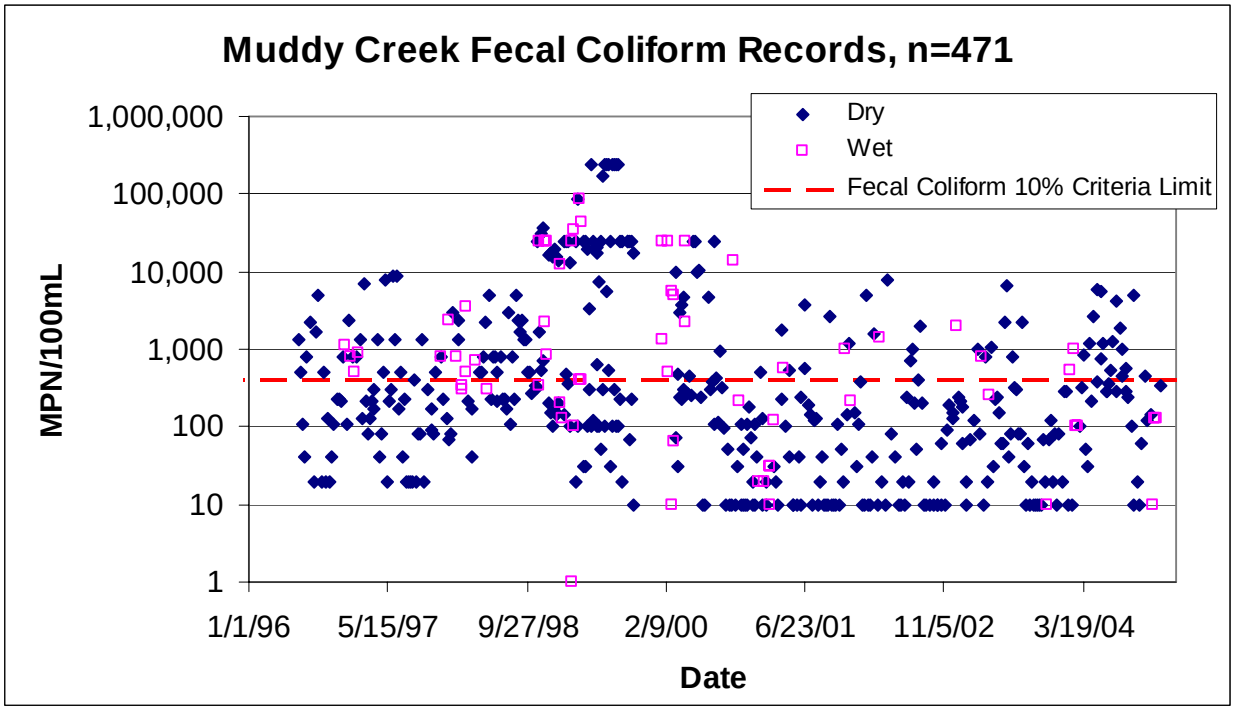



**Figure A 19: Muddy Creek fecal coliform data and corresponding cumulative frequency distribution**



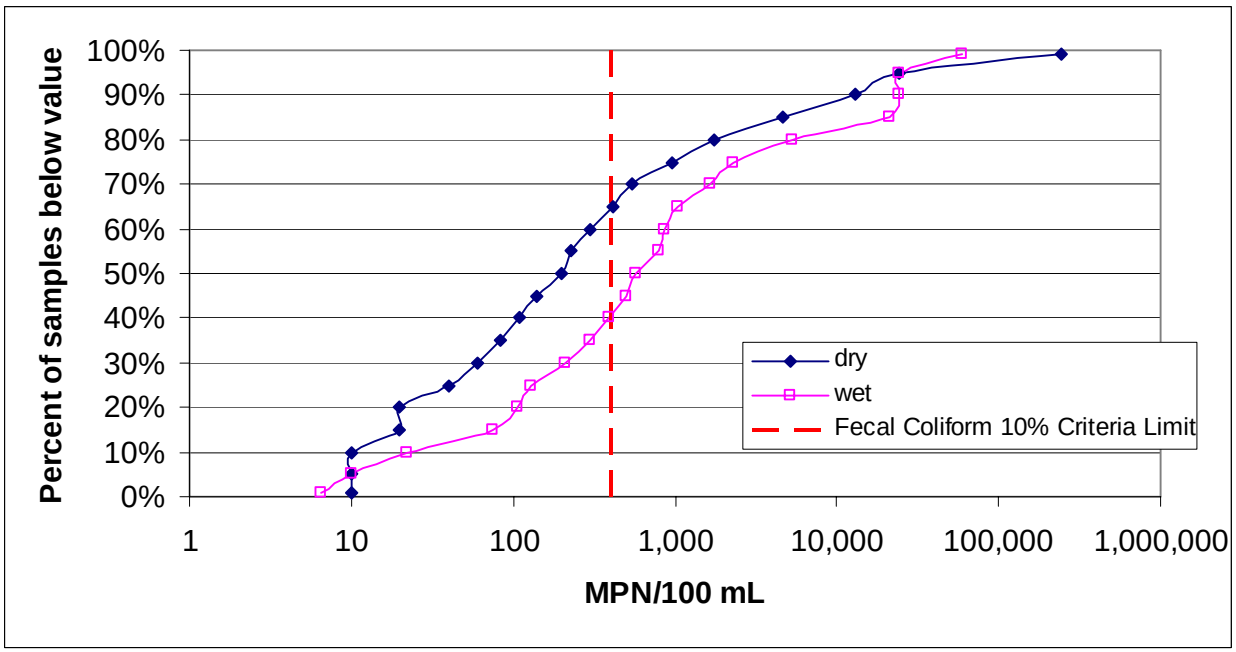
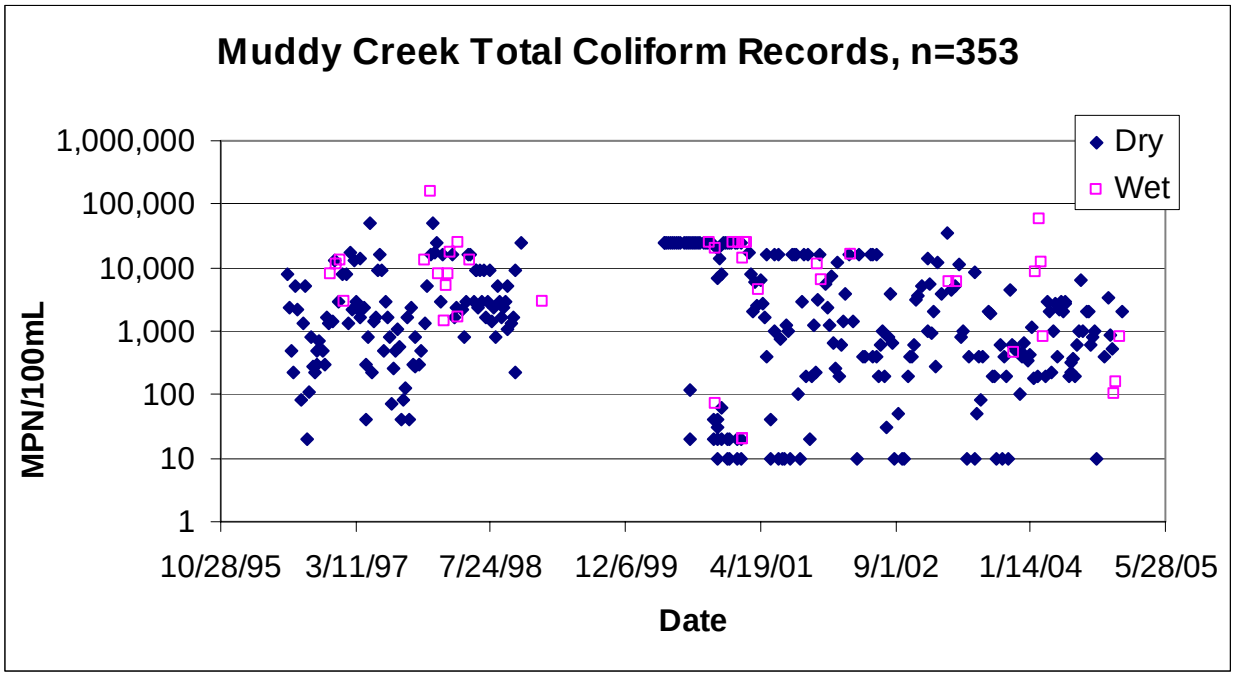



**Figure A 20: Muddy Creek total coliform data and corresponding cumulative frequency distribution**



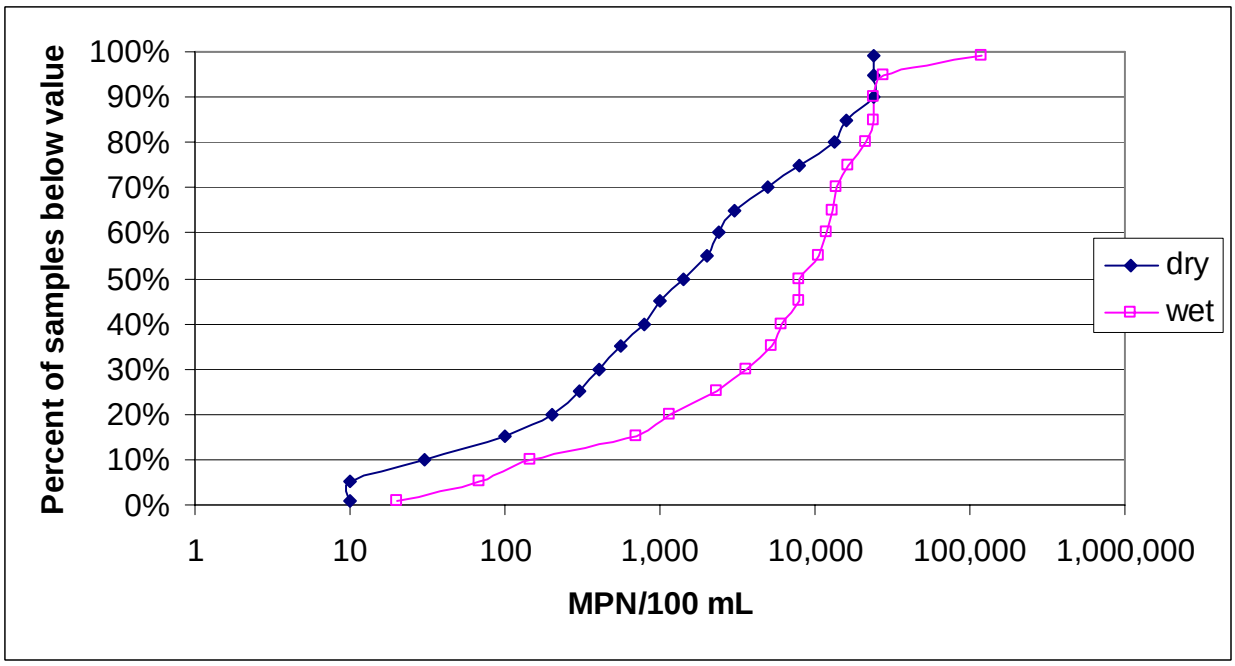



**Figure A 21: Percentage of samples from Muddy Creek which exceed thresholds, by month**

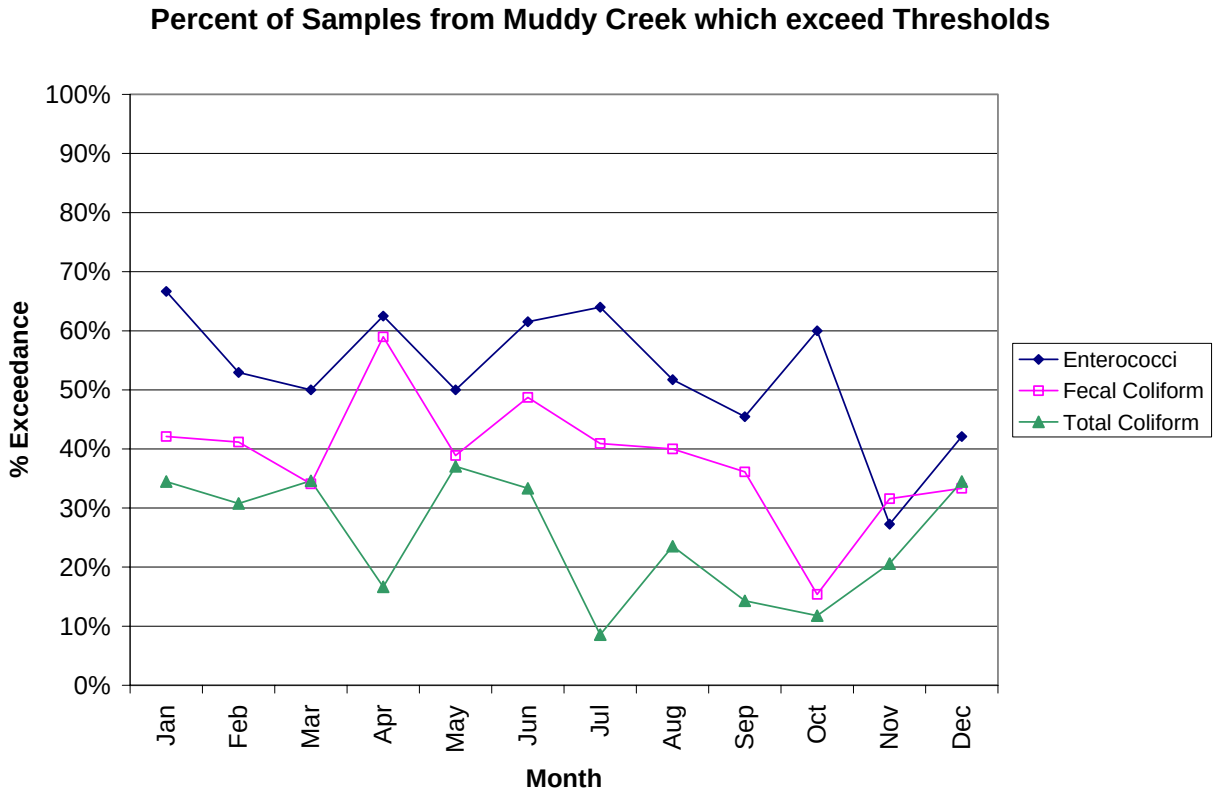
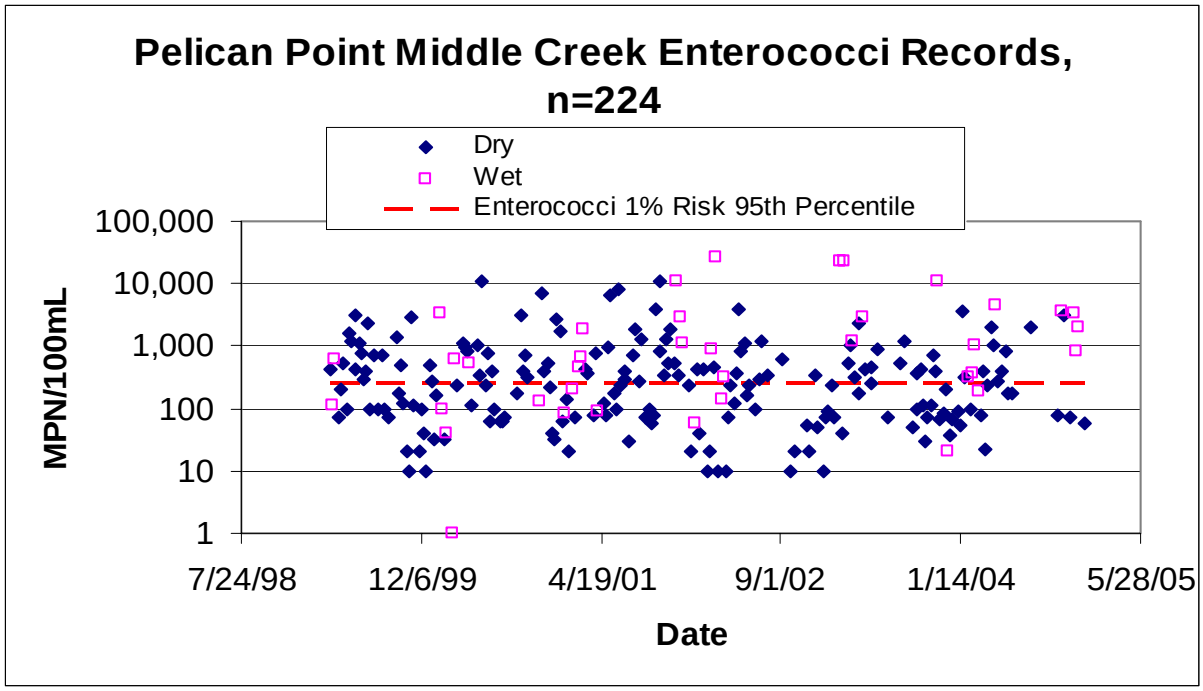


**Figure A 22: Pelican Point Middle Creek enterococci data and corresponding cumulative frequency distribution**



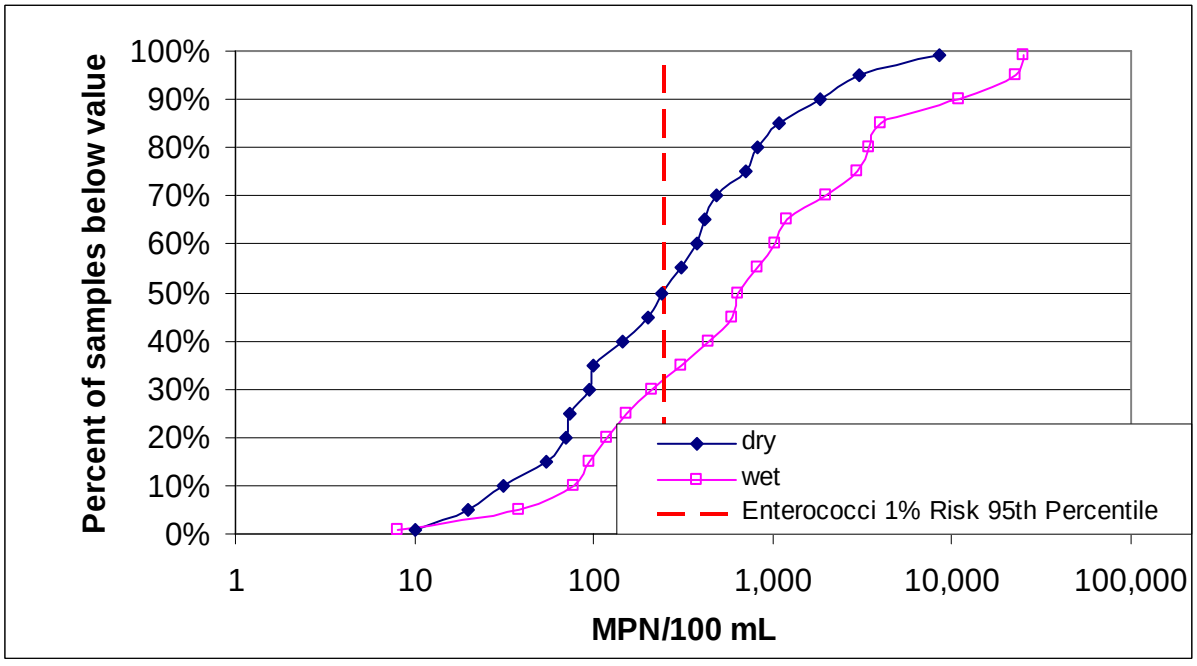
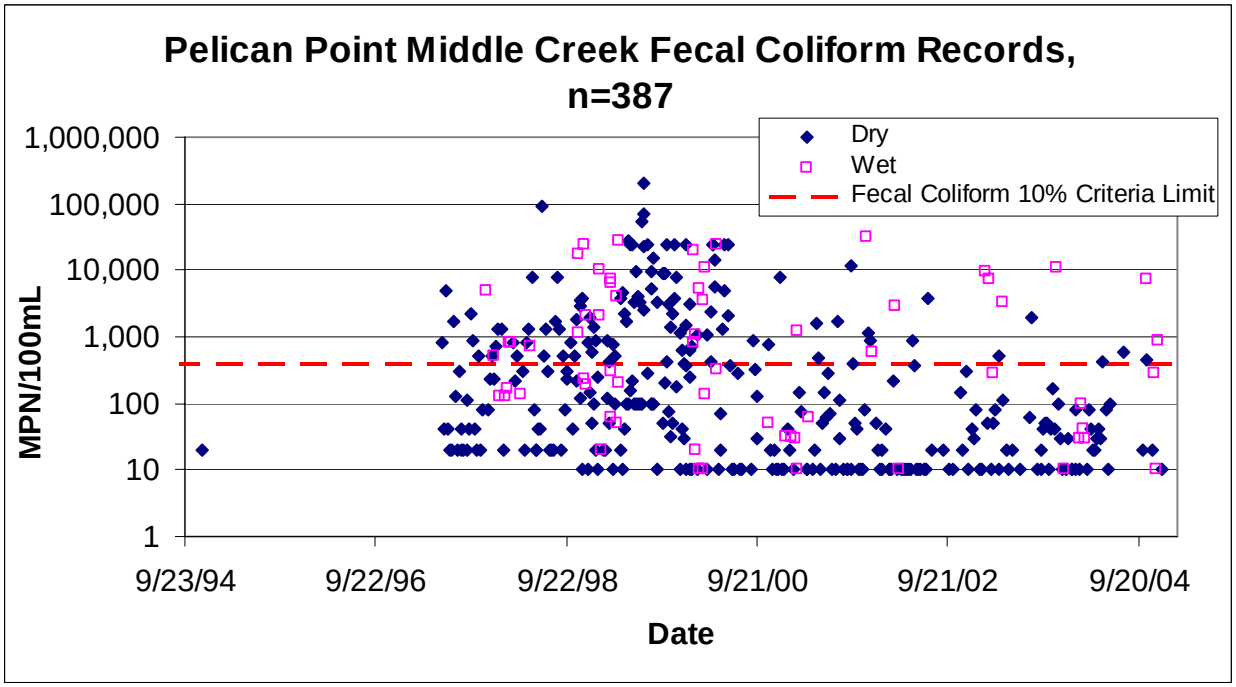



**Figure A 23: Pelican Point Middle Creek fecal coliform data and corresponding cumulative frequency distribution**



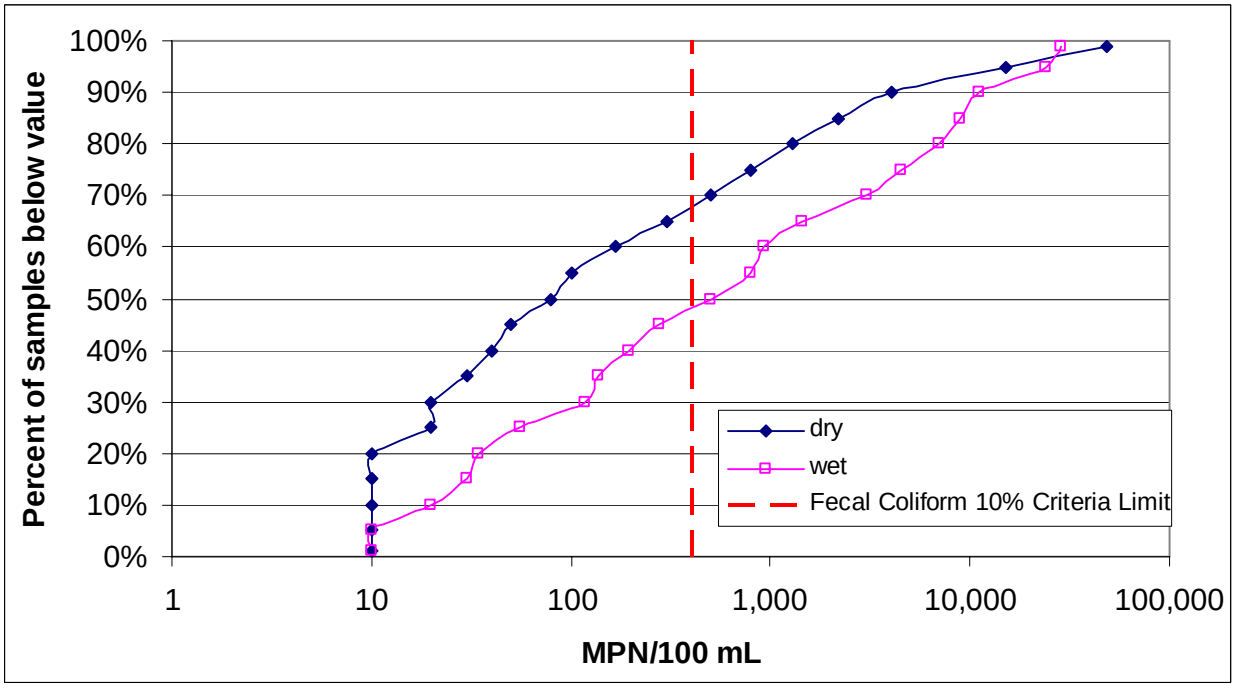
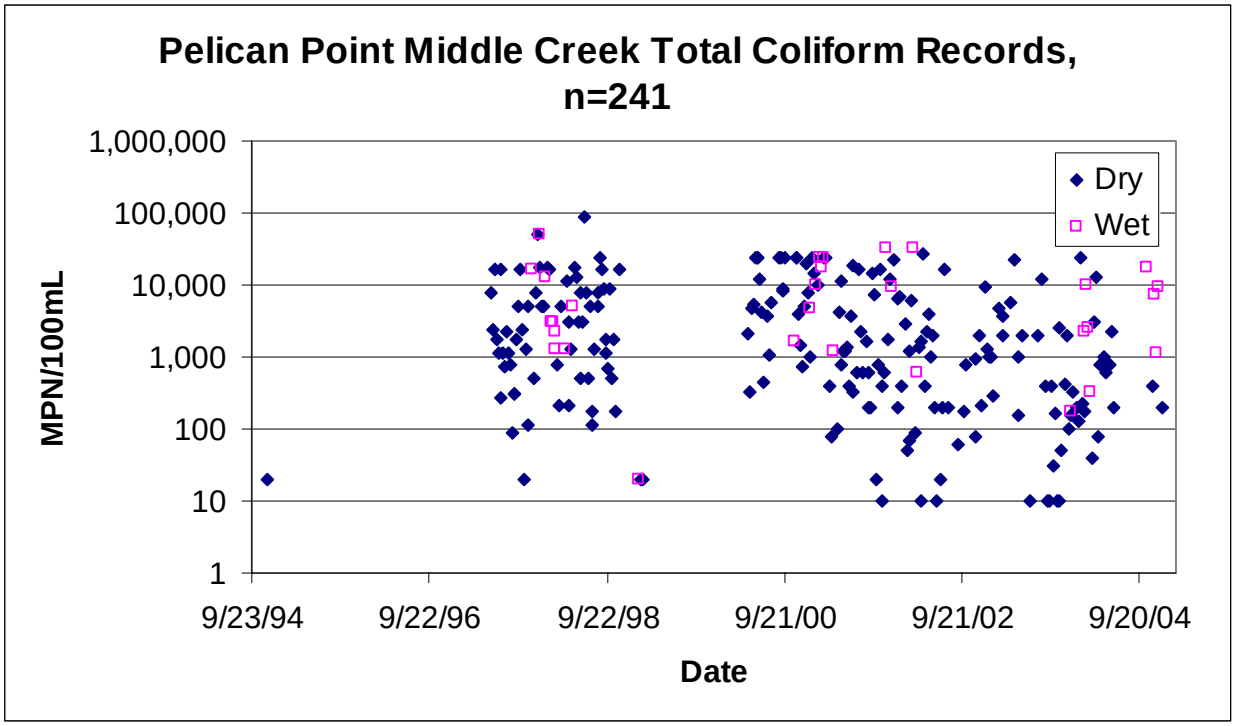



**Figure A 24: Pelican Point Middle Creek total coliform data and corresponding cumulative frequency distribution**



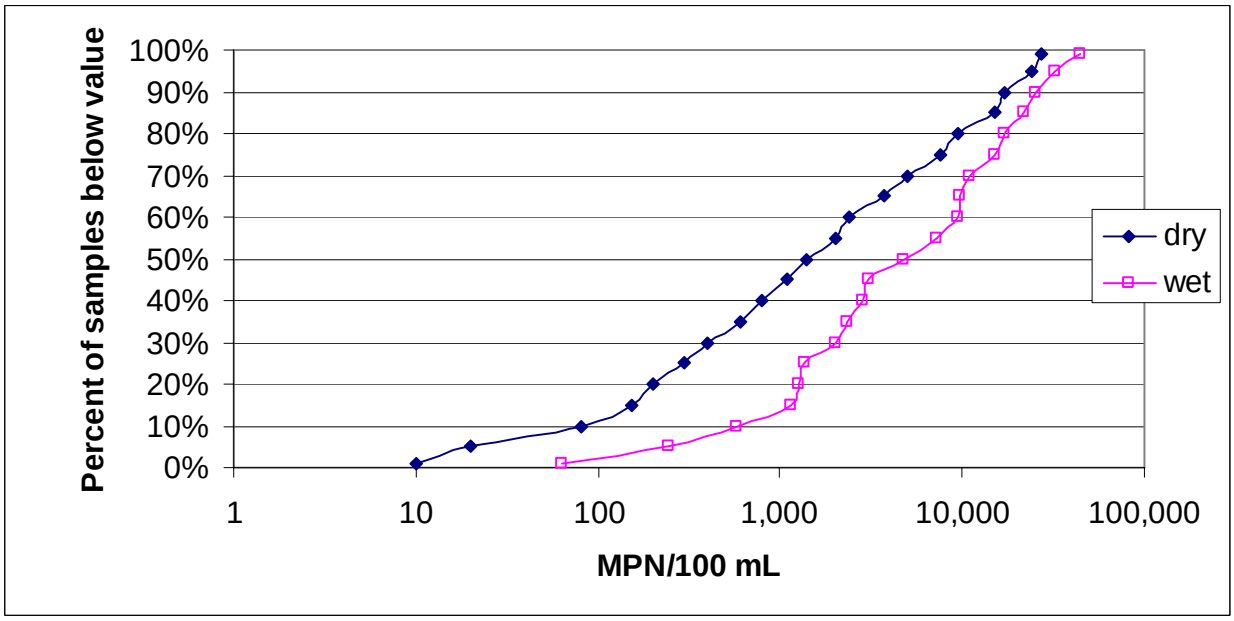



**Figure A 25: Percentage of samples from Pelican Point Middle Creek which exceed thresholds, by month**

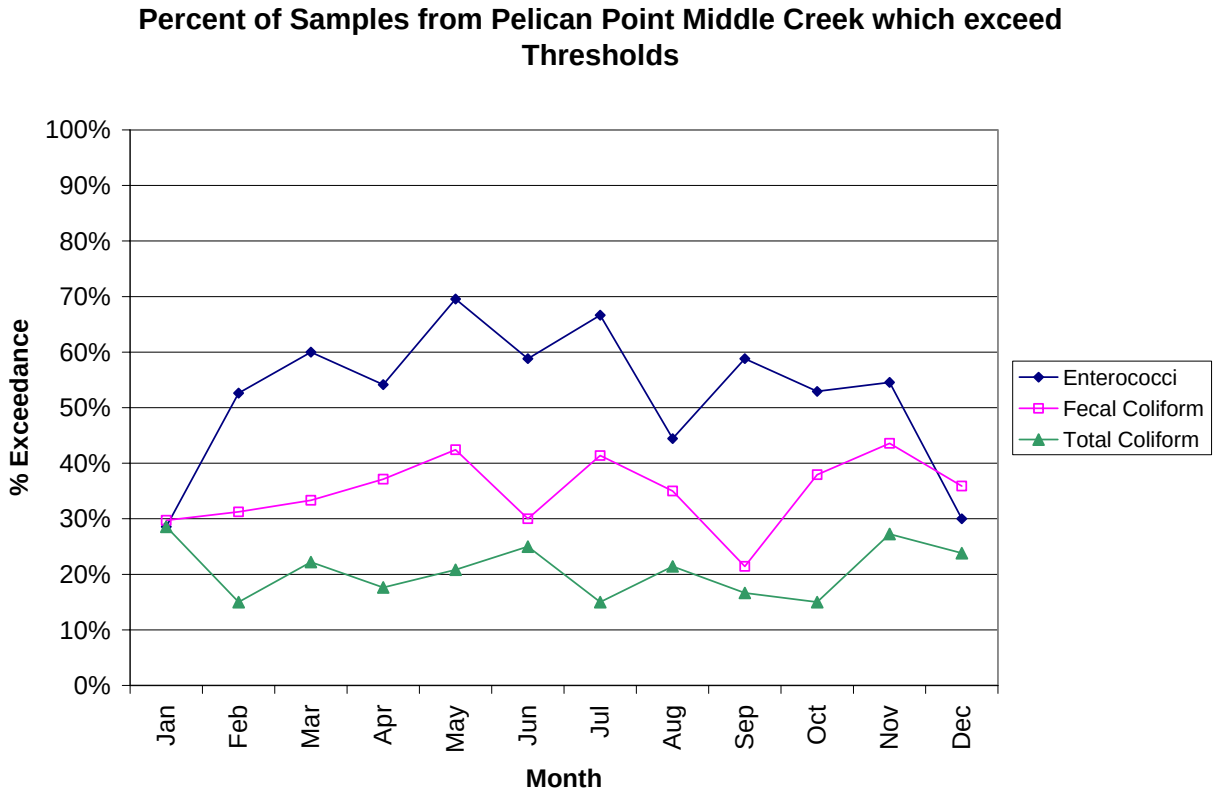
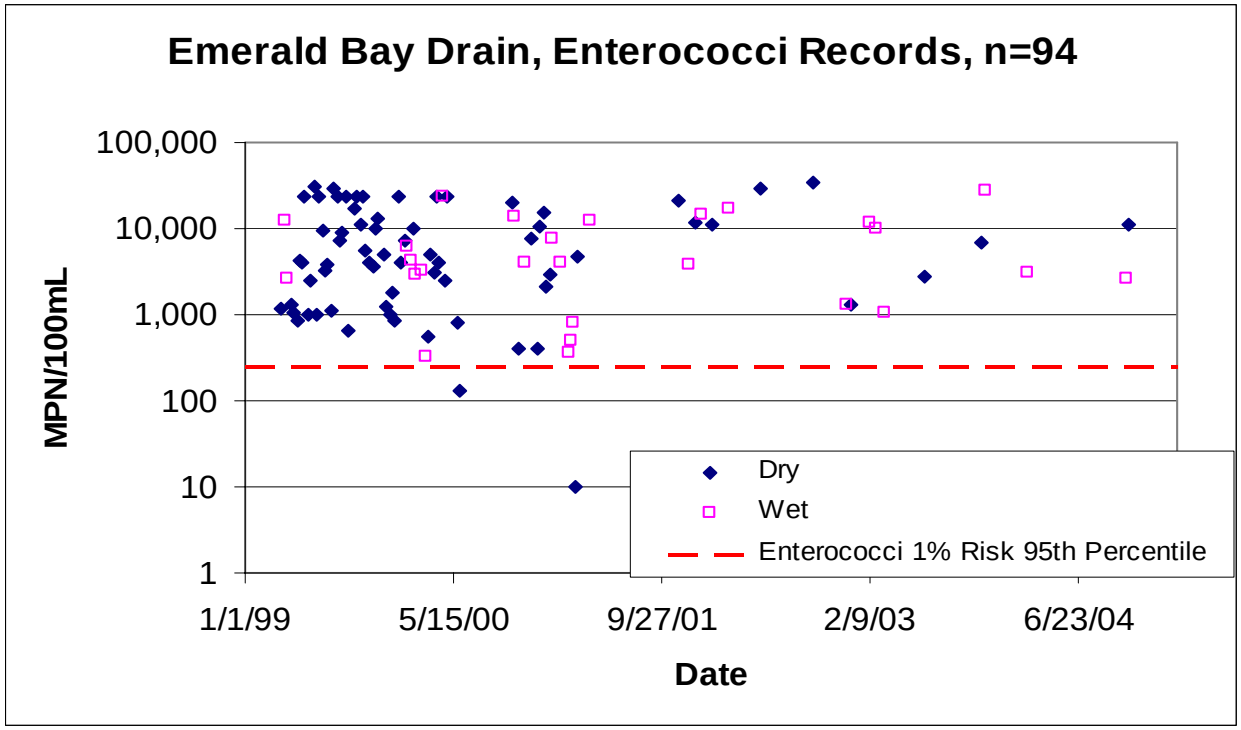


**Figure A 26: Emerald Bay Drain enterococci data and corresponding cumulative frequency distribution**



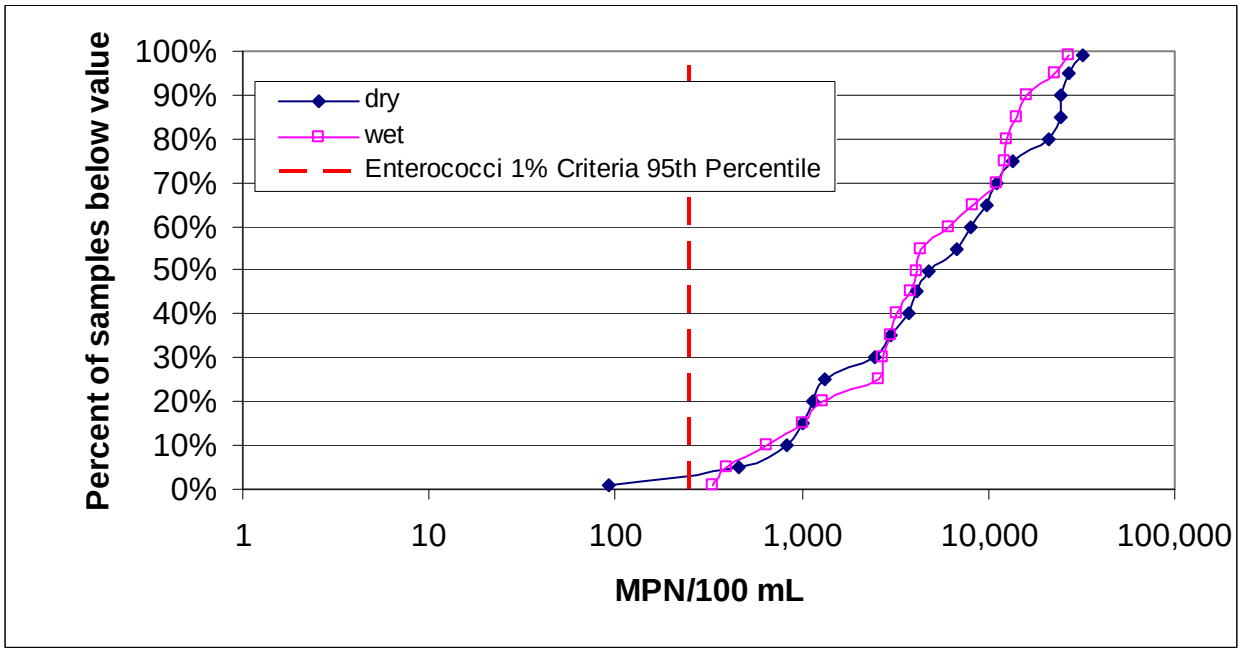
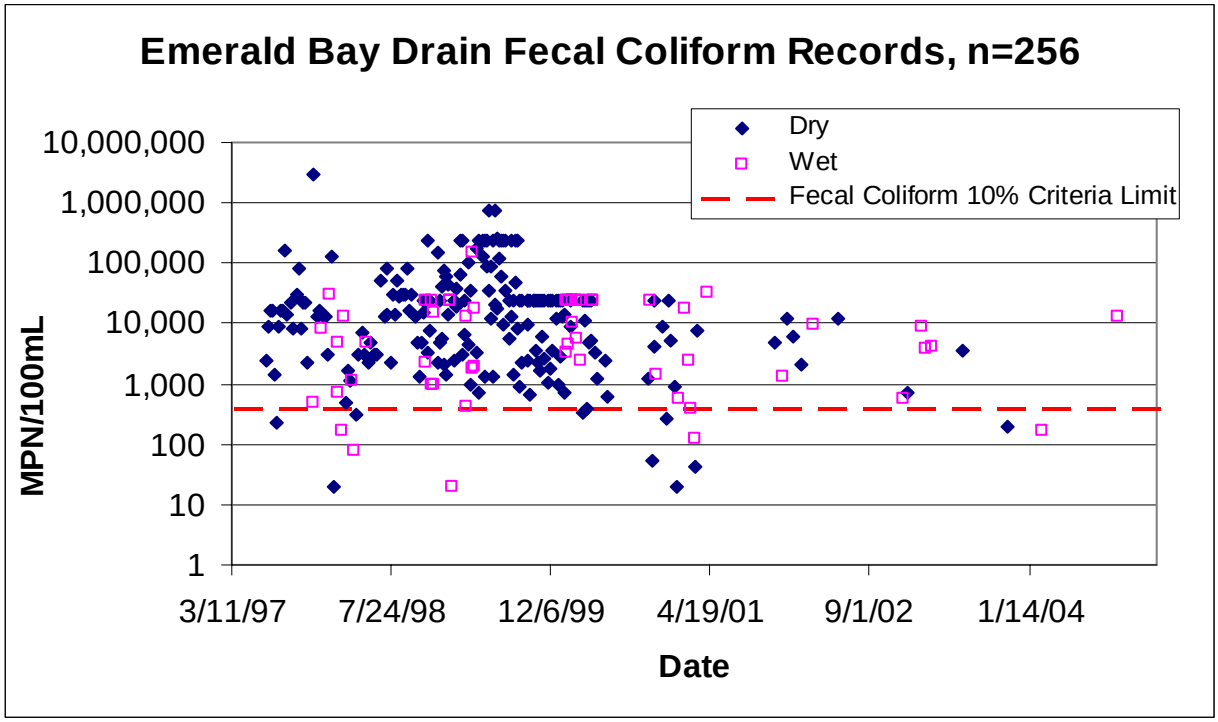



**Figure A 27: Emerald Bay Drain fecal coliform data and corresponding cumulative frequency distribution**



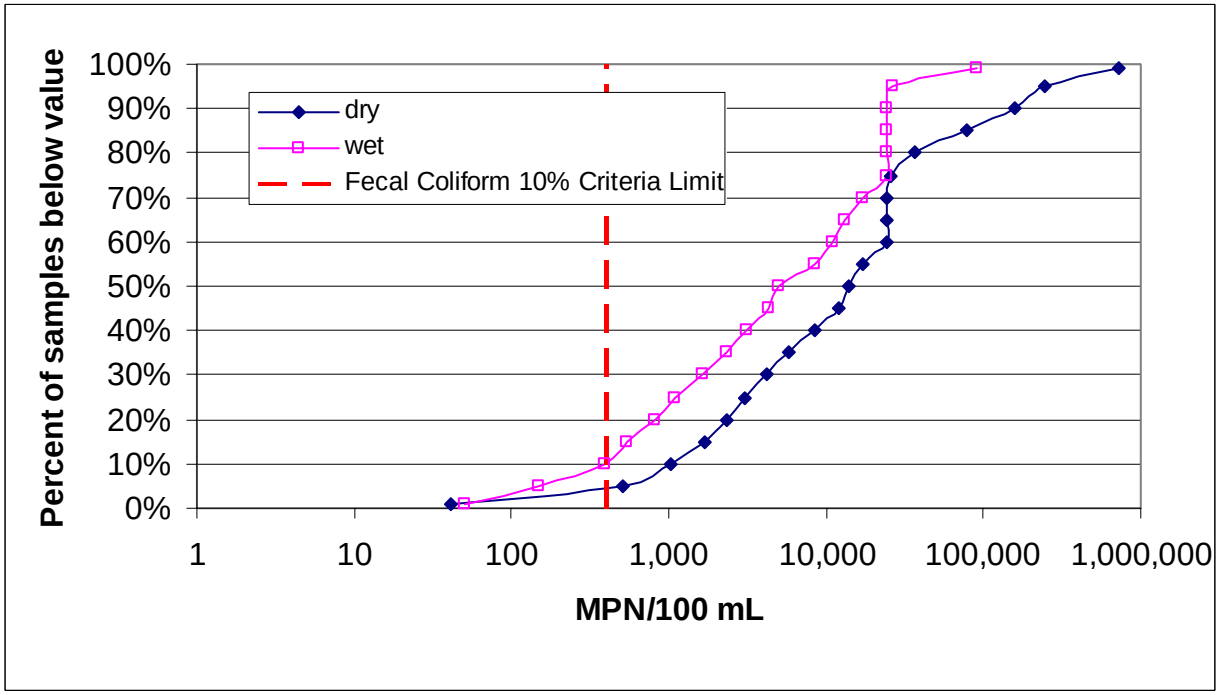
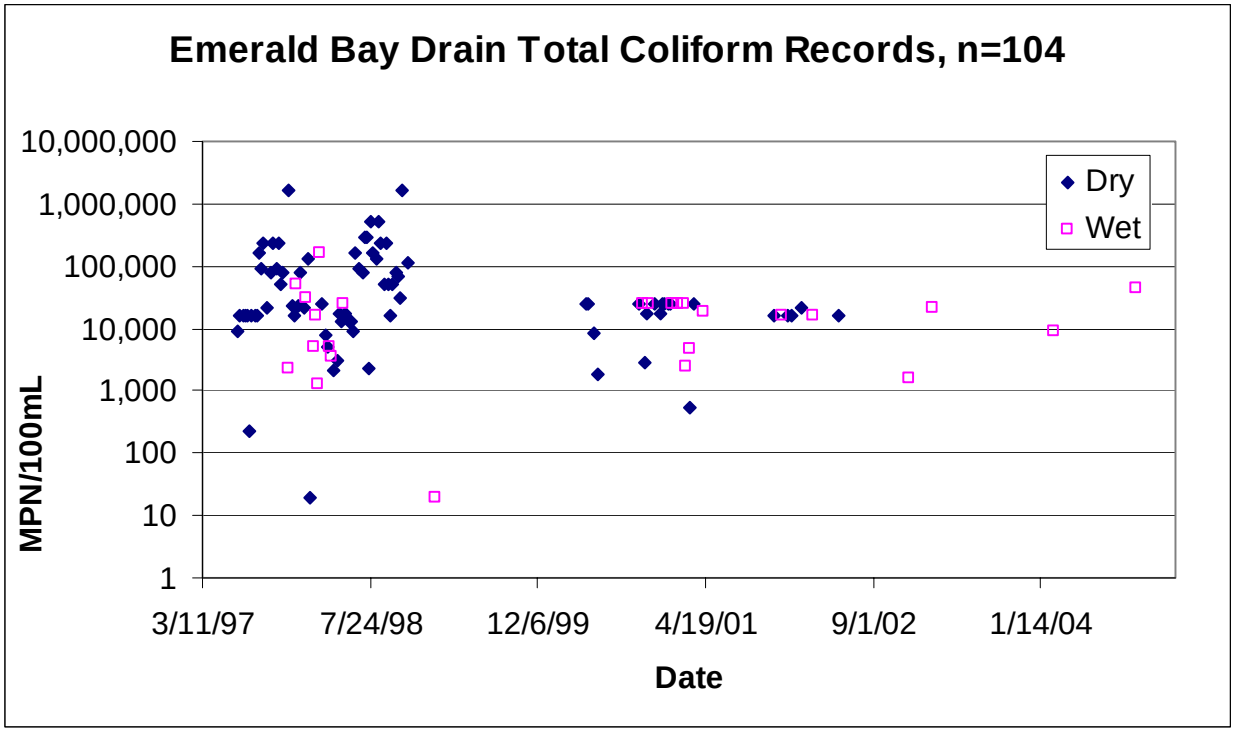



**Figure A 28: Emerald Bay Drain total coliform data and corresponding cumulative frequency distribution**



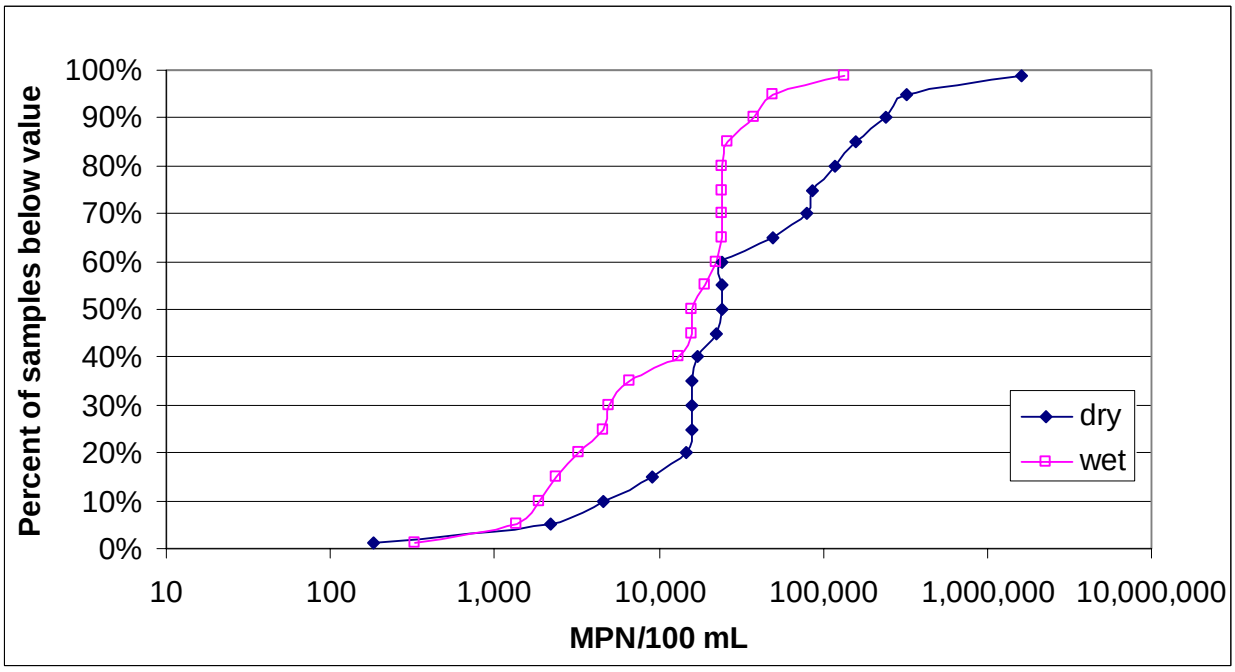



**Figure A 29: Percentage of samples from the Emerald Bay Drain which exceed thresholds, by month**

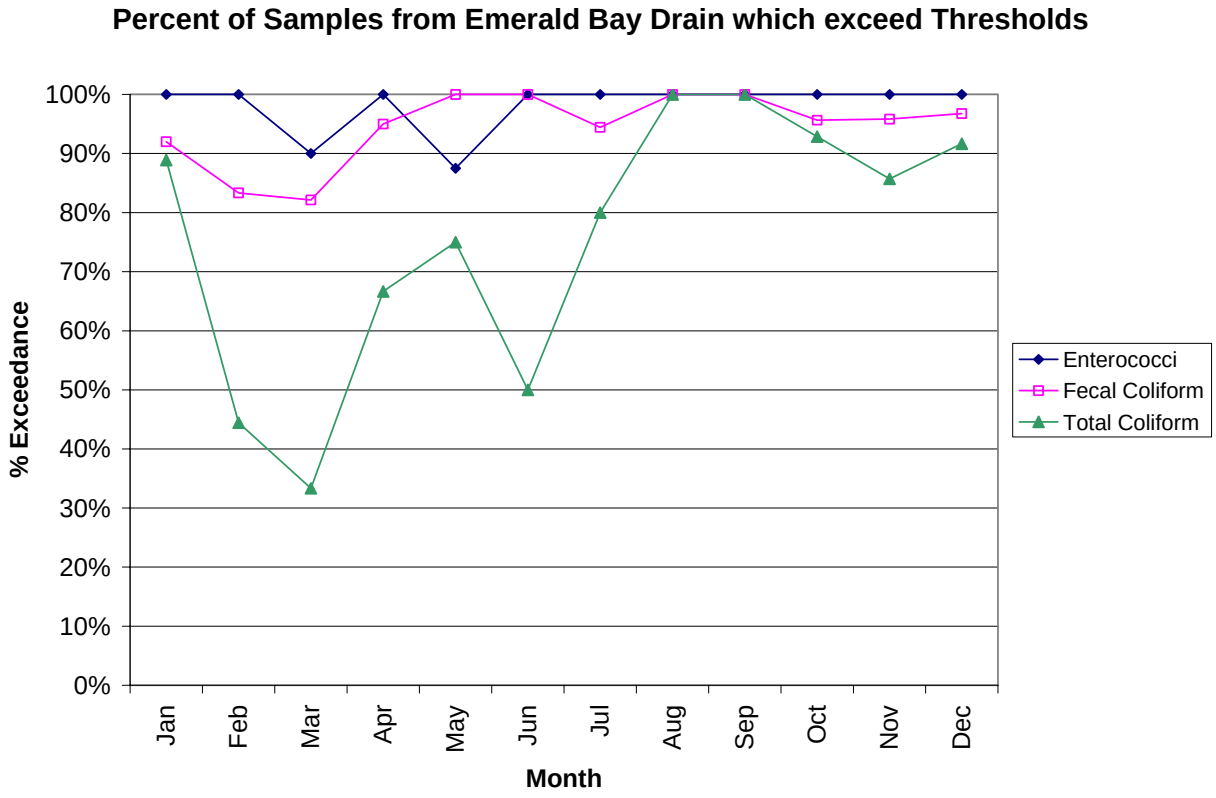
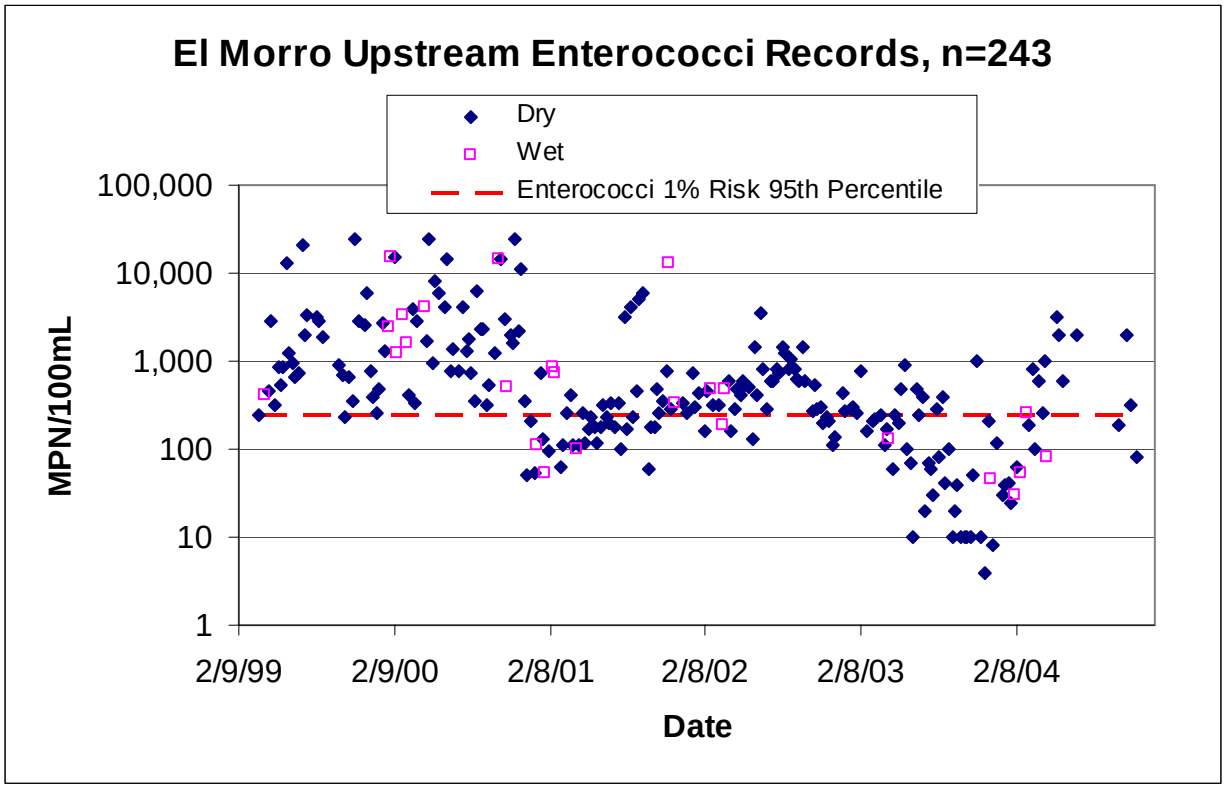


**Figure A 30: El Morro Creek Upstream enterococci data and corresponding cumulative frequency distribution**



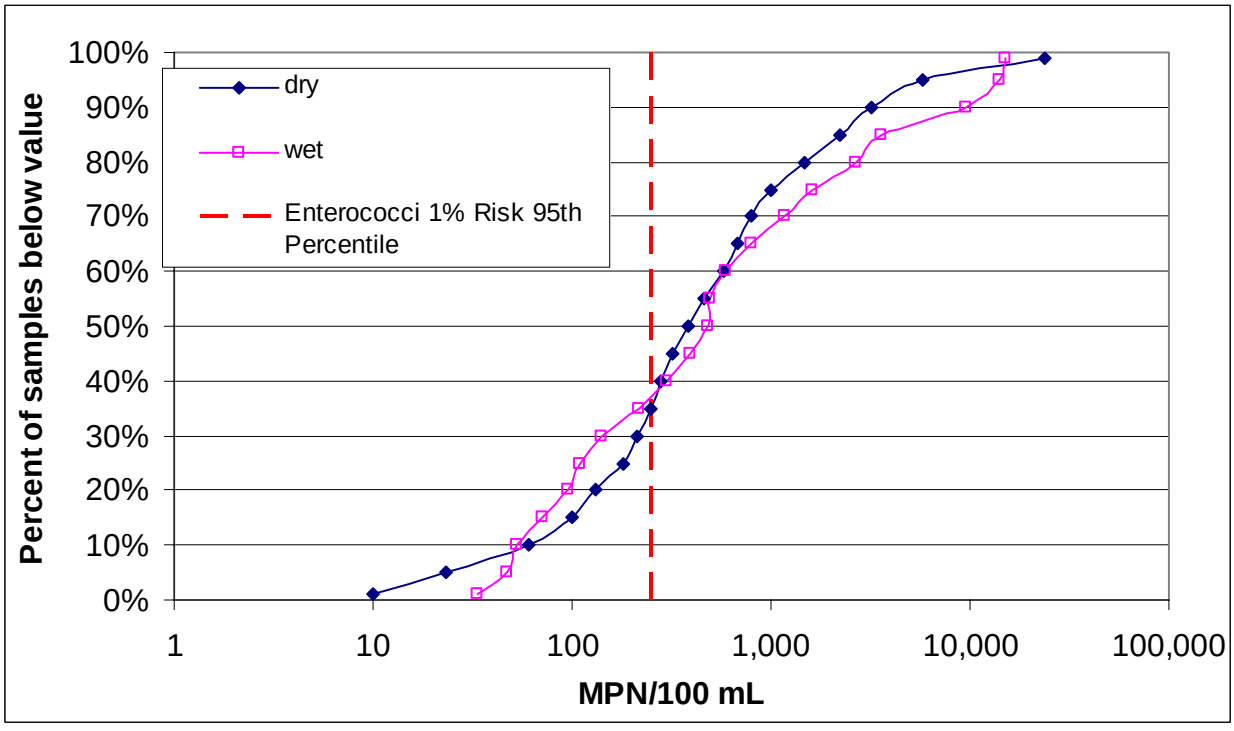
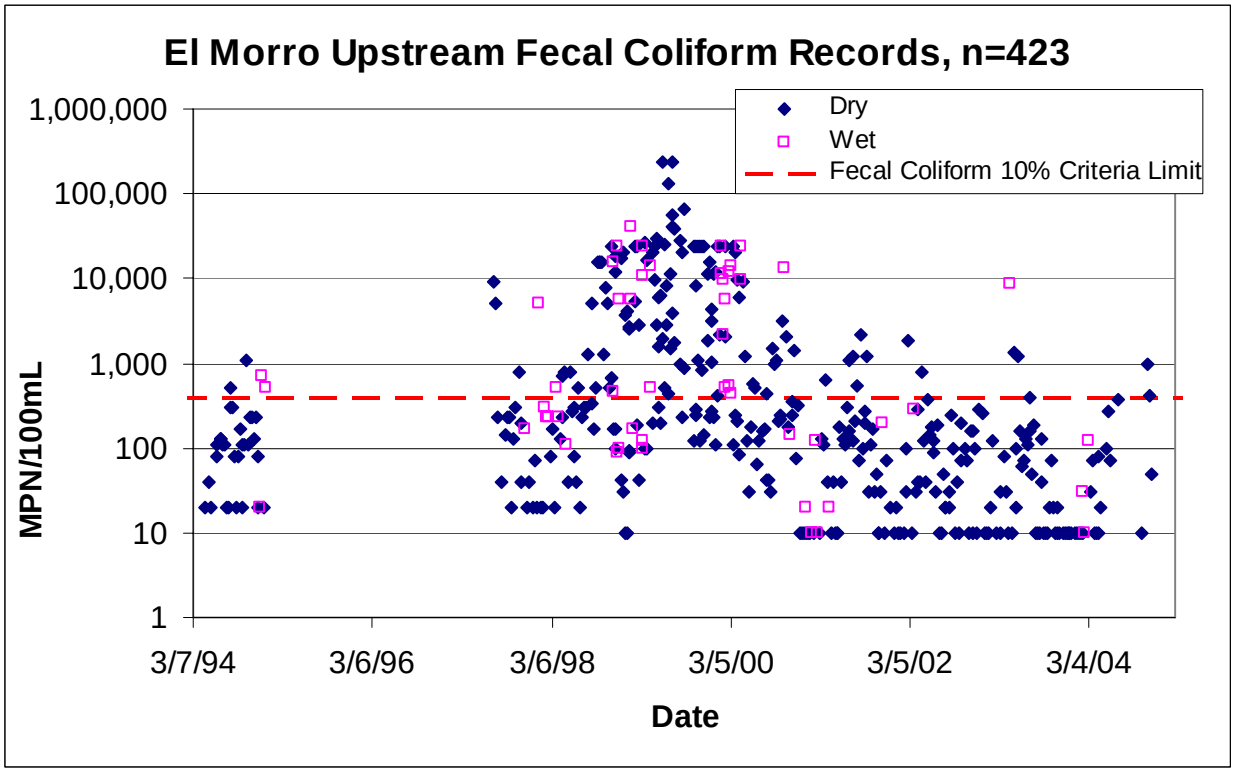



**Figure A 31: El Morro Creek Upstream fecal coliform data and corresponding cumulative frequency distribution**



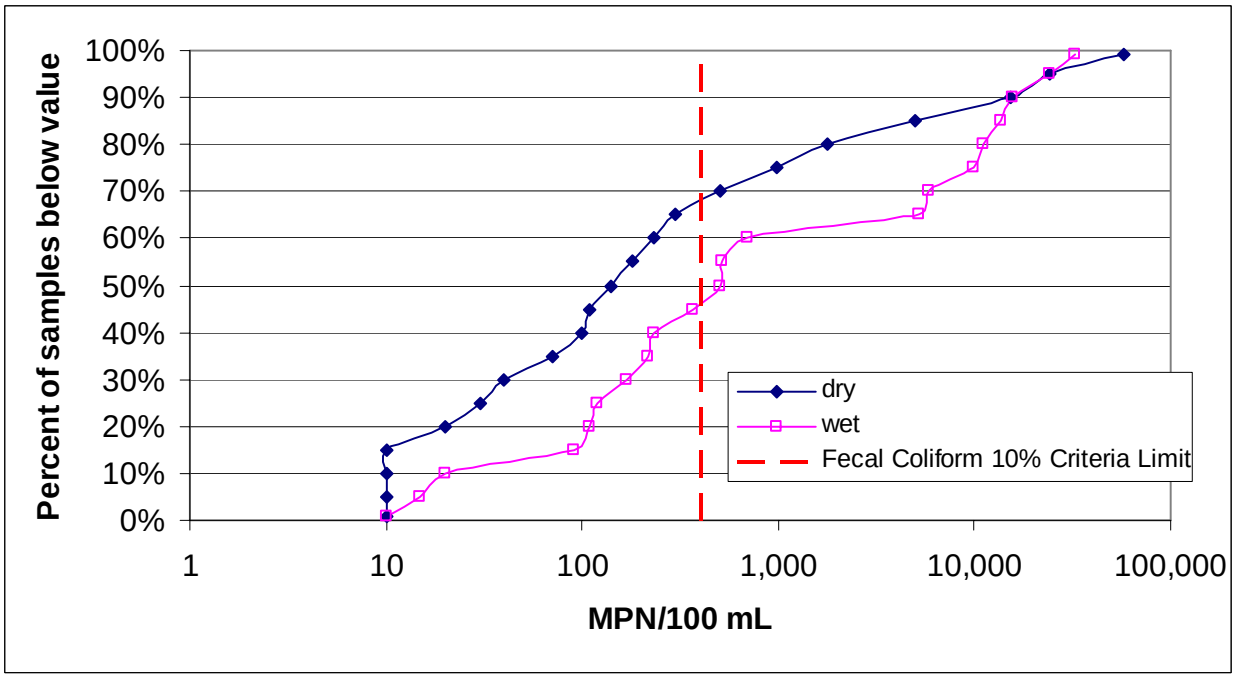
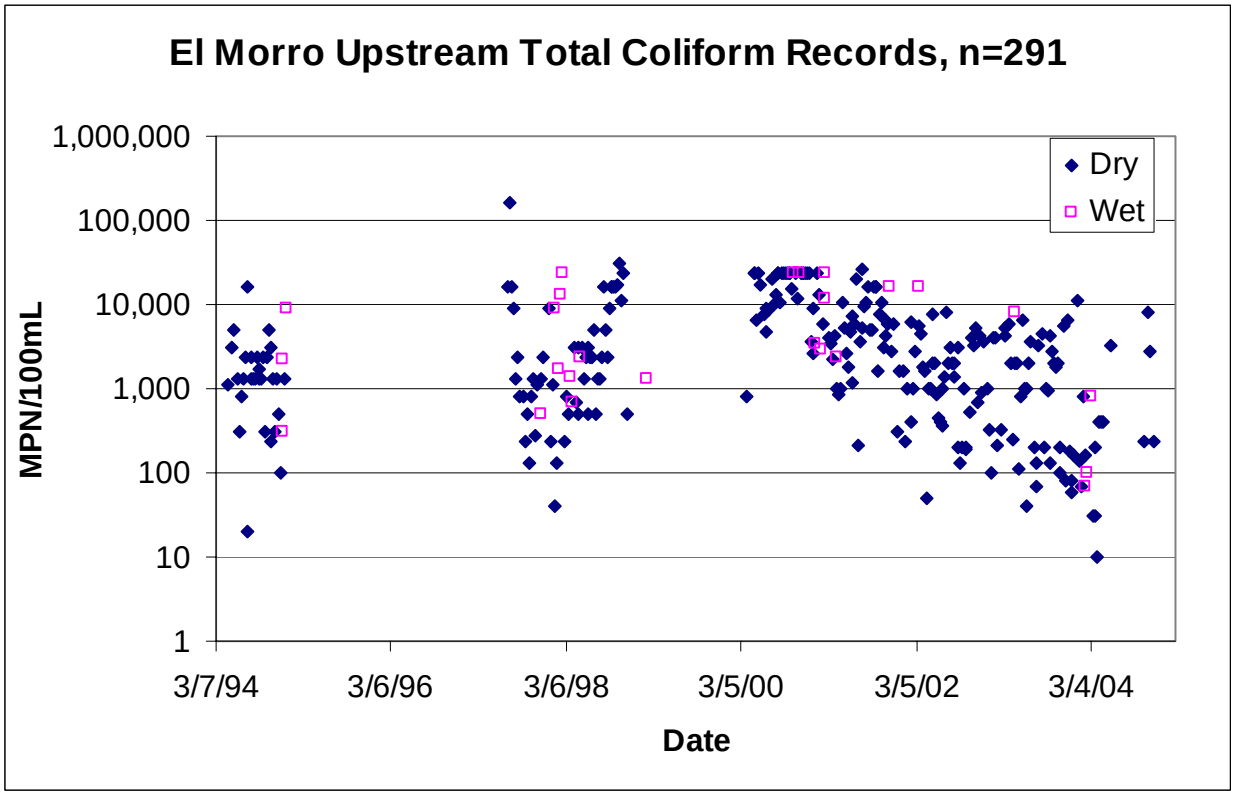



**Figure A 32: El Morro Creek Upstream total coliform data and corresponding cumulative frequency distribution**



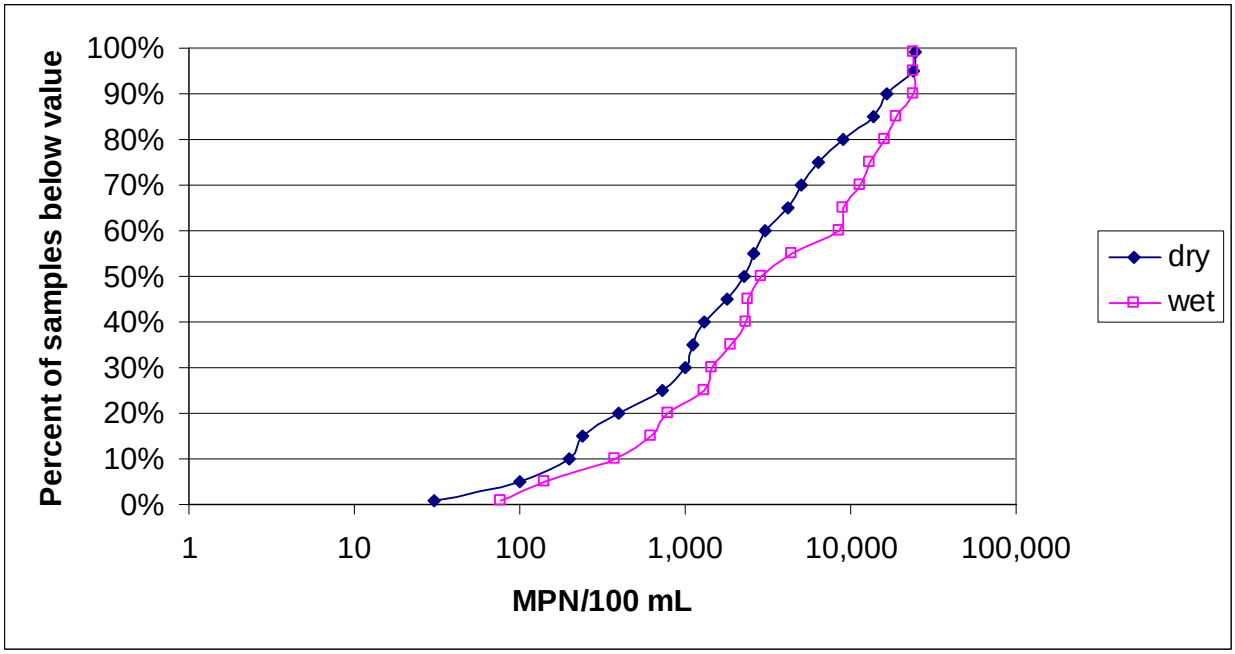



**Figure A 33: Percentage of samples from El Morro Creek Upstream which exceed thresholds, by month**

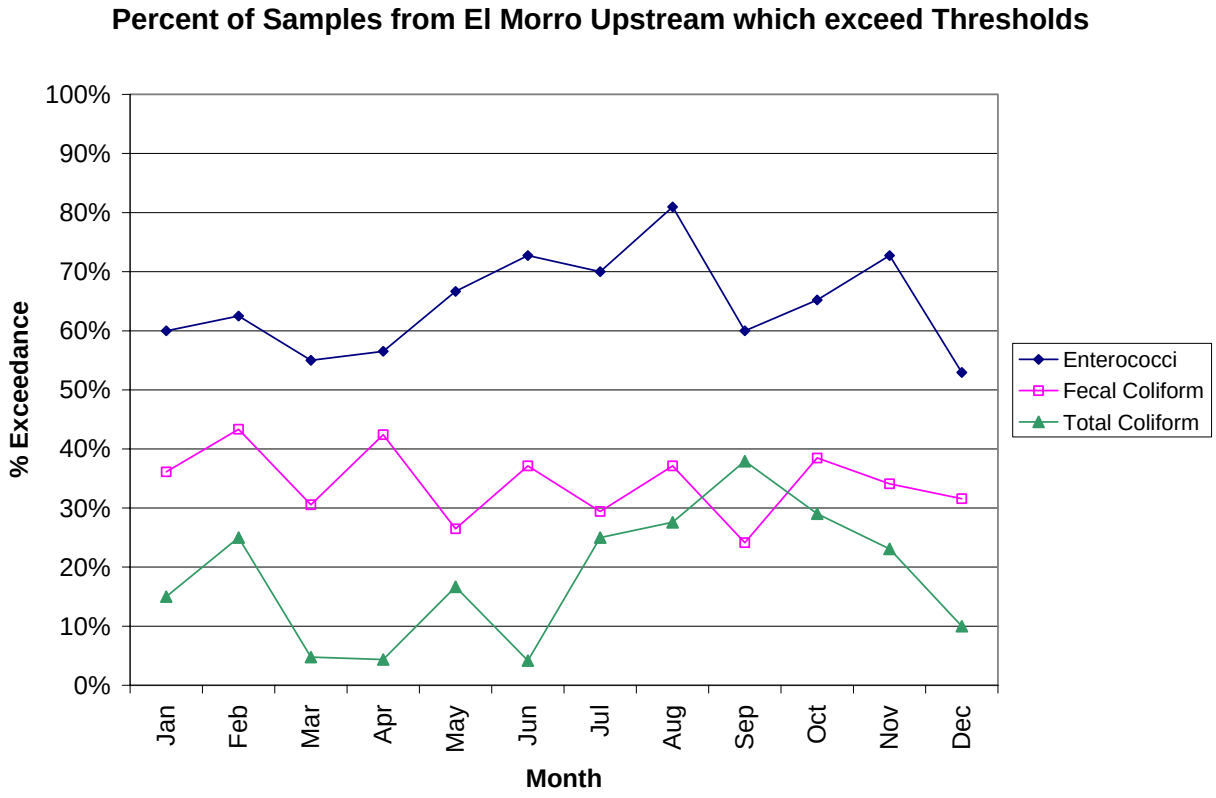
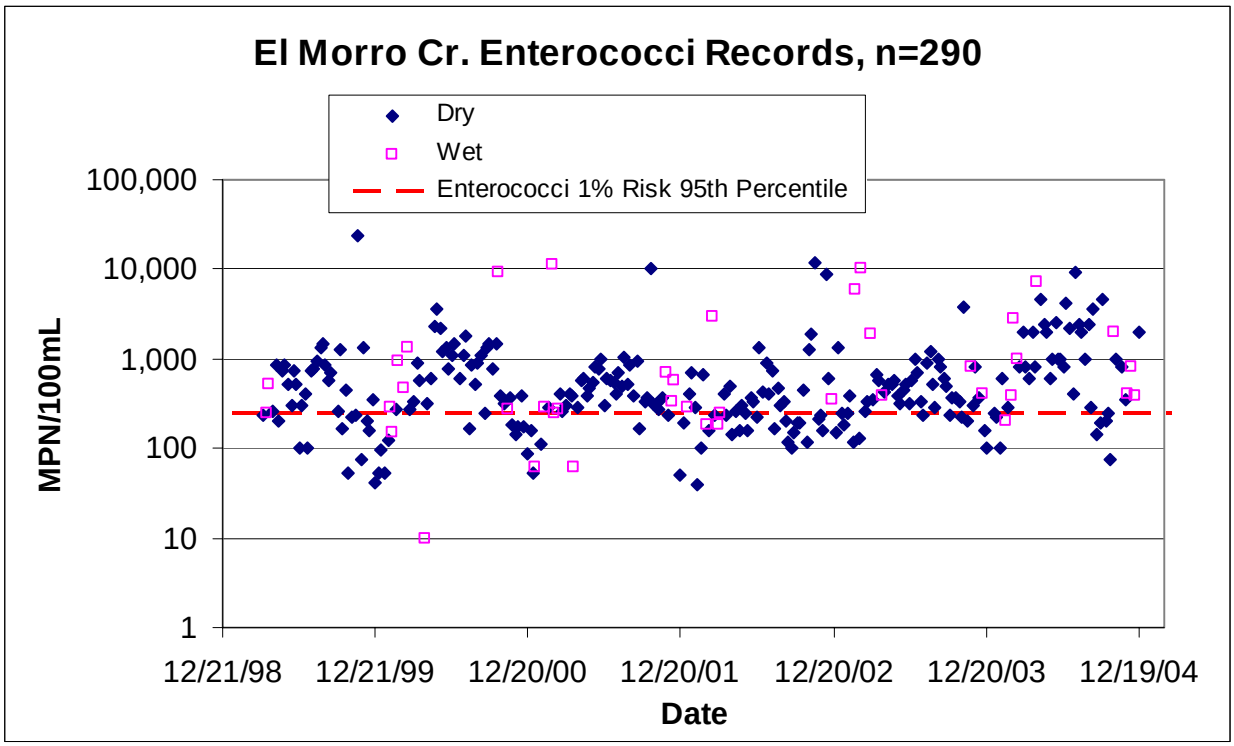


**Figure A 34: El Morro Creek enterococci data and corresponding cumulative frequency distribution**



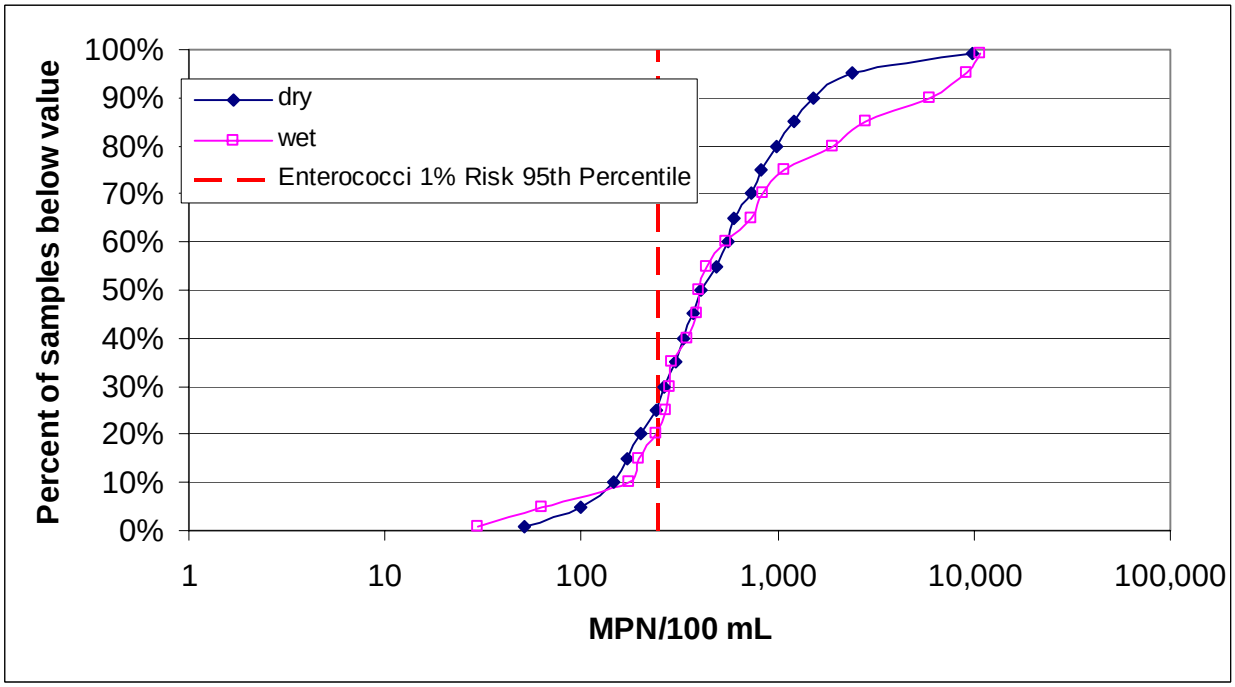
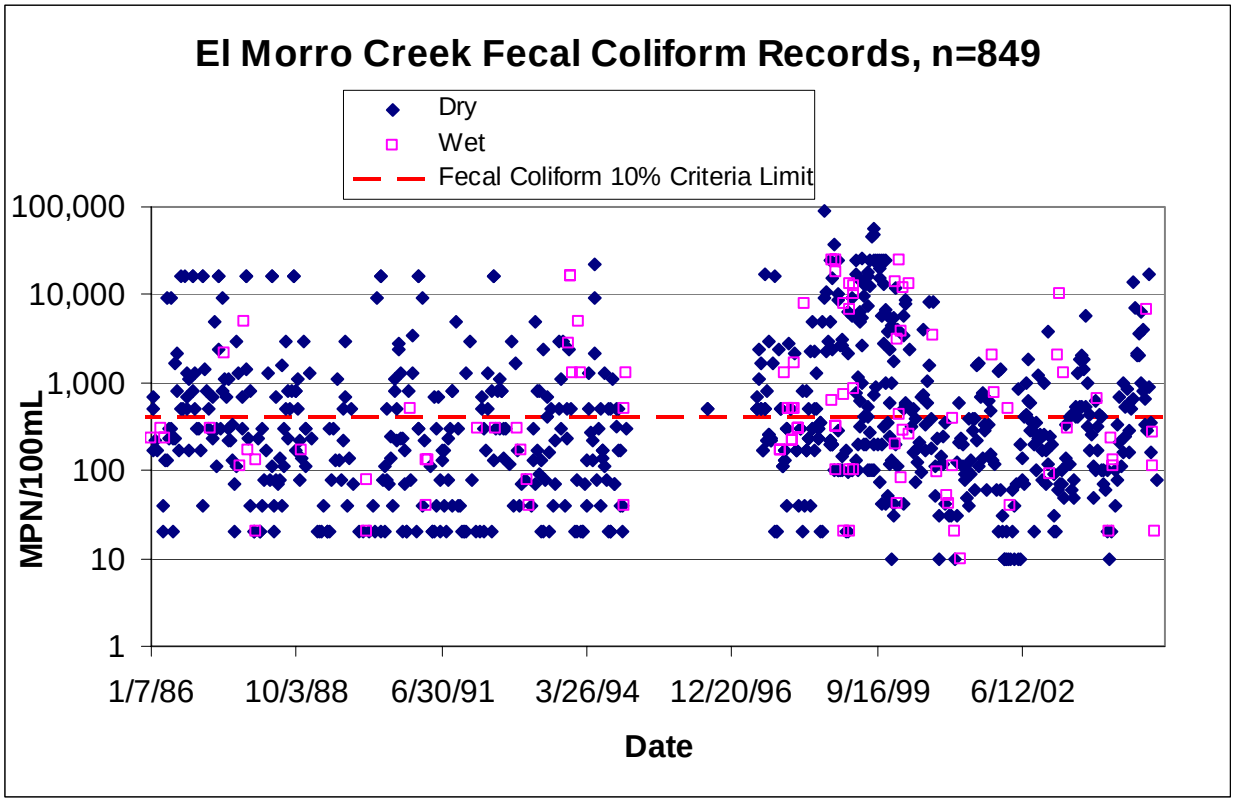



**Figure A 35: El Morro Creek fecal coliform data and corresponding cumulative frequency distribution**



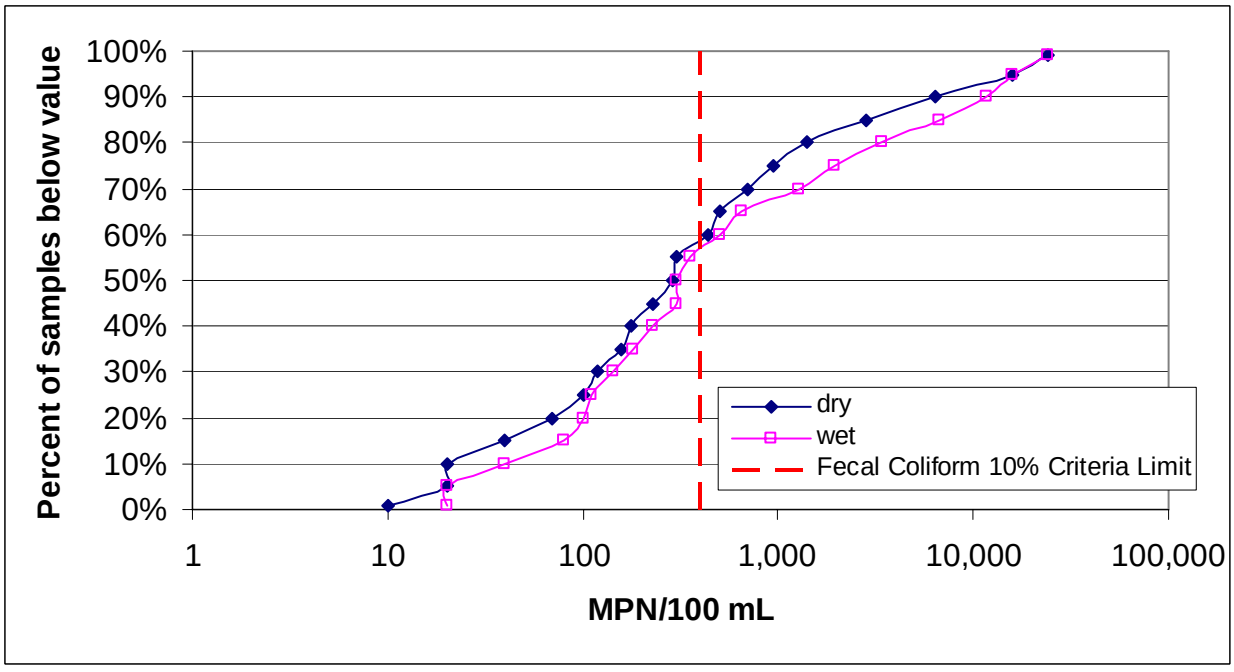
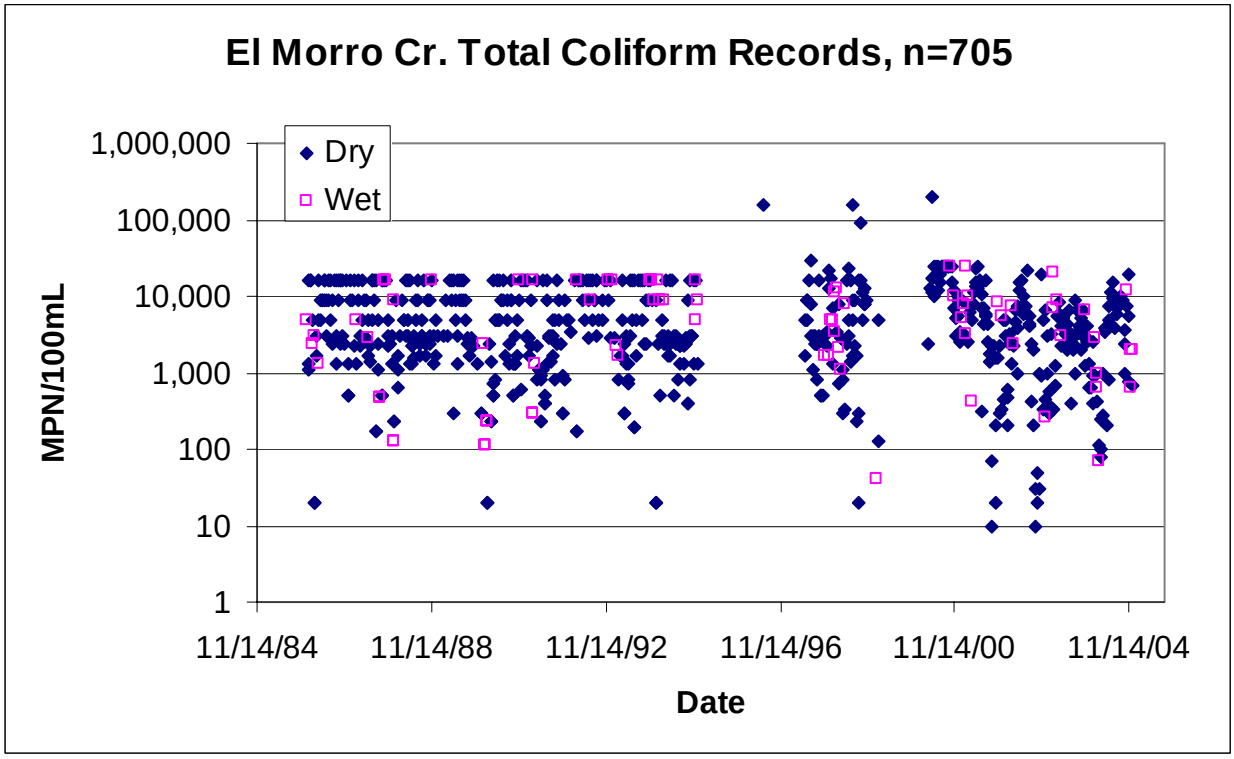



**Figure A 36: El Morro Creek total coliform data and corresponding cumulative frequency distribution**



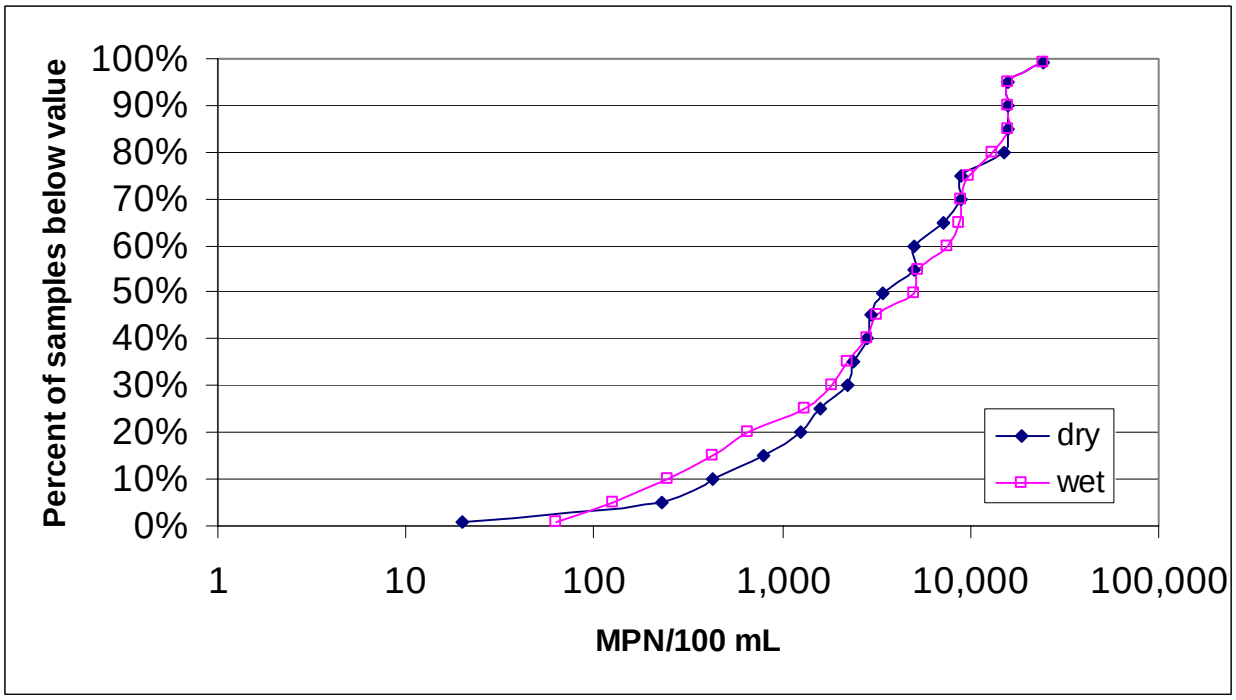



**Figure A 37: Percentage of samples from El Morro Creek which exceed thresholds, by month**

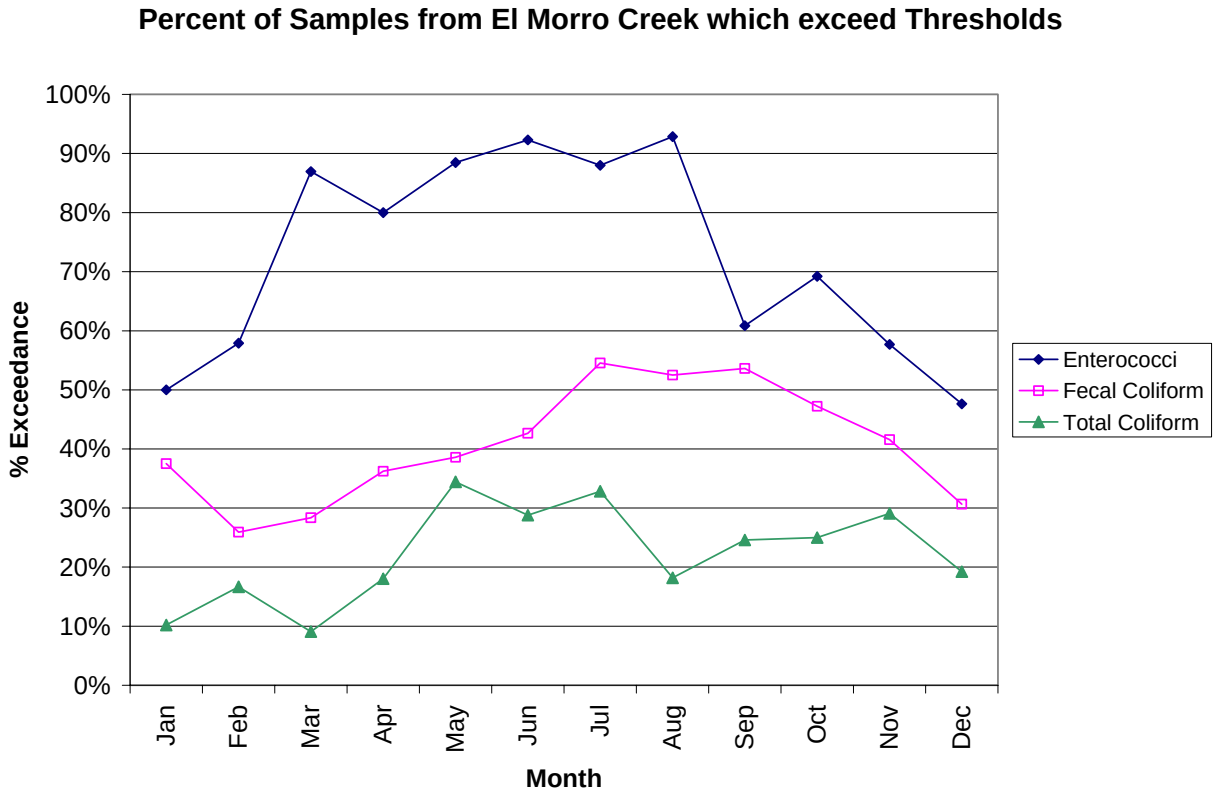
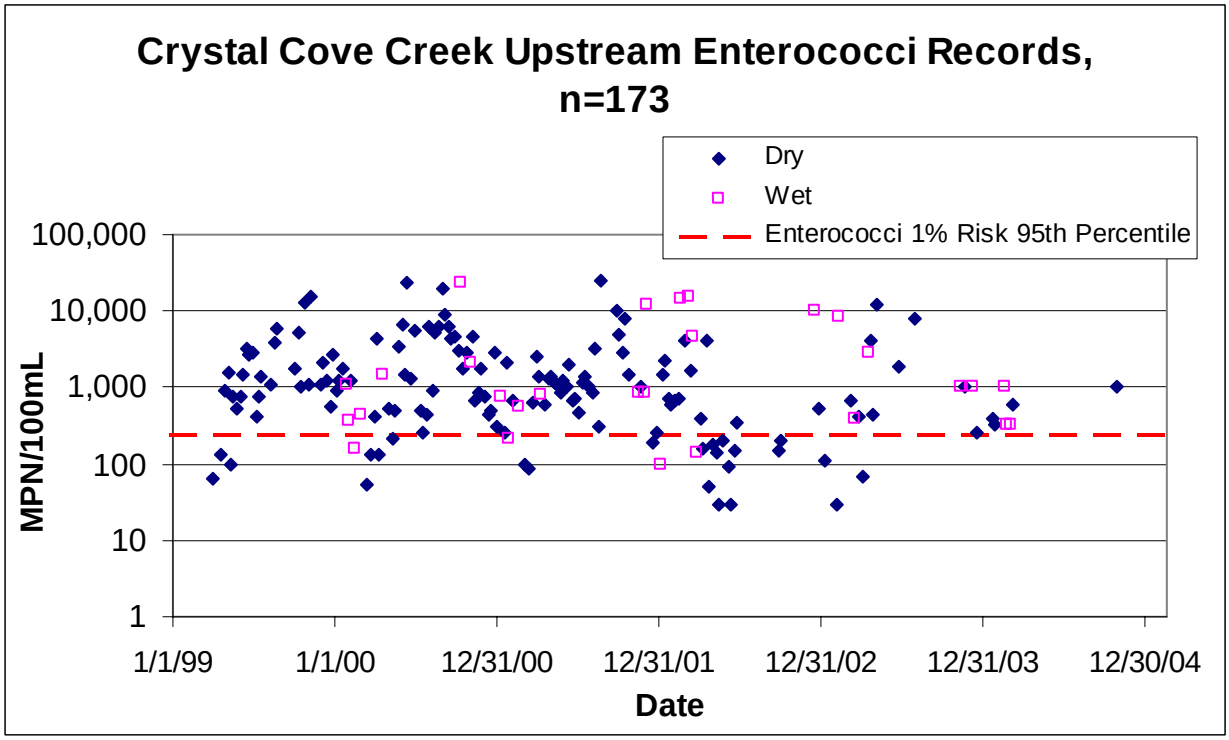


**Figure A 38: Crystal Cove Creek Upstream enterococci data and corresponding cumulative frequency distribution**



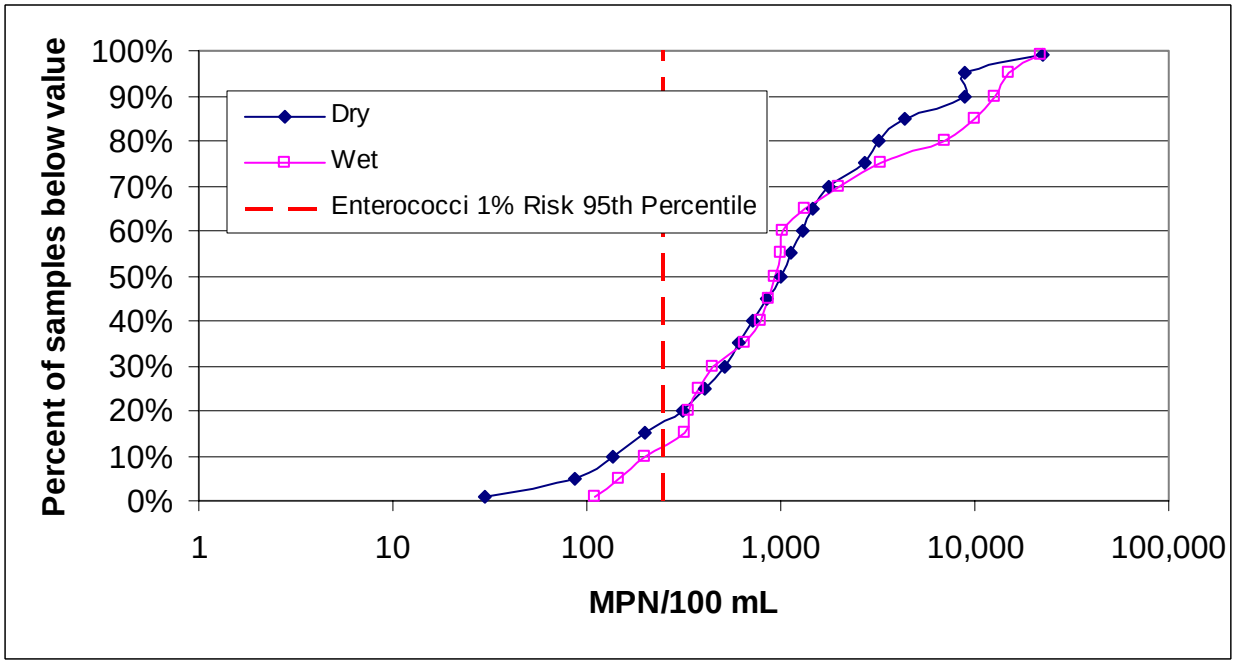
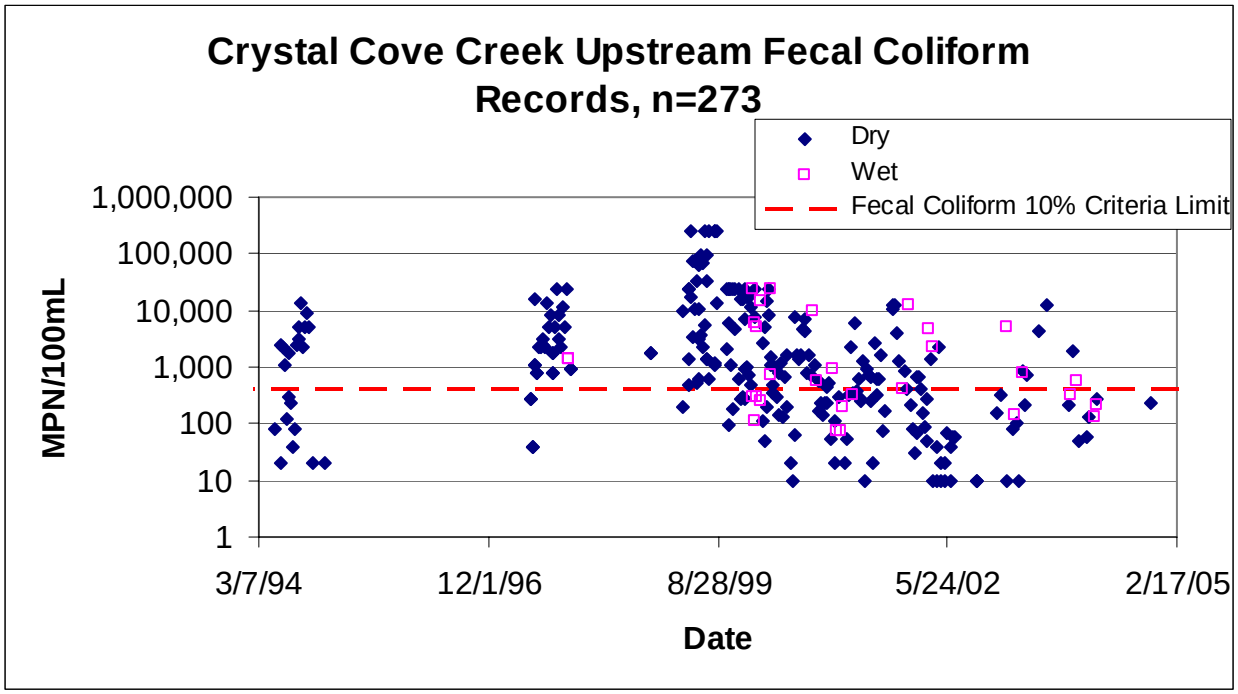



**Figure A 39: Crystal Cove Creek Upstream fecal coliform data and corresponding cumulative frequency distribution**



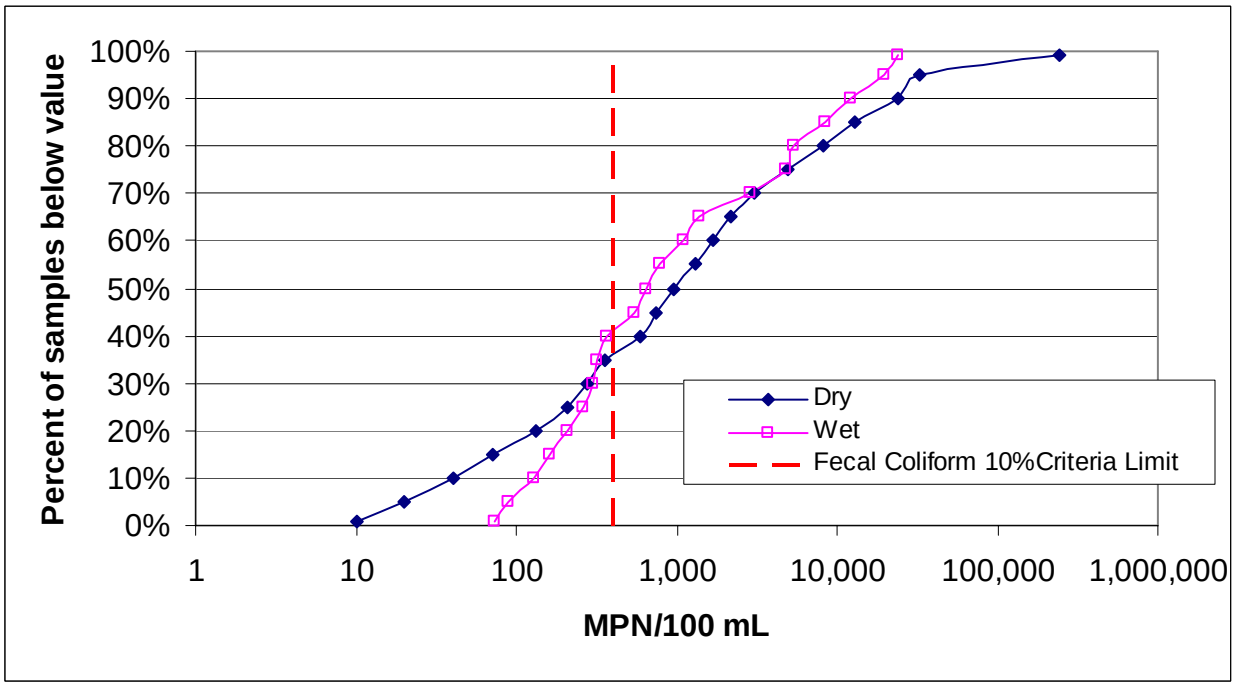
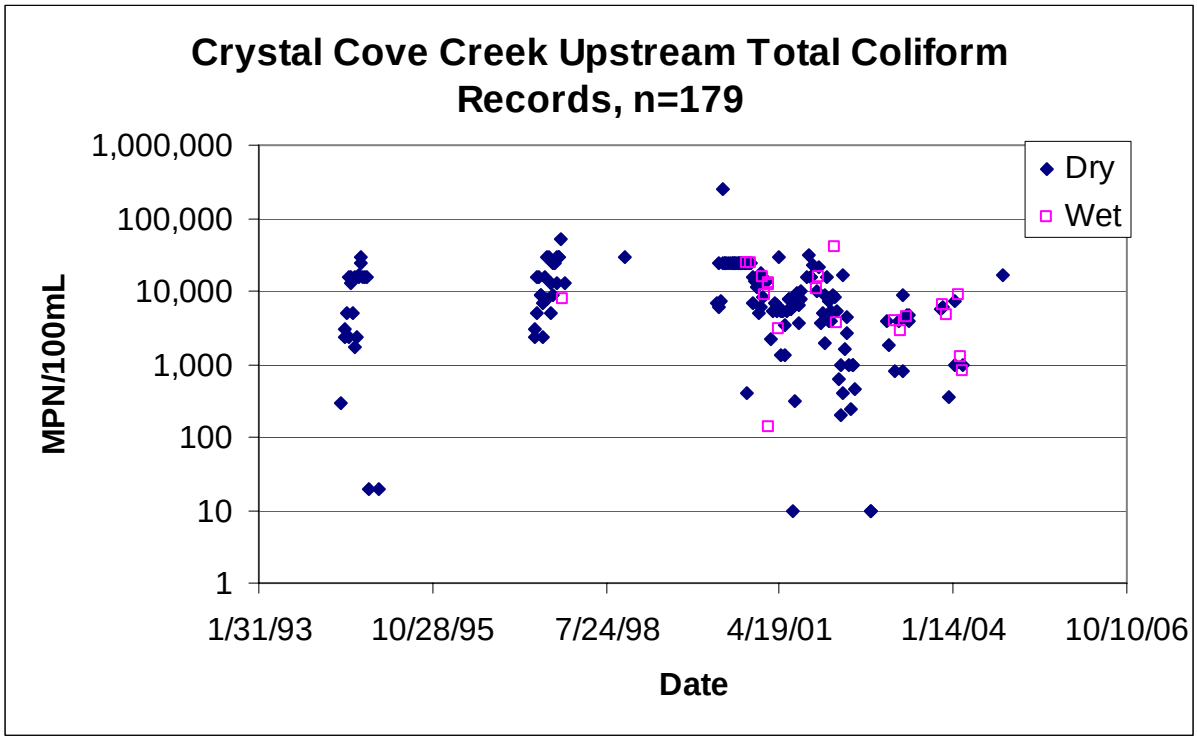



**Figure A 40: Crystal Cove Creek Upstream total coliform data and corresponding cumulative frequency distribution**



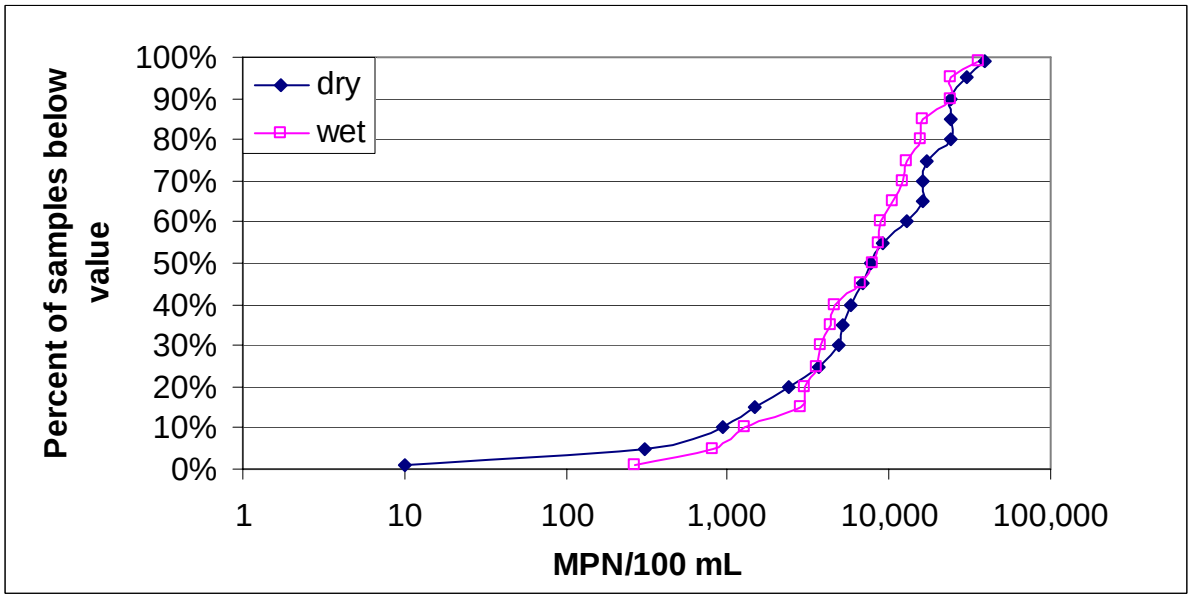



**Figure A 41: Percentage of samples from Crystal Cove Creek Upstream which exceed thresholds, by month**

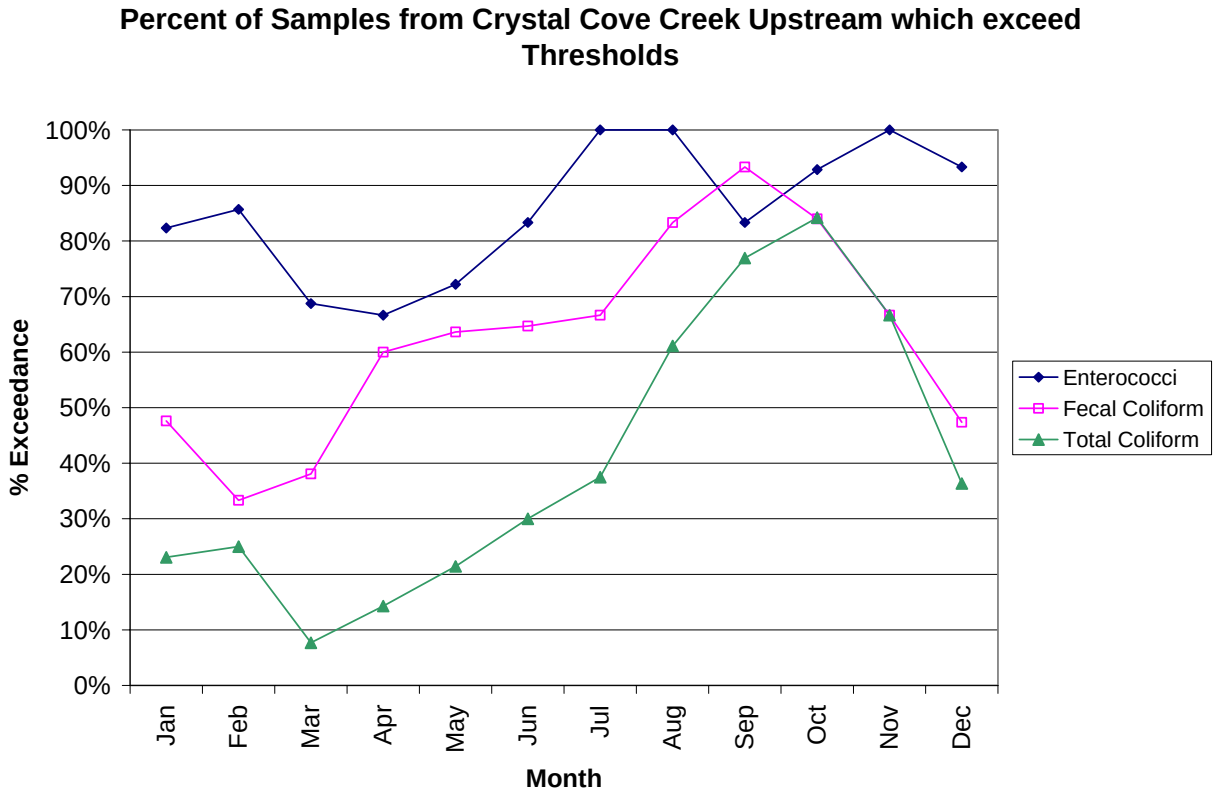
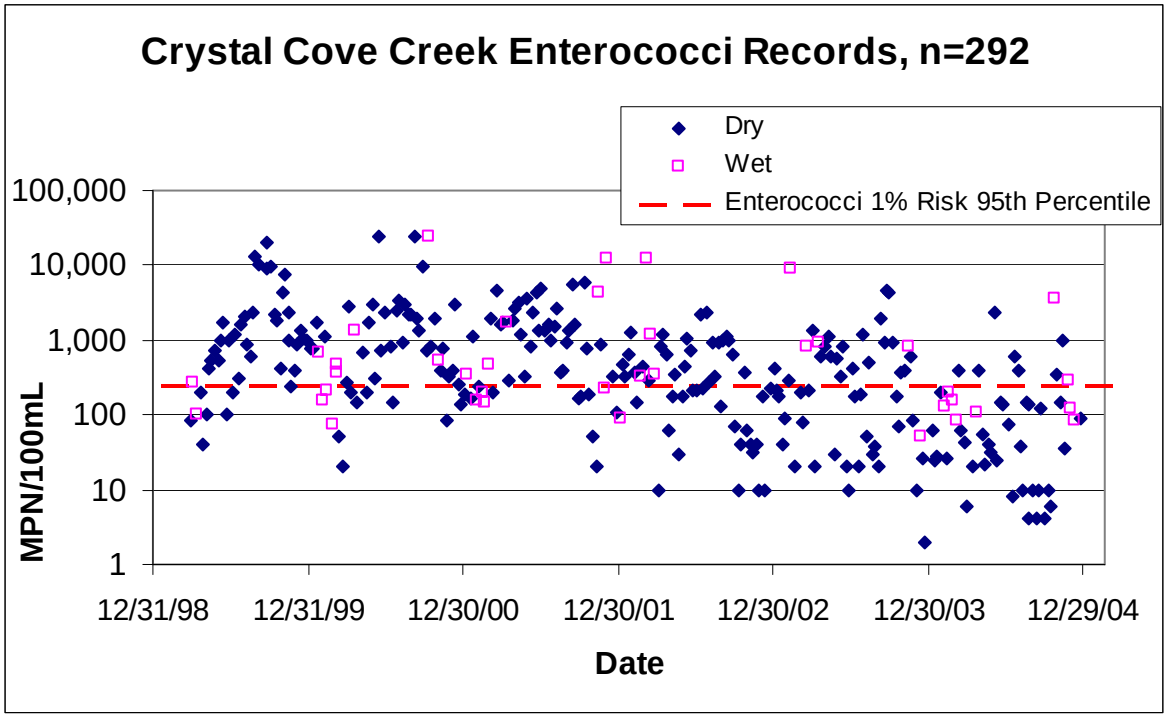


**Figure A 42: Crystal Cove Creek enterococci data and corresponding cumulative frequency distribution**



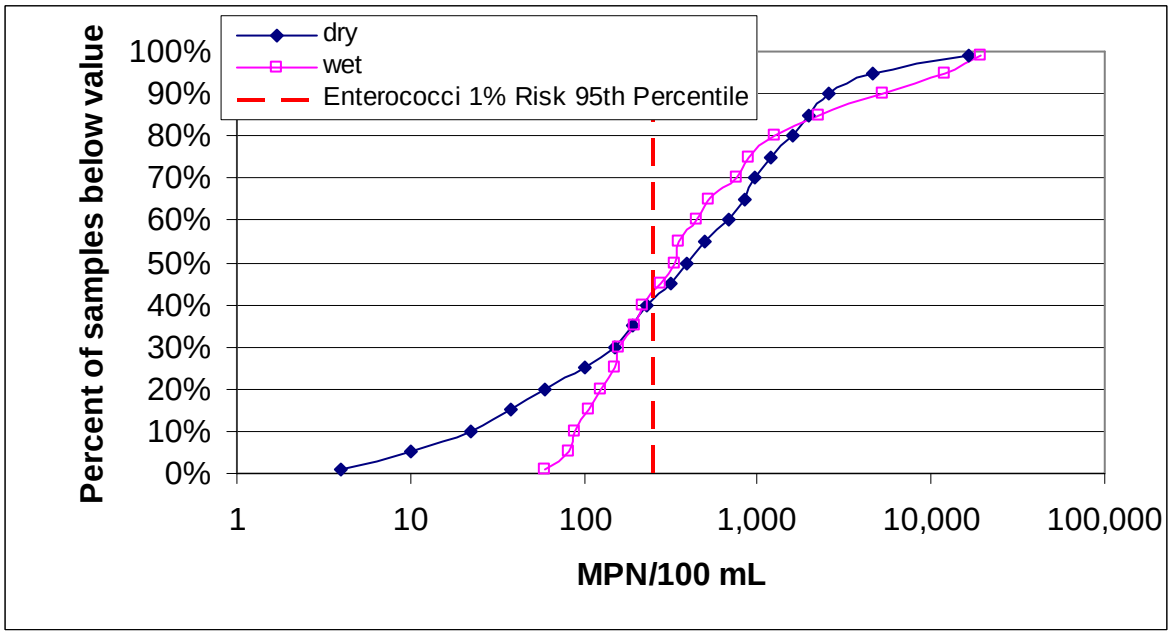
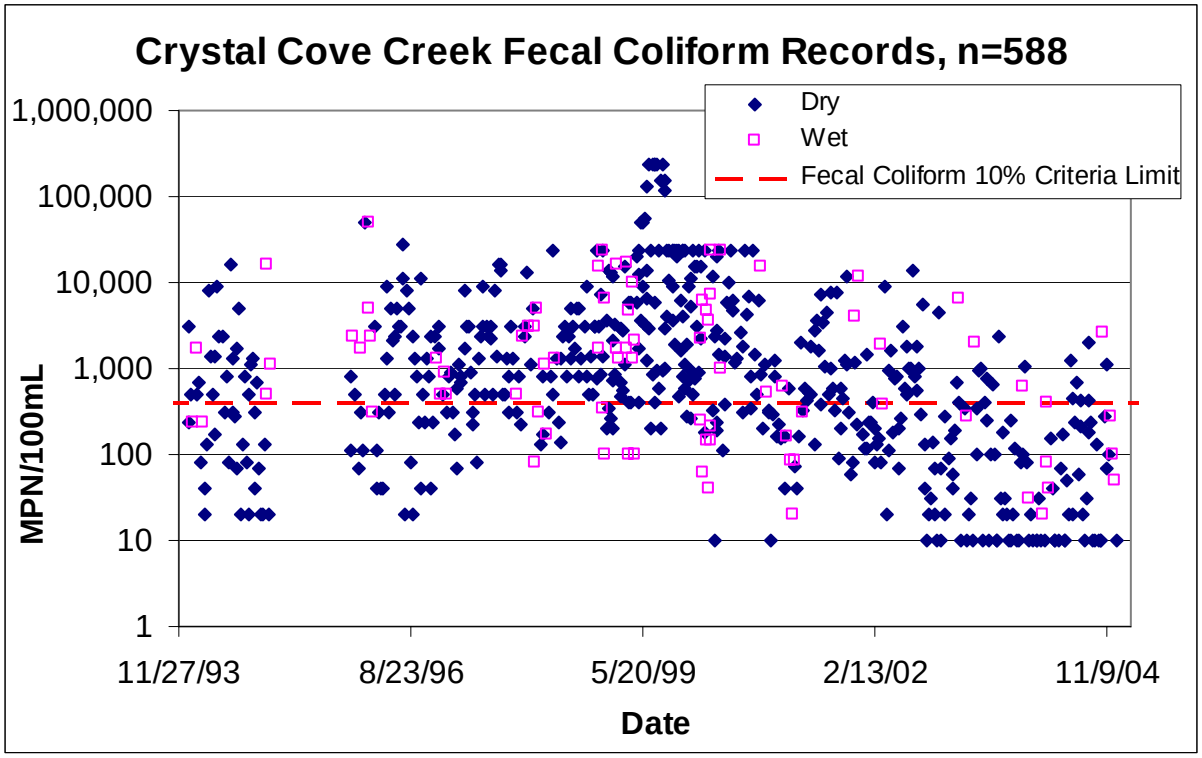



**Figure A 43: Crystal Cove Creek fecal coliform data and corresponding cumulative frequency distribution**



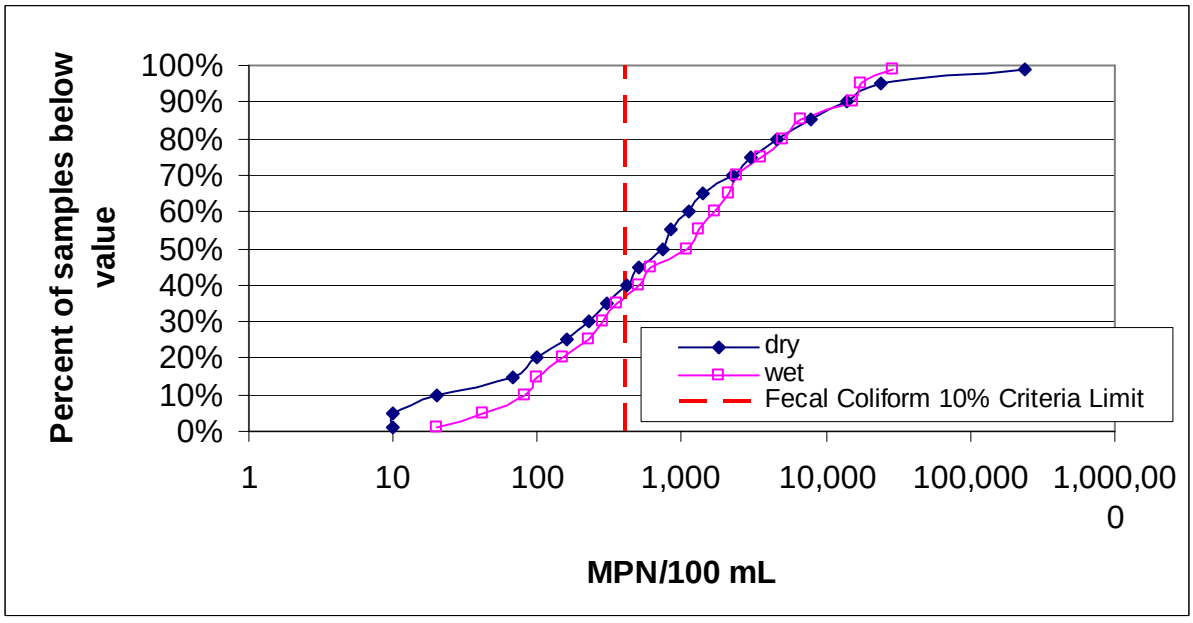
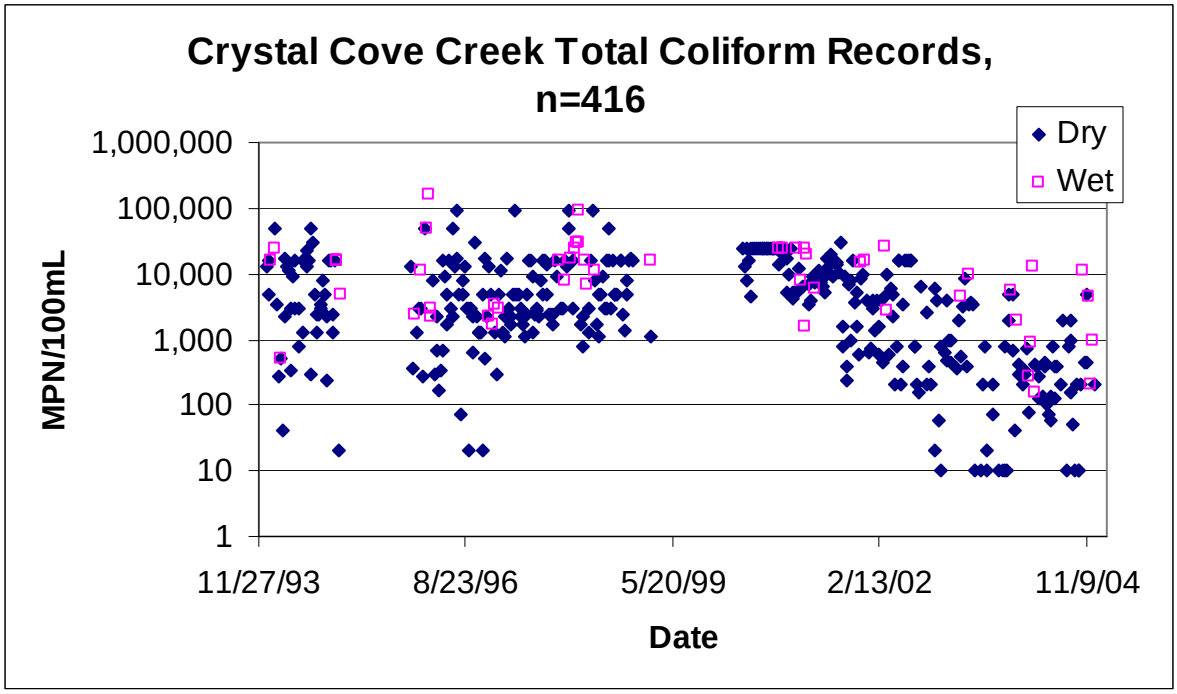



**Figure A 44: Crystal Cove Creek total coliform data and corresponding cumulative frequency distribution**



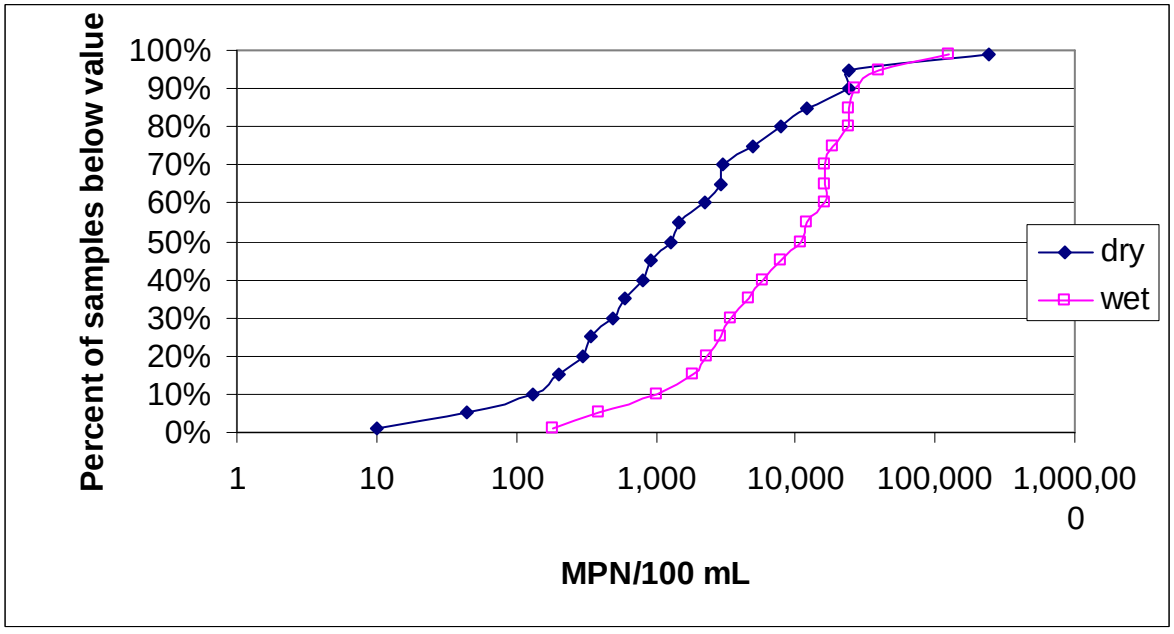



**Figure A 45: Percentage of samples from Crystal Cove Creek which exceed thresholds, by month**

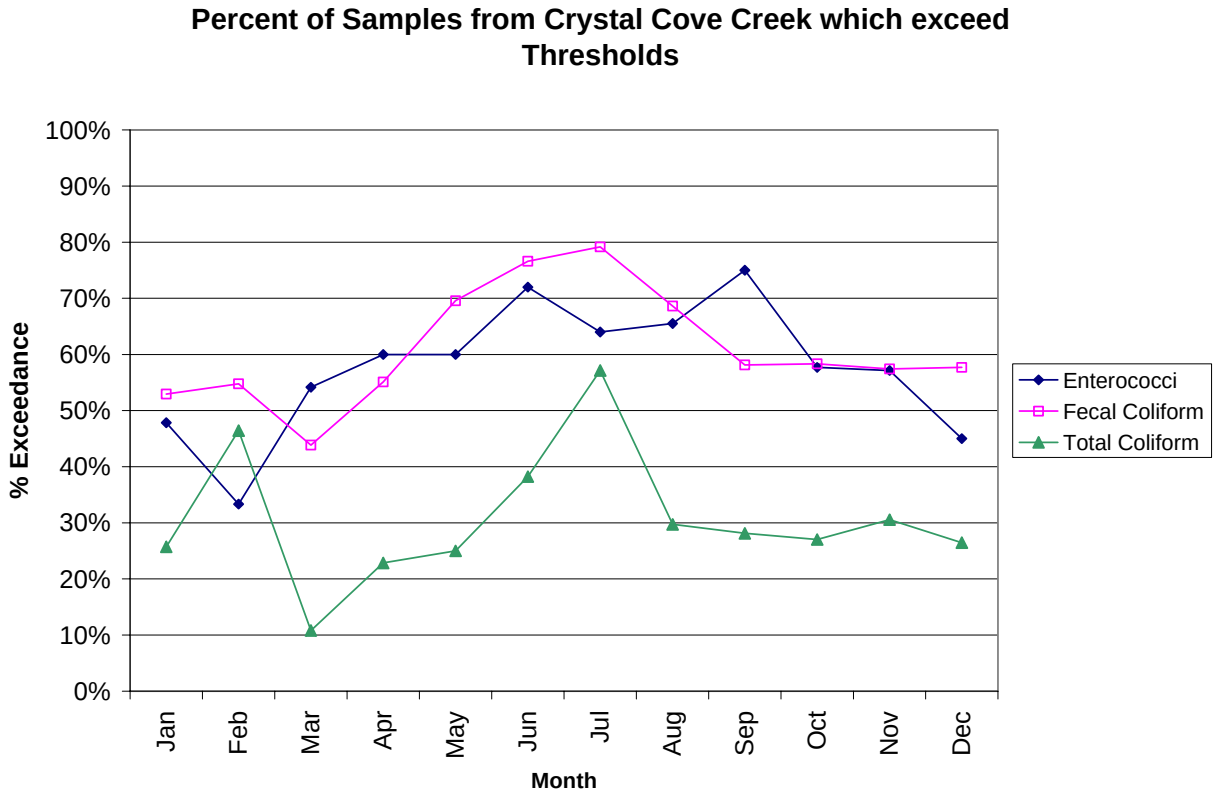
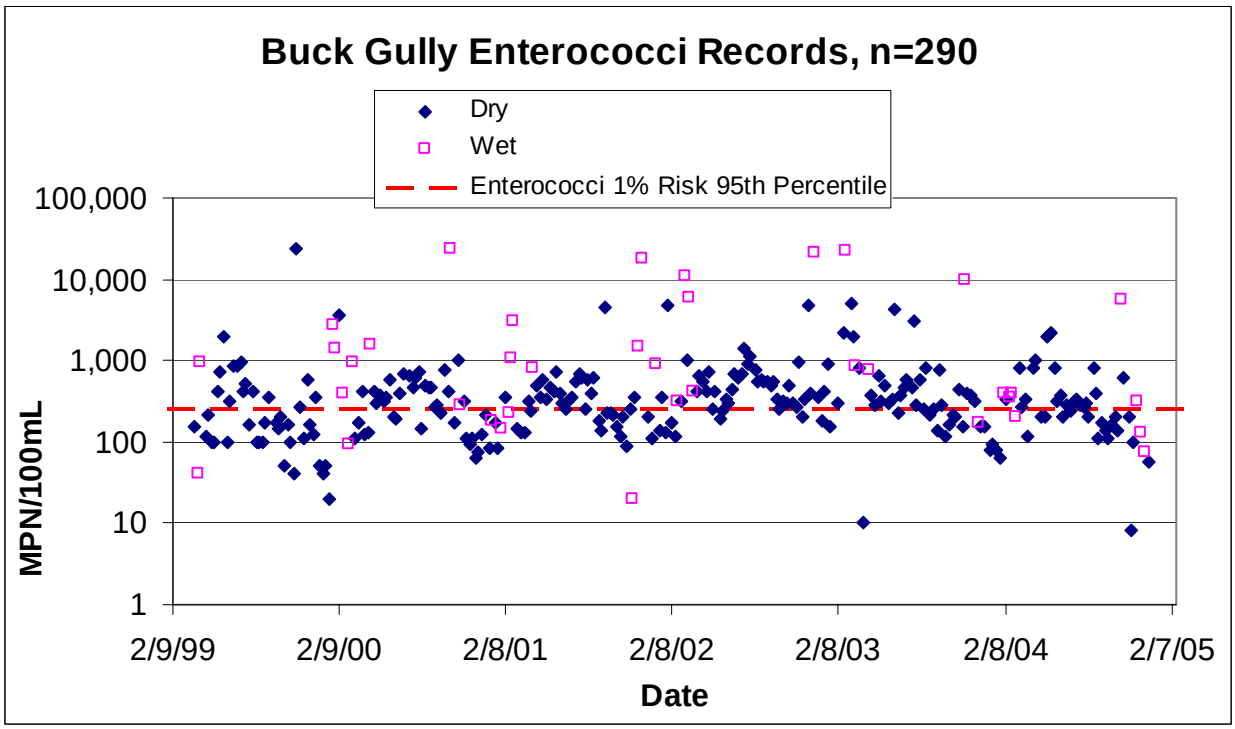


**Figure A 46: Buck Gully enterococci data and corresponding cumulative frequency distribution**



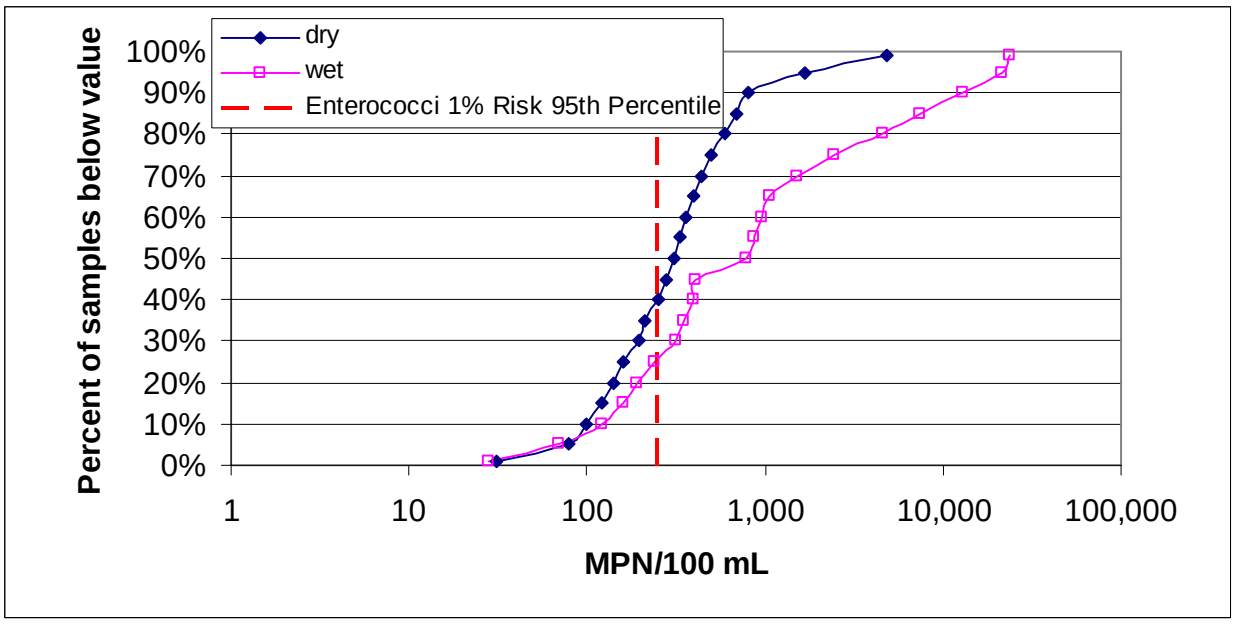
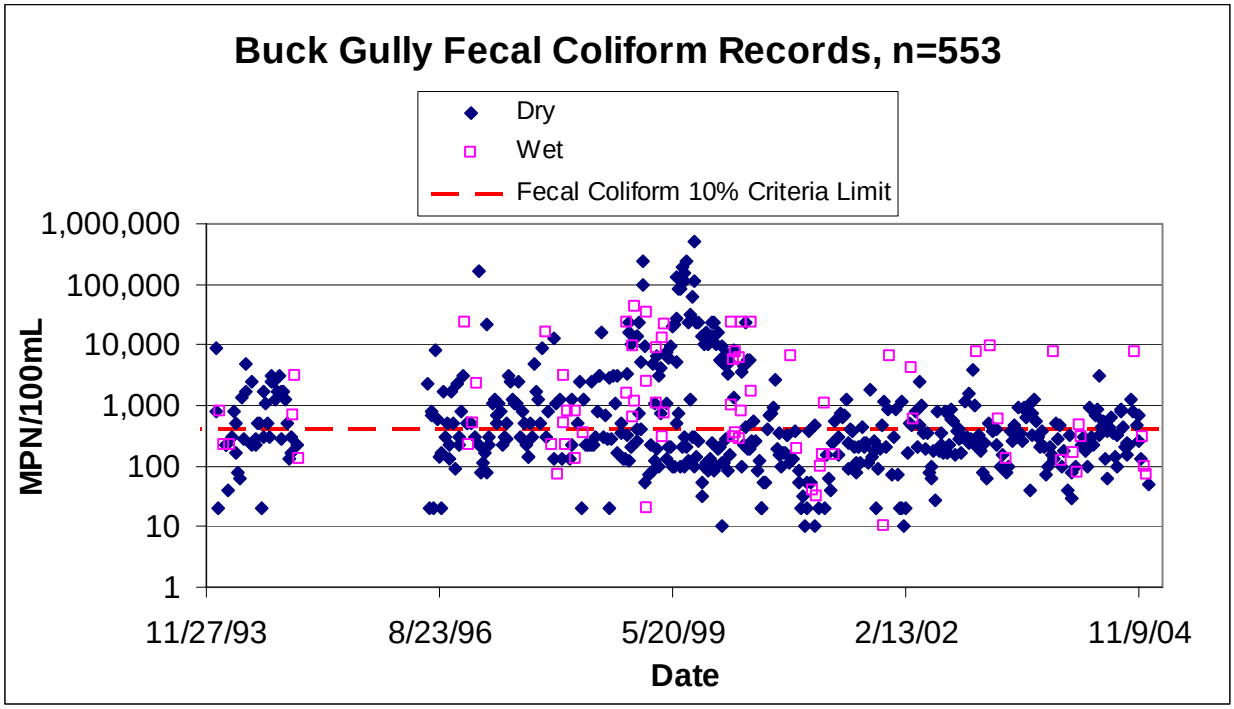



**Figure A 47: Buck Gully fecal coliform data and corresponding cumulative frequency distribution**



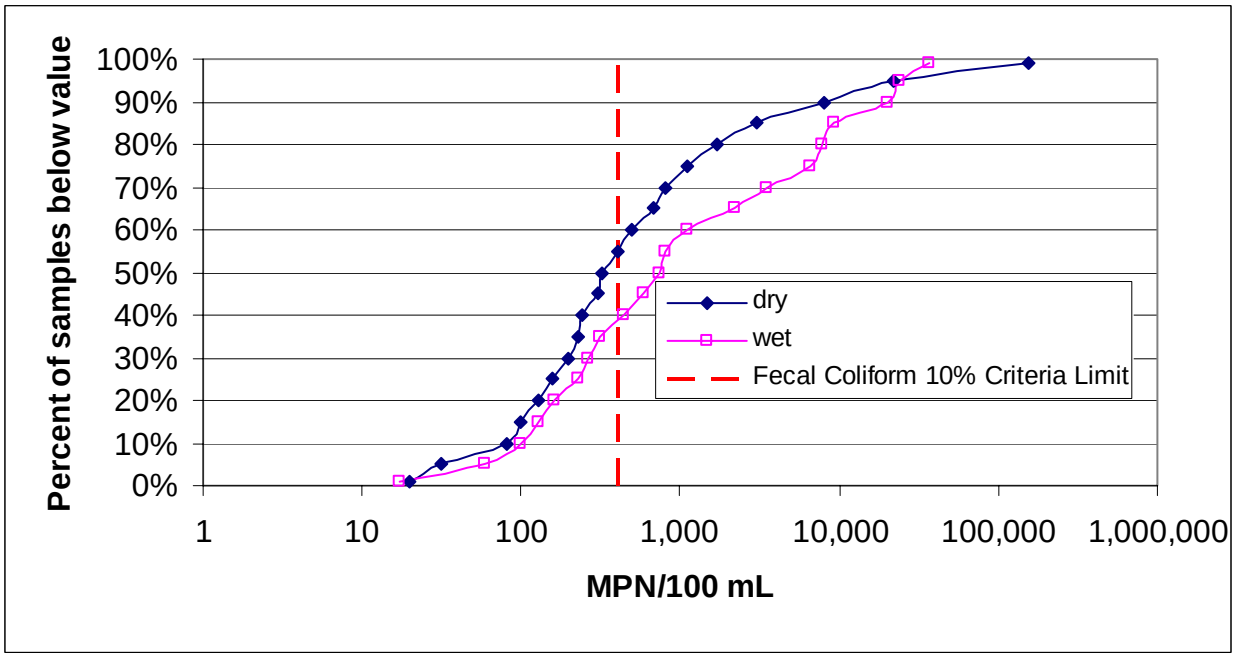
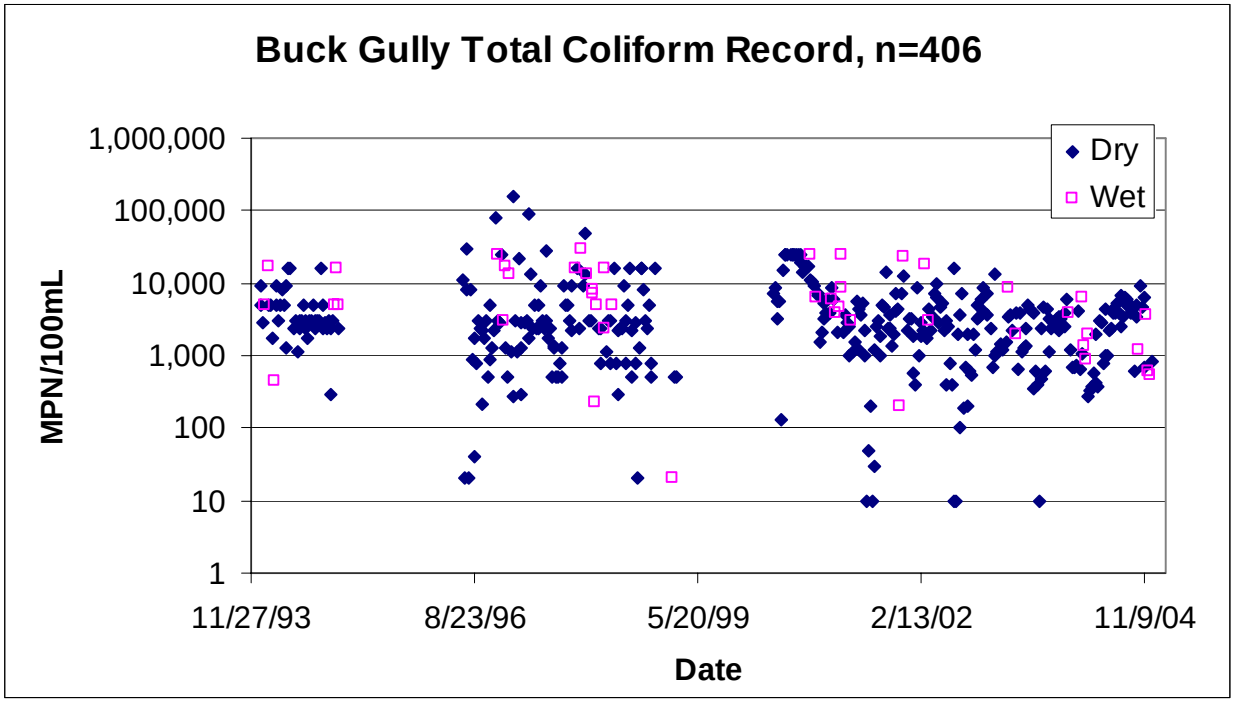



**Figure A 48: Buck Gully total coliform data and corresponding cumulative frequency distribution**



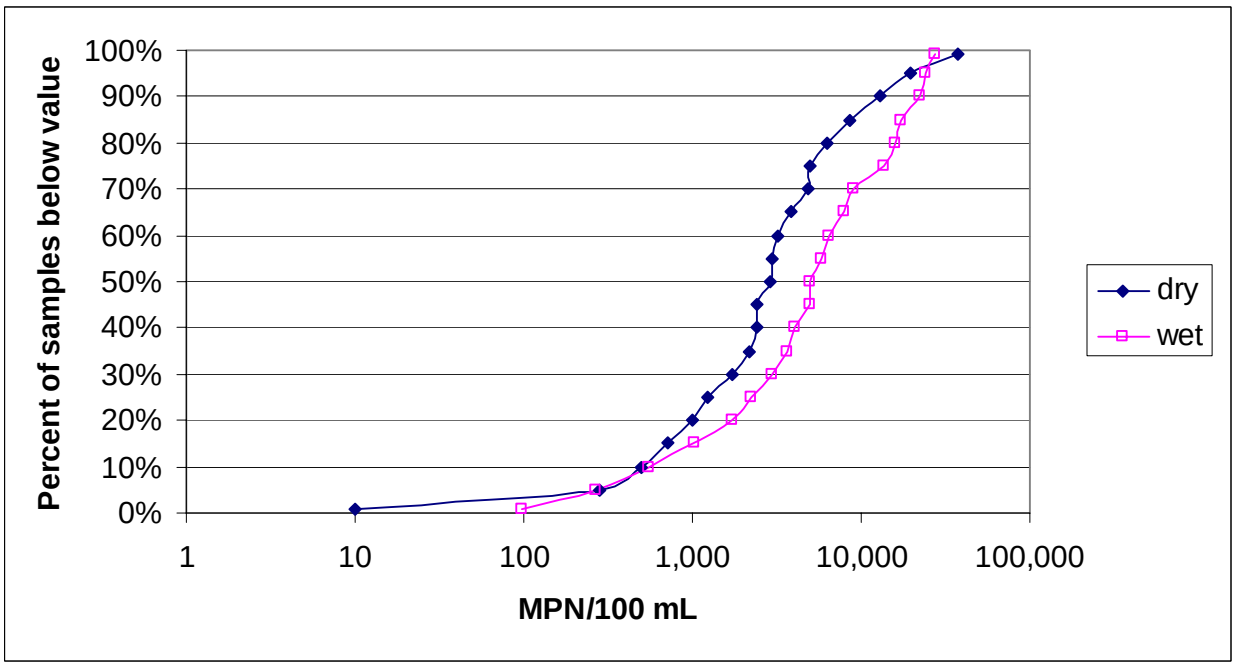



**Figure A 49: Percentage of samples from Buck Gully which exceed thresholds, by month**

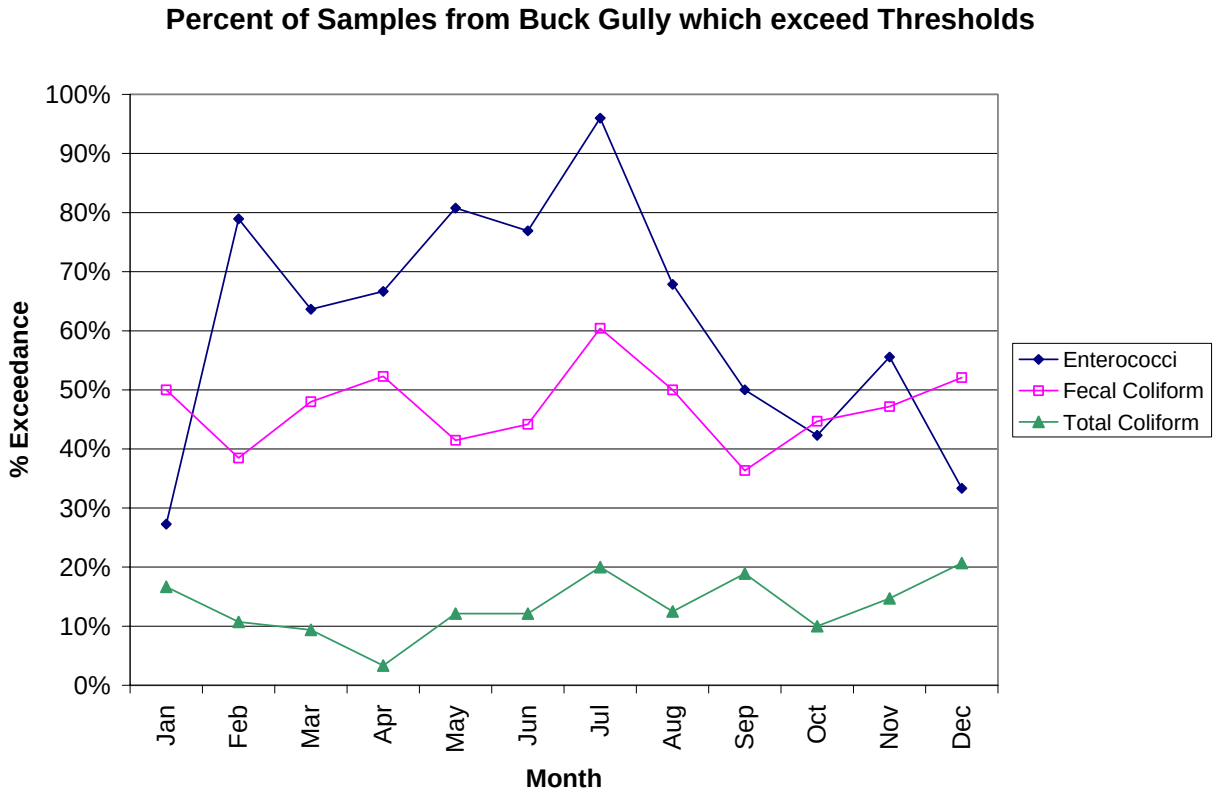
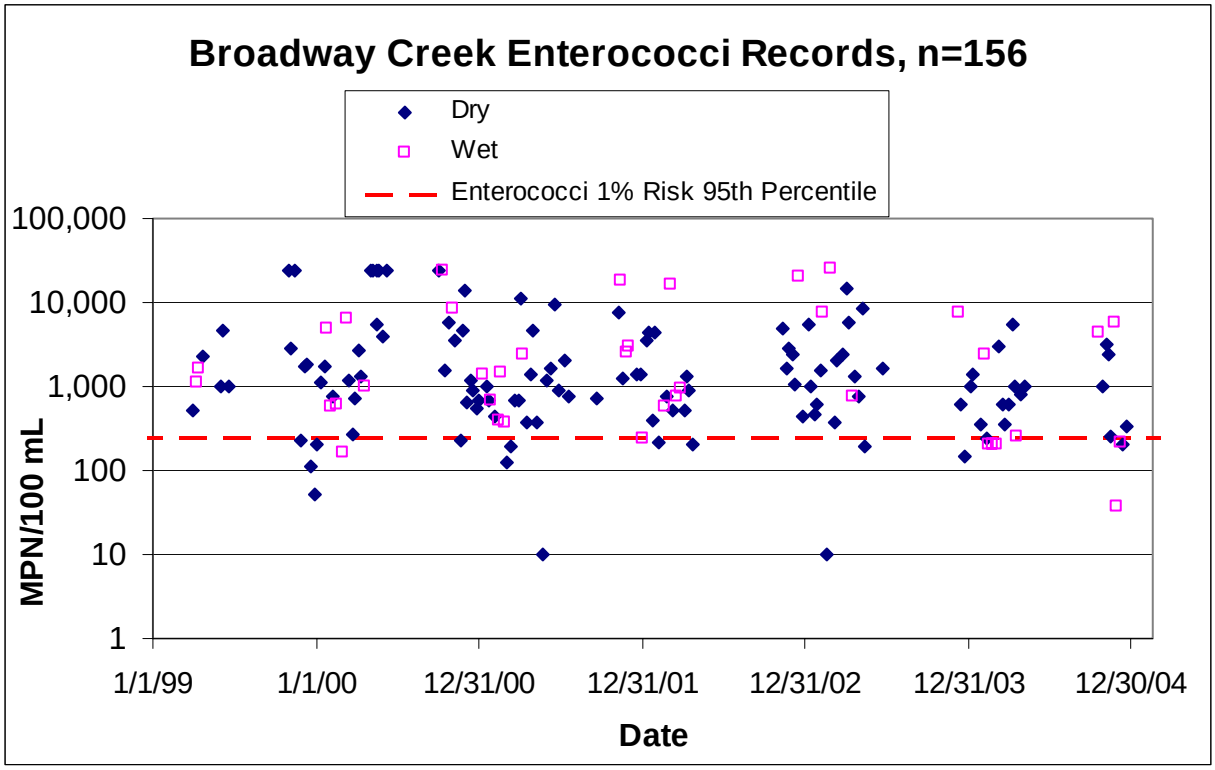


**Figure A 50: Broadway Creek enterococci data and corresponding cumulative frequency distribution**



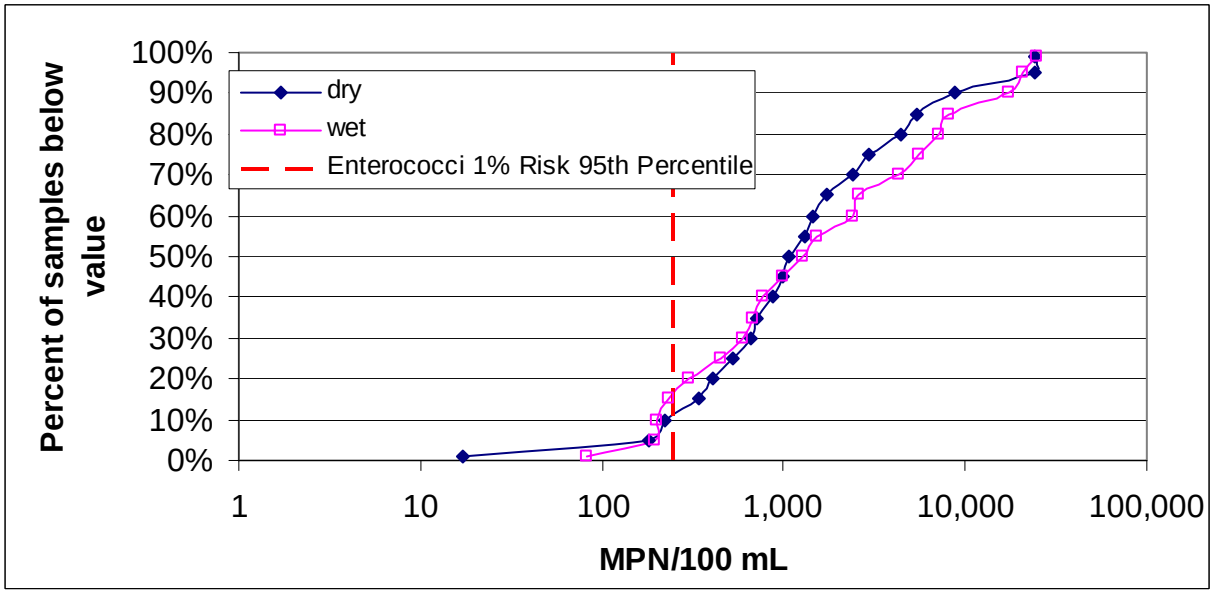
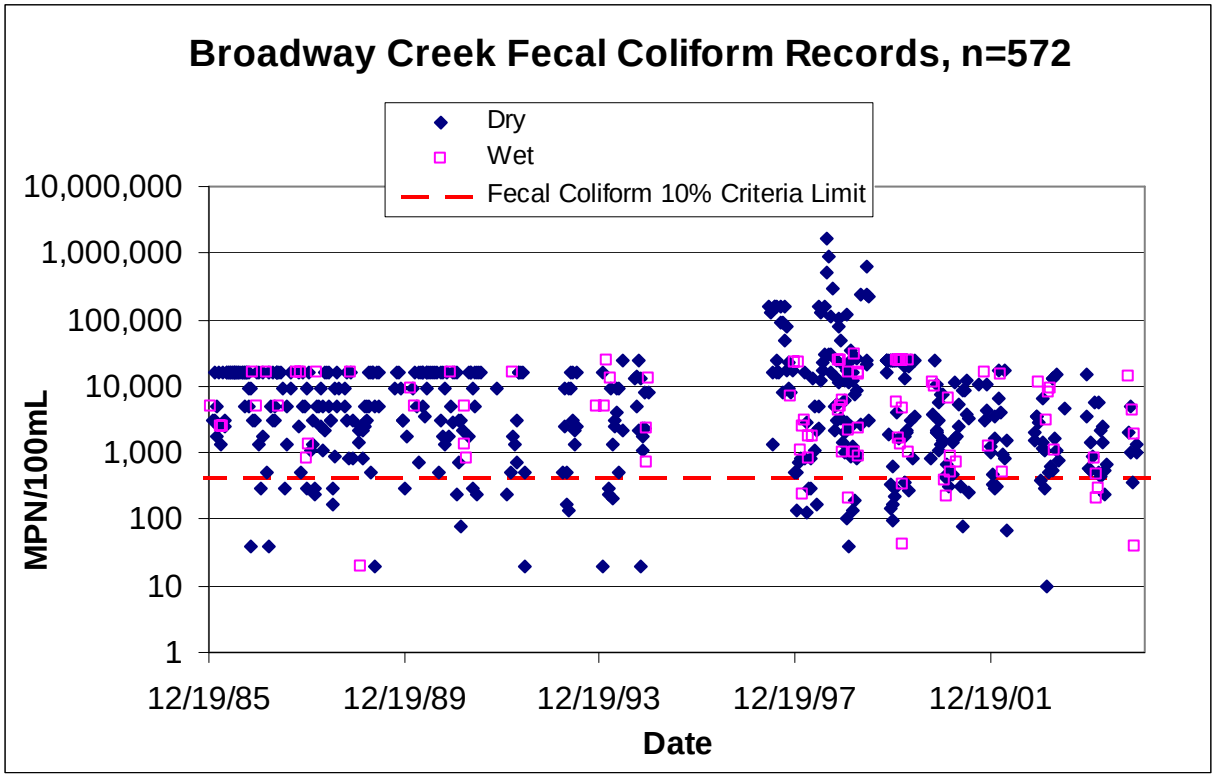



**Figure A 51: Broadway Creek fecal coliform data and corresponding cumulative frequency distribution**



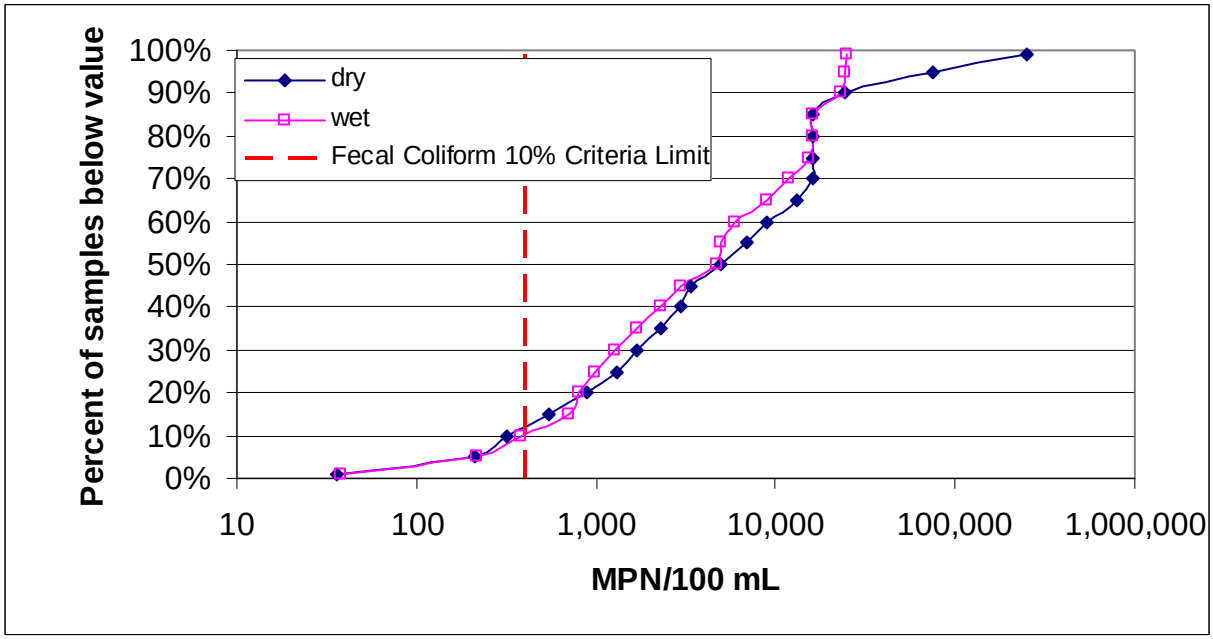
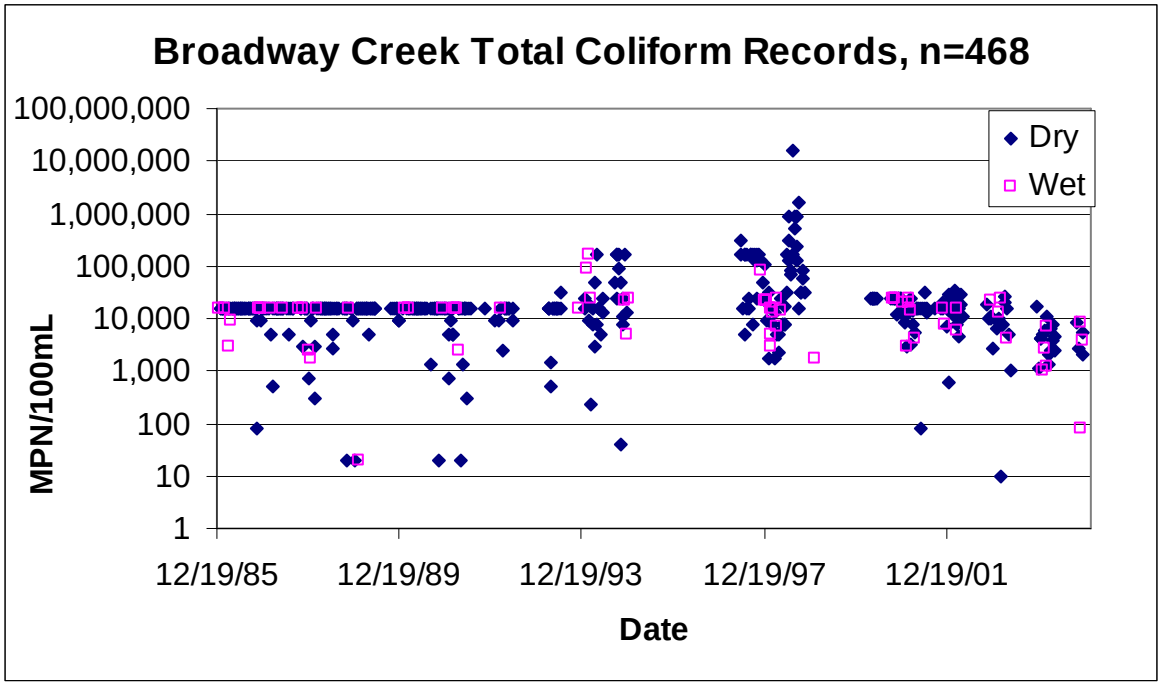



**Figure A 52: Broadway Creek total coliform data and corresponding cumulative frequency distribution**



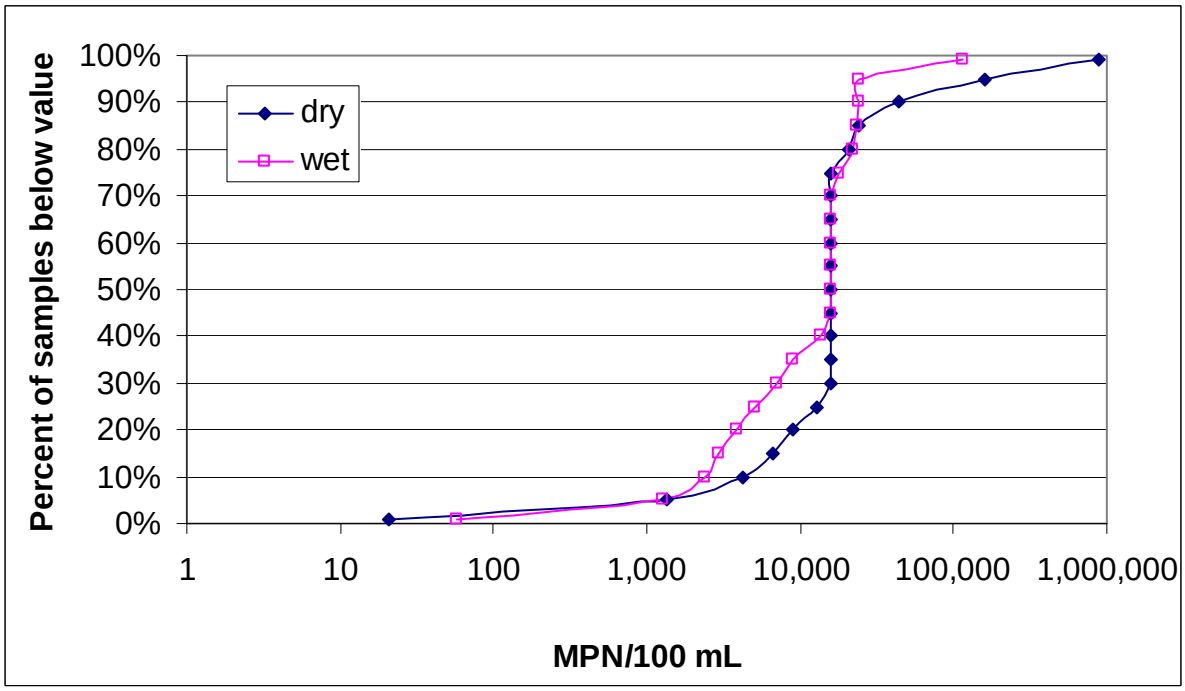
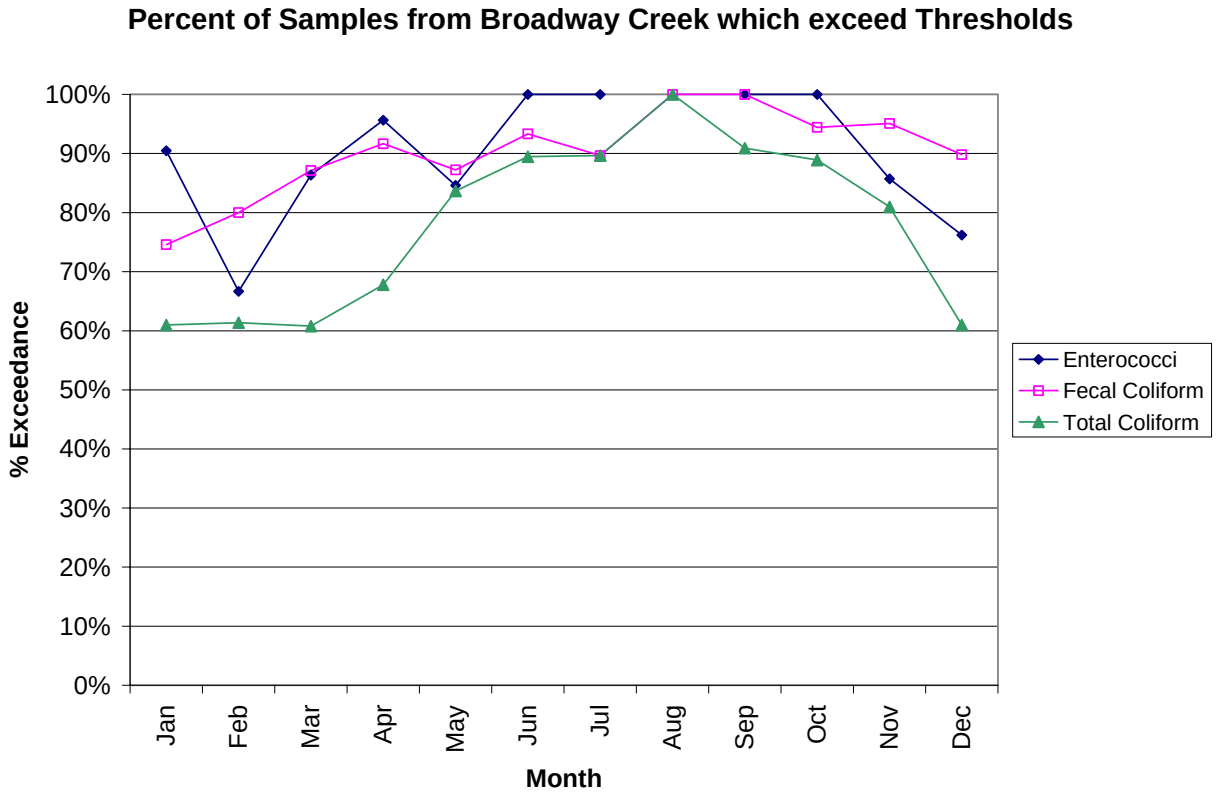



**Figure A 53: Percentage of samples from Broadway Creek which exceed thresholds, by month**



# APPENDIX B

## DATA FROM SANTA ANA REGION

## FIGURES REPRODUCED FROM CDM 2005

**Figure B 1: Santa Ana Watershed and sites selected by CDM for detailed bacteriological analysis (CDM 2005 Figure 19)**

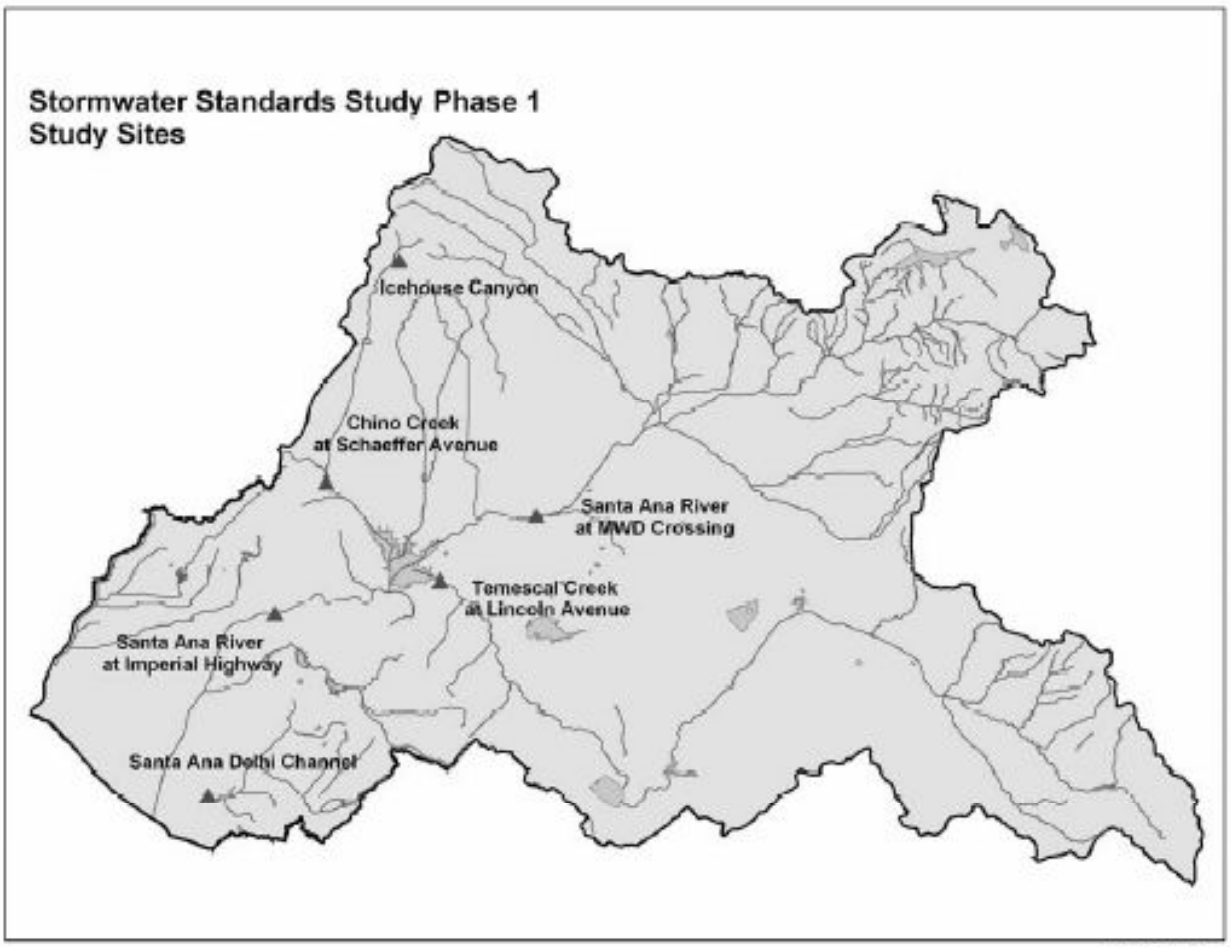



Figure 19
Study Sites Selected for Detailed Analysis

**Figure B 2: Flow rate and bacteria concentration, Chino Creek (CDM 2005 Figure 35)**

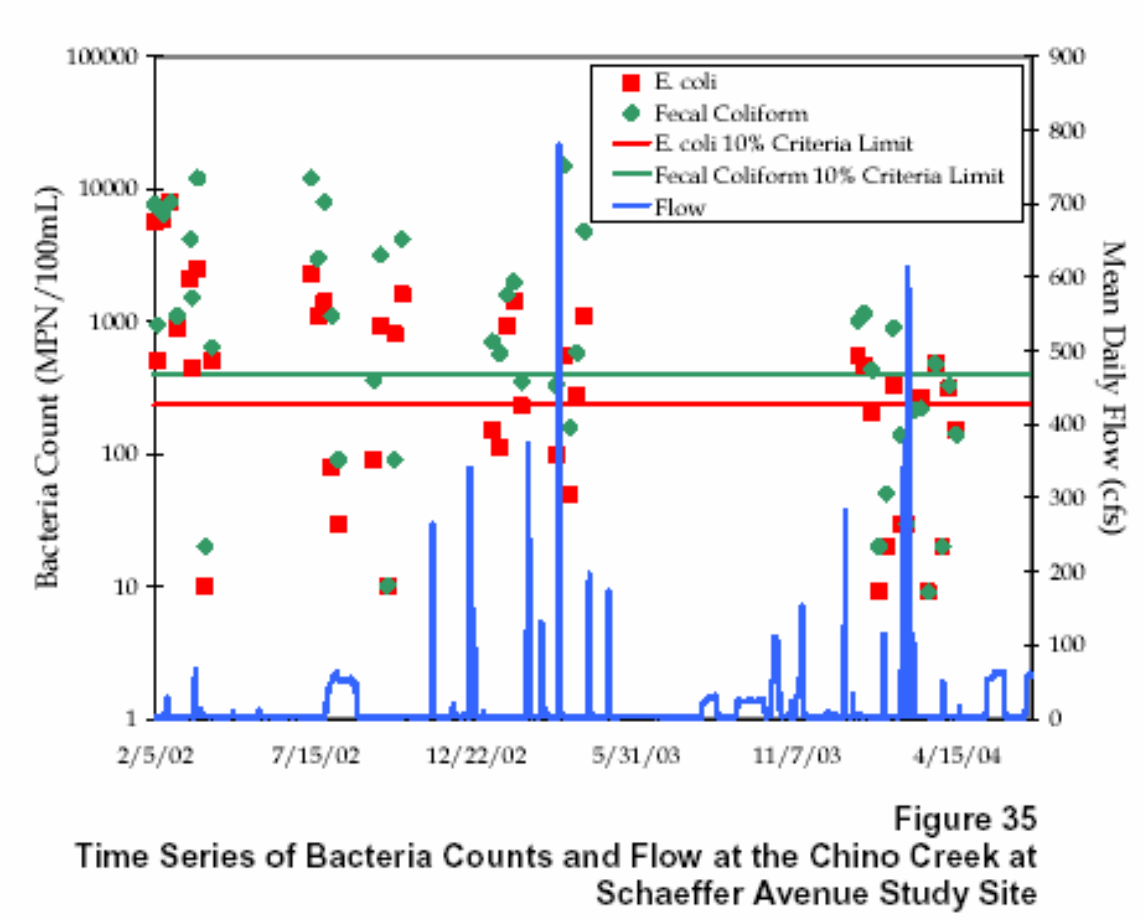



Figure 35
Time Series of Bacteria Counts and Flow at the Chino Creek at Schaeffer Avenue Study Site

**Figure B 3: Flow rate and bacteria concentration, Santa Ana Delhi Channel (CDM 2005 Figure 53)**

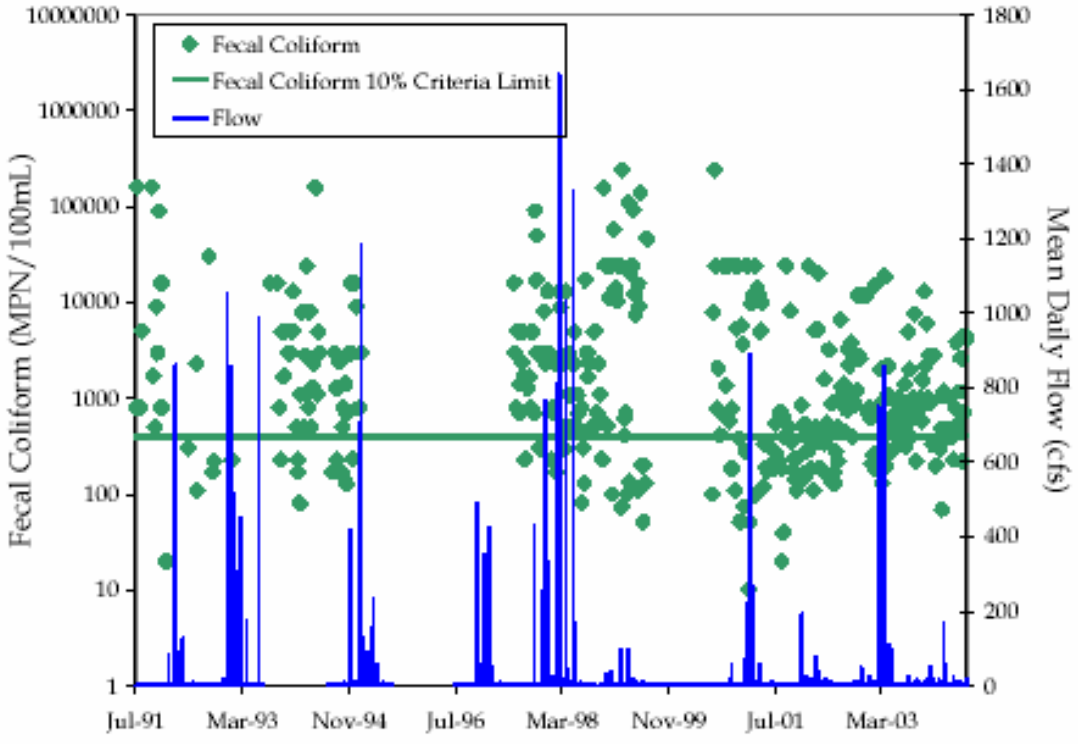



Figure 53
Time Series of Bacteria Concentrations and Flow in the Santa Ana Delhi Channel - Backbay

**Figure B 4: Flow rate and bacteria concentration, Temescal Creek (CDM 2005 Figure 72)**

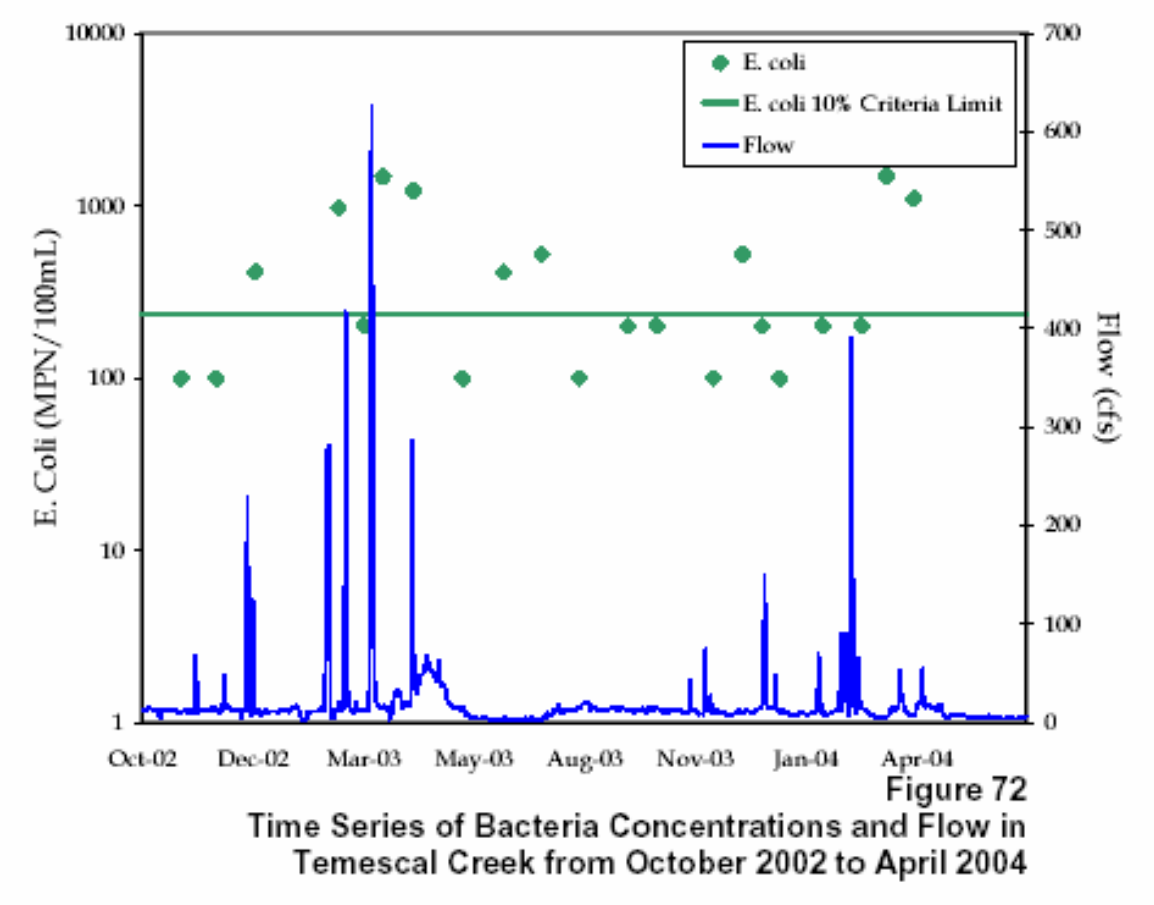


**Figure B 5: Flow rate and bacteria concentration, Santa Ana River at MWD Crossing (CDM 2005 Figures 98 and 99)**

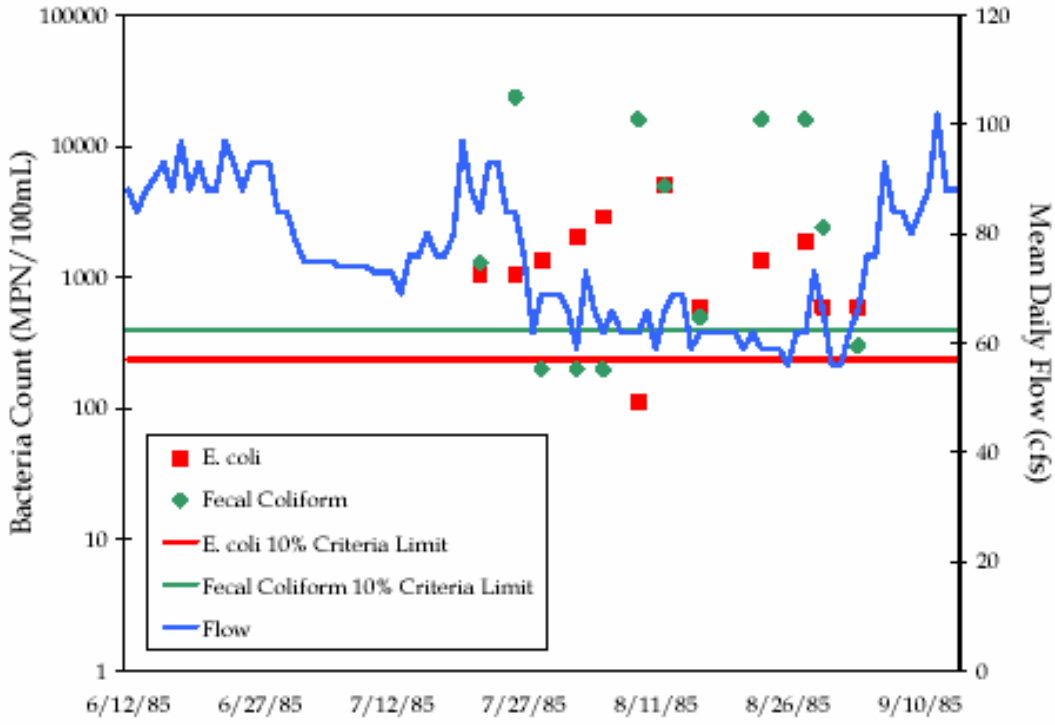



Figure 98
Time Series of Bacteria Concentrations and Flow in the Santa Ana River at the MWD Crossing Study Site

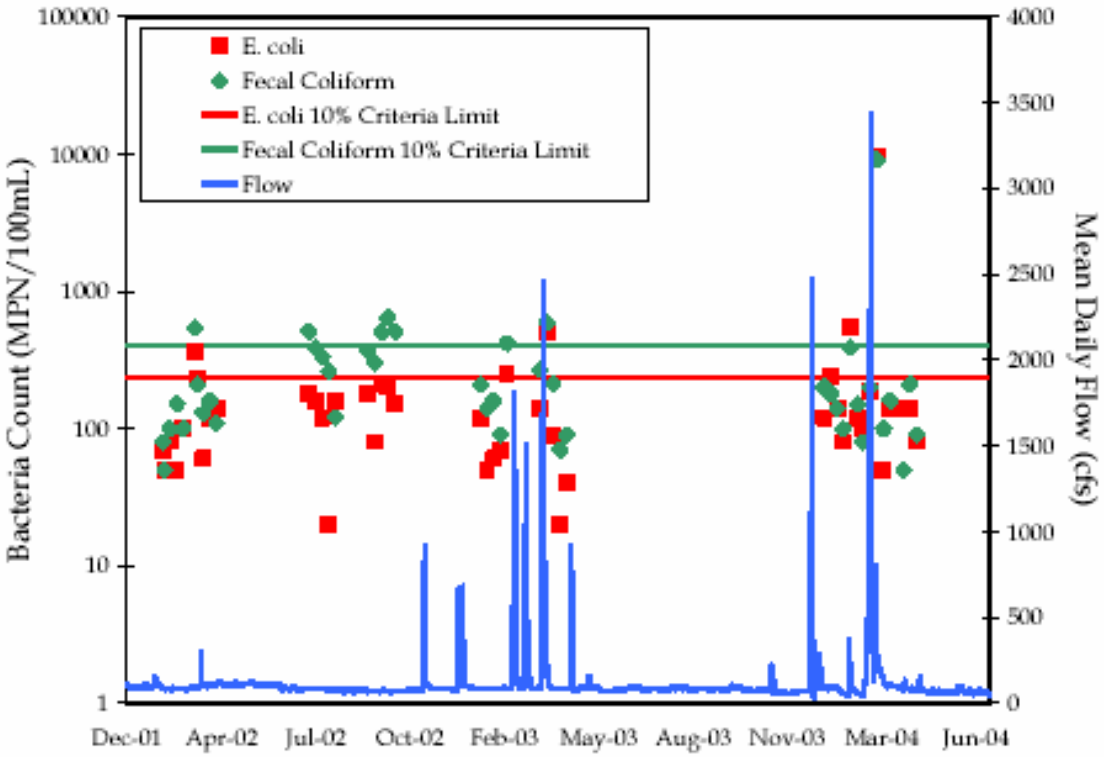



Figure 99
Time Series of Bacteria Concentrations and Flow in the Santa Ana River at the MWD Crossing Study Site

**Figure B 6: Flow rate and bacteria concentration, Santa Ana River at Imperial Highway (CDM 2005 Figure 83)**

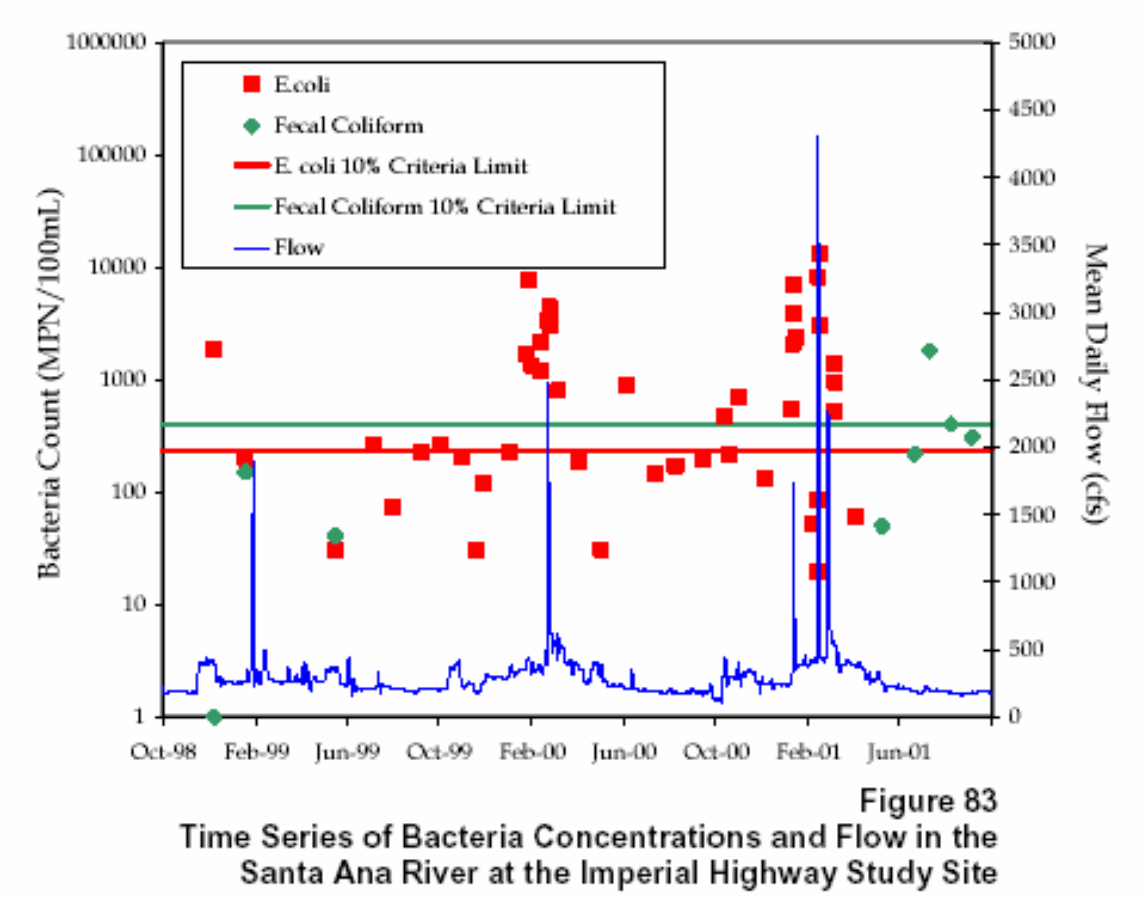



Figure 83
Time Series of Bacteria Concentrations and Flow in the Santa Ana River at the Imperial Highway Study Site

**Figure B 7: Flow rate and bacteria concentration, Santa Ana River at Imperial Highway (CDM 2005 Figure s 84 and 85)**

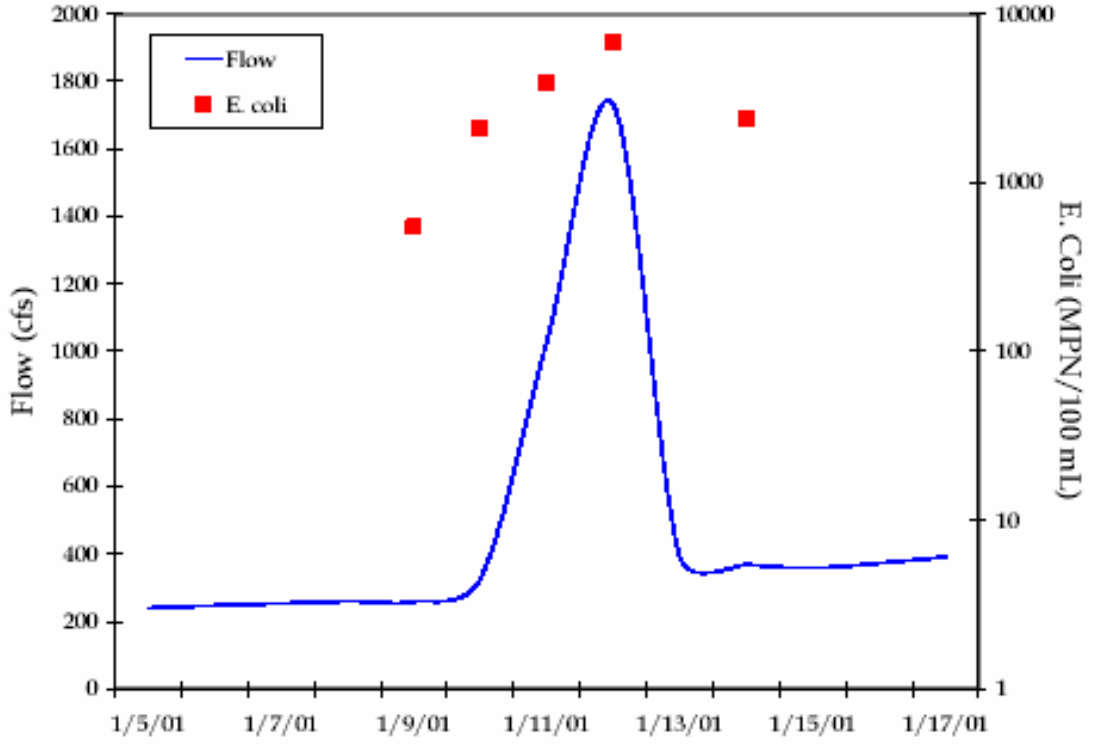



Figure 84
January 2001 Wet Weather E. coli Sampling Event

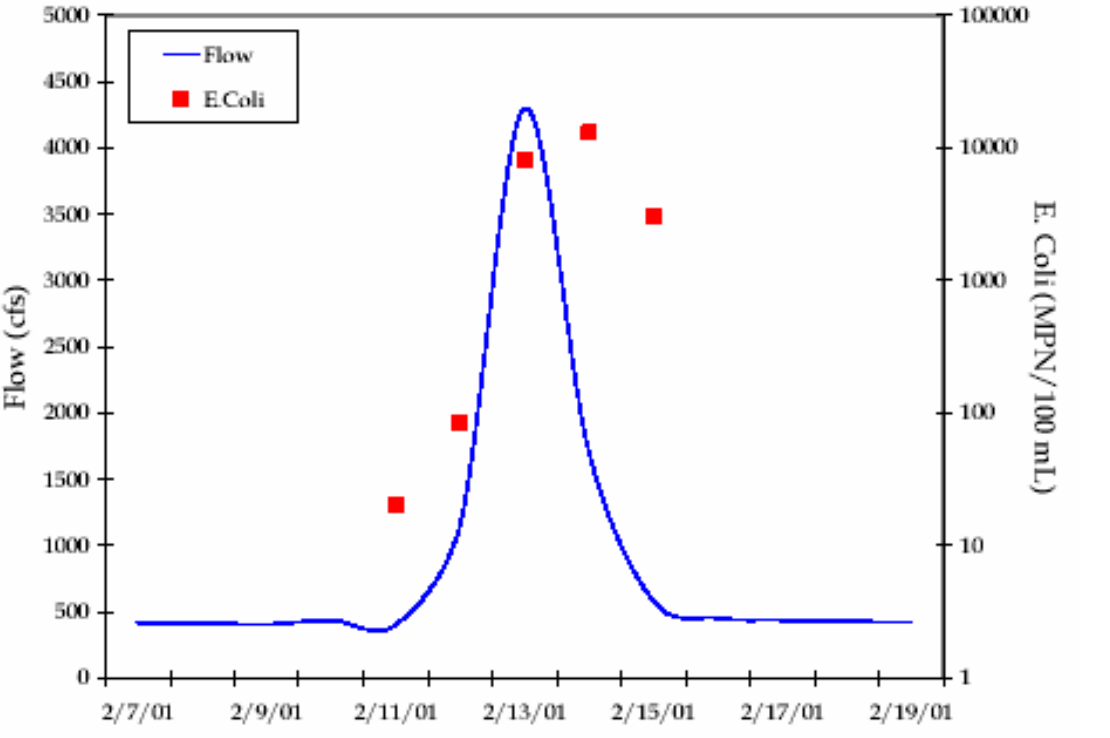



Figure 85
February 2001 Wet Weather E. coli Sampling Event

**Figure B 8: Percent of months exceeding objectives (CDM 2005 Figure 102)**

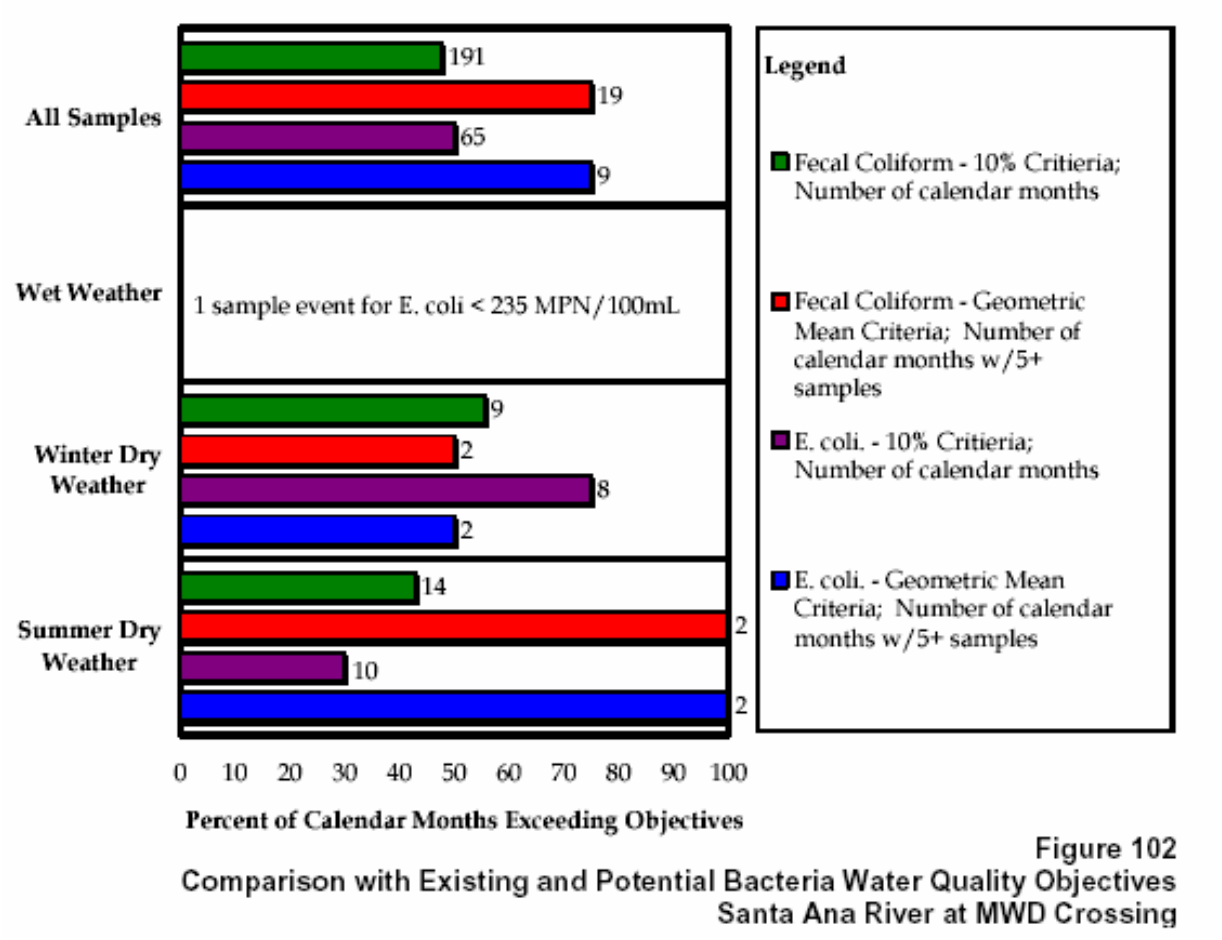



Figure 102
Comparison with Existing and Potential Bacteria Water Quality Objectives
Santa Ana River at MWD Crossing

**Figure B 9: Percent of months exceeding objectives (CDM 2005 Figure 110)**

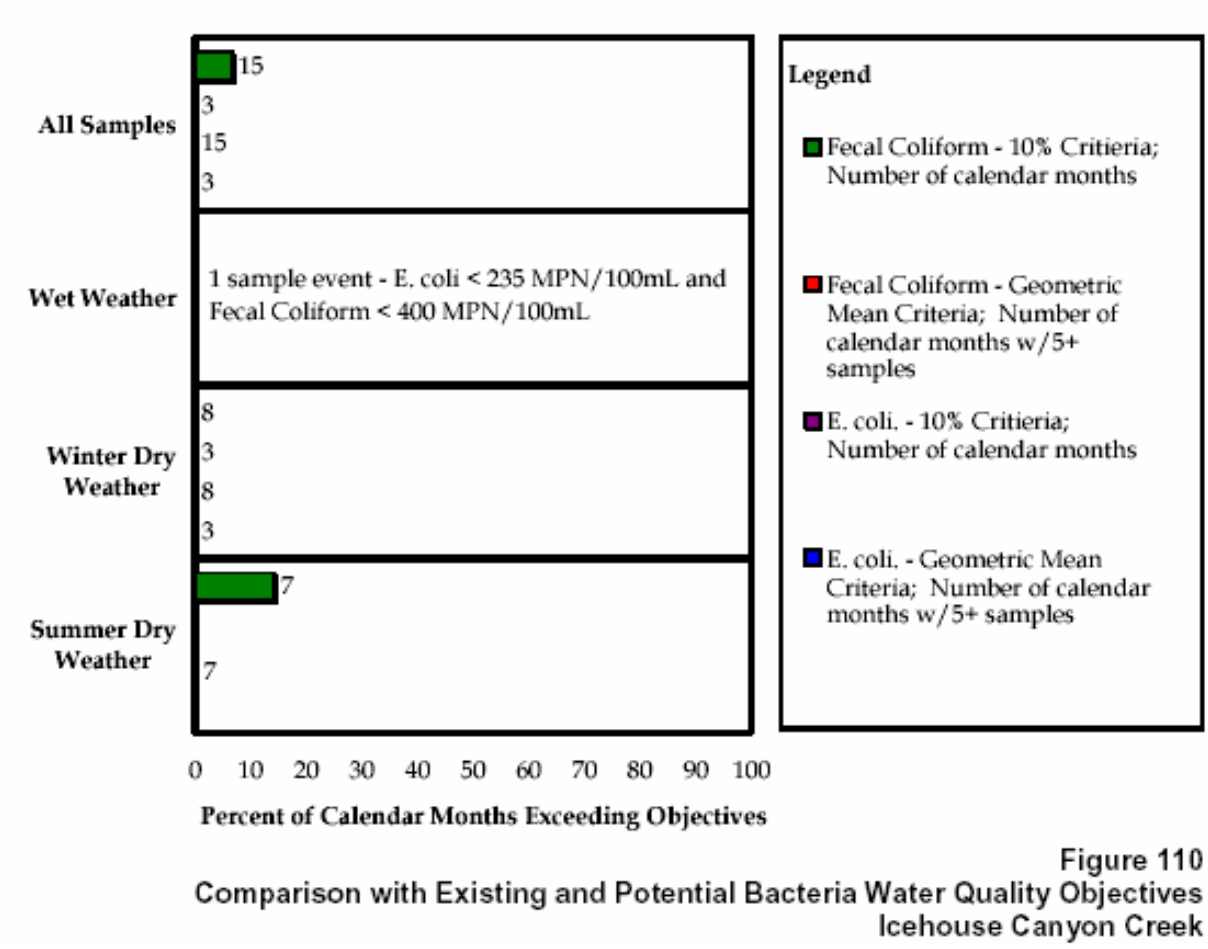



Figure 110
Comparison with Existing and Potential Bacteria Water Quality Objectives
Icehouse Canyon Creek

**Figure B 10: Percent of months exceeding objectives (CDM 2005 Figure 88)**

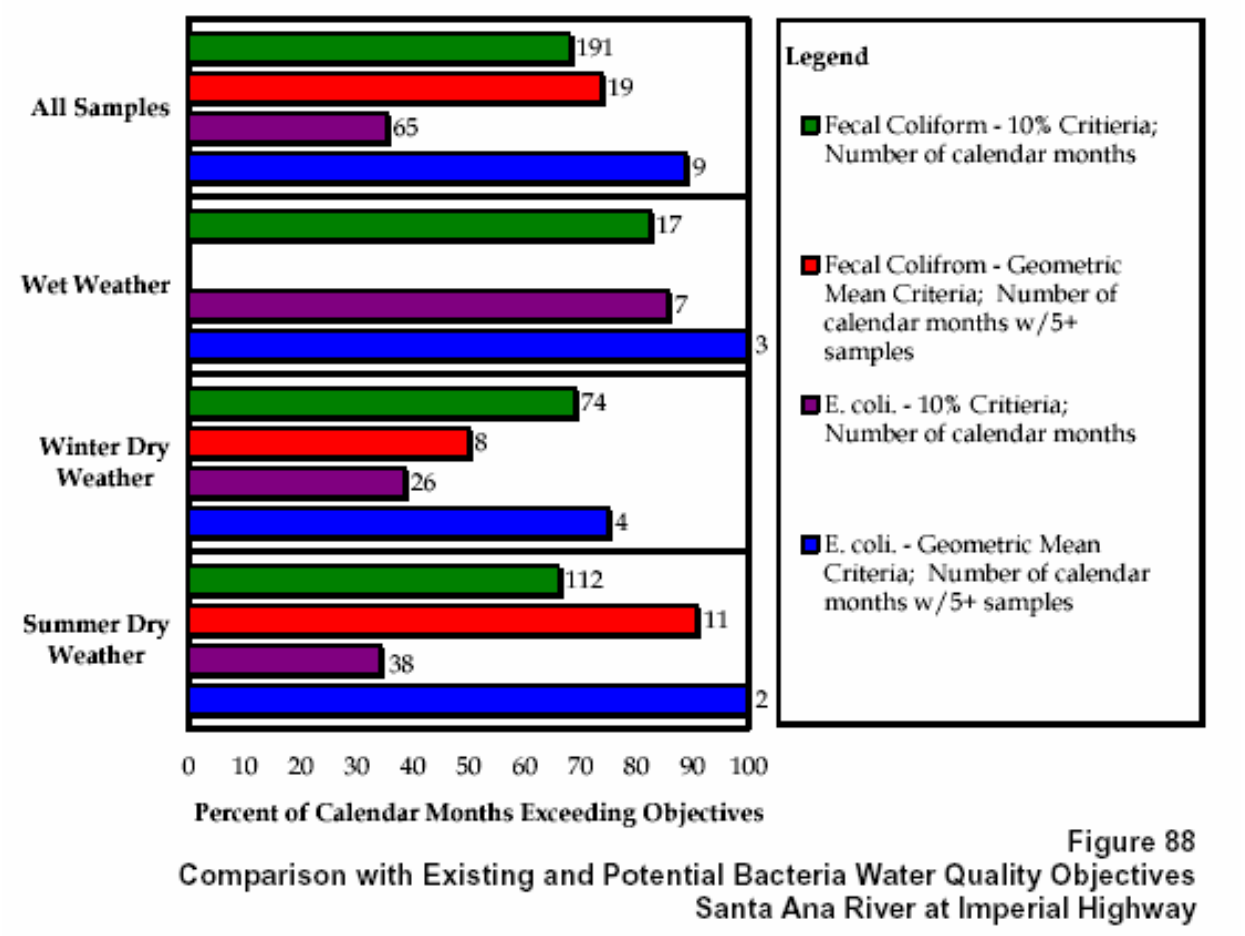



Figure 88
Comparison with Existing and Potential Bacteria Water Quality Objectives
Santa Ana River at Imperial Highway

**Figure B 11: Percent of months exceeding objectives (CDM 2005 Figure 74)**

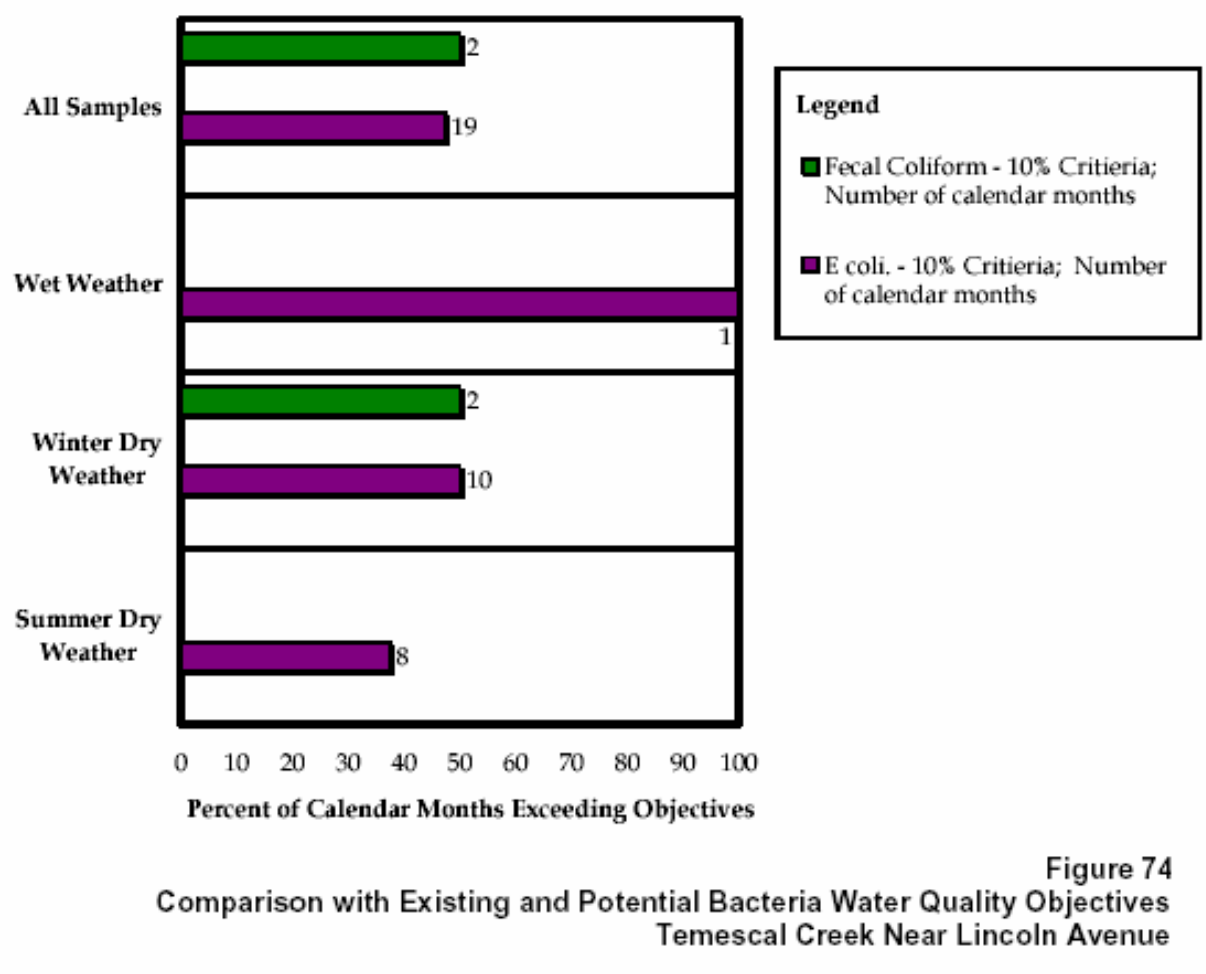



Figure 74
Comparison with Existing and Potential Bacteria Water Quality Objectives
Temescal Creek Near Lincoln Avenue

**Figure B 12: Percent of months exceeding objectives (CDM 2005 Figure 38)**

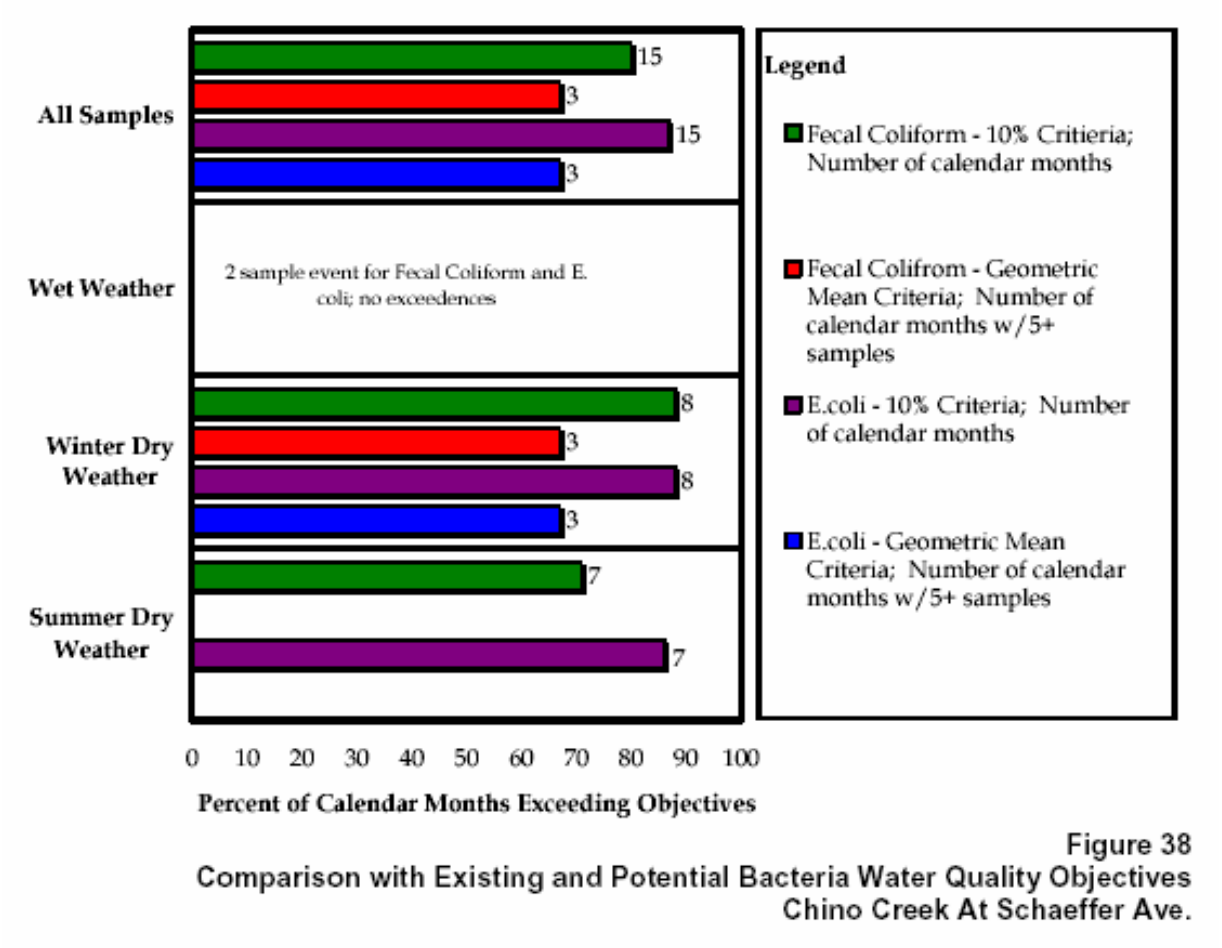



Figure 38
Comparison with Existing and Potential Bacteria Water Quality Objectives
Chino Creek At Schaeffer Ave.

**Figure B 13: Percent of months exceeding objectives (CDM 2005 Figure 57)**

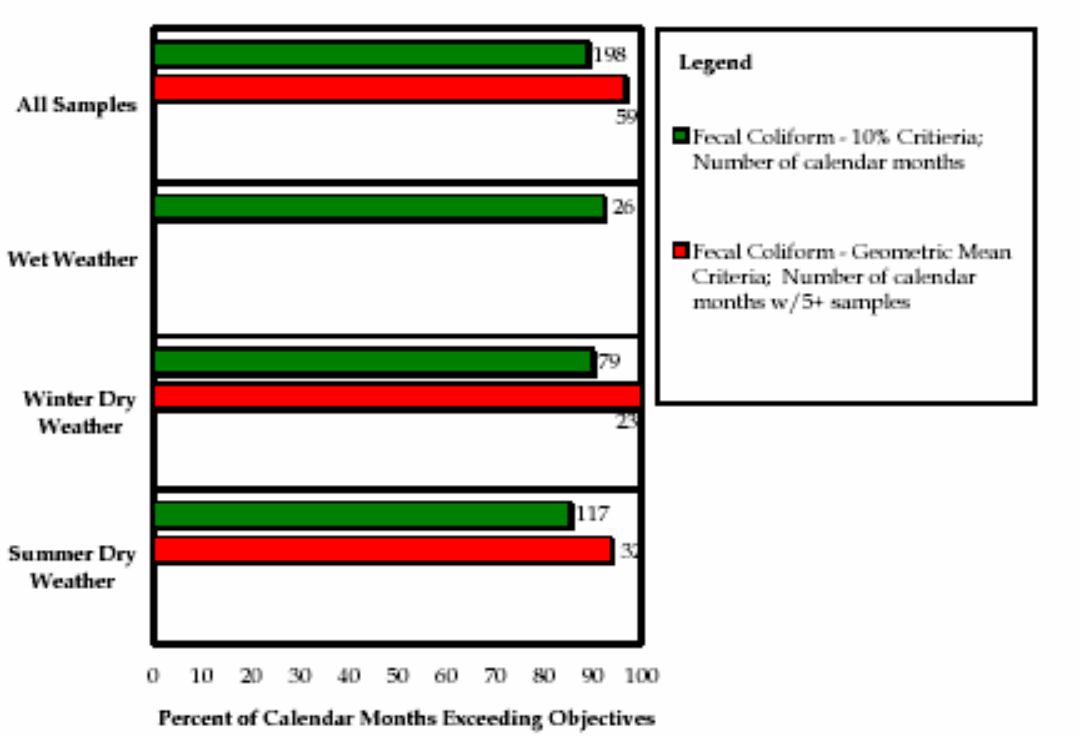



Figure 57
Comparison with Existing and Potential Bacteria Water Quality Objectives
Santa Ana Delhi Channel near Irvine Ave.

# APPENDIX C

# DATA FROM ALISO CREEK

G E O S Y N T E C  C O N S U L T A N T S

838 SW First Avenue, Suite 530
Portland, Oregon 97204

(503) 222-9518
(503) 242-1416 Fax

# MEMORANDUM

TO: SUSAN PAULSEN, FLOW SCIENCE

FROM: BRUCE WILLIAMSON, LISA AUSTIN, GEOSYNTEC CONSULTANTS

SUBJECT: ALISO CREEK BMP EFFECTIVENESS ANALYSIS

DATE: APRIL 13, 2005

CC: PETER MANGARELLA, GEOSYNTEC CONSULTANTS

## Introduction

This purpose of this technical memorandum is to assess the efficacy of Best Management Practices (BMPs) installed in parts of Aliso Creek, Orange County, California (Figure 1) on the removal of pathogen indicators. Pathogen indicator data collected by Orange County Resources and Development Management Department in this watershed and on these BMPs has received increasing attention when project design features are evaluated by regulatory authorities. Therefore, it is important that we have a good understanding of these findings and their uncertainties.

The two BMPs assessed in this memo are:

1. Dry weather flows are passed through multimedia filtration/UV sterilization using a proprietary treatment unit 'Clear Creek Systems'. This treats low flow runoff from a two square mile catchment with mixed urban land use. The storm drain facility and catchment are designated as J01P28 in the watershed map and plans (Figure 1, 2B).

2. Wetland ponds to intercept watershed runoff and treat dry weather flow and first flush. These treat low flow and first flush runoff from a two square mile residential catchment. The storm drain facility and catchment are designated as J03P02 in the watershed map and plans (Figure 1, 2A).

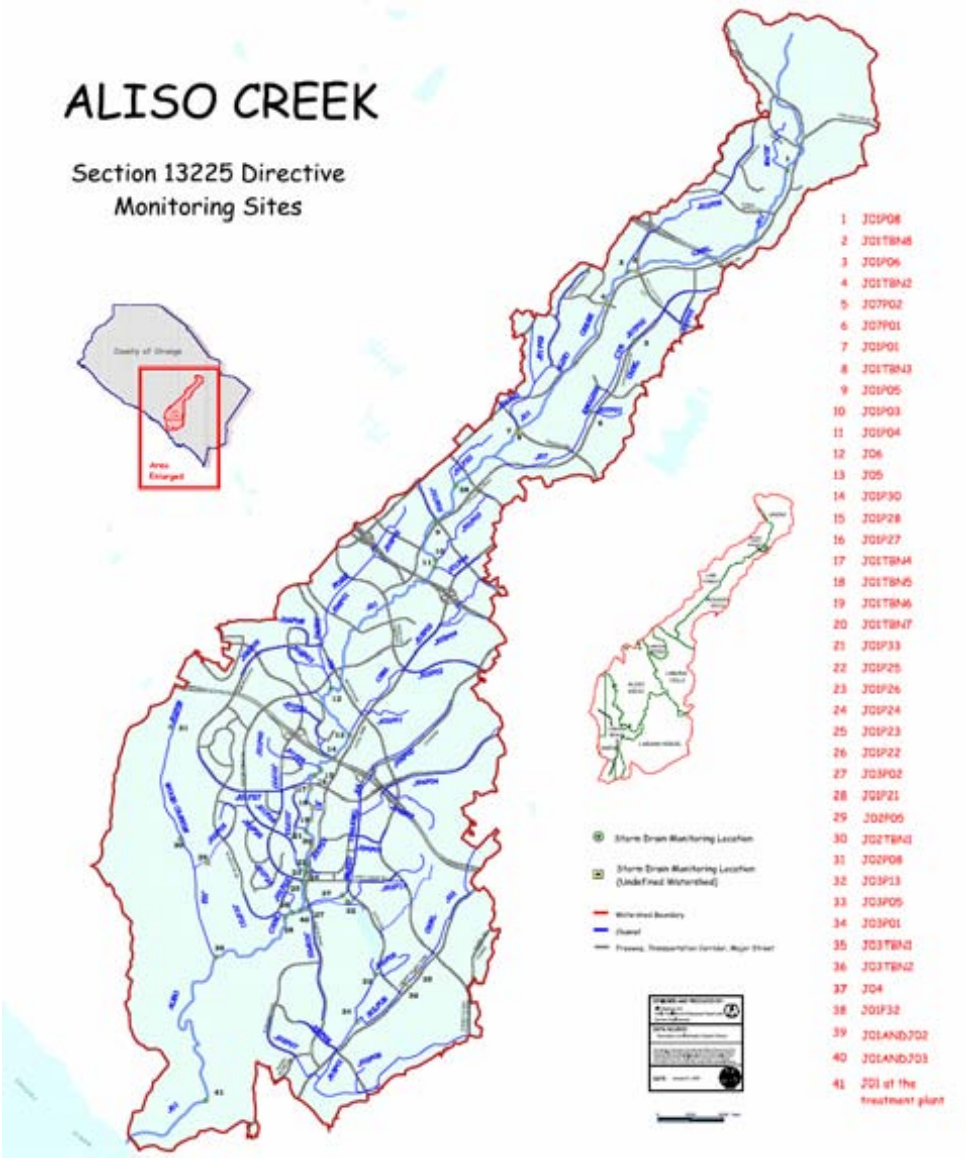
All monitoring of the BMPs and their receiving waters took place during dry weather. Consequently, low flows were mostly sampled, but during the wet season a proportion of these were probably elevated flows during storm recessions.

The data were collected by the County of Orange and its city partners and is available in reports listed at http://www.ocwatersheds.com/watersheds/Aliso_reports_studies.asp, and also in Evaluation Reports by the County of Orange.[1,2]

[1] County of Orange Resources and Development Management Department, Watershed and Coastal Resources Division. 'Aliso Creek Clean Beaches Initiative. Final Report for Agreement 01-227-550-0' submitted to Regional

Note that the Aliso Creek watershed Quarterly Progress Reports (QPR) refer to other BMPs installed in stormwater drains of urban watersheds at a number of locations in the Aliso Creek watershed. These include grassy swales for treating park runoff to Sulfur Creek in Laguna Niguel and a wetland biofilter in another branch of Sulfur Creek in Laguna Hills The status of the these BMPs is unclear, and no monitoring data for these BMPs were located in the QPR.

**Figure 1**




and State Boards in January 2005 and 'Wetland Capture and Treatment Final Report for Agreement No. 01-122-259-0' submitted to Regional and State Boards in March 2004.

[2] "Wetland Capture and Treatment Final Report for Agreement No. 01-122-259-0" submitted to Regional and State Boards in March 2004.

**Figure 2A:** Location of J03P02

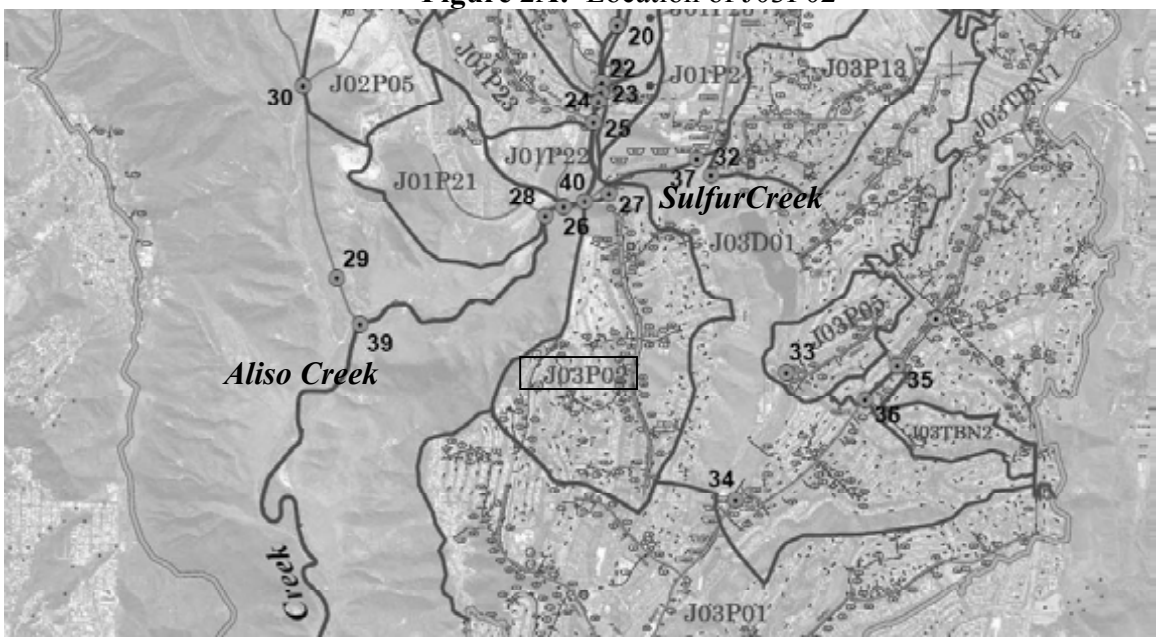
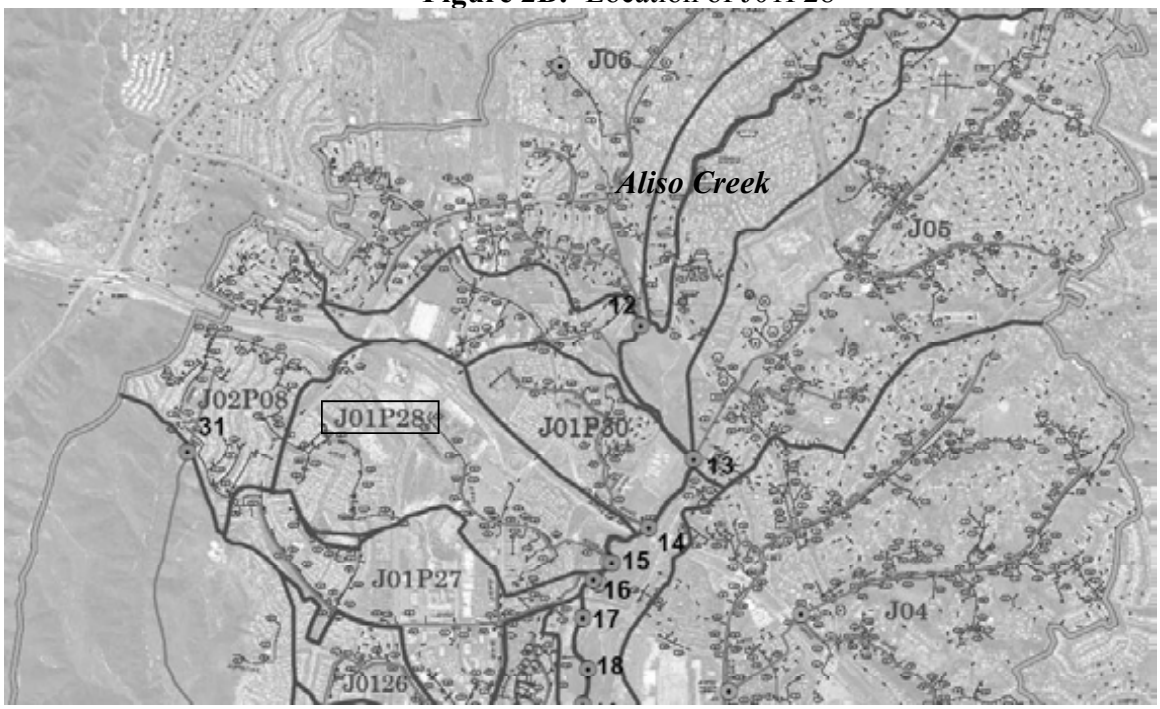



**Figure 2B:** Location of J01P28



# Site Description

### Aliso Creek Watershed

Aliso Creek watershed encompasses 30.4 square miles and includes portions of the cities of Aliso Viejo, Dana Point, Laguna Niguel, Laguna Woods, Laguna Beach, and Lake Forest. Its main tributary, Aliso Creek, originates in the Santa Ana Mountains inside the boundaries of the Cleveland National Forest. Smaller tributaries include Wood Canyon, Sulphur Creek, the Aliso Hills Channel, and English Channel (Figure 1).

Aliso Creek is the subject of a Directive issued by the San Diego Regional Water Quality Control Board (RWQCB) in 2001 for an investigation of urban runoff in the Aliso Creek watershed. The Directive found that the Permittees may be discharging waste with high bacteria levels from municipal storm drain outfalls into Aliso Creek and its tributaries. The Directive required the Permittees to begin a comprehensive monitoring program and undertake investigations within the storm drain system to identify the causes of the problem and the control actions needed to correct the problem. This has resulted in a comprehensive study involving weekly sampling of approximately 35 storm drains and their respective receiving waters, and numerous other initiatives in identifying sources and source control.

Part of the creek (J03P02) is subject to a Cleanup and Abatement Order (CAO) issued by the RWQCB in 1999. This was the result of a survey which showed that pathogen indicators (PI) in the drain were much higher than in Aliso Creek. Experience gained from the more comprehensive monitoring carried out since that time has shown that J03P02 is in the low to middle of the range of PI concentrations compared to the rest of the Aliso Creek watershed.

### Sand Filtration/UV Sterilization

The J01P28 Interim Water Quality Improvement Package Plant BMP was executed in response to the San Diego RWQCB 13225 Directive to clean up Aliso Creek.

This treatment unit is located near the outlet of the J01P28 subcatchment (Figure 2). This subcatchment is a tributary to the main stem of Aliso Creek. The storm drain conveys runoff water from a fully developed area of approximately two square miles in the city of Aliso Viejo. Land uses in the catchment include residential, commercial, light industry, and parks. The BMP was installed in July 2003.

The CCS treatment system includes three multi media filters, two organo clay filters and two ultraviolet light disinfection chambers. The package plant treatment system has three main phases:

- Sediment and debris removal
- Oils, pesticides, and trace metals removal
- Disinfection

The larger debris and trash removal is performed at the inlet strainer that is located in an energy dissipation basin within the storm drain. Sediment removal is performed in the basin and in the multimedia filter. Oils, pesticides and trace metals are removed via adsorption onto the organo-clay media while the ultraviolet light chamber removes bacteria and viruses.

The package plant treatment system filters and disinfects approximately 100,000 gallons per day of urban dry weather runoff. The design capacity is 250,000 gallons per day. By October 2004, a total of 1.4 million gallons had been treated.

Monitoring results from the years 2001 through June 2003 were combined to form the "before" dataset, while results from August 2003 through December 2004 constituted the "after" dataset.

Once discharged from the unit, the water flows through a ponded area approximately 20 feet long, 6 feet wide and 1.5 feet deep, then 30 feet through a natural ditch to Aliso Creek. A monitoring site is located in the natural ditch 15 feet from Aliso Creek.

**Wetlands**

Wetlands have been installed near the outlet of subcatchment J03P28, which is a tributary to Sulfur Creek, itself a tributary to Aliso Creek (Figure 2A). The wetlands are positioned at the bottom of the catchment and designed to capture 100% of the low flows before they discharge to Aliso Creek. The catchment (538 acres) is entirely residential (1600 households, new to 30 years old). A number of structural BMPs have been implemented from 2000 to the present day.

1. From May 2000 to March 2001, dry weather flows were diverted to the AWMA Regional Sewage Treatment Plant.

2. From March 2001 to April 2003 (actually it is not clear when unit stopped operating), dry weather flows in the drain were treated by a mobile Clear Creek Systems filtration/UV treatment unit. The flow was diverted to the treatment plant (e.g., 15% of total flow in the July-September 2002 quarter) when the filter clogged or the UV malfunctioned.

3. The three wetlands were constructed progressively starting in about March 2001 and were completely online from April 2003[2].

J0302 has been subject to detailed studies because of the CAO. These include visual (video) inspection of sewer and storm drain pipes, field reconnaissance, resident surveys, flow monitoring, a wide range of upwatershed sampling and the identification the sources of the pathogenic indicator bacteria. Samples were examined for human enteroviruses, antibiotic resistance, and genotypes of E. coli. The researchers concluded that the primary sources of PI in J03P02 are not likely to be human, and are likely to be due to cows (soil fertilizer amendments), birds, rabbits, and some unidentified other animals. In the Aliso Creek QPRs, the Co-Permittees indicate that the following sources probably contribute to fecal coliform (FC) in J03P02:

- Organic soil amendments
- Turfgrass areas

- Wildlife
- Domestic pets
- Accumulated organic debris in the surface and subsurface storm drain system
- Street sweeping debris

The wetlands – called East, West and North, were positioned to capture 100% of catchment runoff during dry weather and first flush. Design features are summarized in Table 1. The hydrological network is outlined in Figure 3.

Wetland inflow is taken by intercepting flows in the stormwater pipes, including the 60-inch main pipe. After passing through the wetlands, some of the treated stormwater is routed back though the 60-inch pipe to an open channel just before its confluence with Sulfur Creek. Effluent from the West Wetland is discharged directly to this open channel, and does not pass through the pipe. Another untreated, unmonitored inflow also discharges to this point (Figure 2).

**Table 1:** Wetland design features (reference see footnote 2).

| Wetland | Total Catchment Area (acres) | Planned intercepted area (acres) | Wetland Area (acres) | Depth (ft) |
|---|---|---|---|---|
| East | 374 | 37 | 0.3 | 1 |
| West | 342 | 312 | 0.69 | 0.5 |
| North | 122 | 122 | 0.3 | 1 |

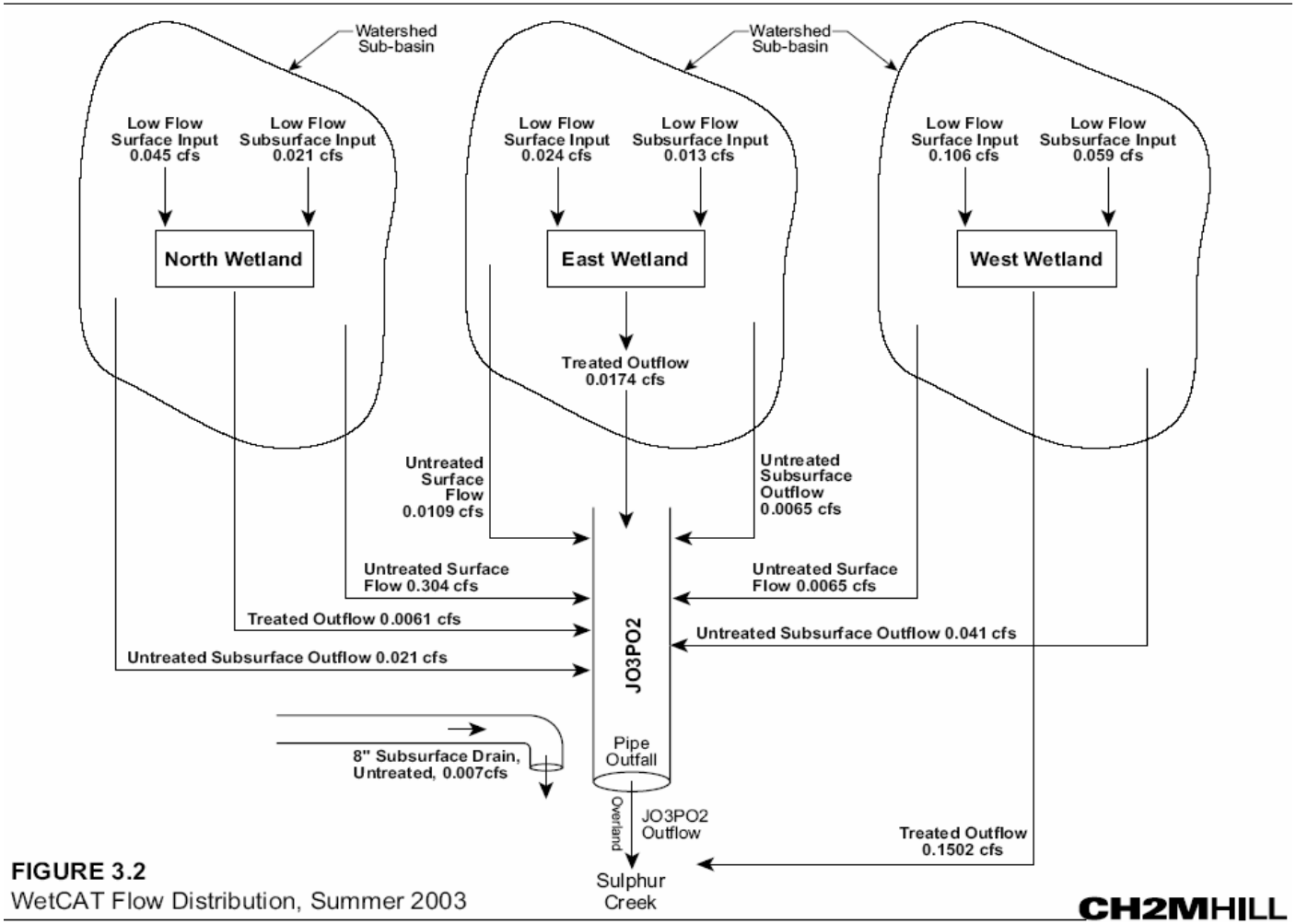
### Sampling Procedures

All sampling was conducted during "dry weather," which is defined as no rain on the day of sampling. Sampling was conducted under strict protocols (see Aliso Creek 8$^{th}$ Quarterly Progress Report). Quality Assurance/Quality Control (QA/QC) sampling procedures were implemented that should have prevented contamination during sampling and significant changes to the sample during transport to the laboratory.

**Directive Monitoring:** Each location has three monitoring sites: two of these are on the main stem, 25 feet upstream and downstream of the storm drain discharge, the other is on the storm drain itself, approximately 15 feet above its confluence with the stream. These three sites were monitored weekly, so that at least five samples were collected each month, at random intervals. Some of these monitoring sites are shown in Figure 1.

**BMP Monitoring:** In addition to the directive sampling program, the influent and effluent to the BMPs were monitored.

**Figure 2.** Source: Wetland Capture and Treatment Final Report (2004)[2]. Note: untreated Surface Flow from North Wetland should probably be 0.0304 cfs.



# Summary of Monitoring Results

## *J01P28 - Multimedia Filtration/UV Digestion*

**Influent/effluent.** Comparison of the influent and effluent concentrations demonstrates a 99.6% reduction in fecal coliform levels. The geometric mean decreases from 77,414 CFU/100mL to 317 CFU/100mL.

**Stream and drain monitoring.** A statistical analysis of the levels in the receiving water (the "directive" dataset) is summarized in Table 2 and as box plots in Figure 3-4. These refer to all data collected before BMP installation. The County monitoring reports summarize data for quarterly monitoring periods. In the QPR, quarterly monitoring data are compared between years to reduce variance from seasonality, and constitute a more powerful assessment of the data. However, for our purposes here, the lumped data is sufficient to demonstrate their findings.

**Table 2:** Comparison of geometric means (cfu/100 ml) before and after multimedia filtration/UV sterilization. The BMP is installed about 35 feet upstream of the storm drain monitoring site.

| **Locations** | **TC** | | **FC** | | **ENT** | |
|---|---|---|---|---|---|---|
| | before | after | before | after | before | after |
| u/s | 5353 | 2851 | 775 | 773 | 990 | 662 |
| storm drain | 52267 | 15232* | 14633 | 5827* | 9171 | 1401* |
| d/s | 17248 | 5142* | 2722 | 1696* | 1791 | 839* |

* = significant change (1-way ANOVA, $\alpha<0.05$)

**Regrowth.** Comparison of effluent and the 'directive' storm drain monitoring site, show a large increase in FC levels in the approximately 35 feet between the unit discharge and the storm drain monitoring site. No other discharges were found, which suggest that rapid re-growth has taken place in the water column, or re-infection has occurred from sloughing or resuspension of bacteria from immersed channel-side vegetation, organic debris and/or sediments. The geometric mean increases in this short distance from 317 cfu/100mL to 2,575 cfu/100mL.

Further work is planned by the County on the re-growth issue. Permits have been requested to perform clean up work on the habitat and the storm drain outlet basin.

**Figure 3:** FC levels for J01P28 monitoring site.

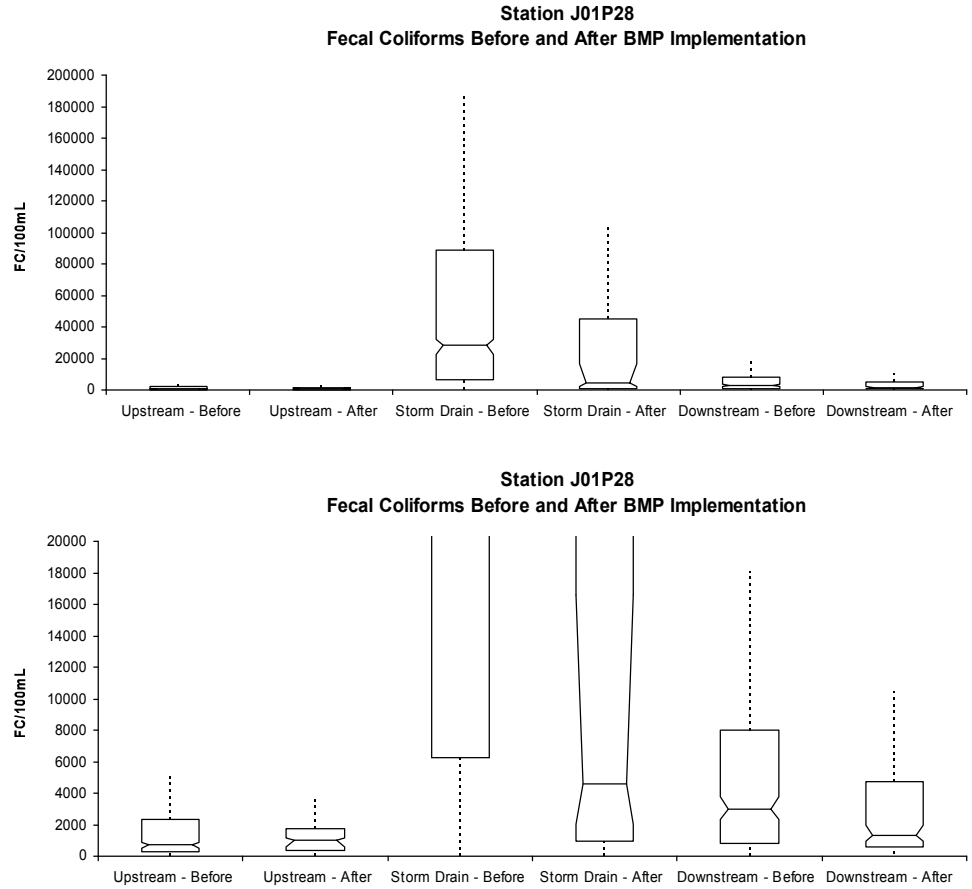



**Figure 4:** ENT levels for J01P28 monitoring site.

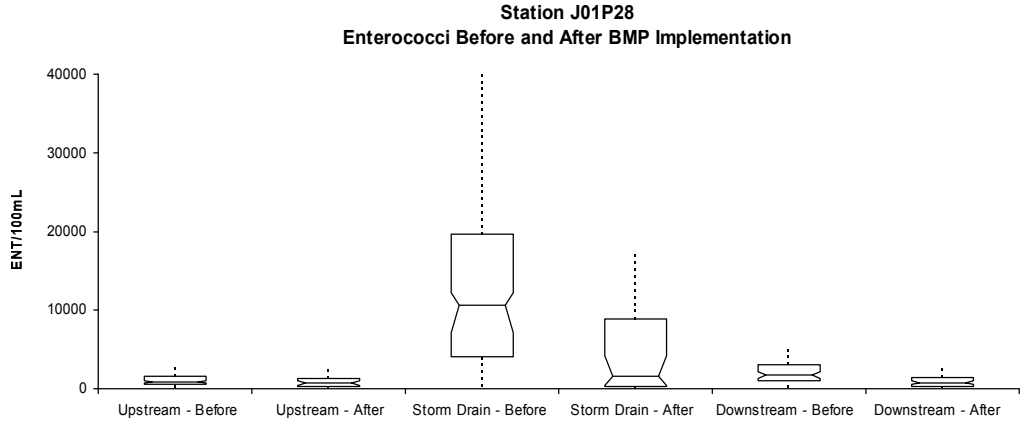
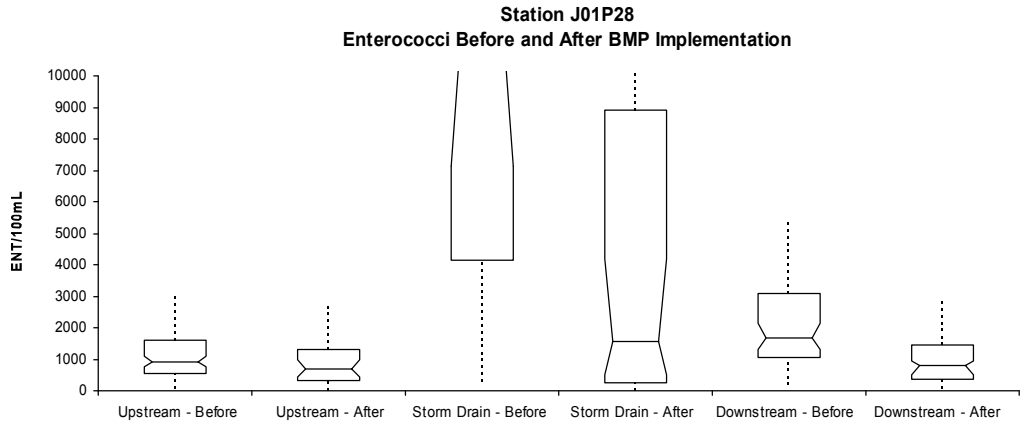


Figure 4 (continued)




## *J03P02 – Wetland BMPs*

**Influent/effluent.** All monitoring took place during dry weather. Flows were measured, but only once per month and not for each sampling occasion. Most sampling took place at lows flows. The flow was typically 0.25 cfs with a range of 0.13-0.56 cfs.

Wetland monitoring in the three wetlands showed 90 to 99 percent reduction in FC levels from 2001 to present day (e.g. see Table 3). (Note that the three wetlands were installed and monitored progressively – results from 2001 were from one wetland only). Overall, 90 percent of treated effluent samples met the REC-1 objectives for FC. Although enterococci (ENT) levels dropped by 60 to 99 percent in wetlands, wetland effluent did not meet the steady state objective of 33 cfu/100ml during the period of monitoring (2001-2004). Few individual wetland samples met the single-sample objective.

**Table 3:** East Wetland fecal coliform (cfu/100mL) removal March 2001 – August 2002.

| Parameter | Inflow | Outflow | Removal |
|---|---|---|---|
| Median | 5000 | 50 | 99% |
| Mean | 14900 | 150 | 99% |
| Geometric mean | 2,800 | 35 | 99% |

Overall there has been a progressive decline in FC and ENT since the wetlands have progressively come on line.

As well as the wetland monitoring, the effluent from the mobile UV sterilization unit was monitored when it was installed (between March 2001 to April 2003). The influent was not monitored directly. A cursory scan of the results suggests that the treatment unit effluent quality met REC-1 requirements on most months, but failed at times, which was attributed to the sand filter clogging.

**Stream and drain monitoring.** No "before BMP implementation" could be found because the 'directive' monitoring period encompassed either diversion to the sewage treatment plant, UV sterilization and/or wetland treatment. (However, some data is available somewhere, because it led to the CAO).

The dry weather discharge from the storm drain had little or no effect on the FC levels in Sulfur Creek. The flow from J03P02 is about 10 percent of the flow in Sulfur Creek.

The bacterial quality of the J03P02 storm drain discharge has steadily improved over the monitoring period. However, the improvement is quite complex, as described in the following section.

**Re-growth.** There is evidence that re-growth occurs between the wetlands and the storm drain monitoring sites. The concentrations in the open channel at the end of the pipe are about twice what is expected based on mass flow considerations.

However, there are some ambiguities in the various Quarterly Reports about the nature of the connection between the catchments, wetlands, and the J03P02 monitoring site[3]. This has been resolved in the detailed report on the BMP project for J03P02[2]. Measurements show that a high proportion of the flow is not intercepted (about 37 percent). Figure 2 also shows that the largest wetland ('West') bypasses and discharges downstream from the pipe.

Therefore, the apparent re-growth phenomenon could be wholly or partly due to the "recontamination" by the un-intercepted flows from the catchment. The project investigated this by carrying out a mass balance calculation. Unfortunately the report does not give any details on the calculations, but states that concentrations at the end of the pipe after discharge are about twice what is expected based on these mass flow considerations.

GeoSyntec confirmed that there was about this order of magnitude difference between observed and calculated mass flows using flows given in Figure 2 and using appropriate median FC numbers for the summer 2003 monitoring period. However, the proposition of re-growth, while plausible, is uncertain because:

- There is a significant input of untreated surface and subsurface flows into and at the end of the J03P02 pipe
- Most flows were estimated and not measured
- Many of the FC and ENT concentrations used in the mass flow calculations were not measured and assumed values were taken from the monthly monitoring data.
- There is a high degree of variability in monitored FC and ENT

The rates of this apparent re-growth appear to be seasonal and variable. As described above, usually observed levels at the J03P02 monitoring site are higher than the combined flows from the wetland. Fecal coliform and enterococci increase by about 100 percent in-pipe during spring, summer, and fall. However, this apparent re-growth does not occur during winter months and

[3] Most comments imply a 200 foot pipe, but 14th QPR refer to pipe outlet and 200 feet overland distance.

sometimes die-off can be observed. For example, the winter FC levels in 2004 were 1/8$^{th}$ of those predicted from the combined treated and untreated contributions, while ENT levels are about the same as predicted levels. The report suggests that die-off and re-growth (or re-contamination) of ENT and FC may be temperature and salinity dependent.

The overall findings of the BMP study to this particular watershed is that as the BMPs came on line, there was a steady improvement in the quality of the J03P02 discharge to Sulfur Creek during some seasons[4]. Results from monitoring the drain downstream of the BMPs show:

- Spring (Apr-Jun) geomeans for FC fell from 2001-2003. The 2004 geomean was similar to that for 2003.
- Summer (Jul-Sep) geomeans for FC have not fallen with statistical significance
- Winter (Jan-Mar) geomeans for FC fell from 2002 – 2004.

## Discussion and Conclusions

Filtration coupled with UV sterilization reduced indicator bacteria to below the REC-1 standard. This was demonstrated at both sites. However, the benefits are compromised by what appears to be re-growth. At J01P28, the re-growth/re-inoculation occurred in a natural steam reach consisting of a pool and run, which was shaded with riparian vegetation dangling in the stream. It occurred within only 35 feet of the discharge point from the treatment unit.

Wetlands reduced fecal coliform (FC) levels by 90 to 99 percent to below the REC-1 guideline for 90 percent of the samples. They also reduced enterococci (ENT) levels by 60 to 99 percent, but the effluent from the three wetlands always exceeded the steady-state ENT objective, and usually exceeded the single sample objective. As with J01P28, the benefits of wetland treatment were compromised by the low-flow capture rate and what appears to be re-growth or re-contamination after discharge from the BMPs. Concentrations of FC and ENT increase between the wetland effluent and the J03P02 monitoring site 15 feet from its confluence with Sulfur Creek. The summary report proposed that most of the re-growth/re-inoculation occurred within a 200-foot pipe carrying wetland effluent to the confluence with Sulfur Creek.[2]

The study report proposed that re-growth was plausible because there was opportunity and time for re-growth to occur. The combined effluent from the East and North wetland is conveyed to Sulfur Creek through the pipe, which has a transit time during low flow of 15 minutes. As stated in the Wetland Capture and Treatment Final Report 2004[2] "Given ….. the microbiologists 'rule of thumb' that bacterial populations can double every 15 minutes under ideal conditions, rapid in-pipe propagation of FC and ENT in the dark pipe may be the main factor, or may be combined with recontamination from bioslimes or muck deposits" (Clean-Up & Abatement Order 99-211 17$^{th}$ QPR). Another possible reason is that the structures which divert low flow from the stormwater pipes to the wetland also trap and retain organic debris, which may act as substrates

[4] This is somewhat surprising given that the drain water was treated by multimedia filtration/UV disinfection or diverted to the sewer system while the wetlands were constructed.

for re-growth. However, re-contamination by unmonitored inflows may also be partly or wholly responsible for the observed increase between the BMPs and the confluence.

The results suggest that the benefits of BMPs may be compromised by re-growth, which occurred in both the natural channel and pipe downstream of the monitored BMPs. The various investigators have concluded that treatment systems would need to be positioned at the bottom of the watershed directly before discharge to the receiving water body – mainly to prevent regrowth during warm weather conditions.[1] Another important general conclusion in the study (see City of Laguna 6th QPR Aliso Creek 13225 Directive) states 'that "primary" bacteria concentrations (from direct deposits of bird droppings, for example) in runoff can be magnified by the "secondary" propagation of bacteria populations within the environment, so that *controlling propagation* may ultimately become as important as *source reduction* in reducing overall outfall concentrations. The research results also suggest that the presumption of a statistically valid relationship between certain concentrations of fecal coliform and an acceptable vs. unacceptable magnitude of public health risk (which is the basis for the REC-1 and REC-2 objectives) may be seriously flawed.'

The proposition that re-growth occurs after treatment has wide ranging implications for stormwater management. Given the uncertainties outlined above as to whether re-growth occurs after wetland treatment, the County study results should be confirmed by more detailed studies and sampling, such as:

- more frequent sampling of concentrations taking into account time of travel
- stormwater runoff monitoring (not just dry weather flows)
- measurement of flows where possible.

It is unknown whether the re-growth phenomenon apparent at the Aliso Creek sites would result in much higher concentrations over longer distances, but such an experiment cannot be conducted at the County-selected sites.

Finally, it is re-emphasized that monitoring was only conducted during dry weather conditions – mostly low flow and do not reflect storm runoff conditions, except for possibly occasionally during the storm regression phase. The impact of storm runoff on the treatment efficacy of the BMPs tested at Aliso Creek is unknown. Likewise, it is unknown what impact high flow may be on the mechanisms that lead to re-growth or re-inoculation; such flows may deliver organic debris and sediments and also slough off slimes and accumulations of organic detritus.

# APPENDIX E

# EFFECT OF URBANIZATION ON GROUNDWATER RECHARGE IN THE SANTA CLARITA VALLEY

# Effect of Urbanization on Aquifer Recharge in the Santa Clarita Valley

TO: Tom Worthington/Impact Sciences, Inc.

FROM: John Porcello/CH2M HILL

DATE: February 22, 2004

## Introduction

In a groundwater basin, the effect of urbanization on recharge to underlying groundwater is dependent on land uses, water uses, vegetative cover, and geologic conditions. Groundwater recharge from undeveloped lands occurs from precipitation alone, whereas areas that are developed for agricultural or urban land uses receive both precipitation and irrigation of vegetative cover. In an urban area, groundwater recharge occurs directly beneath irrigated lands and in drainages whose bottoms are not paved or cemented. This memorandum discusses the general effects of urbanization on groundwater recharge and the specific effects in the Santa Clarita Valley.

## Summary of Findings

In the Santa Clarita Valley, stormwater runoff finds its way to the Santa Clara River and its tributaries, whose channels are predominantly natural and consist of vegetation and coarse-grained sediments (rather than concrete). The stormwater that flows across paved lands in the Santa Clarita Valley is routed to stormwater detention basins and to the river channels, where the porous nature of the sands and gravels forming the streambeds allow for significant infiltration to occur to the underlying groundwater.

Increased urbanization in the Valley has resulted in the irrigation of previously undeveloped lands. The effect of irrigation is to maintain higher soil moisture levels during the summer than would exist if no irrigation were occurring. Consequently, a greater percentage of the fall/winter precipitation recharges groundwater beneath irrigated land parcels than beneath undeveloped land parcels. In addition, urbanization in the Santa Clarita Valley has occurred in part because of the importation of State Water Project (SWP) water, which began in 1980. SWP water use has increased steadily, reaching nearly 44,500 acre-feet (AF) in 2003. Two-thirds of this water is used outdoors, and a portion of this water eventually infiltrates to groundwater. The other one-third is used indoors and is subsequently routed to local water reclamation plants (WRPs) and then to the Santa Clara River (after treatment). A portion of this water flows downstream out of the basin, and a portion infiltrates to groundwater.

Records show that groundwater levels and the amount of groundwater in storage were similar in both the late 1990s and the early 1980s, despite a significant increase in the

urbanized area during these two decades. This long-term stability of groundwater levels is attributed in part to the significant volume of natural recharge that occurs in the streambeds, which do not contain paved, urban land areas. On a long-term historical basis, groundwater pumping volumes have not increased due to urbanization, compared with pumping volumes during the 1950s and 1960s when water was used primarily for agriculture. Also, the importation of SWP water is another process that contributes to recharge in the Valley. In summary, urbanization has been accompanied by long-term stability in pumping and groundwater levels, plus the addition of imported SWP water to the Valley, which together have not reduced recharge to groundwater, nor depleted the amount of groundwater that is in storage within the Valley.

## Effect of Pavement on Recharge Beneath Specific Land Parcels

The amount of paved cover on the ground affects the degree to which rainfall and outdoor-applied urban water will be able to infiltrate to groundwater. In heavily industrialized areas with high percentages of paved cover, such as exist in portions of the Los Angeles Basin, less rainfall recharge will occur than if the land is in an undeveloped condition. Furthermore, if the bottoms of rivers and other drainages are paved, then the majority of stormwater generated during a rainfall event will be unable to infiltrate to groundwater. In contrast, the amount of recharge to groundwater will be greater in urbanized areas, such as the Santa Clarita Valley, that have natural soils in the bottoms of rivers and local drainages or that have lower percentages of paved cover on the developed areas lying outside the principal drainages. In these areas, the outdoor use of water for irrigation landscape vegetation or agricultural lands can notably increase the amount of groundwater recharge, particularly if the outdoor water is imported from outside the local groundwater basin. This is discussed further below.

## Effect of Vegetative Cover and Water Use

From the 1930s through the 1960s, H.F. Blaney and other researchers at the U.S. Department of Agriculture performed numerous studies to measure the amount of infiltration to groundwater that occurs beneath undeveloped lands and irrigated farmlands, and the differences in recharge rates for different types of native vegetation and crops. In California, these studies included a 1933 study by Blaney in Ventura County, a 1963 study by Blaney and others in the Lompoc Uplands, studies by the U.S. Geological Survey and various consultants in the Montecito and Carpenteria groundwater basins, and a groundwater basin study by Santa Barbara County[1] that incorporated the results of these earlier studies.

Together, these studies concluded that deep percolation to groundwater from undeveloped lands occurs only during years of average or above-average precipitation. This occurs because:

1. Southern California's rainfall is highly seasonal in nature, whereupon most rainfall occurs during the relatively cool period November through March, when plant water

[1] See Santa Barbara County Water Agency, December 15, 1977. *Report on Adequacy of the Groundwater Basins of Santa Barbara County.*

requirements are low, and little, if any, rainfall occurs during the remaining (and warmer months) when plant water requirements increase.

2. During the summer, when little or no rainfall occurs, the native vegetation extracts the residual moisture that is present in the soil, which substantially decreases the soil moisture within the root zone of the vegetation. At the end of the dry season, soil moisture levels on undeveloped lands are below the soil's field capacity, which is the amount of moisture that must be present in the soil before free drainage of water can occur below the rooting zone of the native vegetation.

3. When the seasonal rains arrive, the incident rainfall that is not consumed by plants and does not become stormwater runoff must first raise the soil moisture level to the soil's field capacity before any groundwater recharge will occur. The various studies indicate that about 17 inches/year of rainfall is necessary to raise the soil moisture to the field capacity on an undeveloped parcel of land. This is similar to the average annual rainfall in the Santa Clarita Valley and in other lowland coastal and near-coastal valleys in southern California.

On irrigated lands, irrigation occurs during several months of the year, with the exact duration depending on the amount and timing of rainfall and also the crops or type of urban landscaping being irrigated. The principal effect of converting undeveloped land to land that receives agricultural or urban irrigation is to increase the amount of water that is applied to the land during the low-rainfall months. This application of water to the vegetative cover on the surface of the developed land parcel results in the maintenance of higher soil moisture levels during the warm, dry months than would occur without development. This has three effects:

1. Because irrigation will generally be performed in a manner that maintains the health of the vegetative cover, enough water will be applied to maintain the soil moisture at, or close to, the field capacity of the soil. This in turn will allow some deep percolation to occur from the irrigation water itself.

2. When the rainy season begins, because irrigation has maintained soil moisture at or near field capacity, less of the initial rainfall entering the root zone needs to be stored in the soil (to meet soil moisture deficits) beneath an irrigated parcel than in the case of an undeveloped parcel. Therefore, a greater percentage of the initial rainfall and annual rainfall will be able to infiltrate to groundwater. The southern California studies estimated that irrigated land parcels would allow rainfall infiltration to occur in years when annual rainfall is at least 10.5 inches/year. This threshold rainfall value is 6.5 inches less than the threshold rainfall value that the studies estimated to be necessary for generating groundwater recharge beneath undeveloped land parcels.

3. Because the majority of irrigation occurs during the dry (low-rainfall) months, the total annual recharge to groundwater from irrigated developed lands is the sum of: (a) the deep percolation arising from irrigation (during the low-rainfall months); and (b) rainfall (during the months when less irrigation is occurring). Therefore, groundwater recharge beneath developed lands is greater and occurs for a longer period of time each year than in the case of undeveloped lands where no irrigation is occurring.

# Historical Observations of Groundwater Conditions in the Santa Clarita Valley

The findings of the studies described above for other groundwater basins in southern California are consistent with observations that have been made in the Santa Clarita Valley, which are based on long-term water level records, water budget analyses, and groundwater modeling. Based on a month-by-month calibration to a 20-year record of historical water level records (throughout the Valley) and stream gaging records (at the Los Angeles – Ventura County line), the model simulates 10 percent of the applied outdoor water as being available for recharge to groundwater in retail and residential areas, with greater percentages infiltrating beneath golf courses and agricultural lands. This is consistent with a 1980 study by DWR of the groundwater resources of the Santee and El Monte hydrologic subareas of San Diego County. In that study, which was performed to evaluate reclaimed water use plans, DWR concluded that approximately 20 percent of the applied outdoor water in municipal areas infiltrates to the water table, with the remaining 80 percent going to evapotranspiration and direct evaporation. DWR also concluded that there would likely be no significant change in these percentages as urbanization continues.[2]

In the Santa Clarita Valley, as in any urbanized area, urbanization increases the paved area and can increase the magnitude and intensity of stormwater runoff from paved land areas. In the Santa Clarita Valley, this stormwater runoff will find its way to the Santa Clara River and its tributaries, whose channels are predominantly natural and consist of vegetation and coarse-grained sediments (rather than concrete). The stormwater that flows across paved lands in the Santa Clarita Valley is routed to stormwater detention basins and to the river channels, where the porous nature of the sands and gravels forming the streambeds allow for significant infiltration to occur to the underlying groundwater. Consequently, for a developed land parcel, the water that runs off of the paved portion of the land parcel will infiltrate to groundwater from a detention basin or a riverbed, rather than infiltrating onsite.

Riverbed infiltration is a significant percentage of total recharge in the Santa Clarita Valley in any given year. Streamflow records and the model calibration process together demonstrate that year-to-year fluctuations in total recharge in the Valley arise not just from year-to-year variations in incident rainfall within the Valley, but also from year-to-year variations in streamflows in the Santa Clara River and its tributaries. Because the areas contributing flow to the rivers are located both within and outside of the Valley, the recharge that occurs from riverbeds is a significant source of groundwater recharge within the Valley.

Evidence that stormwater infiltration to groundwater is not significantly decreased by urbanization comes from long-term water level records at wells completed in the Alluvial aquifer. These records show that groundwater levels and the amount of groundwater in storage were similar in both the late 1990s and the early 1980s, despite a significant increase in the urbanized area during these two decades. This long-term stability is attributed in part to the significant volume of natural recharge that occurs in the streambeds, which do not contain paved, urban land areas. Also, groundwater pumping volumes have not increased

[2] See State of California, Department of Water Resources, Southern District. August 1984. *San Diego County Cooperative Ground Water Studies: Reclaimed Water Use. Phase II.* Pages 40-41.

due to urbanization, compared with pumping volumes during the 1950s and 1960s when water was used primarily for agriculture. Additionally, beginning in 1980, water was imported into the Santa Clarita Valley from the State Water Project (SWP) for urban use, with SWP water use reaching nearly 30,000 acre-feet per year (AF/yr) by the end of the 1990s, and progressively increasing from about 32,500 AF in 2000 to nearly 44,500 AF in 2003. Because two-thirds of the total urban water demand is used outdoors, a substantial portion of the imported SWP water has been and continues to be applied to urban landscaping, thereby increasing the amount of recharge to groundwater. The remaining urban water is used indoors, and is subsequently routed to local water reclamation plants (WRPs) and then to the Santa Clara River (after treatment). A portion of this water flows downstream out of the basin, and a portion infiltrates to groundwater.

In summary, urbanization has been accompanied by long-term stability in pumping and groundwater levels, plus the addition of imported SWP water to the Valley, which together have not reduced recharge to groundwater, nor depleted the amount of groundwater that is in storage within the Valley.

# APPENDIX F

# ASSESSMENT OF POTENTIAL IMPACTS RESULTING FROM CUMULATIVE HYDROMODIFICATION EFFECTS, SELECTED REACHES OF THE SANTA CLARA RIVER, LOS ANGELES COUNTY, CALIFORNIA

# Assessment of potential impacts resulting from cumulative hydromodification effects, selected reaches of the Santa Clara River, Los Angeles County, California

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**Assessment of potential impacts resulting from cumulative hydromodification effects, selected reaches of the Santa Clara River, Los Angeles County, California**

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## APPENDICES

Appendix A. List of aerial photographs analyzed

# 1. INTRODUCTION

## 1.1 Background and purpose

The Newhall Ranch Specific Plan projects will urbanize a portion of the Santa Clarita Valley in Los Angeles County during the coming decades. The project is an extension of prior community growth, which commenced in earnest during the 1960s, in accordance with the adopted General Plan and adopted growth projections. Concern has been expressed that future urbanization may result in changes in the Santa Clara River, a stream of regional scale draining westward from northern Los Angeles County through Ventura County, flowing into the Pacific Ocean near Oxnard. Prior analysis by Geosyntec Consultants (2005) indicates that cumulative future urbanization in the upper watershed of the Santa Clara River, of which Newhall ranch will contribute a portion, will reach approximately 9 percent at "built-out" conditions. A survey of the literature (reviewed in GeoSyntec, 2002) shows that many western-state streams begin to exhibit effects when impervious areas exceed a threshold of about 10 percent, with some considerable site-by-site variability. Additional studies by GeoSyntec in the San Francisco Bay area (2004) and a recent Southern California regional study (Coleman and others, 2005) indicate that, for watersheds smaller than about 25 square miles, channels in granular, non-cohesive sediments may become unstable downstream from urbanizing areas when impervious coverage reaches as little as 2 to 3 percent.

This report uses an empirical approach to assess the potential effects of urbanization on channel morphology associated with the implementation of the Newhall Ranch Specific Plan, combined with other existing and future development in the upper watershed of the Santa Clara River as described in the adopted General Plan. We use historical changes in the Santa Clara River channel pattern to help bracket potential morphological effects on the river of hydromodification due to accumulated urban development. We note that historical changes (both natural and human-induced) in the three factors most likely to affect the Santa Clara River stability (magnitude and frequency of stormflow events, sediment supply and caliber, and channel vegetation) are very large relative to the effects, if any, of the Newhall Ranch project and other planned future urban development. We hypothesize that it will prove useful to learn from history, and to assess the nature and general degree of change that may result from future urbanization by applying these insights.

Much of what is learned from this analysis may be applicable in other aspects of planning and managing the Santa Clara River in the Newhall Ranch reach and reaches downstream. It is not, however, an immediate objective of this report to develop management plans, to assess

potential changes in tributary channels, or to explore how habitat conditions might be changed by potential hydromodification, beyond that which is related to the physical channel form and dynamics.

## 1.2 Technical approach

The history of the Santa Clara River in the Santa Clarita Valley and eastern Ventura County allows us to explore the three factors most likely to affect the stability and morphology of the river downstream from existing and future development in the Santa Clarita Valley (including Newhall Ranch):

- High streamflows, including increased peak flows, volumes, and/or durations of stormflows,
- Coarse-sediment supply, including sharp curtailment of sediment entering the river following completion of Castaic (1974) and Santa Felicia-Piru (1958) Dams.
- Mature riparian vegetation, with interpenetrating roots, which can stabilize the banks and maintain the channel pattern.

We consider the 'pre-urban' condition to be the form and functions of the river during the 1950s and 1960s, prior to significant urban growth and modification of the flow and sediment regimes due to the construction of the Castaic and Santa Felicia-Piru Dams. Historic deviations from the pre-urban condition can be evaluated using the geomorphic evidence left by a period of floods and high flows from 1938 to about 1945. The effects of sediment supply can be evaluated by quantifying effects of eliminating coarse-sediment delivery from Castaic Creek (with a drainage area of 155 square miles, approximately 25 percent of the Santa Clara watershed at the L.A./Ventura County line. Supporting evidence can also be obtained similarly at Piru Creek (approximately 40 percent of the watershed at its confluence with the Santa Clara River at Piru).

## 1.3 Report organization

The analysis begins with an overview of the factors affecting the form and geomorphic history of the Santa Clara River (Chapter 2). The larger events and fluctuations, and manner in which they may have affected the river, are considered in Chapter 3. The fourth chapter explains the source materials and methods used to quantify the river's response to these perturbations, which are summarized in Chapter 5. Chapter 6 is a discussion of what we have learned from this study, and Chapter 7 draws conclusions as to how these findings relate to potential hydromodification effects in response to anticipated future watershed urbanization.

# 2. GEOMORPHIC SETTING

## 2.1 Channel pattern influences

Several previous reports have described the overall and geomorphic histories of the Santa Clara River (c.f., Schwarzberg and Moore, 1995; SCREMP 2005). In each case, authors have noted that the forms and functions of the river have varied with climatic cycles and with episodes such as floods and fires. It is this variability that is characteristic of the river. In the this report, we utilize the study of historic influences of some of the more pronounced events and cycles to better understand the impacts of drainage changes, if any, that can be expected to result from the anticipated future development in the Santa Clarita Valley, including Newhall Ranch.

### 2.1.1 Physiography

The Santa Clara River flows through a complex, tectonically-active trough generally bounded by reverse faults on the San Cayetano Mountain and South Mountain fronts. Some of the most rapid rates of geologically-current uplift in the world are reported from the Ventura anticline and San Gabriel Mountains, just to the northwest and southeast, respectively, of the river. Slopes are very steep, with local relief of 3000 to 4000 feet being common. These faults bring harder, more resistant sedimentary rocks over softer and younger sedimentary formations, but all formations are fundamentally soft and erodible. On either side of the faults, sandstone (generally multi-cyclic and fine-grained) and mudstones prevail. The northeastern and southeastern corners of the watershed are underlain by deeply-weathered granitic and schistose rocks, which produce sands that are coarser than those of other rock units when they weather and erode. The San Gabriel fault crosses the valley near the county line, bringing slightly more resistant rock to the surface and creating a local base level reflected as a slight rise or 'bump' on the river's longitudinal profile.

Most geologic materials in the watershed decompose mainly to silts and clays and to sand, with some coarser materials. Rhea Williams and his colleagues at the U. S. Geological Survey found that most sediment moved by the Santa Clara River and its main tributaries are quite fine, with less than 5 percent bedload-sized material (>0.25 mm, or about 0.01 inches in diameter). Some gravels and cobbles do occur within the beds of the streams and in their alluvium. Nonetheless, both the bed and the sediment transported by the river tend to be finer than in most Southern California watersheds (c.f., Knudsen and others, 1992).

The Santa Clara River watershed drains a watershed of 1,600 square miles, of which 625 square miles are within Los Angeles County, upstream of the "county-line gage" (USGS No. 11108500), near the western edge of the Newhall Ranch Specific Plan area.

### 2.1.2 Climate

Much of the watershed upstream of the Newhall Ranch Specific Plan area receives rainfall averaging about 18 to 25 inches per year (NOAA). As throughout Southern California, rainfall in the Santa Clara watershed alternates between wet and dry periods, a variation that is central to understanding the cultural and geomorphic histories of the upper watershed (Schwarzberg and Moore, 1995; Lynch, 1931; Reichard, 1981). Wet cycles tend to persist for several years, sometimes for periods of 6 or 8 years, during which rainfall, although variable, may average about 140 to 150 percent of the long-term average. For the woody riparian vegetation along the banks and on islands in the braided channels, these are crucial periods for establishment and growth. During dry cycles, the roots of the riparian vegetation must grow downward to the water table or perched zones, and where it cannot do so, this band of vegetation will die back.

### 2.1.3 Flows

Flows in the Santa Clara River, as in most southern California streams, are highly episodic. For the gaged period between 1953 and 1996 annual flow at the Los Angeles/Ventura County line gage ranged between 253,000 acre-feet (1969) and 561 acre-feet (1961). In general, however, streamflow, and especially dry-season streamflow, has increased over the past few decades primarily due to discharges from two wastewater treatment plants. Mean annual flow at the County Line increased from 25,700 acre-feet in 1972 (averaged over a 20-year record) to 35,360 acre-feet in 1988 (36-year record), with a significant decrease in the number of very low years over that period (UWCD and CLWA, 1996). Downstream of the County line, however, the Santa Clara River flows through the Piru groundwater basin, which represents a "Dry Gap" where dry-season streamflow is lost to groundwater.

Annual peak flows at the County line between 1953 and 1996 ranged from 68,800 cfs (1969) to 109 cfs (1960). Of note is that the second highest annual peak, 32,000 cfs in 1966, was less than half of the highest peak (68,800 in 1969). Both of these events occurred in the late pre-urban to early-urbanization stages within the Santa Clarita Basin and no consistent increase in peak flow is evidence since this time. Flow data for the 2005 flood event are not yet available, however the peak flow at the County line may have approached the flow observed in 1969. As discussed below these large episodic events have a significant impact on the geomorphic characteristics of the Santa Clara River mainstem.

### 2.1.4 Ground-water supported riparian vegetation

The Santa Clara River is underlain by several distinct alluvial ground-water basins—the Piru, Fillmore, and Santa Paula Basins (Reichard and others, 1999; SCREMP 2005). These basins are divided longitudinally by sills or ridges of bedrock that support areas of locally-high ground water, including the area upstream from the County line (above the Piru Basin), and upstream from the mouth Sespe Creek (the transition between the Piru and Fillmore Basins). This locally-high ground water sustains summer baseflow and riparian vegetation within the Santa Clara River corridor even through relatively dry climatic cycles.

# 3. PERTURBATIONS

This section describes several major perturbations (those with the potential to affect channel- and floodplain-form) that occurred in the Santa Clara River watershed since the early 1900s (summarized in Figure 1). Aerial photographs were selected to bracket these events and analyzed, both qualitatively and quantitatively, to try to discern and quantify responses of the Santa Clara River channel to:

(1) changes in flow regime during wet and dry multi-year cycles,

(2) sediment supply, notably describing the channel's adjustments to construction of large dams, and

(3) development of mature riparian vegetation with interpenetrating roots.

## 3.1 Streamflow cycles and events

As described above, streamflow within the Santa Clara watershed is highly episodic, and can vary drastically from year to year. However, decade-scale patterns of wet and dry periods have been identified in the historic record—as early as the 1700s. Previous wet periods (with associated high flows) are reported from 1810 to 1817, 1831 to 1840, 1883 and 1893, and 1903 to 1916, during each of which periods the area received a total of an additional 60 to 80 inches above the mean annual rainfall over the duration of the wet cycle. Prolonged static or drying periods similar to that observed between 1945 and 1977 also occurred from 1780 to 1810, 1842 to 1882, and 1919 to 1935 (with associated reductions in streamflow). The river is likely to have remained most stable during the latter periods, with the notable exceptions of a few major storms of record, such as 1862 (c.f., Lynch, 1931; Reichard, 1981; Schwartzberg and Moore, 1995). The primary wet periods in this study occurred between 1938 and 1946, and 1978 to 1983 (Figures 1 and 2). Other large storm events occurred in 1966, 1969, 1972, 1983, 1998, and 2005. Notable dry periods occurred between 1946 and the late 1960s, and 1983 and 1991.

## 3.2 Dam construction

Castaic Dam was completed on Castaic Creek (a tributary of the Santa Clara River just upstream of the Newhall project) in 1974. The watershed area above the dam is approximately one-quarter of the watershed area of the Santa Clara River at the L.A./Ventura County line, downstream of the Castaic confluence, and therefore the dam effectively reduced the sediment contributing area by about 25 percent. For comparison purposes, we also considered the effects

of the construction of the Santa Felicia Dam (Lake Piru), which resulted in an approximate 38 percent decrease in sediment contribution area below the confluence of Piru Creek and the Santa Clara River[1].

## 3.3 Urbanization

Settlement of the Los Angeles County portion of the watershed transitioned from rural to mixed-use suburban during the mid- to late-1960s. This change initiated a period of ongoing urban expansion, with associated increases in the area of impervious or compacted surfaces as homes, commercial and industrial centers, highways and diverse infrastructure have developed throughout the Santa Clarita Valley. Future General Plan urbanization within the upper watershed, inclusive of Newhall Ranch, will bring the percent of urban area west of the County line to about nine percent (GeoSyntec, 2005).

## 3.4 Treated effluent discharge

Since the 1960's, treated effluent from two water reclamation plants (Saugas and Valencia) has been released directly to the Santa Clara River. This, combined with an increase in applied, imported agricultural water, has led to increased summer baseflows in the Santa Clara River at the County line, which had only rarely occurred under pre-urban conditions. This led to an increase in available water to support woody riparian vegetation. The increase in baseflow is evident in the USGS gaging record at the county line (Figure 2). In some stream corridors, vegetation growth in response to increased baseflow can provide additional bank cohesiveness and reduce erosion; though in others heavy in-channel vegetation growth (riparian encroachment) can serve to destabilize the stream and induce lateral erosion by directing flows toward the banks.

Newhall Ranch has proposed an additional plant that would ultimately treat approximately 5.8 million gallons per day at project build-out. However discharge from the plant in the summer is not expected, as this water will be re-used for irrigation purposes, and we therefore do not expect further change in riparian vegetation growth as a result.

## 3.5 Saint Francis Dam Breach

On March 12, 1928 the Saint Francis Dam, located in San Francisquito Canyon upstream of the Newhall project, failed and released approximately 30,000 acre-feet of water over the course of a few hours, with an estimated peak discharge of up to 800,000 cubic feet per second (Newhall,

[1] Drainage area calculations were based on USGS gaging station watershed data at Piru and Castaic Dams, and gages on the Santa Clara River at the L.A./Ventura County line and near Piru.

1928; and SCREMP, 2005). This event had drastic effects on the stream reaches downstream, as the resulting flows were much higher than anticipated from any natural event. Aerial photograph coverage during this time period is limited, however, and therefore an assessment of this event was not feasible. In addition, because of the extreme size of the event, it is unlikely that an assessment would be beneficial for assessing hydromodification impacts.

# 4. METHODS

We analyzed aerial photographs from 1927, 1947, 1957, 1966/67, 1989, 2002, and 2005 to describe channel change in response to the major episodes described above. The main criteria described were the width of the active braiding area (or meander belt width if there was no braiding), bank vegetation, number of channels, and width of the active channel. Also described, where they could be identified, were the width and length of "islands" (vegetated mid-channel bars) within the stream. Islands were typically easier to identify where vegetation was heavy, as the color of the vegetation highlighted the differences between channel and meta-stable islands.

The aerial photographs were analyzed in two different ways. First, a qualitative comparison of the alluvial corridor shown in the different years' photos was made, describing general differences in channel pattern and vegetation on a reach-wide scale. Second, specific cross sections were defined and the above parameters measured for each year with photo coverage in that area to provide a quantitative comparison of channel change at these standard locations along the Santa Clara River (Figure 3).

## 4.1 Descriptions of analysis criteria

### 4.1.1 Width of active braiding corridor

For braided reaches, the active channel width was identified primarily by noting the extent of active channels or recent sediment deposition. In many cases the active corridor was bounded by a significant change in vegetation or sediment deposition characteristics.

### 4.1.2 Relict channel corridor

The relict channel corridor is the portion of the flood plain that does not appear to have been active in the recent past (within the last 5 years or so). Typically the relict corridor is identified by areas of heavy or scattered vegetation containing no or few distinct channels, or areas that do not appear to have experienced recent sediment deposition. Alternatively, identification was based on the width between farmed fields[2]. Measurements of this feature were made from outside bank to outside bank, and include the active corridor.

[2] The total width of the former channel migration corridor is difficult to identify in aerial photographs due to past and present agricultural field reclamation following major perturbations. Where necessary, we used the width between agricultural fields as a estimate of the relict corridor.

### 4.1.3 Channel width

Where a distinct channel or channels could be identified, the widths of the individual channels were measured. The number of individual channel threads was also recorded, where threads could be distinguished. In some cases, measurement of these features was complicated by poor photo resolution or contrast, and difficulty in distinguishing major channels from minor ones (where a full spectrum was present).

### 4.1.4 Vegetation

Vegetation was described qualitatively as bare, scattered, moderate, and heavy. The location of specific areas of vegetation, such as vegetated islands, vegetation within the relict corridor, or vegetation along banks, was also described. Where the resolution was adequate, the growth form of vegetation, or state of maturity, was also described (trees or shrubs).

### 4.1.5 Number of vegetated islands

The number of distinct vegetated islands (mid-channel bars) was also recorded at each cross-section, where the resolution of the photographs was adequate. Where islands could be identified, measurements of width and length were recorded.

# 5. RESULTS

## 5.1 Qualitative descriptions

Initial inspection of the series of aerial photographs showed that significant changes in channel planform have occurred throughout the 1900s, as would be expected in a large, braided stream in southern California. Vegetation within the relict corridor (see definition above) near the Newhall Ranch planning area appears to become progressively heavier through time, likely due to the increase in agricultural water and discharge of treated effluent to the channel through the summer months.

The photos show many areas of net deposition, and corresponding channel shifts in major depositional areas. Single-thread, dominant channel segments are rarely present, especially in years following large events. Even when there is one main channel, secondary channels are often present within the active channel corridor.

Portions of the stream have been altered for flood control purposes, including stabilization of banks bounded by orchards and fields, or construction of levees within the active corridor. These levees are most prominent in the 1989 photographs (upstream of the L.A./Ventura County line), where the substantial segments of the main channel are confined in a flood control channel approximately 225 feet wide. By 2002, however, little evidence can be discerned in the aerial photographs of these levees.

The 2005 flood events caused significant changes within the Santa Clara River. Vegetation within the channel was almost all completely washed out (compared to 2002 conditions), and many areas of significant bank-widening were identified, even in areas of heavy bank vegetation (Figure 4).

There appears to be little change in agricultural constriction of the Santa Clara River over the span of photographs reviewed. Through the Newhall reach, the agricultural areas appear to be well buffered by the relict channel and the vegetation supported there. There were only a few places identified where the active channel cut into agricultural areas rather than staying within the relict corridor. In contrast, within the Piru Basin (downstream of the Newhall reach), significant agricultural constriction and subsequent channel widening occurred over the time span of the photos reviewed.

Areas of shallow ground water between Piru and Sespe Canyon[3], which support denser riparian vegetation than typical for the river between Valencia and Fillmore, show little if any significant change for all years in the studied photo-sets. Both the density and extent of vegetation in these areas does not appear to change over time (despite significant differences in climate and other watershed factors) nor does the amount of vegetation appear to significantly affect channel planform, compared to upstream and downstream reaches (the braided channel does not shift to a single-threaded channel through the wetted reach).

## 5.2 Quantitative results

For the quantitative portion of the aerial photograph analysis we looked at four different types of criteria to identify physical changes to the Santa Clara River channel (Table 1; see also section 4.1.1 for descriptions of criteria). Because of difficulties in identifying and measuring the width/number of channels and number/dimensions of vegetated islands, because of the varying resolutions and contrasts of the photographs, we concluded that analysis of these two criteria were less meaningful for this study. In other words, there was more variation due to the ability to identify the features for the varying quality of the photos than there was actual variation in the system. While we believe that these criteria may be a valid indicator of channel change, more study would be needed to adequately quantify these features so they were used a supplementary qualitative metric.

For this study we found that measurement of the "active corridor" (see section 4.1.1) was the most useful and easiest to work with to identify channel changes. In most cases there is enough vegetation along the banks that the active braiding corridor is easily identified, and changes in the width of the corridor can be tracked from year-to-year.

Figure 5 summarizes the changes in active corridor width over the time span of the reviewed photos. Within the Newhall reach, the width of the "active corridor" at the four measured cross-sections varies from year-to-year by as much as 500 feet, though most of the variation is considerably less. One station, in the narrows above the Piru Basin, has a very consistent channel width, varying by less than about 50 feet from year to year.

To provide additional analysis, we looked at a series of recent photos (1994, 2000, and 2002-2005) at one cross section downstream of the Castaic confluence. For this photo set, the channel widened significantly between 1994 and 2000 (probably in response to the 1995 or 1998 large

[3] See Reichard and others (1999) for a discussion of the hydrogeology of these shallow ground water areas; although downstream from the Los Angeles County line, results are applicable to the upstream as well, as discussed later in this report.

storms), but showed almost no change between 2000 and 2004 (Figure 6). The channel then widened considerably again in response to the high-flow events in 2005.

As a secondary check of the numbers derived for the measured standardized cross sections, we also measured active channel widths at approximately twenty different locations through the Newhall Reach on three different photo sets—1967, 2004, and 2005. From these measurements an average active braiding corridor width was calculated and compared with the other years. In 1967, the average channel width was approximately 580 feet, which was significantly wider than the average width in 2002 (392 feet). However, after the 2005 storms, the active width was approximately 560 feet, similar to the 1967 conditions.

The "relict corridor" (see section 4.1.2 for definition) also proved useful as a secondary criterion, providing a measurement of potential changes due to agricultural encroachment or constriction of the flood corridor. Measurement of the "relict corridor" at the standard cross sections showed that while there was some variation between photos, there is no consistent trend of agricultural constriction to the Santa Clara River flood corridor. These measurements, along with qualitative observations that within the Newhall reach agricultural activities were generally restricted to outside the active corridor, suggest that agricultural encroachment has not historically affected the geomorphology of the Santa Clara River within the Newhall Reach.

## 6. DISCUSSION

The Santa Clara River is a dynamic, episodic system. The above analyses highlight the magnitude of geomorphic change over the course of recent history, in response to natural and human disturbances in the watershed. Understanding the magnitude of past response is a key factor in assessing the potential response to future urbanization within the watershed.

The construction of Castaic Dam in 1974, regulating approximately 25 percent of the watershed at the L.A./Ventura County line, cut off a significant supply of sediment to the Santa Clara River. This change, however, does not appear to have had an effect on the channel dimensions of the Santa Clara River mainstem. The width of the active corridor, as well as the general form of the channel, are generally consistent both before and after construction of the dam. It appears that the Santa Clara River adjusted without morphological expression to absorb this change. One factor contributing to the lack of change is the seemingly large volume of sediment stored in the tectonic basin above the county line—a result of bedrock control associated with movement along the San Gabriel fault, which supports the large extent of semi-consolidated and alluvial deposits adjoining the drainage net.

The amount of vegetation within the Santa Clara River corridor appears to have increased since the 1960s, likely due to the increased summer return flows from agricultural water and to year-round augmentation of baseflows due to treated effluent discharge to the river. However, this vegetation does not seem to provide enough erosion resistance to maintain a "stable" channel capable of withstanding regular 're-sets', which occur at intervals averaging about a decade – or much less than the expected lifetime of the riparian woodlands which do get established. Despite heavy vegetation on the active channel banks near Newhall ranch and in areas of shallow ground-water, the stream still responds to large events by a general widening and/or shift of the channel. The role of vegetation in large-channel stability and morphology in Southern and Central California does fundamentally differ from that of smaller streams and streams elsewhere in the country. The geomorophic and historical record shows that resets have been occurring throughout the recent geologic past in basins exceeding a certain size. One partial explanation may be that 're-set' flood events in these larger channels exert stresses beneath or around the riparian vegetation exceeding the vegetation's threshold of stability[4].

[4] Sedimentologists note that crossbeds in the alluvium of the Santa Clara River are often 8 to 12 feet high, equal or greater than the depth to which roots can interpenetrate in most riparian settings in the region.

As stated above, the Santa Clara River, as with many streams in semi-arid southern California, is highly episodic. Concepts of "normal" or "average" sediment-supply and flow conditions have limited value in this "flashy" environment where episodic storm and wildfire events have enormous influence on sediment and stormflow conditions. Many of these channels are actively adjusting to lower flows than the last major event, which may have occurred some years before[5] (Hecht, 1993). In these streams, a large portion of the sediment movement events can occur in a matter of hours or days. In many of these channels most sediment is moved—and most bed changes occur—during the large flow events resulting from storms that may be expected approximately every 5 to 15 years (c.f., Capelli and Keller, 1993; Hecht,1993; Inman and Jenkins, 1999; Knudsen and others, 1992; Kroll and Porterfield, 1969).

Evidence of episodic channel changes can be seen in the Newhall reach of the Santa Clara River. Based on aerial-photograph interpretation of a near-yearly sequence of aerial photographs from within the last decade, the channel appears to maintain a consistent planform during average or dry rainfall years (such as between 2000 and 2004). Large events, however, (such as that which occurred in February 1998 and January 2005) can significantly modify this channel form. This widened and/or shifted channel (like that which was present after the 1998 or 2005 stormflow events) then sets the geomorphic template for subsequent normal to dry years. This model, similar to that described for the Ventura River by Capelli and Keller (1993), suggests that the geomorphology of the Santa Clara River is primarily driven by these large events.

Other perturbations which potentially affect channel geometry appear to have transitory or minor manifestations. For example, effects on the channel width due to 1980s levee construction are barely discernible by the first few years of the 21st century, probably mostly due to morphologic compensation associated with the mid- to late-1990s storm events.

[5] Actively adjusting channels may be aggrading, incising, expanding or otherwise changing channel dimensions, depending on the magnitude, type, and various effects of the episodic event.

## 7. CONCLUSIONS

Based on the study of historic aerial photographs described above we conclude that:

- Major perturbations within the Santa Clara River watershed (dam construction, levee construction, changes in flows in response to decadal-scale climatic patterns, and increases in woody vegetation) do not appear to have had a significant impact on the geomorphic expression of the Santa Clara River, as quantified from measurements made from a series of historical aerial photographs flown during the years 1927 through 2005.

- Large events (those which are typically not as affected by increases in impervious area and associated increases in stormwater peaks and runoff volume) can completely alter the form of the Santa Clara River channel. We call these events "re-set" events. These events, perhaps occurring on average once every ten years, are a dominant force in defining channel characteristics.

- The geomorphic dominance of "re-set" events overwhelms geomorphic effects of hydromodification on smaller events. Due to these episodic "re-sets" we do not expect hydromodification feedback "unraveling" of the Santa Clara River mainstem, as is seen in many smaller southern California watersheds[6]. The "re-set" events appear to adequately buffer changes that may occur in short-term sediment transport.

- While there is no expected increase in summer flows due to additional treated effluent discharge to the Santa Clara River, even if summer baseflow do increase we would not expect a significant change within the channel. Additional growth in the extent or density of vegetation is not anticipated, as the reach near Newhall already appears to have enough flow to support summer vegetation, and the existing vegetation does not appear to affect channel form for durations longer than the "re-set" interval. Further, re-sets occur at intervals significantly shorter than the period required for maturation of riparian vegetation, such that full development of bank-holding properties is frequently interrupted.

- Given that the channel morphology of the Santa Clara River mainstem has not adjusted significantly to much larger perturbations in flow, sediment yield, and riparian

[6] In many smaller streams, hydromodification of moderate events can induce incision of the stream bed, which reduces the connection of the stream to the floodplain. This disconnect, in turn, increases the erosive forces of the flows (concentrating more flow in the channel) and causing further erosion, and thus a positive feedback response.

vegetation growth factors, within the Newhall reach, we do not expect a significant geomorphic impact to the Santa Clara River mainstem due to the anticipated increase in 'urban area' from four to nine percent.

## 8. LIMITATIONS

The analyses in this report were designed to help bracket the range of likely effects on the geomorphology of the Santa Clara River due to proposed urban expansion under the General Plan, inclusive of the Newhall Ranch Specific Plan projects. It does not consider specific elements of the project or of evolving mitigation measures; rather, it focuses upon the susceptibility to perturbation of the Santa Clara River corridor as a whole. We believe that it conforms with the standard of care applicable to reconnaissance studies of this nature; no other warranty, expressed or implied, is made.

The above analyses and discussion were intended to assess the potential cumulative impacts to the Santa Clara River *mainstem* (not tributaries) due to the anticipated urban expansion in the watershed. While we conclude that urban expansion from approximately four- to nine-percent urbanized (not 'impervious') will not significantly affect the channel geomorphology of the Santa Clara River, we do expect that there might be a response to urbanization on a larger scale. However, further study would be required to define what the likely threshold and magnitude of response might be.

We ask readers to note that this is a reconnaissance report. It is intended to bracket likely future conditions, to identify factors which must be better known, and to help guide initial planning. This report should *not* be used to site or design individual facilities without further site-specific investigations. Similarly, it is *not* intended to serve as basis for flood management or detailed floodplain planning, both of which should be conducted by well-defined and site-specific procedures, and which frequently require multiple lines of evidence.

The application of geomorphic history to inferring future channel and corridor change has a long and respected record in the earth sciences. As with all history or archival analysis, the better the record is known and understood, the more relevant and predictive the analysis can be. We do encourage readers who have knowledge of other events or processes which may have affected the river to let the authors know at the first available opportunity. The authors and their contacts via several different media are given on the signature page of this report.

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# TABLES

**Table 1. Aerial photograph cross section data at selected locations near Newhall Ranch, Los Angeles County, CA.** See text for explanation and interpretation of data. Locations of cross section are labeled on Figure 2. Photo sources are listed in Appendix A.

| Cross section | location description | photo date | width of active braiding corridor (feet) | width of relict braiding corridor (feet) | is there one primary channel visible? | width of main channel (feet) | number of identifiable channels | total width of channels (including main) (feet) | number of islands | length of islands encountered (feet) | width of islands (feet) | vegetation | other descriptions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| X1 | downstream of Castaic | 8/16/1947 | 570 | 1247 | yes? | 71 | 3? | 107 | can't define | n/a | n/a | moderately vegetated with some portions of relict corridor heavily vegetated | Just downstream a heavily vegetated bar is cut by a very distinct secondary channel |
| | | 7/20/1966 | 729 | 1173 | yes | 27 | 1 | 27 | 1 | 497 | 86 | almost no vegetation within primary corridor except two areas near the primary channel and scattered small patches, only scattered vegetation on relict corridor | while there is only one main channel the rest of the primary corridor is section is almost deltaic in planform, spreading out from constriction upstream (possibly high sediment load coming in from Castaic) |
| | | 5/26/1989 | 173 | 1171 | yes, but small | 43 | 1 | 43 | 0 | n/a | n/a | banks of meander corridor have scattered vegetation (less than 2000) with very little within braiding corridor | meander corridor is very distinct and straight, could be from flood control dredging; |
| | | 6/1/1994 | 337 | 1167 | yes | 72 | 2 | 97 | 1 | 551 | 171 | light to moderate vegetation on braiding corridor banks | very little vegetation within braiding corridor |
| | | 2/1/2002 | 505 | 984 | yes | 42 | 2 | 50 | poorly defined | n/a | n/a | relict braiding corridor is well-vegetated; meander belt/bar is lightly to moderately vegetated; at least one main channel bank is well-vegetated (alternates w/ meanders) | secondary channel essentially cuts off meander |
| | | 4/1/2004 | 505 | 978 | no | n/a | 3 | 87 | 2 | 929, 251 | 248, 56 | heavy vegetation along former primary channel; relict corridor also heavily vegetated | there are two distinct channels, approximately the same size |
| | | 3/1/2003 | 510 | 965 | yes | 75 | 1 | 45 | 0 | n/a | n/a | heavy vegetation on northern bank; some scattered vegetation within active corridor and surrounding low-flow channel | channel branches just downstream of cross section; very similar to 2002 and 2004 photos |
| | | 2/1/2005 | 601 | 999 | no | n/a | 3 | 106 | poorly defined | n/a | n/a | no vegetation in main portion of channel; right bank has heavy tree cover, left bank has few trees | the main channel is about 340 feet wide with an obvious overbank deposition area (with very little vegetation) |
| X2 | Upstream of County line | 8/16/1947 | 532 | 1197 | yes | 89 | 2 | 133 | 1 | 355 | 133 | vegetation is heavy (probably trees) on relict corridor; moderate (probably scrub) within active corridor (difficult to distinguish) | very distinguishable difference between active and relict corridor within this reach |
| | | 3/6/1963 | 491 | 1352 | no | n/a | difficult to define | n/a | 6 | 252, 283, 82, 441, 94, 410 | 44, 57, 52, 76, 38,63 | several well-defined islands behind established vegetation (individual shrubs or small trees); relict corridor has moderate to heavy tree cover | very braided planform; switches to predominately single-thread channel just downstream |
| | | 5/26/1989 | 651 | 651 | yes | 43 | 3 | 108 | 1 | 2385 | 477 | relict corridor has scattered trees with moderate to heavy shrub or grass cover; central island (along levee) has similar vegetation | well-defined flood control channel, but has been breached and there is a significant secondary channel to the north of the levees; included a portion of the island between the flood control channel and the secondary channel in the relict channel (no sign of recent deposition) |



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| Cross section | location description | photo date | width of active braiding corridor (feet) | width of relict braiding corridor (feet) | is there one primary channel visible? | width of main channel (feet) | number of identifiable channels | total width of channels (including main) (feet) | number of islands | length of islands encountered (feet) | width of islands (feet) | vegetation | other descriptions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 6/1/2002 | 608 | 1258 | yes | 131 | 1 | 131 | 0 | n/a | n/a | relict corridor on north bank has heavy tree cover; meander bends are eroding tree bank vegetation in places | stream has meandering planform, though meander belt (400' wide) has high sediment deposition and little vegetation; no evidence of flood control levees (meanders have widened to erode levees); active channel includes meander belt and area of significant recent sediment deposition to the north of the meander belt |
| | | 2/1/2005 | 674 | 1240 | yes | 97 | 3 | 192 | 1 | 475 | 155 | almost no vegetation within active channel; relict corridor on both banks has moderate tree cover; much vegetation eroded away since 2002 | numerous very small channels present as well |
| X3 | downstream of county line | 8/16/1947 | 362 | 805 | yes, at this xs | 80 | 2 | 121 | can't define | n/a | n/a | outer banks of braiding corridor seem heavily vegetated | there seems to be one main channel through this reach, with extensive deposition of sediment outside of the channel |
| | | 7/20/1966 | 140 | 714 | yes | 51 | 2 | 77 | 0 | n/a | n/a | banks of braiding corridor are heavily vegetated | |
| | | 5/26/1989 | 273 | 864 | yes | 91 | 2 | 114 | 1 | 136 | 23 | only scattered vegetation on banks of braiding corridor | braiding corridor looks as though it may be a leveed flood control channel |
| | | 2/1/2002 | 249 | 1466 | yes | 41 | 3 | 79 | 2 | 344, 219 | 66, 36 | scattered vegetation on u/s ends of islands; some recent deposition of sediment within relict braiding corridor (which is predominately heavily vegetated | |
| | | 2/1/2005 | 587 | 1472 | yes | 97 | 3 | 145 | 1 | 543 | 110 | no vegetation in active corridor; right bank has heavy shrub cover with some trees, left bank has light shrub cover | |
| X4 | upstream of Piru Basin | 8/16/1947 | 282 | 885 | yes | 121 | 1 | 121 | can't define | n/a | n/a | little to no vegetation within braiding corridor; relict braiding corridor has heavy tree/shrub cover | |
| | | 7/20/1966 | 281 | 383 | no | n/a | 3 | 26 | poorly defined | n/a | n/a | | |
| | | 5/26/1989 | 318 | 591 | yes | 68 | 1 | 68 | 1 | 91 | 23 | meander belt banks lined with trees; meander belt itself covered with shrubs | "braiding corridor" is actually the meander belt; meander belt outside of channel is heavily vegetated |
| | | 2/1/2002 | 266 | 426 | yes | 35 | 3 | 45 | 1 | 340 | 36 | | secondary channels may be present in other photos, but resolution is poor, esp. 1948 |
| | | 2/1/2005 | 281 | 495 | yes | 44 | 1 | 44 | 0 | n/a | n/a | vegetation on right bank of main channel has diverted some flow over the relict corridor, though conditions are similar in 2002; moderate to heavy trees and shrubs on both banks | conditions are very similar to 2002, but with slightly wider and much clearer channel |



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| Cross section | location description | photo date | width of active braiding corridor (feet) | width of relict braiding corridor (feet) | is there one primary channel visible? | width of main channel (feet) | number of identifiable channels | total width of channels (including main) (feet) | number of islands | length of islands encountered (feet) | width of islands (feet) | vegetation | other descriptions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| X5 | upstream of Piru confluence | 4/1/1927 | 1834 | 3191 | no | n/a | many | n/a | 3 | 3060, 1170, 468 | 540, 450, 90 | sparse scrub vegetation within active corridor, but enough to define the complex channel pattern; only slightly more vegetation (or possibly just less recent sediment deposition) in relict corridor | relict channel is mainly an artifact of flow deflection by several long levees just upstream; typical braided stream with channels of varying widths and scales (can not define number of channels due to complexity and scale variation of channels); only measured large islands |
| | | 8/16/1947 | 1449 | 3066 | no | n/a | 0 | n/a | 1 | 1282 | 279 | island appears heavily vegetated; relict channel has moderate vegetation, possibly some farming | active channel is very burnt in; no evidence of levees, but would be difficult to see |
| | | 11/10/1966 | 957 | 3051 | no | n/a | complex channel pattern | n/a | too complex to define | n/a | n/a | no vegetation within active corridor; sparse scrub vegetation within relict corridor, but very patchy (may be due to clearing) | flood control channel is present down middle of active corridor (196' wide); stream has complex braiding pattern, even with flood control channel present |
| | | 6/20/1989 | 1796 | 2993 | no | n/a | complex channel pattern | n/a | too complex to define | n/a | n/a | light scrub vegetation within active corridor; vegetation is obviously stabilizing small islands, at least until the next big event; relict corridor is sparsely vegetated | little evidence of flood control channel but may have been some excavation in middle of active corridor (~300' wide); |
| | | 6/1/2002 | 1730 | 2452 | no | n/a | 5 | 1000 | 3 | 1200, 1085, 1520 | 384, 406, 400 | moderate scrub vegetation on islands within active channel, similar to 1989 but slightly heavier | channels were relatively easy to pick out due to moderate scrub vegetation; channel width does not necessarily correlate to other measurements (where the only measurable parameter was wetted width) |
| X6 | downstream of Piru confluence | 4/1/1927 | 1713 | 1983 | yes | 18 | 1 | 18 | 0 | n/a | n/a | no vegetation within braiding corridor; only scattered vegetation on relict corridor; heavy trees along portions of the south bank of relict corridor | very wide braided corridor with little definition (too burnt-in to define secondary channels) |
| | | 8/16/1947 | 1767 | 1983 | no | n/a | 0 | n/a | 0 | n/a | n/a | looks similar to 1927 conditions | |
| | | 9/1/1957 | 1220 | 1449 | yes | 25 | 3 | 51 | 2 | 875, 1750 | 325, 425 | very sparse scrub vegetation in active corridor; some small trees on relict corridor (where corridor is present) | well-defined flood control channel through this reach (136' wide), but there are several secondary channels outside the levees; diversion ponds present near the north bank; larger island cut by flood control channel |
| | | 11/10/1966 | 1132 | 1563 | yes | 32 | 4 | 388 | 2 | 2125, 750 | 850, 250 | large island is moderately vegetated with scrub and one line of heavy vegetation; relict braiding corridor is similarly vegetated | braiding corridor has been confined on both sides by levees (especially on the northern portion); looks like the southern levee was recently overtopped (that area was included in the relict corridor); main channel divides in two in some areas |
| | | 6/20/1989 | 1082 | 1082 | no | n/a | n/a | n/a | 1 | 685 | 180 | sparse scrub vegetation growing on poorly-defined islands within channel and near piers | lots of recent grading within the channel, several levees in the middle of the corridor and a series of piers on the southern bank |
| | | 6/1/2002 | 1050 | 1245 | no | n/a | none | n/a | 0 | n/a | n/a | very little vegetation in this portion of the stream; some scattered scrub on relict corridor, even less within active channel | 217-foot wide flood control channel begins just d/s of xs (poorly defined, though) |



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| Cross section | location description | photo date | width of active braiding corridor (feet) | width of relict braiding corridor (feet) | is there one primary channel visible? | width of main channel (feet) | number of identifiable channels | total width of channels (including main) (feet) | number of islands | length of islands encountered (feet) | width of islands (feet) | vegetation | other descriptions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| X7 | between Piru and Sespe (ground-water upwelling) | 8/16/1947 | 1694 | 2472 | no | n/a | 4 | difficult to define the widths | can't define | n/a | n/a | this area is heavily vegetated; difficult to distinguish active braiding corridor from relict corridor | looks like there has been some flood control work in this area, two very straight channels through here, but masked some by vegetation |
| | | 9/1/1957 | 1446 | 2253 | yes | 168 | 4 | 370 | 2 | 4624, 8500 | 272, 408 | northern portion of the corridor (including flood control channels) have heavy vegetation outside of the channels; the southern portion of the corridor has sparse vegetation | the main channel, and possibly the secondary channel, have been altered for flood control |
| | | 6/20/1989 | 749 | 2697 | yes | 37 | 2 | 150 | 1 | 1386 | 449 | thick vegetation (with trees) along main channel; very little vegetation otherwise within active braiding corridor; moderate vegetation in northern portion of relict corridor, but only scattered brush in southern | no evidence of flood control alteration; downstream the corridor has been severely constrained by encroaching agriculture |
| | | 6/1/2002 | 551 | 2767 | yes | 42 | 2 | 65 | 1 | 396 | 108 | heavy vegetation (trees) along secondary channel along north bank; scattered shrub (with some trees) vegetation within active corridor, some defining the edges of bars; heavy scrub vegetation on south relict corridor with scattered trees; heavy trees and scrub on northern relict corridor | just upstream there is a distinct main active corridor and an overbank area of deposition; the main active corridor has portions lined with heavy trees, but becomes less distinct further upstream (no vegetation) |
| X8 | just downstream of Sespe Creek | 8/20/1947 | 2003 | 2003 | no | n/a | 6 | 601 | can't define | n/a | n/a | limited, if any | photo very burnt in, but channels less well-defined than in other photos |
| | | 8/13/1967 | 701 | 2203 | yes | 100 | 3 | 250 | 1 | 2804 | 401 | limited, if any | one single-thread channel with one minor channel |
| | | 6/20/1989 | 1532 | 1723 | yes, but less so than 1967 | 153 | 5 | 306 | poorly defined; small and well-vegetated | n/a | n/a | islands are more heavily vegetated away from main channel; main channel bank is ~75 vegetated w/ thin vegetation line; more vegetation than in other photos | |
| | | 6/1/2002 | 670 | 1820 | no | n/a | 3 | 170 | 1 | 801 | 216 | islands are moderately well-vegetated; relict corridor has scattered vegetation, Sespe mainstem has heavy vegetation along low-flow channels | interpretation complicated by Sespe confluence, but looks very similar to 1989 photo |



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# FIGURES

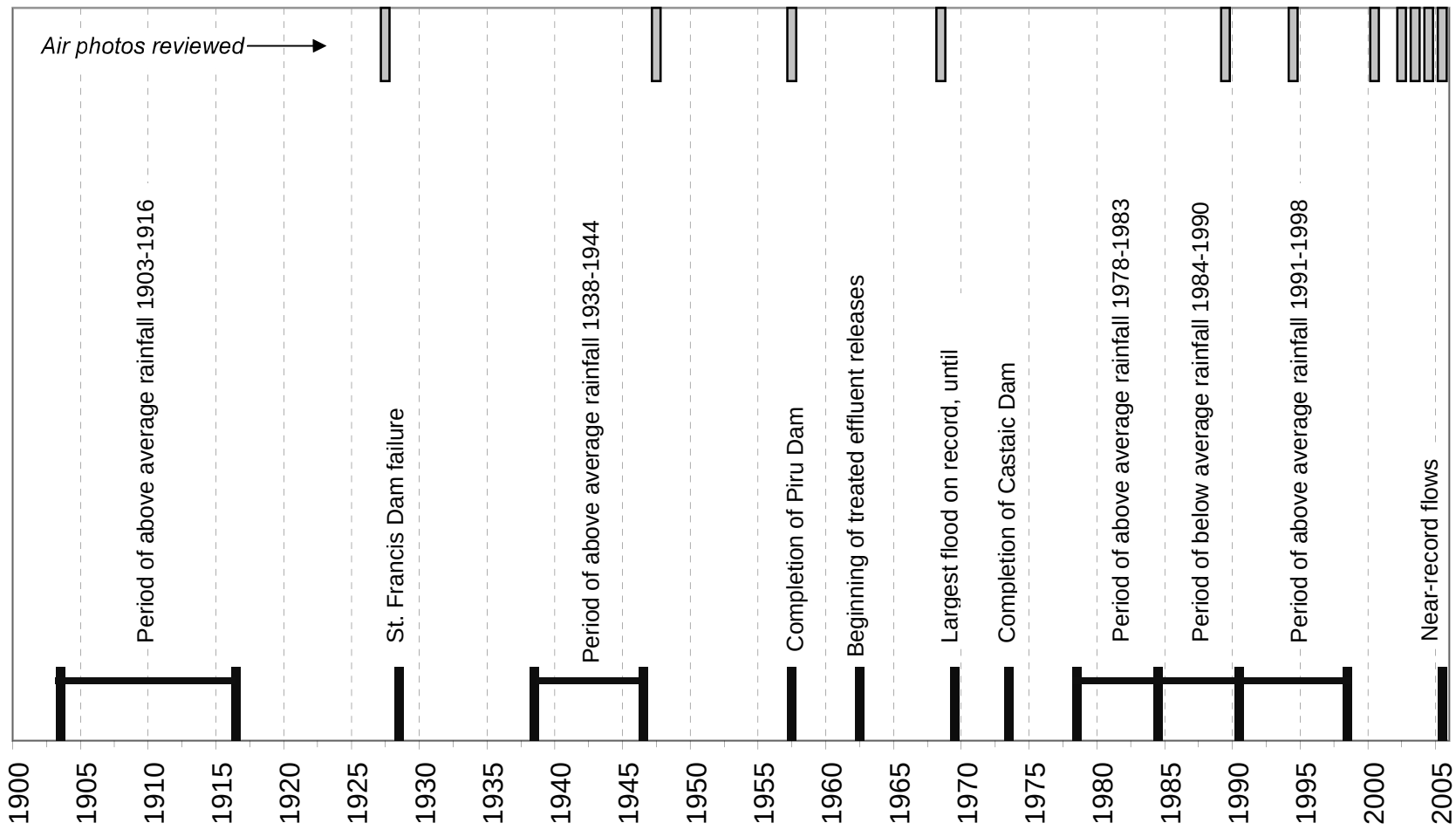


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**Figure 1. Timeline of selected major events in the upper Santa Clara River, California.** Also shown (at top) are the years for which aerial photographs were analyzed.



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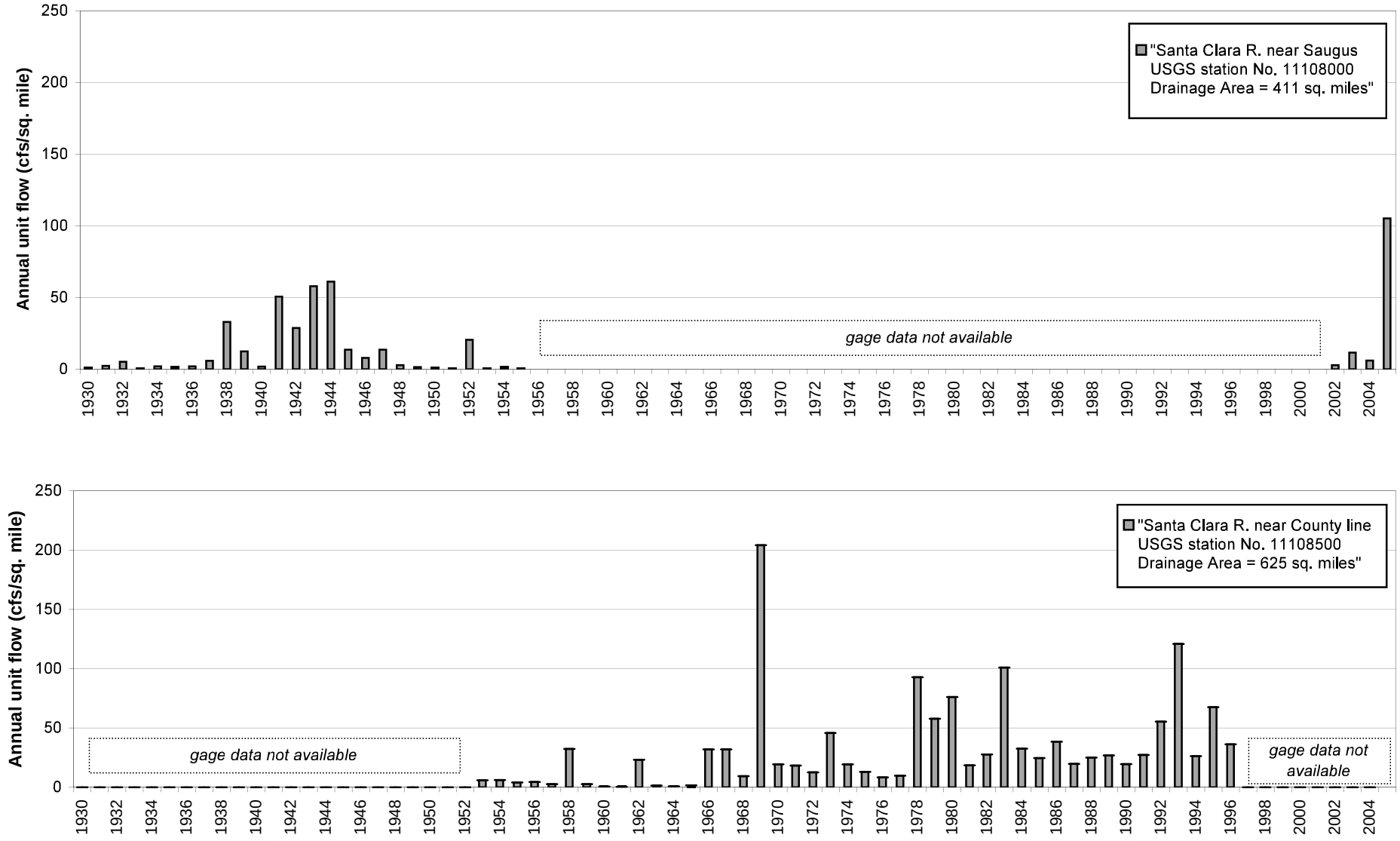


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**Figure 2. Annual unit runoff (annual flow per square mile) for the Santa Clara River near Newhall at two separate gaging stations.** Note that flow in drier years has increased since the 1960s, most likely due to release of treated effluent to the River.



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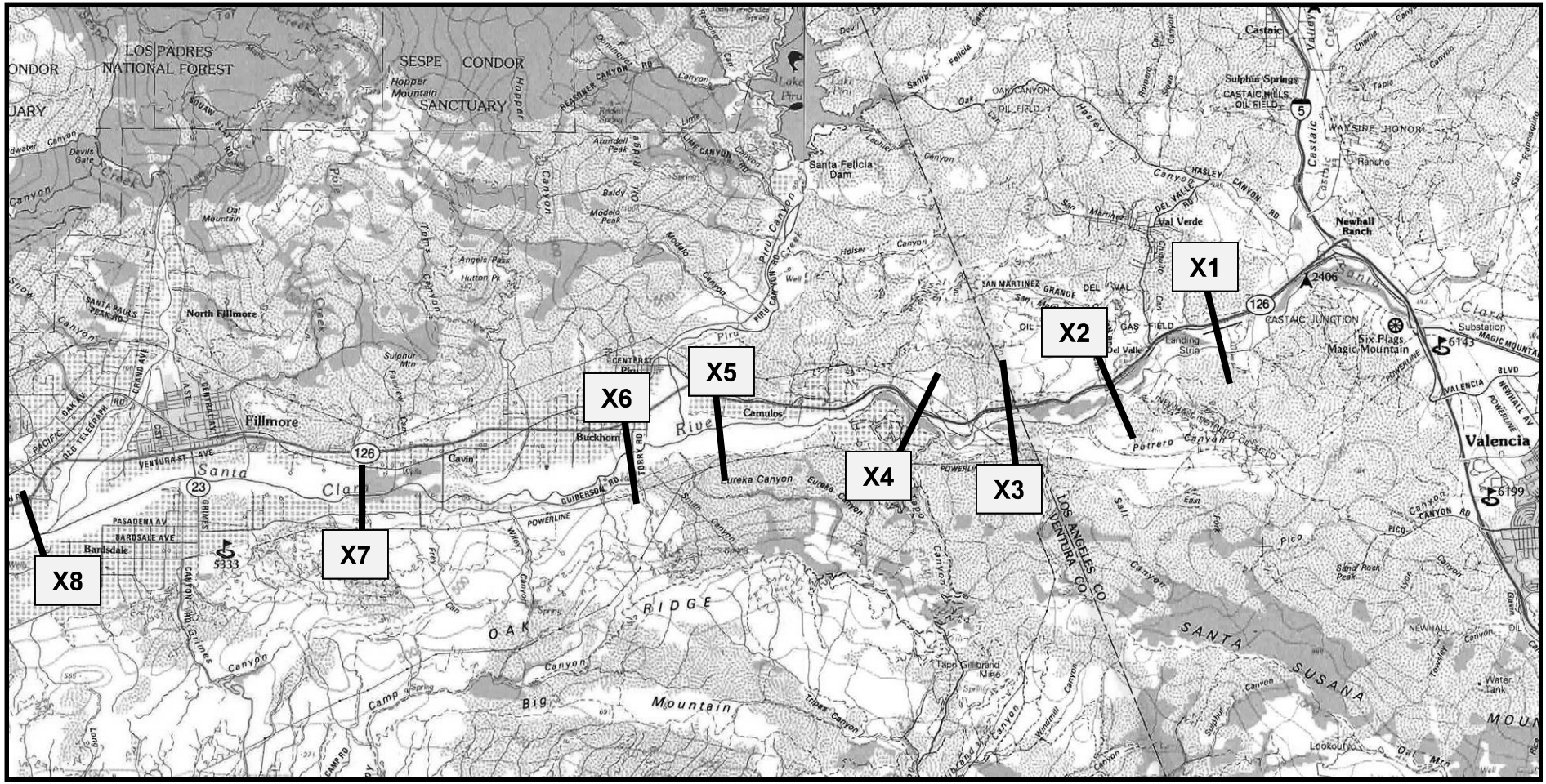


**Figure 3. Location of channel cross sections on the Santa Clara River, measured on aerial photographs.**

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**Figure 4. Comparison of 2004 and 2005 conditions on the Santa Clara River, just downstream of the L.A./Ventura County line.** Note that significant channel widening occurred in response to the 2005 events, even in heavily vegetated areas. See appendix A for photo sources.



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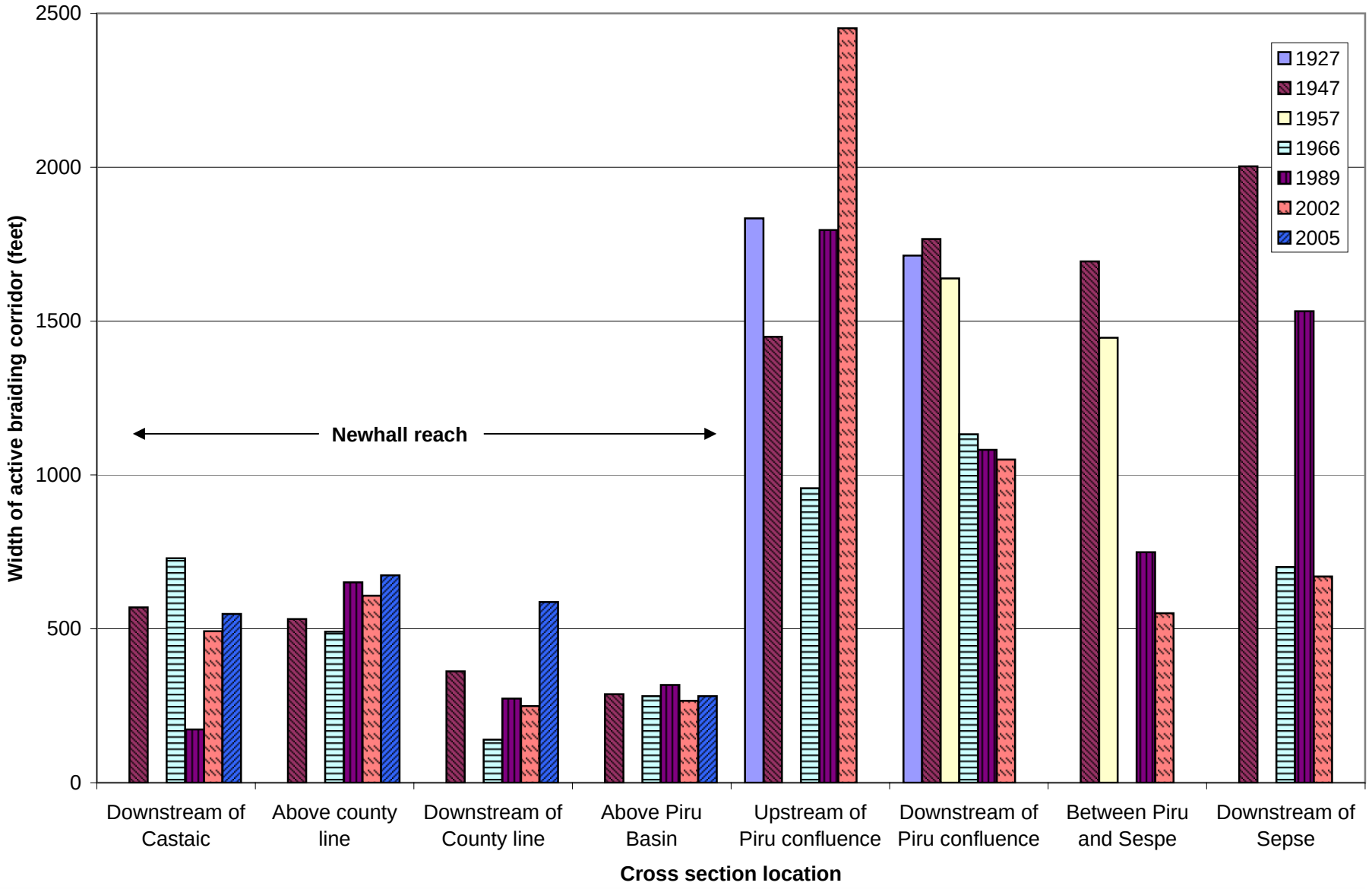


**Figure 5. Measurements of active braiding corridor width from aerial photographs, for cross sections on the Santa Clara River.**

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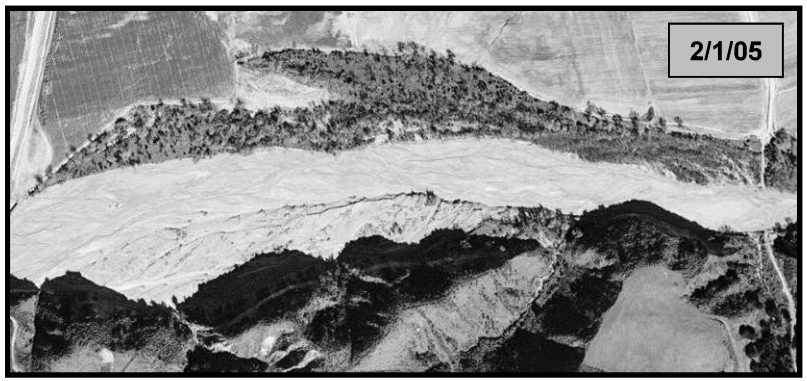


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**Figure 6. Progression of aerial photographs downstream of Castaic Canyon, showing channel change between 1993 and 2005.** Note that there was little change between 2000 and 2004, but the active corridor widened significantly in response to the 2005 events, and that channel traces within the active corridor were effectively erased. See appendix A for photo sources.



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# APPENDICES

**Appendix A: Summary of aerial photographs used for assessment of potential hydromodification effects on the Santa Clara River, Newhall, California.**

| Date | Number of photos | Nominal Scale | Hard Copy? | Electronic copy? | Image Type | Source/Vendor | Remarks |
|---|---|---|---|---|---|---|---|
| 1927 | 6 | 2000 | yes | yes | b/w | Whittier College: 80, 82, 84, F27, F28, F31 | Only available photography prior to the March 1928 collapse of the Saint Francis Dam. Photos show area near Piru confluence |
| August 16, 1947 | 34 | 24000 | no | yes | b/w - Vert Cart | USGS_GS-EM, Rolls 3, 5, 7 | Previews downloaded already are sufficient. |
| 1957 | 2 | 2000 | yes | yes | b/w | Whittier College: 109, 123 | 1957 photos are for justdownstream of Piru Creek. Piru Dam was closed in 1957. |
| March 6, 1963 | 1 (2) | 21670 | no | yes | b/w - Vert Recon | USGS_ARMC630001L0049 a,b | high resolution scans |
| July 20, 1966 | 2 (4) | 21670 | no | yes | b/w - Vert Recon | USGS_ARM6625001L1362 a,b<br>USGS_ARM6625001R1357 a,b | high resolution scans |
| August 19, 1966 | 1 (2) | 21670 | no | yes | b/w - Vert Recon | USGS_ARM6628502L1314 a,b | high resolution scans |
| September 13, 1966 | 1 (2) | 21670 | no | yes | b/w - Vert Recon | USGS_ARM6631405R1165 a,b | high resolution scans |
| November 10, 1966 | 2 (4) | 21670 | no | yes | b/w - Vert Recon | USGS_ARM6638605L1238 a,b<br>USGS_ARM6638605L1242 a,b | high resolution scans |
| August 13, 1967 | 1 | 30000 | no | yes | b/w - Vert Cart | USGS_AR1VBUK00010110 | Preview already obtained. Downstream of Sespe Creek |
| May 26, 1989 | 5 | 31680 | yes | yes | b/w | WAC-89CA, 27-42 | LA County |
| | | | | | | WAC-89CA, 27-62 | LA County |
| | | | | | | WAC-89CA, 27-84 | LA County |
| | | | | | | WAC-89CA, 27-109 | LA County |
| | | | | | | WAC-89CA, 27-135 | LA County |
| May 1, 1989 | 6 | 2000 | yes | yes | Color | PAS_89 06-20 PW VEN 7-229 | Ventura County |
| | | | | | | PAS_89 06-20 PW VEN 7-231 | Ventura County |
| | | | | | | PAS_89 06-20 PW VEN 7-233 | Ventura County |
| | | | | | | PAS_89 06-20 PW VEN 7-235 | Ventura County |
| | | | | | | PAS_89 06-20 PW VEN 7-269 | Ventura County |
| | | | | | | PAS_89 06-20 PW VEN 7-237 | Ventura County |
| June 1, 1994 | n/a | unknown | | | b/w, georeferenced | GlobeXplorer | downloaded select sections from LA and Ventura County |
| April 1, 2000 | n/a | unknown | no | yes | color, georeferenced | GlobeXplorer | downloaded select sections from LA and Ventura County |
| February 1, 2002 | 4 | Unknown | no | yes | Color, georeferenced | AirPhotoUSA (from GeoSyntec) | Covers all of Newhall project area |



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| Date | Number of photos | Nominal Scale | Hard Copy? | Electronic copy? | Image Type | Source/Vendor | Remarks |
|---|---|---|---|---|---|---|---|
| July 23, 2002 | n/a | unknown | no | yes | Color, georeferenced | GlobeXplorer | downloaded select sections from LA and Ventura County |
| March 1, 2003 | n/a | unknown | no | yes | Color, georeferenced | GlobeXplorer | downloaded select sections from LA and Ventura County |
| April 1, 2004 | n/a | unknown | no | yes | Color, georeferenced | GlobeXplorer | downloaded select sections from LA and Ventura County |
| October 13, 2004 | n/a | unknown | no | yes | Color, georeferenced | GlobeXplorer | downloaded select sections from LA and Ventura County |
| February 1, 2005 | n/a | unknown | no | yes | Color, georeferenced | GlobeXplorer | only avaialable for LA County |



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# Appendix G

# LID Water Quality Modeling Methodology

Addendum to *Appendix B* of the *Landmark Village Water Quality Technical Report* (February 2008)

## INTRODUCTION

The purpose of this appendix is to describe the changes to the water quality modeling methodology that have been made to quantify low impact development (LID) BMP implementation for the Landmark Village Project (Project) (i.e., the LID Performance Standard). Changes described in this appendix are discussed in comparison to the modeling methodology that is described in Appendix B of the Landmark Village Water Quality Technical Report (Landmark Village DEIR Appendix 4.3). This appendix addresses only the elements of the modeling methodology that have been updated, added, or clarified for the quantification of LID implementation for the Project.

This appendix is organized as follows:

- Section 1 provides an overview of the changes to the modeling methodology. This section also provides clarification of the rationales for the type of model employed for this analysis.
- Section 2 describes the updates made to model input parameters, as well as the updated approaches used to develop these input parameters.
- Section 3 describes the updates to the structure of the Monte Carlo model (i.e., the way the model is set up) to account for both on-parcel BMPs and sub-regional bioinfiltration/ biofiltration facilities. This section also provides an expanded discussion of the reliability of input parameters and assumptions.

## 1. MODEL OVERVIEW

### 1.1. Overview of Changes to Model Methodology

The overall modeling methodology has not changed substantively in comparison to the methodology described in Appendix B of the Landmark Village Water Quality Technical Report (WQTR). However, the structure of the model used to represent the Project (i.e., the way the model is set up) and some model inputs have changed to represent the LID Implementation Plan. Primary changes to the model structure and inputs include:

- Parcel-based BMPs were included in the model to account for volume reduction and treatment provided in parcel-based LID BMPs prior to draining to sub-regional bioinfiltration/ biofiltration facilities.

- The representations of sub-regional bioinfiltration facilities (previously called "Project Biobasins") and the sub-regional biofiltration facility (previously called the "Project Extended Detention Basin") were updated to reflect facility designs that include retention and biofiltration components which promote infiltration.

- BMP performance statistics were updated to support the simulation of the types of BMPs in the updated BMP plan using the latest version of the International BMP Database.

- The hydrology and hydraulic modeling approach used to develop hydrologic and hydraulic inputs to the Monte Carlo model (i.e., percent capture, percent volume reduction by storm event) was enhanced to more directly derive these estimates.

In addition, the model was updated to reflect the revised Project description and associated Project land use areas. The incorporation of these changes is described in further depth in Sections 2 and 3.

### 1.2. Technical Basis for Modeling Methodology

While the modeling methodology has not changed substantively, this section clarifies the technical basis and provides the rationale for the continued use of this methodology to evaluate Project stormwater quality impacts.

An empirical, pollutant loads model approach has been used to assess stormwater quality impacts associated with the proposed Project. This modeling approach was selected to meet the technical requirements of the water quality impact analysis based on an extensive review of available models and a review of the available datasets applicable to the Project.

A variety of modeling approaches are capable of meeting the technical requirements of this analysis. In general, models can be grouped into three categories:

- Stochastic (or probabilistic): this type of model utilizes observed statistical patterns to produce model estimates. This type of model generally relies on empirical observations, but does not necessarily ignore causal relationships.

- Deterministic (or mechanistic, physically-based): this type of model attempts to perfectly represent physical processes and mechanisms using closed form equations derived from physical phenomena. It is noted that because these models attempt to describe systems that are inherently complex and poorly defined, most deterministic models must rely in part on empirical observations to represent causal relationships.

- Hybrid: this type of model combines elements of stochastic and deterministic models to provide more reliable model estimates.

The modeling methodology used for the Project incorporates stochastic and empirical elements, and is therefore most accurately described as a hybrid approach. The approach uses an empirical, stochastic water quality estimation approach (Monte Carlo) to produce water quality and pollutant loading estimates. Inputs to this model are derived from empirical sources (Los Angeles County Land Use Monitoring Program and the ASCE International BMP Database) and deterministic modeling of hydrology and hydraulics (EPA SWMM4.4h). This approach makes use of robust land use and BMP monitoring datasets applicable to the project and incorporates important causal relationships in hydrologic and hydraulic response that can be reliably represented with deterministic methods. This approach is believed to be most appropriate to meet the technical requirements of the impact analysis for the Project-level analysis at the tract map scale.

The literature studies summarized below generally support the use of an empirically-based hybrid approach for the type of analysis required for the Project:

- Obropta et al. (2007) evaluated six deterministic models, three stochastic models, and three hybrid approaches. They concluded that *hybrid approaches show strong potential for reducing stormwater quality model prediction error and uncertainty* [improving the ability to assess] *best management practice design, land use change impact assessment* [and other applications].

- Charbeneau and Barrett (1998) evaluated different approaches for estimating stormwater pollutant loads based on a comparison of model results to observed land use monitoring data. They found that (1) the development of accurate physically-based models *remains a difficult and elusive goal*, and current understanding of processes *is not sufficient to accurately predict event loads*, (2) a simple empirical stochastic approach is generally as reliable or more reliable than more complicated mechanistic approaches, (3) the use of land use event mean concentrations (EMCs) is appropriate for planning purposes, (4) the land use EMC approach is most reliable when land use EMCs are used as a stochastic input parameter generated from a probabilistic distribution, and (5) stormwater volume is the single most important variable in predicting pollutant loads.

- The National Research Council's (NRC) 2008 report on *Urban Stormwater Management in the United States* generally supports these findings regarding the appropriate use of stormwater quality and quantity models.

Figure 1 provides an overview of the modeling methodology, with minor updates to support the updated BMP plan shown **in bold text**.

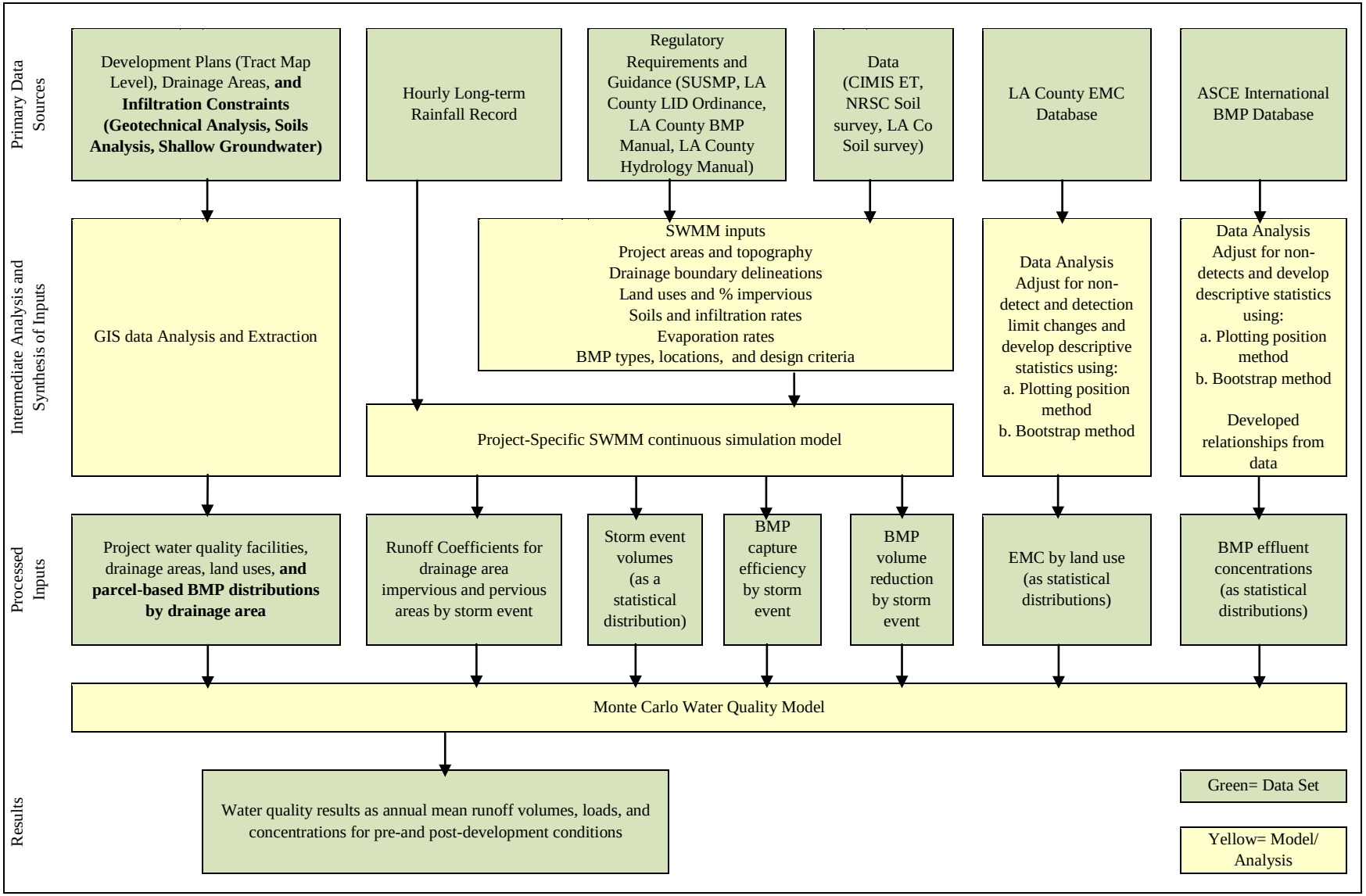


**Figure 1: Overview of Updated Water Quality Analysis Methodology (Updates in Bold)**

## 2. UPDATES TO MODEL INPUT PARAMETERS

### 2.1. Runoff Coefficients

As described in Appendix B of the Landmark Village WQTR, the Monte Carlo model uses runoff coefficients (derived from SWMM simulations of average drainage area soils conditions) as inputs to the modeling framework. Runoff coefficients for pervious portions of the Project area are based in part on the distribution of mapped soil properties in these areas. As a result of the change in Project development footprint, the distribution of soil properties changed slightly and triggered a re-analysis to develop runoff coefficients for pervious area. The updated soil distributions are presented in Table 1 below.

**Table 1: SWMM Runoff Block Modeled Soils Distribution by WQ Drainage Area**

| | **Sub-regional Bioinfiltration Facility** | | **Sub-regional Biofiltration Facility[1]** | | **On-site Treatment (Media Filter or Equivalent)** | | **Off-site Swales** | | **Off-site Swales** | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Soil Group** | **Acres** | **% Total** | **Acres** | **% Total** | **Acres** | **% Total** | **Acres** | **% Total** | **Acres** | **% Total** |
| HSG A | 43.3 | 21.3% | 2.0 | 3.5% | 0.8 | 10% | 0 | 0% | 0 | 0 |
| HSG B | 160.5 | 78.7% | 54.7 | 96.5% | 7.2 | 90% | 8.2 | 100% | 103.6 | 100% |
| *Total* | *203.8* | | *56.7* | | *8.0* | | *8.2* | | *103.6* | |

[1] Includes 2.4 acres of off-site bridge.

The derivation of soil parameter assumptions for each hydrologic soil group (HSG) is summarized in Table 2. Suction head and initial moisture deficit (IMD) were estimated based on the soil texture class reported in the most Natural Resources Conservation Service (NRCS) Soil Survey (No. 675) with guidance on SWMM input parameter selection provided by James and James (2000). The saturated hydraulic conductivity ($K_{sat}$) was estimated based on evaluation of the ranges of undisturbed $K_{sat}$ reported by the NRCS Soil Survey, the HSG reported by the NRCS Soil Survey with guidance on SWMM input parameter selection provided by James and James (2000), and the Los Angeles County Soil Type with infiltration characteristics described in the Los Angeles County Hydrology Manual (LA County, 2006). The preponderance of these soils data generally indicates that the project has relatively high infiltration capacity. Therefore, the assumed $K_{sat}$ was based on the high end of the range of recommended SWMM inputs for A and B soils from James and James (2000).

**Table 2: Green-Ampt Soil Parameters**

| Hydrologic Soil Group | Prevalent Soil Texture Class | Suction Head[1] (in) | IMD[1] (in/in) | Pre-Development $K_{sat}$ (in/hr) | Post-Development $K_{sat}$ (in/hr) |
|---|---|---|---|---|---|
| A | Loam | 8 | 0.30 | 0.45 | 0.34 |
| B | Loam | 8 | 0.30 | 0.30 | 0.23 |

[1] Estimated based on texture class from Rawls, et al., (1983)

Based the soil distributions summarized in Table 1 and soil parameter assumptions summarized in Table 2, average pervious runoff coefficients were generated for each modeled drainage area to each type of sub-regional bioinfiltration/biofiltration BMP. Runoff coefficients are presented in Table 3 below. Runoff coefficients based on guidance from the Los Angeles County Hydrology Manual are also included in this table for reference (LACDPW, 2006).

**Table 3: Runoff Coefficients by Water Quality Drainage Areas**

| WQ Drainage Area | Impervious Runoff Coefficient | | Undeveloped Pervious Runoff Coefficient | | Developed/Disturbed Pervious Runoff Coefficient | |
|---|---|---|---|---|---|---|
| | Model Methodology (used for WQ model) | LA County Hydrology Manual (for comparison purposes) | Model Methodology (used for WQ model) | LA County Hydrology Manual (for comparison purposes) | Model Methodology (used for WQ model) | LA County Hydrology Manual (for comparison purposes) |
| Sub-regional Bioinfiltration Facilities | 96.9 | 90 | 3 | 10 | 6 | 10 |
| Sub-regional Biofiltration Facility | 96.9 | 90 | 3 | 10 | 6 | 10 |
| On-site Treatment (Media filters or equivalent) | 96.9 | 90 | 3 | 10 | 6 | 10 |
| On-site Biofilter Swales | 96.9 | 90 | 3 | 10 | 6 | 10 |
| Off-site Biofilter Swales (or equivalent) | 96.9 | 90 | 3 | 10 | 6 | 10 |

## 2.2. Revisions to Project Land Use

Project land uses were determined from the Landmark Village Vesting Tentative Tract Map (VTTM #53108) and GIS analysis of this map (Psomas, April 2010) for the developed Project conditions, which have been revised for the Final Landmark Village EIR. In general, the assumptions regarding land use properties did not change, however, the revised land use plan contains greater information about the types of roadways than was previously available, which

required additional assumptions about the characteristic imperviousness and runoff quality from these areas, summarized below:

- For the purpose of analysis, roads adjacent to residential land uses were considered to be an integral part of single family detached land uses and assume all properties of this land use.

- Minor roads (private drives and access road) were grouped with major roads due to their proportionately small land area.

- Major roads were modeled using imperviousness and runoff quality associated with roads.

Developed conditions of the Project and associated off-site areas are summarized in Table 4.

Existing condition land uses have not changed since the previous model. Existing condition land uses can be found in Appendix B of Landmark Village WQTR.

**Table 4: Developed Conditions Project and Off-site Land Uses**

| Land Use | Development Area (acres) | | Impervious Fraction Modeled |
|---|---|---|---|
| | Project Site | Off-Site Impacts | |
| **Modeled** | | | |
| Commercial | 27.3 | 8.0[2] | 0.91 |
| Multi-Family | 82.9 | | 0.74 |
| Open Space | 32.9 | | 0.01 |
| Park | 10.1 | | 0.10 |
| Recreation | 5.8 | | 0.50 |
| Road[1] | 41.6 | 98.0[3] | 0.91 |
| School | 9.7 | | 0.82 |
| Single-Family | 53.9 | | 0.42 |
| Water Quality Facility | 10.1 | | 1.0 |
| **Not Modeled** | | | |
| Open Space | 18.3 | | NA |
| *Total* | *292.6* | *106.0* | |

[1] Residential roads are included in the single-family land use. The Roads land use includes major and minor roads. Minor roads are modeled assuming the composite imperviousness and EMC of their adjacent land use types.
[2] Off-site water tanks are modeled as a commercial land use.
[3] Off-site roads consist of 2.4 acres of off-site bridge to the south and 95.6 acres of SR-126 right of way to the north. Impervious fraction of SR-126 ROW based on delineation of tentative improvement plans; not land use-based fraction.

## 2.3. Distribution of Parcel-based LID BMPs for Multi-Family, Commercial, Institutional, Recreation, and Park Land Uses

The LID BMP performance standard for the Landmark Village Project includes parcel-based LID BMPs in multi-family, commercial, institutional, recreation, and park land uses. There are three categories of parcel-based BMPs (Category 1, 2, and 3), the application of which depends

on infiltration feasibility constraints associated with each land use parcel. Infiltration feasibility was screened as follows to determine the distribution of Category 1, 2, and 3 parcel-based BMPs:

- Infiltration feasibility constraints were evaluated by Seward (2010) to determine areas where infiltration is likely feasible. This analysis yielded a shapefile of infiltration feasibility constraints which displays locations where infiltration is likely feasible (Category 1) and where infiltration is likely partially feasible (Category 2). No areas on the Landmark project were identified where infiltration is not feasible in any level or would be hazardous (Category 3). Criteria associated with these distinctions are described in the *Landmark Village LID Supplement.*

- The land use program described in the Landmark Village VTTM (Psomas, April 2010) was converted to a GIS shapefile and was geospatially overlain with the shapefile of infiltration constraints to determine the location(s) and area of each type of parcel-based treatment within each drainage area.

The resulting distribution of parcel-based BMPs is shown in Table 5.

## 2.4. Distribution of Single Family Residential Hydrologic Source Controls

The LID BMP Implementation Plan includes hydrologic source controls (HSCs) in single family detached (SFD) land uses. For the purpose of modeling, it was assumed that rooftops, patios, and walkways would be routed to pervious areas capable of managing the runoff from at least a 0.75 inch storm event.

An analysis of typical development plans was conducted to determine the portion of the impervious area in the SFD residential land use that is made up of rooftops, patios, and walkways. Based on the project VTTM land use break-down, an area-weighted lot-size of 5,025 sq-ft plus 2,250 sq-ft of residential roadway was evaluated. Based on this analysis, it was found that on average approximately 26 percent of SFD land use area is anticipated to be made up of roofs, patios and walkways.

## 2.5. Design of Sub-regional Bioinfiltration/Biofiltration Facilities

The LID BMP Plan includes sub-regional water quality facilities, which are proposed to manage runoff from portions of the Project that are not addressed by parcel-based BMPs as well as bypass and treated discharge from parcel-based BMPs and SFD HSCs.

The areas draining directly to sub-regional facilities and the total tributary area to sub-regional facilities are provided in Table 5 below. Sub-regional bioinfiltration facilities are distributed around the Project site and have individual drainage areas. Because all sub-regional bioinfiltration facilities will be designed to the same design and performance standards, all area draining to sub-regional bioinfiltration facilities was considered to be part of on WQ drainage area for the purpose of modeling.

**Table 5: Areas Draining to Parcel-based BMP Types within WQ Drainage Areas**

| WQ Drainage Area | Category 1 | | Category 2 | | SFD HSC[1] | | Directly to WQ Facility | | *Total* | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Area (Ac) | Imp (%) | Area (Ac) | Imp (%) | Area (Ac) | Imp (%) | Area (Ac) | Imp (%) | Area (Ac) | Imp (%) |
| Sub-regional Bioinfiltration Facilities | 36.1 | 77.7 | 50.0 | 73.4 | 28.1 | 50.0 | 89.6 | 41.1 | 203.8 | 56.8 |
| Sub-regional Biofiltration Facility | 2.8 | 78.0 | 36.3 | 81.9 | 0 | 0 | 17.6 | 71.3 | 56.7 | 78.4 |
| On-Site Treatment (Media Filters or Equivalent) | No parcel-based BMPs | | | | | | 8.0 | 44.9 | 8.0 | 44.9 |
| On-site Biofilter Swales (or equivalent) | No parcel-based BMPs | | | | | | 8.2 | 91.0 | 8.2 | 91.0 |
| Off-site Biofilter Swales (or equivalent) | No parcel-based BMPs | | | | | | 103.6 | 91 | 103.6 | 91.0 |

1 - Includes single-family roofs, patios and sidewalks, draining to a pervious area with an equivalent square-footage.

## 2.6. Updated BMP Performance Parameters

As in the previous modeling methodology, the performance of project BMPs is estimated as a function of three factors: (1) the fraction of stormwater runoff receiving treatment (often referred to as percent of runoff captured, or simply percent capture); (2) the pollutant removal achieved in the BMP by virtue of infiltration and/or evapotranspiration (generically referred to as volume reduction); and (3) the pollutant removal achieved in the BMP by virtue of improved water quality. The performance parameters associated with these factors have been updated to reflect the LID BMP Plan as described in the sections below.

## 2.7. BMP Capture Efficiency and Volume Reduction

The Monte Carlo model utilizes event-by-event estimates of BMP capture efficiencies and volume reduction to describe the hydrologic and hydraulic performance of BMPs. These inputs were developed using SWMM simulations. While this approach has not fundamentally changed, slight changes were required to accommodate the LID BMP Plan including (a) the simulation of parcel-based BMPs that are "nested" within the drainage area of sub-regional facilities, (b) the simulation of SFD HSCs that provide volume reduction from SFD land uses, and (c) the simulation of sub-regional bioinfiltration/ biofiltration facilities that combine infiltration and biofiltration elements in different proportions depending on infiltration feasibility in the location of the facility. The approaches for developing capture efficiency and volume reduction inputs for the Monte Carlo model for each of these BMP types are described in the sections below. These approaches make use of the SWMM Runoff block (hydrologic simulation module) and the SWMM Storage/Treatment block (hydraulic simulation module), both operated in continuous simulation mode for a period of 40 years.

### 2.7.1. **Parcel-based BMPs**

Estimates of capture efficiency and volume reductions achieved by parcel-based BMPs were developed based on hydraulic representations of parcel-based BMPs in EPA SWMM4.4h (Storage/Treatment block), with spatially-averaged tributary catchments (Runoff block). A hypothetical spatially-averaged catchment representation was used because exact drainage areas and imperviousness for each parcel-based BMP are not available at this level of analysis (i.e., Tier 2, the tract map project scale). The hypothetical spatially-averaged catchment was assigned an area of one acre and an impervious fraction representative of the composite imperviousness of Project areas draining to parcel-based BMPs. This catchment was simulated in the SWMM Runoff block to produce a characteristic runoff hydrograph, which was routed through each type of parcel-based BMPs using the SWMM Storage/Treatment block. The reliability of the spatially-averaged catchment approach is discussed in Section 3.2.

The hydraulic representation of each type of parcel-based BMP was developed in the SWMM Storage/Treatment block based on a standard BMP profile formulated to result in the maximum feasible infiltration of the 0.75 inch design storm for each infiltration constraint condition. The standard profiles are primarily dependent on the design infiltration rate of underlying soil for each of the constraints categories. Based on an assessment of likely infiltration rates and allowable infiltration volumes (Seward, 2010), the design infiltration rates were selected as follows.

- **Category 1** areas are located in areas identified as having a natural, undisturbed infiltration rate of greater than 0.5 inches per hour and the potential to use direct infiltration or dry wells to infiltration. Direct infiltration was assumed to be feasible in areas with depth of fill less than 10 feet. Dry wells were assumed to be feasible in areas where the depth from the bottom of fill to seasonally-high groundwater is greater 10 feet. The design infiltration rate for this category of parcel-based BMP was selected by applying a reduction factor of 25 percent to the low end of estimated infiltration rate. The result is a design infiltration rate of **0.375 inches per hour**.

- **Category 2** areas are generally located in areas with natural, undisturbed infiltration rate of less than 0.5 inches per hour (Seward, 2010) and/or where depth of fill or separation from the bottom of fill to groundwater would not permit full infiltration of the design storm volume. The design infiltration rate for this category of parcel-based BMP was selected by applying a reduction factor of 50 percent to the low end of estimated infiltration rate. The result is a design infiltration rate of **0.25 inches per hour**. This assumption considers physical limitations of infiltration into compacted and low permeability soils as well as hazards associated with introduction of excess water into fill structures.

Based on these design infiltration rates and the design goals for parcel-based BMPs described above, the geometric inputs to the SWMM hydraulic representations of parcel-based BMP are described in the Table 6 below.

**Table 6: SWMM Hydraulic Representation of Parcel-based BMPs**

| Parameter | Units | Parcel-based BMP Categories | |
|---|---|---|---|
| | | Category 1 | Category 2 |
| Surface Ponding Depth below Overflow | ft | 1.0 | 0.5 |
| Media Depth | ft | 1.5 | 1.5 |
| Design $K_{sat}$ of Amended Media | in/hr | 2.0 | 2.0 |
| Design $K_{sat}$ of Underlying Soil | in/hr | 0.375 | 0.25 |
| Thickness of Gravel Layer | ft | 0 | 1.5 |
| Height of Underdrain Invert Elevation above Bottom of BMP | ft | None | 1.5 |
| Depth of Retention Storage[1] | inches | 18.3 | 9.0 |
| BMP Footprint as Fraction of Impervious Area | ac/ac | 3.1% | 2.9% |
| Average Annual Capture Efficiency (Percent Capture) | - | 53% | 80% |
| Average Annual Volume Reduction of Captured Water (Percent Volume Reduction) | - | 100% | 41% |
| Average Annual Reduction in Runoff Volume | - | 53% | 33% |

[1] Retention storage depth is determined based on the equivalent depths of volume retained in ponding, media, and gravel (i.e. the full storage volume of Category 1 and, for Category 2, volume below underdrain), as well as additional retention storage in media.

The storm-by-storm capture efficiency and volume reduction estimated from the parcel-based BMP simulations was extracted from SWMM model output and used to represent the hydraulic performance of these BMPs in the Monte Carlo model.

### 2.7.2. **SFD Hydrologic Source Controls**

The effect of HSCs was simulated by routing runoff from impervious areas to pervious areas within the SWMM Runoff block (hydrologic simulation module) and tabulating the combined runoff coefficient from this area for each storm event. For the purpose of analysis, it was assumed that impervious areas would be routed over an equal amount of pervious area with properties modified to represent amended soils in the areas receiving runoff. Table 7 provides the model parameters that were used to represent SFD HSCs.

**Table 7: SWMM Model Representation of Hydrologic Source Controls**

| Parameter | Units | Assumption | Basis of Assumption |
|---|---|---|---|
| Impervious to Pervious Ratio | ft | 1:1 | Based on typical available landscape area per tributary area, or equivalent HSC |
| Slope of Pervious Area | ft/ft | 0.05 | See Appendix B |
| Depression Storage of Pervious Area | inches | 0.5 | Based on soil amendments to 4 inch depth improving soil moisture storage capacity by 0.125 inches per inch; actual design of HSCs may vary |
| Manning's Surface Roughness of Pervious Area | - | 0.25 | See Appendix B (tables) |
| $K_{sat}$ of Pervious Area | in/hr | Based on drainage area average developed $K_{sat}$ | See Appendix B (tables) |
| Saturated Hydraulic Conductivity of Pervious Area ($K_{sat}$) | in/hr | Varies based on soil type | See Table 2 |
| Suction Head of Pervious Area | inches | 8.0 | See Table 2 |
| Initial Moisture Deficit of Pervious Area | in/in | 0.3 | See Table 2 |
| Runoff coefficient of impervious plus pervious area | - | 13.3 | Modeled in SWMM. Takes into account infiltration of runoff from impervious area in pervious area. |

The effect of HSCs was accounted in the Monte Carlo model by modifying the runoff coefficient of the areas being disconnected and receiving disconnection. The runoff coefficient of this area was tabulated from SWMM output for each storm event.

### 2.7.3. **Sub-regional Bioinfiltration/Biofiltration Facilities**

The hydraulic performance of each sub-regional bioinfiltration/biofiltration facility is dependent on characteristics of the tributary drainage area (including the amount of parcel-based BMPs and HSCs provided in the tributary drainage area), the volume of the facility, the underlying design infiltration rate, and the outlet control configuration. Therefore, to evaluate the capture efficiency and volume reduction performance of sub-regional facilities, drainage area hydrologic representations and facility hydraulic representations were developed for each facility.

***Drainage Area Representation for Sub-regional Facilities***

The drainage area representation used to evaluate sub-regional facilities was developed using the same approach described in Landmark Village WQTR Appendix B, with the exception that the effects of "nested" parcel-based BMPs and SFD HSCs were approximated by embedding hydrologic elements in the drainage area representation to represent these BMPs (i.e., hydrologic BMP representations).

To approximately account for the effects of parcel-based BMPs in each sub-regional facility drainage area, "hydrologic representations" of parcel-based BMPs were used. These representations do not account for detailed hydraulic routing, but generally account for the effect

of parcel-based BMPs on the overall volumetric response from the drainage area. These representations included increasing the depression storage of selected pervious and impervious areas, and routing impervious area runoff to these "sump" areas based on the distribution of Category 1 and 2 LID BMPs in each WQ drainage area described in Table 5.

To ensure that this representation provides a reasonably accurate approximation of the effects of parcel-based BMPs, the volume reductions resulting from this hydrologic representation were compared to the volume reductions resulting from the more detailed hydraulic representations described in Section 2.1.7.1. The pervious or impervious depression storage values used in the hydrologic representations were adjusted such that the average annual volume reductions due to depression storage losses (i.e., hydrologic representations of parcel-based BMPs) were equivalent to the average annual volume reductions achieved in the hydraulic representations of parcel-based BMP. The adjusted impervious or pervious depression storage depths used for the drainage area hydrologic representations of parcel-based BMP are reported in Table 8 below. The reliability of this approach is discussed in Section 3.2.

**Table 8: SWMM Hydrologic Model Representation of Parcel-based BMPs**

| SWMM Runoff Parameters | Units | Parcel-based LID BMP Type | |
|---|---|---|---|
| | | Category 1 | Category 2 |
| Depression storage, pervious | inches | 21 | 10 |
| Depression storage, impervious | inches | NA | NA |
| Imperviousness | % | 0 | 0 |
| Infiltration Rate | in/hr | 0.375 | 0.15 |
| Average Annual Reduction in Runoff Volume from Hydrologic Representation | - | 53% | 33% |
| Average Annual Reduction in Runoff Volume from Hydraulic Representation (See Table 6) | - | 53% | 33% |

The selected footprint areas of the parcel-based BMPs for these hydrologic representations were determined by scaling the footprint areas generated from the hydraulic parcel-based BMP representations based on the impervious fraction of the drainage area.

To represent the hydrologic effects of SFD HSCs in the sub-regional facility drainage area representation, the portions of the drainage area attributed to SFD rooftops, patios, and walkways was routed over pervious landscape areas in a one-to-one ratio. Parameters used to represent this disconnection scenario are reported in Table 7.

***Hydraulic Representation of Sub-regional Facilities***

Sub-regional bioinfiltration/biofiltration facilities were represented in the SWMM Storage/Treatment block based on the proposed designs of these facilities.

Designs were developed by first estimating the infiltration rate of soils underlying the proposed facility location and identifying any other constraints on infiltration (Table 9).

**Table 9: Sub-regional Facility Design Infiltration Rates**

| Facility Type | Assumed Design Infiltration Rate, inches per hour | Basis for Assumption |
|---|---|---|
| Sub-regional Bioinfiltration Facilities | 0.25 | Seward screening shows areas have infiltration rates greater than 0.5 in/hr. Factor of safety of 2 applied. |
| Sub-regional Biofiltration Facility | 0.25 | Seward screening shows areas have infiltration rates greater than 0.5 in/hr. Factor of safety of 2 applied. |
| On-site Treatment (Media filter of equivalent) | No infiltration assumed | Are may be treated by a variety of proprietary systems that do not promote infiltration. |
| On-site and Off-site Biofilter Swales | NA - Infiltration not modeled explicitly | Because designs of biofilter swales have not been developed for all areas, estimates of volume reductions expected in swales were derived from analysis of the International BMP Database. |

A standard profile for each sub-regional facility was then developed based on the portion of the facility volume that can be dedicated to infiltration and the portion of the facility volume that is treated and released. This is a function of the design infiltration rate of soil under the facility.

Finally, the geometry of the basins was determined via iterative model runs to meet the following criteria:

- Surface storage draws down in less than or equal to 48 hours (subsurface storage in the pore spaces of gravel and suction storage in media pores may persist for longer than 48 hours as this storage does not pose a risk related to vector control or habitat creation).

- The facility captures and retains or treats runoff volumes such that less than 20 percent of the baseline drainage area runoff volume "bypasses" the facility (i.e., is routed around the facility or flows through the facility without significant treatment). The baseline drainage area runoff volume is defined as the volume that would occur without parcel-based BMPs or SFD HSCs. Limiting the sub-regional facility bypass to 20 percent of the baseline volume ensures that the Project performance standard of 80 percent capture is achieved on a drainage area basis, including the volume reduction effect of BMPs that are nested in the drainage area plus the volume reduction and treatment provided in the downstream sub-regional facility.

After an iterative solution was found that meets these criteria, the capture efficiency and volume reduction were tabulated for each storm event by post-processing SWMM model output. The estimated capture efficiency and volume reduction on a storm-by-storm basis were used to describe hydraulic performance of sub-regional facilities in the Monte Carlo model.

Sub-regional infiltration/ biofiltration facility type and geometries are listed in Table 10.

**Table 10: Sub-regional Bioinfiltration/Biofiltration Facility Geometry**

| Parameter | Units | Sub-regional Bioinfiltration Facilities | Sub-regional Biofiltration Facility |
|---|---|---|---|
| Facility Type | -- | Shallow vegetated basins with vegetated media filtration and gravel sump below underdrain | Basin-type BMP with extended detention, biofiltration, and incidental infiltration |
| Facility Volume | ac-ft | Varies by facility | 4.3 |
| Surface Ponding Depth below Overflow | ft | 1.5 | 6 |
| Surface Drawdown Time | hours | 9 | 48 |
| Assumed Design Saturated Hydraulic Conductivity ($K_{sat}$) of Underlying Soil | in/hr | 0.25 | 0.25 |
| Assumed Biofiltration Media Thickness | ft | 2 or greater | 1.5 or greater |
| Water Equivalent Retention Depth below Underdrain | ft | 0.5 | None |
| Subsurface Drawdown Time | hours | 24 | NA |

Table 12 reports long-term hydrologic performance of sub-regional facilities (capture efficiency and volume reduction) as well as the overall drainage area capture and volume reduction inclusive of volume reductions achieved in nested parcel-based BMPs, hydrologic source controls, and sub-regional facilities.

**Table 11: Sub-regional Facility Hydraulic Performance and Drainage Area Total Performance**

| WQ Drainage Area | Total Tributary Area | Composite % Imp | Sub-Regional Facility Capture Efficiency of Runoff Volume | Sub-Regional Facility Volume Reduction of Captured Water | Parcel-based Volume Reduction Upstream of Sub-regional Facility | Drainage Area Total Capture Efficiency | Drainage Area Total Volume Reduction |
|---|---|---|---|---|---|---|---|
| Sub-regional Bioinfiltration Facilities | 203.8 | 57% | 71% | 33% | 32% | 80% | 48% |
| Sub-regional Biofiltration Facility[1] | 56.7 | 78% | 74% | 16% | 24% | 80% | 34% |
| On-site Treatment (Media filter or equivalent) | 8.0 | 45% | 80% | 0% | 0% | 80% | 0% |
| Biofilter Swales (on-site) | 8.2 | 91% | 80% | 20% | 0% | 80% | 20% |
| Biofilter Swales (off-site) | 103.6 | 91% | 80% | 20% | 0% | 80% | 20% |

[1] Includes 2.4 acres of off-site roadway (bridge) that drains to this BMP.

## 2.8. BMP Pollutant Removal

The Monte Carlo model characterizes BMP pollutant removal as a function of BMP effluent quality (statistical distributions and irreducible concentration) derived from analysis of the International BMP Database (www.bmpdatabase.org). To support the updated BMP plan, the latest version of the BMP Database (obtained 1/13/2011) was queried and analyzed to produce effluent quality distributions characteristic of the types of BMPs included in the updated BMP plan. Project BMP types were matched to the most representative category of BMP in the BMP Database for the purpose of modeling (Table 12).

**Table 12: BMP Effluent Quality Performance Parameters**

| BMP Type | Facility Type | BMP has Treated Effluent? | BMP Database Category for Effluent Quality |
|---|---|---|---|
| Sub-regional Bioinfiltration Facilities | Infiltration and Biofiltration | Y | Media Filter |
| Sub-regional Biofiltration Facility | Extended detention, biofiltration and incidental infiltration | Y | Media filter plus detention basin treatment train |
| Media Filters or equivalent | Flow-based BMPs incorporating media filtration or equivalent treatment mechanisms | Y | Media Filter |
| Biofilter Swales (on- and off-site) | Biofilter Swales | Y | Biofilter |
| Parcel-based Category 1 LID BMPs | Infiltration | N | NA |
| Parcel-based Category 2 LID BMPs | Infiltration and Biofiltration | Y | Media Filter |
| SFD HSC | Infiltration and ET | N | NA |

NA – BMP does not have treated effluent.

Table 13 summarizes the number of data points (individual storm events) and percent non-detects for the pollutants and BMP types of interest for which sufficient data were available. Table 14 summarizes the log-normal statistics that were used in the water quality model, and Table 15 summarizes arithmetic descriptive statistics for those data sets. Table 16 summarizes the irreducible effluent concentration estimates used by for water quality modeling of the proposed condition. A full description of the statistical analysis methods and assumptions used to generate BMP descriptive statistics is contained in Appendix B of the Landmark Village WQTR Appendix B (February 2008). Note that because of a paucity of data in the BMP Database for some pollutants, no treatment was assumed for nitrite ($NO_2$), total aluminum, and chloride, so these constituents are not included on the following summary charts even though they were included in the model. Load reductions are still possible for these pollutants via volume reduction provided in BMPs.

**Table 13: Summary of Number of Data Points and Percent Non-Detects for BMP Effluent Concentration Data from the International BMP Database**

| BMP | | TSS | TP | NH3 | NO3 | TKN | Diss Cu | Tot Pb | Diss Zn |
|---|---|---|---|---|---|---|---|---|---|
| Media Filter | Count | 294 | 292 | 135 | 99 | 263 | 186 | 254 | 185 |
| | % ND | 9% | 8% | 39% | 3% | 3% | 7% | 30% | 21% |
| Detention Basin | Count | 509 | 258 | 85 | 93 | 178 | 173 | 197 | 174 |
| | % ND | 0% | 3% | 7% | 12% | 4% | 32% | 46% | 9% |
| Biofilter (Swale) | Count | 461 | 547 | 361 | 312 | 499 | 255 | 455 | 255 |
| | % ND | 2% | 2% | 15% | 0% | 0% | 3% | 35% | 10% |

**Table 14: International BMP Database Lognormal Statistics of BMP Effluent Concentrations**

| BMP | | TSS | TP | NH3 | NO3 | TKN | Diss Cu | Tot Pb | Diss Zn |
|---|---|---|---|---|---|---|---|---|---|
| Media Filter | Mean | 2.54 | -2.30 | -2.59 | -1.10 | -0.24 | 1.46 | 0.89 | 3.07 |
| | St. Dev | 1.24 | 1.06 | 1.27 | 1.15 | 1.01 | 1.15 | 1.26 | 1.12 |
| Detention Basin | Mean | 2.56 | -1.75 | -2.25 | -2.09 | -0.08 | 1.36 | 1.88 | 2.81 |
| | St. Dev | 1.25 | 1.23 | 0.92 | 1.66 | 1.39 | 0.95 | 1.19 | 1.03 |
| Media Filters plus Detention Basin Treatment Train[1] | Mean | 2.54 | -2.30 | -2.59 | -2.09 | -0.24 | 1.46 | 0.89 | 3.07 |
| | St. Dev | 1.24 | 1.06 | 1.27 | 1.66 | 1.01 | 1.15 | 1.26 | 1.12 |
| Biofilter (Swale) | Mean | 2.66 | -1.78 | -2.44 | -1.68 | -0.30 | 1.81 | 0.91 | 2.76 |
| | St. Dev | 1.06 | 1.17 | 1.37 | 1.01 | 0.94 | 0.69 | 1.36 | 1.05 |

1- MF/DB treatment train is based on lower of observed effluent quality between these two BMP categories. Treatment train effluent quality based on MF for all constituents except nitrate-nitrogen, which is based on DB.

**Table 15: International BMP Database Arithmetic Estimates of BMP Effluent Concentrations**

| BMP | | TSS | TP | NH3 | NO3 | TKN | Diss Cu | Tot Pb | Diss Zn |
|---|---|---|---|---|---|---|---|---|---|
| | *units* | *mg/L* | *mg/L* | *mg/L* | *mg/L* | *mg/L* | *ug/L* | *ug/L* | *ug/L* |
| Media Filter | Mean | 27.54 | 0.18 | 0.17 | 0.65 | 1.32 | 8.28 | 5.42 | 40.25 |
| | St. Dev | 52.86 | 0.26 | 0.34 | 1.08 | 1.77 | 13.65 | 10.75 | 63.56 |
| Detention Basin | Mean | 28.29 | 0.37 | 0.16 | 0.49 | 2.43 | 6.10 | 13.30 | 28.12 |
| | St. Dev | 54.70 | 0.69 | 0.19 | 1.90 | 5.95 | 7.41 | 23.40 | 38.68 |
| Media Filters plus Detention Basin Treatment Train[1] | Mean | 27.54 | 0.18 | 0.17 | 0.49 | 1.32 | 8.28 | 5.42 | 40.25 |
| | St. Dev | 52.86 | 0.26 | 0.34 | 1.90 | 1.77 | 13.65 | 10.75 | 63.56 |
| Biofilter (Swale) | Mean | 25.24 | 0.34 | 0.22 | 0.31 | 1.16 | 7.81 | 6.26 | 27.44 |
| | St. Dev | 36.53 | 0.58 | 0.52 | 0.41 | 1.39 | 6.14 | 14.39 | 38.72 |

1- MF/DB treatment train is based on lower of observed effluent quality between these two BMP categories. Treatment train effluent quality based on MF for all constituents except nitrate-nitrogen, which is based on DB.

**Table 16: International BMP Database Arithmetic Irreducible Effluent Concentration Estimates**

| BMP | TSS | TP | NH3 | NO3 | TKN | Diss Cu | Tot Pb | Diss Zn |
|---|---|---|---|---|---|---|---|---|
| | *mg/L* | *mg/L* | *mg/L* | *mg/L* | *mg/L* | *ug/L* | *ug/L* | *ug/L* |
| Media Filter | 1.49 | 0.03 | 0.01 | 0.01 | 0.24 | 0.99 | 0.20 | 1.35 |
| Detention Basin | 2.99 | 0.09 | 0.34 | 0.02 | 3.78 | 15.16 | 0.27 | 78.83 |
| Media Filters plus Detention Basin Treatment Train[1] | 1.49 | 0.03 | 0.01 | 0.02 | 0.24 | 0.99 | 0.20 | 1.35 |
| Biofilter (Swale) | 2.02 | 0.07 | 0.01 | 0.66 | 0.19 | 2.03 | 0.32 | 4.95 |

1- MF/DB treatment train is based on lower of observed effluent quality between these two BMP categories. Treatment train effluent quality based on MF for all constituents except nitrate-nitrogen, which is based on DB.

# 3. MONTE CARLO MODEL

## 3.1. Updates to Model Methodology

The Monte Carlo model framework used to simulated the LID BMP Implementation Plan is identical to that described in Appendix B of the Landmark Village WQTR, however, the model structure (i.e., the way the model is set up) has been modified somewhat to account for the volume and pollutant load reductions achieved through “nested” parcel-based BMPs and SFD HSCs upstream of sub-regional facilities. Accounting for these nested BMP requires another “loop” of pollutant load generation, removal and routing algorithms to be implemented in the model within each sub-regional facility drainage area for each simulated event. An overview of the revised model structure to account for “nested” BMPs is illustrated in Figure 2.

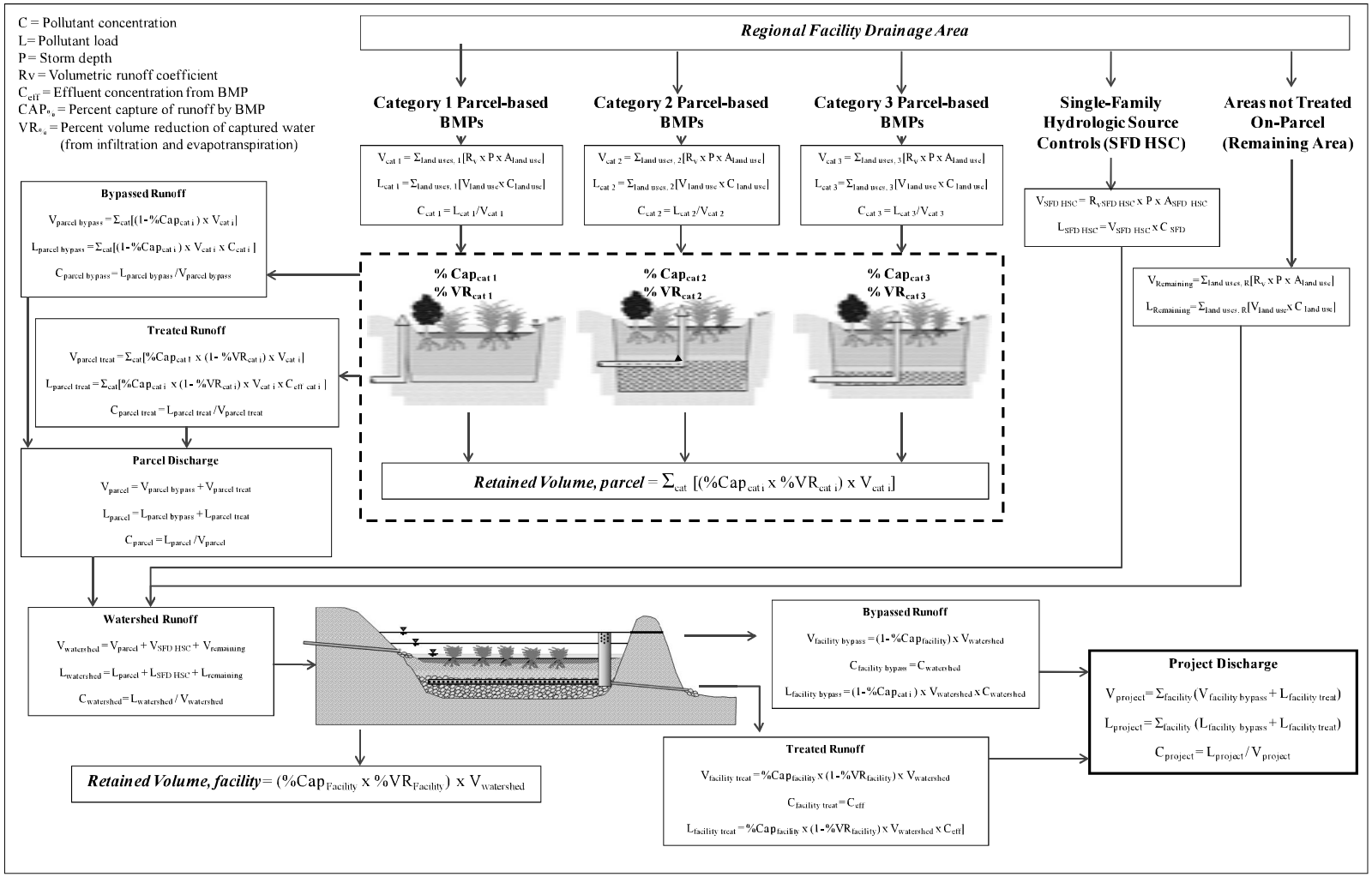


**Figure 2: Monte Carlo Model Schematic with Nested LID BMPs and Hydrologic Source Controls (Generalized Schematic)**

## 3.2. Model Parameter Reliability and Assumptions

This section discusses the reliability of new or revised model parameters and assumptions necessary to support the LID BMP Plan.

### 3.2.1. Drainage Area Runoff Coefficients and Hydrologic Parameter Sensitivity

The estimation of runoff coefficients is highly dependent on soil properties (i.e., infiltration potential) and less dependent on parameters such as evapotranspiration (ET) rates, slopes, and surface roughness. Soil properties are estimated as accurately as possible from available soils data, incorporating the latest soil survey conducted by the USDA NRCS as well as locally-developed infiltration relationships provided in the Los Angeles County Hydrology Manual (LACDPW, 2006). The resultant estimates of runoff coefficients that may somewhat overestimate or underestimate stormwater runoff.

Table 17 provides a comparison of assumed project runoff coefficients (developed from SWMM modeling) to applicable references.

**Table 17: Comparison of project runoff coefficients to applicable references**

| **Drainage Area Imperviousness** | **Project Runoff Coefficient Assumptions** (varies by drainage area; range provided) | **LA County Hydrology Manual** (Minimum Cu = 0.1) | **Ventura County Manual,** Silty Clay Soils (Soil Types 2 or 3) | **ASCE/WEF Manual of Practice 23/87** (3rd order polynomial) |
|---|---|---|---|---|
| Reference | Table 3 | LACDPW, 2006 | Ventura County, 2010 | ASCE/WEF, 1998 |
| 90% impervious, developed | 0.88 | 0.82 | 0.87 | 0.73 |
| 60% impervious, developed | 0.6 - 0.62 | 0.58 | 0.61 | 0.41 |
| 30% impervious, developed | 0.33 - 0.36 | 0.34 | 0.36 | 0.23 |
| 1% impervious, undeveloped | 0.03 - 0.07 | 0.11 | 0.11 | 0.05 |

Based on the comparison provided in Table 17, the assumed developed condition runoff coefficients are reasonably consistent with applicable references, although generally somewhat high. Assumed undeveloped condition runoff coefficients are generally lower than applicable references. The combined effect of these trends results in a somewhat higher estimate of impacts associated with the Project and somewhat higher estimate of absolute runoff volumes and associated pollutant loads in the proposed condition. As such, the assumed runoff coefficients are believed to be somewhat conservatively selected and reliable for the purpose of impact analysis.

### 3.2.2. **Parcel-based BMP Infiltration Feasibility Screening**

The types of parcel-based BMPs applied to commercial, multi-family, institutional, recreation and park land uses was determined based on infiltration feasibility constraints, as described in Section 2.1.3. The criteria used to categorize parcel-based treatment based on infiltration constraints are in agreement with the infiltration constraints listed in the *Ventura Technical Guidance Manual* (Ventura County, 2010), the *LA County LID Ordinance and Manual* (LACDPW, 2009), and the *LID BMP Design, Investigation and Reporting Requirements Administrative Manual* (LACDPW, 2011). Constraints were mapped as accurately as possible at the Tier 2 level of analysis. More detailed site investigation performed at later project phases may result in somewhat different distributions of parcel-based BMPs.

### 3.2.3. **Parcel-based BMP Infiltration Rates**

Infiltration rates beneath parcel-based BMP were assumed based on input from project geotechnical consultant (Seward, 2011) based on review of geologic information and proposed sources of fill material. While it is expected that infiltration rates may vary across the Project, the assumed values are believed to be representative of anticipated average conditions. Detailed designs will be supported by site-specific infiltration testing and will generally be based on the same design goals used to develop the parcel-based BMP designs simulated in this analysis.

### 3.2.4. **Parcel-based BMP Model Representations**

For the purpose of estimating the characteristic hydraulic performance (capture efficiencies and volume reductions) of parcel-based BMPs, detailed hydraulic representations were simulated to manage runoff from hypothetical spatially-averaged catchments. The spatially-averaged hypothetical approach provides representative and reliable estimates of hydraulic performance for two key reasons. First, the sizes of parcel-based BMPs scale linearly with tributary impervious area, there it is expected that the nearly identical capture efficiency and volume reduction (as a percent of total runoff volume) would be expected for catchments with a wide range of tributary area impervious fraction. Second, parcel-based BMP designs include significant “equalization storage” above their treatment layer, therefore the effect of catchment size (i.e., time of concentration) is not believed to be sensitive in the estimation of hydraulic performance. Therefore the use of a hypothetical, spatially-averaged catchment is appropriate to generate these inputs.

In order to size parcel-based BMPs for the purpose of analysis, BMP geometries were assumed based on the assumed underlying infiltration rate and the Project design goals for parcel-based BMPs. While the geometry assumed for this analysis is specific to a certain BMP design, the resulting performance parameters derived from this representation are reasonably representative of the hydraulic performance of a wide range of parcel-based BMPs provided that the Project design goals for parcel-based BMPs remain the same.

### 3.2.5. **Drainage Area Routing and Nested BMP Representations**

Each sub-regional facility drainage area includes areas treated by parcel-based BMPs and/or SFD HSCs. Because the exact location and detailed designs of these parcel-based BMPs and HSCs are not known at the Tier 2 level of analysis, it would be inappropriate to simulate detailed drainage area hydraulic routing to account for these nested BMPs. However, it would also be inappropriate to ignore the role of nested BMPs in the hydraulic performance of downstream region infiltration/ biofiltration facilities. The approach described in Section 2.1.7.3 balances these considerations to provide a reliable estimate of the hydraulic performance of sub-regional facilities that is consistent with the Project performance standards.

### 3.2.6. **Sub-regional Facility Infiltration Rates and Model Representations**

Infiltration rates in the locations of proposed sub-regional bioinfiltration/biofiltration facilities were estimated based on geologic information, soils data, and limited infiltration testing results available at the time of analysis. To account for uncertainty in these estimates, substantial factors of safety were applied. As such, it is believed that infiltration rates are somewhat conservatively selected for the purpose of this analysis and it is anticipated that higher design infiltration rates may be supported through site-specific analysis conducted at the time of the final hydrology report. Should detailed testing show infiltration rates are lower than assumed, additional design features such as dry wells and/or selectively graded fill material could be used to achieve at least the assumed design infiltration rate.

### 3.2.7. **BMP Effluent Statistics**

BMP effluent concentrations are based on studies contained in the most recent version of the International BMP Database. These studies are screened to remove data for undersized (i.e., inadequate design criteria) BMPs that are likely to have pollutant removal performance substantially less than the BMPs to be constructed for the Project. This screening is believed to improve the accuracy of BMP performance estimates; however, it is only intended to remove BMPs that are clearly unrepresentative in terms of sizing. The screening process is intended to include BMPs with adequate performance that may not be as well designed or maintained as the structural BMPs for the Project. It is anticipated that the BMPs for the Project will perform as well, if not better than, the projected performance based on the ASCE International BMP Database.

### 3.2.8. **Assumption of No Correlation between Model Parameters**

The water quality model randomly selects stormwater pollutant concentrations independent of the storm depth or antecedent dry period for each storm event modeled. The validity of the assumption of independence between variables is supported in Appendix B of the Landmark Village WQTR Appendix B. In general, no consistent level of correlation has been demonstrated between stormwater EMCs and rainfall depth or the antecedent dry period.

The assumption of independence of model parameters is believed to result in representative or somewhat conservative estimates post-developed runoff quality and loading, as well as

somewhat conservative estimates of Project impacts. First, the empirical distribution of runoff EMCs implicitly includes events with a wide range of antecedent dry periods and event sizes. Therefore, the effects of antecedent dry period and storm depth are implicitly reflected in model estimates. Second, where weak correlations have been observed, concentrations tend to decrease with increasing storm depth. Because bypass from BMPs tends to occur more frequently in larger events and at the end of events, the assumption of no dependence would generally result in higher bypass concentrations, on average, than would be expected if these negative correlations were included. On these bases, random selection of stormwater pollutant concentrations, independent of storm depth and antecedent dry period, is believed to be the most reliable option for the modeling methodology at this level of analysis.

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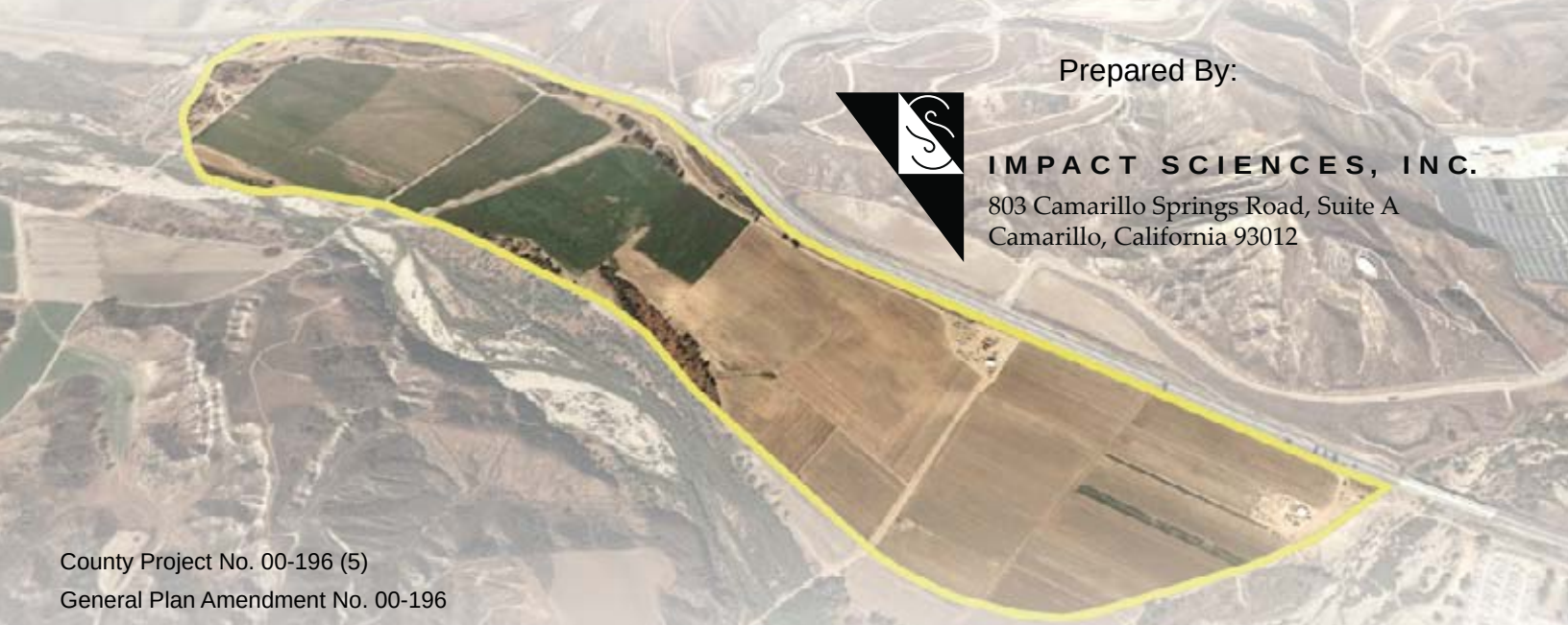
County of Los Angeles

# Revised Final Environmental Impact Report

SCH No. 2004021002

## Volume IV
## Appendices F4.4 - F4.9

# LANDMARK VILLAGE



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NEWHALL RANCH
Newhall Ranch Company

September 2011

# Landmark Village

# Revised Final Environmental Impact Report

# SCH No. 2004021002

# Volume IV

# Appendices F4.4 – F4.9

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## Biota

**URS, "Jurisdiction Delineation, Newhall Ranch Project, for a Portion of the Santa Clara River and Its Tributaries, Los Angeles County, California" (December 2003)**

# JURISDICTION DELINEATION
# NEWHALL RANCH PROJECT

## FOR A PORTION OF THE SANTA CLARA RIVER AND ITS TRIBUTARIES
## LOS ANGELES COUNTY, CALIFORNIA

*Prepared for:*

**U.S. Army Corps of Engineers**
**California Department of Fish and Game**

*Prepared by:*

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December 2003

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This Jurisdiction Delineation Package (Package) has been prepared by URS Corporation (URS) for the Newhall Land and Farming Company (Newhall Land) in cooperation with agency representatives from the U.S. Army Corps of Engineers (Corps) and the California Department of Fish and Game (CDFG), in support of the Newhall Ranch project Corps 404 and CDFG 1603 permitting processes. The purpose of this package is to facilitate the two agencies' determination of jurisdiction boundaries of the portion of the Santa Clara River and its tributaries located within the Newhall Ranch project area. This Package will be formally submitted to both the Corps and CDFG with a request for a jurisdiction determination from each. This jurisdiction determination will be used for both federal and state environmental review and impact assessment under the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA), respectively, for the Newhall Ranch project in Valencia, California.

This jurisdiction delineation for the Newhall Ranch project is organized as follows: Section 1.0 – Introduction and Background; Section 2.0 – Jurisdiction Delineation Methods; Section 3.0 – Project Area Characteristics, including the existing physical, hydrologic/hydraulic, and habitat characteristics of the five major jurisdictional watersheds found within the Newhall Ranch project boundary, along with other minor unnamed tributaries; Section 4.0 – Results of the Jurisdiction Delineation; and Section 5.0 – References.

## 1.1 PROJECT OVERVIEW

The proposed Newhall Ranch project activities that may affect jurisdictional areas are the construction and maintenance of flood control facilities, utility crossings, storm drains, bridges, roads, building pads, nature trails, and a water reclamation facility. These facilities would supply, in an economically practicable manner, a portion of the infrastructure required over the next 20 years to build out the approved Newhall Ranch Specific Plan area's (Figure 1-1) residential, commercial, industrial, mixed uses, and public facilities.

The various proposed projects would be constructed by Newhall Land or other private or public agencies. The proposed 404 permit and 1603 Master Agreement would also include routine maintenance activities to be carried out by the Los Angeles County Department of Public Works (LACDPW) using the 404 permit and 1603 Master Agreement issued to Newhall Land. Any party utilizing a 404 permit and 1603 Master Agreement issued to Newhall Land would be bound by the same conditions in the 404 permit and/or the 1603 Master Agreement.

By seeking a long-term, comprehensive 404 permit and 1603 Master Agreement, Newhall Land can facilitate a well planned and streamlined permit evaluation and decision process by the Corps and CDFG, and can provide an opportunity to design a long-term, regionally-based

planning and mitigation program for impacts to the affected riverine habitats. The 404 permit and 1603 Master Agreement would allow projects to be implemented under specific regional conditions, thereby avoiding the traditional project-by-project permitting process, expediting the permitting process for qualified projects, and ensuring consistent biological mitigation. In addition, the permits would provide a long-term, conditional authorization for ongoing and future maintenance activities by LACDPW.

The proposed federal action under consideration consists of the issuance of an individual permit under Section 404(b)(1) of the federal Clean Water Act (CWA) for those activities that would result in the discharge of fill or dredged material into "waters of the United States." Issuance of a 404(b)(1) permit also requires the Corps to complete an endangered species consultation (pursuant to Section 7 of the federal Endangered Species Act) with the U.S. Fish and Wildlife Service (USFWS). Consultation with the National Marine Fisheries Service (NMFS) may also be required.

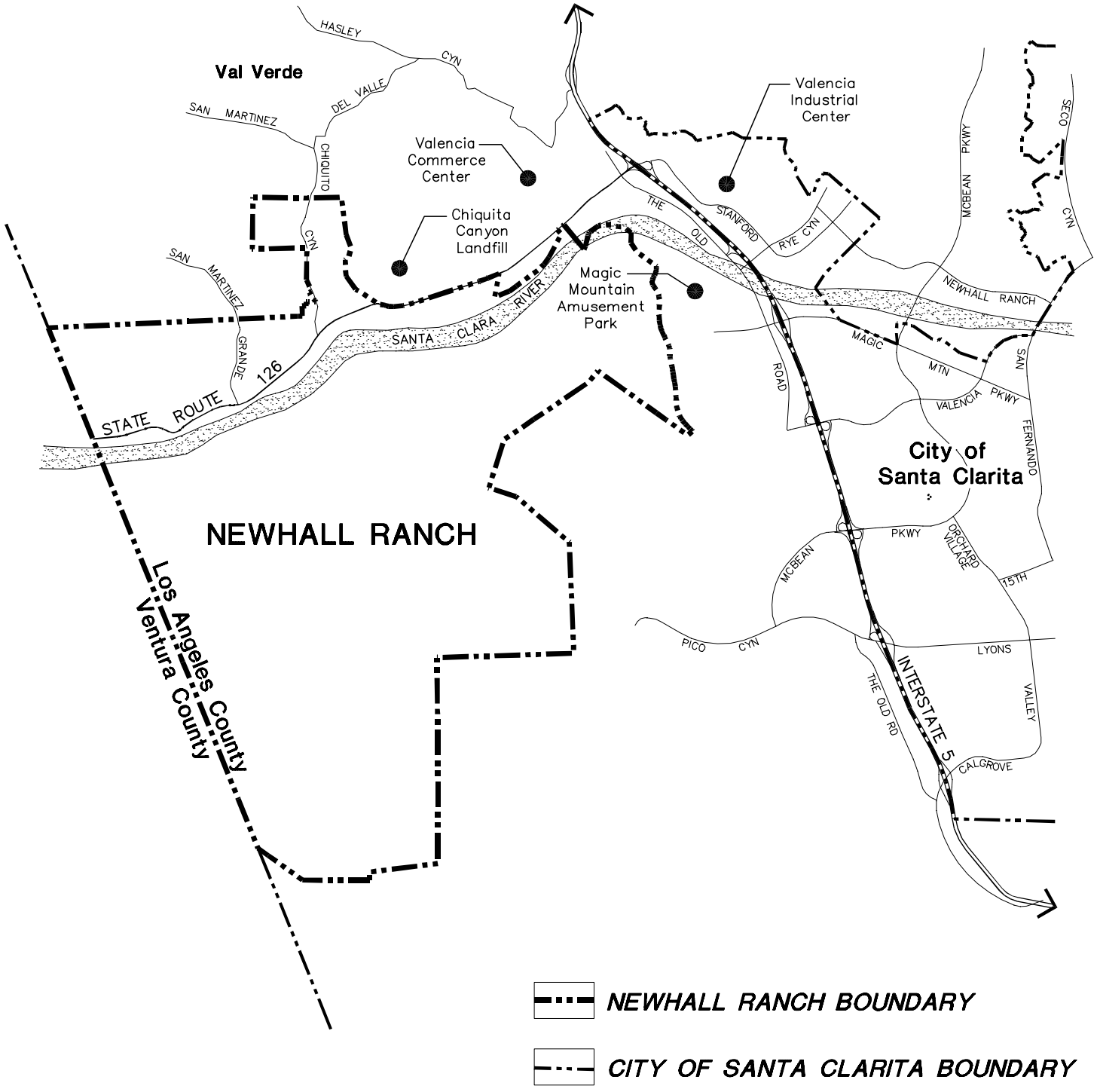
The proposed state action would be the execution of a Master Agreement Regarding Proposed Lake or Streambed Alteration (1603 Agreement) under Section 1603 of the California Fish and Game Code for the activities that would alter the "...natural flow or substantially change the bed, channel, or bank of any river, stream..." and may substantially adversely affect existing fish and wildlife resources. In addition to executing a 1603 Master Agreement, CDFG is required to issue a determination (pursuant to Fish and Game Code 2080.1) of whether the incidental take of species that are listed as threatened or endangered by both the state and federal governments has been authorized by USFWS, and is consistent with the California Endangered Species Act (CESA). Furthermore, CDFG must issue an incidental take permit for all state-only listed species pursuant to Fish and Game Code 2081.

## 1.2 CORPS AND CDFG JURISDICTION CRITERIA

Section 404 of the CWA requires authorization from the Corps for all discharges of dredged or fill material into waters of the U.S., including jurisdictional wetlands. Waters of the United States are defined in the Code of Federal Regulations (33 CFR 328.3), and include all rivers and streams, including ephemeral and intermittent streams. The extent of Corps jurisdiction over non-tidal waters in the absence of adjacent wetlands is defined by the "ordinary high water mark (OHWM)." In 33 CFR Part 329.1, the OHWM is defined as the line on the shore established by the fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank; shelving; changes in the character of the soil; destruction of terrestrial vegetation; or the presence of litter and debris. In general, the OHWM for a stream is usually determined through an examination of the recent physical evidence of surface flow in the stream channel. This evidence may include, but is not limited to, a clear, natural scour line impressed on the bank; recent bank erosion; destruction of

native terrestrial vegetation; and the presence of litter and debris. For many small arid watersheds, the presence of continuous upland vegetation in the stream channel is a good indicator that it only conveys surface flow during extremely large storm events and, as a result, would not usually constitute a jurisdictional water of the U.S. However, the presence of native riparian species in a dry wash is usually a good indicator that the stream channel usually exhibits surface flow during both small and moderate storm events (Corps, 2001).

The CDFG has direct jurisdiction over any activity diverting or obstructing natural flow or modifying the bed, bank, or channel of any river, stream, or lake designated by CDFG in which there is an existing fish or wildlife resource that may be substantially adversely affected, or from which these resources derive benefit, under California Fish and Game Code 1601-1603. CDFG asserts jurisdiction over state water bodies and watercourses that exhibit a defined bed and bank. The upward limit of CDFG jurisdiction is generally the top of the bank, which often extends farther outward than does the Corps' CWA jurisdiction. CDFG 1601 and 1603 codes are similar to the federal CWA 404 permit, but the area of jurisdiction is often determined on a case-by-case basis for the location, nature, and extent of disturbance.




NEWHALL RANCH™
SPECIFIC PLAN

*Prepared For:* Newhall Ranch Company

**FIGURE 1-1**
# SPECIFIC PLAN LOCATION AND BOUNDARIES

Computer Mapping by RRM Systems

**SEPTEMBER 2003**
vicmap2.dwg

The delineation of jurisdictional boundaries within the Newhall Ranch project area began in 1992 with the Corps' jurisdictional survey of Potrero Canyon (Figure 2-1). This survey determined the extent of a portion of the watershed that met the criteria for waters of the U.S. under Section 404 of the CWA. The Corps also conducted a survey of the main stem of the Santa Clara River in 1993 (Figure 2-2).

In April of 1994, CDFG prepared a Stream Alteration Agreement (No. 5-1001-94) for the portion of the Santa Clara River located within the Newhall Ranch project area (Figure 2-3).

Since 1994, Newhall Land staff has continued to work with the Corps and CDFG to define what the jurisdiction within the project area was per each agency's delineation criteria. However, in 2000 these activities ceased while additional environmental analysis was conducted for the Newhall Ranch Specific Plan.

The Los Angeles County Board of Supervisors' approval of the Newhall Ranch Specific Plan on May 27, 2003, triggered the need to resume jurisdiction delineation activities. Since then, Newhall Land and Farming and its consultants have met with agency representatives and conducted several day-long field visits in the project area to look at the tributary drainages to reach concurrence and build upon the previous work regarding their jurisdictional status. Additional meetings have been held with the agencies in an effort to complete this portion of the permitting process. This document contains the results of those activities and serves as a tool to complete the jurisdictional determination process.

## 2.1 METHODS

A variety of methods have been employed during this process to delineate the watersheds located within the Newhall Ranch project boundary, including analysis of historic data, incorporation of previous jurisdictional determinations by the Corps and CDFG, aerial photo interpretation in conjunction with topographic data, and geographic information systems (GIS) technology. Field assessments have also been carried out to verify the delineations completed using digital technology, and to gather additional locational data via the use of global positioning systems (GPS) equipment to further refine the jurisdictional area.

This delineation, as shown on Figures 3-1 and 3-2, reflects a concerted effort to provide a conservative assessment of the Newhall Ranch project area to include all drainages that meet the agencies' criteria for inclusion within their jurisdictional areas. This delineation has been prepared in consultation with agency representatives both in the field and via review of previously prepared delineations of the area.

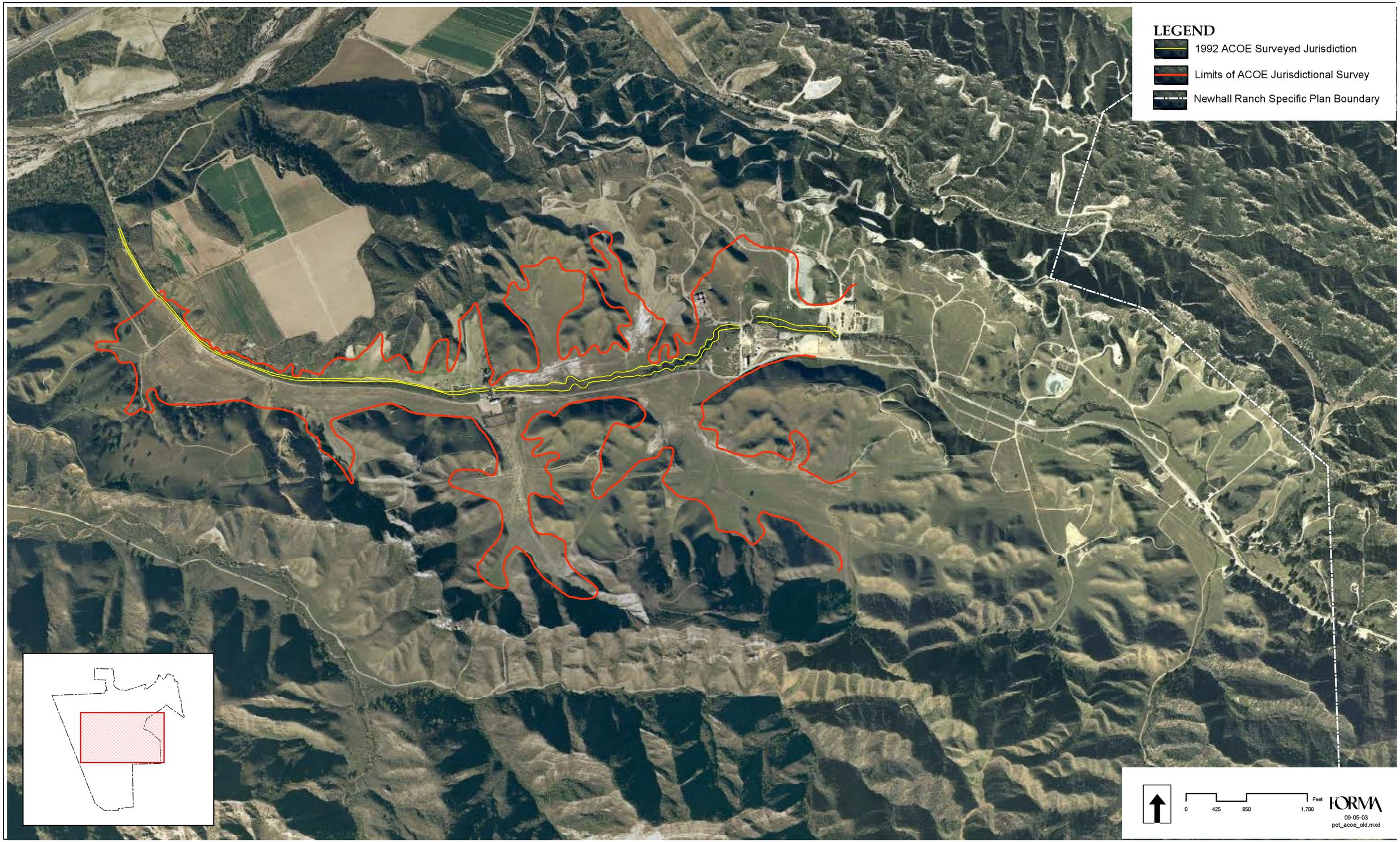



Figure 2-1

**POTRERO CANYON**
**1992 ACOE JURISDICTIONAL SURVEY**
**NOVEMBER 12, 1992**

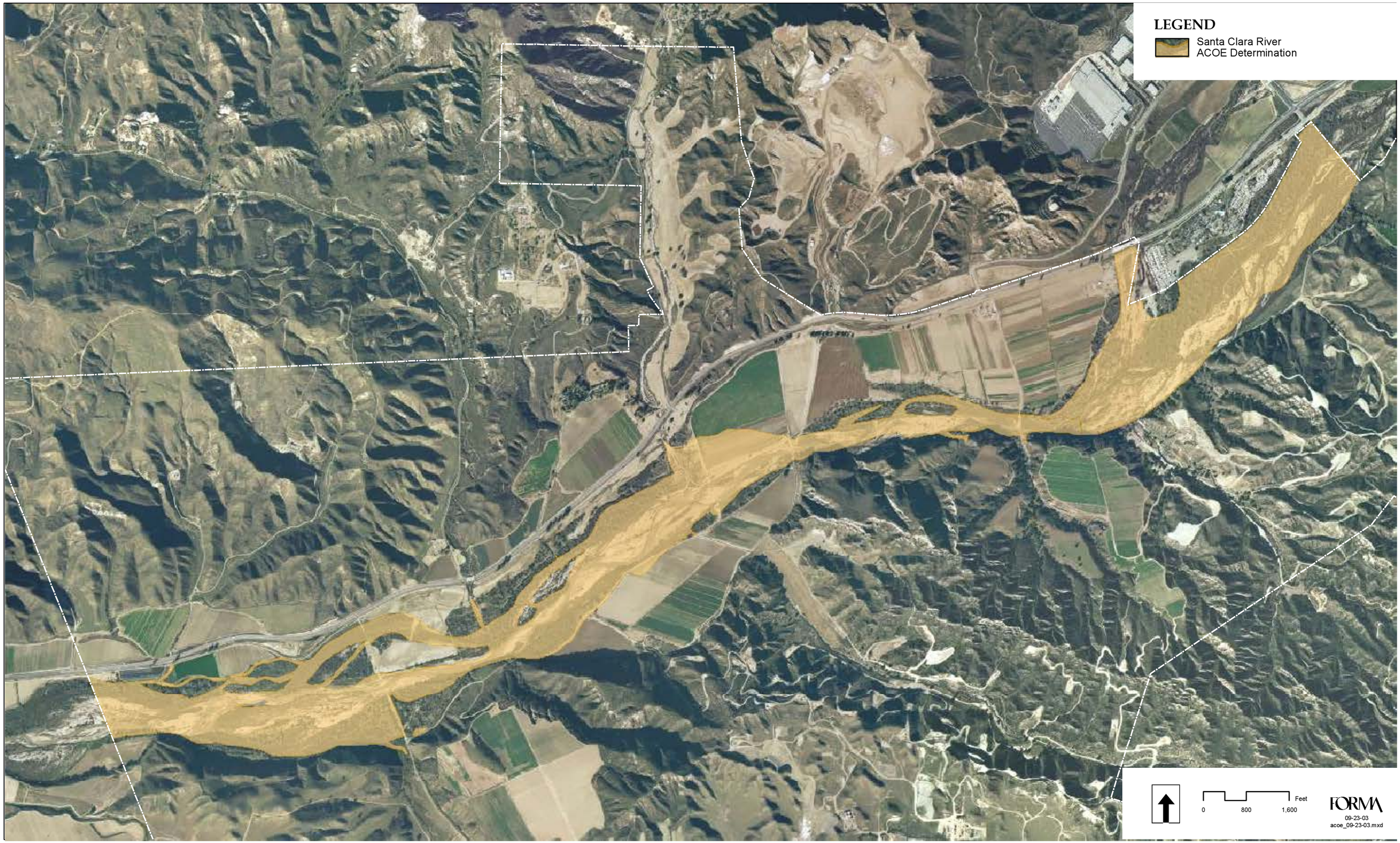



Figure 2-2

**SANTA CLARA RIVER**

**1993 ACOE JURISDICTIONAL DETERMINATION**

**AUGUST 20, 1993**

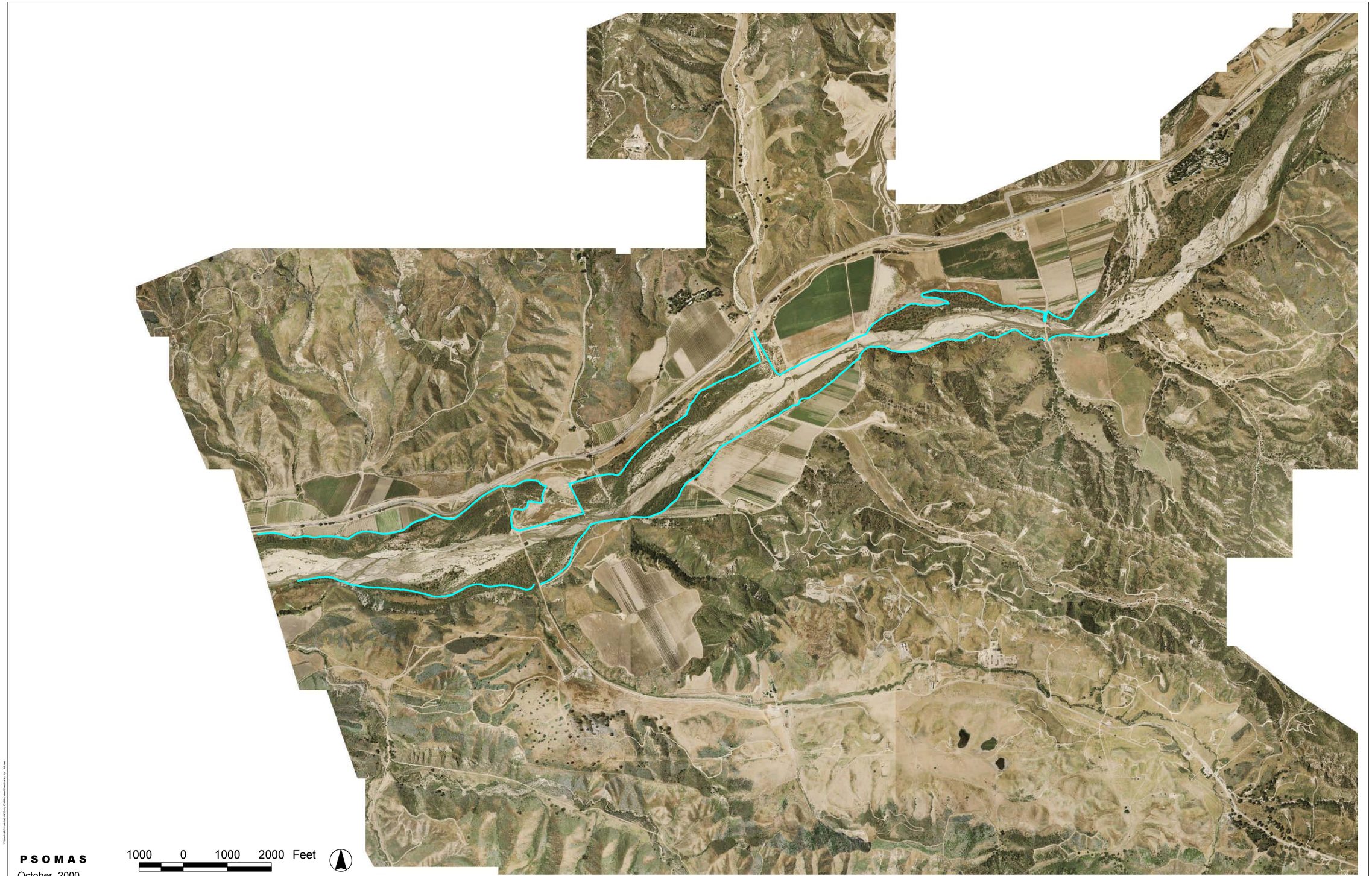



**Figure 2-3**
**CALIFORNIA DEPARTMENT OF FISH AND GAME**
**JURISDICTION DELINEATION**
**APRIL 6, 1994**

This section presents the existing physical, hydrologic/hydraulic, and habitat characteristics of the five major jurisdictional watersheds found within the Newhall Ranch project boundary, including Chiquito Canyon, Long Canyon, San Martinez Grande Canyon, Potrero Canyon, and the main stem of the Santa Clara River. Descriptions of the habitat types found in the other minor watersheds are also included. Figures 3-1 and 3-2 depict the jurisdiction delineation. The purpose of the discussion presented below is to provide the context in which the jurisdiction delineation has been formulated for the OHWM per the Corps' regulatory criteria, and bed and bank per CDFG's regulatory criteria, as described in Sections 1.2 and 2.0.

## 3.1 CHIQUITO CANYON EXISTING CHARACTERISTICS

### 3.1.1 Watershed Description and Characteristics

The 4.8-square mile (3,072-acre) Chiquito Canyon watershed is a tributary to the northern bank of the Santa Clara River within the Newhall Ranch project area (Figure 3-1). Approximately 2,300 acres of Chiquito Canyon, or almost 75 percent of the watershed area, is located upstream or offsite of the Newhall Ranch property boundary. The overall watershed drainage pattern creates a dogleg in which the headwaters flow in a general west to east direction, while the remaining lower portion of the creek flows in a north to south direction, joining the Santa Clara River Valley. The overall watershed boundary has a shape such that the larger portion of the drainage area is tributary in the upper watershed, with the width of the watershed narrowing downstream. The width of the watershed as measured between the watershed ridgelines ranges from approximately 7,000 feet in the upper watershed, to between 4,000 to 2,000 feet in the lower portion of the watershed. The shape of the watershed is important as it influences the time when runoff reaches the outlet or the response of the watershed to rainfall events. The distance from the upper headwaters to the canyon mouth is approximately 24,000 feet with an average overall slope of 0.054. The major natural main stem drainage course within the watershed has an average slope that varies in the upper watershed from 0.043 to approximately 0.029 in the lower reaches of the watershed through the Newhall Ranch property.

The majority of the Chiquito Canyon watershed is characterized by both rugged and steeply developed foothills that have numerous smaller tributary canyons that dissect the watershed, connecting to the narrow alluvial valley associated with the main stem creek. Approximately 90 percent or more of the watershed consists of this rugged foothill topography, with the remainder being the narrow, relatively flat valley floor. The topography for the watershed varies from a maximum elevation of 2,215 feet above mean sea level (amsl) in the headwaters, to a low elevation of 920 feet amsl near the mouth of the canyon in the Santa Clara River Valley.

Generally, the soils in the watershed are characterized as silty clay loams from both the Castaic and Saugus formations. Also, the soils within the Chiquito Canyon watershed can be predominately classified as being in hydrologic soil group C (higher runoff potential) with the exception of areas adjacent to the main stem creek that are Type A (lower runoff potential or higher infiltration rate) and Type B (moderate runoff potential) in the lower reaches. Existing urbanized areas within the watershed that would affect increased impervious areas affecting runoff include the community of Val Verde, which has a population of approximately 1,700 people and approximately 530 housing units covering 211 acres. There are no major flood control improvements or dams within the watershed other than several road culvert/bridge crossings such as that at State Route (SR) 126 that would influence the watershed response to rainfall events. Detailed hydrologic modeling has been performed to evaluate the existing baseline conditions, and the results of the estimated peak discharges for several storm return periods at the downstream canyon mouth are summarized in Table 3-1.

**TABLE 3-1**
**CHIQUITO CANYON EXISTING WATERSHED**
**HYDROLOGY PEAK DISCHARGES**

| Return Period | Canyon Mouth<br>Area = 4.8 sq. miles | Upstream Newhall Boundary<br>Area = 3.6 sq. miles |
|---|---|---|
| 2-year | 216 cfs | 180 cfs |
| 5 – year | 545 cfs | 459 cfs |
| 10-year | 1,252 cfs | 1,074 cfs |
| 20-year | 2,785 cfs | 2,378 cfs |
| 50-year | 3,768 cfs | 3,140 cfs |
| 100-year | 4,663 cfs | 3,917 cfs |

### 3.1.2 Stream Characteristics

The lower portion of Chiquito Canyon is generally located in the canyon floor and follows a mildly sinuous pattern with long linear meanders reflecting the influence of the physiographic features. The active creek is more deeply incised in the lower 2,500 feet of channel upstream from the SR 126 roadway crossing, while the remainder has developed a shallower active channel and wider drainage area. The hydraulics along this portion of the stream are also influenced by three different existing roadway crossing locations that include SR 126, a local access roadway arch crossing, and the Chiquito Canyon Road crossing. The average streambed slope of the channel indicated by the topographic data is relatively constant at approximately 0.029 along the 7,800-foot reach of the lower portion of the stream within the Newhall Ranch boundary (Figure 3-3). Representative cross sections illustrating the geometry of the drainage and the active channel are shown for the lower, middle, and upstream reaches for Chiquito Canyon in (Figures 3-4, 3-5, and 3-6). Detailed hydraulic

modeling of the existing drainage was performed, which indicated that this entire lower reach of Chiquito Canyon was hydraulically "steep," generating higher velocities than a "mild" channel. A brief description of the hydraulic operation for the drainage from the downstream canyon mouth to the upstream Newhall Ranch boundary includes the following:

**Lower Reach**

1. Flows exit the SR 126 multi-span culvert crossing, expanding to the downstream earthen channel system that joins the Santa Clara River. This results in lowered velocity downstream through the expansion area of the valley floor.

2. The arch roadway crossing upstream of SR 126 causes a hydraulic restriction that results in lower localized velocity immediately upstream of this location for medium to large storm events.

**Middle Reach**

3. The incised channel expands upstream of this location to the Chiquito Canyon Road crossing where the flows accelerate near the crossing location.

4. Upstream of this location, the drainage expands over a much wider area in the valley floor but never encompasses the entire valley floor. The average velocity through the middle reach is slightly lower, but still relatively high, ranging from 10 to 22 feet per second (fps).

**Upper Reach**

5. Two areas of natural constrictions influence the remaining upstream portion of the stream located within Newhall Ranch. These constrictions accelerate the flow. This is followed by a large expansion area at the very upstream end of the Newhall Ranch boundary that has very low velocities of approximately 5 fps, as indicated by the high concentration of vegetation within the active channel in this location.

The hydraulic characteristics of the 100-year storm event generated by the hydraulic modeling indicate that:

1. The average depth is approximately 3.8 feet, ranging from 9.5 feet to 1.6 feet

2. The average velocity is approximately 11.9 fps, ranging from 22 fps to 5 fps

3. The width of the stream water surface averages 195 feet, ranging from 285 feet to a minimum of 40 feet at the roadway crossing

Higher velocities generally occur within the contracted and incised portions of the drainage, and lower velocities occur within expansion areas and flatter longitudinal streambed slopes. Lower velocities occur along the fringes of the drainage, while higher velocities are in the deeper portions of a channel section. A comparison of the boundaries for different storm return periods indicates that the majority of the drainage is generally contained within the active channel for the 2-year storm event, which is consistent with the "dominant discharge" or channel-forming discharges found in southern California streams. Larger events expand into the overbank areas, particularly in the middle portion of this part of the stream, while the upper and lower portions are constricted and more incised. During the larger storm events, the wider overbank areas in the mid-portion of the stream encompass active agricultural fields.

### 3.1.3 Biological Characteristics

The area surrounding the channel in Chiquito Canyon within the Newhall Ranch project area is primarily comprised of agricultural land. However, the upstream areas of the watershed outside the project area are dominated by several habitat types including coastal sage scrub (CSS) with patches of chamise chaparral (CC), mixed chaparral (MC), and southern willow scrub (SWS). As noted in the description of the watershed, the upper portion of the drainage at the northern project boundary contains dense vegetation, indicating very low velocity flow during storm events. These habitat types are described as:

**Coastal Sage Scrub (CSS):** Coastal sage scrub habitat is characterized by a dominance of drought-deciduous plant species of the coastal hills. On the Newhall Ranch property, the dominant species that occur in this plant community include California sagebrush (*Artemisia californica*), purple sage (*Salvia leucophylla*), common encelia (*Encelia californica*), California buckwheat (*Eriogonum fasciculatum*), and California broom (*Lotus scoparius*). Coastal sage scrub habitat is distributed in Newhall Ranch on the drier south-facing slopes of the hilly lowlands, and on north-facing slopes and canyons of the Santa Susana Mountains.

**Chamise Chaparral (CC):** Chamise chaparral is characterized by relatively homogeneous stands of the shrub chamise (*Adenostoma fasciculatum*).

**Mixed Chaparral (MC):** The dominant plant species of mixed chaparral communities are comprised of a variety of shrubs at more or less equal densities. Shrub species present in this habitat type on the Newhall Ranch property include hoaryleaf ceanothus (*Ceanothus crassifolius*), coast blue lilac (*Ceanothus tomentosus*), lemonadeberry (*Rhus integrifolia*),

laurel sumac (*Malosma laurina*), toyon (*Heteromeles arbutifolia*), black sage (*Salvia mellifera*), white sage (*Salvia apiana*), and chamise. Understory components are poorly developed due to the dense vegetation cover.

**Southern Willow Scrub (SWS):** This riparian habitat community type is dominated by willow shrubs and small trees, such as arroyo willow (*Salix lasiolepis*), red willow (*Salix laevigata*), and narrow-leaved willow. Mule fat shrubs are often co-dominant with the willows. These thickets often lack a well-developed understory. Southern willow scrub is found along the Santa Clara River along the banks of the low-flow channel where frequent flood disturbance prevents the community from developing into riparian woodland. The habitat is also found in the drainages within Chiquito Canyon, Potrero Canyon, and Salt Creek Canyon. This habitat type includes areas where grazing, clearing, or other factors have opened the willow scrub habitat, allowing either giant cane to invade or an herbaceous layer to develop in the openings.

Like many willow-dominated riparian habitats in California, southern willow scrub has been greatly reduced throughout its range, and provides valuable habitat for many special wildlife species, particularly songbirds.

In contrast to the vegetation found in the upper portion of Chiquito Canyon within the project area, the vegetation found in the downstream portion of the drainage within the project area is quite diverse, supporting scalebroom scrub (SS), coast live oak woodlands (LOW), and Great Basin scrub (GBS). These habitat types are described as:

**Scalebroom Scrub (SS):** Similar to alluvial scrub, scalebroom scrub (*Lepidospartum* scrub) is characterized by homogeneous stands of scalebroom that grow in arroyos and washes. Due to the sparse, nearly pure stands of scalebroom, wildlife use of this community type tends to be low, but similar to the other scrub habitat situated within drainages (i.e., alluvial scrub, Great Basin scrub).

**Coast Live Oak Woodland (LOW):** Coast live oak woodlands are typically located in riparian areas on the drier margins of the drainage where trees of coast live oak (*Quercus agrifolia*) dominate the community. Coast live oak woodlands in the study area occur on the outer, drier portions of the Santa Clara River drainage, especially on the south side of the river near the foothills and slopes of the surrounding hills. Isolated individuals of coast live oak occur on the terraces of drier sites.

**Great Basin Scrub (GBS):** Great basin scrub is characterized by an almost pure stand of big sagebrush (*Artemisia tridentata*). This habitat occurs on Newhall Ranch within the arroyos and on the upper terraces adjacent to the riparian areas along the major drainages.

## 3.2 LONG CANYON EXISTING CHARACTERISTICS

### 3.2.1 Watershed Description and Characteristics

The 1.53-square mile (981-acre) Long Canyon watershed is a tributary to the southern canyon side of the Santa Clara River within the Newhall Ranch project area (Figure 3-1). Approximately 390 acres of Long Canyon, or almost 40 percent of the watershed area, is located upstream and offsite of the Newhall Ranch property boundary. The major drainage course within the watershed flows generally in an easterly to westerly direction, joining the Santa Clara River Valley.

The overall watershed boundary, as defined by the topography and ridgelines, is very long and linear in shape, which influences the watershed response to rainfall. The width of the watershed boundary is fairly uniform with limited variation. The average width measured between ridgelines is approximately 3,000 feet and varies from 2,000 to 3,500 feet. The shape of the watershed has an important effect on the runoff response from the drainage area since it influences when runoff reaches the outlet. A linear watershed such as Long Canyon will distribute the runoff more uniformly over time, spreading the effect of the tributary drainage area and a flattening or spreading of the runoff hydrograph. Another indicator of the watershed shape is the length to width ratio, which has a value of approximately 6, and would describe a long watershed. The distance from the upper headwaters to the canyon mouth outlet is approximately 18,000 feet, with an average overall slope of 0.055. The major natural main stem drainage course within the watershed has an average slope that varies in the upper watershed from 0.039 to approximately 0.026 in the lower reaches of the watershed through the Newhall Ranch property.

The majority of the Long Canyon watershed is characterized by both rugged and steeply developed foothills that have numerous smaller linear tributary canyons that enter the watershed, connecting to the narrow alluvial valley associated with the main stem creek. Approximately 80 percent or more of the watershed consists of the rugged foothill topography, with the remainder being the narrow valley floor. The topography for the watershed varies from a maximum elevation of 1,918 feet amsl in the headwaters, to a low elevation of 934 feet amsl near the mouth of the canyon at the Santa Clara River Valley.

Generally, the soils in the watershed are characterized as silty clay loams from both the Castaic and Saugus formations. Also, the soils within the Long Canyon watershed can be predominately classified as being in hydrologic soil group C (higher runoff potential) with exception of areas adjacent to the main stem creek and canyon floor that are Type A (lower runoff potential) and Type B in the lower reaches. Detailed hydrologic modeling has been performed to evaluate the baseline existing watershed conditions, and the results of the

estimated peak discharges for several storm return periods at the downstream canyon mouth are summarized in the following table:

**TABLE 3-2**
**LONG CANYON EXISTING WATERSHED**
**HYDROLOGY PEAK DISCHARGES**

| Return Period | Canyon Mouth | Upstream Newhall Boundary |
|---|---|---|
| | Area = 1.53 sq. miles | Area = 0.61 sq. miles |
| 2-year | 62 cfs | 30 cfs |
| 5 – year | 159 cfs | 75 cfs |
| 10-year | 367 cfs | 175 cfs |
| 20-year | 862 cfs | 395 cfs |
| 50-year | 1163 cfs | 535 cfs |
| 100-year | 1455 cfs | 663 cfs |

### 3.2.2 Stream Characteristics

The lower Long Canyon drainage extends from the mouth of the canyon at the Santa Clara River to the Newhall Ranch boundary, approximately 8,600 feet upstream of the canyon mouth. The geomorphology of the active stream reflects a long and mildly sinuous alignment with long linear meanders reflecting the influence of the physiographic features. The meanders of the active channel tend to reflect off the canyon walls, and the meanders alternate from the sides of the canyon. The average streambed slope of the channel indicated by the topographic data varies with the upstream portion steeper, and the lower portion tending to flatten out proceeding downstream. The average slopes ranges from 0.039 in the upper reaches to 0.026, with the streambed indicating this average trend through the length of the drainage. There are minor variations in the streambed slope where minor depositional areas are encountered associated with contractions in the creek geometry (Figure 3-7).

The downstream 2,000 feet has a less defined active channel and a much wider canyon floor that reflects a classic alluvial canyon depositional form associated with the sediment delivered from the upper canyon. The canyon widens in this area to approximately 400 feet. The remaining portion of the creek is more incised and the canyon floor is much narrower, averaging 100 feet or less. Representative cross sections illustrating the geometry of the drainage and the active channel are shown for the lower, middle, and upstream reaches for Long Canyon (Figures 3-8, 3-9, and 3-10). There are no manmade structures along the drainage that influence the hydraulic operation.

Detailed hydraulic modeling of the existing drainage was performed and indicated that this entire lower reach of Long Canyon was hydraulically "steep" (Froude numbers greater than a value of 1.0), generating higher velocities than a "mild" channel.

A brief description of the hydraulic operation of this 8,600-foot-length drainage for Long Canyon from the downstream canyon mouth to the upstream Newhall Ranch boundary includes the following:

**Lower Reach**

1. The lower 2,000 feet of drainage near the canyon mouth to the Santa Clara River Valley is very wide, much larger than the upper portion of the drainage by a factor of five, because the channel is less defined and the slopes are flatter, which has resulted in deposits creating a wide valley floor.

2. The wide drainage in the lower reach also reflects much lower velocities across its entire width in the canyon floor.

**Middle Reach**

3. Immediately upstream of the wider valley floor, the channel becomes more incised and deeper.

4. This mid-portion of the stream follows an extremely linear alignment, and the width is very constant with very limited overbank flows.

**Upper Reach**

5. Continuing upstream in the upper portion of the stream are a series of contraction areas that results in larger drainage expansions resulting in some depositional areas.

6. The upper portion of the drainage generally extends across the entire canyon bottom, but the canyon is also narrower than farther downstream.

7. The upper canyon is slightly wider than the mid-portion because there are some overbank flows, and this portion is less deeply incised than the mid-portion of the canyon.

The hydraulic characteristics of the 100-year storm event generated by the hydraulic modeling indicates that:

1. The average depth is approximately 2.4 feet, ranging from 6.7 feet to 0.7 feet

2. The average velocity is approximately 7.8 fps, ranging form 17 fps to 3.5 fps

3. The width of the stream water surface averages 140 feet, ranging from 420 feet to 29 feet at a constriction in the mid-portion of the channel

Higher velocities generally occur within the contracted and incised portions of the drainage, with lower velocities in expansion areas and flatter longitudinal streambed slopes. The wider drainage areas near the mouth of the canyon reflect the sediment deposits that have occurred in the fan-type formation in the canyon floor. Lower velocities occur along the fringes of the drainage, while the higher velocities occur in the deeper portions of a channel section.

### 3.2.3 Biological Characteristics

Both sides of this watershed contain habitat types comprised primarily of coastal sage scrub (CSS), with small pockets of chamise chaparral (CC), and grassland (G) present. Within the stream channel, there is a mixture of grassland, elderberry scrub (ES), live oak woodland (LOW), alluvial scrub (AS), great basin scrub (GBS), mixed chaparral (MC), and alluvial scrub. Habitat types not described in Section 3.1.3 are described as:

**Grassland (G):** The grassland areas of the Newhall Ranch property are dominated by non-native grasses, such as ripgut grass, smooth brome, foxtail chess, and downy brome (*Bromus diandrus, B. hordaceous, B. madritensis* ssp. *rubens*, and *B. tectorum*, respectively); wild oats and slender wild oats (*Avena fatua* and *A. barbata*, respectively); hare barley (*Hordeum leporinum*); and rattail fescue (*Vulpia myorus* var. *hirsuta*). Some native and non-native herbaceous species that occur among the grasses are dove weed (*Eremocarpus setigerus*), common cryptantha (*Cryptantha intermedia*), purple owl's clover (*Castilleja exserta*), white-stemmed filaree (*Erodium cicutarium*), short-pod mustard (*Hirschfeldia incana*), radish (*Rhaphanus sativa*), cheeseweed (*Malva parviflora*), and London rocket (*Sisymbrium irio*).

**Elderberry Scrub (ES):** Thickets of blue elderberry (*Sambucus mexicana*) characterize this community type. It generally occurs on the Newhall Ranch property in association with riparian and scrub communities. Elderberry scrub is not a common vegetation type and has been greatly reduced throughout its range, particularly in southern California.

**Alluvial Scrub (AS):** Alluvial scrub habitat is characterized as a mixture of shrubs that colonize alluvial materials within intermittent creeks, arroyos, and the drier terraces within large washes. Alluvial scrub typically occurs adjacent to and intergrades with sage scrub communities on higher ground, and with riparian communities in the drainage. These sandy-

gravelly flood-deposited soils have a deeper permanent water table and flood infrequently; thus, they support a primarily upland plant association. Plant species observed in this habitat type on the ranch include big sagebrush, scalebroom (*Lepidospartum squamatum*), blue elderberry, big saltbush (*Atriplex lentiformis*), and squaw bush (*Rhus trilobata*), with some areas having high densities of big sagebrush. There are generally three phases of alluvial scrub growth, which are directly related to elapsed time since the last scouring flood event: pioneer, intermediate, and mature. Alluvial scrub is situated within the drier portions of the arroyos and washes.

## 3.3 SAN MARTINEZ GRANDE CANYON EXISTING CHARACTERISTICS

### 3.3.1 Watershed Description and Characteristics

The 3.3-square mile (2,111-acre) San Martinez Grande Canyon watershed is a tributary to the northern bank of the Santa Clara River within the Newhall Ranch project area (Figure 3-1). Approximately 200 acres of San Martinez Grande Canyon, or only 10 percent of the watershed area, is located within the Newhall Ranch property boundary, with the majority being upstream or offsite. The drainage in the headwaters flows generally west to east, while the remaining lower portion of the creek flows north to south, similar in alignment to Chiquito Canyon and joining the Santa Clara River Valley.

The shape of the overall watershed has a dogleg-type appearance similar to Chiquito Canyon, which is the adjacent watershed. The overall watershed boundary, based upon the topography and ridgelines, develops a shape such that a larger portion of the drainage area is tributary in the mid-portion of the watershed. The width of the watershed narrows in both the upstream and downstream tails of the watershed while the central portion of the watershed widens to approximately 6,800 feet in width. The shape of the watershed is important since it influences when runoff reaches the outlet. Although the watershed is relatively long, the large width in the central portion of the watershed will result in delivering more runoff in a shorter amount of time, and with less influence from the upper watershed drainage area.

The distance from the upper headwaters to the canyon mouth is approximately 20,000 feet with an average overall slope of 0.059. The major natural main stem drainage course within the watershed has an average slope in the lower reaches of the watershed through the Newhall Ranch property of approximately 0.022 (Figure 3-11).

The majority of the San Martinez Grande Canyon watershed is characterized by both rugged and steeply developed foothills that have numerous smaller tributary canyons that dissect the watershed, connecting to the narrow alluvial valley associated with the main stem creek. Approximately 90 percent or more of the watershed consists of the rugged foothill

topography with the remainder being the narrow valley floor. The topography for the watershed varies from a maximum elevation of 2,062 feet amsl in the headwaters, to a low elevation of 890 feet amsl near the mouth of the canyon at the Santa Clara River Valley.

Generally, the soils in the watershed are characterized as silty clay loams from both the Castaic and Saugus formations. Also, the soils within the San Martinez Grande Canyon watershed can be predominately classified as being in hydrologic soil group C (higher runoff potential) with exception of areas adjacent to the main stem creek that are Type A (lower runoff potential) and Type B in the lower reaches.

There are no major flood control improvements or dams within the watershed, other than several road culvert/bridge crossings such as the SR 126, which would influence the watershed response to rainfall events. Detailed hydrologic modeling has been performed to evaluate the baseline existing watershed conditions, and the results of the peak discharges for several storm return periods at the downstream canyon mouth are summarized in Table 3-3.

**TABLE 3-3**
**SAN MARTINEZ GRANDE CANYON**
**EXISTING WATERSHED HYDROLOGY**

| Return Period | Canyon Mouth | Upstream Newhall Boundary |
|---|---|---|
| | Area = 3.3 sq. miles | Area = 2.9 sq. miles |
| 2-year | 116 cfs | 105 cfs |
| 5-year | 304 cfs | 276 cfs |
| 10-year | 719 cfs | 655 cfs |
| 20-year | 1727 cfs | 1564 cfs |
| 50-year | 2346 cfs | 2152 cfs |
| 100-year | 2951 cfs | 2653 cfs |

### 3.3.2 Stream Characteristics

The lower San Martinez Grande Canyon Creek extends approximately 4,800 feet upstream from the canyon mouth at the Santa Clara River Valley to the Newhall Ranch boundary. The geomorphology of the active creek reflects a more highly variable and sinuous alignment that indicates the influence of the physical and topographic features. There is also a much greater variation of the active channel geometry (i.e. width and depth) along this relatively short reach of channel. Representative cross sections illustrating the geometry of the drainage and the active channel are shown for the lower, middle, and upstream reaches of San Martinez Grande Canyon (Figures 3-12, 3-13, and 3-14). The active portion of the creek is more deeply incised below the canyon valley floor. The drainage is generally entirely contained within the active creek banks, and there is little overbank flow. The changes in creek

geometry and form may indicate influences from the upper watershed that affect the sediment delivery.

The changes in channel geometry are also reflected in coincidental variations of the streambed slope. The slope variations are generally higher in the contractions of the channel geometry and flatter in the expansion areas, upstream and downstream. The average streambed slope of the channel indicated by the topographic data is approximately 0.022. The average slope ranges are from 0.08 in the contraction to 0.005 in the wider expansion zones located generally upstream of the contractions. The most upstream 500 feet near the Newhall Ranch project boundary has a less defined active channel and a much wider canyon floor, which reflects depositional area, and which contains increased riparian vegetation. The only manmade structure that influences the hydraulic operation is the roadway culvert crossing for SR 126, but this appears to have sufficient hydraulic capacity with minimal effects to the drainage.

Detailed hydraulic modeling of the existing drainage was performed and indicated that approximately 50 percent of the lower reach of the San Martinez Grande Canyon was hydraulically "steep" (Froude numbers greater than a value of 1.0), while the remainder of the canyon, primarily the upper portion near the Newhall Ranch boundary, was hydraulically a "mild" channel. The hydraulic analysis also indicated at several locations the influence of contractions in the channel geometry, which controlled the hydraulics upstream and downstream of these locations. A brief description of the hydraulic operation of this 4,800-foot length drainage for San Martinez Canyon from the downstream canyon mouth to the upstream Newhall Ranch boundary includes the following:

**Lower Reach**

1. The immediate downstream portion of the drainage near the canyon mouth to the Santa Clara River is associated with a more prismatic earthen section that connects to the SR 126 roadway crossing, and velocities downstream of the bridge increase from its influence.

2. Upstream of the bridge crossing, the channel significantly widens into a large incised erosional feature that reduces the velocities.

3. Continuing upstream into the canyon mouth, the creek geometry contracts and the velocities accelerate in this area along with the streambed slopes being steeper.

4. Continuing still through the topographic canyon mouth feature where the canyon narrows, the creek passes through several additional contractions and large expansion

zones, which is also indicated by the zones of riparian vegetation that occur in the expansion zones.

5. The velocities in the contractions can range from 12 fps to 16 fps, while the expansion areas are in the 6 fps range.

**Middle Reach**

6. Continuing through the mid-portion of the canyon, the channel is fairly incised with the velocities averaging from 9 fps to 12 fps and encountering some variation in the channel geometry.

**Upper Reach**

7. The upstream 500 to 800 feet of the drainage significantly widens, which reflects the limited channel depth or incision, and the wider alluvial deposits that appear to have occurred from a significant contraction in the channel geometry influencing the upstream hydraulic operation.

The hydraulic characteristics of the 100-year storm event generated by the hydraulic modeling indicates that:

1. The average depth is approximately 6.4 feet, ranging from 15 feet to 2.9 feet

2. The average velocity is approximately 8.9 fps, ranging form 19 fps to 2.2 fps

3. The width of the creek water surface averages 110 feet, ranging from 220 feet to 42 feet consistent with the various channel constrictions

Higher velocities generally occur within the contracted and incised portions of the drainage and lower velocities within expansion areas and flatter longitudinal streambed slopes. Lower velocities occur along the fringes of the drainage, while the higher velocities are in the deeper portions of a channel section.

### 3.3.3 Biological Characteristics

The San Martinez Grande watershed contains a diverse variety of habitats including Great Basin scrub (GBS), mule fat scrub (MFS), coastal sage scrub (CSS), and some grassland (G). Two small patches of elderberry scrub (ES) exist near the northern boundary of the project footprint. The area just upstream of the Santa Clara River confluence is dominated by arrow

weed scrub (AWS). San Fernando Valley spineflower was also found to be present within this watershed. Habitat types not previously described in Sections 3.1.3 or 3.2.3 include:

**Mule Fat Scrub:** Mule fat scrub is typically a mature riparian habitat dominated by mule fat shrubs (*Baccharis salicifolia*). Co-dominant plant species include narrow-leaved willow (*Salix exigua*), giant cane (*Arundo donax*), and some tamarisk (*Tamarix* sp.). This habitat type is found along the Santa Clara River on upper terraces and on some levees on the ranch property.

**Arrow Weed Scrub (AWS):** This shrub-dominated plant community is characterized by a nearly pure stand of arrow weed shrubs. Big saltbush (*Atriplex lentiformis*) and mule fat shrubs are often co-dominants in more open stands, especially along road cuts. Wet areas where this habitat has developed may also have some freshwater marsh species occurring with the arrow weed. On Newhall Ranch, this plant community is located on the upper Santa Clara River terraces at the edges of woodlands and along the manufactured slopes near SR-126.

A species of particular interest in this watershed is the San Fernando Valley Spineflower (*Chorizanthe parryi* var. *Fernandina*), which is a state-listed endangered species, a candidate for federal listing, and found on List 1B of the California Native Plant Society (CNPS) Inventory. This species was thought to be extinct until its rediscovery at Ahmanson Ranch in Ventura County in 1999. This species was previously thought to occur in sandy to gravelly soils of washes, riverbeds, and upland areas, primarily on the margins of the San Fernando Valley at the base of the Santa Susana Mountains, San Gabriel Mountains, and the Simi Hills. Subsequent to that 1999 rediscovery, this species has been identified at several locations within the Newhall Ranch project boundary, including the San Martinez Grande Canyon (Dudek, 2002).

The northern, upstream reaches of Mid Martinez Canyon drainage are dominated by coastal sage scrub (CSS) on the west bank, and by grassland (G) on the east. The channel then flows through areas of alluvial scrub and coastal sage scrub, and through agricultural fields (AG) to the Santa Clara River.

## 3.4 POTRERO CANYON

### 3.4.1 Watershed Description and Characteristics

The 4.59-square mile (2,936-acre) Potrero Canyon watershed is a tributary to the northern bank of the Santa Clara River within Newhall Ranch (Figure 3-2). The overall watershed drainage pattern is in an east to west direction to the river outlet. The watershed is long compared to the width of the watershed, and the average length-to-width ratio is approximately 3.8. The width of the watershed varies from 4,500 feet to 8,300 feet, as defined by the topographic ridgelines between the adjacent canyons. The larger width of the watershed and greater tributary area occurs in the upper watershed. The shape of the watershed is important since it influences when runoff reaches the outlet. This particular watershed configuration will dominate peak discharges through delaying the runoff but increasing the discharge at the end of the hydrograph. The distance from the upper headwaters to the canyon mouth is approximately 23,000 feet with an average overall slope of 0.045. The major natural main stem drainage course within the watershed has an average slope of approximately 0.02 (Figure 3-15).

The majority of the Potrero Canyon watershed is characterized by both rugged and steeply developed foothills that have numerous smaller tributary canyons that dissect the watershed, connecting to the narrow alluvial valley associated with the main stem creek. There are approximately seven of these smaller tributaries that contribute significant drainage area and function as separate watershed streams. Approximately 65 percent or more of the watershed consists of the rugged foothill topography, with the remainder being the wider valley floor. The topography for the watershed varies from a maximum elevation of 1916 feet amsl in the headwaters, to a low elevation of 866 feet amsl near the mouth of the canyon at the Santa Clara River valley.

Generally, the soils in the watershed are characterized as silty clay loams from both the Castiac and Saugus formations. Also, the soils within the Potrero Canyon watershed can be predominately classified as being in hydrologic soil group C (higher runoff potential) with exception of areas adjacent to the main stem creek that are Type A (lower runoff potential) and Type B in the lower reaches.

Detailed hydrologic modeling has been performed to evaluate the baseline existing watershed conditions, and the results the peak discharges for several storm return periods at the downstream canyon mouth are summarized in Table 3-4.

**TABLE 3-4**
**POTRERO CANYON EXISTING WATERSHED HYDROLOGY**

| Return Period | Canyon Mouth | Upper Drainage |
|---|---|---|
| | Area = 4.59 sq. miles | Area = 1.07 sq. miles |
| 2-year | 133 cfs | 70 cfs |
| 5-year | 337 cfs | 183 cfs |
| 10-year | 774 cfs | 400 cfs |
| 20-year | 1853 cfs | 851 cfs |
| 50-year | 2619 cfs | 1115 cfs |
| 100-year | 3309 cfs | 1363 cfs |

### 3.4.2 Stream Characteristics

The portion of Potrero Canyon Creek that was evaluated consisted of the lower 18,300 feet extending upstream from the canyon mouth at the Santa Clara River Valley. The lower 50 percent of Potrero Canyon has been influenced through manmade activities that had relocated the existing active creek into an engineered earthen channel along the northern side of the canyon. The remaining upper portion of the drainage does not reflect as much of this influence since there appeared to be less historical farming operations and impact to the natural active creek channel. However, the active channel has limited hydraulic capacity, particularly in the lower portion of the canyon, which results in overtopping and creation of a secondary sheet flow on the southern side of the canyon, consistent with the large meadow area. The engineered portions of the active channel follow a very linear alignment, and the channel is generally located adjacent to the roadway along the canyon floor. The canyon floor is characterized by a very large and flat width in the valley as compared to the other tributary canyon watersheds. The drainage characteristics and trends also reflect that of a wide, stable valley system, with little tendency to deeply incise beyond the minor active channel. Representative cross sections illustrating the geometry of the drainage and the active channel are shown for the lower, middle, and upstream reaches for Potrero Canyon (Figures 3-16, 3-17, and 3-18). The average streambed slope indicated by the topographic data is relatively constant along the majority of the streambed at approximately 0.020, while the downstream 3,000 feet through the canyon mouth increase to a slope of 0.038. This relatively constant slope is also reflected in the reduced drainage width near the canyon mouth, and in higher velocities.

Detailed hydraulic modeling of the existing creek was performed and indicated that this entire lower reach of Potrero Canyon was hydraulically "steep," generating higher velocities than a "mild" channel. A brief description of the hydraulic operation of the drainage from the downstream canyon mouth to upstream along the 18,300 feet reach includes the following:

**Lower Reach**

1. The majority of the storm event flows through the lower 3,000 feet of the canyon to the Santa Clara River Valley are conveyed on the southerly side of the canyon and not in the active channel on the northern side because of its limited capacity.

2. The drainage significantly widens upstream of the steeper portion near the canyon mouth, but is still separated from the active channel on the opposite side.

3. The wide drainage area reflects low velocities in the overbank area of the valley floor.

**Middle Reach**

4. Continuing upstream, the canyon narrows slightly and reduces the width of the drainage, which increases the velocities and depths.

5. Within this lower mid portion of the drainage, the active channel and sheet flow area on the southerly side of the canyon rejoin.

6. The drainage then follows a rather linear alignment through the mid portion of the canyon with fairly constant widths.

**Upper Reach**

7. Through the oil field area, the drainage width varies with several contraction and large expansion areas, as indicated by historical deposition and by the variation in average velocity.

8. Continuing through the upper portion of the drainage, it becomes more incised and is generally fully contained in the active channel.

9. The last remaining 1,000 feet of the drainage widens significantly since the channel is not well defined or incised, which reduces the velocities.

The hydraulic characteristics of the 100-year storm event generated by the hydraulic modeling indicates that:

1. The average depth is approximately 2.9 feet, ranging from 6.5 feet to 0.5 feet

2. The average velocity is approximately 7.7 fps, ranging from 19.4 fps to 3.6 fps
3. The width of the creek water surface averages 300 feet, ranging from 840 feet to 35 feet at the roadway crossing

Higher velocities generally occur within the contracted and incised portions of the drainage, and lower velocities occur within expansion areas and flatter longitudinal streambed slopes. Along the fringes of the drainage, lower velocities occur while the higher velocities are in the deeper portions of a channel section.

### 3.4.3 Biological Characteristics

Habitat types in the Potrero Canyon drainage are comprised primarily of grassland (G) and coastal sage scrub (CSS), although a wide variety of habitat is represented. Live oak woodland (LOW), mule fat scrub (MFS), great basin scrub (GBS), mesic meadow (MM), elderberry scrub (ES), and valley oak woodland (VOW) are all present within the Potrero watershed, along with agricultural land (AG). The habitat type not previously described in Sections 3.1.3, 3.2.3, and 3.3.3 is:

**Mesic Meadow:** Mesic meadows form in grassland areas where seeps, springs, or groundwater surfaces are present. In these areas, soils remain saturated most of the year. Plant species found in mesic meadows can tolerate the moist conditions for prolonged periods. Herbaceous species present include yerba mansa (*Anemopsis californica*), curly dock (*Rumex crispus*), spike rush (*Eleocharis* sp.), annual beard grass (*Polypogon monspeliensis*), rush (*Juncus* sp.), and saltgrass (*Distichlis spicata*). Mesic meadows on the ranch are located within Potrero Creek, on an unnamed drainage at the east end of Middle Potrero Canyon, and in Via Canyon.

## 3.5 SALT CREEK

### 3.5.1 Watershed Description and Characteristics

The Salt Creek watershed encompasses approximately 5,816 acres (Figure 3-2). A steep ridgeline between Potrero Canyon and Salt Creek Canyon/Grave Canyon form the eastern limit of the Salt Creek watershed in Los Angeles County. The ridgeline of the Santa Susana Mountains (3,100 feet amsl) forms the southern limits of the Salt Creek watershed in both Los Angeles and Ventura Counties. The western limit of the Salt Creek watershed is in Ventura County, and is formed by a ridgeline that separates Tapo Canyon and Salt Creek Canyon. The Salt Creek watershed terminates to the north where Salt Creek Canyon merges with the Santa Clara River Valley in Ventura County (825 feet amsl).

### 3.5.2 Creek Characteristics

While the Salt Creek drainage is one of the largest found within the boundaries of the Newhall Ranch project area, it was not subjected to detailed hydrologic/hydraulic modeling because it is contained within the High Country set-aside where no development will occur. Any potential impacts would be limited in nature and related to access and recreational use of the High Country, and might include footbridges and maintenance of existing farm roads. Construction of a small visitors' center located outside the jurisdictional area would serve as the gateway into the High Country. Otherwise, this area will be maintained in its present state in perpetuity.

### 3.5.3 Biological Characteristics

The vast majority of this watershed is covered by coastal sage scrub (CSS). Agriculture (AG), great basin scrub (GBS), and grassland (G) habitat types comprise most of the remaining area, although valley oak woodland (VOW), mule fat scrub (MFS), alluvial scrub (AS), and live oak woodland (LOW) are present in small patches.

At the confluence of the middle and east forks of Salt Creek, wetland conditions are present and persist from approximately 750 feet upstream to 700 feet downstream of the confluence. The total area of this wetland is approximately 8.5 acres, and dominant flora include saltgrass (*Distichlis spicata*, 50-60 percent cover), mulefat (*Baccharis salcifolia*, 30-40 percent cover), Arroyo willow (*Salix lasiolepis*), and the sedge, *Scirpus americanus*. In the vicinity of the wetland area, the vast majority of the vegetation is native, and very few weeds are present. Occasional weeds located in the wet portion of the drainage included rabbit's foot grass (*Polypogon spp.*) and tamarisk (*Tamarix spp.*). Other weeds, including tree tobacco, yellowstar thistle, prickly wild lettuce, black mustard, white sweet clover, and fivehook bassia, are primarily located near the road, and cover less than 5 percent of the area sampled. As the Salt Creek drainage has been designated a permanent open space, no impacts to this wetland area are anticipated from the proposed project.

## 3.6 OTHER JURISDICTIONAL DRAINAGES

The Newhall Ranch project area contains several other smaller jurisdictional tributary watersheds comprised of small, ephemeral drainages. Habitat types found in each of these drainages are briefly described below (Figures 3-1 and 3-2).

**Homestead Canyon:** This watershed is dominated by coastal sage scrub (CSS), but also contains one thin strip of great basin scrub (GBS) lining the stream channel near the lower end, and patches of dispersed grassland (G).

**Unnamed Drainage:** This drainage is located to the west of Homestead Canyon and abutting the western project boundary north of SR 126 with only a very short segment of it found within the project footprint. The drainage itself runs through grassland (G) and great basin scrub (GBS), although the watershed is dominated by coastal sage scrub (CSS). The drainage also includes one small patch of agricultural land (AG) on the downstream end.

**Off-Haul Canyon:** The upper reaches of Off-Haul Canyon drainage contain a mixture of coastal sage scrub (CSS) and alluvial scrub (AS). Lower areas, in the vicinity of State Route 126, are dominated by agricultural land (AG).

**Humble Canyon:** The habitat types found in the upper reaches of the Humble Canyon watershed consist primarily of mixed chaparral (MC), grassland (G), and alluvial scrub (AS). The lower portions of the watershed contain a mixture of alluvial scrub, live oak woodland (LOW), coastal sage scrub (CSS) and, in the area directly adjacent to the Santa Clara River, Southern Willow Scrub (SWS). San Fernando Valley spineflower populations are also present within this watershed.

**Unnamed Drainages (2):** These two adjacent unnamed drainages are located between Long and Humble canyons. They are dominated by coastal sage scrub (CSS) with pockets of mixed chaparral (MC) sparsely interspersed. At the canyon mouths, along the south bank of the Santa Clara River, live oak woodland (LOW) and great basin scrub (GBS) are also present.

**Ayres Canyon:** This stream is lined with southern willow scrub (SWS) and alluvial scrub (AS), with some live oak woodland (LOW) present along the south bank. Habitat types within this watershed are dominated by coastal sage scrub (CSS) and grassland (G).

**Lion Canyon:** The upper reaches of the Lion Canyon watershed, which contains several branches, contains mostly mixed chaparral (MC) and coastal sage scrub (CSS). Along the channel, alluvial scrub (AS), live oak woodland (LOW), grassland (G), scalebroom scrub (SS), and chamise chaparral (CC) are present. The two easternmost branches of this drainage also contain great basin scrub (GBS), which is absent from the watershed of the western branch.

**Middle Canyon:** This watershed is dominated by coastal sage scrub (CSS), with small pockets of mixed chaparral (MC) and grassland (G). The stream channel flows through grassland, agricultural areas (AG), alluvial scrub (AS), and live oak woodland (LOW). A freshwater marsh is present at the Santa Clara River confluence. San Fernando Valley spineflower populations are also present within this watershed.

**Exxon Canyon:** This drainage is dominated by coastal sage scrub (CSS), live oak woodland (LOW), and mixed chaparral (MC). On both branches, alluvial scrub (AS) is also present along the stream channel.

**Magic Mountain Canyon:** The small segment of this stream that passes through the project area is surrounded by coastal sage scrub (CSS) and great basin scrub (GBS), with one pocket of mixed chaparral (MC) and one pocket of agricultural land (AG).

**Dead-End Canyon:** This watershed consists almost exclusively of coastal sage scrub (CSS), although isolated pockets of grassland (G), elderberry scrub (ES), mixed chaparral (MC), and live oak woodland (LOW) are present as well.

## 3.7 SANTA CLARA RIVER

This description of the hydrologic characteristics of the Santa Clara River is derived from the Draft Additional Analysis, Vol. 1, April 2001, Section 2.3-4, prepared for Los Angeles County Department of Regional Planning (Impact Sciences, 2002).

### 3.7.1 Watershed Description and Characteristics

The Santa Clara River (SCR) is the largest watercourse in the project area, and all other drainages within the project area are tributary to this river (Figure 3-1). The reach of the Santa Clara River within the Specific Plan area has year-round flows created by tertiary treated effluent discharges from two upstream water reclamation plants operated by the Sanitation Districts of Los Angeles County, rising ground water, and from storm water runoff. Storm flows that occur during winter months due to storm water runoff, and these flows fluctuate significantly from year to year. During the summer months, short-term releases from Castaic Lake reach the river via Castaic Creek, which joins the river upstream of the Newhall Ranch project area.

The average discharges for floods of different return events (2-year, 5-year, 10-year, 20-year, 50-year, and 100-year) at the upstream and downstream ends of the project area are given in Table 3-5.

**TABLE 3-5**
**EXISTING CONDITIONS: DISCHARGES IN SCR**
**AT NEWHALL RANCH PROJECT AREA**

| Return Period | Offsite, Between Newhall Ranch Project Area and Castaic Creek | Downstream End of Newhall Ranch Project Area at Los Angeles County Line |
|---|---|---|
| 2-Year | 2,527 cfs | 2,600 cfs |
| 5-Year | 8,232 cfs | 8,480 cfs |
| 10-Year | 14,942 cfs | 15,400 cfs |
| 20-Year | 24,157 cfs | 24,900 cfs |
| 50-Year | 41,141 cfs | 42,400 cfs |
| 100-Year | 58,207 cfs | 60,000 cfs |

### 3.7.2 River Characteristics

The area of ground surface covered by water in the Newhall Ranch project area between the Commerce Center Drive bridge and a point 4 miles east of the County line during different return events is shown in Table 3-6. This area increases as the discharge and associated water level increase. The width of the active river channel (area inundated by a two-year storm event) within the Newhall Ranch project area varies from 200 to 800 feet. During a 100-year storm event, the maximum width of the inundated river channel is 2,200 feet.

The average width of the low-flow channel during summer months is approximately 50 to 100 feet, with an average depth of about 1 foot. The low flow channel through the project area has a low to moderate sinuosity. Approximately half of this reach is contained within a single channel, while the remainder consists of braided channels and broad, shallow flows.

#### 3.7.2.1 Water Velocity and Depth

Water velocity and depth along the river also increase with higher discharges (i.e., flows). An example of this relationship is provided in Table 3-7 for a location along the river in the Newhall Ranch project area (Figure 3-19). These data indicate that velocities, measured in fps, more than double from the 2-year to the 100-year storm event, while water depth increases three-fold. In contrast, discharge increases thirty-fold from the 2-year to the 100-year storm event.

**TABLE 3-6**
**SCR EXISTING CONDITIONS: FLOODED AREA DURING DIFFERENT RETURN EVENTS**

| Return Period | Newhall Ranch Project Area, Between Commerce Center Drive and LA County Line | From County Line to Point 4 Miles Downstream in Ventura County |
|---|---|---|
| 2-Year | 246 acres | 86 acres |
| 5-Year | 309 acres | 131 acres |
| 10-Year | 361 acres | 160 acres |
| 20-Year | 482 acres | 198.5 acres |
| 50-Year | 664 acres | 257 acres |
| 100-Year | 766 acres | 298 acres |

Velocity and water depth increases do not correspond to the discharge increases because the wide river channel allows flow to spread out as discharge volumes increase.

**TABLE 3-7**
**EXAMPLE OF INCREASING DEPTH AND VELOCITY WITH DISCHARGE – EXISTING CONDITIONS AT THE COUNTY LINE**

| Return Event (Years) | Discharge (cfs) | Average Water Depth (ft) | Average Water Velocity (fps) |
|---|---|---|---|
| 2 | 2,000 | 2.34 | 5.32 |
| 5 | 8,480 | 3.38 | 7.09 |
| 10 | 15,400 | 4.13 | 8.97 |
| 20 | 24,900 | 5.08 | 10.40 |
| 50 | 42,400 | 6.47 | 11.71 |
| 100 | 60,000 | 7.45 | 12.53 |

### 3.7.2.2 River Conditions

The difference in elevation between the channel bottom and the adjacent jurisdictional margins of the river varies greatly within the Newhall Ranch project area. This difference ranges from 9 to 20 feet, and is dependent upon the width of the river channel. For example, in wider portions of the river channel where flows spread out with low velocities, there is only a small elevation difference between the channel bottom and the adjacent jurisdictional boundary. Representative cross sections of the active channel illustrate the geometry, and are provided for the lower, middle, and upstream reaches of the river (Figures 3-20, 3-21, and 3-22). In contrast, the channel is often deep where it is narrower, creating a large elevation difference between the channel bottom and the jurisdictional boundary.

The existing river channel contains a variety of vegetation types. The active river channel is mostly barren due to annual scouring. However, vegetation types on the adjacent terraces vary based on elevation relative to the active channel bottom and the frequency of storm events. The following series of vegetation types occur along a vertical gradient from the channel bottom to the highest river terrace: emergent herbaceous, woody shrubs, and trees.

The substrate of the river channel (i.e., top layer of the river bottom) is primarily sand, which is actively eroded and deposited in flood events. Previous studies by the Los Angeles County Flood Control District have demonstrated that sediment deposition and scouring along the upper Santa Clara River are generally in equilibrium, and that there are no major trends of channel degradation or aggradation. However, some localized areas may experience either greater scouring or sand deposition.

### 3.7.3 Biological Characteristics

#### 3.7.3.1 Existing Aquatic, Wetland, and Riparian Habitats Along the River

The Santa Clara River corridor in the Newhall Ranch project area supports three general categories of habitat:

- Aquatic habitats, consisting of flowing or ponded water
- Wetland habitats, consisting of emergent herbs rooted in ponded water or saturated soils along the margins of the flowing water
- Riparian habitat, consisting of woody vegetation along the margins of the active channel and adjacent terraces

The key characteristics of the dominant aquatic, wetland, and riparian habitats in the Santa Clara River corridor in the Newhall Ranch project area (Commerce Center Drive bridge site to the County line) are summarized in Table 3-8. This table does not include upland habitats, or disturbed or cultivated habitats in the river corridor.

The density, biomass, and location of the vegetation in relation to the channel bottom are directly dependent upon the frequency of disturbance by flood flows. Successional mulefat scrub (SMFS) occupies the active channel and is disturbed annually by flows. This habitat also includes all aquatic features such as pools and flowing water, as well as most of the emergent wetlands in the river corridor because of the presence of water. In contrast, willow woodland and cottonwood-willow woodland is located above the active river channel and is

only flooded during infrequent storm events, which allows large trees to become established between events.

**TABLE 3-8**
**SUMMARY OF DOMINANT WETLAND AND RIPARIAN HABITAT TYPES IN THE RIVER AT THE NEWHALL RANCH PROJECT AREA**

| Habitat | Dominant Species | Structure | Location in the River | Height Above Channel Bottom (ft) |
|---|---|---|---|---|
| Alluvial scrub | Sagebrush and scalebroom | Open, sparse mixture of shrubs | Upper dry terraces; old braided channels | 8 |
| Arrow weed scrub | Arrow weed | Dense monoculture | Upper terraces | 8 |
| Cottonwood willow forest | Fremont cottonwood and red willow | Mature woodland with large overstory trees and dense understory | Upper terraces, near or at upland boundary | 9.5 |
| Mulefat scrub; contains some wetland areas | Mulefat, giant reed, narrow-leaf willow | Moderately dense shrubs, 6 to 10 feet in height; patches of emergent wetlands | Terrace adjacent to active channel | 5.5 |
| Successional mule fat scrub (includes aquatic and wetland habitats) | Mulefat, giant reed, narrow-leaf willow | Mostly barren with scattered small shrubs; flowing water; pools; emergent wetlands | Active channel that is continually disturbed by flows | 1.5 |
| Willow woodland | Red and arroyo willow, Fremont cottonwood | Mature woodland with large overstory trees and dense understory | Upper terraces, near or at upland boundary | 9 |
| Willow scrub | Arroyo willow | Dense willow plants, 10 to 12 feet in height | Mid-level terraces | 6.5 |

**Mule Fat Scrub (MFS):** Mule fat scrub (previously described) is typically a mature riparian habitat dominated by mule fat shrubs (*Baccharis salicifolia*). Co-dominant plant species include narrow-leaved willow (*Salix exigua*), giant cane (*Arundo donax*), and some tamarisk (*Tamarix* sp.). This habitat type is found along the Santa Clara River on upper portions of the terraces and on some levees on the ranch property.

**Successional Mule Fat Scrub (SMFS):** A subclass of mule fat scrub was used to denote the development of this plant community along the active channel of the Santa Clara River. Successional mule fat scrub (SMFS) denotes a young, successional community dominated by young saplings of predominantly mule fat and narrow-leaved willow. This subclass is found

within the low flow (active) channel of the Santa Clara River on sand bars where frequent scouring by floods prevents it from fully developing into mature mule fat scrub.

The Santa Clara River characteristics provide year-round and seasonal aquatic habitats, as described in Table 3-9. All aquatic habitats are subject to periodic disturbances from winter flood flows. These flows inundate areas that are dry most of the year. They also carry and deposit sediments, seeds, and organic debris (e.g., stems, downed trees).

New sandbars are formed and old ones are destroyed. Stands of vegetation are eroded by high flows, and new areas are created where vegetation becomes established by seeds or buried stems. Flows can change the alignment of the low flow channel, the number and location of pools, and the depth of pools. In years with low winter flows, there may be very little change in the aquatic habitats of the river. In such years, wetland vegetation along the margins of the low flow channel and pools would increase. In high flow years, this vegetation would be removed, but would become re-established during the spring and summer due to natural colonization processes. As can be seen, the aquatic habitats of the river are in a constant state of creation, development, disturbance, and destruction. The diversity of habitat conditions in the river at any one time supports a variety of aquatic invertebrates, aquatic plants, and fish.

The abundance and variety of riparian and wetland habitats in the river corridor that support sensitive habitats and species are due largely to the natural dynamic riverine processes that occur unimpeded in the project area. The continual creation and destruction of habitats due to flooding and drought periods provides a mosaic of different types and ages of habitats. This mosaic is a key element in sustaining the habitat of sensitive species.

## TABLE 3-9
## CHANNEL CHARACTERISTICS OF THE SANTA CLARA RIVER AT THE NEWHALL RANCH PROJECT AREA

| Channel Feature | Description/Characteristics | Source of Water | Frequency of Disturbance |
|---|---|---|---|
| Low-flow channel | Highly variable depth, dimensions, and locations. Emergent wetlands form along edges each spring and summer. Mostly sandy substrate with unstable banks. Mostly exposed runs and scattered riffles. Shallow depth (<1 ft). | Year-round treated effluent and winter runoff. | Annual disturbance from flood-related flows. Daily changes in water depth and flow due to variable effluent flows. |
| On-channel pools | Small scattered pools (less than 20 ft long) that form in the main channel in response to debris dams or sandbars. Emergent wetlands and young woody willows along margins. Shallow depths (<1 ft). | Year-round treated effluent and winter runoff. | Annual disturbance from flood-related flows. Daily changes in water depth and flow due to variable effluent flows. |
| Off-channel pools | Highly variable size. Generally < 2 ft depth. Vegetation along the margin may be dense emergent or riparian shrubs, or are absent in some areas. | Groundwater seepage. | Inundation by flood flows every 1-2 years. |
| Road crossing ponds and plunge pools | Four at-grade river crossings create upstream ponds and downstream plunge pools with depths of 3 feet. Aquatic vegetation along the margins. | Year-round treated effluent and winter runoff. | Annual disturbance from flood-related flows. Crossings are re-built every year. |
| Winter secondary channels and overflow areas | Highly variable areas where winter flood flows occur when the low-flow channel is full. Ranging from discrete channels to sheet flow areas. Usually containing young mulefat scrub. | Winter flood related flows. Ephemeral aquatic features. May only persist for several days to weeks after a flood. | Inundation and scouring every 1-2 years. |
| Tributary channels | Highly variable channels that convey water from tributaries to the river channel. Usually small channels with ephemeral or slow moving water, except during the winter. Generally sparsely vegetated except for Potrero, San Martinez, and Salt Creek. | Winter flows, and occasional seepage flow from side canyons; ephemeral flows. | Disturbance each year from flood flows in the tributaries. |

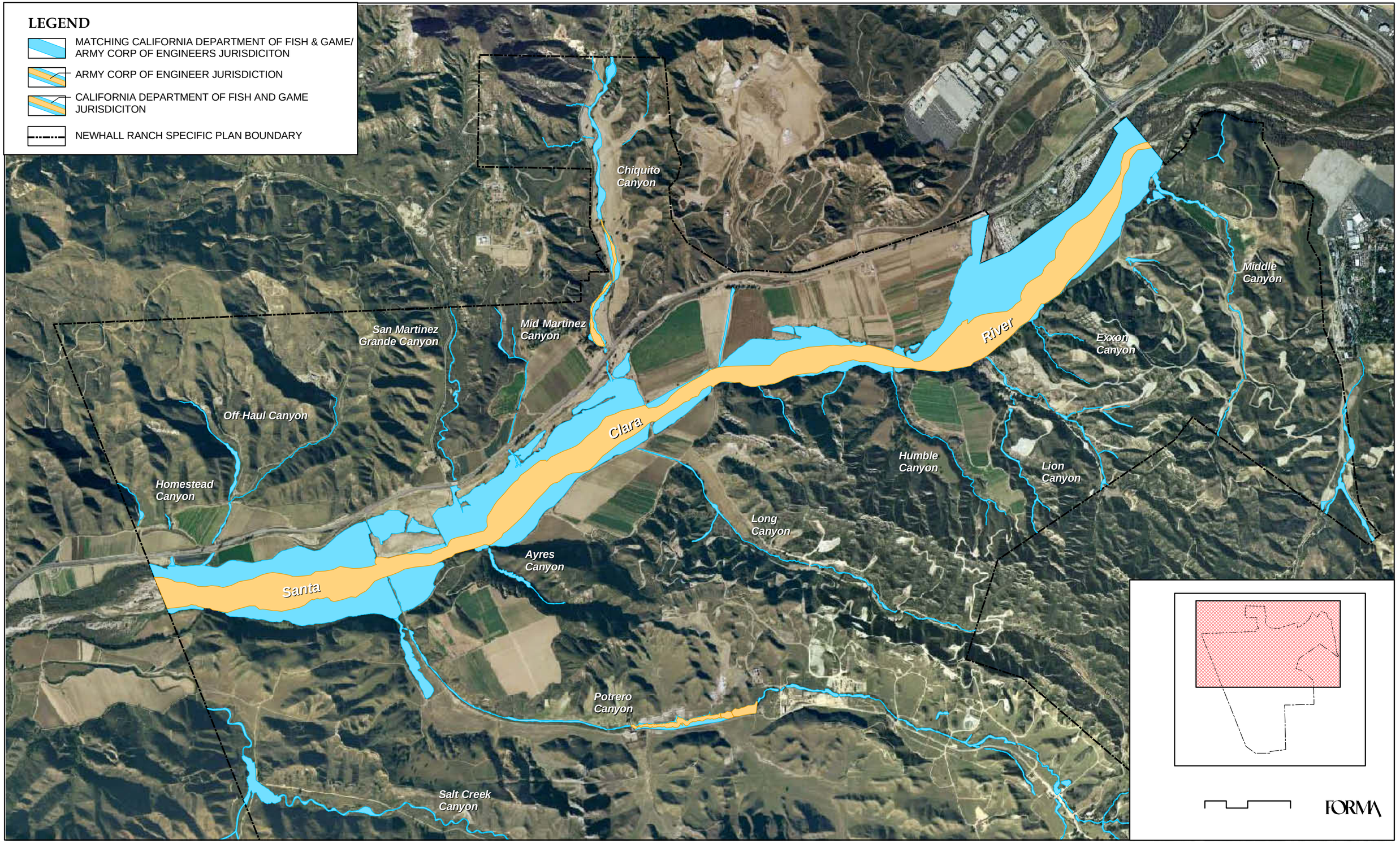



**Figure 3-1 CALIFORNIA DEPARTMENT OF FISH AND GAME AND ARMY CORPS OF ENGINEERS JURISDICTION COMPARISON - EXTENT A**

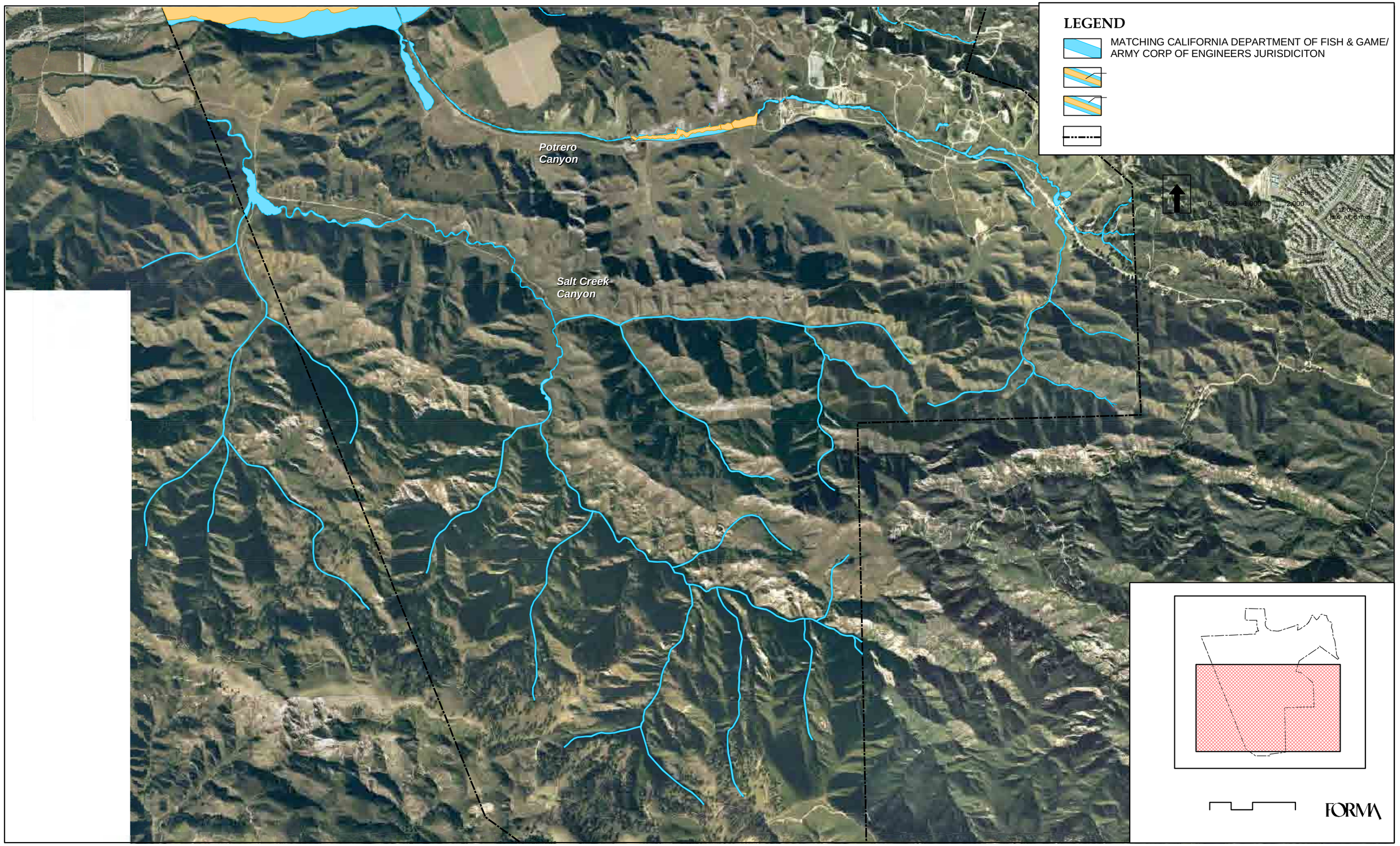



**Figure 3-2 CALIFORNIA DEPARTMENT OF FISH AND GAME AND ARMY CORPS OF ENGINEERS JURISDICTION COMPARISON - EXTENT B**

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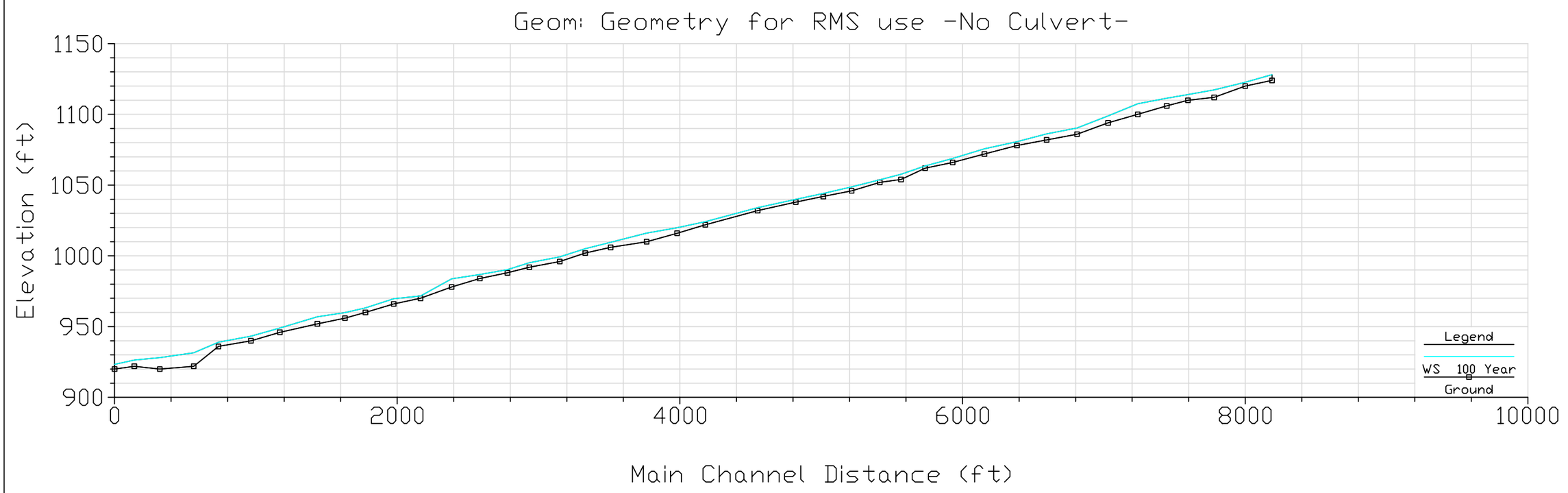


Figure 3-3
STREAM PROFILE SHOWING EXISTING CONDITIONS IN CHIQUITO CANYON

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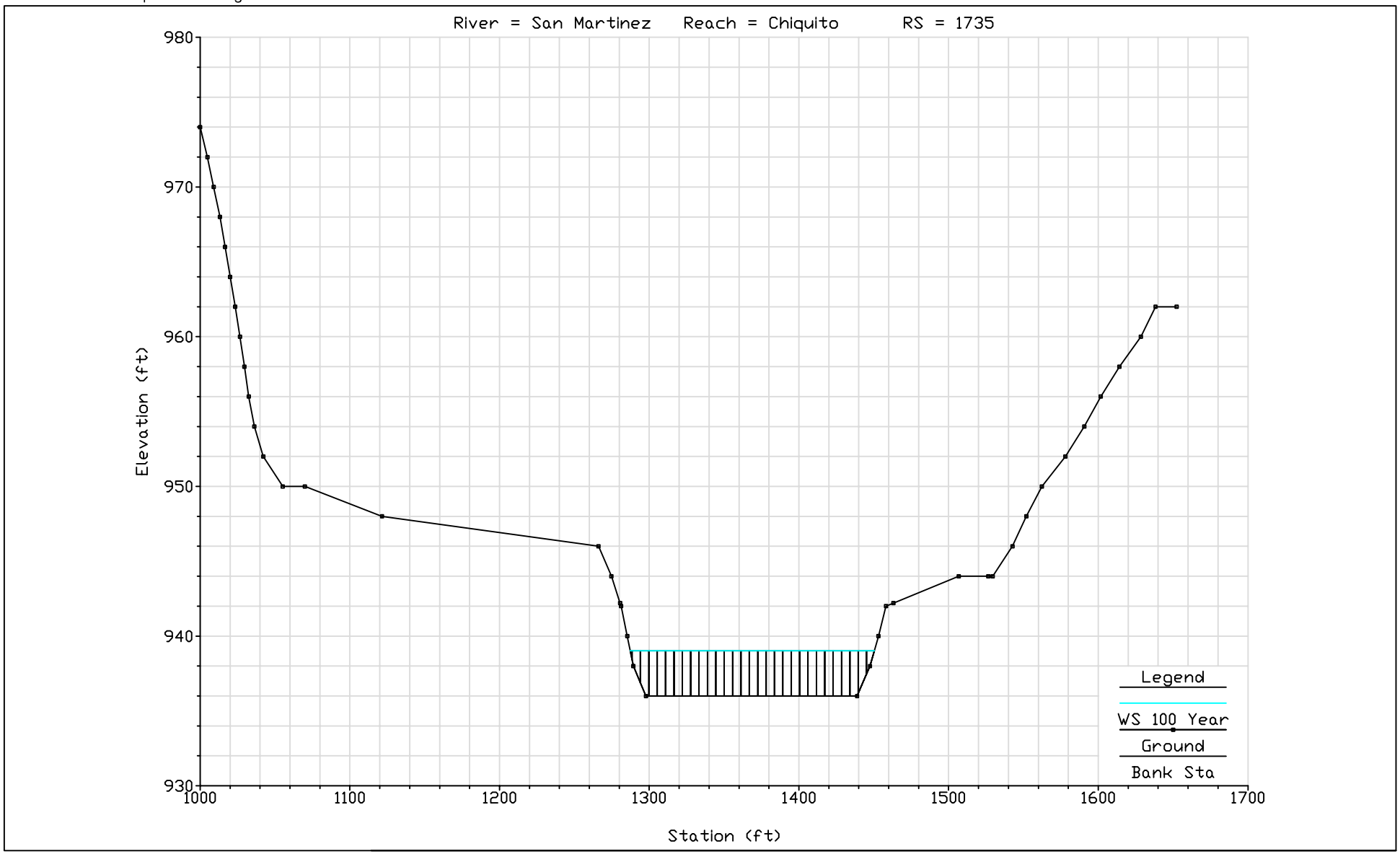


Figure 3-4

SPECIFIC CROSS SECTION SHOWING EXISTING GEOMORPHIC CONDITIONS IN CHIQUITO CANYON DOWNSTREAM STATION

T:\Newhall\cad\Chiquito 5820.dwg 12/12/03

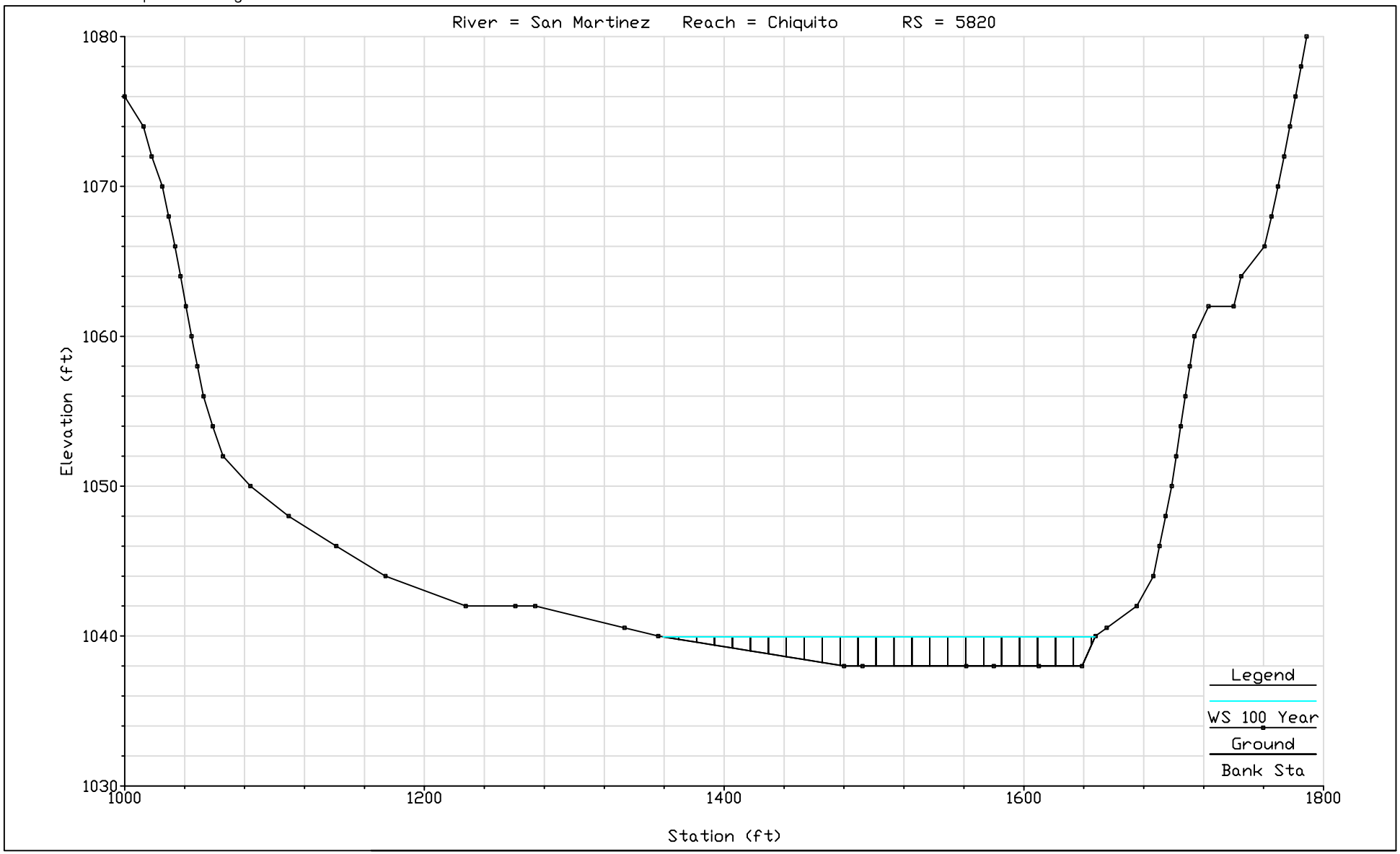


Figure 3-5

SPECIFIC CROSS SECTION SHOWING EXISTING GEOMORPHIC CONDITIONS IN CHIQUITO CANYON MIDDLE STATION

T:\Newhall\cad\Chiquito 8780.dwg 12/12/03

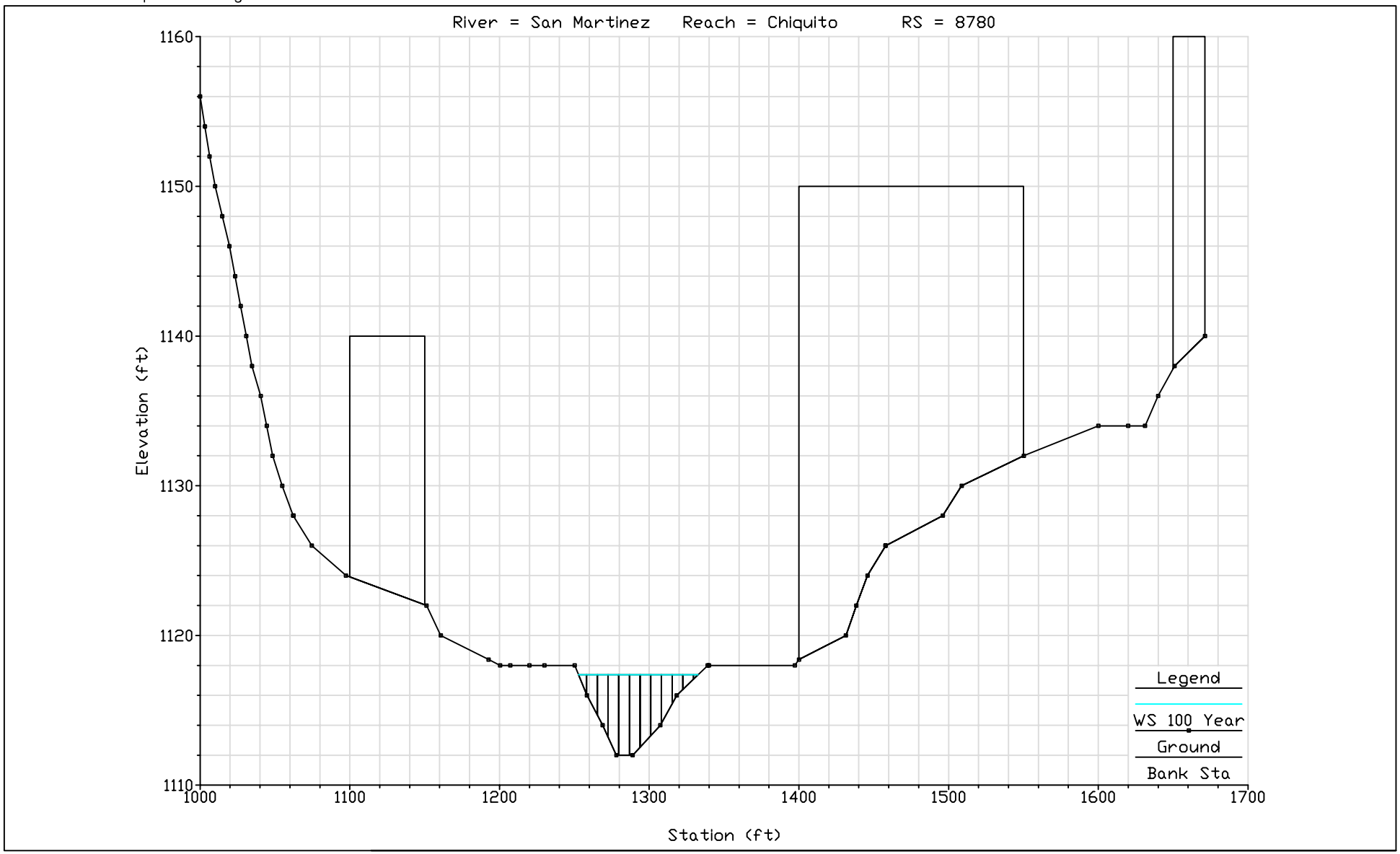


Figure 3-6

SPECIFIC CROSS SECTION SHOWING EXISTING GEOMORPHIC CONDITIONS IN CHIQUITO CANYON UPSTREAM STATION

T:\Newhall\cad\Long PF.dwg 12/12/03

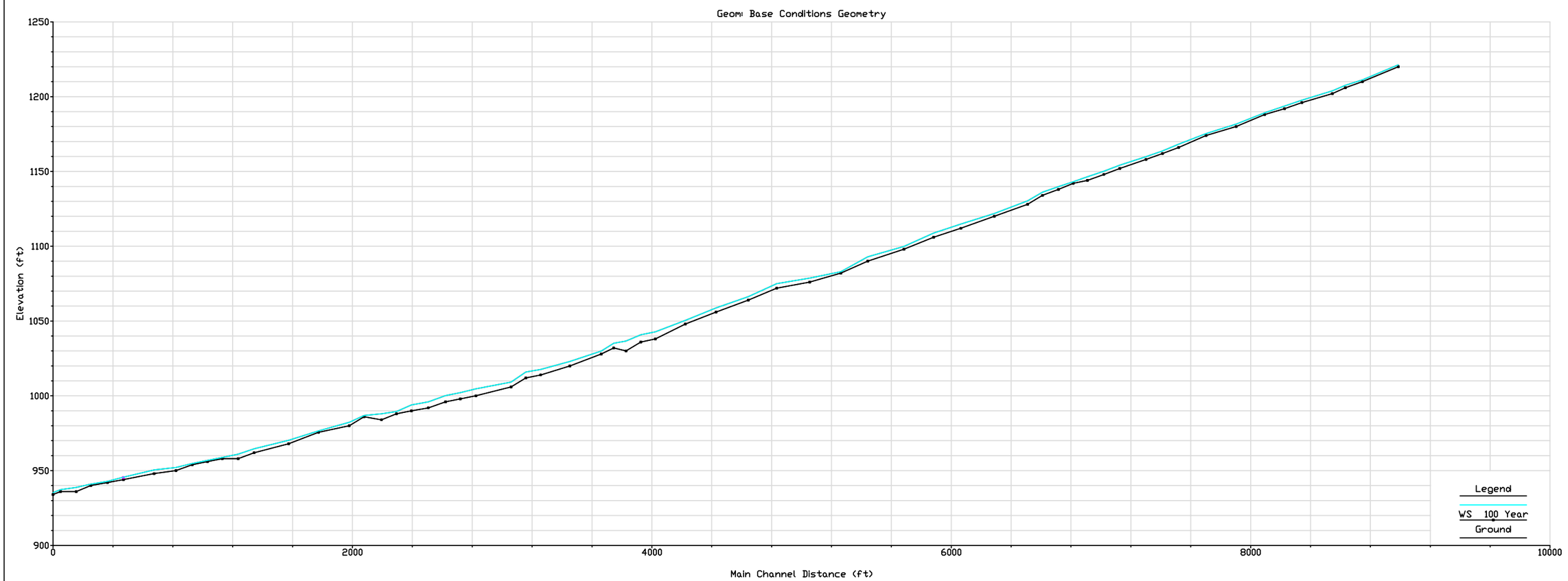


Figure 3-7
STREAM PROFILE SHOWING EXISTING CONDITIONS IN LONG CANYON

T:\Newhall\cad\Long 1000.dwg 12/12/03

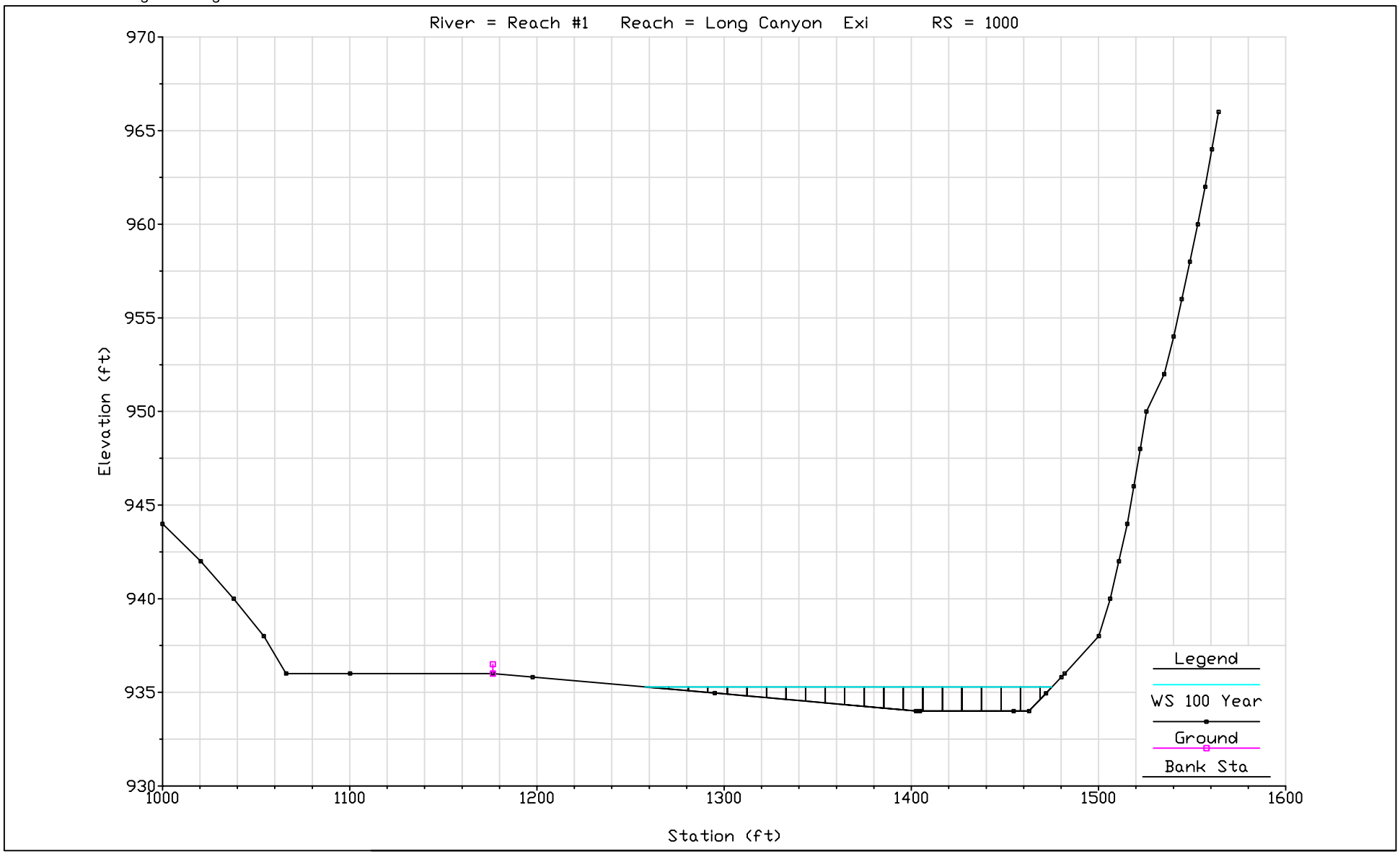


Figure 3-8

SPECIFIC CROSS SECTION SHOWING EXISTING GEOMORPHIC CONDITIONS IN LONG CANYON DOWNSTREAM STATION

T:\Newhall\cad\Long 4600.dwg 12/12/03

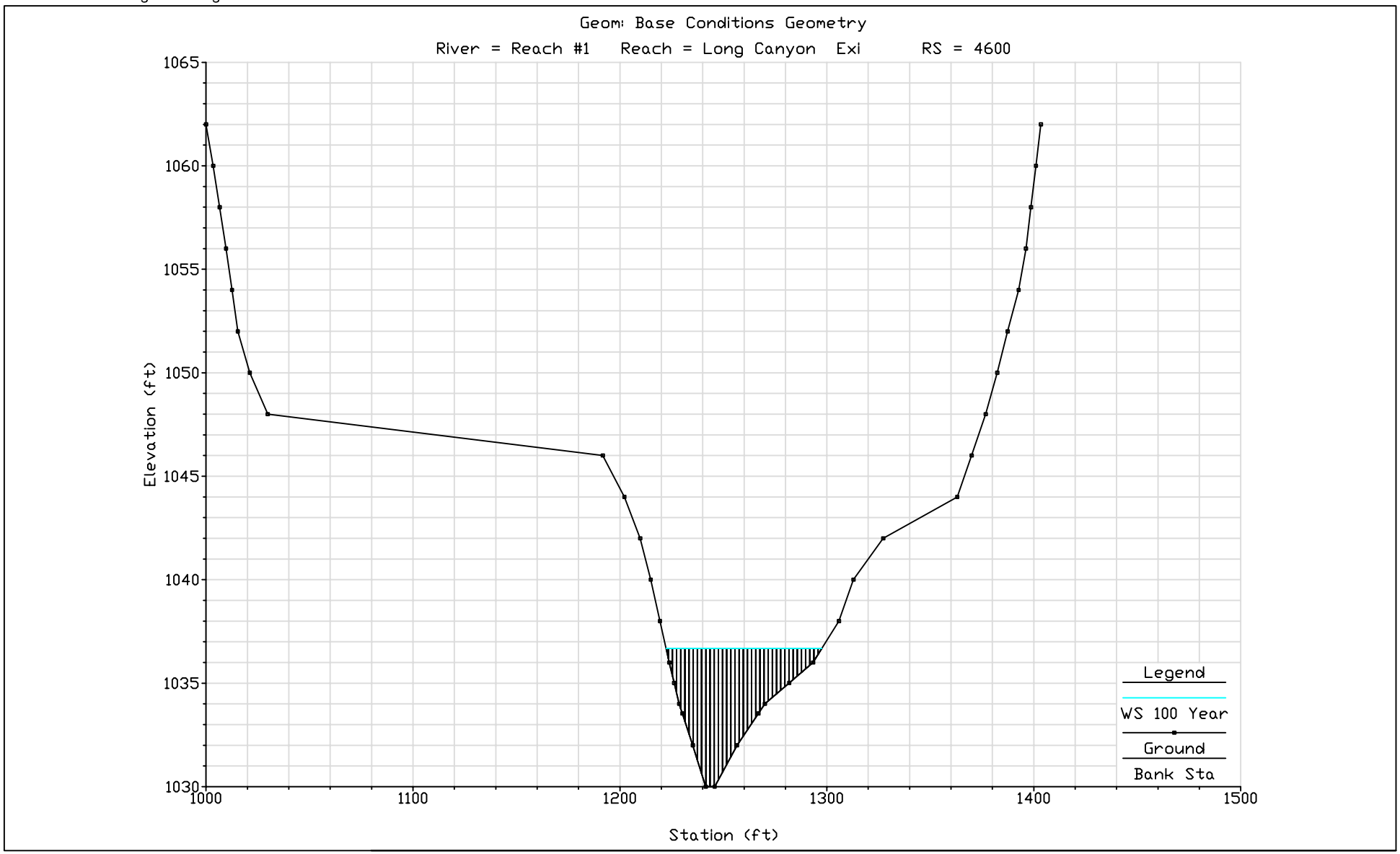


Figure 3-9

SPECIFIC CROSS SECTION SHOWING EXISTING GEOMORPHIC CONDITIONS IN LONG CANYON MIDDLE STATION

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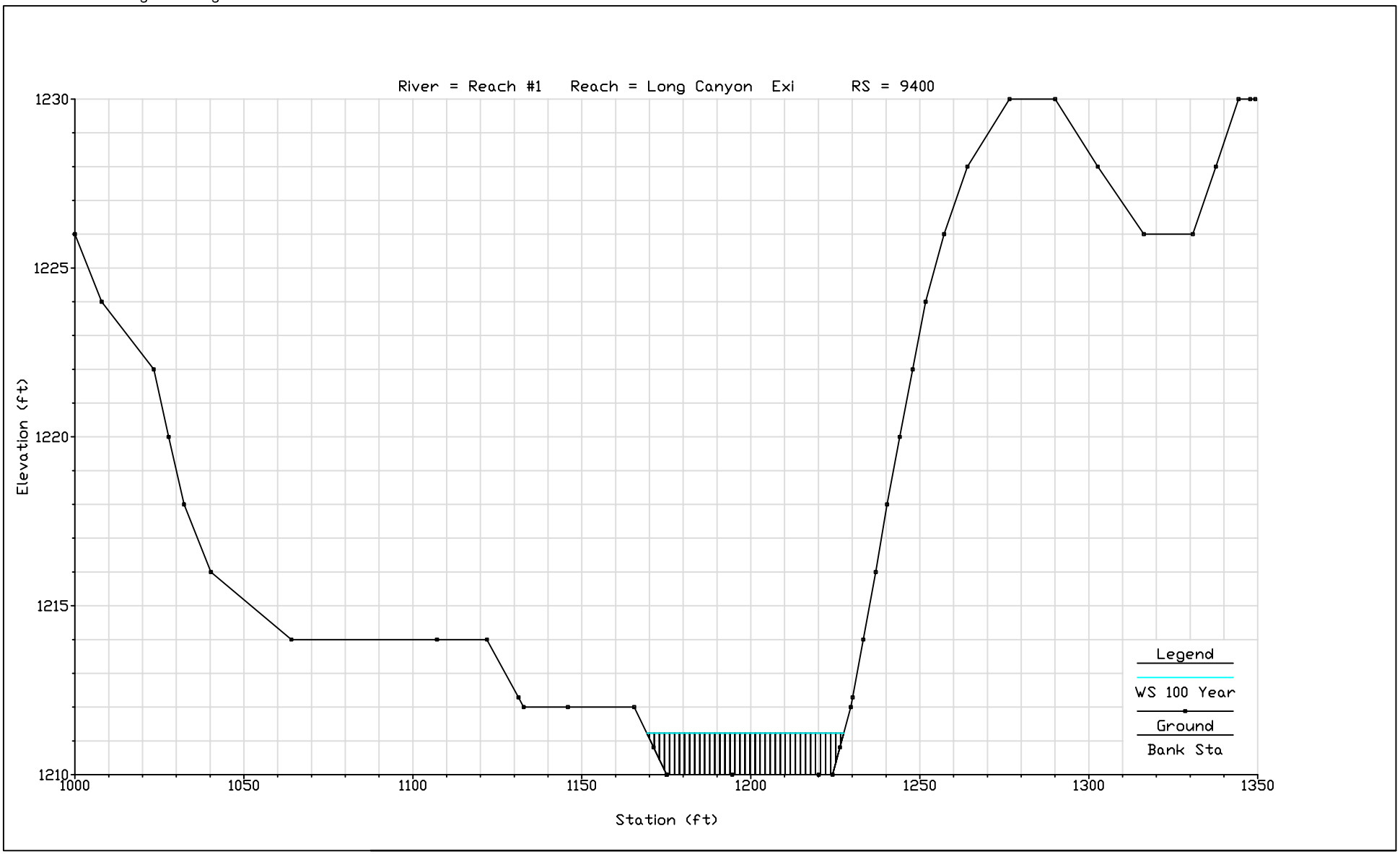



Figure 3-10

SPECIFIC CROSS SECTION SHOWING EXISTING GEOMORPHIC IN LONG CANYON UPSTREAM STATION

T:\Newhall\cad\Grande PF.dwg 12/12/03

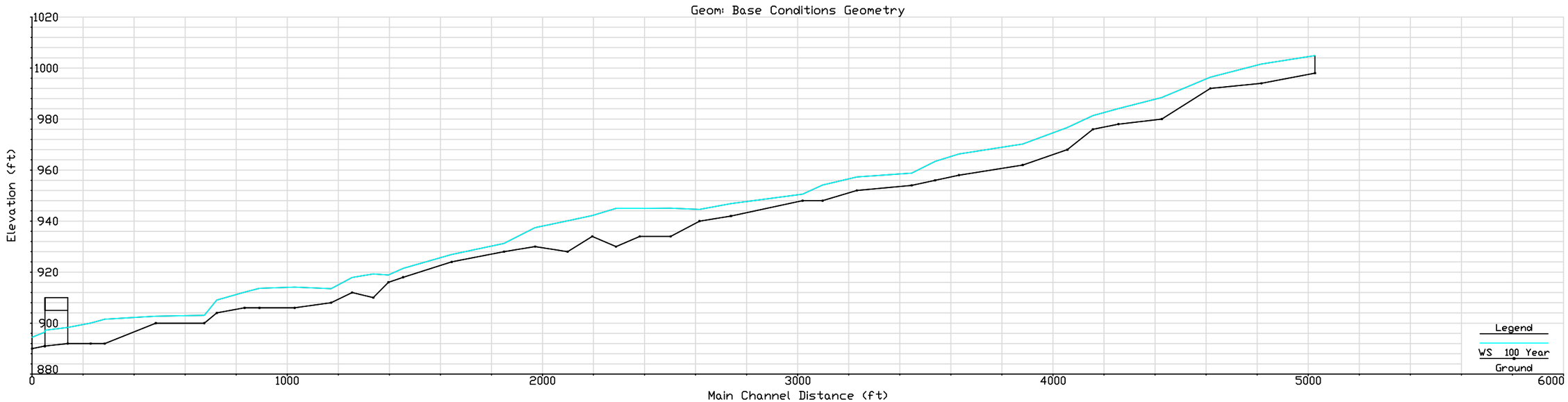



Figure 3-11
STREAM PROFILE SHOWING EXISTING CONDITIONS
IN SAN MARTINEZ GRANDE CANYON

T:\Newhall\cad\Grande 1485.dwg 12/12/03

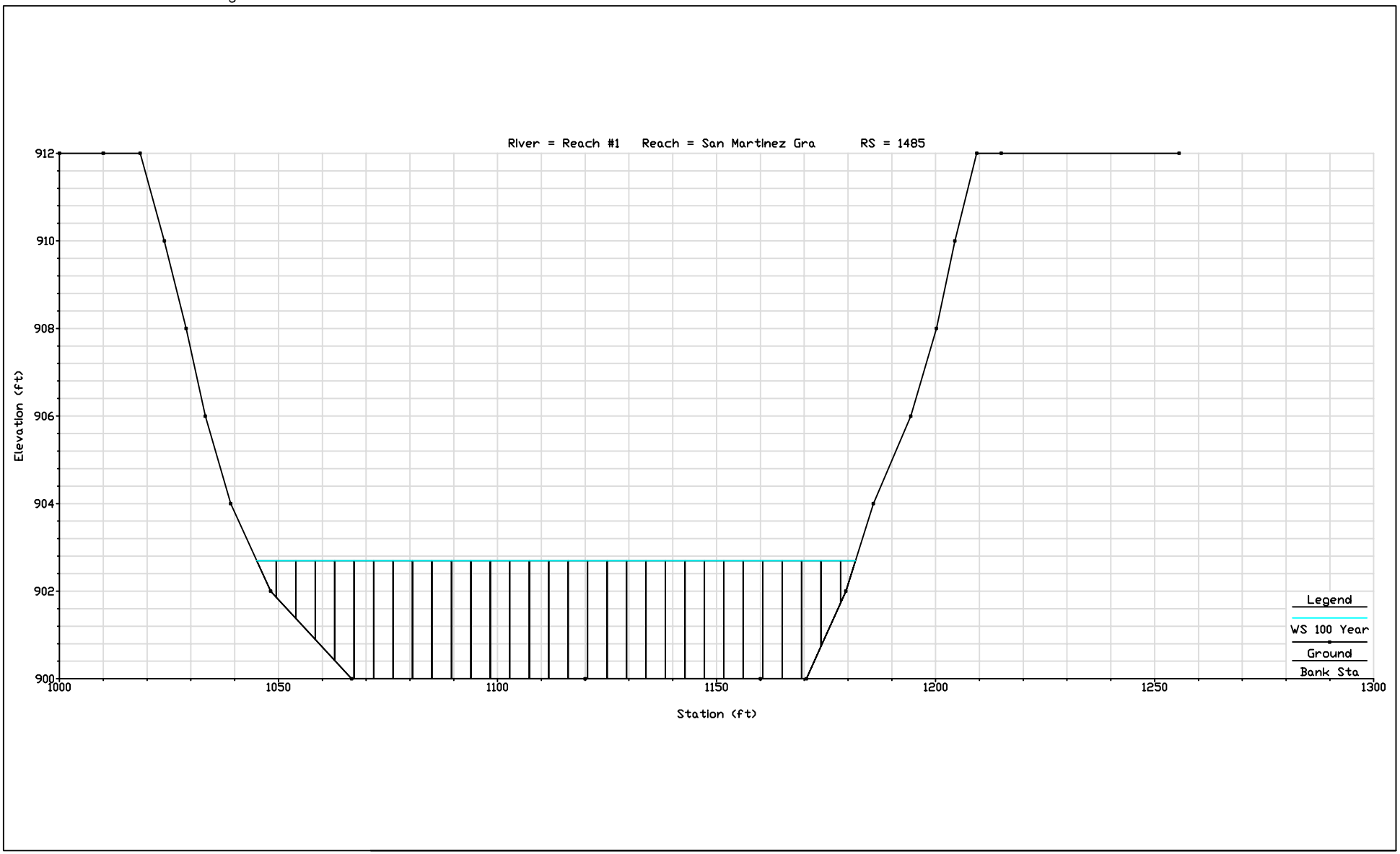



Figure 3-12

SPECIFIC CROSS SECTION SHOWING EXISTING GEOMORPHIC CONDITIONS IN SAN MARTINEZ GRANDE CANYON DOWNSTREAM STATION

T:\Newhall\cad\Grande 2155.dwg 12/12/03

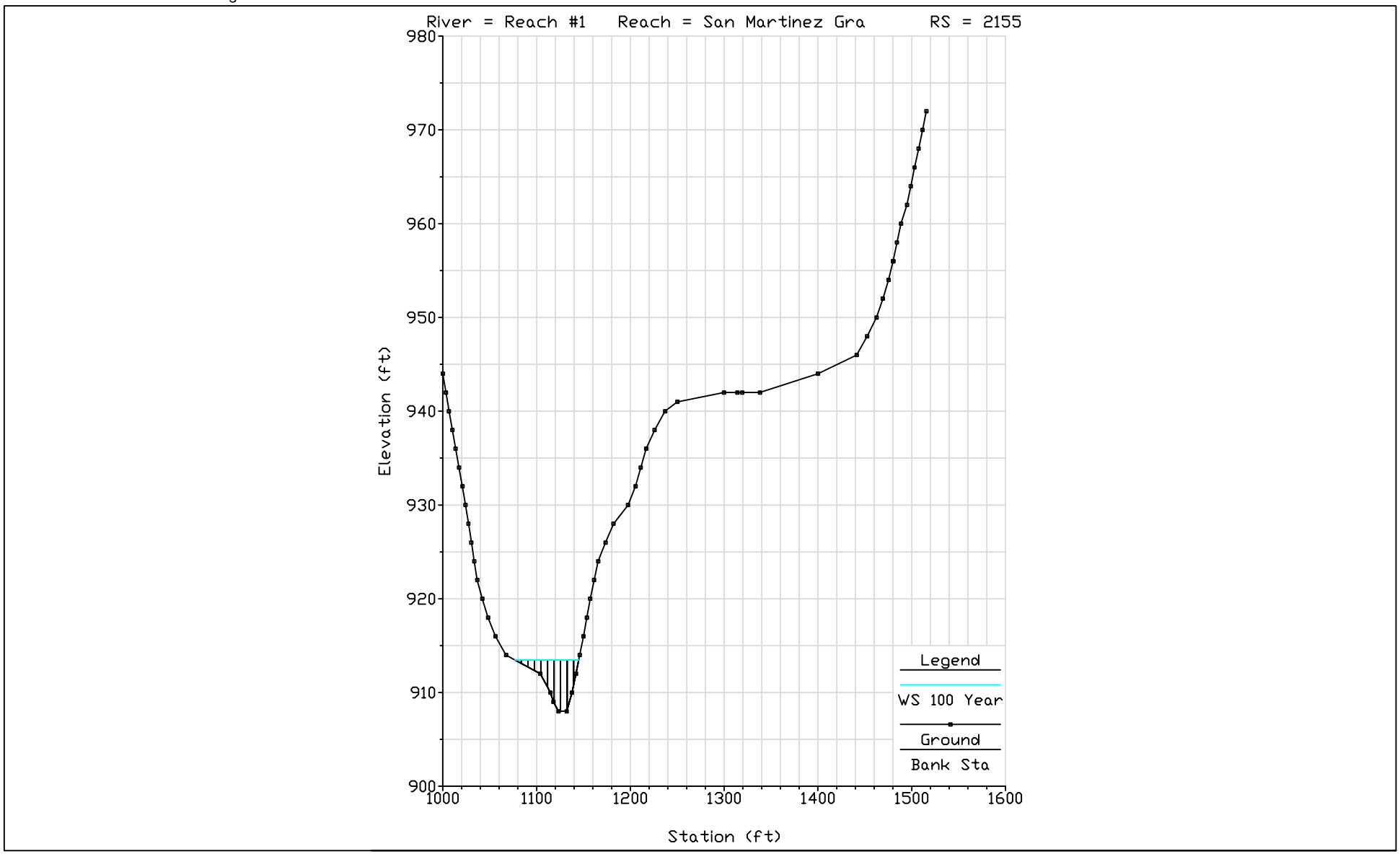



Figure 3-13

SPECIFIC CROSS SECTION SHOWING EXISTING GEOMORPHIC CONDITIONS IN SAN MARTINEZ GRANDE CANYON MIDSTREAM STATION

T:\Newhall\cad\Grande 5850.dwg 12/12/03

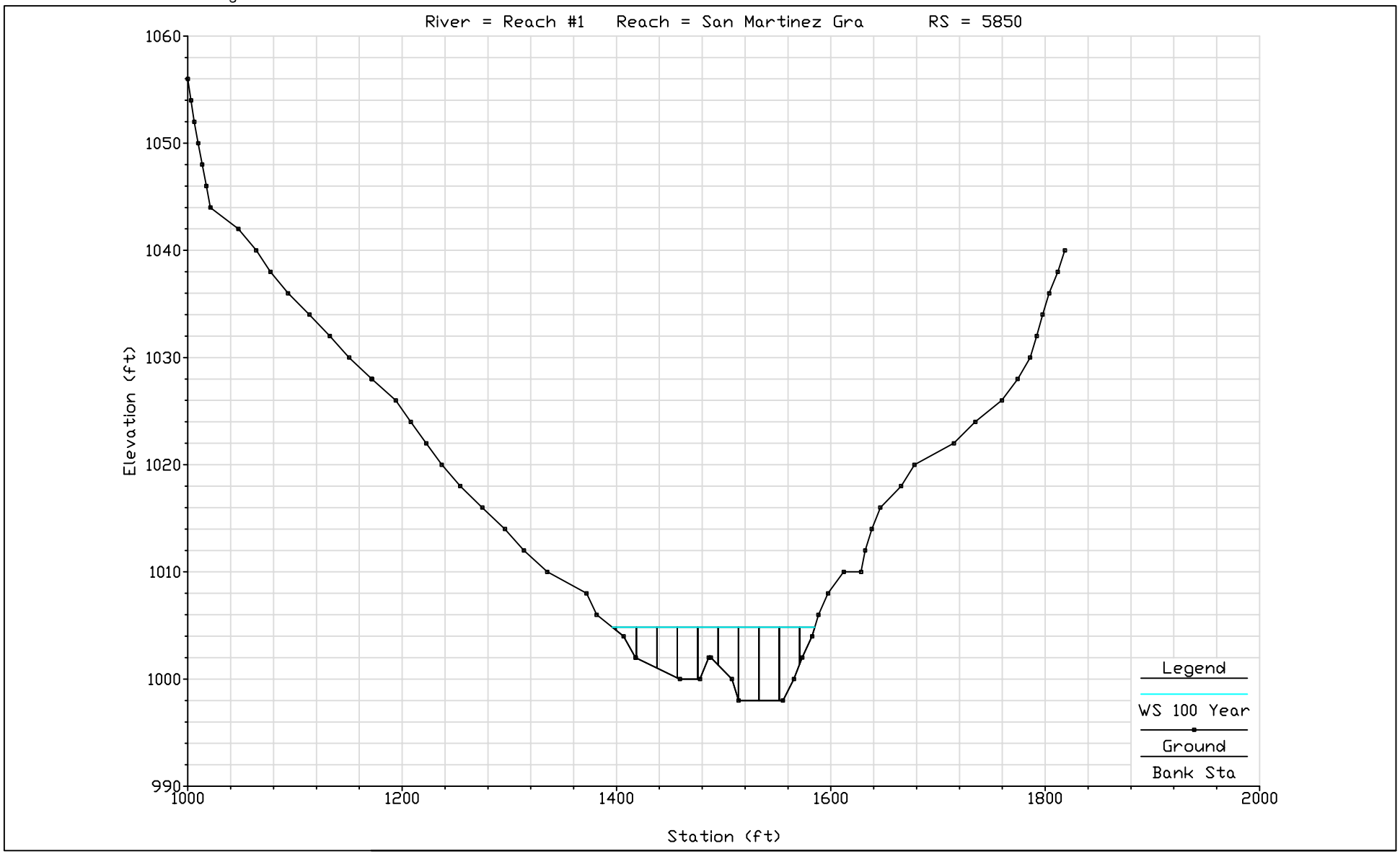



Figure 3-14

SPECIFIC CROSS SECTION SHOWING EXISTING GEOMORPHIC CONDITIONS IN SAN MARTINEZ GRANDE CANYON UPSTREAM STATION

T:\Newhall\cad\Potrero PF.dwg 12/12/03

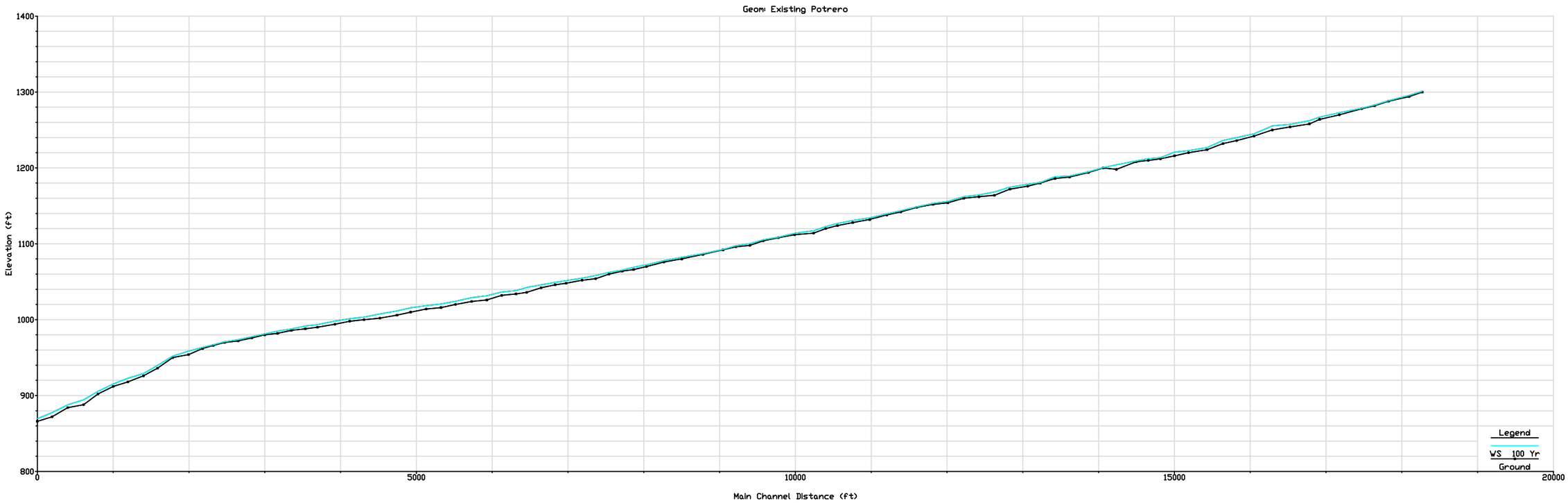



Figure 3-15
STREAM PROFILE SHOWING EXISTING CONDITIONS IN POTRERO CANYON

T:\Newhall\cad\Potrero 1800.dwg 12/12/03

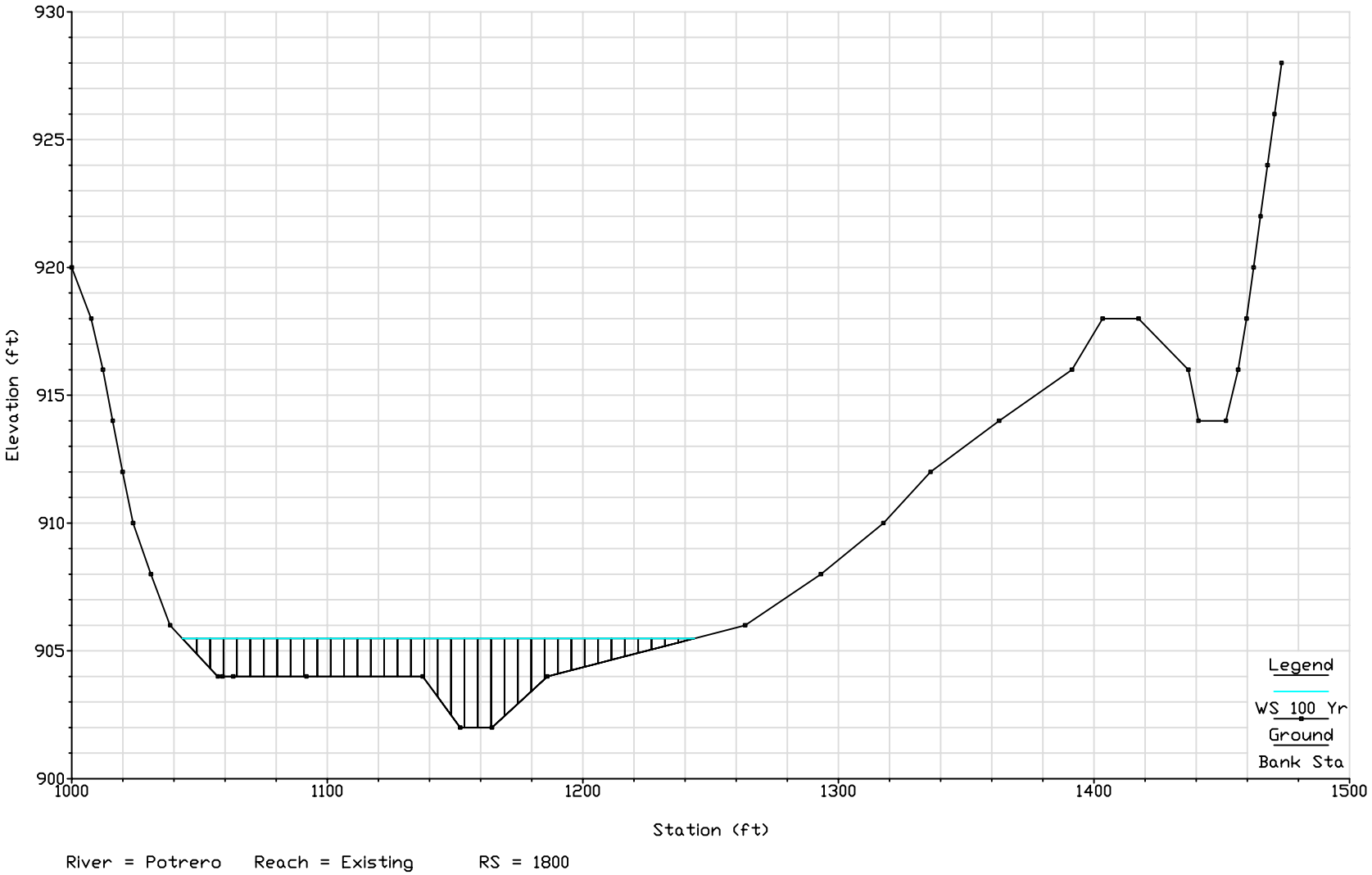



Figure 3-16

SPECIFIC CROSS SECTION SHOWING EXISTING GEOMORPHIC CONDITIONS IN POTRERO CANYON DOWNSTREAM STATION

T:\Newhall\cad\Potrero 9780.dwg 12/12/03

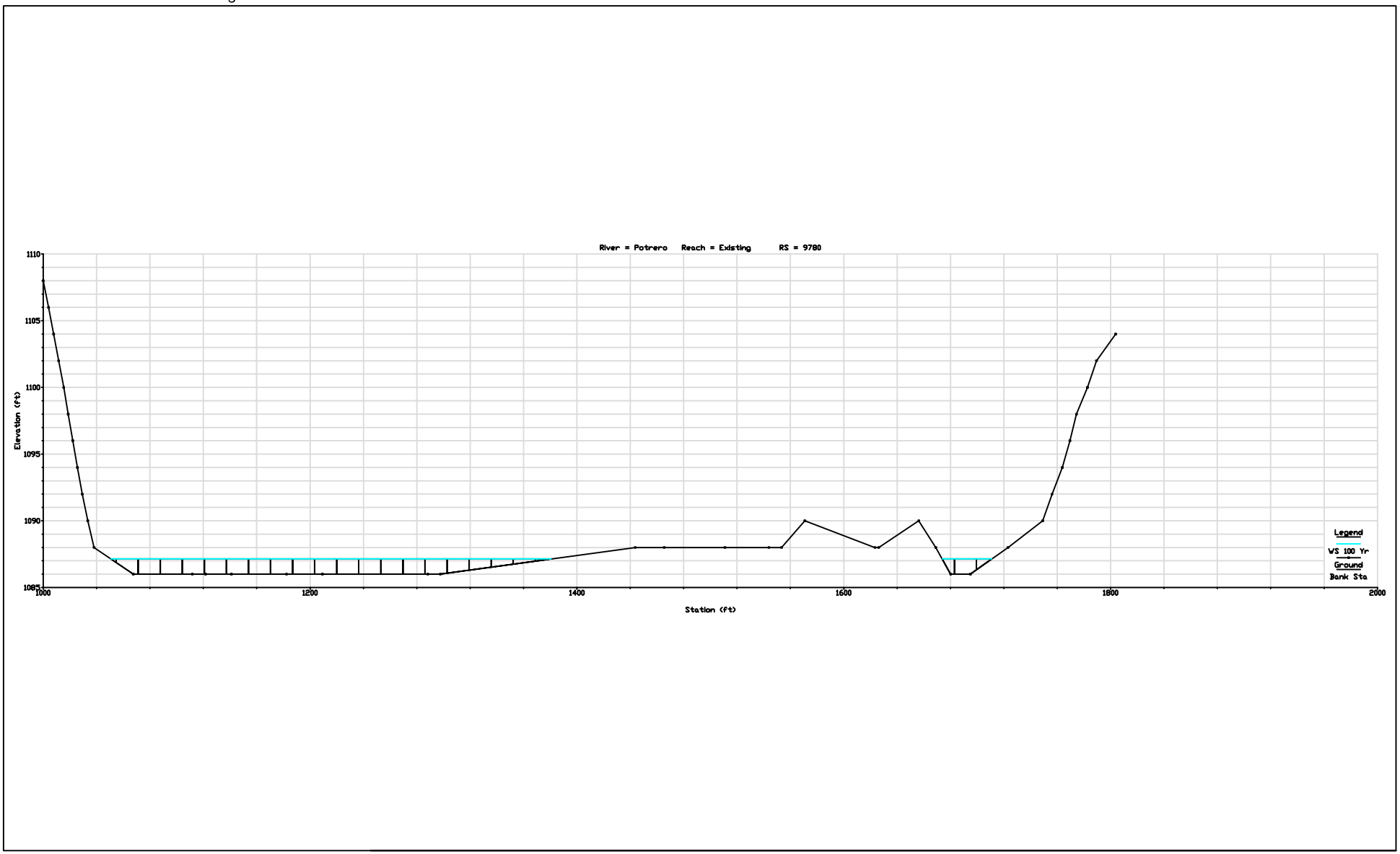



Figure 3-17

SPECIFIC CROSS SECTION SHOWING EXISTING GEOMORPHIC CONDITIONS IN POTRERO CANYON MIDDLE STATION

T:\Newhall\cad\Potrero 17915.dwg 12/12/03

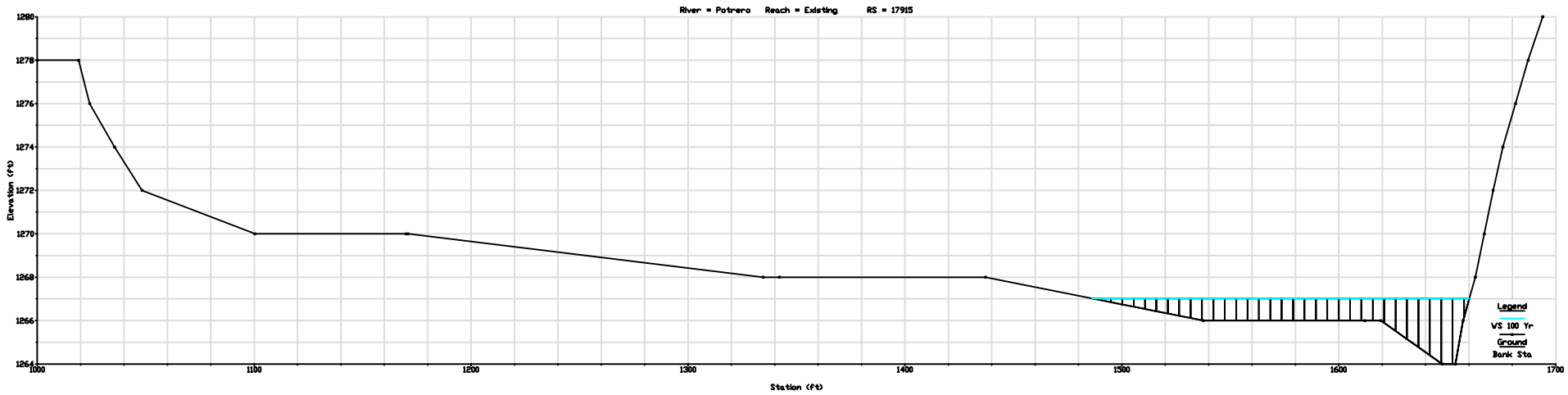



Figure 3-18

SPECIFIC CROSS SECTION SHOWING EXISTING GEOMORPHIC CONDITIONS IN POTRERO CANYON UPSTREAM STATION

T:\Newhall\cad\Santa Clara River PF.dwg 12/12/03

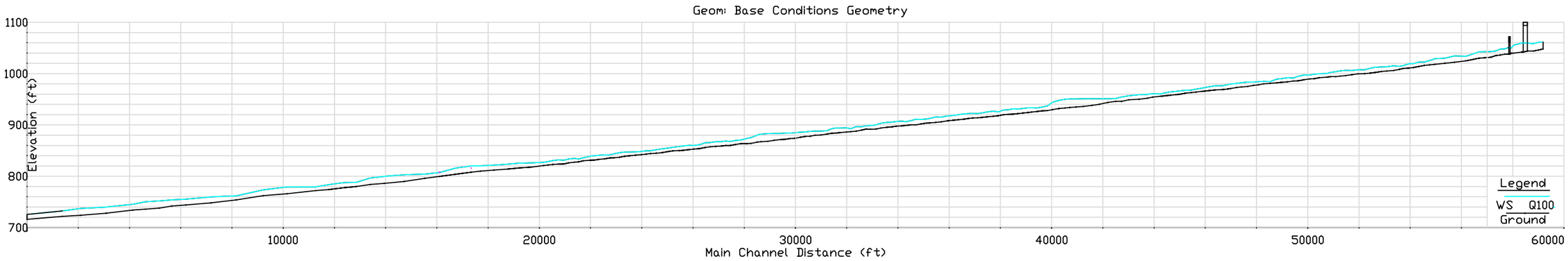



Figure 3-19

STREAM PROFILE SHOWING EXISTING CONDITIONS IN SANTA CLARA RIVER

T:\Newhall\cad\SCR 9220.dwg 12/12/03

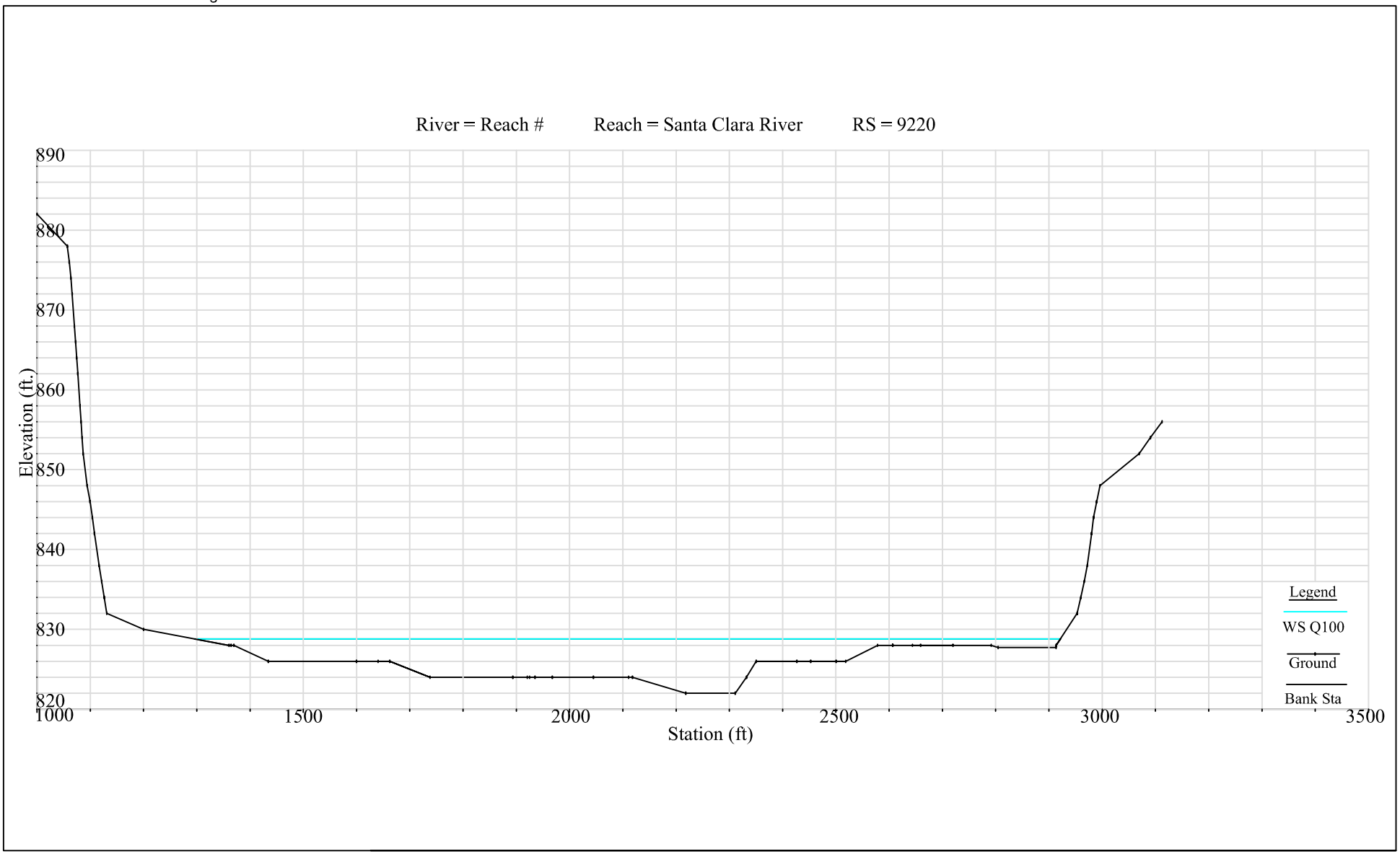



Figure 3-20

SPECIFIC CROSS SECTION SHOWING EXISTING GEOMORPHIC CONDITIONS IN SANTA CLARA RIVER CANYON DOWNSTREAM STATION

T:\Newhall\cad\SCR 15335.dwg 12/12/03

River = Reach #1 Reach = Santa Clara River RS = 15335

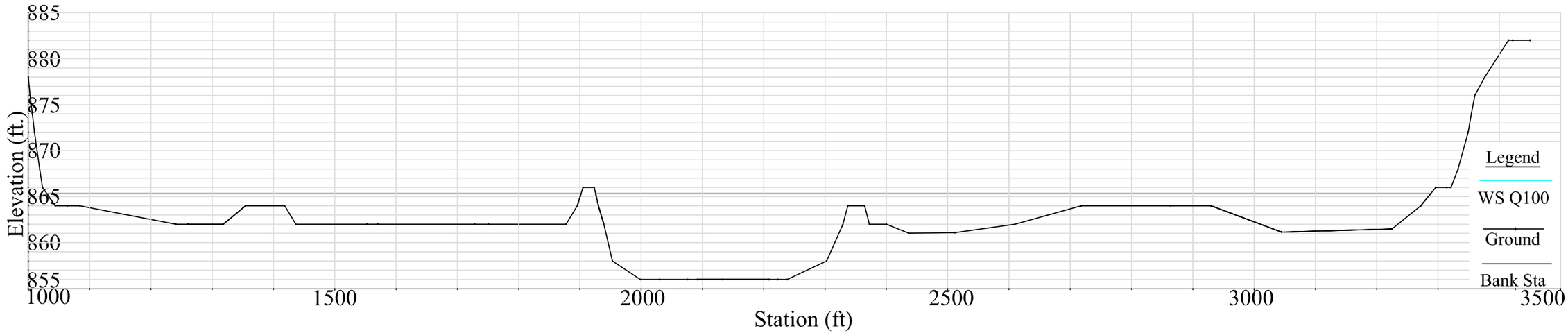



Figure 3-21

SPECIFIC CROSS SECTION SHOWING EXISTING GEOMORPHIC CONDITIONS IN SANTA CLARA RIVER CANYON MIDDLE STATION

T:\Newhall\cad\SCR 45545.dwg 12/12/03

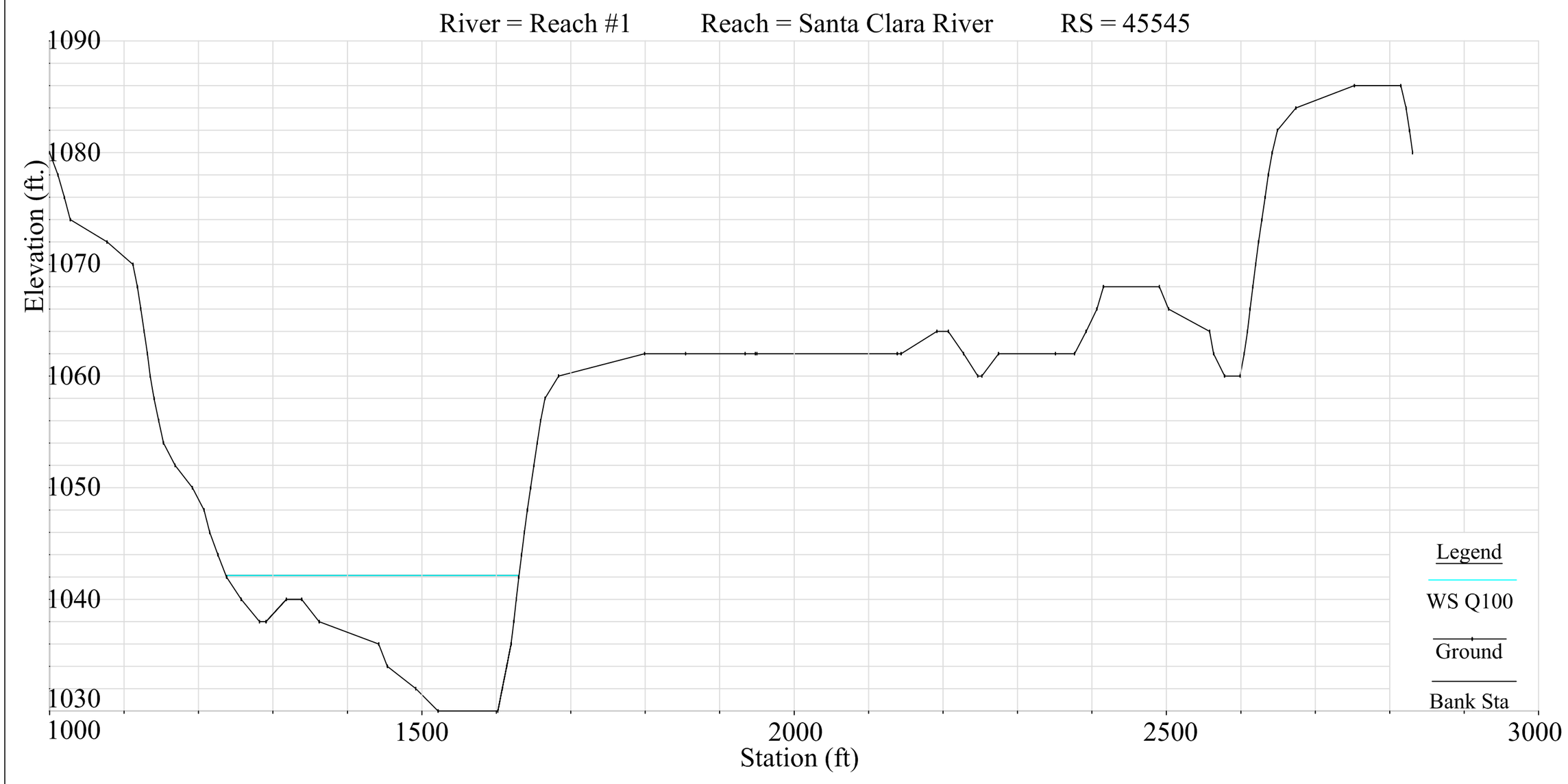



Figure 3-22
SPECIFIC CROSS SECTION SHOWING EXISTING GEOMORPHIC CONDITIONS IN SANTA CLARA RIVER CANYON UPSTREAM STATION

As stated earlier, this jurisdiction delineation has been derived from a process that included extensive coordination with representatives of the Corps, CDFG, USFWS, and other agencies through multiple field visits and planning meetings. Previous jurisdictional determinations by the Corps and CDFG formed the basis for the current delineation. Aerial photo interpretation used in conjunction with topographic data and GIS technology provided a means to update the delineation prior to field verification. The hydrologic/hydraulic modeling also provides the context for defining agency jurisdiction within each watershed evaluated.

Once the digital analysis was completed, field assessments were then used to verify the jurisdictional delineations derived from digital technology, and to gather additional locational data using GPS equipment. This allowed for further refinement of the jurisdictional areas under the purview of the Corps and CDFG. The Corps and CDFG jurisdictional areas by drainage are presented below in Tables 4-1 and 4-2.

As indicated on Figures 3-1 and 3-2, unless otherwise noted, Corps jurisdiction lies within the broader jurisdictional areas under CDFG purview. Hence, the total acreage that falls under Corps jurisdiction is less than that of CDFG. For the purposes of this delineation, it is assumed that on the small side drainages in each watershed evaluated, unless otherwise noted, the area contained within the jurisdictional area is the same for both agencies[1].

**TABLE 4-1**
**CORPS OF ENGINEERS JURISDICTION BY DRAINAGE**

| Drainage | Total Jurisdictional Area |
|---|---|
| Chiquito Canyon | 13.9 Acres |
| Long Canyon | 5.7 Acres |
| San Martinez Grande Canyon | 2.5 Acres |
| Potrero Canyon | 36.7 Acres |
| Lion Canyon | 6.8 Acres |
| Salt Creek | 77.9 Acres |
| Santa Clara River | 316.1 Acres |
| Other Drainages Within Project Area | 33.3 Acres |
| Total | 492.9 Acres |

[1]Newhall Land's attorneys, Downey Brand LLP, believe that in some areas the CDFG asserts 1603 jurisdiction in areas beyond where the statute envisions jurisdiction, e.g., riparian areas contiguous to, but beyond, the bank and/or 100 year floodplain areas beyond the bank. This delineation broadly construed CDFG jurisdiction, and thus may, in the opinion of Newhall's attorneys, include some areas beyond the CDFG's jurisdiction.

## TABLE 4-2
## CALIFORNIA DEPARTMENT OF FISH AND GAME JURISDICTION BY DRAINAGE

| Drainage | Total Jurisdictional Area |
|---|---|
| Chiquito Canyon | 18.3 Acres |
| Long Canyon | 5.7 Acres |
| San Martinez Grande Canyon | 2.5 Acres |
| Potrero Canyon | 41.8 Acres |
| Lion Canyon | 6.8 Acres |
| Salt Creek | 77.9 Acres |
| Santa Clara River | 759.1 Acres |
| Other Drainages Within Project Area | 33.3 Acres |
| Total | 945.4 Acres |

Dudek and Associates. 2002. 2002 Sensitive Plant Survey Results for Newhall Ranch Specific Plan Area. November 20, 2002.

Impact Sciences, Inc. 2002. Revised Draft Additional Analysis to the Newhall Ranch Specific Plan and Water Reclamation Plant Final Environmental Impact Report. November 2002.

U.S. Army Corps of Engineers (USACE). 2001. Final Summary Report: Guidelines for Jurisdictional Determinations for Waters of the United States in the Arid Southwest. June 2001.

**The Newhall Land And Farming Company and U.S. Department of Defense, Army Corps of Engineers, "Correspondence Relating to Amendment to Jurisdiction Delineation Package, Newhall Ranch Project, for a Portion of the Santa Clara River and Its Tributaries, Los Angeles County, California" (February and July 2004)**

**DEPARTMENT OF THE ARMY**
LOS ANGELES DISTRICT, CORPS OF ENGINEERS
VENTURA FIELD OFFICE
2151 ALESSANDRO DRIVE, SUITE 110
VENTURA, CALIFORNIA 93001

REPLY TO
ATTENTION OF:

February 4, 2004

Office of the Chief
Regulatory Branch

Newhall Land and Farming Company
Attention: Mark Subbotin
23823 Valencia Boulevard
Valencia, California 91355-2103

Dear Mr. Subbotin:

Reference is made to your letter (No. 2003-01264-AOA) dated September 24, 2003 for a long-term Department of the Army Permit for proposed discharges of fill material in waters of the United States associated with the Newhall Ranch Specific Plan and associated facilities in the Santa Clara River and several side drainages, including Chiquito Canyon, Long Canyon, San Martinez Grande Canyon, Potrero Canyon and Lion Canyon, near the City of Santa Clarita, Los Angeles County, California.

On December 15, 2003, you submitted a Jurisdictional Delineation Package for the Newhall Ranch Specific Plan for our review and approval. The above information was modified several times based on observations made by the Corps during site visits on August 7, August 19, September 29 and October 27, 2003. Based on our review of the Jurisdictional Delineation Package dated December 15, 2003, the Corps hereby concurs that the project area supports a total of 493 acres of waters of the United States, including wetlands, consisting of 316.1 acres in the Santa Clara River, 13.9 acres in Chiquito Canyon, 5.7 acres in Long Canyon, 2.5 acres in San Martinez Grande Canyon, 36.7 acres in Potrero Canyon, 6.8 acres in Lion Canyon. 77.9 acres in Salt Creek and 33.3 acres in unnamed minor tributaries to the above waters of the United States.

Based on the information furnished in your letter and several site visits, we have determined that your proposed project does discharge dredged or fill material into a water of the United States. Therefore, the project is subject to our jurisdiction under Section 404 of the Clean Water Act and a Section 404 permit is required from our office.

Within the Santa Clara River, moderate to large storm flows can scour and deposit sediment, which can alter the extent and location of the braided stream channel from year to year. The extent of the morphological channel change is dependent on the magnitude of the peak storm flows. One would reasonably expect that storm flows greater than or equal to the 15-year event would have the ability to alter channel morphology and possibly change the ordinary high water mark within the Santa Clara River. Based on the above, if a 15-year or greater storm event occurs during the review of the proposed project, an updated jurisdictional

determination will be required for the Santa Clara River. The updated jurisdictional determination for the Santa Clara River must be reviewed and approved by the Corps of Engineers prior to any discharge of fill material in or adjacent to the Santa Clara River.

If you have any questions, please contact Dr. Aaron O. Allen of my staff at (805) 585-2148.

Sincerely,

David J. Castanon
Chief, North Coast Section
Regulatory Branch

NEWHALL LAND

A LENNAR/LNR COMPANY

July 7, 2004

Mr. Aaron Allen
U.S. Army Corps of Engineers Regulatory Branch
2151 Allessandro Drive, #110
Ventura, California 93001

**Transmittal: Amendment to Jurisdiction Delineation Package, Newhall Ranch Project, for a Portion of the Santa Clara River and its Tributaries, Los Angeles County, California**

Dear Mr. Allen:

On December 10, 2003, the Newhall Land and Farming Company (Newhall Land) provided a jurisdiction delineation associated with the proposed Newhall Ranch Habitat Management Plan, entitled "Jurisdiction Delineation, Newhall Ranch Project, for a Portion of the Santa Clara River and its Tributaries, Los Angeles County, California" to the Corps. In recent months, more precise field mapping on the site has revealed some minor modifications to the maps presented in that document. Enclosed please find Exhibits A and B, which show both the original mapping and revisions to the Corps' jurisdiction on the Newhall Ranch site.

Exhibit A shows the area immediately south of the confluence between Middle Canyon and the Santa Clara River. At the request of California Department of Fish and Game personnel, this area was resurveyed and a connection to the river was added to the jurisdiction. Exhibit B shows the eastern portion of Potrero Canyon, where the previous Jurisdiction Delineation had erroneously mapped the southernmost fork too far north.

Please provide a letter to Newhall Land indicating your concurrence with the enclosed revisions to the Corps jurisdictional boundaries as defined in the Jurisdiction Delineation. Should you have any questions or comments regarding this submittal, please call me at 661-255-4069.

Sincerely,

Mark Subbotin
Senior Vice President
Planning and Environmental Resources

Enclosure

THE NEWHALL LAND AND FARMING COMPANY
23823 VALENCIA BOULEVARD, VALENCIA, CALIFORNIA 91355-2194 • PHONE 661.255.4000 FAX 661.255.3960 WWW.NEWHALL.COM

cc: Morgan Wehtje
Terri Dickerson
Connie Farmer
Pat Mitchell

NEWHALL LAND

A LENNAR/LNR COMPANY

July 7, 2004

Ms. Morgan Wehtje
California Department of Fish and Game
2286 Barbara Drive
Camarillo, California 93012

**Transmittal: Amendment to Jurisdiction Delineation Package, Newhall Ranch Project, for a Portion of the Santa Clara River and its Tributaries, Los Angeles County, California**

Dear Morgan:

On December 10, 2003, the Newhall Land and Farming Company (Newhall Land) provided a jurisdiction delineation associated with the proposed Newhall Ranch Habitat Management Plan, entitled "Jurisdiction Delineation, Newhall Ranch Project, for a Portion of the Santa Clara River and its Tributaries, Los Angeles County, California" to CDFG. In recent months, more precise field mapping on the site has revealed some minor modifications to the maps presented in that document. Enclosed please find Exhibits A and B, which show both the original mapping and revisions to CDFG jurisdiction on the Newhall Ranch site.

Exhibit A shows the area immediately south of the confluence between Middle Canyon and the Santa Clara River. At the request of CDFG personnel, this area was resurveyed and a connection to the river was added to the jurisdiction. Exhibit B shows the eastern portion of Potrero Canyon, where the previous Jurisdiction Delineation had erroneously mapped the southernmost fork too far north.

Please provide a letter to Newhall Land indicating your concurrence with the enclosed revisions to CDFG jurisdictional boundaries as defined in the Jurisdiction Delineation by July 15, 2004. Should you have any questions or comments regarding this submittal, please call me at 661-255-4069.

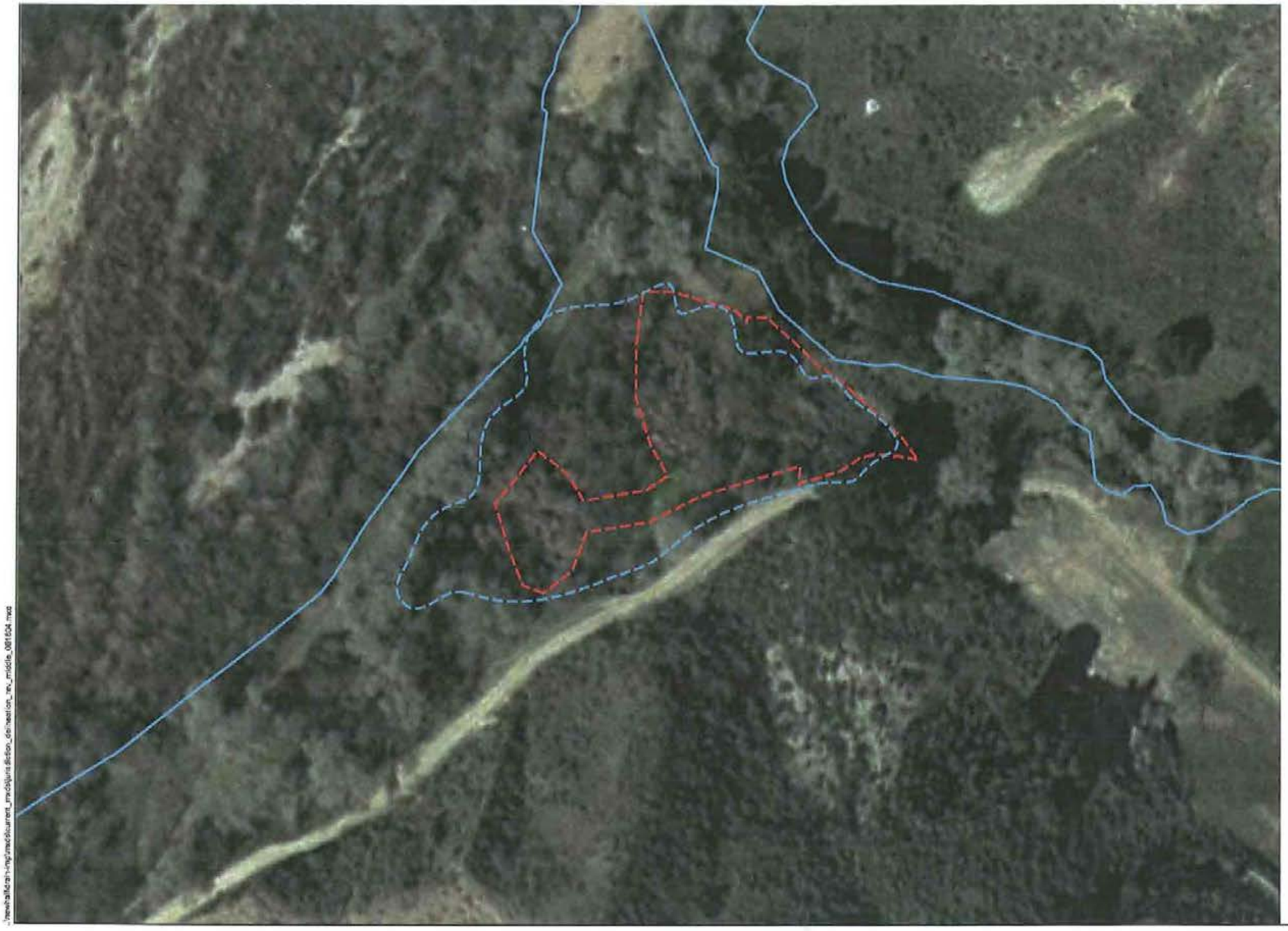
Sincerely,

Mark Subbotin
Senior Vice President
Planning and Environmental Resources

Enclosure

THE NEWHALL LAND AND FARMING COMPANY
23823 VALENCIA BOULEVARD, VALENCIA, CALIFORNIA 91355-2194 • PHONE 661.255.4000 FAX 661.255.3960 WWW.NEWHALL.COM

cc: Terri Dickerson-CDFG
Chuck Raysbrook-CDFG
Aaron Allen-ACOE
Connie Farmer-URS
Pat Mitchell-Downey Brand

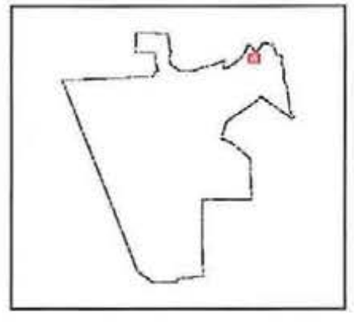


LEGEND

Previous Jurisdiction Delineation

Revised Jurisdiction Delineation

Existing Jurisdictional Delineation



Feet

0 25 50 100

FORMA

06-17-04

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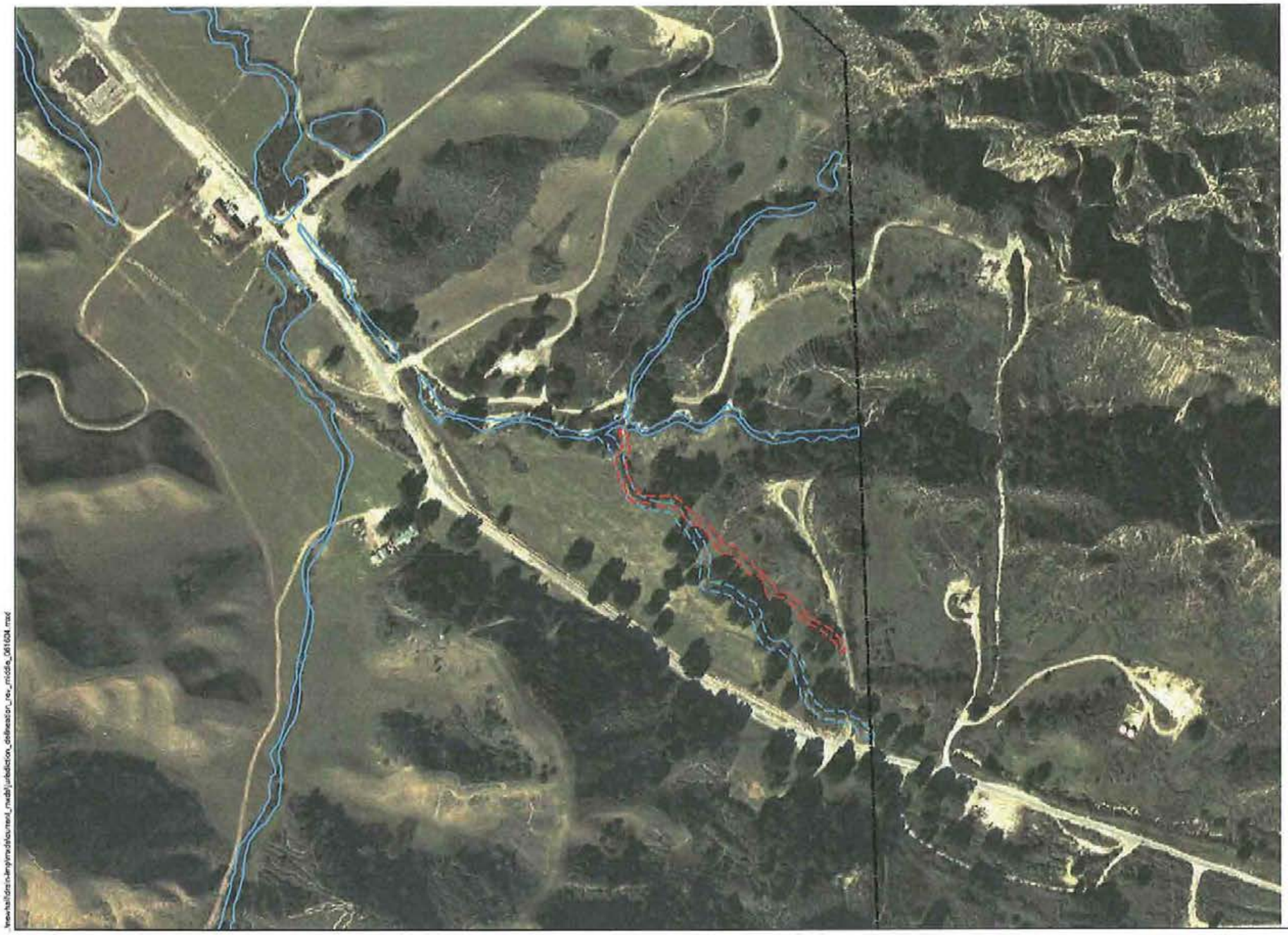
Exhibit A

NEWHALL RANCH SPECIFIC PLAN



LEGEND

- Previous Jurisdiction Delineation
- Revised Jurisdiction Delineation
- Existing Jurisdictional Delineation
- Newhall Ranch Specific Plan Boundary

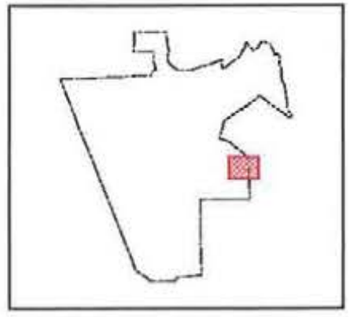


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**Exhibit B**

**NEWHALL RANCH SPECIFIC PLAN**

**Glenn Lukos Associates, "Jurisdictional Delineation for Entrada, An Approximately 850-Acre Property in Los Angeles County, California" (as revised September 15, 2008)**

GLENN LUKOS ASSOCIATES

Regulatory Services

October 18, 2006
[Revised February 9, 2007] [Second Revision September 15, 2008]

Alex Herrell
Newhall Land
23823 Valencia Boulevard
Valencia, California 91355

Los Angeles County, California

Dear Mr. Herrell:

This letter report summarizes our preliminary findings of U.S. Army Corps of Engineers (Corps) and California Department of Fish and Game (CDFG) jurisdiction for the above-referenced property.[1] The Entrada project site in Los Angeles County [Exhibits 1 & 2], comprises approximately 850 acres and contains two blue-line drainages as depicted on the U.S. Geological Survey (USGS) topographic map Newhall, California [dated 1995]) [Exhibit 2]. On August 28, 29 and September 6, 8 12, and 15, 2006, and September 12, 2008, regulatory specialists of Glenn Lukos Associates, Inc. (GLA) examined the project site to determine the limits of (1) Corps jurisdiction pursuant to Section 404 of the Clean Water Act, and (2) CDFG jurisdiction pursuant to Division 2, Chapter 6, Section 1600 of the Fish and Game Code. Enclosed is a map [Exhibit 3], which depicts the areas of Corps and CDFG jurisdiction. Photographs to document the topography, vegetative communities, and general widths of each of the waters are provided as Exhibit 4.

[1] This report presents our best effort at estimating the subject jurisdictional boundaries using the most up-to-date regulations and written policy and guidance from the regulatory agencies. Only the regulatory agencies can make a final determination of jurisdictional boundaries. If a final jurisdictional determination is required, GLA can assist in getting written confirmation of jurisdictional boundaries from the agencies.

Corps jurisdiction at the site totals approximately 4.50 acres, of which 0.15 acres consist of jurisdictional wetlands.

CDFG jurisdiction at the site totals approximately 7.98 acres of which approximately 0.48 acres consist of vegetated riparian habitat.

## I. METHODOLOGY

Prior to beginning the field delineation a 200-scale aerial photograph, a 200-scale topographic base map of the property, and the previously cited USGS topographic map were examined to determine the locations of potential areas of Corps/CDFG jurisdiction. Suspected jurisdictional areas were field checked for the presence of definable channels and/or wetland vegetation, soils and hydrology. Suspected wetland habitats on the site were evaluated using the methodology set forth in the U.S. Army Corps of Engineers 1987 Wetland Delineation Manual[2] (Wetland Manual). While in the field the jurisdictional area was recorded onto a 200-scale base map using visible landmarks.

The Soil Conservation Service (SCS)[3] has mapped the following soil types as occurring in the general vicinity of the project site:

**Castaic-Balcom Silty Clay Loams, 30 to 50 Percent Slopes (CmF)**

The Castaic series consists of well-drained soils that formed in material from soft shale and sandstone. These soils are located within the upland areas on site. The upper nine inches consist of pale brown (10YR 6/3) silty clay loam when dry and dark brown (10YR 4/3) silty clay loam when moist. The Castaic soils are used for dryland small grains and pasture, for range, for watershed, and as wildlife habitat.

**Hanford Sandy Loam, 2 to 9 Percent Slopes (HcC)**

The Hanford series consists of well-drained or somewhat excessively drained soils on alluvial fans. These soils formed in granitic alluvium. The upper 8 inches consist of pale brown (10 YR

[2] Environmental Laboratory. 1987. Corps of Engineers Wetlands Delineation Manual, Technical Report Y-87-1, U.S. Army Engineer Waterways Experimental Station, Vicksburg, Mississippi.

[3] SCS is now known as the National Resource Conservation Service or NRCS.

6/3) coarse sandy loam when dry and dark brown (10 YR 4/3) when moist. The Hanford soils are used for irrigated crops, for dryland small grains, for range, and as wildlife habitat.

**Metz Loam, 2 to 5 Percent Slopes (MgB)**

The Metz series consists of somewhat excessively drained soils on alluvial fans and floodplains. These soils formed in mixed alluvium. The upper 7 inches consist of brown (10YR 5/3) loamy sand when dry and dark brown (10YR 4/3) when moist. Metz soils are used for irrigated crops, for dryland farming, and as wildlife habitat.

**Saugus Loam, 30 to 50 Percent Slopes (ScF)**

The Saugus series consists of well-drained soils on uplands. These soils formed on weakly consolidated sediment that contained pebbles and cobblestones in some places. The upper 15 inches consist of grayish brown (10YR 5/2) loam when dry and dark grayish brown (10YR 4/2) loam when moist. The Saugus soils are used for range and homesites, as well as for wildlife and watershed purposes.

**Yolo Loam, 2 to 9 Percent Slopes (YoC)**

The Yolo series consists of well-drained soils on alluvial fans. These soils formed in sedimentary alluvium. The upper 6 inches consist of grayish-brown (10YR 5/2) loam when dry and very dark grayish brown (10YR 3/2) when moist. Yolo soils are used for irrigated cropes, for range, and for homesites.

None of these soil units are identified as hydric in the SCS's publication, Hydric Soils of the United States.

## II. RESULTS

### A. Corps Jurisdiction

The project site is located within the Santa Clara River watershed, an intrastate waterway that is tributary to the Pacific Ocean. The Corps retains jurisdiction of this watershed because its final destination (i.e. the Pacific Ocean) is a navigable water.

Corps jurisdiction at the project site totals 4.50 acres, of which 0.15 acre is jurisdictional wetland.

The boundaries of the waters of the United States are depicted on the enclosed map provided as Exhibit 3. Six drainages on site were identified that exhibit an OHWM. All of the onsite drainages are ephemeral and flow only during, and for a short duration after, precipitation events. Groundwater is not a source of water for ephemeral streams. Table 1 shows the total Corps jurisdictional acreages, and the acreages of associated jurisdictional wetlands for each drainage. This is followed by a description of the drainages.

**Table 1: Corps Jurisdictional Acreage on Site**

| Drainage | Total Corps Jurisdiction (acres) | Total Wetlands (acres) | Drainage Length (ft) | Drainage Width (ft) |
|---|---|---|---|---|
| Drainage A | 1.45 | 0.13 | 5,299 | 5 to 21 |
| Drainage B | 0.55 | 0 | 7,384 | 1 to 10 |
| Drainage C | 2.15 | 0 | 9,226 | 1 to 52 |
| Drainage D | 0.24 | 0.02 | 2,907 | 1 to 16 |
| Drainage E | 0.06 | 0 | 740 | 3 |
| Drainage F | 0.05 | 0 | 772 | 2 to 5 |
| **TOTAL** | 4.50 | 0.15 | 26,328 | |

## 1. Drainage A

Corps jurisdiction associated with Drainage A and its tributaries totals approximately 1.45 acres, of which 0.13 acre consists of wetlands. The channel is incised with a substrate of sand, silt, and cobble. Drainage A is an ephemeral drainage located in the southwest quadrant of the project and extends for approximately 5,299 feet to where it exits the site. The OHWM varies from five to 21 feet in width. The main stem of the drainage is interrupted in two places by artificial berms constructed to support a dirt road. A culvert in each berm allows discharges to pass through. The southern portion of the eastern tributary to Drainage A receives nuisance flows from nearby development, resulting in a small area of wetland.

Drainage A supports areas of upland vegetation including soft chess (*Bromus hordeaceus*, FACU-), red brome (*Bromus madritensis ssp. rubens*, NI), ripgut brome (*Bromus diandrus*, UPL), great basin sage (*Artemisia tridentata*, UPL), tocalote (*Centaurea melitensis,* UPL), black

mustard (*Brassica nigra,* UPL), black sage (*Salvia mellifera*, UPL), California buckwheat (*Eriogonum fasciculatum*, UPL), grassland goldenbush (*Ericameria palmeri var. pachylepis*, UPL), scrub oak (*Quercus berberidifolia*, UPL), desert scub oak (*Quercus cornelius-mulleri*, UPL), horseweed (*Conyza canadensis*, FAC). Wetland and riparian species include mulefat (*Baccharis salicifolia,* FACW), tall flatsedge (*Cyperus eragrostis*, FACW), rough cockleburr (*Xanthium strumarium*, FAC+), Bermuda grass (*Cynodon dactylon*, FAC), tree tobacco (*Nicotiana glauca*, FAC). Wetlands are limited to areas with standing water and/or saturation in the upper 12 inches. Hydric soils were indicated by the presence of sulfidic odor and/or low chroma matrix with redoxymorphic features.

**2. Drainage B**

Corps jurisdiction associated with Drainage B and its tributaries totals approximately 0.55 acre and is limited to the OHWM of the mainstem channel and its tributaries. Drainage B is an ephemeral drainage located in the southern portion of the project and extends approximately 7,384 feet to where it exits the site at the boundary with Magic Mountain. The channel bottom consists of silt and sand. The OHWM varies from one foot for the tributaries up to 10 feet for the mainstem channel. One tributary creates a one-foot braid running adjacent to the mainstem channel.

The drainage and its tributaries support soft chess (*Bromus hordeaceus*, FACU-), red brome (*Bromus madritensis ssp. rubens*, NI), ripgut brome (*Bromus diandrus*, UPL), tocalote (*Centaurea melitensis,* UPL), black mustard (*Brassica nigra,* UPL), black sage (*Salvia mellifera*, UPL), California buckwheat (*Eriogonum fasciculatum*, UPL), bull thistle (*Cirsium vulgare*, FACU), rough cockleburr (*Xanthium strumarium*, FAC+), purple sage (*Salvia leucophylla*, UPL), white sage (*Salvia apiana*, UPL), doveweed (*Eremocarpus setigerus,* UPL) , elderberry (*Sambucus mexicana*, FAC), scalebroom (*Lepidospartum squamatum*, UPL), coastal sagebrush (*Artemisia californica*, UPL), wild oats (*Avena fatua,* UPL), tree tobacco (*Nicotiana glauca*, FAC), and chamise (*Adenostoma fasciculatum*, UPL). No wetlands are associated with Drainage B.

**3. Drainage C**

Corps jurisdiction associated with Drainage C totals approximately 2.15 acres and is limited to the OHWM of the channel and its tributaries. The channel is incised with a substrate of sand, silt, and cobble. Drainage C is an ephemeral drainage located in the southeast quadrant of the project and extends for approximately 9,226 feet to where it exits the site through a culvert. The OHWM varies from one foot for the tributaries up to 52 feet for the mainstem channel. Located

adjacent to the mainstem channel is a large terrace that no longer receives flows and has revegetated with coastal sage scrub.

The drainage and its tributaries support soft chess (*Bromus hordeaceus*, FACU-), red brome (*Bromus madritensis ssp. rubens*, NI), ripgut brome (*Bromus diandrus*, UPL), tocalote (*Centaurea melitensis,* UPL), black mustard (*Brassica nigra,* UPL), coastal sagebrush (*Artemisia californica*, UPL), scalebroom (*Lepidospartum squamatum*, UPL), California buckwheat (*Eriogonum fasciculatum*, UPL), doveweed (*Eremocarpus setigerus,* UPL), Valley oak (*Quercus lobata*, FAC), California yerba santa (*Eriodictyon californicum*, UPL), and telegraph weed (*Heterotheca grandiflora*, UPL). Local areas of riparian habitat consist of mulefat (*Baccharis salicifolia,* FACW) and elderberry (*Sambucus mexicana*, FAC) however; the mulefat and elderberry were not predominant. The soils in this dry ephemeral drainage exhibit no hydric characteristics and no wetlands are associated with this drainage.

**4. Drainage D**

Corps jurisdiction associated with Drainage D totals approximately 0.26 acre, of which 0.02 acre consists of wetlands. The uppermost reach of the drainage is incised, however below this area, installation of a silt fence has captured sediment resulting in a widened floodplain with multiple braids. The lowest portion of the reach, immediately before discharging into a stormdrain inlet supports cattail-dominated wetland that is hydrologically supported by temporary irrigation that originates on the adjacent upland slope and is carried to the canyon bottom via concrete "V" ditches. The channel bottom is sand and silt over its entire length. Drainage D is largely ephemeral, with the exception of the wetland area that is fed by temporary irrigation and is located in the southeast quadrant of the project site. From where it originates, the drainage extends for approximately 2,907 feet to where it exits the site. The OHWM varies from one to 16 feet in width.

The majority of Drainage D supports areas of upland vegetation including soft chess (*Bromus hordeaceus*, FACU-), red brome (*Bromus madritensis ssp. rubens*, NI), ripgut brome (*Bromus diandrus*, UPL), telegraph weed (*Heterotheca grandiflora*, UPL), tocalote (*Centaurea melitensis,* UPL), black mustard (*Brassica nigra,* UPL), ragweed (*Ambrosia ssp*., UPL), California buckwheat (*Eriogonum fasciculatum*, UPL), doveweed (*Eremocarpus setigerus,* UPL), Valley oak (*Quercus lobata*, FAC), tree tobacco (*Nicotiana glauca*, FAC), lambsquarters (*Chenopodium album*, FAC), and horseweed (*Conyza canadensis*, FAC). The presence of wetlands in the lowest reach was indicated by a predominance of hydrophytes including rough cocklebur (*Xanthium strumarium*, FAC+) and southern cattail (*Typha domingensis*, OBL). Wetlands are limited to areas with standing water and/or saturation in the upper 12 inches that originates with

temporary irrigation water from the adjacent graded slopes. Hydric soils were indicated by the presence of sulfidic odor and/or low chroma matrix with redoximorphic features.

**5. Drainage E**

Corps jurisdiction associated with Drainage E totals approximately 0.06 acre and is limited to the OHWM of the channel. Drainage E is an ephemeral drainage located in the southeast quadrant of the project and extends for approximately 740 feet to where it exits the site. The OHWM for the portion on the project site maintains three feet and the channel bottom consists of silt and cobble. The offsite portion has been maintained with construction of a v-ditch.

Drainage E supports areas of upland vegetation including soft chess (*Bromus hordeaceus*, FACU-), red brome (*Bromus madritensis ssp. rubens*, NI), ripgut brome (*Bromus diandrus*, UPL), black mustard (*Brassica nigra,* UPL), tocalote (*Centaurea melitensis,* UPL), and coastal sagebrush (*Artemisia californica*, UPL). A single Fremont cottonwood (*Populus fremontii*, FACW) is located in the drainage.

**6. Drainage F**

Corps jurisdiction associated with Drainage F totals approximately 0.05 acre and is limited to the OHWM of the channel. The channel bottom consists of silt and cobble. Drainage E is an ephemeral drainage located in the southeast quadrant of the project and extends for approximately 772 feet to where it exits the project site. The OHWM varies from two to five feet in width. The offsite portion has been maintained with construction of a v-ditch.

Drainage F supports areas of upland vegetation including soft chess (*Bromus hordeaceus*, FACU), red brome (*Bromus madritensis ssp. rubens*, NI), ripgut brome (*Bromus diandrus*, UPL), black mustard (*Brassica nigra,* UPL), tocalote (*Centaurea melitensis,* UPL), and coastal sagebrush (*Artemisia californica*, UPL).

**7. Additional Features**

Additional features on the site appeared to exhibit potential for the presence of an OHWM based on site topogaphy, however, field examination showed no evidence of flow or OHWM. As such, Corps jurisdiction is not associated with these features [depicted as dashed lines on Exhibit 3].

## B. CDFG Jurisdiction

CDFG jurisdiction at the project site totals 7.98 acres, of which approximately 0.48 acre consists of vegetated riparian habitat.

The boundaries of CDFG jurisdiction are depicted on the enclosed map provided as Exhibit 3. Six drainages on site were identified that exhibit a defined channel with bed and bank. All of the onsite drainages are ephemeral and flow only during, and for a short duration after, precipitation events. Table 2 shows the total CDFG jurisdictional acreages, and the acreages of associated riparian vegetation for each drainage. This is followed by a description the drainages.

**Table 2: CDFG Jurisdictional Acreage on Site**

| Drainage | Total CDFG Jurisdiction (acres) | Total Riparian Vegetation (acres) | Drainage Length (ft) | Drainage Width (ft) |
|---|---|---|---|---|
| Drainage A | 1.45 | 0.13 | 5,299 | 5 to 21 |
| Drainage B | 0.55 | 0 | 7,384 | 1 to 10 |
| Drainage C | 5.15 | 0.01 | 9,226 | 1 to 160 |
| Drainage D | 0.70 | 0.32 | 2,907 | 3 to 193 |
| Drainage E | 0.08 | 0.02 | 740 | 3 |
| Drainage F | 0.05 | 0 | 772 | 2 to 5 |
| **TOTAL** | 7.98 | 0.48 | 26,328 | |

### 1. Drainage A

CDFG jurisdiction associated with Drainage A and its tributaries totals approximately 1.45 acres, of which 0.13 acre consists of vegetated riparian habitat. Drainage A is ephemeral and is located in the southwest quadrant of the project and extends for approximately 5,299 feet to where it exits the site. The channel is incised with a substrate of sand, silt and cobble. The mainstem of the drainage is interrupted at two locations by road crossings. Each road crossing is culverted, allowing storm discharges to pass through. The southern portion of the eastern tributary to Drainage A receives nuisance flows from nearby development, resulting in a small area of in-channel wetland. This drainage averages five to 21 feet in width.

The banks and bed support upland vegetation including soft chess (*Bromus hordeaceus*, FACU-), red brome (*Bromus madritensis ssp. rubens*, NI), ripgut brome (*Bromus diandrus*, UPL), great

basin sage (*Artemisia tridentata*, UPL), tocalote (*Centaurea melitensis,* UPL), black mustard (*Brassica nigra,* UPL), black sage (*Salvia mellifera*, UPL), California buckwheat (*Eriogonum fasciculatum*, UPL), grassland goldenbush (*Ericameria palmeri var. pachylepis*, UPL), scrub oak (*Quercus berberidifolia*, UPL), desert scub oak (*Quercus cornelius-mulleri*, UPL), horseweed (*Conyza canadensis*, FAC). Wetland and riparian species include mulefat (*Baccharis salicifolia,* FACW), tall flatsedge (*Cyperus eragrostis*, FACW), rough cockleburr (*Xanthium strumarium*, FAC+), Bermuda grass (*Cynodon dactylon*, FAC), tree tobacco (*Nicotiana glauca*, FAC).

**2. Drainage B**

CDFG jurisdiction associated with Drainage B and its tributaries totals approximately 0.55 acre, none of which consists of vegetated riparian habitat. Drainage B is an ephemeral drainage located in the southern portion of the project and extends for approximately 7,384 feet to where it exits the site at the boundary with Magic Mountain. The channel bottom consists of silt and sand. The channel ranges from one foot for the tributaries up to ten feet for the mainstem channel. One tributary consists of a one-foot braid running parallel with the mainstem channel.

The bed and bank of the channel supports a mix of upland scrub, grasses and forbs and riparian/wetland species and includes soft chess (*Bromus hordeaceus*, FACU-), red brome (*Bromus madritensis ssp. rubens*, NI), ripgut brome (*Bromus diandrus*, UPL), tocalote (*Centaurea melitensis,* UPL), black mustard (*Brassica nigra,* UPL), black sage (*Salvia mellifera*, UPL), California buckwheat (*Eriogonum fasciculatum*, UPL), bull thistle (*Cirsium vulgare*, FACU), rough cockleburr (*Xanthium strumarium*, FAC+), purple sage (*Salvia leucophylla*, UPL), white sage (*Salvia apiana*, FACU-), doveweed (*Eremocarpus setigerus,* UPL), Mexican elderberry (*Sambucus mexicana*, FAC), scalebroom (*Lepidospartum squamatum*, UPL), coastal sagebrush (*Artemisia californica*, UPL), wild oats (*Avena fatua,* UPL), tree tobacco (*Nicotiana glauca*, FAC), and chamise (*Adenostoma fasciculatum*, UPL). No vegetated riparian habitat is associated with this drainage.

**3. Drainage C**

CDFG jurisdiction associated with Drainage C and its tributaries totals approximately 5.15 acres, of which 0.01 acre consists of vegetated riparian habitat. Drainage C is an ephemeral drainage located in the southern portion of the project and extends for approximately 9,226 feet to where it exits the site. The channel is incised with a substrate of sand, silt and cobble. The channel ranges from one foot for the tributaries up to 160 feet for the mainstem channel. Located adjacent to the mainstem channel is a large terrace that no longer receives flows and has revegetated with coastal sage scrub.

The drainage and its tributaries support soft chess (*Bromus hordeaceus*, FACU-), red brome (*Bromus madritensis ssp. rubens*, NI), ripgut brome (*Bromus diandrus*, UPL), tocalote (*Centaurea melitensis,* UPL), black mustard (*Brassica nigra,* UPL), coastal sagebrush (*Artemisia californica*, UPL), scalebroom (*Lepidospartum squamatum*, UPL), California buckwheat (*Eriogonum fasciculatum*, UPL), doveweed (*Eremocarpus setigerus,* UPL), Valley oak (*Quercus lobata*, FAC), California yerba santa (*Eriodictyon californicum*, UPL), and telegraph weed (*Heterotheca grandiflora*, UPL). Local areas of riparian habitat consist of mulefat (*Baccharis salicifolia,* FACW) and elderberry (*Sambucus mexicana*, FAC).

**4. Drainage D**

CDFG jurisdiction associated with Drainage D totals approximately 0.70 acre, of which 0.32 acre consists of vegetated riparian habitat. Drainage D is an ephemeral drainage located in the southern portion of the project and extends for approximately 2,907 feet to where it exits the site. This Drainage and associated riparian habitat varies from three to approximately 190 feet in width.

Drainage D supports areas of upland vegetation including soft chess (*Bromus hordeaceus*, FACU-), red brome (*Bromus madritensis ssp. rubens*, NI), ripgut brome (*Bromus diandrus*, UPL), telegraph weed (*Heterotheca grandiflora*, UPL), tocalote (*Centaurea melitensis,* UPL), black mustard (*Brassica nigra,* UPL), ragweed (*Ambrosia ssp*., UPL), California buckwheat (*Eriogonum fasciculatum*, UPL), doveweed (*Eremocarpus setigerus,* UPL), Valley oak (*Quercus lobata*), tree tobacco (*Nicotiana glauca*, FAC), lambsquarters (*Chenopodium album*, FAC), and horseweed (*Conyza canadensis*, FAC). Wetland/riparian species include mulefat (*Baccharis salicifolia,* FACW), salt cedar (*Tamarisk ramosissima*, FAC), rough cocklebur (*Xanthium strumarium*, FAC+), red willow (*Salix laevigata*, FACW), sandbar willow (*Salix exigua*, OBL), rabbitfoot grass (*Polypogon monspeliensis*, FACW+), and southern cattail (*Typha domingensis*, OBL).

**5. Drainage E**

CDFG jurisdiction associated with Drainage E totals approximately 0.08 acre, of which 0.02 acre consists of vegetated riparian habitat. Drainage E is an ephemeral drainage located in the southeast quadrant of the property and extends for approximately 740 feet to where it exits the site. The width of the channel for the portion on the project site maintains three feet. Drainage E supports areas of upland vegetation including soft chess (*Bromus hordeaceus*, FACU-), red brome (*Bromus madritensis ssp. rubens*, NI), ripgut brome (*Bromus diandrus*,

UPL), black mustard (*Brassica nigra,* UPL), tocalote (*Centaurea melitensis,* UPL), and coastal sagebrush (*Artemisia californica*, UPL). A single Fremont Cottonwood (*Populus fremontii*, FACW) is located in the drainage.

**6. Drainage F**

CDFG jurisdiction associated with Drainage F totals approximately 0.05 acre, none of which consists of vegetated riparian habitat. Drainage F is ephemeral and is located in the southeast portion of the property and extends for approximately 772 feet to where it exits the site. This incised channel channel varies from two to five feet in width and is comprised of sand and cobble.

Drainage F supports areas of upland vegetation including soft chess (*Bromus hordeaceus*, FACU), red brome (*Bromus madritensis ssp. rubens*, NI), ripgut brome (*Bromus diandrus*, UPL), black mustard (*Brassica nigra,* UPL), tocalote (*Centaurea melitensis,* UPL), and coastal sagebrush (*Artemisia californica*, UPL). No vegetated riparian habitat is associated with this drainage.

**7. Additional Features**

Additional features on the site appeared to exhibit potential for the presence of a bed, bank, or channel based on site topogaphy, however, field examination showed no evidence of a bed, bank, or channel. As such, CDFG jurisdiction is not associated with these features [depicted as dashed lines on Exhibit 3].

If you have any questions about this letter report, please contact Tony Bomkamp at (949) 837-0404 ext 44.

Sincerely,

GLENN LUKOS ASSOCIATES, INC.

Alexis Kessans

Alexis Kessans
Regulatory Specialist

s:0540-5b.jd.091508.doc

Adapted from USGS quadrangle Los Angeles

NORTH

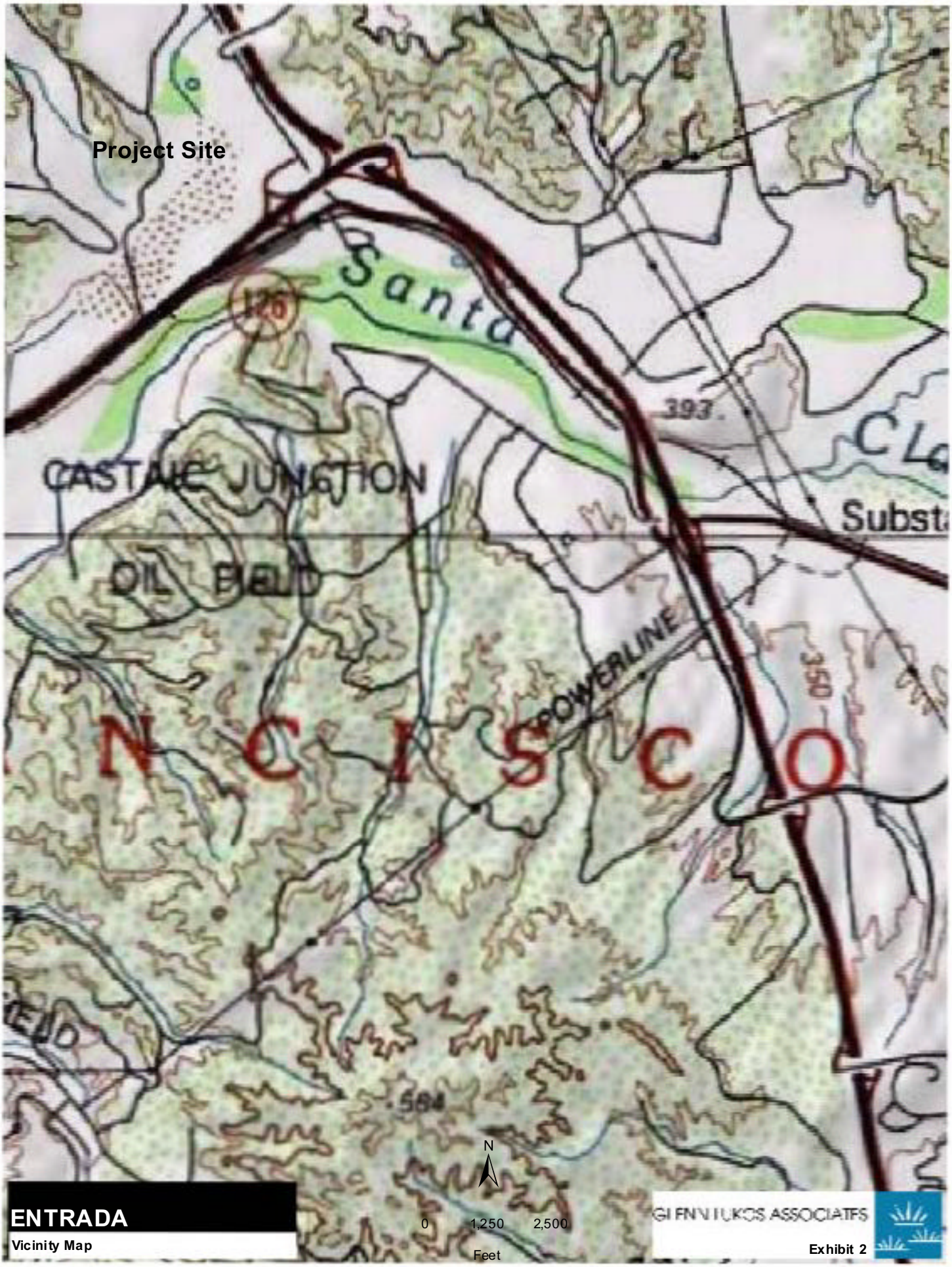
0 2 4 6

MILES

GLENN LUKOS ASSOCIATES

**EXHIBIT 1**

Regional Map




**ENTRADA**

**Vicinity Map**

GI FNVI TUKOS ASSOCIATES

**Exhibit 2**

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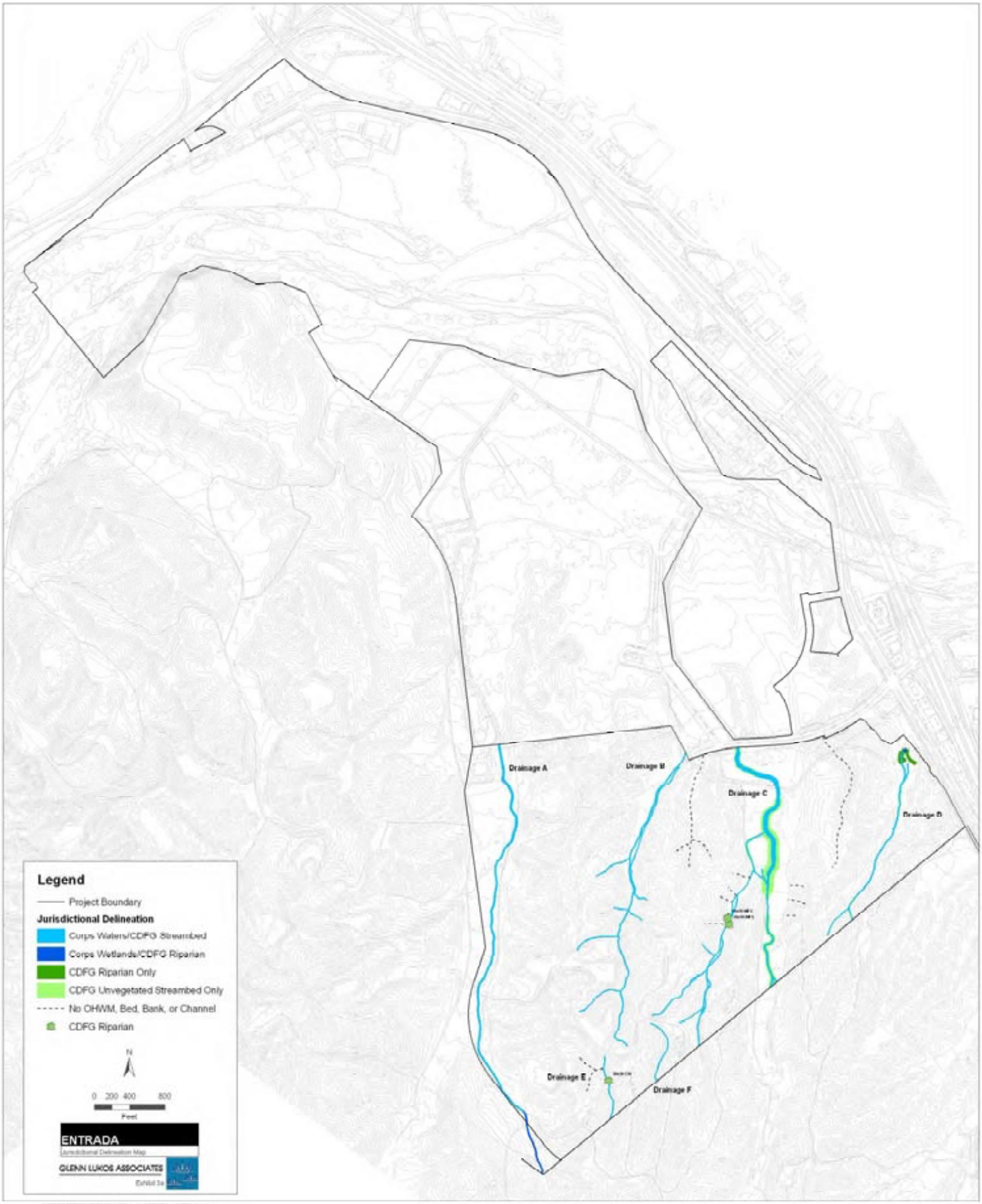
Drainage A
Drainage B
Drainage C
Drainage D
Drainage E
Drainage F
Legend
Project Boundary
Jurisdictional Delineation
Corps Waters/CDFG Streambed
Corps Wetlands/CDFG Riparian
CDFG Riparian Only
CDFG Unvegetated Streambed Only
No OHWM, Bed, Bank, or Channel
CDFG Riparian
N
0 200 400 800
Feet
ENTRADA
Jurisdictional Delineation Map
GLENN LUKOS ASSOCIATES
Exhibit 3a

Drainage C

Drainage D

Drainage B

Drainage A

10x20 MPS

20x10 MPS

Drainage F

30x30 CW

Drainage E

**Legend**

Project Boundary

**Jurisdictional Delineation**

Corps Waters/CDFG Streambed

Corps Wetlands/CDFG Riparian

CDFG Riparian Only

CDFG Unvegetated Streambed Only

No OHWM, Bed, Bank, or Channel

CDFG Riparian

0 1,250 2,500

# ENTRADA

Jurisdictional Delineation Map

GLENN LUKOS ASSOCIATES

Exhibit 3b

X:\0363-THE REST\0540-12ENT2\540-12.GIS\DelineationGIS\0540-12Delineation.mxd
September 16, 2008

PHOTOGRAPH 1 - View of unvegetated ephemeral Drainage C looking north.

PHOTOGRAPH 2 - View of unvegetated ephemeral Drainage C looking south.

GLENN LUKOS ASSOCIATES

EXHIBIT 4

Site Photographs

PHOTOGRAPH 3 - View of ephemeral Drainage B looking south. The drainage is largely populated with California buckwheat (Eriogonum fasciculatum, UPL).

PHOTOGRAPH 4 - View of unvegetated incised ephemeral Drainage D looking southwest.

PHOTOGRAPH 5 - View of sparsely vegetated ephemeral Drainage D looking south. Notice the silt fence across the drainage in the background and the terrace in the foreground.

PHOTOGRAPH 6 - View facing northeast of storm drain inlet in lowest portion of Drainage D.

GLENN LUKOS ASSOCIATES

EXHIBIT 4

Site Photographs

**URS, "Composite Wetland Delineation for the Newhall Ranch Resource Management and Development Plan Site and Entrada Planning Area" (2009)**

# COMPOSITE WETLAND DELINEATION

## FOR THE

## NEWHALL RANCH RESOURCE MANAGEMENT AND DEVELOPMENT PLAN SITE AND ENTRADA PLANNING AREA

*Prepared for:*

**Newhall Land and Farming Company**
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URS Project Number 28907071

April 2, 2009

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# SECTION 1.0
# INTRODUCTION

This composite wetland delineation has been prepared by URS Corporation (URS) on behalf of the Newhall Land and Farming Company (Newhall Land). The purpose of this document is to determine the location and extent of all lands within Newhall Land's Resource Management and Development Plan (RMDP) project site and the adjacent Entrada planning area (Figure 1) that would meet the federal definition of wetlands (see 33 CFR 328.3(b)) promulgated by the U.S. Army Corps of Engineers (Corps). The extent of wetlands presented in this document includes wetland boundaries delineated in previous studies, as well as boundaries delineated specifically for this report. The body of this report is organized in two parts: Part One describes the field study conducted specifically for this report, and Part Two integrates the results of that study with the results of previous investigations to create a comprehensive, composite wetland delineation for the entire project site.

## 1.1 BACKGROUND AND PURPOSE

In 2003, the Los Angeles County Board of Supervisors approved the Newhall Ranch Specific Plan (Specific Plan), which designated a portion of the currently undeveloped Newhall Ranch site near Valencia, California for residential and other urban uses. However, although approval from the County has been granted, build out of the Specific Plan development cannot proceed without compliance with federal and state statutes including the Clean Water Act and applicable sections of the California Fish and Game Code. Both of these statutes require project proponents to acquire authorizations prior to undertaking development activities that would affect waters and streambeds. To meet this need in a streamlined manner, Newhall Land has proposed the RMDP, a comprehensive, long-term permitting plan intended to obtain the required state and federal approvals to build out the site's infrastructure and urban land uses over the next 20 years as previously approved by Los Angeles County. Specifically, the RMDP would involve issuance of a long-term, Individual Section 404 Permit from the Corps and a Master Streambed Alteration Agreement from the California Department of Fish and Game (CDFG). For a more detailed description of the RMDP, please refer to Section 1.2 below, or to the RMDP technical document (Dudek 2006b).

As stated above, Newhall Land is currently in the process of obtaining the federal and state authorizations laid out in the RMDP. Because issuance of the requested permits could potentially result in significant effects on the environment, this process includes working with the Corps and CDFG to prepare a joint Environmental Impact Statement/Environmental Impact Report (EIS/EIR) as required by the National Environmental Policy Act (NEPA) and California Environmental Quality Act (CEQA). To assist preparation of the EIS/EIR, numerous jurisdictional delineations and studies have been conducted within the RMDP site

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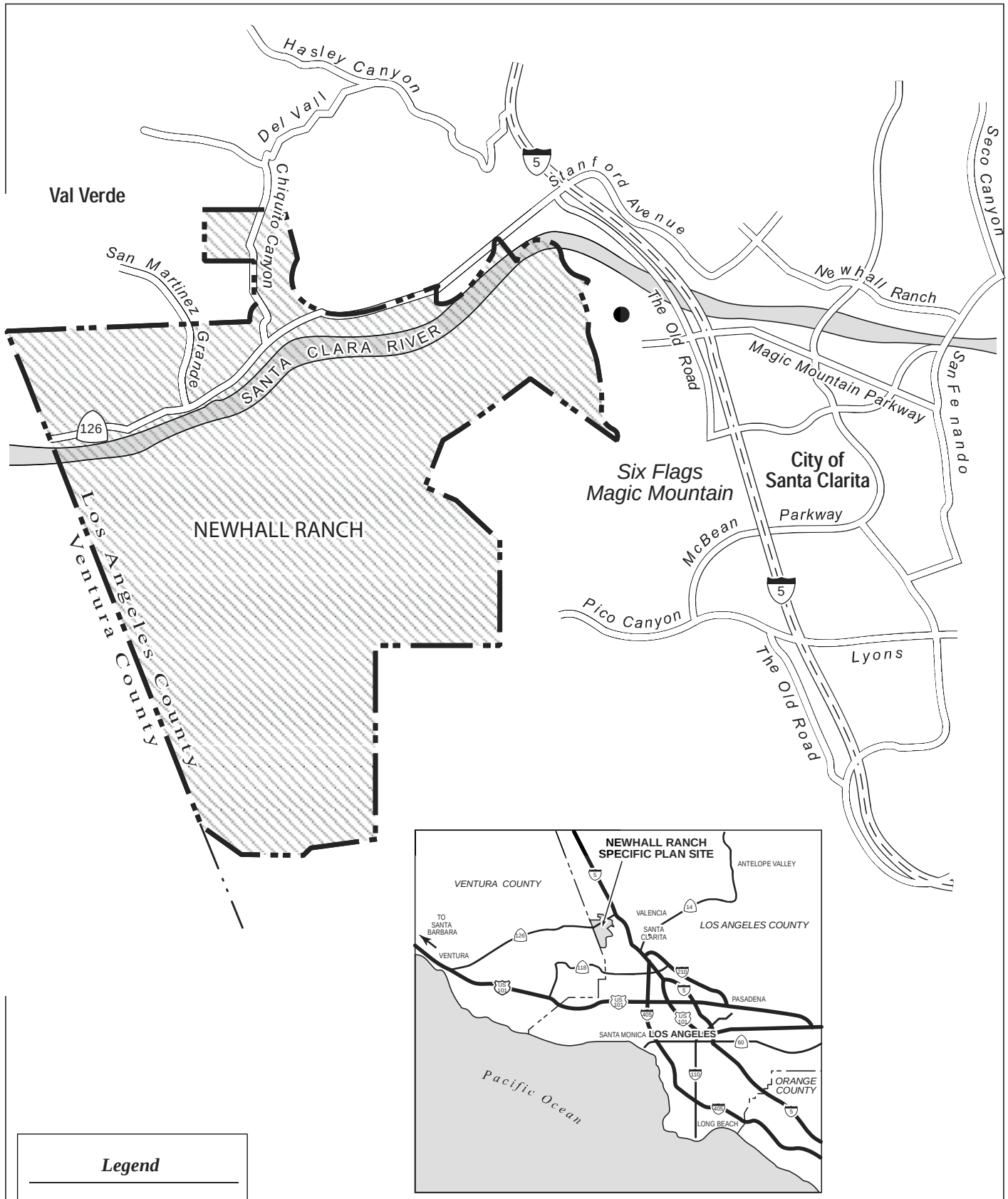





***Legend***

Newhall Ranch Boundary

Quadrangle Location

0 3500 7000

*Feet*

*1 inch dquals 7,000 feet*

Figure 1. Project Vicinity Map

NEWHALL RANCH

URS

*Newhall Ranch*
*Resource Management*
*and Development Plan*

over the last six years. However, not all of these studies addressed wetlands specifically, and some of the studies were limited to specific portions of the project area.

The most comprehensive jurisdictional delineation for the project was completed in 2004, when URS field mapped all jurisdictional rivers and streams within the RMDP project site. Concurrence with the mapped jurisdictional boundaries was received from the Corps and CDFG in 2004. However, while the 2004 delineation provided comprehensive coverage of the jurisdictional streams on-site, it did not address the presence of special aquatic sites, such as wetlands, within the project site. Because special aquatic sites are afforded additional legal protection beyond that extended to non-wetland waters of the U.S. under the Clean Water Act, it was determined that supplemental delineation work should be performed to identify the location and extent of federally protected wetlands on-site. The 2004 delineation was exhaustive in its treatment of CDFG jurisdictional streambeds on-site, and no additional delineation work is required with regard to those areas. Streambeds under the jurisdiction of CDFG are therefore not discussed further in this document. The wetland boundaries presented in this composite wetland delineation report are compiled from the following sources:

- The URS (2004) comprehensive delineation report, discussed above (Appendix D).
- A field delineation of wetlands within the Entrada portion of the project area conducted by Lukos and Associates in 2008 (Appendix E).
- Interpretation of high-resolution aerial photographs of the Santa Clara River within the RMDP site to obtain a planning-level delineation of wetlands, conducted jointly by URS and Dudek and Associates in 2006.
- A field delineation of on-site wetlands in certain portions of the project site where large-scale project facilities (i.e., bridges across the Santa Clara River mainstem) are proposed, conducted specifically for this composite wetland delineation report. For more information, please refer to Part Two of this document.

A report of the field delineations conducted specifically for this composite report in 2007 is presented in Part One, below. The results of that effort and the other surveys identified above are integrated into a single, project-wide plannning-level delineation in Part Two.

## 1.2 DESCRIPTION OF THE PROPOSED RMDP

The intent of the RMDP is to obtain comprehensive state and federal approvals to construct facilities needed to supply a portion of the infrastructure required to build out the Newhall Ranch Specific Plan site's urban land uses over the next 20 years as previously approved by Los Angeles County. The proposed RMDP project activities that may affect jurisdictional areas include construction and maintenance of bridges, bank stabilization, grade control structures, utility crossings, storm drains, building pads, debris and detention basins, and a

water reclamation plant outfall. Among the most prominent features proposed are three new roadway bridges across the Santa Clara River, and buried bank stabilization that would line a portion of the river and tributaries. A fully detailed description of the facilities proposed in the Newhall Ranch RMDP project can be found in the RMDP technical document (Dudek 2006b).

By seeking a long-term, comprehensive Section 404 permit and Master 1605 Agreement, Newhall Land can facilitate a well planned and streamlined environmental evaluation and decision process by the Corps and CDFG, and can provide an opportunity to design a long-term, regionally-based planning and mitigation program for impacts to the affected riparian habitats. The Section 404 permit and Master 1605 Agreement would allow project components to be implemented under a comprehensive set of specific conditions, thereby avoiding the traditional case-by-case permitting process, expediting the permitting process for qualified project components, and ensuring consistent mitigation.

The various components of the proposed RMDP would be constructed by Newhall Land or other private or public agencies. Third parties would be allowed to perform some of the activities (such as ongoing maintenance operations) authorized under the proposed Section 404 permit and Master 1605 Agreement issued to Newhall Land, but would be bound by the conditions in those permits.

# SECTION 2.0
# PART ONE: URS CORPORATION 2007 FIELD DELINEATION OF WETLANDS IN PROPOSED BRIDGE ALIGNMENT AREAS

This Part presents the methods and results of field investigations for wetlands conducted by URS staff in portions of the RMDP site where large-scale facilities, such as bridges across the Santa Clara River mainstem, are proposed that would potentially impact any wetlands present. Field investigations were conducted in August, 2007.

## 2.1 STUDY AREA

The study area assessed in the 2007 field delineation (Part One study area) consists of four discrete locations within the RMDP project site, including three proposed bridge locations and one area where proposed bank stabilization would impact existing riparian vegetation (Figure 2). From west to east, these locations include: the Potrero Canyon Road bridge alignment (actually two alternative alignments, but located in the same general area); the Onion Fields bank stablization area; the Long Canyon Road bridge alignment; and the southern abutment of the Commerce Center Drive bridge. All four of these locations that comprise the Part One study area are located immediately adjacent to the Santa Clara River mainstem within the RMDP site.

As shown on Figure 2, the Santa Clara River traverses the RMDP site from east to west and is the dominant hydrologic feature on the site. The current and historic river floodplain are evident from the the existing hydrology, sediment deposition, topographic gradients, and the residual disjunct riparian vegetation. Row-crop agricultural fields are situated on the historic floodplain and adjacent historic river terraces, especially on the north side of the river where the dominant topography is flat to slightly sloping. On the south side of the river, the presence of steeper canyons reduces the available agricultural land near the Santa Clara River. Oil production is the dominant land use in the southern hills, although some of the larger mesas are actively farmed.

Descriptions of the four locations that comprise the Part One study area are provided below. The study area boundary for each of the locations includes the disturbance footprint for the project component proposed at that location (bridge or bank stabilization) and a 100-foot buffer surrounding the footprint.

### 2.1.1 Potrero Canyon Road Bridge Alignment

The Potrero Canyon Road bridge alignment study location is located in the western portion of the RMDP site at the mouth of Potrero Canyon (Figure 2). This 7.97-acre study location contains the disturbance footprints (including buffers, as described above) of two alternative bridge alignments which will be evaluated in the joint EIS/EIR for the RMDP project. This

0 455 910 1,820

Feet

*1 inch equals 1,525 feet*

***Legend***

Newhall Ranch Boundary

Bridge Alignment Alternatives and Bank Stablization

Aerial Interpreted River

**Basemap**

Aerial flown by Robert J. Lung & Associates, 5/24/2006, 0.5ft resolution

Castaic Creek

Commerce Center Bridge

Santa Clara River

State Route 126

Long Canyon Bridge

Onion Field
Bank Stablization

Santa Clara River

Potrero Canyon Bridge

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Figure 2. Project Location Map

NEWHALL RANCH

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*Newhall Ranch Resource Management and Development Plan*

location includes a portion of the Santa Clara River, its floodplain, and riparian, agricultural, and upland sage scrub vegetation. Current land uses within the Potrero Canyon Road bridge study location include agriculture, grazing, and open space.

The majority of the Potrero Canyon Road bridge study location is composed of a flat to slightly sloping floodplain comprised of a main channel and several secondary channels separated by long, narrow sandbars. The study location spans the active channel, and extends into the adjacent uplands on the northern and southern banks. The dynamic nature of the river prevents vegetation within the channel from reaching maturity and limits the type of vegetation to riparian scrub communities, which occur on stable sandbars and terraces within the active channel. Along the banks of the river, mature vegetation communities including cottonwood/willow riparian forest are present. The area beyond the northern bank includes riparian scrub and riparian forest vegetation that are currently separated from the main channel by agricultural fields. The southern bank at this location contains a slightly sloping terrace that begins near a dry secondary channel along the edge of the River and continues south toward a ranch road. This area is within the Santa Clara River floodplain and is dominated by mature riparian forest. Additionally, riparian scrub vegetation occurs in a drainage ditch adjacent to a ranch road in the southernmost portion of the Potrero Canyon Road bridge study location.

### 2.1.2 Onion Fields Bank Stablization Site

The Onion Fields bank stabilization study location is located in the western portion of the RMDP site approximately 0.5 miles east of the proposed bridge across the river at Potrero Canyon Road and 30 feet south of the Santa Clara River (Figure 2). This 3.13 acre study location covers an oval shaped area between the river and an east-west trending ranch road. The study location is partly elevated above the Santa Clara River floodplain due to an upward-sloping bank. The majority of the study location is composed of a flat to moderately sloping river terrace containing mature riparian forest. The current land use within the Onion Fields study location is open space, although a dirt road and an irrigated agricultural field occur immediately adjacent to this location.

### 2.1.3 Long Canyon Road Bridge Alignment

The Long Canyon Road bridge alignment study location is situated in the middle portion of the project site, approximately 1.25 miles east of the proposed bridge across the river at Potrero Canyon Road (Figure 2). This 2.1 acre study area contains the proposed alignment for the Long Canyon Road bridge across the Santa Clara River, including a 100-foot buffer surrounding the proposed disturbance footprint. Within this area, ground covers include the active channel, riparian corridor, and floodplain of the Santa Clara River, and adjacent fallow agricultural fields. Current land uses within the Long Canyon Road bridge alignment study location include agriculture, cattle grazing, and open space.

The majority of this study location is composed of a flat to slightly sloping floodplain containing a primary channel and several secondary channels separated by sandbars. The floodplain is dominated by riparian scrub habitat. There is a river terrace approximately 12 feet high along the southern part of the study area that is situated above the current floodplain. This terrace is also dominated by riparian scrub vegetation. The northernmost and southernmost portions of the study location (ends of the proposed bridge) currently contain row-crop agricultural fields.

### 2.1.4 Southern Abutment of Commerce Center Drive Bridge

The Commerce Center Drive bridge alignment study location is located very close to the eastern boundary of the RMDP site (Figure 2.) The approximately 2.94 acre study area includes the disturbance footprint for the southern abutment of the Commerce Center Drive bridge across the river, including a 100-foot buffer (The study location was limited to the southern abutment because Newhall Land already holds a valid Section 404 Permit and Streambed Alteration Agreement for the remainder of the bridge, and only the southern abutment would require authorization under the proposed RMDP.). Land covers within the study location include the Santa Clara River, its floodplain, and riparian and sage scrub vegetation. Current land uses within the Commerce Center Drive bridge study location include agriculture and open space.

The majority of the Commerce Center Drive bridge study location is composed of a flat to slightly sloping floodplain dominated by riparian scrub vegetation. The southernmost portion of the study location includes part of a hill dominated by upland sage scrub vegetation.

Pursuant to Section 404 of the Clean Water Act (CWA), the Corps regulates the discharge of dredged and/or fill material into waters of the U.S., including navigable waterways and wetlands adjacent to navigable waterways; relatively permanent, non-navigable tributaries to navigable waterways; and wetlands adjacent to non-navigable waters that are contiguous with navigable waterways. The CWA states that the Corps may only issue a Section 404 Permit for the Least Environmentally Damaging Practicable Alternative (LEDPA), and the U.S. Environmental Protection Agency (EPA) has established guidelines [404(b)(1) Guidelines] enabling the Corps to compare alternatives to a proposed discharge and determine the LEDPA. Certain high-value aquatic resource areas, termed Special Aquatic Sites, are given additional protection by the 404(b)(1) Guidelines and avoidance is required if practicable. Special Aquatic Sites are defined to include wetlands, mudflats, vegetated shallows, riffle/pool complexes, coral reefs, and sanctuaries and refuges. Of these features, only wetlands occur within the RMDP project area.

### 2.1.5 Wetland Defined

Wetlands are defined by 33 CFR 328.3(b) as “those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under

normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (Environmental Laboratory 1987). In 1987, the Corps published the *Corps of Engineers Wetland Delineation Manual* (Environmental Laboratory 1987; Wetland Delineation Manual) to guide its field personnel in determining jurisdictional wetland boundaries. In 2006, the *Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region* (USACE 2006; Arid West Regional Supplement) was published by the Corps for use in California (Region 0) as a complement to the Wetland Delineation Manual. Where differences occur within the two documents, the Arid West Regional Supplement takes precedence. The methodology set forth in the Wetland Delineation Manual and the Arid West Regional Supplement requires that to be considered a wetland, the vegetation, soils, and hydrology of an area must exhibit at least minimal hydric characteristics. While the Wetland Delineation Manual and Arid West Regional Supplement provide great detail concerning methodology and allow for varying special conditions, a wetland should normally meet each of the following three criteria: Hydrophytic Vegetation, Hydric Soils, and Wetland Hydrology. These wetland parameters are discussed in greater detail below.

#### 2.1.5.1 Hydrophytic Vegetation

In order for a site to meet the CWA definition of a wetland, the site must exhibit a prevalence of hydrophytic vegetation. A site is usually considered to have a prevalence of hydrophytic vegetation when 50 percent or more of the dominant plant species of a specific community are classified as obligate, facultative-wetland, or facultative (excluding FAC-) according to the *National List of Plant Species That Occur in Wetlands* (Reed 1988). This list divides plants into five categories that reflect the range of estimated probabilities (expressed as a frequency of occurrence) of a species occurring in a wetland versus a non-wetland.

These categories are as follows:

- **Obligate Wetland (OBL)** – Occur almost always (estimated probability >99 percent) under natural conditions in wetlands.
- **Facultative Wetland (FACW)** – Usually occur in wetlands (estimated probability 67 percent to 99 percent), but occasionally found in non-wetlands.
- **Facultative (FAC)** – Equally likely to occur in wetlands or non-wetlands (estimated probability 34 percent to 66 percent).
- **Facultative Upland (FACU)** – Usually occur in non-wetlands (estimated probability 67 percent to 99 percent), but occasionally found in wetlands.
- **Obligate Upland (UPL)** – May occur in wetlands in another region, but occur almost always (estimated probability >99 percent) under natural conditions in non-wetlands in southern California.

A positive sign (+) or negative sign (-) can be used with the Facultative Wetland, Facultative, and Facultative Upland categories to more specifically define the likelihood of occurrence toward the higher or lower end of the category (positive sign indicates a higher probability that the species occurs in wetlands).

### 2.1.5.2 Hydric Soils

A hydric soil is defined by the National Technical Committee for Hydric Soils as a soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (NRCS 1994). A hydric soil may be drained or undrained, and a drained hydric soil may not continue to support hydrophytic vegetation yet still retain the appearance of a hydric soil.

The following indicators are used as a guide to determine whether a given soil meets the criteria for hydric soils. These indicators are listed in decreasing order of importance and reliability. In most situations, only one of these indicators is required to make a positive determination.

- Presence of organic soils (Histosols) or soils that have more than 50 percent (by volume) of the upper 32 inches of soil is composed of organic soil materials
- Presence of histic epipedons (i.e., layers of organic matter in the upper soil) that are saturated for 30 days or more during the growing season
- Presence of sulfidic material or odors indicating anaerobic conditions
- Presence of an aquic or peraquic regime in which oxygen in the upper soil has been displaced by surface water or groundwater saturation that causes anaerobic conditions
- Evidence of chemically reducing conditions in the soil based on chemical tests
- Presence of gleyed soil conditions or soils with bright mottles and/or low matrix chroma
- Soils that occur on the National Technical Committee for Hydric Soils list of hydric soils
- Presence of manganese and iron concretions
- Presence of high amounts of organic matter in the upper soil and/or organic matter streaking (sandy soils only)

### 2.1.5.3 Wetland Hydrology

The term “wetland hydrology” indicates that the hydrology of an area is periodically inundated or that it has soils saturated to the surface at some time during the growing season. Wetlands are characterized by various hydrologic regimes that range from permanently inundated to irregularly inundated or saturated. In other words, some wetlands are always wet while other wetlands may contain water during only part of the year. The minimum threshold for wetland

hydrology under most circumstances is inundation or saturation within 12 inches of the surface for more than five percent of the growing season (Environmental Laboratory 1987). The growing season is defined as the duration between the last freeze of the spring and the first freeze of the fall.

A list of field indicators of wetland hydrology is presented below in decreasing order of importance and reliability:

- Recorded data on inundation or soil saturation from wells or gauges
- Visual observation of inundation or soil saturation within 12 inches of the surface
- Water marks on stems and fixed objects
- Drift lines consisting of debris and waterborne material
- Sediment deposition
- Visual evidence of surface flows and ponding

Secondary indicators, of which two or more are required in order to meet the hydrology criterion, include the following:

- Oxidized root channels in the upper 12 inches of the soil
- Water-stained leaves
- Local soil survey data
- Other site-dependant features based on the professional judgment of the delineator

According to the Wetland Delineation Manual, wetland hydrology can be inferred indirectly if *all* of the dominant plants in an area are obligate (OBL) species.

### 2.1.6 SWANCC Decision

Although not related to the three parameters discussed above, the Corps' jurisdiction over wetlands is also limited by legal interpretations of the CWA statute and associated regulations. In 2001, the United States Supreme Court stated in *Solid Waste Agency of Northern Cook Cty. v. Army Corps of Engineers* (531 U.S. 159, 168 (2001)), that the Corps' CWA jurisdiction does not extend to ponds that "are not adjacent to open water," and determined that the Corps exceeded its statutory authority by asserting CWA jurisdiction over "an abandoned sand and gravel pit in northern Illinois, which provides habitat for migratory birds." In reaching its decision, the Court concluded that the "Migratory Bird Rule," which served as the basis for the Corps' asserted jurisdiction, was not supported by the CWA. The Migratory Bird Rule extended CWA jurisdiction to intrastate waters "which are or would be used as habitat by birds protected by Migratory Bird Treaties or which are or

would be used as habitat by other migratory birds which cross state lines..." (Id. at p. 164). This decision stands for the proposition that non-navigable isolated, intrastate waters lacking interstate commerce connections other than potential to be used by migratory waterfowl are not waters of the United States and thus are not jurisdictional under the CWA.

### 2.1.7 Rapanos/Carabell Decision

In another example, in 2006 the United States Supreme Court decided Rapanos v. United States, 126 S.Ct. 2208 (2006) ("Rapanos"), consolidated cases regarding the extent of the Corps' jurisdiction over waters of the United States under the CWA. The court issued no majority opinion in Rapanos. Instead, the justices authored five separate opinions including the "plurality" opinion, authored by Justice Scalia (joined by three other justices), and a concurring opinion by Justice Kennedy. To guide implementation of the decision, the Corps issued a memorandum stating that "regulatory jurisdiction under the CWA exists over a water body if either the plurality's or Justice Kennedy's standard is satisfied" (Corps, CWA Jurisdiction Following the United States Supreme Court's Decision in Rapanos v. United States & Carabell v. United States, December 2, 2008, ["Rapanos Guidance Memorandum"]).

According to the plurality opinion in Rapanos, "'the waters of the United States' include only relatively permanent, standing or flowing bodies of water" and do not include "ordinarily dry channels through which water occasionally or intermittently flows" (Rapanos, 126 S. Ct. 2208, 2221). In addition, while all wetlands that meet the Corps' definition are considered adjacent wetlands, only those adjacent wetlands that have a continuous surface connection because they directly abut the tributary (e.g., they are not separated by uplands, a berm, dike, or similar feature) are considered jurisdictional under the plurality standard (Rapanos Guidance Memorandum, p. 7).

Under the Kennedy approach, "the Corps' jurisdiction over wetlands depends upon the existence of a significant nexus between the wetlands in question and navigable waters in the traditional sense" (Rapanos 126 S.Ct. 2208, 2248). "Wetlands possess the requisite nexus, and thus come within the statutory phrase 'navigable waters,' if the wetlands, either alone or in combination with similarly situated lands in the region, significantly affect the chemical, physical, and biological integrity of other covered waters more readily understood as 'navigable.' When, in contrast, wetlands' effects on water quality are speculative or insubstantial, they fall outside the zone fairly encompassed by the statutory term "navigable waters" (Ibid.). Justice Kennedy identified "pollutant trapping, flood control, and runoff storage" as some of the critical functions wetlands can perform relative to other waters (Id. at p. 2248). He concluded that, given wetlands' ecological role, "mere adjacency" to a non-navigable tributary was insufficient to establish CWA jurisdiction, and that "a more specific inquiry, based on the significant nexus standard, is therefore necessary" (Id. at pp. 2249-2252).

Interpreting these decisions, and according to the Rapanos Guidance Memorandum, the Corps and EPA will assert jurisdiction over the following waters:

- Traditional navigable waters
- Wetlands adjacent to traditional navigable waters
- Non-navigable tributaries of traditional navigable waters that are relatively permanent where the tributaries typically flow year-round or have continuous flow at least seasonally (e.g., typically three months)
- Wetlands that directly abut such tributaries

The Corps and EPA will decide jurisdiction over the following waters based on a fact-specific analysis to determine whether they have a significant nexus with a traditional navigable water:

- Non-navigable tributaries that are not relatively permanent
- Wetlands adjacent to non-navigable tributaries that are not relatively permanent
- Wetlands adjacent to but that does not directly abut a relatively permanent non-navigable tributary

Where a significant nexus analysis is required, the Corps and EPA will apply the significant nexus standard as follows:

- A significant nexus analysis will assess the flow characteristics and functions of the tributary itself and the functions performed by all wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical and biological integrity of downstream traditional navigable waters.
- Significant nexus includes consideration of hydrologic and ecologic factors.

The Corps and EPA generally will not assert jurisdiction over the following features:

- Swales or erosional features (e.g., gullies, small washes characterized by low volume, infrequent, or short duration flow)
- Ditches (including roadside ditches) excavated wholly in and draining only uplands and that do not carry a relatively permanent flow of water

A wetland delineation of potentially jurisdictional features was conducted in the study area in accordance with the procedures of the *Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory 1987), Department of the Army (DOA) *Clarification and Interpretation of the 1987 USACE Wetland Delineation Manual* (DOA 1992), and the *Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid*

*West Region* (USACE 2006; Arid West Region Supplement). In addition, the United States Geologic Society (USGS) Val Verde, CA (1995) and Newhall, CA (1995) 7.5 minute topographical quadrangle maps, Soil Survey Geographic Database for the San Francis Area, CA (NRCS 2007), and a high quality aerial photograph of the RMDP project site and the surrounding area (Psomas 2003) were utilized in the delineation. Field surveys were conducted by URS staff on September 25, 26, and 28 and included senior biologists John Davis IV, Johanna Kisner, and Erik Larsen and staff biologists Julie Love, Laura Rizzo, and Wayne Vogler. As described above the study area included four discrete locations, each of which contained the disturbance footprint for a proposed project facility (bridge or bank stabilization) and a 100-foot buffer.

The delineation of wetlands within the study area was complicated because the majority of the study locations were located within the active and/or historic floodplain of the Santa Clara River. Sandy soils and current agricultural uses within the floodplain added to the complexity. To address the challenges presented by sandy soils, the wetland delineation included an evaluation of "problem areas" where appropriate. Areas containing high concentrations of sandy soil were analyzed conservatively for evidence of hydric conditions as specified in the Arid West Region Manual. Agricultural operations have greatly changed the vegetation, soil, and hydrology within the RMDP site. In many areas, agricultural fields are located within the historic river floodplain and often physically isolate on-site hydrophytic vegetation from the river's potential hydrologic influence. Although row-crop agricultural fields within the Santa Clara River floodplain have affected the extent to which flood flows can access floodplain areas beyond the active channel, the RMDP site has been an agricultural operation for many decades, and the existing condition represents "normal circumstances" on the site.

Data collected during the assessment of wetlands were recorded on Wetland Determination Data Forms – Arid West Region Supplement (Corps 2006). Sample point locations were selected for both potential wetland and upland areas to determine the wetland/upland boundary and characterize the vegetation, soils, and hydrology of the area. Soil pits were excavated in areas supporting hydrophytic vegetation to determine the extent of saturation and to examine the soil for positive indicators of hydric soils and wetland hydrology. Soil pits were also excavated in upland areas adjacent to wetlands to aid in delineating the extent of jurisdictional wetlands. At each sample point, plant species composition and indicators of hydric soil and wetland hydrology were recorded. Data forms completed for wetland analysis are included in Appendix A.

Thirty-six sampling points were analyzed to determine boundary between wetland and upland portions of the four study locations. Sample points PC-1 through PC-20 (20 sample points) characterize the Potrero Canyon Road bridge alignment study location; BS-1 (one sample point) characterizes the Onion Fields bank stabilization study location; LC-1 through LC-8 (eight sample points) characterize the Long Canyon Road bridge alignment study

location; and, CC-1 through CC-7 (seven sample points) characterize the study location at the southern abutment of the Commerce Center Drive bridge. To the maximum extent possible, paired upland and wetland sample points were taken. Sample point locations were captured in the field using a Trimble GeoExplorer Series 2003 GPS unit capable of sub-meter accuracy and were plotted on aerial photographs overlaid with the approximate bridge and bank stabilization footprints and study location boundaries. A sample point was considered to be within a wetland (an "in" point) if the area met all three wetland parameters: dominance by wetland plant species; positive wetland hydrology indicators; and hydric soil conditions. If one or more of these parameters was not met, the point was considered not to be within a wetland (an "out" point) and a line was drawn between the two sample points on the site specific aerial photograph.

## 2.2 METHODS

### 2.2.1 Vegetation

Prior to field investigations, URS staff obtained a vegetation map of the entire RMDP project area in GIS format prepared for Newhall Land by Dudek and Associates (2006). The classification system used for the vegetation map is a combination of the established Holland (1986) and Sawyer and Keeler-Wolf (1995) classification systems. This map was used in conjunction with high-resolution aerial photos of the site to predict areas likely to contain wetlands, and to ensure that areas containing riparian vegetation communities were thoroughly sampled during field investigations. At each sampling point, the dominant plant species within each stratum (tree, shrub, herb, woody vine) were determined using the 50/20 rule and were identified to the species level. The wetland status of dominant plant species present at each sampling point was determined using the *National List of Species That Occur in Wetlands: California (Region 0)* (Reed 1988). As defined in Section 2: Regulatory Setting, this list assigns each plant species an indicator status of OBL, FACW, FAC, FACU, or UPL. When more than 50 percent of the dominant plants consisted of species rated OBL, FACW, or FAC (excluding FAC-), the vegetation at the sampling location was classified as "hydrophytic vegetation" in accordance with the Wetland Delineation Manual and Arid West Regional Supplement.

### 2.2.2 Soils

At each sample point, a delineation shovel was used to dig a pit at least 12 inches in depth, and an intact soil sample allowing inspection of the soil profile was extracted where possible. The characteristics of on-site soils were compared to the literature results obtained from the *NRCS Soil Survey Geographic Database, San Francis Area, CA* (NRCS 2007) for the study area. The soil profiles were examined for indicators of hydric soils and to determine if the on-site soils were consistent with the USDA soils map of the area. Soil characteristics assessed were soil color, texture, and the presence of mottles, organic matter, and other

indicators of hydric soils as listed on the Corps' Wetland Determination Data Forms for the Arid West region. A Munsell® Soil Color Chart (Munsell Color 2000) was used in the field to identify the color of soil and to assist in soil type verification and the color of mottles, where present.

### 2.2.3 Hydrology

Each sample point was examined for positive field indicators of wetland hydrology. The soil pit was examined for standing water or saturation, and the surrounding area was investigated for hydrologic indicators as specified on the Wetland Delineation Data Forms, including water marks, sediment deposits, drift lines, and other primary and secondary indicators of wetland hydrology.

### 2.2.4 Classification of Wetlands

After Corps-jurisdictional wetlands were delineated in the field, URS staff classified the delineated areas into wetland classes using *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin *et al.* 1979). This classification system, used by the U.S. Fish and Wildlife Service (USFWS), classifies wetlands[1] into systems and subsystems based on the type of aquatic feature with which the wetland is associated (the five systems are marine, estuarine, lacustrine, riverine, and palustrine) and then further assigns classes subclasses, and dominance types to wetlands within each system and subsystem. As the study area does not include any marine, estuarine, or lacustrine (lake) environments, Corps-jurisdictional wetlands on-site are limited to the riverine and palustrine (vegetated fringe) systems. The palustrine system includes wetlands that are dominated by trees, shrubs, or persistent emergent vegetation, and includes classes such as aquatic bed, scrub-shrub wetland and forested wetland. Because the classification system is open-ended beyond the class level, site-specific subclasses were defined based on vegetation communities present within the study area. Wetlands delineated were classified into two classes and three subclasses, which are described below.

**Class: Scrub-shrub Wetland**. Scrub-shrub Wetlands include areas dominated by woody vegetation less than 6 meters (20 feet) tall, including both shrubs and young trees. Dominant species include true shrubs, young trees, and trees or shrubs that are small or stunted because of environmental conditions. Scrub-shrub Wetlands may represent a successional stage leading to the Forested Wetland class, or they may be relatively stable communities. Scrub-Scrub Wetlands are one of the most widespread classes in the United States (Cowardin *et al.* 1979).

[1] It should be noted that, because the USFWS uses a different definition of wetlands than does the Corps, not all wetlands classified by the Cowardin *et al.* method meet the three-parameter regulatory definition of wetlands promulgated by the Corps and used by URS in this delineation of wetlands within the study area.

**Subclass: Riparian Scrub.** Within the study area, narrow-leaved deciduous scrub-shrub wetland plant communities dominated by mule fat (*Baccharis salicifolia*), narrowleaf willow (*Salix exigua*), red willow (*Salix laevigata*), arroyo willow (*Salix lasiolepis*), tamarisk (*Tamarix* spp.), giant reed (*Arundo donax*), white sweetclover (*Melilotus alba*), Fremont cottonwood (*Populus fremontii*), salt grass (*Distichlis spicata*), and cattail (*Typha* spp.) were classified as Riparian Scrub Wetland. Although the majority of these species are native to the area, white sweet clover, giant reed, and tamarisk are non-native. Giant reed and tamarisk are also considered to be invasive species by the California Invasive Plant Council (Cal-IPC 2007). The riparian scrub canopy within this community was partially open and dominated by shrubs and tree saplings with an herbaceous understory.

**Subclass: Ruderal.** Ruderal vegetation generally occurs in areas of past or chronic disturbance, and is characterized by the presence of species adapted to such conditions. Many of the plant species occurring in ruderal communities are non-native, and the habitat quality associated with this vegetation type is generally low. Although most ruderal plant communities occur in upland areas, portions of the study area contain ruderal vegetation dominated by hydrophytic species. The dominant vegetation included mule fat and Bermuda grass (*Cynodon dactylon*). Bermuda grass is an invasive species (Cal-IPC 2007). Many other non-native grasses were present, but in minor amounts. This vegetation may occur when contiguous areas of riparian vegetation are disrupted and fragmented by human alterations, facilitating invasion by non-native plants.

**Class: Forested Wetland.** The class Forested Wetland is characterized by woody vegetation that is six meters tall or taller. Forested Wetlands are most common in the eastern United States and in those sections of the West where moisture is relatively abundant, particularly along rivers and in the mountains. Forested Wetlands occur only in the palustrine and estuarine systems and normally possess an overstory of trees, an understory of young trees or shrubs, and a herbaceous layer (Cowardin *et al*. 1979).

**Subclass: Riparian Forest.** This subclass includes broad-leaved deciduous riparian forest vegetation, such as that observed on banks along the Santa Clara River within the study area. The dominant hydrophytic species within this wetland subclass on-site included Fremont cottonwood, mule fat, and an unidentified grass. The riparian forest vegetation contained a closed canopy that was dominated by mature trees and a thick ground cover consisting mostly of leaf litter and woody debris. Sporadic mulefat and California rose (*Rosa californica*) shrubs and grasses were also present in the open areas that received sufficient sunlight.

## 2.3 WETLAND DELINEATION RESULTS

A total of 9.06 acres of Corps jurisdictional wetlands were delineated in the four discrete study locations that comprise the Part One study area. Table 1 provides a summary of wetlands observed within each study location by wetland subclass.

**TABLE 1**
**SUMMARY OF JURISDICTIONAL WETLANDS ACREAGE**
**PER STUDY LOCATION AND VEGETATION TYPE**

| | USACE Jurisdictional Wetlands by Vegetation Type | | | |
|---|---|---|---|---|
| **Study Areas** | **Riparian Scrub** | **Riparian Forest** | **Ruderal** | **Total** |
| Potrero Canyon Road Bridge Alignment | 3.82 acres | 0.56 acre | 0.51 acre | 4.89 acres |
| Onion Field Bank Stabilization | -- | -- | -- | 0.00 acre |
| Long Canyon Road Bridge Alignment | 1.33 acres | -- | -- | 1.33 acres |
| Southern Abutment of Commerce Center Bridge | 2.84 acres | -- | -- | 2.84 acres |
| **Total Wetland Acres** | | | | **9.06 acres** |

An overview of conditions related to hydrology, vegetation, and soils within the study area is presented below, followed by a determination of the extent of jurisdictional wetlands at each study location. The study area overview is based on a combination of literature reviews and field verifications of vegetation, soils, and hydrology that occur within the boundaries of the study area. The determination of wetlands provides an assessment and reasoning for the delineation of jurisdictional areas. The determination is further supported by vegetation, soils, and wetland delineation maps.

### 2.3.1 Study Area Overview: Vegetation

The vegetation map of the RMDP site (Dudek 2006) shows eight vegetation/land cover occurring within the four locations that comprise the study area, including arrow weed scrub, mulefat scrub, cottonwood/willow riparian forest, herbaceous wetlands, riverwash, California sagebrush scrub, and agricultural and disturbed lands. These vegetation types can be generally divided into two main categories: riparian communities, which generally occur within and adjacent to areas of ponded or flowing water, and upland communities, which do not. Descriptions of these vegetation types, including mapped locations within the study area and dominant species present, are provided below. A list of all plant species observed in the four locations that comprise the Part One study area and their wetland indicator status is presented in Appendix B.

#### 2.3.1.1 Riparian Communities

Based on the vegetation map of the RMDP site (Dudek 2006) five different riparian plant communities occur within the study area. Several of the sample points were located within these vegetation communities, and some of the areas sampled exhibited a predominance of hydrophytic vegetation. However, because not all of the areas within riparian communities were dominated by hydrophytic species, and because hydrophytic vegetation is only one of the three required wetland parameters, not all areas mapped as riparian vegetation are Corps-jurisdictional wetlands. The five riparian plant communities occurring within the study area are described below.

**Arrow Weed Scrub.** This vegetation type occurs in moderate to dense thickets along stream banks, and is dominated by arrow weed (*Pluchea sericea*). Arrow weed scrub is fairly common is southern California, occurring along sandy streambeds, ditches, and washes. In addition to arrow weed, species commonly found within this community include salt grass, narrow-leaved willow (*Salix exigua*), tamarisk (*Tamarix* spp.), rushes (*Juncus* spp.), and slender cattail (*Typha domingensis*) (Holland 1986). Within the study area, arrow weed scrub occurs in a depression between an agricultural road and a cottonwood/willow riparian forest community at the Potrero Canyon Road bridge alignment study location.

**Mulefat Scrub.** This relatively dense, shrubby riparian plant community occurs on river terraces, atop the banks of stream channels and in floodplain areas that are open or disturbed. It is dominated by mulefat (*Baccharis salicifolia*) although arroyo willow (*Salix lasiolepis*) individuals, upland shrubs, and facultative herbs are often present in limited numbers (Holland 1986). In areas of human disturbance, non-native annual grasses are frequently present as well. Frequent flooding and/or scouring often maintain this community in an early successional state, limiting the height of the shrubs. Within the study area, mulefat scrub occurs at the Potrero Canyon Road bridge alignment in a relict floodplain area; and at the Long Canyon Road bridge alignment adjacent to the active river channel.

**Cottonwood/Willow Riparian Forest.** This mature riparian community is a tall, open, broad-leafed winter-deciduous riparian forest dominated by Fremont cottonwood trees (*Populus fremontii)* and various species of willow (Holland 1986). It occurs commonly on stream banks and in floodplain areas where flooding occurs periodically but not so frequently as to preclude the development of mature trees. The understory within this community can be varied, containing riparian and upland shrub and herb species including Great Basin sagebrush (*Artemisia tridentata*), quail bush (*Atriplex lentiformis*), coyote brush (*Baccharis pilularis*), scale-broom (*Lepidospartum squamatum*), California mugwort (*Artemisia douglasiana*), wild cucumber (*Marah marcocarpus*), and many others. Within the study area, cottonwood/willow riparian forest occurs at all four study locations in portions of the Santa Clara River floodplain, and is the most abundant plant community at the Commerce Center Drive and Onion Fields study locations.

**Herbaceous Wetland.** This vegetation does not conform to a CDFG-defined vegetation community classification, and appears to be an early seral form of riparian vegetation that occurs in perennial stream channels where recent flooding has resulted in substantial scour or sediment deposition. Herbaceous wetlands commonly include thick stands of native seedlings and saplings, including Fremont cottonwood, willows, and mulefat; native herbaceous species, such as broad-leaved cattail (*Typha latifolia*), Hooker's evening primrose (*Oenothera elata*), and bulrushes (*Scirpus* ssp.); and non-native species, including water cress (*Rorippa nasturtium-aquaticum*), curly dock (*Rumex crispus*), and tamarisk (*Tamarix* spp.). Within the study area, herbaceous wetlands occur within the active channel of the Santa Clara River at the Potrero Canyon Road, Long Canyon Road, and Commerce Center Drive bridge locations, but are not present at the Onion Fields study location.

**River Wash.** This land cover does not conform to a CDFG-defined vegetation community classification, and is characterized by unvegetated or sparsely vegetated substrate within stream channels. Such areas may contain seedlings, sparse grasses, and forbs, which often begin colonize the channel after storm events, but mature vegetation is absent due to scouring by seasonal storm flows. River wash is a naturally dynamic habitat which may vary in location and extent depending on local hydrology and long-term and seasonal precipitation patterns. Within the study area, river wash is present within the active channel of the Santa Clara River at the Potrero Canyon Road, Long Canyon Road, and Commerce Center Drive bridge locations, but is absent at the Onion Fields study location.

#### 2.3.1.2 Upland Communities

According to the vegetation map of the RMDP site (Dudek 2006), upland land covers within the study area consisted of California sagebrush scrub and agricultural/disturbed lands. These vegetation types are not typically associated with wetlands, and hydrophytic species are usually not present within these habitats.

**California Sagebrush Scrub.** This scrub community described by Sawyer and Keeler-Wolf (1995) is dominated California sagebrush (*Artemisia californica*). Other native shrub species present commonly include sages (*Salvia* spp.), California buckwheat (*Eriogonum fasciculatum*), and Mexican elderberry (*Sambucus mexicana*), and components occurring between and beneath these shrubs can include California wishbone-bush (*Mirabilis laevis* var. *crassifolia*), yellow pincushion (*Chaenactis glabriuscula*), lacy phacelia (*Phacelia tanacetifolia*), long-stem golden yarrow (*Eriophyllum confertiflorum*), common forget-me-not (*Cryptantha intermedia*), common owl's clover, deerweed (*Lotus scoparius*), and wild cucumber (*Marah macrocarpus*). Non-native species that commonly occur within California sagebrush scrub communities include red-stemmed filaree (*Erodium cicutarium*), short-podded mustard (*Hirschfeldia incana*), horehound (*Marrubium vulgare*), and tree tobacco (*Nicotiana glauca*). Within the study area, California sagebrush scrub occurs in the extreme southern portions of the Potrero Canyon and Commerce Center Drive study locations,

farthest from the river channel. None of the dominant species observed in this community were hydrophytic, and sampling points within sagebrush scrub were not found to exhibit a prevalence of hydrophytic vegetation.

**Agricultural and Disturbed Lands.** These land covers do not occur naturally, but are instead the result of farming, ranching, oil and gas production, and other human activities. Agricultural and disturbed lands within the study area are are typically either unvegetated, as is the case with fallow farm fields and operations areas, which are intentionally kept clear of vegetation; or are vegetated with row crops. However it is possible for non-agricultural species (both native and non-native) to colonize agricultural lands, especially when fields are fallow or not in service. Lands disturbed by non-agricultural activities, such as oil production, are often graded, compacted, and kept free of vegetation while operations are active. When oil activities cease, these areas often become invaded by ruderal vegetation such as bromes (*Bromus* spp.), wild oats (*Avena barbata*), and Russian thistle (*Salsola tragus*). Within the study area, areas mapped as agricultural and disturbed lands occur in association with farm fields and associated roads within the Potrero Canyon Road and Long Canyon Road bridge alignments, and at the Onion Fields bank stabilization location. This land cover was dominated by goose grass (*Eleusine indica*), bluegrass species (*Poa* spp.), and crowfoot grass (*Dactyloctenium aegyptium*) at the Potrero Canyon location, and by many unidentified annual grass species and tilled earth at the Long Canyon location.

### 2.3.2 Study Area Overview: Soils

According to the Soil Survey of San Francis Area, California (USDA 2007), a total of four soil mapping units were identified as occurring in the study area. Of the four, only Sorrento loam is considered to be a true soil type, or a land composition capable of supporting plant life. The other three (Riverwash, Sandy Alluvial Lands, and Terrace Escarpments) are considered land types rather than soils. Land types are defined as areas of frequent disturbance and/or areas harsh to plant life (ice fields, beach sands, riverbeds, etc.). All soils and land types mapped within the study area are described below.

#### 2.3.2.1 Sandy Alluvial Lands

Sandy Alluvial Lands contain alluvial sand, gravel, and cobbles deposited in irregular layers, but do not flood during normal flow periods. Vegetation supported by this land type is sparse, and often consists of scattered sagebrush, small trees, and annual grasses and forbs. This land type is included on the National Hydric Soils List due to frequent flooding and ponding, and occurrence in areas with a high water table. The Sandy Alluvial Lands land type was the dominant “soil type” in the study area according to the County Soil Survey, and occurs throughout the Santa Clara River floodplain in the project region. Because this land type contains a high concentration of fine to coarse sand, hydric soil indicators are often challenging to observe while conducting field investigations in Sandy Alluvial Lands. Soils

in these areas were therefore treated as "Problem Areas," as specified in the Wetland Delineation Manual.

#### 2.3.2.2 Riverwash

The Riverwash land type consists of sand, gravel, and cobblestones in active stream channels. Rocks and sand are constantly being removed and redeposited in the channel during periods of active flow. Riverwash typically supports very little vegetation due to the instability of the substrate; however, willows, sagebrush, and other plants may be found growing on this land type (SCS 1972). This land type is included on the National Hydric Soils List due to occurrence in areas of frequent flooding and high water table. According to the County Soil Survey, the Riverwash land type was the dominant "soil type" in the vicinity of the Long Canyon Road bridge alignment, occurring throughout the full extent of the Santa Clara River floodplain within that study location (approximately 75 percent of study location). The high concentration of sand present in Riverwash poses as problematic when assessing evidence of hydric characteristics. Hydric soil indicators are often challenging to observe while conducting field investigations in this land type.

#### 2.3.2.3 Terrace Escarpments

Terrace Escarpments consist of steep slopes that result from continual erosion or faulting, and separates terraces from lower lying land. The resulting steep faces are influenced heavily by weather conditions and typically do not support diverse vegetation communities. The County Soil Survey showed this land type to be present in a small percentage in the southern portion of the Long Canyon Road bridge alignment area. Sparse vegetation was observed on the north-facing slopes. Terrace Escarpments are included on the National Hydric Soils List due to occurrence in areas of frequent flooding.

#### 2.3.2.4 Sorrento Loam

Sorrento Loam consists of very deep, well-drained soils that formed in alluvium mostly from sedimentary rocks formations. This soil is similar to the Riverwash and Sandy Alluvial land types in that the original alluvium was deposited in layers; however, Sorrento Loam is less subject to flooding and subsequent reworking. Thus, Sorrento Loam had more time to develop the characteristics of a true soil. This soil is classified as a fluvent, which is a very young soil subject to periodic flooding and occurs on alluvial fans and in stabilized floodplains. Vegetation typically consists of irrigated agriculture or annual grasses and forbs within uncultivated areas. This soil is included on the National Hydric Soils List due to occurrence in areas of frequent flooding.

### 2.3.3 Study Area Overview: Hydrology

The Santa Clara River is the dominant hydrologic feature in the study area, and the active river channel flows through three of the four study locations (The Onion Fields bank stabilization site is located directly adjacent to the river, but outside of the channel). Within the study area, the river supports a complex mosaic of riparian plant communities along the channel margins, on alluvial terraces, and within the greater floodplain. Surface flows are perennial within this reach, supported in part by effluent discharges from two publicly owned treatment works upstream. For agricultural purposes, Newhall Land maintains a number of dry-season culvert road crossings over the Santa Clara River that are removed prior to high winter flows each year. A portion of one of these crossings is located within the Potrero Canyon Road bridge alignment study location, and another occurs approximately 300 feet downstream of the Long Canyon Road bridge alignment location.

The headwaters of the Santa Clara River are located in the San Gabriel Mountains in Los Angeles County, and the seasonal hydrology of the river is primarily dictated by patterns of precipitation in these mountains. Upstream of the study area, the watershed consists of approximately 680 square miles of mostly natural land with some areas developed for urban and agricultural uses. The total watershed area is approximately 1,600 square miles. The Santa Clara River is one of two rivers in the region that is not channelized and remains in a relatively natural state. Within the project vicinity, the river is a braided system with a primary active channel and several secondary channels, and its banks are constantly in flux due to erosion and sedimentation. According to a recent study by Balance Hydrologics (2005), the morphology of the channel is in a state of dynamic equilibrium, where the influence of large storm events dominates the form of the channel. Smaller-scale events can shape the channel in the short term, but the morphologic effect of these events is eliminated when larger storms "reset" the channel through large-scale erosional and depositional processes.

### 2.3.4 Determination of Wetlands within the Study Area

Through investigations for on-site indicators of wetland hydrology, hydrophytic vegetation and hydric soils, wetlands were identified and mapped within three of the four discrete locations that comprise the study area. The results and determining factors of the wetland delineation are discussed in this section and presented on location-specific figures.

#### 2.3.4.1 Potrero Canyon Road Bridge Alignment

The Potrero Canyon Road bridge alignment study location is a long, narrow swath that spans the active channel of the Santa Clara River, and includes the wetted channel, riparian corridor, and upland agricultural areas on either bank. Within this study location, a total of 20 data points were investigated for evidence of wetland indicators (Appendix A: Wetland Delineation Forms PC-1 through PC-20). Data points were located in various floodplain

positions, including areas adjacent to the active channel, on alluvial terraces, and within the floodplain beyond the channel banks.

According to the vegetation map for the RMDP site (Dudek 2006), vegetation types within the Potrero Canyon Road study location include arrow weed scrub, cottonwood riparian forest, herbaceous wetlands, mulefat scrub, riverwash, big sagebrush scrub, and agriculture. For a description of these communities, please refer to Section 4.2, above. Of the 20 sampling points within the Potrero Canyon Road study location, three were located within areas mapped as arrow weed scrub, four were within cottonwood/willow riparian forest, two were within herbaceous wetlands, one was in mule fat scrub, seven were in riverwash, and the remaining three were within areas mapped as agricultural and disturbed lands (Figure 3).

All but one of these data points (data point PC-1, located in an agricultural field) showed a dominance of hydrophytic vegetation. Dominant hydrophytic plant species observed within this study location included red willow, narrow-leafed willow, Fremont cottonwood, mulefat, cattail, and white sweetclover. Although most of the hydrophytic vegetation within the study location was associated with the current channel of the Santa Clara River, hydrophytic vegetation was also observed in a strip of agricultural land in the northern portion of the study location. In this area, the historic floodplain of Santa Clara River was evident as riparian scrub and forest bordered the narrow swath of agriculture. The area to the south of this hydrophytic vegetation is occupied by a fallow agriculture field. Vegetation in the field consists of Bermuda grass (*Cynodon dactylon*), Mexican sprangletop (*Leptochloa uninervia*), white sweetclover, and mulefat. The locations of sampling points and presence/absence of hydrophytic vegetation are depicted graphically on Figure 3.

According to the Soil Survey of San Francis Area, California (USDA 2007), the Potrero Canyon Road bridge alignment study location contains three distinct mapped soil types: Riverwash, Sandy Alluvial Lands, and Terrace Escarpments. For a description of these soils, please refer to Section 4.3, above. Soils observed during field investigations within this study location consisted of coarse sand typical of the Sandy Alluvial Land and Riverwash soil mapping units (Figure 4). In areas that experienced recent river deposition, various sized gravels and small cobbles comprised a loose matrix with the coarse sand. The dynamic nature of the on-site river channel and the sandy soil composition posed difficulties in determining the presence of hydric indicators. However, hydric features observed included small reddish mottles often throughout the soil profile (Appendix A: Data Sample Points PC-2 through PC-4, PC-10, PC-11, and PC-17 through PC-20; and Appendix C: Photo 5) and organic material in the top portion of the profile (Sample Point PC-6 and Photo 4). In addition, Sandy Alluvial Land and Riverwash land types are listed by the USDA as hydric soils under flooded conditions, which was the condition of soils observed at several locations during the field survey. Of the 20 data points assessed in this study location, 18 exhibited hydric soil characteristics, while such characteristics were lacking in the remaining two (data points PC-1 and PC-12, located in areas mapped as Sandy Alluvial Lands and Terrace

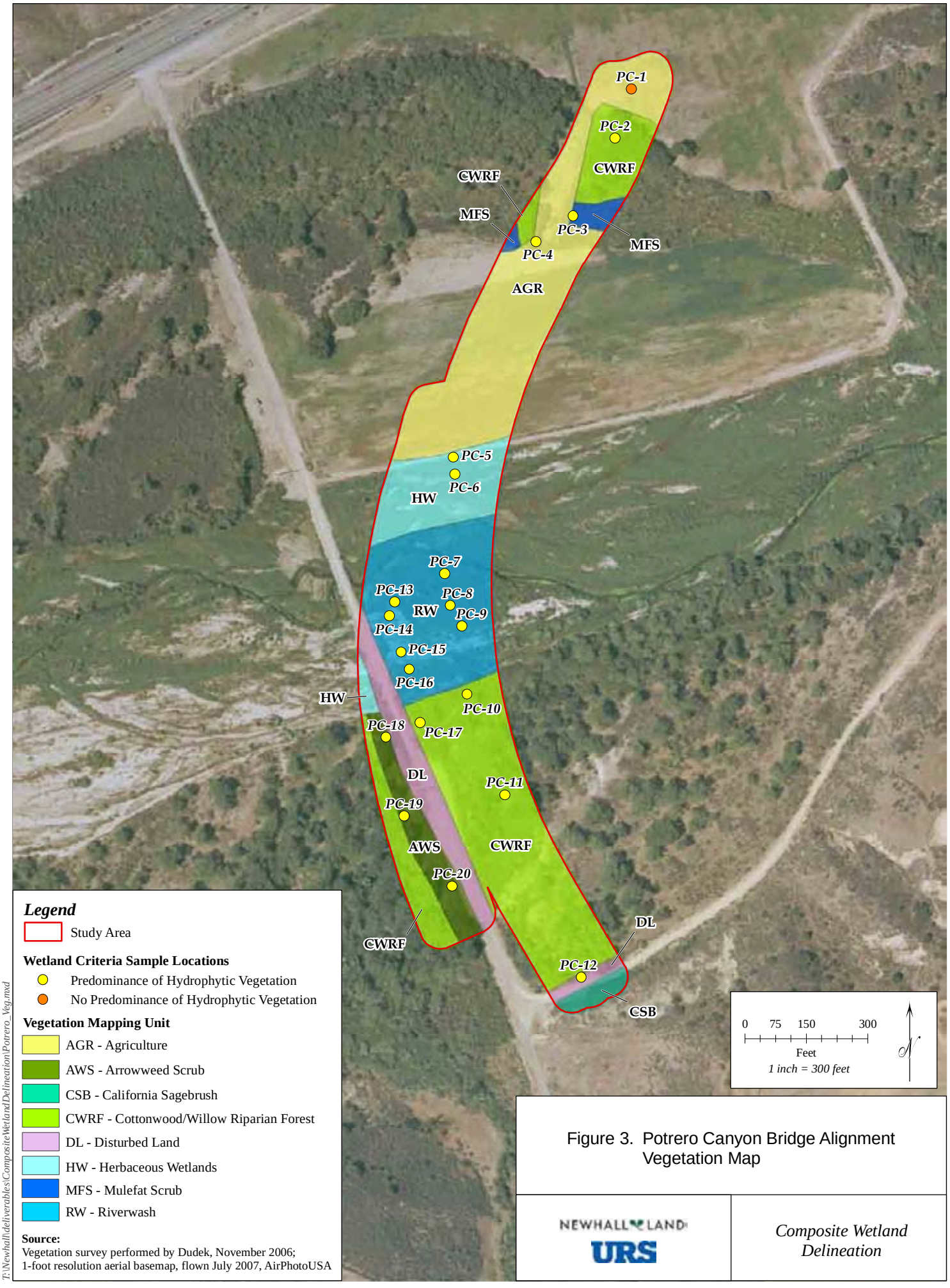


Figure 3. Potrero Canyon Bridge Alignment Vegetation Map

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*Composite Wetland Delineation*

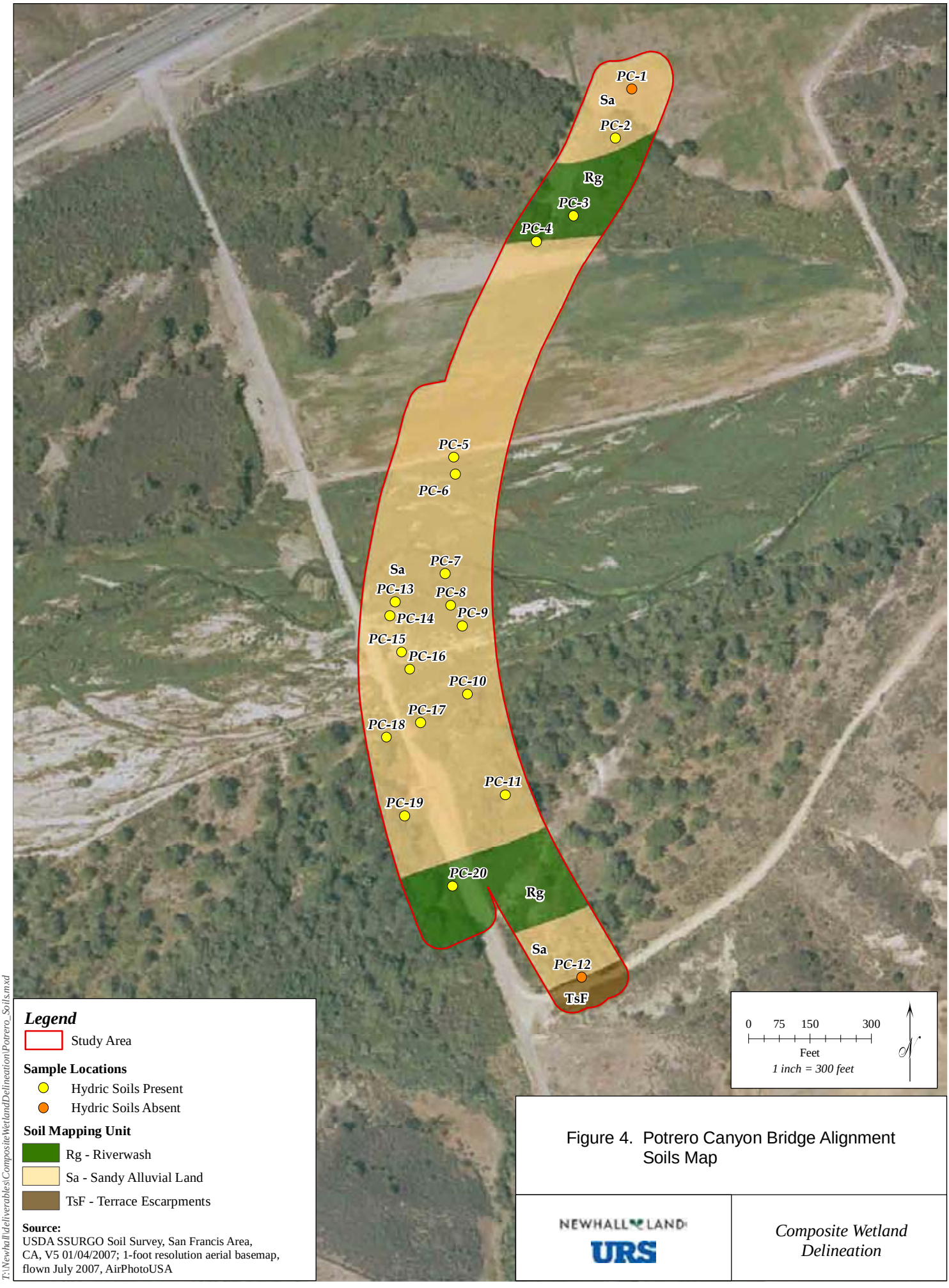


Figure 4. Potrero Canyon Bridge Alignment Soils Map

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*Composite Wetland Delineation*

Escarpments, respectively). The mapped soil types, along with locations of sampling points and presence/absence of hydric soil indicators, are depicted graphically on Figure 4.

Hydrology within the Potrero Canyon Road bridge alignment is dominated by the Santa Clara River mainstem, which flows through this study location. The river supports year-round surface flows at this location, and flows are supplemented by treated wastewater discharges from two treatment works upstream. The study location contains three basic hydrologic zones: the low-flow river channel, which is inundated year-round by surface flows; terraces and secondary channels, which are inundated periodically during periods of high flow but may be saturated at other times depending on the season, flow conditions, and location; and adjacent uplands, which are not regularly or periodically inundated by river flows. Although the boundaries between these zones are not always easily defined and change over time, the 20 sampling points assessed at the Potrero Canyon Road study location were situated to include all hydrologic zones. Wetland hydrology was evident at all data points located within the active river channel and terraces, but was generally absent at points farther removed from the river. However, three data points (PC-2, PC-3, and PC-4) located in a portion of the historic floodplain exhibited wetland hydrology, as did a point (PC-20) located between an artificial berm and a ranch road. Hydrology at these points is dictated by local relief, rather than Santa Clara River flows.

A total of 4.89 acres of wetlands were delineated within the Potrero Canyon Road study location (Figure 5 and Table 1). All of the jurisdictional wetlands identified as this location were within the Palustrine system as described by Cowardin (1979). Based on the vegetation communities present, the wetlands within this study location were classified as Riparian Scrub Wetlands (3.82 acres), Riparian Forest Wetlands (0.56 acres), and Ruderal Wetlands (0.51 acres). The determination of wetlands was difficult given the sandy soil types. In light of problematic sandy soils, the presence of redox mottles and organic matter at several sampling locations provided evidence of hydric soils. Due to the wide distribution of riparian vegetation and problematic sandy soils, the presence of saturated soils, high water table, oxidized roots, and other hydrologic indicators were also used in mapping the wetlands within this study location. Wetlands were mostly located within the active channel of the Santa Clara River, but also occurred in the northern portion of the study area associated with the disjunct historic floodplain and in a small area in the southwest of the study area associated with a small drainage (Figure 5).

#### 2.3.4.2 Onion Fields Bank Stabilization Site

The Onion Fields study location is on the southern bank of the Santa Clara River, on a slope between the river channel and an adjacent agricultural field. Only one data point was assessed in this study location, situated at the bottom of the bank slope (Appendix A: Wetland Delineation Forms BS-1).

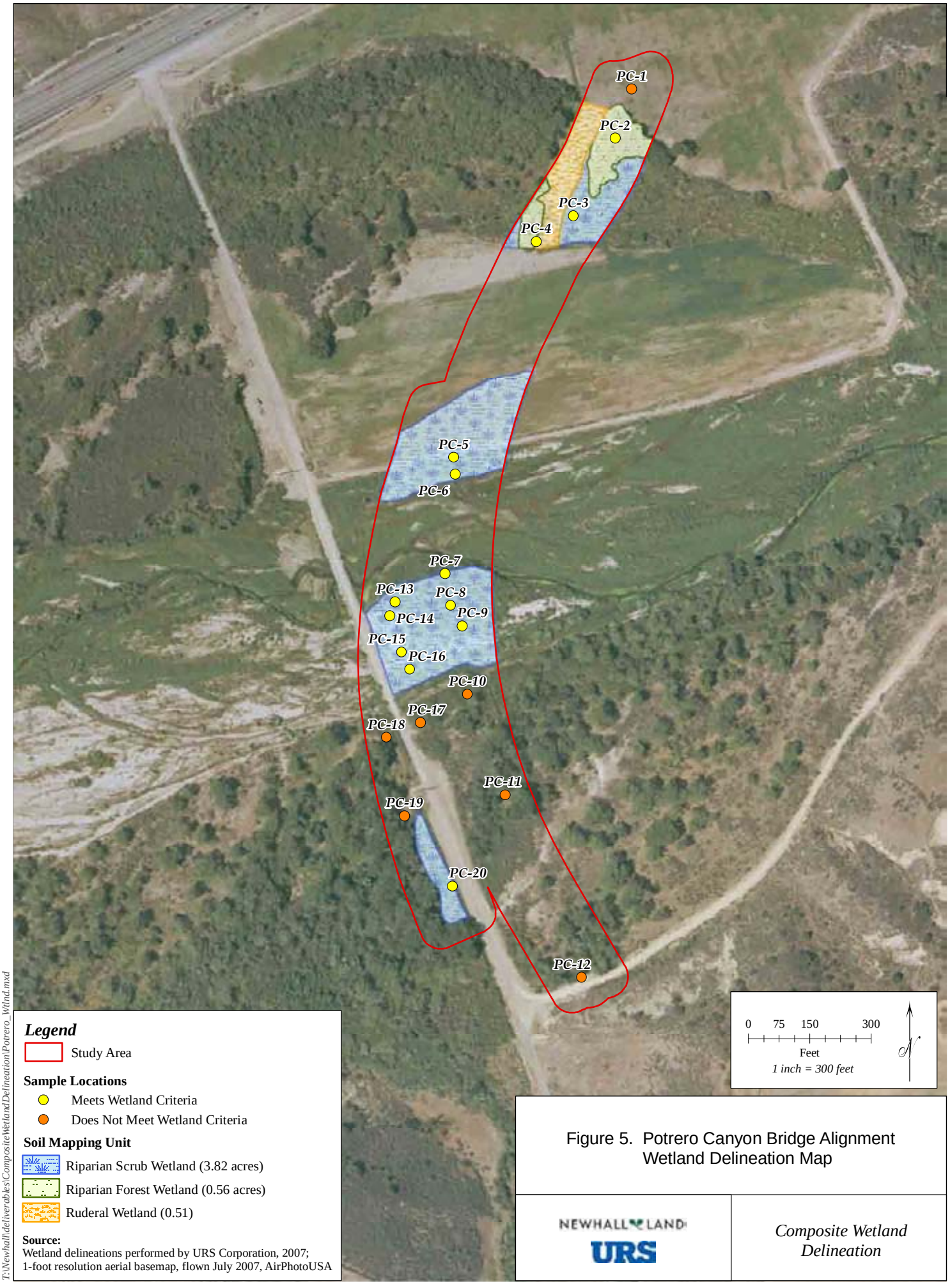


Figure 5. Potrero Canyon Bridge Alignment Wetland Delineation Map

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*Composite Wetland Delineation*

According to the vegetation map for the RMDP site (Dudek 2006), the Onion Fields study location is comprised almost exclusively of cottonwood/willow riparian forest, with small patches of disturbed land present along the agricultural road at the southern boundary. For a description of these communities, please refer to Section 4.2, above. The data point assessed at this location was within the cottonwood/willow riparian forest, and exhibited a dominance of hydrophytic vegetation (Figure 6). Dominant hydrophytic plant species within this study location included Freemont cottonwood and red willow trees, confirming the mapped vegetation type. Understory plants included California rose (*Rosa californica*), stinging nettle (*Urtica dioica*) and mugwort (*Artemisia douglasiana*). The riparian canopy was dense with an open to closed shrub layer. In open areas, thick leaf litter covered the majority of the ground.

According to the Soil Survey of San Francis Area, California (USDA 2007), the entire Onion Fields study location is mapped as Sandy Alluvial Lands (Figure 7). For a description of this land cover, please refer to Section 4.3, above. Soils assessed at the sampling point consisted of sandy loam typical of the Sandy Alluvial Lands soil mapping unit. Typical conditions were present during the delineation, and the soils were not determined to be problematic due to the presence of well-established vegetation. No redox features or other hydric soil indicators were observed at the sampling point.

Although the Onion Fields study location is within the Santa Clara River floodplain, it is located on a slope between the river channel and an adjacent agricultural field. The data point assessed at this study location was located at the bottom end of this slope, closest to the river channel (Figure 8). Due to the age and structure of the riparian forest, it is apparent that this location is seldom affected by high flows in the river, and that regular inundation or saturation does not occur. The sampling point was thoroughly examined for evidence of wetland hydrology, but no primary or secondary indicators were present.

No jurisdictional wetlands were found to occur within the Onion Fields Bank Stabilization study location (Table 1). Although hydrophytic vegetation was present, the area lacked hydric soils and wetland hydrology.

#### 2.3.4.3 Long Canyon Road Bridge Alignment

The Long Canyon Road bridge alignment study location is a long, narrow swath that spans the active channel of the Santa Clara River, and includes the wetted channel, riparian corridor, transitional vegetation, and upland agricultural areas on either bank. Within this study location, a total of eight data points were investigated for evidence of wetland indicators (Appendix A: Wetland Delineation Forms LC-1 through LC-8). Data points were located in various floodplain positions, including areas adjacent to the active channel, on alluvial terraces, and within the floodplain beyond the channel banks. Within this study location, the active river channel is in the northern portion of the floodplain.

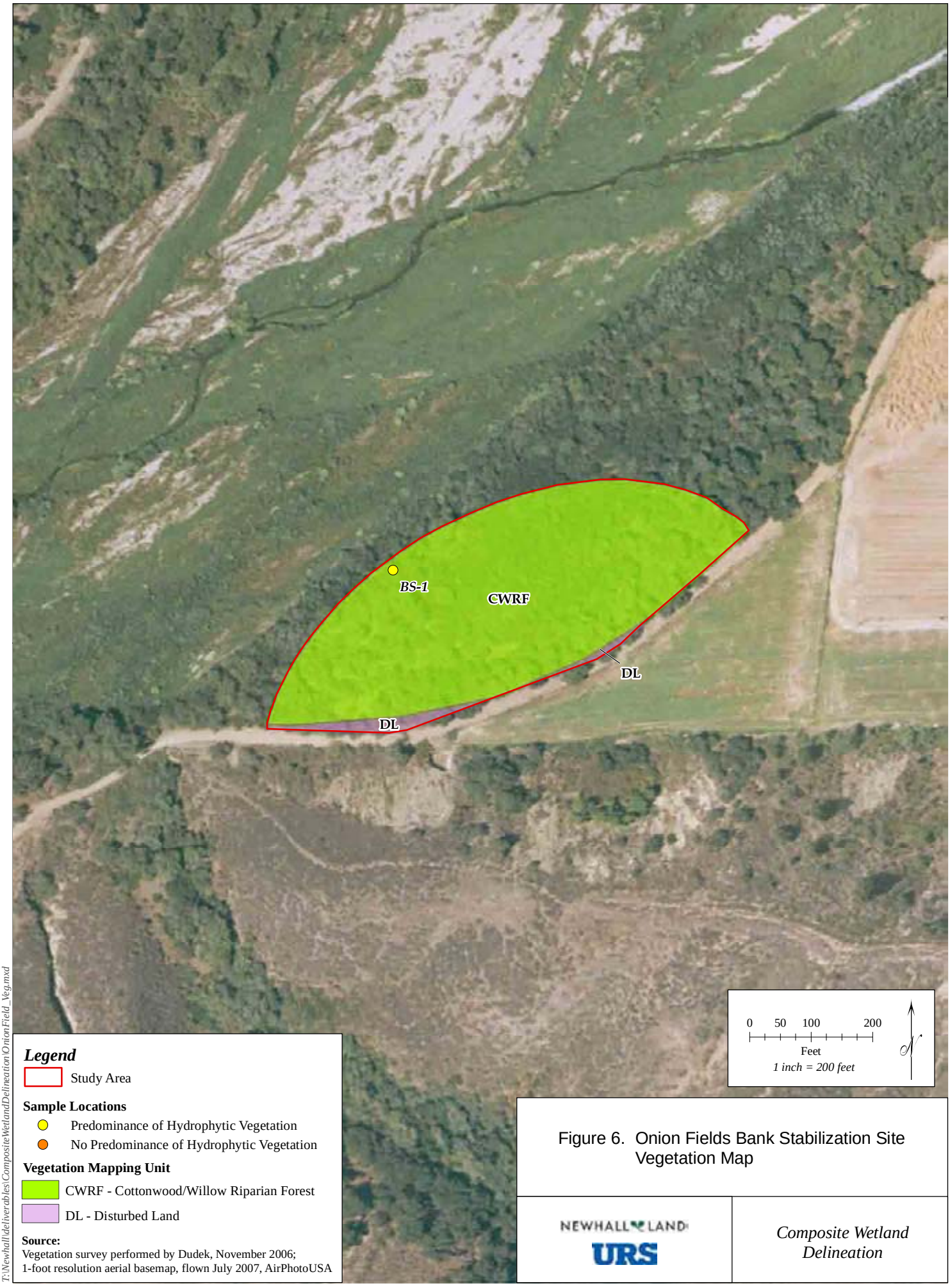


Figure 6. Onion Fields Bank Stabilization Site Vegetation Map

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*Composite Wetland Delineation*

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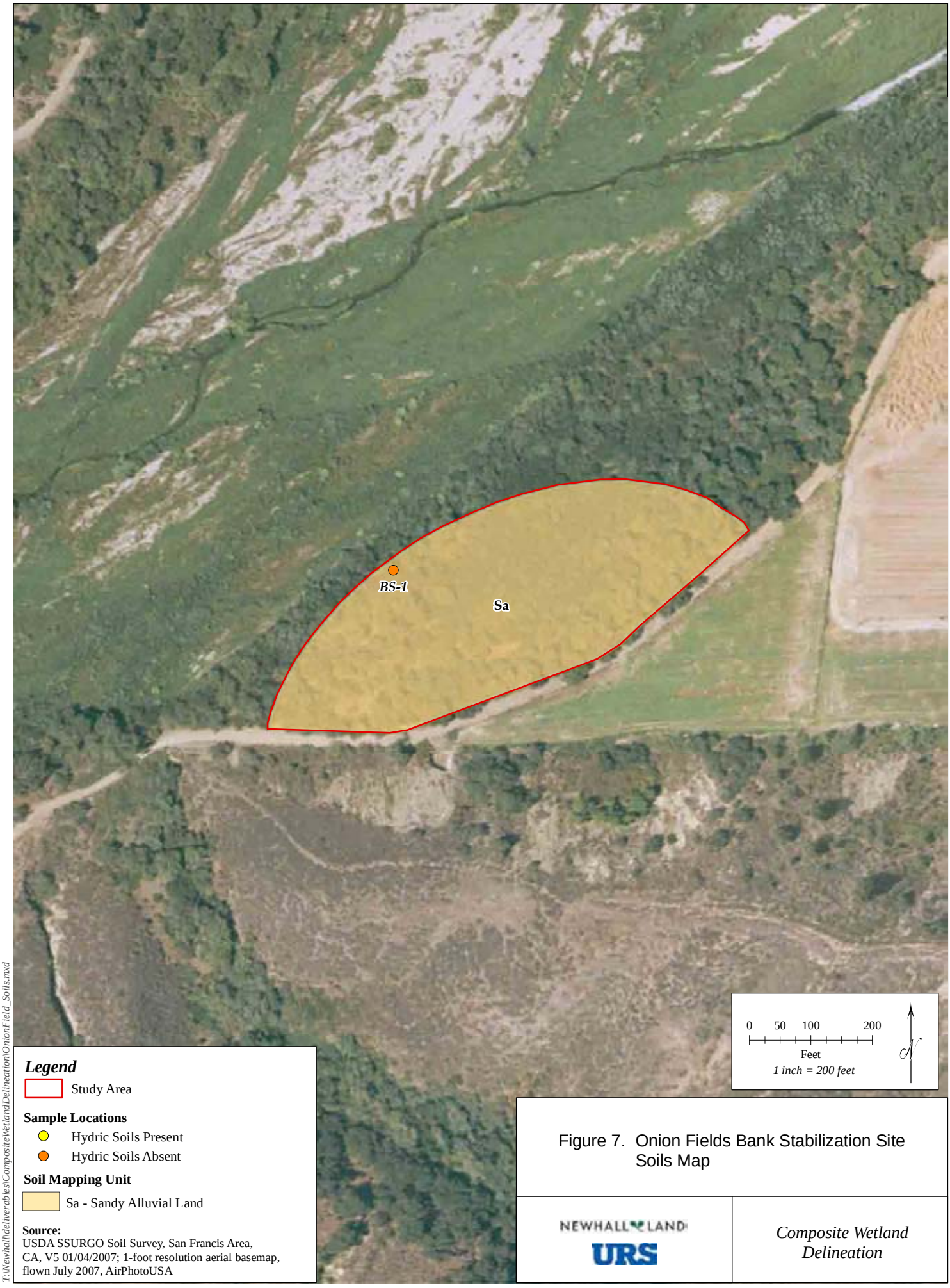


Figure 7. Onion Fields Bank Stabilization Site Soils Map

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*Composite Wetland Delineation*

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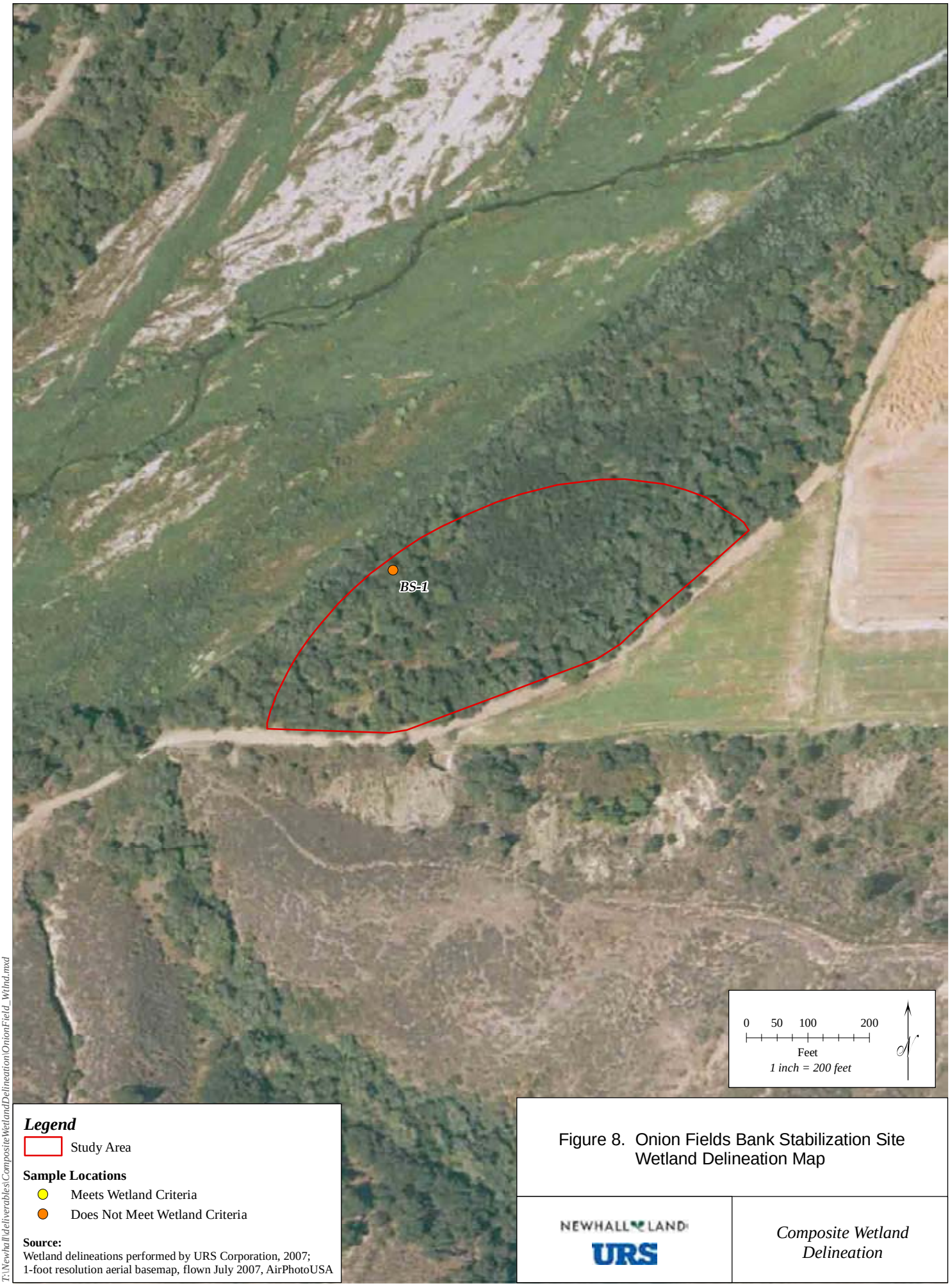


Figure 8. Onion Fields Bank Stabilization Site Wetland Delineation Map

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The vegetation map for the RMDP site (Dudek 2006) shows several vegetation types within the Long Canyon Road study location, including cottonwood/willow riparian forest, herbaceous wetlands, mulefat scrub, riverwash, disturbed land, and agriculture. For a description of these communities, please refer to Section 4.2, above. Of the eight sampling points assessed within the Long Canyon Road bridge alignment study location, one was located within an area mapped as cottonwood/willow riparian forest, one was within mule fat scrub, three were in riverwash, and the remaining three were in areas mapped as agricultural or disturbed land (Figure 9). All but two of these data points (Points LC-1 and LC-8, located in agricultural fields) showed a dominance of hydrophytic vegetation. Dominant hydrophytic plant species within this study location included mulefat, tamarisk, arundo, South American horseweed (*Conyza bonariensis*), red willow, narrow-leaf willow, and willow weed (*Polygonum lapathifolium*). All of the hydrophytic vegetation within this study location was associated with the active channel and riparian corridor of the Santa Clara River. In the southern portion of the Long Canyon Road study location, a terrace at the edge of the riparian corridor contained several hydrophytic vegetation species including mulefat and narrow-leaf willow. Lands within the study location beyond the riparian corridor, at the extreme northern and southern ends of the study location, contained agricultural fields and did not exhibit a dominance of hydrophytic vegetation; these areas were dominated by annual grasses. The locations of sampling points and presence/absence of hydrophytic vegetation are depicted graphically on Figure 9.

According to the Soil Survey of San Francis Area, California (USDA 2007), the Long Canyon Road bridge alignment study location is underlain primarily by Riverwash, but also includes Sandy Alluvial Lands and Sorrento Loam at the northern and southern ends, respectively. For a description of these soils, please refer to Section 4.3, above. Soils observed during field investigations within this study location consisted of coarse sand typical of the Sandy Alluvial Land and Riverwash land types; and loamy sand, sandy loam, and clay loam typical of the Sorrento Loam soil type (Figure 10). Riverwash was found throughout the majority of the study area (Appendix A: LC-2 through LC-5). In areas that experienced recent river deposition, various sized gravels and small cobbles comprised a loose matrix with the coarse sand. The only hydric soil indicator observed within this study location was depleted matrix (data point LC-3); no sandy redox or other hydric soil indicators were evident during examination of soil profiles. However, the dynamic nature of the on-site river channel and the sandy soil composition posed difficulties in determining the presence of hydric soil indicators. Because the Sandy Alluvial Land and Riverwash land types are listed by the USDA as hydric soils under flooded and/or saturated conditions, these soil types were counted as hydric even in the absence of other indicators when flooding and/or saturation were observed (data point LC-5). The mapped soil types, along with locations of sampling points and presence/absence of hydric soil indicators, are depicted graphically on Figure 10.

Hydrology within the Long Canyon Road bridge alignment is dominated by the Santa Clara River mainstem, which flows through this study location. The river supports year-round

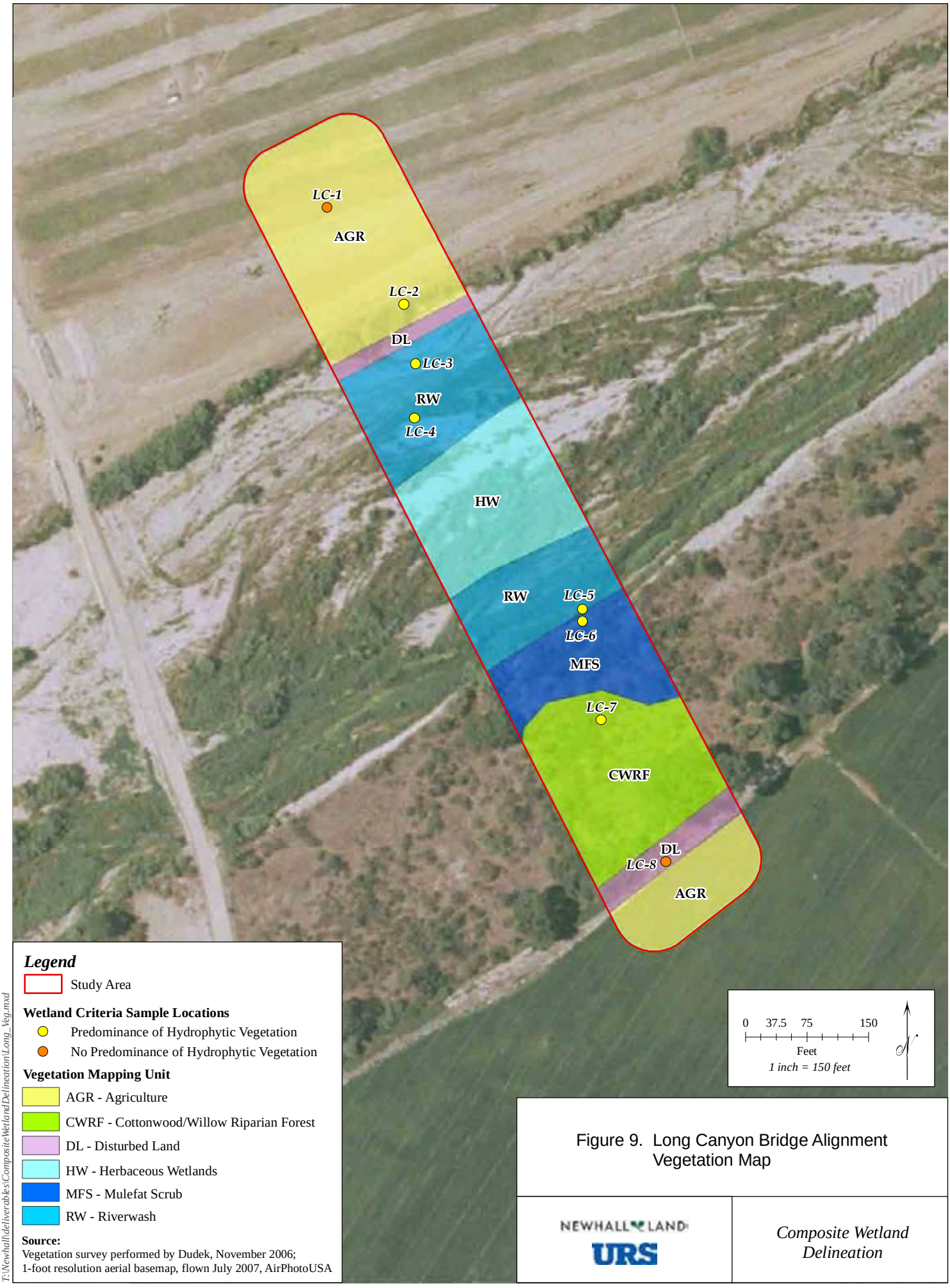


Figure 9. Long Canyon Bridge Alignment Vegetation Map

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Figure 10. Long Canyon Bridge Alignment Soils Map

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*Composite Wetland Delineation*

surface flows at this location, which are supplemented by treated wastewater discharges from two treatment works upstream. The study location contains three basic hydrologic zones: the low-flow river channel, which is inundated year-round by surface flows; terraces and secondary channels, which are inundated periodically during periods of high flow but may be saturated at other times depending on the season, flow conditions, and location; and adjacent uplands, which are not regularly or periodically inundated by river flows. Although the boundaries between these zones are not always easily defined and change over time, the eight sampling points assessed at the Long Canyon Road study location were situated to include all hydrologic zones. Wetland hydrology was evident at all data points located within the active river channel and terraces, but was absent at points farther removed from the river. A total of 1.34 acres of wetlands were delineated within the Long Canyon Road study location (Figure 11 and Table 1). The determination of wetlands was difficult given the problematic, sandy soil types within the study location. Due to the presence of problematic soils, the mapped soil types and position in the riverbed was used as evidence of hydric soils in some areas. Wetlands were present on both banks of the Santa Clara River, within and adjacent to the active channel. All of the jurisdictional wetlands identified as this location were within the Palustrine system as described by Cowardin (1979). Based on the vegetation communities present, the wetlands within this study location were classified as Riparian Scrub Wetlands. The most appropriate National Wetland Inventory (NWI) classification for this community is PSS6.

#### 2.3.4.4 Southern Abutment of Commerce Center Drive Bridge

The study location at the southern abutment of the Commerce Center Drive bridge is a narrow swath that extends southward from the active channel of the Santa Clara River into the uplands on the southern bank. Within this study location, a total of seven data points were investigated for evidence of wetland indicators (Appendix A: Wetland Delineation Forms CC-1 through CC-7). Data points were located in various floodplain positions, including areas adjacent to the active channel, on alluvial terraces, and beyond the southern bank. At the time of the investigation, the active river channel was within the northernmost portion of the study location.

The vegetation map for the RMDP site (Dudek 2006) shows four vegetation types within the Commerce Center Drive study location, including riverwash, herbaceous wetlands, cottonwood/willow riparian forest, and California sagebrush scrub. For a description of these communities, please refer to Section 4.2, above. Of the eight sampling points assessed within this study location, one was located within an area mapped as riverwash, one was in herbaceous wetlands, three were within cottonwood/willow riparian forest, and the remaining two were mapped as California sagebrush scrub (Figure 12). All of the sampling points assessed exhibited a dominance of hydrophytic vegetation. Dominant hydrophytic plant species within the Commerce Center Drive study location included red willow, sandbar willow, Fremont cottonwood, mulefat, cattails (*Typha* spp.), and giant reed. All of the

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Figure 11. Long Canyon Bridge Alignment Wetland Delineation Map

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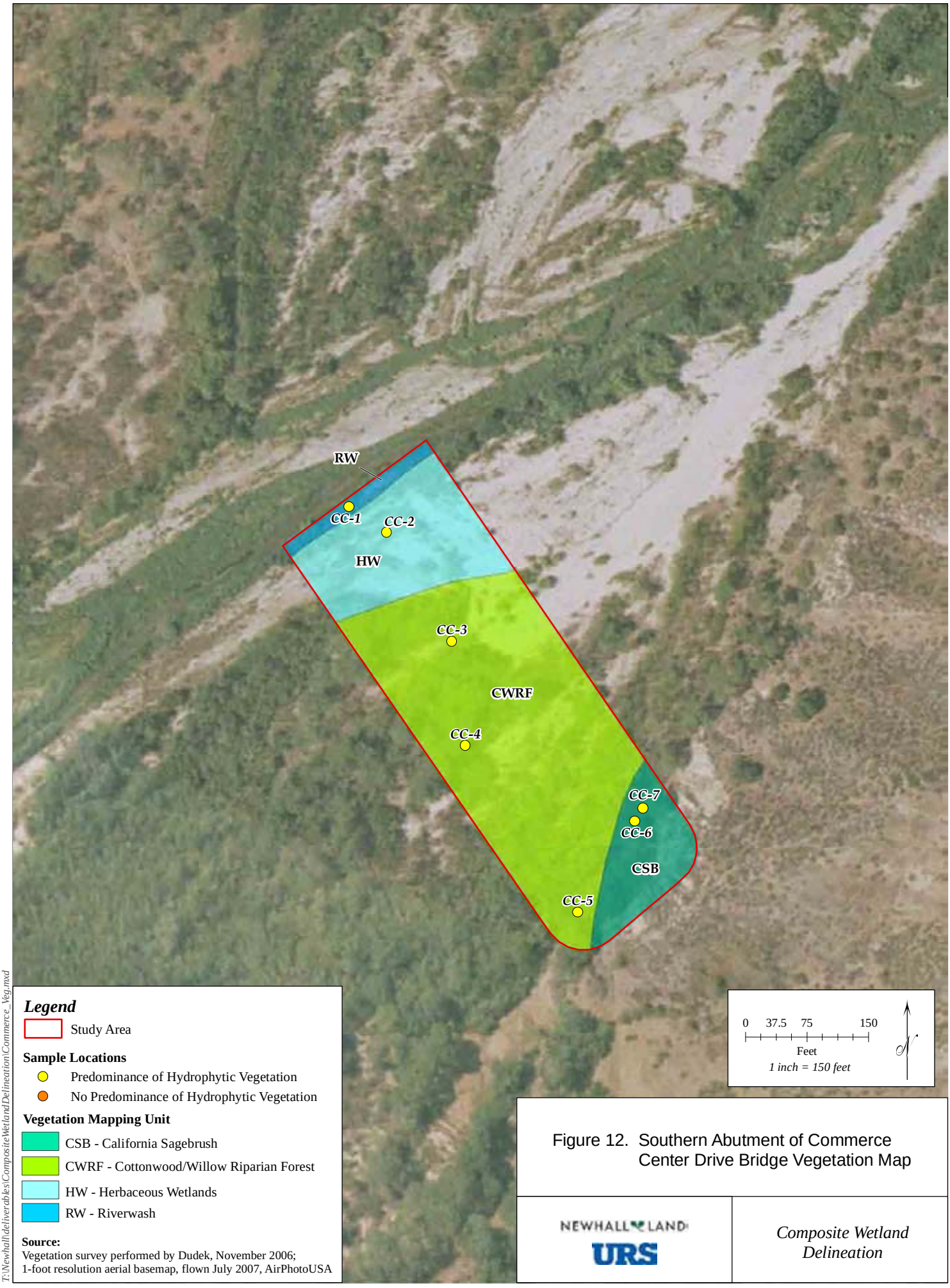


Figure 12. Southern Abutment of Commerce Center Drive Bridge Vegetation Map

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hydrophytic vegetation within this study location was associated with the active channel and riparian corridor of the Santa Clara River. The locations of sampling points and presence/absence of hydrophytic vegetation are depicted graphically on Figure 12.

According to the Soil Survey of San Francis Area, California (USDA 2007), the Commerce Center Drive study location is underlain primarily by Sandy Alluvial Lands, but also includes Terrace Escarpments in the southeastern corner. For a description of these soils, please refer to Section 4.3, above. Soils observed during field investigations within this study location consisted of coarse sand, consistent with the Sandy Alluvial Land and Terrace Escarpments mapping units (Figure 13). In areas that experienced recent river deposition, various sized gravels and small cobbles comprised a loose matrix with the coarse sand. Hydric soil indicators observed within this study location included small reddish mottles, often throughout the soil profile (Appendix A: Data Sample Points CC 1-6 and Appendix B: Photo 4), and organic material in the top portion of the profile. However, the dynamic nature of the on-site river channel and the sandy soil composition posed difficulties in determining the presence of hydric soil indicators. In addition, the Terrace Escarpment land type is especially problematic due to its steep faces and continuing erosional processes. Because Sandy Alluvial Land is listed by the USDA as a hydric soil under flooded and/or saturated conditions, this soil type was counted as hydric even in the absence of other indicators when flooding and/or saturation were observed (data points CC-1, CC-2, and CC-5). The mapped soil types, along with locations of sampling points and presence/absence of hydric soil indicators, are depicted graphically on Figure 13.

Hydrology within the Commerce Center Drive study location is dominated by the Santa Clara River, which flows through the southern end of this study location. The river supports year-round surface flows at this location, which are supplemented by treated wastewater discharges from two treatment works upstream. The study location is sloped, with higher elevation area occurring on the southern river bank and lower elevations at the river channel, in the northern portion of the study location. The sloping topography results in a gradation of hydrologic zones, ranging from the low-flow river channel, which is inundated year-round by surface flows, to upland areas on the southern bank, which are not regularly affected by the river hydrology. The seven sampling points assessed at the Commerce Center Drive study location were situated at various locations throughout the study location, and included all hydrologic zones present. Wetland hydrology was evident at all data points located within the active river channel and terraces, but was absent at points farther removed from the river. Indicators of wetland hydrology included water marks, sediment deposits, and drainage patterns.

A total of 2.84 acres of wetlands were delineated within the Commerce Center Drive study location (Figure 14 and Table 1). The determination of wetlands was difficult given the presence of sandy and eroding soil types, and the mapped soil types and observed inundation/saturation were used as evidence of hydric soils in some areas. Wetlands were

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Figure 13. Southern Abutment of Commerce Center Drive Bridge Soils Map

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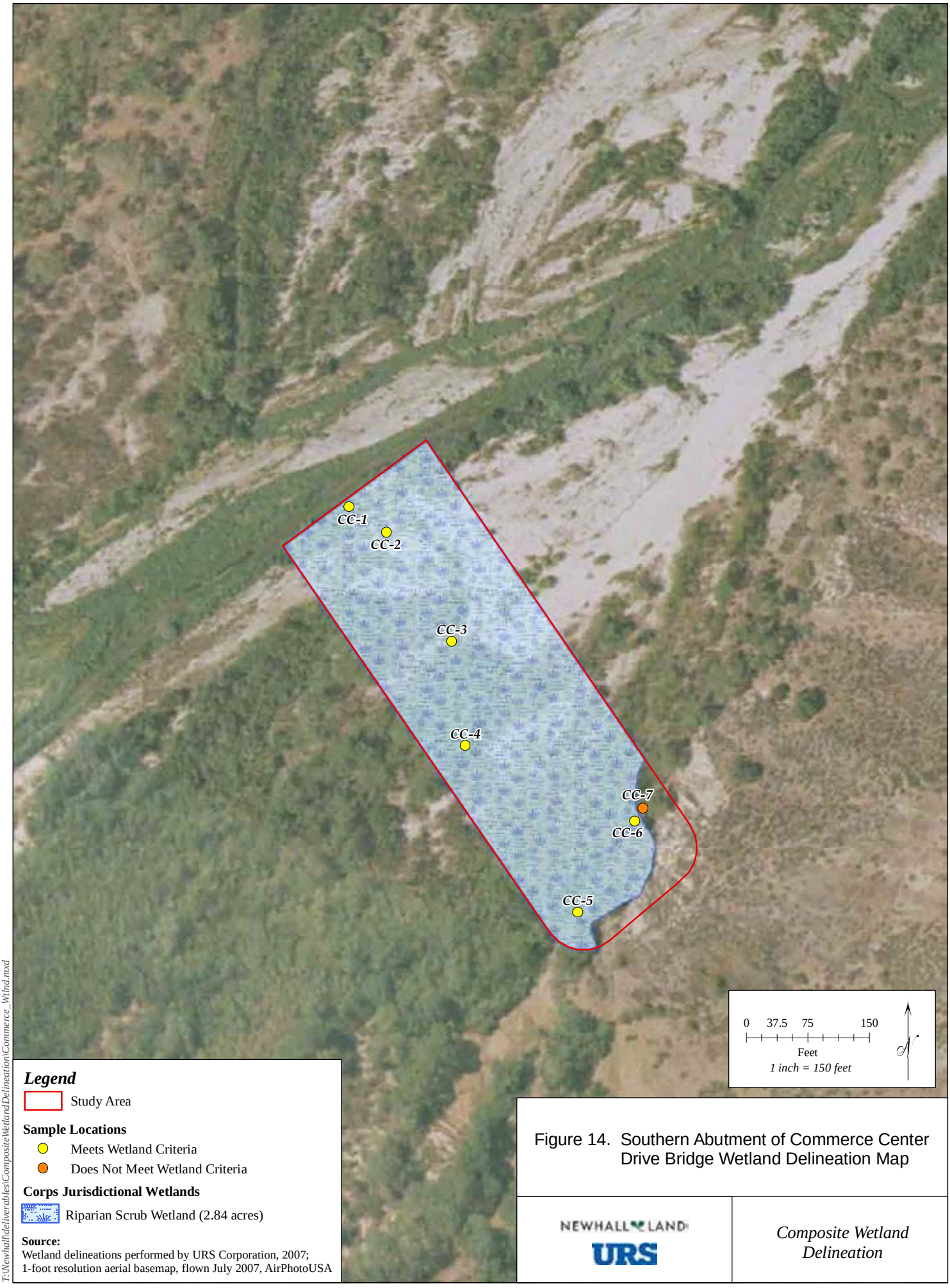


Figure 14. Southern Abutment of Commerce Center Drive Bridge Wetland Delineation Map

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present throughout the study location, with the exception of the southeastern corner which lacked hydric soils and wetland hydrology. All of the jurisdictional wetlands identified as this location were within the Palustrine system as described by Cowardin (1979). Based on the vegetation communities present, the wetlands within this study location were classified as Riparian Scrub Wetlands.

As shown in Table 1, URS Corporation has delineated approximately 9.06 acres of jurisdictional wetlands within four discrete locations on the RMDP site that comprise the Part One study area. The study locations within the bridge alignments at Potrero Canyon Road, Long Canyon Road, and Commerce Center Drive contained 4.89 acres, 2.10 acres, and 2.94 acres of jurisdictional wetlands, respectively. No wetlands were identified at the Onion Fields bank stabilization study location. Because the study area included a 100-foot buffer surrounding the proposed bridge alignments and bank stabilization, construction of these facilities would likely not impact the entire wetland acreage delineated within each study location. The locations of jurisdictional wetlands within the Part One study area are displayed on Figures 5, 11, and 14, and acreages are summarized in Table 1. The use of three field indicators for the three defined parameters: hydrophytic vegetation, hydric soils, and wetland hydrology, as well as the application of the routine and problematic methodologies were used to determine the location and extent of wetlands subject to Corps jurisdiction.

# SECTION 3.0
# PART TWO: COMPOSITE DELINEATION OF WETLANDS WITHIN THE RMDP SITE AND THE ADJACENT ENTRADA PLANNING AREA

As stated previously, the field delineation of wetlands undertaken by URS in 2007 and presented in Part One of this document only addressed areas of the RMDP site that are within and adjacent to the disturbance footprints of major project components, such as roadway bridges across the Santa Clara River. Part Two of this study presents a composite wetland delineation, which combines the findings of Part One with the results of previous studies to yield a comprehensive, planning-level delineation of Corps-jurisdictional wetlands within the entire RMDP site.

## 3.1 STUDY AREA

The study area for this composite wetland delineation includes the entire RMDP site, as well as the adjacent Entrada planning area (Figure 15). The total acreage within the study area is approximately 14,042 acres: 13,651 within the RMDP site and 391 within Entrada. The study area is largely undeveloped, although Newhall Land has historically leased portions of the site for agricultural, grazing, oil and gas production, and filmmaking purposes. Geographically, the study area is bounded by the crest of the Santa Susana Mountains to the south, urban development in the City of Santa Clarita to the east, by the Chiquita Canyon Landfill and the community of Val Verde to the north, and by agricultural lands and open space in Ventura County to the west.

Hydrology within the study area is dominated by the Santa Clara River, which flows through the study area in an east-west direction, and a by a large number of tributary drainages which flow from the mountains on either side of the Santa Clarita Valley to join the river. The river mainstem exhibits perennial flow within the boundaries of the study area, supported in part by treated effluent discharges from two wastewater treatment works located a short distance upstream. This river reach supports substantial habitat for aquatic and riparian plants and wildlife. The majority of the on-site tributaries to the river are ephemeral, first- and second-order streams that exhibit surface flows only immediately following storm events and do not support aquatic life or riparian vegetation. However, the RMDP site does contain seven larger tributaries, some of which exhibit intermittent and perennial flow regimes in some reaches. These larger tributaries convey flows from natural lands outside the study area through the RMDP site and into the Santa Clara River.

The study area contains varied topography due to the presence of low-lying riverbed areas and higher-elevation mountains within the site. At higher elevations within the study area, steep slopes and rugged mountains and foothills dominate the landscape. Vegetation in these

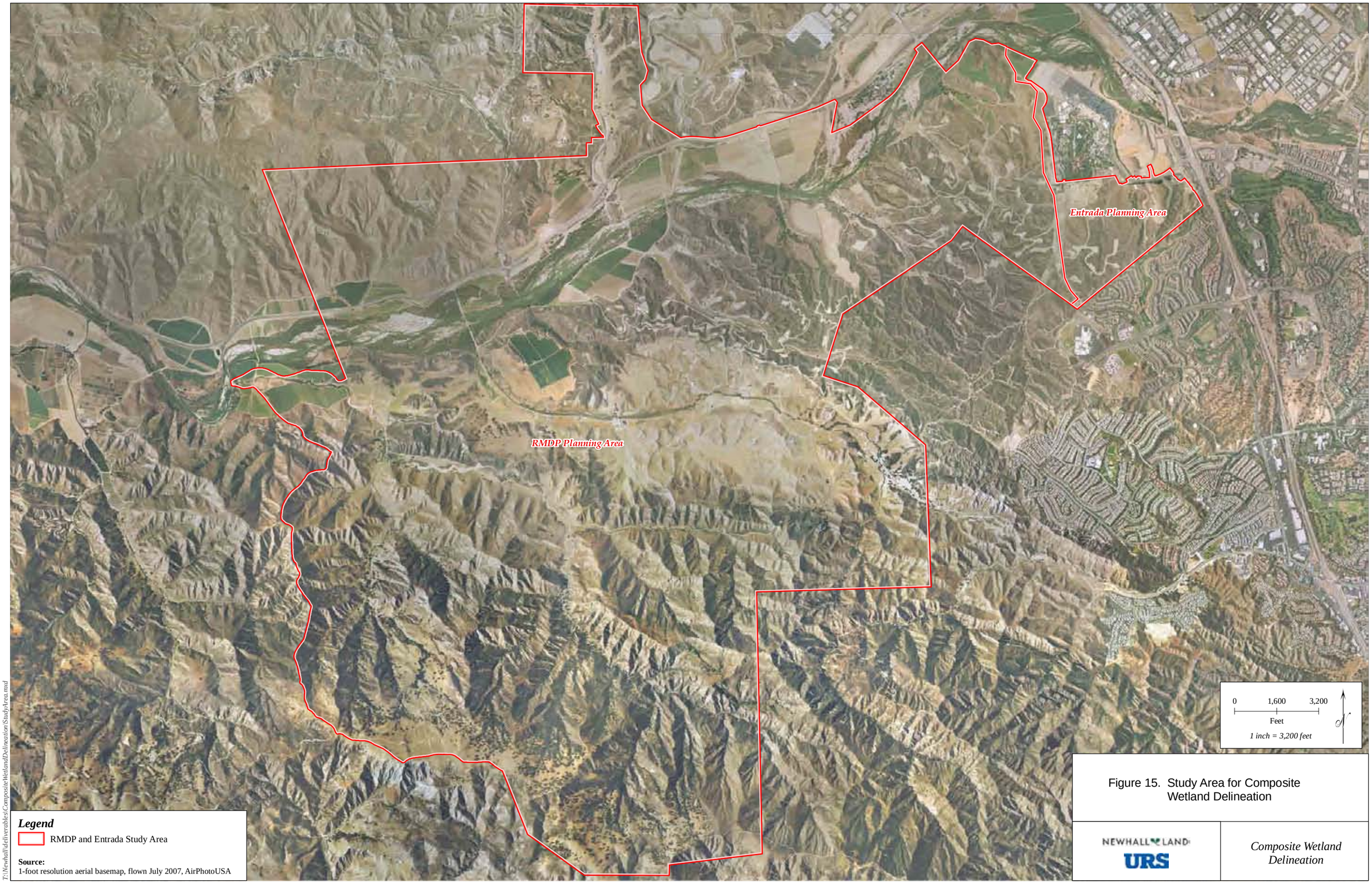


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Figure 15. Study Area for Composite Wetland Delineation

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*Composite Wetland Delineation*

areas consists primarily of shrub-dominated upland habitats, such as California sagebrush scrub and chaparral, although oak woodlands and occasional riparian areas are also present.

Although the site's higher elevations are subject to cattle grazing, human activities within these areas are otherwise minimal. The lower-elevation portions of the study area within the larger tributary valleys and river floodplain, by contrast, have been more heavily impacted by human activities including commercial farming and oil production. These areas have much gentler slopes than the site's mountainous regions, and support habitats including cottonwood/willow riparian forest and riparian scrub habitats along drainages, annual grassland and various scrub communities in the uplands, and ruderal vegetation and bare ground in disturbed areas.

## 3.2 METHODS AND SOURCE MATERIALS

This composite wetland delineation presents a single map of jurisidictional wetlands within the study area that has been compiled from several technical documents produced between 2004 and 2009. Because all of the source materials utilized in this study included map data in Geographic Information Systems (GIS) format, GIS software was used to compile and combine the source data.

Each data source contained one or more shape files that spatially defined the location and extent of areas mapped as wetlands by that particular investigation. The wetland areas were mapped in the source material as enclosed shapes, or polygons, and were distinguished from other, non-wetland polygons by attribute information in the data set. The areas evaluated in the four data sources were mutually exhaustive, meaning that there was no portion of the study area that was not covered in one or more of the source materials. However, the areas evaluated were not mutually exclusive, so certain portions of the study area were covered by more than one data source.

In portions of the study area where only one data source provided wetland delineation information, such as the Entrada planning area and portions of the RMDP site that were not within the Santa Clara River corridor, the wetland polygons from that data source were copied into the composite wetland delineation. In portions of the study area where more than one data source provided wetland information, the union of all wetland polygons from those sources was copied into the composite wetland delineation. This is a more conservative approach than choosing to adopt one set of wetland boundaries over another, as it assigns wetland status to a polygon if any one of the data sources evaluated identified the polygon as a wetland.

It should be noted that the composite wetland delineation is a "planning-level" delineation, as it relies on mutliple data sources, dating from different years and using different investigation methods. While data sources based on field investigations are available for some portions of the study area, other areas were delineated through analysis of aerial photographs. The four

sources from which spatial wetland data was compiled for the composite wetland delineation are described below.

### 3.2.1 URS Corporation (2004) Delineation Report for the RMDP Site

In the winter of 2003, URS staff conducted a delineation of all waters exhibiting an ordinary high water mark and all CDFG-jurisdictional streambeds present within the RMDP site; a technical report was completed in early 2004. The Santa Clara River, Salt Creek, and portions of the Potrero Canyon drainage were found to be the only perennial streams on-site; many jurisdictional intermittent and ephemeral streams also were present. The 2004 delineation was conducted by walking the jurisdictional boundaries using sub-meter accurate GPS units capable of mapping polygons in the field; these data were then transferred into a GIS database. Although the 2004 delineation did not evaluate wetland areas specifically, four of the CDFG-jurisdictional streambed areas identified in this report were determined to meet wetland criteria due to the obvious and continuous presence of hydrophytic vegetation, saturated soils, and wetland hydrology. Two of these areas are cismontane alkali marshes within the Potrero Canyon drainage: one is located adjacent to the low-flow stream channel near the canyon mouth and the other is within the low-flow channel approximately one mile upstream. A third wetland area was identified at a confluence of two branches in the Salt Creek drainage, where perennial flows spread out across a flat floodplain area. The fourth jurisdictional wetland within the RMDP site is a spring complex within the river corridor near the mouth of Middle Canyon, where perennial flows down a slope from a spring support extensive, dense riparian vegetation and continuous soil saturation. Because this delineation report did not specifically investigate wetlands, the report does not provide acreage estimates for these sites. However, acreages have been calculated based on the GIS data, and are presented in Section 3.4 Results, below. The URS Corporation 2004 jurisdictional delineation of the RMDP site is included as Appendix D of this composite wetland delineation.

### 3.2.2 Lukos and Associates (2008) Delineation Report for the Entrada Planning Area

A study conducted by Lukos and Associates in 2008 delineated the limits of waters of the United States, Corps jurisdictional wetlands, and CDFG jurisdictional streams within the Entrada planning area. Methods utilized included field surveys in accordance with the Corps' Wetland Delineation Manual (Environmental Laboratory 1987), mapping of jurisdictional areas on maps and aerial photographs in the field, and digitizing this information to create a GIS layer. This study identified four jurisdictional drainage systems within the Entrada planning area, one of which was the Magic Mountain Canyon drainage previously delineated by URS during the 2004 delineation of the RMDP site (The drainage generally follows the boundary between the RMDP study area and the Entrada planning area, and portions of the drainage are within each area. However, for simplicity of analysis, the Magic Mountain Canyon drainage is considered to be within the RMDP study area). The study identified

jurisdictional wetlands within two of the drainages within the Entrada planning area, and reported the total acreage of these areas to be 0.15 acres. The 2008 Lukos and Associates delineation report for the Entrada planning area is included as Appendix E to this composite wetland delineation.

### 3.2.3 URS Corporation/Dudek and Associates (2006) Planning-level Delineation of Wetlands in the Santa Clara River through Interpretation of Aerial Photography

In 2006, biologists from URS Corporation and Dudek and Associates jointly undertook a planning-level delineation of Corps-jurisdictional wetlands within the reach of the Santa Clara River corridor in the RMDP site. The extent of wetlands within this reach was determined through an analysis of high-resolution (6 inch pixels) aerial photographs flown by Robert J. Lung and Associates on May 24, 2006. Although hydrologic and soils maps were reviewed during this effort, it was determined that the available maps lacked the resolution necessary to be useful in delineating wetland boundaries at the desired scale (For example, the Soil Survey of San Francis Area, California [USDA 2007] maps nearly the entire riverbed within this reach as Sandy Alluvial Land, a problematic soil type). Because the extent of hydric soils within the study reach was not discernible from either the aerial photographs or the soils map, soils were not used as a criterion in the delineation. Instead, to be conservative, all areas where wetland hydrology and hydrophytic vegetation were evident were mapped as wetlands, regardless of soil conditions.

Evidence of wetland hydrology was determined though evaluation of the aerial photographs for evidence of scour, and through inspection of the field-delineated ordinary high water mark boundaries presented in the URS 2004 jurisdiction delineation of the RMDP site. All areas within or adjacent to the mapped river channel that showed signs of recent scour on the aerial photos were considered to exhibit wetland hydrology.

Dominance of hydrophytic vegetation was determined through evaluation of the RMDP site vegetation map prepared by Dudek and Associates in 2006 in conjunction with the aerial photographs. Where riparian vegetation communities were identified on the vegetation map, the air photo was examined, and all areas within or adjacent to mapped riparian vegetation that appeared vegetated were considered to exhibit a predominance of hydrophytic vegetation, except when the vegetation map indicated that a different, non-hydrophytic vegetation type was present.

No technical report or other written document was produced from this study; the tangible result of the planning-level delineation of wetlands within the river corridor was a GIS shape file documenting the location and extent of wetlands delineated. Acreages have been calculated based on this GIS data, and are presented in Section 3.4 Results, below.

### 3.2.4 URS Corporation (2007) Field Delineation of Wetlands in Proposed Bridge Alignment Areas

In 2007, URS Corporation conducted a wetland delineation of potentially jurisdictional features in portions of the RMDP site where major infrastructure improvements, such as roadway bridges across the Santa Clara River, are proposed. This field investigation was performed in accordance with the procedures set forth in the *Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory 1987), Department of the Army (DOA) *Clarification and Interpretation of the 1987 USACE Wetland Delineation Manual* (DOA 1992), and the *Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region* (USACE 2006; Arid West Region Supplement). Data collected during the assessment of wetlands were recorded on Wetland Determination Data Forms – Arid West Region Supplement (Corps 2006). A total of 36 sample point locations were selected in both potential wetland and upland areas to determine the wetland/upland boundary and characterize the vegetation, soils, and hydrology of the area. Soil pits were excavated in areas supporting hydrophytic vegetation to determine the extent of saturation and to examine the soil for positive indicators of hydric soils and wetland hydrology. Soil pits were also excavated in upland areas adjacent to wetlands to aid in delineating the extent of jurisdictional wetlands. At each sample point, plant species composition and indicators of hydric soil and wetland hydrology were recorded. Sample point locations were recorded in the field using a Trimble GeoExplorer Series 2003 GPS unit capable of sub-meter accuracy and were plotted on aerial photographs overlaid with the approximate bridge and bank stabilization footprints and study location boundaries. A sample point was considered to be within a wetland (an "in" point) if the area met all three wetland parameters: dominance by hydrophytic plant species; positive wetland hydrology indicators; and hydric soil conditions. If one or more of these parameters was not met, the point was considered not to be within a wetland (an "out" point) and a line was drawn between the two sample points on the site specific aerial photograph.

The URS 2007 field investigation identified a total of 9.06 acres of Corps-jurisdictional wetlands within the four discrete parts of the RMDP site evaluated. The technical report from this investigation comprises Part One of this composite wetland delineation, and is presented above.

## 3.3 RESULTS

Based on the four data sources identified above, the study area contains wetlands within the Santa Clara River mainstem and the Potrero Canyon and Salt Creek tributaries within the RMDP site and within two unnamed drainages in the Entrada planning area. Of the acreage delineated within the river corridor, 2.51 acres are attributable to a spring complex near the mouth of Middle Canyon, rather than to the hydrologic influence of the river itself. Table 2 presents the acreages of wetlands delineated, as presented in the source technical reports and

## TABLE 2
## CORPS JURISDICTIONAL WETLANDS WITHIN THE RMDP SITE AND ENTRADA PLANNING AREA (ACRES)

| Drainage | Wetland Acreage from URS 2004 Streambed Delineation (from GIS) | Wetland Acreage from Lukos 2008 Entrada Delineation (Reported) | Wetland Acreage from URS/Dudek 2006 Planning-Level Delineation of River Corridor (from GIS) | Wetland Acreage from URS 2007 Delineation of Bridge Alignment Areas (Reported) | Total Wetland Acreage within the RMDP Site and Entrada Planning Area |
|---|---|---|---|---|---|
| Santa Clara River | Not Analyzed | Not Analyzed | 228 | 9.06 | **237.06** |
| Salt Creek | 5.67 | Not Analyzed | Not Analyzed | Not Analyzed | **5.67** |
| Potrero Canyon | 6.52 | Not Analyzed | Not Analyzed | Not Analyzed | **6.52** |
| Spring Complex | 2.14 | Not Analyzed | Not Analyzed | Not Analyzed | **2.14** |
| **Subtotal RMDP Site** | **14.33** | **Not Analyzed** | **228** | **9.06** | **251.39** |
| Entrada Unnamed Drainages | Not Analyzed | **0.15** | Not Analyzed | Not Analyzed | **0.15** |
| **Subtotal Entrada Planning Area** | Not Analyzed | **0.15** | Not Analyzed | Not Analyzed | **0.15** |
| **Grand Total** | **14.33** | **0.15** | **228** | **9.06** | **251.54** |

calculated from the source GIS layers. These wetlands are depicted graphically on Figure 16. The four assessments delineated a total of 251.39 acres of jurisdictional wetlands within the RMDP site and an additional 0.15 acres of wetlands within the Entrada planning area, for a grand total of 251.54 acres of jurisdictional wetlands within the study area.

## 3.4 CONCLUSION AND RECOMMENDATIONS

The composite wetland delineation identified a total of 251.54 acres of jurisdictional wetlands within the study area, most of which occur within the Santa Clara River mainstem. It is important to note that the vast majority of the wetland area delineated in the source studies (228 acres) was identified through the planning-level delineation of the river corridor. While it is almost certainly true that the planning-level delineation methods employed by the biologists at URS Corporation and Dudek and Associates in 2006 determine wetland boundaries with lesser accuracy than the intensive field methods set forth in the Wetland Delineation Manual (Environmental Laboratory 1987), it is important to remember that the Santa Clara River mainstem is a highly dynamic system, and that the proposed RMDP is a long-term project. Even if the extent of wetlands within the river corridor were delineated with the utmost precision today, natural forces such as lateral channel migration, growth and scouring of vegetation, and sediment dynamics would render the delineation progressively less accurate with each passing storm season. The planning-level delineation provides a reasonable estimate (really a conservative estimate, due to the methods employed) of the wetland acreage that occurred within the river corridor in 2006, and the field based source documents provide somewhat more accurate estimates of the location and extent of wetlands in the years when those assessments were conducted. Over the 30-year life of the proposed RMDP project it is not likely that any single delineation of wetlands within the river corridor, regardless of the method employed, would remain accurate.

Despite this reduction in accuracy over time, considerable knowledge can be gained from the results of this composite wetland delineation. Outside the river mainstem, in wetland areas such as Potrero Canyon, Salt Creek, and the unnamed drainages in the Entrada planning area, changes occur much more slowly due to the relative infrequency of extreme flow events in these small watersheds. Wetlands in these areas were delineated using highly accurate field methods, and the delineations should provide useful, accurate information for substantially longer than delineations conducted within the river corridor. In addition, the compilation of many source delineations into a single layer allows an assessment of the proposed RMDP's impacts on wetlands that would not otherwise be possible. Combining the various spatial data sets serves to eliminate the data gaps that would exist if only one of the assessments were used (since no single assessment delineated wetlands within the entire study area) while also eliminating the overlap in the individual GIS layers that prevents an analyst from mathematically combining data from each layer to get a combined wetland impact total.

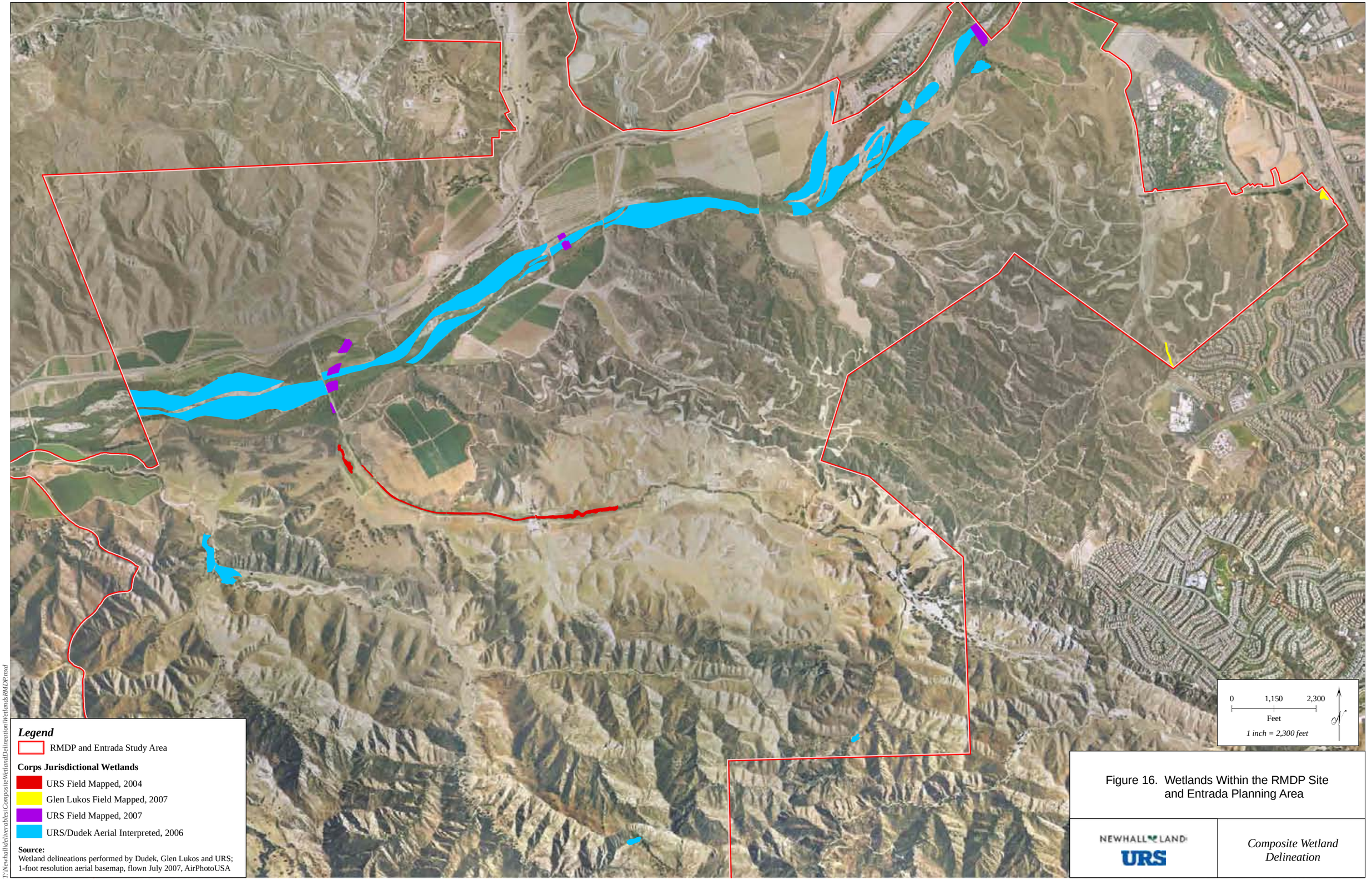


Figure 16. Wetlands Within the RMDP Site and Entrada Planning Area

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*Composite Wetland Delineation*

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Based on the information above, URS recommends that this composite wetland delineation be supplemented by smaller-scale, field-based delineations prior to construction of individual RMDP project components. The RMDP technical document (Dudek 2006b) identifies the types and locations of facilities proposed, but is intended to provide sufficient flexibility for future RMDP components to meet changing demands while avoiding impacts to the aquatic environment to the maximum extent practicable. To this end, the delineations should ideally be conducted close enough to the time of construction to minimize the effects of natural river dynamics, but far enough in advance to allow consideration of design changes that could avoid or minimize impacts to special aquatic sites.

# SECTION 4.0
# REFERENCES

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# APPENDIX A
# WETLAND DETERMINATION DATA FORMS

## WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Newhall Ranch/Potrero Canyon City/County: Los Angeles County Sampling Date: 9/26/07

Applicant/Owner: Newhall Land and Farming Company State: CA Sampling Point: PC-1

Investigator(s): J. Kisner, J. Love, W. Vogler, E. Larsen Section, Township, Range: San Francis Land Grant

Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): None Slope (%): 0

Subregion (LRR): Mediterranean California (LRR-C) Lat: 6358923.7936400 Long: 1971818.2330300 Datum: NAD83

Soil Map Unit Name: Sandy Alluvial Land NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)

Are Vegetation **No**, Soil **No**, or Hydrology **No** significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation **No**, Soil **Yes**, or Hydrology **No** naturally problematic? (If needed, explain any answers in Remarks.)

### SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | |
|---|---|---|
| Hydrophytic Vegetation Present? | Yes ☐ No ☒ | **Is the Sampled Area within a Wetland?** Yes ☐ No ☒ |
| Hydric Soil Present? | Yes ☐ No ☒ | |
| Wetland Hydrology Present? | Yes ☐ No ☒ | |

Remarks:

SP PC-1 characterizes an agricultural field with mixed grasses approximately 850 feet North of the Santa Clara River.

The 2006-2007 rain season had an abnormally low amount of precipitation.

### VEGETATION

| Tree Stratum (Use scientific names.) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| Total Cover: | | | |
| **Sapling/Shrub Stratum** | | | |
| 1. | | | |
| 2. | | | |
| Total Cover: | | | |
| **Herb Stratum** | | | |
| 1. *Eleusine indica* | 25 | Y | FACU |
| 2. *Poa* sp. | 25 | Y | |
| 3. *Dactyloctenium aegyptium* | 25 | Y | NI |
| 4. *Ambrosia acanthicarpa* | 3 | N | NI |
| 5. *Brassica nigra* | 3 | N | NI |
| 6. *Trifolium* sp. | 1 | N | |
| 7. *Leptochloa uninervia* | 1 | N | FACW |
| 8. *Polygonum arenastrum* | 1 | N | FAC |
| 9. *Rumex* sp. | 1 | N | |
| 10. *Sonchus* sp. | 1 | N | |
| 11. *Xanthium strumarium* | 1 | N | FAC+ |
| Total Cover: | 87 | | |
| **Woody Vine Stratum** | | | |
| 1. | | | |
| 2. | | | |
| Total Cover: | | | |

% Bare Ground in Herb Stratum 13 % Cover of Biotic Crust

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 33% (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | Multiply by |
|---|---|
| OBL species | x 1 = |
| FACW species | x 2 = |
| FAC species | x 3 = |
| FACU species | x 4 = |
| UPL species | x 5 = |
| Column Totals: (A) | (B) |

Prevalence Index = B/A =

**Hydrophytic Vegetation Indicators:**

☐ Dominance Test is >50%

☐ Prevalence Index is ≤3.0[1]

☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

**Hydrophytic Vegetation Present?** Yes ☐ No ☒

Remarks:

Reed 1988 was used to determine the wetland indicator status of plants unless otherwise noted.

## SOIL

Sampling Point: PC-1

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | % | Redox Features Color (moist) | % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 0-6 | 10YR4/3 | | | | | | sandy coarse | |
| 6-16 | 10YR4/3 | | | | | | coarse sand w/ gravel (riverwash) | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

**Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)**

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

**Indicators for Problematic Hydric Soils[3]:**

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

**Restrictive Layer (if present):**

Type: _____

Depth (inches): _____

**Hydric Soil Present?** Yes ☐ No ☒

Remarks:

No hydric soil indicators were present.

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

**Field Observations:**

Surface Water Present? Yes ☐ No ☒ Depth (inches): _____

Water Table Present? Yes ☐ No ☒ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ☐ No ☒ Depth (inches): _____

**Wetland Hydrology Present?** Yes ☐ No ☒

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No evidence of hydrology was observed.

# WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Newhall Ranch/Potrero Canyon City/County: Los Angeles County Sampling Date: 9/26/07

Applicant/Owner: Newhall Land and Farming Company State: CA Sampling Point: PC-2

Investigator(s): E. Larsen, J. Kisner, W. Vogler, J. Love Section, Township, Range: San Francis Land Grant

Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): none Slope (%): 0

Subregion (LRR): Mediterranean California (LRR-C) Lat: 6358883.5776700 Long: 1971698.1401700 Datum: NAD83

Soil Map Unit Name: Sany Alluvial Land NWI classification: PFO6

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)

Are Vegetation **no**, Soil **no**, or Hydrology **no** significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation **no**, Soil **yes**, or Hydrology **no** naturally problematic? (If needed, explain any answers in Remarks.)

## SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | |
|---|---|---|
| Hydrophytic Vegetation Present? | Yes ☒ No ☐ | **Is the Sampled Area within a Wetland?** Yes ☒ No ☐ |
| Hydric Soil Present? | Yes ☒ No ☐ | |
| Wetland Hydrology Present? | Yes ☒ No ☐ | |

Remarks:

SP PC-2 characterizes riparian forest North of Santa Clara River. Currently, fragmented from riparian habitat near river due to agricultural use in the area.

The 2006-2007 rain season had an abnormally low amount of precipitation.

## VEGETATION

| Tree Stratum (Use scientific names.) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. *Populus fremontii* | 95 | Y | FACW |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| Total Cover: | 95 | | |
| **Sapling/Shrub Stratum** | | | |
| 1. *Baccharis salicifolia* | 5 | Y | FACW[a] |
| 2. *Salix exigua* | 2 | N | OBL |
| 3. *Tamarix* sp. | 2 | N | FAC[b] |
| 4. | | | |
| 5. | | | |
| Total Cover: | 9 | | |
| **Herb Stratum** | | | |
| 1. grass | 25 | Y | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| Total Cover: | 25 | | |
| **Woody Vine Stratum** | | | |
| 1. | | | |
| 2. | | | |
| Total Cover: | | | |

% Bare Ground in Herb Stratum 75 % Cover of Biotic Crust

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 66% (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | | Multiply by | |
|---|---|---|---|
| OBL species | 2 | x 1 = | 2 |
| FACW species | 100 | x 2 = | 200 |
| FAC species | 2 | x 3 = | 6 |
| FACU species | 0 | x 4 = | 0 |
| UPL species | 0 | x 5 = | 0 |
| Column Totals: | 104 (A) | | 208 (B) |

Prevalence Index = B/A = 2

**Hydrophytic Vegetation Indicators:**

☒ Dominance Test is >50%

☒ Prevalence Index is ≤3.0[1]

☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

**Hydrophytic Vegetation Present?** Yes ☒ No ☐

Remarks:

The vegetation of SP PC-2 most closely corresponds to Cowardin's (1979) riparian forest.

[a] Kartesz, J.T. 1996. National List of Vascular Plant Species that Occur in Wetlands: 1996 National Summary. U.S. Fish and Wildlife Survey.

[b] Wetland indicator status was assumed FAC for all Tamarix species that were not identified to species. Tamarix species found in California have indicators of at least FAC.

## SOIL

Sampling Point: PC-2

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | % | Redox Features Color (moist) | % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 0-2 | 10YR4/3 | | | | | | silty loam | |
| 2-3 | 10YR4/3 | | | | | | sand | |
| 3-16 | 10YR4/2 | 80 | 5YR4/6 | 20 | C | M,RC,PL | silty clay | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

**Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)**

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

**Indicators for Problematic Hydric Soils[3]:**

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☒ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

**Restrictive Layer (if present):**

Type: _____

Depth (inches): _____

**Hydric Soil Present?** Yes ☒ No ☐

Remarks:

Shovel refusal was experienced due to difficulty getting through the thick layer of grass.

Due to the "neutral" characteristics of sandy soils, sandy alluvial land is problematic and often considered to be hydric under flooded conditions.

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☒ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

**Field Observations:**

Surface Water Present? Yes ☐ No ☒ Depth (inches): _____

Water Table Present? Yes ☐ No ☒ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ☐ No ☒ Depth (inches): _____

**Wetland Hydrology Present?** Yes ☒ No ☐

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

# WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Newhall Ranch/Potrero Canyon City/County: Los Angeles County Sampling Date: 9/26/07

Applicant/Owner: Newhall Land and Farming Company State: CA Sampling Point: PC-3

Investigator(s): J. Kisner, J. Love, W. Vogler, E. Larsen Section, Township, Range: San Francis Land Grant

Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): none Slope (%): 0

Subregion (LRR): Mediterranean California (LRR-C) Lat: 6358781.7248300 Long: 1971508.0936000 Datum: NAD83

Soil Map Unit Name: Riverwash NWI classification: PSS6

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)

Are Vegetation **No**, Soil **No**, or Hydrology **No** significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation **No**, Soil **Yes**, or Hydrology **No** naturally problematic? (If needed, explain any answers in Remarks.)

## SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | |
|---|---|---|
| Hydrophytic Vegetation Present? | Yes ☒ No ☐ | **Is the Sampled Area within a Wetland?** Yes ☒ No ☐ |
| Hydric Soil Present? | Yes ☒ No ☐ | |
| Wetland Hydrology Present? | Yes ☒ No ☐ | |

Remarks:

SP PC-3 characterizes riparian habitat north of the Santa Clara River. Currently, fragmented from riparian habitat near river due to agricultural use in the area.

The 2006-2007 rain season had an abnormally low amount of precipitation.

## VEGETATION

| Tree Stratum (Use scientific names.) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| Total Cover: | | | |
| **Sapling/Shrub Stratum** | | | |
| 1. *Baccharis salicifolia* | 70 | Y | FACW[a] |
| 2. *Salix exigua* | 15 | N | OBL |
| 3. *Salix lasiolepis* | 5 | N | FACW |
| 4. *Tamarix* sp. | 2 | N | FAC[b] |
| 5. | | | |
| Total Cover: | 92 | | |
| **Herb Stratum** | | | |
| 1. *Distichlis spicata* | 85 | Y | FACW |
| 2. *Ambrosia psilostachya* var. *californica* | 5 | N | NI |
| 3. *Cynodon dactylon* | 1 | N | FAC |
| 4. *Melilotus alba* | 1 | N | FACU+ |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| Total Cover: | 92 | | |
| **Woody Vine Stratum** | | | |
| 1. | | | |
| 2. | | | |
| Total Cover: | | | |

% Bare Ground in Herb Stratum 5 % Cover of Biotic Crust

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | | Multiply by | |
|---|---|---|---|
| OBL species | 15 | x 1 = | 15 |
| FACW species | 160 | x 2 = | 320 |
| FAC species | 8 | x 3 = | 24 |
| FACU species | 1 | x 4 = | 4 |
| UPL species | 0 | x 5 = | 0 |
| Column Totals: | 184 (A) | | 363 (B) |

Prevalence Index = B/A = 1.97

**Hydrophytic Vegetation Indicators:**

☒ Dominance Test is >50%

☒ Prevalence Index is ≤3.0[1]

☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

**Hydrophytic Vegetation Present?** Yes ☒ No ☐

Remarks:

The vegetation of SP PC-3 most closely corresponds to Cowardin's (1979) riparian scrub.

[a] Kartesz, J.T. 1996. National List of Vascular Plant Species that Occur in Wetlands: 1996 National Summary. U.S. Fish and Wildlife Survey.

[b] Wetland indicator status was assumed FAC for all *Tamarix* species that were not identified to species. *Tamarix* species found in California have indicators of at least FAC.

## SOIL

Sampling Point: PC-3

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | Matrix % | Redox Features Color (moist) | Redox Features % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 0-2 | 10YR4/3 | | none | | | | silt loam | |
| 2-16 | 10YR4/2 | 95 | 5YR4/6 | 5 | C | RC,M | silty clay | small amount of root channels w/ mottles |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

**Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)**

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

**Indicators for Problematic Hydric Soils[3]:**

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☒ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

**Restrictive Layer (if present):**

Type: _____

Depth (inches): _____

**Hydric Soil Present?** Yes ☒ No ☐

Remarks:

Small mottling was found scattered through the soil profile. Oxidation was also observed from 2-16 inches around the roots.

Due to the "neutral" characteristics of sandy soils, riverwash is problematic and often considered to be hydric under flooded conditions.

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☒ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

**Field Observations:**

Surface Water Present? Yes ☐ No ☒ Depth (inches): _____

Water Table Present? Yes ☐ No ☒ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ☐ No ☒ Depth (inches): _____

**Wetland Hydrology Present?** Yes ☒ No ☐

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Soil damp throughout soil pit.

# WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Newhall Ranch/Potrero Canyon City/County: Los Angeles County Sampling Date: 9/26/07

Applicant/Owner: Newhall Land and Farming Company State: CA Sampling Point: PC-4

Investigator(s): J. Kisner, J. Love, W. Vogler, E. Larsen Section, Township, Range: San Francis Land Grant

Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): none Slope (%): 0

Subregion (LRR): Mediterranean California (LRR-C) Lat: 6358690.6215500 Long: 1971446.0286400 Datum: NAD83

Soil Map Unit Name: Sandy Alluvial Land/Riverwash NWI classification: PSS6

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☒ (If no, explain in Remarks.)

Are Vegetation **No**, Soil **No**, or Hydrology **No** significantly disturbed? Are "Normal Circumstances" present? Yes ☐ No ☒

Are Vegetation **No**, Soil **Yes**, or Hydrology **No** naturally problematic? (If needed, explain any answers in Remarks.)

## SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | |
|---|---|---|
| Hydrophytic Vegetation Present? | Yes ☒ No ☐ | **Is the Sampled Area within a Wetland?** Yes ☒ No ☐ |
| Hydric Soil Present? | Yes ☒ No ☐ | |
| Wetland Hydrology Present? | Yes ☒ No ☐ | |

Remarks:

SP PC-4 characterizes riparian habitat North of the Santa Clara River. Currently, fragmented from riparian habitat near river due to agricultural use in the area.

The 2006-2007 rain season had an abnormally low amount of precipitation.

## VEGETATION

| Tree Stratum (Use scientific names.) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| Total Cover: | | | |
| **Sapling/Shrub Stratum** | | | |
| 1. Baccharis salicifolia | 10 | Y | FACW[a] |
| Total Cover: 10 | | | |
| **Herb Stratum** | | | |
| 1. *Cynodon dactylon* | 40 | Y | FAC |
| 2. *Leptochloa uninervia* | 5 | N | FACW |
| 3. *Melilotus alba* | 5 | N | FACU+ |
| 4. *Echinochloa crus-galli* | 2 | N | FACW |
| 5. *Polypogon monspeliensis* | 2 | N | FACW+ |
| 6. *Chenopodium album* | 1 | N | FAC |
| 7. *Cyperus erythrorhizos* | 1 | N | OBL |
| 8. *Eleusine indica* | 1 | N | FACU |
| 9. *Malvella leprosa* | 1 | N | FAC* |
| 10. *Phalaris aquatica* | 1 | N | FAC+ |
| 11. *Poa* sp. | 1 | N | |
| 12. *Sonchus asper* | 1 | N | FAC |
| 13. *Typha domingensis* | 1 | N | OBL |
| 14. *Xanthium strumarium* | 1 | N | FAC+ |
| Total Cover: 63 | | | |
| **Woody Vine Stratum** | | | |
| 1. | | | |
| 2. | | | |
| Total Cover: | | | |

% Bare Ground in Herb Stratum 30 % Cover of Biotic Crust

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | | Multiply by | |
|---|---|---|---|
| OBL species | 2 | x 1 = | 2 |
| FACW species | 19 | x 2 = | 38 |
| FAC species | 45 | x 3 = | 135 |
| FACU species | 6 | x 4 = | 24 |
| UPL species | 0 | x 5 = | 0 |
| Column Totals: | 72 (A) | | 199 (B) |

Prevalence Index = B/A = 2.76

**Hydrophytic Vegetation Indicators:**

☒ Dominance Test is >50%

☒ Prevalence Index is ≤3.0[1]

☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

**Hydrophytic Vegetation Present?** Yes ☒ No ☐

Remarks:

The vegetation of SP PC-4 most closely corresponds to Cowardin's (1979) riparian scrub.

[a] Kartesz, J.T. 1996. National List of Vascular Plant Species that Occur in Wetlands: 1996 National Summary. U.S. Fish and Wildlife Survey.

* = A tentative assignment to that indicator status by Reed, 1988

## SOIL

Sampling Point: PC-4

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | Matrix % | Redox Features Color (moist) | Redox Features % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 0-16 | 10YR4/3 | 98 | 5YR4/6 | 2 | C | RC,M | silty clay mixed w/ silty loam | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

**Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)**

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

**Indicators for Problematic Hydric Soils[3]:**

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☒ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

**Restrictive Layer (if present):**

Type: _____

Depth (inches): _____

**Hydric Soil Present?** Yes ☒ No ☐

Remarks:

Due to the "neutral" characteristics of sandy soils, sandy alluvial land is problematic and often considered to be hydric under flooded conditions.

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☒ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

**Field Observations:**

Surface Water Present? Yes ☐ No ☒ Depth (inches): _____

Water Table Present? Yes ☐ No ☒ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ☐ No ☒ Depth (inches): _____

**Wetland Hydrology Present?** Yes ☒ No ☐

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

# WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Newhall Ranch/Potrero Canyon City/County: Los Angeles County Sampling Date: 9/26/07

Applicant/Owner: Newhall Land and Farming Company State: CA Sampling Point: PC-5

Investigator(s): J. Kisner, W. Vogler Section, Township, Range: San Francis Land Grant

Landform (hillslope, terrace, etc.): Channel Bank Local relief (concave, convex, none): none Slope (%): flat

Subregion (LRR): Mediterranean California (LRR-C) Lat: 6358488.6477700 Long: 1970918.1258500 Datum: NAD83

Soil Map Unit Name: Sandy Alluvial Land NWI classification: PSS6

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)

Are Vegetation **No**, Soil **No**, or Hydrology **No** significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation **No**, Soil **Yes**, or Hydrology **No** naturally problematic? (If needed, explain any answers in Remarks.)

## SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ☒ No ☐

Hydric Soil Present? Yes ☒ No ☐

Wetland Hydrology Present? Yes ☒ No ☐

**Is the Sampled Area within a Wetland?** **Yes** ☒ **No** ☐

Remarks:

SP PC-5 characterizes the floodplain North of the Santa Clara River. Sandy soils present.

The 2006-2007 rain season had an abnormally low amount of precipitation.

## VEGETATION

| Tree Stratum (Use scientific names.) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| Total Cover: | | | |
| **Sapling/Shrub Stratum** | | | |
| 1. *Baccharis salicifolia* | 12 | Y | FACW[a] |
| 2. *Populus fremontii* | 3 | N | FACW |
| 3. *Tamarix* sp. | 3 | N | FAC[b] |
| 4. *Salix exigua* | 2 | N | OBL |
| 5. *Salix laevigata* | 2 | N | FACW+[a] |
| Total Cover: | 22 | | |
| **Herb Stratum** | | | |
| 1. *Melilotus alba* | 50 | Y | FACU+ |
| 2. *Bassia hyssopifolia* | 10 | N | FAC |
| 3. *Ambrosia acanthicarpa* | 2 | N | NI |
| 4. *Aster subulatus* var. *ligulatus* | 2 | N | FACW |
| 5. *Brassica nigra* | 2 | N | NI |
| 6. *Leptochloa uninervia* | 1 | N | FACW |
| 7. unknown grass | 1 | N | |
| 8. | | | |
| Total Cover: | 68 | | |
| **Woody Vine Stratum** | | | |
| 1. | | | |
| 2. | | | |
| Total Cover: | | | |

% Bare Ground in Herb Stratum 10 % Cover of Biotic Crust

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50% (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | | Multiply by | |
|---|---|---|---|
| OBL species | 2 | x 1 = | 2 |
| FACW species | 20 | x 2 = | 40 |
| FAC species | 13 | x 3 = | 39 |
| FACU species | 50 | x 4 = | 200 |
| UPL species | 4 | x 5 = | 20 |
| Column Totals: | 89 (A) | | 301 (B) |

Prevalence Index = B/A = 3.38

**Hydrophytic Vegetation Indicators:**

☐ Dominance Test is >50%

☐ Prevalence Index is ≤3.0[1]

☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

**Hydrophytic Vegetation Present?** **Yes** ☒ **No** ☐

Remarks: Although the dominance test equals 50% and the Prevalence Test was greater than 3.0, the invasive nature and annual/biannual life cycle of *Melilotus alba* has skewed the results. Most plants are hydrophytic.

The vegetation of SP PC-5 most closely corresponds to Cowardin's (1979) riparian scrub.

[a] Kartesz, J.T. 1996. National List of Vascular Plant Species that Occur in Wetlands: 1996 National Summary. U.S. Fish and Wildlife Survey.

[b] Wetland indicator status was assumed FAC for all *Tamarix* species that were not identified to species. *Tamarix* species found in California have indicators of at least FAC.

## SOIL

Sampling Point: PC-5

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | % | Redox Features Color (moist) | % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 0-18 | 10YR6/2 | | n/a | | | | coarse sand w/ cobbles | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

**Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)**

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

**Indicators for Problematic Hydric Soils[3]:**

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☒ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

**Restrictive Layer (if present):**

Type: _____

Depth (inches): _____

**Hydric Soil Present?** Yes ☒ No ☐

Remarks:

Soil pit 3 feet from the bank to the road.

Due to the "neutral" characteristics of sandy soils, sandy alluvial land is problematic and often considered to be hydric under flooded conditions.

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☒ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

**Field Observations:**

Surface Water Present? Yes ☐ No ☒ Depth (inches): 0

Water Table Present? Yes ☒ No ☐ Depth (inches): 15

Saturation Present? (includes capillary fringe) Yes ☒ No ☐ Depth (inches): 8-15

**Wetland Hydrology Present?** Yes ☒ No ☐

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

A high water table and saturated soils provided evidence of hydrology.

## WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Newhall Ranch/Potrero Canyon City/County: Los Angeles County Sampling Date: 9/26/07

Applicant/Owner: Newhall Land and Farming Company State: CA Sampling Point: PC-6

Investigator(s): E. Larsen, J. Love Section, Township, Range: San Francis Land Grant

Landform (hillslope, terrace, etc.): Channel Bank Local relief (concave, convex, none): none Slope (%): 0

Subregion (LRR): Mediterranean California (LRR-C) Lat: 6358492.1903900 Long: 1970877.0632800 Datum: NAD83

Soil Map Unit Name: Sandy Alluvial Land NWI classification: PSS6

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)

Are Vegetation **no**, Soil **no**, or Hydrology **no** significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation **no**, Soil **yes**, or Hydrology **no** naturally problematic? (If needed, explain any answers in Remarks.)

### SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | |
|---|---|---|
| Hydrophytic Vegetation Present? | Yes ☒ No ☐ | **Is the Sampled Area within a Wetland?** Yes ☒ No ☐ |
| Hydric Soil Present? | Yes ☒ No ☐ | |
| Wetland Hydrology Present? | Yes ☒ No ☐ | |

Remarks:

SP PC-6 characterizes the floodplain North of Santa Clara River and its water's edge. Sandy soils present.

The 2006-2007 rain season had an abnormally low amount of precipitation.

### VEGETATION

| Tree Stratum (Use scientific names.) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| Total Cover: | | | |
| **Sapling/Shrub Stratum** | | | |
| 1. *Populus fremontii* | 10 | Y | FACW |
| 2. *Salix laevigata* | 10 | Y | FACW+[a] |
| 3. *Salix exigua* | 10 | Y | OBL |
| 4. *Tamarix sp.* | 10 | Y | FAC[b] |
| Total Cover: | 40 | | |
| **Herb Stratum** | | | |
| 1. *Agrostis viridis* | 20 | Y | OBL |
| 2. *Typha domingensis* | 20 | Y | OBL |
| 3. *Eleocharis macrostachya* | 10 | Y | OBL |
| 4. *Juncus torreyi* | 10 | Y | FACW+ |
| 5. *Tamarix sp.* | 10 | Y | FAC |
| 6. *Arundo donax* | 5 | N | FACW |
| 7. *Cyperus erythrorhizos* | 5 | N | OBL |
| 8. *Cyperus involucratus* | 5 | N | OBL |
| 9. *Epilobium ciliatum* | 5 | N | FACW |
| 10. *Juncus xiphodes* | 5 | N | OBL |
| 11. *Melilotus alba* | 5 | N | FACU+ |
| Total Cover: | 100 | | |
| **Woody Vine Stratum** | | | |
| 1. | | | |
| 2. | | | |
| Total Cover: | | | |

% Bare Ground in Herb Stratum 0 % Cover of Biotic Crust 0

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 8 (A)

Total Number of Dominant Species Across All Strata 8 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | | Multiply by | |
|---|---|---|---|
| OBL species | 75 | x 1 = | 75 |
| FACW species | 40 | x 2 = | 80 |
| FAC species | 20 | x 3 = | 60 |
| FACU species | 5 | x 4 = | 20 |
| UPL species | 0 | x 5 = | 0 |
| Column Totals: | 140 (A) | | 375 (B) |

Prevalence Index = B/A = 2.68

**Hydrophytic Vegetation Indicators:**

☒ Dominance Test is >50%

☒ Prevalence Index is ≤3.0[1]

☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

**Hydrophytic Vegetation Present?** Yes ☒ No ☐

Remarks:

The vegetation of SP PC-6 most closely corresponds to Cowardin's (1979) riparian scrub.

[a] Kartesz, J.T. 1996. National List of Vascular Plant Species that Occur in Wetlands: 1996 National Summary. U.S. Fish and Wildlife Survey.

[b] Wetland indicator status was assumed FAC for all *Tamarix* species that were not identified to species. *Tamarix* species found in California have indicators of at least FAC.

## SOIL

Sampling Point: PC-6

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | % | Redox Features Color (moist) | % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 0-16 | | | n/a | | | | coarse sand | |
| | | | | | | | | |
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[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

**Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)**

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

**Indicators for Problematic Hydric Soils[3]:**

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☒ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

**Restrictive Layer (if present):**

Type: _____

Depth (inches): _____

**Hydric Soil Present?** Yes ☒ No ☐

Remarks:

Due to the "neutral" characteristics of sandy soils, sandy alluvial land is problematic and often considered to be hydric under flooded conditions. Note: Water at 2 inches.

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (any one indicator is sufficient)

- ☒ Surface Water (A1)
- ☒ High Water Table (A2)
- ☒ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☒ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☒ Water Marks (B1) (**Riverine**)
- ☒ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☒ Drainage Patterns (B10)
- ☒ Dry-Season Water Table (C2)
- ☒ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

**Field Observations:**

Surface Water Present? Yes ☐ No ☐ Depth (inches): _____

Water Table Present? Yes ☒ No ☐ Depth (inches): 2-16

Saturation Present? (includes capillary fringe) Yes ☐ No ☐ Depth (inches): _____

**Wetland Hydrology Present?** Yes ☒ No ☐

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

High water table provided evidence of hydrology.

# WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Newhall Ranch/Potrero Canyon City/County: Los Angeles County Sampling Date: 9/25/07

Applicant/Owner: Newhall Land and Farming Company State: CA Sampling Point: PC-7

Investigator(s): J. Davis, J. Love Section, Township, Range: San Francis Land Grant

Landform (hillslope, terrace, etc.): Channel Bank Local relief (concave, convex, none): None Slope (%): 0

Subregion (LRR): Mediterranean California (LRR-C) Lat: 6358467.0973400 Long: 1970634.2451100 Datum: NAD83

Soil Map Unit Name: Sandy Alluvial Land NWI classification: PSS6

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)

Are Vegetation **No**, Soil **No**, or Hydrology **No** significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation **No**, Soil **Yes**, or Hydrology **No** naturally problematic? (If needed, explain any answers in Remarks.)

## SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ☒ No ☐

Hydric Soil Present? Yes ☒ No ☐

Wetland Hydrology Present? Yes ☒ No ☐

**Is the Sampled Area within a Wetland?** **Yes** ☒ **No** ☐

Remarks:

SP PC-7 Characterizes the southern bank of the Santa Clara River.

The 2006-2007 rainy season received an abnormally low amount of precipitation.

## VEGETATION

| Tree Stratum (Use scientific names.) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| Total Cover: | | | |
| **Sapling/Shrub Stratum** | | | |
| 1. *Salix exigua* | 90 | Y | OBL |
| 2. *Populus fremontii* | 5 | N | FACW |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| Total Cover: | 95 | | |
| **Herb Stratum** | | | |
| 1. *Typha* Sp. | 15 | Y | OBL[c] |
| 3. *Salix laevigata* | 10 | Y | FACW+[a] |
| 2. *Melilotus alba* | 5 | N | FACU+ |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| Total Cover: | 30 | | |
| **Woody Vine Stratum** | | | |
| 1. | | | |
| 2. | | | |
| Total Cover: | | | |

% Bare Ground in Herb Stratum 1 % Cover of Biotic Crust

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | | Multiply by | |
|---|---|---|---|
| OBL species | 105 | x 1 = | 105 |
| FACW species | 15 | x 2 = | 30 |
| FAC species | 0 | x 3 = | 0 |
| FACU species | 5 | x 4 = | 20 |
| UPL species | 0 | x 5 = | 0 |
| Column Totals: | 125 (A) | | 155 (B) |

Prevalence Index = B/A = 1.24

**Hydrophytic Vegetation Indicators:**

☒ Dominance Test is >50%

☒ Prevalence Index is ≤3.0[1]

☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

**Hydrophytic Vegetation Present?** **Yes** ☒ **No** ☐

Remarks:

The vegetation of SP PC-7 most closely corresponds to Cowardin's (1979) riparian scrub.

[c] Wetland indicator status was assumed OBL for all Typha species that were not identified to species. Typha species found in California have indicators of at least OBL

[a] Kartesz, J.T. 1996. National List of Vascular Plant Species that Occur in Wetlands: 1996 National Summary. U.S. Fish and Wildlife Survey.

## SOIL

Sampling Point: PC-7

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | % | Redox Features Color (moist) | % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 0-5 | 10YR 4/2 | | N/A | | | | Silty clay loam | |
| 5-16 | N/A | | | | | | Coarse sand riverwash | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

**Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)**

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

**Indicators for Problematic Hydric Soils[3]:**

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☒ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

**Restrictive Layer (if present):**

Type: _____

Depth (inches): _____

**Hydric Soil Present?** Yes ☒ No ☐

Remarks:

Organic material visible from the surface down through the top 5 inches of the rhizosphere/soil profile. With the exception of organic material, there was no additional hydric soil indicators. Due to the "neutral" characteristics of sandy soils, sandy alluvial land is problematic and often considered to be hydric under flooded conditions.

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☒ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

**Field Observations:**

Surface Water Present? Yes ☐ No ☐ Depth (inches): _____

Water Table Present? Yes ☒ No ☐ Depth (inches): 4

Saturation Present? (includes capillary fringe) Yes ☐ No ☐ Depth (inches): _____

**Wetland Hydrology Present?** Yes ☒ No ☐

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

High water table provided evidence of hydrology.

# WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Newhall Ranch/Potrero Canyon City/County: Los Angeles County Sampling Date: 9/25/07

Applicant/Owner: Newhall Land and Farming Company State: CA Sampling Point: PC-8

Investigator(s): J. Davis, J. Love Section, Township, Range: San Francis Land Grant

Landform (hillslope, terrace, etc.): Channel Bank Local relief (concave, convex, none): None Slope (%): 0

Subregion (LRR): Mediterranean California (LRR-C) Lat: 6358481.1919400 Long: 1970556.5810700 Datum: NAD83

Soil Map Unit Name: Sandy Alluvial Land NWI classification: PSS6

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)

Are Vegetation **No**, Soil **No**, or Hydrology **No** significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation **No**, Soil **Yes**, or Hydrology **No** naturally problematic? (If needed, explain any answers in Remarks.)

## SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | |
|---|---|---|
| Hydrophytic Vegetation Present? | Yes ☒ No ☐ | **Is the Sampled Area within a Wetland?** Yes ☒ No ☐ |
| Hydric Soil Present? | Yes ☒ No ☐ | |
| Wetland Hydrology Present? | Yes ☒ No ☐ | |

Remarks:

SP PC-8 characterizes the northern portion of southern abutment within the Santa Clara floodplain. A 2003 aerial review determined a side channel of the river was present at this location. No vegetation existed at that time. Vegetation is immature and tree species are young saplings.

The 2006-2007 rain season had an abnormally low amount of precipitation.

## VEGETATION

| Tree Stratum (Use scientific names.) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| Total Cover: | | | |
| **Sapling/Shrub Stratum** | | | |
| 1. *Salix exigua* | 40 | Y | OBL |
| 2. *Populus fremontii* | 5 | N | FACW |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| Total Cover: | 45 | | |
| **Herb Stratum** | | | |
| 3. *Typha* Sp. | 25 | Y | OBL[c] |
| 2. *Baccharis salicifolia* | 15 | Y | FACW[a] |
| 3. *Arundo donax* | 5 | N | FACW |
| 4. *Salix laevigata* | 5 | N | FACW+[a] |
| 5. *Tamarix* sp. | 2 | N | FAC[b] |
| 6. *Artemisia douglasiana* | 1 | N | FACW |
| 7. *Urtica dioica* | 1 | N | FACW |
| 8. *Xanthium strumarium* | 1 | N | FAC+ |
| Total Cover: | 55 | | |
| **Woody Vine Stratum** | | | |
| 1. | | | |
| Total Cover: | | | |

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust _____

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | | Multiply by | |
|---|---|---|---|
| OBL species | 65 | x 1 = | 65 |
| FACW species | 32 | x 2 = | 64 |
| FAC species | 3 | x 3 = | 9 |
| FACU species | 0 | x 4 = | 0 |
| UPL species | 0 | x 5 = | 0 |
| Column Totals: | 100 (A) | | 138 (B) |

Prevalence Index = B/A = 1.38

**Hydrophytic Vegetation Indicators:**

☒ Dominance Test is >50%

☒ Prevalence Index is ≤3.0[1]

☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

**Hydrophytic Vegetation Present?** Yes ☒ No ☐

Remarks:

The vegetation of SP PC-8 most closely corresponds to Cowardin's (1979) riparian scrub.

A lot of Freemont cottonwood leaf litter.

[c] Wetland indicator status was assumed OBL for all Typha species that were not identified to species. Typha species found in California have indicators of at least OBL

[a] Kartesz, J.T. 1996. National List of Vascular Plant Species that Occur in Wetlands: 1996 National Summary. U.S. Fish and Wildlife Survey.

[b] Wetland indicator status was assumed FAC for all *Tamarix* species that were not identified to species. *Tamarix* species found in California have indicators of at least FAC.

## SOIL

Sampling Point: PC-8

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | % | Redox Features Color (moist) | % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 0-4 | 10YR 2.5/1 | | N/A | | | | coarse sandy loam | |
| 4-5 | 2.5 YR 5-4/2 | | | | | | | Organic layer |
| 5-7/8 | 10YR 4/2 | | | | | | | Depositional layer |
| 10-16 | N/A | | | | | | | oxidized roots |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

**Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)**

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☒ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

**Indicators for Problematic Hydric Soils[3]:**

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☒ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

**Restrictive Layer (if present):**

Type: _____

Depth (inches): _____

**Hydric Soil Present?** Yes ☒ No ☐

Remarks:

Some mottling visible in depositional layer.

Due to the "neutral" characteristics of sandy soils, sandy alluvial land is problematic and often considered to be hydric under flooded conditions.

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☒ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

**Field Observations:**

Surface Water Present? Yes ☒ No ☐ Depth (inches): >16

Water Table Present? Yes ☒ No ☐ Depth (inches): 16

Saturation Present? (includes capillary fringe) Yes ☐ No ☐ Depth (inches): _____

**Wetland Hydrology Present?** Yes ☒ No ☐

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Surface water and a high water table provided evidence of hydrology.

## WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Newhall Ranch/Potrero Canyon City/County: Los Angeles County Sampling Date: 9/25/07

Applicant/Owner: Newhall Land and Farming Company State: CA Sampling Point: PC-9

Investigator(s): J. Davis, J. Love Section, Township, Range: San Francis Land Grant

Landform (hillslope, terrace, etc.): Channel Bank Local relief (concave, convex, none): None Slope (%): 0

Subregion (LRR): Mediterranean California (LRR-C) Lat: 6358508.9742200 Long: 6358508.9742200 Datum: NAD83

Soil Map Unit Name: Sandy Alluvial Land NWI classification: PSS6

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)

Are Vegetation **No**, Soil **No**, or Hydrology **No** significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation **No**, Soil **Yes**, or Hydrology **No** naturally problematic? (If needed, explain any answers in Remarks.)

### SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | |
|---|---|---|
| Hydrophytic Vegetation Present? | Yes ☒ No ☐ | **Is the Sampled Area within a Wetland?** Yes ☒ No ☐ |
| Hydric Soil Present? | Yes ☒ No ☐ | |
| Wetland Hydrology Present? | Yes ☒ No ☐ | |

Remarks:

SP PC-9 characterizes the southern embankment of the Santa Clara River within relict alluvial channel.

The 2006-2007 rain season had an abnormally low amount of precipitation.

### VEGETATION

| Tree Stratum (Use scientific names.) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| Total Cover: | | | |
| **Sapling/Shrub Stratum** | | | |
| 1. *Populus fremontii* | 1 | Y | FACW |
| 2. *Tamarix* Sp. | 1 | Y | FAC[b] |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| Total Cover: 2 | | | |
| **Herb Stratum** | | | |
| 1. *Melilotus alba* | 60 | Y | FACU+ |
| 2. *Baccharis salicifolia* | 30 | Y | FACW[a] |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| Total Cover: 90 | | | |
| **Woody Vine Stratum** | | | |
| 1. | | | |
| 2. | | | |
| Total Cover: | | | |

% Bare Ground in Herb Stratum 8 % Cover of Biotic Crust

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 75 (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | | Multiply by | |
|---|---|---|---|
| OBL species | 0 | x 1 = | 0 |
| FACW species | 31 | x 2 = | 62 |
| FAC species | 1 | x 3 = | 3 |
| FACU species | 60 | x 4 = | 240 |
| UPL species | 0 | x 5 = | 0 |
| Column Totals: | 92 (A) | | 305 (B) |

Prevalence Index = B/A = 3.31

**Hydrophytic Vegetation Indicators:**

☒ Dominance Test is >50%

☐ Prevalence Index is ≤3.0[1]

☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

**Hydrophytic Vegetation Present?** Yes ☒ No ☐

Remarks:

The vegetation of SP PC-9 most closely corresponds to Cowardin's (1979) riparian scrub.

Tree species are young saplings.

[b] Wetland indicator status was assumed FAC for all *Tamarix* species that were not identified to species. *Tamarix* species found in California have indicators of at least FAC.

[a] Kartesz, J.T. 1996. National List of Vascular Plant Species that Occur in Wetlands: 1996 National Summary. U.S. Fish and Wildlife Survey.

## SOIL

Sampling Point: PC-9

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | % | Redox Features Color (moist) | % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 0-16 | N/A | | N/A | | | | Medium gravel w/ coarse sand (riverwash) | |
| | | | | | | | | |
| | | | | | | | | |
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| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

**Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)**

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

**Indicators for Problematic Hydric Soils[3]:**

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☒ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

**Restrictive Layer (if present):**

Type: _____

Depth (inches): _____

**Hydric Soil Present?** Yes ☒ No ☐

Remarks:

No signs of oxidation or organic material.

Due to the "neutral" characteristics of sandy soils, sandy alluvial land is problematic and often considered to be hydric under flooded conditions.

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☒ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

**Field Observations:**

Surface Water Present? Yes ☐ No ☐ Depth (inches): _____

Water Table Present? Yes ☒ No ☐ Depth (inches): 16

Saturation Present? (includes capillary fringe) Yes ☐ No ☐ Depth (inches): _____

**Wetland Hydrology Present?** Yes ☒ No ☐

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

High water table provided evidence of hydrology.

# WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Newhall Ranch/Potrero Canyon City/County: Los Angeles County Sampling Date: 9/25/07

Applicant/Owner: Newhall Land and Farming Company State: CA Sampling Point: PC-10

Investigator(s): J. Davis, J. Love Section, Township, Range: San Francis Land Grant

Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): None Slope (%): 0

Subregion (LRR): Mediterranean California (LRR-C) Lat: 6358522.2620200 Long: 1970339.6556000 Datum: NAD83

Soil Map Unit Name: Sandy Alluvial Land NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)

Are Vegetation **No**, Soil **No**, or Hydrology **No** significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation **No**, Soil **Yes**, or Hydrology **No** naturally problematic? (If needed, explain any answers in Remarks.)

## SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | |
|---|---|---|
| Hydrophytic Vegetation Present? | Yes ☒ No ☐ | **Is the Sampled Area within a Wetland?** Yes ☐ No ☒ |
| Hydric Soil Present? | Yes ☒ No ☐ | |
| Wetland Hydrology Present? | Yes ☐ No ☒ | |

Remarks:

SP PC-10 characterizes change in soil type and a slight elevation change. SP PC-10 is South of the channel with mature trees.

The 2006-2007 rain season had an abnormally low amount of precipitation.

## VEGETATION

| Tree Stratum (Use scientific names.) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. *Populus fremontii* | 80 | Y | FACW |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| Total Cover: | 80 | | |
| **Sapling/Shrub Stratum** | | | |
| 1. *Salix exigua* | 80 | Y | OBL |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| Total Cover: | 80 | | |
| **Herb Stratum** | | | |
| 3. *Leymus triticoides* | 35 | Y | FAC+ |
| 2. *Baccharis salicifolia* | 10 | Y | FACW[a] |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| Total Cover: | 45 | | |
| **Woody Vine Stratum** | | | |
| 1. | | | |
| 2. | | | |
| Total Cover: | | | |

% Bare Ground in Herb Stratum 10 % Cover of Biotic Crust

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | Multiply by |
|---|---|
| OBL species | x 1 = |
| FACW species | x 2 = |
| FAC species | x 3 = |
| FACU species | x 4 = |
| UPL species | x 5 = |
| Column Totals: (A) | (B) |

Prevalence Index = B/A =

**Hydrophytic Vegetation Indicators:**

☒ Dominance Test is >50%

☐ Prevalence Index is ≤3.0[1]

☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

**Hydrophytic Vegetation Present?** Yes ☒ No ☐

Remarks:

The vegetation of SP PC-10 most closely corresponds to Cowardin's (1979) riparian scrub.

A lot of Freemont cottonwood leaf litter.

[a] Kartesz, J\.T. 1996. National List of Vascular Plant Species that Occur in Wetlands: 1996 National Summary. U.S. Fish and Wildlife Survey.

## SOIL

Sampling Point: PC-10

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | % | Redox Features Color (moist) | % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 0-8 | 10YR 4/3 | | N/A | | | | sandy | |
| 8-16 | 10YR 4/2 | | | | | | silty clay | Oxidation around roots |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

**Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)**

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

**Indicators for Problematic Hydric Soils[3]:**

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☒ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

**Restrictive Layer (if present):**

Type: _____

Depth (inches): _____

**Hydric Soil Present?** Yes ☒ No ☐

Remarks:

Small mottling was found scattered through the soil profile. Oxidation was also observed from 8-16 inches around the roots.

Due to the "neutral" characteristics of sandy soils, sandy alluvial land is problematic and often considered to be hydric under flooded conditions.

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

**Field Observations:**

Surface Water Present? Yes ☐ No ☐ Depth (inches): _____

Water Table Present? Yes ☐ No ☐ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ☐ No ☐ Depth (inches): _____

**Wetland Hydrology Present?** Yes ☐ No ☒

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No evidence of hydrology was observed within one meter of sampling point.

# WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Newhall Ranch/Potrero Canyon City/County: Los Angeles County Sampling Date: 9/26/07

Applicant/Owner: Newhall Land and Farming Company State: CA Sampling Point: PC-11

Investigator(s): J. Davis, J. Love Section, Township, Range: San Francis Land Grant

Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): none Slope (%): flat

Subregion (LRR): Mediterranean California (LRR-C) Lat: 6358614.5033300 Long: 1970093.7130200 Datum: NAD83

Soil Map Unit Name: Sandy Alluvial Land NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)

Are Vegetation **no**, Soil **no**, or Hydrology **no** significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation **no**, Soil **Yes**, or Hydrology **no** naturally problematic? (If needed, explain any answers in Remarks.)

## SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | |
|---|---|---|
| Hydrophytic Vegetation Present? | Yes ☒ No ☐ | **Is the Sampled Area within a Wetland?** Yes ☐ No ☒ |
| Hydric Soil Present? | Yes ☒ No ☐ | |
| Wetland Hydrology Present? | Yes ☐ No ☒ | |

Remarks:

SP PC-11 characterizes mature riparian forest approximately 100 feet away from the southern bank of the Santa Clara River.

The 2006-2007 rain season had an abnormally low amount of precipitation.

## VEGETATION

| Tree Stratum (Use scientific names.) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. *Populus fremontii* | 70 | Y | FACW |
| 2. | | | |
| Total Cover: | 70 | | |
| **Sapling/Shrub Stratum** | | | |
| 1. *Salix laevigata* | 15 | Y | FACW+[a] |
| 2. *Salix* sp. | 10 | Y | FACW[d] |
| 3. *Sambucus mexicana* | 10 | Y | FAC |
| Total Cover: | 35 | | |
| **Herb Stratum** | | | |
| 1. *Salix* sp. | 10 | Y | FACW[d] |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| Total Cover: | 10 | | |
| **Woody Vine Stratum** | | | |
| 1. | | | |
| 2. | | | |
| Total Cover: | | | |

% Bare Ground in Herb Stratum 90 % Cover of Biotic Crust 0

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 5 (A)

Total Number of Dominant Species Across All Strata 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | Multiply by |
|---|---|
| OBL species | x 1 = |
| FACW species | x 2 = |
| FAC species | x 3 = |
| FACU species | x 4 = |
| UPL species | x 5 = |
| Column Totals: (A) | (B) |

Prevalence Index = B/A =

**Hydrophytic Vegetation Indicators:**

☒ Dominance Test is >50%

☐ Prevalence Index is ≤3.0[1]

☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

**Hydrophytic Vegetation Present?** Yes ☒ No ☐

Remarks:

The vegetation of SP PC-11 most closely corresponds to Cowardin's (1979) riparian scrub.

[a] Kartesz, J.T. 1996. National List of Vascular Plant Species that Occur in Wetlands: 1996 National Summary. U.S. Fish and Wildlife Survey.

[d] Wetland indicator status was assumed FACW for all *Salix* species not identified to species at this SP. All unidentified *Salix* sp. were either *S. lasiolepis* (FACW) or *S. laevigata* (FACW+), which in some cases were difficult to distinguish during the field survey. FACW is the lower wetland indicator between these two species and therefore was chosen.

## SOIL

Sampling Point: PC-11

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | % | Redox Features Color (moist) | % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 0-8 | 10YR 4/3 | | N/A | | | | sandy | |
| 8-16 | 10YR 4/2 | | N/A | | | | silty clay | Oxidation around roots |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

**Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)**

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☒ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

**Indicators for Problematic Hydric Soils[3]:**

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☒ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

**Restrictive Layer (if present):**

Type: _____

Depth (inches): _____

**Hydric Soil Present?** Yes ☒ No ☐

Remarks:

Small mottling was found scattered through the soil profile. Oxidation was also observed from 8-16 inches around the roots.

Due to the "neutral" characteristics of sandy soils, sandy alluvial land is problematic and often considered to be hydric under flooded conditions.

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

**Field Observations:**

Surface Water Present? Yes ☐ No ☐ Depth (inches): _____

Water Table Present? Yes ☐ No ☐ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ☐ No ☐ Depth (inches): _____

**Wetland Hydrology Present?** Yes ☐ No ☒

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No evidence of hydrology was observed.

# WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Newhall Ranch/Potrero Canyon City/County: Los Angeles County Sampling Date: 9/25/07

Applicant/Owner: Newhall Land and Farming Company State: CA Sampling Point: PC-12

Investigator(s): J. Davis, J. Love Section, Township, Range: San Francis Land Grant

Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): None Slope (%): 0

Subregion (LRR): Mediterranean California (LRR-C) Lat: 6358800.8811600 Long: 1969648.3912600 Datum: NAD83

Soil Map Unit Name: Sandy Alluvial Land NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)

Are Vegetation **No**, Soil **No**, or Hydrology **No** significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation **No**, Soil **No**, or Hydrology **No** naturally problematic? (If needed, explain any answers in Remarks.)

## SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | |
|---|---|---|
| Hydrophytic Vegetation Present? | Yes ☒ No ☐ | **Is the Sampled Area within a Wetland?** Yes ☐ No ☒ |
| Hydric Soil Present? | Yes ☐ No ☒ | |
| Wetland Hydrology Present? | Yes ☐ No ☒ | |

Remarks:

SP PC-12 characterizes the edge of a ranch road. Recent vegetation removal was evident in the area. Riparian forest surrounds and overhangs this SP.

The 2006-2007 rainy season had an abnormally low amount of precipitation.

## VEGETATION

| Tree Stratum (Use scientific names.) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. *Salix laevigata* | 30 | Y | FACW+[a] |
| 2. | | | |
| 3. | | | |
| Total Cover: | 30 | | |
| **Sapling/Shrub Stratum** | | | |
| 1. *Arundo donax* | 10 | Y | FACW |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| Total Cover: | 10 | | |
| **Herb Stratum** | | | |
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| Total Cover: | | | |
| **Woody Vine Stratum** | | | |
| 1. | | | |
| Total Cover: | | | |

% Bare Ground in Herb Stratum 80 % Cover of Biotic Crust 20

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | Multiply by |
|---|---|
| OBL species | x 1 = |
| FACW species | x 2 = |
| FAC species | x 3 = |
| FACU species | x 4 = |
| UPL species | x 5 = |
| Column Totals: (A) | (B) |

Prevalence Index = B/A =

**Hydrophytic Vegetation Indicators:**

☒ Dominance Test is >50%

☐ Prevalence Index is ≤3.0[1]

☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

**Hydrophytic Vegetation Present?** Yes ☒ No ☐

Remarks:

The vegetation of SP PC-12 most closely corresponds to Cowardin's (1979) riparian scrub.

Ruderal with elements of riparian forest.

[a] Kartesz, J.T. 1996. National List of Vascular Plant Species that Occur in Wetlands: 1996 National Summary. U.S. Fish and Wildlife Survey.

## SOIL

Sampling Point: PC-12

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | % | Redox Features Color (moist) | % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| No Soil Pit | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

**Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)**

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

**Indicators for Problematic Hydric Soils[3]:**

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

**Restrictive Layer (if present):**

Type: _____

Depth (inches): _____

**Hydric Soil Present? Yes** ☐ **No** ☒

Remarks:

No soil pit was excavated due to lack of vegetation and observable hydrology.

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

**Field Observations:**

Surface Water Present? Yes ☐ No ☐ Depth (inches): _____

Water Table Present? Yes ☐ No ☐ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ☐ No ☐ Depth (inches): _____

**Wetland Hydrology Present? Yes** ☐ **No** ☒

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No evidence of hydrology was observed.

# WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Newhall Ranch/Potrero Canyon City/County: Los Angeles County Sampling Date: 9/25/07

Applicant/Owner: Newhall Land and Farming Company State: CA Sampling Point: PC-13

Investigator(s): J. Love, L. Rizzo, J. Davis, J. Kisner Section, Township, Range: San Francis Land Grant

Landform (hillslope, terrace, etc.): River Channel Bank Local relief (concave, convex, none): none Slope (%): 0

Subregion (LRR): Mediterranean California (LRR-C) Lat: 6358344.9185400 Long: 1970565.1804200 Datum: NAD83

Soil Map Unit Name: Sandy Alluvial Land NWI classification: PSS6

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)

Are Vegetation **No**, Soil **No**, or Hydrology **No** significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation **No**, Soil **Yes**, or Hydrology **No** naturally problematic? (If needed, explain any answers in Remarks.)

## SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | |
|---|---|---|
| Hydrophytic Vegetation Present? | Yes ☒ No ☐ | **Is the Sampled Area within a Wetland?** Yes ☒ No ☐ |
| Hydric Soil Present? | Yes ☒ No ☐ | |
| Wetland Hydrology Present? | Yes ☒ No ☐ | |

Remarks:

SP PC-13 characterizes the southern edge of a vegetated channel south of the Santa Clara River.

The 2006-2007 rain season had an abnormally low amount of precipitation.

## VEGETATION

| Tree Stratum (Use scientific names.) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| Total Cover: | | | |
| **Sapling/Shrub Stratum** | | | |
| 1. *Salix exigua* | 20 | Y | OBL |
| 2. *Salix laevigata* | 20 | Y | FACW+[a] |
| 3. *Baccharis salicifolia* | 10 | N | FACW[a] |
| 4. *Populus fremontii* | 10 | N | FACW |
| 5. *Tamarix* sp. | 5 | N | FAC[b] |
| Total Cover: | 65 | | |
| **Herb Stratum** | | | |
| 1. *Melilotus alba* | 20 | Y | FACU+ |
| 2. *Typha* sp. | 15 | Y | OBL[c] |
| 3. *Arundo donax* | 5 | Y | FACW |
| 4. *Epilobium ciliatum* | 5 | Y | FACW |
| 5. *Euthamia occidentalis* | 5 | Y | OBL |
| 6. *Aster subulatus* var. *ligulatus* | 2 | N | FAC |
| 7. *Cyperus eragrostis* | 2 | N | FACW |
| 8. *Polygonum lapathifolium* | 2 | N | OBL |
| 9. *Xanthium strumarium* | 2 | N | FAC+ |
| Total Cover: | 58 | | |
| **Woody Vine Stratum** | | | |
| 1. | | | |
| 2. | | | |
| Total Cover: | | | |

% Bare Ground in Herb Stratum 3 % Cover of Biotic Crust

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 6 (A)

Total Number of Dominant Species Across All Strata 7 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 86% (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | | Multiply by | |
|---|---|---|---|
| OBL species | 42 | x 1 = | 42 |
| FACW species | 52 | x 2 = | 104 |
| FAC species | 9 | x 3 = | 24 |
| FACU species | 20 | x 4 = | 80 |
| UPL species | 0 | x 5 = | 0 |
| Column Totals: | 123 (A) | | 250 (B) |

Prevalence Index = B/A = 2.03

**Hydrophytic Vegetation Indicators:**

☒ Dominance Test is >50%

☒ Prevalence Index is ≤3.0[1]

☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

**Hydrophytic Vegetation Present?** Yes ☒ No ☐

Remarks:

The vegetation of SP PC-13 most closely corresponds to Cowardin's (1979) riparian scrub. Height of vegetation ranged from 10'-15'.

[a] Kartesz, J.T. 1996. National List of Vascular Plant Species that Occur in Wetlands: 1996 National Summary. U.S. Fish and Wildlife Survey.

[b] Wetland indicator status was assumed FAC for all *Tamarix* species that were not identified to species. *Tamarix* species found in California have indicators of at least FAC.

[c] Wetland indicator status was assumed OBL for all *Typha* species that were not identified to species. *Typha* species found in California have indicators of at least OBL

## SOIL

Sampling Point: PC-13

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | % | Redox Features Color (moist) | % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 16 | n/a | | n/a | | | | coarse sandy | No gravel |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

**Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)**

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

**Indicators for Problematic Hydric Soils[3]:**

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☒ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

**Restrictive Layer (if present):**

Type: _____

Depth (inches): _____

**Hydric Soil Present? Yes** ☒ **No** ☐

Remarks:

Small organic layer indicates young hydric soils layer (1/8") thick.

Due to the "neutral" characteristics of sandy soils, sandy alluvial land is problematic and often considered to be hydric under flooded conditions.

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (any one indicator is sufficient)

- ☒ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

**Field Observations:**

Surface Water Present? Yes ☐ No ☒ Depth (inches): _____

Water Table Present? Yes ☒ No ☐ Depth (inches): 2-3

Saturation Present? (includes capillary fringe) Yes ☒ No ☐ Depth (inches): 0-2

**Wetland Hydrology Present? Yes** ☒ **No** ☐

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Surface water present adjacent to soil pit.

# WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Newhall Ranch/Potrero Canyon City/County: Los Angeles County Sampling Date: 9/25/07

Applicant/Owner: Newhall Land and Farming Company State: CA Sampling Point: PC-14

Investigator(s): J. Love, L. Rizzo, J. Davis, J. Kisner Section, Township, Range: San Francis Land Grant

Landform (hillslope, terrace, etc.): River Channel Bank Local relief (concave, convex, none): none Slope (%): 0

Subregion (LRR): Mediterranean California (LRR-C) Lat: 6358332.4042200 Long: 1970531.6653300 Datum: NAD83

Soil Map Unit Name: Sandy Alluvial Land NWI classification: PSS6

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)

Are Vegetation **No**, Soil **No**, or Hydrology **No** significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation **No**, Soil **Yes**, or Hydrology **No** naturally problematic? (If needed, explain any answers in Remarks.)

## SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | |
|---|---|---|
| Hydrophytic Vegetation Present? | Yes ☒ No ☐ | **Is the Sampled Area within a Wetland?** Yes ☒ No ☐ |
| Hydric Soil Present? | Yes ☒ No ☐ | |
| Wetland Hydrology Present? | Yes ☒ No ☐ | |

Remarks:

SP PC-14 characterizes a man-created depression within the Santa Clara River floodplain. Vegetation appears to be 2-3 years old.

The 2006-2007 rain season had an abnormally low amount of precipitation.

## VEGETATION

| Tree Stratum (Use scientific names.) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| Total Cover: | | | |
| **Sapling/Shrub Stratum** | | | |
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| Total Cover: | | | |
| **Herb Stratum** | | | |
| 1. *Melilotus alba* | 60 | Y | FACU+ |
| 2. *Typha* sp. | 15 | N | OBL[c] |
| 3. *Epilobium ciliatum* | 5 | N | FACW |
| 4. *Leptochloa uninervia* | 5 | N | FACW |
| 5. *Cyperus erythrorhizos* | 3 | N | OBL |
| 6. *Polygonum lapathifolium* | 3 | N | OBL |
| 7. *Baccharis salicifolia* | 1 | N | FACW[a] |
| 8. *Cyperus involucratus* | 1 | N | OBL |
| 9. *Xanthium strumarium* | 1 | N | FAC+ |
| Total Cover: | 94 | | |
| **Woody Vine Stratum** | | | |
| 1. | | | |
| 2. | | | |
| Total Cover: | | | |

% Bare Ground in Herb Stratum 6 % Cover of Biotic Crust

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0% (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | | Multiply by | |
|---|---|---|---|
| OBL species | 22 | x 1 = | 22 |
| FACW species | 11 | x 2 = | 22 |
| FAC species | 1 | x 3 = | 3 |
| FACU species | 60 | x 4 = | 240 |
| UPL species | 0 | x 5 = | 0 |
| Column Totals: | 94 (A) | | 287 (B) |

Prevalence Index = B/A = 3.05

**Hydrophytic Vegetation Indicators:**

☐ Dominance Test is >50%

☐ Prevalence Index is ≤3.0[1]

☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

**Hydrophytic Vegetation Present?** Yes ☒ No ☐

Remarks: Although the dominance test equals 0% and the Prevalence Test was greater than 3.0, the invasive nature and annual/biannual life cycle of *Melilotus alba* has skewed the results. Most plants are hydrophytic.

The vegetation of SP PC-14 most closely corresponds to Cowardin's (1979) riparian scrub.

[c] Wetland indicator status was assumed OBL for all *Typha* species that were not identified to species. *Typha* species found in California have indicators of at least OBL.

[a] Kartesz, J.T. 1996. National List of Vascular Plant Species that Occur in Wetlands: 1996 National Summary. U.S. Fish and Wildlife Survey.

## SOIL

Sampling Point: PC-14

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | % | Redox Features Color (moist) | % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 0-10 | n/a | | | | | | coarse gravel | soil consists of riverwash within Santa Clara River flood plain |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

**Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)**

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

**Indicators for Problematic Hydric Soils[3]:**

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☒ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

**Restrictive Layer (if present):**

Type: _____

Depth (inches): _____

**Hydric Soil Present?** Yes ☒ No ☐

Remarks:

Soil consisted of primarily 80% small gravel, 5% small gravel, balance 15% sand.

Due to the "neutral" characteristic of sandy soils they are problematic in observing hydric characteristics. Although no sandy redox was at this location, sandy alluvial land is often considered to be hydric under flooded conditions.

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (any one indicator is sufficient)

- ☒ Surface Water (A1)
- ☐ High Water Table (A2)
- ☒ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

**Field Observations:**

Surface Water Present? Yes ☒ No ☐ Depth (inches): 0

Water Table Present? Yes ☐ No ☐ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ☒ No ☐ Depth (inches): 0-1

**Wetland Hydrology Present?** Yes ☒ No ☐

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Recent rains may have contributed to surface water and moist conditions. Water table is high because the SP is within the Santa Clara River floodplain.

# WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Newhall Ranch/Potrero Canyon City/County: Los Angeles County Sampling Date: 9/25/07

Applicant/Owner: Newhall Land and Farming Company State: CA Sampling Point: PC-15

Investigator(s): J. Kisner, L. Rizzo Section, Township, Range: San Francis Land Grant

Landform (hillslope, terrace, etc.): Channel Bank Local relief (concave, convex, none): none Slope (%): 1

Subregion (LRR): Mediterranean California (LRR-C) Lat: 6358361.4192300 Long: 1970442.1226700 Datum: NAD83

Soil Map Unit Name: Sandy Alluvial Land NWI classification: PSS6

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)

Are Vegetation **No**, Soil **No**, or Hydrology **No** significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation **No**, Soil **Yes**, or Hydrology **No** naturally problematic? (If needed, explain any answers in Remarks.)

## SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | |
|---|---|---|
| Hydrophytic Vegetation Present? | Yes ☒ No ☐ | **Is the Sampled Area within a Wetland?** Yes ☒ No ☐ |
| Hydric Soil Present? | Yes ☒ No ☐ | |
| Wetland Hydrology Present? | Yes ☒ No ☐ | |

Remarks:

SP PC-15 characterizes the center portion of a side channel, located to the South of the Santa Clara River. Recently received rainfall.

The 2006-2007 rain season had an abnormally low amount of precipitation.

## VEGETATION

| Tree Stratum (Use scientific names.) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| Total Cover: | | | |
| **Sapling/Shrub Stratum** | | | |
| 1. *Baccharis salicifolia* | 30 | Y | FACW[a] |
| 2. *Populus fremontii* | 10 | N | FACW |
| 3. *Salix exigua* | 5 | N | OBL |
| 4. *Salix laevigata* | 5 | N | FACW+[a] |
| 5. *Tamarix* sp. | 5 | N | FAC[b] |
| Total Cover: | 55 | | |
| **Herb Stratum** | | | |
| 1. *Melilotus alba* | 20 | Y | FACU+ |
| 2. *Ambrosia acanthicarpa* | 4 | N | NI |
| 3. *Conyza canadensis* | 3 | N | FAC |
| 4. *Brassica* sp. | 2 | N | NI |
| 5. *Artemisia douglasiana* | 1 | N | FACW |
| 6. *Aster subulatus* var. *ligulatus* | 1 | N | FACW |
| 7. *Heterotheca grandiflora* | 1 | N | NI |
| 8. *Oenothera elata* | 1 | N | FACW |
| Total Cover: | 33 | | |
| **Woody Vine Stratum** | | | |
| 1. | | | |
| 2. | | | |
| Total Cover: | | | |

% Bare Ground in Herb Stratum 67 % Cover of Biotic Crust

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50% (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | | Multiply by | |
|---|---|---|---|
| OBL species | 5 | x 1 = | 5 |
| FACW species | 48 | x 2 = | 96 |
| FAC species | 8 | x 3 = | 24 |
| FACU species | 20 | x 4 = | 80 |
| UPL species | 7 | x 5 = | 35 |
| Column Totals: | 88 (A) | | 365 (B) |

Prevalence Index = B/A = 4.15

**Hydrophytic Vegetation Indicators:**

☐ Dominance Test is >50%

☐ Prevalence Index is ≤3.0[1]

☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

**Hydrophytic Vegetation Present?** Yes ☒ No ☐

Remarks: Although the dominance test equals 50% and the Prevalence Test was greater than 3.0, the invasive nature and annual/biannual life cycle of *Melilotus alba* has skewed the results. Most plants are hydrophytic.

Willow height between 10'-15'. The vegetation of SP PC-15 most closely corresponds to Cowardin's (1979) riparian scrub.

[a] Kartesz, J.T. 1996. National List of Vascular Plant Species that Occur in Wetlands: 1996 National Summary. U.S. Fish and Wildlife Survey.

[b] Wetland indicator status was assumed FAC for all *Tamarix* species that were not identified to species. *Tamarix* species found in California have indicators of at least FAC.

## SOIL

Sampling Point: PC-15

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | % | Redox Features Color (moist) | % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 0-18 | n/a | | n/a | | | | coarse sandy w/ cobbles | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

**Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)**

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

**Indicators for Problematic Hydric Soils[3]:**

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☒ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

**Restrictive Layer (if present):**

Type: _____

Depth (inches): _____

**Hydric Soil Present?** Yes ☒ No ☐

Remarks:

Thin layer of silty crust on top which is dark in color.

Due to the "neutral" characteristics of sandy soils, sandy alluvial land is problematic and often considered to be hydric under flooded conditions.

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☒ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☒ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☒ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

**Field Observations:**

Surface Water Present? Yes ☐ No ☒ Depth (inches): _____

Water Table Present? Yes ☒ No ☐ Depth (inches): 18

Saturation Present? (includes capillary fringe) Yes ☒ No ☐ Depth (inches): 0

**Wetland Hydrology Present?** Yes ☒ No ☐

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

A high water table and saturated soils provided evidence of hydrology.

## WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Newhall Ranch/Potrero Canyon City/County: Los Angeles County Sampling Date: 9/25/07

Applicant/Owner: Newhall Land and Farming Company State: CA Sampling Point: PC-16

Investigator(s): J. Kisner, L. Rizzo Section, Township, Range: San Francis Land Grant

Landform (hillslope, terrace, etc.): Channel Bank Local relief (concave, convex, none): none Slope (%): 0

Subregion (LRR): Mediterranean California (LRR-C) Lat: 6358381.0721700 Long: 1970400.9710500 Datum: NAD83

Soil Map Unit Name: Sandy Alluvial Land NWI classification: PSS6

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)

Are Vegetation **No**, Soil **No**, or Hydrology **No** significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation **No**, Soil **Yes**, or Hydrology **No** naturally problematic? (If needed, explain any answers in Remarks.)

### SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | |
|---|---|---|
| Hydrophytic Vegetation Present? | Yes ☒ No ☐ | **Is the Sampled Area within a Wetland?** Yes ☒ No ☐ |
| Hydric Soil Present? | Yes ☒ No ☐ | |
| Wetland Hydrology Present? | Yes ☒ No ☐ | |

Remarks:

SP PC-16 characterizes previous channel of the Santa Clara River according to aerial field maps (Psomas, 2003)..

The 2006-2007 rain season had an abnormally low amount of precipitation.

### VEGETATION

| Tree Stratum (Use scientific names.) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| Total Cover: | | | |
| **Sapling/Shrub Stratum** | | | |
| 1. *Populus fremontii* | 30 | Y | FACW |
| 2. *Baccharis salicifolia* | 25 | Y | FACW[a] |
| 3. *Salix exigua* | 25 | Y | OBL |
| 4. *Salix laevigata* | 8 | N | FACW+[a] |
| 5. *Tamarix* sp. | 5 | N | FAC[b] |
| Total Cover: | 93 | | |
| **Herb Stratum** | | | |
| 1. *Melilotus alba* | 3 | Y | FACU+ |
| 2. *Arundo donax* | 2 | Y | FACW |
| 3. *Brassica* sp. | 2 | Y | NI |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| Total Cover: | 7 | | |
| **Woody Vine Stratum** | | | |
| 1. | | | |
| 2. | | | |
| Total Cover: | | | |

% Bare Ground in Herb Stratum 7 % Cover of Biotic Crust

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 67 (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | | Multiply by | |
|---|---|---|---|
| OBL species | 25 | x 1 = | 25 |
| FACW species | 65 | x 2 = | 130 |
| FAC species | 5 | x 3 = | 15 |
| FACU species | 3 | x 4 = | 12 |
| UPL species | 2 | x 5 = | 10 |
| Column Totals: | 100 (A) | | 192 (B) |

Prevalence Index = B/A = 1.92

**Hydrophytic Vegetation Indicators:**

☒ Dominance Test is >50%

☒ Prevalence Index is ≤3.0[1]

☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

**Hydrophytic Vegetation Present?** Yes ☒ No ☐

Remarks:

The vegetation of SP PC-16 most closely corresponds to Cowardin's (1979) riparian scrub.

[a] Kartesz, J.T. 1996. National List of Vascular Plant Species that Occur in Wetlands: 1996 National Summary. U.S. Fish and Wildlife Survey.

[b] Wetland indicator status was assumed FAC for all *Tamarix* species that were not identified to species. *Tamarix* species found in California have indicators of at least FAC.

## SOIL

Sampling Point: PC-16

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | % | Redox Features Color (moist) | % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 0-13 | n/a | | n/a | | | | coarse sandy w/ cobbles | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

**Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)**

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

**Indicators for Problematic Hydric Soils[3]:**

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☒ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

**Restrictive Layer (if present):**

Type: _____

Depth (inches): _____

**Hydric Soil Present?** Yes ☒ No ☐

Remarks:

Very thin silty surface layer crust; dark in color.

Due to the "neutral" characteristics of sandy soils, sandy alluvial land is problematic and often considered to be hydric under flooded conditions.

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☒ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☒ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☒ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

**Field Observations:**

Surface Water Present? Yes ☐ No ☒ Depth (inches): _____

Water Table Present? Yes ☒ No ☐ Depth (inches): 13

Saturation Present? (includes capillary fringe) Yes ☒ No ☐ Depth (inches): 0-13

**Wetland Hydrology Present?** Yes ☒ No ☐

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Slight bank on south side, approximately 6 inches in height.

## WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Newhall Ranch/Potrero Canyon City/County: Los Angeles County Sampling Date: 9/25/07

Applicant/Owner: Newhall Land and Farming Company State: CA Sampling Point: PC-17

Investigator(s): J. Kisner, L. Rizzo Section, Township, Range: San Francis Land Grant

Landform (hillslope, terrace, etc.): Flat Upland Local relief (concave, convex, none): none Slope (%): 0

Subregion (LRR): Mediterranean California (LRR-C) Lat: 6358407.4331100 Long: 1970270.4295400 Datum: NAD83

Soil Map Unit Name: Sandy Alluvial Land NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)

Are Vegetation **No**, Soil **No**, or Hydrology **No** significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation **No**, Soil **Yes**, or Hydrology **No** naturally problematic? (If needed, explain any answers in Remarks.)

### SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | |
|---|---|---|
| Hydrophytic Vegetation Present? | Yes ☒ No ☐ | **Is the Sampled Area within a Wetland?** Yes ☐ No ☒ |
| Hydric Soil Present? | Yes ☒ No ☐ | |
| Wetland Hydrology Present? | Yes ☐ No ☒ | |

Remarks:

SP PC-17 characterizes a flat upland area south of the Santa Clara River channel.

The 2006-2007 rain season had an abnormally low amount of precipitation.

### VEGETATION

| Tree Stratum (Use scientific names.) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. *Salix lasiolepis* | 20 | Y | FACW |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| Total Cover: | | | |
| **Sapling/Shrub Stratum** | | | |
| 1. *Salix exigua* | 45 | Y | OBL |
| 2. *Baccharis salicifolia* | 5 | N | FACW[a] |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| Total Cover: 50 | | | |
| **Herb Stratum** | | | |
| 1. *Ambrosia psilostachya* var. *californica* | 25 | Y | FAC |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| Total Cover: 25 | | | |
| **Woody Vine Stratum** | | | |
| 1. | | | |
| 2. | | | |
| Total Cover: | | | |

% Bare Ground in Herb Stratum 5 % Cover of Biotic Crust

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | Multiply by |
|---|---|
| OBL species | x 1 = |
| FACW species | x 2 = |
| FAC species | x 3 = |
| FACU species | x 4 = |
| UPL species | x 5 = |
| Column Totals: (A) | (B) |

Prevalence Index = B/A =

**Hydrophytic Vegetation Indicators:**

☒ Dominance Test is >50%

☐ Prevalence Index is ≤3.0[1]

☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

**Hydrophytic Vegetation Present?** Yes ☒ No ☐

Remarks:

The vegetation of SP PC-17 most closely corresponds to Cowardin's (1979) riparian scrub.

[a] Kartesz, J.T. 1996. National List of Vascular Plant Species that Occur in Wetlands: 1996 National Summary. U.S. Fish and Wildlife Survey.

## SOIL

Sampling Point: PC-17

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | Matrix % | Redox Features Color (moist) | Redox Features % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 0-16 | 10YR4/2 | 85 | 5YR4/6 | 15 | RM | M | Loam | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

**Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)**

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☒ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

**Indicators for Problematic Hydric Soils[3]:**

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☒ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

**Restrictive Layer (if present):**

Type: _____

Depth (inches): _____

**Hydric Soil Present?** Yes ☒ No ☐

Remarks:

Due to the "neutral" characteristics of sandy soils, sandy alluvial land is problematic and often considered to be hydric under flooded conditions.

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

**Field Observations:**

Surface Water Present? Yes ☐ No ☒ Depth (inches): _____

Water Table Present? Yes ☐ No ☒ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ☐ No ☒ Depth (inches): _____

**Wetland Hydrology Present?** Yes ☐ No ☒

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Recent rains may have caused soil to be moist down through the bottom of pit, but no hydrology indicators were present.

# WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Newhall Ranch/Potrero Canyon City/County: Los Angeles County Sampling Date: 9/26/07

Applicant/Owner: Newhall Land and Farming Company State: CA Sampling Point: PC-18

Investigator(s): J. Kisner, L. Rizzo Section, Township, Range: San Francis Land Grant

Landform (hillslope, terrace, etc.): Flat Upland Local relief (concave, convex, none): none Slope (%): 0

Subregion (LRR): Mediterranean California (LRR-C) Lat: 6358324.0847400 Long: 1970234.5389700 Datum: NAD83

Soil Map Unit Name: Sandy Alluvial Land NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)

Are Vegetation **No**, Soil **No**, or Hydrology **No** significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation **No**, Soil **Yes**, or Hydrology **No** naturally problematic? (If needed, explain any answers in Remarks.)

## SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | |
|---|---|---|
| Hydrophytic Vegetation Present? | Yes ☒ No ☐ | **Is the Sampled Area within a Wetland?** Yes ☐ No ☒ |
| Hydric Soil Present? | Yes ☒ No ☐ | |
| Wetland Hydrology Present? | Yes ☐ No ☒ | |

Remarks:

SP PC-18 characterizes the boundary between vegetation types; riparian scrub and riparian forest. This SP focuses on the scrub habitat to the East. The Western area includes riparian forest with few small shrubs.

The 2006-2007 rain season had an abnormally low amount of precipitation.

## VEGETATION

| Tree Stratum (Use scientific names.) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| Total Cover: | | | |
| **Sapling/Shrub Stratum** | | | |
| 1. *Salix lasiolepis* | 30 | Y | FACW |
| 2. *Salix exigua* | 20 | Y | OBL |
| 3. *Baccharis* sp. | 5 | N | |
| 4. *Baccharis salicifolia* | 2 | N | FACW[a] |
| 5. *Populus fremontii* | 2 | N | FACW |
| 6. *Salix laevigata* | 2 | N | FACW+[a] |
| 7. *Baccharis pilularis* | 1 | N | NI |
| Total Cover: | 62 | | |
| **Herb Stratum** | | | |
| 1. *Ambrosia psilostachya* var. *californica* | 15 | Y | FAC |
| 2. *Leymus triticoides* | 5 | N | FAC+ |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| Total Cover: | 20 | | |
| **Woody Vine Stratum** | | | |
| 1. | | | |
| 2. | | | |
| Total Cover: | | | |

% Bare Ground in Herb Stratum 20 % Cover of Biotic Crust

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | Multiply by |
|---|---|
| OBL species | x 1 = |
| FACW species | x 2 = |
| FAC species | x 3 = |
| FACU species | x 4 = |
| UPL species | x 5 = |
| Column Totals: (A) | (B) |

Prevalence Index = B/A =

**Hydrophytic Vegetation Indicators:**

☒ Dominance Test is >50%

☐ Prevalence Index is ≤3.0[1]

☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

**Hydrophytic Vegetation Present?** Yes ☒ No ☐

Remarks:

The vegetation of SP PC-18 most closely corresponds to Cowardin's (1979) riparian scrub and Cowardin's (1979) riparian forest.

[a] Kartesz, J.T. 1996. National List of Vascular Plant Species that Occur in Wetlands: 1996 National Summary. U.S. Fish and Wildlife Survey.

## SOIL

Sampling Point: PC-18

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | % | Redox Features Color (moist) | % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 0-16 | n/a | | 5YR4/6 | 55 | RM | M | fine sand | moist for first 6" |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

**Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)**

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☒ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

**Indicators for Problematic Hydric Soils[3]:**

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☒ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

**Restrictive Layer (if present):**

Type: _____

Depth (inches): _____

**Hydric Soil Present?** Yes ☒ No ☐

Remarks:

Small chucks of clay deposits present in soil sample.

Due to the "neutral" characteristics of sandy soils, sandy alluvial land is problematic and often considered to be hydric under flooded conditions.

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

**Field Observations:**

Surface Water Present? Yes ☐ No ☒ Depth (inches): _____

Water Table Present? Yes ☐ No ☒ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ☐ No ☒ Depth (inches): _____

**Wetland Hydrology Present?** Yes ☐ No ☒

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No evidence of hydrology was observed.

## WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Newhall Ranch/Potrero Canyon City/County: Los Angeles County Sampling Date: 9/28/07

Applicant/Owner: Newhall Land and Farming Company State: CA Sampling Point: PC-19

Investigator(s): J. Love, J. Kisner, W. Vogler, E. Larsen Section, Township, Range: San Francis Land Grant

Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): none Slope (%): 0

Subregion (LRR): Mediterranean California (LRR-C) Lat: 6358368.3670400 Long: 1970042.3134900 Datum: NAD83

Soil Map Unit Name: Sandy Alluvial Land NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)

Are Vegetation **No**, Soil **No**, or Hydrology **No** significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation **No**, Soil **Yes**, or Hydrology **No** naturally problematic? (If needed, explain any answers in Remarks.)

### SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | |
|---|---|---|
| Hydrophytic Vegetation Present? | Yes ☒ No ☐ | **Is the Sampled Area within a Wetland?** Yes ☐ No ☒ |
| Hydric Soil Present? | Yes ☒ No ☐ | |
| Wetland Hydrology Present? | Yes ☐ No ☒ | |

Remarks:

SP PC-19 characterizes flat floodplain area to the south of the Santa Clara River.

The 2006-2007 rainy season had an abnormally low amount of precipitation.

### VEGETATION

| Tree Stratum (Use scientific names.) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| Total Cover: | | | |
| **Sapling/Shrub Stratum** | | | |
| 1. *Pluchea sericea* | 75 | Y | FACW |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| Total Cover: | | | |
| **Herb Stratum** | | | |
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| Total Cover: | | | |
| **Woody Vine Stratum** | | | |
| 1. | | | |
| 2. | | | |
| Total Cover: | | | |

% Bare Ground in Herb Stratum 25 % Cover of Biotic Crust

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | Multiply by |
|---|---|
| OBL species | x 1 = |
| FACW species | x 2 = |
| FAC species | x 3 = |
| FACU species | x 4 = |
| UPL species | x 5 = |
| Column Totals: (A) | (B) |

Prevalence Index = B/A =

**Hydrophytic Vegetation Indicators:**

☒ Dominance Test is >50%

☐ Prevalence Index is ≤3.0[1]

☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

**Hydrophytic Vegetation Present?** Yes ☒ No ☐

Remarks:

The vegetation of SP PC-19 most closely corresponds to Cowardin's (1979) riparian scrub.

## SOIL

Sampling Point: PC-19

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | Matrix % | Redox Features Color (moist) | Redox Features % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 0-18 | 10 YR 3/2 | 99 | 5YR 4/6 | <1 | C | M | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
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| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

**Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)**

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

**Indicators for Problematic Hydric Soils[3]:**

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☒ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

**Restrictive Layer (if present):**

Type: _____

Depth (inches): _____

**Hydric Soil Present?** Yes ☒ No ☐

Remarks:

Evidence that this SP is within floodplain due to large sediment deposits.

Due to the "neutral" characteristics of sandy soils, sandy alluvial land is problematic and often considered to be hydric under flooded conditions.

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

**Field Observations:**

Surface Water Present? Yes ☐ No ☒ Depth (inches): _____

Water Table Present? Yes ☐ No ☒ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ☐ No ☒ Depth (inches): _____

**Wetland Hydrology Present?** Yes ☐ No ☒

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No evidence of hydrology was observed.

## WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Newhall Ranch/Potrero Canyon City/County: Los Angeles County Sampling Date: 9/26/07

Applicant/Owner: Newhall Land and Farming Company State: CA Sampling Point: PC-20

Investigator(s): J. Love, J. Kisner, W. Vogler, E. Larsen Section, Township, Range: San Francis Land Grant

Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): none Slope (%): 0

Subregion (LRR): Mediterranean California (LRR-C) Lat: 6358485.2757400 Long: 1969870.9522100 Datum: NAD83

Soil Map Unit Name: Riverwash NWI classification: PSS6

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)

Are Vegetation **No**, Soil **No**, or Hydrology **No** significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation **NO**, Soil **Yes**, or Hydrology **No** naturally problematic? (If needed, explain any answers in Remarks.)

### SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | |
|---|---|---|
| Hydrophytic Vegetation Present? | Yes ☒ No ☐ | **Is the Sampled Area within a Wetland?** Yes ☒ No ☐ |
| Hydric Soil Present? | Yes ☒ No ☐ | |
| Wetland Hydrology Present? | Yes ☒ No ☐ | |

Remarks:

SP PC-20 is located in a small side drainage adjacent to a small berm along a ranch road. This SP is at the southernmost part of the entire PC site. The 2006-2007 rainy season had an abnormally low amount of precipitation.

### VEGETATION

| Tree Stratum (Use scientific names.) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| Total Cover: | | | |
| **Sapling/Shrub Stratum** | | | |
| 1. *Pluchea sericea* | 95 | Y | FACW |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| Total Cover: | 95 | | |
| **Herb Stratum** | | | |
| 1. *Arundo donax* | 5 | Y | FACW |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| Total Cover: | 5 | | |
| **Woody Vine Stratum** | | | |
| 1. | | | |
| 2. | | | |
| Total Cover: | | | |

% Bare Ground in Herb Stratum 5 % Cover of Biotic Crust

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | Multiply by |
|---|---|
| OBL species | x 1 = |
| FACW species | x 2 = |
| FAC species | x 3 = |
| FACU species | x 4 = |
| UPL species | x 5 = |
| Column Totals: (A) | (B) |

Prevalence Index = B/A =

**Hydrophytic Vegetation Indicators:**

☒ Dominance Test is >50%

☐ Prevalence Index is ≤3.0[1]

☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

**Hydrophytic Vegetation Present?** Yes ☒ No ☐

Remarks:

The vegetation of SP PC-20 most closely corresponds to Cowardin's (1979) riparian scrub.

## SOIL

Sampling Point: PC-20

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | Matrix % | Redox Features Color (moist) | Redox Features % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 0-18 | 10YR3/2 | 98 | 5YR4/6 | 2 | C | M | silty clay mixed with fine sand | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

**Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)**

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☒ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

**Indicators for Problematic Hydric Soils[3]:**

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☒ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

**Restrictive Layer (if present):**

Type: _____

Depth (inches): _____

**Hydric Soil Present?** Yes ☒ No ☐

Remarks:

Due to the "neutral" characteristics of sandy soils, riverwash is problematic and often considered to be hydric under flooded conditions.

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☒ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

**Field Observations:**

Surface Water Present? Yes ☐ No ☒ Depth (inches): _____

Water Table Present? Yes ☐ No ☒ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ☐ No ☒ Depth (inches): _____

**Wetland Hydrology Present?** Yes ☒ No ☐

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Anthropogenic created berms visible. Possibly created from soil being pushed up along the sides of the nearby road during soil removal activities after high flood events.

## APPENDIX A USACE WETLAND DETERMINATION DATA FORMS

Onion Field Bank Stabilization

# WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Newhall Ranch/Onion Field Bank Stabilization City/County: Los Angeles County Sampling Date: 9/28/07

Applicant/Owner: Newhall Land and Farming Company State: CA Sampling Point: BS-1

Investigator(s): J. Davis, J. Love, W, Vogler, L. Rizzo Section, Township, Range: San Francis Land Grant

Landform (hillslope, terrace, etc.): River Bank Slope Local relief (concave, convex, none): none Slope (%): 5

Subregion (LRR): Mediterranean California (LRR-C) Lat: 6361064.5315100 Long: 1971370.3761600 Datum: NAD83

Soil Map Unit Name: Sandy Alluvial Land NWI classification: PFO6

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)

Are Vegetation **no**, Soil **no**, or Hydrology **no** significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation **no**, Soil **Yes**, or Hydrology **no** naturally problematic? (If needed, explain any answers in Remarks.)

## SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | |
|---|---|---|
| Hydrophytic Vegetation Present? | Yes ☒ No ☐ | **Is the Sampled Area within a Wetland?** Yes ☐ No ☒ |
| Hydric Soil Present? | Yes ☐ No ☒ | |
| Wetland Hydrology Present? | Yes ☐ No ☒ | |

Remarks:

SP BS-1 characterizes the northern portion of the bank stabilization site. This SP is located approximately 60 feet to the south of the Santa Clara River and is representative of the riparian forest on the south bank.

The 2006-2007 rainy season had an abnormally low amount of precipitation.

## VEGETATION

| Tree Stratum (Use scientific names.) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. *Salix laevigata* | 60 | Y | FACW+[a] |
| 2. *Populus fremontii* | 30 | Y | FACW |
| 3. *Tamarix* Sp. | 10 | N | FAC[b] |
| Total Cover: | 100 | | |
| **Sapling/Shrub Stratum** | | | |
| 1. *Rosa californica* | 40 | Y | FAC+ |
| 2. *Urtica dioica* | 25 | Y | FACW |
| 3. *Arundo donax* | 10 | N | FACW |
| Total Cover: | 75 | | |
| **Herb Stratum** | | | |
| 1. *Artemisia douglasiana* | 5 | Y | FACW |
| 2. *Conium maculatum* | 1 | N | FACW |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| Total Cover: | 6 | | |
| **Woody Vine Stratum** | | | |
| 1. | | | |
| 2. | | | |
| Total Cover: | | | |

% Bare Ground in Herb Stratum 94 % Cover of Biotic Crust 0

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 5 (A)

Total Number of Dominant Species Across All Strata 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | Multiply by |
|---|---|
| OBL species | x 1 = |
| FACW species | x 2 = |
| FAC species | x 3 = |
| FACU species | x 4 = |
| UPL species | x 5 = |
| Column Totals: (A) | (B) |

Prevalence Index = B/A =

**Hydrophytic Vegetation Indicators:**

☒ Dominance Test is >50%

☐ Prevalence Index is ≤3.0[1]

☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

**Hydrophytic Vegetation Present?** Yes ☒ No ☐

Remarks:

Vegetation is representative of a riparian forest habitat (Cowardin 1979) with red willow and Freemont cottonwood comprising the dominant canopy layer. Vegetation is open to dense with a high leaf/branch litter content.

[a] Kartesz, J.T. 1996. National List of Vascular Plant Species that Occur in Wetlands: 1996 National Summary. U.S. Fish and Wildlife Survey.

[b] Wetland indicator status was assumed FAC for all *Tamarix* species that were not identified to species. *Tamarix* species found in California have indicators of at least FAC.

## SOIL

Sampling Point: BS-1

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | Matrix % | Redox Features Color (moist) | Redox Features % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 0-16 | 10YR 3/2 | 100 | None OBS | | | | Sandy loam | Soil texture & color consistent throughout |
| | | | | | | | | |
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| | | | | | | | | |
| | | | | | | | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

**Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)**

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

**Indicators for Problematic Hydric Soils[3]:**

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

**Restrictive Layer (if present):**

Type: _____

Depth (inches): _____

**Hydric Soil Present?** Yes ☐ No ☒

Remarks:

No hydric soil indicators were present.

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

**Field Observations:**

Surface Water Present? Yes ☐ No ☐ Depth (inches): _____

Water Table Present? Yes ☐ No ☐ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ☐ No ☐ Depth (inches): _____

**Wetland Hydrology Present?** Yes ☐ No ☒

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No evidence of hydrology was observed.

## APPENDIX A USACE WETLAND DETERMINATION DATA FORMS

Long Canyon Bridge

## WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Newhall Ranch/Long Canyon Bridge City/County: Los Angeles County Sampling Date: 9/28/07

Applicant/Owner: Newhall Land and Farming Company State: CA Sampling Point: LC-1

Investigator(s): W. Vogler, J. Love Section, Township, Range: San Francis Land Grant

Landform (hillslope, terrace, etc.): Upland/Agriculture Local relief (concave, convex, none): none Slope (%): 5

Subregion (LRR): Mediterranean California (LRR-C) Lat: 6364608.8561600 Long: 1974793.5144700 Datum: NAD83

Soil Map Unit Name: Sandy Alluvial Land NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)

Are Vegetation **no**, Soil **no**, or Hydrology **no** significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation **no**, Soil **yes**, or Hydrology **no** naturally problematic? (If needed, explain any answers in Remarks.)

### SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | |
|---|---|---|
| Hydrophytic Vegetation Present? | Yes ☐ No ☒ | **Is the Sampled Area within a Wetland?** Yes ☐ No ☒ |
| Hydric Soil Present? | Yes ☐ No ☒ | |
| Wetland Hydrology Present? | Yes ☐ No ☒ | |

Remarks:

SP LC-1 characterizes the upland/agricultural area north of the Santa Clara River. The 2006-2007 rain season had an abnormally low amount of precipitation.

### VEGETATION

| Tree Stratum (Use scientific names.) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| Total Cover: | | | |
| **Sapling/Shrub Stratum** | | | |
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| Total Cover: | | | |
| **Herb Stratum** | | | |
| 1. annual grasses | 70 | Y | |
| 2. *Conyza canadensis* | 8 | N | FAC |
| 3. *Zea mays* | 7 | N | NI |
| 4. *Spergularia* sp. | 5 | N | |
| 5. *Ambrosia acanthicarpa* | 2 | N | NI |
| 6. *Polygonum arenastrum* | 1 | N | FAC |
| 7. | | | |
| 8. | | | |
| Total Cover: | 93 | | |
| **Woody Vine Stratum** | | | |
| 1. | | | |
| 2. | | | |
| Total Cover: | | | |

% Bare Ground in Herb Stratum 20 % Cover of Biotic Crust

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0% (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | Multiply by |
|---|---|
| OBL species | x 1 = |
| FACW species | x 2 = |
| FAC species | x 3 = |
| FACU species | x 4 = |
| UPL species | x 5 = |
| Column Totals: (A) | (B) |

Prevalence Index = B/A =

**Hydrophytic Vegetation Indicators:**

- ☐ Dominance Test is >50%
- ☐ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

**Hydrophytic Vegetation Present?** Yes ☐ No ☒

Remarks:

SP LC-1 does not have any natural vegetation communities; the site is characterized by ruderal vegetation and graded conditions.

## SOIL

Sampling Point: LC-1

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | % | Redox Features Color (moist) | % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 0-12 | 10YR4/3 | | | | | | loamy sand | |
| 12-16 | 10YR5/3 | | | | | | sand | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

**Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)**

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

**Indicators for Problematic Hydric Soils[3]:**

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

**Restrictive Layer (if present):**

Type: _____

Depth (inches): _____

**Hydric Soil Present? Yes** ☐ **No** ☒

Remarks:

Hydric soil indicators are absent due to sandy soils.

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

**Field Observations:**

Surface Water Present? Yes ☐ No ☒ Depth (inches): _____

Water Table Present? Yes ☐ No ☒ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ☐ No ☒ Depth (inches): _____

**Wetland Hydrology Present? Yes** ☐ **No** ☒

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No evidence of hydrology was observed.

# WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Newhall Ranch/Long Canyon Bridge City/County: Los Angeles County Sampling Date: 9/28/07

Applicant/Owner: Newhall Land and Farming Company State: CA Sampling Point: LC-2

Investigator(s): J. Davis, L. Rizzo Section, Township, Range: San Francis Land Grant

Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): none Slope (%): 5

Subregion (LRR): Mediterranean California (LRR-C) Lat: 6364702.4617800 Long: 1974675.5218600 Datum: NAD83

Soil Map Unit Name: Riverwash NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)

Are Vegetation **no**, Soil **no**, or Hydrology **no** significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation **no**, Soil **yes**, or Hydrology **no** naturally problematic? (If needed, explain any answers in Remarks.)

## SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | |
|---|---|---|
| Hydrophytic Vegetation Present? | Yes ☒ No ☐ | **Is the Sampled Area within a Wetland?** Yes ☐ No ☒ |
| Hydric Soil Present? | Yes ☐ No ☒ | |
| Wetland Hydrology Present? | Yes ☒ No ☐ | |

Remarks:

SP LC-2 characterizes the floodplain of the northern side of the Santa Clara River. The "main channel" was recently located adjacent to this point according to aerial field maps (Psomas, 2003). Vegetation is young in age. The 2006-2007 rain season had an abnormally low amount of precipitation.

## VEGETATION

| Tree Stratum (Use scientific names.) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. *Nicotiana glauca* | 20 | Y | FAC |
| 2. | | | |
| 3. | | | |
| Total Cover: | 20 | | |
| **Sapling/Shrub Stratum** | | | |
| 1. *Arundo donax* | 50 | Y | FACW |
| 2. *Populus fremontii* | 20 | Y | FACW |
| 3. *Baccharis salicifolia* | 10 | N | FACW[a] |
| 4. *Tamarix* sp. | 10 | N | FAC[b] |
| 5. *Salix exigua* | 5 | N | OBL |
| 6. *Typha latifolia* (?) | 5 | N | OBL |
| Total Cover: | 100 | | |
| **Herb Stratum** | | | |
| 1. *Brassica* sp. | 5 | Y | NI |
| 2. *Heliotropium curassavicum* | 5 | Y | OBL |
| 3. *Melilotus alba* | 5 | Y | FACU+ |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| Total Cover: | 15 | | |
| **Woody Vine Stratum** | | | |
| 1. | | | |
| 2. | | | |
| Total Cover: | | | |

% Bare Ground in Herb Stratum 65 % Cover of Biotic Crust

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 66% (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | Multiply by |
|---|---|
| OBL species | x 1 = |
| FACW species | x 2 = |
| FAC species | x 3 = |
| FACU species | x 4 = |
| UPL species | x 5 = |
| Column Totals: (A) | (B) |

Prevalence Index = B/A =

**Hydrophytic Vegetation Indicators:**

☒ Dominance Test is >50%

☐ Prevalence Index is ≤3.0[1]

☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

**Hydrophytic Vegetation Present?** Yes ☒ No ☐

Remarks:

The vegetation of SP LC-2 most closely corresponds to Cowardin's (1979) riparian scrub.

[a] Kartesz, J.T. 1996. National List of Vascular Plant Species that Occur in Wetlands: 1996 National Summary. U.S. Fish and Wildlife Survey.

[b] Wetland indicator status was assumed FAC for all *Tamarix* species that were not identified to species. *Tamarix* species found in California have indicators of at least FAC.

## SOIL

Sampling Point: LC-2

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | Matrix % | Redox Features Color (moist) | Redox Features % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 0-12 | n/a | 100 | n/a | | | | coarse sand | with small gravel in matrix; oxidation on roots |
| 12-16 | 10YR3/3 | 80 | n/a | | | | coarse sand/sandy loam | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

**Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)**

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

**Indicators for Problematic Hydric Soils[3]:**

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

**Restrictive Layer (if present):**

Type: _____

Depth (inches): _____

**Hydric Soil Present?** Yes ☐ No ☒

Remarks:

Soil primarily consisted of riverwash or recently deposited sediment (coarse sand/small gravel). Soil became apparent in low stratum where sandy loam was present. No hydric soil indicators were present.

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☒ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☒ Inundation Visible on Aerial Imagery (B7)
- ☒ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☒ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☒ Water Marks (B1) (**Riverine**)
- ☒ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☒ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☒ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

**Field Observations:**

Surface Water Present? Yes ☐ No ☐ Depth (inches): _____

Water Table Present? Yes ☒ No ☐ Depth (inches): 12-16

Saturation Present? (includes capillary fringe) Yes ☐ No ☐ Depth (inches): _____

**Wetland Hydrology Present?** Yes ☒ No ☐

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Primary indicators, secondary indicators, and water table presence provided evidence of hydrology. Inundation visible on aerial from 2003 (Psomas, 2003). Site is within OHWM, therefore site is considered Waters of the U.S.

## WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Newhall Ranch/Long Canyon Bridge City/County: Los Angeles County Sampling Date: 9/28/07

Applicant/Owner: Newhall Land and Farming Company State: CA Sampling Point: LC-3

Investigator(s): W. Vogler, J. Love Section, Township, Range: San Francis Land Grant

Landform (hillslope, terrace, etc.): Riverbed Local relief (concave, convex, none): none Slope (%): 5

Subregion (LRR): Mediterranean California (LRR-C) Lat: 6364716.8658200 Long: 1974603.2893700 Datum: NAD83

Soil Map Unit Name: Riverwash NWI classification: PSS6

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)

Are Vegetation **no**, Soil **no**, or Hydrology **no** significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation **no**, Soil **yes**, or Hydrology **no** naturally problematic? (If needed, explain any answers in Remarks.)

### SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | |
|---|---|---|
| Hydrophytic Vegetation Present? | Yes ☒ No ☐ | **Is the Sampled Area within a Wetland?** Yes ☒ No ☐ |
| Hydric Soil Present? | Yes ☒ No ☐ | |
| Wetland Hydrology Present? | Yes ☒ No ☐ | |

Remarks:

SP LC-3 characterized the floodplain on the northern side of the Santa Clara River. The 2006-2007 rain season had an abnormally low amount of precipitation.

### VEGETATION

| Tree Stratum (Use scientific names.) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| Total Cover: | | | |
| **Sapling/Shrub Stratum** | | | |
| 1. *Tamarix* sp. | 35 | Y | FAC[b] |
| 2. *Baccharis salicifolia* | 10 | Y | FACW[a] |
| 3. *Melilotus alba* | 2 | N | FACU+ |
| 4. *Salix exigua* | 2 | N | OBL |
| 5. *Salix laevigata* | 1 | N | FACW+[a] |
| Total Cover: | 50 | | |
| **Herb Stratum** | | | |
| 1. *Arundo donax* | 2 | Y | FACW |
| 2. *Conyza bonariensis* | 1 | Y | NI |
| 3. *Populus fremontii* | <1 | N | FACW |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| Total Cover: | 3 | | |
| **Woody Vine Stratum** | | | |
| 1. | | | |
| 2. | | | |
| Total Cover: | | | |

% Bare Ground in Herb Stratum 50 % Cover of Biotic Crust 0

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 75% (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | | Multiply by | |
|---|---|---|---|
| OBL species | 0 | x 1 = | 0 |
| FACW species | 12 | x 2 = | 24 |
| FAC species | 35 | x 3 = | 105 |
| FACU species | 0 | x 4 = | 0 |
| UPL species | 1 | x 5 = | 5 |
| Column Totals: | 48 (A) | | 134 (B) |

Prevalence Index = B/A = 2.79

**Hydrophytic Vegetation Indicators:**

☒ Dominance Test is >50%

☒ Prevalence Index is ≤3.0[1]

☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

**Hydrophytic Vegetation Present?** Yes ☒ No ☐

Remarks:

The vegetation of SP LC-3 most closely corresponds to Cowardin's (1979) riparian scrub.

[b] Wetland indicator status was assumed FAC for all *Tamarix* species that were not identified to species. *Tamarix* species found in California have indicators of at least FAC.

[a] Kartesz, J.T. 1996. National List of Vascular Plant Species that Occur in Wetlands: 1996 National Summary. U.S. Fish and Wildlife Survey.

## SOIL

Sampling Point: LC-3

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | % | Redox Features Color (moist) | % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 0-16 | 10YR5/2 | | | | | | coarse sand | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

**Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)**

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☒ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

**Indicators for Problematic Hydric Soils[3]:**

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☒ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

**Restrictive Layer (if present):**

Type: _____

Depth (inches): _____

**Hydric Soil Present?** Yes ☒ No ☐

Remarks:

Riverwash depositional fill in one of the primary channels. Due to the "neutral" characteristics of sandy soils, riverwash is problematic and often considered to be hydric under flooded conditions.

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☒ High Water Table (A2)
- ☒ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☒ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☒ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

**Field Observations:**

Surface Water Present? Yes ☐ No ☒ Depth (inches): _____

Water Table Present? Yes ☒ No ☐ Depth (inches): 4

Saturation Present? (includes capillary fringe) Yes ☒ No ☐ Depth (inches): surface

**Wetland Hydrology Present?** Yes ☒ No ☐

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Primary indicators, secondary indicators, and water table and saturation presence provided evidence of hydrology. Inundation visible on aerial from 2003 (Psomas, 2003).

# WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Newhall Ranch/Long Canyon Bridge City/County: Los Angeles County Sampling Date: 9/18/07

Applicant/Owner: Newhall Land and Farming Company State: CA Sampling Point: LC-4

Investigator(s): J. Davis, L. Rizzo Section, Township, Range: San Francis Land Grant

Landform (hillslope, terrace, etc.): Riverbed Local relief (concave, convex, none): none Slope (%): 5

Subregion (LRR): Mediterranean California (LRR-C) Lat: 6364715.6990700 Long: 1974536.6755100 Datum: NAD83

Soil Map Unit Name: Riverwash NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)

Are Vegetation **no**, Soil **no**, or Hydrology **no** significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation **no**, Soil **yes**, or Hydrology **no** naturally problematic? (If needed, explain any answers in Remarks.)

## SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | |
|---|---|---|
| Hydrophytic Vegetation Present? | Yes ☒ No ☐ | **Is the Sampled Area within a Wetland?** Yes ☐ No ☒ |
| Hydric Soil Present? | Yes ☐ No ☒ | |
| Wetland Hydrology Present? | Yes ☐ No ☒ | |

Remarks:

SP LC-4 characterized a stable sandbar in the Santa Clara River. The SP was located on the southern bank of a main channel of the river. Elevation is approximately 18" above the channel. The 2006-2007 rain season had an abnormally low amount of precipitation.

## VEGETATION

| Tree Stratum (Use scientific names.) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| Total Cover: | | | |
| **Sapling/Shrub Stratum** | | | |
| 1. *Baccharis salicifolia* | 70 | Y | FACW[a] |
| 2. *Tamarix* sp. | 10 | N | FAC[b] |
| 3. unknown plant | 10 | N | |
| 4. *Populus fremontii* | 5 | N | FACW |
| 5. | | | |
| Total Cover: | 95 | | |
| **Herb Stratum** | | | |
| 1. *Melilotus alba* | 5 | Y | FACU+ |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| Total Cover: | 5 | | |
| **Woody Vine Stratum** | | | |
| 1. | | | |
| 2. | | | |
| Total Cover: | | | |

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust _____

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50% (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | Multiply by |
|---|---|
| OBL species _____ | x 1 = _____ |
| FACW species _____ | x 2 = _____ |
| FAC species _____ | x 3 = _____ |
| FACU species _____ | x 4 = _____ |
| UPL species _____ | x 5 = _____ |
| Column Totals: _____ (A) | _____ (B) |

Prevalence Index = B/A = _____

**Hydrophytic Vegetation Indicators:**

☒ Dominance Test is >50%

☐ Prevalence Index is ≤3.0[1]

☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

**Hydrophytic Vegetation Present?** Yes ☒ No ☐

Remarks:

The vegetation of SP LC-4 most closely corresponds to Cowardin's (1979) riparian scrub. Vegetation was observed primarily on the bank's edge above channel. To the north was an existing sparsely vegetated wash. Dense vegetation is approximately 12 ft wide at this location.

[a] Kartesz, J.T. 1996. National List of Vascular Plant Species that Occur in Wetlands: 1996 National Summary. U.S. Fish and Wildlife Survey.
[b] Wetland indicator status was assumed FAC for all *Tamarix* species that were not identified to species. *Tamarix* species found in California have indicators of at least FAC.

## SOIL

Sampling Point: LC-4

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | % | Redox Features Color (moist) | % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 0-16 | n/a | | n/a | | | | coarse sand | small to large gravel, no saturation |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

**Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)**

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

**Indicators for Problematic Hydric Soils[3]:**

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

**Restrictive Layer (if present):**

Type: _____

Depth (inches): _____

**Hydric Soil Present?** Yes ☐ No ☒

Remarks:

Substrate mainly consists of river sediment deposit with small cobbles, no saturation present. No hydric soil indicators were present.

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☒ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

**Field Observations:**

Surface Water Present? Yes ☐ No ☐ Depth (inches): _____

Water Table Present? Yes ☐ No ☐ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ☐ No ☐ Depth (inches): _____

**Wetland Hydrology Present?** Yes ☐ No ☒

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Sandbar area of the greater Santa Clara River. Sediment deposits are evident on the sandbar; however no other indicators of hydrology were observed. Waters of the U.S. – OHWM.

# WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Newhall Ranch/Long Canyon Bridge City/County: Los Angeles County Sampling Date: 9/28/07

Applicant/Owner: Newhall Land and Farming Company State: CA Sampling Point: LC-5

Investigator(s): J. Davis, L. Rizzo Section, Township, Range: San Francis Land Grant

Landform (hillslope, terrace, etc.): Riverbed Local relief (concave, convex, none): none Slope (%): 5

Subregion (LRR): Mediterranean California (LRR-C) Lat: 6364920.5617900 Long: 1974303.83132 Datum: NAD83

Soil Map Unit Name: Riverwash NWI classification: PSS6

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)

Are Vegetation **no**, Soil **no**, or Hydrology **no** significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation **no**, Soil **yes**, or Hydrology **no** naturally problematic? (If needed, explain any answers in Remarks.)

## SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | |
|---|---|---|
| Hydrophytic Vegetation Present? | Yes ☒ No ☐ | **Is the Sampled Area within a Wetland?** Yes ☒ No ☐ |
| Hydric Soil Present? | Yes ☒ No ☐ | |
| Wetland Hydrology Present? | Yes ☒ No ☐ | |

Remarks:

SP LC-5 characterizes the main summer channel of the Santa Clara River that was present during the 2007 site visit. The 2006-2007 rain season had an abnormally low amount of precipitation.

## VEGETATION

| Tree Stratum (Use scientific names.) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| Total Cover: | | | |
| **Sapling/Shrub Stratum** | | | |
| 1. *Salix exigua* | 35 | Y | OBL |
| 2. *Salix laevigata* | 30 | Y | FACW+[a] |
| 3. *Arundo donax* | 15 | N | FACW |
| 4. *Typha latifolia* | 10 | N | OBL |
| 5. *Populus fremontii* | 5 | N | FACW |
| Total Cover: | 95 | | |
| **Herb Stratum** | | | |
| 1. *Polygonum lapathifolium* | 55 | Y | OBL |
| 2. unknown grass | 15 | N | |
| 3. *Urtica dioica* | 5 | N | FACW |
| 4. *Xanthium strumarium* | 5 | N | FAC+ |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| Total Cover: | 80 | | |
| **Woody Vine Stratum** | | | |
| 1. | | | |
| 2. | | | |
| Total Cover: | | | |

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust _____

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | | Multiply by | |
|---|---|---|---|
| OBL species | 100 | x 1 = | 100 |
| FACW species | 55 | x 2 = | 110 |
| FAC species | 5 | x 3 = | 15 |
| FACU species | 0 | x 4 = | |
| UPL species | 0 | x 5 = | |
| Column Totals: | 160 (A) | | 225 (B) |

Prevalence Index = B/A = 1.41

**Hydrophytic Vegetation Indicators:**

☒ Dominance Test is >50%

☒ Prevalence Index is ≤3.0[1]

☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

**Hydrophytic Vegetation Present?** Yes ☒ No ☐

Remarks:

The vegetation of SP LC-5 most closely corresponds to Cowardin's (1979) riparian scrub.

[a] Kartesz, J.T. 1996. National List of Vascular Plant Species that Occur in Wetlands: 1996 National Summary. U.S. Fish and Wildlife Survey.

## SOIL

Sampling Point: LC-5

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | % | Redox Features Color (moist) | % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| No soil pit | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

**Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)**

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

**Indicators for Problematic Hydric Soils[3]:**

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☒ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

**Restrictive Layer (if present):**

Type: _____

Depth (inches): _____

**Hydric Soil Present?** Yes ☒ No ☐

Remarks:

Site was inaccessible. Soil was assumed hydric due to its vegetation and position in the main channel. Due to the "neutral" characteristics of sandy soils, riverwash is problematic and often considered to be hydric under flooded conditions.

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (any one indicator is sufficient)

- ☒ Surface Water (A1)
- ☐ High Water Table (A2)
- ☒ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☒ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

**Field Observations:**

Surface Water Present? Yes ☒ No ☐ Depth (inches): _____

Water Table Present? Yes ☐ No ☐ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ☐ No ☐ Depth (inches): _____

**Wetland Hydrology Present?** Yes ☒ No ☐

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Primary indicators, secondary indicators, and saturation presence provided evidence of hydrology.

## WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Newhall Ranch/Long Canyon Bridge City/County: Los Angeles County Sampling Date: 9/28/07

Applicant/Owner: Newhall Land and Farming Company State: CA Sampling Point: LC-6

Investigator(s): J. Davis, L. Rizzo Section, Township, Range: San Francis Land Grant

Landform (hillslope, terrace, etc.): Upland terrace/Bank slope Local relief (concave, convex, none): none Slope (%): 5

Subregion (LRR): Mediterranean California (LRR-C) Lat: 6364920.4195000 Long: 1974289.0605600 Datum: NAD83

Soil Map Unit Name: Riverwash NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)

Are Vegetation **no**, Soil **no**, or Hydrology **no** significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation **no**, Soil **yes**, or Hydrology **no** naturally problematic? (If needed, explain any answers in Remarks.)

### SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | |
|---|---|---|
| Hydrophytic Vegetation Present? | Yes ☒ No ☐ | **Is the Sampled Area within a Wetland?** Yes ☐ No ☒ |
| Hydric Soil Present? | Yes ☐ No ☒ | |
| Wetland Hydrology Present? | Yes ☐ No ☒ | |

Remarks:

SP LC-6 characterizes the southern bank edge of the Santa Clara River. The river is approximately 12 ft below the edge of the terrace. This SP is within riparian scrub habitat directly south of the OHWM. The 2006-2007 rain season had an abnormally low amount of precipitation.

### VEGETATION

| Tree Stratum (Use scientific names.) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| Total Cover: | | | |
| **Sapling/Shrub Stratum** | | | |
| 1. *Baccharis salicifolia* | 75 | Y | FACW[a] |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| Total Cover: 75 | | | |
| **Herb Stratum** | | | |
| 1. unknown grass (dry) | 85 | Y | |
| 2. *Brassica* spp. | 10 | N | NI |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| Total Cover: 95 | | | |
| **Woody Vine Stratum** | | | |
| 1. | | | |
| 2. | | | |
| Total Cover: | | | |

% Bare Ground in Herb Stratum 5 % Cover of Biotic Crust

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50% (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | Multiply by |
|---|---|
| OBL species | x 1 = |
| FACW species | x 2 = |
| FAC species | x 3 = |
| FACU species | x 4 = |
| UPL species | x 5 = |
| Column Totals: (A) | (B) |

Prevalence Index = B/A =

**Hydrophytic Vegetation Indicators:**

☐ Dominance Test is >50%

☐ Prevalence Index is ≤3.0[1]

☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

**Hydrophytic Vegetation Present?** Yes ☒ No ☐

Remarks:

Riparian vegetation primarily consists of mule fat with grass understory. The vegetation of SP LC-6 most closely corresponds to Cowardin's (1979) riparian scrub.

[a] Kartesz, J.T. 1996. National List of Vascular Plant Species that Occur in Wetlands: 1996 National Summary. U.S. Fish and Wildlife Survey.

## SOIL

Sampling Point: LC-6

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | % | Redox Features Color (moist) | % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 0-16 | n/a | | n/a | | | | coarse sand | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

**Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)**

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

**Indicators for Problematic Hydric Soils[3]:**

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

**Restrictive Layer (if present):**

Type: _____

Depth (inches): _____

**Hydric Soil Present? Yes** ☐ **No** ☒

Remarks:

The soil consists of old riverwash and alluvial material. Hydric soil indicators are likely absent due to sandy soils.

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

**Field Observations:**

Surface Water Present? Yes ☐ No ☒ Depth (inches): _____

Water Table Present? Yes ☐ No ☒ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ☐ No ☒ Depth (inches): _____

**Wetland Hydrology Present? Yes** ☐ **No** ☒

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No evidence of hydrology was observed.

## WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Newhall Ranch/Long Canyon Bridge City/County: Los Angeles County Sampling Date: 9/28/07

Applicant/Owner: Newhall Land and Farming Company State: CA Sampling Point: LC-7

Investigator(s): W. Vogler, J. Love Section, Township, Range: San Francis Land Grant

Landform (hillslope, terrace, etc.): Upland terrace Local relief (concave, convex, none): none Slope (%): 5

Subregion (LRR): Mediterranean California (LRR-C) Lat: 6364943.0013000 Long: 1974168.5593200 Datum: NAD 1983

Soil Map Unit Name: Riverwash NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)

Are Vegetation **no**, Soil **no**, or Hydrology **no** significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation **no**, Soil **yes**, or Hydrology **no** naturally problematic? (If needed, explain any answers in Remarks.)

### SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | |
|---|---|---|
| Hydrophytic Vegetation Present? | Yes ☒ No ☐ | **Is the Sampled Area within a Wetland?** Yes ☐ No ☒ |
| Hydric Soil Present? | Yes ☐ No ☒ | |
| Wetland Hydrology Present? | Yes ☐ No ☒ | |

Remarks:

SP LC-7 characterizes the upland terrace south of the Santa Clara River. The 2006-2007 rain season had an abnormally low amount of precipitation.

### VEGETATION

| Tree Stratum (Use scientific names.) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| Total Cover: | | | |
| **Sapling/Shrub Stratum** | | | |
| 1. *Baccharis salicifolia* | 60 | Y | FACW[a] |
| 2. *Salix exigua* | 10 | N | OBL |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| Total Cover: | 70 | | |
| **Herb Stratum** | | | |
| 1. *Bromus diandrus* (dead) | 80 | Y | NI |
| 2. *Bromus diandrus* (live) | 1 | N | NI |
| 3. *Leymus triticoides* (?) | 1 | N | FAC+ |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| Total Cover: | 82 | | |
| **Woody Vine Stratum** | | | |
| 1. | | | |
| 2. | | | |
| Total Cover: | | | |

% Bare Ground in Herb Stratum 3 % Cover of Biotic Crust

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50% (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | Multiply by |
|---|---|
| OBL species | x 1 = |
| FACW species | x 2 = |
| FAC species | x 3 = |
| FACU species | x 4 = |
| UPL species | x 5 = |
| Column Totals: (A) | (B) |

Prevalence Index = B/A =

**Hydrophytic Vegetation Indicators:**

☒ Dominance Test is >50%

☐ Prevalence Index is ≤3.0[1]

☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

**Hydrophytic Vegetation Present?** Yes ☒ No ☐

Remarks:

The vegetation of SP LC-7 most closely corresponds to Cowardin's (1979) riparian scrub.

[a] Kartesz, J.T. 1996. National List of Vascular Plant Species that Occur in Wetlands: 1996 National Summary. U.S. Fish and Wildlife Survey.

## SOIL

Sampling Point: LC-7

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | Matrix % | Redox Features Color (moist) | Redox Features % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 0-16 | 10YR4/3 | 100 | | | | | clay loam | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

**Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)**

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

**Indicators for Problematic Hydric Soils[3]:**

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

**Restrictive Layer (if present):**

Type: _____

Depth (inches): _____

**Hydric Soil Present?** Yes ☐ No ☒

Remarks:

No hydric soil indicators were present.

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

**Field Observations:**

Surface Water Present? Yes ☐ No ☒ Depth (inches): _____

Water Table Present? Yes ☐ No ☒ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ☐ No ☒ Depth (inches): _____

**Wetland Hydrology Present?** Yes ☐ No ☒

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No evidence of hydrology was observed.

## WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Newhall Ranch/Long Canyon Bridge City/County: Los Angeles County Sampling Date: 9/28/07

Applicant/Owner: Newhall Land and Farming Company State: CA Sampling Point: LC-8

Investigator(s): J. Davis, J. Love, W. Vogler, L. Rizzo Section, Township, Range: San Francis Land Grant

Landform (hillslope, terrace, etc.): Upland terrace/Agriculture Local relief (concave, convex, none): none Slope (%): 5

Subregion (LRR): Mediterranean California (LRR-C) Lat: 6364920.4195000 Long: 1974289.0605600 Datum: NAD83

Soil Map Unit Name: Sorrento loam NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)

Are Vegetation **no**, Soil **no**, or Hydrology **no** significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation **no**, Soil **no**, or Hydrology **no** naturally problematic? (If needed, explain any answers in Remarks.)

### SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | | |
|---|---|---|---|
| Hydrophytic Vegetation Present? | Yes ☐ | No ☒ | **Is the Sampled Area within a Wetland?** Yes ☐ No ☒ |
| Hydric Soil Present? | Yes ☐ | No ☒ | |
| Wetland Hydrology Present? | Yes ☐ | No ☒ | |

Remarks:

SP LC-8 characterizes upland habitat consisting of a recently tilled agricultural field. The 2006-2007 rain season had an abnormally low amount of precipitation.

### VEGETATION

| Tree Stratum (Use scientific names.) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| Total Cover: | | | |
| **Sapling/Shrub Stratum** | | | |
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| Total Cover: | | | |
| **Herb Stratum** | | | |
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| Total Cover: | | | |
| **Woody Vine Stratum** | | | |
| 1. | | | |
| 2. | | | |
| Total Cover: | | | |

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust _____

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A)

Total Number of Dominant Species Across All Strata _____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | | Multiply by | |
|---|---|---|---|
| OBL species | | x 1 = | |
| FACW species | | x 2 = | |
| FAC species | | x 3 = | |
| FACU species | | x 4 = | |
| UPL species | | x 5 = | |
| Column Totals: | (A) | | (B) |

Prevalence Index = B/A = _____

**Hydrophytic Vegetation Indicators:**

☐ Dominance Test is >50%

☐ Prevalence Index is ≤3.0[1]

☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

**Hydrophytic Vegetation Present?** Yes ☐ No ☒

Remarks:

SP LC-8 does not have any natural vegetation communities; the site is characterized by ruderal vegetation and graded conditions.

## SOIL

Sampling Point: LC-8

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | % | Redox Features Color (moist) | % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| No Soil Pit | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

**Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)**

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

**Indicators for Problematic Hydric Soils[3]:**

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

**Restrictive Layer (if present):**

Type: _____

Depth (inches): _____

**Hydric Soil Present? Yes** ☐ **No** ☒

Remarks:

No soil pit was excavated due to lack of vegetation and observable hydrology.

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

**Field Observations:**

Surface Water Present? Yes ☐ No ☐ Depth (inches): _____

Water Table Present? Yes ☐ No ☐ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ☐ No ☐ Depth (inches): _____

**Wetland Hydrology Present? Yes** ☐ **No** ☒

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No evidence of hydrology was observed.

## APPENDIX A USACE WETLAND DETERMINATION DATA FORMS

Commerce Center Bridge

## WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Newhall Ranch/Commerce Center Bridge City/County: Los Angeles County Sampling Date: 9/26/07

Applicant/Owner: Newhall Land and Farming Company State: CA Sampling Point: CC-1

Investigator(s): J. Kisner, W. Vogler, J. Love, E. Larsen Section, Township, Range: San Francis Land Grant

Landform (hillslope, terrace, etc.): Riverbed Local relief (concave, convex, none): none Slope (%): 5

Subregion (LRR): Mediterranean California (LRR-C) Lat: 6375973.9068700 Long: 1980360.7805500 Datum: NAD83

Soil Map Unit Name: Sandy Alluvial Land NWI classification: PSS6

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)

Are Vegetation **no**, Soil **no**, or Hydrology **no** significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation **no**, Soil **yes**, or Hydrology **no** naturally problematic? (If needed, explain any answers in Remarks.)

### SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | |
|---|---|---|
| Hydrophytic Vegetation Present? | Yes ☒ No ☐ | **Is the Sampled Area within a Wetland?** Yes ☒ No ☐ |
| Hydric Soil Present? | Yes ☒ No ☐ | |
| Wetland Hydrology Present? | Yes ☒ No ☐ | |

Remarks:

SP CC-1 characterizes the floodplain on the southern side of the Santa Clara River. This SP is immediately adjacent to the water's edge and incorporates a portion of a sandbar, a portion of a side channel, and a portion of the adjacent floodplain. The 2006-2007 rain season had an abnormally low amount of precipitation.

### VEGETATION

| Sapling/Shrub Stratum (Use scientific names.) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. *Baccharis salicifolia* | 20 | Y | FACW[a] |
| 2. *Salix exigua* | 20 | Y | OBL |
| 3. *Salix laevigata* | 10 | N | FACW+[a] |
| 4. *Tamarix* sp. | 8 | N | FAC[b] |
| 5. *Populus fremontii* | 5 | N | FACW |
| Total Cover: | 63 | | |
| **Herb Stratum** | | | |
| 1. *Melilotus alba* | 40 | Y | FACU+ |
| 2. *Polygonum lapathifolium* | 10 | Y | OBL |
| 3. *Veronica anagallis-aquatica* | 10 | Y | OBL |
| 4. *Leptochloa uninervia* | 5 | N | FACW |
| 5. *Typha angustifolia* | 5 | N | OBL |
| 6. *Aster subulatus* var. *ligulatus* | 3 | N | FACW |
| 7. *Cyperus erythrorhizos* | 2 | N | OBL |
| 8. *Agrostis viridis* | 1 | N | OBL |
| 9. *Ambrosia acanthicarpa* | 1 | N | NI |
| 10. *Apium graveolens* | 1 | N | FACW |
| 11. *Epilobium ciliatum* | 1 | N | FACW |
| 12. *Heterotheca grandiflora* | 1 | N | NI |
| 13. *Ludwigia peploides* | 1 | N | OBL |
| 14. *Rumex* sp. | 1 | N | |
| 15. *Urtica dioica* | 1 | N | FACW |
| 16. *Xanthium strumarium* | 1 | N | FAC+ |
| Total Cover: | 84 | | |

% Bare Ground in Herb Stratum 0 % Cover of Biotic Crust 0

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 60% (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | | Multiply by | |
|---|---|---|---|
| OBL species | 40 | x 1 = | 40 |
| FACW species | 20 | x 2 = | 40 |
| FAC species | 0 | x 3 = | 0 |
| FACU species | 40 | x 4 = | 160 |
| UPL species | 0 | x 5 = | 0 |
| Column Totals: | 100 (A) | | 240 (B) |

Prevalence Index = B/A = 2.4

**Hydrophytic Vegetation Indicators:**

☒ Dominance Test is >50%

☒ Prevalence Index is ≤3.0[1]

☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

**Hydrophytic Vegetation Present?** Yes ☒ No ☐

Remarks:

Reed 1988 was used to determine the wetland indicator status of plants unless otherwise noted.

The vegetation of SP CC-1 most closely corresponds to Cowardin's (1979) riparian scrub.

[a] Kartesz, J.T. 1996. National List of Vascular Plant Species that Occur in Wetlands: 1996 National Summary. U.S. Fish and Wildlife Survey.

[b] Wetland indicator status was assumed FAC for all *Tamarix* species that were not identified to species. *Tamarix* species found in California have indicators of at least FAC.

## SOIL

Sampling Point: CC-1

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | % | Redox Features Color (moist) | % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 0-16 | | | | | | | coarse sand riverwash | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

**Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)**

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

**Indicators for Problematic Hydric Soils[3]:**

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

**Restrictive Layer (if present):**

Type: _____

Depth (inches): _____

**Hydric Soil Present?** Yes ☒ No ☐

Remarks:

Small organic layer on top. With the exception of organic material, there were no additional hydric soil indicators. Due to the "neutral" characteristics of sandy soils, sandy alluvial land is problematic and often considered to be hydric under flooded conditions.

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

**Field Observations:**

Surface Water Present? Yes ☐ No ☒ Depth (inches): _____

Water Table Present? Yes ☒ No ☐ Depth (inches): 9

Saturation Present? (includes capillary fringe) Yes ☒ No ☐ Depth (inches): 6

**Wetland Hydrology Present?** Yes ☒ No ☐

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Water table and saturation provided evidence of hydrology. No primary or secondary indicators were present.

# WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Newhall Ranch/Commerce Center Bridge City/County: Los Angeles County Sampling Date: 9/26/07

Applicant/Owner: Newhall Land and Farming Company State: CA Sampling Point: CC-2

Investigator(s): E. Larsen, W. Vogler Section, Township, Range: San Francis Land Grant

Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): none Slope (%): 5

Subregion (LRR): Mediterranean California (LRR-C) Lat: 6376020.0814000 Long: 1980329.5854800 Datum: NAD83

Soil Map Unit Name: Sandy Alluvial Land NWI classification: PSS6

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)

Are Vegetation **no**, Soil **no**, or Hydrology **no** significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation **no**, Soil **yes**, or Hydrology **no** naturally problematic? (If needed, explain any answers in Remarks.)

## SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | |
|---|---|---|
| Hydrophytic Vegetation Present? | Yes ☒ No ☐ | **Is the Sampled Area within a Wetland?** Yes ☒ No ☐ |
| Hydric Soil Present? | Yes ☒ No ☐ | |
| Wetland Hydrology Present? | Yes ☒ No ☐ | |

Remarks:

SP CC-2 characterizes the floodplain on the southern side of the Santa Clara River. This SP is approximately 15m from the low flow channel of the Santa Clara River. The 2006-2007 rain season had an abnormally low amount of precipitation.

## VEGETATION

| Tree Stratum (Use scientific names.) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| Total Cover: | | | |
| **Sapling/Shrub Stratum** | | | |
| 1. *Baccharis salicifolia* | 30 | Y | FACW[a] |
| 2. *Salix exigua* | 30 | Y | OBL |
| 3. *Populus fremontii* | 20 | Y | FACW |
| 4. *Tamarix aphylla* | 20 | Y | FAC |
| 5. | | | |
| Total Cover: | 100 | | |
| **Herb Stratum** | | | |
| 1. *Arundo donax* | 5 | Y | FACW |
| 2. *Cyperus involucratus* | 5 | Y | OBL |
| 3. *Ambrosia acanthicarpa* | 1 | N | NI |
| 4. *Washingtonia robusta* | 1 | N | NI |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| Total Cover: | 12 | | |
| **Woody Vine Stratum** | | | |
| 1. | | | |
| 2. | | | |
| Total Cover: | | | |

% Bare Ground in Herb Stratum 50 % Cover of Biotic Crust 0

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 6 (A)

Total Number of Dominant Species Across All Strata 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | | Multiply by | |
|---|---|---|---|
| OBL species | 35 | x 1 = | 35 |
| FACW species | 55 | x 2 = | 110 |
| FAC species | 20 | x 3 = | 60 |
| FACU species | 0 | x 4 = | 0 |
| UPL species | 0 | x 5 = | 0 |
| Column Totals: | 110 (A) | | 205 (B) |

Prevalence Index = B/A = 1.86

**Hydrophytic Vegetation Indicators:**

☒ Dominance Test is >50%

☒ Prevalence Index is ≤3.0[1]

☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

**Hydrophytic Vegetation Present?** Yes ☒ No ☐

Remarks:

The vegetation of SP CC-2 most closely corresponds to Cowardin's (1979) riparian scrub.

[a] Kartesz, J.T. 1996. National List of Vascular Plant Species that Occur in Wetlands: 1996 National Summary. U.S. Fish and Wildlife Survey.

## SOIL

Sampling Point: CC-2

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | % | Redox Features Color (moist) | % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 0-6 | | | | | | | sand | moist; dark layers 1 cm intervals |
| 6-16 | | | | | | | sand | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

**Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)**

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

**Indicators for Problematic Hydric Soils[3]:**

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☒ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

**Restrictive Layer (if present):**

Type: _____

Depth (inches): _____

**Hydric Soil Present?** Yes ☒ No ☐

Remarks:

Sand has black, organic layering (1cm). Soil is characterized as riverwash. Due to the "neutral" characteristics of sandy soils, sandy alluvial land is problematic and often considered to be hydric under flooded conditions.

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☒ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☒ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

**Field Observations:**

Surface Water Present? Yes ☐ No ☒ Depth (inches): _____

Water Table Present? Yes ☐ No ☒ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ☐ No ☒ Depth (inches): _____

**Wetland Hydrology Present?** Yes ☒ No ☐

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Secondary indicators provided evidence of hydrology.

## WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Newhall Ranch/Commerce Center Bridge City/County: Los Angeles County Sampling Date: 9/26/07

Applicant/Owner: Newhall Land and Farming Company State: CA Sampling Point: CC-3

Investigator(s): J. Love, J. Kisner Section, Township, Range: San Francis Land Grant

Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): none Slope (%): 5

Subregion (LRR): Mediterranean California (LRR-C) Lat: 6376099.4530800 Long: 1980196.6727200 Datum: NAD83

Soil Map Unit Name: Sandy Alluvial Land NWI classification: PSS1

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)

Are Vegetation **no**, Soil **no**, or Hydrology **no** significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation **no**, Soil **yes**, or Hydrology **no** naturally problematic? (If needed, explain any answers in Remarks.)

### SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | |
|---|---|---|
| Hydrophytic Vegetation Present? | Yes ☒ No ☐ | **Is the Sampled Area within a Wetland?** Yes ☒ No ☐ |
| Hydric Soil Present? | Yes ☒ No ☐ | |
| Wetland Hydrology Present? | Yes ☒ No ☐ | |

Remarks:

SP CC-3 characterizes the floodplain on the southern side of the Santa Clara River. The 2006-2007 rain season had an abnormally low amount of precipitation.

### VEGETATION

| Tree Stratum (Use scientific names.) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. *Populus fremontii* | 20 | Y | FACW |
| 2. *Salix lasiolepis* | 15 | Y | FACW |
| 3. *Salix laevigata* | 5 | N | FACW+[a] |
| Total Cover: | 40 | | |
| **Sapling/Shrub Stratum** | | | |
| 1. *Populus fremontii* | 20 | Y | FACW |
| 2. *Salix lasiolepis* | 10 | Y | FACW |
| 3. *Baccharis salicifolia* | 5 | N | FACW[a] |
| 4. *Salix exigua* | 5 | N | OBL |
| 5. *Artemisia tridentata* | 1 | N | NI |
| 6. *Salvia mellifera* | 1 | N | NI |
| Total Cover: | 42 | | |
| **Herb Stratum** | | | |
| 1. *Arundo donax* | 50 | Y | FACW |
| 2. *Ambrosia acanthicarpa* | 1 | N | NI |
| 3. *Distichlis spicata* | 1 | N | FACW |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| Total Cover: | 52 | | |
| **Woody Vine Stratum** | | | |
| 1. | | | |
| 2. | | | |
| Total Cover: | | | |

% Bare Ground in Herb Stratum 30 % Cover of Biotic Crust

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 5 (A)

Total Number of Dominant Species Across All Strata 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | | Multiply by | |
|---|---|---|---|
| OBL species | 5 | x 1 = | 5 |
| FACW species | 126 | x 2 = | 252 |
| FAC species | 0 | x 3 = | 0 |
| FACU species | 0 | x 4 = | 0 |
| UPL species | 3 | x 5 = | 15 |
| Column Totals: | 134 (A) | | 272 (B) |

Prevalence Index = B/A = 2.03

**Hydrophytic Vegetation Indicators:**

☒ Dominance Test is >50%

☒ Prevalence Index is ≤3.0[1]

☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

**Hydrophytic Vegetation Present?** Yes ☒ No ☐

Remarks:

SP is located in small depression/drainage. The vegetation of SP CC-3 most closely corresponds to Cowardin's (1979) riparian scrub.

[a] Kartesz, J.T. 1996. National List of Vascular Plant Species that Occur in Wetlands: 1996 National Summary. U.S. Fish and Wildlife Survey.

## SOIL

Sampling Point: CC-3

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | Matrix % | Redox Features Color (moist) | Redox Features % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 0-6 | 10YR3/2 | 80 | 5YR4/6 | 20 | C | M | silt loam | |
| 6-16 | | | | | | | fine sand | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

**Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)**

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☒ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

**Indicators for Problematic Hydric Soils[3]:**

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☒ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

**Restrictive Layer (if present):**

Type: _____

Depth (inches): _____

**Hydric Soil Present?** Yes ☒ No ☐

Remarks:

Hydric soils are present due to presence of redox concentrations or iron mottles. Due to the "neutral" characteristics of sandy soils, sandy alluvial land is problematic and often considered to be hydric under flooded conditions.

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☒ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☒ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

**Field Observations:**

Surface Water Present? Yes ☐ No ☒ Depth (inches): _____

Water Table Present? Yes ☐ No ☒ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ☐ No ☒ Depth (inches): _____

**Wetland Hydrology Present?** Yes ☒ No ☐

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Secondary indicators provided evidence of hydrology.

# WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Newhall Ranch/Commerce Center Bridge City/County: Los Angeles County Sampling Date: 9/26/07

Applicant/Owner: Newhall Land and Farming Company State: CA Sampling Point: CC-4

Investigator(s): E. Larsen, W. Vogler Section, Township, Range: San Francis Land Grant

Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): none Slope (%): 5

Subregion (LRR): Mediterranean California (LRR-C) Lat: 6376115.9530100 Long: 1980069.5899200 Datum: NAD83

Soil Map Unit Name: Sandy Alluvial Land NWI classification: PSS6

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)

Are Vegetation **no**, Soil **no**, or Hydrology **no** significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation **no**, Soil **yes**, or Hydrology **no** naturally problematic? (If needed, explain any answers in Remarks.)

## SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | |
|---|---|---|
| Hydrophytic Vegetation Present? | Yes ☒ No ☐ | **Is the Sampled Area within a Wetland?** Yes ☒ No ☐ |
| Hydric Soil Present? | Yes ☒ No ☐ | |
| Wetland Hydrology Present? | Yes ☒ No ☐ | |

Remarks:

SP CC-4 characterizes the floodplain on the southern side of the Santa Clara River. The 2006-2007 rain season had an abnormally low amount of precipitation.

## VEGETATION

| Tree Stratum (Use scientific names.) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. *Populus fremontii* | 10 | Y | FACW |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| Total Cover: | 10 | | |
| **Sapling/Shrub Stratum** | | | |
| 1. *Arundo donax* | 60 | Y | FACW |
| 2. *Salix exigua* | 40 | Y | OBL |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| Total Cover: | 100 | | |
| **Herb Stratum** | | | |
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| Total Cover: | | | |
| **Woody Vine Stratum** | | | |
| 1. | | | |
| 2. | | | |
| Total Cover: | | | |

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust 0

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | | Multiply by | |
|---|---|---|---|
| OBL species | 40 | x 1 = | 40 |
| FACW species | 70 | x 2 = | 140 |
| FAC species | 0 | x 3 = | 0 |
| FACU species | 0 | x 4 = | 0 |
| UPL species | 0 | x 5 = | 0 |
| Column Totals: | 110 (A) | | 180 (B) |

Prevalence Index = B/A = 1.64

**Hydrophytic Vegetation Indicators:**

☒ Dominance Test is >50%

☒ Prevalence Index is ≤3.0[1]

☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

**Hydrophytic Vegetation Present?** Yes ☒ No ☐

Remarks:

The vegetation of SP CC-4 most closely corresponds to Cowardin's (1979) riparian scrub. The ground was 100 percent covered, consisting of mostly leaf litter with some woody debris.

## SOIL

Sampling Point: CC-4

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth | Matrix | | Redox Features | | | | | |
|---|---|---|---|---|---|---|---|---|
| (inches) | Color (moist) | % | Color (moist) | % | Type[1] | Loc[2] | Texture | Remarks |
| 0-6 | 10YR4/3 | 95+ | 5YR5/4 | <5 | C | M | silt/loam | organic flakes 25% |
| 6-20 | 10YR5/4 | | n/a | n/a | n/a | n/a | sand/loam | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

**Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)**

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☒ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

**Indicators for Problematic Hydric Soils[3]:**

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☒ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

**Restrictive Layer (if present):**

Type: _____

Depth (inches): _____

**Hydric Soil Present?** Yes ☒ No ☐

Remarks:

Hydric soils are present due to the presence of redox concentrations or iron mottles. Due to the "neutral" characteristics of sandy soils, sandy alluvial land is problematic and often considered to be hydric under flooded conditions.

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☒ Water Marks (B1) (**Riverine**)
- ☒ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☒ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

**Field Observations:**

Surface Water Present? Yes ☐ No ☒ Depth (inches): _____

Water Table Present? Yes ☐ No ☒ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ☐ No ☒ Depth (inches): _____

**Wetland Hydrology Present?** Yes ☒ No ☐

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Secondary indicators provided evidence of hydrology.

## WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Newhall Ranch/Commerce Center Bridge City/County: Los Angeles County Sampling Date: 9/26/07

Applicant/Owner: Newhall Land and Farming Company State: CA Sampling Point: CC-5

Investigator(s): J. Love, J. Kisner Section, Township, Range: San Francis Land Grant

Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): none Slope (%): 5

Subregion (LRR): Mediterranean California (LRR-C) Lat: 6376253.1696300 Long: 1979866.4310200 Datum: NAD83

Soil Map Unit Name: Sandy Alluvial Land NWI classification: PSS6

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)

Are Vegetation **no**, Soil **no**, or Hydrology **no** significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation **no**, Soil **yes**, or Hydrology **no** naturally problematic? (If needed, explain any answers in Remarks.)

### SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | |
|---|---|---|
| Hydrophytic Vegetation Present? | Yes ☒ No ☐ | **Is the Sampled Area within a Wetland?** Yes ☒ No ☐ |
| Hydric Soil Present? | Yes ☒ No ☐ | |
| Wetland Hydrology Present? | Yes ☒ No ☐ | |

Remarks:

SP CC-5 characterizes the floodplain on the southern side of the Santa Clara River. The 2006-2007 rain season had an abnormally low amount of precipitation.

### VEGETATION

| Tree Stratum (Use scientific names.) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. *Populus fremontii* | 70 | Y | FACW |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| Total Cover: | 70 | | |
| **Sapling/Shrub Stratum** | | | |
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| Total Cover: | | | |
| **Herb Stratum** | | | |
| 1. *Arundo donax* | 90 | Y | FACW |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| Total Cover: | 90 | | |
| **Woody Vine Stratum** | | | |
| 1. | | | |
| 2. | | | |
| Total Cover: | | | |

% Bare Ground in Herb Stratum 5 % Cover of Biotic Crust

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | Multiply by |
|---|---|
| OBL species 0 | x 1 = 0 |
| FACW species 160 | x 2 = 320 |
| FAC species 0 | x 3 = 0 |
| FACU species 0 | x 4 = 0 |
| UPL species 0 | x 5 = 0 |
| Column Totals: 160 (A) | 320 (B) |

Prevalence Index = B/A = 2

**Hydrophytic Vegetation Indicators:**

☒ Dominance Test is >50%

☒ Prevalence Index is ≤3.0[1]

☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

**Hydrophytic Vegetation Present?** Yes ☒ No ☐

Remarks:

The vegetation of SP CC-4 most closely corresponds to Cowardin's (1979) riparian scrub.

## SOIL

Sampling Point: CC-5

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | Matrix % | Redox Features Color (moist) | Redox Features % | Redox Features Type[1] | Redox Features Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 0-16 | 10YR3/2 | 98 | | | | | silt loam | |
| 0-4 | | | 5YR4/6 | 2 | C | M | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

**Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)**

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

**Indicators for Problematic Hydric Soils[3]:**

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☒ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

**Restrictive Layer (if present):**

Type: _____

Depth (inches): _____

**Hydric Soil Present?** Yes ☒ No ☐

Remarks:

Hydric soils are present due the presence of redox concentrations or iron mottles. Due to the "neutral" characteristics of sandy soils, sandy alluvial land is problematic and often considered to be hydric under flooded conditions.

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☒ Sediment Deposits (B2) (**Riverine**)
- ☒ Drift Deposits (B3) (**Riverine**)
- ☒ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

**Field Observations:**

Surface Water Present? Yes ☐ No ☒ Depth (inches): _____

Water Table Present? Yes ☐ No ☒ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ☐ No ☒ Depth (inches): _____

**Wetland Hydrology Present?** Yes ☒ No ☐

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Secondary indicators provided evidence of hydrology.

# WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Newhall Ranch/Commerce Center Bridge City/County: Los Angeles County Sampling Date: 9/26/07

Applicant/Owner: Newhall Land and Farming Company State: CA Sampling Point: CC-6

Investigator(s): E. Larsen, W. Vogler Section, Township, Range: San Francis Land Grant

Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): none Slope (%): 5

Subregion (LRR): Mediterranean California (LRR-C) Lat: 6376322.4256200 Long: 1979977.4281500 Datum: NAD83

Soil Map Unit Name: Sandy Alluvial Land NWI classification: PSS6

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)

Are Vegetation **no**, Soil **no**, or Hydrology **no** significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation **no**, Soil **yes**, or Hydrology **no** naturally problematic? (If needed, explain any answers in Remarks.)

## SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | |
|---|---|---|
| Hydrophytic Vegetation Present? | Yes ☒ No ☐ | **Is the Sampled Area within a Wetland?** Yes ☒ No ☐ |
| Hydric Soil Present? | Yes ☒ No ☐ | |
| Wetland Hydrology Present? | Yes ☒ No ☐ | |

Remarks:

SP CC-6 characterizes the floodplain on the southern side of the Santa Clara River. Similar to sampling point CC-7 in vegetation and CC-5 in soils. The 2006-2007 rain season had an abnormally low amount of precipitation.

## VEGETATION

| Tree Stratum (Use scientific names.) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. *Populus fremontii* | 20 | Y | FACW |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| Total Cover: | 20 | | |
| **Sapling/Shrub Stratum** | | | |
| 1. *Baccharis salicifolia* | 20 | Y | FACW[a] |
| 2. *Artemisia californica* | 10 | Y | NI |
| 3. *Nicotiana glauca* | 5 | N | FAC |
| 4. *Eriodictyon crassifolium* | 5 | N | NI |
| 5. | | | |
| Total Cover: | 40 | | |
| **Herb Stratum** | | | |
| 1. *Arundo donax* | 20 | Y | FACW |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| Total Cover: | 20 | | |
| **Woody Vine Stratum** | | | |
| 1. | | | |
| 2. | | | |
| Total Cover: | | | |

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust _____

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 75% (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | | Multiply by | |
|---|---|---|---|
| OBL species | 0 | x 1 = | 0 |
| FACW species | 60 | x 2 = | 120 |
| FAC species | 5 | x 3 = | 15 |
| FACU species | 0 | x 4 = | 0 |
| UPL species | 15 | x 5 = | 75 |
| Column Totals: | 80 (A) | | 210 (B) |

Prevalence Index = B/A = 2.6

**Hydrophytic Vegetation Indicators:**

☒ Dominance Test is >50%

☒ Prevalence Index is ≤3.0[1]

☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

**Hydrophytic Vegetation Present?** Yes ☒ No ☐

Remarks:

The vegetation of SP CC-6 most closely corresponds to Cowardin's (1979) riparian scrub.

[a] Kartesz, J.T. 1996. National List of Vascular Plant Species that Occur in Wetlands: 1996 National Summary. U.S. Fish and Wildlife Survey.

## SOIL

Sampling Point: CC-6

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | Matrix % | Redox Features Color (moist) | Redox Features % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 0-6 | 10YR3/2 | 98 | | | | | silt loam | |
| 6-20 | | | 5YR4/6 | 2 | C | M | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

**Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)**

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☒ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☒ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

**Indicators for Problematic Hydric Soils[3]:**

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☒ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

**Restrictive Layer (if present):**

Type: _____

Depth (inches): _____

**Hydric Soil Present?** Yes ☒ No ☐

Remarks:

Hydric soils are present due to the presence of redox concentrations or iron mottles. Due to the "neutral" characteristics of sandy soils, sandy alluvial land is problematic and often considered to be hydric under flooded conditions.

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☒ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☒ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☒ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

**Field Observations:**

Surface Water Present? Yes ☐ No ☒ Depth (inches): _____

Water Table Present? Yes ☐ No ☒ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ☐ No ☒ Depth (inches): _____

**Wetland Hydrology Present?** Yes ☒ No ☐

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Secondary indicators provided evidence of hydrology.

# WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Newhall Ranch/Commerce Center Bridge City/County: Los Angeles County Sampling Date: 9/26/07

Applicant/Owner: Newhall Land and Farming Company State: CA Sampling Point: CC-7

Investigator(s): E. Larsen, W. Vogler Section, Township, Range: San Francis Land Grant

Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): convex Slope (%): 45

Subregion (LRR): Mediterranean California (LRR-C) Lat: 6364920.4195000 Long: 1974289.06056 Datum: NAD83

Soil Map Unit Name: Sandy Alluvial Land NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)

Are Vegetation **no**, Soil **no**, or Hydrology **no** significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation **no**, Soil **yes**, or Hydrology **no** naturally problematic? (If needed, explain any answers in Remarks.)

## SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | |
|---|---|---|
| Hydrophytic Vegetation Present? | Yes ☒ No ☐ | **Is the Sampled Area within a Wetland?** Yes ☐ No ☒ |
| Hydric Soil Present? | Yes ☐ No ☒ | |
| Wetland Hydrology Present? | Yes ☐ No ☒ | |

Remarks:

SP CC-7 characterizes the beginning of the upland area on the southern side of the Santa Clara River. Similar in vegetation to SP CC-6. The 2006-2007 rain season had an abnormally low amount of precipitation.

## VEGETATION

| Tree Stratum (Use scientific names.) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. *Populus fremontii* | 20 | Y | FACW |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| Total Cover: | 20 | | |
| **Sapling/Shrub Stratum** | | | |
| 1. *Baccharis salicifolia* | 20 | Y | FACW[a] |
| 2. *Artemisia californica* | 10 | Y | NI |
| 3. *Nicotiana glauca* | 5 | N | FAC |
| 4. *Eriodictyon crassifolium* | 5 | N | NI |
| 5. | | | |
| Total Cover: | 40 | | |
| **Herb Stratum** | | | |
| 1. *Arundo donax* | 20 | Y | FACW |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| Total Cover: | 20 | | |
| **Woody Vine Stratum** | | | |
| 1. | | | |
| 2. | | | |
| Total Cover: | | | |

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust _____

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 75% (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | Multiply by |
|---|---|
| OBL species _____ | x 1 = _____ |
| FACW species _____ | x 2 = _____ |
| FAC species _____ | x 3 = _____ |
| FACU species _____ | x 4 = _____ |
| UPL species _____ | x 5 = _____ |
| Column Totals: _____ (A) | _____ (B) |

Prevalence Index = B/A = _____

**Hydrophytic Vegetation Indicators:**

☒ Dominance Test is >50%

☐ Prevalence Index is ≤3.0[1]

☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

**Hydrophytic Vegetation Present?** Yes ☒ No ☐

Remarks:

The vegetation of SP CC-7 most closely corresponds to Cowardin's (1979) riparian scrub; however this SP was at the bottom edge of a hill dominated by coastal sage scrub.

[a] Kartesz, J.T. 1996. National List of Vascular Plant Species that Occur in Wetlands: 1996 National Summary. U.S. Fish and Wildlife Survey.

## SOIL

Sampling Point: CC-7

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth (inches) | Matrix Color (moist) | % | Redox Features Color (moist) | % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 0-6 | 10YR5/4 | 97 | 5YR5/6 | 3 | | | silt loam | |
| 6-20 | | | | | | | silt loam | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

**Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)**

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

**Indicators for Problematic Hydric Soils[3]:**

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

**Restrictive Layer (if present):**

Type: _____

Depth (inches): _____

**Hydric Soil Present?** Yes ☐ No ☒

Remarks:

No hydric soil indicators were present.

## HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

**Field Observations:**

Surface Water Present? Yes ☐ No ☒ Depth (inches): _____

Water Table Present? Yes ☐ No ☒ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ☐ No ☒ Depth (inches): _____

**Wetland Hydrology Present?** Yes ☐ No ☒

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No evidence of hydrology was observed.

# APPENDIX B
# LIST OF ON-SITE PLANT SPECIES AND THEIR WETLAND INDICATOR STATUS

# LIST OF PLANT SPECIES THAT WERE OBSERVED WITHIN THE STUDY AREAS AND THEIR WETLAND INDICATOR STATUS

| Scientific Name | Common Name | Wetland Indicator Status[3] |
|---|---|---|
| *Agrostis viridis*[#] | Water Bent Grass | OBL |
| *Ambrosia acanthicarpa* | Annual Burweed | NI |
| *Ambrosia psilostachya* var. *californica* | Western Ragweed | FAC |
| *Apium graveolens*[#] | Wild Celery | FACW* |
| *Artemisia californica* | California Sagebrush | NI |
| *Artemisia douglasiana* | Mugwort | FACW |
| *Artemisia tridentata* | Big Sagebrush | NI |
| *Arundo donax*[#,1] | Giant Reed | FACW |
| *Aster subulatus* var. *ligulatus* | Slender Aster | FACW |
| *Baccharis pilularis* | Coyote Brush | NI |
| *Baccharis salicifolia* | Mulefat | FACW[4] |
| *Bassia hyssopifolia*[#,1] | Five-hook Bassia | FAC |
| *Brassica nigra*[#,1] | Black Mustard | NI |
| *Brassica* spp.[#,1] | Mustard | NI |
| *Bromus diandrus*[#,1] | Ripgut Brome | NI |
| *Chenopodium album*[#] | White Goosefoot | FAC |
| *Conium maculatum*[#,1] | Poison Hemlock | FACW |
| *Conyza bonariensis*[#] | South American Horseweed | NI |
| *Conyza canadensis* | Horseweed | FAC |
| *Cynodon dactylon*[#,1] | Bermuda Grass | FAC |
| *Cyperus eragrostis* | Flatsedge | FACW |
| *Cyperus erythrorhizos* | Redroot Flatsedge | OBL |
| *Cyperus involucratus*[#] | Umbrella Plant | OBL |
| *Dactyloctenium aegyptium*[#] | Crowfoot Grass | NI |
| *Distichlis spicata* | Saltgrass | FACW |
| *Echinochloa crus-galli*[#] | Barnyard Grass | FACW |
| *Eleocharis macrostachya* | Common Spikerush | OBL |
| *Eleusine indica*[#] | Goose Grass | FACU |
| *Epilobium ciliatum* | Willow Herb | FACW |
| *Eriodictyon crassifolium* | Yerba Santa | NI |
| *Euthamia occidentalis* | Western Goldenrod | OBL |
| *Heliotropium curassavicum* | Alkali Heliotrope | OBL |
| *Heterotheca grandiflora* | Telegraph Weed | NI |
| *Juncus torreyi* | Torrey's Rush | FACW+ |

## LIST OF PLANT SPECIES THAT WERE OBSERVED WITHIN THE STUDY AREAS AND THEIR WETLAND INDICATOR STATUS (CONTINUED)

| Scientific Name | Common Name | Wetland Indicator Status[3] |
|---|---|---|
| *Juncus xiphioides* | Iris-leaved Rush | OBL |
| *Leptochloa uninervia* | Mexican Sprangletop | FACW |
| *Leymus triticoides* | Alkali Ryegrass | FAC+ |
| *Ludwigia peploides* | Floating Water Primrose | OBL |
| *Malvella leprosa* | Alkali Mallow | FAC* |
| *Melilotus alba*[#] | White Sweetclover | FACU+ |
| *Nicotiana glauca*[#,1] | Tree Tobacco | FAC |
| *Oenothera elata* | Hooker's Evening Primrose | FACW |
| *Phalaris aquatica*[#,1] | Harding Grass | FAC+ |
| *Pluchea sericea* | Arrowweed | FACW |
| *Poa annua*[#] | Annual Bluegrass | FACW- |
| *Poa* spp. | Bluegrass | |
| *Polygonum arenastrum*[#] | Common Knotweed | FAC |
| *Polygonum lapathifolium* | Willow Weed | OBL |
| *Polypogon monspeliensis*[#,1] | Rabbitsfoot Grass | FACW+ |
| *Populus fremontii* | Fremont Cottonwood | FACW |
| *Rosa californica* | California Rose | FAC+ |
| *Rumex* spp.[#] | Dock | |
| *Salix exigua* | Narrowleaf Willow | OBL |
| *Salix laevigata* | Red Willow | FACW+[4] |
| *Salix lasiolepis* | Arroyo Willow | FACW |
| *Salvia mellifera* | Black Sage | NI |
| *Sambucus mexicana* | Blue Elderberry | FAC |
| *Sonchus asper*[#,1] | Prickly Sow-thistle | FAC |
| *Sonchus* spp.[#] | Sow-thistle | |
| *Spergularia* spp. | Sandspurry | |
| *Tamarix aphylla*[#,1] | Athel Tamarisk | FACW- |
| *Tamarix* spp.[#,1] | Tamarisk | FAC[5] |
| *Trifolium* spp.[#] | Clover | |
| *Typha angustifolia* | Narrowleaf Cattail | OBL |
| *Typha domingensis* | Southern Cattail | OBL |
| *Typha latifolia* | Cattail | OBL |
| *Typha* spp. | Cattail | OBL[6] |

# LIST OF PLANT SPECIES THAT WERE OBSERVED WITHIN THE STUDY AREAS AND THEIR WETLAND INDICATOR STATUS (CONTINUED)

| Scientific Name | Common Name | Wetland Indicator Status[3] |
|---|---|---|
| *Urtica dioica* | Stinging Nettle | FACW |
| *Veronica anagallis-aquatica*[#] | Water Speedwell | OBL |
| *Washingtonia robusta*[2,1] | Fan Palm | NI |
| *Xanthium strumarium* | Cocklebur | FAC+ |
| *Zea mays*[2] | Corn | NI |

Notes:

[#] Non-native (Hickman 1993)

[1] Invasive (California Invasive Plant Council 2007)

[2] Non-native (Calflora 2007)

[3] As described in Reed, 1988 unless otherwise noted

[4] Kartesz 1996

[5] Wetland indicator status was assumed FAC for all *Tamarix* species that were not identified to species. *Tamarix* species found in California have indicators of at least FAC.

[6] Wetland indicator status was assumed OBL for all *Typha* species that were not identified to species. *Typha* species found in California have indicators of at least OBL.

Wetland Indicator Status Key

OBL = Obligate wetland species, occur almost always in wetlands (>99% probability).
FACW = Facultative Wetland species, usually occur in wetlands (67 to 99% probability), but occasionally found in non-wetlands.
FAC = Facultative species, equally likely to occur in wetlands or non-wetlands (34 to 66% probability).
FACU = Facultative Upland, usually occur in non-wetlands (67% to 99%), but occasionally found in wetlands.
UPL = Obligate Upland species, occur almost always in non-wetlands (>99% probability).
NI = Non Indicator, not present on list.
+ = Modifier that indicates a frequency toward the higher end of the category (more frequently found in wetlands).
- = Modifier that indicates a frequency toward the lower end of the category (less frequently found in wetlands).
* = A tentative assignment to that indicator status by Reed, 1988.

# APPENDIX C
# PHOTO DOCUMENTATION

Photo 1. Viewing west along the Santa Clara River, featuring the main channel and riparian scrub vegetation. Wetlands occur adjacent to the river and riparian scrub vegetation is visible in the background. This photo was taken on September 26, 2007 (CC-1).

Photo 2. A mix of hydrophytic vegetation is displayed consisting of narrowleaf willow, red willow, western goldenrod, and cattail. This vegetation arrangement is representative of the on-site riparian scrub wetlands. This photo was taken on September 25, 2007 (PC-13).

Photo 3. A view of a representative on-site mature riparian forest. This photo was taken on September 26, 2007 (PC-2).

Photo 4. A view of redox features that occurred in sandy soils in a riverwash land form adjacent to the Santa Clara River. This photo was taken on September 26, 2007 (CC-3).

Photo 5. A view of a depleted matrix that occurred in a sandy alluvial land form within a mature riparian forest wetland. This photo was taken on September 26, 2007 (PC-2).

Photo 6. A view of a high water table present within sandy soils. This photo was taken on September 26, 2007 (PC-6).

Photo 7. A view of a soil pit in a typical upland habitat. Hydric soils and hydrology indicators were absent. This photo was taken on September 28, 2007 (LC-7).

Photo 8. A view of wetland hydrology indicators including soil cracking, crust, and sediment deposits. This photo was taken on September 25, 2007 (PC-15).

# APPENDIX D
# URS CORPORATION (2004) JURISDICTION DELINEATION FOR THE RMDP SITE

*Under separate cover.*

# APPENDIX E
# LUKOS AND ASSOCIATES (2008) JURISDICTION DELINEATION FOR THE ENTRADA PLANNING AREA

*Under separate cover.*

**URS, "Preliminary Jurisdictional Determination for the Newhall Ranch Resource Management and Development Plan Site and Entrada Planning Area, Los Angeles County, California" (2009)**

April 8, 2009

Dr. Aaron Allen, SPL
U.S. Army Corps of Engineers
2151 Alessandro Dr. #110
Ventura, California 93001

**Re: Preliminary Jurisdictional Determination for the Newhall Ranch Resource Management and Development Plan Site and Entrada Planning Area, Los Angeles County, California**

Dear Dr. Allen:

Please accept this letter as our preliminary Jurisdictional Determination (JD) for the Newhall Ranch Resource Management and Development Plan (RMDP) site. The Newhall Land and Farming Company (Newhall Land) has submitted an Individual 404 Permit application (File No. 2003- 01264- AOA) for Department of the Army authorization of impacts under the RMDP, including approximately 80 acres of permanent impacts to waters of the United States for the construction of roads, flood control structures and associated infrastructure for the Newhall Ranch Specific Plan in the Santa Clara River and several tributaries near Santa Clarita in Los Angeles County, California. The Corps is currently preparing an Environmental Impact Statement (EIS) prior to making a permit decision (a joint EIS/EIR is being prepared in consult with the California Department of Fish and Game, which also discloses impacts of the RMDP pursuant to CEQA requirements). As detailed below, multiple delineation efforts have been completed on the site in support of the EIS/EIR process between 2004 and 2009.

The RMDP project is a multi-phased development proposed to occur over an extended period of time (approximately 20 years). Accordingly, impacts to waters of the U.S. will also occur over an extended period. Due to the long-term nature of the proposed Individual Permit, Newhall Land is proceeding under a preliminary JD for planning purposes, and will seek approved JDs prior to construction of project components requiring Section 404 authorization. This approach allows for consideration of any changes in the exact location or extent of waters of the U.S. onsite, as well as other changes, that may occur over the 20-year implementation period of the proposed RMDP.

## 1.0 INTRODUCTION AND BACKGROUND

Newhall Land owns the Newhall Ranch RMDP site, a 13,651-acre property located in the Santa Clarita Valley in northern Los Angeles County. The Santa Clara River traverses the RMDP site in an east-west direction, and a substantial number of tributary drainages run north-south conveying flows from upland areas to the river. The Newhall Land and Farming Company has submitted an application (File No. 2003-01264-AOA) for Department of the Army authorization to permanently impact approximately 80 acres of waters of the United States for the construction of roads, flood control structures and associated infrastructure for the Newhall Ranch Specific Plan in the Santa Clara River and several tributaries near Santa Clarita. Project implementation is expected to occur over a 20 year period. The Corps determined that issuance of such a permit would require environmental analysis under the National Environmental Policy Act (NEPA), and issued a Notice of Intent to prepare an EIS in early 2004. Since that time, collection of data and completion of required evaluation of the proposed permit's effect on the environment has been ongoing.

In 2003, URS Corporation completed field investigations delineating all areas within the RMDP site that exhibited an ordinary high-water mark; a delineation report was prepared in early 2004. The report was submitted to the Corps (see Attachment B), and the Corps responded with a letter approving the jurisdictional boundaries as delineated, but stipulating that their approval would remain valid only for a five-year term. During that term, large storm events in the 2004-2005 season scoured and reshaped the channel, altering the width and location of the active river channel within the floodplain. Further, the scope of the EIS/EIR necessitated additional delineation work, including a delineation of waters within the Entrada planning area (adjacent to the RMDP site, see Attachment C) and a delineation of wetlands within the RMDP site (see Attachment D). These additional delineation reports have not previously been submitted to the Corps. A preliminary jurisdictional delineation approach to the long-term permit is justified due to the geomorphologic and hydrodynamic processes apparent in the Santa Clara River. Large storm events, termed "reset" events, can completely reconfigure the channel, altering channel width and the location of the active channel within the floodplain. The channel then remains in this altered configuration, enduring minor changes due to smaller storm events and other perturbations, until the next reset event occurs, reconfiguring the floodplain once again. In 2007, Balance Hydrologics conducted a study evaluating the extent to which various factors influence the morphology of the Santa Clara River channel. The need for this study arose from concerns regarding the potential hydrologic and hydraulic effects of bridges, bank stabilization, and increased impervious surfaces within the RMDP site on river channel morphology within and downstream of the site. The study used historic aerial photographs to describe changes to the

river channel and floodplain that occurred due to major perturbations (extreme wet and dry weather cycles, dam construction at Castaic Lake, dam failure at St. Francis Dam, urbanization in the watershed, and waste water treatment works discharging to the river) over the last century. The study observed that some perturbations, such as construction of Castaic Dam and an increase in dry-season flows due to treatment plant discharge, appear to have had only minor effects on channel morphology, and that these effects are masked by the much larger morphological changes that occur in response to large storm events.

The results of the Balance Hydrologics study are important, because the proposed Individual Section 404 Permit desired by Newhall Land would authorize the construction of various facilities within the river over a 20-year period, with maintenance occurring under the permit for a total of 50 years. Due to this long project timeframe, it is possible that a reset event could occur between the time jurisdictional areas are delineated and the time the impact actually occurs. However, to allow an accurate evaluation of project impacts and to ensure appropriate mitigation, a delineation of jurisdictional areas is needed where intervening changes in channel configuration have not occurred. To address this need, the proposed permit would involve individual, site-specific JDs to be conducted prior to construction of any project element, and submitted to the Corps for approval as a component of a pre-construction notification under the Individual 404 Permit. The acreage of mitigation required would be based on the approved JD rather than on the preliminary JD presented below. Thus, this preliminary JD is intended primarily for planning purposes and to provide a basis for evaluating impacts of the RMDP on waters of the U.S. under current conditions.

## 2.0 JURISDICTIONAL DETERMINATION METHODS

The jurisdictional boundaries presented in this preliminary JD were mapped during three separate field investigations that were conducted on the RMDP site between 2003 and 2007. The formal reports from these investigations are included as Attachments B through D, and the investigations are described briefly below:

- **URS Corporation, 2004: Jurisdiction Delineation Package.** This investigation field mapped all areas within the RMDP site that exhibited an ordinary high-water mark during the summer and fall of 2003. Mapping was conducted using sub-meter accurate GPS units, and a GIS layer was constructed from the resulting polygons. The Santa Clara River and all tributaries within the RMDP site were mapped, including both banks where feasible. In smaller drainages where the accuracy of the GPS units was insufficient to allow separate mapping of both banks, the centerline of the stream was mapped and a fixed measured width was then applied to the center line in GIS to create a polygon. This study did not take into consideration the presence of wetlands, and no wetland delineation

forms were completed. It is therefore possible that wetlands could exist both within and beyond the ordinary high-water mark boundaries mapped, and this investigation therefore does not represent a complete delineation of all waters of the U.S. within the RMDP site. The ordinary high-water mark boundaries mapped in this study were approved by the Corps in 2004.

- **Lukos and Associates, 2008: Jurisdictional Delineation for Entrada, an Approximately 850-Acre Property in Los Angeles County, California.** This investigation mapped six drainage segments within the Entrada planning area, a parcel owned by Newhall Land and located immediately adjacent to the RMDP site. Although the proposed Section 404 Permit would not authorize any discharge of fill material within the Entrada planning area, waters within that area were delineated because Entrada falls within the geographic scope of Newhall Land's Spineflower Conservation Plan, a related, non-federal project that would facilitate an urban development on Entrada that could potentially affect jurisdictional waters. This investigation delineated all waters of the U.S. within the Entrada planning area, including both wetlands and non-wetland waters, mapping the features on a 200-scale basemap using visible landmarks. The mapped polygons were digitized into a GIS layer, in which wetland polygons were distinguishable from non-wetland waters.

- **URS Corporation, 2009: Newhall Ranch RMDP Composite Wetland Delineation.** This investigation's geographic scope encompassed the entire RMDP site, and the study was focused on Corps-jurisdictional wetlands, as these were not considered in the URS 2004 delineation. Due to the large size of the RMDP site, combined with the inherent morphological dynamism of the Santa Clara River documented in the 2007 Balance Hydrologics study, field delineation of all wetlands within the RMDP site was not performed. Rather, field delineations in this study were limited to wetland areas within tributary drainages, which are less morphologically dynamic than the river, and wetland areas along the river in areas where major project components, such as roadway bridges across the river, are proposed. For the remainder of the river corridor, this study incorporated the results of a planning-level delineation effort undertaken by URS Corporation and Dudek and Associates in 2006, which mapped wetlands based on topographic and vegetation maps and high-resolution (six-inch pixels) aerial photography. Areas within and adjacent to the active channel of the river where riparian vegetation was evident on aerial photos were mapped as wetlands. The study notes that this is a conservative approach that may actually overstate the extent of wetlands onsite, because wetlands were delineated based on vegetation and hydrology, but not soils. For areas where wetlands were mapped in the field, the report includes the associated data forms. The study compiled both types of wetland data (field delineated and planning-

level, aerial photo delineated) into a GIS layer showing the full extent of wetlands within the RMDP site.

The GIS data produced from the three studies described above were compiled to create a consolidated layer showing the full extent of waters of the U.S., including wetlands, within the RMDP site and the adjacent Entrada planning area. This data layer will be used for planning purposes, including identification and evaluation of project alternatives and environmental analysis under NEPA and CEQA, but will be superseded by refined, site-specific, approved JDs to be conducted prior to construction. These approved JDs will be the basis for determining the exact extent of impacts and mitigation required.

## 3.0 RESULTS: WATERS OF THE UNITED STATES WITHIN THE RMDP SITE AND ENTRADA PLANNING AREA

As stated previously, the delineated boundaries presented in this preliminary JD are taken from three field studies conducted between 2003 and 2007. This section presents a brief description of the aquatic resources within the RMDP site, and quantitatively presents the current acreages of all waters of the U.S. (both wetland and non-wetland) as mapped in the source studies.

The RMDP site contains a diverse array of jurisdictional drainages, which vary in size from small, first and second order headwater streams to a reach of the much larger Santa Clara River. The river traverses the site flowing in a westward direction, and the onsite tributary drainages generally run perpendicular, conveying flows southward and northward into the river from the mountains and foothills on either side (See Figure 1). The small tributaries, large tributaries, and river mainstem onsite differ in their physical and biological characteristics, but all three of these drainage types provide important physical and biological functions.

### 3.1 RMDP Site: Small Tributaries

The smallest tributary streams onsite are ephemeral drainages, which support surface flows for only a short duration following rain events. With the exception of Magic Mountain canyon, which receives flows from areas south of the RMDP site boundary, the ephemeral drainages onsite have their watersheds almost completely contained within the RMDP site. The ephemeral streams onsite lack riparian vegetation, and are covered instead with a combination of upland vegetation types and river wash (unvegetated channel). The canyon mouths of these drainages can provide limited refuge habitat for aquatic species during periods of high river flow, although the lack of relatively permanent flow in ephemeral

streams generally precludes their use by aquatic species. In addition, the large number and varied location of these tributaries (of the 22 tributary drainages onsite, 15 are ephemeral) provides opportunities for wildlife to use the ephemeral tributary drainages as movement corridors between the Santa Clara River and upland portions of the project site.

Although ephemeral tributaries constitute the majority of streams within the RMDP site, the acreage they encompass is relatively minor because these channels are much narrower than the channels of the larger tributaries onsite. The 22 ephemeral tributary drainages within the RMDP site currently contain a combined total of 30.3 acres of non-wetland waters of the U.S. (see Table 1). The ephemeral drainages onsite do not support any jurisdictional wetlands.

### 3.2 RMDP Site: Large Tributaries

In addition to the small ephemeral streams identified above, the RMDP site also contains seven tributaries that support surface flows at least intermittently in some reaches. Two of these seven (Potrero Canyon and Salt Creek) have reaches that support perennial flows during most years. The intermittent streams onsite are substantially longer than the ephemeral tributaries, and originate in the Santa Susana Mountains (south side of the river) and the lower reaches of the San Gabriel Mountains (north side of the river), outside the RMDP site boundary. (The only exception to this is Salt Creek, which is entirely within the RMDP site by definition because the Salt Creek watershed boundary forms the southern boundary of the site.) The site's intermittent tributaries support riparian vegetation in many reaches; this vegetation consists primarily of southern willow scrub and mule fat scrub.

In total, the seven larger, intermittent and perennial tributaries within the RMDP site contain approximately 140 acres of non-wetland waters of the U.S. and an additional 12.2 acres of jurisdictional wetlands, (see Table 1). Currently, the total Corps jurisdiction within these tributaries is therefore approximately 152 acres. Of this total, more than half (85.4 total acres of waters of the U.S.) are within the Salt Creek watershed.

### 3.3 RMDP Site: Santa Clara River Mainstem

The river main stem is the receiving water for all of the tributary drainages within the RMDP site, as well as 644 square miles of mainstem and tributary watersheds upstream of the project reach. The mainstem has a much lower gradient compared to the tributaries, and supports a substantial floodplain with an extensive mosaic of braids, bars and terraces. Within the RMDP site, the river mainstem exhibits year round surface flows (supported in part by effluent discharges from upstream treatment works). These flows are adequate to

support resident populations of many fishes and aquatic reptiles and amphibians. The river mainstem supports an extensive riparian community comprised of mature cottonwood forests beyond the ordinary high water mark, successional riparian communities on bars and terraces, and emergent wetlands near the active channel. These vegetation types provide suitable breeding and foraging habitat for many wildlife species. The river mainstem also serves as an east-west wildlife corridor through the project area, and connects natural open spaces along its length.

Within the RMDP site, the Santa Clara River mainstem currently supports approximately 215 acres of non-wetland waters of the U.S., and an additional approximately 237 acres of adjacent wetlands. The river mainstem within the RMDP site therefore contains a total of approximately 452 acres of waters of the U.S.

### 3.4 RMDP Site: Spring Complex

In addition to the river and streams described above, the RMDP site also contains the Middle Canyon spring, a slope wetland located on an upper terrace along the southern bank of the Santa Clara River just downstream from the confluence with Middle Canyon (one of the site's ephemeral drainages). The spring complex is a unique aquatic resource in the RMDP site supporting snail and sunflower species that are taxonomically undescribed and may only occur in this location regionally. The spring is fed perennially by flows from the shallow alluvial groundwater system in lower Middle Canyon, which is connected to the spring through permeable beds directing groundwater flow to the spring (see Figure 1).

The spring complex does not contain any non-wetland waters of the U.S., but supports approximately 2.14 acres of jurisdictional wetlands (see Table 1).

### 3.5 Entrada Planning Area: Small Drainages

The Entrada planning area contains six distinct drainage segments comprising three drainages. All three of Entrada's drainages are ephemeral, and are similar in many ways to the ephemeral drainages within the RMDP site. The channels are vegetated primarily with upland plant communities, and contain areas where the channel is unvegetated. Flows from ephemeral streams within the Entrada planning area flow to the north, and leave the site at the boundary with the Magic Mountain theme park. One of the drainages within the Entrada planning area contains a jurisdictional wetland are supported by nuisance flows from a storm drain outlet.

One of Entrada's drainages (identified in the Lukos 2008 report as Drainage A) is contained mostly within the RMDP site and was delineated in the URS 2004 JD. The acreage of this drainage has been deducted from the Entrada total to prevent double-counting this drainage. The ephemeral drainages within Entrada (excluding Drainage A) contain a current total of 3.05 acres of non-wetland waters and 0.17 acres of wetlands, for a total of 3.22 acres of waters of the U.S.

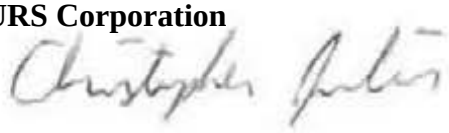
The acreages of waters of the U.S. within the RMDP site and Entrada planning area are presented in Table 1, below. The locations of waters of the U.S. on the site are also depicted graphically on Figure 1.

**TABLE 1**
**WATERS OF THE UNTIED STATES, INCLUDING WETLANDS, WITHIN THE RMDP SITE AND ENTRADA PLANNING AREA**

| Drainage | Non-Wetland Waters of the United States (Acres) | Corps Adjacent Wetlands (Acres) | Total Waters of the United States (Acres) |
|---|---|---|---|
| Santa Clara River | 215.00 | 237.00 | 452.00 |
| Salt Creek | 79.70 | 5.67 | 85.40 |
| Potrero Canyon | 31.40 | 6.52 | 37.90 |
| San Martinez Grande Canyon | 2.55 | 0.00 | 2.55 |
| Chiquito Canyon | 12.20 | 0.00 | 12.20 |
| Long Canyon | 5.70 | 0.00 | 5.70 |
| Lion Canyon | 6.86 | 0.00 | 6.86 |
| Humble Canyon | 1.91 | 0.00 | 1.91 |
| Minor Ephemeral Drainages Within RMDP Study Area | 30.30 | 0.00 | 30.30 |
| Spring Complex | 0.00 | 2.14 | 2.14 |
| **Subtotal RMDP Site** | **386** | **251** | **637** |
| Entrada Unnamed Drainages | 3.05 | **0.17** | 3.22 |
| **Subtotal Entrada Planning Area** | **3.05** | **0.15** | **3.20** |
| **Grand Total** | **389** | **251** | **639** |

We look forward to continuing work with your agency on this project, and wish to ensure that this preliminary JD submittal meets all applicable requirements. Should you have any questions regarding this submittal, please contact Christopher Julian of URS Corporation at (805) 964-6010.

Sincerely,
**URS Corporation**



Christopher Julian
Project Biologist/Regulatory Specialist

**List of Attachments**

| | |
|---|---|
| Attachment A | Preliminary Jurisdictional Determination Form |
| Attachment B | URS Corporation 2004 Jurisdictional Delineation |
| Attachment C | Lukos and Associates 2008 Entrada Delineation Report |
| Attachment D | URS Corporation 2009 Composite Wetlands Delineation Report |

DRAFT

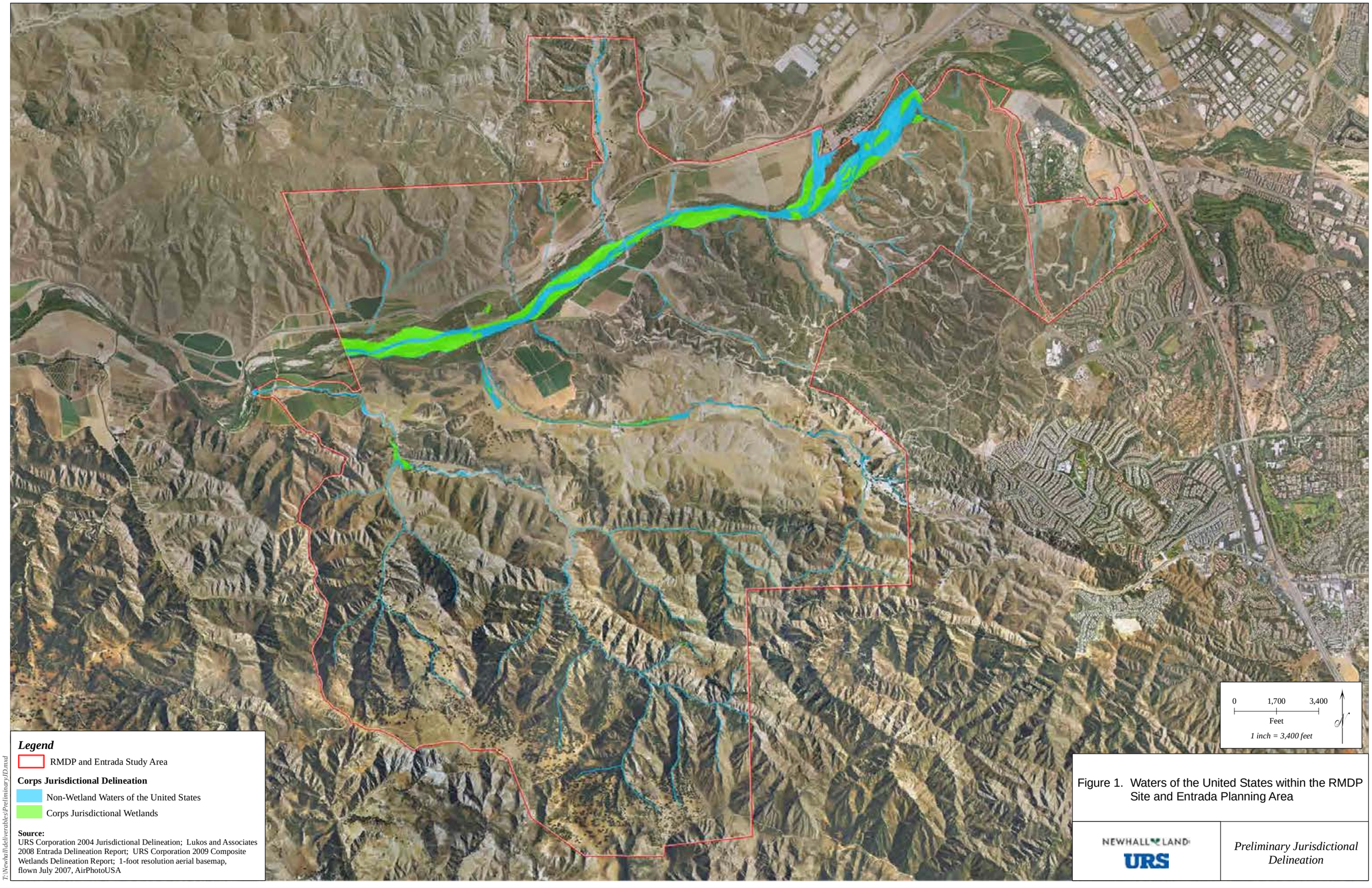



Figure 1. Waters of the United States within the RMDP Site and Entrada Planning Area

NEWHALL LAND

URS

*Preliminary Jurisdictional Delineation*

# *PRELIMINARY JURISDICTIONAL DETERMINATION FORM*

**This preliminary JD finds that there *"may be"* waters of the United States on the subject project site, and identifies all aquatic features on the site that could be affected by the proposed activity, based on the following information:**

District Office: LOS ANGELES | File/ORM #: 2003-01264-AOA | PJD Date: Apr 7, 2009

State: CA | City/County: Los Angeles County

Nearest Waterbody: Santa Clara River

Location: TRS, LatLong or UTM: Approximate site center at 347752.848962, 3807607.71454 (UTM NAD83, Meters).

Name/ Address of Person Requesting PJD: Newhall Land and Farming Company
23823 Valencia Blvd.
Valencia, CA 91355

Identify (Estimate) Amount of Waters in the Review Area:

Non-Wetland Waters: ~220k linear ft | var. | width 389 | acres | Stream Flow: N/A

Wetlands: 251 acre(s) | Cowardin Class: Palustrine, scrub-shrub

Name of Any Water Bodies on the Site Identified as Section 10 Waters: Tidal: None | Non-Tidal: None

☑ Office (Desk) Determination
☑ Field Determination: Date of Field Trip: Several, see reports

**SUPPORTING DATA: Data reviewed for preliminary JD (check all that apply - checked items should be included in case file and, where checked and requested, appropriately reference sources below):**

- ☑ Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant: See accompanying survey reports
- ☑ Data sheets prepared/submitted by or on behalf of the applicant/consultant.
  - ☐ Office concurs with data sheets/delineation report.
  - ☐ Office does not concur with data sheets/delineation report.
- ☐ Data sheets prepared by the Corps
- ☐ Corps navigable waters' study:
- ☐ U.S. Geological Survey Hydrologic Atlas:
  - ☐ USGS NHD data.
  - ☐ USGS 8 and 12 digit HUC maps.
- ☑ U.S. Geological Survey map(s). Cite quad name: Val Verde, Newhall, Santa Susana Mtns, Ont Mtn.
- ☑ USDA Natural Resources Conservation Service Soil Survey. Citation: USDA Soil Survey of San Francis Area, California
- ☐ National wetlands inventory map(s). Cite name:
- ☐ State/Local wetland inventory map(s):
- ☐ FEMA/FIRM maps:
- ☑ 100-year Floodplain Elevation is: 865 ft. amsl
- ☑ Photographs: ☑ Aerial (Name & Date): Robert J. Lung & Associates, 2008; Pronin, 2008
  - ☐ Other (Name & Date):
- ☑ Previous determination(s). File no. and date of response letter: File 2003-01264-AOA; response date 2/4/2004
- ☑ Other information (please specify): See accompanying survey reports

IMPORTANT NOTE: The information recorded on this form has not necessarily been verified by the Corps and should not be relied upon for later jurisdictional determinations.

Signature and Date of Regulatory Project Manager (REQUIRED)

Steven D. Gunnell
Signature and Date of Person Requesting Preliminary JD (REQUIRED, unless obtaining the signature is impracticable)

**EXPLANATION OF PRELIMINARY AND APPROVED JURISDICTIONAL DETERMINATIONS:**

1. The Corps of Engineers believes that there may be jurisdictional waters of the United States on the subject site, and the permit applicant or other affected party who requested this preliminary JD is hereby advised of his or her option to request and obtain an approved jurisdictional determination (JD) for that site. Nevertheless, the permit applicant or other person who requested this preliminary JD has declined to exercise the option to obtain an approved JD in this instance and at this time.

2. In any circumstance where a permit applicant obtains an individual permit, or a Nationwide General Permit (NWP) or other general permit verification requiring "preconstruction notification" (PCN), or requests verification for a non-reporting NWP or other general permit, and the permit applicant has not requested an approved JD for the activity, the permit applicant is hereby made aware of the following: (1) the permit applicant has elected to seek a permit authorization based on a preliminary JD, which does not make an official determination of jurisdictional waters; (2) that the applicant has the option to request an approved JD before accepting the terms and conditions of the permit authorization, and that basing a permit authorization on an approved JD could possibly result in less compensatory mitigation being required or different special conditions; (3) that the applicant has the right to request an individual permit rather than accepting the terms and conditions of the NWP or other general permit authorization; (4) that the applicant can accept a permit authorization and thereby agree to comply with all the terms and conditions of that permit, including whatever mitigation requirements the Corps has determined to be necessary; (5) that undertaking any activity in reliance upon the subject permit authorization without requesting an approved JD constitutes the applicant's acceptance of the use of the preliminary JD, but that either form of JD will be processed as soon as is practicable; (6) accepting a permit authorization (e.g., signing a proffered individual permit) or undertaking any activity in reliance on any form of Corps permit authorization based on a preliminary JD constitutes agreement that all wetlands and other water bodies on the site affected in any way by that activity are jurisdictional waters of the United States, and precludes any challenge to such jurisdiction in any administrative or judicial compliance or enforcement action, or in any administrative appeal or in any Federal court; and (7) whether the applicant elects to use either an approved JD or a preliminary JD, that JD will be processed as soon as is practicable. Further, an approved JD, a proffered individual permit (and all terms and conditions contained therein), or individual permit denial can be administratively appealed pursuant to 33 C.F.R. Part 331, and that in any administrative appeal, jurisdictional issues can be raised (see 33 C.F.R. 331.5(a)(2)). If, during that administrative appeal, it becomes necessary to make an official determination whether CWA jurisdiction exists over a site, or to provide an official delineation of jurisdictional waters on the site, the Corps will provide an approved JD to accomplish that result, as soon as is practicable.

**URS Corporation, 2009, Revised Preliminary Jurisdictional Determination**

June 7, 2010

Dr. Aaron Allen, SPL
U.S. Army Corps of Engineers
2151 Alessandro Dr. #110
Ventura, California 93001

**Re: Preliminary Jurisdictional Determination for the Newhall Ranch Resource Management and Development Plan Site and Entrada Planning Area, Los Angeles County, California**

Dear Dr. Allen:

On behalf of the Newhall Land and Farming Company (Newhall Land), please accept the attached materials containing revisions to our previously submitted preliminary Jurisdictional Determination (JD) dated April 20, 2009, for the Newhall Ranch Resource Management and Development Plan (RMDP) site (File No. 2003-01264-AOA). Per your request, URS Corporation (URS) staff have conducted additional wetland delineation field work in the portion of the RMDP site north of the Santa Clara River near the proposed Potrero Canyon Road bridge, an area which had been previously surveyed for wetlands only by interpreting aerial photographs. In addition, the boundaries of waters of the United States and wetlands at some other locations have been refined to reflect the most recent data available (generally, 2006 data replacing 2004 data). These revisions to the 2009 Preliminary JD are described and quantified below.

**Santa Clara River Mainstem near Potrero Canyon Road Bridge**

In the 2009 Preliminary JD, the boundaries of a wetland at this location had been based on field investigations only within the construction disturbance zone of the Potrero Canyon Road bridge, and had been based on interpretation of aerial photographs outside this disturbance zone. In response to comments received from the public on the Draft EIS/EIR, field mapping techniques were employed throughout this area to determine the wetland boundary with greater precision. The wetland delineation field work was conducted by URS biologists Christopher Julian and Julie Love on December 21, 2009 and January 6, 2010, and was performed in accordance with the methods set forth in the Corps' Wetland Delineation Manual and the Arid West Regional Supplement to that manual. A total of 32 new data points were evaluated for wetland characteristics. The field investigations identified an additional 15.5 acres of wetland waters of the United States adjacent to the Santa Clara River mainstem.

**Margins of the Santa Clara River, Potrero Canyon, and Salt Creek**

Upon more detailed inspection of the jurisdictional boundaries and data sources used in the 2009 Preliminary JD, it was observed that the results of a field mapping exercise conducted by Dudek and Associates in 2006 had not been incorporated into the results, and that older boundaries, mapped by URS Corporation in 2004, had been used instead. Although the difference between these data sources is not great, the 2004 boundaries have been replaced with 2006 boundaries where applicable, to ensure that the JD contains the most current information available. Incorporating this change yielded an increase of 21.9 acres of waters of the United States, including 10.4 acres of wetlands (in addition to the 15.5 acres of Santa Clara River wetlands identified above).

In addition to the mapping revisions identified above, the GIS database for the project has also been updated to include some tributary confluence areas that were properly identified as waters of the United States on the graphics in the 2009 Preliminary JD, but were inadvertently excluded from the database. Addition of these areas to the GIS database yielded an additional 1.8 acres of non-wetland waters of the United States along the Santa Clara River mainstem.

Incorporation of the revisions described above yielded an updated total of 660.1 acres of waters of the United States within the site, of which 276.9 acres are jurisdictional wetlands. Updated acreages of jurisdictional waters, including wetlands, are included on the attached preliminary JD form, and the additional wetland area is depicted graphically on the attached site map. Other information presented in the previous preliminary JD, including the overview of the RMDP project, survey methods, and general descriptions of the aquatic resources on-site, would not change as a result of these updates, and are not restated here. Revised acreages of waters of the United States within the project area, including wetlands, are presented in Table 1, below.

We look forward to continuing work with your agency on this project. Should you have any questions regarding this submittal, please contact Christopher Julian of URS Corporation at (805) 964-6010.

Sincerely,
**URS Corporation**

Christopher Julian
Project Biologist/Regulatory Specialist

**TABLE 1**
**WATERS OF THE UNITED STATES, INCLUDING WETLANDS, WITHIN THE RMDP SITE AND ENTRADA PLANNING AREA**

| Drainage | Non-wetland Waters of the United States (Acres) | Corps Adjacent Wetlands (Acres) | Total Waters of the United States (Acres) |
|---|---|---|---|
| Santa Clara River | 212.5 | 258.8 | 471.2 |
| Salt Creek | 79.7 | 8.7 | 88.5 |
| Potrero Canyon | 31.4 | 7.3 | 38.7 |
| San Martinez Grande Canyon | 2.55 | 0.00 | 2.55 |
| Chiquito Canyon | 12.21 | 0.00 | 12.21 |
| Long Canyon | 5.70 | 0.00 | 5.70 |
| Lion Canyon | 6.86 | 0.00 | 6.86 |
| Minor Ephemeral Drainages within RMDP Study Area | 32.25 | 0.00 | 32.25 |
| Spring Complex | 0.00 | 2.13 | 2.13 |
| **Subtotal RMDP Site** | **383.2** | **276.9** | **660.1** |
| Entrada Unnamed Drainages | 2.4 | **0.55** | 2.95 |
| **Subtotal Entrada Planning Area** | **2.4** | **0.55** | **2.95** |
| **Grand Total** | **385.6** | **277.5** | **663.1** |

## List of Attachments

Attachment A Preliminary Jurisdictional Determination Form
Attachment B Map of Waters of the United States within the Project Site

cc: Matt Carpenter, Newhall Land and Farming Company

# *PRELIMINARY JURISDICTIONAL DETERMINATION FORM*

**This preliminary JD finds that there *"may be"* waters of the United States on the subject project site, and identifies all aquatic features on the site that could be affected by the proposed activity, based on the following information:**

District Office: Los Angeles | File/ORM #: 2003-01264-AOA | PJD Date: May 6, 2010

State: CA | City/County: Los Angeles County

Nearest Waterbody: Santa Clara River

Location: TRS, LatLong or UTM: Approximate site center at 347752.848962, 3807607.71454 (UTM NAD 83, Meters).

Name/ Address of Person Requesting PJD:
Mr. Matt Carpenter
Newhall Land and Farming Company
25124 Springfield Court, 3rd Floor
Valencia, California 91355-1088

Identify (Estimate) Amount of Waters in the Review Area:

Non-Wetland Waters: ~220k linear ft | var. width | 660.1 acres | Stream Flow: N/A

Wetlands: 276.1 acre(s) | Cowardin Class: Palustrine, scrub-shrub

Name of Any Water Bodies on the Site Identified as Section 10 Waters: Tidal: None | Non-Tidal: None

☑ Office (Desk) Determination
☑ Field Determination: Date of Field Trip: Several, see reports.

**SUPPORTING DATA: Data reviewed for preliminary JD (check all that apply - checked items should be included in case file and, where checked and requested, appropriately reference sources below)**:

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- ☑ Data sheets prepared/submitted by or on behalf of the applicant/consultant.
  - ☐ Office concurs with data sheets/delineation report.
  - ☐ Office does not concur with data sheets/delineation report.
- ☐ Data sheets prepared by the Corps
- ☐ Corps navigable waters' study:
- ☐ U.S. Geological Survey Hydrologic Atlas:
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- ☐ National wetlands inventory map(s). Cite name:
- ☐ State/Local wetland inventory map(s):
- ☐ FEMA/FIRM maps:
- ☑ 100-year Floodplain Elevation is: 865 ft. amsl
- ☑ Photographs: ☑ Aerial (Name & Date): Robert J. Lung & Associates 2006, Psomas 2008
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Signature and Date of Regulatory Project Manager (REQUIRED)

Signature and Date of Person Requesting Preliminary JD (REQUIRED, unless obtaining the signature is impracticable)

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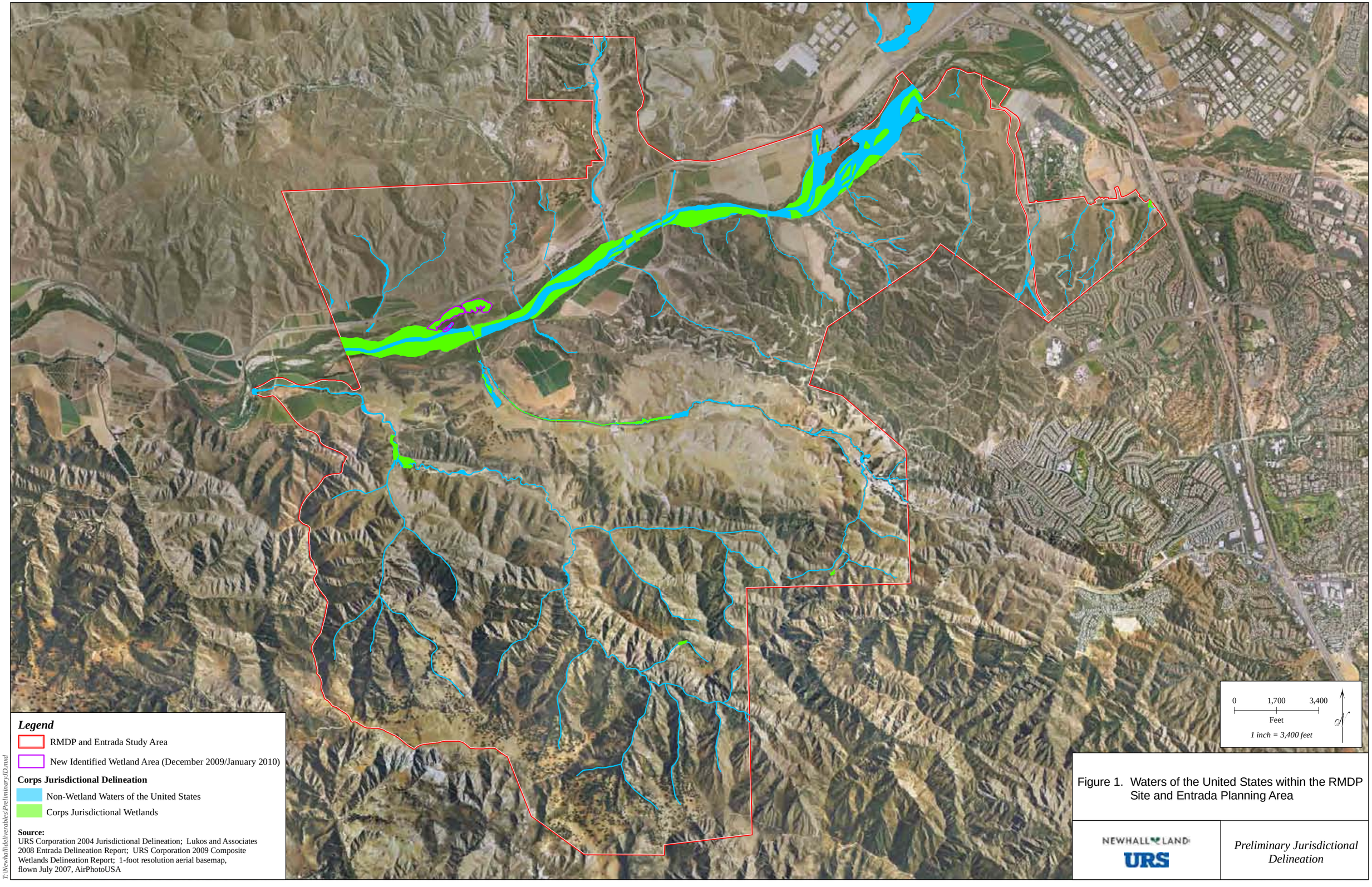


Figure 1. Waters of the United States within the RMDP Site and Entrada Planning Area

NEWHALL LAND

URS

*Preliminary Jurisdictional Delineation*

# United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ventura Fish and Wildlife Office
2493 Portola Road, Suite B
Ventura, California 93003

IN REPLY REFER TO:
81440-2009-F-0197

June 7, 2011

Aaron O. Allen, Chief
Regulatory Division
U.S. Army Corps of Engineers
2151 Alessandro Drive, Suite 110
Ventura, California 93001

Subject: Biological Opinion for the Newhall Ranch Resource Management and Development Plan, Santa Clarita, Los Angeles County, California (File Number 2003-01264-AOA) (8-8-09-F-44)

Dear Dr. Allen:

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion on the U.S. Army Corps of Engineers' (Corps) proposed authorization of Newhall Land and Farming (Newhall) to permanently impact approximately 92.3 acres of Waters of the U.S. for the construction of roads, flood control structures, and associated infrastructure for the Newhall Ranch Resource Management and Development Plan (RMDP) in the Santa Clara River and several other tributaries near Santa Clarita, Los Angeles County. At issue are the effects of this action on the federally endangered least Bell's vireo (*Vireo bellii pusillus*) and its critical habitat, southwestern willow flycatcher (*Empidonax traillii extimus*), California condor (*Gymnogyps californianus*), arroyo toad (*Anaxyrus californicus*) and its critical habitat, and unarmored threespine stickleback (*Gasterosteus aculeatus williamsoni*), and the federally threatened coastal California gnatcatcher (*Polioptila californica californica*), in accordance with section 7 of the Endangered Species Act of 1973, as amended (Act) (16 U.S.C. 1531 *et seq.*). Your June 10, 2009, request for the initiation of formal consultation was received on June 11, 2009.

You have determined that the California red-legged frog may be adversely affected as a result of habitat loss and RMDP activities. No documented occurrences of California red-legged frog have been recorded within the RMDP area, despite numerous surveys for special status aquatic species conducted during a period of time from 1999 to 2010. Given the intensity of the aquatic survey efforts for the proposed project, California red-legged frog would likely have been detected if they occurred within the RMDP area. Lastly, because of the overwhelming presence of non-native species (e.g., African clawed frogs (*Xenopus laevis*), bullfrogs (*Rana catesbeiana*), bass species, etc.) within the action area, we believe the California red-legged frog to be

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precluded from the site due to predation. Consequently, we believe the proposed RMDP activities would not adversely affect the California red-legged frog and it will not be discussed further in this document.

This biological opinion is based on information that accompanied your request for consultation, including the biological assessment (URS 2010), Newhall Ranch Resource Management and Development Plan and Spineflower Conservation Plan, Final Joint Environmental Impact Statement and Environmental Impact Report (Corps and California Department of Fish and Game (CDFG) 2010) and information in our files. A complete record of this consultation can be made available at the Ventura Fish and Wildlife Office.

CONSULTATION HISTORY

On October 13, 2009, the Service proposed critical habitat for the arroyo toad (74 Federal Register (FR) 52612). Proposed RMDP activities located within the Santa Clara River fall within what was proposed critical habitat Unit 6 for the arroyo toad. During a meeting on November 6, 2009, with Mark Subbotin and Matt Carpenter of Newhall Land and Farming, Chris Dellith of the Service recommended that because the critical habitat could become final during the proposed RMDP activities, the Corps should request a conference opinion regarding the project effects on the proposed critical habitat for the arroyo toad. We received an electronic mail correspondence (e-mail) of your request for a conference opinion on November 10, 2009.

Subsequently, due to the complexity of this consultation and the time it took to complete, the critical habitat designation became final on February 9, 2011 (76 Federal Register (FR) 7246). We incorporated the revised final critical habitat for the arroyo toad into this document and have made it a biological opinion rather than a conference opinion. This obviates the need to convert any conference opinion into a biological opinion.

## BIOLOGICAL OPINION

The Corps' request for consultation indicates that the projected buildout of the RMDP requiring a permit from them will take 25 years. The Corps' permit and its discretionary authority will be in effect for those 25 years. Consequently, the duration of this biological opinion will also be 25 years, coinciding with the date of issuance of the Corps' permit and its termination. Any take that occurs outside of the Corps' discretionary authority or beyond the duration of its permit and this biological opinion would not be exempt from the prohibitions provided for in section 9 of the Act. In the absence of a further federal nexus, the applicant should apply for an incidental take permit pursuant to section 10(a)(1)(B) of the Act for take that is not exempted from the section 9 prohibitions, especially at the end of the 25-year period.

## DESCRIPTION OF THE PROPOSED ACTION

The Corps proposes to issue a long-term Individual Permit under Section 404 of the Clean Water Act authorizing those components of the RMDP that would require the placement of fill material within waters of the U.S. The activities to be authorized by the Corps include: temporary haul routes; nature viewing platforms; wastewater reclamation plant outfall; storm drain outlets; modified tributary drainages; bank stabilization; grade control structures; bridges and road crossings; engineered natural channels; trail crossings and building pads; debris and detention basins; and powerlines, towers, and utility crossings.

The RMDP is a comprehensive plan of development and conservation in an area located in northern Los Angeles and eastern Ventura counties. The RMDP area encompasses approximately 13,651 acres and includes the Newhall Ranch Specific Plan (Specific Plan). The Specific Plan was approved by the County of Los Angeles on March 27, 2003, and establishes the general plan and zoning designations necessary to develop the Specific Plan area with residential, commercial, and mixed uses over the next 20 to 30 years (County of Los Angeles 2003). At build-out per the Specific Plan, the proposed Newhall Ranch development would result in approximately 2,550 acres of residential uses (9,081 single-family homes on 1,559 acres, and 11,804 multi-family homes on 991 acres), 5.5 million square feet of commercial uses on 258 acres; and the development of approximately 643 acres devoted to public facilities such as community parks, neighborhood parks, golf course, community lake, new elementary, junior high and high schools, library, electrical substation, fire stations, and a 6.8 million gallon per day water reclamation plant. Open space would be provided on approximately 8,683 acres within the Specific Plan area, and an additional 1,517 acres of open space in the Salt Creek area adjacent to the Specific Plan area for a total of approximately 10,200 acres of open space within the RMDP. The open space would also include land dedicated to the preservation of the state-listed endangered San Fernando Valley spineflower (*Chorizanthe parryi var. fernandina*).

### Newhall Ranch Resource Management and Development Plan Components

*Bridges and Road-Crossing Culverts*

Two river bridges and three tributary bridges, and 13 new road-crossing culverts would be installed to serve the Specific Plan development, and to accommodate future traffic associated with development of the Specific Plan and the region. Two bridges, Long Canyon Road Bridge and Commerce Center Drive Bridge[1], would be installed over the main stem of the Santa Clara River. Three bridges would cross tributary drainages (one each at Chiquito, San Martinez Grande, and Potrero drainages). The bridges are proposed to be constructed of conventional concrete girders placed over concrete-filled piers. Twelve of the 13 new road-crossing culverts

[1] The Commerce Center Drive bridge was addressed in previous consultations with the Corps (1-8-98-F/C-61 and 1-8-02-F-4R). We are addressing it in this biological opinion because sufficient time has passed and the final arroyo toad critical habitat designation warrants reinitiation of consultation for this feature as part of the larger RMDP project. The findings of this biological opinion supersede those made in the previous consultations for the Commerce Center Drive bridge within the RMDP area.

would cross five tributaries to the Santa Clara River. A thirteenth road-crossing culvert would cross Ayers Canyon, near Potrero Mesa. The road crossings are proposed to be constructed of earthen fill and pre-fabricated arched culverts.

*Bank Stabilization*
Bank stabilization would be installed along portions of the Santa Clara River and its tributary drainages within the RMDP area. Bank stabilization would include buried soil cement, grouted and ungrouted rock riprap, turf reinforcement mats, and limited gunite slope lining in and around bridge abutments and other areas where other methods are not technically feasible. Approximately 105,207 linear feet of buried bank stabilization would be placed along the River Corridor and tributaries within the Specific Plan portion of the RMDP area. Raising of the ground surface for building pads would occur in areas along the Santa Clara River and major tributary drainages to protect land uses from flooding.

*Drainage Facilities*
Drainage facilities would be installed and include open and closed drainage systems, inlets, outlets, bank stabilization, and National Pollutant Discharge Elimination System (NPDES) water quality basins. The proposed drainage structures focus on minimizing the amount of debris that would enter the drainage system, and maintaining the quality of water within the system.

*Water Quality Control Facilities*
Pursuant to NPDES requirements, Best Management Practices (BMPs) would be implemented, including the following water quality control facilities: 1) water quality basins; 2) debris basins, located just upstream of the interface between developed and undeveloped areas, primarily to trap debris coming from the upper watersheds (Debris Retaining Inlets [DRI]); 3) detention basins, which are typically sized to capture the predicted runoff volume and retain the water volume for a period of time (usually 24 to 48 hours); 4) catch basin inserts or screens/filters installed in existing or new storm drains to capture pollutants in the stormwater runoff; 5) bioretention, such as vegetated, grassy swales, that provide water quality benefits and convey stormwater runoff; and 6) solids separator units or in-line structures that reduce or manipulate runoff velocities such that particulate matter falls out of suspension and settles in a collection chamber.

*Tributary Drainages*
Modified Tributary Drainages – Existing Channels Stabilized. Some of the existing major tributary drainages within the RMDP area (e.g., Chiquito Canyon and San Martinez Grande Canyon and portions of Lion, Long and Potrero canyons) would remain intact, but would sustain permanent and temporary impacts from construction of stabilization elements, including buried bank stabilization and grade stabilization structures. Areas subject to temporary impacts would be appropriately planted with native vegetation following construction activities.

Modified Tributary Drainages – Regraded Channels. Portions of some existing drainages in the RMDP area (e.g., portions of Long, Lion, and Potrero canyons), would be graded, and a new

drainage would be constructed in the same or similar location. The new drainages would be designed to incorporate buried bank stabilization and grade stabilization, and would have sufficient hydrologic capacity to pass the Los Angeles County Capital Flood without the need for clearing vegetation from the channels. The new channel banks would be appropriately planted with native vegetation following construction.

Unmodified (Preserved) Drainages. Among the minor tributary drainages within the RMDP area, some are located in areas where no impacts are proposed, and are distant enough from surrounding development that bank stabilization or any routine maintenance would not be required. These drainages would remain in their existing condition; although portions of these drainages may be suitable for restoration where channel morphology and habitat have been degraded, the RMDP does not propose to impact or enhance these drainages at this time. In most situations, unmodified drainages would be located within future open space areas and maintain their current hydrologic functions, as well as providing linkages for wildlife movement to and from the Santa Clara River.

Drainages Converted to Buried Storm Drains. Some of the drainages within the RMDP area, including many of the smallest, ephemeral streams, would be graded. Development flows in these drainages meet the Los Angeles County flood criteria (less than 2,000 cubic feet per second (cfs)) to be conveyed by storm drain. Because of the small, ephemeral nature of these drainages, under the RMDP, Newhall does not propose to create new drainage channels to replace these impacted drainages. Rather, these areas would be graded with the development activities and new buried storm drain systems would be installed pursuant to the development plans. Wet-weather flows from these areas occupy the drainages that would be routed into the development's storm drain system, and would be discharged to the Santa Clara River via the proposed storm drain outlets and BMPs, as applicable.

Grade Stabilization Structures. Grade stabilization structures would be installed on five existing tributaries (Chiquito Canyon, Long Canyon, Potrero Canyon, San Martinez Grande Canyon, and Lion Canyon) to the main stem of the Santa Clara River. The grade stabilization structures are designed to contain the hydraulic "jump" that occurs when there is a significant drop in streambed elevation, so that higher velocities are dissipated within the area. The structures would help control erosion and changes to channel morphology. Such structures would be constructed of soil cement, sheet piles, or reinforced concrete.

Utility Corridors. Various electrical, sewer, water, gas, and communications lines would be installed parallel to the right-of-way of SR-126 to bring utilities to various planning areas and the WRP. These utilities would require some bank stabilization along the Santa Clara River and cross various drainages (Castaic Creek, Chiquito Canyon, San Martinez Grande, and other minor drainages) either buried beneath the creekbed, suspended from bridges, or located in the road bed at culverted crossings.

Utility Crossings. Various electrical, sewer, water, gas, and communications lines would be installed across the Santa Clara River, Chiquito Canyon, San Martinez Grande Canyon, Potrero Canyon, and Long Canyon to serve the Specific Plan. Typically, the utility lines would be installed in rights-of-way adjacent to bridges where access for installation and maintenance can be easily accommodated. Smaller utility lines serving local planning areas may cross beneath the bed of stabilized, regraded, or preserved channels and drainages.

Temporary Haul Routes for Grading Equipment. Temporary haul routes across the Santa Clara River would be used during construction to move equipment and excavated soil to locations in the RMDP area where fill is needed.

Wastewater Reclamation Outfall Construction Activities. An effluent outfall pipeline would be constructed from the Newhall Ranch WRP through the bank stabilization to the bed of the Santa Clara River. An earthen channel and adjacent walkway also would be constructed to reach the confluence of the outfall and actual flow path of the River.

Roadway Improvements to SR – 126. Various roadway improvements to SR-126 would made within the vicinity of the RMDP area, including new bridges or culvert crossings and outlets at Castaic Creek, Chiquito Canyon, San Martinez Canyon, and other minor drainages.

Roadway Improvements to Magic Mountain Parkway. To realize the Specific Plan approved traffic circulation plan, Magic Mountain Parkway would be widened and extended from its current limits into Newhall Ranch.

Maintenance Activities. The Los Angeles County Department of Public Works (DPW) or other management entity would conduct regular and ongoing maintenance of flood, drainage, and water quality protection facilities in the RMDP area. Such activities would include periodic inspection of structures and monitoring of vegetation growth and sediment buildup to ensure that the integrity of the structures is maintained and that planned conveyance capacity is present. Maintenance may also include repairs and maintenance of bridges and bank stabilization, repair to buried, suspended, and overhead utilities, and/or emergency maintenance activities. The RMDP Maintenance Manual in Appendix A of the RMDP, incorporated here by reference, specifies the anticipated maintenance practices and restrictions for each facility type described above and includes general restrictions for all maintenance (Dudek 2010).

Recreation Facilities. The Specific Plan Master Trails Plan describes a comprehensive system of bicycle, pedestrian, and equestrian trails. Implementation of the RMDP would include construction of these features, including several new trail bridges at various large and small tributaries and construction of up to eight nature viewing platforms that would be located in or adjacent to jurisdictional areas along the Santa Clara River.

Geotechnical Investigations. Geotechnical investigations may occur throughout the RMDP area. Equipment would access investigation sites along a 10- to 20-foot-wide access route and would

utilize access ramps of similar width, as necessary. Investigation sites typically require a cleared area for safe access. Test Pit excavations would be up to 20 feet deep, 36 inches wide, and 200 feet long, with the excavated soils temporarily piled adjacent to the excavation and then placed back into the excavated area. Activities are generally within areas that would be impacted by future RMDP development components.

Habitat Enhancement and Restoration Activities. The RMDP incorporates a variety of design features intended to minimize impacts to riparian and upland resources along and within the Santa Clara River and its tributary drainages, including avoidance, minimization, restoration, and enhancement activities. In addition, the RMDP would include features, such as removal of grazing to enhance riparian habitat, and rehabilitating native habitat areas that have been disturbed by past activities or invaded by non-native plant species. These activities would primarily occur in the following areas: River Corridor SMA, Salt Creek Corridor, and High Country SMA. Other open space, Open Area, Manufactured Open Area, and other suitable locations may be proposed to CDFG and the Corps in the future for additional enhancement and restoration activities.

Newhall would construct most of the above facilities; however, other entities could construct some of these facilities on behalf of the applicant using the Section 404 permit issued to Newhall by the Corps. The Section 404 permit would also include routine maintenance activities to be carried out DPW (or other entities). Any party working under the Section 404 permit on behalf of Newhall would be bound by the same conditions in the Section 404 permit. Under the proposed long-term permit, subsequent maintenance or construction activities for a given portion of the RMDP area could also be transferred to another entity. Therefore, if Newhall wants to transfer construction or maintenance of flood control or other facilities within the RMDP area, Newhall and the potential transferee would be required to submit a joint written notice to the Corps for the proposed transfer of authorization, subject to the Corps' approval.

**Santa Clara River Development Components**

Under the RMDP, Newhall proposes bank stabilization, two bridges (one previously authorized), the Newhall Ranch WRP outfall, bank stabilization along the utility corridor, temporary haul routes, water quality control facilities (including outlet structures/energy dissipaters), viewing platform locations, and habitat enhancement activities.

*Bank Stabilization – Santa Clara River*

Under the RMDP, Newhall proposes buried bank stabilization where necessary to protect against flooding and erosion pursuant to Federal Emergency Management Administration (FEMA) and Los Angeles County Department of Public Works' requirements. The bank stabilization is designed and would be constructed to retain the Santa Clara River's significant riparian habitat, and to allow the river to continue to provide flood protection pursuant to Los Angeles County standards.

Buried bank stabilization would extend along the north and south banks of the Santa Clara River. In total, the Newhall proposes installation of approximately 26,539 linear feet of bank stabilization along the north and south banks of the Santa Clara River to facilitate build-out of the Specific Plan area. Approximately 24,639 linear feet of buried bank stabilization (93 percent) would be installed in non-jurisdictional areas adjacent to the river. Such installation would result in newly created river channel and jurisdictional areas (approximately 94 acres), as well as upland habitat.

The RMDP incorporates the following types of bank stabilization: 1) buried soil cement; 2) ungrouted rock riprap; 3) gunite slope lining; and 4) turf reinforcement mats (TRMs). These types of bank stabilization can be divided into two different categories, flexible and rigid revetments. Ungrouted rock riprap and TRMs are flexible revetment systems that would be used as exposed bank stabilization in areas that do not have earthen cover and where stream velocities are low enough to ensure that the stabilization can resist erosive hydraulic forces. Generally, this would be a maximum stream velocity of 12 to 14 feet per second. Rigid revetments are able to resist much higher velocities or erosive forces; however, they do not adjust or move like flexible systems. Rigid revetments can resist velocities in excess of 20 feet per second.

Maintenance of buried soil cement and TRMs would be minimal. The use of buried soil cement, and other buried bank stabilization, eliminates the need to maintain a clear zone at base of the bank. In general, no maintenance is required unless there is evidence of bank failure, in which case temporary impacts to resources remaining on and around the failed structure may be necessary to repair the failure. Ungrouted rock riprap and gunite slope lining would require removal of trash and debris, replacement of riprap, and removal of trees and other vegetation possibly impeding access or threatening the structural integrity of the levees. If access to the bottom of the river is required, in general, the work area would be an approximately 30-foot-wide zone extending outward from the levee at the invert and 15 feet upstream and downstream on either side of the material to be removed.

These bank areas would require clear access for inspection and potential maintenance for structural repairs, graffiti removal, etc. A mow-strip area approximately 15 feet wide, parallel to the gunite lining, would be routinely cleared of woody vegetation to allow for visual inspections. Repairs may require a work area that is the same size as the original work area used for construction of the structure under repair (Matt Carpenter, Newhall, pers. comm., 2010).

*Bridges/Road Crossings – Santa Clara River*

Under the RMDP, Newhall proposes construction of two bridges across the Santa Clara River: one at Commerce Center Drive (previously authorized under Corps Permit No. 94-00504-BAH and Lake/Streambed Alteration Agreement No. 5-502-97 and identified here for information purposes only) and one at Long Canyon Road. Structural repairs may be necessary to bridge supports or bridge decks that can only be completed from within the riverbed. In addition, subsequent to major storm seasons or events, accumulated debris and vegetation may create hazardous conditions to bridge supports. This includes growth of large woody vegetation along

the length of the bridge, which may reduce the flood flow capacity during such major storm events and provide locations for debris to accumulate. Depending on scope of repairs or debris and vegetation to be removed, it may be necessary for heavy equipment to be operated within the channel. Whenever practical, repairs or maintenance to bridges would be made from the bridge deck, although if this is not practical, encroachment upstream and/or downstream of the bridge may be necessary. The maintenance work area for structural repairs would be limited to the area necessary to complete the work and for access, generally 30 feet on either side of the bridge and under the bridge itself. Access ramps, as necessary, would be located as close to the repair site as feasible, with preference given to locations with minimal mature vegetation, lacking flowing water, and requiring minimal bank disturbance.

*Temporary Haul Routes-Santa Clara River*
During construction, three temporary haul routes would cross the Santa Clara River, for moving excavated soil and to provide general construction access to locations within the RMDP area where fill is needed. The proposed crossings would be two-way with 60 feet of travel surface width. In locations where the riverbank is steep and ramping is required, fill would be placed in the River to create a safe slope ratio for passage of heavy equipment. Extra width for the side slopes of such crossings would be required. Passage of river flows would be maintained for all periods when the temporary haul routes are in use, and may include culverts or simple span bridge crossing of flowing water. Crossings may be removed as necessary to pass larger winter flows.

These temporary haul route locations would be used during construction of all four planning areas: Mission Village, Landmark Village, Homestead Village, and Potrero Village. Between periods of use, the haul routes would either: 1) revert back to general ranch use (oil and gas and agricultural); 2) be rendered inoperable by removal of portion crossing flowing water; or 3) if no longer needed for ranch operations, the approaches to the river crossings would be gated, or otherwise controlled, to prevent unauthorized access to the river corridor until such time that they are put into service for grading or permanently closed and restored to appropriate native habitats. As they are not permanent features, temporary haul routes would not require maintenance.

*Viewing Platforms-Santa Clara River*
Under the RMDP, Newhall proposes to construct five nature viewing platforms that would be located in or adjacent to jurisdictional areas along the Santa Clara River corridor. General maintenance of viewing platforms would include repair, painting, or coating of structures or trimming of native growth encroaching on the pathways.

*Wastewater Reclamation Plant Outfall-Santa Clara River*
An effluent outfall pipeline, approximately 30 inches in diameter, would be constructed from the Newhall Ranch WRP through the bank stabilization to an energy dissipater and pilot channel out to the bed of the Santa Clara River. The approved Newhall Ranch WRP is to be located on the

south side of State Route (SR)-126, adjacent to the Santa Clara River and near the Los Angeles County/Ventura County jurisdiction line.

The outfall pipe would terminate on the side of the bank stabilization, similar to a typical storm drain outfall where an energy dissipater would be located. A pilot channel and adjacent walkway would be constructed and maintained to reach the actual flow path of the River. The walkway would be used to obtain water samples, which would be required under the National Pollutant Discharge Elimination System (NPDES) permit for the Newhall Ranch WRP. The channel would be excavated with equipment and lined with concrete, gunite, turf reinforcement mat (TRM), rock, or if velocities are low enough, simply compacted soil. The channel and walkway would be maintained periodically to restore functions lost due to storm damage, vegetative growth, or soil erosion from plant discharge. Maintenance would be limited to hand cutting vegetation along the path, maintaining the outlet and energy dissipater and restoration of the functions of the pilot channel.

*Storm Drain Outlets-Santa Clara River*
Under the RMDP, Newhall proposes installation of 25 storm drain outlets along the Santa Clara River. Installation of storm drain outlets would require a 20-foot-wide excavation/construction zone. All of the storm drain outlets would eventually drain to jurisdictional areas of the Corps and CDFG. Maintenance of storm drain outlets would include clearing vegetation and removal of accumulated sediment. In situations where drain outlets are not draining sufficiently, pilot channels up to 75 feet long by 10 feet wide may be created to facilitate the conveyance of storm flows.

**Tributary Drainages**
Within the tributary drainages in the RMDP area, certain drainages would not be graded and would remain undisturbed, while other drainage areas would be graded, reconstructed to a soft-bottom drainage channel with buried bank stabilization along each side of the drainage, or converted to buried storm drain. Reconstructed drainage areas would integrate flood control and grade stabilizing measures (i.e., a combination of drop structures/grade stabilizers and bank stabilization) to maintain sediment equilibrium and protect the channel bed and banks from hydro-modification impacts. This design methodology is intended to create stable drainage channels that would support in-channel native habitats following RMDP implementation. The approach focuses on developing channel width, depth, slope, and other parameters based on the future flow and sediment regime of each drainage, using an integrated approach that predicts stable characteristics, and that uses structures and other measures only in those drainage locations where erosional forces would exceed the natural stability of the drainage channel. All such structures (bank and channel bed stabilization) are designed to mimic natural features and use a combination of structural and vegetative methods to provide drainage channels that are stable, visually aesthetic, and provide for the desired habitat (i.e., riparian, wetland, and upland) with minimal maintenance required after RMDP implementation. Road-crossing culverts and bridges would cross various drainages, but only where necessary to accommodate the approved Specific Plan circulation system. Modified drainage/jurisdiction includes stabilized and

engineered tributary drainages that are renegotiated and where new drainage/jurisdiction is being created.

*Grade Stabilizing Design Measures and Bank Stabilization*
The five modified drainages (Chiquito Canyon, Lion Canyon, Long Canyon, Potrero Canyon, and San Martinez Grande Canyon) would contain structures (bank and channel-bed stabilization) designed to mimic natural features, and use a combination of structural and vegetative methods to provide drainages that are stable, visually aesthetic, and support the desired habitat following RMDP implementation. Described below are drop structures/grade stabilizers and bank stabilization techniques that would be used in the design of the modified drainages within the RMDP boundary.

Grade Stabilization Structures. On-site soils would be combined with cement and water to form a higher strength soil-cement mixture that would mimic the appearance of soils in the drainage area. Riprap would be placed in and along the structure and downstream, and would be planted with native vegetation. Soil cement would be mixed on site, placed, compacted, finished, and cured, resulting in a durable and erosion-resistant material.

Grouted Sloping Boulder Drops. Boulders, typically with a 24-inch minimum diameter, would be placed in a step-like fashion, creating a condition similar to that in a natural riffle or small cascade. Boulders would be placed to minimize channel erosion at the downstream end of the boulder drop. Grout would be placed at the bottom one-third to one-half of the depth of the boulders to lock them together. In some cases, where the stream discharge and gradient are not excessive, grouting of the boulders would not be necessary, and non-grouted, placed boulders could be installed. Riprap would be placed along the approach, in the upper voids of the boulders, along the upper banks, and downstream of the stilling basin, and would be planted with native vegetation.

Non-grouted Boulders and Step-pools. Boulders, composed of various sizes between 24-inch and 36-inch minimum diameter, would be placed to form a step-pool complex, which would prevent excessive scour, while maintaining a functional drainage system. Boulders would be placed on the face of the step-pool structure, the crest, the lower part of the side slopes, and pool. The sub-base of the structure would be adequately designed using a mixture of compacted soil and riprap. The boulders would be individually placed and chinked to lock them together. Native plants would be established to help prevent boulders from dislodging. The non-grouted boulder step-pool would be designed for less than $Q_{cap}$ (capital flood standard) and have typical dimensions of roughly 50 feet by 50 feet. Riprap would be placed along the approach, in the upper voids of the boulders, along the upper banks, and downstream of the pool, and would also be planted with native vegetation.

Sculpted Concrete Drop Structures. Poured and shaped concrete would be molded to form an aesthetic modification to the grouted sloping boulder style drop structure. Design of these drop structures would be conducted individually but similarly to the grouted sloping boulder drop

design. The finished product would be analogous to a natural streambed in a bedrock-dominated system, with alternating fast, narrow segments and broader, deeper pools. Construction typically would be conducted with a single monolithic full-depth pour or using a two-pour system over steel reinforcement, then contoured and textured to finish. Planting wells would be considered to help revegetate and conceal the structure.

Grade control and drop-pool structures are designed to be primarily self-cleaning with limited need for sediment removal or vegetation control. In the event vegetative growth threatens the integrity of the crest, chute, or splash pool, such vegetation may be hand-cut and removed. Sediment is to be removed when sedimentation occurs to the point that the structure does not function or causes nuisance conditions. These features would likely be within reasonable distance of a service road, therefore, access would be limited to short-distance travel over open scrub habitat. General vegetation clearing would not be required within the banks of the tributaries. Invasive species may require control. Clearing of excess sedimentation to enable proper flow characteristics, or to abate nuisance ponding conditions, may be required.

*Bridges/Culvert Road Crossings—Tributaries/SR-126*
In addition to the proposed and previously approved bridges over the Santa Clara River, the RMDP addresses three proposed widened bridges/culvert road crossings at SR-126. There are two proposed widened bridges at SR-126, the first is at Castaic Creek (six lanes expanded to eight) and the second is at San Martinez Grande Canyon (four lanes expanded to six). There is also one proposed culvert extension at SR-126 and Chiquito Canyon (four lanes expanded to six) (depending on Caltrans final design decision on the SR-126/Chiquito Canyon interchange, the culvert depicted may in actuality include three independent bridge decks and a separate trail bridge). The proposed widened bridges/culvert road crossings are part of the Caltrans widening project for SR-126, and they are proposed by Caltrans to accommodate increased traffic flow along SR-126.

A previously approved project processed by the applicant allowed for expansion of the SR-126/Castaic Creek Bridge from four to six lanes, which widened the bridge by an additional 50 feet. The proposed RMDP would widen this previously approved bridge from six to eight lanes. An additional 50 feet of width, plus a separate 10-foot-wide pedestrian/bike lane, would be located on the south side of the bridge, with utility crossings located on both the north and south sides of the bridge in a 100-foot-wide disturbance zone.

Structural repairs may be necessary to bridge supports or bridge decks that can only be completed from within the riverbed. In addition, subsequent to major storm seasons or events, accumulated debris and vegetation may create hazardous conditions to bridge supports. This includes growth of large woody vegetation along the length of the bridge, which may reduce the flood flow capacity during such major storm events and provide locations for debris to accumulate. Depending on scope of repairs or debris and vegetation to be removed, it may be necessary for heavy equipment to be operated within the channel. Whenever practical, repairs or maintenance to bridges would be made from the bridge deck, although if this is not practical,

encroachment upstream and/or downstream of the bridge may be necessary. The maintenance work area for structural repairs would be limited to the area necessary to complete the work and for access, generally 30 feet on either side of the bridge and under the bridge itself. Access ramps, as necessary, would be located as close to the repair site as feasible, with preference given to locations with minimal mature vegetation, lacking flowing water, and requiring minimal bank disturbance.

*Magic Mountain Parkway Extension*
The approved Specific Plan includes an extension of Magic Mountain Parkway to the west into the RMDP area. The purpose of this roadway extension is to accommodate future traffic associated with the continued development of the approved Specific Plan and surrounding region. This roadway extension would extend existing culvert road crossings at Unnamed Canyon 1 and Unnamed Canyon 2 over drainages, both tributaries of the Santa Clara River. Construction of this road results in a permanent impact to the drainages for extending existing culverts and construction of debris retaining inlets.

Temporary impacts would include areas necessary for construction of the debris retaining inlets. Following completion of construction activities, the temporary impact zone would be restored to the original channel grade and revegetated with native riparian and upland species as appropriate.

**Utility Crossings**
Primary electrical, sewer, water, gas, and communications lines would be installed across the Santa Clara River at two locations, Chiquito Canyon, and San Martinez Canyon to serve the approved Specific Plan (County of Los Angeles 2003). Other locally serving utilities would be installed across other tributaries and drainages described in the RMDP.

On the River, utility lines would be installed in rights-of-way adjacent to, within, or hanging from bridges where access for installation and repair could be readily accommodated. To the extent feasible, utility lines would be located within the elevated bridge deck. Depending on the timing of bridge construction and subsequent installation of utilities, access to the riverbed and/or creekbed may be necessary to facilitate placement or hanging of pipes and conduits. Access activities would result in temporary impacts to riverbed vegetation. For installation of buried utilities, directional drilling techniques would be used, where feasible, to avoid the environmental impacts associated with trenching across the Santa Clara River. In the Chiquito Canyon and San Martinez Grande Canyon tributaries, where trenching is likely to be used, installation of buried lines would require a 30- to 50-foot-wide construction zone. In other tributaries and drainages, trenching is also likely to be used with similar construction zones. Buried lines across watercourses would be located below scour depth and weighted or cemented in place, where appropriate, or collocated with bed stabilization features that provide scour protection. Following completion of construction activities, the temporary impact zone would be restored to the original channel grade and revegetated with native riparian and upland species, as appropriate. Permanent access for maintenance of utilities would be located outside the Corps and CDFG jurisdictional limits of the streambed and associated wetlands.

**Water Quality Treatment Basins and Debris Basins**
Under the RMDP, Newhall proposes to implement a sub-regional stormwater mitigation plan to address the Specific Plan's construction, municipal, and industrial stormwater discharges under the NPDES program. This program requires that all flood control facilities comply with the General Permit for Los Angeles County or conditions placed upon individual NPDES permits. As build-out of the Specific Plan occurs, individual tract maps would comply with those NPDES requirements in effect at the time the proposed water quality features are designed. The drainage concept for the Specific Plan was developed to respond to the NPDES program. Project-specific drainage concept reports are to be prepared with each tract map. The drainage plans would include implementation of BMPs to document compliance with the Los Angeles County Standard Urban Stormwater Mitigation Plan (SUSMP) requirements.

Each of these water quality control facilities requires maintenance, and may or may not be located within the Corps' and CDFG's jurisdictional areas. Because of their function as water conveyance from development areas, unwanted vegetation may develop, reducing the conveyance capacity for certain features. The RMDP Maintenance Manual in Appendix A of the RMDP, incorporated here by reference, specifies the anticipated maintenance practices and restrictions for each facility type and includes general restrictions for all maintenance (Dudek 2010). In general, each facility type would require periodic removal of vegetation, sediment, and debris; although some facility types would require planting and maintenance of specific plant species to maintain function. Access ramps to the facilities would be maintained clear to allow access. Respecting the fact that natural habitats may form in these man-made features, the maintenance practices and mitigation measures are to be implemented in these types of facilities regardless of Corps and CDFG jurisdictional location to avoid and/or minimize effects on species.

Under the RMDP, Newhall proposes NPDES water quality treatment/detention basins throughout the RMDP area. Water quality treatment/detention basins are typically sized to capture the predicted runoff (first flush) volume and retain the design volume for a period typically between 24 and 48 hours. Detention basins would be designed with multiple stages to provide both flood control and water quality benefits. The upper stage is designed to store a large volume of runoff to reduce flood peaks. The lower, smaller volume stage provides slower drainage times (longer detention) to promote water quality by settling of particulates and removal of nutrients, heavy metals, and other pollutants potentially present in the sediment.

*Debris Basins*
Throughout the RMDP area, various open channel, buried storm drain, and natural drainage areas would be fed by overland flow from the upstream watersheds. These systems eventually drain into the Santa Clara River. To ensure the proper function of the engineered portions of the storm drainage system, in certain areas debris retaining inlets are proposed at the interface between development and undeveloped areas upstream. The precise locations of the basins and access to the basins would be defined by subsequent tract maps that implement the Specific Plan.

**Geotechnical Investigations**
Geotechnical investigations are conducted to give a better understanding of subsurface geologic and hydrogeologic conditions to engineers, planners, and reviewing agencies when determining design feasibility of flood protection structures. On occasion they are also used to determine the depth of alluvial deposits that may coincide with jurisdictional areas. Investigations, and associated access into jurisdictional areas if necessary, would occur in advance of development mass grading. The activities are typical of short duration, 1 to 3 days, and may be extended based on the complexity of the site and investigative methods.

Investigation activities have similar impacts as typical construction activities, primarily related to creating access areas, although on a much reduced scale. Equipment used during these activities may include drill rigs, van-truck mounted drill rigs (CPT), backhoes and excavators (for digging test pits), dozers and rubber tire loaders (to dig trenches), and various support vehicles (pickups, tool-trucks). Equipment would access investigation sites along a 10- to 20-foot-wide access route, avoiding species and habitats to the extent possible. Where necessary, an access ramp would be cut into the river or creek bank to reach the lower terrace and bed locations. At the completion of activities, the bank would be returned to its original configuration. Vegetation in the access route and at the drill site would be cut a few inches above the ground surface to allow for re-vegetation. At a drilling site, an area 20 feet by 50 feet would be cleared of vegetation for personnel and fire safety.

At test pit excavations, a trench up to 20 feet deep, 36 inches wide, and 200 feet long may be opened, with the excavated soils temporarily piled adjacent to the excavation. At completion of the trench, it would be backfilled and stabilized with native vegetation. Trench excavations may be much wider and longer than test pits and generally are deeper, possibly involving dozers.

**Maintenance Activities**
DPW, or other responsible management entity, would maintain flood, drainage, and water quality protection facilities located within the RMDP area. In general, maintenance activities would involve the periodic inspection of the structures to ensure that the structures are intact, and to monitor any flow capacity restrictions due to vegetation growth and sediment buildup at or near the structures. Maintenance activities would be initiated if the integrity of the structures is compromised or if conveyance capacity is inadequate.

In addition, DPW, or other responsible management entity, would conduct regular maintenance to ensure that all flood control structures operate at their design standards. For example, DPW requires that open channels, closed conduits, bridges, dams, and debris basins (not under State of California jurisdiction, i.e., dam safety) accommodate flows resulting from a Capital Flood. Other facilities in developed areas must be designed to accommodate the "Urban Flood," which is the amount of runoff resulting from a 25-year frequency storm falling on a saturated watershed. In the RMDP area, maintenance may include activities such as:

- Periodic removal of woody vegetation from riprap to protect its structural integrity;
- Periodic clearing of storm drain outlets to ensure proper drainage;
- Periodic removal of ponded water that causes odor and/or mosquito problems;
- As-needed repairs and routine maintenance of bridges, decks, piers, abutments, and associated facilities (e.g., utilities, clearing of trapped debris and vegetation);
- As-needed repairs of bank stabilization;
- As-needed vegetation, debris, and sediment deposit removal at detention and debris basins;
- Periodic inspection, vegetation removal, and repair to creek-bed stabilization structures;
- Periodic vegetation removal and sediment removal at road-crossing culverts;
- Vegetation control and repair to viewing platforms and trails (including associated fencing);
- Exotic and invasive plant and animal species control efforts; and
- Emergency repair activities.

Routine maintenance of drainage facilities may require the use of a backhoe, excavator, loader or other similar construction equipment to excavate accumulated sediment and other debris and hand tools for cutting of vegetation. The excavated soil material would be placed into off- and/or on-highway trucks for removal from the site and transportation to an approved reuse or disposal site. To the extent feasible, cut native materials would be mulched and beneficially reused on or off site, and any invasive species would be directed to proper disposal. Maintenance activities in the RMDP area could be conducted by any responsible management entity pursuant to the RMDP agency permits and agreements.

The RMDP Maintenance Manual for use within the RMDP area and incorporated here by reference, identifies the extent and frequency of various maintenance activities that may occur on site and describes standard mitigation, monitoring, notification, and reporting conditions applicable to all types of maintenance activities (Dudek 2010).

*Environmental Protection During DPW Maintenance Activities*
Appendix A of the RMDP (the Maintenance Manual), incorporated here by reference, describes minor and major maintenance procedures designed to avoid impacts to endangered species and minimize impacts to other riparian resources (see Sections 2.1 and 2.2 of the manual) (Dudek 2010). Some of the design features that accomplish this are:

- The use of buried soil cement, and other buried bank stabilization, which eliminates the need to clear a zone at the base of the riverbank or creek-bank where buried bank stabilization is located;

- Grade control and drop structures designed to be primarily self-cleaning with limited need for sediment removal or vegetation control; and

- Allowing large trees to grow in the upland or transitional habitat zones (typically consisting of upland scrub and grassland mitigation areas constructed along the margins of stream courses), at or near buried soil cement and other bank stabilization.

Specific procedures to limit the impact of maintenance activities, incorporated here by reference, are detailed in the RMDP Maintenance Manual (Dudek 2010). Procedures relating to access, work-zone restrictions, and monitoring outline the avoidance of riparian vegetation and streams, the passive restoration of areas temporarily disturbed, the installation of silt-settling basins for the maintenance activities, the location of staging and storing areas outside the streambed, and other actions.

Procedures relating to avoidance and mitigation of impacts of maintenance on sensitive species of fish and amphibians include surveys for sensitive species prior to initiation of maintenance activities, the removal and relocation of sensitive species by a qualified biologist, and various measures relating to the diversion of stream flow in the event that maintenance work in the stream is unavoidable. A qualified biologist would be present when any stream diversion takes place. Procedures relating to avoiding or mitigating impacts of maintenance on sensitive bird species include weekly surveys for nesting native birds, the postponement of maintenance activities within 300 feet of active nests (500 feet for raptors), and specific procedures to avoid impacts to special-status species using upland habitats.

Procedures relating to the avoidance and mitigation of impacts of maintenance on sensitive mammal and reptile species outline the species surveyed for prior to maintenance activities, based on the habitat types in which these activities would take place. Maintenance activities within the RMDP area would be conducted in adherence to the procedures identified in the RMDP maintenance manual, incorporated here by reference (Dudek 2010).

*Agency Notification of DPW Maintenance Activities*
The owner/operator or DPW would notify the Corps, CDFG, Los Angeles Regional Water Quality Control Board (Board), and Service at least 30 calendar days in advance of any planned maintenance activities. The Corps and CDFG would respond within the 30 day period, either notifying DPW that: 1) the maintenance activities can proceed as planned because they are consistent with the RMDP, EIS/EIR, and conditions of the agency Permits, or 2) the activities cannot proceed as planned. In the latter circumstance, the agencies would provide written reason for denial and suggest how the notification may be revised or corrected. The agencies would also make staff available to discuss inconsistencies or problems. The agencies have the discretion to add conditions to the authorization for any maintenance activities if needed to ensure compliance with applicable state and federal laws, regulations, and codes. Results of any surveys and relocation efforts for aquatic, reptile, and mammalian species would be provided to CDFG in the Annual Mitigation Status Report.

*Catastrophic Failures*
Events related to full or partial failure of a structure would require, in some instances, immediate response and repair, sometimes during storm flow conditions. In the event of a catastrophic failure the following responses may occur:

- Emergency work would follow the notification procedures of the agency permits;
- Significant damage may require reconstruction or repair to creek bank stabilization (soil cement, gunite, grouted and ungrouted riprap, and other erosion control systems);
- Significant erosion may require filling and regrading the damaged areas;
- Geotechnical instrument installation and monitoring may be required to investigate and control unstable subsurface geologic conditions;
- If a Geological Hazard Abatement District (GHAD) is created, it would have a site specific monitoring program, including specific activities to be conducted to ensure safe geologic conditions within the RMDP area;
- Major landslides may require filling, regrading, stabilization, and significant debris removal from the tributaries and other stormwater control system features;
- Open space maintenance may be required after a significant flooding or fire event to protect property and human health;
- Revegetation efforts may be implemented for public safety, restoration, or aesthetic reasons;
- Slope stabilization beyond what was initially installed may be required, and if impacts to jurisdictional areas are to occur above what was originally described in the sub-notification, then a new sub-notification shall be filed;
- Sub-drain outfall maintenance may require that new sub-drains be excavated and installed, and existing sub-drains be exposed and repaired to alleviate unstable subsurface conditions related to excessive pore pressure; and
- Concrete V-ditches may need to be replaced when damaged. V-ditches are likely to be outside of jurisdictional areas, but in some cases may be integral to the jurisdictional feature, functioning as low flow or nuisance water management systems to alleviate surface soil saturation issues or to minimize vegetative growth where it is not wanted.

**Storm Drain Outlets along SR-126**

The Specific Plan calls for improvements to several existing roadways, including SR-126, Magic Mountain Parkway, Potrero Valley Road, Commerce Center Drive, Chiquito Canyon Road, San Martinez Grande Road, and Pico Canyon Road. Several storm drain outlets would be extended as a function of the SR-126 widening and/or utility corridor construction, which would impact RMDP jurisdiction areas. A 10-foot-wide by 75-foot-long pilot channel may be graded from the end of each of the outlet riprap aprons towards the riverbed to promote positive drainage.

**Recreational Facilities**

The Specific Plan Master Trails Plan (Plan) encompasses a comprehensive system of bicycle, pedestrian, and equestrian trails that would facilitate movement throughout the RMDP area. The Plan also provides potential connections to regional trail systems within the Santa Clarita Valley. Trails are a key component of the recreation element of the approved Specific Plan and provide public access to open space within the Specific Plan area. Approximately 20 trail crossings and 8 viewing platforms are included in or adjacent to the Santa Clara River and its drainages within the RMDP area, many of them unimproved within the channel bed. The precise location of trails and proposed trail crossings would be defined by final tract maps that implement the Specific Plan. As previously discussed, trails may also include separate bridge structures adjacent to

SR-126 crossings of San Martinez Canyon, Chiquito Canyon, and Castaic Creek, as well as north-south equestrian trails at Chiquito Canyon and Castaic Creek Bridges. Other trail crossings would be seasonal (i.e., no structural stream crossing) with appropriate signage to address public safety.

Trail facilities typically require as-needed maintenance in the form of vegetation removal on and adjacent to trails and platforms, removal of debris, and resurfacing and replacement of structures (e.g., fences, signs, kiosks, wooden structures).

**Environmental Protection Design Features**
The RMDP incorporates a variety of design features that minimize impacts to riparian resources. These features include avoidance, minimization, and restoration of riparian habitat, and enhancement activities.

*Restoration Design Features*
Riparian resources along the Santa Clara River that are impacted by the RMDP would require restoration. The primary objective of restoration efforts would be to enhance habitat quality and values within the RMDP area. Habitat restoration activities that would be implemented in conjunction with the RMDP include revegetation of native plant communities on candidate sites contiguous to existing riparian habitats. Site restoration also would include the maintenance of revegetation sites, including the control of non-native plants and irrigation system maintenance. Site restoration may include the use of herbicides.

Monitoring of the restoration sites would be conducted to evaluate the success of revegetation efforts. Contingency plans and appropriate remedial measures to be implemented should habitat restoration objectives not be achieved would also be included in proposed habitat restoration plans.

Revegetation plans would be developed and submitted to Corps and CDFG in accordance with the section 404 Permit and Master Lake/Streambed Alteration Agreement. In accordance with the Corps Mitigation and Monitoring Plan, the Comprehensive Mitigation Implementation Plan (CMIP), and the mitigation feasibility study the revegetation plan would provide details on where restoration sites are located and the appropriate restoration methods to be used at each location.

*Enhancement Design Features*
Habitat enhancement associated with the RMDP includes rehabilitation of areas of native habitat that have been disturbed by past activities (e.g., grazing, roads, oil and natural gas operations, etc.), or impacted by non-native plant species such as giant reed (*Arundo donax*) and tamarisk (*Tamarix* spp.).

Not all enhancement areas would necessarily require supplemental plantings of native species. Some areas may support conditions conducive for rapid natural re-establishment of native

species. The revegetation plans may incorporate means of enhancement to areas by reconditioning compacted soils, amending poor soil fertility, removing trash or flood debris, and by removing any unneeded ranch roads as a way of increasing habitat values. Removal of non-native species such as giant reed, tamarisk, tree tobacco (*Nicotiana glauca*), and castor bean (*Ricinus communis*) to mitigate impacts would be subject to the management requirements described in the Specific Plan, Corps section 404 Permit, the CDFG Master Lake/Streambed Alteration Agreement, and the RMDP.

**Building Pads and Buried Storm Drains**

The RMDP proposes that 18 drainages within the RMDP area be graded to accommodate pads for residential and commercial buildings and that these flows be conveyed by buried storm drains varying in diameter from 30 to 144 inches. In total, approximately 60,010 linear feet of existing drainage channel would be converted to buried storm drains. Drainages converted to storm drains would occur in Homestead Canyon, Off-Haul Canyon, Chiquito Canyon (tributaries to Chiquito Canyon mainstem), Mid-Martinez Canyon, Humble Canyon (tributary to Humble Canyon mainstem), Lion Canyon (portions of the mainstem, east, and west forks), Exxon Canyon, Agricultural Ditch, Unnamed B, Unnamed C, Unnamed D, Dead-End Canyon, Magic Mountain Canyon, Middle Canyon, Long Canyon (upstream portion of the mainstem) and the upstream, intermittent portion of the Potrero Canyon. Drainages proposed for conversion to buried storm drains are described in greater detail and depicted graphically in Section 3.4.3 of the RMDP-SCP EIS/EIR, incorporated here by reference, and included as Appendix A of the biological assessment (URS 2010).

**Background on High Country** Special Management Area **and Salt Creek Reserve Area Dedication**

The RMDP outlines special conservation provisions for the California condor within the over 5,700-acre High Country Special Management Area (SMA) and Salt Creek open space areas (the Reserve). The Reserve would be dedicated in fee to the Newhall Ranch High Country Recreation and Conservation Authority, a joint powers authority (JPA) comprised of the County of Los Angeles, the Santa Monica Mountains Conservancy, and the City of Santa Clarita. The phasing of dedication to the JPA would take place with the issuance of the 2,000$^{th}$, 6,000$^{th}$, and 11,000$^{th}$ residential building permits during the build-out of Newhall Ranch; however, resource management within the Reserve would be initiated when the first residential building permit is issued by the County to begin construction. The resource management activities outlined in the RDMP would be funded through a non-wasting endowment by the Newhall to the Natural Lands Management Organization (NLMO) for implementation. The NLMO would appoint a Reserve Manager, who would be responsible for implementing all of the measures outlined in the RMDP. Also, the NLMO Reserve Manager would be an official member of the JPA to provide input on resource management within the Reserve. The CDFG would have input on the management of the reserve and approval over any management plans. Because the conservation goals of the CDFG are similar to those of the Service, we believe its approval of management plans would be sufficient for our purposes.

**Condor Mitigation and Management Activities**
As part of implementing the RMDP under the Newhall Ranch Specific Plan, mitigation measures to enhance the natural habitat in the Reserve (e.g. oak woodlands, savannahs, grasslands, etc.) would be undertaken to improve the overall productivity (e.g., more habitat for deer, improvements to increase populations of other native plants and wildlife, etc.). The Reserve Manager would coordinate all cattle/livestock management activities with the Service to ensure consistency with the Condor Recovery Team's ongoing condor management program. In conjunction with the Reserve Manager's coordination with the Service, the Condor Recovery Team would be provided with access to the Reserve areas to conduct scientific research and to implement necessary condor-specific management and monitoring activities to support overall condor productivity.

The Final Joint Environmental Impact Statement and Environmental Impact Report (Corps and CDFG 2010) includes mitigation measures that would reduce the RMDP's impacts on biological resources, including 80 measures previously adopted by the County of Los Angeles during the Specific Plan approval process and an additional 89 measures proposed by the Corps and CDFG. The 80 mitigation measures identified in the Newhall Ranch Specific Plan Program Environmental Impact Report for biological resources (measures SP-4.6-1 through SP-4.6-80) are included below in Appendix B of the biological assessment (URS 2010). The 89 additional mitigation measures (BIO-1 through BIO-89) developed for the Final Joint Environmental Impact Statement and Environmental Impact Report (Corps and CDFG 2010) are also included in Appendix B of the biological assessment (URS 2010). These additional measures are consistent with and supplement those mitigation measures listed in the previously certified Newhall Ranch Specific Plan Program Environmental Impact Report. The mitigation measures described in Appendix B of the RMDP biological assessment are incorporated here by reference (URS 2010).

## ANALYTICAL FRAMEWORK FOR JEOPARDY AND ADVERSE MODIFICATION DETERMINATIONS

### Jeopardy Determination

The jeopardy analysis in this biological opinion relies on four components: (1) the *Status of the Species*, which evaluates the range-wide conditions of the least Bell's vireo, southwestern willow flycatcher, California condor, coastal California gnatcatcher, arroyo toad, and unarmored threespine stickleback, the factors responsible for those conditions, and their survival and recovery needs; (2) the *Environmental Baseline*, which evaluates the conditions of the least Bell's vireo, southwestern willow flycatcher, California condor, coastal California gnatcatcher, arroyo toad, and unarmored threespine stickleback in the action area, the factors responsible for those conditions, and the relationship of the action area to the survival and recovery of these species; (3) the *Effects of the Action*, which determines the direct and indirect impacts of the proposed Federal action and the effects of any interrelated or interdependent activities on the least Bell's vireo, southwestern willow flycatcher, California condor, coastal California

gnatcatcher, arroyo toad, and unarmored threespine stickleback; and (4) the *Cumulative Effects*, which evaluates the effects of future, non-Federal activities in the action area on the least Bell's vireo, southwestern willow flycatcher, California condor, coastal California gnatcatcher, arroyo toad, and unarmored threespine stickleback,.

In accordance with policy and regulation, the jeopardy determination is made by evaluating the effects of the proposed federal action in the context of the current status of the least Bell's vireo, southwestern willow flycatcher, California condor, coastal California gnatcatcher, arroyo toad, and unarmored threespine stickleback, taking into account any cumulative effects, to determine if implementation of the proposed action is likely to cause an appreciable reduction in the likelihood of the survival and the recovery of the least Bell's vireo, southwestern willow flycatcher, California condor, coastal California gnatcatcher, arroyo toad, and unarmored threespine stickleback in the wild.

**Adverse Modification Determination**

This biological opinion does not rely on the regulatory definition of "destruction or adverse modification" of critical habitat at 50 CFR 402.02. Instead, we have relied on the statutory provisions of the Act to complete the following analysis with respect to critical habitat.

In accordance with policy and regulation, the adverse modification analysis in this biological opinion relies on four components: (1) the *Status of Critical Habitat*, which evaluates the range-wide condition of designated critical habitat for the least Bell's vireo and arroyo toad in terms of primary constituent elements (PCEs), the factors responsible for that condition, and the intended recovery function of the critical habitat overall; (2) the Environmental Baseline, which evaluates the condition of the critical habitat in the action area, the factors responsible for that condition, and the recovery role of the critical habitat in the action area; (3) the *Effects of the Action*, which determines the direct and indirect impacts of the proposed Federal action and the effects of any interrelated and interdependent activities on the PCEs and how that would influence the recovery role of the affected critical habitat units; and (4) *Cumulative Effects*, which evaluates the effects of future non-Federal activities in the action area on the PCEs and how that would influence the recovery role of affected critical habitat units.

For purposes of the adverse modification determination, the effects of the proposed federal action on the critical habitat of the least Bell's vireo and arroyo toad are evaluated in the context of the range-wide condition of the critical habitat, taking into account any cumulative effects, to determine if the critical habitat (both by unit and range-wide) would remain functional (or would retain the current ability for the PCEs to be functionally established in areas of currently unsuitable but capable habitat) to serve its intended recovery role for the least Bell's vireo and arroyo toad.

## STATUS OF THE SPECIES

### Least Bell's Vireo

The least Bell's vireo was federally listed as endangered on May 2, 1986 (51 FR 16474) and critical habitat was designated for the subspecies on February 2, 1994 (59 FR 4845). A draft recovery plan was completed in 1998 (Service 1998); no final plan has been published. The Service completed a 5-year review for the least Bell's vireo in September 2006 in which we indicated that, due to new information on the species and an improved understanding of ongoing recovery actions to reduce threats, the recovery goals and strategies should be modified and refined. In addition, we recommended that the least Bell's vireo should be downlisted from endangered status to threatened status because of a 10-fold increase in population size since its listing in 1986, expansion of locations with breeding least Bell's vireo throughout southern California, and conservation and management of suitable breeding habitat throughout its range (Service 2006). Additional information on the least Bell's vireo may be found in Wilbur (1980), Garrett and Dunn (1981), Zembal et al. (1985), Miner (1989), Pike and Hays (1992), and Service (1998).

The least Bell's vireo is a small, migratory songbird that nests and forages almost exclusively in riparian woodland habitats. The least Bell's vireo is in the family Vireonidae and is one of four subspecies of Bell's vireo (*Vireo bellii*) that have been recognized (American Ornithological Union (AOU) 1998), with each subspecies isolated from one another throughout the year (Hamilton 1962; Service 1998). They are site-tenacious across breeding seasons, highly territorial, and almost exclusively insectivorous. Least Bell's vireos are obligate riparian breeders, typically inhabiting structurally diverse woodlands along watercourses that feature dense cover within 3 to 6 feet of the ground and a dense, stratified canopy (Goldwasser 1981; Salata 1983; Gray and Greaves 1984; Service 1998). The understory within this riparian habitat is typically dominated by mulefat (*Baccharis salicifolia*), California wild rose (*Rosa californica*), poison oak (*Toxicodendron diversiloba*), sandbar willow (*Salix hindsiana*), young individuals of other willow species, and several perennial species (Service 1998). Important canopy species include mature arroyo willows (*S. lasiolepis*) and black willows (*S. gooddingii*), and occasional cottonwoods (*Populus* spp.), western sycamore (*Platanus racemosa*), or coast live oak (*Quercus agrifolia*). Least Bell's vireos primarily forage and nest in riparian habitat, but they may also use adjoining upland scrub habitat (Salata 1983; Kus and Miner 1989).

Least Bell's vireos primarily feed on invertebrates, especially lepidopteran larvae, within willow stands or associated riparian vegetation (Miner 1989; Brown 1993). Least Bell's vireos occasionally forage in nonriparian vegetation such as coastal sage scrub, chaparral, and oak woodlands, although foraging in these other habitats usually occurs within 100 feet of the edge of riparian vegetation (Salata 1983; Gray and Greaves 1984; Kus and Miner 1989). Least Bell's vireo feeding behavior largely consists of gleaning prey from leaves or woody surfaces while perched or hovering, and less frequently by capturing prey by aerial pursuit (Salata 1983; Miner 1989). Least Bell's vireos concentrate most of their foraging between 0 to 20 feet above ground level (Salata 1983; Miner 1989).

Least Bell's vireos generally arrive in southern California breeding areas by mid-March to early April, with males arriving before females and older birds arriving before first-year breeders (Service 1998). Least Bell's vireos generally remain on the breeding grounds until late September, although some post-breeding migration may begin as early as late July (Service 1998). Male least Bell's vireos establish and defend breeding territories through singing and physically chasing intruders (Barlow 1962; Beck 1996; Service 1998). Although territories typically range in size from 0.5 to 7.5 acres (Service 1998), no relationship appears to exist between territory size and various measures of territory quality (Newman 1992).

Nest building commences a few days after pair formation, with the female selecting a nest-site location and both sexes constructing the nest (Pitelka and Koestner 1942; Barlow 1962; Service 1998). Nests are typically suspended in forked branches within 3 feet above the ground with no clear preference for any particular plant species as the nest host (Nolan 1960; Barlow 1962; Gray and Greaves 1984; Service 1998). Typically 3 or 4 eggs are laid on successive days shortly after nest construction (Service 1998). The eggs are incubated by both parents for about 14 days with the young remaining in the nest for another 10 to 12 days (Pitelka and Koestner 1942; Nolan 1960; Barlow 1962). Each nest appears to be used only once with new nests constructed for each nesting attempt (Greaves 1987). Least Bell's vireos may attempt up to five nests within a breeding season, but they are typically limited to one or two successful nests within a given breeding season (Service 1998).

Multiple long-term monitoring studies indicate that approximately 59 percent of nests successfully produce fledglings, although on average only 1.8 chicks fledge per nest (Service 1998). Although least Bell's vireo nests appear to be more accessible to terrestrial predators because of their relatively low placement (Franzreb 1989), western scrub-jays (*Aphelocoma californica*) have been documented to account for the majority of documented depredation events (Peterson 2002; Peterson et al. 2004); depredation by jays and other avian predators may have selected for relatively low nest placement (Ferree 2002). Predation rates can exceed 60 percent of the least Bell's vireo nests in a given area within a year (Kus 1999), but typical nest predation rates average around 30 percent (Franzreb 1989), which is comparable to predation rates for other North American passerines (Martin and Clobert 1996; Grishaver et al. 1998; Ferree 2002).

Nest parasitism by cowbirds is another major source of failure for least Bell's vireo nests (Franzreb 1989; Service 1998; Kus 1999, 2002; Griffith and Griffith 2000; Sharp 2002); nests that are parasitized are either abandoned or fledge cowbird chicks rather than least Bell's vireos. It is believed that cowbirds did not historically occur within the least Bell's vireo's range, and therefore least Bell's vireos have not evolved adequate defenses to avoid loss of productivity due to parasitism (Franzreb 1989; Kus 2002). Parasitism of least Bell's vireo nests may exceed 42 percent in some locations (Kus 1999), but extensive cowbird trapping and focused nest monitoring can substantially reduce parasitism or its effects (Franzreb 1989; Service 1998; Griffith and Griffith 2000; Kus 2002).

Fledgling least Bell's vireos expand their dispersal distances from about 35 feet the first day to about 200 feet several weeks after fledging (Hensley 1950; Nolan 1960). This distance has been shown to increase to at least 1 mile prior to their first fall migration (Gray and Greaves 1984). Banding records indicate that while most first-year breeding least Bell's vireos return to their natal drainage after winter migration, some disperse considerable distances to other breeding locations (Greaves and Labinger 1997; Service 1998; Kus and Beck 1998). Movement by least Bell's vireos between drainages within San Diego County is not uncommon (Kus and Beck 1998). Additionally, several least Bell's vireos banded as nestlings in San Diego County have been resighted as breeding adults in Ventura County, and the opposite movement from Ventura to San Diego has also been observed (Greaves and Labinger 1997). The maximum dispersal distance currently documented is approximately 130 miles (Service 1998), but this is probably an underestimate due to the limited number of least Bell's vireos that are banded and insufficient re-sighting efforts. Although movement between sites by older birds may occur, site fidelity by least Bell's vireos after the first breeding season is generally high, and most dispersal between sites occurs between the time that least Bell's vireos fledge from their nest and their first breeding season (Service 1998).

The least Bell's vireo historically occupied willow riparian habitats from Tehama County, in northern California, southward to northwestern Baja California, Mexico, and as far east as Owens Valley, Death Valley, and the Mojave River (Grinnell and Miller 1944; Service 1998). Although originally considered to be abundant locally, regional declines of this subspecies were noticeable by the 1940s (Grinnell and Miller 1944), and the least Bell's vireo was believed to have been extirpated from California's Central Valley by the early 1980s (Franzreb 1989). Except for a few outlying pairs, the least Bell's vireo is currently restricted to southern California south of the Tehachapi Mountains and northwestern Baja California (Wilbur 1980; Garrett and Dunn 1981; Franzreb 1989; U.S. Geological Survey (USGS) 2002). The largest current concentrations of least Bell's vireos are in San Diego County along the Santa Margarita River on Camp Pendleton and in Riverside County at the Prado flood control basin (Service 2006).

Historically, the San Joaquin and Sacramento Valleys were considered to be the center of the least Bell's vireo's breeding range (60 to 80 percent of the historic population; 51 FR 16474), but the least Bell's vireo has not yet meaningfully re-colonized those areas. In 2005 and 2006, the first breeding pair of least Bell's vireos detected in the San Joaquin Valley since the listing of the this species successfully bred at the San Joaquin National Wildlife Refuge in Stanislaus County (Service 2006). There have been no sightings of least Bell's vireos in the Sacramento Valley since prior to the listing, and it is unlikely that any breeding least Bell's vireos have occurred within recent years in the Sacramento Valley (Service 2006).

Greater than 99 percent of the remaining least Bell's vireos were concentrated in southern California (Santa Barbara County and southward) at the time of the listing in 1986 (51 FR 16474), with San Diego County containing 77 percent of the population. Greater than 99 percent still remain in southern California, although the populations are now more evenly distributed in southern California with 54 percent of the total population occurring in San Diego County and

30 percent of the population occurring in Riverside County (Service 2006); however, there has been only a slight shift northward in the species' overall distribution. Thus, despite a significant increase in overall population numbers, the population remains restricted to the southern portion of its historic range (Service 2006).

Causes for decline of the least Bell's vireo included destruction or degradation of habitat, river channelization, water diversions, lowered water tables, gravel mining, agricultural development, and cowbird parasitism (Service 1986, 1994, 1998). Habitat losses had fragmented most remaining populations into small, disjunct, widely dispersed subpopulations (Franzreb 1989). Habitat fragmentation negatively affects abundance and distribution of neotropical migratory songbirds, in part by increasing incidence of nest predation and parasitism (Whitcomb et al. 1981; Small and Hunter 1988; Yahner and DeLong 1992; Sharp 2002; Peterson 2002). Least Bell's vireos nesting in areas containing a high proportion of degraded habitat have lower productivity (e.g., hatching success) than those in areas of high quality riparian woodland (Pike and Hays 1992).

The least Bell's vireo population in the U.S. has increased 10-fold since its listing in 1986, from 291 to 2,968 known territories (Service 2006). The population has grown during each 5-year period since the original listing, although the rate of increase has slowed over the last 10 years. Population growth has been greatest in San Diego County and Riverside County, with lesser but significant increases in Orange County, Ventura County, San Bernardino County, and Los Angeles County. The population in Santa Barbara County has declined since the listing in 1986, although it is uncertain whether this population was historically significant. Kern, Monterey, San Benito, and Stanislaus counties have had a few isolated individuals and/or breeding pairs since the original listing, but these counties have not supported any sustained populations (Service 2006).

At the time of the listing, loss of habitat due to agricultural practices, urbanization, and exotic plant invasion was identified as a major threat to least Bell's vireo populations. Since the listing of the least Bell's vireo, destruction and modification of riparian habitat within its current range has been curtailed significantly, primarily as a consequence of protections provided by the original listing in 1986 (51 FR 16474), the subsequent designation of critical habitat in 1994 (59 FR 4845), and other Federal and State regulatory processes. Other efforts not driven by regulatory processes have also promoted increased conservation and restoration of riparian habitat since the listing of the least Bell's vireo in 1986 (Service 2006).

Agriculture and grazing continue to threaten riparian habitat within the larger historic range, particularly the Salinas, San Joaquin, and Sacramento valleys (Service 1998). Urbanization appears to have displaced former agriculture and grazing operations in many areas within southern California, thereby indirectly reducing riparian habitat degradation caused by these activities. On the other hand, occupied least Bell's vireo habitat that is adjacent to highly urbanized areas or within major river systems continues to be impacted by flood control and

water impoundment projects and may be subject to ongoing and future habitat loss or degradation (Service 2006).

Several large, regional Habitat Conservation Plans in southern California have addressed the effects of urban development on this species. These plans are expected to provide long-term protection of core occurrences of least Bell's vireos in western Riverside, Orange, and San Diego counties. Compliance-driven and voluntary riparian restoration activities throughout the historic range may have contributed to an increase in riparian habitat since the listing of the least Bell's vireo (Service 2006), although this cannot be established without a thorough evaluation of riparian habitat within California. Starting in 2007, the Riparian Habitat Joint Venture ("RHJV"; a cooperative association of Federal, State, and private organizations) began systematically mapping existing riparian habitat in California starting (RHJV 2006), which should provide a more objective measure of ongoing changes to riparian habitat in California.

Giant reed removal has also been initiated within several watersheds within southern California (Natural Resources Conservation Service (NRCS) 2006; Service 2006). In general, giant reed removal has been effective but will require continued annual efforts to achieve local eradications and address new invasions. Although control of giant reed has made great progress since the original listing of the least Bell's vireo, invasions by other exotic plants (e.g., Tamarix species, perennial pepperweed (*Lepidium latifolium*)) continue to degrade existing riparian habitat (Kus and Beck 1998; Hoffman and Zembal 2006).

The 1986 listing rule identified brood parasitism by cowbirds as a substantial threat to the least Bell's vireo, and it remains the most significant threat to the recovery of the least Bell's vireo (Service 2006). Cowbird trapping has proven a successful tool to halt least Bell's vireo population declines over the short term within a limited area, but Kus and Whitfield (2005) have argued that trapping may not be the best method for long-term recovery of the least Bell's vireo because maintaining cowbird populations at low levels may not allow the least Bell's vireo to evolve resistance to cowbird parasitism. The issue of cowbird trapping remains unclear as to the best way to manage this threat over the long term, and additional research is needed to determine whether there are any alternatives to the intensive cowbird trapping programs currently being implemented (Service 2006).

**Critical Habitat for the Least Bell's Vireo**

Critical habitat for the least Bell's vireo encompasses about 38,000 acres at 10 locations in Santa Barbara, Ventura, Los Angeles, San Bernardino, Riverside, and San Diego counties. Primary constituent elements that support feeding, nesting, and sheltering are essential to the conservation of the least Bell's vireo and include riparian woodland vegetation that generally contains both canopy and shrub layers and some associated upland habitats (59 FR 4845). The 1994 critical habitat rule for least Bell's vireo states that the goal of the designation is the conservation of known populations of least Bell's vireo. This was to be accomplished through designation of critical habitat encompassing approximately 75 percent of the nesting least Bell's vireo locations

known at the time of listing, and the review of impacts to critical habitat through the section 7 process.

**Draft Recovery Plan for the Least Bell's vireo**
The 1998 draft recovery plan for the least Bell's vireo states that the goal of recovery efforts is the reclassification of the subspecies from endangered to threatened and, ultimately, delisting of the subspecies. The draft plan states that reclassification to threatened status may be considered when there are stable or increasing population/metapopulations of least Bell's vireos for a period of 5 consecutive years, each consisting of several hundred or more breeding pairs at the following sites: Tijuana River, Dalzura/Jamul Creek/Otay River, Sweetwater River, San Diego River, San Luis Rey River, Camp Pendleton/Santa Margarita River, Santa Ana River, an Orange County/Los Angeles County metapopulation, Santa River, Santa Ynez River, and an Anza Borrego Desert metapopulation. The draft plan states that each of these populations and metapopulations should be protected and managed.

The draft plan states that delisting of the least Bell's vireo may be considered when the subspecies meets the criterion for downlisting and there are stable or increasing least Bell's vireo population/metapopulations for a period of 5 consecutive years established at the following currently unoccupied areas of the species' historical range: Salinas River, a San Joaquin Valley metapopulation, and a Sacramento Valley metapopulation. The draft plan states that each of these populations and metapopulations should be protected and managed.

Lastly, the draft plan states that threats to the least Bell's vireo at the aforementioned sites should be reduced or eliminated so that these populations/metapopulations are capable of persisting without significant human intervention, or perpetual endowments are secured for cowbird trapping and exotic plant control in riparian habitat occupied by the least Bell's vireos.

The draft recovery plan describes a strategy for reclassification, recovery, and delisting. Instrumental to this strategy is securing and managing riparian habitat within the historical breeding range of the least Bell's vireo, annual monitoring and rangewide surveys, and research activities necessary to monitor and guide the recovery effort.

**Relationship of Recovery Units, Critical Habitat Units, and Other Conservation Measures**
The 10 least Bell's vireo critical habitat units have defined boundaries and cover specific areas that overlap with 10 of the 14 population/metapopulation (recovery) units identified in the draft recovery plan. Table 1 depicts the relationship among the 14 recovery units and the critical habitat units for least Bell's vireo.

Table 1.

| Recovery Units | Critical Habitat Units | County | Size of Critical Habitat Unit (acres)[1] |
|---|---|---|---|
| Tijuana River | Tijuana River | San Diego | 880 |
| Dulzura Creek/Jamul Creek/Otay River | Jamul-Dulzura Creeks | San Diego | 642 |
| Sweetwater River | Sweetwater River | San Diego | 771 |
| San Diego River | San Diego River | San Diego | 929 |
| San Luis Rey River | San Luis Rey River | San Diego | 7,286 |
| Camp Pendleton/Santa Margarita River | Santa Margarita River | San Diego | 2,278 |
| Santa Ana River | Santa Ana River | San Bernardino and Riverside | 9,900 |
| An Orange County/Los Angeles County metapopulation | ---------- | ---------- | |
| Santa Clara River | Santa Clara River | Los Angeles and Ventura | 4,411 |
| Santa Ynez River | Santa Ynez River | Santa Barbara | 9,247 |
| Anza Borrego Desert metapopulation | Coyote Creek | San Diego | 630 |
| Salinas Valley | ---------- | ---------- | |
| A San Joaquin Valley metapopulation | ---------- | ---------- | |
| A Sacramento Valley metapopulation. | ---------- | ---------- | |
| Total | | | 36,974 |

[1] Values in table do not sum to the 38,000 acres estimated in the critical habitat designation, but are based on the critical habitat GIS coverage created by the Service for the units identified in the critical habitat designation.

The draft recovery plan also describes other conservation efforts for the least Bell's vireo (Service 1998). The Santa Clara River Enhancement and Management Plan is a joint effort of the Service, the State Coastal Conservancy, and Ventura and Los Angeles counties to develop a long-range conservation plan for the Santa Clara River that includes recovery actions for the least Bell's vireo. Other conservation efforts include brown-head cowbird control programs being funded by the Service, Caltrans, the Corps, the International Boundary and Water Commission, and the Marine Corps Base, Camp Pendleton. Nest monitoring and research is also being conducted in conjunction with the cowbird controls, which is important for evaluating the effectiveness of cowbird trapping and removal and providing guidance for their improvement. Nest monitoring also provides valuable long-term reproductive data and facilitates banding of juveniles and adults for ongoing studies of demography, dispersal, and wintering site selection. Finally, habitat creation and restoration efforts implemented to offset loss and degradation of riparian efforts are being undertaken and monitored.

**Southwestern Willow Flycatcher**

The southwestern willow flycatcher was federally listed as endangered on February 27, 1995 (60 FR 10694) and critical habitat was designated for the subspecies on October 19, 2005 (70 FR 60886). Critical habitat in California is designated in Kern, Santa Barbara, San Bernardino, and San Diego counties; critical habitat is not designated in the action area and it will not be discussed further in this biological opinion. The final recovery plan for the subspecies was completed in August 2002 (Service 2002). The action area is located within the Coastal

California Recovery Unit of the final recovery plan, and establishment of new territories is part of the recovery criteria for the subspecies. Within the Santa Clara River, the reach from Bouquet Canyon Road to the Pacific Ocean, which crosses through the action area, has been identified in the recovery plan as a Management Unit where recovery actions should be focused (Service 2002).

The southwestern willow flycatcher breeds in southern California (north to the Santa Ynez River, Kern River, and Independence on the Owens River), southern Nevada, southern Utah, Arizona, New Mexico, and extreme western Texas. All subspecies of the willow flycatcher are completely migratory. The species as a whole winters from southern Mexico south through Central America to Panama and western Venezuela. Subspecies *extimus* has been collected in winter in Guatemala, El Salvador, Honduras, and Costa Rica (Unitt 1987).

Unitt (1987) concluded that the southwestern willow flycatcher was once fairly common in the Los Angeles Basin, where habitat is virtually absent now. Approximately 616 acres of riparian habitat has regenerated along the South Fork Kern River since the early 1980s, but fluctuations in number of territories in this area has made it difficult to determine a trend in the population for this area (Whitfield et al. 1999). Downstream from the South Fork Kern River, willow flycatchers (unknown subspecies) were common breeders in the early 1900s, but today virtually no riparian habitat remains. Outside of the Kern River, southwestern willow flycatcher populations are present along the Owens, San Luis Rey, and Santa Margarita (Camp Pendleton) Rivers. Changes in land use along the San Luis Rey River have improved habitat quality and extent, which has resulted in an increase in the number of territorial southwestern willow flycatcher males from 12 in the late 1980s (Unitt 1987) to more than 40 in 1999 (Kus et al. 1999). In contrast, the populations on Camp Pendleton have remained fairly constant for the past two decades despite apparently suitable habitat to support population expansion. The remaining southwestern willow flycatcher populations in southern California, most of which number fewer than five territories, occur at scattered sites along drainages that have changed little in the past 15 years.

The southwestern willow flycatcher breeds only in riparian woodland, typically adjacent to or over water. Surface water or saturated soil is usually present in or adjacent to nesting sites during at least the initial portion of the nesting period (Muiznieks et al. 1994, Tibbits et al. 1994). Riparian woodland used by willow flycatchers typically has a canopy and an understory of shrubs or saplings. Native willows dominate the habitat commonly represented in current and historical records.

Southwestern willow flycatchers do nest in some riparian habitats containing and even dominated by tamarisk (McKernan and Braden 1999, Paradzick et al. 2000). In terms of southwestern willow flycatcher productivity, the suitability of tamarisk dominated habitats is not known. Southwestern willow flycatcher productivity in some sites dominated by non-native vegetation is lower than in some native-dominated habitats (Sferra et al. 1997, Sogge et al. 1997). The reverse is also true, however, within some tamarisk-dominated habitats where

southwestern willow flycatcher productivity is similar or higher than nearby native-dominated sites (McKernan and Braden 1999, Paradzick et al. 1999).

The southwestern willow flycatcher is a diurnal insectivore, catching its prey on the wing usually in the middle story of riparian woodland. Males maintain and advertise a territory by singing to attract females. There is little information on the factors a southwestern willow flycatcher female uses to select a mate, though it may be related to some factor of habitat quality or potential quality of the male (Service 2002). Territorial defense begins immediately after spring arrival. Females occasionally sing, apparently when stimulated by territorial disputes (Sogge et al. 1997). Male southwestern willow flycatchers sing most persistently early in the breeding season, but song rate declines as the season progresses, particularly once the male finds a mate and nesting efforts begin (Finch et al. 2000). Their response to taped playback of songs during surveys has also been known to decrease as the nesting season progresses. Mapped breeding territory sizes are 0.15 to 0.5 acre on the Colorado River (Sogge et al. 1997), 0.5 to 1.25 acres along the Verde River, Arizona (Sogge 1995), and 0.35 to 5.7 acres along the Kern River, California (Whitfield and Enos 1996).

Nests are initiated usually within one week of pair formation, 10 to 14 days after spring arrival. Building nests takes 3 to 8 days. In historical egg collections from southern California, 86 percent of nests were in *Salix* spp. (willow), 4 percent in *Urtica dioica* (stinging nettles), and 10 percent in other plants (Unitt 1987). Females typically lay one egg per day, until the nest contains three to four eggs. Incubation begins after the last egg is laid, and lasts 12 to 13 days (Service 2002). For the southwestern willow flycatcher, incubation generally lasts 12 to 15 days from the date that the last egg was laid. During incubation, females spend approximately 50 percent of the day attending (incubating or shading) the eggs and incubate throughout the night. Incubation and shading bouts can last from less than 1 to more than 60 minutes (Finch et al. 2000).

Southwestern willow flycatcher young usually leave the nest 12 to 15 days after hatching. During the brooding period, the young are cared for by both the male and female. Feeding trips during the peak of this period can reach 30 trips per hour during days 5 to 10 (Finch et al. 2000). Fledglings stay close to the nest and each other for 3 to 5 days, and may repeatedly return to and leave the nest during this period (Spencer et al. 1996).

Southwestern willow flycatchers typically arrive on breeding grounds from late April to early June (Maynard 1995, Skaggs 1996, Sferra et al. 1997). Evidence gathered during multi-year studies of color-banded populations show that although most southwestern willow flycatchers return to former breeding areas, they regularly move among sites within and between years (Netter et al. 1998). From 1997 to 2000, 66 to 78 percent of southwestern willow flycatchers returned to the same breeding site (Luff et al. 2000). Within drainage movements are more common than between drainage movements.

The decline of the southwestern willow flycatcher is attributed to numerous factors, including nest depredation and brood parasitism by the brown-headed cowbird. However, large scale loss of southwestern wetlands, particularly cottonwood-willow riparian habitat, is the principal reason for the southwestern willow flycatcher's current status. Habitat loss is a result of urban and agricultural development, water diversion and impoundment, livestock grazing, and hydrological changes attributable to these and other land uses (60 FR 10694). In some cases, willow flycatchers are faced with situations that force movement, such as when catastrophic habitat loss occurs from fire or flood. Several such cases have been documented, with some of the resident willow flycatchers moving to remaining habitat within the breeding site, some moving to other sites 1.2 to 16.8 miles away (Paxton et al. 1997, Owen and Sogge 1997), and others disappearing without being seen again. For a discussion on the status of riparian habitat, see the status of the least Bell's vireo above.

**Recovery Plan for the Southwestern Willow Flycatcher**
The 2002 final recovery plan for the southwestern willow flycatcher states that the goal of recovery efforts is the reclassification of the subspecies from endangered to threatened and, ultimately, delisting of the subspecies. The plan states that reclassification to threatened status may be considered when either of the following criteria have been met:

Criterion A: Increase the total known population to a minimum of 1,950 territories (equating to approximately 3,900 individuals), geographically distributed to allow proper functioning as metapopulations, so that the southwestern willow flycatcher is no longer in danger of extinction. For reclassification to threatened status, these prescribed numbers and distributions must be reached as minimum, and maintained over a 5 year period.

Criterion B: Increase the total known populations to a minimum of 1,500 territories (equating to approximately 3,000 individuals), geographically distributed among Management Units and Recovery Units, so that the southwestern willow flycatcher is no longer in danger of extinction. Recovery Units are large watershed or hydrologic areas, while Management Units are a subset of the Recovery units and encompass local drainages and distinct geographic features. For reclassification to threatened status, these prescribed numbers and distributions must be reached as a minimum, and maintained over a 3 year period, and the habitats supporting this subspecies must be protected from threats and loss.

The plan states that the southwestern willow flycatcher may be removed from the list of threatened and endangered species when both of the following criteria have been met:

Criterion 1: Meet and maintain, at a minimum, the population levels and geographic distribution specified under reclassification to threatened Criterion A.

Criterion 2: Provide protection from threats and create/secure sufficient habitat to assure maintenance of these populations and/or habitat over time. The sites containing southwestern willow flycatcher breeding groups, in sufficient number and distribution to warrant downlisting,

must be protected into foreseeable future through development and implementation of conservation management agreements (e.g., public land management planning process for Federal lands, habitat conservation plans (under Section 10 of the Act), conservation easements, and land acquisition agreements for private lands, and intergovernmental conservation agreements with Tribes). Prior to delisting, the Service must confirm that the agreements have been created and executed in such a way as to achieve their role in southwestern willow flycatcher recovery, and individual agreements for all areas within all Management Units (public, private, and Tribal) that are critical to metapopulation stability (including suitable, unoccupied habitat) must have demonstrated their effectiveness for a period of at least 5 years.

The recovery plan categorizes recovery actions into nine types: (1) increase and improve occupied, suitable, and potential breeding habitat; (2) increase metapopulation stability; (3) improve demographic parameters; (4) minimize threats to wintering and migration habitat; (5) survey and monitor; (6) conduct research; (7) provide public education and outreach; (8) assure implementation of laws, policies, and agreements that benefit the southwestern willow flycatcher; and (9) track recovery progress.

**California Condor**

The California condor was listed as endangered on March 11, 1967 (32 FR 4001), and state listed as endangered on June 27, 1971. Critical habitat for the California condor was designated 9 years later on September 24, 1976 (41 FR 187), and consists of nine critical habitat units scattered throughout the California condor range in California totaling approximately 570,400 acres. The RMDP area is not within any of the designated critical habitat units; therefore, critical habitat will not be discussed further in this biological opinion, An experimental population listed as threatened under section 10(j) of the Act was introduced in Arizona in 1996. The California condor is a fully protected species under California law (see California Fish and Game Code, Section 5515 (b)(9)).

The California condor is a member of the family Cathartidae or New World vultures, a family of seven species, including the closely related Andean condor (*Vultur gryphus*) and the sympatric turkey vulture (*Cathartes aura*). Although the family has traditionally been placed in the Order Falconiformes, most contemporary taxonomists believe that New World vultures are more closely related to storks (Ligon 1967, Rea 1983, Sibley and Ahlquist 1990). California condors are among the largest flying birds in the world. Adults weigh approximately 17 to 22 pounds and have a wing span up to 9.5 feet. They are generally black, with prominent white underwing linings, with naked skin on the head and neck that ranges from gray to shades of yellow, red, and orange. Males and females cannot be distinguished by size or plumage characteristics.

California condors nest in various types of rock formations including crevices, overhung ledges, and potholes, and, more rarely, in cavities in giant sequoia trees (*Sequoiadendron giganteum giganteus*) (Snyder et al. 1986) and giant coast redwoods (*Sequoia sempervirens*) with cavities or broken out tops. California condor nest sites share the following characteristics: nest cavity ceiling height of at least 15 inches at the egg position; fairly level floors with some loose surface

substrate; unobstructed area around the nest for incubating adults; and short distance to an accessible landing point (Snyder et al. 1986).

All but one of the nest sites used between 1979 to 1986 were in a narrow belt of chaparral and coniferous forested mountains from central Santa Barbara County across northern and central Ventura County to northwestern Los Angeles County. The sites were located within a total area approximately 56 miles from west to east and only about 15 miles from north to south. The only nest outside this area was located in a giant sequoia in Tulare County in 1984. In 2006, released condors in the Big Sur area used a cavity in a giant coastal redwood, and since that time three additional nests have been located in cavities in coastal redwoods.

All recent California condor nest sites have been located on public lands within the Los Padres, Angeles, and Sequoia National Forests.

California condors are opportunistic scavengers, feeding only on the carcasses of dead animals. Typical foraging behavior includes long-distance reconnaissance flights, lengthy circling flights over a carcass, and occasionally hours of waiting at a roost or on the ground near a carcass. Prior to the arrival of Europeans, California condor food items within interior California probably included mule deer (*Odocoileus hemionus*), tule elk (*Cervus elaphus nannoides*), pronghorn antelope (*Antilocapra americana*), and smaller mammals. Along the Pacific shore the diet of the California condor has included whales, sea lions, and other marine species (Koford 1953, Emslie 1987, Service 1996). Koford (1953) estimated that 95 percent of the California condor diet after the arrival of European settlers consisted of cattle, domestic sheep, ground squirrels (*Spermophilus beecheyi*), mule deer, and horses.

Most California condor foraging occurs in open terrain of foothill grassland and oak savannah habitats because that is where the preferred food items may be located. While it has often been portrayed that California condors need wide open spaces in which to feed, they have been observed feeding under vegetation, including canyon bottoms where open areas for take-off and landing are easily accessible. The principal foraging regions used by California condors from the late 1970s to 1987 were the foothills bordering the southern San Joaquin Valley and axillary valleys in San Luis Obispo, Santa Barbara, Kern, and Tulare counties. After 1982, most observations of feeding by the small remaining wild population of California condors occurred in the Elkhorn Hills-Cuyama Valley-Carrizo Plain complex, and in the foothills of the southern San Joaquin Valley, extending north into Tulare County (Meretsky and Snyder 1992). The majority of important foraging areas were on private cattle-grazing lands.

Currently free-ranging California condors forage throughout the birds' present range, which extends from San Benito and Monterey counties in the north, south through Santa Barbara, Ventura, Kern, and Los Angeles counties, feeding naturally on cattle, sheep, pigs, and deer. Supplemental feeding is provided in specific locations to help facilitate the transition of newly released birds from captivity to the wild, to reduce the potential for birds coming into contact

with contaminated food in the form of lead bullet fragments, and to bait birds into trapping sites for lead testing and health checks.

Depending upon weather conditions and the hunger of the bird, a California condor may spend most of its time perched at a roost. California condors often use traditional roosting sites near important foraging grounds (Service 1996). Although California condors usually remain at roosts until mid-morning, and generally return in mid- to late afternoon, it is not unusual for a bird to stay perched throughout the day. While at a roost, California condors devote considerable time to preening and other maintenance activities. Roosting sites and nesting sites are susceptible to similar disturbance threats, and their preservation requires isolation from human intrusion. Cliffs and tall conifers, including snags, are generally utilized as roost sites in nesting areas. Although most roost sites are near nesting or foraging areas, scattered roost sites are located throughout the range.

California condors use topography and associated thermal weather patterns for flight. This is best illustrated by observations indicating that almost all flights by California condors, whether covering long distances or not, followed routes over the foothills and mountains bordering the southern San Joaquin Valley. Rarely do California condors pass directly over the flat, highly agricultural floor of the San Joaquin Valley and no California condors have ever been witnessed actually crossing over this Valley. Where flat, agricultural regions are much less extensive, such as the Cuyama Valley in Santa Barbara and San Luis Obispo counties, California, this species freely passed high above en route to foraging grounds. California condors are highly dependent on topography, which dictates prevailing wind patterns (Service 1996). The species is totally dependent on favorable wind conditions to move throughout its range, and long periods of inclement weather will keep birds immobile.

As mentioned above, climatic conditions change throughout the year across the landscape in southern California. Because the California condor is totally dependent on wind conditions for survival, favorable wind conditions that allow the bird to forage for food over a broad area are necessary. When wind conditions may not be favorable elsewhere, in the foothills of the San Joaquin Valley for example, they may be favorable over the Santa Susana Mountains. Therefore, California condor movements are, in part, dictated by favorable wind patterns.

During the Pleistocene era (10,000 to 100,000 years ago) the California condor ranged from British Columbia, Canada, to Baja California, Mexico, and through the southwest to Florida and north to New York State (one record). With the extinction of the large Pleistocene Era mammals, condors declined in range and numbers. Another large decline occurred when European settlers arrived on the West Coast, and accelerated during the gold rush of 1849. Condors were wantonly shot and poisoned, and eggs and adults were collected. By 1940, the condors' range was reduced to a horseshoe-shaped area in southern California that included the coastal mountain ranges of San Luis Obispo, Santa Barbara and Ventura counties; a portion of the Transverse Range in Kern and Los Angeles counties; and the Southern Sierras in Tulare County.

The California condor remains one of the world's rarest and most imperiled vertebrate species. The California condor declined over the past century to such a low level that only 22 individuals existed in 1982. The last free-flying California condors were captured by 1987 and brought into a captive breeding program.

The central purposes of the Endangered Species Act for the California condor, as for any listed species, are to provide for the survival and recovery of the condor in the wild and to conserve the ecosystem on which the condor depends. The most important recovery milestone for the California condor is to have wild adults fledging chicks into the wild. Recovery of the condor cannot rely upon captive-rearing because the goal is to have self-sustaining populations in the wild. Following several years of increasingly successful captive breeding, captive-produced California condors were first released back to the wild in southern California in early 1992. Additional releases have been made in the Ventana Wilderness area along California's central coast, Pinnacles National Monument, and in Baja California, Mexico. Under section 10(j) of the Act, an experimental population was also begun with releases in Arizona in 1996.

As of October 6, 2010, 100 California condors were free-flying in California, 20 in Baja California, and 75 in Arizona and Utah, with 26 awaiting release for all sites. Another 160 are in captivity. The first nesting activity by California condors released back into the wild occurred in 2001 in Lion Canyon above the Cuyama Valley in the Sierra Madre Mountains. Although this nesting attempt was ultimately unsuccessful, it marked the beginning of an increasingly successful pattern of reproduction in the wild by California condors (California condors also attempted to nest in Arizona in 2001). In 2002, three condor chicks were produced in the wild in California by re-introduced birds. Unfortunately, these three chicks perished prior to fledging. Two died due to ingestion of foreign materials (e.g., glass, bottle caps, etc.); the cause of death of the other chick is unknown, but the ingestion of foreign material cannot be ruled out. Another chick was produced in the wild in California in 2003, but again died before fledging due to the ingestion of foreign objects. Three chicks were produced in the wild in California in 2004. One died partly due to the ingestion of foreign objects, one was taken into captivity for rehabilitation after it broke a wing (and was released in the fall of 2007), and the third fledged successfully. Nesting activity has also been occurring in the Arizona population. The first California condor chick to successfully fledge in the wild since the 1980s occurred in the Grand Canyon in 2003. Eight chicks have survived to fledging since 2003 in Arizona.

In California, two chicks were produced in 2005. One was taken captive after it was revealed that the bird contained a large amount of micro-trash in its digestive tract and exhibited retarded feather growth (this bird was subsequently released into the wild in the fall of 2007), and the second chick died of a combination of West Nile Virus and micro-trash impaction. Additionally, a third egg was laid in the wild but was destroyed by predators before hatching. In 2006 four pairs attempted to breed. One chick fledged successfully, but only after being removed from the nest, flown to Los Angeles Zoo for emergency surgery to remove trash from an impacted ventriculus, and returned to the nest the following day. One chick died of unknown causes, and two eggs were lost during incubation to unknown causes. In 2007, field biologists set a goal for

100 percent fledging success in California, putting all available resources into the effort. Six pairs of condors produced eggs in 2007. Every nest was monitored intensively, and nest visits were made to each nest once a month during the nestling stage to monitor the health of the chick, inoculate chicks against West Nile Virus, and remove micro-trash from nests. Fertility of eggs was also checked. Two nests that contained infertile eggs were given fertile eggs from the captive breeding program so all pairs would have the opportunity to fledge chicks into the wild. The results for 2007 were six chicks fledged successfully. One subsequently died in the Ranch Fire of October when the fire raged through the Hopper Mountain National Wildlife Refuge and up Hopper Canyon, and one bird, in the Big Sur area, disappeared in early December. From 2008 through 2010 there have been 25 nesting attempts in California, which produced 15 chicks that have become integrated into the wild population.

Currently the most serious sources of human-related condor mortality are lead poisoning, shooting, collision with power lines, and the ingestion of small pieces of trash which, in combination with hair and other natural items, become compacted in the birds' digestive tract. In addition, two California condors have been shot and killed since 1999. One person was arrested in July 1992 for shooting at a California condor and another condor was shot and killed in Arizona in 1999. The second death, in California, occurred in 2003. This particular bird, AC-8, was the last wild female captured in 1986 and the first of the original wild birds to be released in 2000 back into the wild. She had spent 14 years in captivity as part of the captive breeding program. The bird was shot by a hunter in February 2003 (M. Hall, Refuge Manager, Hopper Mountain National Wildlife Refuge, pers. comm. 2004) on Tejon Ranch in the Tehachapi Mountains.

Post-mortem examinations performed on four wild dead California condors found between 1983 and 1986, indicated that three of the birds died from the effects of lead poisoning (Janssen et al. 1986, Wiemeyer et al. (1988) and one died of cyanide poisoning when a California condor triggered an M-44 cyanide gun set out for coyotes (Wiemeyer et al. 1988). High lead levels in the blood, resulting from the ingestion of fragments of lead bullets in shot mammal carcasses, may be a pervasive problem throughout the historical foraging range of the California condor. Wiemeyer et al. (1988) concluded that lead exposure was the major factor having an adverse impact on the wild California condor population from 1982 to 1986.

With the passage of AB 821, the Ridley-Tree Condor Preservation Act, signed by Governor Arnold Schwarzenegger in August 2007, lead ammunition was regulated within the present and historical range of the California condor. Theoretically, this should remove one of the major causes of mortality to California condors; ingestion of lead bullet fragments from large game carcasses. Additional rulings by the California Fish and Game Department expand the calibers of ammunition covered under the new regulation. Two federal installations, Fort Hunter Liggett and Camp Roberts in central California instituted non-lead ammunition hunting requirements in July of 2007, and the 275,000-acre private Tejon Ranch required non-lead ammunition in all of its hunting programs beginning on January 1, 2008.

Eleven of the California condors released since 1992 were killed in collisions with power lines. At least two deaths from collisions with manmade objects, including power lines, were known historically (Koford 1953). Condors are given power pole aversion training prior to release, which may deter birds from sitting on power poles, but it may have little effect on actual collisions with powerlines. Condors have not evolved to be looking directly ahead for small thin nearly invisible wires stretched across their flight path. Thus powerlines, particularly small distribution lines, have been a serious source of mortality for free-flying condors.

In an attempt to open up other foraging areas to the north to compensate for lost foraging habitat within the species' recent historic foraging range in the south, the Service put effort into attempting to move all California condor feeding activity 45 miles to the northwest of the Hopper Mountain National Wildlife Refuge, to Bittercreek National Wildlife Refuge. In July of 2007, all feeding sites at Hopper Mountain National Wildlife Refuge were shut down and food was only provided at the Bittercreek site. All California condors in the southern California population now must fly 45 miles from the Hopper Mountain Refuge to Bittercreek to obtain food, thus lessening their presence in the Hopper/Sespe area during the summer and fall months and opening up potential foraging areas to the north/northwest. Additional feeding sites have been established on Wind Wolves Preserve in the San Joaquin Valley foothills, west of Interstate 5, also to the north of Hopper Refuge, and within historic foraging habitat. California condors are now also taking advantage of naturally occurring food in the form of dead cattle, deer and pigs.

The major threat to condor recovery still remains lead poisoning. Collisions with powerlines and ingestion of micro-trash seem to have been significantly reduced. Other threats include the cumulative impacts of habitat loss, the continued possibilities of birds being shot, and other possible contaminants in their food supply.

**Recovery Plan for the California Condor**

The 1996 final recovery plan for the California condor states that the goal of recovery efforts is the reclassification of the species from endangered to threatened. Removing the California condor from the list of threatened and endangered species has been deferred to a future recovery plan. The recovery plan states that reclassification to threatened status may be considered when, at a minimum, there are at least two non-captive populations that do not require maintenance and one captive population. These populations (1) must each number at least 150 individuals, (2) must each contain at least 15 breeding pairs and (3) be reproductively self-sustaining and have a positive rate of population growth. In addition, the non-captive populations (4) must be spatially disjunct and non-interacting, and (5) must contain individuals descended from each of the 14 founders.

The recovery plan describes a strategy for reclassification, which includes the following actions: (1) establish a captive breeding program to preserve the gene pool; (2) reintroduce California condors to the wild; (3) minimize mortality factors in the natural environment; (4) maintain habitat for condor recovery; and (5) implement condor information and education programs.

**Arroyo Toad**

The arroyo toad was listed as endangered on December 16, 1994 (59 FR 64589). Critical habitat for the arroyo toad was designated on April 13, 2005 (70 FR 19562). The critical habitat designation did not include the action area. On July 20, 2007, the Service announced it would review the critical habitat designation after questions were raised about the integrity of scientific information used and whether the decision made was consistent with appropriate legal standards. Based on this review of the final critical habitat designation, the Service determined it was necessary to revise critical habitat. On October 13, 2009, the Service proposed revised critical habitat for the arroyo toad (74 FR 52612), and it became final on February 9, 2011 (76 FR 7246). The newly designated critical habitat includes lands within the action area. The final recovery plan for the arroyo toad was published in 1999 (Service 1999). In addition to the final recovery plan, important sources for information on the biology of the arroyo toad include: Campbell et al. (1996), Griffin and Case (2001), Griffin et al. (1998), Holland and Sisk (2001), Ramirez (2002a, 2002b, 2002c, 2003), and Sweet (1992, 1993).

The arroyo toad is a light-olive green or gray to tan, dark-spotted toad with a distinctive light-colored, V-shaped stripe across the head and the eyelids. The species is endemic to the coastal plain and mountains of central and southern California and northwestern Baja California from near sea level to about 8,000 feet in elevation. Within these areas, arroyo toads are found in both perennial and intermittent rivers and streams that have shallow, sandy to gravelly pools adjacent to sand or fine gravel terraces. Breeding habitat requirements are highly specialized; specifically, arroyo toads require shallow, slow-moving streams, and riparian habitats that are disturbed on a regular basis, primarily by flooding. High stream order (i.e., 3$^{rd}$ to 6$^{th}$ order), low elevation (particularly below 3,000 feet), and wide flood plains seem to be positively correlated with arroyo toad population size. However, small arroyo toad populations are found along 1$^{st}$ and 2$^{nd}$ order streams at elevations up to 4,200 feet in southern California. The arroyo toad evolved in a system that is inherently dynamic, with marked seasonal and annual fluctuations in rainfall and flooding.

Arroyo toad juveniles and adults use upland areas adjacent to breeding habitat for foraging and wintering. They are known to use a variety of upland habitats including, but not limited to, sycamore-cottonwood woodlands, oak woodlands, coastal sage scrub, chaparral, and grassland (Holland and Goodman 1998, Griffin and Case 2001, Holland and Sisk 2001), but grasslands are perhaps less suitable and may primarily be used to travel through (U.S. Geological Survey (USGS) 2003). Griffin *et al.* (1999) found arroyo toads spent most of their time during the breeding season within the stream channel or on adjacent sandy terraces, but they also used upland areas such as campgrounds and even agricultural fields. Additionally, they found that arroyo toads seemed to select habitat more according to vegetation structure than vegetation type; dense and tall vegetative structure was preferred least of all.

In a radio telemetry study conducted during the arroyo toad breeding season, Griffin *et al.* (1999) found that adult female arroyo toads moved up to 443 feet from water, on average, while males moved up to 302 feet from water, on average, in streams with broad, coastal floodplains. In a

study using pitfall traps, Holland and Sisk (2001) captured arroyo toads primarily within the stream channel and riparian habitats, but approximately 18 percent of the adult and subadult captures averaged across all 3 years of the study were in upland habitats (11 percent at one site and 24 percent at the other). These upland captures averaged more than 1,640 feet and 820 feet from the riparian/upland ecotone in two separate coastal streams; one arroyo toad was even captured 3,740 feet beyond the edge of the riparian habitat bordering the stream. However, radio telemetry and pitfall trap studies from a variety of inland streams often bordered by steep, dry terrain show arroyo toad activity typically closer to the active stream channel. Four separate studies of inland populations by Ramirez (2002a, 2002b, 2002c, 2003) showed that arroyo toads burrowed no farther than 121 to 1,062 feet from the edge of a stream, with an overall average of approximately 52 feet between a toad's burrow and the edge of the stream. Griffin *et al.* (1999) also found male arroyo toads no further than 75 feet, on average, from a steep-sided stream near the coast. The extent of arroyo toad movement away from the stream channel is influenced by climatic conditions, availability of surface water, floodplain width, vegetative cover, and topography (Griffin *et al.* 1999; Ramirez 2002a). Moderate, stable temperatures and high humidity facilitate longer-distance movements into upland habitats (Service 1999).

Arroyo toads typically breed sometime between March and early June, although the breeding season may occur earlier or later, depending on weather conditions, elevation, and latitude. Males may breed with several females in a season; however, female arroyo toads release their entire clutch of eggs as a single breeding effort and probably do not produce a second clutch during the mating season. Eggs are deposited and larvae (tadpoles) develop in shallow pools with minimal current, little or no emergent vegetation and sand or pea gravel substrate. Embryos usually hatch in 4 to 6 days; the larval period lasts approximately 65 to 85 days. Metamorphosis from tadpole to juvenile toad typically occurs in June or July. The juveniles remain on gravel bars bordering the stream until the pool dries up. They reach sexual maturity in 1 to 2 years, and arroyo toads may live for as few as 5 years (Sweet 1993). Much less is known about movements or behavior in the late summer and winter months.

Larvae feed by inserting their heads into the substrate and ingesting loose organic material such as detritus, interstitial algae, bacteria, and diatoms. Juveniles and adults forage for insects, especially ants and small beetles, on sandy stream terraces. Juveniles spend more time exposed on terraces during the daytime than do adults, and are thus vulnerable to diurnal predators. Once juveniles are of sufficient size to dig burrows and bury themselves in the sand, they become nocturnal. All age classes of post-metamorphic arroyo toads tend to be active on rainy nights with moderate temperatures (above 45 degrees Fahrenheit). Adults excavate shallow burrows for shelter during the day when the surface is damp or during longer intervals in the dry season.

Arroyo toads have disappeared from approximately 75 percent of the previously occupied habitat in California. Historically, they were recorded in coastal drainages in southern California from Monterey County to San Diego County and in Baja California, Mexico. Today, the species occurs in Orange and San Diego Counties, and on the desert slopes of both the San Gabriel Mountains (in Little Rock Creek in Los Angeles County) and the San Bernardino Mountains (in

the Mojave River and in its tributaries, Little Horsethief and Deep Creeks, in San Bernardino County).

Extensive habitat degradation has led to the decline and isolation of the remaining populations of arroyo toads. This habitat loss is due primarily to urbanization, agriculture, dam construction, water manipulation (e.g., diversion, drawdown, changed hydroperiod), mining, livestock grazing, and recreational activities in riparian areas. The introduction of bullfrogs and exotic fish have negatively affected arroyo toad populations due to predation. Exotic plant species degrade arroyo toad habitat, and may cause changes in the invertebrate fauna upon which the arroyo toad feeds. The spread of chytrid fungus (*Batrachochytrium dendrobatidis*) may have also played a role in the loss of some populations. Changes in hydrologic regimes and loss of overwintering habitat as streamside areas are developed are probably the most important factors in the decline of arroyo toads.

**Critical Habitat for the Arroyo Toad**
The designated critical habitat for the arroyo toad includes 98,366 acres of federal, state, local, and private land in Santa Barbara, Ventura, Los Angeles, Riverside, San Bernardino, Orange, and San Diego counties. Primary constituent elements for the arroyo toad are identified as:

1. Rivers or streams with hydrologic regimes that supply water to provide space, food, and cover needed to sustain eggs, tadpoles, metamorphosing juveniles, and adult breeding toads. Breeding pools must persist a minimum of 2 months for the completion of larval development. However, due to the dynamic nature of southern California riparian systems and flood regimes, the location of suitable breeding pools may vary from year to year. Specifically, the conditions necessary to allow for successful reproduction of arroyo toads are:
   Breeding pools that are less than 6 in. (15 cm) deep;
   Areas of flowing water with current velocities less than 1.3 ft per second (40 cm per second); and
   Surface water that lasts for a minimum of 2 months during the breeding season (a sufficient wet period in the spring months to allow arroyo toad larvae to hatch, mature, and metamorphose).
2. Riparian and adjacent upland habitats, particularly low-gradient (typically less than 6 percent) stream segments and alluvial streamside terraces with sandy or fine gravel substrates that support the formation of shallow pools and sparsely vegetated sand and gravel bars for breeding and rearing of tadpoles and juveniles; and adjacent valley bottomlands, that include areas of loose soil where toads can burrow underground, to provide foraging and living areas for juvenile and adult arroyo toads.

3. A natural flooding regime, or one sufficiently corresponding to natural, that: A) is characterized by intermittent or near-perennial flow that contributes to the persistence of shallow pools into at least mid-summer; B), maintains areas of open, sparsely vegetated, sandy stream channels and terraces by periodically scouring riparian vegetation; and C)

also modifies stream channels and terraces and redistributes sand and sediment, such that breeding pools and terrace habitats with scattered vegetation are maintained.

4. Stream channels and adjacent upland habitats that allow for movement to breeding pools, foraging areas, overwintering sites, upstream and downstream dispersal, and connectivity to areas that contain suitable habitat.

The goal of the critical habitat designation is the protection and management of breeding and non-breeding habitat on a watershed basis for the conservation of the species.

**Recovery Plan for the Arroyo Toad**

The 1999 final recovery plan for the arroyo toad states that the goal of recovery efforts is the reclassification of the species from endangered to threatened status and, ultimately, delisting of the species. The plan states that reclassification to threatened status may be considered when management plans have been approved and implemented on federally managed lands to provide for conserving, maintaining, and restoring the riparian and upland habitats used by arroyo toads for breeding, foraging, and wintering habitat. In addition, at least 20 self-sustaining metapopulations or subpopulations of arroyo toads must be maintained at the following locations (minimum number of populations for each agency and targeted river basins is indicated in parentheses): Fort Hunter Liggett Army Reserve Training Center (1: San Antonio River basin); Marine Corps Base Camp Pendleton (2: San Mateo/San Onofre Creek basins, Santa Margarita River basin); Los Padres National Forest (3: Castaic Creek basin, Los Angeles River basin [including Big Tujunga and Alder Creeks], Little Rock Creek basin); San Bernardino National Forest (1: Mojave River basin [including West Fork of the Mojave River, Little Horsethief Canyon, and Deep Creek]); Cleveland National Forest (8: San Juan Creek basin, San Mateo Creek basin, Upper Santa Margarita River basin, Sweetwater River basin, Tijuana River basin); and the Jacumba (In-Ko-Pah Mountains) Wilderness Study Area (1: Pinot Wash basin) managed by the Bureau of Land Management. Self-sustaining populations or metapopulations are those documented as having successful recruitment (i.e., inclusion of newly matured individuals into the breeding adult cohort in 7 of 10 years of average to above average rainfall amounts with normal rainfall patterns). Self-sustaining populations or metapopulations require little or no direct human assistance such as captive breeding or rearing, or translocation of arroyo toads between sites.

The plan states that delisting of the arroyo toad may be considered when genetic and phenotypic variation of the arroyo toad, throughout its range in California, is secured by maintaining 15 additional self-sustaining subpopulations or metapopulations of the arroyo toads on the coastal plain, coastal slope, desert slope, and desert lands, including known subpopulations and metapopulations outside of Federal jurisdiction in the Mojave River basin (San Bernardino County); the Whitewater River basin (Riverside County); the San Juan Creek basin (Orange and Riverside counties); Santa Margarita River basin (Sa Diego and Riverside counties); and the San Luis Rey River, San Dieguito River/Santa Ysabel Creek. San Diego River, Sweetwater, Otay River/Dulzura Creek, and Tijuana River basins (in San Diego County).

The recovery plan describes a strategy for reclassification, which includes the following actions: (1) stabilize and maintain populations throughout the range of the arroyo toad in California by protecting sufficient breeding and nonbreeding habitat; (2) monitor the status of existing populations to ensure recovery actions are successful; (3) identify and secure additional suitable arroyo toad habitat and populations; (4) conduct research to obtain data to guide management efforts and determine the best methods for reducing threats; and (5) develop and implement an outreach program.

**Relationship of Recovery Units and Critical Habitat Units**

Based in part on the recovery plan for the arroyo toad, the Service proposed revised critical habitat units throughout the range of the arroyo toad (74 FR 52612). When the critical habitat became final, some of the critical habitat areas were removed or reduced in size. The critical habitat units designated have defined boundaries and cover specific areas throughout the three recovery units identified in the recovery plan. Table 2 depicts the relationship among the three recovery units and critical habitat units throughout the range of the arroyo toad.

**Table 2.**

| Northern Recovery Unit | | | |
|---|---|---|---|
| **Unit** | **Critical Habitat Units and Subunits** | **County** | **Size of Critical Habitat Unit (acres)[1]** |
| 1 | San Antonio River - exempt | Monterey | 0 |
| 2 | Sisquoc River | Santa Barbara | 3,775 |
| 3 | Upper Santa Ynez River | Santa Barbara | 3,032 |
| 4 | Sespe Creek | Ventura | 2,760 |
| 5 | Piru Creek | Ventura | 2,507 |
| 5a | ..... | ..... | 1,358 |
| 5b | ..... | ..... | 1,149 |
| 6 | Upper Santa Clara River | Los Angeles | 2,802 |
| 6a | ..... | ..... | 520 |
| 6b | ..... | ..... | 1,003 |
| 6c | ..... | ..... | 1,279 |
| 7 | Upper Los Angeles River Basin | Los Angeles | 1,190 |
| Subtotal | | | 16,066 |

**Table 2. (continued)**

| Southern Recovery Unit | | | |
|---|---|---|---|
| Unit | Critical Habitat Units and Subunits | County | Size of Critical Habitat Unit (acres)[1] |
| 8 | Lower Santa Ana River Basin | Orange | 737 |
| 9 | San Jacinto River Basin | Riverside | 2,391 |
| 9a | ..... | ..... | 1,226 |
| 9b | ..... | ..... | 1,165 |
| 10 | San Juan Creek Basin | Orange, Riverside | 3,496 |
| 10a | ..... | ..... | 3,097 |
| 10b | ..... | ..... | 399 |
| 11 | San Mateo Basin | Orange, San Diego | 1,820 |
| 11a | ..... | ..... | 975 |
| 11b | ..... | ..... | 845 |
| 12 | Lower Santa Margarita Basin | San Diego | 1,009 |
| 12a | ..... | ..... | 394 |
| 12b | ..... | ..... | 615 |
| 13 | Upper Santa Margarita Basin | Riverside, San Diego | 7,863 |
| 13a | ..... | ..... | 1,155 |
| 13b | ..... | ..... | 4,731 |
| 13c | ..... | ..... | 1,977 |
| 14 | Lower and Middle San Luis Rey Basin | San Diego | 10,115 |
| 15 | Upper San Luis Rey Basin | San Diego | 8,368 |
| 16 | Santa Ysabel Creek | San Diego | 15,370 |
| 16a | ..... | ..... | 13,866 |
| 16d | ..... | ..... | 1,504 |
| 17 | San Diego River Basin | San Diego | 4,171 |
| 17a | ..... | ..... | 1,149 |
| 17b | ..... | ..... | 1,865 |
| 17d | ..... | ..... | 1,157 |
| 18 | Sweetwater River Basin | San Diego | 4,625 |
| 18a | ..... | ..... | 4,155 |
| 18c | ..... | ..... | 470 |
| 19 | Cottonwood Creek Basin | San Diego | 14,345 |
| 19a | ..... | ..... | 5816 |
| 19b | ..... | ..... | 5,130 |
| 19c | ..... | ..... | 1,512 |
| 19d | ..... | ..... | 938 |
| 19e | ..... | ..... | 950 |
| Subtotal | | | 74,310 |

**Table 2. (continued)**

| Desert Recovery Unit | | | |
|---|---|---|---|
| Unit | Critical Habitat Units and Subunits | County | Size of Critical Habitat Unit (acres)[1] |
| 20 | Upper Santa Ana River Basin/Cajon Wash | San Bernardino | 1,775 |
| 21 | Little Rock Creek Basin | Los Angeles | 612 |
| 22 | Upper Mojave River Basin | San Bernardino | 5,602 |
| 22a | ..... | ..... | 5,684 |
| 22c | ..... | ..... | 0 |
| 23 | Whitewater River Basin | Riverside | 0 |
| Subtotal | | | 7,989 |
| Total | | | 98,366 |

Source: Service 2009
[1] Values in table may not sum due to rounding

**Unarmored Threespine Stickleback**

The unarmored threespine stickleback was federally listed as endangered in 1970 primarily due to competition with and predation by non-native fish, loss of habitat through urbanization and channelization, and introgression with other subspecies of sticklebacks (35 FR 16047). The unarmored threespine stickleback is a fully protected species under California law (see California Fish and Game Code, Section 5515 (b)(9)). The recovery plan for the unarmored threespine stickleback (Service 1985) provides additional information on the biology of the species, reasons for its decline, areas of essential habitat, and the actions needed for recovery of the species.

On November 17, 1980, the Service proposed designating approximately 31.7 miles of streams in Los Angeles and Santa Barbara counties as critical habitat for the unarmored threespine stickleback (45 FR 76012). The proposed critical habitat included three stream zones of the upper Santa Clara River, including the Del Valle zone, the San Francisquito zone, and the Soledad Canyon zone. The Del Valle zone includes the action area and runs from the confluence with San Martinez Grande Canyon upstream to the I-5 Bridge. On September 17, 2002, the Service determined that a designation of critical habitat for unarmored threespine stickleback should not be made because the initial federal listing was in 1970 under the Endangered Species Conservation Act of 1969, the predecessor of the Act (67 FR 58850). The Endangered Species Conservation Act did not have a critical habitat designation requirement. A lawsuit brought by the Center for Biological Diversity resulted in a decision by the Ninth Circuit Court of Appeals in 2006 upholding the Service decision to not designate critical habitat for unarmored threespine stickleback. Therefore, critical habitat for the unarmored threespine stickleback will not be discussed further in this biological opinion.

Unarmored threespine sticklebacks are small fish (up to 2.36 inches) inhabiting slow moving reaches or quiet water microhabitats of streams and rivers. Favorable habitats usually are shaded by dense and abundant vegetation. In more open reaches, algal mats or barriers may provide refuge for the species. Unarmored threespine sticklebacks feed primarily on benthic insects, small crustaceans, and snails, and to a lesser degree, on flat worms, nematodes, and terrestrial

insects. Unarmored threespine sticklebacks reproduce throughout the year with a minimum of breeding activity occurring from October to January. Reproduction occurs in areas with adequate aquatic vegetation and gentle flow of water where males establish and vigorously defend territories. The male builds a nest of fine plant debris and algal strands and courts all females that enter his territory; a single nest may contain the eggs of several females. Following spawning, the males defend the nests and the newly hatched fry, which hatch after approximately 6 days. Unarmored threespine sticklebacks are believed to live for only 1 year (Service 1985).

Unarmored threespine sticklebacks historically were distributed throughout southern California but are now restricted to the upper Santa Clara River and its tributaries in Los Angeles County, San Antonio Creek on Vandenberg Air Force Base (VAFB) in Santa Barbara County, Shay Creek (tributary to Baldwin Lake) in San Bernardino County, and San Felipe Creek in San Diego County. A population was transplanted into San Felipe Creek in the Salton Sea drainage and into Cañada Honda Creek on VAFB. Transplanted populations tend not to persist (Moyle 2002). In fact, no individuals have been observed in Cañada Honda Creek in 13 years (R. Evans, VAFB Natural Resource Manager, pers. comm., 2008).

Habitat degradation in the form of flood control and channelization are the primary threats to the survival of the unarmored threespine stickleback. Other forms of habitat degradation can occur when people or livestock trample stream banks, causing increased soil erosion and sedimentation in streams and breeding pools and reducing the availability of plants and insects that serve as habitat and food for the species. Damage to, or destruction of, the emergent vegetation along the stream banks also degrades the shallow, weedy nursery areas that provide abundant food and shelter for unarmored threespine stickleback.

Other threats to unarmored threespine stickleback often occur in popular riparian areas near campgrounds where humans dam pools for wading and inadvertently trample adjacent sand or gravel bars during streamside recreational activities. These activities force the unarmored threespine stickleback to constantly move away from human traffic or be driven into areas where they are more susceptible to injury or mortality due to predation or recreational activities.

Exotic predators such as African clawed frogs, bullfrogs, mosquitofish (*Gambusia affinis*), red swamp crayfish (*Procambarus clarkii*), and green sunfish (*Lepomis cyanellus*), prey on or compete for resources with unarmored threespine sticklebacks. In addition, certain non-native species may serve as vectors for the Ich parasite (*Ichthyopthirius multifilis*) that could infect populations of unarmored threespine stickleback. Populations of unarmored threespine stickleback in the Angeles National Forest were severely affected by the introduction of Ich in 1995 (U.S. Forest Service (USFS) 2000). Introduced goldfish (*Carasius auratus*) were suspected to be the source of the Ich infestation.

**Recovery Plan for the Unarmored Threespine Stickleback**

The 1985 final recovery plan for the unarmored threespine stickleback states that the species could be considered recovered when: (1) habitat conditions for each of the known remnant

populations have been stabilized at or near historical carrying capacities; (2) the other known threats have been addressed in a manner that assures the continued existence of these populations; and (3) at least five self-sustaining populations have been maintained within the historical range of unarmored threespine stickleback for a period of 5 consecutive years without significant threats to their continued existence.

The plan states that to reach the point of recovery, the known extant populations must be preserved and protected, additional populations will need to be successfully reintroduced into historical habitats, the spread of exotic organisms will need to be controlled, and degraded habitats will need to be restored and maintained. In order to do this, adequate instream flows must be maintained in all essential habitats, land uses must be regulated to maintain good water quality, the introduction of additional exotic organisms must be prevented, the spread of established populations of exotic organisms controlled, suitable reintroduction sites within the historical range must be found, and habitat conditions must be monitored to ensure that satisfactory conditions for unarmored threespine stickleback are being maintained.

The recovery strategy for the unarmored threespine stickleback, as defined in the recovery plan, includes the following actions: (1) close regulation of removal (take) of the species; (2) monitoring and appropriate management of habitat conditions; (3) implementation of contingency plans to protect the species from natural or man-made disasters; and (4) establishment of additional populations in suitable reintroduction sites as needed.

**Coastal California Gnatcatcher**

The coastal California gnatcatcher was federally listed as threatened on March 30, 1993 (58 FR 16742). Revised critical habitat for the coastal California gnatcatcher was designated on December 19, 2007 (72 FR 72010) . The RMDP area does not include any critical habitat for the coastal California gnatcatcher; therefore, critical habitat for this species will not be discussed further in this biological opinion. No recovery plan exists for the coastal California gnatcatcher. The Service completed a 5-year of the species' status in September 2010 (Service 2010b).

The coastal California gnatcatcher is a small member of the old-world warbler and gnatcatcher family Sylviidae (AOU 1998). The bird is dark blue-gray above and grayish-white below. The tail is mostly black above and below. The male has a distinctive black cap, which is absent during the winters. Both sexes have a white eye-ring. The coastal California gnatcatcher is primarily insectivorous, non-migratory, and exhibits strong site tenacity (Atwood 1990). Fecal samples showed a predominance of leaf and plant-hoppers and spiders in the diet, while true bugs, wasps, bees, and ants were only minor components (Burger et al. 1999). The coastal California gnatcatcher is a highly detectable species for much of the year, both visually and vocally. Preston et al. (1998) found that detectability of a San Diego population ranged from 80 percent to 90 percent of pairs from March through September and from 50 percent to 80 percent of pairs from October through December.

Coastal California gnatcatchers occur mainly on cismontane slopes (coastal side of the mountains) in southern California, ranging from Ventura and northern Los Angeles counties, south through the Palos Verdes Peninsula to Orange, Riverside, San Bernardino and San Diego counties (Service 2010b). The species' range continues south into Baja California to El Rosario, Mexico (Atwood 1991). Atwood (1990) reported that 99 percent of all coastal California gnatcatcher locality records occurred at or below an elevation of 984 feet. Atwood and Bolsinger (1992) reported that, of 324 sites of recent occurrence, 272 (84 percent) were located below 820 feet, 315 (97 percent) were below 1,640 feet, and 324 (100 percent) were below 2,460 feet. Since that time, additional data collected at higher elevation shows that this species may occur as high as 3,000 feet and that more than 99 percent of the known coastal California gnatcatcher locations occurred below 2,500 feet (65 FR 63680).

Coastal California gnatcatchers are typically found in or near coastal sage scrub habitat on mesas, gently sloping areas, and along the lower slopes of the coast ranges. The species tends to occur most frequently within stands dominated by California sagebrush (*Artemisia californica*) (Atwood 1990). An analysis of the percent gap in shrub canopy supports the observation that coastal California gnatcatchers prefer relatively open stands of coastal sage scrub (Weaver 1998). The coastal California gnatcatcher occurs in high frequencies and densities in scrub with an open or broken canopy, is absent from scrub dominated by tall shrubs, and occurs in low frequencies and densities in low scrub with a closed canopy (Weaver 1998).

Coastal California gnatcatchers also use chaparral, grassland, and riparian habitats where they occur adjacent to coastal sage scrub (Campbell et al. 1998). The use of these habitats appears to be most frequent during late summer, autumn, and winter, with smaller numbers of individuals using such areas during the breeding season. Although existing quantitative data may reveal relatively little about coastal California gnatcatcher use of these other habitats, these areas may be critical during certain times of year for dispersal or as foraging areas during drought conditions (Campbell et al. 1998). Breeding territories have also been documented in non-sage scrub habitat. Campbell et al. (1998) believe that habitats other than coastal sage scrub are used by coastal California gnatcatchers for foraging, dispersal by juveniles, respite from temperature extremes, fire avoidance, and fledglings to escape predation. Linkages of habitats other than coastal sage scrub along linear features such as highways and power line corridors may also be of substantial value in linking populations of the coastal California gnatcatcher (Famolaro and Newman 1998).

The coastal California gnatcatcher becomes highly territorial by late February or early March and males become more vocal during this period (Mock et al. 1990). In southwestern San Diego County, the mean territory size during the breeding season ranged from 12 to 27 acres per pair; during the non-breeding season, territory size ranged from 12 to 42 acres per pair. During the non-breeding season, coastal California gnatcatchers have been observed to wander into adjacent territories and unoccupied habitat, increasing their home range size by up to 78 percent over their breeding territory (Preston et al. 1998).

The breeding season of the coastal California gnatcatcher extends from mid-February through the end of August, with the peak of nesting activity occurring from mid-March through mid-May. The coastal California gnatcatcher's nest is a small, cup shaped basket usually found 1 to 3 feet above the ground in a small shrub or cactus. Clutch sizes range between three and five eggs, with the average being four. Juvenile birds associate with their parents for several weeks (sometimes months) after fledging (Atwood 1990). Nest building begins in mid-March with the earliest recorded egg date of March 20 (Mock et al. 1990). Post breeding dispersal of fledglings occurs between late May and late November. Coastal California gnatcatchers are persistent nest builders and often attempt multiple broods, which is suggestive of a high reproductive potential. This may be offset by high rates of nest predation and nest parasitism (Atwood 1990).

Predation is the most common cause of nest failure (Grishaver et al. 1998). Potential nest predators are numerous, and include cats, snakes, raccoons, and corvids (birds in the family Corvidae) (Grishaver et al. 1998). The coastal California gnatcatcher also is known to be affected by nest parasitism by the brown headed cowbird. Nest parasitism may have shifted the coastal California gnatcatcher's nesting season in some areas to earlier in the year to help compensate for the negative effects (Patten and Campbell 1998). However, the gains in nest success from decreased nest parasitism appear to be negated by increased nest abandonment due to predation before brown-headed cowbirds have migrated into an area (Braden et al. 1997).

Post-natal dispersal for the coastal California gnatcatcher is an important aspect of the biology of the species (Galvin 1998). The mean dispersal distance of coastal California gnatcatchers from a study of birds banded in San Diego County is reported at less than 1.9 miles (Bailey and Mock 1998). Although the mean dispersal distances that have been documented above are relatively low, dispersal of juveniles is difficult to observe and document without extensive banding studies. The few current studies may not adequately estimate the coastal California gnatcatcher's dispersal capability (Bailey and Mock 1998). Juvenile coastal California gnatcatchers are apparently able to traverse highly man modified landscapes for at least short distances (Bailey and Mock 1998).

Natural and restored coastal sage scrub habitat along highway corridors is used for foraging and nesting by coastal California gnatcatchers and may also serve important dispersal functions (Famolaro and Newman 1998). Typically, however, the dispersal of juveniles requires a corridor of native vegetation, which provides foraging and cover opportunities to link larger patches of appropriate sage scrub vegetation (Soulé 1991). These dispersal corridors may facilitate the exchange of genetic material and provide a path for recolonization of areas from which the species has been extirpated (Soulé 1991, Galvin 1998). Without dispersal corridors, birds in shrub habitats isolated by urbanization may undergo rapid, localized extinction (Soulé et al. 1988).

The coastal California gnatcatcher was considered locally common in the mid-1940s, but by the 1960s this subspecies had declined substantially in the U.S. due to widespread habitat destruction (Atwood 1990). In 1993, at the time the coastal California gnatcatcher was listed as threatened,

the Service estimated that approximately 2,562 pairs of coastal California gnatcatchers occurred in the U.S. In 1997, the total number of coastal California gnatcatchers in the U.S. was estimated at 2,899 pairs with two-thirds occurring in San Diego County (Service 1996). These population estimates were intended to represent a coarse approximation of the number of coastal California gnatcatchers in southern California. Currently, the Service believes that earlier estimates were probably low and that the number of coastal California gnatcatchers is higher, although no accurate estimate is available (Service 2010b).

The destruction and fragmentation of habitat are the principal reasons for the coastal California gnatcatcher's federally threatened status (58 FR 16742). Up to 90 percent of coastal sage scrub vegetation has been lost as a result of development and land conversion (Westman 1981a and b; Barbour and Major 1977); coastal sage scrub is considered to be one of the most depleted habitat-types in the U.S. (Kirkpatrick and Hutchinson 1977, O'Leary 1990). The amount of occupied suitable habitat available to coastal California gnatcatchers has continued to decline since the species was listed as development in the species' range has continued. Urbanization contributes to the loss, degradation, and fragmentation of coastal sage scrub by altering wildfire frequency due to human intervention. Higher fire frequencies and the lag period associated with recovery of the vegetation may substantially reduce the viability of affected subpopulations. Less frequent fires may allow the vegetation to reach a density and height not preferred by coastal California gnatcatchers.

**Spotlight Species Action Plan for Coastal California Gnatcatcher**

A recovery plan for the coastal California gnatcatcher has not been published; however, a Spotlight Species Action Plan (2010-2014) (SSAP) has been prepared (Service 2009). This and similar plans are intended as internal guidance documents for the Service to direct its resources toward recovery of "at risk" or high profile listed species.

According to the SSAP, areas with coastal sage vegetation have been subject to much urban development resulting in conflicts between species and habitat conservation and construction or other development projects and other forms of economic activity. To address this economic conflict and promote recovery of the coastal California gnatcatcher, the Service and CDFG have worked jointly with jurisdictions and other stakeholders to prepare regional Habitat Conservation Plans (HCPs) and Natural Community Conservation Plans (NCCPs) that permitted incidental take of coastal California gnatcatcher in return for mitigation in the form of habitat conservation and management to benefit the species. These regional HCP/NCCP Plans established a network of core and linkage habitat preserves throughout much of the coastal California gnatcatcher U.S. range. The SSAP identifies two threat sources: (1) urban and agriculture development; wildland fire; habitat type conversion; and (2) climate change. Wildfires in 2003 and, especially, 2007 burned tens of thousands of acres of coastal California gnatcatcher's habitat including areas preserved under the regional HCP/NCCPs. The burned areas are now at risk of being overrun by nonnative grasses and forbs (habitat type-conversion).

The SSAP states that the target of recovery efforts is to improve the population status of the coastal California gnatcatcher by increasing the size of coastal California gnatcatcher populations and improving habitat quality at sites burned in the past 10 years. To accomplish this, the Service would work with its partners to select sites that would be the best candidates for restoration. The RMDP area is not within any of the burned areas targeted for habitat restoration; however the SSAP's general recovery goal of improving the population status of the California gnatcatcher as applied to the RMDP area is to increase the size of coastal California gnatcatcher populations in the plan area.

**Five-year Review of the Status of the Coastal California Gnatcatcher (Service 2010b)**
The 5-year review of the status of the coastal California gnatcatcher concludes that many of the threats that existed when the species was listed as threatened in 1993 remain. A more recent development is the conversion of coastal sage scrub habitat to other vegetation types as a result of catastrophic wildfires in the first decade of this century. Despite large-scale, long-time planning efforts to conserve the species (e.g., NCCPs, HCPs), the 5-year review concludes that the species' listing status should remain unchanged.

## ENVIRONMENTAL BASELINE

The implementing regulations for section 7(a)(2) define the action area being addressed in a consultation as the area that may be directly or indirectly affected by the proposed action (50 *Code of Federal Regulations* 402.02). We consider the action area for this biological opinion to include the entire RMDP area, totaling 13,651 acres. In addition, because of the potential for indirect effects due to non-point and point source discharges into the Santa Clara River from the proposed development, the action area includes the Santa Clara River corridor between the RMDP area and the "dry gap," which is approximately 5 miles downstream of the RMDP area boundary.

The RMDP area is located in northern Los Angeles and eastern Ventura counties, and consists of the Newhall Ranch Specific Plan area and the adjacent Salt Creek Area. The Santa Clara River and State Highway 126 traverse the northern portion of the site, and the Santa Clara River extends approximately 5.5 miles east to west across the RMDP area.

The action area contains large areas of natural vegetation; however, the project applicant has historically leased, and continues to lease, portions of the RMDP area for oil and natural gas production, as well as for cattle grazing, ranching, and agricultural operations (e.g., food crop production, dry land farming, honey farming). As a result of these activities, natural vegetation is absent in some areas, replaced by dirt and asphalt roads, graded oil well pads and pipelines, and pumping, storage, and transmission facilities.

Vegetation communities and land covers in the action area vary in quality from high biological value in natural areas to highly disturbed lands, such as upland agricultural areas and facilities related to oil and natural gas production (Table 3). Native and naturalized vegetation

communities present are representative of those found in the region and include high-quality examples of the vegetation communities found in the Santa Susana Mountains to the south and the Santa Clara River ecosystem. Upland vegetation communities dominate the landscape within the site, both north and south of the Santa Clara River. The dominant upland native vegetation communities include California sagebrush scrub and associations, undifferentiated chaparral and associations, coast live oak woodlands, and valley oak woodlands and associations. The dominant non-native community is California annual grassland. The Santa Clara River supports a variety of riparian vegetation communities, including southern cottonwood-willow riparian forest, southern willow scrub, southern coast live oak riparian forest, giant reed, bulrush-cattail wetland, Mexican elderberry and associations, tamarisk scrub, mulefat scrub, arrow weed scrub, alluvial scrub, big sagebrush scrub, herbaceous wetlands, coastal and valley freshwater marsh, cismontane alkali marsh, and river wash. Intermittent and ephemeral drainages within the action area include cismontane alkali marsh, river wash, mulefat scrub, scalebroom scrub, big sagebrush scrub, and alluvial scrubs.

TABLE 3. Vegetation Communities and Land Cover Types within the RMDP Area

| Vegetation Community/Land Cover Type | Associations | Total Acreage |
|---|---|---|
| **Upland Grassland** | | |
| California annual grassland | | 2,175.5 |
| Purple needlegrass | | 0.6 |
| **Coastal Scrub** | | |
| California sagebrush scrub | | 1,529.3 |
| California sagebrush scrub | Burned California sagebrush scrub | 1,469.3 |
| California sagebrush scrub | California sagebrush scrub – *Artemisia californica* | 82.5 |
| California sagebrush scrub | California sagebrush scrub – purple sage | 393.5 |
| California sagebrush scrub | Disturbed California sagebrush scrub – purple sage scrub | 4.5 |
| California sagebrush scrub – black sage scrub | | 196.3 |
| California sagebrush scrub – California buckwheat | | 310.0 |
| California sagebrush scrub/undifferentiated chaparral | | 135.0 |
| California sagebrush scrub/undifferentiated chaparral | Burned California sagebrush scrub/ undifferentiated chaparral | 5.2 |
| Coyote brush scrub | | 9.2 |
| **Chaparral Scrub** | | |
| Chamise chaparral | | 55.7 |
| Scrub oak chaparral | | 1.5 |
| Undifferentiated chaparral | | 1,106.9 |
| Undifferentiated chaparral | Burned undifferentiated chaparral | 957.2 |
| **Other Scrubs** | | |
| Eriodictyon scrub | | 0.2 |
| **Upland Woodland and Savannah** | | |
| California walnut woodland | | 27.2 |
| Coast live oak woodland | | 757.8 |
| Mixed oak woodland | | 168.9 |
| Valley oak woodland | | 79.4 |
| Valley oak woodland | Valley oak/grass | 461.4 |

TABLE 3. Vegetation Communities and Land Cover Types within the RMDP Area (continued)

| Vegetation Community/Land Cover Type | Associations | Total Acreage |
|---|---|---|
| **Riparian Waters and Wetlands** | | |
| Bulrush–cattail wetland | | 1.4 |
| Cismontane alkali marsh | | 18.6 |
| Coastal and valley freshwater marsh | | 2.0 |
| Herbaceous wetland | | 183.1 |
| River wash | | 290.0 |
| **Riparian Scrub** | | |
| Alluvial scrub | | 1.0 |
| Arrow weed scrub | | 18.7 |
| Big sagebrush scrub | | 76.5 |
| Big sagebrush - California buckwheat | | 0.5 |
| Giant reed | | 5.6 |
| Mexican elderberry | | 12.8 |
| Mexican elderberry | Disturbed Mexican elderberry | 0.3 |
| Mulefat scrub | | 71.5 |
| Southern willow scrub | | 22.7 |
| Shrub tamarisk | | 2.8 |
| **Riparian Forest Woodland** | | |
| Southern coast live oak riparian forest | | 0.7 |
| Southern cottonwood-willow riparian forest | | 358.3 |
| **Land Covers** | | |
| Agriculture | | 1,576.4 |
| Developed land[1] | | 0.5 |
| Disturbed land[2] | | 1,080.6 |
| **Total** | | **13,651.1** |

[1] Developed land refers to areas supporting manmade structures including homes, yards, roadways, and other highly modified lands supporting structures associated with dwellings or other permanent structures. Within the RMDP area, developed land refers to existing roads.

[2] Disturbed land typically occurs in areas where soils have been recently or repeatedly disturbed by grading or compaction resulting in the growth of very few native perennials, and are usually dominated by bare ground or non-native dicotyledonous species including filaree (*Erodium* spp.), black mustard, thistles (e.g., *Cynara cardunculus*, *Carduus pynocephalus*, and *Centaurea melitensis*), dove weed, and others.

The action area is topographically diverse, with slope gradients ranging from moderate to steep in the hillsides to very gentle in the Santa Clara River floodplain and in major tributary canyons. Two large mesas (i.e., Grapevine Mesa and Airport Mesa) are adjacent to the Santa Clara River. The primary ridges are east-, west-, and northwest-trending, with secondary ridges trending north and south. Distinctive ridges within the action area include Sawtooth Ridge, along the northeastern side of Long Canyon, and Round Mountain at the northern edge of Potrero Canyon. Site elevations range from 825 feet above mean sea level in the Santa Clara River bottom at the Ventura County/Los Angeles County line to approximately 3,200 feet on the ridgeline of the Santa Susana Mountains along the southern boundary.

**Past Consultations in the Vicinity of the Action Area**

The Service has issued numerous biological opinions for actions that have occurred or will occur within the vicinity of the action area for this consultation. In all cases, the Service determined that the proposed action was not likely to jeopardize the continued existence of, nor destroy or

adversely modify the critical habitat of, the least Bell's vireo, southwestern willow flycatcher, California condor, arroyo toad, unarmored threespine stickleback, or coastal California gnatcatcher. Appendix A shows the level of take we anticipated in each of the biological opinions issued in the action area and vicinity.

**Least Bell's Vireo**

Least Bell's vireos have been observed within the action area during focused bird surveys, which were conducted annually from 1993 to 2007 following surveys according to Service protocol for this species. Least Bell's vireos nested in the River corridor on-site in every year surveys were conducted (Guthrie 1993, 1995, 1996, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006; Labinger and Greaves 1995, 1996, 1997, 1999; Bloom Biological 2007). According to Bloom Biological (2007), at least 56 territories and three active nests occurred along the Santa Clara River and adjacent floodplains within and immediately surrounding the RMDP area (Interstate 5 Bridge west to Las Brisas Bridge). The species is associated primarily with the Santa Clara River mainstem; all observations of nesting and transient individuals were within this area. The number of observations of this species in the vicinity of the action area suggests that least Bell's vireos regularly use riparian habitat in the Santa Clara River corridor in and around the site for breeding and foraging as well as during migration.

Within the action area, the primary nesting habitat (southern cottonwood-willow riparian forest, southern coast live oak riparian forest, southern willow scrub, mulefat scrub, arrow weed scrub, and Mexican elderberry scrub and woodland,) of the least Bell's vireo occurs along the Santa Clara River and Castaic Creek. Based upon the figures in Table 3, primary nesting habitat for least Bell's vireos totals 485 acres. Some suitable nesting habitat may exist in the other drainages within the action area (e.g., Potrero Canyon and Salt Creek). The scientific literature indicates that native upland shrubland and woodland habitat adjacent to nesting habitat may be used for foraging as well, especially late in the breeding season; the majority of habitat for upland foraging occurs within 100 feet of the riparian zone (Kus and Miner 1989). Specific locations of suitable nesting riparian habitat with adjacent upland foraging habitat occur within the action area, generally along the south side of the Santa Clara River.

Appendix A shows that in past biological opinions in the vicinity of the action area, we anticipated the cumulative projects would result in take of 39 least Bell's vireos and 1.68 acres of designated critical habitat. None of these biological opinions resulted in jeopardy or adverse modification determinations. During the period over which these biological opinions were issued, the least Bell's vireo population along the Santa Clara River has grown (Service 2006).

**Critical Habitat for the Least Bell's Vireo**

The Santa Clara River is within critical habitat Unit 2. This unit includes approximately 4,409 acres, which extends for approximately 12 miles beginning in the vicinity of Rancho Camulos in Ventura County and ending in the vicinity of Rye Canyon Road in Los Angeles County. The critical habitat rule does not define any specific conservation function for this unit. We assume

that it is intended to serve the same function as the overall designation, which is to conserve known populations of least Bell's vireo through the section 7 consultation mechanism.

The action area includes approximately 2,252 acres of critical habitat. According to the response to a comment in the final rule concerning refinement of the critical habitat,

> "In cases where areas designated as critical habitat do not contain the primary constituent elements, impacts occurring within this area will not result in a finding of adverse modification by the Service. Thus, designation of critical habitat will not effect [sic] those areas within the legal critical habitat boundaries that do not contain vireo nesting or foraging habitat." (59 FR 4845).

A total of 443 acres of the 2,252-acre critical habitat unit within the RMDP area supports the primary constituent elements of critical habitat for the least Bell's vireo (Corps and CDFG 2010). The remaining 1,809 acres are agricultural fields, oil production, and other uses that have removed the natural vegetation. By further calculation, of those 2,252 acres, approximately 1,408 acres are within the footprint of the proposed development (the Specific Plan area). Most of the habitat in these 1,408 acres is upland habitat which does not support the PCEs of least Bell's vireo critical habitat.

**Draft Recovery Plan for the Least Bell's vireo**

The draft recovery plan for the least Bell's vireo identified 14 vireo "population/metapopulation units," including the Santa Clara River population unit. The draft recovery plan does not identify the geographic limits of the Santa Clara River population unit, simply stating that "habitat for the [vireo] occurs in patches along much of the river, with location and quality varying from year to year as conditions in the river change following winter storm events." The draft recovery plan does not specify the recovery function of the Santa Clara River unit.

**Southwestern Willow Flycatcher**

Willow flycatchers (possibly *E.t. extimus, E. t. adastus,* or *E. t. brewsteri*) have been detected almost every year within the river corridor in the action area during the focused bird surveys. All observations of willow flycatchers within the region have been concluded to be migrants because they were only detected once, or were only detected during the first two survey periods and not during the survey period between June 22 and July 17 when only the southwestern willow flycatcher would be present. While the migrant willow flycatchers observed could include the southwestern willow flycatcher, no southwestern willow flycatchers exhibiting nesting, paired, or territorial behavior have been observed in the action area.

The most recent observation of confirmed breeding southwestern willow flycatchers along the Santa Clara River was in 2009, when one pair nested within the vicinity of the Santa Paula Water Recycling Facility (approximately 24 miles downstream of the RMDP area). This pair successfully fledged one chick (Davenport 2009). Another observation of confirmed breeding southwestern willow flycatchers along the Santa Clara River was in 2006, when two pairs nested

near Fillmore (approximately 11 miles downstream of the RMDP area), one successfully. The California Natural Diversity Database (CDFG 2010a) also lists one occurrence of nesting southwestern willow flycatchers in the Santa Clara River corridor upstream of the action area, along Soledad Canyon Road near Agua Dulce, in 1997.

Within the action area, suitable willow flycatcher habitat exists in southern willow scrub, southern coast live oak riparian forest, and southern cottonwood–willow riparian forest, which occur predominantly in the Santa Clara River as well as a portion of Castaic Creek and Salt Creek. Based upon the figures in Table 1, suitable southwestern willow flycatcher habitat totals 382 acres. Suitable southwestern willow flycatcher habitat on-site has been surveyed annually from 1999 to 2007 according to Service protocol for this species. Between 1993 and 1998, surveys were conducted in conjunction with surveys for least Bell's vireo and although protocol southwestern willow flycatcher surveys were not conducted during these years, observations of non-breeding willow flycatchers were recorded. The most recent protocol survey (Bloom Biological 2007) was conducted by surveying all potential and marginally potential habitat by slowly walking and stopping to listen for calls and songs over a 2.5-mile stretch (0.25 to 0.75 miles wide) of the Santa Clara River and its tributaries within and adjacent to the RMDP area.

Currently, the action area appears to be a migratory stop for willow flycatchers. Nesting populations of the southwestern willow flycatcher have not been detected on-site.

Appendix A shows that in past biological opinions in the vicinity of the action area, we anticipated that, cumulatively, the projects would result in take of 9 southwestern willow flycatchers. None of these biological opinions resulted in jeopardy determinations.

**Recovery Plan for Southwestern Willow Flycatcher**

The action area is located within the Coastal California Recovery Unit of the final recovery plan. Within the Santa Clara River, the reach from Bouquet Canyon Road to the Pacific Ocean, which crosses through the action area, has been identified as a Management Unit where recovery actions should be focused (Service 2002). Specifically, the metapopulation in his management unit has been identified for increased population stability and enhancement. The minimum number of territories targeted for this management unit before the southwestern willow flycatcher can be reclassified to threatened is 25.

**California Condor**

Surveys for the California condor were included as part of other raptor and avian species surveys that were conducted along the Santa Clara River (Bloom Biological 2007). The entire survey area consisted of approximately 25 miles of the Santa Clara River and its major tributaries, which included the entire stretch of the river within the action area.

California condors are known to exist and nest in the Sespe Condor Sanctuary approximately 13 miles northwest of the action area. As opportunistic scavengers, California condors can travel up to 139 miles per day (Wilbur 1978; Meretsky and Snyder 1992; Snyder and Snyder 2000). In

recent history California condors in Ventura and Los Angeles counties had extensive foraging habitat in the southern portion of their range, including the Simi Hills, Thousand Oaks, Santa Susana Mountains, and the Antelope Valley. Beginning in the 1950s, much of this area began to go through extensive land use change, from undeveloped land to commercial and residential development and changes in agricultural practices which reduced the extent of suitable foraging habitat.

California condors traveling between the roosting and nesting areas of the Sespe Condor Sanctuary and extensive portions of the Los Padres National Forest and the San Gabriel Mountains travel along the northern ridges and foothills east of Hopper Canyon and north of the Santa Clara River Valley, and cross the valley to the south where they pick up the Santa Susana Mountains as an extension of their flyway to the east. Flying conditions are excellent for the birds as they take advantage of prevailing winds coming up the Santa Clara River Valley and thermals rising off the grassland and chaparral hillsides on both sides of the Santa Clara and Simi Valleys.

Since 2000, a number of condors in the population have been fitted with either satellite or Global Positioning System (GPS) transmitters, which produce GPS coordinates. These coordinates can pinpoint topographically the exact location for each bird at any given moment. California condors released at the Hopper Mountain National Wildlife Refuge north of Fillmore soon discovered the excellent flying conditions of the Santa Clara Valley and the San Gabriel Mountains, and began exploring these areas. A favorite destination for the birds was Kagel Mountain in the San Gabriel Mountains, a well-known launch site for paragliders and hanggliders. The obvious attraction is the excellent flying conditions. Flights from Hopper Mountain to the San Gabriel Mountains take birds directly over the action area.

As described in the introduction for the species, California condors are obligate scavengers, constantly surveying the landscape for potential food sources. The RMDP area offers excellent foraging habitat for California condors; an open grassland oak-savanna landscape with domestic cattle and native deer populations.

Historical records for the RMDP area documented in the McBee archives, a system developed in the mid 1960's by Service research biologists studying the species, record all known California condor sightings up through 1986. The earliest known records from the RMDP area are from 1935 in an interview conducted by Carl Koford in 1940, with a Mr. Hackney, orchard foreman of Newhall Ranch. Carl Koford describes the interview as follows: "…..5 to 6 years ago he and his brother saw 7 to 8 condors on Tapo Ridge at a carcass. They were on the road, and as they drew near, the birds took off. They seemed very clumsy on the ground and took off downhill to the North. Mr. Hackney thinks this observation took place in May or June. He recognized the birds by the large size and white patches under the wing." A second historical sighting relayed to Mr. Koford on June 3, 1940, by a Mr. Villa regarding condors in Tapo Canyon state: "condors were most numerous in winter by far. He said he had seen great numbers-perhaps 100-at a time in winter (1938-1939 winter especially)." The observations of Mr. Villa would corroborate

observations by staff of the Condor Recovery Program in the southern part of the condor's range. Condor numbers increase in the southern part of the range during winter months when flying conditions in the foothills of the San Joaquin Valley are less optimal due to tule fog and overcast conditions.

In the 1974 California Condor Recovery Plan, mention is also made of the importance of grassland foraging habitat south of the Santa Clara River Corridor. Under Appendix A, titled Action Plan Narrative outside the Sespe-Piru area, "Food and feeding habitat", the Recovery Plan states, "Through contact with Ventura County Planning departments and other groups and individuals, encourage zoning, land use agreements, legislation, etc., that will result in large areas of open space within the present condor range being retained with few disturbances and with an optimum complement of livestock. *Emphasis should be placed on the Big Mountain-Oak Ridge area south of the Santa Clara Valley, as this is a historically used condor feeding area, and is the largest area of open range in close proximity to the Sespe Condor Sanctuary.*" (emphasis is the author's). Since this was written, additional areas of potential foraging habitat have been lost in the Simi Valley foothills and surrounding areas making this area of additional concern.

Recent condor use of the RMDP area has been documented by visual observations and GPS data (Table 4). Twenty-five out of 46 condors are now wearing GPS transmitters in southern California. These transmitters give hourly locations (coordinates) for each bird throughout most daylight hours. The ability to download this data on a daily basis greatly increases the accuracy of tracking individual bird movements and determining high use areas.

TABLE 4. California Condor Records on Newhall Ranch in 2008 and 2009.

| Condor (by number) | Date of Record | Behavior | Notes |
|---|---|---|---|
| SB #79 | 1/26/09 | Perched, flying | Likely associated with cow carcass documented by C. Niemela on 1/30/09. |
| | 1/27/09 | Perched, flying | |
| | 4/11/09 | Flying | Likely associated with cow carcass found by G. Grisdale on 4/24/09. |
| | 4/15/09 | Perched, flying | |
| | 4/16/09 | Perched, flying | |
| SB #107 | 4/10/08 | Ground | |
| | 1/27/09 | Perched | Likely associated with cow carcass documented by C. Niemela on 1/30/09. |
| | 4/16/09 | Flying, perched | Likely associated with cow carcass found by G. Grisdale on 4/24/09. |
| SB #125 | 4/24/09 | Flying, perched | Likely associated with cow carcass found by G. Grisdale on 4/24/09. |
| SB #156 | 4/2/08 | Flying, perched | |
| | 4/3/08 | Flying | |
| | 4/4/08 | Ground | |

TABLE 4. California Condor Records on Newhall Ranch in 2008 and 2009. (continued)

| Condor (by number) | Date of Record | Behavior | Notes |
|---|---|---|---|
| | 4/6/08 | Ground | |
| | 4/7/08 | Ground | |
| | 5/20/08 | Ground | |
| | 5/24/08 | Ground | |
| | 5/25/08 | Ground | |
| | 6/3/08 | Ground | |
| SB #161 | 4/3/08 | Ground | |

On several days during April through July of 2008, staff from Hopper Mountain National Wildlife Refuge detected via GPS transmitters that California condors had landed within the action area. Peter Bloom (biological consultant to Newhall Land) went to the landing and confirmed that there was a domestic cow carcass that had been scavenged and that there was "white wash" at the site of the carcass. This observation shows that, although the RMDP area does not provide suitable nesting habitat for California Condors, this opportunistic species does at least sporadically forage over the higher-elevation areas of the site, including the High Country SMA region where more exposed terrain and updrafts likely occur. Additionally, as the California condor population increases, California condors may fly more frequently over the action area on their way to foraging opportunities

No other biological opinions have been issued for the California condor in the vicinity of the RMDP area. We have issued biological opinions to the U.S. Forest Service for effects of ongoing activities (e.g., road maintenance) on the California condor in the Los Padres National Forest and to the Bureau of Land Management for the leasing of an oil pad site near the Sespe Condor area. Neither of these biological opinions concluded that the actions would result in jeopardy of the California condor, nor did they anticipate that any injury or mortality would result from the proposed actions.

**Recovery Plan for the California Condor**

The California condor recovery plan identifies a series of geography-specific activities (Service 1996) to assist in the recovery of the condor. The recovery plan does not propose any recovery activities in the action area. The nearest recovery activity area relative to the action area is the Sespe–Piru Condor Area.

**Arroyo Toad**

Studies by Bloom Biological (2009) and Impact Sciences (2001, 2002a) concluded that nearly all of the suitable arroyo toad habitat within the action area occurs between the banks of the Santa Clara River (excluding adjacent uplands) and within its associated tributaries. This suggests that suitable habitat exists within the action area for breeding adults and arroyo toad tadpoles; however, beyond the outer banks, both natural topography and human activities provide either an inaccessible or inhospitable environment for dispersing juvenile and/or adult arroyo toads. Furthermore, much of the upland habitat beyond the banks of the river and its tributaries does not support habitat for adult arroyo toads. The only areas where suitable, accessible, upland foraging

habitat exists are on the southern side of the Santa Clara River (primarily California sagebrush scrub vegetation). These areas were designated as being of moderate habitat quality by Impact Sciences (2001). Only a few such areas exist where access by adult toads would not be constrained by either very dense vegetation or steep banks (Bloom Biological 2007).

During surveys conducted in May and September of 2000, six arroyo toad tadpoles were identified by Aquatic Consulting Services (2002a, 2002d) at five locations within the action area. Although several protocol surveys were conducted after 2000 for all life stages of arroyo toads, including eggs, larvae, juveniles, and adults (SMEA 1995; RECON 1999; Impact Sciences 2001, 2002a; Aquatic Consulting Services 2002a, 2002b, 2002c, 2002d), no other arroyo toads were been identified within the action area..

In portions of the Santa Clara River watershed upstream of the action area, adult toads have been documented in limited numbers along the river and tributaries. One adult toad was identified within approximately 0.31 mile of the action area's upper limit (CNDDB 2010c). Other documented occurrences of arroyo toad in the upper Santa Clara River watershed (but outside the action area boundaries) include:

- Santa Clara River just east of Interstate 5; one individual captured and released on July 20, 1994 (CNDDB 2010c), located approximately 2 river miles from the action area; however, a portion of the action area (upland and not within the river) is located approximately 0.25 mile away from this occurrence. This upland area between the occurrence and the action area is already developed and urbanized. Therefore, the principle connection between the action area and the known record is along the 2 river miles.
- Castaic Creek; occurrences have been documented on Department of Water Resources land and the Angeles National Forest, both above and below Castaic Lake Reservoir (70 FR 19562), located approximately 12 river miles upstream from the action area.
- Upper San Francisquito Creek; calling male arroyo toads observed in 1997 near the old Saint Francis Dam (70 FR 19562), located approximately 12 river miles upstream from the action area.
- Upper San Francisquito Creek; recent surveys (presumably on USFS land) "found evidence of the species" in the drainage (70 FR 19562), approximately 8.5 river miles upstream of the action area.
- Santa Clara River; report of six arroyo toad tadpoles adjacent to Castaic Junction in 2000 (CNDDB 2010c), which is within the action area.
- Santa Clara River; four adult arroyo toads reported by Sandburg (2001) near the confluence with San Francisquito Creek (unpublished notes sent to the Service), located approximately 3 river miles upstream of the action area.
- Santa Clara River; a single adult was observed near the confluence with San Francisquito Creek (Impact Sciences 2002a), located approximately 3 river miles upstream of the action area.

- Soledad Canyon area; 75 tadpoles reported from 3 sites located approximately 11 miles east of the Interstate 5 crossing (Sandburg 2001), located approximately 17 river miles upstream of the action area.
- Santa Clara River; in 2003, Ramirez reported "recent observations of arroyo toads and eggs" in the vicinity of the confluence with San Francisquito Creek (Ramirez 2003), located approximately 3 river miles upstream of the action area.

The survey protocol for the arroyo toad (Service 1999) states that areas within 0.62 mile of arroyo toad sites (documented by the presence of eggs, tadpoles, juveniles, or adults) that have suitable habitat will be presumed to have arroyo toads. Given that a known adult arroyo toad occurrence has been identified within 0.62 mile of the site boundary and six tadpoles were located in the action area, and because the riverine habitat within the action area is contiguous, the arroyo toad may be present anywhere suitable habitat for the species occurs within the action area. URS (2010) reports that the action area supports approximately 1,476.3 acres of potential arroyo toad habitat (Figure 5-2 of the biological assessment).

Although the action area supports suitable habitat for the arroyo toad and tadpoles have been reported within the action area, only a low number of tadpoles, and no adult or subadult arroyo toads, have been observed within the action area despite multiple survey efforts conducted over more than a decade. Additionally, the CNDDB (2010c) lists no arroyo toad sightings within the portion of the action area between the RMDP area and the "dry gap," several miles downstream in eastern Ventura County. Work by Impact Sciences (2001, 2002a, 2002b) suggests that, because the upland habitat is not suitable for adult arroyo toad foraging within the action area, it is possible that arroyo toad numbers were never high in this portion of the Santa Clara River. Bloom Biological (2007) suggests that there may be many factors responsible for the absence of arroyo toads from the action area, including stream contaminants, predation by African clawed frogs and bullfrogs, disease, irregular pulses of water in the river, and reduced arthropod food supply.

Regardless of explanation, data from the systematic surveys that have been conducted to date appear to support the conclusion that no resident breeding population of this species is currently present within the action area (SMEA 1995; RECON 1999; Impact Sciences 2001, 2002a; Aquatic Consulting Services 2002a, 2002b, 2002c, 2002d). Additionally, the arroyo toad is likely extirpated from the portion of the Santa Clara River from Castaic Creek downstream to the Ventura County line (Bloom Biological 2007). However, given the presence of upstream populations of arroyo toad, tadpole observations in the eastern portion of the action area (within the Santa Clara River), and the presence of high quality habitat throughout the reach of the Santa Clara River and Castaic Creek on the site, the potential exists for the arroyo toad to occur in the portions of the Santa Clara River and Castaic Creek within the action area as well as in surrounding riparian and upland areas.

Appendix A shows that in past biological opinions in the vicinity of the action area, we anticipated the projects would result in take of 11 arroyo toads in total. None of these biological

opinions resulted in jeopardy determinations. During the period over which these biological opinions were issued, the population of arroyo toads in the action area has apparently declined. Past observations have not been repeated despite surveys for aquatic species during which arroyo toads would have been observed.

**Critical Habitat for the Arroyo Toad**

The Santa Clara River is within critical habitat Unit 6. This unit is located in northwestern Los Angeles County and consists of three subunits totaling 2,802 acres. The action area lies within critical habitat subunit 6b, which encompasses approximately 2.6 miles of Castaic Creek from the downstream edge of the Old Road right-of-way down to the confluence with the Santa Clara River, 6 miles of the Santa Clara River from the confluence with Bouquet Creek down to the confluence with Castaic Creek, and 1.1 mile of San Francisquito Creek from Newhall Ranch Road downstream to the confluence with the Santa Clara River. This subunit consists of 1,003 acres. The conservation function of this unit is as a connection between the known populations of arroyo toad in tributaries to the Santa Clara River, and to accommodate natural population expansion and fluctuation.

The action area includes approximately 413.1 acres of critical habitat for the arroyo toad. The physical and biological features essential for the conservation of the arroyo toad found in this subunit include: breeding pools in low-gradient stream segments with sandy substrate, seasonal flood flows, and riparian habitat and upland benches for foraging and dispersal (i.e., primary constituent elements).

According to the final rule (76 FR 7246),

> "When determining revisions to critical habitat boundaries for this final rule, we made every effort to avoid developed areas, such as lands covered by buildings, pavement, and other structures, because such lands lack PCEs for the arroyo toad. We did not designate some areas if habitat was highly degraded and not likely restorable, nor did we designate areas that were highly fragmented or isolated. Such areas provide little or no long-term conservation value and do not support the physical and biological features essential to the conservation of the arroyo toad. Agricultural lands may have been included if they were within areas identified as necessary for dispersal or connectivity between known occurrences. However, we avoided known areas of intensive agriculture that lacked the PCEs for the arroyo toad. The scale of the maps we prepared under the parameters for publication within the Code of Federal Regulations may not reflect the exclusion of such developed lands. Any such lands inadvertently left inside critical habitat boundaries shown on the maps of this revised critical habitat are excluded by text in this final rule. Therefore, Federal action involving these lands would not trigger section 7 consultation with respect to critical habitat and the requirement of no adverse modification, unless the specific action may affect adjacent critical habitat.

Consequently, while the boundary of the critical habitat includes 413.1 acres within the RMDP area, some of the lands within those 413.1 acres may be "excluded by text" because they do not contain the PCEs. Newhall estimates[2] that of the 413.1 acres of designated critical habitat within the RMDP area, approximately 71.4 acres do not contain the PCEs identified in the arroyo toad critical habitat, and 341.7 acres do contain the PCEs. This figure is based upon exclusion of heavily cultivated fields, oil production areas, and areas of permanent disturbance that were included within the limits of designated critical habitat and not excluded because of the scale of the maps.

**Recovery Plan for the Arroyo Toad**

The Santa Clara River basin is included in Subregion 7 of the Northern Recovery Unit in the recovery plan for the arroyo toad (Service 1999). More specifically, waterways included in this Recovery Unit Subregion include Sespe Creek, Piru Creek, Agua Blanca Creek, Castaic Creek, San Francisquito Creek, and Bouquet Creek (Service 1999). The inclusion of these waterways is based on current or historical occurrences of arroyo toad in portions of the drainages. The main stem of the Santa Clara River is not directly identified in the recovery plan as having a conservation role in the recovery strategy for the species.

**Unarmored Threespine Stickleback**

ENTRIX (2009) conducted surveys for the unarmored threespine stickleback in 2004 and 2005 within the reach of the Santa Clara River mainstem within the action area. Where flows were present, the tributary drainages of Salt Canyon, Potrero Canyon, Long Canyon, San Martinez Grande Canyon, Chiquito Canyon, Humble Canyon, Lion Canyon, and Middle Canyon were surveyed using dip nets and seines. At certain locations, bank observation was utilized when other techniques were not feasible due to access issues.

ENTRIX (2009) surveyed for unarmored threespine stickleback habitat attributes between Salt Creek Canyon and The Old Road Bridge. The survey recorded habitat type, length and mean width, mean and maximum depth, substrate composition, water and air temperature, and percent edgewater vegetation.

Additional surveys for the unarmored threespine stickleback were conducted in 1988, 1995, 2000, 2002 through 2005 and 2007 (Aquatic Consulting Services 2002a, 2002b, 2002c, 2002d; ENTRIX 2009, Haglund 1989; Impact Sciences 2003a, 2003b, 2003c, 2003d). The unarmored threespine stickleback was observed during surveys within the Santa Clara River portion of the Newhall Ranch Specific Plan in 1988, 1995, 2000, 2002, 2003, and 2007 (Aquatic Consulting Services 2002a, 2002b, 2002c, 2002d; ENTRIX 2009; Haglund 1989; Impact Sciences 2003a, 2003b, 2003c).

[2] We reviewed maps and aerial photographs of the action area with Newhall's representatives and agree that their estimates are and conclusions are valid. Maps showing the acreages and boundaries were provided by Newhall and are on file at the Ventura Fish and Wildlife Office.

On August 24, 2009, Service staff along with biologists from the U.S. Geological Survey (USGS), San Marino Associates, and Newhall Land and Farming staff surveyed the Santa Clara River beginning at its confluence with San Francisquito Creek downstream to the Las Brisas Bridge. Approximately 60 unarmored threespine sticklebacks were detected in the vicinity of the Santa Clara River and San Francisquito confluence. Approximately 60 more unarmored threespine sticklebacks were detected immediately downstream of The Old Road Bridge. No unarmored threespine sticklebacks were detected below the Valencia waste water treatment plant (Chris Dellith, Service, pers. obs. 2009).

Suitable habitat for this species is present throughout the reach of the Santa Clara River within the action area (approximately 5 river miles), although the locations of the habitat change temporally with changes in river morphology. No suitable unarmored threespine stickleback habitat, with the exception of Castaic Creek, is present in tributaries to the Santa Clara River within the action area (ENTRIX 2009). The unarmored threespine stickleback is found in all sections of the Santa Clara River within the action area.

Appendix A shows that in past biological opinions in the vicinity of the action area, we anticipated that cumulatively, the projects would result in take of 68 unarmored threespine stickleback. None of these biological opinions resulted in jeopardy determinations.

**Recovery Plan for the Unarmored Threespine Stickleback**
The unarmored threespine stickleback recovery plan (Revised) was published in 1985 (Service 1985). The recovery plan designated three areas as very important for the survival and recovery of the species: (1) two disjunct reaches of the Santa Clara River in Los Angeles County; (2) a short reach of San Francisquito Canyon; and (3) and the lowermost 8.4 miles in San Antonio Creek in Santa Barbara County. One of the reaches in the Santa Clara River is the area from San Martinez Grande Canyon upstream to the I-5 Bridge, which runs through the action area. The recovery plan does not specify the recovery function of any of the units.

**Coastal California Gnatcatcher**
The coastal California gnatcatcher was not detected within the RMDP area during annual surveys between 1993 and 2008 (Bloom Biological 2007a; Dudek 2006; Guthrie 2000a, 2000b, 2004a, 2004d, 2004e; Impact Sciences 2000; SAIC 2003) and surveys according to Service protocol for this species in 2000 (Guthrie 2000a, 2000b, 2000c; Impact Sciences 2000), in 2004 (Guthrie 2004a, 2004b, 2004d, 2004e and 2004g), in 2007 (Dudek 2007b), and in 2008 (Dudek 2008); however, an individual coastal California gnatcatcher was observed on August 8 and August 15, 2008, within the RMDP area by Dudek biologist Traci Caddy, during monitoring for improvements of the Del Valle Training Center Road, located south of the town of Val Verde, off Chiquito Canyon and east of the Del Valle Training Center. The August 15 observation occurred during construction monitoring, when the individual was observed for approximately 5 minutes in California sagebrush-California buckwheat scrub before it flew west. The coastal California gnatcatcher was not observed for the remaining 3 weeks of construction monitoring, which terminated on September 15, 2008. Given the time of year and because no other coastal

California gnatcatchers have ever been detected within the RMDP area (despite extensive focused and general surveys), these observations are suspected to have been dispersing or transient individuals, perhaps from isolated populations of coastal California gnatcatchers that have been periodically observed to the east of the RMDP area. A second individual coastal California gnatcatcher was observed on October 5, 2007, by Dudek biologist Jeff Priest and biologist Ron Francis, a sub-consultant to Dave Crawford, Compliance Biology, Inc., at the Valencia Commerce Center (VCC) project site, adjacent to the RMDP area (Dudek 2007c). This observation occurred for approximately 8 to 10 minutes within the VCC planning area in coastal scrub habitat located on the hills in the north-central portion of the site, on an easterly-facing slope.

The action area supports approximately 4,126 acres of suitable habitat (i.e., California sagebrush scrub) for the coastal California gnatcatcher. Based on the amount of suitable habitat onsite, the number of coastal California gnatcatchers currently known to occur in Los Angeles and Ventura counties, and the species range of territory sizes, we believe that the action area could theoretically contain from 152 to 343 coastal California gnatcatcher pairs. Other documented occurrences of coastal California gnatcatcher in the vicinity of the action area (but outside the action area boundaries) have been detected or are known to occur approximately:

- 3.9 miles south of the action area in Las Virgenes Canyon in Calabasas;
- 9.2 miles southwest of the action area near Little Simi Valley;
- 14 miles southwest of the action area adjacent to Tierra Rejada Road and borders the western boundary of the City of Simi Valley;
- 16 miles southwest of the action area near the intersection of State Route 23 and Tierra Rejada Road in Moorpark;
- 10 miles southwest of the action area near California Lutheran University in Thousand Oaks;
- 5 miles northeast of the action area near the intersection of Lowridge Place and San Francisquito Canyon Road in Santa Clarita;
- 7 miles northeast of the action area near the junction of Haskell Canyon and Bouquet Canyon in Santa Clarita;
- 11 miles east of the action area near the intersection of Live Oaks Spring and Sand Canyon Road in Santa Clarita;
- 8 miles southeast of the action area near the intersection of Golden Valley Road and Sierra Highway in Santa Clarita; and
- 12 miles southeast of the action area near the intersection of Odyssey Dive and Blucher Avenue in Granada Hills.

Appendix A shows that in past biological opinions in the vicinity of the action area, we anticipated that cumulatively, the projects would result in take of two coastal California gnatcatchers and loss of approximately 389 acres of designated critical habitat. None of these biological opinions resulted in jeopardy or adverse modification determinations. During the period over which these biological opinions were issued, more coastal California gnatcatchers have been observed; however, we do not know whether these additional observations are due to

population increases or greater survey efforts. Also, since the biological opinions were issued that analyzed coastal California gnatcatcher critical habitat, the critical habitat rule has been revised and no longer includes any critical habitat in the region.

While we estimate that, based on suitable habitat, the potential exists for up to 343 pairs of coastal California gnatcatcher in the action area (based upon suitable habitat and published range sizes), the actual number of coastal California gnatcatchers observed in the action area following 15 years of avian surveys is one individual bird. This bird was not located during subsequent surveys, so we conclude it was either a transient or at the edge of its territory. In any case, we have no evidence that the action area supports the estimated number of coastal California gnatcatcher pairs that we calculated based on suitable habitat. Notwithstanding the potential for large numbers of coastal California gnatcatchers based on habitat availability, we conclude from the known records that one coastal California gnatcatcher is present in the action area.

**Spotlight Species Action Plan**

The SSAP (Service 2009) states that the target of recovery efforts is to improve the population status of the coastal California gnatcatcher by increasing the size of coastal California gnatcatcher populations and improving habitat quality at selected sites within regional HCP/NCCPs that burned in the past 10 years. Although portions of the action area burned during fires in 2007, the action area is not within a designated regional HCP/NCCP selected for restoration under the SSAP; however the SSAP's general recovery goal of improving the population status of the California gnatcatcher can be applied to the RMDP area, and we conclude that the goal would be to increase the size of coastal California gnatcatcher populations in the plan area.

## EFFECTS ANALYSIS

The RMDP area is located in northern Los Angeles and eastern Ventura counties, and encompasses approximately 13,651 acres. The proposed action under review is the issuance of an individual 404 permit by the Corps. As detailed earlier in this opinion in the Project Description section, issuance of the permit is necessary to enable construction of development associated with the RMDP. Therefore, we consider the impacts of the development project itself to be an indirect effect of the Corps permit and thus include the development project in our analysis of impacts. At build-out, the proposed development would result in permanent impacts to approximately 4,907 acres of existing vegetation communities and land covers, representing 36 percent of the RMDP area. Of the six species potentially affected by the proposed action (i.e., the least Bell's vireo, southwestern willow flycatcher, California condor, coastal California gnatcatcher, arroyo toad, and unarmored threespine stickleback), four species are dependent upon aquatic and riparian habitat. In total, the build-out would result in the permanent removal of approximately 184 acres of riparian vegetation, representing 13.1 percent of the vegetation within RMDP area. The coastal California gnatcatcher occurs in coastal scrub habitats. In total, the build-out would result in the permanent removal of approximately 1,458 acres of coastal scrub communities, representing 10.2 percent of these communities within the RMDP area.

In addition to the permanent loss of the riparian vegetation and other land covers, there would be both direct and indirect effects to the least Bell's vireo, southwestern willow flycatcher, California condor, arroyo toad, unarmored threespine stickleback, and coastal California gnatcatcher. Some of these effects would be the result of the following: habitat loss; habituation; use of herbicides and pesticides; maintenance activities; nonpoint-source pollution; project-related fugitive dust; project-related noise: project-related ground vibration; project-related night lighting; predation and resource competition by pets and non-native animal species; invasion by exotic plant species; introduction of diseases; project-related trash; and urbanization. Specific effects of these factors and activities are described below, under the sub-heading for each of the respective species covered in this consultation; however, a general discussion of urbanization, which would directly and indirectly affect the least Bell's vireo, southwestern willow flycatcher, California condor, arroyo toad, unarmored threespine stickleback, and coastal California gnatcatcher is provided in the following paragraphs.

Development for urban use involves clearing of existing vegetation. Larger urban developments also often involve earth-moving activities resulting in topographical recontouring. Urban development typically results in buildings, roads, and other infrastructure, such as pipeline installation, which are permanent. Without active management in the form of habitat restoration, sites formerly supporting native vegetation (e.g., coastal sage scrub) that have undergone severe disturbance (like heavy equipment and earth moving activities) take decades to recover (Stylinski and Allen 1999). Clearing for fire abatement (e.g., fire breaks, fuel breaks) is done to protect urban and agricultural areas and similarly involves vegetation clearing and often tilling, and can thus result in adverse effects to listed species.

Residential and commercial development (i.e., urbanization) adjacent to or upstream of a water course can lead to the loss of freshwater fish and an increase in non-native species (Marchetti et al. 2006). Nonpoint-source pollution and habitat alteration often result from urbanization. One of these sources of pollutants is stormwater run-off, which is the byproduct of the construction of roadways or structures that reduce the permeability of urban watersheds. Stormwater run-off resulting from urbanization conveys large amounts of organic matter; pesticides; and fertilizers; heavy metals; hydrocarbons; oil and grease; and other debris into streams and wetlands. Skinner et al. (1999) found that developed watersheds had greater concentrations of toxic pollutants than less developed areas with more open space. The decrease in water quality can have negative impacts on native aquatic and riparian species (Moyle 2002).

In the sections that follow, we analyze the effects of project components on individuals of the species and their habitats. The impact of these combined effects on the survival and recovery of each species is summarized at the end of each analysis and re-stated in detail in the Conclusion section that follows these analyses.

**Least Bell's Vireo and Southwestern Willow Flycatcher**

Because these species generally occupy the same habitat types, we expect that the effects to least Bell's vireo and southwestern willow flycatcher due to the proposed project will be similar; therefore we have combined the analysis for these two species. Loss of riparian habitat would diminish available foraging habitat for least Bell's vireos and southwestern willow flycatchers. Project-related fugitive dust, noise and ground vibration, and night lighting, contact with polluted runoff, and human activity near habitat occupied by least Bell's vireos and southwestern willow flycatchers could disturb individuals to the extent that they could abandon foraging and breeding habitat. In particular, construction-related noise, vibration, and night lighting could adversely affect nesting and breeding behavior, resulting in a decrease in nesting success. Specific Plan build-out would convert lands adjacent to the river corridor to urban uses and could potentially result in adverse edge effects on least Bell's vireo and southwestern willow flycatcher populations within the river corridor. Long-term potential secondary impacts include harassment by humans, predation by pets and non-native animal species, invasion by exotic plant species such as giant reed and tamarisk, increased trash, increased native and non-native mesopredators (e.g., striped skunks (*Mephitis mephitis*), raccoons, and Virginia opossums (*Didelphis virginiana*)) as a result of increased habitat fragmentation, degraded water quality, hydrologic and geomorphic alterations, noise, and night lighting. Least Bell's vireos and southwestern willow flycatchers often react strongly to the close approach of humans, particularly when nestling or fledgling young are also present. Moreover, human disturbances may compromise least Bell's vireo nesting (Salata 1987). Anecdotal evidence further suggests that human presence can attract predators to least Bell's vireo and southwestern willow flycatcher habitat areas. Predators and cowbirds may both be capable of "homing in" on agitated least Bell's vireos and southwestern willow flycatchers, and subsequently destroy or parasitize nearby nests (The Nature Conservancy 1997, Chace et al. 2002). Project-induced alterations, reductions, or disturbances of occupied and potential least Bell's vireo habitat and an increased human presence may induce higher rates of cowbird parasitism and nest depredation (RECON 1989, Pike and Hays 1992).

Construction activities that completely remove habitat reduce availability of breeding, nesting, and foraging sites for least Bell's vireos and southwestern willow flycatcher. Even if habitat modification activities occur outside of the breeding season for these subspecies, the reduction of nesting and foraging habitat could adversely affect individual least Bell's vireos and southwestern willow flycatchers by reducing the available resources for individuals' subsequent reproduction. Least Bell's vireos and southwestern willow flycatchers typically return to established breeding territories year after year (Greaves and Labinger 1997, Salata 1983, Sogge 2000, Sedgewick 2000). In a study on the San Diego River (Beck 1996), a banded population of least Bell's vireo generally returned year after year with only minor adjustments in territory location. Further, loss of habitat may cause the returning least Bell's vireos or southwestern willow flycatchers to adjust or shift their territories. When shifting territories, least Bell's vireos or southwestern willow flycatcher could experience decreased fitness due to increased energy and time spent competing for a new territory. A shift in territories could result in a delay in the initiation of nest building, fewer nesting attempts per season, a reduced clutch size per attempt,

and an overall reduction in reproductive output. Loss of habitat, even temporarily, may cause the birds to seek out another area in which to nest, either permanently or until the site has been revegetated and restored. Although the RMDP area is not expected to be fully restored for several years following construction activities, restoration of the disturbed areas and removal of invasive, exotic vegetation, would help minimize the long-term effects on the least Bell's vireos and southwestern willow flycatcher from the project related to habitat degradation.

In specific terms, Newhall's construction-related activities (e.g., vegetation removal and movement of equipment in construction zones) would result in the permanent loss of 77 acres of least Bell's vireo nesting and foraging habitat. Based upon the published territory sizes for the least Bell's vireo (0.5 to 7.5 acres/pair) and assuming a uniform distribution of territories and saturation of suitable habitat and the area of permanently affected habitat, the project activities could theoretically result in the permanent direct loss of habitat for 10 to 154 pairs of least Bell's vireos. Approximately 41 acres of suitable least Bell's vireo nesting and foraging habitat would be temporarily affected as a result of project construction (temporarily affected habitat includes disturbed areas that would be subject to restoration or would not have permanent structures or roads). Based upon the published territory sizes for the least Bell's vireo (0.5 to 7.5 acres/pair) and assuming a uniform distribution of territories and saturation of suitable habitat and the area of temporarily affected habitat, the project activities could theoretically result in the temporary loss of habitat for 5 to 82 pairs of least Bell's vireos.

Newhall's construction-related activities would result in the permanent loss (direct and indirect) of 23.1 acres of suitable breeding and foraging habitat for the southwestern willow flycatcher. Based on the range of territory sizes for southwestern willow flycatcher (0.15 to 5.7 acres/pair) and assuming a uniform distribution of territories and saturation of suitable habitat and the amount of suitable habitat for this species that could be lost, the project activities could result in the direct loss of 4 to 154 southwestern willow flycatcher territories due to permanent habitat loss. Approximately 30 acres of suitable southwestern willow flycatcher nesting and foraging habitat would be temporarily affected as a result of project construction. By similar calculation, approximately 5 to 200 southwestern willow flycatcher territories could be adversely affected as a result of temporary impacts.

Least Bell's vireos and southwestern willow flycatcher may attempt to nest in uncleared riparian habitat near any development during periods when construction activity or project-related noise is temporarily halted, minimized, or in a different location. If construction activity or noise increases once a least Bell's vireo or southwestern willow flycatcher pair has established a nest or breeding territory near the project activities, the pair may abandon their nest, resulting in a failed breeding attempt and unnecessary expenditure of energy.

Accidental releases of contaminants (e.g., fuels, oil, pesticides, etc.) into the riparian area or water may negatively affect the quality of the habitat for the least Bell's vireo and southwestern willow flycatcher by killing native plants used for nesting or foraging and decreasing the prey base. Maintenance of flood, drainage, and water quality protection facilities also has the

potential to cause injury or mortality of least Bell's vireos and southwestern willow flycatchers due to destruction of nests; however, to reduce or eliminate such effects, Newhall would implement minimization and avoidance measures described in the RMDP.

Polluted run-off from construction activities as well as long-term adverse effects to water quality also have the potential to cause harm to individual least Bell's vireos and southwestern willow flycatchers; however, compliance with the construction general permit (Order No. 99-08-DWQ) mandates that construction-related non-stormwater discharges do not cause or contribute to violation of any clean water standards. Also, Project Design Features of the RMDP would limit stormwater pollutant levels in the long term.

The development proposed within the RMDP area would preclude least Bell's vireo or southwestern willow flycatcher from nesting within the immediate vicinity of residential or commercial development for two reasons related to predation. The first predation problem is the introduction of non-native predators, specifically cats, which can prey on least Bell's vireo or southwestern willow flycatcher adults, young and eggs. Cats are known to have a great impact on native animals, especially birds (Jurek 1994). The presence of cats extends the negative effects of the development well into adjacent habitat and could eliminate any nesting attempts by least Bell's vireo and southwestern willow flycatcher in the future, even if the habitat adjacent to development is preserved. Second, residential development may result in the control of native predators, such as coyote (*Canis latrans*). Coyotes are known to suppress the populations of smaller predators, such as cats, grey foxes (*Urocyon cinereoargenteus*), and Virginia opossums that also prey upon nesting birds. In the absence of coyotes, populations of these smaller predators may increase, and native birds that nest in riparian habitat, including the least Bell's vireo and southwestern willow flycatcher, may decline or be eliminated (Soulé *et al.* 1988).

In addition to the predator problems, housing and commercial development introduces a suite of other indirect effects. These include night lighting, noise, introduction of non-native plants, increased irrigation and surface water runoff, and potential contamination by pesticides used by residents. Furthermore, human activity in least Bell's vireo and southwestern willow flycatcher breeding habitat such as hiking, exploring, recreational shooting, and walking unleashed dogs could flush birds away from nests, or disturb adults to such a degree that reproductive attempts are unsuccessful. The combined impact of these effects would be to reduce the suitability of the habitat for least Bell's vireo and southwestern willow flycatcher.

Chronic traffic noise associated with roads and bridges in close proximity to potential breeding habitat in the river corridor could have adverse effects on the establishment of breeding territories and reproductive success. Birds rely on auditory signals in the form of songs, and alarm or scolding calls, to establish and defend territories, attract a mate, feed and care for young at the nest, and to locate and evade a potential predator (e.g., Scherzinger 1979). Construction and the use of heavy equipment can result in noise and vibration impacts which are thought to be potentially harmful to a variety of bird species (Gunn and Livingston 1974, RECON 1989, Pike and Hays 1992).

We have used 60 dBA as a practical threshold above which significant impacts to the least Bell's vireo and southwestern willow flycatcher might occur. The 60dBA threshold is considered average conversation level and is typically the level encountered under ambient conditions (i.e., without noise sources such as vehicles or tools). Based upon this threshold, RECON (1989) estimated that noise levels above 60 dBA from March 15 to September 15 may impact least Bell's vireo reproductive success. While least Bell's vireos often continue to occupy areas subject to noise levels above 60 dBA, one study has documented significantly reduced reproductive success due to noise impacts (U.S. Marine Corps 1995). We expect that above some yet unknown noise threshold, least Bell's vireos, as well as southwestern willow flycatcher, could abandon an otherwise suitable habitat area. Greaves (1989) hypothesized that the lack of breeding least Bell's vireos in apparently suitable habitat is due to noise from human presence (e.g., bulldozers, off-highway vehicles, and hiker travel). Therefore, unabated noise resulting from construction activities may interfere with the reception of auditory signals by least Bell's vireo and southwestern willow flycatcher potentially resulting in increased predation, lowered reproductive success and/or abandonment of otherwise suitable habitat. Dudek (2007d) conducted a traffic noise study that indicates least Bell's vireos currently nest in close proximity to State Route-126 in areas where noise levels somewhat exceed 60 dBA.

The noise model for the proposed RMDP shows that the large majority of the riparian zone in the river corridor would have noise levels less than 65 dBA (except at two bridge crossings) and, thus, levels not substantially greater than existing conditions. The noise levels at the two bridges would affect at least three known least Bell's vireo territories. One known least Bell's vireo territory would be affected by noise as a result of increased traffic along Highway 126. In terms of suitable habitat for both the least Bell's vireos and southwestern willow flycatcher, 332.3 acres would be affected by noise. Within this suitable habitat, approximately seven known territories of least Bell's vireo would be affected by noise. No known territories of the southwestern willow flycatcher would be affected.

Night lighting associated with roads and bridges in close proximity to potential breeding habitat for least Bell's vireos and southwestern willow flycatchers in the river corridor could have adverse effects on the establishment of breeding territories and reproductive success for both species. Construction-related and long-term lighting secondary impacts, may impede the establishment of breeding territories and reproductive success both in the short-term and long-term.

Despite the amount of suitable habitat for the least Bell's vireos and southwestern willow flycatcher that would be permanently and temporarily affected by the project, and the number of territories for each species that could hypothetically be present, the data for the action area indicate that neither species is as abundant in the action area as measurements based solely on territory size and acreage of suitable habitat would indicate. The highest census for least Bell's vireos recorded 56 territories within the action area. Of those 56 known territories, none would be directly removed by project activities. Impacts to the least Bell's vireo are expected to result solely from indirect effects (e.g., noise), and the indirect effects would extend only into 1 of the

known 56 territories (based upon the 60dBA noise contour). The total effect of the project on the known least Bell's vireo territories would be the potential loss of 1 out of 56. Rangewide, this number is small in comparison to the most recent census data for the species that indicates an increase in the number of territories from 298 at the time of listing to 2,968 (Service 2006). With the measures proposed by the applicant to address other threats to the least Bell's vireo (e.g. cowbird trapping, habitat restoration), the impact on the species rangewide would be minimal.

For the southwestern willow flycatcher, no territories have been recorded within the action despite several years of survey effort. Therefore, we assume no territories would be lost as a result of the project. Impacts to the southwestern willow flycatcher would be limited to loss of habitat used by migrating individuals for foraging and resting. Because much more suitable habitat for those activities would remain intact after the project due to measures proposed by the applicant (e.g., preservation of riparian habitat), we expect that the impact of the project on the southwestern willow flycatcher rangewide to be negligible. No active or known nesting habitat would be lost and the species should not decline in numbers or distribution as a result of the RMDP project.

As described in the recovery plan for the southwestern willow flycatcher (Service 2002) and in the draft recovery plan for the least Bell's vireo (Service 1998), the recovery strategies for both species focus on five tasks: (1) protecting and/or restoring habitat, (2) reducing cowbird nest parasitism, (3) reducing influx of exotic species, (4) researching life histories of the species, and (5) increasing public education about the species (Service 2002, Service 1998). Although the action under review has the potential to adversely affect least Bell's vireo and southwestern willow flycatcher, and will result in the permanent loss and temporary disturbance of habitat for both species, these impacts should be minimized through implementation of conservation measures. Mainly, the applicant proposes to preserve and restore riparian habitat and implement cowbird trapping. These measures are consistent with the recovery tasks listed above and, as a result, the proposed project should not impede attainment of the recovery goals for the two species. Impacts to suitable habitat should be offset by riparian and upland restoration and enhancement activities that will provide suitable habitat for least Bell's vireo and southwestern willow flycatcher (See Dudek 2010, Mitigation Measures BIO-1 through BIO-16).

To the extent the RMDP will cause changes in hydrology, these impacts are expected to be minimal and largely offset by hydro-modification control measures (e.g., a combination of drop structures/grade stabilizers and bank stabilization to maintain sediment equilibrium and protect the channel bed and banks). Also, the Santa Clara River system is dynamic and undergoes cyclical flooding, scouring, and successional revegetation, and we do not expect the hydrological changes resulting from the proposed project will change those dynamics. Consequently, changes to hydrology are not expected to have a substantial effect on suitable habitat for the least Bell's vireo and southwestern willow flycatcher.

The suite of RMDP mitigation measures also includes a cowbird trapping program and strategies for the removal and control of exotic plant species, such as giant reed, which degrade habitat

necessary for least Bell's vireo and southwestern willow flycatcher (see Dudek 2010, Mitigation Measures BIO-78; SP-4.6-11, SP-4.6-15, BIO-6, BIO-10). The proposed cowbird trapping will help alleviate the nest parasitism that has contributed to the decline of both species throughout their respective ranges and should help increase nesting success (or allow nesting by southwestern willow flycatchers which are not currently known to nest in the action area). The proposed restoration and exotic plant removal measures should increase the amount of available and suitable habitat for both species, and help offset the habitat losses that would occur.

As to the remaining two recovery goals – species research and public education – the proposed action either advances these objectives or is task-neutral. For example, previously adopted mitigation measures for the Newhall Specific Plan require extensive pre-construction surveys for least Bell's vireo and southwestern willow flycatcher. These surveys add to the store of publicly-available data on these species. The RMDP also includes a program for educating homeowners as to the wildlife surrounding residential developments (Dudek 2010, Mitigation Measure BIO-63).

The proposed action also is subject to a host of pollution-control measures that will reduce secondary effects on least Bell's vireo and southwestern willow flycatcher. These include measures to maintain water quality in riparian areas ( see Dudek 2010, Mitigation Measures SP-4.2-6, SP-4.2-7, WQ-1, WQ-2). Furthermore, noise impacts on the species should be controlled to minimize impacts on the birds (Dudek 2010, Mitigation Measure BIO-56.)

We conclude that the proposed action, as modified by the RMDP proposed mitigation measures, should not appreciably reduce the reproduction, numbers, or distribution of either the least Bell's vireo or southwestern willow flycatcher. The total effect of the project on the known least Bell's vireo territories would be the potential loss of 1 out of 56. Rangewide, this number is negligible in comparison to the most recent census data for the species that indicates an increase in the number of territories from 298 at the time of listing to 2,968 (Service 2006). No southwestern willow flycatcher territories would be lost as a result of the project; no active or known nesting habitat would be lost and the species should not decline in number or distribution as a result of the RMDP project. Impacts to the southwestern willow flycatcher would be limited to loss of habitat used by migrating individuals for foraging and resting. Because much more suitable habitat for those activities would remain intact after the project due to measures proposed by the applicant (e.g., preservation of riparian habitat), we expect that the impact of the project on the southwestern willow flycatcher rangewide to be negligible. Most of the existing suitable habitat for both species would be preserved in the action area, and the applicant has proposed specific measures (e.g., cowbird trapping, exotic plant removal, habitat restoration, maintenance of current hydrological conditions, etc.) to address likely sources of adverse effects that could result from the action, as described above.

**Critical Habitat for the Least Bell's Vireo**

Critical habitat Unit 2 comprises approximately 4,409 acres, of which approximately 2,252 acres are within the RMDP area. Of those 2,252 acres, approximately 1,408 acres are within the

footprint of the proposed development (the Specific Plan area). For its proposed development, Newhall selected areas within the RMDP and the critical habitat where native habitat has been replaced by other uses, such as agriculture, cattle grazing, and oil production. Most of these are upland areas which do not support the PCEs of least Bell's vireo critical habitat. According to the response to a comment in the final rule concerning refinement of the critical habitat, "In cases where areas designated as critical habitat do not contain the primary constituent elements, impacts occurring within this area will not result in a finding of adverse modification by the Service. Thus, designation of critical habitat will not effect [sic] those areas within the legal critical habitat boundaries that do not contain vireo nesting or foraging habitat." (59 FR 4845).

According to the Final EIR/EIS (Corps and CDFG 2010), a total of 443 acres of the 2,252-acre critical habitat unit within the RMDP area supports the primary constituent elements of critical habitat for the least Bell's vireo. The remaining 1,809 acres are agricultural fields, or are in oil production or other uses that have removed the natural vegetation. Of the 443 acres, 408 acres are southern willow scrub, southern cottonwood–willow riparian forest, mulefat scrub, arrow weed scrub, and Mexican elderberry scrub and woodland, which are breeding/foraging habitats for the least Bell's vireo. The other 35 acres are riparian/wetland and upland shrub habitats (big sagebrush scrub, alluvial scrub, sagebrush scrubs, chaparral, and coyote brush scrub) and woodlands (coast live oak, valley oak) within 100 feet of nesting/foraging habitat that may be used for foraging, especially in the latter part of the breeding season.

Overall, the construction of RMDP facilities and build-out of the Specific Plan area will result in the permanent loss of 62 acres of the 443 acres of critical habitat containing primary constituent elements. An additional 49 acres of critical habitat that contain the primary constituent elements, including 48 acres of nesting/foraging habitat and 0.8 acre of foraging habitat only, would be temporarily impacted as a result of implementation of the RMDP. Restoration and enhancement components of the RMDP would create an additional 139 acres of riparian/wetland habitat in the Santa Clara River corridor within the critical habitat unit.

In addition to the direct habitat impacts described above, implementation of the proposed RMDP and build-out of the Specific Plan could also potentially modify natural watershed and stream hydrologic and geomorphologic function/processes within the action area by increasing volumes and duration of flow via increased runoff from impervious surfaces and drainage infrastructure. Increased flow could also result in the modification of riparian communities. Sediment-transport modeling by Pacific Advanced Civil Engineering determined that the total floodplain area within the Santa Clara River exposed to potentially erosive velocities would increase for only the five-year and 20-year flood events (PACE 2010). These changes to stream hydrology and geomorphic function/processes could adversely affect the primary constituent elements for the least Bell's vireo by changing the vegetative structure in certain areas; however, the Santa Clara River system is naturally subject to a flood/scour/regrowth cycle and the changes that could occur to the PCEs at these locations would be masked by the normal processes. Localized erosion could result from high flow around outlet structures, access ramps, and bridge abutments. These adverse effects would be offset by a decrease in acres exposed to erosive velocities in two-

year, 10-year, 50-year, 100-year, and capital flood events (PACE 2010). Consequently, the critical habitat unit and its function should remain intact and not be substantially affected by changes to the hydrology of the watershed.

As noted here and in the Environmental Baseline, of the 2, 252 acres of the critical habitat unit within the action area, only 443 acres within the action area support the PCEs. Approximately 62 acres of this 443 acres (14 percent) would be permanently lost due to the proposed actions The additional 49 acres of critical habitat that would be temporarily affected would be restored, as well as an additional 139 acres that do not currently support the PCEs. We conclude that the permanent loss of the 62 acres and temporary loss of 49 acres would be offset by successful restoration/creation of 139 acres of riparian/wetland habitat in the Santa Clara River corridor in the critical habitat unit (the success of restoration would be monitored and reported to the Corps and CDFG pursuant to the measures proposed by the applicant, see Appendix B), and that the recovery function of the critical habitat unit will remain intact.

**Summary of the Effects on the Least Bell's Vireo and Southwestern Willow Flycatcher**
Because we do not expect any direct impacts to least Bell's vireos, and indirect effects to only 4 known territories, we have concluded that the proposed project would not reduce the reproduction, numbers, or distribution of the species to the point where it would reduce appreciably the likelihood of the species' survival and recovery. In addition, the applicant has proposed numerous measures to protect and restore suitable habitat for the least Bell's vireo and these measures should further reduce the impacts of the project on the species. Similarly for the southwestern willow flycatcher, because none have been recorded nesting in the action area, the few observed have likely been migrants, and much of the suitable habitat for the species would remain intact, we also do not expect the RMDP project to reduce the southwestern willow flycatcher's reproduction, numbers, or distribution in the wild or adversely affect recovery of the species.

For the critical habitat of the least Bell's vireo, we conclude that the loss of a small proportion of the unit would not interfere appreciably with the survival or recovery function of either the unit or the entire critical habitat designation. The lost habitat is at the periphery of the unit's boundaries and not in a location where it would fragment the critical habitat unit or result in the loss of the function of the critical habitat. The majority of the critical habitat would continue to support the PCEs where they currently exist and provide habitat for the recovering least Bell's vireo population. Also, considering the entire critical habitat designation of 38,000 acres statewide, the proposed effects are relatively small and should not diminish the value of the critical habitat overall for recovery of the species. While the critical habitat rule does not define any specific conservation function for this unit, we ascribe to the unit the same function as the overall designation, which is to conserve known populations of least Bell's vireo through the section 7 consultation mechanism. Given the relatively small impact of the RMDP project on least Bell's vireo and the restoration efforts incorporated into the project that will create PCEs within the unit where they currently do not exist, we conclude that the recovery function of the critical habitat designation will not be diminished. The number of acres within the unit with

functioning PCEs will increase as a result of implementation of the project following restoration of up to 139 acres of riparian habitat (compared to approximately 62 acres permanently lost). We therefore conclude that the proposed action is not likely to appreciably diminish the value of critical habitat for the survival or recovery of the least Bell's vireo.

**California Condor**

California condors are highly social, inquisitive, and intelligent animals, and by nature are attracted to areas of activity. In the early years of release, California condors showed little wariness of humans and human structures because there were no older wild mentor birds in the release population. Young newly released California condors were attracted to houses and other human structures where they found objects and items to stimulate their curiosity. They also showed little fear of humans. A great deal of effort was expended flushing and hazing birds from human habitation, and with regard to a number of individuals, this procedure was effective; however, at least 19 birds strongly exhibiting this human attraction behavior had to be permanently removed from the wild and placed in the captive breeding program.

Evidence from monitoring this behavior suggests that some California condors, depending upon the individual condor's tendencies, may continue to exhibit their attraction to humans and human structures, while others may react to the hazing or other deterrent actions, and begin to spend less and less time around humans and human habitation. Birds that do not react to discouragement techniques become habituated to humans and their activities, and seem to be drawn to close contact with humans. California condors that become attracted to human activity and structures are more susceptible to being shot, fed harmful foods, being struck by vehicles, ingesting toxic substances (e.g., coolant, rodenticides), collisions with structures, ingesting microtrash, and other forms of injury.

California condors that do not respond to deterrence must be removed from the wild for their own safety and to minimize the transference of such behaviors to other members of the flock. Such individuals are no longer part of the wild flock and cannot contribute to the species' survival and recovery in the wild. While physical injury to a condor in the traditional sense may not always occur, such as injury due to ingestion of harmful foods (i.e., foods that do not meet the condor's nutritional requirements, such as dog food or cooked meat), the habituation of condors to human presence nevertheless injures condors because habituation significantly disrupts essential behavioral patterns of individual birds and prevents them from surviving successfully in the wild. For instance, a habituated bird may seek out humans for proffered food rather than forage and hunt in the wild for carrion. The ability to successfully forage and hunt for food is essential for the survival of a condor in the wild. Habituation interferes with feeding and other essential behaviors and compels the capture of the bird for its own safety and the safety of other condors. We thus consider habituation necessitating capture of a condor as an injury to the bird – a form of "harm" within the definition of take under the Act. The removal of an individual from the wild flock also harms the species as a whole because it reduces the size of an already small wild population while it struggles to recover. The individual may still contribute to recovery of the species through participation in the captive-breeding program;

however, the goal of recovery is wild reproduction, to which birds remanded to captivity do not contribute.

The applicant has proposed minimize the potential for habituation by having a qualified biologist with knowledge of California condors to monitor construction activities within the action area. The biologist would be present at all times during clearing and grubbing of construction areas. During mass grading, construction sites would be monitored on a daily basis. The authorized biologist would have the authority to stop all activities until appropriate corrective measures have been completed. If condors are observed landing in the action area, the applicant would avoid further construction within 500 feet of the sighting until the animals have left the area, or as otherwise authorized by CDFG and the Service. All condor sightings in the action area are required to be reported to CDFG and the Service within 24 hours of the sighting. Should condors be found roosting within 0.5 mile of the construction area, no construction activity would occur between one hour before sunset to 1 hour after sunrise, or until the condors leave the area, or as otherwise directed by the Service. Should condors be found nesting within 1.5 miles of the construction area, no construction activity will occur until further authorization occurs from CDFG and the Service.

To further protect California condor from negative interactions with humans and/or artificial structures, the applicant (or the applicant's agents managing the preserved open space) would remove dead cattle that are found or reported within 1,000 feet of a residential or commercial development boundary. Dead cattle would be relocated to a predetermined location within the High Country SMA or Salt Creek area. The locations where carcasses would be placed would be a minimum of 1,000 feet from a development area boundary. Appropriate locations for transfer of carcasses include open grasslands and oak/grassland areas where condors can readily detect carcasses and easily land and take off without encountering physical obstacles such as powerlines and other utility structures. The proposed locations would be selected and approved by the CDFG and the Service. Pursuant to this measure, a telephone number for reporting dead cattle would be provided and actively maintained. Any cattle carcasses transferred to the relocation areas would be reported to the Service.

The measures outlined above would help minimize the potential for condors to become habituated to new structures in the action area. However, over the 25-year period that this biological opinion is in effect, we cannot rule out the likelihood that such habituation would still occur. We do not think habituation would be a frequent event because condors only rarely occur in the action area, and even then such visits mainly occur when they are attracted to a food item. The measures to move carcasses away from development should reduce those instances. But condors remain intelligent and curious, and as their population increases and they expand their exploration of their historical range, we think at least one instance of habituation may still occur within the 25-year period.

Irrespective of the potential for habituation, garbage and debris left out by construction workers while conducting project activities could be detrimental to California condors. Such small items

include: bottle caps, nails, screws, nuts, washers, rags, electrical components, and wire. California condors have been known to ingest these and similar items. Between 2001 and 2010, of the 29 California condor chicks hatched in the wild, 25 were determined to have micro-trash in their digestive tracts, 10 died as a result, others were removed from the wild for recuperation, and two had emergency surgery and were returned to the wild (Service 2010a). Newhall has proposed to require that all construction areas be kept clean of debris, such as cable, trash, and construction materials. The applicant proposes to collect all microtrash and litter, vehicle fluids, and food waste from construction areas on a daily basis. Workers would be trained on what constitutes microtrash, its potential effects on California condors, and how to avoid the deposition of microtrash. These measures should avoid microtrash ingestion by California condors at construction sites.

California condors may collide with exposed power lines erected to deliver power to development areas. Powerlines that span canyons or are located along ridge lines would be the most dangerous for flying California condors. Collision with power lines has been one of the leading causes of recent California condor injury and mortality, especially for young birds. Six immature California condors have been recovered below power lines in southern California, three of those near the Hopper Mountain National Wildlife Refuge; another five condors have collided with power lines in the northern portion of their range in Central California. Several of these were near the Ventana Wilderness Area. California condors can also be electrocuted by power lines if the lines are spaced too closely.

The applicant proposes to install utility poles, phone, and cell towers in conformance with APLIC standards for collision-reducing techniques (APLIC 2006). The effectiveness of the APLIC guidelines may depend upon the location of new powerlines; the measures are less likely to be effective where the powerlines span canyons or are located along ridgelines where California condors are more likely to be soaring due to favorable wind patterns. To that end, the proposed avoidance and minimization measures state that the location of powerlines would be coordinated with CDFG and the Service[3] to ensure that new powerlines and poles in the High Country SMA (where condors are most likely to occur) would be situated where collisions by condors would be avoided. Because the Service and CDFG would not approve any towers or powerlines that would pose a collision hazard to condors, combined with implementation of the APLIC guidelines, we conclude that the potential for such collisions to occur is eliminated. Although condor use of the area is currently low, we expect that use to increase as the population gets larger and the birds explore more of their historical range. Consequently, we will take any increased use of the action area into consideration if powerline or tower installation is proposed in areas that could be used by condors.

The proposed project would result in the loss of some foraging habitat for the California condor within the RMDP area (i.e., condors fed on calf carcasses in Potrero Canyon in 2008 and 2009).

[3] The original measure (BIO-81) did not include the Service. The applicant agreed upon consultation to include the Service in the approval process so that this agency would be satisfied that collision potential was eliminated. BIO-81 has been revised in Appendix B to reflect the changes.

Construction activities and the corresponding removal of cattle from the lower canyons and urban development would eliminate foraging options; however, much of the canyon landscape within the action area is marginally to severely degraded and only small sections are now conducive to grazing range for cattle. Until recently, the few historical records of condor feeding were restricted to the upper elevations (Tapo Canyon and Ridge on the eastern edge of the Ranch property boundary) and with the removal of cattle from the lower canyons only upper elevations would remain available foraging habitat for condors. The protection of the oak-savannah upper elevations (High Country SMA and Salt Creek Area) in permanent conservation easements and ownership in the amount of 5,722 acres would continue to provide suitable foraging habitat for condors, especially if these areas are managed for cow/calf operations. A native deer population should provide some feeding opportunities in the preserved lands.

The proposed action includes measures intended to avoid and/or minimize most of the adverse effects described above. We believe the measures should reduce the potential for most these effects on the California condor; however, we believe that despite the measures proposed by the applicant, condor attraction to new structures and human activity in proximity to known foraging and feeding areas may lead to habituation during the 25-year life of this biological opinion, and that such habituation is itself a form of injury to the bird and would necessitate the removal such birds from the wild.

The recovery plan for the California condor focuses on: (1) increasing reproduction in captivity to provide condors for release, (2) release of condors to the wild, (3) minimizing condor mortality factors, (4) maintaining habitat for condor recovery, and (5) implementing condor information and education programs. None of these recovery activities were identified within the action area. The proposed action does not involve captive breeding programs or the release of condors into the wild, and is therefore neutral as to tasks (1) and (2). The proposed action is also neutral as to task (5), although the research required in evaluating the action has increased the amount of publicly-available information on the California condor.

Although none of recovery activities were identified for the action area in the recovery plan, the proposed action does have the potential to affect tasks (3) and (4) – minimizing condor mortality factors and maintaining condor habitat, respectively. As to the first, the major mortality factor affecting the species is lead poisoning, followed by collisions with human structures and ingestion of microtrash. The project area lies within the area of California covered under AB 821, the Ridley-Tree Condor Preservation Act, which prohibits the use of lead hunting ammunition, the leading source of lead poisoning among condors. In addition, hunting of all types will be prohibited in the entire project area, including the High Country SMA and Salt Creek area where condors are most likely to opportunistically forage. Further, the proposed action includes mitigation measures that we anticipate will eliminate the likelihood of bird collisions and microtrash ingestion, including: design and construction of utilities per Avian Power Line Interaction Committee (APLIC 2006) guidelines and operated with anti-perching devices to help reduce collisions and electrocutions of California condors; maintenance of construction areas free of microtrash and other debris; and biological monitoring by a qualified

biologist during construction activities (URS 2010). Therefore, the proposed action will complement efforts to minimize condor mortality factors.

With respect to maintaining condor habitat in the RMDP area over the long term, the proposed action will cause the loss of known foraging/feeding areas for the condor. Construction activities and the corresponding removal of cattle from the lower canyons and urban development would eliminate foraging options in some of the lower canyons; however, much of the canyon landscape within the action area is marginally to severely degraded and only small sections are now conducive to grazing range for cattle. Until recently, the few historical records of condor feeding were restricted to the upper elevations (Tapo Canyon and Ridge on the eastern edge of the Ranch property boundary) and with the removal of cattle from the lower canyons those upper elevations would remain available foraging habitat for condors. The protection of the oak-savannah upper elevations (High Country SMA and Salt Creek Area) in permanent conservation easements and ownership in the amount of 5,722 acres would continue to provide suitable foraging habitat for condors. A native deer population should provide some feeding opportunities in the preserved lands, and that may be supplemented with current cow/calf operations. While we do not have exact figures for how much foraging/feeding habitat would be lost because condors are opportunistic feeders and can forage over a wide variety of habitat, we believe the lost foraging/feeding habitat is relatively small in comparison to the permanent conservation easements in the High Country SMA and Salt Creek Area totaling more than 5,700 acres.

**Summary of Effects on the California Condor**

In summary, we conclude that although the proposed project would have some effects on the California condor, we do not believe the impacts would be substantial. The proposed project does introduce urbanization into a currently undeveloped landscape; however, the areas to be developed consist of marginal to severely degraded habitat that provides very limited foraging opportunities for the condor. The condor should continue to expand its use of higher value historical habitat that would be preserved by the project in the High Country SMA and Salt Creek areas, and should occasionally find food during routine foraging bouts over the area. Although there is some potential for individual birds to become habituated, we expect it to be an infrequent occurrence for the reasons cited earlier. With incorporation into the proposed action of various measures to protect the condor and higher quality condor foraging habitat, we do not expect that the action will reduce the reproduction, numbers, or distribution of the species, or impede its recovery.

**Arroyo Toad**

The analysis of effects of the proposed project on the arroyo toad is hypothetical. The species has not been observed in the action area during aquatic surveys for the last 10 years; however, we do have historical records of its presence and recent observations nearby the action area that indicate the potential for the species' presence during the 25-year permit term.

Development activities could kill, injure or otherwise displace arroyo toads from suitable habitat that are present within the RMDP area. Construction actions have the potential to cause mortality, limit foraging and breeding, and to exclude arroyo toads from portions of the area. Maintenance of bridges and of flood, drainage, and water quality protection features may have similar effects. Development is expected to result in the permanent and temporary losses of suitable arroyo toad habitat.

Implementation of the proposed RMDP would include the construction of bridges and bank stabilization within areas of the Santa Clara River containing high-quality arroyo toad habitat. Maintenance of these features and of other flood, drainage, and water quality protection features, may also result in effects to this habitat. Other construction activities would occur in areas containing moderate- to low-quality habitat. Additionally, build-out of the Specific Plan area would include construction in riparian and upland habitats potentially occupied by arroyo toad. These changes to habitat could result in displacement of individuals, interruption of breeding, and reduction in the availability of habitat for any members of the species present in the action area.

Construction of these features associated with both the RMDP and build-out of the Specific Plan area would require movement of people and equipment in construction areas. Any arroyo toads present could be killed or injured, either on the ground surface or in their burrows, by vehicles and heavy equipment associated with bank stabilization activities, repair, and maintenance. Trench excavation and berm removal could injure or kill arroyo toads by crushing them at the surface or within their burrows. Foot traffic by workers associated with the construction activities, biological surveys, and restoration activities could kill or injure arroyo toads. Revegetation activities involving the use of augers to dig holes for plantings could kill arroyo toads within burrows. The potential for arroyo toads to be killed or injured during these activities would be greatest within riparian habitats when workers are concentrated in those areas, or at night along the access roads and sandy areas when arroyo toads are either actively foraging or moving to or away from the Santa Clara River. The applicant has proposed to have a qualified biologist survey for and relocate any arroyo toads found in construction areas. This measure should reduce the potential for arroyo toads to be killed or injured by people or equipment; however, it is unlikely that if the species is present, all individuals could be detected. Although such effects could result from the proposed action, we do not expect injury or mortality to occur because no arroyo toads have been observed in the action area in approximately 10 years.

Build-out of the Specific Plan area would increase impervious surfaces in the surrounding watershed, which, in the absence of water detention basins and other facilities, would increase surface runoff into the Santa Clara River both within the RMDP area and downstream. Increases in surface runoff could affect any arroyo toads present in the action area by disrupting breeding if flow rates were too high to allow eggs and tadpoles to remain in place. Increased water flows could also cause sedimentation which would bury eggs or displace adults and juveniles. Although such effects to individual arroyo toads could result from the proposed action, we do not

expect them to occur because no arroyo toads have been observed in the action area in approximately 10 years.

The RMDP could affect arroyo toads downstream of work areas through short-term hydrologic or water quality alterations of the river during construction. In addition, RMDP-related work could disperse sediments and pollutants from construction on upland portions of the site into the Santa Clara River. Hydrologic and water-quality-related impacts could include changes to the base flows, changes to the timing and duration of flood flows, discharges of chemical pollutants, increased turbidity and sedimentation, and changes in water temperature due to short-term changes to the active channel morphology. As described above, increases in surface runoff could affect arroyo toads by disrupting breeding if flow rates were too high, and increased water flows could also cause sedimentation which would bury eggs or displace adults and juveniles; however, the Corps and Newhall have proposed avoidance and minimization measures, as well as BMPs (i.e., erosion and sedimentation controls), including restoration of disturbed areas, removal of exotic vegetation and predators, and preservation of existing habitat, which we believe will avoid or reduce the effects on hydrology and water quality alterations on the arroyo toads it the species if found within the action area.

A study by PACE (2010) addressed issues related to the long-term hydrology and geomorphic function of the river and potential long-term impacts. Sediment-transport modeling in the study determined that, with the build-out of the RMDP components and Specific Plan land uses, the total floodplain area exposed to erosive velocities would be lower in most storm events and that, overall, there would be no significant change in erosion and sediment deposition, within the action area or downstream. The study also showed that RMDP components would result in a net decrease in the degradation of geomorphic function on the river. In addition, the impacts of RMDP on Santa Clara River vegetation are expected to be minor, both within the action area and downstream of the action area. Regarding water quality issues, compliance with the construction general permit (Order No. 99-08-DWQ) mandates that construction-related non-stormwater discharges do not cause or contribute to violation of any clean water standards. Project Design Features of the RMDP would reduce stormwater pollutant levels in the long term. The PACE (2010) study also concluded that there would be no significant impacts in water flows, velocities, depth, sedimentation, or floodplain and channel conditions downstream of the RMDP area as a result of the proposed project. These hydraulic effects were also found to be insufficient to alter the amount, location, and nature of aquatic and riparian habitats within the RMDP area. PACE (2010) has further determined that the river would still retain sufficient width to allow natural fluvial processes to continue. As a result, the mosaic of habitats in the Santa Clara River that support the arroyo toad should be maintained, and any populations found within the river corridor would not be substantially affected. Assuming the PACE (2010) study is correct, combined with the avoidance and minimization measures proposed by the applicant, we conclude that the potential effects to the arroyo toad from changes in the stream hydrology and water quality would be minor, and that the remaining potential habitat for the species would continue to support the species if it were present.

The occupancy of the Specific Plan area, over the long term, could result in adverse secondary effects to arroyo toads, if found within the action area . Specifically, the proximity of urban development to suitable arroyo toad habitat could result in disruption of nocturnal activities and greater vulnerability to predation by nocturnal predators (such as owls and coyotes) as a result of nighttime lighting; greater vulnerability to predation by pets, stray, and feral cats and dogs as well as other mesopredators (see Crooks and Soulé 1999); collecting; degradation of habitat from increased human use (e.g., trampling, trash, and off-road vehicles) and altered fire regimes (likely too frequent fire); invasion by exotic plants (e.g., giant reed, tamarisk, and pampas grass) and wildlife species (e.g., bullfrogs, African clawed frogs, exotic fish, and crayfish); and increased risk of roadkill on roads adjacent to any occupied areas, particularly at proposed culvert crossings where vehicles would cross the site's smaller tributary drainages. The applicant has proposed to remove exotic predators and maintain suitable habitat within the Santa Clara River, as well as restrict human access to open space through well-defined trials and restrictions. These measures should be effective at avoiding and minimizing the effects on any toads present in the action area.. Further, because no arroyo toads have been observed in the action area in approximately 10 years of surveys, we have no evidence to suggest that these effects would decrease the numbers or distribution of the arroyo toad.

Project-related noise and activity near habitat occupied by arroyo toads could disturb individuals to the extent that foraging and burrowing behavior could be altered. Although the site is not expected to be fully restored for several years following construction activities, restoration of the site and removal of invasive, exotic vegetation, as proposed by Newhall, would help minimize any potential long-term effects of the project on the arroyo toad related to habitat degradation.

Temporary effects to any arroyo toads present in the action area would result during installation of the bank protection and preparation of the 85-foot construction zone required for bridge construction. When heavy equipment is used in proximity to aquatic habitats, the potential exists that these sensitive areas may be destroyed or degraded. The direct placement of material or runoff of sediments generated by the project into aquatic habitats can result in the loss of habitat values through filling or in the degradation of water quality. Arroyo toads are likely to be particularly sensitive to both direct filling of streams and sedimentation; the shallow pools this species requires for breeding can be destroyed by the addition of relatively small amounts of material, either by direct filling or by the alteration of the sandy and gravelly substrata that the arroyo toad requires. Arroyo toads may also be particularly vulnerable to the release of toxic materials because they generally use aquatic habitats with low flows; under such environmental conditions, toxins may be more concentrated and lethal. Additionally, the slow flows associated with breeding pools may increase the likelihood that fine sediments carried into the pools would remain there smothering eggs and tadpoles.

Runoff from areas where concrete is being used to mix with the soil cement could cause increases in water pH. Substantial increases would kill all life stages of the arroyo toad for some distance downstream of the release; a release of such materials resulted in mortalities of arroyo toads in Mono Creek in the Los Padres National Forest in the early 1990s. The rate of water

flow and amount of released material would affect the distance over which the pH would be altered. Because such effects could extend far beyond the actual work area, this has the ability to affect a larger number of arroyo toads. Equipment storage, maintenance, and staging areas would be located on upland sites and away from the any surface flow. These measures would be effective at reducing the potential for arroyo toad mortality and would reduce the likelihood that toxic materials would inadvertently reach aquatic habitat.

Project personnel associated with the project could travel outside of areas where work is occurring; such activities, particularly with vehicles, could kill or injure arroyo toads and damage their habitat. Flagging of the construction areas may help reduce intrusions. Careless workers could release toxic materials, leave garbage that would attract predators of the arroyo toad, or conduct activities outside of designated areas. Newhall has proposed to limit construction activities in the river bed, and define and mark the limits of project disturbance. These measures should be effective in reducing direct mortality or injury of arroyo toads during bridge and bank protection installation.

Biologists conducting surveys and project monitoring could transmit diseases carried on field equipment and gear used in other places. In some cases, these introduced diseases have had catastrophic effects on amphibian populations. Some evidence exists that other environmental stresses, such as the introduction of chytrid fungus, may exacerbate the effects of diseases on amphibians (Fellers et al. 2001). Chytrid fungus is a water-borne fungus that can be spread through direct contact between aquatic animals and by a spore that can move short distances through the water. The fungus only attacks the parts of an animal's skin that have keratin (thickened skin), such as the mouthparts of tadpoles and the tougher parts of adults' skin, such as the toes. It can decimate amphibian populations, causing fungal dermatitis, which usually results in death in 1 to 2 weeks. Infected animals may spread the fungal spores to other ponds and streams before they die. Once a water body has become infected with chytrid fungus, the fungus stays in the water for an undetermined amount of time. Infected equipment or footwear could introduce chytrid fungus into areas where it did not previously occur. If this occurs in the action area, any arroyo toads present could be affected. The potential for transfer of chytrid fungus on equipment would be effectively reduced or avoided by implementing the declining amphibian population task force code of practice as proposed by the Corps and Newhall (a copy of the guidelines is attached as Appendix C).

Arroyo toads present in the action area in various life stages could be affected by trampling while the site is being accessed, or by installation of fencing material. Impacts to arroyo toad egg masses and tadpoles would be most severe if fencing were installed through occupied breeding pools. Newhall proposes to survey the construction area, including breeding pools, and monitor construction activities in order to avoid arroyo toad egg masses and tadpoles to help reduce the likelihood of arroyo toad deaths. Following the construction of bridge and bank protection, the affected reach of the creek would lack streamside vegetation. This may allow invasive, exotic vegetation to establish and become dominant in the project area, reducing habitat for the arroyo toad. To prevent the spread of exotic vegetation in the project site, Newhall would remove

exotic vegetation from the project area during grubbing operations, and monitor and control infestations of exotic vegetation infestation in the project area during the planned restoration of the riparian habitat.

Some actions proposed by Newhall may involve the use of herbicides to control or eliminate non-native plant species in suitable arroyo toad habitat. The effects of these pesticides and herbicides are not limited to arroyo toad; other aquatic species such the unarmored threespine stickleback may be adversely affected as well and this discussion applies to both species. If Newhall uses herbicides, glyphosate (formulated as Rodeo® or Aquamaster®) is probably the most likely herbicide to be used. Glyphosate is the active ingredient in a variety of herbicides including Roundup®, Rodeo®, Aquamaster®, Buccaneer®, Glyfos®, Honcho®, Touchdown®, Vision®, Duramax®, Rattler®, and others. Glyphosate is a systemic herbicide that will kill broadleaf and grass species by inhibiting the production of aromatic amino acids in plants and some microorganisms that are necessary to build proteins (Devine et al. 1993). Because many animals lack the synthesis pathway that glyphosate disrupts, it is considered to have low potential to cause toxicity in animals (Devine et al. 1993). Most glyphosate products are formulated to contain surfactants that allow the active ingredients to spread over and penetrate the plant cuticles. Surfactants can be the most toxic portion of a pesticide product. The surfactant associated with many glyphosate products is a polyethoxylated tallowamine (POEA) surfactant.

Arroyo toad egg strands, tadpoles, juveniles and adults and all life stages of unarmored threespine stickleback may be exposed to glyphosate products and POEA surfactants in aquatic habitats through direct overspray of wetlands, drift from treated areas, or contaminated runoff from treated areas. The half-life of glyphosate in pond water ranges between 12 days and 10 weeks (Extoxnet 1996). Additionally, juvenile and adult arroyo toads can also be exposed to glyphosate in terrestrial habitats that have been treated. Glyphosate and POEA readily binds to soil particles and can be degraded by microbes in 7 to 70 days depending on soil conditions (Giesy et al. 2000). The half-life of glyphosate in soil can range from three to 249 days and the POEA surfactant in Roundup has a soil half-life of less than one week (USFS 1997).

No information is available regarding the toxicity of glyphosate products specifically to arroyo toads or unarmored threespine stickleback. Studies exploring the lethal and sublethal effects of glyphosate products on other amphibians or fish, including similar frog species classified in the same genus as the arroyo toad (*Anaxryus*) are available but are largely focused on aquatic life stages of the species and formulations of glyphosate that include surfactants. Roundup Original Max®, a glyphosate product with POEA surfactant, was demonstrated to be moderately to highly toxic to nine species of frog and toad tadpoles (Relyea and Jones 2009). Mann and Bidwell (1999) also found evidence of acute toxicity to four Australian frog species exposed to Roundup,® while the isopropylamine (IPA) salt of glyphosate (the active constituent in Roundup®) was found to be non-toxic. The mortality of tadpoles is hypothesized to be caused by the lysis of gill cells from exposure to surfactants (Lajmanovich et al. 2003, Edington et al. 2004) resulting in either to asphyxiation or loss of osmotic stability (Able 1974) indicating that the life stage during

which frogs and toads have gills may be particularly vulnerable. Glyphosate products containing POEA surfactants have also been shown to have sub-lethal effects to amphibians including decreased size, increased time to metamorphosis, tail malformations, and gonadal abnormalities (Govindarajulu 2008, Howe et al. 2004).

Several studies suggest that the toxicity of glyphosate products is linked with the surfactant, and not the glyphosate. Howe et al. (2004) compared the toxicity of glyphosate alone, to glyphosate with POEA surfactant, and POEA alone, on green frogs. Results indicated that the toxicity of glyphosate with POEA surfactant was similar to the POEA surfactant alone, which was much greater than glyphosate alone, indicating that the POEA was responsible for the toxic effects. In a comprehensive review of studies involving the effects of glyphosate on amphibians Govindarajulu (2008) concluded that the toxic effect of glyphosate products containing POEA are due to the POEA rather than the active glyphosate ingredient.

These studies indicate that glyphosate products formulated with POEA surfactants will likely kill or injure arroyo toads in aquatic habitats, with tadpoles being particularly vulnerable. Because glyphosate and POEA readily bind to soil and sediments, these chemicals may be less available to arroyo toads in terrestrial habitats; however, research is needed to determine toxicity mechanisms and thresholds from terrestrial exposure. Based on the literature (Howe 2004, Govindarajulu 2008), adverse effects to arroyo toads from the use of glyphosate products can be minimized through the use of products that do not contain a surfactant. Formulations that lack a surfactant include Rodeo and Aquamaster, which have been approved by the Environmental Protection Agency, through their registration process, for aquatic use.

A low-toxicity, non-POEA surfactant that works well with Rodeo® or Aquamaster® is Agri-Dex®, produced by Helena Chemicals. We are not aware of any information regarding the toxicity of Agri-Dex® on amphibians, but based on the data available, Monheit et al. (2004) concluded crop oil-based surfactants (i.e., Agri-Dex®) are probably less acutely toxic to fish, aquatic invertebrates and one frog species tested, than some other types of surfactants. The amount of Agri-Dex® that resulted in acute toxicity (i.e., >1000 parts per million (ppm) (Helena Chemical Company 2004, Washington State Department of Ecology and Agriculture 2004) was levels of magnitude higher than other surfactants tested including POEA (1.6 to 0.65ppm in Haller and Stocker 2003, Giesy et al. 2000, Folmar et al. 1979). It is important to note that so called crop oil-based surfactants, which suggest these products are vegetable-based, are actually petroleum products (USFS 1997). There could be sub-lethal adverse effects or long-term adverse effects to arroyo toads from chronic exposure to these chemicals that have not been documented. Overall, Agri-Dex® may be less toxic than other surfactants, but the use of glyphosate without a surfactant is probably even less toxic to the arroyo toads.

Herbicides may be used anywhere within the RMDP area in areas where non-native plants are to be controlled. Within suitable arroyo toad habitat, herbicides are most likely to be used to control giant reed and tamarisk. According to Table 3, the RMDP area supports approximately 5.6 acres of giant reed and 2.8 acres of tamarisk. Therefore, the project could result in the

application of herbicides over 8.4 acres of suitable arroyo toad habitat. This is approximately 0.6 percent of the total suitable arroyo toad habitat in the RMPD area. The removal of these non-native plants would be beneficial to the arroyo toad.

Adverse effects from herbicides may be reduced by measures proposed in section 7 of the RMDP, incorporated here by reference (e.g., Mitigation Measure E-3 requires the use of Rodeo® and Agri-Dex® in certain circumstances). The measures in section 7 of the RMDP are designed to avoid impacts to endangered species and minimize impacts to other riparian resources (Dudek 2010). They include species-specific measures, such as surveying for individuals of the listed species each day prior to beginning work activities and clearly demarcating all treatment areas, to avoid and minimize direct and indirect contact of the herbicides with unarmored threespine stickleback and arroyo toads, if any are present in the area, that are foraging or moving about. If surfactants are required, Newhall will be restricted to using non-ionic chemicals, such as Agri-Dex, which are approved for aquatic use (Dudek 2010) and are the least toxic alternative to aquatic species like the arroyo toad and unarmored threespine stickleback. Combined with the small proportion of suitable arroyo toad habitat that could be sprayed, we believe these measures would be effective at minimizing or avoiding the effects of herbicides on the arroyo toad, if any are found to be present.

According to the Recovery Plan for the arroyo toad, "[t]he recovery strategy for the arroyo toad consists of five parts: 1) stabilize and maintain populations throughout the range of the arroyo toad in California by protecting sufficient breeding and nonbreeding habitat, 2) monitor the status of existing populations to ensure recovery actions are successful, 3) identify and secure, by appropriate management and monitoring, additional suitable arroyo toad habitat and populations, 4) conduct research to determine the population dynamics and ecology of the species to guide management efforts and determine the best methods for reducing threats, and 5) develop and implement an outreach program" (Service 1999). The proposed action should not impede the recovery of the arroyo with respect to the recovery plan and in general for the following reasons:

As discussed above, few arroyo toads (i.e., a few tadpoles, but no metamorphs, juveniles, sub-adults or adults) have ever been observed in the action area – and none have been observed over 10 years of recent surveys - so the likelihood of direct loss of individuals is low. Nevertheless, the RMDP includes a 17-point protocol for protecting individual arroyo toads in the event they are encountered (Dudek 2010, Mitigation Measure BIO-17). These measures will ensure that if arroyo toads are found within the action area that injury or mortality of individuals would be avoided to the extent practicable.

Habitat for the arroyo toad could be affected by the action, especially if the proposed flood control structures or other facilities change the flow regime in the Santa Clara River; however, these impacts should be minimized by hydro-modification controls, BMPs, and other measures implemented both during construction and post-construction. Such measures include: a Stream Diversion Plan; construction of bypass channels; prohibition of unauthorized operation of equipment in flowing or ponded water; provision of alternative slow-water habitats near river

crossing and bridge construction areas to provide refuge during construction; mud, silt, and other pollutant controls and other BMPs to protect water quality; and biological monitoring during construction by a Service-approved biologist (Dudek 2010, Mitigation Measures BIO-43 through BIO-47, GRR-1 through GRR-8, WQ-1 and WQ-2). Furthermore, the proposed action includes large conservation easements in the River Corridor SMA and Salt Creek area, both of which would benefit the arroyo toad (Dudek 2010, Mitigation Measures BIO-1 through BIO-16). The sum of these measures indicate to us that sufficient habitat to support arroyo toads would remain within the action area following project completion, notwithstanding the fact that the species has not been observed in the action area for approximately 10 years.

To the extent the action may introduce exotic species into suitable arroyo toad habitat, or exacerbate colonization by such exotic species, those impacts will be controlled through the monitoring and removal of exotic plants and wildlife, such as giant reed, bullfrog, and African clawed frog (Dudek 2010, Mitigation Measures BIO-10 and BIO-80). In addition, the action will be subject to controls on the use of herbicidal surfactants, as described above. Therefore, the action should improve the potential for the recovery of the arroyo toad by eliminating, in the action area, one source of the species' rangewide decline.

With respect to recovery task 2) (monitoring of arroyo toad population status), the proposed action advances this goal by requiring monitoring to detect species presence prior to initiation of construction activities. In addition, the mitigation measures imposed for the benefit of the arroyo toad and other riparian species have specific success criteria that must be met. The action also advances task 3), as it creates, enhances, and/or restores riparian and upland areas that may function as habitat for the arroyo toad in the future. (Dudek 2010, Mitigation Measures BIO-1 through BIO-16)

**Critical Habitat for the Arroyo Toad**

Subunit 6b of the designated critical habitat comprises approximately 1,003 acres, of which approximately 413.1 acres are within the RMDP area. As described in the Environmental Baseline section, Newhall estimates that approximately 71.4 acres within designated critical habitat Subunit 6b do not support the PCEs due to intensive agriculture, oil production, and permanent development. Implementation of the RMDP and build-out of the Specific Plan area would result in the permanent loss of 12.0 acres of the 341.7 acres of designated critical habitat containing primary constituent elements, which represents a loss of 3.8XXX percent of the designated critical habitat with the primary constituent elements in the RMDP area. In terms of impacts to designated critical habitat areas that do not support the primary constituent elements, the RMDP activities would also result in temporary impacts to 30.7 acres, permanent impacts to 28.2 acres, and the remaining 12.5 acres would not be affected by the action. Habitat temporarily affected in both areas (those with the primary constituent elements and those lacking those elements) would be restored to a natural condition.

**Summary of Effects on Arroyo Toad**
Because arroyo toads have not been detected despite numerous surveys over 10 years within the RMDP area, we do not anticipate that any arroyo toads will be killed or injured by project activities. Because the action area does not appear to currently support the species, and because the applicant has proposed numerous measures to protect aquatic species including the arroyo toad if it is found during activities, we do not expect the proposed action would appreciably reduce the species' reproduction, numbers, or distribution in the wild.

The proposed action, as modified by the RMDP proposed mitigation measures, will not impede recovery of the arroyo toad. Although the Santa Clara River is not directly identified in the Recovery Plan as having a conservation role in the recovery strategy for the species, the proposed mitigation measures would support and facilitate recovery should arroyo toads occupy this area in the future, including protection of suitable breeding and nonbreeding habitat in the River Corridor SMA and habitat management (e.g., water quality, controls on bullfrogs, African clawed frogs, and giant reed).

Because only a small portion of the designated critical habitat would be affected by the project, we do not expect that the function of critical habitat Subunit 6b would be appreciably diminished. The unit should still meet the goal of the critical habitat designation, which is the protection and management of breeding and non-breeding habitat on a watershed basis for the conservation of the species because most of the unit is conserved, and areas that were proposed but excluded from the final rule designating critical habitat are also conserved.

**Unarmored Threespine Stickleback**
Under the RMDP, Newhall proposes bank stabilization, two bridges, the Newhall Ranch WRP outfall, temporary haul routes, water quality control facilities (including outlet structures/energy dissipaters), viewing platform locations, and habitat enhancement activities within the Santa Clara River. Newhall proposes to construct approximately 29,843 feet of bank stabilization along the north and south banks of the Santa Clara River. Approximately 29,293 feet of buried bank stabilization (i.e., 98 percent of the project total) would be installed in upland areas adjacent to the river. By constructing the majority of the proposed buried bank stabilization in the upland areas, direct impacts to the unarmored threespine stickleback habitat should be minimized; however, the remaining 550 feet of bank stabilization would occur in unarmored threespine stickleback habitat.

Individual unarmored threespine sticklebacks in the RMDP area may be injured or crushed by excavation and construction equipment, construction debris or worker foot traffic during construction activities. The noise and ground vibrations from the operation of heavy equipment during construction activities may disturb unarmored threespine sticklebacks and cause individuals to disperse and possibly be driven into areas where they would be more susceptible to injury or mortality due to predation, vehicular or foot traffic, or falling debris. The effects of these activities would be minimized by the proposed capture and relocation of individual unarmored threespine sticklebacks out of work areas to prevent injury and mortality.

The dewatering and diversion of water for construction projects within the project area could result in the direct mortality of unarmored threespine sticklebacks from desiccation or crushing. The use of blocking nets, as proposed in the RMDP, would prevent unarmored threespine sticklebacks from entering the diversion channel during its construction. With the termination of the above dewatering activities, unarmored threespine sticklebacks could become stranded in the diversion channels or caught in the folds of the proposed plastic sheeting that would line the diversion as the flow recedes. Newhall proposes to gradually step-down water discharges once dewatering is no longer needed so that Service-approved biologists can capture stranded unarmored threespine stickleback and relocate them to a predetermined downstream site. This measure will minimize the effects to unarmored threespine stickleback from dewatering and diversions.

Disturbance of unarmored threespine sticklebacks would occur while capturing and transporting individuals to suitable habitat. Individuals may also be injured or killed in a seine net should it be used improperly, such as if fish remained trapped in the net or out of water for too long. Mortality following translocation may occur given the uncertainty of the survival of unarmored threespine sticklebacks in unfamiliar sites or from injuries and stress to related handling and transportation. These effects would be reduced by clearly marking the boundaries of the work areas and by employing only experienced biologists to capture and handle the species.

Project-related material releases onto channel substrate or into water would result in effects to water quality that may be hazardous to unarmored threespine sticklebacks. Debris falling into the river may also degrade water quality. Water quality in the Santa Clara River could be affected if construction-related chemicals (fuels, lubricants, wastes) are accidentally introduced into the water or are allowed to accumulate in stream soils. As proposed in the RMDP, the implementation of measures to control pollution, such as refueling at designated areas and containment of spilled substances, would reduce these effects. The effects of herbicide use on aquatic species, including the unarmored threespine stickleback, are discussed above under the heading for the arroyo toad.

Employees of Newhall and other personnel associated with the project could travel outside of areas where work is occurring and into adjacent flowing water; such activities, particularly with vehicles, could kill or injure unarmored threespine stickleback. Flagging of the construction areas may help reduce intrusions. Careless workers could release toxic materials, leave garbage and food-related items that would attract predators of the unarmored threespine stickleback, or conduct activities outside of designated areas.

A study by PACE (2010) addressed issues related to hydrology and geomorphic function of the river and potential long-term impacts. Sediment-transport modeling in the study determined that, with the build-out of the RMDP components and Specific Plan land uses, the total floodplain area exposed to erosive velocities would be lower in most storm events and that, overall, there would be no significant change in erosion and sediment deposition, within the action area or downstream. The study also showed that RMDP components would result in a net decrease in

the degradation of geomorphic function on the river. In addition, the impacts of RMDP on Santa Clara River vegetation are expected to be minor, both within the action area and downstream of the action area. Regarding water quality issues, compliance with the construction general permit (Order No. 99-08-DWQ) mandates that construction-related non-stormwater discharges do not cause or contribute to violation of any clean water standards. Project Design Features of the RMDP would reduce stormwater pollutant levels in the long term. Based upon this information, we do not expect any adverse effects to unarmored threespine stickleback as a result of changes to the hydrology, geomorphpology, and water quality.

While the long-term effects of the specific plan build-out described above could lead to the loss of an indeterminable number of unarmored threespine stickleback and an increase in non-native species (Marchetti et al. 2006), the RMDP incorporates measures to minimize these effects. These measures include compliance with NPDES requirements, including the following water quality control facilities: 1) water quality basins; 2) debris basins, located just upstream of the interface between developed and undeveloped areas, primarily to trap debris coming from the upper watersheds (Debris Retaining Inlets [DRI]); 3) detention basins, which are typically sized to capture the predicted runoff volume and retain the water volume for a period of time (usually 24 to 48 hours); 4) catch basin inserts or screens/filters installed in existing or new storm drains to capture pollutants in the stormwater runoff; 5) bioretention, such as vegetated, grassy swales, that provide water quality benefits and convey stormwater runoff; and 6) solids separator units or in-line structures that reduce or manipulate runoff velocities such that particulate matter falls out of suspension and settles in a collection chamber. The overall population status of the species in the watershed would not be substantially altered by the proposed action because the applicant proposes measures to minimize these effects and the majority of the existing habitat would remain intact..

The recovery plan for the unarmored threespine stickleback designated three areas as very important for the survival and recovery of the species: (1) two disjunct reaches of the Santa Clara River in Los Angeles County; (2) a short reach of San Francisquito Canyon; and (3) and the lowermost 8.4 miles in San Antonio Creek in Santa Barbara County (Service 1985). One of the reaches in the Santa Clara River is the area from San Martinez Grande Canyon upstream to the I-5 Bridge, which runs through the action area.

According to the recovery plan, the unarmored threespine stickleback faces three major threats: (1) inadequate or unsuitable stream flows, (2) predation and/or overcompetition by exotic species, and (3) introgression by *G. a. microcephalus* (Service 1985). Each of these threats must be addressed to facilitate recovery of the species. Further, each threat tends to increase in magnitude when the stream habitat on which the unarmored threespine stickleback depends is channelized. In this case, the proposed action contemplates the construction of significant flood control infrastructure in portions of the Santa Clara River used by the stickleback. Should those infrastructure components materially alter the flow regime of the river in these locations, the action could exacerbate existing threats and frustrate recovery of the species.

To avoid this outcome, the proposed action has been designed to minimize its potential to alter flows within the Santa Clara River (Dudek, Mitigation Measures GRR-1 through GRR-8.) Hydrological analyses show that the proposed action should reduce erosion and scour of the River's floodplain, except during the five-year and 20-year flood events (see ENTRIX 2010 study, entitled "Focused Special Status Fish Habitat Assessment and Impact Analysis," attached as Appendix F.5 to Dudek 2010, at 4-2 through 4-6, and 6-13). These same analyses indicate that the action should actually increase the amount of refugia habitat for the unarmored threespine stickleback (i.e., backflows with velocities of less than two cubic feet per second), thus potentially improving the species' ability to survive storm events.

In addition, to avoid harm to individual unarmored threespine stickleback during construction activities, the RMDP includes specific protocols for diverting fish away from construction areas. (Dudek 2010, Mitigation Measures BIO-43 through BIO-47). Pollutants, including those from pesticides should be controlled through BMPs and water quality protective measures set forth in Mitigation Measures WQ-1 and WQ-2, among others.

With respect to threat (2) – invasive species – the project has the potential to introduce such species into habitat used or occupied by unarmored threespine stickleback (Dudek 2010, Mitigation Measures BIO-10 and BIO-80). However, mitigation measures imposed on the action (e.g., BIO-80, control of exotic species) should offset this threat. The success of these measures will be monitored on a long-term basis.

Finally, as to threat (3) – introgression – the proposed action will not cause inundation of the "Dry Gap" that separates the protected subspecies, *G. a. williamsoni*, from *G. a. microcephalus*. GSI Water Solutions' analysis (2008) of post-development conditions within the Dry Gap determined that the future WRP discharge will not affect the seasonality (i.e., ephemeral nature) or duration of flows through the Dry Gap. Potential impacts to unarmored threespine stickleback from genetic introgression are not expected to occur. Therefore, the proposed action should not increase the threat of introgression.

**Summary of Effects to the Unarmored Threespine Stickleback**
The proposed project, as modified by proposed mitigation measures, should not reduce the reproduction, numbers, or distribution of the unarmored threespine stickleback. The proposed measures will minimize the direct effects to individuals of the species and the current hydrological conditions are predicted to be maintained (PACE 2010). Further, the proposed action includes measures that support and facilitate recovery, including protection, restoration, and enhancement of habitat.

**Coastal California Gnatcatcher**
The action area supports approximately 4,126 acres of suitable habitat (i.e., coastal sage scrub) for the coastal California gnatcatcher. Approximately 1,350 acres of suitable habitat within the action area would be directly permanently lost as a result of project implementation, representing approximately 33 percent of suitable habitat within the action area for the coastal California

gnatcatcher. A total of 2.3 acres would be directly but temporarily impacted by project implementation.

All project-related activities in the action area (e.g., construction of roads, flood control structures, associated infrastructure, and residential development) could adversely affect coastal California gnatcatchers. These activities could have direct or indirect effects to coastal California gnatcatchers within the action area. As mentioned above in the Environmental Baseline section, we estimate that the action area could theoretically provide suitable habitat for 152 to 343 pairs of coastal California gnatcatchers. Based on the permanent impacts and territory size, suitable habitat for 50 to 112 pairs of coastal California gnatcatchers would be destroyed; however, surveys for coastal California gnatcatcher have not detected any territories within the action area. The applicant has requested that the Corps consider the species present in the action area due to the observation of one individual coastal California gnatcatcher in the action area, the proximity of other observations of the species, and the quality of the habitat in the action area.

The project activities could result in disturbance or possibly direct injury or mortality of any resident or nesting coastal California gnatcatchers present in the area, including, but not limited to disturbance of nesting behavior resulting in unsuccessful breeding and nest formation, abandonment of an active nest by adult birds, mortality of eggs and young birds within a nest, dispersal of adults to other suitable habitat because of temporary loss or degradation of habitat within the action area (1 to 5 years for habitat regeneration in areas of revegetation), and reduction in the value of the habitat for cover and foraging. The loss of habitat for cover, forage, and reproduction could cause individuals to disperse to other suitable habitat. Any breeding pairs or resident coastal California gnatcatchers discovered within the action area would likely relocate to nearby unoccupied suitable habitat, and direct mortality of these birds and direct disturbance to nesting would likely be avoided because of the specific procedures to limit the impact of maintenance and construction activities, which are detailed in the RMDP biological assessment in Appendix B, incorporated here by reference (URS 2010).

Coastal California gnatcatchers are highly territorial and a loss of habitat due to project development outside of the nesting season may cause the birds to seek out another area in which to forage and nest permanently. Such relocation may adversely affect the birds by causing an increase in energy expenditure necessary to locate, establish and defend a new territory. However, to date, we are not aware of any gnatcatcher territories within the action area. Food-related trash and open containers attract raccoons, coyotes, ravens (*Corvus corax*), and other predators of coastal California gnatcatcher. Any increase in normal predation levels could have adverse effects on coastal California gnatcatchers that could potentially occupy the site in the future. This potential impact would be minimized or avoided by the careful control of waste products at all work sites as discussed in the RMDP biological assessment in Appendix B, incorporated here by reference (URS 2010).

The project could indirectly affect suitable gnatcatcher habitat through introduction of non-native plants, increased fire frequency or fire suppression (i.e., brush clearance), the loss of large predators that control the numbers of small and medium predators that prey upon birds (e.g., raccoon, Virginia opossum, striped skunk), and human intrusions.

**Summary of Effects on the Coastal California Gnatcatcher**

While we estimated that up to 343 pairs of coastal California gnatcatcher theoretically could occur in the action area (based upon suitable) habitat and published range sizes), and that up to 112 pairs could be affected directly by habitat removal, only one individual bird has been observed in the action area over 15 years of surveys. We conclude that that very few, if any, coastal California gnatcatchers are present in the action area and could be affected by the action. While the proposed activities could disturb all coastal California gnatcatchers found to be present within the action area, because we are not aware of any gnatcatchers occupying the action area, the activities are not likely to result in the death of any coastal California gnatcatcher individuals; therefore, the effects on the California gnatcatcher are likely to be minimal. While approximately 33 percent (approximately 1,350 acres) of the suitable habitat in the action area would be lost, that loss constitutes only a small portion of suitable habitat of the entire range of the coastal California gnatcatcher would be affected by the project (approximately 0.2 percent of the rangewide modeled habitat estimated at 639,387 acres; Service 2010b). Consequently, the proposed action should not reduce the reproduction, numbers, or distribution of the species in the wild.

A recovery plan for the coastal California gnatcatcher has not been prepared. According to the Spotlight Species Action Plan for the coastal California gnatcatcher (as described earlier), the action area is not within any regional HCP/NCCP. Therefore, we do not expect the proposed action to interfere with the goals of the SSAP. In general recovery terms, the action area is at the northern edge of the coastal California gnatcatcher's distribution and likely represents the species at the extreme of its historical range. Only one individual coastal California gnatcatcher has been observed in the action area. The single gnatcatcher individual observed in the action area and immediate vicinity indicates that the rangewide recovery of the species is not dependent upon the small number of individuals potentially present within the action area. Approximately 67 percent of the suitable habitat for the coastal California gnatcatcher within the action area RDMP plan area would not be disturbed and would be preserved as open space and remain available to the California gnatcatcher should it eventually colonize this area. We conclude that the proposed action should not appreciably diminish the contribution of the action area to the recovery of the coastal California gnatcatcher.

## CUMULATIVE EFFECTS

Cumulative effects are those impacts of future State and private actions that are reasonably certain to occur in the action area. Future Federal actions that are unrelated to the proposed action would be subject to the consultation requirements established in section 7 of the Act and, therefore, are not considered cumulative to the proposed project. We are unaware of any other

non-Federal actions that are reasonably certain to occur and are likely to adversely affect the least Bell's vireo or its critical habitat, southwestern willow flycatcher, California condor, arroyo toad and its proposed critical habitat, unarmored threespine stickleback, and coastal California gnatcatcher in the action area.

**CONCLUSIONS**

After reviewing the current status of the least Bell's vireo, southwestern willow flycatcher, California condor, arroyo toad, unarmored threespine stickleback, coastal California gnatcatcher; the environmental baseline; the effects of the action; and the cumulative effects; it is the Service's biological opinion that the Corp's proposed authorization of Newhall to permanently impact approximately 66 acres of Waters of the U.S. for the construction of roads, flood control structures, associated infrastructure, and build-out of the specific plan (i.e., urban development) for the Newhall Ranch Resource Management and Development Plan in the Santa Clara River and several other tributaries near Santa Clarita is:

(a) not likely to jeopardize the continued existence of the least Bell's vireo, southwestern willow flycatcher, California condor, arroyo toad, unarmored threespine stickleback, or coastal California gnatcatcher, and

(b) not likely to destroy or adversely modify the designated critical habitat of the least Bell's vireo or arroyo toad.

We have reached these conclusions for the following reasons:

Least Bell's vireo

Of the 485 acres of suitable nesting habitat for the least Bell's vireo in the action area, 77 acres would be directly, permanently removed by project activities. None of the recorded territories of least Bell's vireo would be affected. The remaining 408 acres would be conserved and, with the exception of areas that would be subject to indirect effects as described in the Effects Analysis and below, we expect the remaining habitat to continue to support known least Bell's vireo territories and to accommodate any population expansion the species experiences. The applicant has proposed numerous measures (e.g., restoration of disturbed areas, removal of invasive exotic plants, etc.) to minimize and mitigate the effects of the habitat loss on the least Bell's vireo and these should be effective at ensuring that the species persists in the action area.

As described in the Effects Analysis section, the proposed actions pose potential indirect effects to the least Bell's vireo. These include effects from noise, non-native predators, fire management, and other causes. The applicant has proposed measures to address these effects; however, indirect effects cannot be completely avoided or minimized to the point where the least Bell's vireo would not be affected. Based upon the 60 dBA contour provided by the applicant as a measure of the extent of indirect effects, as described in the Effects Analysis, of the 56 least Bell's vireo territories recorded in the action area, only four of those territories would be affected

by noise from the project activities (including long-term occupancy). In addition to the indirect effects to known territories, we expect indirect effects to intrude into approximately 2 acres of suitable least Bell's vireo habitat (Dudek 2010), thus potentially interfering with the essential behaviors of additional least Bell's vireos. Put into context of the total available suitable habitat within the action area and the number of pairs of least Bell's vireo that suitable habitat could potentially support, the number of least Bell's vireos that would be affected by indirect impacts is a small proportion of the least Bell's vireo population that could be supported in the action area. We do not expect that the project will appreciably diminish the least Bell's vireo population in the action area as a result of indirect effects.

Because we do not anticipate an appreciable decline in the population of least Bell's vireos within the action area, we also do not believe that the proposed action will appreciably reduce the likelihood of the species' survival and recovery in the wild. The action area represents a small percentage of the known population, so that the minor effects we expect due to the proposed action are not likely to reduce the numbers, reproduction, or distribution of the species. The recovery plan does not define any specific recovery function for the Santa Clara River unit; however, the minor impact to the species as a whole supports our conclusion that the proposed project would not interfere substantially with the likelihood of the recovery of the of the least Bell's vireo.

As noted in the Environmental Baseline, the critical habitat unit of which the action area is a part comprises 4,409 acres, 2,252 acres of which are within the action area. Of the 2, 252 acres of the unit within the action area, 1,408 acres would be permanently lost to development; however, much of this 1,408 acres does not support the PCEs of the critical habitat designation. Newhall has calculated, and we concur, that only 443 acres within the action area support the PCEs. Approximately 77 acres of this 443 acres (17 percent) would be permanently lost due to the proposed actions. We conclude that the loss of this small proportion of the unit would not interfere appreciably with the survival or recovery function of either the unit or the entire critical habitat designation. The lost habitat is not in a location where it would fragment the critical habitat unit or result in the loss of an important element in the function of the critical habitat. The majority of the critical habitat would continue to support the PCEs where they currently exist and provide habitat for the recovering least Bell's vireo population. Also, considering the entire critical habitat designation of 38,000 acres statewide, the proposed effects are relatively small and should not diminish the value of the critical habitat overall.

Southwestern willow flycatcher

Despite surveys, no nesting southwestern willow flycatchers have been recorded within the action area. A few southwestern willow flycatchers have been observed but these birds were not nesting and did not persist through the breeding season so they are assumed to have been transients. As a result, we do not expect any nesting southwestern willow flycatchers to be adversely affected by the proposed project. Because the only direct effect to the species would be the permanent loss of 21 acres of suitable habitat and 2.1 acres of indirect effects, we do not expect that the population of southwestern willow flycatcher in the action area which thus far has

consisted only of transient individuals, to be appreciably reduced by the proposed activities. The applicant has proposed numerous measures (e.g., restoration of disturbed areas, removal of invasive exotic plants, etc.; see Appendix B) to minimize and mitigate the effects of the habitat loss on the southwestern willow flycatcher and these should be effective at ensuring that the species persists in the action area.

Because we do not anticipate an appreciable decline in southwestern willow flycatchers within the action area, we also do not believe that the proposed action will appreciably reduce the likelihood of the species' survival and recovery in the wild. The action area represents a small percentage of the known population so that the minor effects we expect due to the proposed action are not likely to substantially reduce the numbers, reproduction, or distribution of the species.

The recovery plan for the southwestern willow flycatcher indicates that the Coastal California Recovery Unit that comprises the action area requires improved population stability and enhancement of existing habitat. The proposed action includes habitat restoration that is consistent with this goal. The recovery plan also states that delisting would require, in part, a stable population of 25 pairs of southwestern willow flycatcher in the recovery unit. Despite the loss of a small area of suitable nesting habitat, the proposed action would not interfere with this goal as no territories have been recorded within the action area. We have determined that the minor impact to the species as a whole supports our conclusion that the proposed project would not interfere appreciably with the likelihood of the recovery of the southwestern willow flycatcher in the wild.

California condor

In the Effects Analysis section of this biological opinion, we discuss several possible effects to California condors that could result from the proposed action. We conclude that the most likely adverse effect that could arise from the proposed action, for which avoidance and minimization measures would not be completely effective, is habituation of individual birds to human structures or activities. Other effects from the project, such as the loss of potential foraging/feeding habitat and exposure to microtrash, are addressed by the proposed avoidance and minimization measures (e.g., preservation of high elevation habitat, removal of microtrash form construction sites) such that the adverse effects are not likely to have an impact on the species.

While it is possible that individual California condors may become attracted to new development in the RMDP area, we expect that such occurrences would be infrequent because the birds do not visit the area very often and are more likely to be drawn to a carcass and feeding than solely to new human activity. Despite the infrequency at which we expect habituation to occur, we still consider it a possible effect of the proposed development. If such habituation does occur, the individual California condor would have to be removed from the wild and either relocated to an another area to try to break this pattern of behavior, or taken permanently into captivity if the behavior continued. Birds removed from the wild may still play a role in the captive breeding

program, but they would not be a part of the recovering wild flock. Because we expect the measures built into the project will effectively reduce the habituation impacts of the project, , we believe the impact of the project on the California condor as a species would be minimal and would not reduce appreciably the likelihood of the species' survival and recovery in the wild.

Arroyo toad

Very few arroyo toads have been recorded in the action area. The last record was of 6 tadpoles in 2000. Despite numerous aquatic surveys in the last 10 years, no other arroyo toads have been observed in the action area; however, per the survey protocol, as the species has been observed within 0.31 miles upstream of the action area, we assume arroyo toads could be present. Because the numbers are so low, we expect the proposed actions to affect few, if any, arroyo toads. Further, we expect that the loss of the 733 acres of suitable habitat that supports few, if any, arroyo toads, while a fairly large percentage of the available suitable habitat (38 percent) within the action area would not have a substantial effect on the species. The preservation of the remaining 62 percent of the suitable habitat in the action area, restoration of other areas proposed by the project, and the low potential for direct and indirect effects to individual arroyo toads lead us to conclude that the minor effects of the action at the local level will not have an appreciable effect on the arroyo toad, and thus will not result in an appreciable reduction of the reproduction, numbers, or distribution of the species.

The recovery plan for the arroyo toad does not state any specific goal for the Northern Recovery Unit of which the action area is a part. The overarching goal of the plan is to have in place management plans implemented on federally-controlled lands to conserve, maintain, and restore habitat for the arroyo toad. None of those federally-controlled lands are present in the action area; however, the RMDP includes measures that are intended to conserve the physical and biological features that would support arroyo toads. We conclude that the proposed action would not reduce appreciably the likelihood of recovery of the arroyo toad because the action area currently does not support a substantial population of the species and the applicant proposes to implement measures that would contribute to the species' conservation (i.e., habitat restoration, removal of non-native predators, etc.).

As discussed in the Effects Analysis section, the action area comprises approximately 413.1 acres of the designated critical habitat for the arroyo toad. The applicant has calculated, and we agree, that 341.7 acres of the critical habitat within the action area support the PCEs as defined in the final rule (the remaining 71.4 acres are agricultural fields, oil production, or other permanent disturbance). Of the 341.7 acres that support the PCEs, the proposed action would permanently remove 12.0 acres. We do not expect this amount of permanent loss to appreciably reduce the value of the critical habitat, either at the unit level (3.8 percent) or for the entire designation of 98,366 acres (X0.01 percent) because the physical and biological features (PCEs) would remain intact on a vast majority of the designated critical habitat. Also, temporarily disturbed areas and some which do not currently support the PCEs would be restored. The critical habitat unit of which the action area is a part will continue to serve its conservation functions as a connection between the known populations of arroyo toad in tributaries to the Santa Clara River, and to

accommodate natural population expansion and fluctuation. The minor effects of the proposed action should not diminish the ability of the entire critical habitat designation to protect and support the management of breeding and non-breeding habitat on a watershed basis for the conservation of the species. Because the goals of the critical habitat designation would still be met within the action area, we conclude that the recovery function of the entire 98,366 acres of critical habitat would not be appreciably diminished.

Unarmored threespine stickleback

The unarmored threespine stickleback is present throughout the action area within the Santa Clara River where surface flows are present. Numbers of individuals are not a good measure of the effects of the proposed action on the species because they fluctuate widely within and between years, depending upon conditions and the time of year (e.g., more individuals are present following breeding). While we acknowledge that some individual unarmored threespine sticklebacks could be killed or injured by the proposed actions, we believe these small numbers would be masked by the species' normal population fluctuations. Therefore, we look at the area of affected habitat when making conclusions about the survival and recovery of the unarmored threespine stickleback as related to this action.

The Effects Analysis indicates that the proposed action would permanently affect only 550 feet (of approximately 5 river miles) of habitat for unarmored threespine stickleback (i.e., bank stabilization would be installed mostly in upland areas away from unarmored threespine stickleback habitat). Other potential effects (e.g., changes in water quality and quantity, stranding during temporary water diversions, etc.) would be avoided or minimized by the measures proposed by the applicant as described in the Effects Analysis. Therefore, we expect the proposed actions to have only a minor effect on the unarmored threespine stickleback population in the action area. Because the reproduction, numbers, or distribution of the unarmored threespine stickleback in the watershed would not be altered by the action, we conclude that it is not likely to appreciably diminish the likelihood of the species' survival and recovery throughout its known range.

The recovery plan for the unarmored threespine stickleback identifies the stretch of the Santa Clara River within the action area to be one of three significant stretches of habitat for the survival and recovery of the unarmored threespine stickleback. As described in the Effects Analysis section, the proposed action has been designed to avoid changes in streamflows, reduce the number of exotic predators (e.g., African clawed frogs), and to avoid introgression with the more common subspecies which is currently separated from the listed subspecies by a "dry gap" in the Santa Clara River. The proposed action is also intended to protect, restore, and enhance suitable habitat for the unarmored threespine stickleback, which is consistent with the goals of the recovery plan. Because we have already determined that the effects to both individual unarmored threespine sticklebacks and the species' habitat would not be substantial on either a local or range-wide basis, we conclude that the proposed action would not appreciably diminish the species' likelihood of recovery.

Coastal California gnatcatcher

The actual number of coastal California gnatcatchers observed in the action area following 15 years of annual bird surveys is one (1) individual bird. This bird was not located during subsequent focused surveys, so we conclude it was either a transient or at the edge of its territory. In the Effects Analysis, we project the potential for up to 343 pairs of coastal California gnatcatchers in the action area (based upon suitable habitat and published range sizes); however, the action area does not appear to support any resident coastal California gnatcatchers. In other words, while approximately 33 percent of the suitable habitat for coastal California gnatcatchers in the action area would be removed by the project (1,350 acres lost out of 4,126 acres present), this habitat is not occupied by the species (based upon repeated surveys). Therefore, we have determined that the effects to coastal California gnatcatcher within the action area would be minor and the effects to the coastal California gnatcatcher and its habitat would not result in an appreciable reduction in the numbers, reproduction, or distribution of the species. Because this is true at the level of the action area, it is also true when considering the effects to the species rangewide. That is, if the local effects are minor, the effects to the species as a whole would be similarly and proportionately small.

In terms of the coastal California gnatcatcher's recovery, the loss of approximately 33 percent of the suitable habitat for the species within the action area would appear to be substantial. If the suitable habitat areas were known to be occupied by the species, the loss of that much habitat could have the effect of diminishing the numbers and distribution of the species. However, because only one individual coastal California gnatcatcher was observed on the site on one occasion, we conclude that the loss of 1,350 acres of (mostly) unoccupied suitable habitat would not appreciably diminish the species' likelihood of recovery. The large areas of coastal sage scrub habitat that would remain intact (approximately 2,776 acres) within the action area would still be available to support the species and contribute to its recovery if the species should expand into and occupy the to the action area in the future.

## INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened wildlife species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as an intentional or negligent actions that create the likelihood of injury to a listed species by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the

Act provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are non-discretionary and the Corps must include these measures in any permit issued to Newhall and the applicant must carry out these measures for the exemption in section 7(o)(2) to apply. The Corps has a continuing duty to regulate the activity covered by this incidental take statement. If the Corps or the applicant fail to implement these terms and conditions, the protective coverage of section 7(o)(2) may lapse. To monitor the impact of incidental take, the Corps must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [50 CFR §402.14(i)(3)].

This incidental take statement exempts from the take prohibitions of the Act, take of least Bell's vireo, southwestern willow flycatcher, California condor, arroyo toad, unarmored threespine stickleback, and coastal California gnatcatcher that is carried out in accordance with its terms and conditions. It does not address the restrictions or requirements of other applicable laws.

## AMOUNT AND EXTENT OF TAKE

### Least Bell's Vireo

We anticipate that take of least Bell's vireos would be most likely to result from habitat loss and indirect effects (e.g., noise). None of the other effects of the project we analyzed are likely to result in take of least Bell's vireos due, in part, to the avoidance and minimization measures proposed to address the project impacts.

Surveys have detected up to 56 territories in the action area; however, none of these territories would be directly affected by the project activities. Although no known territories of least Bell's vireo within the action area would be directly affected by the project, the RMDP and specific plan build out would directly remove 77 acres of habitat that could be used by the least Bell's vireo for nesting and foraging. We do not anticipate that the loss of these 77 acres will directly result in the take of least Bell's vireos because it does not overlap with any of the 56 known territories. Of the 56 recorded least Bell's vireo territories, elevated noise levels (above the 60 dBA noise contour) at the two bridge crossings and due to increased traffic on Highway 126 overlap with 4 of these recorded territories. We assume that the elevated noise levels at these 4 territories could disrupt nesting and foraging behavior, resulting in nest abandonment, which could lead to starvation, predation, and other effects listed in the Effects Analysis. Thus, we anticipate the take of up to 4 pairs of least Bell's vireo (8 individuals). While indirect effects could intrude into other areas of suitable habitat, none of those areas are currently occupied by any of the 56 known territories and we do not anticipate any further take in these areas due to noise and other indirect impacts.

**Southwestern Willow Flycatcher**
We anticipate that any potential take of southwestern willow flycatcher most likely would result from habitat loss and indirect effects (e.g., noise). None of the other effects of the project we analyzed are likely to result in take of southwestern willow flycatchers, in part due to the avoidance and minimization measures proposed to address the project impacts.

Within the action area, the RMDP and specific plan build out would directly remove 23 acres of riparian habitat that could be used by the southwestern willow flycatcher for nesting and foraging as described in the Effects Analysis section. . However, no nesting territories have recorded in the action area; only individual southwestern willow flycatchers, assumed to be transients, have been observed. Because 359 acres of suitable southwestern willow flycatcher habitat would remain intact (382 acres of suitable habitat minus 23 acres), we assume that other transient southwestern willow flycatchers could easily find adequate foraging or resting habitat in the action area.

We do not anticipate the proposed action will incidentally take any southwestern willow flycatchers. Although the "Effects Analysis" section above indicates that implementation of the proposed action has the potential to cause biological effects to the southwestern willow flycatcher that conform to the regulatory definition of take, the mere potential for take is not a legitimate basis for a take exemption. Since no take is anticipated or exempted, no reasonable and prudent measures and terms and conditions for the southwestern willow flycatcher are provided below. If take is detected during implementation of the proposed action, reinitiation of formal consultation should be requested, and any operations causing such take should cease pending the outcome of the reinitiated consultation.

**California Condor**
We anticipate that take of California condors as a result of the proposed project would be limited to harm that could occur as a result of habituation to human activity and structures. Condors that become habituated to new development in the RMDP area are vulnerable to injury from collision with powerlines and vehicles, interactions with humans (e.g., shooting), ingesting toxic substances, being fed harmful items, and ingestion of microtrash. While the applicant has proposed measures to reduce the potential for habituation (e.g., removal of animal carcasses at least 1,000 feet from development), the long-term presence of the development and our expectation that as condor numbers increase, they will resume using parts of their historical range more frequently, including the RMDP area, suggests that interactions between humans and condors are likely to occur, and such interactions could result in habituation of a condor.

We further anticipate that habituation will be infrequent. Given the restriction of development to mainly lowland areas that are rarely frequented by condors and the preservation of the higher elevation lands and habitat that the California condors are more likely to use (i.e., foraging, feeding, roosting), interactions with humans should be uncommon. However, habituation that leads to a condor's removal from the wild flock represents a substantial impact to the individual

bird and to the small population of a species in the initial stages of recovery. Many of the historical threats to the California condor have been addressed (e.g., DDT, lead poisoning), but as the number of condors in the wild increases, new unhealthy and potentially dangerous behaviors are observed, such as habituation, and require new techniques to remedy.

Even though we believe the number of condors that will become habituated to human activity as a result of the RMDP project would be low, we cannot precisely determine what that number would be. For the purpose of providing a level at which reinitiation of formal consultation would be triggered, we anticipate that no more than one (1) California condor will become habituated within the 25-year period during which this biological opinion is in effect. This number takes into account the the condors infrequent use of lowland areas where development will occur within the action area, the natural likelihood that condors will interact with humans, and the measures the applicant has proposed to minimize such interactions and prevent habituation.

Further, because considerable uncertainty exists regarding the extent of future condor use of the RMDP area, in the face of an expanding wild condor population that appears to be recolonizing areas of its historical range, we have determined that the level of take should be conservatively estimated and be protective of the species' recovery.

**Arroyo Toad**

Arroyo toads have not been reported in the action area, despite numerous aquatic surveys, since 6 tadpoles were observed in 2000. Based upon the most recent survey data indicating the species is not present, we would anticipate that none (0) would be taken as a result of construction, maintenance, and restoration activities because none have been reported since 2000. While we assumed the species is present for the effects analysis and jeopardy determination (based upon past observations and the presence of individuals upstream of the action area), we cannot extend that assumption to anticipating take because we have no basis for determining the numbers or locations of individual arroyo toads that are not observed. If any arroyo toads are found dead or injured as a result of construction, maintenance, or restoration activities, the action should cease until the Corps reinitiates formal consultation and that process is concluded.

The applicant has proposed to capture and relocate any arroyo toads encountered during project activities that could be affected by the actions. The purpose of this measure is to avoid and minimize any injury or mortality to individual arroyo toads. Because no arroyo toads have been recorded in the action area since 2000, we would expect that none would be captured and relocated. Consequently, if any arroyo toads are found in the project area, all activities should cease until this biological opinion is amended to account for such take.

**Unarmored Threespine Stickleback**

Based upon the Effects Analysis and the avoidance and minimization measures proposed by the Corps and applicant, we anticipate that take from the proposed action will result from individual unarmored threespine sticklebacks being killed or injured by equipment or foot traffic during

work in the river (i.e., bridge and bank stabilization installation), entrainment in pumps during de-watering and diversions, and as a result of capture for relocation purposes. We do not anticipate that take will result from the other effects analyzed (i.e., water quality changes, non-native predators, etc.).

We cannot determine the precise number of unarmored threespine sticklebacks that may be killed or injured as a result of the construction, maintenance and restoration activities in the Santa Clara River authorized by the Corps. Numbers and locations of unarmored threespine sticklebacks within a population vary from year to year. Because the Corps and Newhall have proposed to use numerous avoidance and minimization measures (see Appendix B), we anticipate that few, unarmored threespine sticklebacks are likely to be killed or injured during this work.

Despite our inability to anticipate a precise number of unarmored threespine sticklebacks that would be killed or injured during construction, maintenance, and restoration activities, we must determine a reasonable number for the purpose of establishing a limit that would trigger reinitiation of formal consultation. The considerations we used in arriving at that number include: (1) the unarmored threespine stickleback population can fluctuate greatly in number of individuals; (2) dead or injured individuals are difficult to detect, so that any that are found dead or injured may represent a larger impact to the population; (3) some unarmored threespine sticklebacks may be killed or injured by equipment or foot traffic and during pumping of water for diversions or dewatering; (5) because the number of unarmored threespine sticklebacks in a population can be high, many individuals could be affected without a substantial effect on the population; and (6) the take level we anticipate must be consistent with the non-jeopardy determination in that it cannot appreciably reduce the numbers reproduction, or distribution of the species. Based upon the scope of the RMDP project and take anticipated in previous biological opinions from the region (see Appendix A), we have determined that if 10 (ten) unarmored threespine sticklebacks are found dead or injured as a result of construction (including entrainment in pumps; excluding capture, as described below), maintenance, or restoration activities, the actions resulting in take should cease until the Corps reinitiates formal consultation and that process is concluded.

In addition to take we anticipate from construction, maintenance, or restoration activities and entrainment in pumps, the applicant has proposed to capture and relocate unarmored threespine sticklebacks from construction zones and parts of the river that would be de-watered or subject to water diversion. We cannot precisely anticipate how many unarmored threespine sticklebacks would be captured during these activities; however, we are obliged to make a reasonable estimate based upon factors similar to those outlined in the previous paragraph. In contrast, many more unarmored threespine sticklebacks are likely to be captured than would be found dead or injured (in fact, that is the goal of the capture/relocation). Consequently, if 100 unarmored threespine sticklebacks are captured during de-watering/water diversion activities, the Corps must reinitiate formal consultation. Project activities that could result in further take should cease during the reinitiation period because the take exemption would have lapsed when

more than 100 unarmored threespine sticklebacks were captured. (More detail on the reinitiation requirements is provided in the section on Reinitiation, below.)

**Coastal California Gnatcatcher**

Despite the presence of 4,126 acres of suitable coastal sage scrub habitat that could be occupied by the coastal California gnatcatcher, only one individual coastal California gnatcatcher has been observed within the action area in 15 years of avian surveys. We analyzed the effects of the project on much of this suitable habitat, but based upon the negative surveys results for the species for approximately 15 years, we conclude that only the area where the one bird was observed is occupied. We anticipate that the one (1) coastal California gnatcatcher will be taken as a result of habitat loss for development in the area where it was observed. The bird may be killed or injured outright by the removal of vegetation, or it may be forced from its territory into adjacent habitat that may be less suitable where it would be at risk of predation, starvation, or other injury as described in the Effects Analysis. If other coastal California gnatcatchers are observed during or prior to habitat removal and could be taken, the activities should cease until the Corps reinitiates formal consultation and that process is completed. The take of any other coastal California gnatcatchers in the action area is not anticipated nor exempted from the section 9 prohibitions pursuant to section 7(o)(2).

## REASONABLE AND PRUDENT MEASURES

As discussed in the Effects Analysis and shown in Appendix B, the Corps and Newhall have proposed numerous measures to minimize the incidental take of listed species (see Appendix B); however; the Service believes that the following reasonable and prudent measures are necessary and appropriate to minimize the impacts of incidental take anticipated by this biological opinion:

1. The Corps must require Newhall to minimize the impact of indirect effects on the least Bell's vireo by implementing measures to address noise.

2. The applicant will incorporate measures into its development plans to minimize potential for habituation behaviors by California condors.

3. The Corps must require Newhall to employ only qualified biologists to capture and relocate any unarmored threespine sticklebacks at risk of desiccation or other injury or mortality during construction, maintenance, or restoration activities.

4. The Corps must require Newhall to screen any pumps used in de-watering in unarmored threespine stickleback habitat to prevent entrainment.

5. Measures must be implemented during construction in suitable coastal California gnatcatcher to minimize the impact of the habitat loss that will occur.

The Service's evaluation of the effects of the proposed action includes consideration of the measures to minimize the adverse effects of the proposed action on the least Bell's vireo, southwestern willow flycatcher, California condor, arroyo toad, unarmored threespine stickleback, and coastal California gnatcatcher that were developed by the Corps and Newhall and are discussed in the RMDP biological assessment in Appendix B, which are incorporated here by reference (URS 2010). Any subsequent changes in these measures proposed by the Corps and Newhall may constitute a modification of the proposed action and may warrant reinitiation of formal consultation, as specified at 50 CFR 402.16. These reasonable and prudent measures are intended to supplement the protective measures that are proposed by the Corps and Newhall as part of the proposed action.

**TERMS AND CONDITIONS**

To be exempt from the prohibitions of section 9 of the Act, the Corps and Newhall must comply with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms and conditions are non-discretionary.

The following term and condition implements reasonable and prudent measure 1:

1.1 Newhall or its contractors must employ any practicable methods to minimize noise impacts to least Bell's vireo habitat during construction, including temporary soundwalls, use of quieter equipment, or vegetation screening. For long-term noise impacts, Newhall must incorporate vegetation screening where possible to reduce traffic noise into least Bell's vireo habitat, using only plant species native to the action area.

The following terms and conditions implement reasonable and prudent measure 2:

2.1 The applicant must produce educational materials to be included in Homeowner's Associations (HOA) notifications to prospective homeowners, that provides information on the identification and protection of California condors. The information on California condors included in HOA publications must be approved by the Service prior to human occupancy of any project development.

2.2 The applicant must ensure that HOA materials provided under 2.1 include mandatory reporting by residents of any California condors seen on or near developed areas, including any condor seen perching on structures, drinking from standing water (e.g., swimming pools), or feeding on carcasses within an estimated 1,000 feet of development. .

2.3 If any California condor is observed on or near (perched or on the ground within est. 1,000 feet) developed areas, the applicant or HOA must notify the Service immediately. The applicant or HOA must call the Hopper Mountain National Wildlife Refuge office (phone: (805) 644-5185) and the Ventura Fish and Wildlife Office (phone: (805) 644-1766) to report the incident.

The Service will likely be concurrently monitoring the movements of any California condor that moves toward the RMDP area (using GPS units or telemetry). If the Service has data to indicate that any California condor is on the vicinity of the RMDP area, the Service shall be allowed access to the project to make visual observations of the bird(s).

2.4 If any California condor is on or near developed areas, as described above, the HOA or applicant must allow the Service access to attempt to haze the bird away from the area. Hazing may include running dogs in the area, spraying the condor with water, noise-making devices, and other deterrents. Residents and people other than Service personnel are not authorized to haze the condors; such hazing could constitute take by harassment which is not exempted from the take prohibitions of section 9 by this biological opinion.

The Service shall be allowed to attempt hazing as often and repeatedly as it deems necessary to prevent habituation or other injury to a condor.

2.5 If attempts at hazing are unsuccessful, the Service will notify the HOA and/or applicant that capture of the California condor is required. Upon notification that capture is required, the HOA or applicant must allow the Service access to an appropriate area (as determined by the Service) to capture the California condor for relocation or removal to captivity. Any California condor that must be captured will be considered taken.

The following terms and conditions implement reasonable and prudent measure 3:

3.1 At least 30 days prior to the onset of any activity, Newhall must submit for Service approval the names and qualifications of any individuals it wishes to conduct capture and relocation of unarmored threespine sticklebacks. While individuals possessing recovery permits issued pursuant to section 10(a)(1)(A) of the Act may be qualified to conduct these activities, that permit does not authorize the activities covered in this biological opinion. The authorization of such take must be made under the auspices of this biological opinion, and such authorization is valid only for the RMDP project.

3.2 Prior to any work, the authorized biologist must locate a suitable relocation spot for any unarmored threespine sticklebacks captured. A suitable relocation spot should be within 500 feet of the point of capture, contain water of adequate depth and flow rate (similar to the point of capture), and have a suitable substrate (similar to the point of capture).

3.3 Any unarmored threespine sticklebacks captured must be held for as short a time as possible using clean buckets free of lotions, soaps, or other chemicals.

The following terms and conditions implement reasonable and prudent measure 4:

4.1 Intakes of any pumps used for dewatering or diversions must be completely screened with wire mesh with openings no larger than 0.25 inches.

4.2 Upon completion of activities that required dewatering or diversion, the flow that existed prior to the dewatering/diversion must be restored.

The following terms and conditions implement reasonable and prudent measure 5:

5.1 A qualified biologist must survey and monitor the coastal California gnatcatcher habitat to determine if the species is present, and if so, whether it is actively nesting. The qualifications of the biologist will be submitted to the Service for our approval at least 15 days prior to the onset of activities that would require the biologist to survey and monitor for coastal California gnatcatchers.

5.2 Surveys must be conducted by the authorized biologist(s) walking through suitable habitat areas, within the limits described below, while watching and listening for coastal California gnatcatchers. If necessary, the authorized biologist(s) may use playback of recorded coastal California gnatcatcher calls to elicit a response, as described in the Service's coastal California gnatcatcher survey protocol.

5.3 Monitoring of coastal California gnatcatchers must be conducted by the authorized biologist(s) during the construction period. This period must include initial grading, excavation and fill, and contouring of the pads and roadways. Surveys must be conducted at least twice per week, separated by at least one day, between 6:00 am and 10:00 am. The optimum survey time would be before daily construction activities begin, although the Service recognizes that this may not always be possible. All survey dates and times must be logged and reported to the Service at the end of the project.

5.4 If grading occurs during the peak of the coastal California gnatcatcher nesting season (mid-March through mid-May), the applicant must not remove vegetation within 400 feet of any active coastal California gnatcatcher nest. The 400-foot distance is the radius necessary to protect a circular area of 12 acres (the minimum size of one coastal California gnatcatcher territory; habitat connection between the nest site and adjacent dedicated open space must be maintained until nesting is completed). The authorized biologist must have the authority to halt activities that he/she determines may affect any nesting coastal California gnatcatchers detected within the limits described above.

5.5 Monitoring for nesting coastal California gnatcatchers during activities following initial vegetation grubbing must extend 200 feet into adjacent coastal sage scrub habitat, beyond the marked grading limits. The Service assumes that 200 feet off-site will satisfy the 400-foot buffer intended to protect nesting coastal California gnatcatchers. Regardless of whether nesting coastal California gnatcatchers are found on the site or within the 200-foot off-site buffer, no vegetation removal or construction must proceed within 400 feet of any coastal California gnatcatcher nest location. The authorized biologist must have the authority to halt activities that he/she determines may affect any nesting coastal California gnatcatchers detected within the limits described above.

5.6 If the Service-approved biologist(s) halts any action that may result in impacts that exceed the levels anticipated by the Corps and the Service during review of the proposed action, the Corps and the Service must be notified immediately by the biological monitor. The monitor must keep a log of survey dates, times, and observations to be submitted to the Service at the end of the project.

5.7 The number of access routes, number and size of staging areas, and the total area of the activities within suitable coastal California gnatcatcher habitat must be limited to the minimum necessary to achieve the project goal. Routes and boundaries must be clearly demarcated and these areas must be outside of coastal sage scrub habitat unless included in the original plans. Areas disturbed for access and staging must be restored.

5.8 Measures to prevent unauthorized off-road vehicles from accessing adjacent areas from the project site must be implemented, including barriers (*e.g.*, boulders, fencing) or security patrols.

## REPORTING REQUIREMENTS

The Corps or Newhall must provide a written report to the Service on an annual basis for the duration of the project plus a final report once the project has been completed. The reports must document the age class (if possible) and number of arroyo toads, and unarmored threespine stickleback relocated from the action area, the date and time of relocation, and a description of relocation sites. The report must also state the number of least Bell's vireo, southwestern willow flycatcher, California condor, arroyo toad, unarmored threespine stickleback, and coastal California gnatcatcher killed or injured, and describe the circumstances of the injuries or mortalities if known. The report must contain a brief discussion of any problems encountered in implementing minimization measures, results of biological surveys and sighting records, and any other pertinent information. We encourage you to submit recommendations regarding modification or addition of measures that would maintain or improve protection of least Bell's vireo, southwestern willow flycatcher, California condor, arroyo toad, unarmored threespine stickleback, and coastal California gnatcatcher, while simplifying compliance with the Act.

## DISPOSITION OF INJURED OR DEAD SPECIMENS

Within 3 days of locating any dead or injured listed animals, the Corps or Newhall must notify the Ventura Fish and Wildlife Office by telephone ((805) 644-1766) and in writing. The report must include the date, time, location of the carcass, a photograph, cause of death, if known, and any other pertinent information. Care must be taken in handling dead specimens to preserve biological material in the best possible state for later analysis. Should any injured animals survive, either the Corps or Newhall must contact the Service regarding their final disposition.

The remains of any least Bell's vireos, southwestern willow flycatchers, California condors, arroyo toads, unarmored threespine sticklebacks, and coastal California gnatcatcher, must be

placed with the Ventura Fish and Wildlife Office, 2493 Portola Road, Suite B, California, 93010 (Attention: Chris Dellith; (805) 644-1766, extension 227).

## CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to use their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

1. We recommend that any non-native predators of least Bell's vireo, southwestern willow flycatcher, arroyo toad, unarmored threespine stickleback, and coastal California gnatcatcher, be permanently removed from the wild if they can be captured while monitoring project activities. Anyone conducting such removals should be in compliance with the California Fish and Game Code.

2. We recommend that Newhall conduct annual breeding season surveys within the Santa Clara River watershed for least Bell's vireos and southwestern willow flycatchers, and report the results of these surveys to the Service. This will improve our knowledge of the distribution of these species and assist us in making future conservation decisions regarding these species and their habitat.

3. We recommend that Newhall pursue additional vegetation enhancement, exotic plant removal, and African clawed frog control opportunities in the Santa Clara River corridor to further the recovery of the unarmored threespine stickleback, and arroyo toad.

4. We recommend that Newhall relocate other native amphibians and reptiles that could be harmed by project activities from the project area to suitable habitat outside the project area prior to and during project activities.

The Service requests notification of the implementation of any conservation recommendations so we may be kept informed of actions benefiting listed species or their habitats.

## REINITIATION NOTICE

This concludes formal consultation on the Corps' proposed authorization of activities associated with the Newhall Ranch Specific Plan. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat

not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, the exemption issued pursuant to section 7(o)(2) will have lapsed and any further take would be a violation of section 4(d) or 9. Consequently, operations causing such take should cease pending reinitiation.

If you have any questions regarding this consultation, please contact Chris Dellith of my staff at (805) 644-1766, extension 227.

Sincerely,

Diane K. Noda
Field Supervisor

cc:
Helen Birss, California Department of Fish and Game

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## PERSONAL COMMUNICATION AND OBSERVATIONS

Lenny Malo, Los Angeles Basin, Natural Resources Division Manager, URS Corporation, email correspondence, September 30, 2009.

Matt Carpenter, Environmental Resources Director, Newhall Land and Farming, telephone conversation, August 26, 2010.

Chris Dellith, Senior Biologist, U.S. Fish and Wildlife Service, personal observation, August 26, 2009.

Rhys Evans, Natural Resource Manager, Vandenberg Air Force Base, email correspondence, 2008

Appendix A. Past Consultations in the Vicinity of the Action Area

| Project Name | Date | Biological Opinion Number | Species Covered[1] | Take (Anticipated) | Critical Habitat[1] (Acres Permanently Disturbed) |
|---|---|---|---|---|---|
| Temporary Diversion Berm on the Santa Clara River, Newhall Ranch | October 26, 1993 | 1-8-94-F-1 | UTS | 5 | NA |
| Southern Pacific Milling Company Sand and Gravel Mine | February 7, 1994 | 1-8-93-F-29 | LBV | 1 | NA |
| Installation of a Southern California Gas Company Pipeline | August 28, 1995 | 1-8-95-F-34 | UTS | 10 | NA |
| Installation of Irrigation Pipelines on the Santa Clara River, Newhall Ranch | October 23, 1995 | 1-8-95-F-47 | UTS | 10 | NA |
| Construction of Erosion Control Facilities for the Valencia Water Reclamation Plant | February 29, 1996 | 1-8-96-FC-18 | LBV<br>UTS | 0<br>10 | 0<br>NA |
| Repair of I-5 Bridge over the Santa Clara River | September 6, 1996 | 1-8-96-F-39 | LBV | 1 | NA |
| Widening of State Route 126 | April 20, 1997 | 1-8-97-F-44 | LBV | 1 | 0.5 |
| Newhall Land and Farming's Summer Crossings and Water Diversion | September 25, 1998 | 1-8-98-FW-68 | UTS | 10 | NA |
| Sewer Line and Force Main | September 28, 1998 | 1-8-98-F-67 | LBV | 10 | NA |

| Project Name | Date | Biological Opinion Number | Species Covered[1] | Take (Anticipated) | Critical Habitat[1] (Acres Permanently Disturbed) |
|---|---|---|---|---|---|
| Natural River Management Plan | November 27, 1998 | 1-8-98-FC-61 | LBV<br>SWIFL<br>UTS | UTD[2]<br>UTD<br>10 | 11<br>NA<br>NA |
| Replacement of I-5 Bridge over the Santa Clara River | December 26, 2000 | 1-8-00-F-68 | LBV<br>SWIFL<br>UTS | 2<br>2<br>1 | 1.18<br>NA<br>NA |
| Replacement of Highway 101 Bridge over the Santa Clara River, Ventura County | May 3, 2001 | 1-8-01-F-4 | LBV<br>SWIFL | 2<br>1 | NA<br>NA |
| Plum Canyon Phase 1C Residential Development, Santa Clarita, Los Angeles County | June 27, 2001 | 1-8-01-F-30 | CAGN | 0 | 90[3] |
| Amendment to the Biological Opinion for the Santa Clara River Bridge Replacement Project | April 3, 2002 | 1-8-01-F-4 | LBV<br>SWIFL | 0<br>0 | NA<br>NA |
| Natural River Management Plan (Supplement to previous application dated November 27, 1998) | November 15, 2002 | 1-8-02-F-4R | ARTO | 1 | NA |
| Castaic Creek Bank Protection, Valencia Commerce Center, Los Angeles County | December 17, 2002 | 1-8-02-F-43 | ARTO<br>UTS | 1<br>1 | NA<br>NA |

| Project Name | Date | Biological Opinion Number | Species Covered[1] | Take (Anticipated) | Critical Habitat[1] (Acres Permanently Disturbed) |
|---|---|---|---|---|---|
| Restoration of Hart Baseball Field along the Santa Clara River, Los Angeles County | February 20, 2003 | 1-8-02-F-54 | ARTO<br>UTS | 1<br>1 | NA<br>NA |
| Plum Canyon Residential Development, Los Angeles County | March 25, 2003 | 1-8-02-F-63 | CAGN | 0 | 206[3] |
| Sand Canyon Residential Development, Santa Clarita, Los Angeles County | June 30, 2003 | 1-8-02-F-65 | CAGN | 0 | 39.6[3] |
| Re-initiation of the Replacement of the I-5 Bridge over the Santa Clara River | August 1, 2003 | 1-8-03-F-22R | LBV<br>SWIFL<br>ARTO<br>UTS | 2<br>2<br>6<br>3 | 1.18<br>NA<br>NA<br>NA |
| Santa Clara River Reaches 71 and 82 | October 24, 2004 | 1-8-04-F-4 | ARTO<br>UTS | 1<br>1 | NA<br>NA |
| Townhomes at the River Development and Construction of a Flood Control Levee | March 31, 2005 | 1-8-04-F-39 | LBV | 4 | NA |
| I-5 Hasley Canyon Interchange Improvement | May 31, 2005 | 1-8-05-F-16 | ARTO<br>UTS | 1<br>1 | NA<br>NA |
| Plum Canyon Phase 1D Residential Development, Santa Clarita, Los Angeles County | June 16, 2005 | 1-8-04-F-51 | CAGN | 2 | 53[3] |
| Northlake Residential Development Project, Santa Clarita, Los Angeles County | June 21, 2005 | 1-8-04-F-57 | LBV<br>SWIFL | 4<br>4 | NA<br>NA |

| Project Name | Date | Biological Opinion Number | Species Covered[1] | Take (Anticipated) | Critical Habitat[1] (Acres Permanently Disturbed) |
|---|---|---|---|---|---|
| Amendment to Biological Opinion for Santa Clara River Bridge Replacement | February 16, 2006 | 1-8-01-F-04 | LBV<br>SWIFL | 0<br>0 | 1.18<br>NA |
| Santa Paula Water Recycling Facility | September 5, 2006 | 1-8-06-F-34 | LBV | 12 | NA |
| Robin's Nest Recreational Vehicle Park | September 28, 2006 | 1-8-06-F-27 | UTS | 5 | NA |

[1] Notes: Least Bell's Vireo (LBV), Southwestern Willow Flycatcher (SWIFL), Arroyo Toad (AT), Unarmored Threespine Stickleback (UTS), Coastal California Gnatcatcher (CAGN), Not Applicable (NA)
[2] UTD = Unable to determine; the biological opinion does not specify the level of take anticipated.
[3] The affected critical habitat unit for the coastal California gnatcatcher was removed from the revised designation.

Appendix B: Mitigation Measures Proposed Newhall Land and Farming

In June 2010, the U.S. Army Corps of Engineers (Corps) and the California Department of Fish and Game (CDFG) released a Final Environmental Impact Statement/Environmental Impact Report (EIS/EIR) for the proposed Newhall Ranch Development project. The EIS/EIR provides mitigation measures that would reduce the project's impacts on biological resources, including 80 measures previously adopted by the County of Los Angeles during the Specific Plan approval process and 89 measures added by the Corps and CDFG. Measures identified in the Newhall Ranch Specific Plan Program EIR for biological resources that minimize effects to federally listed wildlife species within the action area are included below from subsection B-1. Additional measures identified in the EIR/EIS for biological resources that minimize effects to federally listed wildlife species within the action area are included below in subsection B-2. These additional measures are consistent with and supplement those mitigation measures listed in the previously certified Newhall Ranch Specific Plan Program EIR.

## B.1 MITIGATION MEASURES ALREADY REQUIRED BY THE ADOPTED SPECIFIC PLAN

SP-4.6-1 The restoration mitigation areas located within the River Corridor SMA shall be in areas that have been disturbed by previous uses or activities. Mitigation shall be conducted only on sites where soils, hydrology, and microclimate conditions are suitable for riparian habitat. First priority will be given to those restorable areas that occur adjacent to existing patches (areas) of native habitat that support sensitive species, particularly Endangered or Threatened species. The goal is to increase habitat patch size and connectivity with other existing habitat patches while restoring habitat values that will benefit sensitive species.

SP-4.6-2 A qualified biologist shall prepare or review revegetation plans. The biologist shall also monitor the restoration effort from its inception through the establishment phase.

SP-4.6-3 Revegetation Plans may be prepared as part of a CDFG 1603 Streambed Alteration Agreement and/or a Corps Section 404 Permit, and shall include:

- Input from both the Project proponent and resource agencies to assure that the Project objectives applicable to the River Corridor SMA and the criteria of this RMDP are met.
- The identification of restoration/mitigation sites to be used. This effort shall involve an analysis of the suitability of potential sites to support the desired habitat, including a description of the existing conditions at the site(s) and such base line data information deemed necessary by the permitting agency.

SP-4.6-4 The revegetation effort shall involve an analysis of the site conditions such as soils and hydrology so that site preparation needs can be evaluated. The revegetation plan shall include the details and procedures required to prepare the restoration site for planting (i.e., grading, soil preparation, soil stockpiling, soil amendments, etc.), including the need for a supplemental irrigation system, if any.

SP-4.6-5 Restoration of riparian habitats within the River Corridor SMA shall use plant species native to the Santa Clara River. Cuttings or seeds of native plants shall be gathered within the River Corridor SMA or purchased from nurseries with local supplies to provide good genetic stock for the replacement habitats. Plant species used in the restoration of riparian habitat shall be listed on the approved project plant palette (Specific Plan Table 2.6-1, Recommended Plant Species for Habitat Restoration in the River Corridor SMA) or as approved by the permitting State and Federal agencies.

SP-4.6-6 The final revegetation plans shall include notes that outline the methods and procedures for the installation of the plant materials. Plant protection measures identified by the project biologist shall be incorporated into the planting design/layout.

SP-4.6-7 The revegetation plan shall include guidelines for the maintenance of the mitigation site during the establishment phase of the plantings. The maintenance program shall contain guidelines for the control of non-native plant species, the maintenance of the irrigation system, and the replacement of plant species.

SP-4.6-8 The revegetation plan shall provide for monitoring to evaluate the growth of the developing habitat. Specific performance goals for the restored habitat shall be defined by qualitative and quantitative characteristics of similar habitats on the River (e.g., density, cover, species composition, structural development). The monitoring effort shall include an evaluation of not only the plant material installed, but the use of the site by wildlife. The length of the monitoring period shall be determined by the permitting state and/or federal agency.

SP-4.6-9 Monitoring reports for the mitigation site shall be reviewed by the permitting State and/or Federal agency.

SP-4.6-10 Contingency plans and appropriate remedial measures shall also be outlined in the revegetation plan.

SP-4.6-11 Habitat enhancement as referred to in this document means the rehabilitation of areas of native habitat that have been moderately disturbed by past activities (e.g., grazing, roads, oil and natural gas operations, etc.) or have been invaded by non-native plant species such as giant cane (*Arundo donax*) and tamarisk (*Tamarix* sp.).

SP-4.6-12 Removal of grazing is an important means of enhancement of habitat values. Without ongoing disturbance from cattle, many riparian areas will recover naturally. Grazing except as permitted as a long-term resource management activity will be removed from the River Corridor SMA pursuant to the Long-Term Management Plan set forth in Section 4.6 of the Specific Plan EIR.

SP-4.6-13 To provide guidelines for the installation of supplemental plantings of native species within enhancement areas, a revegetation plan shall be prepared prior to implementation of mitigation (see guidelines for revegetation plans above). These supplemental plantings will be composed of plant species similar to those growing in the existing habitat patch (see Specific Plan Table 2.6-1).

SP-4.6-14 Not all enhancement areas will necessarily require supplemental plantings of native species. Some areas may support conditions conducive for rapid "natural" reestablishment of native species. The revegetation plan may incorporate means of enhancement to areas of compacted soils, poor soil fertility, trash or flood debris, and roads as a way of enhancing riparian habitat values.

SP-4.6-15 Removal of non-native species such as giant cane (*Arundo donax*), salt cedar or tamarisk (*Tamarix* sp.), tree tobacco (*Nicotiana glauca*), castor bean (*Ricans communis*), if included in a revegetation plan to mitigate impacts, shall be subject to the following standards:

- First priority shall be given to those habitat patches that support or have a high potential for supporting sensitive species, particularly Endangered or Threatened species.
- All non-native species removals shall be conducted according to a resource agency approved exotics removal program.
- Removal of non-native species in patches of native habitat shall be conducted in such a way as to minimize impacts to the existing native riparian plant species.

SP-4.6-16 Mitigation banking activities for riparian habitats will be subject to State and Federal regulations and permits. Mitigation banking for oak resources shall be conducted pursuant to the Oak Resources Replacement Program. Mitigation banking for elderberry scrub shall be subject to approval of plans by the County Forester.

SP-4.6-17 Access to the River Corridor SMA for hiking and biking shall be limited to the River trail system (including the Regional River Trail and various Local Trails) as set forth in this Specific Plan.

- The River trail system shall be designed to avoid impacts to existing native riparian habitat, especially habitat areas known to support sensitive species. Where impacts to riparian habitat are unavoidable, disturbance shall be minimized and mitigated as outlined above under Mitigation Measures 4.6-1 through 4.6-8.

- Access to the River Corridor SMA will be limited to day time use of the designated trail system.
- Signs indicating that no pets of any kind will be allowed within the River Corridor SMA, with the exception that equestrian use is permitted on established trails, shall be posted along the River Corridor SMA.
- No hunting, fishing, or motor or off-trail bike riding shall be permitted.
- The trail system shall be designed and constructed to minimize impacts on native habitats.

SP-4.6-18 Where development lies adjacent to the boundary of the River Corridor SMA a transition area shall be designed to lessen the impact of the development on the conserved area. Transition areas may be comprised of Open Area, natural or revegetated manufactured slopes, other planted areas, bank areas, and trails. Exhibits 2.6-4, 2.6-5, and 2.6-6 indicate the relationship between the River Corridor SMA and the development (disturbed) areas of the Specific Plan. The SMAs and the Open Area as well as the undisturbed portions of the development areas are shown in green. As indicated on the exhibits, on the south side of the river the River Corridor SMA is separated from development by the river bluffs, except in one location. The Regional River Trail will serve as transition area on the north side of the river where development areas adjoin the River Corridor SMA (excluding Travel Village).

SP-4.6-19 The following are the standards for design of transition areas:

- In all locations where there is no steep grade separation between the River Corridor SMA and development, a trail shall be provided along this edge.
- Native riparian plants shall be incorporated into the landscaping of the transition areas between the River Corridor SMA and adjacent development areas where feasible for their long-term survival. Plants used in these areas shall be those listed on the approved plant palette (Specific Plan Table 2.6-2 of the Resource Management Plan [Recommended Plants for Transition Areas Adjacent to the River Corridor SMA]).
- Roads and bridges that cross the River Corridor SMA shall have adequate barriers at their perimeters to discourage access to the River Corridor SMA adjacent to the structures.
- Where bank stabilization is required to protect development areas, it shall be composed of ungrouted rock, or buried bank stabilization as described in Section 2.5.2.a, except at bridge crossings and other locations where public health and safety requirements necessitate concrete or other bank protection.
- A minimum 100-foot-wide buffer adjacent to the Santa Clara River should be required between the top river side of bank stabilization and development within the Land Use Designations Residential Low Medium, Residential Medium, Mixed-Use and Business Park unless, through Planning Director review in consultation with the staff biologist, it is determined that a lesser buffer would adequately protect the riparian resources within the River Corridor, or that a

100-foot-wide buffer is infeasible for physical infrastructure planning. The buffer area may be used for public infrastructure, such as: flood control access; sewer, water and utility easements; abutments; trails and parks, subject to findings of consistency with the Specific Plan and applicable County policies.

SP-4.6-20 The following guidelines shall be followed during any grading activities that take place within the River Corridor SMA:

- Grading perimeters shall be clearly marked and inspected by the project biologist prior to grading occurring within or immediately adjacent to the River Corridor SMA.
- The project biologist shall work with the grading contractor to avoid inadvertent impacts to riparian resources.

SP-4.6-21 Upon final approval of the Newhall Ranch Specific Plan, the Special Management Area designation for the River Corridor SMA shall become effective. The permitted uses and development standards for the SMA are governed by the Development Regulations, Chapter 3 of the Specific Plan.

SP-4.6-22 Upon completion of development of all land uses, utilities, roads, flood control improvements, bridges, trails, and other improvements necessary for implementation of the Specific Plan within the River Corridor in each subdivision allowing construction within or adjacent to the River Corridor, a permanent, non-revocable *conservation and public access easement* shall be offered to the County of Los Angeles pursuant to Mitigation Measure 4.6-23, below, over the portion of the River Corridor SMA within that subdivision.

SP-4.6-23 The River Corridor SMA *Conservation and Public Access Easement* shall be offered to the County of Los Angeles prior to the transfer of the River Corridor SMA ownership, or portion thereof to the management entity described in Mitigation Measure 4.6-26, below.

SP-4.6-24 The River Corridor SMA *Conservation and Public Access Easement* shall prohibit grazing, except as a long-term resource management activity, and agriculture within the River Corridor and shall restrict recreation use to the established trail system.

Agricultural land uses and grazing for purposes other than long-term resource management activities within the River Corridor shall be extended in the event of the filing of any legal action against Los Angeles County challenging final approval of the Newhall Ranch Specific Plan and any related project approvals or certification of the Final EIR for Newhall Ranch. Agricultural land uses and grazing for purposes other than long-term resource management activities within the River Corridor shall be extended by the time period between the filing of any such legal action and the entry of a final judgment by a court with appropriate jurisdiction, after exhausting all

rights of appeal, or execution of a final settlement agreement between all parties to the legal action, whichever occurs first.

SP-4.6-25 The River Corridor SMA conservation and public access easement shall be consistent in its provisions with any other conservation easements to State or Federal resource agencies which may have been granted as part of mitigation or mitigation banking activities.

SP-4.6-26 Prior to the recordation of the River Corridor SMA *Conservation and Public Access Easement* as specified in Mitigation Measure 4.6-23, above, the land owner shall provide a plan to the County for the permanent ownership and management of the River Corridor SMA, including any necessary financing. This plan shall include the transfer of ownership of the River Corridor SMA to the Center for Natural Lands Management, or if the Center for Natural Lands Management is declared bankrupt or dissolved, ownership will transfer or revert to a *joint powers authority* consisting of Los Angeles County (4 members), the City of Santa Clarita (2 members), and the Santa Monica Mountains Conservancy (2 members).

SP-4.6-26a Two types of habitat restoration may occur in the High Country SMA: 1) riparian revegetation activities principally in Salt Creek Canyon; and 2) oak tree replacement in, or adjacent to, existing oak woodlands and savannahs.

- Mitigation requirements for riparian revegetation activities within the High Country SMA are the same as those for the River Corridor SMA and are set forth in Mitigation Measures 4.6-1 through 4.6-11 and 4.6-13 through 4.6-16, above.
- Mitigation requirements for oak tree replacement are set forth in Mitigation Measure 4.6-48, below.

SP-4.6-27 Removal of grazing from the High Country SMA except for those grazing activities associated with long-term resource management programs, is a principal means of enhancing habitat values in the creeks, brushland and woodland areas of the SMA. The removal of grazing in the High Country SMA is discussed below under (b) 4. Long Term Management. All enhancement activities for riparian habitat within the High Country SMA shall be governed by the same provisions as set forth for enhancement in the River Corridor SMA. Specific Plan Table 2.6-3 of the Resource Management Plan provides a list of appropriate plant species for use in enhancement areas in the High Country SMA.

SP-4.6-28 Mitigation banking activities for riparian habitats will be subject to State and Federal regulations and permits. Mitigation banking for oak resources, shall be conducted pursuant to the Oak Resource Replacement Program. Mitigation banking for elderberry scrub shall be subject to approval of plans by the County Forester.

SP-4.6-29 Access to the High Country SMA will be limited to day time use of the designated trail system.

SP-4.6-30 No pets of any kind will be allowed within the High Country SMA, with the exception that equestrian use is permitted on established trails.

SP-4.6-31 No hunting, fishing, or motor or trail bike riding shall be permitted.

SP-4.6-32 The trail system shall be designed and constructed to minimize impacts on native habitats.

SP-4.6-33 Construction of buildings and other structures (such as patios, decks, etc.) shall only be permitted upon developed pads within Planning Areas OV-04, OV-10, PV-02, and PV-28 and shall not be permitted on southerly slopes facing the High Country SMA (Planning Area HC-01) or in the area between the original SEA 20 boundary and the High Country boundary. If disturbed by grading, all southerly facing slopes which adjoin the High Country SMA within those Planning Areas shall have the disturbed areas revegetated with compatible trees, shrubs and herbs from the list of plant species for south and west facing slopes as shown in Table 2.6-3, Recommended Plant Species For Use In Enhancement Areas In The High Country.

Transition from the development edge to the natural area shall also be controlled by the standards of wildfire fuel modification zones as set forth in Mitigation Measure 4.6-49. Within fuel modification areas, trees and herbs from Table 2.6-3 of the Resource Management Plan should be planted toward the top of slopes; and trees at lesser densities and shrubs planted on lower slopes.

SP-4.6-34 Grading perimeters shall be clearly marked and inspected by the project biologist prior to impacts occurring within or adjacent to the High Country SMA.

SP-4.6-35 The project biologist shall work with the grading contractor to avoid inadvertent impacts to biological resources outside of the grading area.

SP-4.6-36 Upon final approval of the Newhall Ranch Specific Plan, the Special Management Area designation for the High Country SMA shall become effective. The permitted uses and development standards for the SMA are governed by the Development Regulations, Chapter 3.

SP-4.6-37 The High Country SMA shall be offered for dedication in three approximately equal phases of approximately 1,400 acres each proceeding from north to south, as follows:

1. The first offer of dedication will take place with the issuance of the 2,000$^{th}$ residential building permit of Newhall Ranch;

2. The second offer of dedication will take place with the issuance of the 6,000th residential building permit of Newhall Ranch; and
3. The remaining offer of dedication will be completed by the 11,000th residential building permit of Newhall Ranch.

The Specific Plan applicant shall provide a quarterly report to the Departments of Public Works and Regional Planning which indicates the number of residential building permits issued in the Specific Plan area by subdivision map number.

SP-4.6-38 Prior to dedication of the High Country SMA, a *conservation and public access easement* shall be offered to the County of Los Angeles and a conservation and management easement offered to the Center for Natural Lands Management. The High Country SMA *Conservation and Public Access Easement* shall be consistent in its provisions with any other *conservation easements* to State or Federal resource agencies which may have been granted as part of mitigation or mitigation banking activities.

SP-4.6-39 The High Country SMA conservation and public access easement shall prohibit grazing within the High Country, except for those grazing activities associated with the long-term resource management programs, and shall restrict recreation to the established trail system.

SP-4.6-40 The High Country SMA conservation and public access easement shall be consistent in its provisions with any other conservation easements to State or Federal resource agencies which may have been granted as part of mitigation or mitigation banking activities.

SP-4.6-41 The High Country SMA shall be offered for dedication in fee to a *joint powers authority* consisting of Los Angeles County (4 members), the City of Santa Clarita (2 members), and the Santa Monica Mountains Conservancy (2 members). The *joint powers authority* will have overall responsibility for recreation within and conservation of the High Country.

SP-4.6-42 An appropriate type of service or assessment district shall be formed under the authority of the Los Angeles County Board of Supervisors for the collection of up to $24 per single family detached dwelling unit per year and $15 per single family attached dwelling unit per year, excluding any units designated as Low and Very Low affordable housing units pursuant to Section 3.10, Affordable Housing Program of the Specific Plan. This revenue would be assessed to the homeowner beginning with the occupancy of each dwelling unit and distributed to the *joint powers authority* for the purposes of recreation, maintenance, construction, conservation and related activities within the *High Country Special Management Area*.

SP-4.6-43 Suitable portions of *Open Area* may be used for mitigation of riparian, *oak resources*, or elderberry scrub. Mitigation activities within *Open Area* shall be subject to the following requirements, as applicable:

- River Corridor SMA Mitigation Requirements, including: Mitigation Measures 4.6-1 through 4.6-11 and 4.6-13 through 4.6-16
- High Country SMA Mitigation Requirements, including: Mitigation Measures 4.6-27, 4.6-29 through 4.6-42
- Mitigation Banking: Mitigation Measure 4.6-16

SP-4.6-44 Drainages with flows greater than 2,000 cfs will have soft bottoms. Bank protection will be of ungrouted rock, or buried bank stabilization as described in Section 2.5.2.a, except at bridge crossings and other areas where public health and safety considerations require concrete or other stabilization.

SP-4.6-45 The precise alignments and widths of major drainages will be established through the preparation of drainage studies to be approved by the County at the time of subdivision maps which permit construction.

SP-4.6-46 While Open Area is generally intended to remain in a natural state, some grading may take place, especially for parks, major drainages, trails, and roadways. Trails are also planned to be within Open Area.

SP-4.6-47 At the time that final subdivision maps permitting construction are recorded, the *Open Area* within the map will be offered for dedication to the Center for Natural Lands Management. Community Parks within *Open Area* are intended to be public parks. Prior to the offer of dedication of *Open Area* to the Center for Natural Lands Management, all necessary *conservation and public access easements*, as well as easements for infrastructure shall be offered to the County.

SP-4.6-47a Mitigation Banking will be permitted within the River Corridor SMA, the High Country SMA, and the *Open Area land use designations*, subject to the following requirements:

- Mitigation banking activities for riparian habitats will be subject to State and Federal regulations, and shall be conducted pursuant to the mitigation requirements set forth in Mitigation Measure 4.6-1 through 4.6-15 above.
- Mitigation banking for oak resources shall be conducted pursuant to 4.6-48, below.
- Mitigation banking for elderberry scrub shall be subject to approval of plans by the County Forester

SP-4.6-48 Standards for the restoration and enhancement of oak resources within the High Country SMA and the Open Area include the following (oak resources include oak trees of the sizes regulated under the County Oak Tree Ordinance, southern California black walnut trees, Mainland cherry trees, and Mainland cherry shrubs):

- To mitigate the impacts to oak resources that may be removed as development occurs in the Specific Plan Area, replacement trees shall be planted in conformance with the oak tree ordinance in effect at that time.
- Oak resource species obtained from the local gene pool shall be used in restoration or enhancement.
- Prior to recordation of construction-level final subdivision maps, an oak resource replacement plan shall be prepared that provides the guidelines for the oak tree planting and/or replanting. The Plan shall be reviewed by the Los Angeles Department of Regional Planning and the County Forester and shall include the following: site selection and preparation, selection of proper species including sizes and planting densities, protection from herbivores, site maintenance, performance standards, remedial actions, and a monitoring program.
- All plans and specifications shall follow County oak tree guidelines, as specified in the County Oak Tree Ordinance.

SP-4.6-49 To minimize the potential exposure of the development areas, Open Area, and the SMAs to fire hazards, the Specific Plan is subject to the requirements of the Los Angeles County Fire Protection District (LACFPD), which provides fire protection for the area. At the time of final subdivision maps permitting construction in development areas that are adjacent to Open Area and the High Country SMA, a wildfire fuel modification plan shall be prepared in accordance with the fuel modification ordinance standards in effect at that time and shall be submitted for approval to the County Fire Department.

SP-4.6-50 The wildfire fuel modification plan shall depict a fuel modification zone the size of which shall be consistent with the County fuel modification ordinance requirements. Within the zone, tree pruning, removal of dead plant material and weed and grass cutting shall take place as required by the fuel modification ordinance.

SP-4.6-51 In order to enhance the habitat value of plant communities that require fuel modification, fire retardant plant species containing habitat value may be planted within the fuel modification zone. Typical plant species suitable for Fuel Modification Zones are indicated in Specific Plan Table 2.6-5 of the Resource Management Plan. Fuel modification zones adjacent to SMAs and Open Areas containing habitat of high value such as oak woodland and savannas shall utilize a more restrictive plant list, which shall be reviewed by the County Forester.

SP-4.6-52 The wildfire fuel modification plan shall include the following construction period requirements: a) a fire watch during welding operations; b) spark arresters on all equipment or vehicles operating in a high fire hazard area; c) designated smoking and non-smoking areas; and d) water availability pursuant to the County Fire Department requirements.

SP-4.6-53 If, at the time any subdivision map proposing construction is submitted, the County determines through an Initial Study, or otherwise, that there may be Rare, Threatened or Endangered, plant or animal species on the property to be subdivided, then, in addition to the prior surveys conducted on the Specific Plan site to define the presence or absence of sensitive habitat and associated species, current, updated site-specific surveys for all such animal or plant species shall be conducted in accordance with the consultation requirements set forth in Mitigation Measure 4.6-59 within those areas of the Specific Plan where such animal or plant species occur or are likely to occur.

The site-specific surveys shall include the unarmored three-spine stickleback, the arroyo toad, the Southwestern pond turtle, the California red-legged frog, the southwestern willow flycatcher, the least Bell's vireo, the San Fernando Valley spineflower and any other Rare, Sensitive, Threatened, or Endangered plant or animal species occurring, or likely to occur, on the property to be subdivided. All site-specific surveys shall be conducted during appropriate seasons by qualified botanists or qualified wildlife biologists in a manner that will locate any Rare, Sensitive, Threatened, or Endangered animal or plant species that may be present. To the extent there are applicable protocols published by either the U.S. Fish and Wildlife Service (Service) or the CDFG, all such protocols shall be followed in preparing the updated site-specific surveys.

All site-specific survey work shall be documented in a separate report containing at least the following information: a) project description, including a detailed map of the project location and study area; b) a description of the biological setting, including references to the nomenclature used and updated vegetation mapping; c) detailed description of survey methodologies; d) dates of field surveys and total person-hours spent on the field surveys; e) results of field surveys, including detailed maps and location data; f) an assessment of potential impacts; g) discussion of the significance of the Rare, Threatened or Endangered animal or plant populations found in the project area, with consideration given to nearby populations and species distribution; h) mitigation measures, including avoiding impacts altogether, minimizing or reducing impacts, rectifying or reducing impacts through habitat restoration, replacement or enhancement, or compensating for impacts by replacing or providing substitute resources or environments, consistent with CEQA (*CEQA Guidelines* section 15370); i) references cited and persons contacted; and j) other pertinent information, which is designed to disclose impacts and mitigate for such impacts."

SP-4.6-54 Prior to development within or disturbance to occupied unarmored threespine stickleback habitat, a formal consultation with the Service shall occur.

SP-4.6-55 Prior to development or disturbance within wetlands or other sensitive habitats, permits shall be obtained from pertinent Federal and State agencies and the Specific Plan shall conform to the specific provisions of said permits. Performance criteria shall include that described in Mitigation Measures 4.6-1 through 4.6-16 and 4.6-42 through 4.6-47 for wetlands, and Mitigation Measures 4.6-27, 4.6-28, and 4.6-42 through 4.6-48 for other sensitive habitats.

SP-4.6-56 All lighting along the perimeter of natural areas shall be downcast luminaries with light patterns directed away from natural areas.

SP-4.6-57 Where bridge construction is proposed and water flow would be diverted, blocking nets and seines shall be used to control and remove fish from the area of activity. All fish captured during this operation would be stored in tubs and returned unharmed back to the river after construction activities were complete.

SP-4.6-58 To limit impacts to water quality the Specific Plan shall conform with all provisions of required NPDES permits and water quality permits that would be required by the State of California Regional Water Quality Control Board.

SP-4.6-59 Consultation shall occur with the County of Los Angeles ("County") and California Department of Fish and Game ("CDFG") at each of the following milestones:

1. Before Surveys. Prior to conducting sensitive plant or animal surveys at the Newhall Ranch subdivision map level, the applicant, or its designee, shall consult with the County and CDFG for purposes of establishing and/or confirming the appropriate survey methodology to be used.
2. After Surveys. After completion of sensitive plant or animal surveys at the subdivision map level, draft survey results shall be made available to the County and CDFG within sixty (60) calendar days after completion of the field survey work.
3. Subdivision Map Submittal. Within thirty (30) calendar days after the applicant, or its designee, submits its application to the County for processing of a subdivision map in the Mesas Village or Riverwood Village, a copy of the submittal shall be provided to CDFG. In addition, the applicant, or its designee, shall schedule a consultation meeting with the County and CDFG for purposes of obtaining comments and input on the proposed subdivision map submittal. The consultation meeting shall take place at least thirty (30) days prior to the submittal of the proposed subdivision map to the County.

4. Development/Disturbance and Further Mitigation. Prior to any development within, or disturbance to, habitat occupied by Rare, Threatened, or Endangered plant or animal species, or to any portion of the Spineflower Mitigation Area Overlay, as defined below, all required permits shall be obtained from both The Service and CDFG, as applicable. It is further anticipated that the federal and state permits will impose conditions and mitigation measures required by federal and state law that are beyond those identified in the Newhall Ranch Final EIR (March 1999), the Newhall Ranch DAA (April 2001) and the Newhall Ranch Revised DAA (2002). It is also anticipated that conditions and mitigation measures required by federal and state law for project-related impacts on Endangered, Rare or Threatened species and their habitat will likely require changes and revisions to Specific Plan development footprints, roadway alignments, and the limits, patterns and techniques associated with project-specific grading at the subdivision map level.

SP-4.6-60 If at the time subdivisions permitting construction are processed, the County determines through an Initial Study that there may be elderberry scrub vegetation on the property being subdivided, then a site specific survey shall be conducted to define the presence or absence of such habitat and any necessary mitigation measures shall be determined and applied.

SP-4.6-61 If at the time subdivisions permitting construction are processed, the County determines through an Initial Study that there may be mainland cherry trees and/or mainland cherry shrubs on the property being subdivided, then a site specific survey shall be conducted to define the presence or absence of such habitat and any necessary mitigation measures shall be determined and applied.

SP-4.6-62 When a map revision or Substantial Conformance determination on any subdivision map or Conditional Use Permit would result in changes to an approved oak tree permit, then the oak tree report for that oak tree permit must be amended for the area of change, and the addendum must be approved by the County Forester prior to issuance of grading permits for the area of the map or CUP being changed.

SP-4.6-63 Riparian resources that are impacted by buildout of the Newhall Ranch Specific Plan shall be restored with similar habitat at the rate of 1 acre replaced for each acre lost.

SP-4.6-64 The operator of the golf course shall prepare a Golf Course Maintenance Plan which shall include procedures to control storm water quality and ground water quality as a result of golf course maintenance practices, including irrigation, fertilizer, pesticide and herbicide use. This Plan shall be prepared in coordination with the County biologist and approved by the County Planning Director prior to the issuance of a Certificate of Occupancy.

## B.2 ADDITIONAL MITIGATION MEASURES ADOPTED IN THE EIS/EIR

BIO-1 Mitigation Measures SP-4.6-1 through SP-4.6-16 specify requirements for riparian mitigation conducted in the High Country SMA, Salt Creek area, and Open Area. The RMDP includes requirements for mitigation of both riparian and upland habitats (such as riparian adjacent big sagebrush scrub), and incorporates these Mitigation Measures (SP-4.6-1 through SP-4.6-16). A Comprehensive Mitigation Implementation Plan (CMIP) has been developed by Newhall Land that provides an outline of mitigation to offset impacts described in the RMDP. The CMIP demonstrates the feasibility of creating the required mitigation acreage from RMDP project impacts (see BIO-2).

Detailed riparian/wetland mitigation plans, in accordance with the CMIP, shall be submitted to, and are subject to the approval of, the Corps and CDFG as part of the sub-notification letters for individual projects. Individual project submittals shall include applicable CMIP elements, complying with the requirements outlined below. The detailed wetlands mitigation plan shall specify, at a minimum, the following: 1) the location of mitigation sites; 2) site preparation, including grading, soils preparation, irrigation installation, 2a) the quantity (seed or nursery stock) and species of plants to be planted (all species to be native to region); 3) detailed procedures for creating additional vegetation communities; 4) methods for the removal of non-native plants; 5) a schedule and action plan to maintain and monitor the enhancement/restoration area; 6) a list of criteria by which to measure success of the mitigation sites (e.g., percent cover and richness of native species, percent survivorship, establishment of self-sustaining native of plantings, maximum allowable percent of non-native species); 7) measures to exclude unauthorized entry into the creation/enhancement areas; and 8) contingency measures in the event that mitigation efforts are not successful. The detailed wetlands mitigation plans shall also classify the biological value (as "high," "moderate," or "low") of the vegetation communities to be disturbed as defined in these conditions, or may be based on an agency-approved method (e.g., Hybrid Assessment of Riparian Communities (HARC)). The biological value shall be used to determine mitigation replacement ratios required under BIO-2 and BIO-10. The detailed wetlands mitigation plans shall provide for the 3:1 replacement of any southern California black walnut to be removed from the riparian corridor for individual projects. The plan shall be subject to the approval of CDFG and the Corps and approved prior to the impact to riparian resources. BIO-4 describes that the functions and values will be assessed for the riparian areas that will be removed, and BIO-2 and BIO-10 describe the replacement ratios for the habitats that will be impacted.

BIO-2 The permanent removal of existing habitats in Corps and/or CDFG jurisdictional areas in the Santa Clara River and tributaries shall be replaced by creating habitats of similar functions and values/services (see Mitigation Measure BIO-4 and Mitigation

Measure SW-3 of Section 4.6 of the Final EIS/EIR) on the Project site, or as allowed under Mitigation Measure BIO-10.

a. Permanent impacts to Corps jurisdiction (which is a subset of CDFG jurisdiction) are to be mitigated by initiating mitigation site creation and/or restoration in advance of impacts, to replace the combined loss of acreage, functions, and services at a minimum 1:1 ratio. Initiation of a Corps mitigation site is defined as: (1) completion of site preparation; (2) installation of temporary irrigation; and (3) seeding and/or planting of the mitigation site. For detailed information, please refer to the *Mitigation Plan for Impacts to Waters of the United States* included in the Draft 404(b)(1) Alternatives Analysis in Appendix F1.0 of the Final EIS/EIR. The Salt Creek creation and restoration site and the Mayo Crossing restoration site (i.e., an existing agricultural field) are considered the initial sites to be implemented prior to Corps jurisdictional impacts by development, thereby establishing upfront mitigation credits. As individual Project components are proposed for construction, consistent with the construction notification, quantities of mitigation acreage required to offset permanent impact acreages shall be calculated and compared to pre-mitigation area credits remaining. A project would not proceed unless adequate mitigation capacity is demonstrated. Temporary impact areas shall be mitigated in place in a manner that restores impacted functions and services as described in the mitigation plan noted above. If upfront compensatory mitigation cannot be achieved, a Corps-approved method would be utilized to determine the additional compensatory mitigation to offset the temporal loss of functions and services not included in the 1:1 mitigation ratio for permanent impacts.

   These measures satisfy the Corps mitigation requirements for impacts to Corps jurisdictional areas. However, impacts to jurisdictional areas (which include all areas subject to Corps and/or CDFG jurisdiction) are also subject to all of the mitigation requirements for impacts to CDFG jurisdiction, including BIO-2b.

b. For permanent and temporary impacts to CDFG jurisdiction, consistent with the sub-notification, quantities of mitigation acreage required shall be calculated in accordance with the criteria below:

   - If suitable mitigation sites have met success criteria (BIO-6) prior to disturbance at the impact site, the mitigation sites shall replace the permanently impacted habitats in kind at a 1:1 ratio.
   - If a suitable mitigation site has not met success criteria prior to disturbance of the impact site, habitat shall be replaced in kind (tributary for tributary impacts, river for river impacts) according to the replacement ratios specified in Table 4.5-68, below. These ratios provide compensatory mitigation for temporal losses of riparian function by considering the existing functional condition of

the resources to be impacted, as well as time required for different vegetation types to become established and mature.

- If a suitable mitigation site has not been initiated within two years following disturbance of the impact site, but is initiated within 5 years following such disturbance, the permanently impacted habitats shall be replaced in kind at a replacement ratio equal to the ratio required by Table 4.5-68, below, plus 0.5:1. (For example, if mitigation for impacts to high-quality mulefat scrub were initiated three years after disturbance, the required replacement ratio would be 2.5:1.)
- If a suitable mitigation site has not been initiated within 5 years following disturbance of the impact site, the permanently impacted habitats shall be replaced in kind at a replacement ratio equal to the ratio required by Table 4.5-68, below, plus 1:1. (For example, if mitigation for impacts to high-quality mulefat scrub were initiated six years after disturbance, the required replacement ratio would be 3:1.)

Where temporary impacts to CDFG-jurisdictional areas are proposed, the mitigation acreage required shall be determined based upon the duration of the proposed construction disturbance and the type of vegetation to be impacted. As individual Project components are proposed for construction, consistent with the sub-notification process, the quantities of mitigation acreage required for temporary impacts to CDFG jurisdictional areas shall be calculated according to the following criteria:

- If suitable mitigation sites have met success criteria prior to temporary disturbance at the impact site, the mitigation sites shall replace the temporarily impacted habitats in kind at a 1:1 ratio regardless of the duration of the temporary disturbance.
- If the duration of temporary disturbance is less than two years, and no suitable mitigation sites have met success criteria prior to the disturbance, temporarily impacted habitats shall be replaced in kind at a 1:1 ratio, except for southern cottonwood/willow riparian forest and oak woodland habitats, which shall be replaced in kind at a ratio of 1:1 if low quality, 1.5:1 if medium quality, and 2:1 if high quality.
- If the duration of temporary disturbance is between two and five years, and no suitable mitigation sites have met success criteria prior to the disturbance, temporarily impacted habitats shall be replaced in kind at a 1.5:1 ratio, except for southern cottonwood/willow riparian forest and oak woodland habitats, which shall be replaced in kind at a ratio of 1:1 if low quality, 1.5:1 if medium quality, and 2:1 if high quality.
- If the duration of temporary disturbance exceeds five years, and no suitable mitigation sites have met success criteria prior to the disturbance, temporarily impacted habitats shall be replaced in kind at a 2:1 ratio, except for southern cottonwood/willow riparian forest and oak woodland habitats, which shall be

replaced in kind at a ratio of 1:1 if low quality, 1.5:1 if medium quality, and 2:1 if high quality.

In lieu of the habitat replacement described above and subject to CDFG approval, removal of invasive, exotic plant species from existing CDFG jurisdictional areas, followed by restoration/revegetation, may also be used to offset impacts. If this method is employed, mitigation shall be credited at an acreage equivalent to the percentage of exotic vegetation present at the restoration site. For example, if a 10-acre jurisdictional area is occupied by 10 percent exotic species, restoration shall be credited for 1 acre of impact. If appropriate, as authorized by CDFG, reduced percentage credits may be applied for invasive removal with passive restoration (weeding and documentation of natural recruitment only).

BIO-3 Creation of new vegetation communities and restoration of impacted vegetation communities shall occur at suitable sites in or adjacent to jurisdictional areas or in areas where bank stabilization would occur. Locations where the excavation of uplands for bank protection/stabilization results in creation of new, unvegetated riverbed or other disturbance shall receive the highest level of priority for vegetation community restoration. Restoration sites may also occur at locations outside the riverbed where there are appropriate hydrologic conditions to create a self-sustaining riparian vegetation community and where upland and riparian vegetation community values are absent or very low. All sites shall contain suitable hydrological conditions and surrounding land uses to ensure a self-sustaining functioning riparian vegetation community. Candidate restoration sites shall be described in the annual mitigation status report (BIO-12). Sites will be approved when the detailed wetlands mitigation plans are submitted to the Corps and CDFG as part of the sub-notification letters submitted for individual projects Status of the sites will be addressed as part of the annual mitigation status report and mitigation accounting form agency review. Each mitigation plan will include acreages, maps and site specific descriptions of the proposed revegetation site, including analysis of soils, hydrologic suitability, and present and future adjacent land uses.

BIO-4 Replacement vegetation communities shall be designed to replace the functions and values of the vegetation communities being removed. The replacement vegetation communities shall have similar dominant trees and understory shrubs and herbs (excluding exotic species) to those of the affected vegetation communities (see [EIS/EIR] Table 4.5-69 for example of recommended plant species for the River Corridor SMA and tributaries). In addition, the replacement vegetation communities shall be designed to replicate the density and structure of the affected vegetation communities once the replacement vegetation communities have met the mitigation success criteria.

BIO-5 Average plant spacing shall be determined based on an analysis of vegetation communities to be replaced. The applicant shall develop plant spacing specifications

for all riparian vegetation communities to be restored. Plant spacing specifications shall be reviewed and approved by the Corps and CDFG when restoration plans are submitted to the agencies as part of the sub-notification letters submitted to the Corps and CDFG for individual projects or as part of the annual mitigation status report and mitigation accounting form.

**TABLE 4.5-68 CDFG JURISDICTIONAL PERMANENT IMPACTS MITIGATION RATIOS**

RATIOS LISTED BY VEGETATION TYPES AND QUALITY

| Vegetation Community | Veg Code/ID | High Reach Value[1] (Mit. Ratio) | Medium Reach Value[2] (Mit. Ratio) | Low Reach Value[3] (Mit. Ratio) |
|---|---|---|---|---|
| Southern Cottonwood-Willow Riparian Forrest | SCWRF | 4:1 | 3:1 | 2:1 |
| Southern Willow Scrub | SWS | 3:1 | 2.5:1 | 2:1 |
| Oak Woodland (Coast Live, Valley) | CLOW/VOW | 3:1 | 2.5:1 | 2:1 |
| Big Sagebrush Scrub | BSS | 2.5:1 | 2:1 | 1.5:1 |
| Mexican Elderberry Scrub | MES | 2.5:1 | 2:1 | 1.5:1 |
| Cismontane Alkaline Marsh | CAM | 2.5:1 | 2:1 | 1.5:1 |
| Coastal and Valley Fresh Water Marsh | CFWM | 2:1 | 1.5:1 | 1:1 |
| Mulefat Scrub | MFS | 2:1 | 1.5:1 | 1.25:1 |
| Arrowweed Scrub | AWS | 2:1 | 1.5:1 | 1:1 |
| California Sagebrush scrub, and CSB-dominated habitats | CSB, CSB-A, -BS, -CB, -CHP, and -PS | 2:1 | 1.5:1 | 1:1 |
| Herbaceous Wetland | HW | 1.5:1 | 1.25:1 | 1:1 |
| River Wash, emergent veg. | RW | 1.5:1 | 1.25:1 | 1:1 |
| Chaparral, Chamise Chaparral | CHP, CC | 1.5:1 | 1.25:1 | 1:1 |
| Coyote Brush Scrub | CYS | 1.5:1 | 1.25:1 | 1:1 |
| Eriodictyon Scrub | EDS | 1.5:1 | 1.25:1 | 1:1 |
| California Grass Lands | CGL | 1:1 | 1:1 | 1:1 |
| Agricultural/Disturbed/Developed | AGR/DL/DEV | 1:1 | 1:1 | 1:1 |

[1] HIGH reach value indicates a portion of the Santa Clara River or main tributary that scored above 0.79 Total Score utilizing the HARC methodology described in Section 4.2, Geomorphology and Riparian Resources, of this EIS/EIR.

[2] MEDIUM reach value indicates a portion of the Santa Clara River or main tributary that scored between 0.4 and 0.79 Total Score utilizing the HARC methodology described in Section 4.2.

[3] LOW reach value indicates a portion of the Santa Clara River or main tributary that scored below 0.4 Total Score utilizing the HARC methodology described in Section 4.2.

**TABLE 4.5-69 POTENTIAL PLANT SPECIES FOR VEGETATION COMMUNITY RESTORATION IN THE RIVER CORRIDOR SMA AND TRIBUTARIES**

| Common Name | Scientific Name |
|---|---|
| Trees | |
| Red willow | *Salix laevigata* |
| Arroyo willow | *Salix lasiolepis* |
| Fremont cottonwood | *Populus fremontii* |
| Black cottonwood | *Populus balsamifera* ssp. *trichocarpa* |
| Western sycamore | *Platanus racemosa* |
| Shrubs | |
| Mulefat | *Baccharis salicifolia* |
| Sandbar willow | *Salix exigua* |
| Arrow weed | *Pluchea sericea* |
| Herbs | |
| Mugwort | *Artemisia douglasiana* |
| Western ragweed | *Ambrosia psilostachya* |
| Cattail | *Typha latifolia* |
| Bulrush | *Scirpus americanus* |
| Prairie bulrush | *Scirpus maritimus* |

Note: This is a recommended list. Other species may be found suitable based on site conditions and state and federal permits.

BIO-6 The revegetation site will be considered "complete" upon meeting all of the following success criteria. In a sub-notification letter, the applicant may request modification of success criteria on a project by project basis. Acceptance of such request will be at the discretion of CDFG and the Corps.

1. Regardless of the date of initial planting, any restoration site must have been without active manipulation by irrigation, planting, or seeding for a minimum of three years prior to Agency consideration of successful completion.
2. The percent cover and species richness of native vegetation shall be evaluated based on local reference sites established by CDFG and the Corps for the plant communities in the impacted areas.
3. Native shrubs and trees shall have at least 80 percent survivorship after two years beyond the beginning of the success evaluation start date. This may include natural recruitment.
4. Non-native species cover will be no more than 5 percent absolute cover through the term of the restoration.
5. Giant reed (*Arundo donax*), tamarisk (*Tamarix ramosissima*), perennial pepperweed (*Lepidium latifolium*), tree of heaven (*Ailanthus altissimus*), pampas grass (*Cortaderia selloana*) and any species listed on the California State Agricultural list, or Cal-IPC list of noxious weeds will not be present on the revegetation site as of the date of completion approval.

6. Using the HARC assessment methodology, the compensatory mitigation site shall meet or exceed the baseline functional scores of the impact area in jurisdictional waters of the United States. If the compensatory mitigation site cannot meet or exceed the baseline functional score of the impact area in Corps' jurisdictional waters.

BIO-7 If at any time prior to Agency approval of the restoration area, the site is subject to an act of "God" (e.g., flood, fires, or drought) the applicant shall be responsible for replanting the damaged area. The site will be subject to the same success criteria as provided for in BIO-6. Should a second act of God occur prior to Agency approval of the restoration area, the applicant shall coordinate with the Agencies and develop an alternative restoration strategy(ies) to meet success requirements. This may include restoration elsewhere in the river corridor or tributaries.

BIO-8 Temporary irrigation shall be installed as necessary for plant establishment. Irrigation shall continue as needed until the restoration site becomes self sustaining, regarding survivorship and growth. Irrigation shall be terminated in the fall to provide the least stress to plants.

BIO-9 In areas where invasive exotic plant species control is authorized by CDFG in-lieu of other riparian habitat mitigation (BIO-2), removal areas shall be kept free of exotic plant species for five years after initial treatment. In areas where extensive exotic removal occurs, revegetation with native plants or natural recruitment shall be documented.

BIO-10 The exotics control program may utilize methods and procedures in accordance with the provisions in the Upper Santa Clara River Watershed Arundo/Tamarisk Removal Plan Final EIR, dated February 2006, or the applicant may propose alternative methods and procedures for Corps and CDFG review and approval pursuant to a sub-notification letter or annual mitigation status report submittal. Exotic plant species control will be credited at an acreage equivalent to the percentage of exotic vegetation at the restoration site. By example: a 10-acre site occupied by 10 percent exotic species will be credited for one acre of mitigation. The exotic weed control location will be documented on the annual mitigation status report and mitigation accounting form. If "in-lieu fees" are paid, it will be documented on the annual mitigation status report and mitigation accounting form, along with a reporting of the status of exotic vegetation treatment.

BIO-11 To provide an accurate and reliable accounting system for mitigation, the applicant utilizing the RMDP shall file a mitigation accounting form annually with the Corps and CDFG by April 1. This form shall document the amount of vegetation planted during the past year, any "in-lieu fees" paid for exotic invasive plant species control, the status of all mitigation credits to date, and any credits subtracted by projects implemented during the past year. The applicant, utilizing the RMDP, shall keep

detailed records and provide a mitigation accounting form to the Corps and CDFG annually for review for the life of the permit, or until all credits have been used up for individual projects, and success criteria have been met. The Corps and CDFG shall provide concurrence within 60 days, including written verification for all restoration and weed removal sites that meet the specified performance criteria. Adequate proof of delivery of applicable reports would be required as well as subsequent notice to the Agencies requesting surety release.

BIO-12 An annual mitigation status report shall be submitted to the Corps and CDFG by April 1 of each year until satisfaction of success criteria identified in BIO-6. This report shall include any required plans for plant spacing, locations of candidate restoration and weed control sites or proposed "in-lieu fees," restoration methods, and vegetation community restoration performance standards. For active vegetation community creation sites, the report shall include the survival, percent cover, and height of planted species; the number by species of plants replaced; an overview of the revegetation effort and its success in meeting performance criteria; the method used to assess these parameters; and photographs. For active exotics control sites, the report shall include an assessment of weed control; a description of the relative cover of native vegetation, bare areas, and exotic vegetation; an accounting of colonization by native plants; and photographs. The report shall also include the mitigation accounting form (see BIO-11), which outlines accounting information related to species planted or exotics control and mitigation credit remaining. The annual mitigation and monitoring report shall document the current functional capacity of the compensatory mitigation site using the HARC assessment methodology, as well as documenting the baseline functional scores of the impact site in jurisdictional waters of the United States.

BIO-13 The mitigation program shall incorporate applicable principles in the interagency Federal Guidance for the Establishment, Use, and Operation of Mitigation Banks (60 FR 58605–58614) to the extent feasible and appropriate, particularly the guidance on administration and accounting. Nothing in the section 404 or section 2081 Permit or section 1605 agreement shall preclude the applicant from selling mitigation credits to other parties wishing to use those permits or that agreement for a project and/or maintenance activity included in the permits/agreement.

BIO-14 Temporary impacts from construction activities in the riverbed shall be restricted to the following areas of disturbance: 1) an 85-foot-wide zone that extends into the river from the base of the rip-rap or gunite bank protection where it intercepts the river bottom; 2) 100 feet on either side of the outer edge of a new bridge or bridge to be modified; 3) a 60-foot-wide corridor for utility lines; 4) 20-foot-wide temporary access ramps; and 5) 60-foot roadway width temporary construction haul routes. The locations of these temporary construction sites and the routes of all access roads shall be shown on maps submitted with the sub-notification letter submitted to the Corps and CDFG for individual project approval. Any variation from these limits shall be

submitted, with a justification for a variation for Corps and CDFG approval. The construction plans should indicate what type of vegetation, if any, would be temporarily disturbed or removed and the post-construction activities to facilitate revegetation of the temporarily impacted areas. The boundaries of the construction site and any temporary access roads within the riverbed shall be marked in the field with stakes and flagging. No construction activities, vehicular access, equipment storage, stockpiling, or significant human intrusion shall occur outside the work area and access roads.

BIO-15 All native riparian trees with a three-inch diameter at breast height (dbh) or greater in temporary construction areas shall be replaced using 1- or 5-gallon container plants, containered trees, or pole cuttings in the temporary construction areas in the winter following the construction disturbance. The mitigation ratios for temporary impacts to vegetation communities are described in BIO-2. The growth and survival of the replacement trees shall meet the performance standards specified in BIO-6. In addition, the growth and survival of the planted trees shall be monitored until they meet the self sustaining success criteria in accordance with the methods and reporting procedures specified in BIO-6, BIO-7, BIO-11, and BIO-12.

BIO-16 Vegetation communities temporarily impacted by the proposed Project shall be revegetated as described in BIO-2. Large trunks of removed trees may also remain on site to provide habitat for invertebrates, reptiles, and small mammals or may be anchored within the Project site for erosion control. To facilitate restoration, mulch, or native topsoil (the top 6- to 12-inch deep layer containing organic material), may be salvaged from the work area prior to construction. Following construction, salvaged topsoil shall be returned to the work area and placed in the restoration site. Within one year, the Project biologist will evaluate the progress of restoration activities in the temporary impact areas to determine if natural recruitment has been sufficient for the site to reach performance goals. In the event that native plant recruitment is determined by the Project biologist to be inadequate for successful habitat establishment, the site shall be revegetated in accordance with the methods designed for permanent impacts (i.e., seeding, container plants, and/or a temporary irrigation system may be recommended). This will help ensure the success of mitigation areas. The applicant shall restore the temporary construction area per the success criteria and ratios described in BIO-1, BIO-2, and BIO-6. Annual monitoring reports on the status of the recovery of temporarily impacted areas shall be submitted to the Corps and CDFG as part of the annual mitigation status report (BIO-11 and BIO-12).

BIO-17 Focused surveys for arroyo toad shall be conducted. Prior to initiating construction for the installation of bridges, storm drain outlets, utility lines, bank protection, trails, and/or other construction activities, all construction sites and access roads within the riverbed as well as all riverbed areas within 1,000 feet of construction sites and access roads shall be surveyed at the appropriate season for arroyo toad. The applicant shall

contract with a qualified biologist to conduct focused surveys for arroyo toad. If detected in or adjacent to the Project area, no work will be authorized within 500 feet of occupied habitat until the applicant provides concurrence from the Service to CDFG and the Corps. The applicant shall implement measures required by the Service Biological Opinion that either supplement or supersede these measures. If arroyo toads are determined to be present, the applicant shall develop and implement a monitoring plan that includes the following measures in consultation with the Service and CDFG.

1) The applicant shall retain a qualified biologist with demonstrated expertise with arroyo toads to monitor all construction activities in potential arroyo toad habitat and assist the applicant in the implementation of the monitoring program. This person will be approved by the Service prior to the onset of ground-disturbing activities. This biologist will be referred to as the authorized biologist hereafter. The authorized biologist will be present during all activities immediately adjacent to or within habitat that supports populations of arroyo toad.
2) Prior to the onset of construction activities, the applicant shall provide all personnel who will be present on work areas within or adjacent to the Project area the following information:

    a. A detailed description of the arroyo toad, including color photographs;
    b. The protection the arroyo toad receives under the Endangered Species Act and possible legal action that may be incurred for violation of the Act;
    c. The protective measures being implemented to conserve the arroyo toad and other species during construction activities associated with the proposed Project; and
    d. A point of contact if arroyo toads are observed.

3) All trash that may attract predators of the arroyo toad will be removed from work sites or completely secured at the end of each work day.
4) Prior to the onset of any construction activities, the applicant shall meet on site with staff from the Service and the authorized biologist. The applicant shall provide information on the general location of construction activities within habitat of the arroyo toad and the actions taken to reduce impacts to this species. Because arroyo toads may occur in various locations during different seasons of the year, the applicant, the Service, and authorized biologists will, at this preliminary meeting, determine the seasons when specific construction activities would have the least adverse effect on arroyo toads. The goal of this effort is to reduce the level of mortality of arroyo toads during construction. The parties realize that if arroyo toads are present, complete prevention of all mortality is likely not possible because some arroyo toads may occur anywhere within suitable habitat during any given season; the detection of every individual over large areas is impossible because of the small size, fossorial habits, and cryptic coloration of the arroyo toad.

5) Where construction can occur in habitat where arroyo toads are widely distributed, work areas will be fenced in a manner that prevents equipment and vehicles from straying from the designated work area into adjacent habitat. The authorized biologist will assist in determining the boundaries of the area to be fenced in consultation with the Service /CDFG. All workers will be advised that equipment and vehicles must remain within the fenced work areas.
6) The authorized biologist will direct the installation of the fence and conduct a minimum of three nocturnal surveys to move any arroyo toads from within the fenced area to suitable habitat outside of the fence. If arroyo toads are observed on the final survey or during subsequent checks, the authorized biologist will conduct additional nocturnal surveys if he or she determines that they are necessary in concurrence with the Service /CDFG.
7) Fencing to exclude arroyo toads will be at least 24 inches in height.
8) The type of fencing must be approved by the authorized biologist and the Service /CDFG.
9) Construction activities that may occur immediately adjacent to breeding pools or other areas where large numbers of arroyo toads may congregate will be conducted during times of the year (fall/winter) when individuals have dispersed from these areas. The authorized biologist will assist the applicant in scheduling its work activities accordingly.
10) If arroyo toads are found within an area that has been fenced to exclude arroyo toads, activities will cease until the authorized biologist moves the arroyo toads.
11) If arroyo toads are found in a construction area where fencing was deemed unnecessary, work will cease until the authorized biologist moves the arroyo toads. The authorized biologist in consultation with the Service /CDFG will then determine whether additional surveys or fencing are needed. Work may resume while this determination is being made, if deemed appropriate by the authorized biologist and the Service.
12) Any arroyo toads found during clearance surveys or otherwise removed from work areas will be placed in nearby suitable, undisturbed habitat. The authorized biologist will determine the best location for their release, based on the condition of the vegetation, soil, and other habitat features and the proximity to human activities. Clearance surveys shall occur on a daily basis in the work area.
13) The authorized biologist will have the authority to stop all activities until appropriate corrective measures have been completed.
14) Staging areas for all construction activities will be located on previously disturbed upland areas designated for this purpose. All staging areas will be fenced within potential toad habitat.
15) To ensure that diseases are not conveyed between work sites by the authorized biologist or his or her assistants, the fieldwork code of practice developed by the Declining Amphibian Populations Task Force (DAPTF 2009) will be followed at all times.

16) Drift fence/pitfall trap surveys will be implemented in toad sensitive areas prior to construction in an effort to reduce potential mortality to this species. Prior to any construction activities in the Project area, silt fence shall be installed completely around the proposed work area and a qualified biologist should conduct a preconstruction/clearance survey of the work area for arroyo toads. Any toads found in the work area should be relocated to suitable habitat. The silt fence shall be maintained for the duration of the work activity.
17) The applicant shall restrict work to daylight hours, except during an emergency, in order to avoid nighttime activities when arroyo toads may be present on the access road. Traffic speed should be maintained at 15 mph or less in the work area.

BIO-19 The 1,518-acre Salt Creek area shall be offered for dedication to the public pursuant to Condition 42 of the approved Specific Plan using a "rough step" land dedication approach. Irrevocable offers of dedication will be provided to CDFG for identified impact offsets in accordance with the Plan (BIO-1). The Salt Creek area includes approximately 629 acres of coastal scrub communities within both Ventura and Los Angeles counties. This land dedication shall be managed in conjunction with the 4,205-acre High Country SMA (containing 1,314 acres of coastal scrub communities).

a. To facilitate wildlife movement between the north side of SR-126 and the Salt Creek area, enhancements will be made to the existing agricultural undercrossing and to the agricultural land at the base of Salt Creek as discussed in BIO-59. A Wildlife Movement Enhancement Plan shall be submitted to the Corps and CDFG for approval prior to implementation. The plan shall include at the minimum the following:

   i. A portion of the agricultural field on the north side of SR-126 will be dedicated to wildlife movement. Trees and/or scrubs will be planted in the agricultural field to guide wildlife into the existing undercrossing.
   ii. On the south side of SR-126 two rows of trees/scrubs will be planted to guide wildlife to the Santa Clara River.
   iii. A wildlife corridor will be created through the agricultural fields at the base of Salt Creek Canyon.

BIO-20 Approximately 1,900 acres of coastal scrub shall be preserved on the Project site. The preservation of this vegetation type shall occur on site within the High Country SMA, the Salt Creek area, and the River Corridor SMA within the Specific Plan site. Irrevocable offers of dedication will be provided to CDFG for identified impact offsets in accordance with the Plan (BIO-1) using a "rough step" land dedication approach. Some of this habitat is recovering from wildfire and the expectation is that it will recover without active intervention. The functional values of any burned dedicated land areas shall be evaluated annually until such time that conditions are

commensurate with the quality of the impacted habitat being mitigated. In the event that the functional value of this burned habitat has not recovered within 5 years of the dedication due to invasive species, to fire ecology, erosion, drought, or unforeseen events, then adaptive management pursuant to BIO-21 will be implemented for coastal scrub restoration.

BIO-21 Supplemental restoration of coastal scrub shall be conducted as an adaptive management measure pursuant to BIO-20. Eight areas were identified in the Draft Newhall Ranch Mitigation Feasibility Report in the High Country SMA, Salt Creek area, and River Corridor SMA (Dudek 2007a) for coastal scrub restoration. In the event that coastal scrub restoration is required pursuant to BIO-20, the applicant shall develop a Coastal Scrub Restoration Plan, subject to the approval of CDFG. The plan shall specify, at a minimum, the following: 1) the location of mitigation sites to be selected from suitable mitigation land in the High Country and Salt Creek areas identified in the Feasibility Study; 2) a description of "target" vegetation (native shrubland) to include estimated cover and abundance of native shrubs; 3) site preparation measures to include topsoil treatment, soil decompaction, erosion control, temporary irrigation systems, or other measures as appropriate; 4) methods for the removal of non-native plants (e.g., mowing, weeding, raking, herbicide application, or burning); 5) the source of all plant propagules (e.g., seed, potted nursery stock, etc. collected from within five miles of the restoration site), the quantity and species of seed or potted stock of all plants to be introduced or planted into the restoration/enhancement areas; 6) a schedule and action plan to maintain and monitor the enhancement restoration areas, to include at minimum, qualitative annual monitoring for revegetation success and site degradation due to erosion, trespass, or animal damage for a period no less than 2 years; 7) as needed where sites are near trails or other access points, measures such as fencing, signage, or security patrols to exclude unauthorized entry into the restoration/enhancement areas; and 8) contingency measures such as replanting, weed control, or erosion control to be implemented if habitat improvement/restoration efforts are not successful.

Habitat restoration/enhancement will be judged successful when: 1) percent cover and species richness of native species reach 50 percent of cover and species richness at reference sites; and 2) the replacement vegetation has persisted at least one summer without irrigation.

Annual monitoring reports will be prepared and submitted to CDFG and will be made available to the public to guide future mitigation planning. Monitoring reports will describe all restoration/enhancement measures taken in the preceding year; describe success and completion of those efforts and other pertinent site conditions (erosion, trespass, animal damage) in qualitative terms; and describe vegetation survival or establishment in quantitative terms.

BIO-22 a. Newhall Land shall prepare an Oak Resource Management Plan, to be submitted for approval to CDFG and County of Los Angeles, and implemented upon approval. The Plan shall identify areas suitable for oak woodland enhancement and creation. The Plan shall distinguish between oaks to be planted in compliance with CLAOTO (BIO-22b) and the additional measures required by this EIS/EIR (BIO-2 for woodlands in jurisdictional streambeds; and BIO-22c and BIO-22d for upland areas).

The Oak Resource Management Plan shall include measures to create or enhance woodlands as follows: 1) locations and acreages of mitigation sites where woodland creation or enhancement will occur; 2) a description of proposed cover and number of native trees, shrubs, and grasses per acre to be established. This description shall be based on comparable intact woodlands in the area of impact or elsewhere within the RMDP planning area, consistent with conditions of the proposed mitigation site; 3) site preparation measures to include (as appropriate) topsoil treatment, soil decompaction, erosion control, weed grow/kill cycle, or as otherwise approved by the agencies; 4) methods for the removal of non-native plants (e.g., mowing, weeding, raking, herbicide application, or burning); 5) a plant palette listing all species, including sizes, planting densities, or seeding rates, to be based on target vegetation; 6) the source of all plant propagules (e.g., seed, potted nursery stock) and the quantity and species of seed or potted stock of all plants to be introduced or planted into the mitigation areas; 7) temporary irrigation, protection from herbivores, fertilizer, weeding, etc.; 8) a schedule and action plan to maintain and monitor the enhancement/restoration areas to include, at minimum, qualitative annual monitoring for revegetation success and site degradation due to erosion, trespass, or animal damage for a period no less than five years total and no less than two years after removal of irrigation (if any); 9) where sites are near trails or other access points, measures such as fencing, signage, or security patrols to exclude unauthorized entry into the mitigation areas shall be implemented as needed; 10) tree protection standards to be implemented for individual trees or woodlands adjacent to development activity; 11) success criteria as stated in BIO-22b and BIO-22d; and 12) contingency measures, such as replanting, erosion control, irrigation system repair, or understory re-seeding, to be implemented if habitat improvement/restoration efforts do not meet the success criteria stated in the plan.

b. To meet the minimum mitigation criteria set forth in CLAOTO, Newhall Land will replace impacted oaks (measuring 8 inches in diameter, or greater, or with a combined diameter of 12 inches for multi-stem oaks) at a ratio of 2:1. Additionally, oaks meeting the criteria for classification as a Heritage Tree (defined by CLAOTO as "any oak tree measuring 36 inches or more in diameter") will be replaced at a ratio of 10:1. Whether they are planted in dedicated open space areas or developed areas, replacement oak trees planted in conformance with CLAOTO shall adhere to the following standards:

1. Replacement oak trees shall be exclusively indigenous species, shall be at least a 15-gallon size specimen, and measure at least one inch in diameter one foot above the base, unless otherwise approved by the County Forester.
2. Replacement trees shall be properly cared for and maintained for a period of two years and replaced by Newhall Land if mortality occurs within that period.
3. Replacement planting shall be conducted in phases as impacts occur. Alternatively, Newhall Land may choose to plant replacement trees in open space areas prior to realization of Project-related impacts (pre-mitigation). Any pre-mitigation shall adhere to the standards outlined herein.
4. Following completion of the two-year maintenance period, the County Forester shall provide final authorization that CLAOTO standards have been met.

c. In addition to the CLAOTO requirements (BIO-22b, above), this EIS/EIR requires replacement of oak trees at the ratios in the table below for trees lost or impacted in uplands. These trees are in addition to the CLAOTO requirement described above. These additional trees may also be incorporated into woodland habitat enhancement or creation, as described above. Additional replacement ratios are provided in [EIS/EIR] Table 4.5-70.

**TABLE 4.5-70 ADDITIONAL BIO-22C OAK TREE REPLACEMENT RATIOS**

| Trunk Diameter[1] | Mitigation Ratio |
|---|---|
| 8 – 35 | 0.5:1 |
| 36 + | 2.5:1 |

[1] Trunk diameter measured at 4.5 feet above mean natural grade. Miligation required for single-stem oaks with a minimum 8-inch diameter and multi-stem oaks with a combined diameter of 12 inches.

d. Newhall will mitigate lost oak woodlands occurring on upland sites (i.e., outside CDFG/Corps jurisdictional stream channels) by creating or enhancing oak woodlands in the Salt Creek area and High Country SMA. At minimum, Newhall Land will mitigate woodland habitat at a 1:1 ratio through creation of new oak woodlands. As an alternative, Newhall Land may choose to enhance, improve, and manage existing degraded woodland areas at a minimum 2:1 ratio for lost woodland acreage.

For woodland enhancement or replacement, dominant species (coast live oak or valley oak) and planting densities will be based on mitigation site suitability. All plant propagules, including acorns or tree cuttings and all seed or potted nursery stock of oaks or other species, shall be collected within a five-mile radius and within 1,000 feet elevation of the restoration site.

The woodland creation or enhancement sites shall be monitored for oak tree survival and vigor and other habitat values, including species diversity and wildlife use. The replacement or enhancement sites will be considered "complete" upon meeting all of

the following success criteria, or as otherwise approved by CDFG. Any replacement oak trees planted in woodlands for conformance with CLAOTO will also be subject to CLAOTO performance criteria (BIO-22b).

1. Regardless of the date of initial woodland creation or enhancement, each site must have been without active manipulation by irrigation, planting, or re-seeding for a minimum of three years prior to evaluation for successful completion.
2. The percent cover and species richness of restored or enhanced native vegetation shall be evaluated based on target vegetation described in the woodland creation or enhancement plan.
3. Densities (numbers/acre) of surviving, healthy oak shall be within 5 percent of the plan target density. Cover and species richness of other native shrubs shall reach 50 percent of the cover and species richness described for the "target" woodland. Optimal woodland densities and acorn planting quantities, by oak woodland type, are presented in [EIS/EIR] Table 4.5-71.

**TABLE 4.5-71 OPTIMAL WOODLAND DENSITIES AND ACORN PLANTING QUANTITIES, BY OAK WOODLAND TYPE**

| Woodland Type | Average Existing Woodland Density (Trees per Acre) | Target Density for Newhall Land (Trees per Acre) |
|---|---|---|
| Coast live oak woodland | 22 | 50 |
| Mixed oak woodland | 19 | 40 |
| Valley oak woodland | 16 | 25 |

4. Non-native grass cover shall not exceed the "target" woodland non-native grass cover, and other non-native species shall not exceed 10 percent cover at any time. Any species listed on the California State Agricultural list (CDFA 2009) or Cal-IPC list of noxious weeds (Cal-IPC 2006, 2007) will not be present on the revegetation site at the time that project success is determined.

BIO-42 All oaks that will not be removed that are regulated under CLAOTO with driplines within 50 feet of land clearing (including brush clearing) or areas to be graded shall be enclosed in a temporary fenced zone for the duration of the clearing or grading activities. Fencing shall extend to the root protection zone (i.e., the area at least 15 feet from the trunk or five feet beyond the drip line, whichever distance is greater). No parking or storage of equipment, solvents, or chemicals that could adversely affect the trees shall be allowed within 25 feet of the trunk at any time. Removal of the fence shall occur only after the Project arborist or qualified biologist confirms the health of preserved trees.

BIO-43 Prior to initiating construction for the installation of bridges, storm drain outlets, utility lines, bank protection, trails, and/or other construction activities that result in any disturbance to the banks or wetted channel, aquatic habitats within construction sites and access roads, as well as all aquatic habitats within 300 feet of construction sites and access roads, shall be surveyed by a qualified biologist for the presence of the unarmored threespine stickleback, arroyo chub, and Santa Ana sucker. The Corps

and CDFG shall be notified at least 14 days prior to the survey and shall have the option of attending. The biologist shall file a written report of the survey with both agencies within 14 days of the survey and no later than 10 days prior to any construction work in the riverbed. If there is evidence that fish spawn has occurred in the survey area, then surveys shall cease unless otherwise authorized by the Service. If surveys determine that gravid fish are present, that spawning has recently occurred, or that juvenile fish are present in the proposed construction areas, all activities within aquatic habitat will be suspended. Construction within aquatic habitats shall only occur when it is determined that juvenile fish are not present within the Project area.

BIO-44 Temporary bridges, culvert crossings, or other feasible methods of providing access across the river shall be constructed outside of the winter season and not during periods when spawning is occurring. Prior to the construction of any temporary or permanent crossing of the Santa Clara River, the applicant shall develop a Stream Crossing and Diversion Plan. The plan shall include the following elements: the timing and methods for pre-construction aquatic species surveys; a detailed description of the diversion methods (e.g., berms shall be constructed of on-site alluvium materials of low silt content, inflatable dams, sand bags, or other approved materials); special-status species relocation; fish exclusion techniques, including the use of block netting and fish relocation; methods to maintain fish passage during construction; channel habitat enhancement, including the placement of vegetation, rocks, and boulders to produce riffle habitat; fish stranding surveys; and the techniques for the removal of crossings prior to winter storm flows. The Plan shall be submitted to the Service and CDFG for approval at least 30 days prior to implementation.

If adult special-status fishes are present and spawning has not occurred, they shall be relocated prior to the diversion or crossing. Block nets of 1/8-inch woven mesh will be set upstream and downstream. On days with possible high temperature or low humidity (temperatures in excess of 80 degrees F), work will be done in the early morning hours, as soon as sufficient light is available, to avoid exposing fishes to high temperatures and/or low humidity. If high temperatures are present, the fishes will be herded to downstream areas past the block net. Once the fishes have been excluded by herding, a Service staff member or his or her agents shall inspect the site for remaining or stranded fish. A Service staff member or his or her agents shall relocate the fish to suitable habitat outside the Project area (including those areas potentially subject to high turbidity). During the diversion/relocation of fishes, the Service or his or her agents shall be present at all times.

BIO-45a Stream diversion bypass channels: Stream diversion bypass channels will be constructed when the active wetted channel is within the work zone. Diversion bypass channels will be built in accordance with BIO-44 and in consultation with CDFG/Service. Equipment shall not be operated in areas of ponded or flowing water unless authorized by CDFG/Service.

The diversion channel shall be of a width and depth comparable to the natural river channel. In all cases where flowing water is diverted from a segment of the stream channel, the bypass channel will be constructed prior to the diversion of the active stream. The bypass channel will be constructed prior to diverting the stream, beginning in the downstream area and continuing in an upstream direction. Where feasible and in consultation with CDFG/Service, the configuration of the diversion channel will be curved (sinuous) with multiple sets of obstructions (i.e., boulders, large logs, or other CDFG/Service-approved materials) placed in the channel at the point of each curve (i.e., on alternating sides of the channel). If emergent aquatic vegetation is present in the original channel, the applicant will transplant suitable vegetation into the diversion channel and on the banks prior to or at the time of the water diversion. A qualified restoration ecologist will supervise the construction of the diversion channels on site. The integrity of the channel and diversion shall be maintained throughout the intended diversion period. Channel bank or barrier construction shall be adequate to prevent seepage into or from the work area. Construction of diversion channels shall not occur if surveys determine that gravid fish are present, spawning has recently occurred, or juvenile fish are present in the proposed construction areas. At the conclusion of the diversion, either at the commencement of the winter season, or the completion of construction, the applicant will coordinate with CDFG/Service to determine if the diversion should be left in place or the stream returned to the original channel. If CDFG/Service determine the stream should be diverted to the original channel, the original channel will be modified prior to re-diversion (i.e., while dry) to construct curves (sinuosity) into that channel, including the placement of obstructions (i.e., boulders, large logs, or other CDFG/Service-approved materials). The original channel will be replanted with emergent vegetation as the diversion channel was planted. If the diversion channel is abandoned, the boulders will remain in place.

BIO-45b Dewatering: Construction dewatering in close proximity to stream flow shall implement the following:

- Assess local stream and groundwater conditions, including flow depths, groundwater elevations, and anticipated dewatering cone of influence (radius of draw down).
- Assess surface water elevations upstream, adjacent to, and downstream of the extraction points, to assess any critical flow regimes susceptible to excessive draw down and therefore fish stranding issues.
- Assess surface water elevations downstream of the discharge locations (if discharge is proposed to the flowing stream) to assess any flow regimes and overbank areas that may be susceptible to flooding and therefore fish stranding at the cessation of discharge. Discharge locations shall also be assessed for potential channel bed erosion from dewatering discharge, and appropriate BMPs must be implemented to prevent excessive erosion or turbidity in the discharge.

- The information above shall be summarized and provided in a plan approved by CDFG and Corps.
- Fish shall be excluded from any artificial flowing channels from dewatering discharge. Methods to ensure separation may include, but are not limited to: block netting at the confluence; creation of a physical drop greater than four inches at the confluence; or maintaining a velocity range unsuitable for fish passage, such as a berm at the confluence with small diameter pipes for discharge.

BIO-46 During any stream diversion or culvert installation activity, a qualified biologist(s) shall be present and shall patrol the areas within, upstream, and downstream of the work area. The biologists shall inspect the diversion and inspect for stranded fish or other aquatic organisms. Under no circumstances shall the unarmored threespine stickleback be collected or relocated, unless Service personnel or their agents implement this measure. Any event involving stranded fish shall be recorded and reported to CDFG and the Service within 24 hours.

BIO-47 Slow moving water habitats shall be constructed upstream and downstream of any river crossing or bridge construction area to provide refuge for special-status fishes during construction. Where feasible and in consultation with CDFG and the Service, the applicant shall enhance slow-moving water habitats for each linear foot disturbed by hand-excavating shallow side channels and placing multiple sets of obstructions (e.g., boulders, large logs, or other CDFG- and the Service-approved materials) in the channel.

BIO-48 Installation of bridges, culverts, or other structures shall not impair the movement of fish and aquatic life. Bottoms of temporary culverts shall be placed at or below channel grade. Bottoms of permanent culverts shall be placed below channel grade. Culvert crossings shall include provisions for a low flow channel where velocities are less than 2 feet per second to allow fish passage.

BIO-49 Water containing mud, silt, or other pollutants from construction activities shall not be allowed to enter a flowing stream or be placed in locations that may be subject to normal storm flows during periods when storm flows can reasonably be expected to occur.

BIO-51 Bridges over the Santa Clara River shall be designed to minimize impacts to natural areas and riparian resources from associated lighting and stormwater runoff. All lighting will be designed to be directed away from natural areas (pursuant to SP-4.6-56) using shielded lights, low sodium-vapor lights, bollard lights, or other available light and glare minimization methods. Bridges will be designed to minimize normal vehicular lighting from trespassing into natural areas using side walls a minimum of 24 inches high. All stormwater from the bridges will be directed to water treatment facilities for water quality treatment.

BIO-52 Prior to grading and construction activities, a qualified biologist shall be retained to conduct a Worker Environmental Awareness Program (WEAP) for all construction/contractor personnel. A list of construction personnel who have completed training prior to the start of construction shall be maintained on site and this list shall be updated as required when new personnel start work. No construction worker may work in the field for more than 5 days without participating in the WEAP. The qualified biologist shall provide ongoing guidance to construction personnel and contractors to ensure compliance with environmental/permit regulations and mitigation measures. The qualified biologist shall perform the following:

- Provide training materials and briefings to all personnel working on site. The material shall include but not be limited to the identification and status of plant and wildlife species, significant natural plant community habitats (e.g., riparian), fire protection measures, and review of mitigation requirements.
- A discussion of the federal and state Endangered Species Acts, Bald and Golden Eagle Protection Act, Migratory Bird Treaty Act, other state or federal permit requirements and the legal consequences of non-compliance with these acts;
- Attend the pre-construction meeting to ensure that timing/location of construction activities do not conflict with other mitigation requirements (e.g., seasonal surveys for nesting birds, pre-construction surveys, or relocation efforts);
- Conduct meetings with the contractor and other key construction personnel describing the importance of restricting work to designated areas. Maps showing the location of special-status wildlife or populations of rare plants, exclusion areas, or other construction limitations (e.g., limitations on nighttime work) will be provided to the environmental monitors and construction crews prior to ground disturbance. This applies to preconstruction activities, such as site surveying and staking, natural resources surveying or reconnaissance, establishment of water quality BMPs, and geotechnical or hydrological investigations;
- Discuss procedures for minimizing harm to or harassment of wildlife encountered during construction and provide a contact person in the event of the discovery of dead or injured wildlife;
- Review/designate the construction area in the field with the contractor in accordance with the final grading plan;
- Ensure that haul roads, access roads, and on-site staging and storage areas are sited within grading areas to minimize degradation of vegetation communities adjacent to these areas (if activities outside these limits are necessary, they shall be evaluated by the biologist to ensure that no special-status species habitats will be affected);
- Conduct a field review of the staking (to be set by the surveyor) designating the limits of all construction activity;
- Flag or temporarily fence any construction activity areas immediately adjacent to riparian areas;

- Ensure and document that required pre-construction surveys and/or relocation efforts have been implemented;
- To reduce the potential for the spread of New Zealand mud snails and weeds (including weed seeds) during Project clearing and construction, all heavy equipment proposed for use on the Project site shall be verified cleaned (including wheels, tracks, undercarriages, and bumpers, as applicable) before delivery to the Project site. Equipment must be documented as mud snail and weed free upon delivery to the Project site initial staging area, including: (1) vegetation clearing equipment (skid steer loaders, loaders, dozers, backhoes, excavators, chippers, grinders, and any hauling equipment, such as off-road haul trucks, flat bed, or other vehicles); (2) earth-moving equipment (scrapers, dozers, excavators, loaders, motor-graders, compactors, backhoes, off-road water trucks, and off-road haul trucks); and (3) all Project-associated vehicles (including personal vehicles) that, upon inspection by the monitoring biologist, are deemed to present a risk for spreading mud snails or weeds. Equipment shall be cleaned at existing construction yards or at a wash station. The biological monitor shall document that all construction equipment (as described above) has been cleaned prior to working within the Project work site. Any equipment/vehicles determined to not be free of mud snails and weeds shall immediately be sent back to the originating construction yard for washing, or wash station where rinse water is collected and disposed of in either a sanitary sewer or other legal point of disposal. Equipment/vehicles moved from the site must be inspected, and re-washed as necessary, prior to re-engaging in construction activities in the Project work area. A written daily log shall be kept for all vehicle/equipment washing that states the date, time, location, type of equipment washed, methods used, and location of work;
- Be present during initial vegetation clearing and grading; and
- Submit to CDFG an immediate report (within 72 hours) of any conflicts or errors resulting in impacts to special-status biological resources.

BIO-55 a. As a supplement to BIO-1 through BIO-16, additional habitat mitigation through replacement or enhancement of nesting/foraging habitat for least Bell's vireo will be provided for certain key habitat zones at higher ratios (identified as "key population areas" in [EIS/EIR] Figure 4.5-86, Alternative 2 Impacts to Least Bell's Vireo Habitat). Southern willow scrub, southern cottonwood–willow riparian, arrow weed scrub, mulefat scrub, and Mexican elderberry scrub and woodland that provide nesting/foraging habitat for least Bell's vireo in "key population areas" shall be replaced or enhanced. All permanent loss to nesting/foraging habitat in key population areas shall be mitigated at a 5:1 ratio unless otherwise authorized by CDFG or the Service. Temporary habitat loss of foraging/nesting habitat in key population areas shall be mitigated at a 2:1 ratio. The requirements for replacing habitat by either creating new habitat or removing exotic species from existing habitat shall follow the procedures outlined in BIO-1 through BIO-16. To replace the lost functions of habitat located adjacent to the Santa Clara River due to noise impacts, all

nesting/foraging habitat within the 60 dBA sound contour (associated with development site roadway improvements) shall be considered degraded. Nesting/foraging habitat within this area shall be mitigated at a ratio of 2:1.

b. The loss of documented occupied nesting habitat for coastal California gnatcatcher shall be mitigated. If the coastal California gnatcatcher is identified nesting on site, the applicant will acquire or preserve nesting coastal California gnatcatcher habitat at a 3:1 ratio for impacts to documented occupied habitat, or by the ratio specified in BIO-2, whichever is greater. Mitigation acquisition shall occur at an agreed-upon location as approved by the Service upon consultation. The applicant shall enter into a binding legal agreement regarding the preservation of occupied habitat describing the terms of the acquisition, enhancement, and management of those lands.

BIO-56 Within 30 days of ground-disturbing activities associated with construction or grading that would occur during the nesting/breeding season of native bird species potentially nesting on the site (typically March through August in the Project region, or as determined by a qualified biologist), the applicant shall have weekly surveys conducted by a qualified biologist to determine if active nests of bird species protected by the Migratory Bird Treaty Act and/or the California Fish and Game Code are present in the disturbance zone or within 300 feet (500 feet for raptors) of the disturbance zone. Pre-construction surveys shall include nighttime surveys to identify active rookery sites. The surveys shall continue on a weekly basis, with the last survey being conducted no more than 7 days prior to initiation of disturbance work. If ground-disturbing activities are delayed, then additional pre-disturbance surveys shall be conducted such that no more than seven days will have elapsed between the survey and ground-disturbing activities.

If active nests are found, clearing and construction within 300 feet of the nest (500 feet for raptors) shall be postponed or halted, at the discretion of the biologist in consultation with CDFG, until the nest is vacated and juveniles have fledged, as determined by the biologist, and there is no evidence of a second attempt at nesting. In the event that golden eagles establish an active nest in the River Corridor SMA, the buffers will be established in consultation with CDFG. Potential golden eagle nesting will be reported to CDFG within 24 hours. Limits of construction to avoid an active nest shall be established in the field with flagging, fencing, or other appropriate barriers and construction personnel shall be instructed on the sensitivity of nest areas. The biologist shall serve as a construction monitor during those periods when construction activities will occur near active nest areas to ensure that no inadvertent impacts to these nests occur. Results of the surveys shall be provided to CDFG in the annual mitigation status report.

For listed riparian songbirds (least Bell's vireo, southwestern willow flycatcher, yellow-billed cuckoo) Service protocol surveys shall be conducted. If active nests are found, clearing and construction within 300 feet of the nest shall be postponed or

halted, at the discretion of the biologist in consultation with CDFG and the Service, until the nest is vacated and juveniles have fledged, as determined by the biologist, and there is no evidence of a second attempt at nesting. If no active nests are observed, construction may proceed. If active nests are found, work may proceed provided that construction activity is located at least 300 feet from active nests (or as authorized through the context of the Biological Opinion and 2081b Incidental Take Statement). This buffer may be adjusted provided noise levels do not exceed 60 dBA hourly Leq at the edge of the nest site as determined by a qualified biologist in coordination with a qualified acoustician.

If the noise meets or exceeds the 60 dBA Leq threshold, or if the biologist determines that the construction activities are disturbing nesting activities, the biologist shall have the authority to halt the construction and shall devise methods to reduce the noise and/or disturbance in the vicinity. This may include methods such as, but not limited to, turning off vehicle engines and other equipment whenever possible to reduce noise, installing a protective noise barrier between the nest site and the construction activities, and working in other areas until the young have fledged. If noise levels still exceed 60 dBA Leq hourly at the edge of nesting territories and/or a no-construction buffer cannot be maintained, construction shall be deferred in that area until the nestlings have fledged. All active nests shall be monitored on a weekly basis until the nestlings fledge. The qualified biologist shall be responsible for documenting the results of the surveys and the ongoing monitoring and for reporting these results to CDFG and the Service.

For coastal California gnatcatcher, the applicant shall conduct Service protocol surveys in suitable habitat within the Project area and all areas within 500 feet of access or construction-related disturbance areas. Suitable habitats, according to the protocol, include "coastal sage scrub, alluvial fan, chaparral, or intermixed or adjacent areas of grassland and riparian habitats." A permitted biologist shall perform these surveys according to the Service' Coastal California Gnatcatcher Presence/Absence Survey Guidelines. If a territory or nest is confirmed, the Service and CDFG shall be notified immediately. If present, a 500-foot disturbance-free buffer shall be established and demarcated by fencing or flagging. No Project activities may occur in these areas unless otherwise authorized by the Service and CDFG. Construction activities in suitable gnatcatcher habitat will be monitored by a full-time qualified biologist. The monitoring shall be of a sufficient intensity to ensure that the biologist could detect the presence of a bird in the construction area.

BIO-62 At least 1,900 acres of Open Area within the Specific Plan area shall be offered for dedication to an NLMO in fee and/or by conservation easement. These 1,900 acres of the Open Area will be left as natural vegetation. Dedication of open areas lands shall be reported annually to CDFG.

BIO-63 Each tract map Home Owners' Association shall supply educational information to future residents regarding pets, wildlife, and open space areas. The material shall discuss the presence of native animals (e.g., coyote, bobcat, and mountain lion), indicate that those native animals could prey on pets, indicate that no actions shall be taken against native animals should they prey on pets allowed outdoors, and indicate that pets must be leashed while using the designated trail system and/or in any areas within or adjacent to open space. Control of stray and feral cats and dogs will be conducted in open space areas on an as-needed basis by the NLMO(s) or the Newhall Ranch joint powers authority (JPA) managing the River Corridor SMA, High Country SMA, or Salt Creek area or by the HOAs managing the Open Areas. Feral cats and dogs may be trapped and deposited with the local Society for the Prevention of Cruelty to Animals or the Los Angeles County Department of Animal Control.

BIO-64 An integrated pest management (IPM) plan that addresses the use of pesticides (including rodenticides and insecticides) on site will be prepared prior to the issuance of building permits for the initial tract map. The IPM will implement appropriate Best Management Practices to avoid and minimize adverse effects on the natural environment, including vegetation communities, special-status species, species without special status, and associated habitats, including prey and food resources (e.g., insects, small mammals, seeds). Potential management practices include cultural (e.g., planting pest-free stock plants), mechanical (e.g., weeding, trapping), and biological controls (e.g., natural predators or competitors of pest species, insect growth regulators, natural pheromones, or biopesticides), and the judicious use of chemical controls, as appropriate (e.g., targeted spraying versus broadcast applications). The IPM will establish management thresholds (i.e., not all incidences of a pest require management); prescribe monitoring to determine when management thresholds have been exceeded; and identify the most appropriate and efficient control method that avoids and minimizes risks to natural resources. Preparation of the CC&Rs for each tract map shall include language that prohibits the use of anticoagulant rodenticides in the Project site.

BIO-69 The Newhall Ranch JPA will have overall responsibility for recreation within and conservation of the High Country. The Newhall Ranch JPA and NLMO shall develop and implement a conservation education and citizen awareness program for the High Country SMA informing the public of the special-status resources present within the High Country SMA and providing information on common threats posed by the presence of people and pets to those resources. The NLMO shall install trailhead and trail signage indicating the High Country SMA is a biological conservation area and advising that people and their animals must stay on existing trails at all times and that violators may be cited. The NLMO shall provide quarterly maintenance patrols to remove litter and monitor trail expansion and fire hazards within the High Country SMA, funded by the JPA.

BIO-70 Construction plans shall include necessary design features and construction notes to ensure protection of vegetation communities and special-status plant and aquatic wildlife species adjacent to construction. In addition to applicable erosion control plans and performance under SCAQMD Rule 403d dust control (SCAQMD 2005), the Project stormwater pollution prevention plan (SWPPP) shall include the following minimum BMPs. Together, the implementation of these requirements shall ensure protection of adjacent habitats and wildlife species during construction. At a minimum, the following measures/restrictions shall be incorporated into the SWPPP, and noted on construction plans where appropriate, to avoid impacting special-status species during construction:

- Avoid planting or seeding invasive species in development areas within 200 feet of native vegetation communities.
- Provide location and details for any dust control fencing along Project boundaries (BIO-71).
- Vehicles shall not be driven or equipment operated in areas of ponded or flowing water, or where wetland vegetation, riparian vegetation, or aquatic organisms may be destroyed, except as otherwise provided for in the 404 Permit or 1603 Agreement.
- Silt settling basins installed during the construction process shall be located away from areas of ponded or flowing water to prevent discolored, silt-bearing water from reaching areas of ponded or flowing water during normal flow regimes.
- If a stream channel has been altered during the construction and/or maintenance operations, its low flow channel shall be returned as nearly as practical to pre-Project topographic conditions without creating a possible future bank erosion problem or a flat, wide channel or sluice-like area. The gradient of the streambed shall be returned to pre-Project grade, to the extent practical, unless it represents a wetland restoration area.
- Temporary structures and associated materials not designed to withstand high seasonal flows shall be removed to areas above the high water mark before such flows occur.
- Staging/storage areas for construction equipment and materials shall be located outside of the ordinary high water mark.
- Any equipment or vehicles driven and/or operated within or adjacent to the stream shall be checked and maintained daily, to prevent leaks of materials that could be deleterious to aquatic life if introduced to water.
- Stationary equipment such as motors, pumps, generators, and welders which may be located within the riverbed construction zone shall be positioned over drip pans. No fuel storage tanks shall be allowed in the riverbed.
- No debris, bark, slash sawdust, rubbish, cement or concrete or washing thereof, oil, petroleum products, or other organic material from any construction, or associated activity of whatever nature, shall be allowed to enter into, or be placed where it may be washed by rainfall or runoff into, watercourses included in the

permit. When construction operations are completed, any excess materials or debris shall be removed from the work area.

- No equipment maintenance shall be done within or near any stream where petroleum products or other pollutants from the equipment may enter these areas with stream flow.
- The operator shall install and use fully covered trash receptacles to contain all food, food scraps, food wrappers, beverage containers, and other miscellaneous trash.
- The operator shall not permit pets on or adjacent to the construction site.
- No guns or other weapons are allowed on the construction site during construction, with the exception of the security personnel and only for security functions. No hunting shall be authorized/permitted during construction.

BIO-71 Development areas shall have dust control measures implemented and maintained to prevent dust from impacting vegetation communities and special-status plant and aquatic wildlife species. Dust control shall comply with SCAQMD Rule 403d (SCAQMD 2005). Where construction activities occur within 100 feet of known special-status plant species locations, chemical dust suppression shall not be utilized. Where determined necessary by a qualified biologist, a screening fence (i.e., a 6-foot-high chain link fence with green fabric up to a height of 5 feet) shall be installed to protect special-status species locations.

BIO-72 Plant palettes proposed for use on landscaped slopes, street medians, park sites, and other public landscaped and FMZ areas within 200 feet of native vegetation communities shall be reviewed by a qualified restoration specialist to ensure that the proposed landscape plants will not naturalize and require maintenance or cause vegetation community degradation in the open space areas (River Corridor SMA, High Country SMA, Salt Creek area, and natural portions of the Open Area). Container plants to be installed within public areas within 200 feet of the open space areas shall be inspected by a qualified restoration specialist for the presence of disease, weeds, and pests, including Argentine ants. Plants with pests, weeds, or diseases shall be rejected. In addition, landscape plants within 200 feet of native vegetation communities shall not be on the Cal-IPC California Invasive Plant Inventory (most recent version) or on the list of Invasive Ornamental Plants listed in Appendix B of the SCP. The current Cal-IPC list can be obtained from the Cal-IPC web site (http://www.cal-ipc.org/ip/inventory/index.php). Landscape plans will include a plant palette composed of native or non-native, non-invasive species that do not require high irrigation rates. Except as required for fuel modification, irrigation of perimeter landscaping shall be limited to temporary irrigation (i.e., until plants become established).

BIO-73 Permanent fencing shall be installed along all River Corridor SMA trails adjacent to the Santa Clara River, or other sensitive resources, in order to minimize impacts associated with increased human presence on protected vegetation communities and

special-status plant and wildlife species. The fencing will be split rail to avoid inhibiting wildlife movement. Viewing platforms will be located in land covers currently mapped as agriculture, disturbed land, or developed land.

BIO-74 To protect Middle Canyon Spring and to reduce potential direct impacts to any special-status species that may be located within the spring complex due to unrestricted access, the Project applicant or its designee shall avoid all construction-related activities within the Middle Canyon Spring complex and erect and maintain temporary orange fencing and prohibitive signage around the Middle Canyon Spring prior to and during all phases of construction within 200 feet of the spring and, if applicable, around the Middle Canyon drainage within 100 feet of flowing water. A qualified biologist will be present to monitor construction activities within 200 feet of the spring and, if applicable, around the Middle Canyon drainage within 100 feet of flowing water. The areas behind the temporary fencing shall not be used for the storage of any equipment, materials, construction debris, or anything associated with construction activities. Any upslope runoff from construction areas will be directed away from the Middle Canyon Spring. Following the final phase of construction of any Newhall Ranch subdivision tract adjacent to Middle Canyon Spring, the Project applicant or its designee shall install and maintain permanent fencing along the subdivision tract bordering the spring. Permanent signage shall be installed on the fencing along the spring boundary to indicate that the fenced area is a biological preserve that contains protected species and habitat. No trail shall be constructed that passes within 100 feet of the Middle Canyon Spring.

a. As described in BIO-51, the Commerce Center Drive Bridge will be designed to minimize secondary impacts associated with lighting and water quality impacts through the installation of indirect and downcast lighting, and routing of stormwater to water quality treatment facilities.

BIO-78 A cowbird trapping program shall be implemented once vegetation clearing begins and maintained throughout the construction, maintenance, and monitoring period of the riparian restoration sites. A minimum of five traps shall be utilized, with at least one trap adjacent to the project site and one or two traps located at feeding areas or other CDFG-approved location. The trapping contractor may consult with CDFG to request modification of the trap location(s). CDFG must approve any relocation of the traps. Traps will be maintained beginning each year on April 1 and concluding on/or about November 1 (may conclude earlier, depending upon weather conditions and results of capture). The trapping contractor may also consult CDFG on a modified, CDFG-approved trapping schedule modification. The applicant shall follow CDFG and the Service protocol. In the event that trapping is terminated after the first few years, subsequent phases of the RMDP development will require initiation of trapping surveys to determine whether re-establishment of the trapping program is necessary.

BIO-80 The Project applicant will retain a qualified biologist to develop an Exotic Wildlife Species Control Plan and implement a control program for bullfrog, African clawed frog, and crayfish. The program will require the control of these species during construction within the River corridor and modified tributaries (bridges, diversions, bank stabilization, drop structures). The Plan shall include a description of the species targeted for eradication, the methods of harvest that will be employed, the disposal methods, and the measures that would be employed to avoid impacts to sensitive wildlife (e.g., stickleback, arroyo toad, nesting birds) during removal activities (i.e., timing, avoidance of specific areas). Annual monitoring shall occur for the first 5 years after construction of Project facilities. After 5 years, bi-annual monitoring shall occur in perpetuity to determine if additional control is necessary. The Project applicant will fund an endowment, approved by CDFG, for monitoring in perpetuity. Monitoring will be conducted within sentinel locations along the River Corridor SMA and where the Project provides potential habitat for these species (e.g., future ponds and water features). Control shall be conducted within Project facilities where monitoring results indicate that exotic species have colonized an area.

BIO-81 The installation of new, or relocation of existing, utility poles and phone and cell towers shall be coordinated with CDFG where located in the High Country SMA and Salt Creek area. The applicant or SCE shall install utility poles, phone, and cell towers in conformance with APLIC standards for collision-reducing techniques as outlined in Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006 (APLIC 2006).

BIO-82a. All surfaces on new antennae and phone/utility towers shall be designed and operated with anti-perching devices in conformance with APLIC standards to deter California condors and other raptors from perching. During construction the area shall be kept clean of debris, such as cable, trash, and construction materials. The applicant shall collect all microtrash and litter (anything shiny, such as broken glass), vehicle fluids, and food waste from the Project area on a daily basis. Workers will be trained on the issue of microtrash: what constitutes microtrash, its potential effects on California condors, and how to avoid the deposition of microtrash.

b. The applicant shall retain a qualified biologist with knowledge of California condors to monitor construction activities within the Project area. The resumes of the proposed biologist(s) will be provided to CDFG for concurrence. This biologist(s) will be referred to as the authorized biologist hereafter. During clearing and grubbing of construction areas, the qualified biologist shall be present at all times. During mass grading, construction sites shall be monitored on a daily basis. The authorized biologist will have the authority to stop all activities until appropriate corrective measures have been completed. If condors are observed landing in the Project area, the applicant shall avoid further construction within 500 feet of the sighting until the animals have left the area, or as otherwise authorized by CDFG and the Service. All condor sightings in the Project area will be reported to CDFG and the Service within

24 hours of the sighting. Should condors be found roosting within 0.5 mile of the construction area, no construction activity shall occur between one hour before sunset to 1 hour after sunrise, or until the condors leave the area, or as otherwise directed by the Service. Should condors be found nesting within 1.5 miles of the construction area, no construction activity will occur until further authorization occurs from CDFG and the Service.

c. To further protect California condor potentially foraging in the Project area over the long term from negative interactions with humans and/or artificial structures, the applicant or the JPA or the NLMO shall remove dead cattle that are found or reported within 1,000 feet of a residential or commercial development boundary. Dead cattle shall be relocated to a predetermined location within the High Country SMA or Salt Creek area. The locations where carcasses shall be placed shall be a minimum of 1,000 feet from a development area boundary. Appropriate locations for transfer of carcasses include open grasslands and oak/grassland areas where condors can readily detect carcasses and easily land and take off without encountering physical obstacles such as powerlines and other utility structures. The proposed locations would be selected and approved by the CDFG and the Service. Pursuant to this measure, a telephone number for reporting dead cattle shall be provided and actively maintained. Any cattle carcasses transferred to the relocation areas shall be reported to the Service Condor group.

APPENDIX C

## The Declining Amphibian Populations Task Force Fieldwork Code of Practice

1. Remove mud, snails, algae, and other debris from nets, traps, boots, vehicle tires, and all other surfaces. Rinse cleaned items with sterilized (e.g., boiled or treated) water before leaving each work site.

2. Boots, nets, traps, and other types of equipment used in the aquatic environment should then be scrubbed with 70 percent ethanol solution and rinsed clean with sterilized water between study sites. Avoid cleaning equipment in the immediate vicinity of a pond. wetland, or riparian area.

3. In remote locations, clean all equipment with 70 percent ethanol or a bleach solution, and rinse with sterile water upon return to the lab or "base camp" Elsewhere, when washing-machine facilities are available, remove nets from poles and wash in a protective mesh laundry bag with bleach on the "delicates" cycle.

4. When working at sites with known or suspected disease problems, or when sampling populations of rare or isolated species, wear disposable vinyl[4] gloves and change them between handling each animal. Dedicate sets of nets, boots, traps, and other equipment to each site being visited. Clean them as directed above and store separately at the end of each field day.

5. When amphibians are collected, ensure that animals from different sites are kept separately and take great care to avoid indirect contact (e.g., via handling, reuse of containers) between them or with other captive animals. Isolation from unsterilized plants or soils which have been taken from other sites is also essential. Always use disinfected and disposable husbandry equipment.

6. Examine collected amphibians for the presence of diseases and parasites soon after capture. Prior to their release or the release of any progeny, amphibians should be quarantined for a period and thoroughly screened for the presence of any potential disease agents.

7. Used cleaning materials and fluids should be disposed of safely and, if necessary, taken back to the lab for proper disposal. Used disposable gloves should be retained for safe disposal in sealed bags.

The Fieldwork Code of Practice has been produced by the Declining Amphibian Populations Task Force with valuable assistance from Begona Arano, Andrew Cunningham, Tom Langton, Jamie Reaser, and Stan Sessions.

[4] Do not use latex gloves. Latex is toxic to amphibians.

For further information on this Code, or on the Declining Amphibian Populations Task Force, contact John Wilkinson, Biology Department, The Open University, Walton Hall, Milton Keynes, MK7 6AA, UK.
E-mail: DAPTF@open.ac.uk
Fax: +44 (0) 1908-654167

# The Santa Clarita Valley 2010 Water Quality Report

Castaic Lake Water Agency (CLWA) and the local water retailers continuously work to provide new ways to ensure you and your neighbors have a reliable water supply at a reasonable price. We are committed to maintaining high quality water for you, our customers. The California Department of Public Health requires water agencies to publish a report that provides background on the quality of your water and shows you how it meets or exceeds federal and state drinking water standards.

This 2010 Annual Water Quality Report describes in detail the quality of local water supplies in Santa Clarita Valley. In 2009, CLWA and the local retailers met all of the drinking water quality standards. Further explanations of the requirements are in the accompanying pages.

Water conservation is a collaborative effort between CLWA, the local water retailers and their customers. Santa Clarita Valley's water supply remains sufficient to meet resident's needs in 2010, largely due to the community's ongoing conservation efforts and rainfall experienced earlier this year.

*Despite this year's normal rainfall total, California has not yet recovered from three consecutive years of drought and residents need to continue to conserve water inside and outside. Remember to water at night or the early morning hours and regularly check your toilets and faucets for leaks.*

Last year, we launched a series of programs to encourage residents and businesses to continue their conservation efforts. These programs include free on-site water survey for businesses, institutions and homeowners' associations as well as residential programs for free weather-based irrigation controllers. We urge businesses and institutional customers to take action and reduce water use by signing up for free water use surveys. We will evaluate your business' water use patterns and offer ways you can reduce water use and save money.

In addition, our new plant book "Colorful Landscapes for Water Conservation" makes it easy for both novice and experienced gardeners to incorporate California-friendly plants into their gardens. Take a trip to the CLWA Conservatory Garden to pick up your free copy or sign up for one of the free monthly Landscape Education workshops. Visit us on the web at www.clwa.org for more easy water conservation tips. Also, check with your local water retailer for its conservation programs.

If you have any questions about this report or water quality, please contact us at 661-297-1600. Additional information is available from the local water retailers, whose contact information is supplied at the end of this report.

Sincerely,

Dan Masnada
General Manager
CLWA

Steve Cole
General Manager
NCWD

Mauricio Guardado
Retail Manager
SCWD

Robert DiPrimio
President
VWC

Adam Ariki
District Engineer
Los Angeles County
Waterworks District #36

NOTE: All of the test results in this report were run in 2009 unless noted otherwise. If you do not find a chemical listed in this report, it was not found in any test performed on local water. Your local water supplier is therefore in compliance with all drinking water regulations unless a specific violation is noted.

CASTAIC LAKE WATER AGENCY

CLWA SANTA CLARITA WATER DIVISION

NEWHALL COUNTY-WATER DISTRICT

VALENCIA WATER COMPANY

LA COUNTY DEPARTMENT OF PUBLIC WORKS

# REMEMBER:

## Use Water Wisely It's a Way of Life

The Castaic Lake Water Agency wants all customers to rethink household and outdoor water habits and reduce water use even more during the hot, dry summer months.

**You can easily reduce water use with simple adjustments to your outdoor watering:**

- Replace a section of your water guzzling grass with California friendly plants
- Reduce evaporation by watering at night or early morning
- Avoid runoff by setting your sprinklers to run for two short cycles

By conserving water, you help your water providers help you.
To find out how, visit **clwa.org or scvh2o.org.**

### FOR MORE INFORMATION

**CASTAIC LAKE WATER AGENCY**
David Kimbrough | 661-297-1600 x223
E-mail: dkimbrough@clwa.org | Website: www.clwa.org
The Castaic Lake Water Agency is governed by a Board of Directors that meets at 6:30 pm on the second and fourth Wednesdays of each month at the Rio Vista Administration Building, 27234 Bouquet Canyon Road.

**CLWA SANTA CLARITA WATER DIVISION**
Cathy Hollomon | 661-259 -2737
E-mail: chollomon@scwater.org | Website: www.scwater.org
The Santa Clarita Water Division is a division of the CLW . The CLWA Retail Operations Committee meets at 6:30 pm on the first Monday of each month at the SCWD office, 22722 Soledad Canyon Road.

**NEWHALL COUNTY WATER DISTRICT**
Ryan Bye | 661-259-3610
E-mail: rbye@ncwd.org | Website: www.ncwd.org
The Newhall County Water District is governed by a Board of Directors that meets at 6:30 pm on the second Thursday of each month at the District Board Room, 23655 Newhall Avenue, Suite "C."

**VALENCIA WATER COMPANY**
James Saenz | 661-294-0828
E-mail: jsaenz@valenciawater.com | W .valenciawater.com
The Valencia Water Company is a public water utility regulated by the California Public Utilities Commission. The office is located at 24631 Avenue Rockefeller.

**LOS ANGELES COUNTY WATERWORKS DISTRICT NO. 36**
Timothy Chen | (626) 300-3342
E-mail: tchen@dpw.lacounty.gov | W .lacwaterworks.org
Waterworks District No. 36 is governed by the Los Angeles County Board of Supervisors that meets every Tuesday at 9:30 am at the Kenneth Hahn Hall of Administration, 500 West Temple Street Room 381B, Los Angeles.
On Tuesdays following a Monday holiday, the meetings begin at 1:00 pm.

**Este informe contiene información muy importante sobre su agua potable.** Si usted quisiera el texto en español para este reporte, comuníquese con David Kimbrough al número de teléfono 661-297-1600 x223.

CASTAIC LAKE WATER AGENCY

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## CLWA PROVIDES WATER TO LOCAL PURVEYORS

CLWA receives and treats surface water from the SWP and other imported sources. The SWP consists of facilities operated by the California Department of Water Resources to conserve and convey water to SWP contractors for use as agricultural or urban supply. CLWA operates two water treatment plants, the Earl Schmidt Filtration Plant (ESFP) in Castaic and the Rio Vista Water Treatment Plant (RVWTP) in Saugus. The SCV's four water purveyors distribute the treated imported water along with groundwater from the shallow Alluvial aquifer and the deeper Saugus formation. Water quality information for your area is presented in the table contained in this report.

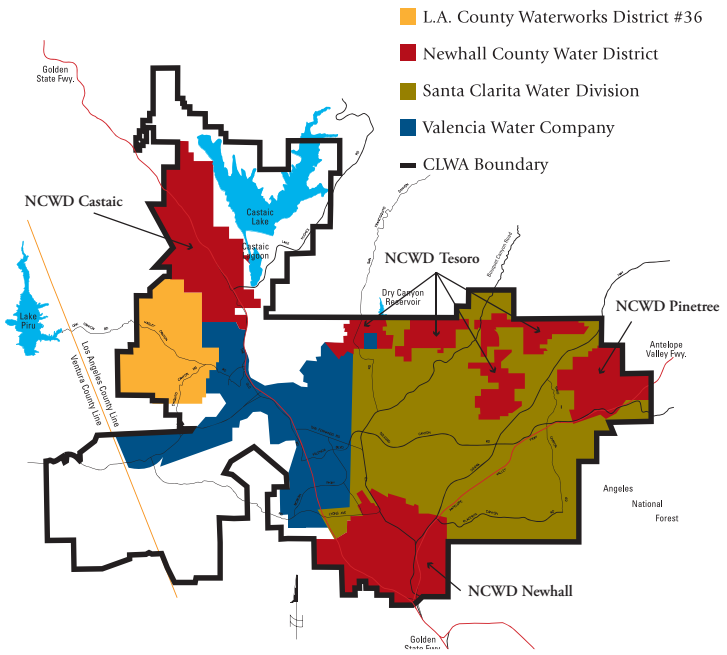
**CLWA Santa Clarita Water Division (SCWD)** provides water to a portion of the City of Santa Clarita and unincorporated portions of Los Angeles County in the communities of Saugus, Canyon Country and Newhall. Customers received approximately 64% imported water and 36% local groundwater in 2009.

**Los Angeles County Waterworks District #36 (LACWD #36)** serves customers located in Hasley Canyon and the community of Val Verde. Customers received 100% imported water in 2009.

**Newhall County Water District (NCWD)** serves customers located in the Castaic, Newhall, Pinetree and Tesoro del Valle areas. In 2009, Castaic customers received 43% imported water and 57% local groundwater, Newhall customers received 20% imported water and 80% local groundwater, and Pinetree customers received 77% imported water and 23% local groundwater. Tesoro del Valle customers received 100% imported water.

**Valencia Water Company (VWC)** supplies water to customers in Valencia, Stevenson Ranch, and portions of Castaic, Saugus, and Newhall. In 2009, VWC customers received 48% imported water and 51% local groundwater and 1% recycled water was delivered to large landscape customers.

## Castaic Lake Water Agency Service Area




## CHEMICALS IN THE NEWS – NITROSAMINES (NDMA)

In complying with USEPA sampling requirements under the Unregulated Contaminant Monitoring Regulation – Cycle 2 (UCMR2), Valencia Water Company detected N-Nitrosodimethylamine (NDMA) above the detection limit for reporting of 2.0 parts per trillion in a few samples. These detections are at extremely low concentrations.

NDMA is formed from nitrites and amines. Recent research and results of UCMR2 data suggest this contaminant is created as a disinfection by-product during water treatment processes. In addition, NDMA has been found in groundwater near sites that used or manufacture rocket fuel or other combustible compounds.

Public health authorities are expected to regulate NDMA over the next few years. Recent laboratory studies have indicated NDMA caused various health risks in laboratory animals, including liver, kidney, lung and stomach cancer. NDMA has been detected in nearly 25% of public water supplies during the first 24 months of UCMR2 monitoring, at concentrations as high as 600 parts per trillion. For details you can visit the UCMR section on the EPA's website at http://www.epa.gov/safewater/ucmr/data.html.

## WATER QUALITY DEFINITIONS

In order to ensure that tap water is safe to drink, the United States Environmental Protection Agency (USEPA) and the California Department of Public Health (DPH) prescribe regulations that limit the amount of certain contaminants in water provided by public water systems. USEPA, DPH and the California Environmental Protection Agency (CalEPA) set goals and legal standards for the quality of drinking water. These standards are intended to protect consumers from contaminants in drinking water. Most of the standards are based on the concentration of contaminants, but a few are based on a Treatment Technique (TT) to remove the contaminant. Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the EPA's Safe Drinking Water Hotline 1-800-426-4791.

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. USEPA/Centers for Disease Control (CDC) guidelines on appropriate means to lessen the risk of infection by Cryptosporidium and other microbial contaminants are available from the Safe Drinking Water Hotline.

When a contaminant is regulated based on concentration, there are three levels that are listed: 1) **Detection Limit for Report (DLR)**, 2) the **Public Health Goal (PHG)** or **Maximum Contaminant Level Goal (MCLG)**, and 3) the **Maximum Contaminant Level (MCL), Action Level (AL) or Notification Level (NL).**

**The DLR** is the smallest concentration of a contaminant that can be measured and reported. DLRs are set by DPH (same as MRL, Minimum Reporting Level, set by USEPA).

**PHG and MCLG** are the level of a contaminant in drinking water below which there is no known or expected risk to health. PHGs are set by Cal EPA. MCLGs are set by the USEPA.

**A Primary MCL** is the highest level of a contaminant that is allowed in drinking water. Primary MCLs are set as close to the PHGs (or MCLGs) as is economically and technologically feasible.

**Secondary MCLs** are set to protect the odor, taste and appearance of drinking water.

**ALs** are federal standards developed by USEPA that address the concentration of a contaminant which, if exceeded, triggers treatment or other requirements that a water system must follow.

**NLs** are state guidelines developed by DPH that address the concentration of a contaminant which, if exceeded, triggers public notification.

**TTs** are a required process intended to reduce the level of a contaminant in drinking water.

**Maximum Residual Disinfectant Level (MRDL):** The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.

**Maximum Residual Disinfectant Level Goal (MRDLG)**: The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.

## METALS AND SALTS

Metals and salts are tested in groundwater from wells once every three years and in Castaic Lake water every month. Small quantities of naturally occurring arsenic are found in Castaic Lake and in groundwater from a few wells. These are present due to the natural erosion of the rocks that water travels over or through. Inorganic compounds such as salts and metals can be naturally occurring or result from urban storm water runoff, industrial or domestic wastewater discharges, oil and gas production, mining, or farming.

A number of naturally occurring salts are found in both surface and well water. These include chloride, fluoride, nitrate, nitrite, calcium, magnesium, potassium, and sodium. Taken together they are called Total Dissolved Solids (TDS). Calcium and magnesium together are called "hardness" and can deposit as scale.

Nitrate in drinking water at levels above 45 mg/L is a health risk for infants less than six months of age. High nitrate levels in drinking water can interfere with the capacity of the infant's blood to carry oxygen, resulting in a serious illness; symptoms include shortness of breath and blueness of the skin. High nitrate levels may also affect the ability of the blood to carry oxygen in other individuals, such as pregnant women and those with certain specific enzyme deficiencies. Nitrate levels may rise quickly for short periods of time because of rainfall or agricultural activity. If you are pregnant or caring for an infant, y ld ask for advice from your health care provider. Nitrates are tested at least annually.

While your drinking water meets the federal and state standard for arsenic, it does contain low levels of arsenic. The arsenic standard balances the current understanding of arsenic's possible health effects against the costs of removing arsenic from drinking water. The USEPA continues to research the health effects of low levels of arsenic, which is a mineral known to cause cancer in humans at high concentrations and is linked to other health effects such as skin damage and circulatory problems.

## DISINFECTION BY-PRODUCTS

The CLWA uses ozone and chloramines to disinfect its water. Disinfection By-Products (DBPs), which include Trihalomethanes (THMs) and Haloacetic Acids (HAA5) are generated by the interaction between naturally occurring organic matter and disinfectants such as chlorine and ozone. THMs and HAA5 a l average.

Ozone is a very powerful disinfectant that not only kills organisms that no other disinfectant can but also destroys organic chemicals that cause unpleasant tastes and odors.

## MICROBIOLOGICAL

Microbial contaminants, such as viruses and bacteria, can be naturally occurring or result from urban storm water runoff, sewage treatment plants, septic systems, agricultural livestock operations, and wildlife.

The most important microbiological drinking water tests are for bacteria. Water is tested throughout the systems weekly for Total Coliform bacteria and for Escherichia coli (E. coli). The presence of E. coli indicates fecal contamination of waters. No E.coli was detected in any drinking waters in the SCV last year. Total coliforms are a group of bacteria that indicate water quality may have deteriorated. The MCL for total coliforms is 5% of all monthly tests showing positives for larger systems.

Additional microbiological tests for the water-borne parasites cryptosporidium parvum and giardia lamblia were performed on Castaic Lake water, and none were detected.

## RADIOLOGICAL TESTS

Radioactive compounds can be found in both ground and surface waters, and can be naturally occurring or be the result of oil and gas production and mining activities. Testing is conducted for two types of radioactivity: alpha and beta. If none is detected at concentrations above five picoCuries per liter no further testing is required. If it is detected, the water must be checked for uranium and radium.

CLWA is required to monitor its source water for specific contaminants on a regular basis. R . CLWA failed to monitor as required for drinking water standards during the past two year and, therefore, was in violation of the regulations. In 2008 and 2009 one sample should have been collected for both tritium and strontium-90. Therefore, the quality of our drinking water during those two years is uncertain in regard to those two analytes. Even though this failure was not an emergency, as our customers, you have a right to know what you should do, what happened, and what we did to correct this situation. There is nothing you need to do at this time. CLWA has collected the appropriate samples and no standards were exceeded, as results from sampling in years preceding 2008 also indicated.

## LEAD AND COPPER

The local water retailers are required to sample for lead and copper at specific consumer taps every three years. The results for lead and copper are reported as the 90th percentile. The 90th percentile is the result that is greater than 90% of all t ly for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. CLWA and the retailers are responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead in your water, you may wish to have your water tested. Information on lead in drinking water, testing methods, a lable from the Safe Drinking Water Hotline 1-800-42604791 or at http://www.epa.gov/safewater/lead

## ORGANIC COMPOUNDS

Organic chemical contaminants, including synthetic and volatile organic chemicals, are by products of industrial processes and petroleum production, and can also come from gas stations, urban storm water runoff, and septic systems. Organic compounds also include pesticides and herbicides, which may come from a variety of sources such as agriculture, urban storm water runoff, and residential uses. Water is tested for two types of organic compounds: volatile organic compounds (VOCs) and non-volatile synthetic organic compounds (SOCs). These organic compounds are synthetic chemicals produced from industrial and agricultural uses. Castaic Lake is checked annually for VOCs and SOCs. Local w lls are tested at least annually for VOCs and periodically for SOCs. Tetrachloroethylene (PCE) was found in trace levels (below the MCL in groundwater in the SCV. Some people who use water containing tetrachloroethylene in excess of the MCL over many years may experience liver problems, and may have an increased risk of getting cancer.

## DRINKING WATER SOURCE ASSESSMENT AND PROTECTION

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally-occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity.

Contaminants that may be present in source water include:

- Microbial contaminants, such as viruses and bacteria, that may come from sewage treatment plants, septic systems, agricultural livestock operations, and wildlife.
- Inorganic contaminants, such as salts and metals, that can be naturally-occurring or result from urban stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, mining, or farming.
- Pesticides and herbicides, that may come from a variety of sources such as agriculture, urban stormwater runoff, and residential uses.
- Organic chemical contaminants, including synthetic and volatile organic chemicals, that are by products of industrial processes and petroleum production, a .
- Radioactive contaminants, that can be naturally-occurring or be the result of oil and gas production and mining activities.

In order to ensure that tap water is safe to drink, the USEPA and the DPH prescribe regulations that limit the amount of certain contaminants in water provided by public water systems. Department regulations also establish limits for contaminants in bottled water that provide the same protection for public health.

As part of DPH requirements, the retailers of the SCV conducted a Drinking Water Source Assessment and Protection (DWSAP) study for all of their groundwater sources. This study enables DPH and water utilities to collect information about each drinking water source and surrounding residential, commercial, and industrial activities. It was completed and provided to DPH in 2002.

As part of the program, "surrounding activities" which include schools, medical offices, gas stations and various other facilities around each water source are categorized and ranked as "possible contaminating activities" (PCA). Below is a list of PCAs that may have contributed to trace levels of contaminants in local wells. Trace levels of PCE (below the MCL) have been detected in one well.

- Automobile/gas stations, auto shops - tetrachloroethylene (PCE)
- Dry cleaners - PCE
- Known contaminant plumes - perchlorate

In addition, a known perchlorate contaminant plume has been identified and several wells have tested positive for perchlorate. In October 2007, DPH adopted an MCL of 6 ug/L for this contaminant. Prior to October, a PHG of 6 ug/L and a notification level (NL) of 6 ug/L were established by the Office of Health Hazard Assessment and the DPH respectively.

In 2008, all of the surface water supplied to the SCV was provided by or delivered through the SWP via Castaic Lake. The Department of Water Resources produces a watershed sanitary survey (WSS) of the SWP watersheds every five years. The last survey was published in 2001. Based on that WSS, a DWSAP study for Castaic Lake was completed in 2003. The study found that Castaic Lake supplies are considered to be most vulnerable to septic and sewage lift stations, recreational activities, boating, traffic accidents and spills, grazing livestock, algal blooms and fires.

Assessments for SCWD's two new drinking water sources, the Santa Clara and Valley Center wells, were completed in January 2009 and February 2009 respectively. The Santa Clara well is considered principally vulnerable to septic systems although this assessment was not made as a result of any detected contaminant.

The Valley Center well is considered principally vulnerable to the following activities also not made as a result of any detected contaminants: automobile body and repair shops, fleet/truck/bus terminals, furniture repair/manufacturing, machine shops, photo processing/printing, and sewer collection systems. Copies of the complete assessments are available at the SCWD office located at 22722 Soledad Canyon Road in Santa Clarita. You may request summaries of the assessments be sent to you by contacting Cathy Z. Hollomon at (661) 259-2737.

Additional DWSAP information is available upon request from your local water retailers. Contact names and numbers are supplied at the end of this report.

# The Results of Thousands of Tests on Your Water

| PARAMETERS/ CONSTITUENTS | Units | MCL (AL) | MCLG (PHG) | DLR | Castaic Lake Water Agency Wholesale Division | | | Castaic Lake Water Agency Santa Clarita Division | | | Valencia Water Company | | | Newhall County Water District Castaic | | | Newhall County Water District Newhall | | | Newhall County Water District Pinetree | | | Newhall County Water District Tesoro[1] | | | Los Angeles County Water Works District #36[1] | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **INORGANICS** | | | | | Minimum | Maximum | Typical | Minimum | Maximum | Typical | Minimum | Maximum | Typical | Minimum | Maximum | Typical | Minimum | Maximum | Typical | Minimum | Maximum | Typical | Minimum | Maximum | Typical | Minimum | Maximum | Typical |
| **Aluminum** | ug/L | 1000 | (60) | 50 | <DLR | <DLR | <DLR | <DLR | <DLR | <DLR | <DLR | 90 | <DLR | <DLR | <DLR | <DLR | <DLR | <DLR | <DLR | <DLR | <DLR | <DLR | | | | | | |
| **Arsenic** | ug/L | 10 | None | 2 | 2.2 | 5.6 | 4.2 | <DLR | 2.3 | <DLR | <DLR | 4.6 | <DLR | <DLR | <DLR | <DLR | <DLR | <DLR | <DLR | <DLR | 4.3 | 2.2 | | | | | | |
| **Barium** | ug/L | 1000 | (2000) | 100 | | | | <DLR | 140 | <DLR | <DLR | 103 | <DLR | <DLR | <DLR | <DLR | <DLR | <DLR | <DLR | <DLR | 150 | <DLR | | | | | | |
| **Boron** | ug/L | None | None | 100 | | | | 490 | 1800 | 1000 | | | | | | | | | | | | | | | | | | |
| **Fluoride[2]** | mg/L | 2 | (1) | 0.1 | <DLR | <DLR | <DLR | 0.30 | 0.52 | 0.4 | 0.10 | 0.80 | 0.40 | 0.5 | 0.5 | 0.5 | 0.30 | 0.40 | 0.35 | 0.34 | 0.45 | 0.40 | | | | | | |
| **Nitrate (as NO3)** | mg/L | 45 | (45) | 2 | <DLR | 4.4 | 2.3 | 11 | 32 | 23 | 6.7 | 28.2 | 16.8 | <DLR | <DLR | <DLR | 15.0 | 36.0 | 28.4 | 8.8 | 20 | 12.9 | | | | | | |
| **ORGANICS** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Tetrachloroethylene[3]** | ug/L | 5 | (0.06) | 0.5 | <DLR | <DLR | <DLR | <DLR | <DLR | <DLR | <DLR | <DLR | <DLR | <DLR | <DLR | <DLR | <DLR | <DLR | <DLR | <DLR | 0.60 | <DLR | | | | | | |
| **DISINFECTION BY-PRODUCTS** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Bromate RVWTP** | ug/L | 10 | 0 | 5 | <DLR | 6.0 | <DLR | | | | | | | | | | | | | | | | | | | | | |
| **Bromate ESFP** | ug/L | 10 | 0 | 5 | <DLR | 11 | <DLR | | | | | | | | | | | | | | | | | | | | | |
| **Haloacetic Acids (HAA5)** | ug/L | 60 | 0 | 1.0 | 2.0 | 8.1 | 4.4 | 0 | 17 | 4.3 | 0 | 5.8 | 2.8 | 1.9 | 4.1 | 3.1 | <DLR | 3.4 | 0.1 | 2.6 | 5.3 | 3.9 | 3.2 | 8.6 | 4.9 | <DLR | 23.1 | 8.6 |
| **Trihalomethanes, Total (TTHMs)** | ug/L | 80 | 0 | 0.5 | 8.0 | 23.0 | 16.0 | 0.95 | 72 | 18.7 | 1.7 | 36 | 16.5 | 9.3 | 19 | 13.4 | <DLR | 19.0 | 1.6 | 12 | 21 | 16.9 | 18 | 39 | 26.4 | 12.3 | 33 | 24.5 |
| **MICROBIOLOGICAL** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Coliform % Positive Samples** | % | 5 | 0 | | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **CLARITY / TURBIDITY** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Surface Water Only RVWTP** | NTU | TT = 1 NTU | None | | 0.07 | 0.12 | 0.09 | | | | | | | | | | | | | | | | | | | | | |
| | | TT = 95% of Samples ≤ 0.2 NTU | | | 100 | 100 | 100 | | | | | | | | | | | | | | | | | | | | | |
| **Surface Water Only ESFP** | NTU | TT = 1 NTU | None | | 0.07 | 0.15 | 0.10 | | | | | | | | | | | | | | | | | | | | | |
| | | TT = 95% of Samples ≤ 0.2 NTU | | | 100 | 100 | 100 | | | | | | | | | | | | | | | | | | | | | |
| **RADIOLOGICAL** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Alpha Activity, Gross** | pCi/L | 15 | 0 | 3 | <DLR | 5.8 | 3.3 | <DLR | 4.7 | 2.4 | <DLR | 5.96 | <DLR | <DLR | 7.6 | <DLR | 4.6 | 5.8 | 5.2 | <DLR | 17 | 8.4 | | | | | | |
| **Beta Activity, Gross** | pCi/L | 50 | 0 | 4 | <DLR | <DLR | <DLR | <DLR | <DLR | <DLR | | | | <DLR | <DLR | <DLR | <DLR | <DLR | <DLR | <DLR | 27 | 10.4 | | | | | | |
| **Radium 228** | pCi/L | 5 | 0 | 1 | | | | <DLR | <DLR | <DLR | <DLR | <DLR | <DLR | <DLR | <DLR | <DLR | <DLR | <DLR | <DLR | <DLR | <DLR | <DLR | | | | | | |
| **Uranium** | pCi/L | 20 | (0.2) | 2 | 3.1 | 4.9 | 4.1 | 1.7 | 4.6 | 2.6 | <DLR | 2.5 | <DLR | <DLR | <DLR | <DLR | 1.4 | 2.8 | 2.1 | <DLR | 20 | 11.35 | | | | | | |
| **Year of Analysis** | | | | | 2009 | 2009 | 2009 | 2009 | 2009 | 2009 | 2009 | 2009 | 2009 | 2008 | 2008 | 2008 | 2009 | 2009 | 2009 | 2005/ 2009 | 2005/ 2009 | 2005/ 2009 | | | | | | |
| **LEAD AND COPPER (Retailers Only)** | | | | | | | | 90th Percentile | No. of sites Tested | No. of Sites Above the AL | 90th Percentile | No. of Sites Tested | No. of Sites Above the AL | 90th Percentile | No. of Sites Tested | No. of Sites Above the AL | 90th Percentile | No. of Sites Tested | No. of Sites Above the AL | 90th Percentile | No. of Sites Tested | No. of Sites Above the AL | 90th Percentile | No. of Sites Tested | No. of Sites Above the AL | 90th Percentile | No. of Sites Tested | No. of Sites Above the AL |
| **Copper** | ug/L | (1300) | (170) | 50 | | | NA | 480 | 54 | 1 | 690 | 32 | 1 | 400 | 20 | 0 | 1100 | 30 | 3 | 1100 | 20 | 1 | 180 | 20 | 0 | 538 | 23 | 0 |
| **Lead** | ug/L | (15) | (2) | 5 | | | NA | 7.4 | 54 | 2 | 6 | 32 | 1 | 2.5 | 20 | 0 | 9.5 | 30 | 3 | 3.3 | 20 | 0 | 12 | 20 | 1 | 6 | 23 | 0 |
| **Year of Analysis** | | | | | | | | 2009 | 2009 | 2009 | 2007 | 2007 | 2007 | 2009 | 2009 | 2009 | 2009 | 2009 | 2009 | 2009 | 2009 | 2009 | 2008 | 2008 | 2008 | 2008 | 2008 | 2008 |
| **SECONDARY STANDARDS** | | | | | Minimum | Maximum | Typical | Minimum | Maximum | Typical | Minimum | Maximum | Typical | Minimum | Maximum | Typical | Minimum | Maximum | Typical | Minimum | Maximum | Typical | Minimum | Maximum | Typical | Minimum | Maximum | Typical |
| **Chlorides[4]** | mg/L | 250/500/600 | | | 74 | 78 | 76 | 67 | 110 | 92 | 24 | 128 | 71 | 75 | 76 | 76 | 35 | 40 | 37.5 | 78 | 140 | 109 | | | | | | |
| **Color** | Units | 15 | | | 5 | 10 | 5 | <DLR | <DLR | <DLR | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | | | | | | |
| **Odor-Threshold** | Units | 3 | | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | | | | |
| **Sulfates[4]** | mg/L | 250/500/600 | | 1 | 50 | 63 | 56 | 110 | 200 | 159 | 127 | 406 | 226 | 100 | 110 | 107 | 150 | 210 | 180 | 99 | 120 | 110 | | | | | | |
| **Turbidity** | NTU | 5 | | | 0.44 | 1.87 | 1.02 | 0.05 | 0.71 | 0.13 | 0.05 | 0.33 | 0.11 | 0.07 | 0.34 | 0.17 | 0.15 | 0.19 | 0.17 | 0.06 | 0.21 | 0.14 | | | | | | |
| **Total Dissolved Solids[4]** | mg/L | 500/1000/1500 | | | 285 | 387 | 333 | 650 | 888 | 777 | 542 | 983 | 732 | 466 | 478 | 474 | 592 | 716 | 654 | 610 | 764 | 687 | | | | | | |
| **Conductivity[4]** | uS / cm | 900/1600/2200 | | | 540 | 585 | 562 | 1000 | 1310 | 1162 | 872 | 1572 | 1175 | 777 | 789 | 782 | 803 | 973 | 888 | 984 | 1290 | 1137 | | | | | | |
| **ADDITIONAL TESTS** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Calcium** | mg/L | | | | 27 | 35 | 31 | 94 | 140 | 111 | 87 | 147 | 107 | 54 | 61 | 58 | 83 | 120 | 102 | 94 | 110 | 102 | | | | | | |
| **Magnesium** | mg/L | | | | 11 | 13 | 12 | 24 | 48 | 33 | 23.3 | 45 | 33.8 | 23 | 23 | 23 | 18 | 28 | 23 | 21 | 24 | 22.5 | | | | | | |
| **Sodium** | mg/L | | | | 56 | 69 | 61 | 71 | 110 | 95 | 55 | 117 | 86.1 | 68 | 69 | 205 | 51 | 61 | 56 | 81 | 140 | 110.5 | | | | | | |
| **Potassium** | mg/L | | | | 2.3 | 3.2 | 2.8 | 2.3 | 4.7 | 3.8 | 1.3 | 5 | 3.3 | 3.3 | 3.7 | 3.5 | 2.2 | 2.2 | 2.2 | 3.2 | 3.4 | 3.3 | | | | | | |
| **Hardness as CaCO[3]** | mg/L | | | | 114 | 137 | 127 | 334 | 502 | 412 | 317 | 535 | 407 | 235 | 238 | 237 | 274 | 415 | 345 | 334 | 361 | 348 | | | | | | |
| **pH** | Units | | | | 7.60 | 8.40 | 7.92 | 7.6 | 7.9 | 7.8 | 7.22 | 7.57 | 7.47 | 7.61 | 7.70 | 7.64 | 7.25 | 7.35 | 7.30 | 7.17 | 7.28 | 7.23 | | | | | | |
| **Alkalinity as CaCO[3]** | mg/L | | | | 81 | 99 | 90 | 130 | 330 | 285 | 166 | 304 | 240 | 167 | 176 | 172 | 183 | 221 | 202 | 289 | 359 | 324 | | | | | | |

*Key for the Charts used in this Report*

1 All values for NCWD Tesoro Water and Los Angeles County Waterworks District #36 are the same as CLWA, except in the specific rows shown.

2 Depending on annual temperatures.

3 Some people who use water containing tetrachloroethylene in excess of the MCL over many years may experience liver problems, and may have an increased risk of getting cancer.

4 There are three MCLs for these parameters: The first is the recommended, long term. The second is the upper, long term. The third is short term.

AL Action Level
DLR Detection Limit for Reporting
ESFP Earl Schmidt Filtration Plant
MCL Maximum Contaminant Level

MCLG Maximum Contaminant Level Goal
ug/L Microgram / Liter
mg/L Milligram / Liter
mS Millisiemens / Centimeter

NTU Nephlometric Turbidity Units
NA Not Analyzed/Not Applicable
pCi/L Picocurie / Liter
PHG Public Health Goal

RVWTP Rio Vista Water Treatment Plant
ESFP Earl Schmidt Filtration Plant

# APPENDIX F4.7

## Traffic/Access

**Austin-Foust Associates, Inc. – Memorandum, Landmark Village Traffic Impact Analysis – Supplemental Freeway Analysis (May 23, 2011)**

AUSTIN-FOUST ASSOCIATES, INC.
TRAFFIC ENGINEERING AND TRANSPORTATION PLANNING

**MEMORANDUM**

TO: Susan Tebo, Impact Sciences, Inc.

FROM: Daryl Zerfass, P.E.

DATE: May 23, 2011

SUBJECT: **LANDMARK VILLAGE TRAFFIC IMPACT ANALYSIS – SUPPLEMENTAL FREEWAY ANALYSIS**

This memo serves as a supplement to the Landmark Village Long-Range Cumulative (Buildout) Conditions Traffic Forecasts (December 2007) and the Landmark Village Traffic Impact Analysis (September 2004). This supplemental study provides an analysis of the project's freeway impacts using revised freeway lane capacities and updated forecasts of long-range cumulative conditions.

The I-5 freeway impacts analysis presented in the Landmark Village Recirculated Draft EIR (RDEIR) analyzed the potential impacts of the proposed project on the I-5 freeway. The analysis was prepared shortly after the completion of the Caltrans freeway impact study that was prepared for the upcoming I-5 High Occupancy Vehicle (HOV) and Truck Lane project (I-5 PA&ED HOV & Truck Lanes – SR-14 to Parker Road Traffic Study, October 2007), and the Landmark Village RDEIR analysis utilized data directly from the Caltrans study. However, because the analysis presented in the RDEIR was prepared prior to final approval and funding by Caltrans of the SR-14 to Parker Road project, the analysis did not include the improvements as in place as part of the baseline condition. Caltrans has subsequently certified the necessary environmental documentation (September 2009) and expects construction of the improvement project to be completed in 2016.

Following release of the RDEIR, Caltrans District 7 staff requested that impact analyses evaluating the section of the I-5 freeway within the Santa Clarita Valley utilize a capacity of 1,600 vehicles per hour (vph) for the future HOV lanes based on the desire to achieve an operating condition for the HOV lanes that is better than the operating condition for the general purpose or mixed-flow lanes, i.e., a desire that the HOV lanes operate at LOS C rather than LOS E or F as is accepted for the general purpose lanes. For buffered or contiguous HOV facilities, Caltrans considers that LOS C occurs at approximately 1,650 vph, or less if there is significant bus volume or if there are physical constraints. (*High Occupancy Vehicle Guidelines for Planning, Design and Operations*, Caltrans, 2003, Chapter 2,

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page 4.) In contrast, 2,000 vph is commonly utilized to represent the threshold between LOS E and F conditions for a mixed-flow freeway lane. In addition, Caltrans staff specified that 1,200 vph be utilized as the capacity of the future truck climbing lanes for this section of freeway.

As explained below, the analysis conducted utilizing these reduced capacities shows that while some segments of the HOV lanes would operate over capacity under the 2030 scenario utilizing this criteria, the Landmark Village project would not cause a significant project or cumulative impact.

Table 1 depicts the Freeway Volumes and V/C Ratios - Long-Range Buildout Conditions and shows that while none of the mixed-flow (general purpose) lanes exceed a V/C ratio of 1.00 when taking into account the planned freeway improvement project, several segments of the southbound HOV lane exceed a V/C ratio of 1.00 under long-range buildout conditions. Specifically, the southbound HOV lane from Rye Canyon Road to SR-14 is shown to have V/C ratios that range from 1.13 to 1.25. However, since the capacity used for the HOV lane (1,600 vph) represents mid-LOS C operating conditions, it is important to note that a V/C ratio of 1.00 in the HOV lanes represents a substantially better operating condition than does a V/C ratio of 1.00 in a mixed-flow lane.

Consideration has also been given to the number of vehicles actually eligible to utilize the HOV lane. Under existing conditions within the project's study area, the volume of traffic eligible to utilize the HOV lane is approximately 27 percent of the total volume according to a survey prepared for the Caltrans PA&ED EIR. Under long-range buildout peak conditions, when the total volume of traffic is approaching the maximum capacity of the freeway and traffic volumes reach the point of being uniformly distributed across all lanes, in no case does the HOV lane volume exceed 27 percent of the total volume. Therefore, the HOV lane volume estimates utilized for this study are supported by data for the existing condition.

In summary, with the planned freeway improvement project that is adding truck lanes and HOV lanes to the I-5 freeway within the Santa Clarita Valley in place, project traffic does not result in a significant impact to the freeway, which is the same conclusion reached in the RDEIR traffic study. However, because the RDEIR traffic study identified significant project impacts to the freeway without the freeway improvement project in place, the RDEIR includes mitigation measures for the four freeway segments identified as significantly impacted. Specifically, the mitigation measures require the project to pay its fair share of the HOV/Truck Lanes freeway improvement project for those four segments.

Subsequent to the circulation of the RDEIR, the project applicant has had regular meetings with Caltrans staff to develop a mitigation agreement addressing the project's fair-share payment towards the planned freeway project. As part of the mitigation agreement, the project's share of future traffic along all segments of the freeway project limits (i.e., from Parker Road to SR-14) was calculated using a fair-share formula developed by Caltrans. For the mitigation agreement, the project applicant has agreed to pay the project's fair-share for all nine freeway segments that comprise the SR-14 to Parker Road HOV/Truck Lanes freeway project, not just for the four segments where the RDEIR has identified a significant project impact. As such, the project's mitigation agreement with Caltrans will over mitigate the impact identified in the RDEIR.

**Table 1: Freeway Volumes and V/C Ratios – Long-Range Buildout Conditions**

| Segment | Lanes | Capacities | | Long-Range Without Project | | | | Long-Range With Project | | | | Project Increment | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | MF Lanes | | HOV Lanes | | MF Lanes | | HOV Lanes | | | |
| | | MF Lanes | HOV Lanes | Vol | V/C | Vol | V/C | Vol | V/C | Vol | V/C | MF | HOV |
| **Northbound – AM Peak Hour** | | | | | | | | | | | | | |
| 401. North of Lake Hughes | 4M | 8,000 | n/a | 3,411 | 0.43 | n/a | n/a | 3,400 | 0.43 | n/a | n/a | 0.00 | n/a |
| 402. Between Lake Hughes & Parker | 4M | 8,000 | n/a | 3,707 | 0.46 | n/a | n/a | 3,700 | 0.46 | n/a | n/a | 0.00 | n/a |
| 403. Between Parker & Hasley Canyon | 4M + 1H | 8,000 | 1,600 | 3,718 | 0.46 | 340 | 0.21 | 3,760 | 0.47 | 340 | 0.21 | 0.01 | 0.00 |
| 404. Between Hasley Canyon & SR-126 | 4M + 1H + 1A | 9,000 | 1,600 | 5,274 | 0.59 | 370 | 0.23 | 5,320 | 0.59 | 380 | 0.24 | 0.00 | 0.01 |
| 405. Between SR-126 & Rye Canyon | 4M + 1H | 8,000 | 1,600 | 5,328 | 0.67 | 500 | 0.31 | 5,480 | 0.69 | 520 | 0.33 | 0.02 | 0.02 |
| 406. Between Rye Canyon & Magic Mtn | 4M + 1H | 8,000 | 1,600 | 5,298 | 0.66 | 530 | 0.33 | 5,450 | 0.68 | 550 | 0.34 | 0.02 | 0.01 |
| 407. Between Magic Mtn & Valencia | 4M + 1H+ 1A | 9,000 | 1,600 | 6,165 | 0.69 | 610 | 0.38 | 6,280 | 0.70 | 620 | 0.39 | 0.01 | 0.01 |
| 408. Between Valencia & McBean | 4M + 1H | 8,000 | 1,600 | 7,062 | 0.88 | 720 | 0.45 | 7,170 | 0.90 | 730 | 0.46 | 0.02 | 0.01 |
| 409. Between McBean & Pico/Lyons | 4M + 1H | 8,000 | 1,600 | 7,141 | 0.89 | 740 | 0.46 | 7,250 | 0.91 | 750 | 0.47 | 0.02 | 0.01 |
| 410. Between Pico/Lyons & Calgrove | 4M + 1H+ 1A | 9,000 | 1,600 | 6,976 | 0.78 | 720 | 0.45 | 7,070 | 0.79 | 730 | 0.46 | 0.01 | 0.01 |
| 411. Between Calgrove & SR-14 | 4M + 1H + 1T | 9,200 | 1,600 | 6,980 | 0.76 | 730 | 0.46 | 7,060 | 0.77 | 740 | 0.46 | 0.01 | 0.00 |
| 412. South of SR-14 | 6M + 2H + 2T | 14,400 | 3,200 | 9,156 | 0.64 | 1,010 | 0.32 | 9,180 | 0.64 | 1,020 | 0.32 | 0.00 | 0.00 |
| **Northbound – PM Peak Hour** | | | | | | | | | | | | | |
| 401. North of Lake Hughes | 4M | 8,000 | n/a | 6,389 | 0.80 | n/a | n/a | 6,400 | 0.80 | n/a | n/a | 0.00 | n/a |
| 402. Between Lake Hughes & Parker | 4M | 8,000 | n/a | 7,468 | 0.93 | n/a | n/a | 7,500 | 0.94 | n/a | n/a | 0.01 | n/a |
| 403. Between Parker & Hasley Canyon | 4M + 1H | 8,000 | 1,600 | 7,621 | 0.95 | 1,320 | 0.83 | 7,670 | 0.96 | 1,330 | 0.83 | 0.01 | 0.00 |
| 404. Between Hasley Canyon & SR-126 | 4M + 1H + 1A | 9,000 | 1,600 | 7,927 | 0.88 | 1,310 | 0.82 | 7,980 | 0.89 | 1,320 | 0.83 | 0.01 | 0.01 |
| 405. Between SR-126 & Rye Canyon | 4M + 1H | 8,000 | 1,600 | 6,752 | 0.84 | 1,280 | 0.80 | 6,810 | 0.85 | 1,290 | 0.81 | 0.01 | 0.01 |
| 406. Between Rye Canyon & Magic Mtn | 4M + 1H | 8,000 | 1,600 | 6,762 | 0.85 | 1,270 | 0.79 | 6,820 | 0.85 | 1,280 | 0.80 | 0.00 | 0.01 |
| 407. Between Magic Mtn & Valencia | 4M + 1H+ 1A | 9,000 | 1,600 | 6,764 | 0.75 | 1,300 | 0.81 | 6,800 | 0.76 | 1,300 | 0.81 | 0.01 | 0.00 |
| 408. Between Valencia & McBean | 4M + 1H | 8,000 | 1,600 | 7,414 | 0.93 | 1,340 | 0.84 | 7,460 | 0.93 | 1,340 | 0.84 | 0.00 | 0.00 |
| 409. Between McBean & Pico/Lyons | 4M + 1H | 8,000 | 1,600 | 7,005 | 0.88 | 1,370 | 0.86 | 7,030 | 0.88 | 1,370 | 0.86 | 0.00 | 0.00 |
| 410. Between Pico/Lyons & Calgrove | 4M + 1H+ 1A | 9,000 | 1,600 | 6,984 | 0.78 | 1,390 | 0.87 | 7,010 | 0.78 | 1,390 | 0.87 | 0.00 | 0.00 |
| 411. Between Calgrove & SR-14 | 4M + 1H + 1T | 9,200 | 1,600 | 6,891 | 0.75 | 1,390 | 0.87 | 6,910 | 0.75 | 1,390 | 0.87 | 0.00 | 0.00 |
| 412. South of SR-14 | 6M + 2H + 2T | 14,400 | 3,200 | 14,235 | 0.99 | 3,130 | 0.98 | 14,270 | 0.99 | 3,130 | 0.98 | 0.00 | 0.00 |
| **Southbound – AM Peak Hour** | | | | | | | | | | | | | |
| 401. North of Lake Hughes | 4M | 8,000 | n/a | 4,696 | 0.59 | n/a | n/a | 4,700 | 0.59 | n/a | n/a | 0.00 | n/a |
| 402. Between Lake Hughes & Parker | 4M | 8,000 | n/a | 5,689 | 0.71 | n/a | n/a | 5,700 | 0.71 | n/a | n/a | 0.00 | n/a |
| 403. Between Parker & Hasley Canyon | 4M + 1H | 8,000 | 1,600 | 6,483 | 0.81 | 710 | 0.44 | 6,490 | 0.81 | 710 | 0.44 | 0.00 | 0.00 |
| 404. Between Hasley Canyon & SR-126 | 4M + 1H | 8,000 | 1,600 | 6,763 | 0.85 | 730 | 0.46 | 6,770 | 0.85 | 730 | 0.46 | 0.00 | 0.00 |
| 405. Between SR-126 & Rye Canyon | 4M + 1H+ 1A | 9,000 | 1,600 | 6,625 | 0.74 | 700 | 0.44 | 6,690 | 0.74 | 710 | 0.44 | 0.00 | 0.00 |
| 406. Between Rye Canyon & Magic Mtn | 4M + 1H+ 1A | 9,000 | 1,600 | 6,650 | 0.74 | 710 | 0.44 | 6,690 | 0.74 | 710 | 0.44 | 0.00 | 0.00 |
| 407. Between Magic Mtn & Valencia | 4M + 1H | 8,000 | 1,600 | 6,720 | 0.84 | 780 | 0.49 | 6,720 | 0.84 | 780 | 0.49 | 0.00 | 0.00 |
| 408. Between Valencia & McBean | 4M + 1H+ 1A | 9,000 | 1,600 | 7,795 | 0.87 | 910 | 0.57 | 7,790 | 0.87 | 910 | 0.57 | 0.00 | 0.00 |
| 409. Between McBean & Pico/Lyons | 4M + 1H | 8,000 | 1,600 | 7,561 | 0.95 | 960 | 0.60 | 7,540 | 0.94 | 960 | 0.60 | -0.01 | 0.00 |
| 410. Between Pico/Lyons & Calgrove | 4M + 1H + 1T | 9,200 | 1,600 | 7,202 | 0.78 | 1,010 | 0.63 | 7,190 | 0.78 | 1,010 | 0.63 | 0.00 | 0.00 |
| 411. Between Calgrove & SR-14 | 4M + 1H + 2T | 10,400 | 1,600 | 7,308 | 0.70 | 1,020 | 0.64 | 7,280 | 0.70 | 1,020 | 0.64 | 0.00 | 0.00 |
| 412. South of SR-14 | 6M + 2H + 2T | 14,400 | 3,200 | 13,842 | 0.96 | 3,010 | 0.94 | 13,800 | 0.96 | 3,000 | 0.94 | 0.00 | 0.00 |

**(Continued)**

**Table 1: Freeway Volumes and V/C Ratios – Long-Range Buildout Conditions (Continued)**

| Segment | Lanes | Capacities | | Long-Range Without Project | | | | Long-Range With Project | | | | Project Increment | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | MF Lanes | | HOV Lanes | | MF Lanes | | HOV Lanes | | | |
| | | MF Lanes | HOV Lanes | Vol | V/C | Vol | V/C | Vol | V/C | Vol | V/C | MF | HOV |
| **Southbound – PM Peak Hour** | | | | | | | | | | | | | |
| 401. North of Lake Hughes | 4M | 8,000 | n/a | 6,384 | 0.80 | n/a | n/a | 6,400 | 0.80 | n/a | n/a | 0.00 | n/a |
| 402. Between Lake Hughes & Parker | 4M | 8,000 | n/a | 6,890 | 0.86 | n/a | n/a | 6,900 | 0.86 | n/a | n/a | 0.00 | n/a |
| 403. Between Parker & Hasley Canyon | 4M + 1H | 8,000 | 1,600 | 6,622 | 0.83 | 1,330 | 0.83 | 6,670 | 0.83 | 1,330 | 0.83 | 0.00 | 0.00 |
| 404. Between Hasley Canyon & SR-126 | 4M + 1H | 8,000 | 1,600 | 7,853 | 0.98 | 1,390 | 0.87 | 7,900 | 0.99 | 1,400 | 0.88 | 0.01 | 0.01 |
| 405. Between SR-126 & Rye Canyon | 4M + 1H+ 1A | 9,000 | 1,600 | 7,488 | 0.83 | 1,450 | 0.91 | 7,630 | 0.85 | 1,470 | 0.92 | 0.02 | 0.01 |
| 406. Between Rye Canyon & Magic Mtn | 4M + 1H+ 1A | 9,000 | 1,600 | 8,234 | 0.91 | 1,820 | 1.14 | 8,460 | 0.94 | 1,840 | 1.15 | 0.03 | 0.01 |
| 407. Between Magic Mtn & Valencia | 4M + 1H | 8,000 | 1,600 | 7,772 | 0.97 | 1,920 | 1.20 | 7,960 | 1.00 | 1,940 | 1.21 | 0.03 | 0.01 |
| 408. Between Valencia & McBean | 4M + 1H+ 1A | 9,000 | 1,600 | 8,366 | 0.93 | 1,950 | 1.22 | 8,540 | 0.95 | 1,960 | 1.23 | 0.02 | 0.01 |
| 409. Between McBean & Pico/Lyons | 4M + 1H | 8,000 | 1,600 | 7,856 | 0.98 | 1,990 | 1.24 | 8,000 | 1.00 | 2,000 | 1.25 | 0.02 | 0.01 |
| 410. Between Pico/Lyons & Calgrove | 4M + 1H + 1T | 9,200 | 1,600 | 8,475 | 0.92 | 1,880 | 1.18 | 8,610 | 0.94 | 1,890 | 1.18 | 0.02 | 0.00 |
| 411. Between Calgrove & SR-14 | 4M + 1H + 2T | 10,400 | 1,600 | 8,974 | 0.86 | 1,800 | 1.13 | 9,090 | 0.87 | 1,810 | 1.13 | 0.01 | 0.00 |
| 412. South of SR-14 | 6M + 2H + 2T | 14,400 | 3,200 | 11,813 | 0.82 | 2,140 | 0.67 | 11,850 | 0.82 | 2,150 | 0.67 | 0.00 | 0.00 |

MF (or M) = Mixed-Flow/General Purpose Lane (Capacity = 2,000 vehicles per hour)
HOV (or H) = HOV Lane (Capacity = 1,600 vehicles per hour)
A = Auxiliary Lane (Capacity = 1,000 vehicles per hour)
T = Truck Lane (Capacity = 1,200 vehicles per hour)

Capacities derived from PeMS data and through discussions with Caltrans staff.

**Austin-Foust Associates, Inc. – Memorandum, Landmark Village Traffic Impact Analysis – Supplemental Freeway Fair-Share Calculation Analysis (June 17, 2011)**

AUSTIN-FOUST ASSOCIATES, INC.
TRAFFIC ENGINEERING AND TRANSPORTATION PLANNING

**MEMORANDUM**

TO: Susan Tebo, Impact Sciences, Inc.

FROM: Daryl Zerfass, P.E.

DATE: June 17, 2011

SUBJECT: **LANDMARK VILLAGE TRAFFIC IMPACT ANALYSIS – SUPPLEMENTAL FREEWAY FAIR-SHARE CALCULATION ANALYSIS**

Two procedures have been used to calculate the project's share of future traffic on the I-5 freeway. First, a Nexus computer modeling software procedure was prepared in which a computerized traffic demand model calculated the origin and destination of each project trip that utilizes the freeway, and then determined the project's share of the future growth based on trips that begin and/or end at future development. A second procedure subsequently was developed in conjunction with Caltrans transportation engineers to calculate project shares while similarly taking into account only future development, but without reliance on the modeling software for the share calculation. This second procedure represents a hybrid of modeling steps and spreadsheet calculations to develop the share percentages.

The Nexus procedure and the Hybrid procedure are similar in concept in that they each calculate the project's percentage share of future traffic growth for the respective subject segments of freeway. The procedures differ in the respect that the Hybrid procedure is based on a series of manual calculation steps in which multiple traffic modeling procedures are individually prepared, and then data is manually combined utilizing a spreadsheet to calculate project share percentages. In contrast, the mathematically complex Nexus procedure is fully computerized and is calculated as part of a single traffic modeling operation. Accordingly, the individual steps of the Hybrid procedure are independently discernible, while the individual steps of the Nexus process are not. The ability to separate the individual steps of the Hybrid procedure resulted in Caltrans ultimately selecting it as the preferred method to calculate the Landmark Village fair-share payment to be made to Caltrans towards I-5 mitigation improvements.



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The Nexus procedure results in the project fair-share percentages shown in RDEIR Table 4.7-34 (see also, Landmark Village Long-Range Cumulative (Buildout) Conditions Traffic Forecasts, Austin-Foust Associates, December 4, 2007), which shows that for the four segments of the I-5 freeway where the proposed Landmark Village project is identified as having a significant impact, the proposed project's average share of the traffic growth is 2.4 percent.

In comparison, the Hybrid procedure (see Landmark Village (Newhall Ranch) I-5 Share Calculations, Austin-Foust Associates, Inc., November 1, 2010) considered the increase attributable to project traffic along nine freeway segments (the four significantly impacted segments plus five additional segments), and determined that project traffic would comprise 1,067 trips out of a total projected growth of 71,200 future trips, or 1.5% of the future forecasted growth (1,067/71,200 = 1.5%). (The nine segments would be significantly impacted on a cumulative basis with buildout of the Newhall Ranch Specific Plan, which includes Landmark Village, and the Valencia Commerce Center and Entrada developments. See Newhall Ranch Resource Management and Development Plan and Spineflower Conservation Plan Environmental Impact Statement/Environmental Impact Report, SCH No. 2000011025.)

Thus, under the Nexus procedure, the project's fair-share is 2.4% towards improvements on four segments, while under the Hybrid approach, the project's fair-share is 1.5% towards improvements on nine segments.

The improvements recommended to mitigate the project's identified significant cumulative impacts are the addition of a high occupancy vehicle (HOV) lane in each direction to the segment of I-5 between Rye Canyon Road and McBean Parkway and between Pico Canyon Road/Lyons Avenue and Calgrove Avenue, and the addition of one truck lane in the southbound direction to the segment between Pico Canyon Road/Lyons Avenue and Calgrove Avenue. (See Landmark Village Long-Range Cumulative (Buildout) Conditions Traffic Forecasts, Austin-Foust Associates, December 4, 2007, and RDEIR Mitigation Measures LV 4.7-17 through LV 4.7-20.) Accordingly, in calculating the project's fair-share dollar amount under each of the two methodologies, the cost basis for the calculations is the I-5 HOV and Truck Lanes SR-14 to Parker Road improvement project, which includes the improvements recommended to mitigate the project's impacts as well as improvements for adjacent freeway segments. The improvements to be constructed under the I-5 improvement project would span nine freeway segments, and include the addition of one HOV lane in each direction between SR-14 and Parker Road, connecting to the HOV lanes currently under construction on the I-5 freeway south of the SR-14 freeway. Additionally, one truck lane will be constructed in the northbound direction between SR-14 and Calgrove Avenue, one southbound truck lane will be constructed between Pico Canyon Road/Lyons Avenue and Calgrove Avenue, and two southbound truck lanes will be constructed for the segment between Calgrove Avenue and SR-14.

As shown below in Table 1, Fair-Share Cost Comparison, application of the Hybrid procedure that was selected by Caltrans for use with this project results in an overall fair-share cost attributable to the proposed Landmark Village project of approximately $625,000, whereas the RDEIR's Nexus procedure would result in a net mitigation obligation cost to the project of approximately $343,000. The greater cost resulting from the Hybrid procedure is reflective of the fact that the calculations consider the entire nine segment freeway improvement project due to the nexus between the Newhall Ranch Specific Plan, of which Landmark Village is a part, and the freeway improvement project.

**Table 1: Fair-Share Cost Comparison**

| | Nexus Procedure | Hybrid Procedure |
|---|---|---|
| Project's Share of Future Trips | 2.4% of 4 segments | 1.5% of 9 segments |
| Unfunded portion of I-5 Improvement Project | $29,067,000[1] | $65,400,000[2] |
| Cost to Landmark Village (Gross) | $697,608 | $980,081 |
| Credit for Prior I-5 Expenditures | -$354,420 | -$354,420 |
| Cost to Landmark Village (Net) | $343,188 | $625,661 |

[1]4/9 of total unfunded portion (4 impacted segments/9 total segments x $65,400,000 = $29,067,000)
[2]As of July 2010, Caltrans estimated the total cost to construct the I-5 Improvement Project at $543 million, with $65.4 million or approximately 12% of the total cost unfunded at the time.

**Austin-Foust Associates, Inc. – Memorandum, Landmark Village Traffic Impact Analysis – Additional Existing Plus Project Scenario Analysis (June 16, 2011)**

AUSTIN-FOUST ASSOCIATES, INC.
TRAFFIC ENGINEERING AND TRANSPORTATION PLANNING

**MEMORANDUM**

TO: Susan Tebo, Impact Sciences, Inc.

FROM: Daryl Zerfass, P.E.

DATE: June 16, 2011

SUBJECT: **RIVER VILLAGE (LANDMARK VILLAGE) TRAFFIC IMPACT ANALYSIS – ADDITIONAL EXISTING PLUS PROJECT SCENARIO ANALYSIS**

This memo serves as a supplement to the original River Village (renamed and referred to herein as Landmark Village) Traffic Impact Analysis (TIA, September 2004) and provides additional analysis of the project's traffic impacts by comparing existing conditions (i.e., Existing No-Project) against the Existing Plus Project traffic conditions. The September 2004 TIA includes an Existing Plus Project analysis of the study area intersections; this memorandum summarizes that analysis and includes additional analysis of the I-5 freeway under this scenario. This memo, therefore, documents project related trips and their addition to the observed traffic count data (i.e., existing conditions) to create an Existing Plus Project scenario.

Preliminarily, the Existing Plus Project scenario generally is regarded by traffic engineers, including this engineer, as a hypothetical scenario when used in connection with a development project such as the proposed Landmark Village project, which is not anticipated to reach full buildout until approximately 2014. The scenario is hypothetical because it assumes that the proposed project would be fully built out immediately and the corresponding full buildout traffic volumes added to existing roadway volumes and infrastructure. The Existing Plus Project analysis presumes that the existing environment (existing traffic volumes, existing roadway infrastructure, and existing land uses) will not change over the buildout of the project. As a result, future increases in traffic volumes attributable to other development projects (i.e., cumulative traffic volumes) are not accounted for in the analysis. This results in the analysis potentially understating project impacts because capacity that otherwise would be utilized by intervening cumulative development is now available to the proposed project. On the other hand, because the scenario does not account for future planned roadway network improvements that would increase roadway capacities, the analysis potentially results in overstating project impacts. Furthermore, because the analysis does not take into account future development and related changing land uses, the analysis does not account for the corresponding change in trip distribution patterns that accompanies changing



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land uses, which could lead to overstating impacts in some circumstances, while understating them in others.

*Analysis*

Landmark Village is located within the Santa Clarita Valley in unincorporated County of Los Angeles. The Landmark Village project is bounded by State Route (SR) 126 to the north, the Santa Clara River to the south, and the Castaic Creek to the east. Landmark Village consists of a variety of land uses and, as described in the traffic study, these land uses have been categorized based on the land use categories used by the Santa Clarita Valley Consolidated Traffic Model (SCVCTM). The geographic distribution of project generated trips was derived by utilizing the SCVCTM. A special select zone trip assignment calculates the volume of project traffic on roadway segments throughout the study area.

The Landmark Village TIA includes an Existing plus Project impact analysis for the study area intersections. (A copy of the TIA is included in the Landmark Village Recirculated Draft Environmental Impact Report (RDEIR, January 2010), Appendix 4.7, River Village Traffic Impact Analysis, Austin-Foust Associates, September 2004, Section 4.8.) The conclusions reached through that Existing Plus Project scenario analysis are summarized below. Peak hour intersection capacity utilization ("ICU") values that correspond with the Existing Plus Project conditions traffic forecasts referenced above can be found in Table 1, ICU and LOS Summary - Existing Conditions with and without Project, which provides a comparison between the no-project and the with-project conditions. The table indicates that under Existing Plus Project conditions, the following intersections would be significantly impacted by the addition of project traffic:

8. I-5 NB Ramps & SR-126
80. Wolcott & SR-126
94. Commerce Center & SR-126
110. Chiquito/Long Canyon & SR-126

Roadway improvements that would mitigate the identified project impacts are identified in Table 2, Mitigation Measures for Project Intersection Impacts - Existing Conditions With Project, which lists the proposed mitigation measures for existing conditions with project. Each of the recommended mitigation measures is included in the TIA as mitigation either for the impacts identified under the Existing Plus Ambient Plus Project scenario, or under the Existing Plus Ambient Plus Project and Related projects scenario and, therefore, each will be implemented as part of the project irrespective of the Existing Plus Project analysis. (See EIR mitigation measures LV 4.7-7, 4.7-10, 4.7-11 and 4.7-12.) Table 3, ICU and LOS Summary - With Mitigation, summarizes the resulting ICUs and LOS with the mitigation in place. Detailed ICU worksheets are attached to this memorandum.

In addition to an intersection level of analysis, an evaluation of the I-5 freeway for conditions with and without the project was conducted. As noted above, the Landmark Village project is located south of and adjacent to SR-126, which is a four-lane highway. Approximately two miles east of the project site is the I-5 Freeway, which would provide regional access for residents of the site. In the vicinity of the project site, I-5 is generally an eight-lane (four lanes in each direction) freeway.

The freeway impact analysis has been prepared using a methodology developed through consultation with Caltrans District 7 staff. The determination of significant impacts is based on the Los Angeles County Congestion Management Program (CMP) criteria. This criteria identifies a significant project impact as when project traffic causes or worsens LOS F conditions by a V/C of .02 or more.

**Table 1: ICU and LOS Summary – Existing Conditions with and without Project**

| | Existing Conditions without Project | | | | Existing Conditions with Project | | | | Project Increment | |
|---|---|---|---|---|---|---|---|---|---|---|
| | AM | | PM | | AM | | PM | | | |
| **Intersection** | **ICU** | **LOS** | **ICU** | **LOS** | **ICU** | **LOS** | **ICU** | **LOS** | **AM** | **PM** |
| 7. I-5 SB Ramps & SR-126 | .39 | A | .36 | A | .63 | B | .52 | A | .24 | .16 |
| 8. I-5 NB Ramps & SR-126 | .71 | C | .77 | C | 1.15 | F | 1.18 | F | **.44** | **.41** |
| 80. Wolcott & SR-126 | .34 | A | .42 | A | 1.03 | F | 1.26 | F | **.69** | **.84** |
| 94. Commerce Center & SR-126 | .52 | A | .68 | B | .88 | D | .99 | E | **.36** | **.31** |
| 96. San Martinez Canyon & SR-126 | .31 | A | .40 | A | .33 | A | .43 | A | .02 | .03 |
| 110. Chiquito/Long Canyon & SR-126 | .36 | A | .43 | A | 1.05 | F | 1.31 | F | **.69** | **.88** |

**Bold = Significant Impact**

Level of service ranges: .00 - .60 A .61 - .70 B .71 - .80 C .81 - .90 D .91 – 1.00 E Above 1.00 F

**Table 2: Mitigation Measures for Project Intersection Impacts – Existing Conditions With Project**

| Location | Mitigation |
|---|---|
| 8. I-5 NB Ramps & SR-126 | Add 2nd & 3rd NBL, add 2nd 3rd & 4th EBT, convert shared WBL/WBT lanes to 1st & 2nd dedicated WBT, and add 3rd WBT & 1st free flow WBR. |
| 80. Wolcott & SR-126 | Add 1st NBL, add 2nd & 3rd NBR, convert shared SBL/SBT to dedicated SBT, add 2nd SBL, add 2nd EBL, add 3rd EBT, add 1st EBR, add 2nd WBL, and add 3rd WBT. |
| 94. Commerce Center & SR-126 | Construct Grade Separated Interchange |
| 110. Chiquito/Long Canyon & SR-126 | Add 1st & 2nd NBL, add 1st & 2nd NBR, add 2nd NBT, add 1st & 2nd SBL, add 2nd & 3rd SBT, add 2nd EBL, add 3rd EBT, add 1st EBR, add 1st and 2nd WBL, and add 3rd WBT. |

**Table 3: ICU and LOS Summary – With Mitigation**

| | Existing Conditions without Project | | | | Existing Conditions plus Project with Mitigation | | | | Change | |
|---|---|---|---|---|---|---|---|---|---|---|
| | AM | | PM | | AM | | PM | | | |
| **Intersection** | **ICU** | **LOS** | **ICU** | **LOS** | **ICU** | **LOS** | **ICU** | **LOS** | **AM** | **PM** |
| 8. I-5 NB Ramps & SR-126 | .71 | C | .77 | C | .48 | A | .40 | A | -.21 | -.21 |
| 80. Wolcott & SR-126 | .34 | A | .42 | A | .52 | A | .64 | B | .18 | .22 |
| 94. Commerce Center & SR-126 | .52 | A | .68 | B | n/a (Grade Separated Interchange) | | | | | |
| 110. Chiquito/Long Canyon & SR-126 | .36 | A | .43 | A | .51 | A | .57 | A | .15 | .14 |

Level of service ranges: .00 - .60 A .61 - .70 B .71 - .80 C .81 - .90 D .91 – 1.00 E Above 1.00 F

An evaluation of the I-5 freeway for conditions with and without the project is provided in Table 4, Freeway Volumes and V/C ratios - Existing + Project Conditions, which indicates that the following freeway segment would be significantly impacted by the project under Existing Plus Project conditions:

411. Southbound I-5 between Calgrove & SR-14

It should be noted that under the Existing Plus Project scenario, the project would add a greater volume of traffic to the I-5 freeway than it would under long-range cumulative conditions when the Newhall Ranch Specific Plan area (and adjacent development areas) is fully built out. The reason for this is that the built out Specific Plan area would include a significant amount of employment and commercial retail development that would serve as trip destinations for residents of the Landmark Village project, as well as other Specific Plan development. Likewise, the employment and commercial retail areas of the Landmark Village project will provide trip destinations for future residents of the Specific Plan area. As such, under Specific Plan build out conditions, Landmark Village would result in fewer project trips that leave the Santa Clarita Valley than under Existing Plus Project conditions, which translates to fewer project trips on the I-5 freeway. In this regard, the Existing Plus Project scenario overstates project impacts.

The southbound segment of I-5 between the Calgrove interchange and SR-14, which is shown to be significantly impacted by the project under Existing Plus Project conditions, operates at LOS F under existing (no-project) conditions. This segment consists of a four-lane section of uphill grade that significantly reduces travel speed for the many heavy trucks that use this segment of freeway. The two right-most lanes are primarily utilized by the slow moving trucks, which reduces the overall capacity of this segment. As such, this segment experiences worse LOS than adjacent segments that carry similar volumes of traffic.

As shown in Table 5, Mitigation Measure for Project Freeway Impacts - Existing Conditions With Project, the improvement recommended to mitigate the project's impact is the addition of one truck lane in the southbound direction. Table 6, Freeway Volumes and V/C Ratios - Existing + Project + Mitigation Conditions, summarizes the resulting V/C with the mitigation in place.

The recommended mitigation would be implemented as part of the Caltrans and Metropolitan Transportation Authority (Metro) plans to expand the I-5 freeway to include high occupancy vehicle (HOV) and truck lanes. In September 2009, Caltrans approved a Final Environmental Impact Report/Environmental Assessment (EIR/EA) for the I-5 HOV/Truck Lanes Project SR-14 to Parker Road, or I-5 Improvement Project. The I-5 Improvement Project will add: one HOV lane in each direction on I-5 from the SR-14 interchange north to Parker Road; truck climbing lanes from the SR-14 interchange to Calgrove Boulevard (northbound) and from Pico Canyon Road/Lyons Avenue to the SR-14 interchange (southbound); and full auxiliary lanes within portions of the Improvement Project study area. The Caltrans EIR/EA reports the project is included in the 2008 Regional Transportation Plan and is fully funded, and construction is anticipated to begin in 2011, with completion scheduled for 2015. Subsequent communications with Caltrans indicate that the first phase of construction, or the "Early Implementation Project," is estimated to be completed in July 2013, and the full I-5 Improvement Project is estimated to be completed in February 2016. The impacts of the Landmark Village project under Existing Plus Project conditions would be fully mitigated with completion of the Early Implementation Project, which will include a truck lane in the southbound direction from Pico/Lyons to the SR-14, and which is scheduled to be completed prior to buildout of the Landmark Village project.

**Table 4: Freeway Volumes and V/C Ratios – Existing + Project Conditions**

| Segment | Lanes | Capacity | Existing Without Project | | | | Existing With Project | | | | Project Increment | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | AM Pk Hr | | PM Pk Hr | | AM Pk Hr | | PM Pk Hr | | | |
| | | | Vol | V/C | Vol | V/C | Vol | V/C | Vol | V/C | AM | PM |
| **Northbound** | | | | | | | | | | | | |
| 401. North of Lake Hughes | 4M | 8,000 | 1,200 | .15 | 1,900 | .24 | 1,229 | .15 | 1,986 | .25 | .00 | .01 |
| 402. Between Lake Hughes & Parker | 4M | 8,000 | 1,300 | .16 | 2,000 | .25 | 1,330 | .17 | 2,087 | .26 | .01 | .01 |
| 403. Between Parker & Hasley Canyon | 4M | 8,000 | 1,600 | .20 | 2,000 | .25 | 1,637 | .20 | 2,109 | .26 | .00 | .01 |
| 404. Between Hasley Canyon & SR-126 | 4M | 8,000 | 2,100 | .26 | 2,500 | .31 | 2,143 | .27 | 2,626 | .33 | .01 | .02 |
| 405. Between SR-126 & Rye Canyon | 4M | 8,000 | 2,800 | .35 | 3,100 | .39 | 3,286 | .41 | 3,411 | .43 | .06 | .04 |
| 406. Between Rye Canyon & Magic Mtn | 4M | 8,000 | 2,800 | .35 | 3,100 | .39 | 3,286 | .41 | 3,411 | .43 | .06 | .04 |
| 407. Between Magic Mtn & Valencia | 4M | 8,000 | 4,200 | .53 | 5,300 | .66 | 4,589 | .57 | 5,546 | .69 | .04 | .03 |
| 408. Between Valencia & McBean | 4M | 8,000 | 5,300 | .66 | 6,100 | .76 | 5,599 | .70 | 6,287 | .79 | .04 | .03 |
| 409. Between McBean & Pico/Lyons | 4M | 8,000 | 5,600 | .70 | 6,700 | .84 | 5,825 | .73 | 6,838 | .85 | .03 | .01 |
| 410. Between Pico/Lyons & Calgrove | 4M | 8,000 | 5,400 | .68 | 7,200 | .90 | 5,578 | .70 | 7,307 | .91 | .02 | .01 |
| 411. Between Calgrove & SR-14 | 4M | 8,000 | 5,400 | .68 | 7,200 | .90 | 5,574 | .70 | 7,304 | .91 | .02 | .01 |
| 412. South of SR-14 | 6M + 2T | 14,400 | 6,800 | .47 | 13,700 | .95 | 6,899 | .48 | 13,759 | .96 | .01 | .01 |
| **Southbound** | | | | | | | | | | | | |
| 401. North of Lake Hughes | 4M | 8,000 | 1,300 | .16 | 1,700 | .21 | 1,384 | .17 | 1,742 | .22 | .01 | .01 |
| 402. Between Lake Hughes & Parker | 4M | 8,000 | 1,400 | .18 | 1,900 | .24 | 1,486 | .19 | 1,943 | .24 | .01 | .00 |
| 403. Between Parker & Hasley Canyon | 4M | 8,000 | 1,600 | .20 | 2,000 | .25 | 1,707 | .21 | 2,054 | .26 | .01 | .01 |
| 404. Between Hasley Canyon & SR-126 | 4M | 8,000 | 1,900 | .24 | 2,100 | .26 | 2,024 | .25 | 2,162 | .27 | .01 | .01 |
| 405. Between SR-126 & Rye Canyon | 4M | 8,000 | 2,400 | .30 | 2,500 | .31 | 2,640 | .33 | 2,997 | .37 | .03 | .06 |
| 406. Between Rye Canyon & Magic Mtn | 4M | 8,000 | 4,200 | .53 | 5,100 | .64 | 4,448 | .56 | 5,587 | .70 | .03 | .06 |
| 407. Between Magic Mtn & Valencia | 4M | 8,000 | 4,700 | .59 | 5,800 | .73 | 4,897 | .61 | 6,182 | .77 | .02 | .04 |
| 408. Between Valencia & McBean | 4M | 8,000 | 5,700 | .71 | 6,600 | .83 | 5,850 | .73 | 6,885 | .86 | .02 | .03 |
| 409. Between McBean & Pico/Lyons | 4M | 8,000 | 6,600 | .83 | 7,200 | .90 | 6,711 | .84 | 7,405 | .93 | .01 | .03 |
| 410. Between Pico/Lyons & Calgrove | 4M | 8,000 | 7,000 | .88 | 6,800 | .85 | 7,086 | .89 | 6,954 | .87 | .01 | .02 |
| 411. Between Calgrove & SR-14 | 4M* | 6,400 | 7,300 | 1.14 | 6,800 | 1.06 | 7,384 | 1.15 | 6,950 | 1.09 | .01 | **.03** |
| 412. South of SR-14 | 5M + 2T | 12,400 | 14,100 | 1.14 | 9,400 | .76 | 14,148 | 1.14 | 9,485 | .76 | .00 | .00 |

M = Mixed-Flow/General Purpose Lane (Capacity = 2,000 vehicles per hour)
M* = Mixed-Flow Lane on an Extended Uphill Grade, Without a Truck Lane (Capacity = 1,600 vehicles per hour)
T = Truck Lane (Capacity = 1,200 vehicles per hour)

**Bold** = Significant impact

Capacities derived from PeMS data and through discussions with Caltrans staff.

**Table 5: Mitigation Measure for Project Freeway Impacts – Existing Conditions With Project**

| Location | Mitigation |
|---|---|
| 411. Between Calgrove & SR-14 | Add 1 Truck lane in southbound direction. |

**Table 6: Freeway Volumes and V/C Ratios – Existing + Project + Mitigation Conditions**

| Segment | Existing Without Project | | | | Existing Plus Project Plus Mitigation | | | | | | Project Increment | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | AM Pk Hr | | PM Pk Hr | | | | AM Pk Hr | | PM Pk Hr | | | |
| | Vol | V/C | Vol | V/C | Lanes | Capacity | Vol | V/C | Vol | V/C | AM | PM |
| **Southbound** | | | | | | | | | | | | |
| 411. Between Calgrove & SR-14 | 7,300 | 1.14 | 6,800 | 1.06 | 4M+1T | 9,200 | 7,384 | .80 | 6,950 | .76 | -.34 | -.30 |

M = Mixed-Flow/General Purpose Lane (Capacity = 2,000 vehicles per hour)
T = Truck Lane (Capacity = 1,200 vehicles per hour)
Capacities derived from PeMS data and through discussions with Caltrans staff.

**7. I-5 SB Ramps & SR-126**

**Existing (2003) Counts**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | f | | 147 | | 132 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 2 | 3200 | 304 | .10 | 425 | .13 |
| EBR | f | | 639 | | 1058 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 2 | 3200 | 943 | .29* | 822 | .26* |
| WBR | 0 | 0 | 0 | | 0 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.39** | | **.36** |

**Existing Volumes With Project**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | f | | 271 | | 194 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 2 | 3200 | 524 | .16 | 875 | .27 |
| EBR | f | | 879 | | 1555 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 2 | 3200 | 1684 | .53* | 1338 | .42* |
| WBR | 0 | 0 | 0 | | 0 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.63** | | **.52** |

**8. I-5 NB Ramps & SR-126**

**Existing (2003) Counts**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1600 | 639 | .40* | 620 | .39* |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 1 | 1600 | 201 | .13 | 36 | .02 |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 1 | 1600 | 216 | .14* | 220 | .14* |
| EBR | f | | 88 | | 205 | |
| WBL | 1.5 | | 111 | .07* | 251 | {.14}* |
| WBT | 0.5 | 3200 | 304 | .19 | 202 | .14 |
| WBR | 0 | 0 | 0 | | 0 | |
| Clearance Interval | | | | .10* | | .10* |

**TOTAL CAPACITY UTILIZATION** **.71** **.77**

**Existing Volumes With Project**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1600 | 1124 | .70* | 931 | .58* |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 1 | 1600 | 201 | .13 | 36 | .02 |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 1 | 1600 | 395 | .25 | 543 | .34* |
| EBR | f | | 130 | | 331 | |
| WBL | 1.5 | | 111 | .07 | 251 | .16* |
| WBT | 0.5 | 3200 | 560 | .35* | 407 | .25 |
| WBR | 0 | 0 | 0 | | 0 | |
| Clearance Interval | | | | .10* | | .10* |

**TOTAL CAPACITY UTILIZATION** **1.15** **1.18**

**Existing Volumes With Project With Mitigation**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 3 | 4320 | 1124 | .26* | 931 | .22* |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 1 | 1600 | 201 | .13 | 36 | .02 |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 4 | 6400 | 395 | .06 | 543 | .08* |
| EBR | f | | 130 | | 331 | |
| WBL | 0 | 0 | 111 | | 251 | {.16}* |
| WBT | 3 | 4800 | 560 | .14* | 407 | .14 |
| WBR | f | | 0 | | 0 | |
| Clearance Interval | | | | .10* | | .10* |

**TOTAL CAPACITY UTILIZATION** **.50** **.56**

**80. Wolcott & SR-126**

**Existing (2003) Counts**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 5 | | 0 | |
| NBT | 1 | 1600 | 0 | .00 | 0 | .00 |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 1.5 | | 1 | | 2 | |
| SBT | 0.5 | 3200 | 0 | .00* | 0 | .00* |
| SBR | 1 | 1600 | 7 | .00 | 20 | .01 |
| EBL | 1 | 1600 | 12 | .01* | 4 | .00 |
| EBT | 2 | 3200 | 662 | .21 | 1030 | .32* |
| EBR | 0 | 0 | 1 | | 0 | |
| WBL | 1 | 1600 | 3 | .00 | 0 | .00 |
| WBT | 2 | 3200 | 731 | .23* | 1005 | .31 |
| WBR | 1 | 1600 | 2 | .00 | 0 | .00 |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.34** | | **.42** |

**Existing Volumes With Project**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 51 | | 66 | |
| NBT | 1 | 1600 | 68 | .31* | 54 | .43* |
| NBR | 0 | 0 | 373 | | 566 | |
| SBL | 1.5 | | 1 | | 2 | |
| SBT | 0.5 | 3200 | 24 | .02 | 85 | .05 |
| SBR | 1 | 1600 | 34 | .02 | 92 | .06 |
| EBL | 1 | 1600 | 42 | .03 | 66 | .04 |
| EBT | 2 | 3200 | 972 | .32* | 1572 | .51* |
| EBR | 0 | 0 | 63 | | 72 | |
| WBL | 1 | 1600 | 482 | .30* | 354 | .22* |
| WBT | 2 | 3200 | 1313 | .41 | 1410 | .44 |
| WBR | 1 | 1600 | 2 | .00 | 0 | .00 |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **1.03** | | **1.26** |

**Existing Volumes With Project With Mitigation**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1600 | 51 | .03* | 66 | .04* |
| NBT | 1 | 1600 | 68 | .04 | 54 | .03 |
| NBR | 2 | 3200 | 373 | .12 | 566 | .18 |
| SBL | 2 | 2880 | 1 | .00 | 2 | .00 |
| SBT | 1 | 1600 | 24 | .02* | 85 | .05* |
| SBR | 1 | 1600 | 34 | .02 | 92 | .06 |
| EBL | 2 | 2880 | 42 | .01 | 66 | .02 |
| EBT | 3 | 4800 | 972 | .20* | 1572 | .33* |
| EBR | 1 | 1600 | 63 | .04 | 72 | .05 |
| WBL | 2 | 2880 | 482 | .17* | 354 | .12* |
| WBT | 3 | 4800 | 1313 | .27 | 1410 | .29 |
| WBR | 1 | 1600 | 2 | .00 | 0 | .00 |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.52** | | **.64** |

**94. Commerce Center & SR-126**

**Existing (2003) Counts**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1600 | 28 | .02 | 64 | .04* |
| NBT | 1 | 1600 | 152 | .10* | 44 | .03 |
| NBR | 1 | 1600 | 21 | .01 | 41 | .03 |
| SBL | 2 | 2880 | 296 | .10* | 677 | .24* |
| SBT | 1 | 1600 | 39 | .02 | 141 | .09 |
| SBR | 1 | 1600 | 22 | .01 | 53 | .03 |
| EBL | 1 | 1600 | 27 | .02* | 23 | .01* |
| EBT | 2 | 3200 | 652 | .20 | 827 | .26 |
| EBR | 1 | 1600 | 51 | .03 | 24 | .02 |
| WBL | 1 | 1600 | 24 | .02 | 23 | .01 |
| WBT | 2 | 3200 | 632 | .20* | 922 | .29* |
| WBR | f | | 648 | | 123 | |
| Clearance Interval | | | | .10* | | .10* |

Note: Assumes N/S Split Phasing

**TOTAL CAPACITY UTILIZATION** **.52** **.68**

**Existing Volumes With Project**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1600 | 136 | .09 | 151 | .09* |
| NBT | 1 | 1600 | 152 | .10* | 44 | .03 |
| NBR | 1 | 1600 | 21 | .01 | 41 | .03 |
| SBL | 2 | 2880 | 296 | .10* | 677 | .24* |
| SBT | 1 | 1600 | 39 | .02 | 141 | .09 |
| SBR | 1 | 1600 | 95 | .06 | 163 | .10 |
| EBL | 1 | 1600 | 181 | .11* | 66 | .04 |
| EBT | 2 | 3200 | 1113 | .35 | 1773 | .55* |
| EBR | 1 | 1600 | 117 | .07 | 138 | .09 |
| WBL | 1 | 1600 | 24 | .02 | 23 | .01* |
| WBT | 2 | 3200 | 1497 | .47* | 1499 | .47 |
| WBR | f | | 648 | | 123 | |
| Clearance Interval | | | | .10* | | .10* |

Note: Assumes N/S Split Phasing

**TOTAL CAPACITY UTILIZATION** **.88** **.99**

**96. San Martinez Cyn & SR-126**

**Existing (2003) Counts**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 0 | 0 | 4 | | 8 | |
| SBT | 1 | 1600 | 0 | .00* | 0 | .01* |
| SBR | 0 | 0 | 2 | | 2 | |
| EBL | 1 | 1600 | 1 | .00 | 0 | .00 |
| EBT | 2 | 3200 | 650 | .20 | 937 | .29 |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 2 | 3200 | 659 | .21* | 934 | .29* |
| WBR | 0 | 0 | 1 | | 5 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.31** | | **.40** |

**Existing Volumes With Project**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 0 | 0 | 4 | | 8 | |
| SBT | 1 | 1600 | 0 | .00* | 0 | .01* |
| SBR | 0 | 0 | 2 | | 2 | |
| EBL | 1 | 1600 | 1 | .00 | 0 | .00 |
| EBT | 2 | 3200 | 737 | .23* | 1002 | .31 |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 2 | 3200 | 681 | .21 | 1028 | .32* |
| WBR | 0 | 0 | 1 | | 5 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.33** | | **.43** |

**110. Chiquito Cyn & SR-126**

**Existing (2003) Counts**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 1 | |
| NBT | 1 | 1600 | 1 | .00 | 0 | .00 |
| NBR | 0 | 0 | 1 | | 0 | |
| SBL | 0 | 0 | 70 | | 50 | |
| SBT | 1 | 1600 | 0 | .04* | 0 | .03* |
| SBR | 1 | 1600 | 12 | .01 | 8 | .01 |
| EBL | 1 | 1600 | 6 | .00 | 15 | .01* |
| EBT | 2 | 3200 | 663 | .21 | 927 | .29 |
| EBR | 0 | 0 | 4 | | 0 | |
| WBL | 0 | 0 | 1 | | 0 | |
| WBT | 2 | 3200 | 713 | .22* | 935 | .29* |
| WBR | 1 | 1600 | 22 | .01 | 86 | .05 |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.36** | | **.43** |

**Existing Volumes With Project**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 15 | | 80 | |
| NBT | 1 | 1600 | 36 | .25* | 179 | .55* |
| NBR | 0 | 0 | 345 | | 628 | |
| SBL | 0 | 0 | 117 | {.07}* | 80 | {.05}* |
| SBT | 1 | 1600 | 158 | .17 | 78 | .10 |
| SBR | 1 | 1600 | 12 | .01 | 8 | .01 |
| EBL | 1 | 1600 | 6 | .00 | 15 | .01 |
| EBT | 2 | 3200 | 673 | .24* | 944 | .31* |
| EBR | 0 | 0 | 82 | | 47 | |
| WBL | 0 | 0 | 632 | {.39}* | 483 | {.30}* |
| WBT | 2 | 3200 | 722 | .42 | 951 | .45 |
| WBR | 1 | 1600 | 37 | .02 | 130 | .08 |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **1.05** | | **1.31** |

**Existing Volumes With Project With Mitigation**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 2 | 2880 | 15 | .01 | 80 | .03 |
| NBT | 2 | 3200 | 36 | .01* | 179 | .06* |
| NBR | 2 | 3200 | 345 | .11 | 628 | .20 |
| SBL | 2 | 2880 | 117 | .04* | 80 | .03* |
| SBT | 3 | 4800 | 158 | .03 | 78 | .02 |
| SBR | 1 | 1600 | 12 | .01 | 8 | .01 |
| EBL | 2 | 2880 | 6 | .00 | 15 | .01 |
| EBT | 3 | 4800 | 673 | .14* | 944 | .20* |
| EBR | 1 | 1600 | 82 | .05 | 47 | .03 |
| WBL | 2 | 2880 | 632 | .22* | 483 | .17* |
| WBT | 3 | 4800 | 722 | .15 | 951 | .20 |
| WBR | 1 | 1600 | 37 | .02 | 130 | .08 |
| Right Turn Adjustment | | | | | NBR | .01* |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.51** | | **.57** |

**Subject:** Re: I-5 North Project - Phases 1 & 2
**From:** Ashraf A Habbak
**Date:** Tue, 14 Sep 2010 15:46:49 -0700
**To:** Daryl Zerfass

Hi Daryl,

The tentative schedule of delivery is shown below for I-5 North area projects:

| EA | Start PS&E | RTL | Award | CCA |
|---|---|---|---|---|
| 2332A | | 5/31/11 | 10/1/11 | 7/22/13 |
| 23321 | 1/3/11 | 6/15/13 | 12/15/13 | 2/10/16 |
| 23322 | 1/3/11 | 6/15/13 | 12/15/13 | 2/10/16 |

EA 2332A is the truck lanes project: One N/B lane from Weldon Cyn. To South of Calgrove Blvd & One S/B Lane from South of Pico Cyn / Lyons Ave. to Weldon Cyn OC.
Funding has been identified for design and construction.

EA 23321 is HOV & Aux Lanes (NB&SB) from SR-14 to Pico Cyn / Lyons Ave & one Truck lane (S/B) from South of Calgrove to Weldon Cyn.
Funding has been identified for design but not yet for construction.

EA 23322 is HOV & Aux Lanes (NB&SB) from Pico Cyn / Lyons Ave to Parker Road.
Funding has been identified for design but not yet for construction.

Please let me know if you have any questions.

Ashraf Habbak, P.E., PMP, AVS
Project Manager

**Daryl Zerfass**

09/14/2010 03:11 PM

To Ashraf Habbak
cc
Subject I-5 North Project - Phases 1 & 2

Hi Ashraf,

I am in the process of preparing some planning studies for the Santa Clarita Valley. As part of these studies, we are evaluating conditions on the I-5 freeway that includes the area covered by the Truck Lane/HOV Lane project from SR-14 to Parker Road. For the study it is necessary to have an estimate for the completion date of the full project (i.e., adding the truck lanes between Pico Canyon Road and SR-14 plus adding the HOV lanes between Parker Road and SR-14).

I realize the project may be phased, and if you have an estimate for when each phase will be completed that would be helpful. If that is too speculative, a reasonable estimate for the final year in which the project is completed based on what you know today will suffice.

Please feel free to give me a call if you need further details or wish to discuss. I appreciate whatever help you can provide.

Thanks,
Daryl
--
Daryl Zerfass, P.E.
*AUSTIN-FOUST ASSOCIATES, INC.*
(714) 667-0496

**Austin-Foust Associates, Inc. – Memorandum, Landmark Village Traffic Impact Analysis – Supplemental Freeway Analysis (June 9, 2011)**

AUSTIN-FOUST ASSOCIATES, INC.
TRAFFIC ENGINEERING AND TRANSPORTATION PLANNING

**MEMORANDUM**

TO: Susan Tebo, Impact Sciences, Inc.

FROM: Daryl Zerfass, P.E.

DATE: June 9, 2011

SUBJECT: **LANDMARK VILLAGE TRAFFIC IMPACT ANALYSIS – SUPPLEMENTAL FREEWAY ANALYSIS**

This memo serves as a supplement to the Landmark Village Long-Range Cumulative (Buildout) Conditions Traffic Forecasts (December 2007) and the Landmark Village Traffic Impact Analysis (September 2004). This supplemental study provides an analysis of the project's freeway impacts using revised freeway lane capacities and updated forecasts of long-range cumulative conditions.

The I-5 freeway impacts analysis presented in the Landmark Village Recirculated Draft EIR (RDEIR) analyzed the potential impacts of the proposed project on the I-5 freeway. The analysis was prepared shortly after the completion of the Caltrans freeway impact study that was prepared for the upcoming I-5 High Occupancy Vehicle (HOV) and Truck Lane project (I-5 PA&ED HOV & Truck Lanes – SR-14 to Parker Road Traffic Study, October 2007), and the Landmark Village RDEIR analysis utilized data directly from the Caltrans study. However, because the analysis presented in the RDEIR was prepared prior to final approval and funding by Caltrans of the SR-14 to Parker Road project, the analysis did not include the improvements as in place as part of the baseline condition. Caltrans has subsequently certified the necessary environmental documentation (September 2009) and expects construction of the improvement project to be completed in 2016.

Following release of the RDEIR, Caltrans District 7 staff requested that impact analyses evaluating the section of the I-5 freeway within the Santa Clarita Valley utilize a capacity of 1,600 vehicles per hour (vph) for the future HOV lanes based on the desire to achieve an operating condition for the HOV lanes that is better than the operating condition for the general purpose or mixed-flow lanes, i.e., a desire that the HOV lanes operate at LOS C rather than LOS E or F as is accepted for the general purpose lanes. For buffered or contiguous HOV facilities, Caltrans considers that LOS C occurs at approximately 1,650 vph, or less if there is significant bus volume or if there are physical constraints.



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(*High Occupancy Vehicle Guidelines for Planning, Design and Operations*, Caltrans, 2003, Chapter 2, page 4.) In contrast, 2,000 vph is commonly utilized to represent the threshold between LOS E and F conditions for a mixed-flow freeway lane. In addition, Caltrans staff specified that 1,200 vph be utilized as the capacity of the future truck climbing lanes for this section of freeway.

As explained below, the analysis conducted utilizing these reduced capacities shows that while some segments of the HOV lanes would operate over capacity under the 2030 scenario utilizing this criteria, the Landmark Village project would not cause a significant project or cumulative impact.

Table 1 depicts the Freeway Volumes and V/C Ratios - Long-Range Buildout Conditions and shows that while none of the mixed-flow (general purpose) lanes exceed a V/C ratio of 1.00 when taking into account the planned freeway improvement project, several segments of the southbound HOV lane exceed a V/C ratio of 1.00 under long-range buildout conditions. Specifically, the southbound HOV lane from Rye Canyon Road to SR-14 is shown to have V/C ratios that range from 1.13 to 1.25. However, since the capacity used for the HOV lane (1,600 vph) represents mid-LOS C operating conditions, it is important to note that a V/C ratio of 1.00 in the HOV lanes represents a substantially better operating condition than does a V/C ratio of 1.00 in a mixed-flow lane.

Consideration has also been given to the number of vehicles actually eligible to utilize the HOV lane. Under existing conditions within the project's study area, the volume of traffic eligible to utilize the HOV lane is approximately 27 percent of the total volume according to a survey prepared for the Caltrans PA&ED EIR. Under long-range buildout peak conditions, when the total volume of traffic is approaching the maximum capacity of the freeway and traffic volumes reach the point of being uniformly distributed across all lanes, in no case does the HOV lane volume exceed 27 percent of the total volume. Therefore, the HOV lane volume estimates utilized for this study are supported by data for the existing condition.

In summary, with the planned freeway improvement project that is adding truck lanes and HOV lanes to the I-5 freeway within the Santa Clarita Valley in place, project traffic does not result in a significant impact to the freeway, which is the same conclusion reached in the RDEIR traffic study. However, because the RDEIR traffic study identified significant project impacts to the freeway without the freeway improvement project in place, the RDEIR includes mitigation measures for the four freeway segments identified as significantly impacted. Specifically, the mitigation measures require the project to pay its fair share of the HOV/Truck Lanes freeway improvement project for those four segments.

Subsequent to the circulation of the RDEIR, the project applicant has had regular meetings with Caltrans staff to develop a mitigation agreement addressing the project's fair-share payment towards the planned freeway project. As part of the mitigation agreement, the project's share of future traffic along all segments of the freeway project limits (i.e., from Parker Road to SR-14) was calculated using a fair-share formula developed by Caltrans. Under the agreement, Caltrans acknowledges that the applicant's full payment of its share amount satisfies its mitigation obligations to Caltrans relative to the project.

**Table 1: Freeway Volumes and V/C Ratios – Long-Range Buildout Conditions**

| Segment | Lanes | Capacities | | Long-Range Without Project | | | | Long-Range With Project | | | | Project Increment | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | MF Lanes | | HOV Lanes | | MF Lanes | | HOV Lanes | | | |
| | | MF Lanes | HOV Lanes | Vol | V/C | Vol | V/C | Vol | V/C | Vol | V/C | MF | HOV |
| **Northbound – AM Peak Hour** | | | | | | | | | | | | | |
| 401. North of Lake Hughes | 4M | 8,000 | n/a | 3,411 | 0.43 | n/a | n/a | 3,400 | 0.43 | n/a | n/a | 0.00 | n/a |
| 402. Between Lake Hughes & Parker | 4M | 8,000 | n/a | 3,707 | 0.46 | n/a | n/a | 3,700 | 0.46 | n/a | n/a | 0.00 | n/a |
| 403. Between Parker & Hasley Canyon | 4M + 1H | 8,000 | 1,600 | 3,718 | 0.46 | 340 | 0.21 | 3,760 | 0.47 | 340 | 0.21 | 0.01 | 0.00 |
| 404. Between Hasley Canyon & SR-126 | 4M + 1H + 1A | 9,000 | 1,600 | 5,274 | 0.59 | 370 | 0.23 | 5,320 | 0.59 | 380 | 0.24 | 0.00 | 0.01 |
| 405. Between SR-126 & Rye Canyon | 4M + 1H | 8,000 | 1,600 | 5,328 | 0.67 | 500 | 0.31 | 5,480 | 0.69 | 520 | 0.33 | 0.02 | 0.02 |
| 406. Between Rye Canyon & Magic Mtn | 4M + 1H | 8,000 | 1,600 | 5,298 | 0.66 | 530 | 0.33 | 5,450 | 0.68 | 550 | 0.34 | 0.02 | 0.01 |
| 407. Between Magic Mtn & Valencia | 4M + 1H+ 1A | 9,000 | 1,600 | 6,165 | 0.69 | 610 | 0.38 | 6,280 | 0.70 | 620 | 0.39 | 0.01 | 0.01 |
| 408. Between Valencia & McBean | 4M + 1H | 8,000 | 1,600 | 7,062 | 0.88 | 720 | 0.45 | 7,170 | 0.90 | 730 | 0.46 | 0.02 | 0.01 |
| 409. Between McBean & Pico/Lyons | 4M + 1H | 8,000 | 1,600 | 7,141 | 0.89 | 740 | 0.46 | 7,250 | 0.91 | 750 | 0.47 | 0.02 | 0.01 |
| 410. Between Pico/Lyons & Calgrove | 4M + 1H+ 1A | 9,000 | 1,600 | 6,976 | 0.78 | 720 | 0.45 | 7,070 | 0.79 | 730 | 0.46 | 0.01 | 0.01 |
| 411. Between Calgrove & SR-14 | 4M + 1H + 1T | 9,200 | 1,600 | 6,980 | 0.76 | 730 | 0.46 | 7,060 | 0.77 | 740 | 0.46 | 0.01 | 0.00 |
| 412. South of SR-14 | 6M + 2H + 2T | 14,400 | 3,200 | 9,156 | 0.64 | 1,010 | 0.32 | 9,180 | 0.64 | 1,020 | 0.32 | 0.00 | 0.00 |
| **Northbound – PM Peak Hour** | | | | | | | | | | | | | |
| 401. North of Lake Hughes | 4M | 8,000 | n/a | 6,389 | 0.80 | n/a | n/a | 6,400 | 0.80 | n/a | n/a | 0.00 | n/a |
| 402. Between Lake Hughes & Parker | 4M | 8,000 | n/a | 7,468 | 0.93 | n/a | n/a | 7,500 | 0.94 | n/a | n/a | 0.01 | n/a |
| 403. Between Parker & Hasley Canyon | 4M + 1H | 8,000 | 1,600 | 7,621 | 0.95 | 1,320 | 0.83 | 7,670 | 0.96 | 1,330 | 0.83 | 0.01 | 0.00 |
| 404. Between Hasley Canyon & SR-126 | 4M + 1H + 1A | 9,000 | 1,600 | 7,927 | 0.88 | 1,310 | 0.82 | 7,980 | 0.89 | 1,320 | 0.83 | 0.01 | 0.01 |
| 405. Between SR-126 & Rye Canyon | 4M + 1H | 8,000 | 1,600 | 6,752 | 0.84 | 1,280 | 0.80 | 6,810 | 0.85 | 1,290 | 0.81 | 0.01 | 0.01 |
| 406. Between Rye Canyon & Magic Mtn | 4M + 1H | 8,000 | 1,600 | 6,762 | 0.85 | 1,270 | 0.79 | 6,820 | 0.85 | 1,280 | 0.80 | 0.00 | 0.01 |
| 407. Between Magic Mtn & Valencia | 4M + 1H+ 1A | 9,000 | 1,600 | 6,764 | 0.75 | 1,300 | 0.81 | 6,800 | 0.76 | 1,300 | 0.81 | 0.01 | 0.00 |
| 408. Between Valencia & McBean | 4M + 1H | 8,000 | 1,600 | 7,414 | 0.93 | 1,340 | 0.84 | 7,460 | 0.93 | 1,340 | 0.84 | 0.00 | 0.00 |
| 409. Between McBean & Pico/Lyons | 4M + 1H | 8,000 | 1,600 | 7,005 | 0.88 | 1,370 | 0.86 | 7,030 | 0.88 | 1,370 | 0.86 | 0.00 | 0.00 |
| 410. Between Pico/Lyons & Calgrove | 4M + 1H+ 1A | 9,000 | 1,600 | 6,984 | 0.78 | 1,390 | 0.87 | 7,010 | 0.78 | 1,390 | 0.87 | 0.00 | 0.00 |
| 411. Between Calgrove & SR-14 | 4M + 1H + 1T | 9,200 | 1,600 | 6,891 | 0.75 | 1,390 | 0.87 | 6,910 | 0.75 | 1,390 | 0.87 | 0.00 | 0.00 |
| 412. South of SR-14 | 6M + 2H + 2T | 14,400 | 3,200 | 14,235 | 0.99 | 3,130 | 0.98 | 14,270 | 0.99 | 3,130 | 0.98 | 0.00 | 0.00 |
| **Southbound – AM Peak Hour** | | | | | | | | | | | | | |
| 401. North of Lake Hughes | 4M | 8,000 | n/a | 4,696 | 0.59 | n/a | n/a | 4,700 | 0.59 | n/a | n/a | 0.00 | n/a |
| 402. Between Lake Hughes & Parker | 4M | 8,000 | n/a | 5,689 | 0.71 | n/a | n/a | 5,700 | 0.71 | n/a | n/a | 0.00 | n/a |
| 403. Between Parker & Hasley Canyon | 4M + 1H | 8,000 | 1,600 | 6,483 | 0.81 | 710 | 0.44 | 6,490 | 0.81 | 710 | 0.44 | 0.00 | 0.00 |
| 404. Between Hasley Canyon & SR-126 | 4M + 1H | 8,000 | 1,600 | 6,763 | 0.85 | 730 | 0.46 | 6,770 | 0.85 | 730 | 0.46 | 0.00 | 0.00 |
| 405. Between SR-126 & Rye Canyon | 4M + 1H+ 1A | 9,000 | 1,600 | 6,625 | 0.74 | 700 | 0.44 | 6,690 | 0.74 | 710 | 0.44 | 0.00 | 0.00 |
| 406. Between Rye Canyon & Magic Mtn | 4M + 1H+ 1A | 9,000 | 1,600 | 6,650 | 0.74 | 710 | 0.44 | 6,690 | 0.74 | 710 | 0.44 | 0.00 | 0.00 |
| 407. Between Magic Mtn & Valencia | 4M + 1H | 8,000 | 1,600 | 6,720 | 0.84 | 780 | 0.49 | 6,720 | 0.84 | 780 | 0.49 | 0.00 | 0.00 |
| 408. Between Valencia & McBean | 4M + 1H+ 1A | 9,000 | 1,600 | 7,795 | 0.87 | 910 | 0.57 | 7,790 | 0.87 | 910 | 0.57 | 0.00 | 0.00 |
| 409. Between McBean & Pico/Lyons | 4M + 1H | 8,000 | 1,600 | 7,561 | 0.95 | 960 | 0.60 | 7,540 | 0.94 | 960 | 0.60 | -0.01 | 0.00 |
| 410. Between Pico/Lyons & Calgrove | 4M + 1H + 1T | 9,200 | 1,600 | 7,202 | 0.78 | 1,010 | 0.63 | 7,190 | 0.78 | 1,010 | 0.63 | 0.00 | 0.00 |
| 411. Between Calgrove & SR-14 | 4M + 1H + 2T | 10,400 | 1,600 | 7,308 | 0.70 | 1,020 | 0.64 | 7,280 | 0.70 | 1,020 | 0.64 | 0.00 | 0.00 |
| 412. South of SR-14 | 6M + 2H + 2T | 14,400 | 3,200 | 13,842 | 0.96 | 3,010 | 0.94 | 13,800 | 0.96 | 3,000 | 0.94 | 0.00 | 0.00 |

**(Continued)**

**Table 1: Freeway Volumes and V/C Ratios – Long-Range Buildout Conditions (Continued)**

| Segment | Lanes | Capacities | | Long-Range Without Project | | | | Long-Range With Project | | | | Project Increment | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | MF Lanes | | HOV Lanes | | MF Lanes | | HOV Lanes | | | |
| | | MF Lanes | HOV Lanes | Vol | V/C | Vol | V/C | Vol | V/C | Vol | V/C | MF | HOV |
| **Southbound – PM Peak Hour** | | | | | | | | | | | | | |
| 401. North of Lake Hughes | 4M | 8,000 | n/a | 6,384 | 0.80 | n/a | n/a | 6,400 | 0.80 | n/a | n/a | 0.00 | n/a |
| 402. Between Lake Hughes & Parker | 4M | 8,000 | n/a | 6,890 | 0.86 | n/a | n/a | 6,900 | 0.86 | n/a | n/a | 0.00 | n/a |
| 403. Between Parker & Hasley Canyon | 4M + 1H | 8,000 | 1,600 | 6,622 | 0.83 | 1,330 | 0.83 | 6,670 | 0.83 | 1,330 | 0.83 | 0.00 | 0.00 |
| 404. Between Hasley Canyon & SR-126 | 4M + 1H | 8,000 | 1,600 | 7,853 | 0.98 | 1,390 | 0.87 | 7,900 | 0.99 | 1,400 | 0.88 | 0.01 | 0.01 |
| 405. Between SR-126 & Rye Canyon | 4M + 1H+ 1A | 9,000 | 1,600 | 7,488 | 0.83 | 1,450 | 0.91 | 7,630 | 0.85 | 1,470 | 0.92 | 0.02 | 0.01 |
| 406. Between Rye Canyon & Magic Mtn | 4M + 1H+ 1A | 9,000 | 1,600 | 8,234 | 0.91 | 1,820 | 1.14 | 8,460 | 0.94 | 1,840 | 1.15 | 0.03 | 0.01 |
| 407. Between Magic Mtn & Valencia | 4M + 1H | 8,000 | 1,600 | 7,772 | 0.97 | 1,920 | 1.20 | 7,960 | 1.00 | 1,940 | 1.21 | 0.03 | 0.01 |
| 408. Between Valencia & McBean | 4M + 1H+ 1A | 9,000 | 1,600 | 8,366 | 0.93 | 1,950 | 1.22 | 8,540 | 0.95 | 1,960 | 1.23 | 0.02 | 0.01 |
| 409. Between McBean & Pico/Lyons | 4M + 1H | 8,000 | 1,600 | 7,856 | 0.98 | 1,990 | 1.24 | 8,000 | 1.00 | 2,000 | 1.25 | 0.02 | 0.01 |
| 410. Between Pico/Lyons & Calgrove | 4M + 1H + 1T | 9,200 | 1,600 | 8,475 | 0.92 | 1,880 | 1.18 | 8,610 | 0.94 | 1,890 | 1.18 | 0.02 | 0.00 |
| 411. Between Calgrove & SR-14 | 4M + 1H + 2T | 10,400 | 1,600 | 8,974 | 0.86 | 1,800 | 1.13 | 9,090 | 0.87 | 1,810 | 1.13 | 0.01 | 0.00 |
| 412. South of SR-14 | 6M + 2H + 2T | 14,400 | 3,200 | 11,813 | 0.82 | 2,140 | 0.67 | 11,850 | 0.82 | 2,150 | 0.67 | 0.00 | 0.00 |

MF (or M) = Mixed-Flow/General Purpose Lane (Capacity = 2,000 vehicles per hour)
HOV (or H) = HOV Lane (Capacity = 1,600 vehicles per hour)
A = Auxiliary Lane (Capacity = 1,000 vehicles per hour)
T = Truck Lane (Capacity = 1,200 vehicles per hour)

Capacities derived from PeMS data and through discussions with Caltrans staff.

AUSTIN-FOUST ASSOCIATES, INC.
TRAFFIC ENGINEERING AND TRANSPORTATION PLANNING

**MEMORANDUM**

TO: Mr. Alex Herrell, Newhall Land

FROM: Daryl Zerfass, P.E.

DATE: July 1, 2010

SUBJECT: **POTRERO CANYON ROAD BRIDGE**

This memorandum addresses the effect, if any, of elimination of the Potrero Canyon Road Bridge on the traffic impacts analysis presented in the Landmark Village Recirculated Draft EIR (January 2010). As explained below, because the Potrero Canyon Road Bridge is not necessary to provide acceptable levels of service to the Landmark Village roadways following project buildout, the impacts analysis is unaffected by elimination of the bridge.

The Newhall Ranch Specific Plan (Specific Plan) identifies three future bridge crossings of the Santa Clara River within the Specific Plan boundary – Commerce Center Drive Bridge, Long Canyon Road Bridge, and Potrero Canyon Road Bridge. The Specific Plan EIR addresses a long-range scenario in which all three crossings are envisioned. Subsequent to the EIR, a separate study was prepared to identify a timeframe for construction of the roadways, including these bridges, that would support the increased traffic levels resulting from development of the Specific Plan, Entrada/Legacy Village, and Valencia Commerce Center buildout (i.e., all the projects that will build out in the Westside of the Santa Clarita Valley over the next 25 years). That study, the *Westside Santa Clarita Valley Roadway Phasing Analysis*, November 2006 (Phasing Study), was reviewed and approved by the Los Angeles County Department of Public Works for the purpose of phasing the roadway improvements necessary to support development of these projects.

The process utilized to prepare the Phasing Study consisted of first identifying the amount of development anticipated to occur each year as the Westside area first begins to develop, and continuing through the complete buildout of the Westside area. The Newhall Ranch master developer provided these anticipated absorption amounts along with the specific geographical areas anticipated to be developed each year. Based on the geographical areas being developed, the roadway infrastructure needed to serve those areas was then identified and separated into seven distinct stages. Special versions of the traffic model used by the County of Los Angeles were then prepared for each of the seven stages.



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The Phasing Study included the calculation of levels of service (LOS) for each stage based on the amount of new land development estimated to be in place at the time of road improvement construction. If deficiencies were identified, the road improvements for that stage were then modified such that acceptable LOS (defined as LOS D or better) was obtained. The study ultimately determined that each stage of road improvement construction would accommodate the concurrent level of development with acceptable levels of service.

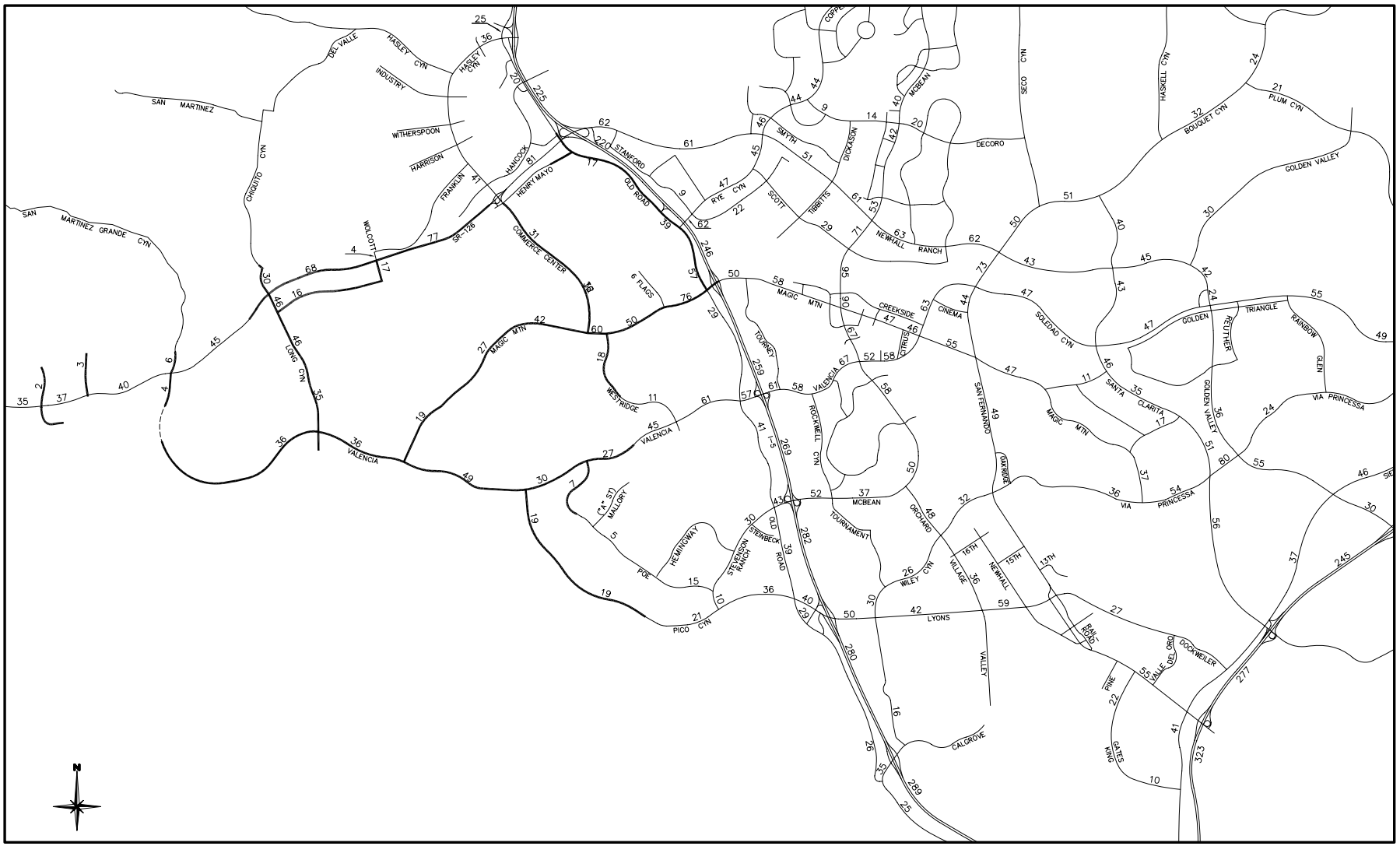
Under the Phasing Study, construction of the primary road improvements, which includes the three bridge crossings, would occur in seven stages concurrent with development of the respective land uses. Specific to the three bridge crossings, the study determined that in order to maintain acceptable levels of service, the Commerce Center Drive Bridge would be included as part of development Stage 2, the Long Canyon Road Bridge would be included as part of Stage 3, and construction of the Potrero Canyon Road Bridge would not occur until the final stage, Stage 7.

Attached are four exhibits from the Phasing Study. Specific to the Potrero Canyon Road Bridge, the first exhibit (Figure 23) shows the year 2030 average daily traffic (ADT) volumes for the development stage immediately *prior* to construction of the Potrero Canyon Road Bridge (the dashed line at the location of the bridge indicates that the bridge was not included when modeling that stage). The second and third exhibits (Tables 6 & 7) show that each roadway within the study area would operate at acceptable LOS under this scenario. The fourth exhibit, (Figure 24), shows the amount of development that was included within the year 2030 horizon under the development stage immediately prior to construction of the Potrero Canyon Road Bridge. As shown, under this scenario, the Landmark Village development is 100 percent complete by the year 2030, as is the remainder of the Specific Plan area. A fifth exhibit (Figure 23b), which was prepared for this memorandum, is also attached for comparison purposes, and it shows the ADT volumes based on Stage 7, which includes the Potrero Canyon Road Bridge. As shown on Figure 23b, the primary effect of the addition of the Potrero Canyon Road Bridge would be to reduce traffic volumes on Long Canyon Road and SR-126 as traffic is redistributed to Potrero Canyon Road.

More specific to the internal or on-site roadways, an assessment of the Landmark Village on-site roadways was conducted based on a comparison of 2030 traffic volumes with and without the Potrero Canyon Road Bridge. As shown on Figures 23 and 23b, with the exception of Long Canyon Road, traffic volumes on the on-site roadways would be unaffected by the removal of a Potrero Canyon Road Bridge. Specific to Long Canyon Road, as illustrated on Figures 23 and 23b, traffic volumes on Long Canyon Road would increase without the Potrero Canyon Road Bridge from 28,000/37,000 ADT to 35,000/46,000 ADT. However, the planned six-lane roadway would have sufficient capacity to accommodate the increase in traffic volumes as an ADT of 35,000/46,000 on a six-lane roadway is equivalent to acceptable LOS B/D. As to the local street intersection with Long Canyon Road, an evaluation of the Landmark Village local street ("A" Street) intersection with Long Canyon Road was conducted. The evaluation determined that with the planned six-lane Long Canyon Road, the intersection will operate acceptably at LOS C. As shown on Table 1, Year 2030 Level of Service Summary, under the 2030 scenario without Potrero Canyon Road Bridge, the intersection would operate at LOS C during the AM Peak Hour and LOS B during the PM Peak Hour. (The intersection capacity utilization (ICU) worksheets are attached to this memorandum.)

Thus, the Phasing Study in combination with the supplemental analysis conducted for the on-site roadways establishes that full buildout of the Specific Plan area, including Landmark Village, can occur without the Potrero Canyon Road Bridge being in place while maintaining acceptable levels of service. This is due primarily to the fact that the Potrero Canyon Road Bridge was included as part of the Specific Plan for purposes other than maintaining acceptable LOS, such as facilitating access to State Route 126. Thus, the Potrero Canyon Road Bridge is not essential to provide acceptable levels of service upon buildout of the Landmark Village project and its absence does not affect the results of the traffic impacts analysis, including the identification of significant impacts, provided in the Recirculated Draft EIR.

Enclosures




Legend

New/Upgraded Westside Roadway

Future Westside Roadway

Figure 23

AVERAGE DAILY TRAFFIC VOLUMES (000s)
-2030

**Table 6: AM Peak Hour Level of Service Summary**

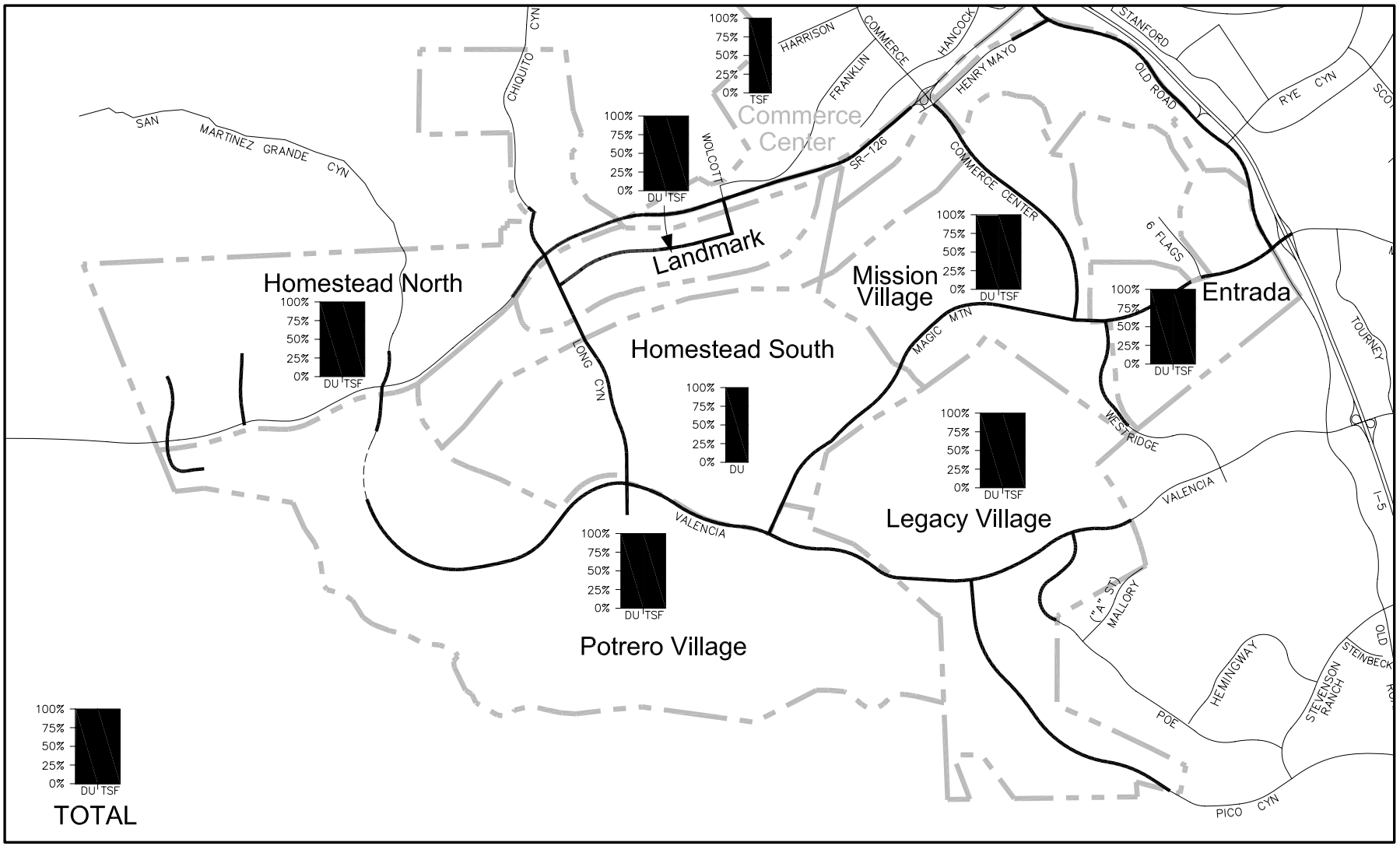
| Intersection | Exist. | 2011 | 2012 | 2014 | 2018 | 2022 | 2025 | 2030 |
|---|---|---|---|---|---|---|---|---|
| 7. I-5 SB Ramps & SR-126 | A | C | C | C | C | C | C | C |
| 8. I-5 NB Ramps & SR-126 | A | B | B | B | A | A | B | B |
| 9. Old Road & I-5 SB Ramps (at Rye Canyon) | C | A | A | A | A | A | A | A |
| 10. I-5 SB Ramps & Magic Mountain | A | A | A | A | A | B | B | B |
| 11. I-5 NB Ramps & Magic Mountain | B | A | A | A | B | B | C | C |
| 12. I-5 SB Ramps & Valencia | A | A | A | A | B | A | A | A |
| 13. I-5 NB Ramps & Valencia | A | A | A | A | B | B | B | C |
| 14. I-5 SB Ramps & McBean | A | A | A | A | A | A | A | A |
| 15. I-5 NB Ramps & McBean | A | A | A | A | A | A | B | B |
| 16. I-5 SB On-Loop & Lyons | A | A | A | A | A | A | A | A |
| 17. I-5 NB Ramps & Lyons | A | A | A | A | A | A | A | A |
| 18. I-5 SB Ramps & Calgrove | A | B | B | B | B | C | C | A |
| 19. I-5 NB Ramps & Calgrove | B | C | C | C | D | D | D | B |
| 20. I-5 SB Ramp & Lyons | A | A | A | A | A | A | A | A |
| 25. Old Road & Rye Canyon | D | B | C | C | D | D | D | D |
| 26. Old Road & Magic Mountain | A | A | A | A | B | C | C | D |
| 27. Old Road & Valencia | A | A | A | A | B | C | C | C |
| 28. Old Road & McBean | A | A | A | A | A | A | A | A |
| 29. Old Road & Pico | A | D | D | D | C | C | D | D |
| 80. Wolcott & SR-126 | A | A | A | A | A | B | C | C |
| 81. Commerce Center & Henry Mayo | -- | A | A | A | A | B | C | C |
| 82. Commerce Center & SR-126 EB Ramps | -- | A | A | A | A | A | A | A |
| 83. Commerce Center & SR-126 WB Ramps | -- | A | B | C | C | C | D | C |
| 96. Martinez/Potrero & SR-126 | A | A | A | A | A | A | A | B |
| 101. Long Canyon & Valencia | -- | -- | -- | A | A | A | A | A |
| 102. Newhall Ranch & Valencia | -- | -- | -- | A | A | A | A | B |
| 103. Pico Canyon & Valencia | -- | -- | -- | -- | A | A | B | B |
| 104. Poe & Valencia | -- | -- | A | A | A | A | B | B |
| 105. Westridge & Valencia | A | A | A | A | A | A | A | A |
| 106. Commerce Center & Magic Mountain | -- | A | B | D | C | A | B | C |
| 107. Westridge & Magic Mountain | -- | A | A | A | A | B | B | B |
| 110. Chiquito Canyon & SR-126 | A | A | A | A | A | B | D | D |
| 118. Six Flags Entrance & Magic Mountain | -- | A | A | A | A | A | A | A |

See Figure B-1 for intersection locations.

**Table 7: PM Peak Hour Level of Service Summary**

| Intersection | Exist. | 2011 | 2012 | 2014 | 2018 | 2022 | 2025 | 2030 |
|---|---|---|---|---|---|---|---|---|
| 7. I-5 SB Ramps & SR-126 | A | A | B | B | B | B | B | C |
| 8. I-5 NB Ramps & SR-126 | A | A | B | B | B | B | B | C |
| 9. Old Road & I-5 SB Ramps (at Rye Canyon) | E | B | A | A | B | B | C | D |
| 10. I-5 SB Ramps & Magic Mountain | A | B | B | B | D | D | D | C |
| 11. I-5 NB Ramps & Magic Mountain | B | B | B | B | C | D | D | D |
| 12. I-5 SB Ramps & Valencia | A | B | B | C | D | C | D | D |
| 13. I-5 NB Ramps & Valencia | A | B | B | B | B | B | C | C |
| 14. I-5 SB Ramps & McBean | B | C | B | C | C | D | C | D |
| 15. I-5 NB Ramps & McBean | B | C | B | B | C | C | D | D |
| 16. I-5 SB On-Loop & Lyons | A | C | C | C | C | D | D | D |
| 17. I-5 NB Ramps & Lyons | B | C | C | C | D | D | D | D |
| 18. I-5 SB Ramps & Calgrove | B | B | B | B | C | D | D | B |
| 19. I-5 NB Ramps & Calgrove | A | A | A | A | A | B | C | B |
| 20. I-5 SB Ramp & Lyons | A | A | A | A | A | B | B | B |
| 25. Old Road & Rye Canyon | D | C | C | C | B | C | C | D |
| 26. Old Road & Magic Mountain | B | B | A | B | C | C | D | D |
| 27. Old Road & Valencia | B | A | A | B | C | D | D | D |
| 28. Old Road & McBean | C | D | D | D | C | C | C | D |
| 29. Old Road & Pico | B | C | C | C | C | D | D | D |
| 80. Wolcott & SR-126 | A | C | C | C | C | C | D | C |
| 81. Commerce Center & Henry Mayo | -- | A | A | A | A | A | B | C |
| 82. Commerce Center & SR-126 EB Ramps | -- | A | A | A | A | A | A | A |
| 83. Commerce Center & SR-126 WB Ramps | -- | A | A | B | B | C | C | D |
| 96. Martinez/Potrero & SR-126 | A | A | A | A | A | A | B | C |
| 101. Long Canyon & Valencia | -- | -- | -- | A | A | A | B | D |
| 102. Newhall Ranch & Valencia | -- | -- | -- | A | A | A | A | C |
| 103. Pico Canyon & Valencia | -- | -- | -- | -- | A | A | C | C |
| 104. Poe & Valencia | -- | -- | A | A | A | A | A | B |
| 105. Westridge & Valencia | A | A | A | A | A | A | A | B |
| 106. Commerce Center & Magic Mountain | -- | A | A | A | A | B | C | C |
| 107. Westridge & Magic Mountain | -- | A | A | A | A | B | B | B |
| 110. Chiquito Canyon & SR-126 | A | A | A | A | A | B | D | D |
| 118. Six Flags Entrance & Magic Mountain | -- | A | A | A | A | B | B | C |

See Figure B-1 for intersection locations.




Legend

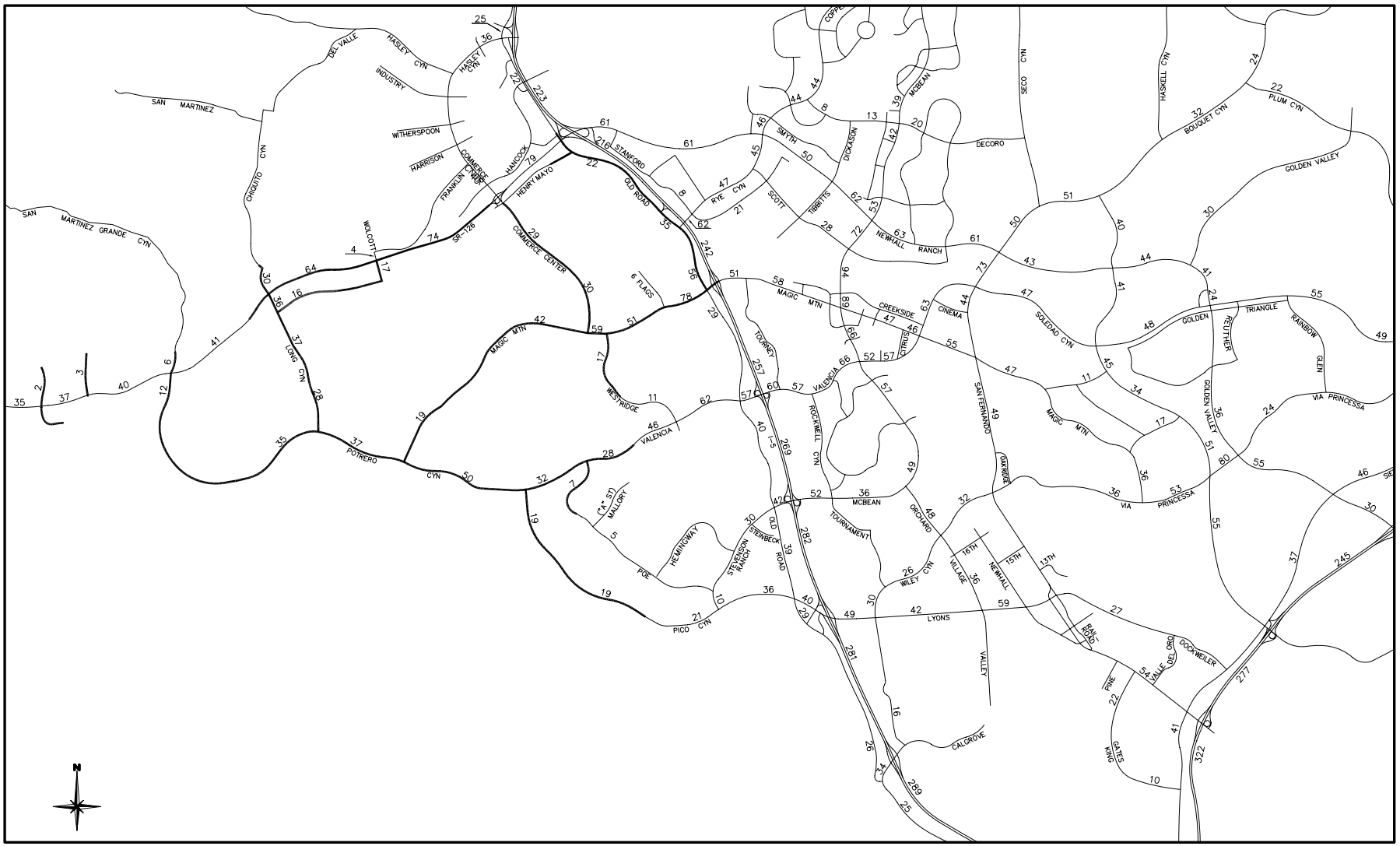
Percent Completion of Dwelling Units & Non-Res. Square Footage

Constructed Roadway

Future Roadway

Figure 24

PROJECT DEVELOPMENT BY PLANNING AREA -2030




Legend

New Westside Roadway

Figure 23b

AVERAGE DAILY TRAFFIC VOLUMES (000s)
-2030 with Potrero Canyon Road Bridge

**Table 1: Year 2030 Level of Service Summary**

| Intersection | 2030 Without Potrero Bridge | | | | 2030 With Potrero Bridge | | | |
|---|---|---|---|---|---|---|---|---|
| | AM Peak Hour | | PM Peak Hour | | AM Peak Hour | | PM Peak Hour | |
| | ICU | LOS | ICU | LOS | ICU | LOS | ICU | LOS |
| Long Canyon Road & Landmark Village "A" Street | .75 | C | .66 | B | .69 | B | .67 | B |

Level of service ranges: .00 - .60 A .71 - .80 C .91 – 1.00 E
.61 - .70 B .81 - .90 D Above 1.00 F

**Long Canyon & Landmark Village "A" Street**

**2030 Buildout Without Potrero Bridge**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1600 | 204 | .13 | 41 | .03* |
| NBT | 3 | 4800 | 2184 | .50* | 596 | .15 |
| NBR | 0 | 0 | 218 | | 143 | |
| SBL | 2 | 2880 | 207 | .07* | 529 | .18 |
| SBT | 3 | 4800 | 544 | .12 | 1620 | .34* |
| SBR | 0 | 0 | 8 | | 30 | |
| EBL | 2 | 2880 | 105 | .04* | 335 | .12 |
| EBT | 1 | 1600 | 11 | .02 | 20 | .06* |
| EBR | 0 | 0 | 17 | | 80 | |
| WBL | 2 | 2880 | 105 | .04 | 366 | .13* |
| WBT | 0.5 | 3200 | 22 | {.04}* | 38 | {.06} |
| WBR | 1.5 | | 188 | | 412 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.75** | | **.66** |

**2030 Buildout With Potrero Bridge**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1600 | 204 | .13 | 41 | .03* |
| NBT | 2 | 3200 | 1405 | .44* | 486 | .15 |
| NBR | 1 | 1600 | 218 | .14 | 143 | .09 |
| SBL | 2 | 2880 | 207 | .07* | 529 | .18 |
| SBT | 2 | 3200 | 281 | .09 | 1112 | .35* |
| SBR | 1 | 1600 | 8 | .01 | 30 | .02 |
| EBL | 2 | 2880 | 105 | .04* | 335 | .12 |
| EBT | 1 | 1600 | 11 | .02 | 20 | .06* |
| EBR | 0 | 0 | 17 | | 80 | |
| WBL | 2 | 2880 | 105 | .04 | 366 | .13* |
| WBT | 0.5 | 3200 | 22 | {.04}* | 38 | {.05} |
| WBR | 1.5 | | 188 | | 412 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.69** | | **.67** |

# I-5 HOV/Truck Lanes Project
# SR-14 to Parker Road

LOS ANGELES COUNTY, CALIFORNIA
DISTRICT 7 – LA–005, PM R45.4/R59.0
EA 2332E0
EA 2332A0

## Final Environmental Impact Report/ Environmental Assessment with Finding of No Significant Impact

**Prepared by the**
**State of California Department of Transportation**

The environmental review, consultation, and any other action required in accordance with applicable Federal laws for this project is being, or has been, carried-out by the Department under its assumption of responsibility pursuant to 23 U.S.C. 327.

Caltrans

September 2009

SCH# 2007051028
07-LA-05-PM 45.4/59.0
2332E0
2332A0

Interstate 5, widen existing to include high-occupancy vehicle lanes and truck climbing lanes from State Route 14 in the south to Parker Road in the north, in the City of Santa Clarita and unincorporated Los Angeles County, California

**FINAL ENVIRONMENTAL IMPACT REPORT**
Submitted Pursuant to: (State) Division 13, California Public Resources Code
California Environmental Quality Act

THE STATE OF CALIFORNIA
Department of Transportation

Sept 1, 2009
Date of Approval

Ron Kosinski
Ron Kosinski
Deputy District Director
Division of Environmental Planning, District 7
California Department of Transportation

CALIFORNIA DEPARTMENT OF TRANSPORTATION
FINDING OF NO SIGNIFICANT IMPACT (FONSI)

FOR

I-5 HOV/TRUCK LANES PROJECT

SR-14 TO PARKER ROAD.

The California Department of Transportation (Caltrans) has determined that Alternative 2 (Reduced Median Alternative), will have no significant impact on the human environment. This FONSI is based on the attached Environmental Assessment (EA), which has been independently evaluated by Caltrans and determined to adequately and accurately discuss the need, environmental issues, and impacts of the proposed project and appropriate Mitigation Measures. It provides sufficient evidence and analysis for determining that an EIS is not required. Caltrans takes full responsibility for the accuracy, scope, and content of the attached EA.

The environmental review, consultation, and any other action required in accordance with applicable Federal laws for this project is being, or has been, carried-out by Caltrans under its assumption of responsibility pursuant to 23 U.S.C. 327.

Notwithstanding any other provision of law, a claim arising under federal law seeking judicial review of a permit, license or approval issued by federal agency for a highway or public transportation project shall be barred unless it is filed within 180 days after publication of a notice in the Federal Register announcing that the permit, license, or approval is final pursuant to the law under which the agency action is taken, unless a shorter time is specified in the federal law pursuant to which judicial review is allowed.

September 1, 2009
Date of Approval

Ron Kosinski
Caltrans Deputy District Director
Division of Environmental Planning, District 7
California Department of Transportation

SCH# 2007051028
07-LA-05-PM 45.4/59.0
EA 2332E0

Interstate 5, widen existing to include high-occupancy vehicle lanes and truck climbing lanes from State Route 14 in the south to Parker Road in the north, in the City of Santa Clarita and unincorporated Los Angeles County, California

**DRAFT ENVIRONMENTAL IMPACT REPORT/ENVIRONMENTAL ASSESSMENT**

Submitted Pursuant to: (State) Division 13, California Public Resources Code
and (Federal) 42 U.S.C. 4332(2)(C)

The environmental review, consultation, and any other action required in accordance with applicable Federal laws for this project is being, or has been carried out by Caltrans under its assumption of responsibility pursuant to 23 U.S.C. 327

THE STATE OF CALIFORNIA
Department of Transportation

Dec 11, 2008
Date of Approval

Ron Kosinski
Deputy District Director
Division of Environmental Planning District 7
California Department of Transportation

# I-5 HOV/Truck Lanes Project

**SCH Number:** 2007051028

**Document Type:** NOD - Notice of Determination

**Alternate Title:** Interstate 5 High Occupancy Vehicle/Truck Lane Project

**Project Lead Agency:** Caltrans #7

---

**Project Description**

Proposed widening of existing I-5 to include HOV lanes, truck climbing lanes, and additional auxilary lanes from SR 14 on the south to Parker Rd on the north. The proposed improvements include extending the existing HOV lanes on I-5 from SR 14 to south of Paker Rd, and adding truck climbing lanes form the SR 14 interchange to Calgrove Blvd (northbound) and to Pico Canyon Rd/Lyons avenue (southbound). Also proposed adding and/or extending auxilary lanes in the northbound and southbound direction at several locations.

---

**Contact Information**

**Primary Contact:**
Carlos Montez
California Department of Transportation, District 7
213 897-9116
100 South Main Street, Suite 100
Los Angeles, CA 90012-3712

---

**Project Location**

County: Los Angeles
City: Santa Clarita
Region:
Cross Streets: I-5, SR 14, Interchange and Parker Road
Latitude/Longitude: 34° 25' 23.7" / 119° 34' 59.7" Map
Parcel No: various
Township: 5N
Range: 71W
Section: 25
Base: SBB&M
Other Location Info:

---

**Determinations**

This is to advise that the ☒ Lead Agency ☐ Responsible Agency Caltrans has approved the project described above on 9/1/2( made the following determinations regarding the project described above.

1. The project ☒ will ☐ will not have a significant effect on the environment.
2. ☒ An Environmental Impact Report was prepared for this project pursuant to the provisions of CEQA.
   ☐ A Negative Declaration was prepared for this project pursuant to the provisions of CEQA.
3. Mitigation measures ☒ were ☐ were not made a condition of the approval of the project.
4. A Statement of Overriding Considerations ☒ was ☐ was not adopted for this project.
5. Findings ☒ were ☐ were not made pursuant to the provisions of CEQA.

**Final EIR Available at:** Caltrans District 7 100 S. Main Street, Suite 100 MS16A Los Angeles, CA 90012

---

**Date Received:** 10/7/2009

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# Executive Summary

## S.1 Overview

The California Department of Transportation (Caltrans) proposes to widen existing Interstate 5 (I-5) to include high-occupancy vehicle (HOV) lanes, truck climbing lanes, and additional auxiliary lanes from State Route 14 (SR-14) on the south to Parker Road on the north, a distance of approximately 13.6 miles (mi) (Figure ES.1). The project is located within the City of Santa Clarita and unincorporated Los Angeles County. The proposed improvements include extending the existing HOV lanes on I-5 from SR-14 to south of Parker Road, a distance of approximately 13 mi, and adding truck climbing lanes from the SR-14 interchange to Calgrove Boulevard (northbound) and to Pico Canyon Road/Lyons Avenue (southbound), a distance of approximately 3 to 4 mi. The proposed I-5 HOV/Truck Lanes project (project) also proposes adding and/or extending auxiliary lanes in the northbound and southbound direction at several locations.

I-5 is a major north/south freeway connecting the states of California, Oregon, and Washington, and a major commuter route from the Santa Clarita Valley into the southern Los Angeles area. The area within the project limits is surrounded by mountainous terrain, and is therefore a geographically constrained area. As such, there is no direct alternative freeway route to I-5 in the city of Santa Clarita. A local arterial, The Old Road, runs parallel and adjacent to the I-5 freeway within the study limits.

In addition to serving as a major commuter facility, it is also the region's primary goods movement artery. It is part of the Interstate System of highways and is used as a major local and regional truck route. I-5 is listed as a "high-priority corridor" on the National Highway System (NHS), serving inter-regional commodities and vehicular travel in the north-south direction from California's most southern border with Mexico to its most northern border with Oregon. It is also listed on the State Highway Extra Legal Load (SHELL) Route system. These systems list those highways that have been constructed to accommodate the high volume and weight of inter- and intrastate truck traffic. Within the project limits, I-5 is classified as an urban freeway, and it functions as the gateway to and from the Los Angeles Basin to central and northern California. As a result of this unique characteristic of spanning the entire

state, the interstate in the north Los Angeles County area experiences high volumes of traffic, including truck traffic.

The existing I-5 facility within the project limits currently provides generally four mixed-flow lanes in each direction with the exception of through the midpoint of the I-5/SR-14 interchange, where there are three mixed-flow lanes in each direction. Two truck lanes in each direction pass through the I-5/SR-14 interchange area, separated from the mainline freeway. Within the project limits, this truck bypass route begins (southbound)/ends (northbound) just north of the I-5/SR-14 interchange consisting of ±5 percent grade.

Changes have been made to this environmental document since the circulation of the draft environmental document. Public and agency comments received during the circulation of the Draft Environmental Impact Report/Environmental Assessment (EIR/EA) and Public Hearing have resulted in refinements that have been incorporated in this final environmental document. A vertical line in the outside margin indicates changes in the document.

## S.2 Purpose and Need

### S.2.1 Need

I-5 is experiencing greater automobile and truck congestion as a result of population growth in north Los Angeles County and goods movement into and out of the Ports of Los Angeles and Long Beach. Freeway traffic volumes are expected to approximately double by 2030, which will continue to cause substantial delays.

### S.2.2 Purpose

The purpose of the project is to achieve the following objectives:

- Reduce delays to vehicles caused by slower-moving trucks through the hilly southern portion of this segment of I-5.
- Improve operational and safety design features to facilitate the movement of people, freight, and goods on the project segment.
- Reduce existing and forecast traffic congestion on the project segment of I-5 to accommodate planned growth within the study area.

## S.3 Project Description

This section describes the Proposed Action and the design alternatives that were developed by a multidisciplinary team to achieve the proposed project purpose and need while avoiding or minimizing environmental impacts. The alternatives are Alternative 1 (No Build Alternative), Alternative 2 (Reduced Median Alternative), and Alternative 3 (Full Median Alternative).

The project is being evaluated in three segments. Segment 1 extends from the I-5/SR-14 interchange to north of the Pico Canyon Road/Lyons Avenue/I-5 interchange. Segment 2 extends from north of the Pico Canyon Road/Lyons Avenue/I-5 interchange to north of the State Route 126 (SR-126) interchange. Segment 3 extends from north of SR-126 to south of Parker Road.

### S.3.1 No Build Alternative (Alternative 1)

The No Build Alternative would maintain the current configuration of the existing freeway. There would be no improvements to the mainline freeway, only approved/ pending local interchange improvements. Some of the known projects include the following:

- **Hasley Canyon Road/I-5 Interchange Improvements:** Construction ongoing; anticipated to be completed in 2011.
- **Rye Canyon Road/I-5 Southbound Ramp Improvements:** Construction is anticipated to begin in 2009/2010 fiscal year.
- **Rye Canyon Road Widening:** Construction is anticipated to begin in 2009/ 2010.
- **Magic Mountain Parkway/I-5 Interchange Improvements:** Phase 1 was completed in April 2006. Phase 2 construction is ongoing and expected to be complete in 2009. Phase 3 currently has no funding.
- **The Old Road Improvement Projects (Widening of The Old Road from Magic Mountain Parkway to Turnberry Lane):** The Draft EIR anticipated for public review in early 2011. Phase I (Magic Mountain Parkway to Rye Canyon Road and replacement of the Santa Clara River Bridge) construction is anticipated to begin in 2013. Phase II (Rye Canyon Road to Turnberry Lane) construction is anticipated to begin as early as 2013.
- **The Old Road Widening (Parker Road to Hillcrest Parkway):** The Project Study Report (PSR) equivalent was approved on January 25, 2007. Los Angeles

County is currently performing environmental studies. Public review of the environmental document is tentatively scheduled for early 2010. The schedule is contingent upon securing additional funding for the project.

- **I-5/SR-14 HOV Direct Connector Project:** Construction is anticipated from 2008 to 2011.
- **I-5 HOV Lanes from SR-118 to SR-14:** Construction has been completed. The HOV lanes were opened in April 2008.
- **I-5 Pavement Rehabilitation:** One project is programmed, with construction to begin in 2012/2013. Other projects are to follow as funding becomes available.
- **Upgrade I-5 Median Barrier from South of Weldon Canyon Road to 530 Feet (ft) north of Weldon Canyon:** Construction is anticipated to begin in 2011.
- **Corridor Intelligent Transportation System (ITS) Improvements:** No project is currently programmed. These improvements are to be implemented with projects as appropriate until complete.
- **I-5 at Castaic Weight Station; Upgrade Weight Station Facility:** The Final Project Report/Environmental Document (PR/ED) was approved October 2008. Construction is expected to begin October 2010.

Under the No Build Alternative, the HOV and truck lanes would not be added and the congestion and operational problems in this segment would not be alleviated.

The No Build Alternative provides a baseline for comparing the impacts associated with the Build Alternatives since environmental reviews must consider the effects of not implementing the project.

### S.3.2 Build Alternatives

Both Build Alternatives (Alternatives 2 and 3) propose to widen the center median and the outside shoulder of the northbound and southbound lanes between SR-14 and south of Parker Road to accommodate HOV, additional auxiliary, and truck lanes. Both Build Alternatives would provide one HOV lane in each direction from the I-5/ SR-14 interchange to south of the Parker Road interchange. Both Build Alternatives would extend one northbound truck lane from where the truck lanes currently merge with northbound I-5 near the Weldon Canyon Road/I-5 overcrossing to the Calgrove Boulevard/I-5 interchange. Southbound truck climbing lanes are proposed between the Weldon Canyon Road overcrossing and Calgrove Boulevard interchange (two

truck lanes) and from Calgrove Boulevard to south of the Pico Canyon Road/Lyons Avenue interchange (one truck lane).

Both Build Alternatives propose adding and/or extending auxiliary lanes in the northbound direction from SR-14 to the northbound truck lane merge, Calgrove Boulevard to Pico Canyon Road/Lyons Avenue, and Valencia Boulevard to Magic Mountain Parkway, and in the southbound direction between SR-126 and Rye Canyon Road, Rye Canyon Road, and Magic Mountain Parkway, and Valencia Boulevard and McBean Parkway.

### S.3.2.1 Alternative 2 (Reduced Median Alternative) – Preferred Alternative

Alternative 2 proposes median and inside shoulder widths that are less than the Caltrans standard (48 ft median and less than 10 ft inside shoulders at median structure columns) within a maximum 210 ft cross section. The reduced median width of 48 ft is measured from the inside the Mixed Flow Lane (MFL), Edge of Travel Way (ETW), to inside the MFL ETW. Additional widening beyond the 48 ft minimum in the median area would be provided when necessary for horizontal stopping sight distance requirements. A 48 ft median would accommodate a 1 ft buffer, a 12 ft HOV lane, and a 10 ft inside shoulder. Shoulder widths along freeway ramps would be 8 ft. Alternative 2 would not provide for a 10 ft continuous inside shoulder (at column locations) or a 4 ft buffer between HOV and adjacent mixed-flow lanes. The HOV buffer would be 1 ft. The maximum cross section width under Alternative 2 (210 ft) is intended to accommodate the proposed HOV and truck climbing lanes within the existing Caltrans right of way to the extent feasible to limit the number of right of way acquisitions.

Per Caltrans HOV lane guidelines, California Highway Patrol (CHP) enforcement areas are recommended every 2 mi. Based on Caltrans criteria, approximately five enforcement areas would be required within the 13.6 mi project limit. Additional width in the median (beyond the proposed 48 ft) is required to provide for those CHP enforcement areas and has been included in the design of the Reduced Median Alternative.

### S.3.2.2 Alternative 3 (Full Median Alternative)

The Full Median Alternative (Alternative 3) proposes construction of the truck climbing and HOV lanes consistent with Caltrans standards. The standard full median width of 62 ft is measured from inside the MFL ETW to inside the MFL ETW. The only exception to the 62 ft median width occurs in two areas north of the Pico Canyon Road/Lyons Avenue interchange, where the existing median is 60 ft wide. The typical cross section for this alternative is a maximum of 245 ft, which includes 12 ft travel lanes, a 10 ft outside shoulder, and a continuous CHP enforcement area in the median. The standard median width of 62 ft would accommodate a 4 ft buffer, a 12 ft HOV lane, a 10 ft inside shoulder, and an additional 4 ft inside shoulder for continuous CHP enforcement. The only exception to the 62 ft median width would be in two areas north of the Pico Canyon Road/Lyons Avenue interchange, where the median width would be 60 ft. The additional width for the continuous enforcement area provides for continuous 10 ft inside shoulders at the structure column locations.

#### *Early Implementation Project (EIP)*

Construction of the truck lane improvements has been identified as the EIP due to partial funding of the truck lanes component. The EIP consists of construction of truck lanes from the SR-14 interchange to south of the Pico Canyon Road/Lyons Avenue interchange.

The EIP improvements in the northbound direction would include widening into the existing median to maintain five northbound lanes after the merge of the separated truck lanes just north of the Weldon Canyon Road/I-5 overcrossing to the Calgrove Boulevard interchange. The outside lane would become the truck climbing lane as the general-purpose lanes would be shifted toward the median.

The EIP improvements in the southbound direction would include widening into the existing median to maintain five southbound lanes from south of the Pico Canyon Road/Lyons Avenue interchange to Calgrove Boulevard. The truck lanes would become the truck climbing lane and the general-purpose lanes would be shifted toward the median.

At the Calgrove Boulevard southbound on-ramp, a sixth lane would be added on southbound I-5. Two of the six southbound lanes would be dropped at the existing SR-14 interchange truck bypass lanes, while four lanes would join the existing I-5 lanes before the SR-14 general-purpose lane connector.

The EIP would be constructed within the limits analyzed for the ultimate improvements.

## S.4 Joint CEQA/NEPA Document

The proposed project is a joint project by Caltrans and the Federal Highway Administration (FHWA) and is subject to state and federal environmental review requirements. Project documentation, therefore, has been prepared in compliance with both the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA). Caltrans is the lead agency under CEQA. In addition, FHWA's responsibility for environmental review, consultation, and any other action required in accordance with applicable federal laws for this project is being, or has been, carried out by Caltrans under its assumption of responsibility pursuant to 23 U.S.C. 327(a)(2)(a).

The Draft EIR/EA was circulated for public review from December 17, 2008, to February 17, 2009. Comments have been received and addressed from the public and reviewing agencies. The Final EIR/EA includes responses to comments received on the Draft EIR/EA, and identifies the selection of Alternative 2 as the Preferred Alternative. Following the distribution of the Final EIR/EA, if the decision is made to approve the project, a Notice of Determination (NOD) will be published for compliance with CEQA and a Finding of No Significant Impact (FONSI) will be issued for compliance with NEPA.

## S.5 Coordination with Public and Other Agencies

### S.5.1 Permits and Approvals Needed

Table S.1 identifies the permits and/or approvals that are or may be required prior to or during construction of the project.

### S.5.2 Unresolved Issues

There are no unresolved issues at this time. Coordination with regulatory agencies is ongoing.

**Table S.1 Permits and/or Approvals Needed**

| Permit/Approval | Agency | Status |
|---|---|---|
| Encroachment Permit-Roadway | County of Los Angeles-Public Works | Coordination will occur after environmental document approval. |
| Streambed Alteration Agreement (Section 1602) | California Department of Fish and Game (CDFG) | Application will be submitted after environmental document approval. |
| Section 402 NPDES (Construction Activity) | Los Angeles Regional Water Quality Control Board | Application will be submitted prior to construction. |
| Section 402 NPDES (Groundwater Dewatering) | Los Angeles Regional Water Quality Control Board | Application will be submitted prior to construction. |
| Section 401 Permit | Los Angeles Regional Water Quality Control Board | Application will be submitted after environmental document approval. |
| Section 404 Permit (Individual or Nationwide[1]) | United States Army Corps of Engineers (ACOE) | Application will be submitted after environmental document approval. |
| Section 7 Informal Consultation for Threatened and Endangered Species | United States Fish and Wildlife Service | Completed |
| Encroachment Permit-Flood Control | County of Los Angeles-Public Works | Coordination will occur after environmental document approval. |

[1] After receipt of the Section 404 Permit application, the ACOE will determine whether an Individual or Nationwide Permit is applicable.

## S.6 Project Impacts

Table S.2 provides a summary of the impacts that are summarized from the environmental analysis contained in Chapter 2. The environmental commitments and measures to minimize harm are listed in the Environmental Commitments Record in Appendix E.

## Table S.2 Summary of Impacts

| Environmental Resource | | Alternative 1 (No Build) | Alternative 2 (Reduced Median) – Preferred Alternative | Alternative 3 (Full Median) |
|---|---|---|---|---|
| **Land Use** | | No impact. | Temporary construction impacts and permanent acquisition of one full parcel and three partial parcels for additional right of way. | Temporary construction impacts and permanent acquisition of eight partial parcels and one full parcel for additional right of way. |
| **Growth** | | No impact. | Temporary noise impacts would include construction crew commuting of construction equipment and materials to the project site and excavation/grading/roadway construction.<br><br>Permanent impacts are solely from traffic noise. | Temporary noise impacts would include construction crew commuting of construction equipment and materials to the project site and excavation/grading/roadway construction<br><br>Permanent impacts are solely from traffic noise. |
| **Farmlands** | | No impact. | No temporary or permanent impacts to Farmlands. | Permanent loss of 3.02 acres (ac) of Prime Farmland and 1.024 ac of Farmland of Statewide Importance. |
| **Community Impacts** | **Community Character and Cohesion** | No impact. | Temporary impacts would include construction-related impacts such as traffic disruptions/congestion/detours/ increasing of noise/vibration/light and glare/increasing of emissions.<br><br>No negative permanent impacts to the regional and local community. | Temporary impacts would include construction-related impacts such as traffic disruptions/congestion/detours/ increasing of noise/vibration/light and glare/increasing of emissions.<br><br>No negative permanent impacts to the regional and local community. |
| | **Relocation** | No impact. | Temporary loss of parking spaces and unpaved field roads.<br><br>No permanent impacts related to acquisitions or relocation of residential or commercial buildings. | Temporary loss of parking spaces and unpaved field roads.<br><br>No permanent impacts related to acquisitions or relocation of residential or commercial buildings. |
| | **Environmental Justice** | No Impact. | No disproportionately high and adverse impacts on any minority or low-income populations. | No disproportionately high and adverse impacts on any minority or low-income populations. |
| **Utilities and Emergency Services** | | No impact. | Temporary construction impacts.<br><br>Permanent beneficial impacts from replacement/upgrade/addition of the Intelligent Transportation System (ITS) facilities. | Temporary construction impacts.<br><br>Permanent beneficial impacts from replacement/upgrade/addition of the ITS facilities. |
| **Traffic and Transportation/Pedestrian and Bicycle Facilities** | | Increased traffic congestion; degradation of LOS | Temporary construction impacts, closures, detours.<br><br>Permanent beneficial impacts from improvement in existing and future level of service (LOS) and reduced traffic congestion. | Temporary construction impacts, closures, detours.<br><br>Permanent beneficial impacts from improvement in existing and future LOS and reduced traffic congestion. |
| **Visual and Aesthetics** | | No impact. | Temporary visual effects during construction.<br><br>Permanent change in appearance of freeway facility. | Temporary visual effects during construction.<br><br>Permanent change in appearance of freeway facility. |
| **Cultural Resources** | | No impact. | No impact to known resources. Potential impact to unknown resources/burials. | No impact to known resources. Potential impact to unknown resources/burials. |

## Table S.2 Summary of Impacts

| Environmental Resource | Alternative 1 (No Build) | Alternative 2 (Reduced Median) – Preferred Alternative | Alternative 3 (Full Median) |
|---|---|---|---|
| **Hydrology and Floodplains** | No impact. | Temporary construction impact.<br><br>Permanent minor increase in 100-year base flood elevation. | Temporary construction impact.<br><br>Permanent minor increase in 100-year base flood elevation. |
| **Water Quality and Storm Water Runoff** | No impact. | Permanent and temporary increase in pollutant loading from freeway during storm events.<br><br>Permanent increase in volume of storm water runoff. | Permanent and temporary increase in pollutant loading from freeway during storm events.<br><br>Permanent increase in volume of storm water runoff. |
| **Geology and Soils** | No impact. | Temporary disturbance and compaction of soil and increased soil erosion during construction.<br><br>Permanent alteration of existing landforms during construction grading and construction of cut and fill slopes. | Temporary disturbance and compaction of soil and increased soil erosion during construction.<br><br>Permanent alteration of existing landforms during construction grading and construction of cut and fill slopes. |
| **Paleontology** | No impact. | Potential permanent loss due to ground-disturbing activities; Paleontological Mitigation Plan required. | Potential permanent loss due to ground-disturbing activities; Paleontological Mitigation Plan required. |
| **Hazardous Waste and Materials** | No impact. | Likelihood of encountering aerially deposited lead, asbestos-containing materials, lead-based paint, and lead- and chromium-containing paint and pavement markings during construction. Potential to encounter petroleum hydrocarbon contamination, naturally occurring petroleum gas or natural gas, and polychlorinated biphenyls during construction. | Likelihood of encountering aerially deposited lead, asbestos-containing materials, lead-based paint, and lead- and chromium-containing paint and pavement markings during construction. Potential to encounter petroleum hydrocarbon contamination, naturally occurring petroleum gas or natural gas, and polychlorinated biphenyls during construction. |
| **Air Quality** | Continued degradation of air quality. | Temporary fugitive dust and diesel engine emissions during construction.<br><br>Decreased air pollutant emissions during operation. | Temporary fugitive dust and diesel engine emissions during construction<br><br>Decreased air pollutant emissions during operation. |
| **Noise** | No impact. | Temporary increase in noise levels during construction; permanent increase in noise levels during operation. | Temporary increase in noise levels during construction; permanent increase in noise levels during operation. |
| **Energy** | No impact. | One-time expenditure of energy to construct improvements. | One-time expenditure of energy to construct improvements. |
| **Natural Communities** | No impact. | Temporary impacts from grading and construction activities and trimming and pruning oak trees. Temporary impacts to of 4.96 ac of oak woodland habitat, 2.65 ac of Riparian Communities, 23.49 ac of Coastal Sage Scrub Communities, and 73 oak trees (including 14 heritage oaks).<br><br>Permanent removal of vegetation, including mature trees; | Temporary impacts from grading and construction activities and trimming and pruning oak trees. Temporary impacts to 5.01 ac of oak woodland habitat, 2.43 ac of Riparian Communities, 26.38 ac of Coastal Sage Scrub Communities, and 80 oak trees (including 27 heritage oaks).<br><br>Permanent removal of vegetation, including mature trees. |

## Table S.2 Summary of Impacts

| Environmental Resource | Alternative 1 (No Build) | Alternative 2 (Reduced Median) – Preferred Alternative | Alternative 3 (Full Median) |
|---|---|---|---|
| | | Permanent impacts to 3.27 ac of Oak Woodland Communities, 1.60 ac of Riparian Communities, 18.51 ac of Coastal Sage Scrub Communities, and 109 oak trees (including 20 heritage oaks). | Permanent impacts to 4.98 ac of Oak Woodland Communities, 1.92 ac of Riparian Communities, 22.25 ac of Coastal Sage Scrub Communities, and 120 oak trees (including 12 heritage oaks). |
| **Wetlands and Other Waters** | No impact. | 4.01 ac temporary impacts to California Department of Fish and Game (CDFG) jurisdictional areas. 3.55 ac temporary impacts to United States Army Corps of Engineers (ACOE) and Regional Water Quality Control Board (RWQCB) jurisdictional areas.<br><br>1.65 ac permanent impacts to CDFG jurisdictional areas. 1.84 ac permanent impacts to ACOE and RWQCB jurisdictional areas. | 4.04 ac temporary impacts to CDFG jurisdictional areas. 3.52 ac temporary impacts to ACOE and RWQCB jurisdictional areas.<br><br>2.01 ac permanent impacts to CDFG jurisdictional areas. 2.32 ac permanent impacts to ACOE and RWQCB jurisdictional areas. |
| **Plant Species** | No impact. | No impact. | No impact. |
| **Animal Species** | No impact. | Temporary construction impacts and permanent loss of habitat for Santa Ana sucker; arroyo chub; bat species; and special-status coastal sage scrub and chaparral, riparian, woodland and montane, and grassland and open space animal species. | Temporary construction impacts and permanent loss of habitat for Santa Ana sucker; arroyo chub; bat species; and special-status coastal sage scrub and chaparral, riparian, woodland and montane, and grassland and open space animal species. |
| **Threatened and Endangered Species** | No impact. | Temporary construction impacts and permanent loss of habitat for unarmored threespine stickleback, least Bell's vireo, southwestern willow flycatcher, western yellow-billed cuckoo, California gnatcatcher, and, potentially, arroyo toad. | Temporary construction impacts and permanent loss of habitat for unarmored threespine stickleback, least Bell's vireo, southwestern willow flycatcher, western yellow-billed cuckoo, California gnatcatcher, and, potentially, arroyo toad. |
| **Invasive Species** | No impact. | Potential permanent spread of invasive species. | Potential permanent spread of invasive species. |
| **Cumulative Impacts** | No impact | Cumulative loss of oak woodland. | Cumulative loss of oak woodland. |

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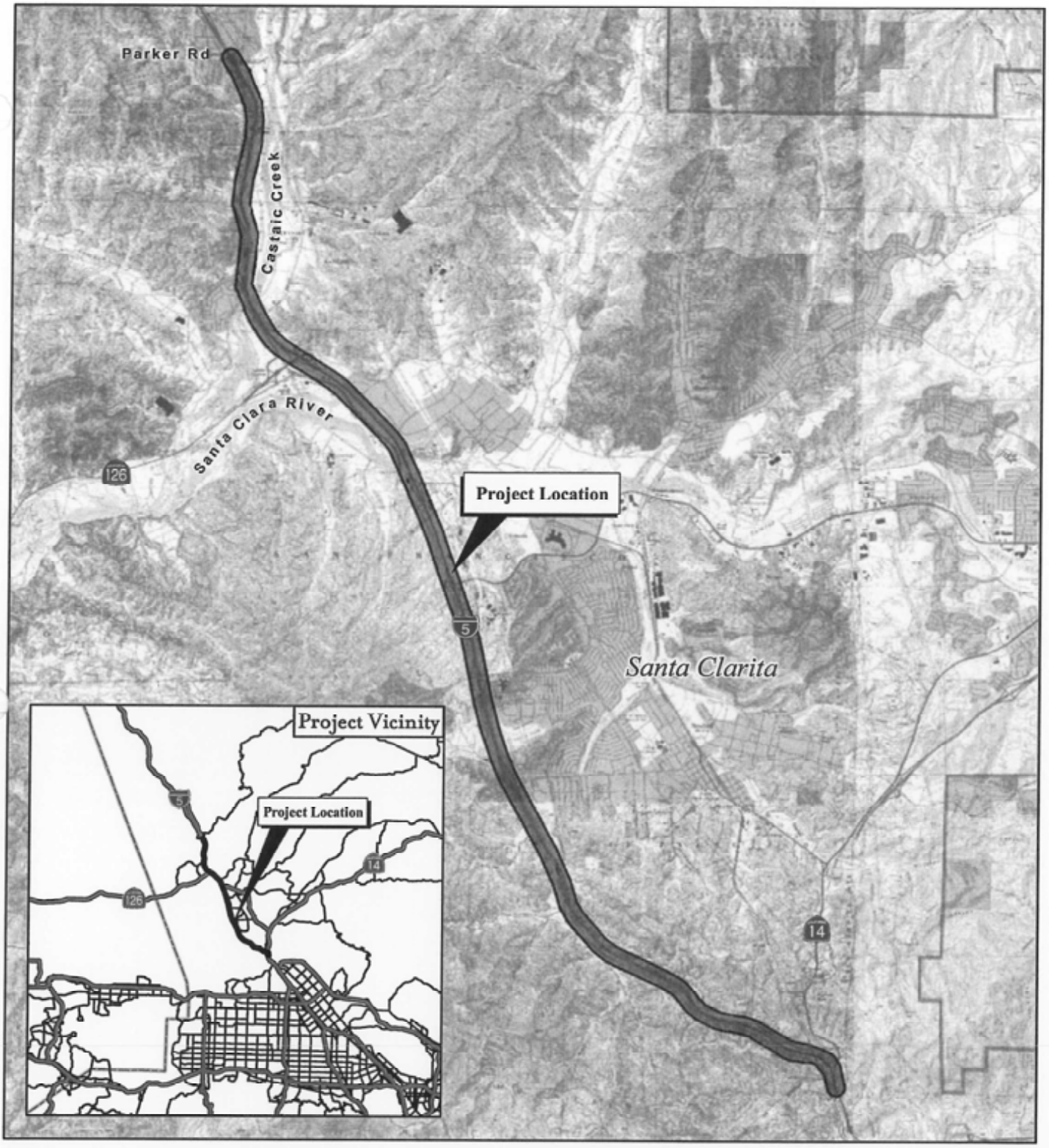


FIGURE ES.1

LEGEND

Project Location

N

0 3,750 7,500 Feet

*I-5 HOV / Truck Lanes Project*

Project Location

07-LA-5 PM R45.4/R59.0

EA 2332E0

SOURCE: USGS 7.5' QUAD, CALIF.

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# Chapter 1 Proposed Project

## 1.1 Introduction

The California Department of Transportation (Caltrans) proposes to widen existing Interstate 5 (I-5) to include high-occupancy vehicle (HOV) lanes, truck climbing lanes, and additional auxiliary lanes from State Route 14 (SR-14) on the south to Parker Road on the north, a distance of approximately 13.6 miles (mi) (Figure 1.1). The project is located within the City of Santa Clarita and within unincorporated Los Angeles County. The proposed improvements include extending the existing HOV lanes on I-5 from SR-14 to south of Parker Road, a distance of approximately 13 mi, and adding truck climbing lanes from the SR-14 interchange at Calgrove Boulevard (northbound) and to Pico Canyon Road/Lyons Avenue (southbound), a distance of approximately 3 to 4 mi. The proposed I-5 HOV/Truck Lanes project (project or proposed project) also includes additional auxiliary lanes in the northbound and southbound directions at several locations.

I-5 is a major north/south freeway connecting the States of California, Oregon, and Washington, and a major commuter route from the Santa Clarita Valley into the southern Los Angeles area. The area within the proposed project limits is surrounded by mountainous terrain, and is therefore a geographically constrained area. As such, there is no direct alternative freeway route to I-5 in Santa Clarita Valley. A local arterial, The Old Road, runs parallel and adjacent to I-5 within the study limits.

In addition to serving as a major commuter facility, it is also the region's primary goods movement artery. It is part of the Interstate System of highways and is used as a major local and regional truck route. I-5 is listed as a "high-priority corridor" on the National Highway System (NHS), serving inter-regional commodities and vehicular travel in the north-south direction from California's most southern border with Mexico to its most northern border with Oregon. It is also listed on the State Highway Extra Legal Load (SHELL) Route system. These systems list those highways that have been constructed to accommodate the high volume and weight of inter- and intrastate truck traffic. Within the project limits, I-5 is classified as an urban freeway, and it functions as the gateway to and from the Los Angeles Basin to central and northern California. As a result of this unique characteristic of spanning the entire state, the interstate in the north Los Angeles County area experiences high volumes of traffic, including truck traffic.

The existing I-5 facility within the project limits currently provides generally four mixed-flow lanes in each direction with the exception of through the midpoint of the I-5/SR-14 interchange, where there are three mixed-flow lanes in each direction. Two truck lanes in each direction pass through the I-5/SR-14 interchange area, separated from the mainline freeway. Within the project limits, this truck bypass route begins (southbound)/ends (northbound) just north of the I-5/SR-14 interchange consisting of ±5 percent grade.

Two studies preceded development of the project. The *Transportation Concept Report* (November 1998) for I-5, prepared by Caltrans, suggested improvements to achieve or maintain a Level of Service (LOS) of D during the peak hours. Specifically, the *Transportation Concept Report* recommended four mixed-flow lanes, two HOV lanes, and one truck lane in each direction.

The Los Angeles County Metropolitan Transportation Authority (Metro) prepared the *North County Combined Highway Corridors Study (North County Study)* (June 24, 2004) to develop feasible and cost-effective solutions for alleviating traffic congestion in the north Los Angeles County area. Both short- and long-range improvements for the project corridor were identified in the *North County Study*. As part of the Short Term Plan, the addition of an HOV lane and a truck lane in each direction from the I-5/SR-14 interchange to Calgrove Boulevard and addition of an HOV lane in each direction from Calgrove Boulevard to I-5/SR-126 was identified. The Long Range Plan identified the addition of one truck lane and one HOV lane from SR-14 to Calgrove Boulevard, two truck lanes and one HOV lane from Calgrove Boulevard to SR-126 and one truck lane and one HOV lane from SR-126 to Lake Hughes. Both studies acknowledge the existing and projected population growth within the Santa Clarita Valley and identified freeway improvements that respond to this growth.

The proposed project is fully funded and is in the 2008 Regional Transportation Plan (RTP), which was found to conform by the Southern California Association of Governments (SCAG) on May 8, 2008, and the Federal Highway Administration/ Federal Transit Administration (FHWA/FTA) adopted the air quality conformity finding on June 5, 2008. The project is also included in 2008 Regional Transportation Improvement Program (RTIP) (RTIP Project ID: LAE0465, In L.A./Santa Clarita on Route 5 from State Route 14 to Parker Road, HOV, Truck and Auxiliary Lane Improvement, page 4). The 2008 RTIP was found to conform by FHWA/FTA on November 17, 2008. The design concept and scope of the proposed project are

consistent with the project description in the 2008 RTP, the 2008 RTIP, and the assumptions in the SCAG regional emissions analysis.

## 1.2 Purpose and Need

### 1.2.1 Need for the Proposed Project

I-5 is experiencing greater automobile and truck congestion as a result of population growth in north Los Angeles County and goods movement into and out of the Ports of Los Angeles and Long Beach. Freeway traffic volumes are expected to approximately double by 2030, which will continue to cause substantial delays.

#### 1.2.1.1 Capacity, Transportation Demand, and Safety

***Level of Service***

The quality of traffic flow can be defined in terms of level of service (LOS). The measure used to provide an estimate of LOS is density. There are six LOS, ranging from LOS A (free traffic flow with low volumes and high speeds, resulting in low densities) to LOS F (traffic volumes exceed capacity and result in forced flow operations at low speeds, resulting in high densities). LOS thresholds for a basic freeway segment are summarized in Table 1.A.

***Existing Traffic Volumes***

Existing (2006) traffic volumes are shown in Table 1.B. Within the project limits, in the southbound direction, I-5 is experiencing a.m. and p.m. peak-hour traffic that ranges from 2,210 to 6,610 vehicles per hour (vph) and from 2,420 to 6,460 vph, respectively. In the northbound direction, the a.m. and p.m. peak-hour traffic volumes range from 1,570 to 5,620 vph and from 2,790 to 7,020 vph, respectively. The percentage of truck traffic along this stretch of I-5 varies from 9.4 percent to 20.8 percent of the total traffic volume. Average Daily Traffic (ADT)[1] ranges from 83,000 to 202,000 in the project segment of I-5.

[1] Average Daily Traffic is an estimate of the average number of vehicles passing a point or segment of a roadway facility, in both directions, during a 24-hour period.

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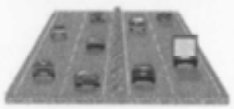
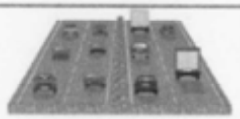
## Table 1.A LOS Thresholds for a Basic Freeway Segment

# LEVELS OF SERVICE
for Freeways

| Level of Service | Flow Conditions | Operating Speed (mph) | Technical Descriptions |
|---|---|---|---|
| A | | 70 | Highest quality of service. Traffic flows freely with little or no restrictions on speed or maneuverability. **No delays** |
| B | | 70 | Traffic is stable and flows freely. The ability to maneuver in traffic is only slightly restricted. **No delays** |
| C |  | 67 | Few restrictions on speed. Freedom to maneuver is restricted. Drivers must be more careful making lane changes. **Minimal delays** |
| D |  | 62 | Speeds decline slightly and density increases. Freedom to maneuver is noticeably limited. **Minimal delays** |
| E | | 53 | Vehicles are closely spaced, with little room to maneuver. Driver comfort is poor. **Significant delays** |
| F | | <53 | Very congested traffic with traffic jams, especially in areas where vehicles have to merge. **Considerable delays** |

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## Table 1.B Existing (2006) Traffic Volumes

| I-5 Segment | % Trucks (Daily) | AM Peak Hour | | PM Peak Hour | | ADT |
|---|---|---|---|---|---|---|
| | | SB | NB | SB | NB | |
| North of Parker Road[1] | 26.6 | 1,600 | 1,190 | 2,040 | 2,250 | 65,000 |
| Between Parker Road and Hasley Canyon Road | 20.8 | 2,210 | 1,570 | 2,420 | 2,790 | 83,000 |
| Between Hasley Canyon Road and SR-126 | 17.3 | 3,110 | 2,170 | 3,010 | 3,620 | 100,000 |
| Between SR-126 and Rye Canyon Road | 15.3 | 3,420 | 3,340 | 4,150 | 4,080 | 124,000 |
| Between Rye Canyon Road and Magic Mountain Parkway | 14.2 | 4,200 | 3,340 | 5,350 | 4,080 | 134,000 |
| Between Magic Mountain Parkway and Valencia Boulevard | 12.2 | 4,490 | 4,490 | 5,600 | 5,270 | 156,000 |
| Between Valencia Boulevard and McBean Parkway | 10.6 | 5,310 | 5,430 | 6,420 | 6,050 | 179,000 |
| Between McBean Parkway and Pico Canyon Road/Lyons Avenue | 10.1 | 5,730 | 5,560 | 6,450 | 6,610 | 189,000 |
| Between Pico Canyon Road/ Lyons Avenue and Calgrove Boulevard | 9.5 | 6,320 | 5,620 | 6,460 | 7,020 | 199,000 |
| Between Calgrove Boulevard and SR-14 | 9.4 | 6,610 | 5,600 | 6,410 | 6,970 | 202,000 |
| South of SR-14[2] | 8.6 | 13,270 | 7,390 | 9,180 | 13,710 | 325,000 |

Source: Traffic Study, October 2007.
[1] This segment of I-5 is north of the project limits.
[2] This segment of I-5 is south of the project limits.
ADT = average daily traffic
NB = northbound
SB = southbound

The existing LOS during the a.m. and p.m. peak hours for the project segment of I-5 are summarized in Table 1.C. From this table, it can be seen that northbound I-5 from SR-14 to Magic Mountain Parkway operates at LOS C during the a.m. peak hour and at LOS C and D during the p.m. peak hour. Traffic conditions along southbound I-5 during the a.m. and p.m. peak hours operate at LOS E between Calgrove Boulevard and Pico Canyon Road/Lyons Avenue and at LOS F between the Truck Route Bypass and Calgrove Boulevard. During the p.m. peak hour, Pico Canyon Road/Lyons Avenue to Valencia Boulevard in the northbound direction operates at LOS D.

**Table 1.C LOS Summary–Existing Conditions**

| I-5 Segment | AM Peak Hour LOS | PM Peak Hour LOS |
|---|---|---|
| ***Northbound*** | | |
| Lake Hughes Road to Parker Road | A | A |
| Parker Road to Hasley Canyon Road | A | B |
| Hasley Canyon Road to SR-126 | B | B |
| SR-126 to Rye Canyon Road | B | B |
| Rye Canyon Road to Magic Mountain Parkway | B | B |
| Magic Mountain Parkway to Valencia Boulevard | C | C |
| Valencia Boulevard to McBean Parkway | C | C |
| McBean Parkway to Pico Canyon Road | C | D |
| Pico Canyon Road/Lyons Avenue to Calgrove Boulevard | C | D |
| Calgrove Boulevard to Truck Route Bypass | C | D |
| Truck Route Bypass to SR-14 on-Ramp | C | D |
| SR-14 on-Ramp to SR-14 off-Ramp | C | D |
| ***Southbound*** | | |
| Lake Hughes Road to Parker Road | A | A |
| Parker Road to Hasley Canyon Road | A | A |
| Hasley Canyon Road to SR-126 | A | B |
| SR-126 to Rye Canyon Road | B | B |
| Rye Canyon Road to Magic Mountain Parkway | B | C |
| Magic Mountain Parkway to Valencia Boulevard | C | C |
| Valencia Boulevard to McBean Parkway | C | D |
| McBean Parkway to Pico Canyon Road/Lyons Avenue | C | D |
| Pico Canyon Road/Lyons Avenue to Calgrove Boulevard | E | E |
| Calgrove Boulevard to Truck Route Bypass | F | F |
| Truck Route Bypass to SR-14 on-Ramp | C | C |
| SR-14 on-Ramp to Balboa Road | C | C |

Source: Traffic Study, October 2007.

Observation of the four-lane southbound segment of I-5 between Pico Canyon Road/ Lyons Avenue and the start of the Truck Route Bypass at SR-14 indicates that the outside lane is used exclusively by trucks. This segment was evaluated as a three-lane segment, with the fourth lane serving as the truck climbing lane for approximately 80 percent of trucks. The method indicates LOS E for each peak-hour time period for the segment between Pico Canyon Road/Lyons Avenue and Calgrove Boulevard, and LOS F between Calgrove Boulevard and SR-14.

### 1.2.1.2 Future Traffic Projections

The Santa Clarita Valley is a rapidly growing portion of the southern California area and is likely to continue due to the ongoing new land use development that is anticipated to continue as the valley builds out over the next 25 years. This growth

would increase both truck and general automobile traffic on I-5. Table 1.D summarizes land use and vehicle trip generation statistics for 2004 and buildout (2030) conditions. Table 1.D shows that ADT generation within the Santa Clarita Valley is forecast to increase by 99 percent between the present day and valley-wide buildout.

**Table 1.D Land Use and Trip Generation Projections–Santa Clarita Valley**

| Land Use Type | Units | 2004 | | 2030 | |
|---|---|---|---|---|---|
| | | Amount | ADT | Amount | ADT |
| Single-Family Residential | DU | 51,300 | 501,000 | 92,000 | 903,000 |
| Multifamily Residential | DU | 25,600 | 203,000 | 54,800 | 423,000 |
| Commercial, Retail, Office, and Industrial | MSF | 31.8 | 696,000 | 81.9 | 1,539,000 |
| Other | – | – | 170,000 | – | 256,000 |
| Total | – | – | 1,570,000 | - | 3,121,000 (+99%) |

Source: Traffic Study, October 2007.
DU = Dwelling Unit
MSF = Million Square Feet
ADT = Average Daily Traffic

The daily number of vehicles traveling the project segment of I-5 is forecast to increase over time, which will increase traffic congestion in the project area under the existing lane configuration. As discussed below, without any improvements to the existing facility, traffic volumes in the project area are forecast to increase by 2030, resulting in a decrease in LOS.

### 1.2.1.3 Future Traffic Volumes

Future traffic demand was forecast using the Santa Clarita Valley Consolidated Traffic Model prepared to reflect the actual flow of traffic volumes south of the I-5/ SR-14 interchange, which is constrained by the available (existing and planned) capacity for that heavily traveled section of freeway. The Constrained Flow Model provides a realistic peak-hour volume for the freeway segments north of the I-5/ SR-14 interchange by taking into account the constraints that determine the flow rates south of the interchange. The predicted future traffic conditions using both models are shown in Tables 1.E and 1.F for the project segment of I-5.

## Table 1.E 2030 (Santa Clarita Valley Buildout) Peak-Hour Traffic Volumes–Constrained Flow Model

| I-5 Segment | AM Peak Hour | | PM Peak Hour | | ADT |
|---|---|---|---|---|---|
| | SB | NB | SB | NB | |
| North of Parker Road[1] | 5,200 | 4,100 | 6,500 | 6,800 | 207,000 |
| Between Parker Road and Hasley Canyon Road | 6,700 | 4,900 | 7,600 | 8,200 | 240,000 |
| Between Hasley Canyon Road and SR-126 | 7,200 | 6,500 | 9,100 | 8,700 | 251,000 |
| Between SR-126 and Rye Canyon Road | 7,000 | 6,900 | 9,200 | 7,700 | 234,000 |
| Between Rye Canyon Road and Magic Mountain Parkway | 7,200 | 6,900 | 10,100 | 7,700 | 255,000 |
| Between Magic Mountain Parkway and Valencia Boulevard | 7,300 | 7,100 | 9,800 | 7,900 | 263,000 |
| Between Valencia Boulevard and McBean Parkway | 8,100 | 7,600 | 10,000 | 8,300 | 268,000 |
| Between McBean Parkway and Pico Canyon Road/Lyons Avenue | 7,800 | 7,500 | 9,600 | 8,400 | 283,000 |
| Between Pico Canyon Road/ Lyons Avenue and Calgrove Boulevard | 7,300 | 7,000 | 8,900 | 8,400 | 281,000 |
| Between Calgrove Boulevard and SR-14 | 7,400 | 6,400 | 8,800 | 8,200 | 290,000 |
| South of SR-14[2] | 17,700 | 9,200 | 11,500 | 16,700 | 617,000 |

Source: Traffic Study, October 2007.
[1] This segment of I-5 is north of the project limits.
[2] This segment of I-5 is south of the project limits.

**Table 1.F LOS Summary–2030 No-Build Conditions (Constrained Flow Model)**

| I-5 Segment | AM Peak Hour (LOS) | PM Peak Hour (LOS) |
|---|---|---|
| ***Northbound*** | | |
| Lake Hughes Road to Parker Road | B | D |
| Parker Road to Hasley Canyon Road | C | E |
| Hasley Canyon Road to SR-126 | D | F |
| SR-126 to Rye Canyon Road | D | E |
| Rye Canyon Road to Magic Mountain Parkway | D | E |
| Magic Mountain Parkway to Valencia Boulevard | D | E |
| Valencia Boulevard to McBean Parkway | E | E |
| McBean Parkway to Pico Canyon Road/Lyons | E | F |
| Pico Canyon Road/Lyons Avenue to Calgrove | D | E |
| Calgrove Boulevard to Truck Route Bypass | D | E |
| Truck Route Bypass to SR-14 Ramp (On) | C | E |
| SR-14 Ramp (On) to SR-14 Ramp (Off) | C | D |
| ***Southbound*** | | |
| Lake Hughes Road to Parker Road | C | D |
| Parker Road to Hasley Canyon Road | D | E |
| Hasley Canyon Road to SR-126 | D | F |
| SR-126 to Rye Canyon Road | D | F |
| Rye Canyon Road to Magic Mountain Parkway | D | F |
| Magic Mountain Parkway to Valencia Boulevard | E | F |
| Valencia Boulevard to McBean Parkway | F | F |
| McBean Parkway to Pico Canyon Road/Lyons | E | F |
| Pico Canyon Road/Lyons Avenue to Calgrove | F | F |
| Calgrove Boulevard to Truck Route Bypass | F | F |
| Truck Route Bypass to SR-14 Ramp (On) | C | D |
| SR-14 Ramp (On) to Balboa Road | D | E |

Source: Traffic Study, October 2007.

As shown in Tables 1.E and 1.F, without the project, the southbound a.m. and p.m. peak-hour traffic volumes are expected to range from 6,700 to 8,100 vph and 7,600 to 10,100 vph, respectively. The northbound a.m. and p.m. peak-hour traffic volumes are expected to range from 4,900 to 7,600 vph and 7,700 and 8,700 vph, respectively. ADT is expected to range from approximately 234,000 to 290,000 vehicles in the project segment of I-5. The corresponding LOS for the northbound direction ranges from C to E in the a.m. peak hour and from D to F in the p.m. peak hour. Similarly, the corresponding LOS for the southbound direction ranges from D to F in the a.m. peak hour and from E to F in the p.m. peak hour (with the exception of the Truck Route Bypass to the SR-14 ramp, which is projected to operate at LOS C in the a.m. peak hour and LOS D in the p.m. peak hour). As shown from Tables 1.B and 1.E, the average daily traffic (ADT) volumes are expected to increase from approximately one and a half times to more than triple from the existing (2006) to the 2030 forecast

volumes. As shown in Tables 1.C and 1.F, the existing (2006) LOS of A, B, C, and D would be degraded to LOS E and F in many locations if no action is taken.

### 1.2.1.4 Safety

A summary of accident rates for the project area is provided in Table 1.G with a comparison to the statewide average. This data, which is for the 36-month period of June 2005 through May 2008, indicates that the study area has a total accident rate lower than the statewide average, with the exception of the northbound direction, which has a fatality rate equal to the statewide average.

**Table 1.G Accident Rate Summary–June 2005 through May 2008**

| Post Mile | Name | Segment Accident Rates* | | | Statewide Accident Rates | | |
|---|---|---|---|---|---|---|---|
| | | Fatal Accidents | Fatal + Injury | Total Accidents | Fatal Accidents | Fatal + Injury | Total Accidents |
| *Northbound* | | | | | | | |
| R45.500–R59.299 | Junction Route 14 to Lake Hughes Road | 0.009 | 0.18 | 0.60 | 0.009 | 0.28 | 0.90 |
| *Southbound* | | | | | | | |
| R45.500–R59.299 | Junction Route 14 to Lake Hughes Road | 0.008 | 0.20 | 0.68 | 0.009 | 0.28 | 0.09 |

Source: Transportation Systems Network Report, Traffic Accident Surveillance and Analysis System (TSN - TASAS), June 2009.
* Note: Accidents per million vehicle miles traveled.

The causes for most of the accidents were speeding and improper turning movements. These accidents occurred at various times of the day and resulted mostly in rear-end collisions (over 37 percent). Hitting objects (over 25 percent) and sideswiping (over 21 percent) were the second and third most common collision results.

Over the 36-month accident review period, 22 fatalities occurred within the limits of the proposed project. This section of roadway is generally an eight-lane freeway. A review of the accidents indicate the following: (1) over 34 percent of the accidents occur during congested periods when slower-moving vehicles are present, and (2) over 48 percent of the accidents involve trucks.

### 1.2.1.5 Operational Deficiencies

The topography in the project area is mountainous or hilly, which, when combined with the large volume of trucks and passenger vehicles, results in conflicts and inefficient operations along the project segment of I-5. Due to the grades within the

project area, slow-moving trucks and vehicles must share existing travel lanes with other vehicles and can obstruct the flow of traffic, thereby increasing congestion and reducing mobility. According to the Traffic Study (October 2007), the greatest grade occurs between Calgrove Boulevard and SR-14 and through the SR-14 interchange, with ±5 percent and ±4.5 percent northbound/southbound, respectively. These areas also experience the greatest speed reduction, to less than 50 miles per hour (mph).

As described in Table 1.B, the percentage of truck traffic along this stretch of I-5 ranges from 9.4 percent to 20.8 percent of the total traffic volume. Truck percentages along the study area are higher than other freeway facilities, which generally average between 5 and 8 percent. With this level of truck traffic, delays and accidents can be attributed to slower-moving vehicles, especially in sustained grades south of the Pico Canyon Road/Lyons Avenue interchange.

Given the high percentage of trucks and the conflict and inefficient operations as mentioned above, there is a need to separate trucks from passenger vehicles to improve congestion and delay associated with the interaction of these vehicle types.

#### 1.2.1.6 Modal Interrelationships and System Linkages

As the greater metropolitan area of Los Angeles County continues to grow to the north, the freeways will continue to be more and more congested. HOV lanes are an effective method of increasing the capacity of the freeway system. In the city of Santa Clarita, annual ridership of the Metrolink commuter rail service has more than doubled in the past 10 years. During this time, annual ridership on the local fixed bus route network grew from 1.1 million annual riders to 3.3 million annual riders, while annual ridership on the express buses increased from 107,000 to 314,000.

#### 1.2.1.7 District 7 HOV Lane Program

Caltrans District 7 has a district-wide HOV Lane Program in place to provide HOV lanes on most of the freeways in Los Angeles County. An HOV project on I-5 from State Route 118 (SR-118) to SR-14 has recently been opened to traffic. The proposed HOV projects on I-5 from State Route 170 (SR-170) to SR-118 and from State Route 134 (SR-134) to SR-170 are currently in the design stage. The SR-14/I-5 HOV Direct Connector project is currently under construction.

According to the *North County Combined Highway Corridors Study* (June 24, 2004), long-distance trips of 25 mi or more make up a high percentage of the trips on this

segment of I-5. Trips of this length are very suitable for ridesharing if HOV lanes are available to be utilized for significant travel time advantage.

#### 1.2.1.8 Goods Movement

SCAG has identified goods movement as a critical component of transportation system planning within southern California. In March 2005, SCAG adopted the Southern California Strategy for Goods Movement: A Plan for Action, which identified the existing and projected volume of goods being transported through the Ports of Los Angeles and Long Beach and identified strategies to address movement of these goods through both rail and surface transportation facilities. According to SCAG's Action Plan, over one-third of waterborne freight containers traffic at United States ports are handled by the Ports of Los Angeles and Long Beach, with 50 to 60 percent of this freight then transported to destinations outside the Southern California region.

Provision of truck lanes on this portion of I-5 to facilitate goods movements is currently under further review as part of the Multi-County Goods Movement Action Plan (MCGMP). Metro, in partnership with the County Transportation Commissions; SCAG; and Caltrans Districts 7, 8, 11, and 12, is developing a plan that would address the multi-county goods movement challenges and identify solutions. The goal of the MCGMP is to identify a program of planned improvements/strategies to facilitate goods movement throughout the southern California region.

### 1.2.2 Purpose of the Proposed Project

The purpose of the project is to achieve the following objectives:

- Reduce delays to vehicles caused by slower-moving trucks through the hilly southern portion of this segment of I-5.
- Improve operational and safety design features to facilitate the movement of people, freight, and goods on the project segment.
- Reduce existing and forecast traffic congestion on the project segment of I-5 to accommodate planned growth within the study area.

## 1.3 Project Description

This section describes the Proposed Action and the design alternatives that were developed by a multidisciplinary team to achieve the proposed Interstate 5 (I-5) High-Occupancy Vehicle (HOV)/Truck Lanes project (project) purpose and need while avoiding or minimizing environmental impacts. The alternatives are Alternative 1 (No Build Alternative), Alternative 2 (Reduced Median Alternative), and Alternative 3 (Full Median Alternative).

The project is located in Los Angeles County on I-5 from State Route 14 (SR-14) on the south to Parker Road on the north and covers a distance of approximately 13.6 mi (PM R45.4/R59.0). Within the limits of the project, I-5 currently provides generally four mixed-flow lanes in each direction, with the exception of three mixed-flow lanes in each direction at the I-5/SR-14 interchange. In the project area, two truck lanes are separated from the mainline freeway south of Weldon Canyon Overcrossing. This truck bypass route begins/ends just north of the I-5/SR-14 interchange. As stated in Section 1.2, the purpose of the project is to reduce delays to other vehicles caused by slower-moving trucks through the hilly southern portion of the project area, improve persons and goods throughput, and reduce existing and forecast traffic congestion.

The project is being evaluated in three segments. Segment One extends from the I-5/ SR-14 interchange to north of the Pico Canyon Road/Lyons Avenue/I-5 interchange. Segment Two extends from north of the Pico Canyon Road/Lyons Avenue/I-5 interchange to north of the State Route 126 (SR-126) interchange. Segment Three extends from north of SR-126 to south of Parker Road.

Extending the proposed HOV lanes from SR-14 to Parker Road will maximize the HOV potential in this portion of the I-5 corridor, consistent with the existing planned development in north Los Angeles County, and are logical termini for the proposed project. For optimum HOV operations, it is preferable to end or begin HOV lanes in a lane that enables the HOV traffic to continue their travel without forcing those vehicles to exit an HOV lane and merge into a general-purpose lane. Connection to the existing HOV lanes at the I-5/State Route 24 (SR-24) interchange will maintain continuous flow of traffic north into the Santa Clarita Valley. Extending the HOV lanes through the I-5/SR-126 interchange will allow traffic to merge with the mainline without interfering with the HOV traffic.

## 1.4 Project Alternatives

### 1.4.1 Build Alternatives

Both Build Alternatives (Alternatives 2 and 3) propose to widen the center median and the outside shoulder of the northbound and southbound lanes between SR-14 and south of Parker Road to accommodate HOV, additional auxiliary, and truck lanes. Both Build Alternatives would provide one HOV lane in each direction from the I-5/ SR-14 interchange to south of the Parker Road interchange. Both Build Alternatives would extend one northbound truck lane from where the truck lanes currently merge with northbound I-5 near the Weldon Canyon Road/I-5 overcrossing to the Calgrove Boulevard/I-5 interchange. Southbound truck climbing lanes are proposed between the Weldon Canyon Road overcrossing and Calgrove Boulevard interchange (two truck lanes) and from Calgrove Boulevard to south of the Pico Canyon Road/Lyons Avenue interchange (one truck lane).

Both Build Alternatives propose adding and/or extending auxiliary lanes in the northbound direction from SR-14 to the northbound truck lane merge, Calgrove Boulevard to Pico Canyon Road/Lyons Avenue, and Valencia Boulevard to Magic Mountain Parkway, and in the southbound direction between SR-126 and Rye Canyon Road, Rye Canyon Road and Magic Mountain Parkway, and Valencia Boulevard and McBean Parkway.

#### 1.4.1.1 Alternative 2 (Reduced Median Alternative) – Preferred Alternative

Alternative 2 proposes median and inside shoulder widths that are less than the California Department of Transportation (Caltrans) standard (48-foot [ft] median and less than 10 ft inside shoulders at median structure columns) within a maximum 210 ft cross section. The reduced minimum median width of 48 ft is measured from inside the Mixed Flow Lane (MFL), Edge of the Traveled Way (ETW), to inside the MFL ETW. Additional widening beyond the 48 ft minimum in the median area would be provided when necessary for horizontal stopping sight distance requirements. See Figure 1.2 for a typical cross section of Alternative 2. A 48 ft median would accommodate a 1 ft buffer, a 12 ft HOV lane, and a 10 ft inside shoulder. Shoulder widths along freeway ramps would be 8 ft. Alternative 2 would not provide for a 10 ft continuous inside shoulder (at column locations) or a 4 ft buffer between HOV and adjacent mixed-flow lanes. The HOV buffer would be 1 ft. The maximum cross

section width under Alternative 2 (210 ft) is intended to accommodate the proposed HOV and truck climbing lanes within the existing Caltrans right of way to the extent feasible to limit the number of right of way acquisitions.

Per Caltrans HOV lane guidelines, California Highway Patrol (CHP) enforcement areas are recommended every 2 mi. Based on Caltrans criteria, approximately five enforcement areas would be required within the 13.6 mi project limit. Additional width in the median (beyond the proposed 48 ft) is required to provide for those CHP enforcement areas and has been included in the design of the Reduced Median Alternative.

#### 1.4.1.2 Alternative 3 (Full Median Alternative)

The Full Median Alternative (Alternative 3) proposes construction of the truck climbing and HOV lanes consistent with Caltrans standards. The standard full median width of 62 ft is measured from inside MFL ETW to inside MFL ETW. The only exception to the 62 ft median width occurs in two areas north of the Pico Canyon Road/Lyons Avenue interchange, where the existing median is 60 ft wide. Previous improvements in this area were constructed based on a previous standard of 60 ft. The typical cross section for this alternative is a maximum of 245 ft, which includes 12 ft travel lanes, a 10 ft outside shoulder, and a continuous CHP enforcement area in the median. See the typical cross section provided in Figure 1.3 for an example of this design. The standard median width of 62 ft would accommodate a 4 ft buffer, a 12 ft HOV lane, a 10 ft inside shoulder, and an additional 4 ft inside shoulder for continuous CHP enforcement. The only exception to the 62 ft median width would be in two areas north of the Pico Canyon Road/Lyons Avenue interchange where the median width would be 60 ft. The additional width for the continuous enforcement area provides for continuous 10 ft inside shoulders at the structure column locations.

#### 1.4.1.3 Common Design Features of the Build Alternatives

Project features are shown in Figures 1.4, Alternative 2, and 1.5, Alternative 3, respectively. Common design features of both alternatives are described below.

***Permanent Project Components***

*Mainline Improvements (HOV, Truck, and Auxiliary Lanes)*

Both Build Alternatives propose:

- One HOV lane in the median in each direction from the I-5/SR-14 interchange (southern project limit) to south of the Parker Road interchange (northern project limit).
- One southbound truck lane south of Pico Canyon Road/Lyons Avenue and Calgrove Boulevard, and two southbound truck lanes from Calgrove Boulevard to just south of Weldon Canyon Road, where the truck bypass lanes (2) begin.
- Addition of one northbound truck lane from the I-5/SR-14 interchange to Calgrove Boulevard. All truck lanes would be built along the outside edge of the freeway.
- Auxiliary lanes in the northbound direction from SR-14 to Weldon Canyon Road, Calgrove Boulevard to Pico Canyon Road/Lyons Avenue, McBean Parkway to Valencia Boulevard, and Valencia Boulevard to Magic Mountain Parkway.
- Auxiliary lanes in the southbound direction between SR-126 and Rye Canyon Road, Rye Canyon Road and Magic Mountain Parkway, and Valencia Boulevard and McBean Parkway.
- Additional widening to provide standard horizontal stopping sight distance (SSD) (70 mph) on all 13 mainline horizontal curves.

### *Bridges*

Several bridge structures require widening and/or replacement under both Build Alternatives. Both Alternatives would require the replacement of Weldon Canyon Bridge. In addition, both Build Alternatives would require the widening of the following seven bridges: Gavin Canyon undercrossing, Calgrove Boulevard undercrossing, Butte Canyon Bridge, I-5/SR-26 Separation (Magic Mountain Parkway overcrossing), Santa Clara Overhead, Rye Canyon undercrossing, and Castaic Creek Bridge.

Both Build Alternatives propose to improve the vertical clearance and provide SSD (70 mph) for the southbound I-5 lanes at the Pico Canyon Road/Lyons Avenue overcrossing structure.

### *Major Drainage Facilities*

Drainage facilities are proposed at locations identified in the Preliminary Drainage Report to provide additional capacity for the existing drainage facilities based on the design flows established for the crossings. These facilities include the upsizing or replacement of existing culverts.

Water quality treatment devices include numerous vegetated swales to provide biofiltration, three detention basins, one gross solids removal device, and two Austin sand media filters. Depending on actual groundwater elevations, the detention basins may be able to function as infiltration basins. The locations of water quality treatment facilities will continue to be refined during final design.

### *Retaining Walls*

Retaining walls are required to retain fill or cut slopes to avoid impacts and additional right of way throughout the corridor.

Retaining walls are required in the median where the elevation differences between the northbound and southbound lanes exceed 2 ft. Median retaining walls are generally required between SR-14 and Valencia Boulevard and between SR-126 and Parker Road. The heights of the median retaining walls vary from 2 ft to 18 ft.

Retaining walls are also required along the outside shoulder in many locations throughout the project to reduce impacts and minimize additional right of way requirements. These wall locations for Alternative 2 are shown in Figure 1.4, and the wall locations for Alternative 3 are shown on Figure 1.5. The outside shoulder retaining walls' heights range from 2 ft to 39 ft.

### *Sound Barriers*

The project includes construction of sound barriers (SB) to reduce traffic noise associated with the proposed project. The following sound walls are considered reasonable and feasible on the basis of cost and effectiveness for both Alternatives 2 and 3:

- 10 ft sound barrier outside of Caltrans right of way adjacent to homes along Foxtail Court (SB No. 1-2).
- 6 ft sound barrier outside of Caltrans right of way adjacent to homes along The Old Road (SB No. 1-6).
- 10 ft sound barrier outside of Caltrans right of way, adjacent to homes along Los Arqueros and Playa Serena Drive (SB No. 2-1).
- 8 ft sound barrier for Alternative 2 and 12 ft sound wall for Alternative 3 outside of Caltrans right of way, adjacent to homes along Baviera Way (SB No. 2-2).
- 12 ft sound barrier outside of Caltrans right of way, adjacent to homes along Sycamore Meadow Drive (SB No. 2-3) for Alternative 2, and 14 to 16 ft for Alternative 3.

- 12 ft sound barrier outside of Caltrans right of way, adjacent to homes along Silver Aspen Way (SB No. 2-4).
- 16 ft sound barrier along the edge of shoulder within Caltrans right of way, adjacent to homes on Sandwedge Lane (SB No. 2-5)
- 6 ft sound barrier outside of Caltrans right of way, adjacent to homes along Altos Drive (SB No. 2-6).
- 6 ft sound barrier outside of Caltrans right of way, adjacent to the homes along Romeo Canyon Road (SB No. 3-3).
- 12 ft sound barrier outside of Caltrans right of way for Alternative 2, and 10 ft barrier for Alternative 3, adjacent to homes along Holmby Court (SB No. 3-7).
- 16 ft sound barrier along the edge of Caltrans right of way, adjacent to homes along Daisy Court (SB No. 3-11a).

Additional input from affected property owners would be obtained before the start of final design to confirm whether the walls would be constructed.

### *On- and Off-Ramps*

Modifications to all the on- and off-ramps in the project limits are required to transition to the mainline widening.

### *Utilities*

Utility relocations would be required in local roadways primarily at the transverse crossing of the mainline and, in some cases, adjacent to the Caltrans right of way to allow widening of the mainline. In general, the utility relocations are limited to areas where the local roadways cross I-5 at the interchanges and other structures and adjacent to the I-5 right of way where the widening encroaches onto the local roadway. Utilities to be relocated include general telephone cable, water lines, communication conduits, sewer lines, gas pipes, electrical lines, and oil transmission pipes.

### *Intelligent Transportation System (ITS) Facilities*

Both Build Alternatives would include the addition of the following ITS facilities:

- Five new Closed Circuit Television (CCTV) cameras
- Nine new Ramp Metering Stations/Traffic Monitoring Stations (RMS/TMS)
- A new communication conduit throughout the project from SR-14 to Parker Road
- The upgrading of four CCTV cameras
- The upgrading of 19 RMS/TMS stations

- Upgrading three Changeable Message Signs (CMS)
- Upgrading a Weigh-in-Motion system (WIM)

These elements would provide needed links and fill data gaps in the current ITS system and provide for more comprehensive corridor management.

### *Landscaping and Irrigation Systems*

Landscaping and irrigation systems would be provided where necessary within the corridor to provide aesthetic treatment, replacement planting, or mitigation planting for the project. The areas available for planting would be identified and coordinated with operations and maintenance to ensure consistency with their objectives and requirements. New irrigation systems would be designed to use reclaimed water (if available).

### *Design Exceptions*

Both Build Alternatives would require mandatory design exceptions for the spacing between interchanges from Rye Canyon Road to Magic Mountain Parkway and from Rye Canyon Road to SR-126. The spacing between these interchanges would be less than 1 mi.

The following advisory design exceptions would be required for both Build Alternatives: (1) 2:1 sideslopes instead of the standard 4:1 sideslopes; (2) a 26 ft standard between the outer edge-of-travel-way (ETW) of I-5 and the ETW of the frontage road for both Build Alternatives at various locations; (3) a median width of 22 ft under Alternative 2 and 30 to 36 ft under Alternative 3 rather than the standard 36 ft median; (4) outer separation distance, with guardrails and/or walls proposed where the separation distance is less than 26 ft; and (5) use of the Rye Canyon Interchange as a partial interchange, with all ramps not connecting to a single cross street.

## ***Temporary Project Components***

### *Construction*

A preliminary Transportation Management Plan has been developed and included in the Project Report.

Staging of the construction would be required for all ramp reconstruction, freeway widening, and profile adjustments. The number of through lanes would be maintained by restriping and shifting traffic on the existing lanes to maintain the existing

capacity. Closure of I-5 is not anticipated; however, temporary ramp closures are expected at various interchanges within the corridor.

The majority of the project involves widening the median area and the outside shoulder area of I-5 in two stages. Stage 1 involves placing temporary railing in the median area, constructing the median retaining walls and widening the median. Stage 2 involves placing temporary railing near the outside edge of traveled way, constructing outer retaining walls, and widening the proposed outside pavement. Widening of existing structures would be constructed in a similar sequence, with interior widening completed first, followed by exterior widening. Late-night closures in each direction may also be necessary for removal of the existing and construction of the new Weldon and Biscailuz Drive Overcrossings. Reconstruction at the ramp exit and entrances may require short-term closures.

The southbound lanes at the westbound to southbound loop on-ramp at the Pico Canyon Road/Lyons Avenue interchange would be closed for three to five months during the reconstruction of the profile of southbound I-5 to provide standard vertical clearance and improved SSD. The ramp provides access from westbound Pico Canyon Road to southbound I-5. The reconstruction of the profile would require shifting of the mainline travel lanes to the east to allow for the removal of material to lower the profile. During the closure period, the existing southbound on-ramp that serves eastbound Pico Canyon Road would be temporarily reconfigured to also allow left turns from westbound Pico Canyon Road to maintain the vehicle movement affected by the ramp closure. To allow left turns from westbound Pico Canyon Road onto the ramp, the westbound approach would require temporary restriping and a temporary two-phase traffic signal would be required to control the left turns and conflicting eastbound traffic.

All construction activities would be closely coordinated with other construction projects that are occurring. Existing state facilities such as changeable message signs, traffic cameras, and traffic count stations would also be protected during construction. Close coordination would also be needed with the City, the County, Caltrans, and the public to ensure that traffic along I-5 and surrounding streets remains at an acceptable level of operation during construction.

Construction activities are anticipated to occur between 2011 and 2015.

### *Construction Vehicle Access and Material Staging*

Construction vehicle access and staging of construction materials would occur within disturbed or developed areas inside the existing right of way or the proposed additional right of way. Vehicle access and materials staging during construction of walls adjacent to Caltrans right of way would occur in approved designated areas. All construction vehicle access, materials staging and storage, and other construction activities would occur within the defined disturbance limits for the project.

### *Construction Lighting*

The project would require nighttime construction activities in some parts of the project area, which would require use of portable equipment to light up the work areas.

### *Temporary Construction Easements*

Temporary construction easements (TCEs) would be necessary for constructing walls along the right of way, for the extension of major drainage facilities, for widening bridges, and for water quality improvements that extend outside of the existing right of way. Alternative 2 would require 18 TCEs and Alternative 3 would require 26 TCEs.

### ***Early Implementation Project (EIP)***

Partial funding of the truck lanes component allows these lanes to be constructed as an early phase of the project. Construction of these truck lane improvements have been identified as the Early Implementation Project (EIP). The EIP consists of construction of truck lanes from the SR-14 Interchange to south of the Pico Canyon Road/Lyons Avenue (Pico/Lyons) overcrossing. The construction of the truck lanes would be accomplished generally through widening into the existing median and shifting lanes to utilize the available width in the median and defer the major outside widening until the construction of the HOV lanes. Minor outside widening would be required to accommodate retaining walls or drainage features in some locations.

There are currently five lanes on northbound I-5 north of the State Route 14 (SR-14) interchange. Two are separated truck lanes. After the merge of the truck lanes to the I-5 mainline, the existing outside lane drops approximately 1,600 feet (ft) north of the Weldon Canyon/I-5 overcrossing. The EIP improvements in the northbound direction would include widening into the existing median to maintain five northbound lanes after the merge of the separated truck lanes just north of the Weldon Canyon Road/I-5 overcrossing to the Calgrove Boulevard interchange. The outside lane would become

the truck climbing lane as the general-purpose lanes would be shifted toward the median. The inside lane would be dropped south of the Calgrove Boulevard undercrossing structure to join the existing four northbound lanes. Dropping the inside lane rather than the outside lane is proposed to avoid weaving conflicts in advance of the northbound off-ramp to Calgrove Boulevard between exiting vehicles and slower trucks in the outside lanes.

On southbound I-5, there are currently five lanes south of the Pico/Lyons interchange. The existing outside lane drops immediately after the southbound on-ramp from the Pico/Lyons interchange. The EIP improvements in the southbound direction would include widening into the existing median to maintain five southbound lanes from south of the Pico/Lyons interchange to Calgrove Boulevard. The truck lanes would become the truck climbing lane and the general-purpose lanes would be shifted toward the median.

At the Calgrove Boulevard southbound on-ramp, a sixth lane would be added on southbound I-5. Six southbound lanes would continue over The Old Road on the Gavin Canyon undercrossing structures, which would also be widened. Two of the six southbound lanes would be dropped at the existing SR-14 interchange truck bypass lanes, while four lanes would join the existing I-5 lanes before the SR-14 general-purpose lane connector.

For the EIP, retaining walls would be constructed along the centerline of I-5, from north of Weldon Canyon Road to approximately 1,600 ft south of the Pico Canyon/Lyons interchange, to accommodate the grade difference between the northbound and southbound inside median widening. The wall heights would range from 5.9 to 18.3 ft, with an average height of 11 ft.

Minor outside widening is proposed along southbound I-5, north of Weldon Canyon Road overcrossing, which will require reconstruction of an existing retaining wall along an existing cut slope. Reconstruction of this retaining wall would also be required for the Build Alternatives.

Drainage improvements identified for the full project would be constructed with the EIP unless alternative analysis and justification is provided to defer the improvements until the full project is constructed. These drainage improvements would include an additional 12 ft by 12 ft box culvert (or alternative with equal capacity) at Drainage 39 (located east of I-5 just north of Calgrove Boulevard that receives flows from Drainage 40 via two 11 ft wide box culverts and a 4 ft diameter concrete pipe, as

well as several small corrugated metal pipes) and a 30-inch reinforced concrete pipe (RCP) at Drainage 53 (a series of earthen drainages and v-ditches located where The Old Road passes under I-5, south of Calgrove Boulevard). These drainage improvements would also be required for the Build Alternatives. All of the proposed improvements would be constructed within the grading limits previously identified for the Build Alternatives in the EIR/EA.

#### 1.4.1.4 Unique Features of the Build Alternatives

The following text discusses additional features to those discussed above that are unique to the two Build Alternatives.

***Permanent Project Components***

*Mainline Improvements*

Alternative 2 would have a reduced median width of 48 ft, no continuous CHP enforcement area, and nonstandard interchange ramp tapers.

Alternative 3 would have a standard median width of 62 ft (except in two areas north of the Pico/Lyons interchange where the existing median is 60 ft), a continuous CHP enforcement area, and standard interchange ramp tapers.

*Improvements to Adjacent Roadways*

Alternative 2 would not require the realignment of any adjacent roadways.

Alternative 3 would require the realignment of a portion of Coltrane Avenue and the restriping of a portion of The Old Road.

*Bridges*

In addition to modifications to the bridges discussed in Section 1.4.1, under Alternative 3 the Santa Clara River Bridge would be widened and Biscailuz Drive Overcrossing would be replaced.

*Sound Barriers*

In addition to the sound barriers discussed above under Section 1.4.1, the additional sound barriers are proposed to reduce traffic noise associated with either Alternative 2 or 3 only.

The following sound barrier is considered reasonable and feasible on the basis of cost and effectiveness for Alternative 2 only:

- A 10 ft sound barrier outside of Caltrans right-of-way, adjacent to homes along Desert Rose Drive (SB No. 3-8).

The following sound barrier is considered reasonable and feasible on the basis of cost and effectiveness for Alternative 3 only:

- A 16 ft sound barrier outside of Caltrans right of way, adjacent to homes along Saguaro Street and Apache Court (SB No. 3-9).

Additional input from affected property owners would be obtained before the start of final design to confirm whether the walls would be constructed.

### *Right-of-Way Acquisition*

Alternative 2 would require acquisition of two parcels for additional right of way. The acquisition would be limited to one partial parcel take and one full parcel take.

Alternative 3 would require acquisition of four parcels for additional right of way. The acquisition would be limited to three partial parcel takes and one full parcel take.

Both alternatives would require TCEs to provide access to construct the improvements.

### *Castaic Commercial Vehicle Enforcement Facility*

Alternative 3 would permanently remove one of three lanes at the Castaic Commercial Vehicle Enforcement Facility (Castaic CVEF) that is used to inspect vehicles/trucks, reducing the total number of lanes available to two. Modifications to the exiting facility would be needed to restore the existing available truck inspection capacity. Improvements would include expansion to the east to generate more usable area for the facility. This expansion would require conversion of the existing open channel into a covered pipe system to provide room for the ramps to be widened. Retaining walls would also be necessary.

### *Design Exceptions*

In addition to the design exceptions discussed in Section 1.4.1, Alternative 2 would require a mandatory design exception to the standard 10 ft inside shoulder at structure columns (a minimum 7.4 ft shoulder is proposed) and the standard 8 ft outside shoulder at the Magic Mountain Parkway northbound on-ramp (a 4 to 8 ft shoulder is proposed).

In addition, an advisory design exception is required where the entrance and exit convergence/divergence geometry is not met under Alternative 2 at ramps at SR-14, Calgrove Boulevard, Pico Canyon Road/Lyons Avenue, and Hasley Canyon. This design exception is needed to avoid reverse curves along ramps to tie back into existing ramps, realignment of frontage roads, higher or increased retaining walls and/or existing ditch reconstruction.

#### *Soil Balance*

Alternative 2 would result in approximately 216,000 cubic yards (cy) of excess soil material that would require disposal.

Alternative 3 would result in approximately 296,000 cy of excess soil material that would require disposal.

The preference is that the contractor would be responsible for determining where the soil would be exported/imported. Excess material would be recycled into the project as feasible. In the worst case, the soil would be exported to a landfill. The nearest two landfills that accept construction material are in Sun Valley, California.

#### *Cost*

The estimated cost for Alternative 2 is $456 million and the estimated cost for Alternative 3 is $590 million.

#### ***Temporary Project Components***

#### *Construction*

Under Alternative 3, the Biscailuz Drive/Honor Ranch Overcrossing would be constructed using a half width construction to maintain traffic flow on the overcrossing during construction. The three phases of a half width construction would be as follows: (1) Half of the new bridge would be constructed just north of the existing structure. Because the existing bridge structure is not impacted during this stage; it remains open to traffic. (2) The existing bridge would be removed and the remaining half of the proposed bridge would be constructed. Traffic would be shifted to the portion of the new bridge that was previously constructed. (3) The two halves of the newly constructed bridge would be joined.

### 1.4.2 No Build Alternative (Alternative 1)

The No Build Alternative would maintain the current configuration of the existing freeway. There would be no improvements to the mainline freeway, only approved/

pending local interchange improvements. Some of the known projects include the following:

- **Hasley Canyon Road/I-5 Interchange Improvements:** Construction ongoing, anticipated completion in 2009.
- **Rye Canyon Road/I-5 Southbound Ramp Improvements:** Construction anticipated to begin in 2009/2010 Fiscal Year.
- **Rye Canyon Road Widening:** Construction anticipated to begin in 2009/2010.
- **Magic Mountain Parkway/I-5 Interchange Improvements:** Phase 1 completed in April 2006. Phase 2 construction is ongoing and expected to be complete in 2009. Phase 3 currently has no funding.
- **The Old Road improvement projects (Widening of The Old Road from Magic Mountain Parkway to Turnberry Lane):** Draft Environmental Impact Report (EIR) anticipated for public review in early 2011. Phase I (Magic Mountain Parkway to Rye Canyon Road and replacement of the Santa Clara River Bridge) construction anticipated to begin in 2013. Phase II (Rye Canyon Road to Turnberry Lane) construction anticipated to begin as early as 2013.
- **The Old Road Widening (Parker Road to Hillcrest Parkway):** Project Study Report (PSR) equivalent approved January 25, 2007. Los Angeles County is currently performing environmental studies. Public review of the environmental document is tentatively scheduled for early 2010 . Schedule is contingent upon securing additional funding for the project.
- **I-5/SR-14 HOV Direct Connector Project:** Construction anticipated from 2008 to 2011.
- **I-5 HOV lanes from SR-118 to SR-14:** Construction completed. HOV lanes opened in April 2008.
- **I-5 Pavement Rehabilitation:** One project programmed with construction to begin in 2012/2013. Other projects to follow as funding becomes available.
- **Upgrade I-5 Median Barrier from South of Weldon Canyon Road to 530 ft north of Weldon Canyon:** Construction to begin in 2011.
- **Corridor ITS Improvements:** No project currently programmed. To be implemented with projects as appropriate until complete.
- **I-5 at Castaic Weight Station; Upgrade Weigh Station Facility:** Final Project Report/Environmental Document (PR/ED) approved in October 2008. Construction to begin in October 2010.

Under the No Build Alternative, the HOV and truck lanes would not be added and the congestion and operational problems in this segment would not be alleviated.

The No Build Alternative provides a baseline for comparing the impacts associated with the Build Alternatives since environmental reviews must consider the effects of not implementing the project.

### 1.4.3 TSM and Mass-Transit Alternatives

The Build Alternatives are part of a comprehensive strategy to address existing and forecast traffic congestion within north Los Angeles County. In June 2004, the North County Combined Highway Corridors Study was completed and provided a multimodal transportation plan for the northern portion of Los Angeles County, addressing both short- (2010) and long-range (2025) requirements to accommodate a variety of trip purposes, including travel (highways and transit) and goods movement (trucks) within and through the Study Area. This study was conducted by the Los Angeles Metropolitan Transportation Authority (Metro) in cooperation with the Cities of Lancaster, Los Angeles, Palmdale, and Santa Clarita and the County of Los Angeles.

The study developed a list of 11 conceptual alternatives for I-5 and SR-14 based on the results of a comprehensive scoping process conducted between October 2001 and March 2002. The process involved the study team, several dozen key study stakeholders, representatives from participating agencies, and a Technical Advisory Committee (TAC) composed of representatives of the sponsoring agencies, Caltrans, SCAG, and the FHWA and FTA.

The North County Transportation Coalition, composed of elected officials from Los Angeles County, north Los Angeles County cities, and the California State Legislature, provided policy oversight for the study.

Through a comprehensive public outreach process, the study identified and screened 11 conceptual scenarios to a short list of six feasible alternatives.

A locally preferred corridor strategy was developed through this process and includes both short-term and long-term recommendations.

The recommended short-term locally preferred strategy consists of:

- Adding an initial HOV lane in each direction between SR-14 and SR-126 and extending truck lanes north of SR-14 to Calgrove Avenue. This strategy increases capacity just north of the I-5/SR-14 interchange by nearly 50 percent.
- Increased Metrolink commuter rail and express bus services will be made available for I-5 travelers. The short-term strategy would triple the existing peak-hour express bus service and increase Metrolink commuter rail service from two peak-hour trains with a total of eight cars to three peak-hour trains with a total of 18 cars, more than doubling Metrolink commuter rail capacity in the corridor.

The recommended long-term locally preferred strategy as modified for corridor integration includes:

- Doubling the current four lanes to eight lanes in each direction between SR-14 and SR-126. This would provide two lanes for HOV use, two lanes for trucks and four lanes for general use. The increase in the number of lanes would accommodate the forecast for a doubling of I-5 travel demand by 2025.
- North of SR-126, one new HOV lane would be extended to Lake Hughes and a new truck lane would be added to the existing four lanes in each direction. Sizing of I-5 north of Lake Hughes was largely governed by anticipated through traffic rather than suburban development, and includes four general-purpose lanes and one truck climbing lane in each direction north to the Kern County Line.
- Transit service in the I-5 corridor would be tripled, with twice the number of Metrolink train departures and three times the number of commuter rail cars. Express bus departures in the peak period would increase fourfold over current levels.

This project proposes to complete portions of the identified highway improvements of the short- and long-range strategies consistent with other improvements in the corridor. The Transportation System Management (TSM) and transit elements of the locally preferred strategy within the corridor are being pursued and developed separately by Metro and other local agencies as part of the North County Combined Highway Corridor Study multimodal transportation plan.

### *Existing and Future Transit Opportunities*

The study area contains a variety of public transit options, including fixed-route and express bus services, park-and-ride lots, dial-a-ride, paratransit services, and Metrolink commuter rail, to address existing demand for public transit. Amtrak bus service links the Antelope Valley to the rail system in Bakersfield, where the

Southwest Chief line leaves for Victorville, and eastward through Las Vegas, Kansas City, and Chicago.

Transit operators in North County are aggressively expanding services and facilities to meet short-term demand, especially for north/south commuter express service. However, funded improvements are insufficient to address transit's emerging long-range role (which could be significantly greater if increased transit capacity receives priority) as a cost-effective remedy to some of the regional mobility challenges. Congestion will continue, requiring public transportation to carry more of the burden. A comprehensive multimodal transit framework that is an appropriate mix of rail and bus services is needed to support future urban growth, provide a backup to travel by automobile, and support a lifestyle less dependent on the automobile.

Various rail and bus services currently serve the north Los Angeles County area and many short- and long-term improvements are planned and programmed. The transit infrastructure includes transit centers, maintenance facilities, park-and-ride facilities, and transportation coordination. Many improvements to facilities and the service are proposed. The following discussion identified existing and programmed/proposed transit facilities within the north Los Angeles County area.

### *Passenger Rail*

The Southern California Regional Rail Authority (SCRRA) operates Metrolink, a five-county commuter rail network of over 400 mi. In the vicinity of the project area, Metrolink operates the Antelope Valley Line, which connects Palmdale/Lancaster and Santa Clarita to the Los Angeles Union Station and points in between, including San Fernando Valley, Burbank, and Glendale. Twelve weekday trains operate in each direction on the Antelope Valley Line. There are three Metrolink stations within the City of Santa Clarita: the Jan Heidt Newhall Metrolink Station, Santa Clarita Metrolink Station and Princessa Metrolink Station.

Metrolink's Short Range Plan includes improvements to the Antelope Valley line, which will allow more trains to serve the Newhall Metrolink Station and will also allow faster train travel (included in the 2008 RTIP). The Santa Clarita Transportation Development Plan indicates that Metrolink anticipates increasing the 24-train weekday schedule to 28 trains by 2010 and 32 trains by 2015. In addition, the number of cars and seats per trip will also expand. Track and facility improvements are proposed at the Sylmar, Santa Clarita, Vincent Grade, and Lancaster Metrolink stations. Signal upgrades are also proposed for the Antelope Valley Line. SCAG's

2008 RTP includes funding for the right of way procurement for additional land at the Santa Clarita Metrolink station and purchase of land and construction of a regional park-and-ride lot adjacent to the McBean Regional Transit Center park-and-ride.

### *Bus Services*

Within the project area, various agencies provide regional express service and local bus service. The City of Santa Clarita operates 10 regional express routes between Santa Clarita and the San Fernando Valley, West Los Angeles, and Downtown Los Angeles. In addition to the Santa Clarita and Newhall Metrolink Stations, the McBean Transfer Station (MTS) was recently developed to provide a transfer point. Antelope Valley Transit operates three commuter routes and a commuter service to Los Angeles International Airport (LAX). Nine park-and-ride lots are provided within the study area.

Santa Clarita operates seven local routes connecting various attractors in the City. Metrolink Station Link Series 500 Feeder buses operate between the Metrolink Stations and Magic Mountain, Central Valencia, Valencia Industrial Center, and Valencia Commerce Center. In addition to the local service routes, a Commuter Express Service is available Monday through Friday. The Commuter Express Service operates between Santa Clarita, downtown Los Angeles, various cities within northern Los Angeles County, Lancaster, and Palmdale.

Transit use has greatly increased in the north Los Angeles County area, and thus a number of improvements are planned. Several buses would be purchased for Santa Clarita. Additions to the University of California at Los Angeles (UCLA)/Century City and Downtown service are proposed. Additionally, the City is considering a North Hollywood and Universal City route, which would connect Santa Clarita to Metro's Red and Orange Line Stations. New routes between Canyon Country and Castaic and Downtown Los Angeles are also proposed.

In Antelope Valley, there are proposals to expand the existing passenger service as well as add new routes to Universal City where riders could connect to the Metro Red Line or Metro Rapid and to Pasadena that would connect to the Metro Gold Line. An additional route to serve Westwood and Wilshire only and reserve the existing route to serve only Century City and West Hollywood have been identified..

In addition to providing additional service and coaches, a number of system improvements are planned, including bus maintenance facilities, advanced

communications and monitoring systems, a Universal Fare System, ITS enhancements, transit priority strategies, and computer-aided dispatching.

The City of Santa Clarita is proposing to expand the existing park-and-ride lots and to consider a new park-and-ride lot in the Castaic area.

*Other TSM/TDM Improvements*

Currently, there is existing ramp metering at the on-ramps at Valencia Boulevard and on the northbound ramps at Pico Canyon Road/Lyons Avenue. With construction of the approved/pending projects listed in Section 1.4.1.5, ramp metering would be added at Magic Mountain Parkway, Hasley Canyon Road, and the southbound ramp at Rye Canyon Road. The project would maintain the existing and planned ramp metering.

As described above, the proposed project is a component of an integrated strategy for addressing long-term transportation issues in north Los Angeles County that includes commuter rail, regional and local bus, and roadway/freeway improvements. The proposed HOV lane would enhance the existing, programmed, and planned transit service within the north Los Angeles County, consistent with the overall transportation plan for this portion of the County. Upon completion of the project, a continuous HOV lane in each direction would extend from Parker Road to SR-134. Commuter buses would be able to access these lanes, speeding their commute and reducing auto trips as they continue to attract more riders. HOV lanes enhance the commuter bus experience by reducing travel time and providing more reliability in meeting their schedules. Given that the Build Alternatives are part of an integrated transportation program that includes passenger rail, and regional and local bus service improvements to address projected travel demand within north Los Angeles County, evaluation of TSM/TDM improvements beyond those identified in the North County Study and the local planning efforts of METRO and City of Santa Clarita Transit are not appropriate.

### 1.4.4 Comparison of the Alternatives

Table 1.H provides a summary/comparison of the design features of the project alternatives.

## Table 1.H Comparison of Alternatives

| Feature | Alternative 1 (No Build) | Alternative 2 (Reduced Median Alternative) – Preferred Alternative | Alternative 3 (Full Median Alternative) |
|---|---|---|---|
| HOV Lanes | No addition of HOV lanes | One HOV lane in each direction from the I-5/SR-14 interchange to south of the Parker Road interchange | One HOV lane in each direction from the I-5/SR-14 interchange to south of the Parker Road interchange |
| Truck Lanes | No addition of truck lanes | One truck lane northbound from where the truck lanes currently merge with northbound I-5 near the Weldon Canyon Road/I-5 interchange to the Calgrove Boulevard/I-5 interchange.<br><br>Southbound truck climbing lanes are proposed between the Weldon Canyon Road and Calgrove Boulevard interchanges (two truck lanes) and from Calgrove Boulevard to the Pico Canyon Road/Lyons Avenue interchange (one truck lane). | One truck lane northbound from where the truck lanes currently merge with northbound I-5 near the Weldon Canyon Road/I-5 interchange to the Calgrove Boulevard/I-5 interchange.<br><br>Southbound climbing lanes are proposed between Weldon Canyon Road and Calgrove Boulevard interchanges (two truck lanes) and Calgrove Boulevard to the Pico/Lyons interchange (one truck lane). |
| Auxiliary Lanes | No additional auxiliary lanes | Northbound:<br>• SR-14 to the northbound truck lane merge<br>• Calgrove Boulevard to Pico Canyon Road/Lyons Avenue<br>• Valencia Boulevard to Magic Mountain Parkway<br><br>Southbound<br>• SR-126 to Rye Canyon Road<br>• Rye Canyon Road to Magic Mountain Parkway<br>• Valencia Boulevard to McBean Parkway | Northbound:<br>• SR-14 to the northbound truck lane merge<br>• Calgrove Boulevard to Pico Canyon Road/Lyons Avenue<br>• Valencia Boulevard to Magic Mountain Parkway<br><br>Southbound:<br>• SR-126 to Rye Canyon Road<br>• Rye Canyon Road to Magic Mountain Parkway<br>• Valencia Boulevard to McBean Parkway |
| Median and inside shoulder widths | No improvements | 48 ft; less than 10 ft at structure columns | 62 ft; 10 ft |
| CHP enforcement area | No improvements | Five individual enforcement areas within the median | One continuous enforcement area in the median |
| Stopping site distance | No improvements | Standard horizontal SSD on all mainline curves | Standard horizontal SSD on all mainline curves |

## Table 1.H Comparison of Alternatives

| Feature | Alternative 1 (No Build) | Alternative 2 (Reduced Median Alternative) – Preferred Alternative | Alternative 3 (Full Median Alternative) |
|---|---|---|---|
| Bridges | No bridge replacement or widening | Replacement:<br>• Weldon Canyon Bridge<br><br>Widening:<br>• Gavin Canyon<br>• Calgrove<br>• Butte Canyon<br>• Magic Mountain (Route 5/126 Separation)<br>• Santa Clara Overhead<br>• Rye Canyon<br>• Castaic Creek<br><br>Standard vertical clearance at Pico/Lyons | Replacement:<br>• Weldon Canyon Bridge<br>• Biscailuz Drive Overcrossing<br><br>Widening:<br>• Gavin Canyon<br>• Calgrove<br>• Butte Canyon<br>• Magic Mountain (Route 5/126 Separation)<br>• Santa Clara Overhead<br>• Rye Canyon<br>• Castaic Creek<br>• Santa Clara River Bridge<br><br>Standard vertical clearance at Pico/Lyons |
| Drainage facilities | No modification of drainage facilities | • Gavin Canyon Tributary: Replace 30 in CMP with 30 in RCP<br>• Gavin Canyon Culvert : Add one 12 x 12 ft RCB or three 36 in RCP<br>• South Fork Santa Clara River Tributary: Add two 3 x 8 ft RCB or three 36 in RCP<br>• Tributary to Santa Clara River: Add 48 in reinforced concrete pipe (RCP)<br>• Tributary to Santa Clara River: Add 42 in RCP<br>• Tributary to Santa Clara River: Add 42 in RCP<br>• Tributary to Santa Clara River: Add two 8 x 6 ft RCB<br>• Tributary to Castaic Creek: Replace 30 in RCP with 42 in RCP<br>• Tributary to Castaic Creek: Replace 30 in RCP with | • Gavin Canyon Tributary: Replace 30 in CMP with 30 in RCP<br>• Gavin Canyon Culvert : Add one 12 x 12 ft RCB or three 36 in RCP<br>• S. Fork Santa Clara River Tributary: Add two 3 x 8 ft RCB or three 36 in RCP<br>• Tributary to Santa Clara River: Add 48 in RCP<br>• Tributary to Santa Clara River: Add 42 in RCP<br>• Tributary to Santa Clara River: Add 42 in RCP<br>• Tributary to Santa Clara River: Add two 8 x 6 ft RCB<br>• Tributary to Castaic Creek: Replace 30 in RCP with 42 in RCP<br>• Tributary to Castaic Creek: Replace 30 in RCP with |

## Table 1.H Comparison of Alternatives

| Feature | Alternative 1 (No Build) | Alternative 2 (Reduced Median Alternative) – Preferred Alternative | Alternative 3 (Full Median Alternative) |
|---|---|---|---|
| | | 42 in RCP | 42 in RCP |
| Water quality treatment | No water quality treatment | Vegetated swales, detention basins, gross solids removal device, Austin sand media filters, and possibly infiltration basins | Vegetated swales, detention basins, gross solids removal device, Austin sand media filters, and possibly infiltration basins |
| Retaining walls | No additional retaining walls | Median retaining walls between SR-14 and Valencia Boulevard and between SR-126 and Parker Road<br><br>Retaining walls along outside shoulder (shown in Figure 2.1); height ranging from 2 ft to 39 ft | Median retaining walls between SR-14 and Valencia Boulevard and between SR-126 and Parker Road<br><br>Retaining walls along outside shoulder (shown in Figure 2.1); height ranging from 2 ft to 39 ft |
| Sound walls | No additional soundwalls | Sound walls outside of Caltrans right-of-way adjacent to homes along Foxtail Court, Old Road, Los Arqueros and Playa Serena Drive, Baviera Way, Sycamore Meadow Drive, Silver Aspen Way, Altos Drive, Holmby Court, and Romeo Canyon Road. For Alt. 2 only, Desert Rose Drive. | Sound walls outside of Caltrans right-of-way adjacent to homes along Foxtail Court, Old Road, Los Arqueros and Playa Serena Drive, Baviera Way, Sycamore Meadow Drive, Silver Aspen Way, , Altos Drive, Holmby Court, and Romeo Canyon Road. For Alt. 3 only, Saquaro Street and Apache Court |
| Ramps | No improvements | Modification of all on- and off-ramps | Modification of all on- and off-ramps |
| Utilities | No utility relocation | Relocation of general telephone cable, water lines, communication conduits, sewer lines, gas pipes, electrical lines, and oil transmission pipes. | Relocation of general telephone cable, water lines, communication conduits, sewer lines, gas pipes, electrical lines, and oil transmission pipes. |
| ITS Facilities | No ITS facilities proposed | • 5 new Closed Circuit Television (CCTV) cameras<br>• 9 new Traffic Monitoring Stations/Ramp Metering Stations (TMS/RMS)<br>• New communication conduit throughout the project from SR-14 to Parker Road<br>• Upgrading of 4 CCTV cameras<br>• Upgrading of 19 TMS/RMS stations<br>• Upgrading of 3 Changeable Message Signs (CMS) | • 5 new Closed Circuit Television (CCTV) cameras<br>• 9 new Traffic Monitoring Stations/Ramp Metering Stations (TMS/RMS)<br>• New communication conduit throughout the project from SR-14 to Parker Road<br>• Upgrading of 4 CCTV cameras<br>• Upgrading of 19 TMS/RMS stations<br>• Upgrading of 3 Changeable Message Signs (CMS) |
| Landscaping and irrigation systems | No improvements | Landscaping and irrigation systems would be provided where necessary within the corridor to provide aesthetic treatment, replacement planting, or mitigation | Landscaping and irrigation systems would be provided where necessary within the corridor to provide aesthetic treatment, replacement planting, or |

## Table 1.H Comparison of Alternatives

| Feature | Alternative 1 (No Build) | Alternative 2 (Reduced Median Alternative) – Preferred Alternative | Alternative 3 (Full Median Alternative) |
|---|---|---|---|
| | | planting for the project. | mitigation planting for the project. |
| Construction | No construction activities | • Closure of southbound lanes at the westbound to southbound loop on-ramp at Pico Canyon Road/Lyons Avenue interchange<br>• Construction staging areas<br>• Nighttime construction lighting | • Closure of southbound lanes at the westbound to southbound loop on-ramp at Pico Canyon Road/Lyons Avenue interchange<br>• Construction staging areas<br>• Nighttime construction lighting |
| Temporary construction easements | No temporary construction easements | 18 temporary construction easements for:<br>• Construction of walls along the right of way<br>• Extension of major drainage facilities<br>• Bridge widening<br>• Water quality improvements that extend outside the right of way | 26 temporary construction easements for:<br>• Construction walls along the right of way<br>• Extension of major drainage facilities<br>• Bridge widening<br>• Water quality improvements that extend outside the right of way |
| Right of way acquisition | No right of way acquisition | • 1 partial parcel takes<br>• 1 full parcel take | • 3 partial parcel takes<br>• 1 full parcel take |
| Soil balance | No change in soil balance | Approximately 216,000 cy of exported material | Approximately 296,000 cy of exported material |

### 1.4.5 Identification of the Preferred Alternative

The Draft EIR/EA was circulated for public review between December 17, 2008, and February 17, 2009. A public hearing was held on February 5, 2009. All comments from the public hearing and those received during the public review period were reviewed by Caltrans.

After comparing and weighing the benefits and impacts of all of the feasible alternatives, as summarized in Summary Table S.2, the project development team has identified Alternative 2 (Reduced Median Alternative) as the Preferred Alternative for the I-5 HOV/Truck Lanes project. Caltrans has made the final determination of the project's impact on the environment based on the comments and concerns expressed during the public review period and the results of the engineering and environmental technical analysis, and the Preferred Alternative would attain the purpose of the project.

Alternative 2 would achieve the project's purpose by providing the same operational benefits to the freeway as Alternative 3, but it would have fewer impacts because of its smaller environmental footprint. The design of Alternative 2 does not include widening of the Santa Clarita River Bridge, encroachment into the Castaic CVEF, or reconstruction of the Biscailuz Drive/Honor Ranch Overcrossing. All three of these components are part of Alternative 3 and would result in greater environmental and/or community impacts than Alternative 2.

With the construction of Alternative 2, the proposed truck climbing lanes would reduce the delays to vehicles caused by the slower-moving trucks; improve the operational and safety design features with the addition of the HOV lanes, which would allow traffic to use the lanes more efficiently; and facilitate the movement of people, freight, and goods in the project area. Alternative 2 would reduce traffic congestion because of the improved traffic flow and would accommodate the planned growth within the project area. The HOV lanes provided in Alternative 2 would also lead to other enhanced transit options, such as an express bus facility.

As shown in Table S.2, Summary of Impacts, Alternative 2 would have fewer impacts to environmental resources than Alternative 3 since it has a smaller footprint design. Substantial difference in impacts between Alternatives 2 and 3 are highlighted below:

- Reduced number of partial acquisitions (one parcel for Alternative 2 versus three parcels for Alternative 3).
- No impacts occurring to Farmlands with Alternative 2. Alternative 3 affects 3.02 ac of Prime Farmland or Farmland of Statewide Importance.
- Reduced community and law enforcement impacts, as Alternative 2 maintains the CVEF, operated by the CHP, in its existing configuration and does not include reconstruction of the Biscailuz Drive overcrossing (which provides access to the Pitchess Detention Center).
- Reduced permanent impacts to oak woodland and individual oaks with Alternative 2 compared to Alternative 3.
- Reduced permanent impacts to jurisdictional waters/wetlands with Alternative 2 compared to Alternative 3.
- Reduced cumulative impacts associated with the temporal loss of oak trees.

After careful consideration of all the aforementioned concerns, and in further consideration of all other environmental analyses contained in the EIR/EA, Alternative 2 (Reduced Median Alternative) has been selected as the Preferred Alternative.

### 1.4.6 Alternatives Considered but Eliminated from Further Discussion

During preliminary studies, four project alternatives were identified and studied in the Project Study Report/Project Development Support (PSR/PDS) and Preliminary Environmental Assessment Report (PEAR). The four alternatives included Alternative 1 (No Build Alternative), Alternative 2 (Reduced Median Alternative), Alternative 3 (Full Median Alternative), and Alternative 4 (Transportation Concept Report [TCR] Alternative). As discussed below, the TCR Alternative (Alternative 4) was considered but dropped from consideration.

#### *TCR Alternative (Alternative 4)*

Alternative 4 would build out this roadway section to full buildout as considered in the TCR approved by Caltrans in November of 1998. Alternative 4 proposed adding two HOV lanes in each direction from the I-5/SR-14 interchange to a transition point north of Valencia Boulevard and south of Magic Mountain Parkway. From there, up to the northern project limit at the Parker Road interchange, it proposed the addition of one HOV lane. Alternative 4 also proposed extending the existing truck lanes in each direction from the I-5/SR-14 interchange to the northern project limit at the

Parker Road interchange. Alternative 4 proposed standard median and shoulder widths and CHP enforcement areas. This widening would require substantially more property acquisitions than the other Build Alternatives, resulting in greater disruption to the local community.

Given the larger footprint, impacts to biological resources and jurisdictional waters would be greater than the other Build Alternatives due to the larger roadway width, grading requirements, structure widening, and utility extensions. As the two Build Alternatives can be implemented with minimal additional right of way, Alternative 4 would require additional right of way and have major impacts beyond the two Build Alternatives brought forward for review.

In addition to the community and resource impacts described above, Alternative 4 is inconsistent with the segment of I-5 to the south. Currently, HOV lanes are being constructed south and through the SR-14 interchange. The current I-5 HOV lane project, immediately south of SR-14, is constructing only one HOV lane in each direction. Without two HOV lanes in each direction south of the I-5/SR-14 interchange, the double HOV lanes to the north would be inconsistent with the corridor improvements and cause operational issues at the transitions.

Given the greater level of environmental impacts and inconsistency with corridor improvements to the south of the project study area, the TCR Alternative has been withdrawn from further consideration.

### *Truck Lanes Only*

This alternative includes construction of one northbound and one southbound truck lane within the study corridor. These truck lanes would connect to the existing truck lanes located south of the project area. Implementation of this alternative would reduce the existing congestion that currently results from truck/vehicle conflicts (i.e., slow-moving vehicles and weaving limitations). Although congestion would be improved through the separation of trucks from mixed-flow traffic, construction of the truck lanes only would not completely address existing and forecast congestion within the study corridor previously described in Section 1.4.1, since the majority of vehicles are passenger cars, not trucks. As this alternative does not reduce congestion, it does not meet the purpose and need for the proposed project.

### *HOV Lanes Only*

This alternative includes construction of one northbound and one southbound HOV lane within the study corridor. These HOV lanes would connect to the HOV lanes

currently under construction south of the I-5/SR-14 interchange. Implementation of this alternative would address existing and forecast traffic congestion by reducing the number of vehicles using the facility. Congestion associated with truck/vehicle conflicts (i.e., slow-moving vehicles and weaving limitations) would not be addressed by this alternative. Construction of the HOV lanes only would address existing and forecast congestion within the study corridor but not the truck/vehicle conflicts previously described in Section 1.4.1. As this alternative does not improve goods movement in the corridor, it does not meet the purpose and need for the proposed project.

### *HOV Lanes with One Northbound and Southbound Truck Lane*

This alternative would construct two HOV lanes (one northbound and one southbound) and two truck lanes (one northbound and one southbound) within the project study area. Construction of the second truck lane from Calgrove Boulevard to SR-14 would be eliminated from the project. The construction of one versus two truck lanes was evaluated in the Traffic Analysis (October 2007).

As described in the Traffic Analysis, the operation of the truck lanes would be reduced by one Level of Service (LOS) (A to B) with the provision of one truck lane instead of two. Conversely, by providing two truck lanes, the LOS of the truck lanes improves by one LOS (from B to A).

A single truck lane in the uphill grade section is only able to accommodate the slowest trucks since the faster (e.g., unloaded) trucks, will use the outside mixed-flow lane to pass the slower trucks. Observed conditions indicate that due to the grade the faster trucks travel at a speed slower than the free-flow speed of passenger vehicles, thus reducing the average speeds in the mixed-flow lanes. Providing two truck lanes would allow the faster trucks to pass the slower trucks without impacting the adjacent mixed-flow lanes, and improved LOS for both the trucks and the vehicles in the mixed-flow lanes would result. The analysis indicates that providing two truck lanes improves the LOS of the mixed-flow lanes by one LOS from D to C. Since provision of one truck lane did not provide the same operational improvements identified for the Build Alternatives, it was determined to be less effective at achieving the purpose and need and was withdrawn from further consideration.

### *Mixed-Flow Lanes*

This alternative would construct one northbound and one southbound mixed-flow lane within the study corridor. Construction of the mixed-flow lanes would result in a

cross section consisting of five mixed-flow lanes in each direction. South of the project area, I-5 has four mixed-flow lanes in each direction. North of the study area, I-5 has four mixed-flow lanes in each direction. Thus, construction of the mixed-flow lanes would result in bottlenecks at the northerly and southerly ends of the project area, where the widened mainline would have to merge with the smaller facility width. Currently, there are no plans to widen I-5 north and south of the project area. Given that chokepoints would be generated at the northern and southern termini of the project area due to the lane limitations, construction of mixed-flow lanes within the study corridor was determined not feasible.

### *Directional-Flow HOV Lane*

This alternative provides for one HOV lane in the median of the freeway, which would allow traffic use in a southerly direction during the a.m. peak hour and a northerly direction in the p.m. peak hour, the general commuting pattern out of and into the Santa Clarita Valley. Provision of a directional-flow HOV lane would not be feasible given the topographic constraints within the existing median and the design of the existing bridge structures within the study corridor. Currently, the existing median is in a split-grade configuration in several areas, which would not be conducive to construction of a single HOV lane. Additionally, all of the bridges in the study area have center columns located in the median. To provide for a single HOV lane, these bridges would need to be redesigned to remove/alter the center column or the lane would have to weave through the bridges to avoid the columns. Given the existing topographic and structural constraints in the corridor, construction of a directional-flow HOV lane was determined not to be feasible.

## 1.5 Anticipated Permits and Approvals Needed

Table 1.I identifies the permits and/or approvals that are or may be required prior to or during construction of the project.

## Table 1.I Permits and/or Approvals Needed

| Permit/Approval | Agency | Status |
|---|---|---|
| Encroachment Permit | County of Los Angeles | Coordination will occur after environmental document approval. |
| Streambed Alteration Agreement (Section 1600) | California Department of Fish and Game (CDFG) | Application will be submitted after environmental document approval. |
| Section 402 NPDES (Construction Activity) | Los Angeles Regional Water Quality Control Board | Application will be submitted prior to construction. |
| Section 402 NPDES (Groundwater Dewatering) | Los Angeles Regional Water Quality Control Board | Application will be submitted prior to construction. |
| Section 401 Permit | Los Angeles Regional Water Quality Control Board | Application will be submitted after environmental document approval. |
| Section 404 Permit (Individual or Nationwide[1]) | United States Army Corps of Engineers (ACOE) | Application will be submitted after environmental document approval. |
| Section 7 Informal Consultation for Threatened and Endangered Species | United States Fish and Wildlife Service | Completed |
| Flood Control Permit | County of Los Angeles | Coordination will occur after environmental document approval. |

[1] After receipt of the Section 404 Permit application, the ACOE will determine whether an Individual or Nationwide Permit is applicable.

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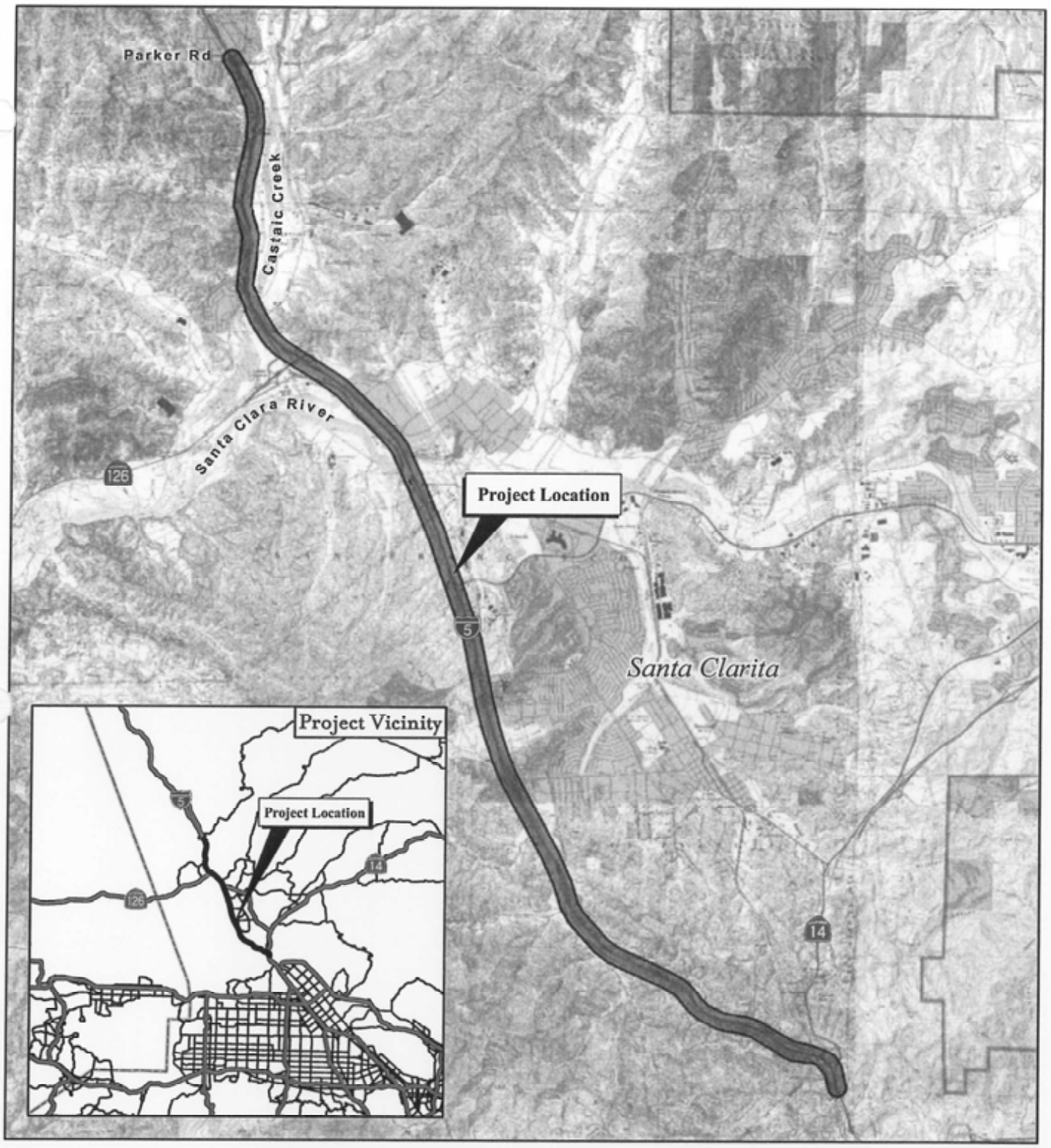


FIGURE 1.1

LEGEND

Project Location

N

0 3,750 7,500 Feet

*I-5 HOV / Truck Lanes Project*

Project Location

07-LA-5 PM R45.4/R59.0

EA 2332E0

SOURCE: USGS 7.5' QUAD, CALIF.

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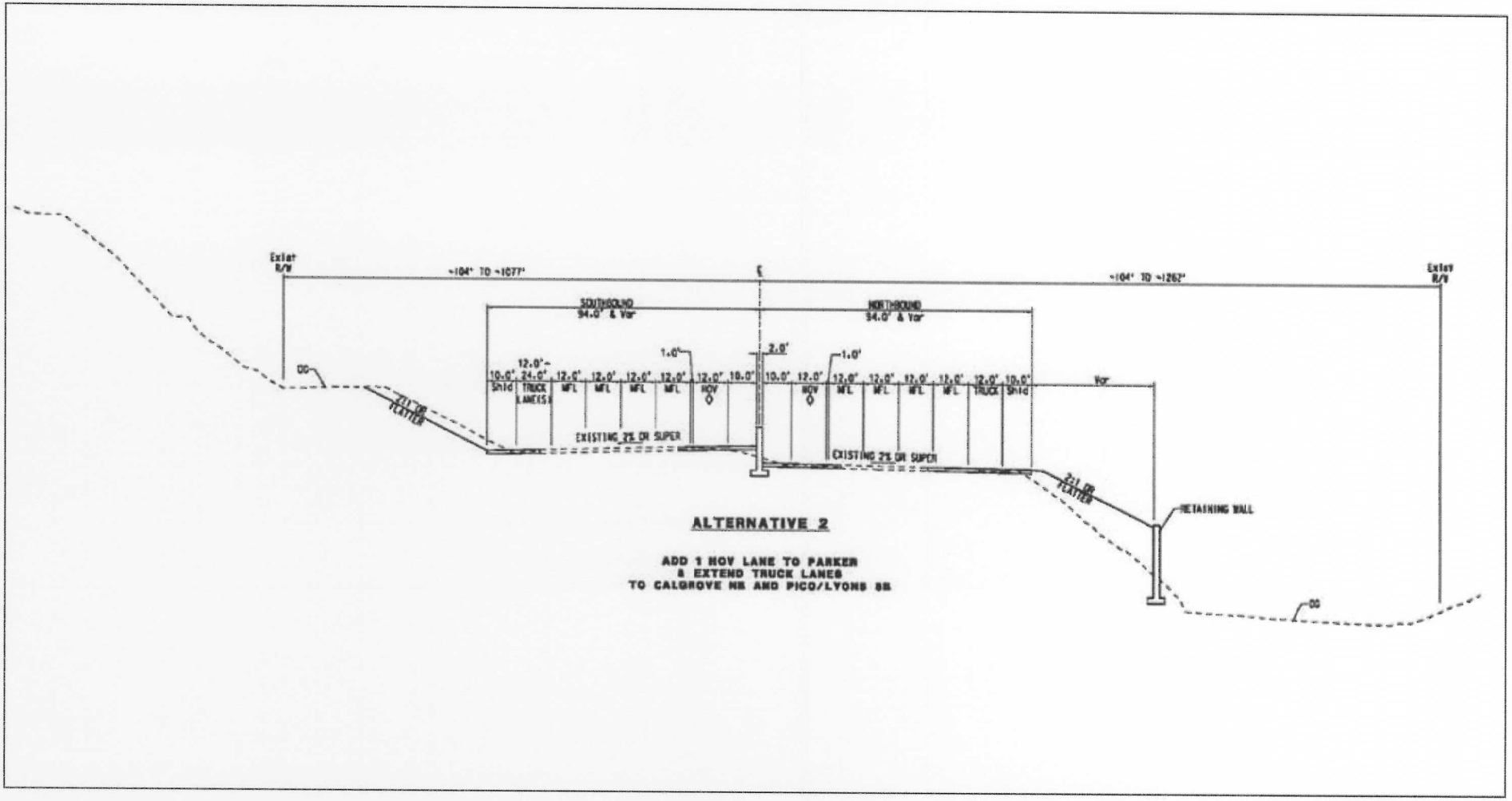


FIGURE 1.2

*I-5 HOV / Truck Lanes Project*

Alternative 2 Typical Cross Section

07-LA-5 PM R45.4/R59.0

EA 2332E0

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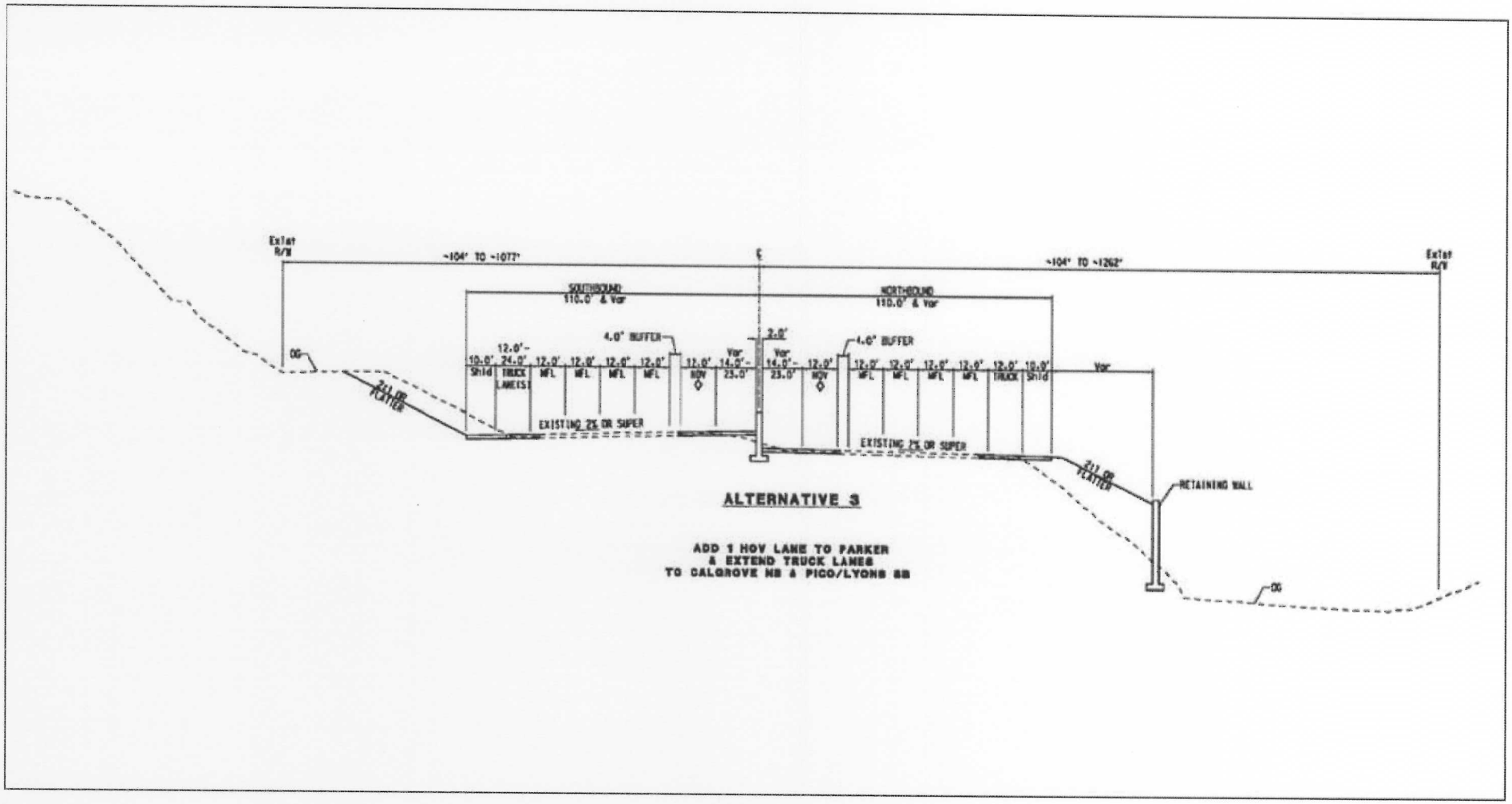


FIGURE 1.3

*I-5 HOV / Truck Lanes Project*
Alternative 3 Typical Cross Section
07-LA-5 PM R15.4/R59.0
EA 2332E0

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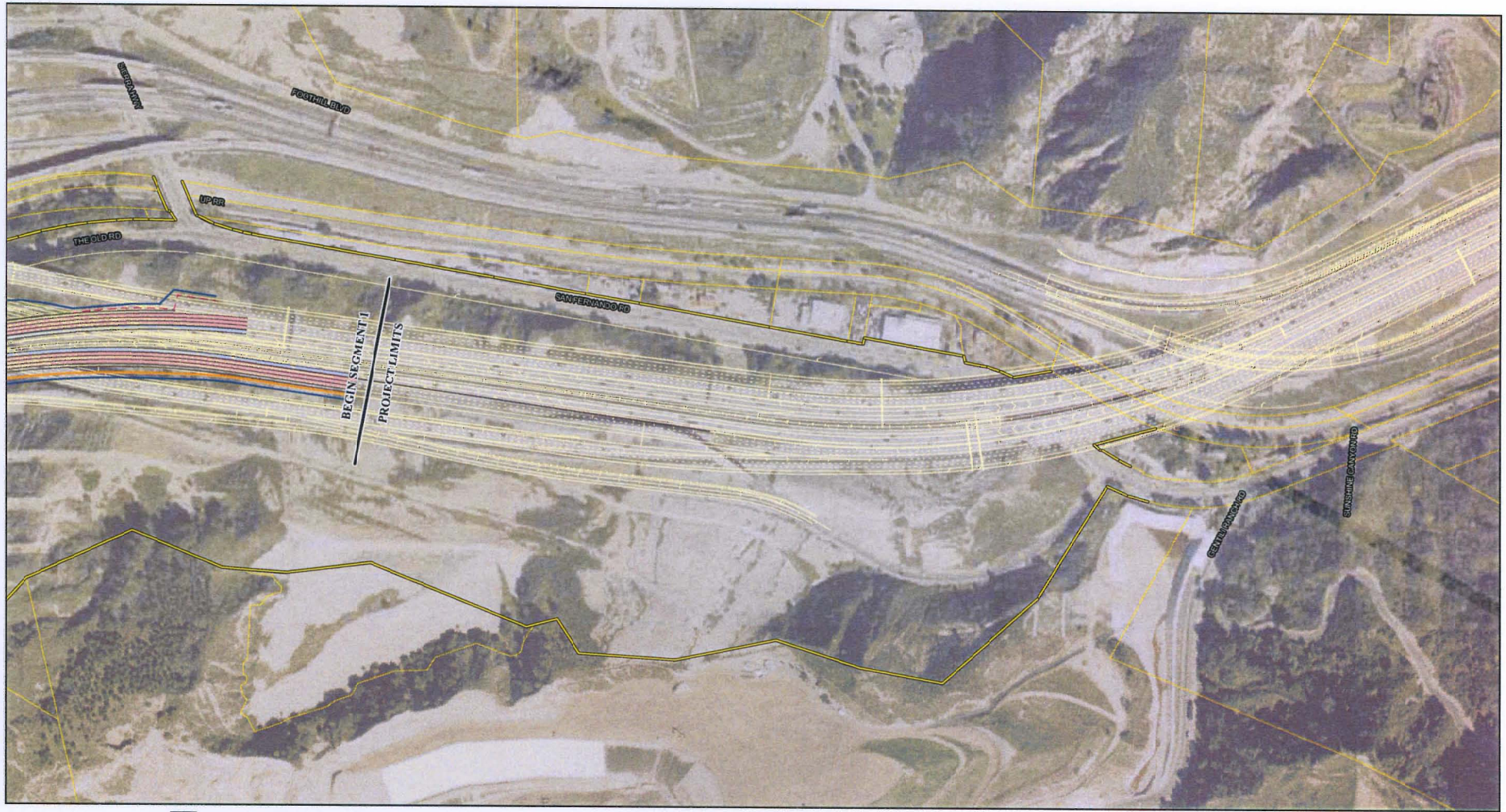


Potential Water Treatment Basin
Potential Construction Staging Area
Proposed Alignment
Existing Right-of-Way
Proposed Right-of-Way
Parcel Boundary
Disturbance Line
Temporary Construction Easement (TCE)
Structure to be Widened or Replaced
Toe of Fill
Top of Cut
Potential Retaining Wall
Existing Retaining Wall
Proposed Drainage Improvements
Improvements by Others
Existing Length of AUX Lane/ Extend Ramp
HOV Lanes
MFL Lanes
Proposed AUX Lanes
Truck Lanes
Unimproved Lanes/No Improvements

0 150 300 Feet

SOURCE: Psomas (2008).

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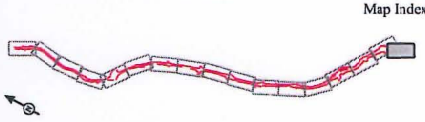
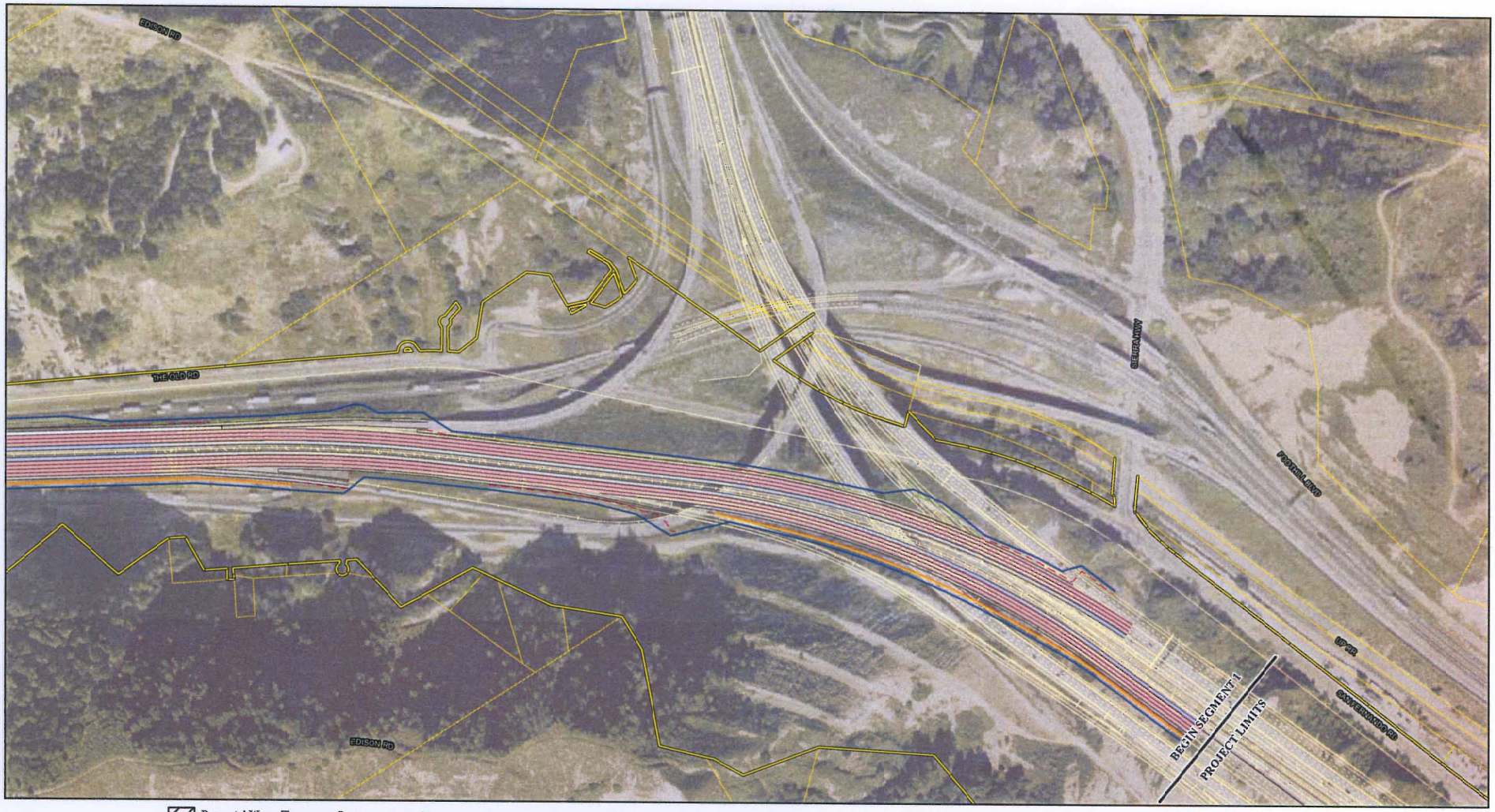


FIGURE 1.4
Sheet 1 of 17

*I-5 HOV/Truck Lanes Project*
Alternative 2 - Project Features
07-LA-5 PM R45.4/R59.0
EA 2332E0




Potential Water Treatment Basin
Potential Construction Staging Area
Proposed Alignment
Existing Right-of-Way
Proposed Right-of-Way
Parcel Boundary
Disturbance Line
Temporary Construction Easement (TCE)
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Existing Retaining Wall
Proposed Drainage Improvements
Improvements by Others
Existing Length of AUX Lane/ Extend Ramp
HOV Lanes
MFL Lanes
Proposed AUX Lanes
Truck Lanes
Unimproved Lanes/No Improvements

0 150 300 Feet

SOURCE: Psomas (2008).

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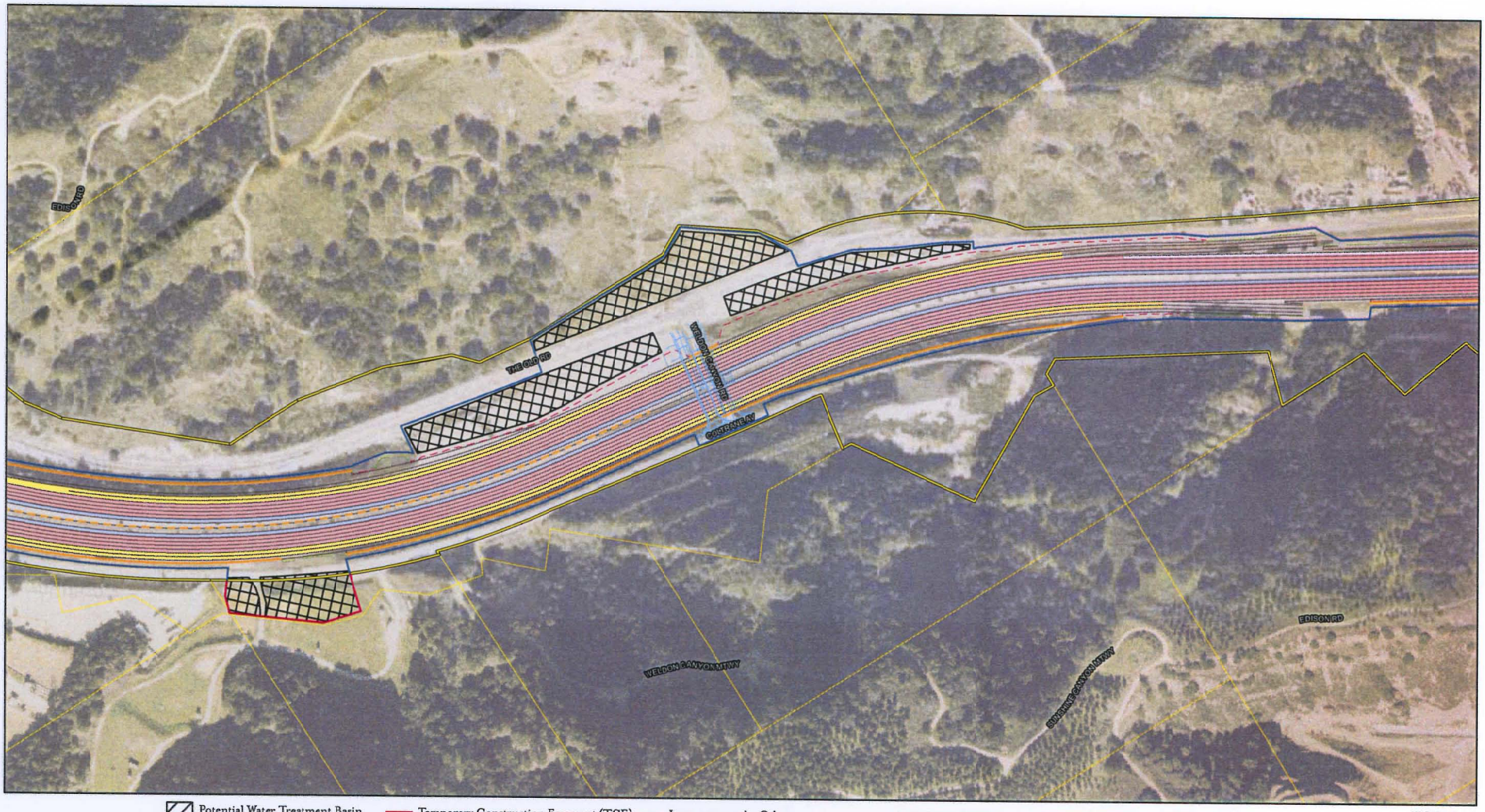
FIGURE 1.4
Sheet 2 of 17

*I-5 HOV/Truck Lanes Project*
Alternative 2 - Project Features
07-LA-5 PM R45.4/R59.0
EA 2332E0




Potential Water Treatment Basin
Potential Construction Staging Area
Proposed Alignment
Existing Right-of-Way
Proposed Right-of-Way
Parcel Boundary
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Temporary Construction Easement (TCE)
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HOV Lanes
MFL Lanes
Proposed AUX Lanes
Truck Lanes
Unimproved Lanes/No Improvements

0 150 300 Feet

SOURCE: Psomas (2008).

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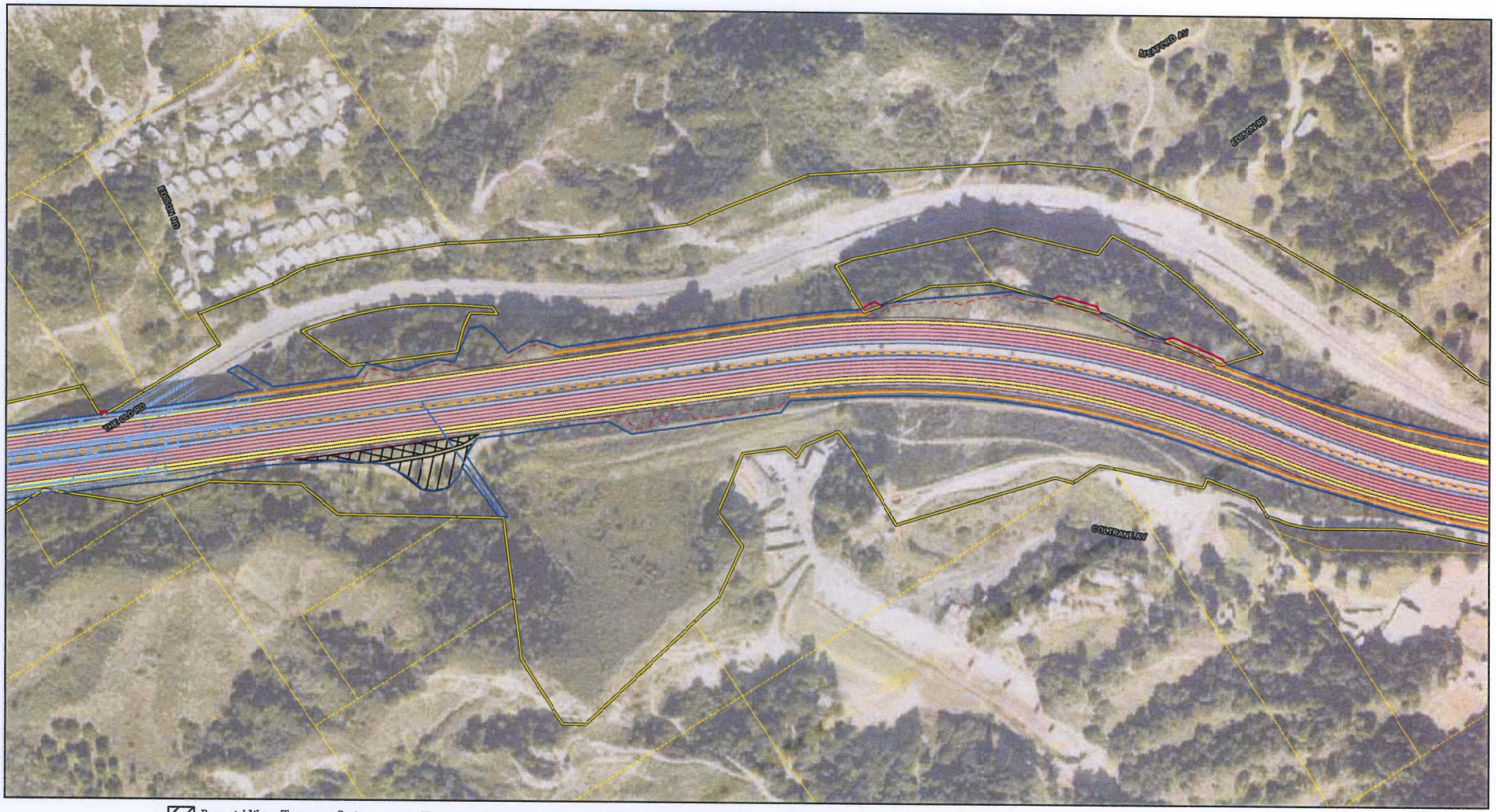
FIGURE 1.4
Sheet 3 of 17

*I-5 HOV/Truck Lanes Project*
Alternative 2 - Project Features
07-LA-5 PM R45.4/R59.0
EA 2332E0




Potential Water Treatment Basin
Potential Construction Staging Area
Proposed Alignment
Existing Right-of-Way
Proposed Right-of-Way
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Temporary Construction Easement (TCE)
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Improvements by Others
Existing Length of AUX Lane/ Extend Ramp
HOV Lanes
MFL Lanes
Proposed AUX Lanes
Truck Lanes
Unimproved Lanes/No Improvements

0 150 300 Feet

SOURCE: Psomas (2008).

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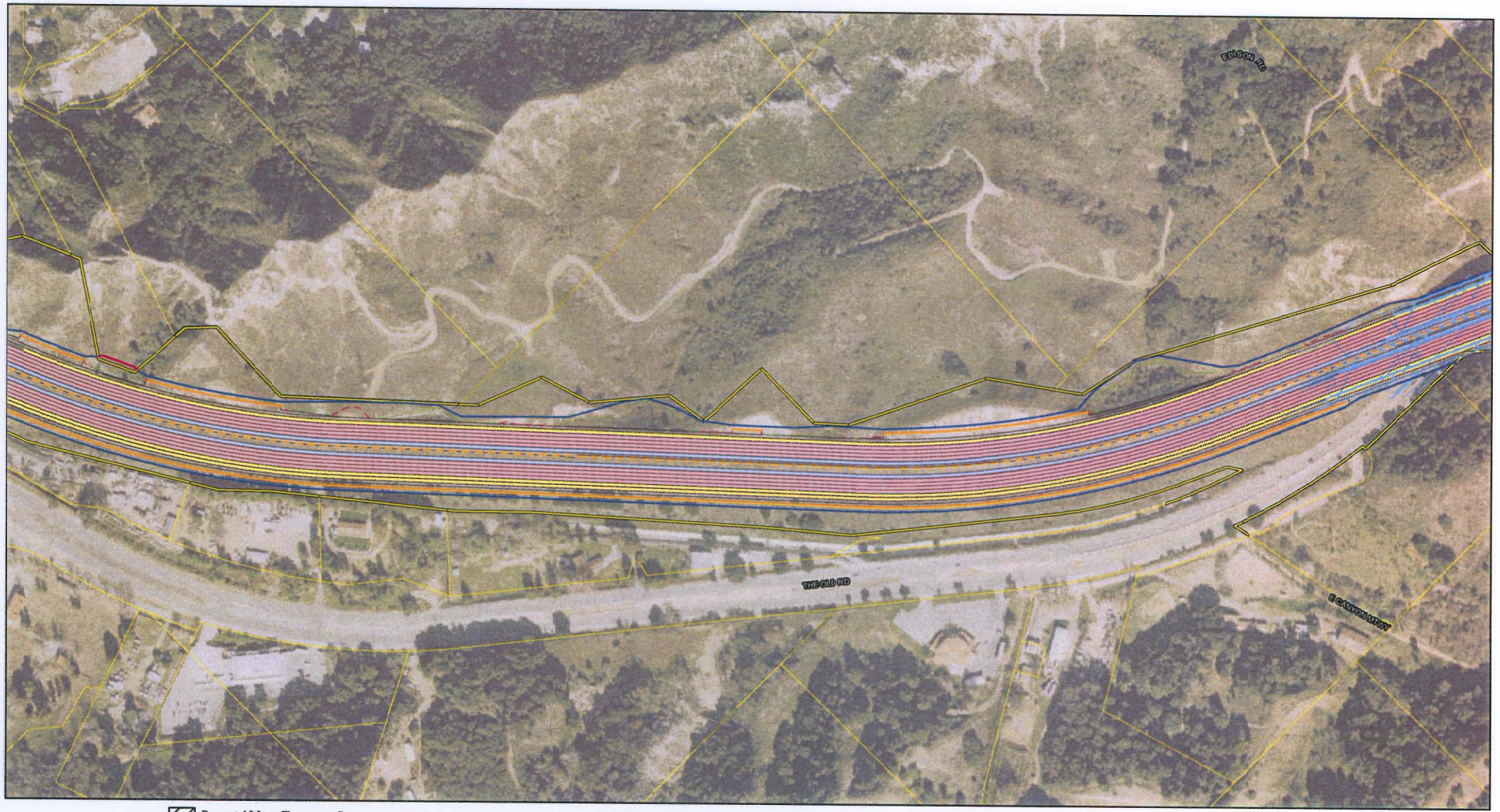
FIGURE 1.4
Sheet 4 of 17

*I-5 HOV/Truck Lanes Project*
Alternative 2 - Project Features
07-LA-5 PM R45.4/R59.0
EA 2332E0




Potential Water Treatment Basin
Potential Construction Staging Area
Proposed Alignment
Existing Right-of-Way
Proposed Right-of-Way
Parcel Boundary
Disturbance Line
Temporary Construction Easement (TCE)
Structure to be Widened or Replaced
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Existing Retaining Wall
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Improvements by Others
Existing Length of AUX Lane/ Extend Ramp
HOV Lanes
MFL Lanes
Proposed AUX Lanes
Truck Lanes
Unimproved Lanes/No Improvements

0 150 300 Feet

SOURCE: Psomas (2008).

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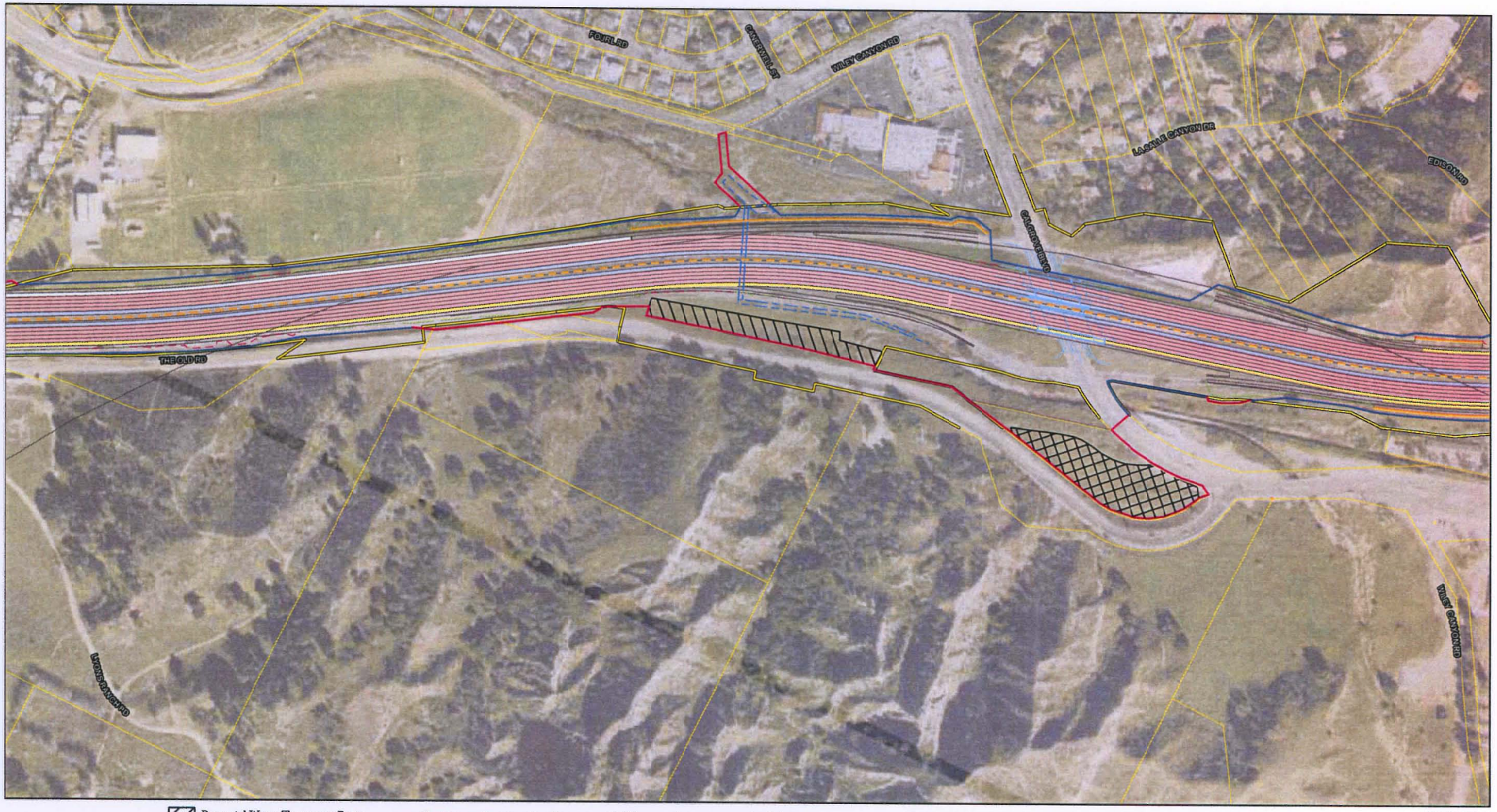
FIGURE 1.4
Sheet 5 of 17

*I-5 HOV/Truck Lanes Project*
Alternative 2 - Project Features
07-LA-5 PM R45.4/R59.0
EA 2332E0




Potential Water Treatment Basin
Potential Construction Staging Area
Proposed Alignment
Existing Right-of-Way
Proposed Right-of-Way
Parcel Boundary
Disturbance Line
Temporary Construction Easement (TCE)
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Existing Retaining Wall
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Improvements by Others
Existing Length of AUX Lane/ Extend Ramp
HOV Lanes
MFL Lanes
Proposed AUX Lanes
Truck Lanes
Unimproved Lanes/No Improvements

0 150 300 Feet

SOURCE: Psomas (2008).

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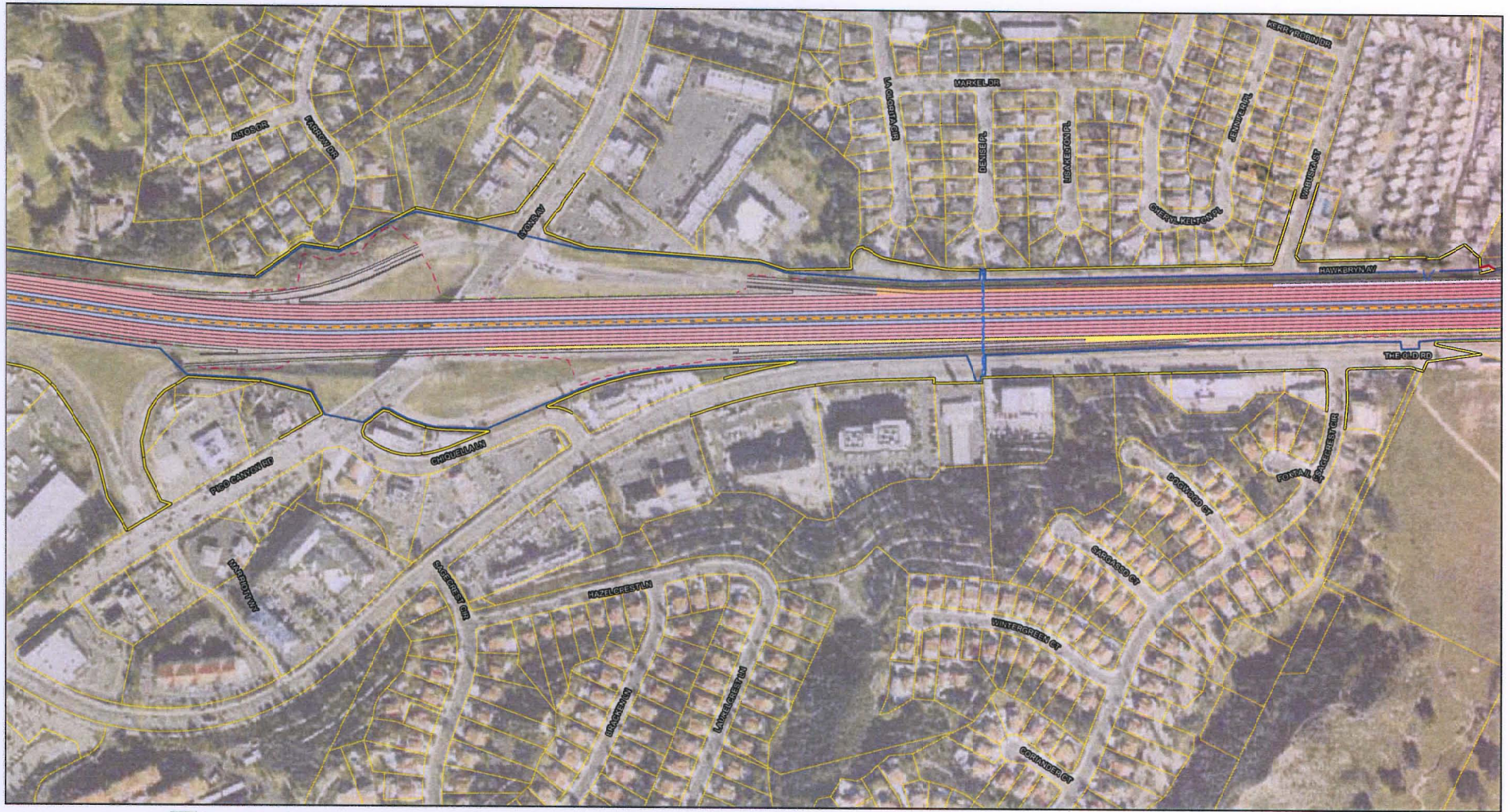
FIGURE 1.4
Sheet 6 of 17

*I-5 HOV/Truck Lanes Project*
Alternative 2 - Project Features
07-LA-5 PM R45.4/R59.0
EA 2332E0




Potential Water Treatment Basin
Potential Construction Staging Area
Proposed Alignmen:
Existing Right:-of-Way
Proposed Right-of-Way
Parcel Boundary
Disturbance Line

Temporary Construction Easement (TCE)
Structure to be Widened or Replaced
Toe of Fill
Top of Cut
Potential Retaining Wall
Existing Retaining Wall
Proposed Drainage Improvements

Improvements by Others
Existing Length of AUX Lane/ Extend Ramp
HOV Lanes
MFL Lanes
Proposed AUX Lanes
Truck Lanes
Unimproved Lanes/No Improvements

0 150 300 Feet

SOURCE: Psomas (2008).

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FIGURE 1.4
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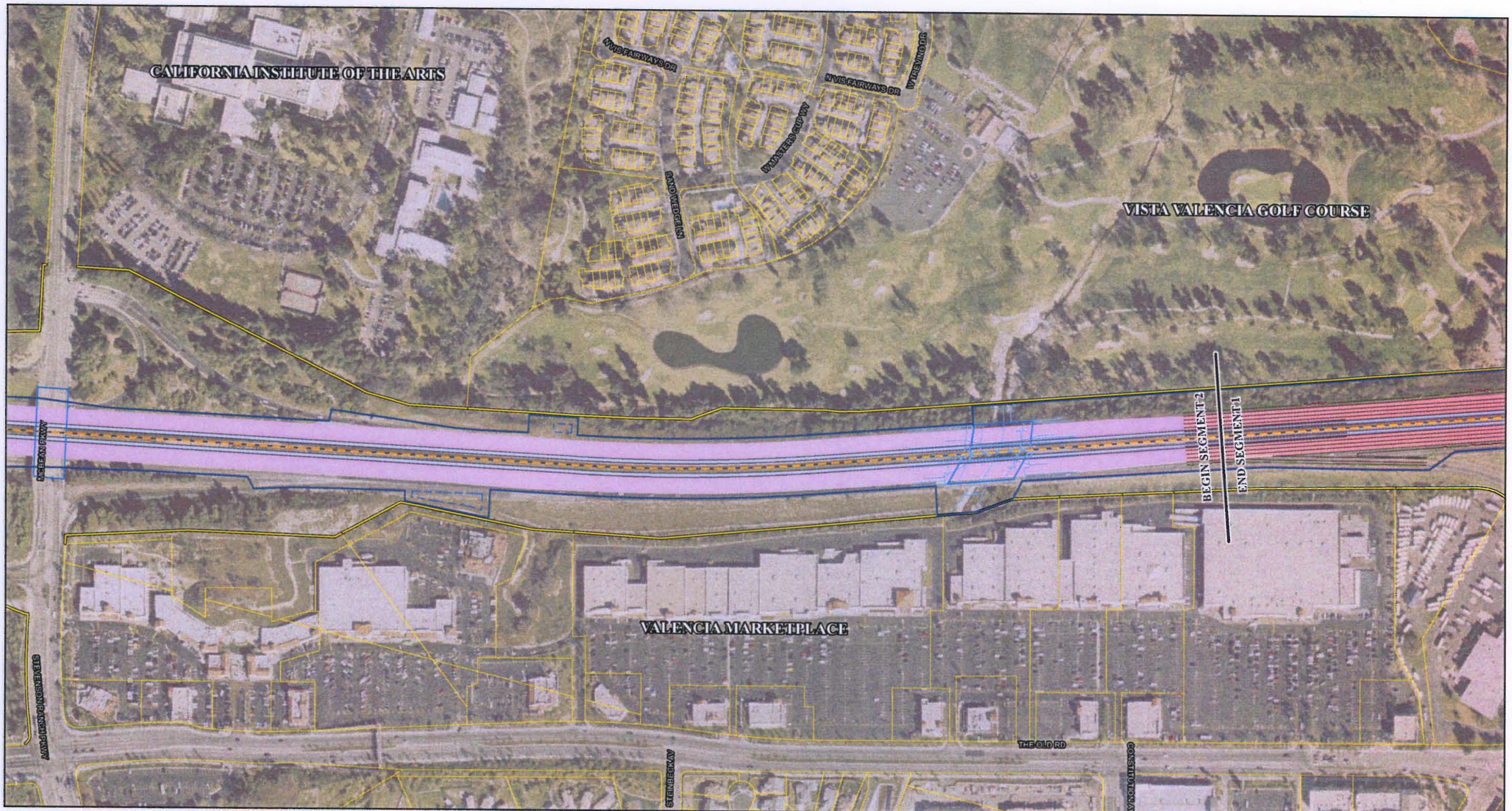
*I-5 HOV/Truck Lanes Project*
Alternative 2 - Project Features
07-LA-5 PM R45.4/R59.0
EA 2332E0




Potential Water Treatment Basin
Potential Construction Staging Area
Proposed Alignment
Existing Right-of-Way
Proposed Right-of-Way
Parcel Boundary
Disturbance Line
Temporary Construction Easement (TCE)
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Existing Length of AUX Lane/ Extend Ramp
HOV Lanes
MFL Lanes
Proposed AUX Lanes
Truck Lanes
Unimproved Lanes/No Improvements

0 150 300 Feet

SOURCE: Psomas (2008).

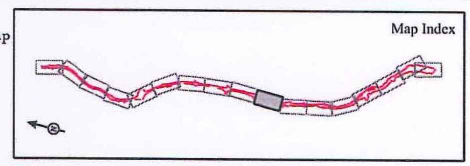


FIGURE 1.4
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*I-5 HOV/Truck Lanes Project*
Alternative 2 - Project Features
07-LA-5 PM R45.4/R59.0
EA 2332E0

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Potential Water Treatment Basin
Potential Construction Staging Area
Proposed Alignment
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Proposed Right-of-Way
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HOV Lanes
MFL Lanes
Proposed AUX Lanes
Truck Lanes
Unimproved Lanes/No Improvements

0 150 300 Feet

SOURCE: Psomas (2008).

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FIGURE 1.4
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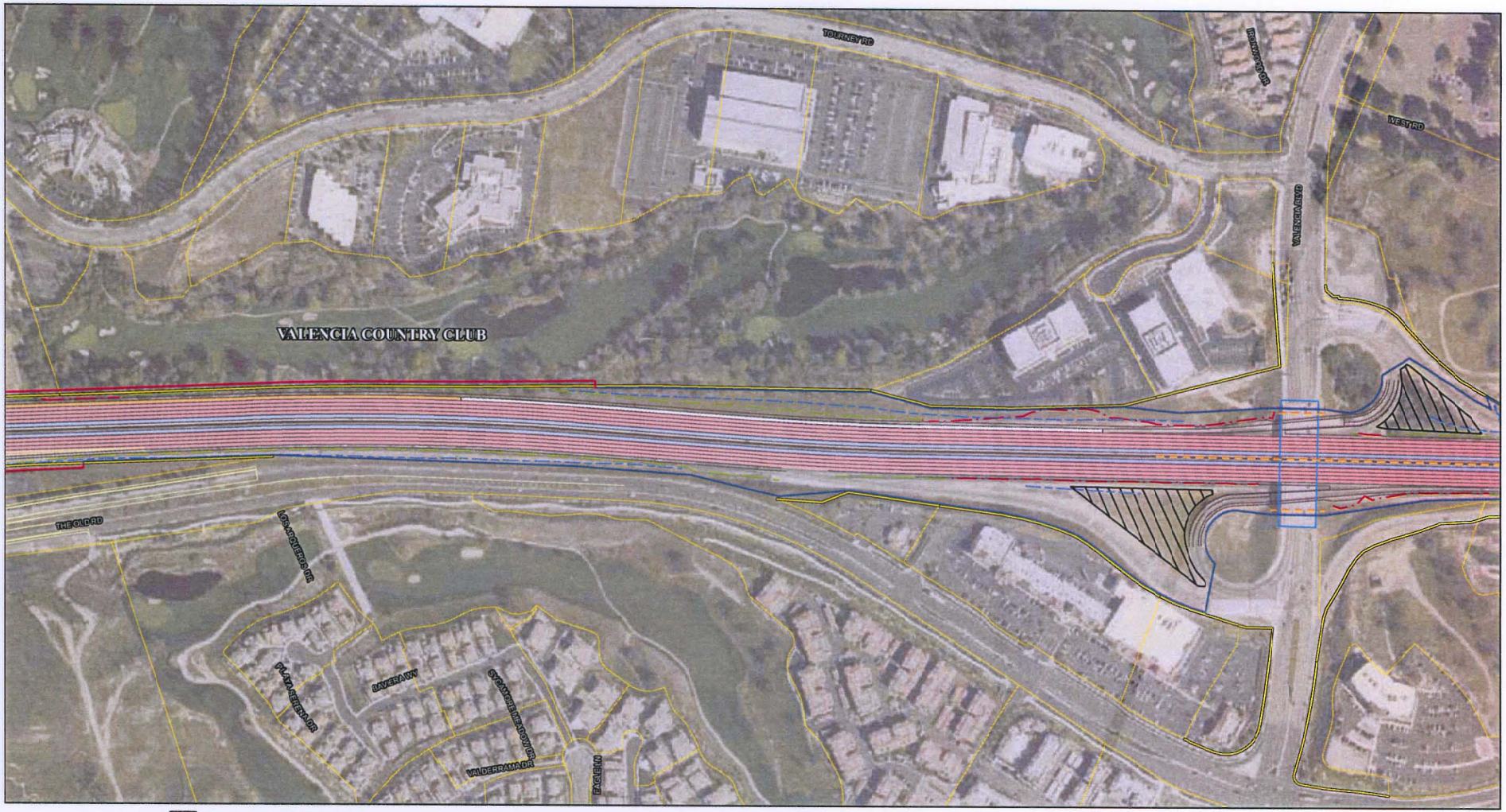
*I-5 HOV/Truck Lanes Project*
Alternative 2 - Project Features
07-LA-5 PM R45.4/R59.0
EA 233E0




Potential Water Treatment Basin
Potential Construction Staging Area
Proposed Alignment
Existing Right-of-Way
Proposed Right-of-Way
Parcel Boundary
Disturbance Line

Temporary Construction Easement (TCE)
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Toe of Fill
Top of Cut
Potential Retaining Wall
Existing Retaining Wall
Proposed Drainage Improvements

Improvements by Others
Existing Length of AUX Lane/ Extend Ramp
HOV Lanes
MFL Lanes
Proposed AUX Lanes
Truck Lanes
Unimproved Lanes/No Improvements

0 150 300 Feet

SOURCE: Psomas (2008).

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FIGURE 1.4
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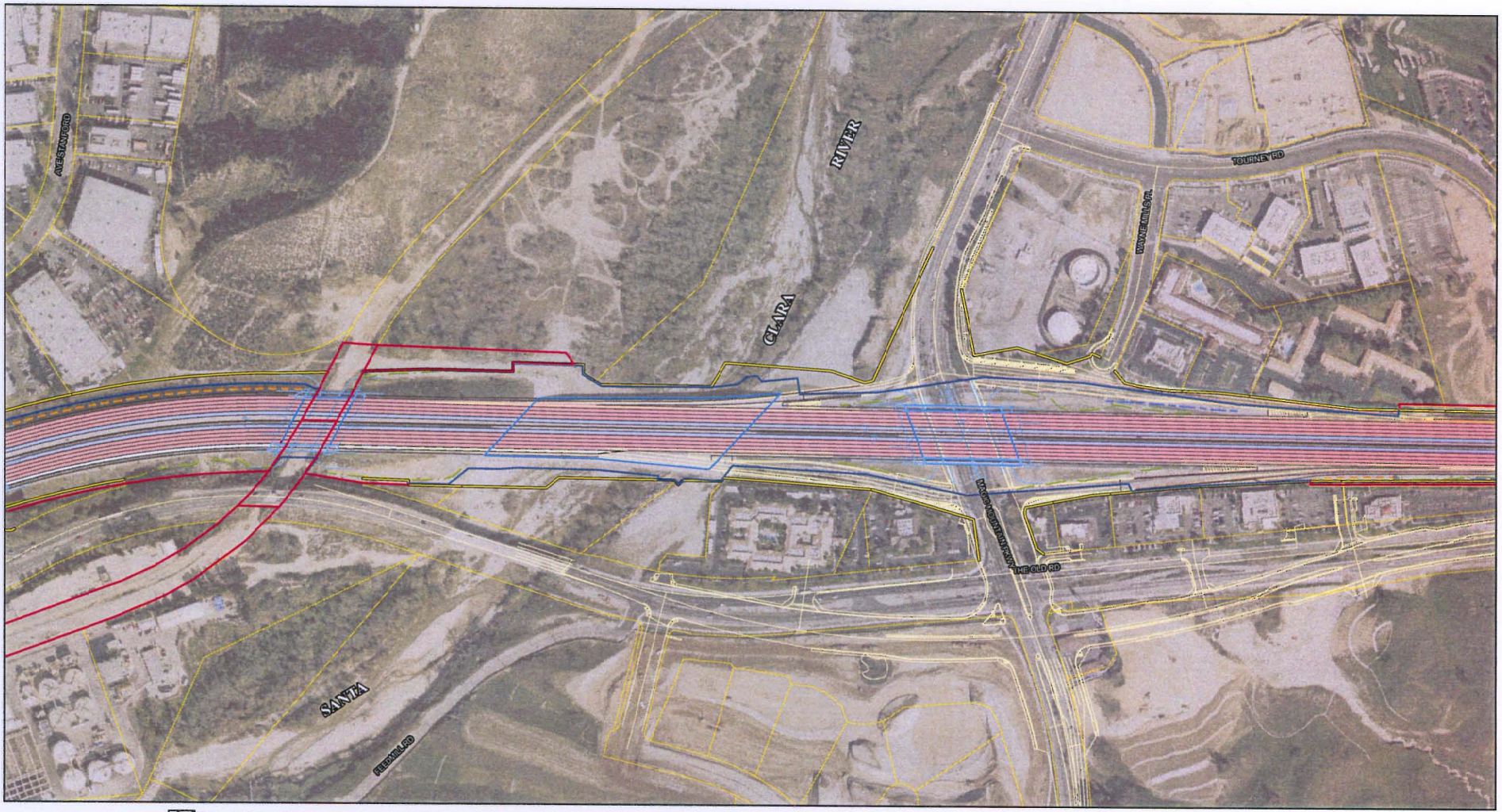
*I-5 HOV/Truck Lanes Project*
Alternative 2 - Project Features
07-LA-5 PM R45.4/R59.0
EA 2332E0




Potential Water Treatment Basin
Potential Construction Staging Area
Proposed Alignment
Existing Right-of-Way
Proposed Right-of-Way
Parcel Boundary
Disturbance Line
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Improvements by Others
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HOV Lanes
MFL Lanes
Proposed AUX Lanes
Truck Lanes
Unimproved Lanes/No Improvements

0 150 300 Feet

SOURCE: Psomas (2008).

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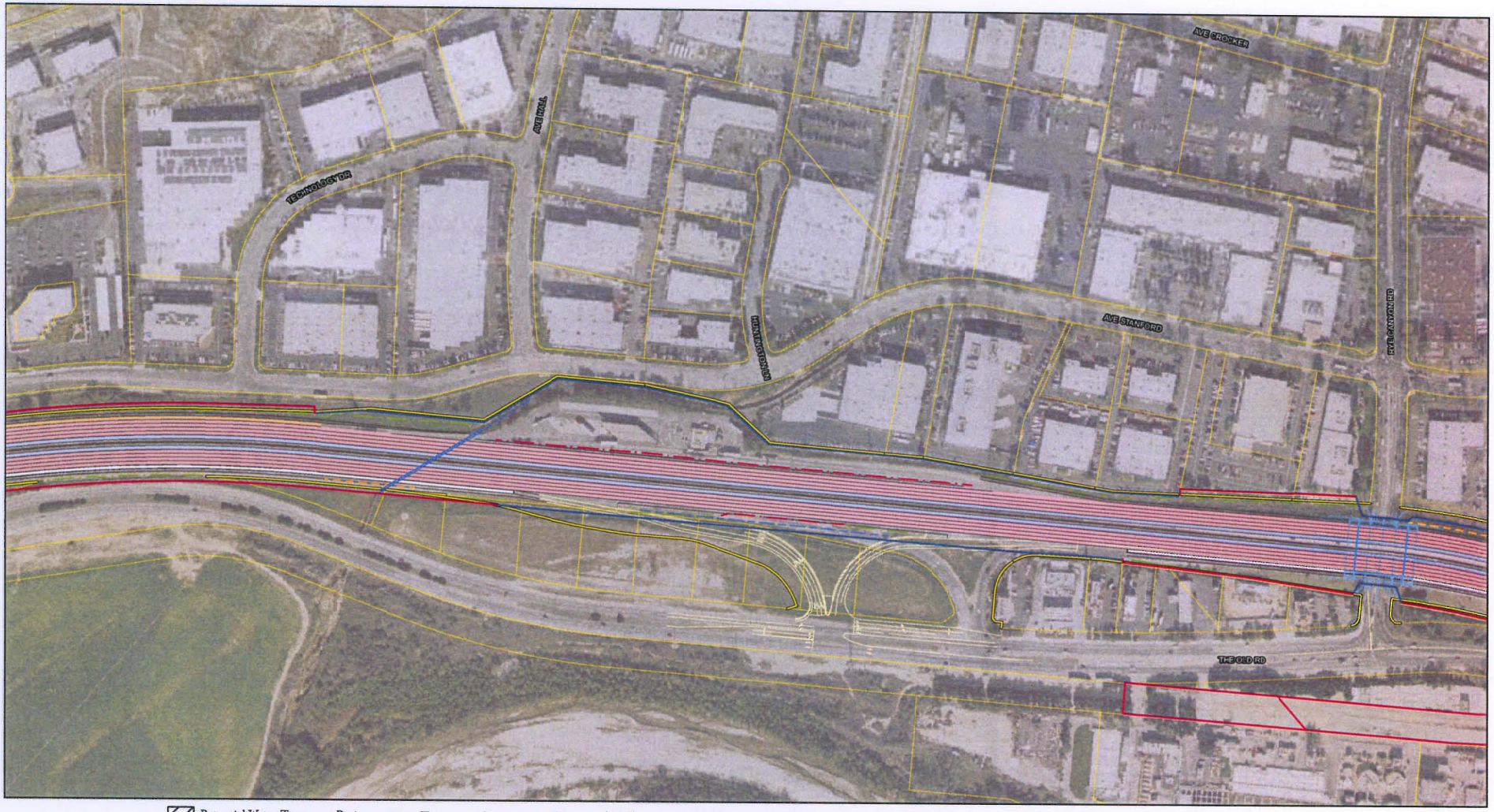
FIGURE 1.4
Sheet 11 of 17

*I-5 HOV/Truck Lanes Project*
Alternative 2 - Project Features
07-LA-5 PM R45.4/R59.0
EA 2332E0




Potential Water Treatment Basin
Potential Construction Staging Area
Proposed Alignment
Existing Right-of-Way
Proposed Right-of-Way
Parcel Boundary
Disturbance Line

Temporary Construction Easement (TCE)
Structure to be Widened or Replaced
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Potential Retaining Wall
Existing Retaining Wall
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Improvements by Others
Existing Length of AUX Lane/ Extend Ramp
HOV Lanes
MFL Lanes
Proposed AUX Lanes
Truck Lanes
Unimproved Lanes/No Improvements

0 150 300 Feet

SOURCE: Psomas (2008).

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FIGURE 1.4
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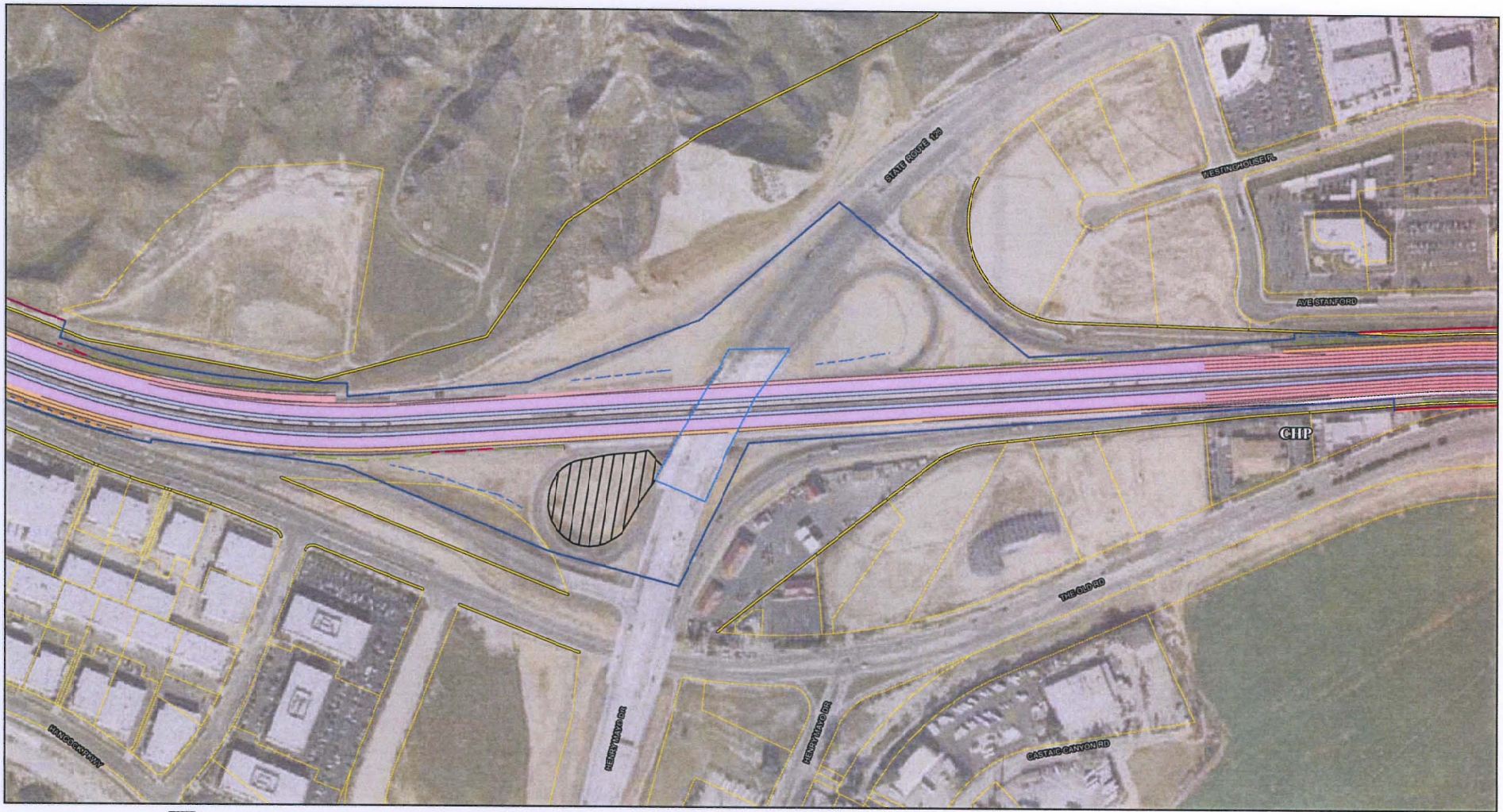
*I-5 HOV/Truck Lanes Project*
Alternative 2 - Project Features
07-LA-5 PM R45.4/R59.0
EA 233280




Potential Water Treatment Basin
Potential Construction Staging Area
Proposed Alignment
Existing Right-of-Way
Proposed Right-of-Way
Parcel Boundary
Disturbance Line
Temporary Construction Easement (TCE)
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Existing Retaining Wall
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Improvements by Others
Existing Length of AUX Lane/ Extend Ramp
HOV Lanes
MFL Lanes
Proposed AUX Lanes
Truck Lanes
Unimproved Lanes/No Improvements

0 150 300 Feet

SOURCE: Psomas (2008).

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FIGURE 1.4
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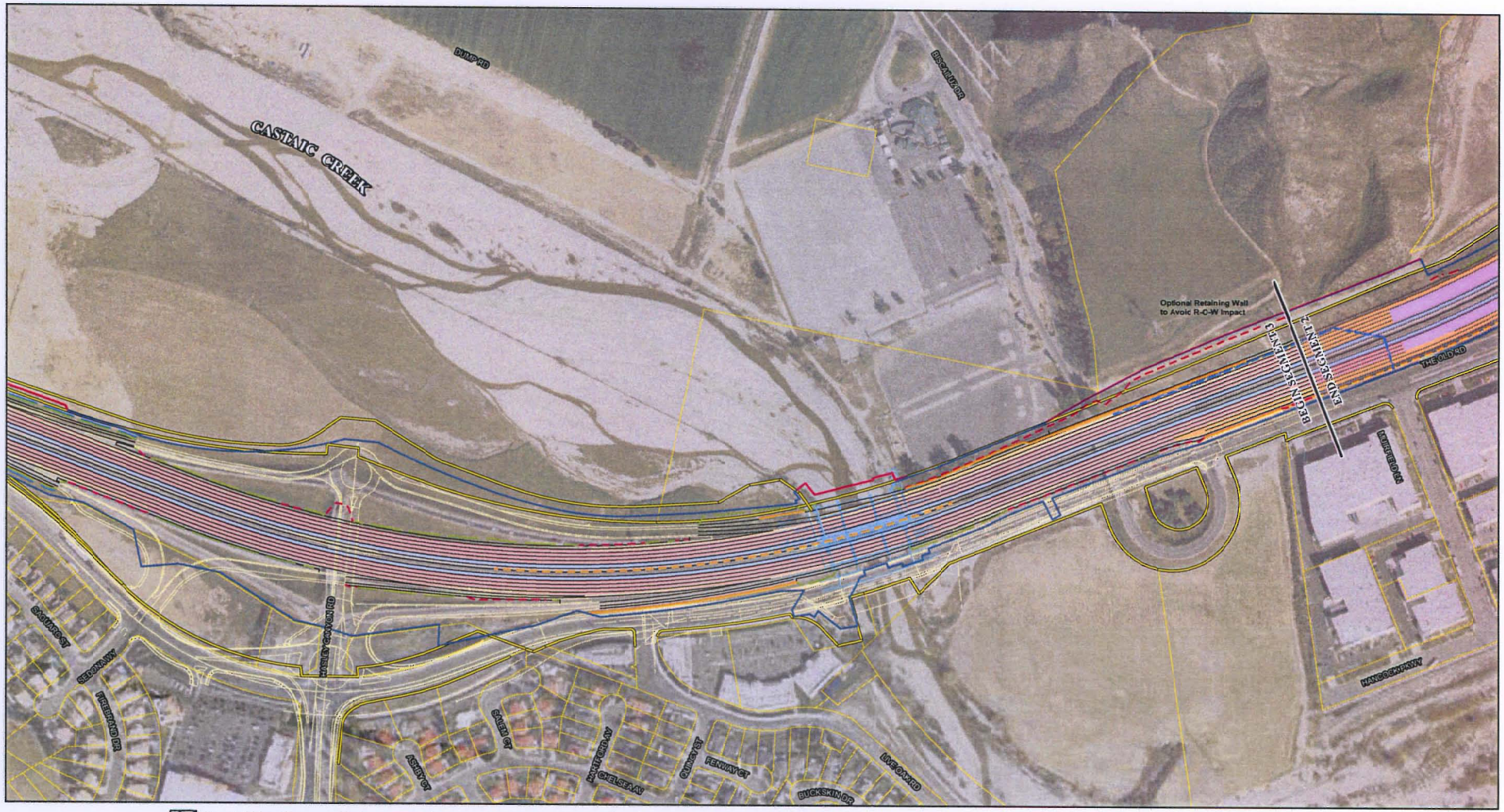
*I-5 HOV/Truck Lanes Project*
Alternative 2 - Project Features
07-LA-5 PM R45.4/R55.0
EA 2332E0




Potential Water Treatment Basin
Potential Construction Staging Area
Proposed Alignment
Existing Right-of-Way
Proposed Right-of-Way
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Improvements by Others
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HOV Lanes
MFL Lanes
Proposed AUX Lanes
Truck Lanes
Unimproved Lanes/No Improvements

0 150 300 Feet

SOURCE: Psomas (2008).

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FIGURE 1.4
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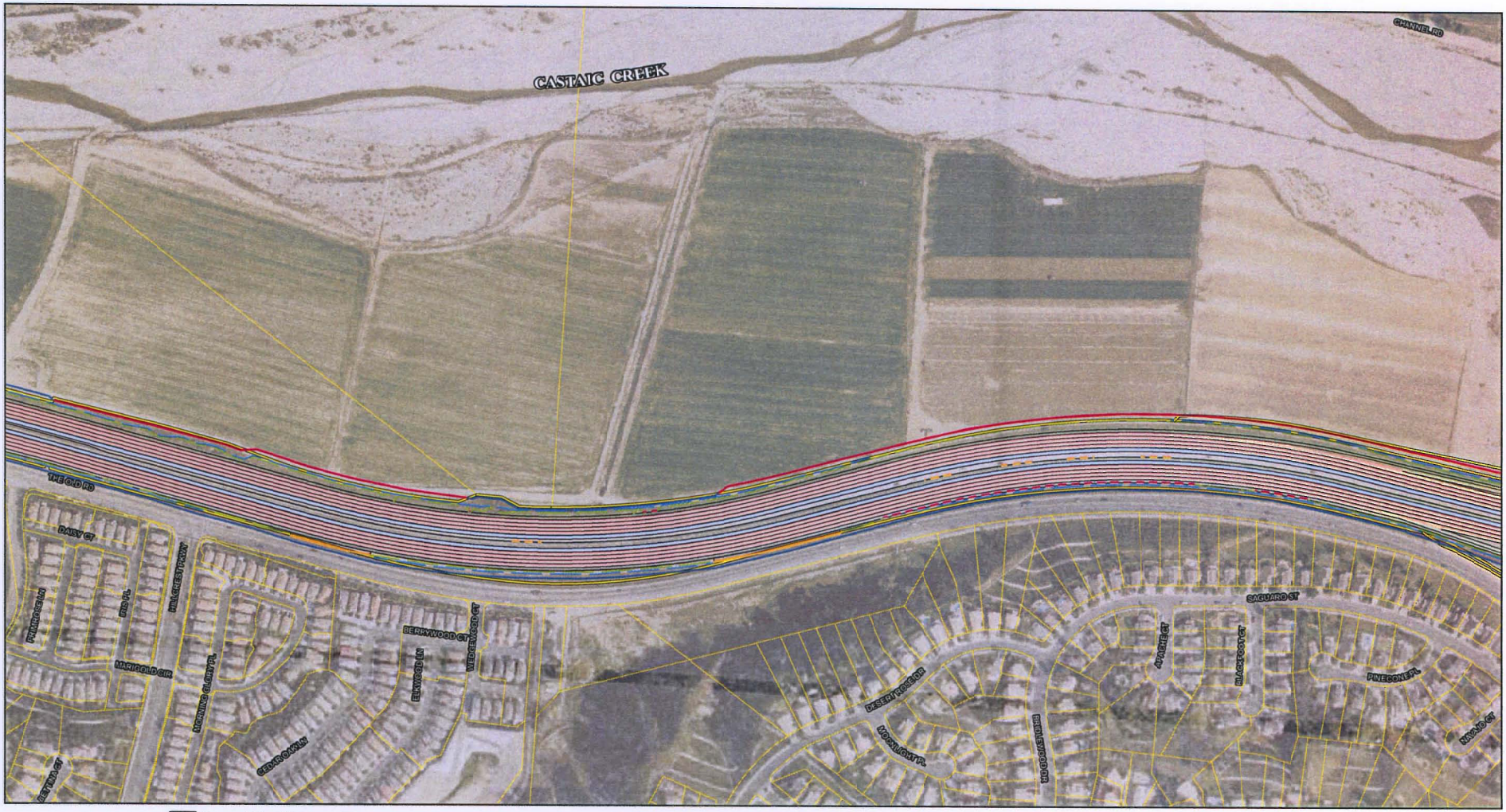
*I-5 HOV/Truck Lanes Project*
Alternative 2 - Project Features
07-LA-5 PM R45.4/R59.0
EA 2332E0




- Potential Water Treatment Basin
- Potential Construction Staging Area
- Proposed Alignment
- Existing Right-of-Way
- Proposed Right-of-Way
- Parcel Boundary
- Disturbance Line
- Temporary Construction Easement (TCE)
- Structure to be Widened or Replaced
- Toe of Fill
- Top of Cut
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- Existing Retaining Wall
- Proposed Drainage Improvements
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- HOV Lanes
- MFL Lanes
- Proposed AUX Lanes
- Truck Lanes
- Unimproved Lanes/No Improvements

0 150 300 Feet

SOURCE: Psomas (2008).

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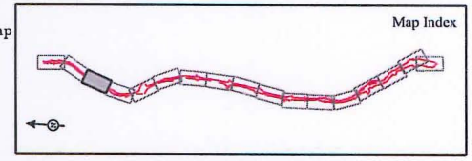
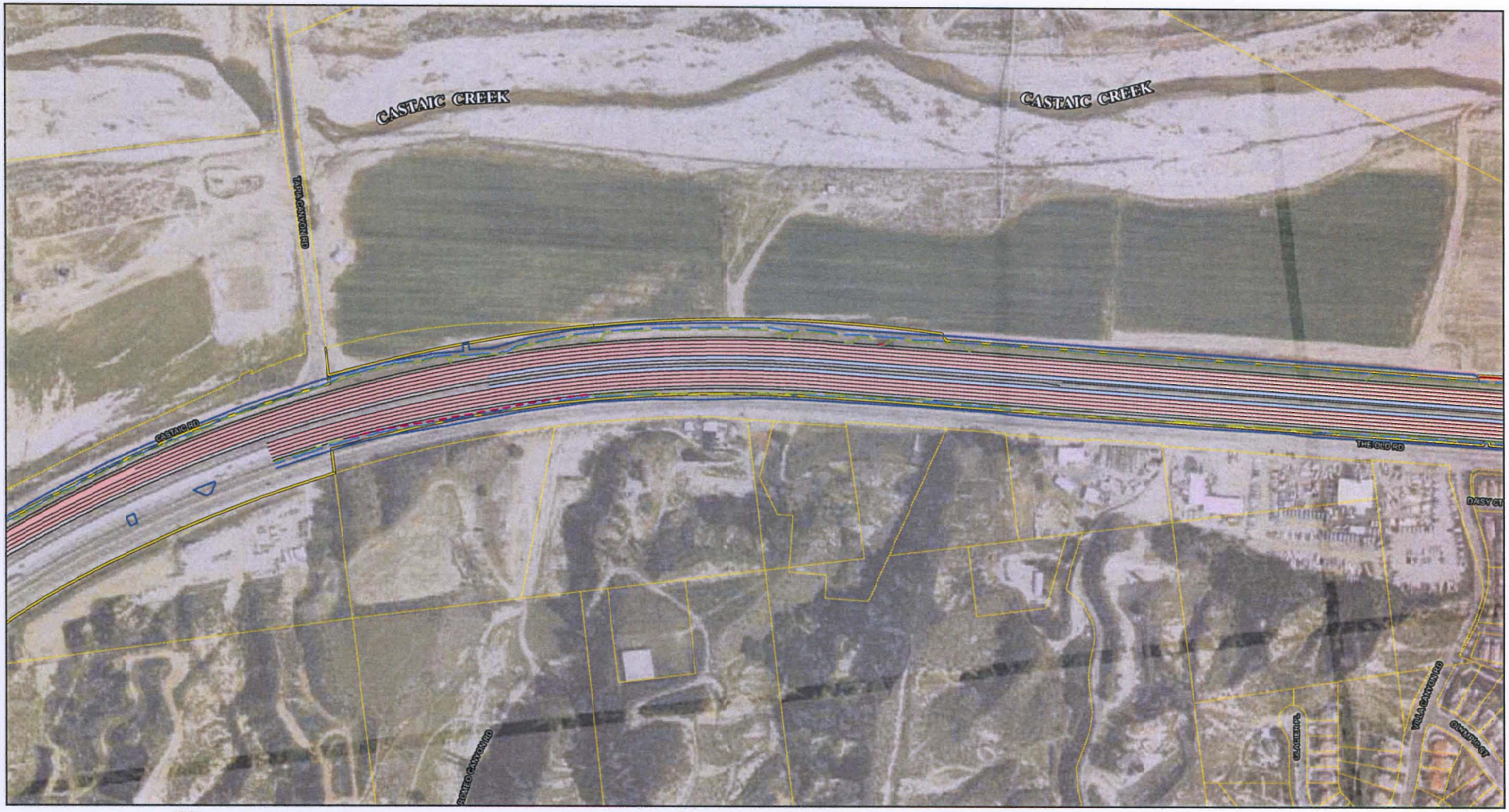



FIGURE 1.4
Sheet 15 of 17

*I-5 HOV/Truck Lanes Project*

Alternative 2 - Project Features

07-LA-5 PM R45.4/R59.0
EA 2332E0




Potential Water Treatment Basin
Potential Construction Staging Area
Proposed Alignment
Existing Right-of-Way
Proposed Right-of-Way
Parcel Boundary
Disturbance Line

Temporary Construction Easement (TCE)
Structure to be Widened or Replaced
Toe of Fill
Top of Cut
Potential Retaining Wall
Existing Retaining Wall
Proposed Drainage Improvements

Improvements by Others
Existing Length of AUX Lane/ Extend Ramp
HOV Lanes
MFL Lanes
Proposed AUX Lanes
Truck Lanes
Unimproved Lanes/No Improvements

0 150 300 Feet

SOURCE: Psomas (2008).

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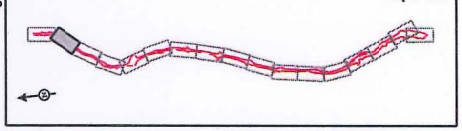

FIGURE 1.4
Sheet 16 of 17

*I-5 HOV/Truck Lanes Project*
Alternative 2 - Project Features
07-LA-5 PM R45.4/R59.0
EA 233230

SOURCE: Psomas (2008).

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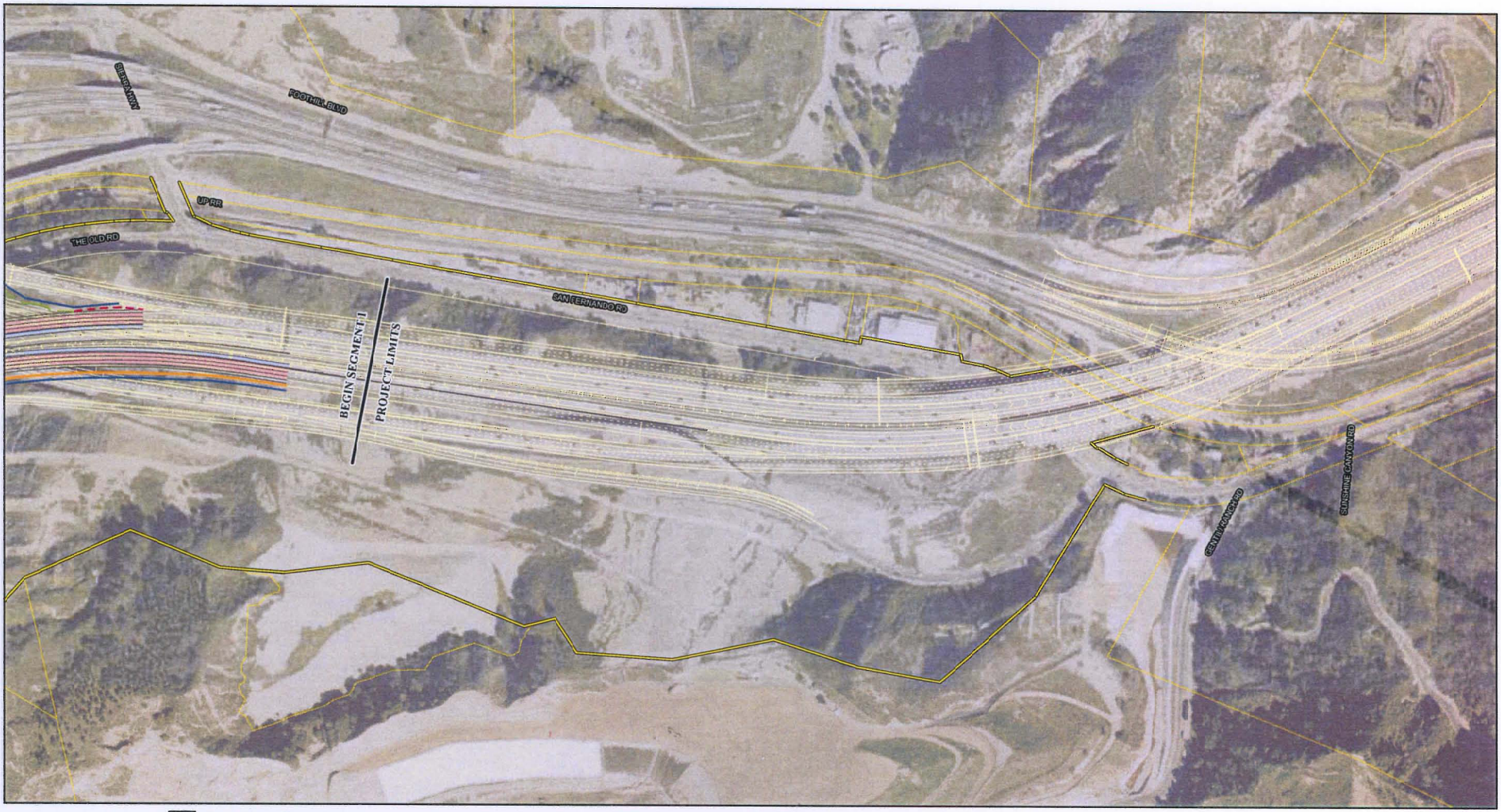
FIGURE 1.4
Sheet 17 of 17

*I-5 HOV/Truck Lanes Project*
Alternative 2 - Project Features
07-LA-5 PM R45.4/R59.0
EA 233E0




Potential Water Treatment Basin
Potential Construction Staging Area
Proposed Alignment
Existing Right-of-Way
Proposed Right-of-Way
Parcel Boundary
Disturbance Line
Temporary Construction Easement (TCE)
Structure to be Widened or Replaced
Toe of Fill
Top of Cut
Proposed Retaining Wall
Existing Retaining Wall
Proposed Drainage Improvements
Improvements by Others
Existing Length of AUX Lane/ Extend Ramp
HOV Lanes
MFL Lanes
Proposed AUX Lanes
Truck Lanes
Unimproved Lanes/No Improvements
Frontage Road Improvements

0 150 300 Feet

SOURCE: Psomas (2008).

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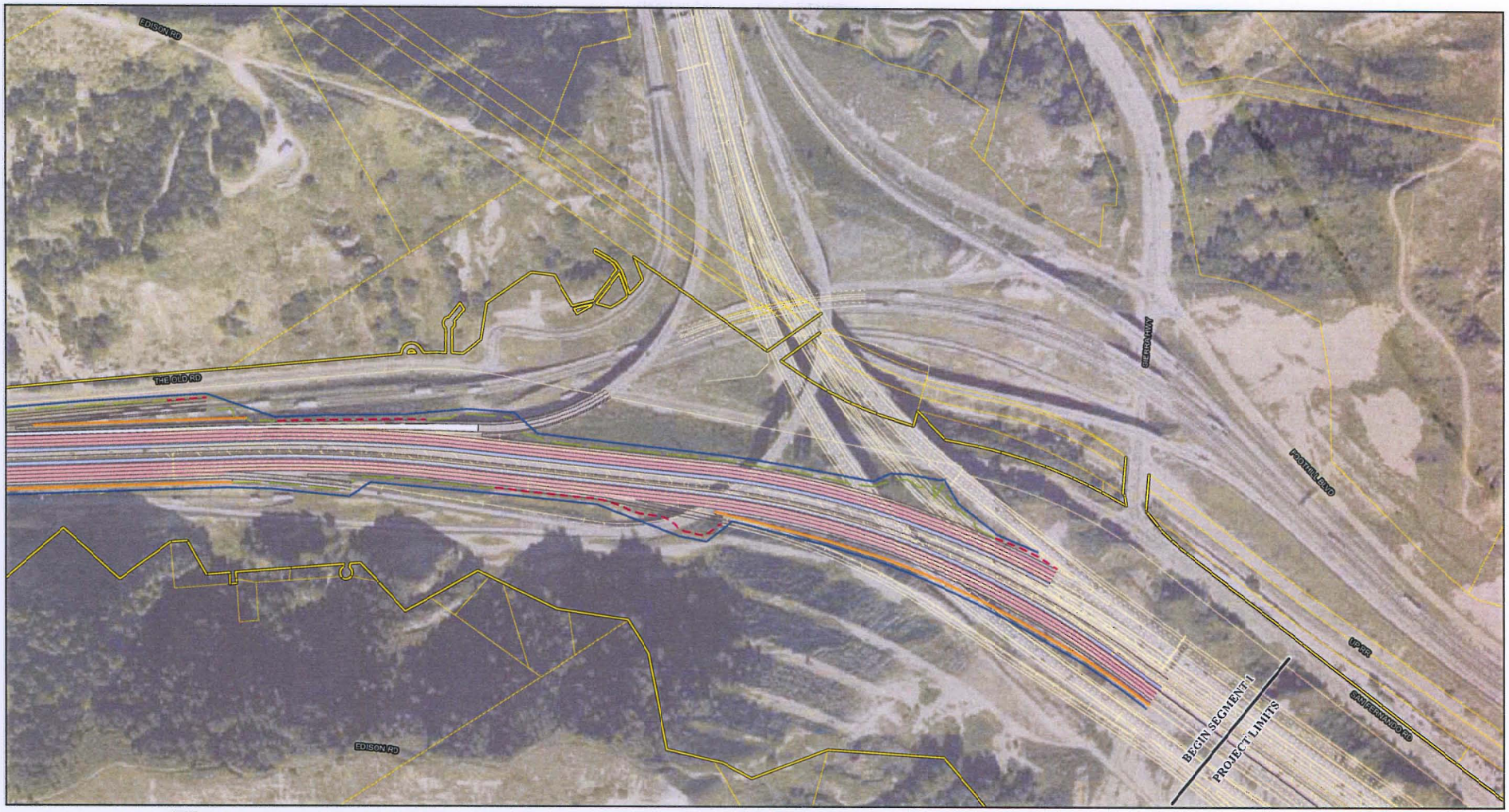
FIGURE 1.5
Sheet 1 of 17

*I-5 HOV/Truck Lanes Project*
Alternative 3 - Project Features
07-LA-5 PM R45.4/R59.0
EA 2332E0




Potential Water Treatment Basin
Potential Construction Staging Area
Proposed Alignment
Existing Right-of-Way
Proposed Right-of-Way
Parcel Boundary
Disturbance Line
Temporary Construction Easement (TCE)
Structure to be Widened or Replaced
Toe of Fill
Top of Cut
Proposed Retaining Wall
Existing Retaining Wall
Proposed Drainage Improvements
Improvements by Others
Existing Length of AUX Lane/ Extend Ramp
HOV Lanes
MFL Lanes
Proposed AUX Lanes
Truck Lanes
Unimproved Lanes/No Improvements
Frontage Road Improvements

0 150 300 Feet

SOURCE: Psomas (2008).

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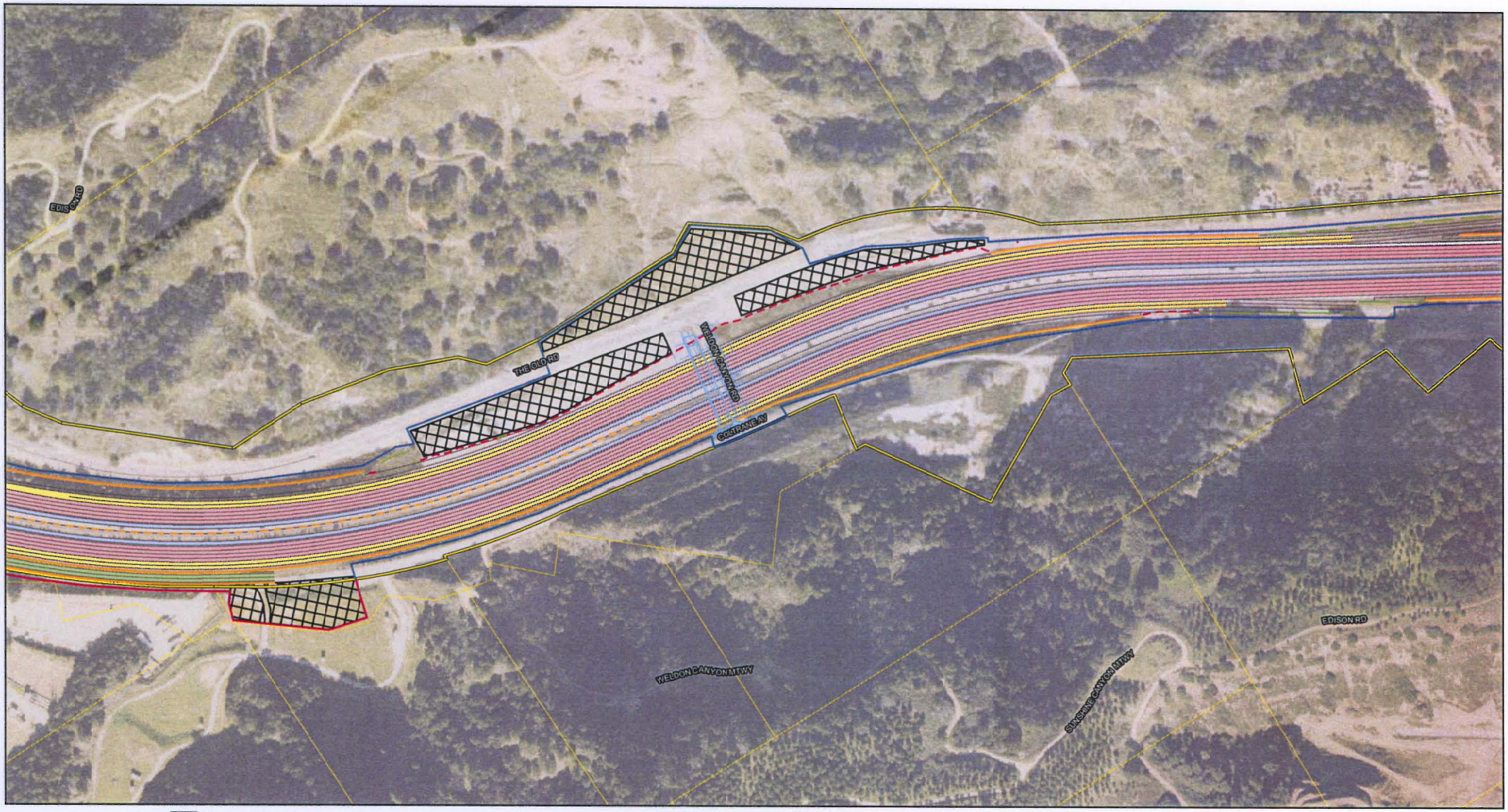
FIGURE 1.5
Sheet 2 of 17

*I-5 HOV/Truck Lanes Project*
Alternative 3 - Project Features
07-LA-5 PM R45.4/R59.0
EA 2332E0




Potential Water Treatment Basin
Potential Construction Staging Area
Proposed Alignment
Existing Right-of-Way
Proposed Right-of-Way
Parcel Boundary
Disturbance Line
Temporary Construction Easement (TCE)
Structure to be Widened or Replaced
Toe of Fill
Top of Cut
Proposed Retaining Wall
Existing Retaining Wall
Proposed Drainage Improvements
Improvements by Others
Existing Length of AUX Lane/ Extend Ramp
HOV Lanes
MFL Lanes
Proposed AUX Lanes
Truck Lanes
Unimproved Lanes/No Improvements
Frontage Road Improvements

0 150 300 Feet

SOURCE: Psomas (2008).

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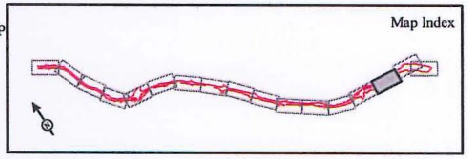
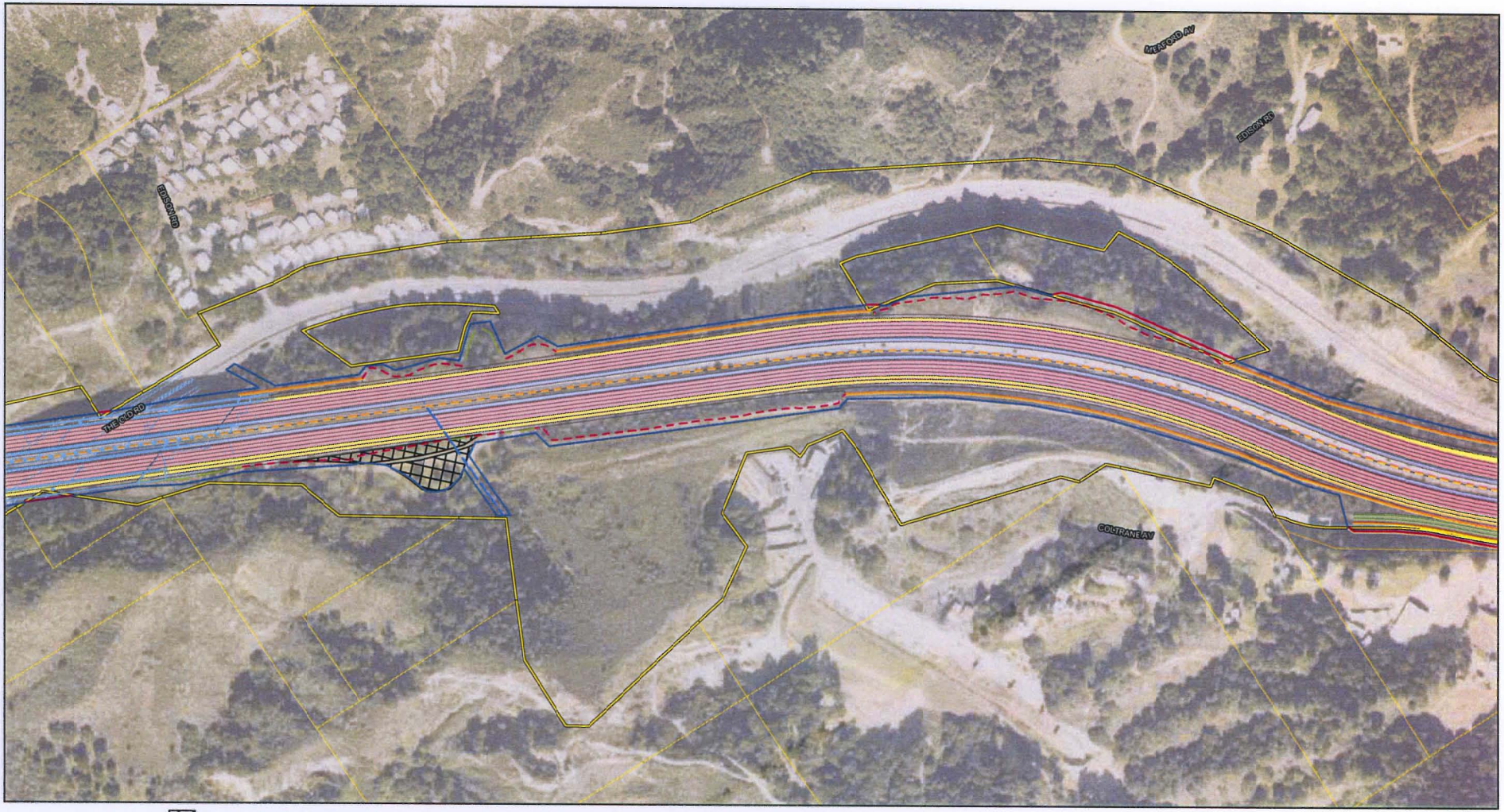


FIGURE 1.5
Sheet 3 of 17

*I-5 HOV/Truck Lanes Project*
Alternative 3 - Project Features
07-LA-5 PM R45.4/R59.0
EA 233250




Potential Water Treatment Basin
Potential Construction Staging Area
Proposed Alignment
Existing Right-of-Way
Proposed Right-of-Way
Parcel Boundary
Disturbance Line

Temporary Construction Easement (TCE)
Structure to be Widened or Replaced
Toe of Fill
Top of Cut
Proposed Retaining Wall
Existing Retaining Wall
Proposed Drainage Improvements

Improvements by Others
Existing Length of AUX Lane/ Extend Ramp
HOV Lanes
MFL Lanes
Proposed AUX Lanes
Truck Lanes
Unimproved Lanes/No Improvements
Frontage Road Improvements

0 150 300 Feet

SOURCE: Psomas (2008).

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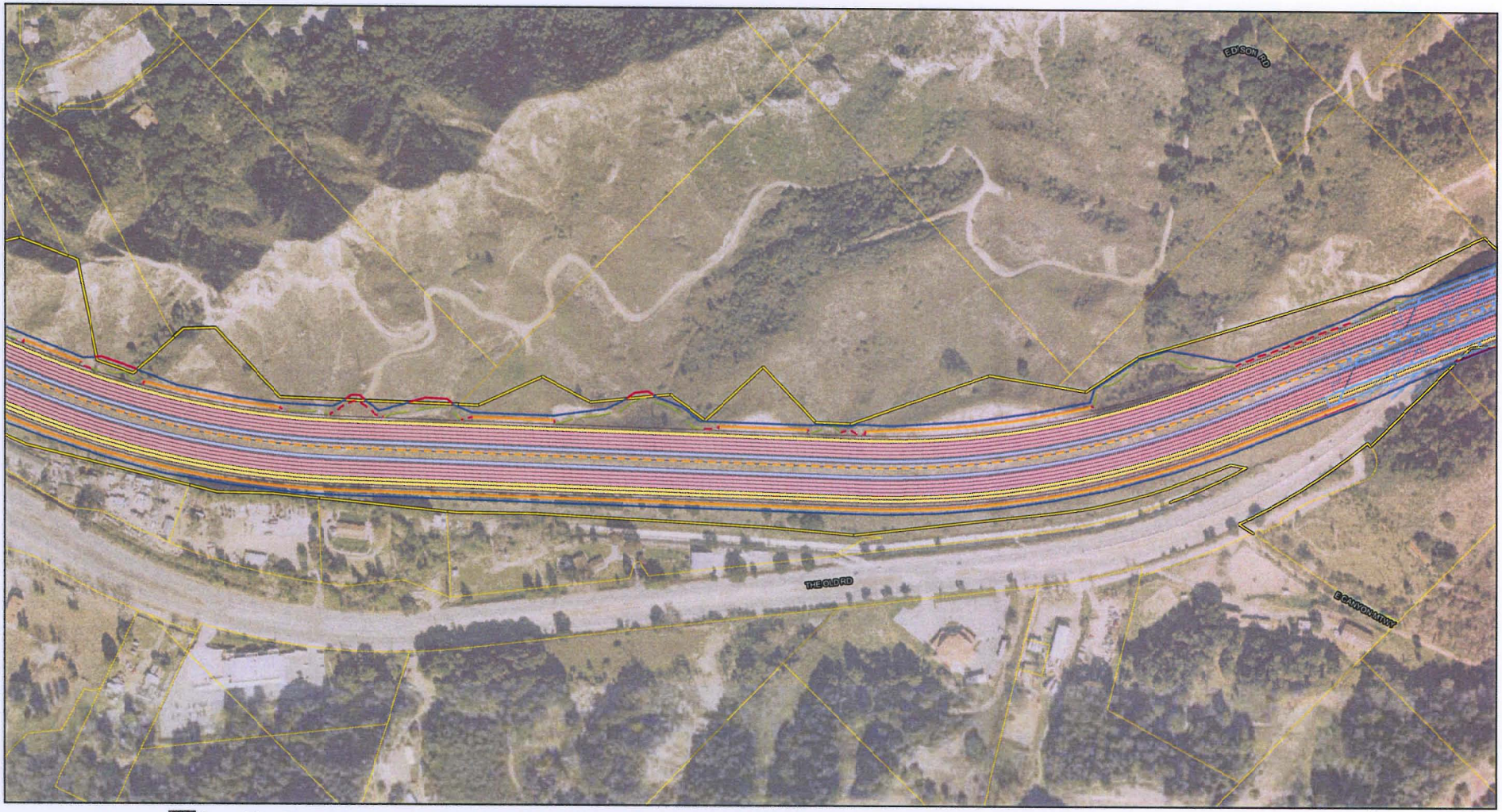
FIGURE 1.5
Sheet 4 of 17

*I-5 HOV/Truck Lanes Project*
Alternative 3 - Project Features
07-LA-5 PM R45.4/R59.0
EA 2332E0




Potential Water Treatment Basin
Potential Construction Staging Area
Proposed Alignment
Existing Right-of-Way
Proposed Right-of-Way
Parcel Boundary
Disturbance Line
Temporary Construction Easement (TCE)
Structure to be Widened or Replaced
Toe of Fill
Top of Cut
Proposed Retaining Wall
Existing Retaining Wall
Proposed Drainage Improvements
Improvements by Others
Existing Length of AUX Lane/ Extend Ramp
HOV Lanes
MFL Lanes
Proposed AUX Lanes
Truck Lanes
Unimproved Lanes/No Improvements
Frontage Road Improvements

0 150 300 Feet

SOURCE: Psomas (2008).

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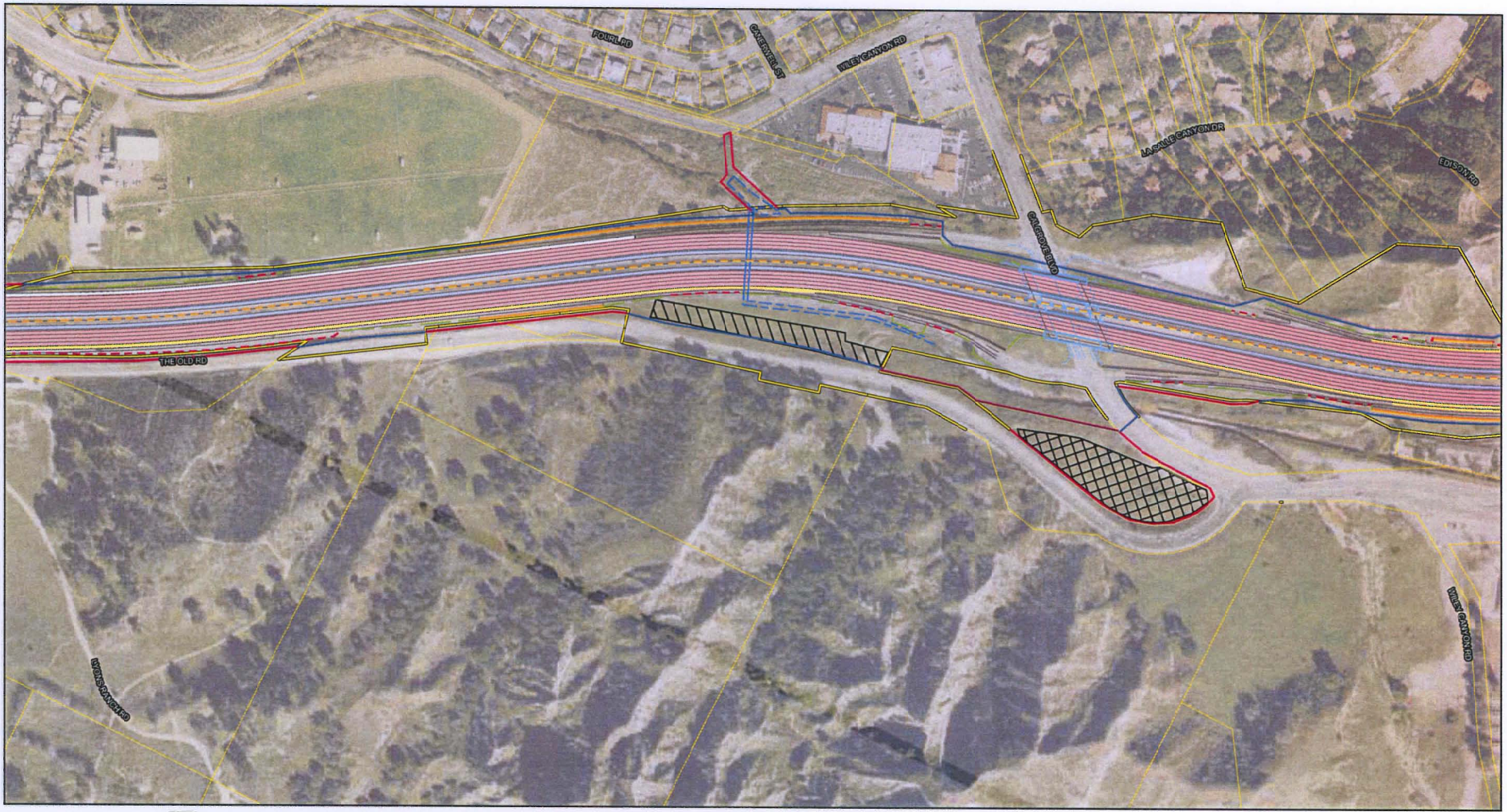
FIGURE 1.5
Sheet 5 of 17

*I-5 HOV/Truck Lanes Project*
Alternative 3 - Project Features
07-LA-5 PM R45.4/R59.0
EA 2332E0




Potential Water Treatment Basin
Potential Construction Staging Area
Proposed Alignment
Existing Right-of-Way
Proposed Right-of-Way
Parcel Boundary
Disturbance Line
Temporary Construction Easement (TCE)
Structure to be Widened or Replaced
Toe of Fill
Top of Cut
Proposed Retaining Wall
Existing Retaining Wall
Proposed Drainage Improvements
Improvements by Others
Existing Length of AUX Lane/ Extend Ramp
HOV Lanes
MFL Lanes
Proposed AUX Lanes
Truck Lanes
Unimproved Lanes/No Improvements
Frontage Road Improvements

0 150 300 Feet

SOURCE: Psomas (2008).

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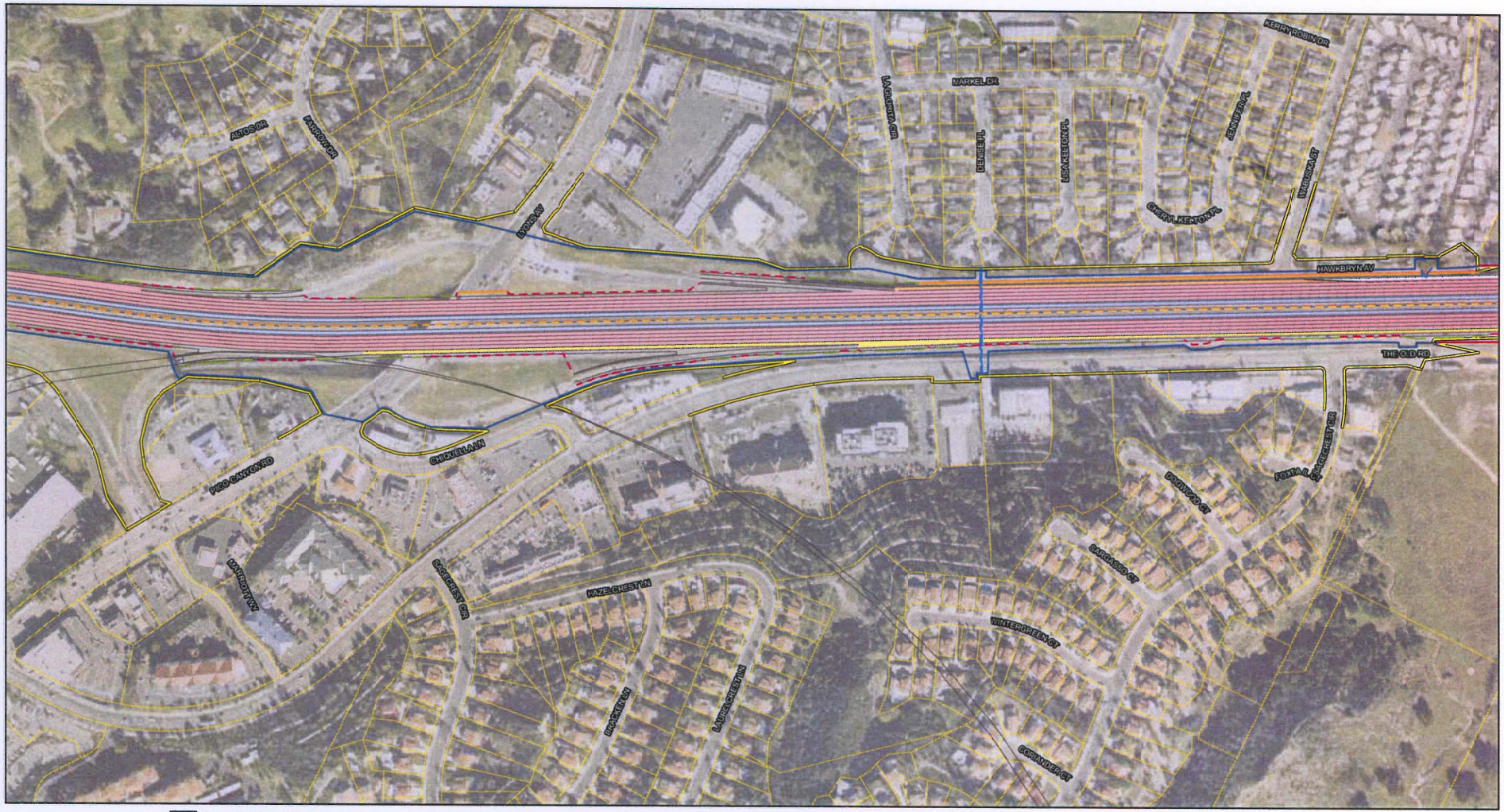
FIGURE 1.5
Sheet 6 of 17

*I-5 HOV/Truck Lanes Project*
Alternative 3 - Project Features
07-LA-5 PM R45.4/R55.0
EA 2332E0




- Potential Water Treatment Basin
- Potential Construction Staging Area
- Proposed Alignment
- Existing Right-of-Way
- Proposed Right-of-Way
- Parcel Boundary
- Disturbance Line
- Temporary Construction Easement (TCE)
- Structure to be Widened or Replaced
- Toe of Fill
- Top of Cut
- Proposed Retaining Wall
- Existing Retaining Wall
- Proposed Drainage Improvements
- Improvements by Others
- Existing Length of AUX Lane/ Extend Ramp
- HOV Lanes
- MFL Lanes
- Proposed AUX Lanes
- Truck Lanes
- Unimproved Lanes/No Improvements
- Frontage Road Improvements

0 150 300 Feet

SOURCE: Psomas (2008).

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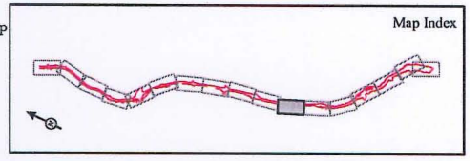


FIGURE 1.5
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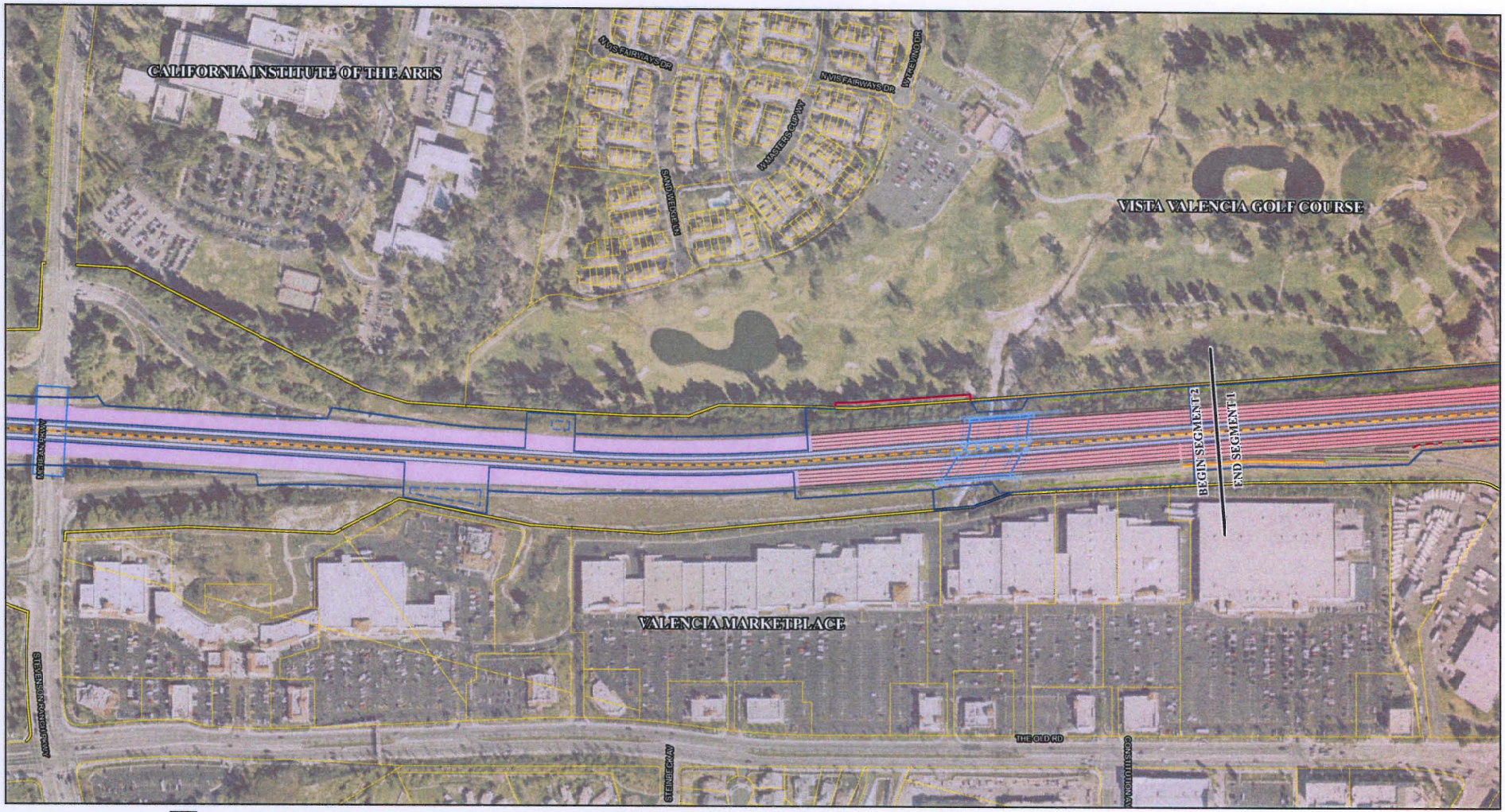
*I-5 HOV/Truck Lanes Project*
Alternative 3 - Project Features
07-LA-5 PM R45.4/R59.0
EA 2332E0




Potential Water Treatment Basin
Potential Construction Staging Area
Proposed Alignment
Existing Right-of-Way
Proposed Right-of-Way
Parcel Boundary
Disturbance Line
Temporary Construction Easement (TCE)
Structure to be Widened or Replaced
Toe of Fill
Top of Cut
Proposed Retaining Wall
Existing Retaining Wall
Proposed Drainage Improvements
Improvements by Others
Existing Length of AUX Lane/ Extend Ramp
HOV Lanes
MFL Lanes
Proposed AUX Lanes
Truck Lanes
Unimproved Lanes/No Improvements
Frontage Road Improvements

0 150 300 Feet

SOURCE: Psomas (2008).

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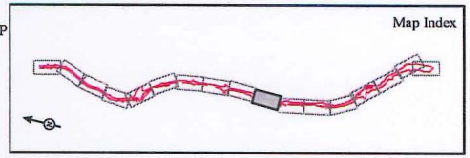


FIGURE 1.5
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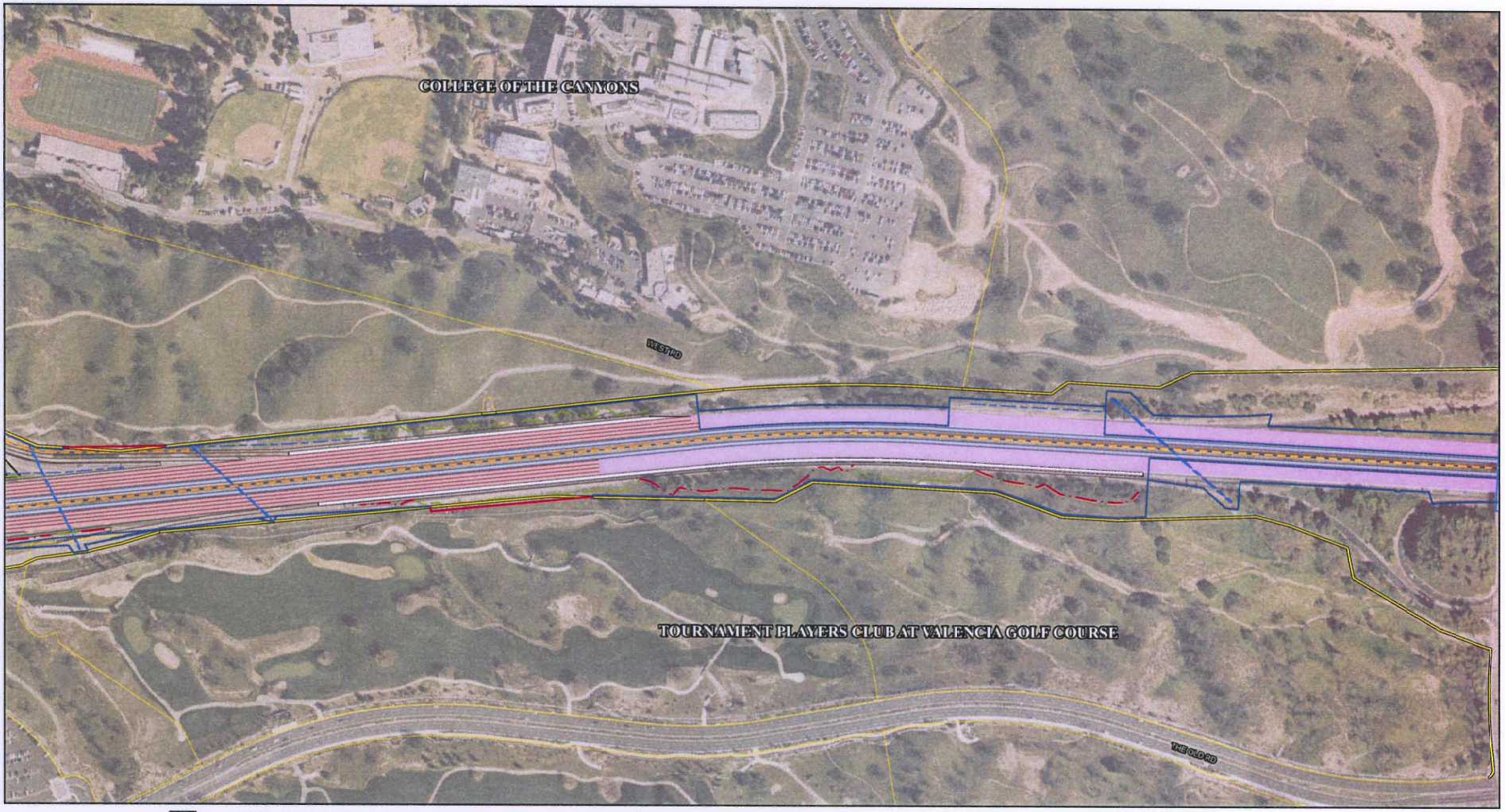
*I-5 HOV/Truck Lanes Project*
Alternative 3 - Project Features
07-LA-5 PM R45.4/R59.0
EA 2332E0




Potential Water Treatment Basin
Potential Construction Staging Area
Proposed Alignment
Existing Right-of-Way
Proposed Right-of-Way
Parcel Boundary
Disturbance Line
Temporary Construction Easement (TCE)
Structure to be Widened or Replaced
Toe of Fill
Top of Cut
Proposed Retaining Wall
Existing Retaining Wall
Proposed Drainage Improvements
Improvements by Others
Existing Length of AUX Lane/ Extend Ramp
HOV Lanes
MFL Lanes
Proposed AUX Lanes
Truck Lanes
Unimproved Lanes/No Improvements
Frontage Road Improvements

0 150 300 Feet

SOURCE: Psomas (2008).

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FIGURE 1.5
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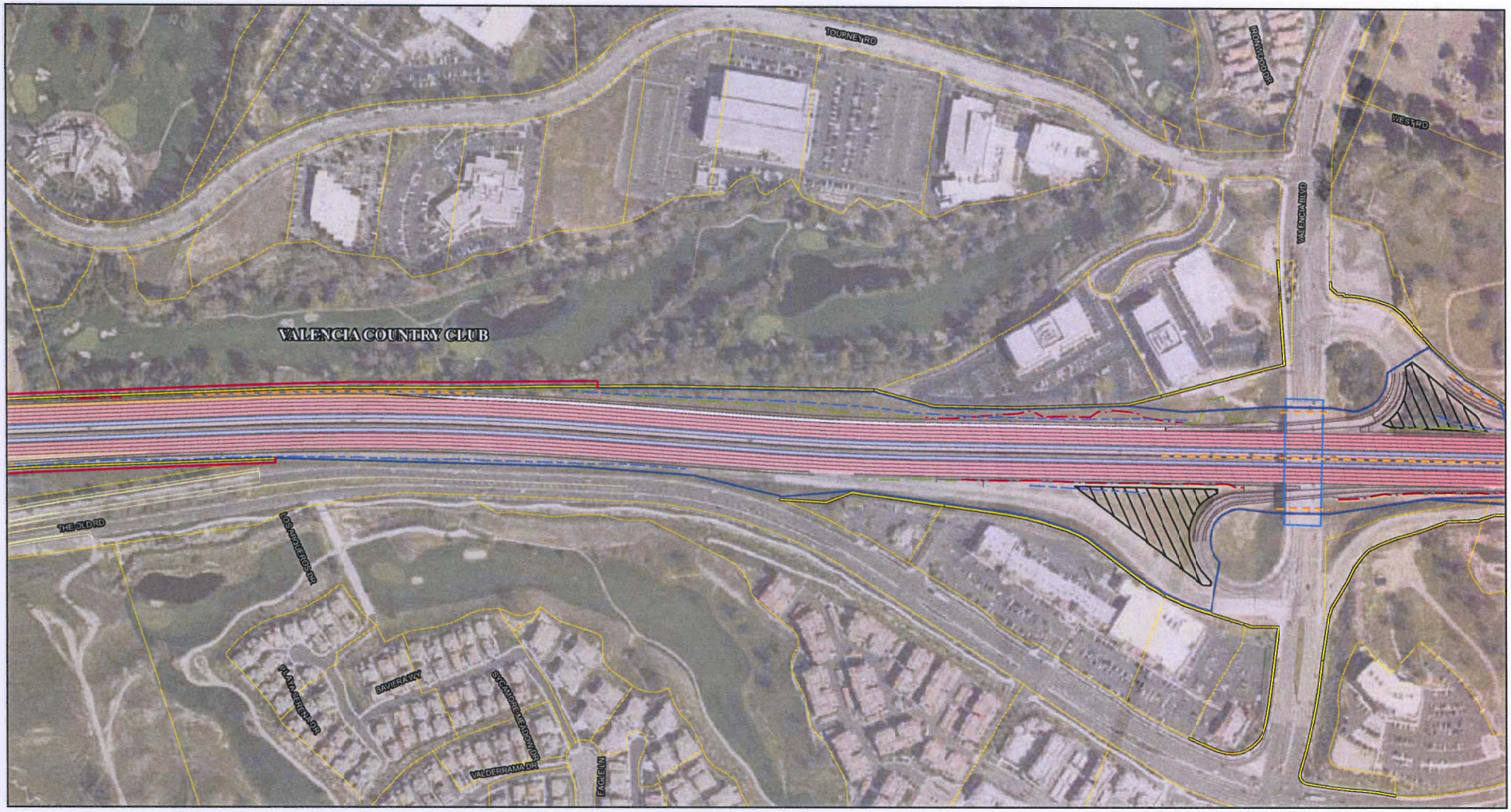
*I-5 HOV/Truck Lanes Project*
Alternative 3 - Project Features
07-LA-5 PM R45.4/R59.0
EA 2332E0




Potential Water Treatment Basin
Potential Construction Staging Area
Proposed Alignment
Existing Right-of-Way
Proposed Right-of-Way
Parcel Boundary
Disturbance Line
Temporary Construction Easement (TCE)
Structure to be Widened or Replaced
Toe of Fill
Top of Cut
Proposed Retaining Wall
Existing Retaining Wall
Proposed Drainage Improvements
Improvements by Others
Existing Length of AUX Lane/ Extend Ramp
HOV Lanes
MFL Lanes
Proposed AUX Lanes
Truck Lanes
Unimproved Lanes/No Improvements
Frontage Road Improvements

0 150 300 Feet

SOURCE: Psomas (2008).

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FIGURE 1.5
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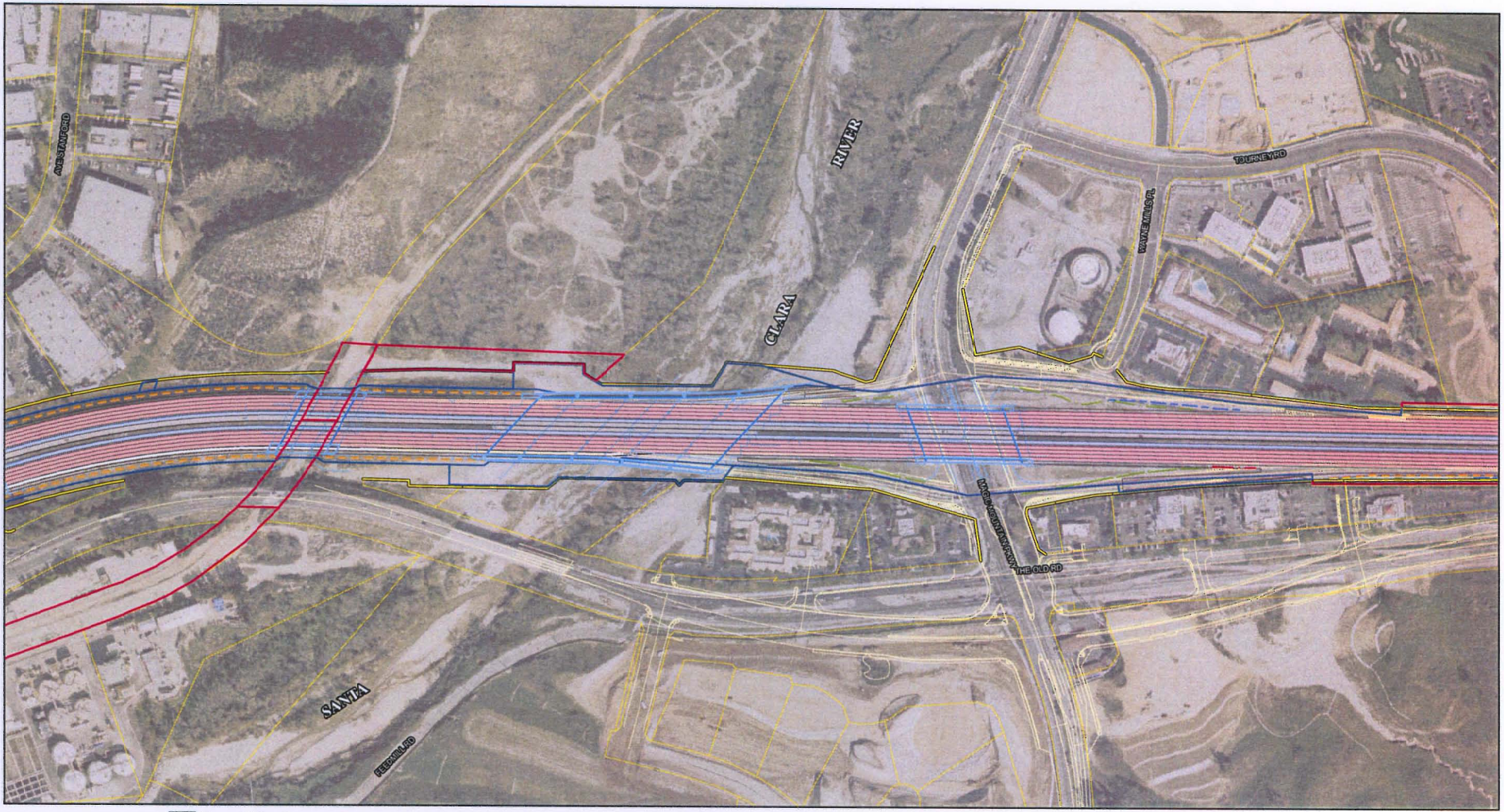
*I-5 HOV/Truck Lanes Project*
Alternative 3 - Project Features
07-LA-5 PM R45.4/R59.0
EA 2332E0




Potential Water Treatment Basin
Potential Construction Staging Area
Proposed Alignment
Existing Right-of-Way
Proposed Right-of-Way
Parcel Boundary
Disturbance Line
Temporary Construction Easement (TCE)
Structure to be Widened or Replaced
Toe of Fill
Top of Cut
Proposed Retaining Wall
Existing Retaining Wall
Proposed Drainage Improvements
Improvements by Others
Existing Length of AUX Lane/ Extend Ramp
HOV Lanes
MFL Lanes
Proposed AUX Lanes
Truck Lanes
Unimproved Lanes/No Improvements
Frontage Road Improvements

0 150 300 Feet

SOURCE: Psomas (2008).

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FIGURE 1.5
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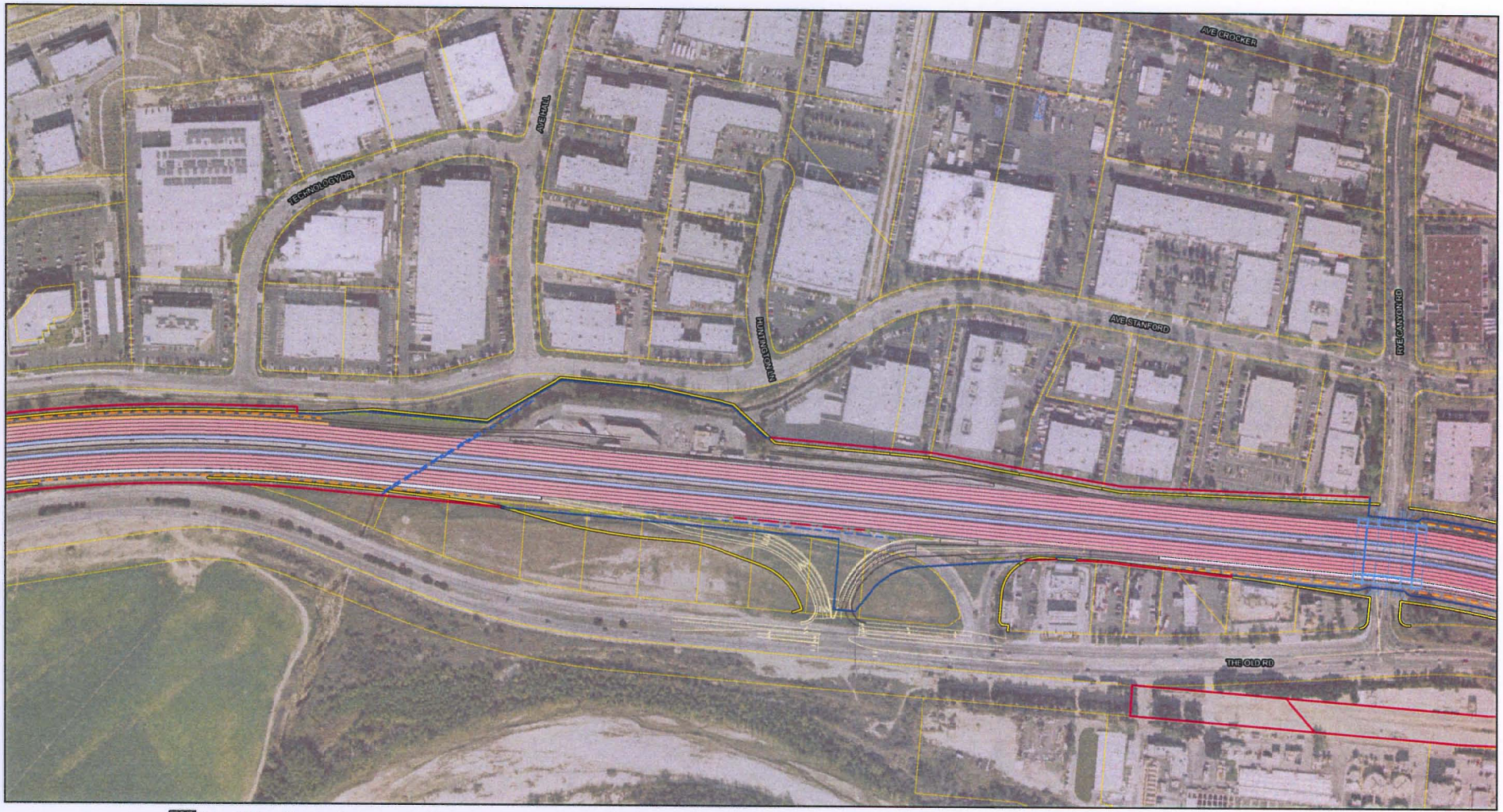
*I-5 HOV/Truck Lanes Project*
Alternative 3 - Project Features
07-LA-5 PM R45.4/R59.0
EA 2332E0




Potential Water Treatment Basin
Potential Construction Staging Area
Proposed Alignment
Existing Right-of-Way
Proposed Right-of-Way
Parcel Boundary
Disturbance Line
Temporary Construction Easement (TCE)
Structure to be Widened or Replaced
Toe of Fill
Top of Cut
Proposed Retaining Wall
Existing Retaining Wall
Proposed Drainage Improvements
Improvements by Others
Existing Length of AUX Lane/ Extend Ramp
HOV Lanes
MFL Lanes
Proposed AUX Lanes
Truck Lanes
Unimproved Lanes/No Improvements
Frontage Road Improvements

0 150 300 Feet

SOURCE: Psomas (2008).

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FIGURE 1.5
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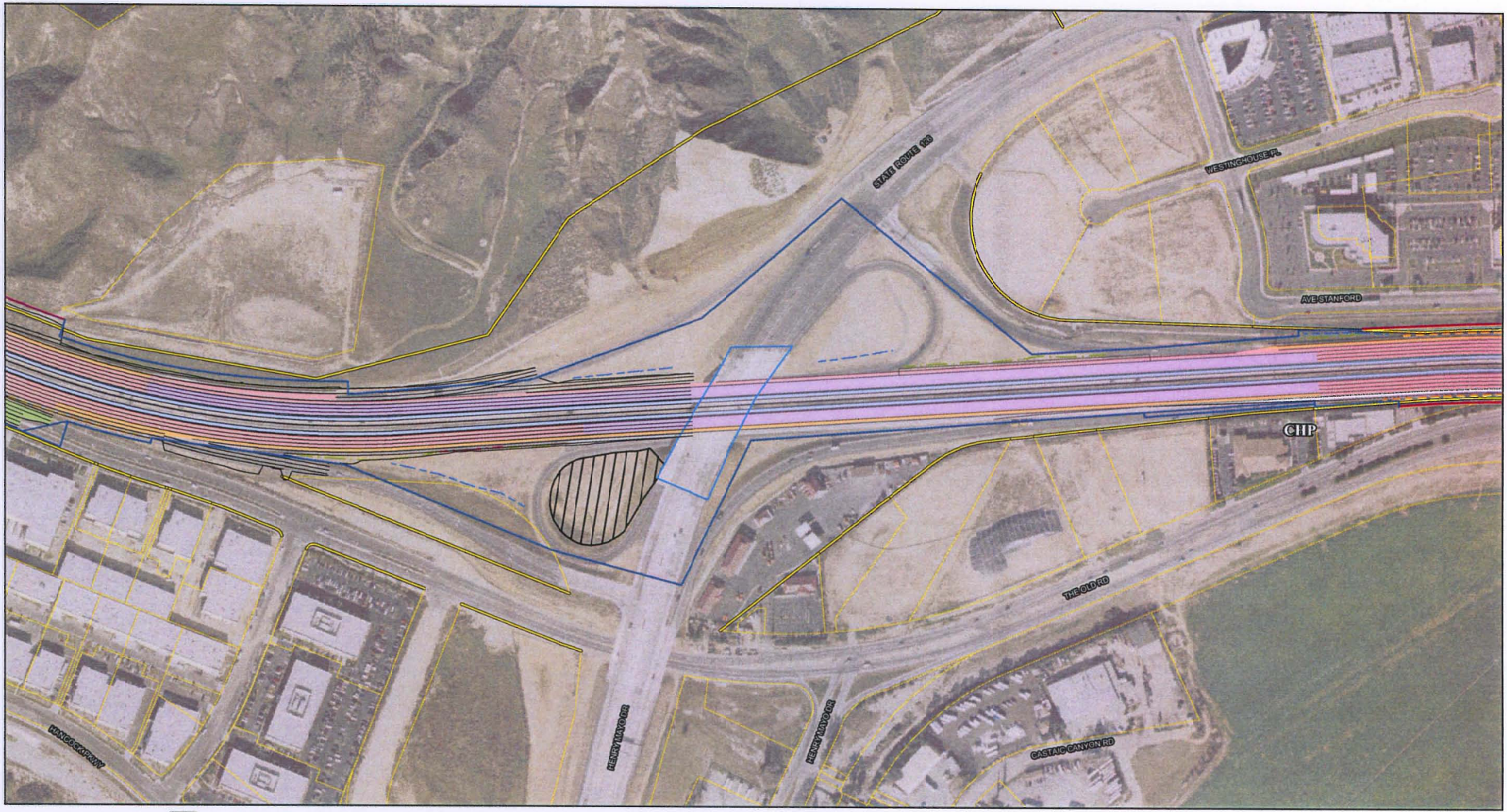
*I-5 HOV/Truck Lanes Project*
Alternative 3 - Project Features
07-LA-5 PM R45.4/R59.0
EA 2332E0




Potential Water Treatment Basin
Potential Construction Staging Area
Proposed Alignment
Existing Right-of-Way
Proposed Right-of-Way
Parcel Boundary
Disturbance Line
Temporary Construction Easement (TCE)
Structure to be Widened or Replaced
Toe of Fill
Top of Cut
Proposed Retaining Wall
Existing Retaining Wall
Proposed Drainage Improvements
Improvements by Others
Existing Length of AUX Lane/ Extend Ramp
HOV Lanes
MFL Lanes
Proposed AUX Lanes
Truck Lanes
Unimproved Lanes/No Improvements
Frontage Road Improvements

0 150 300 Feet

SOURCE: Psomas (2008).

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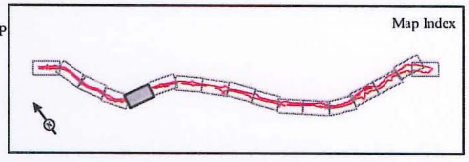


FIGURE 1.5
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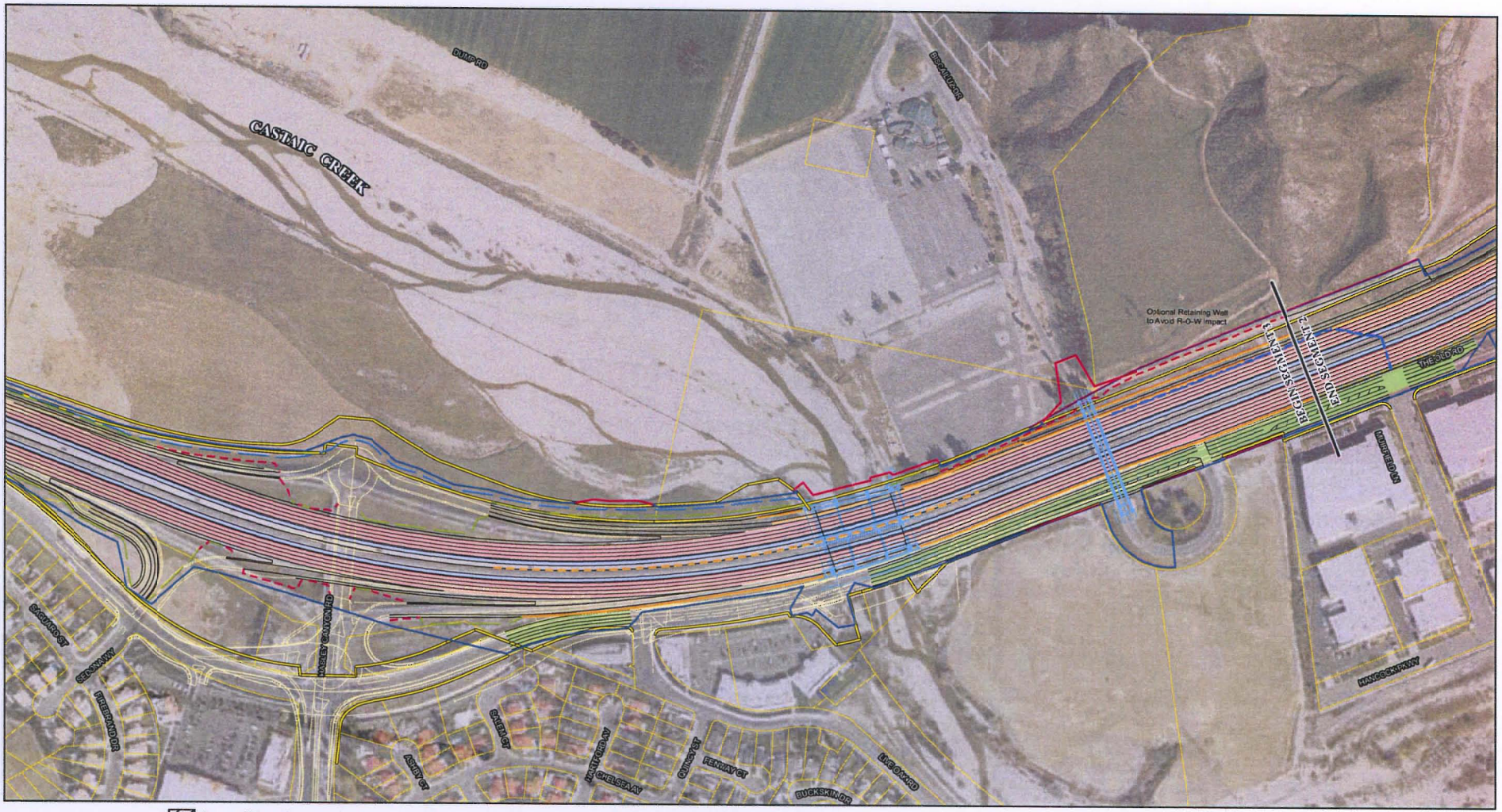
*I-5 HOV/Truck Lanes Project*
Alternative 3 - Project Features
07-LA-5 PM R45.4/R59.0
EA 2332E0




Potential Water Treatment Basin
Potential Construction Staging Area
Proposed Alignment
Existing Right-of-Way
Proposed Right-of-Way
Parcel Boundary
Disturbance Line

Temporary Construction Easement (TCE)
Structure to be Widened or Replaced
Toe of Fill
Top of Cut
Proposed Retaining Wall
Existing Retaining Wall
Proposed Drainage Improvements

Improvements by Others
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HOV Lanes
MFL Lanes
Proposed AUX Lanes
Truck Lanes
Unimproved Lanes/No Improvements
Frontage Road Improvements

0 150 300 Feet

SOURCE: Psomas (2008).

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FIGURE 1.5
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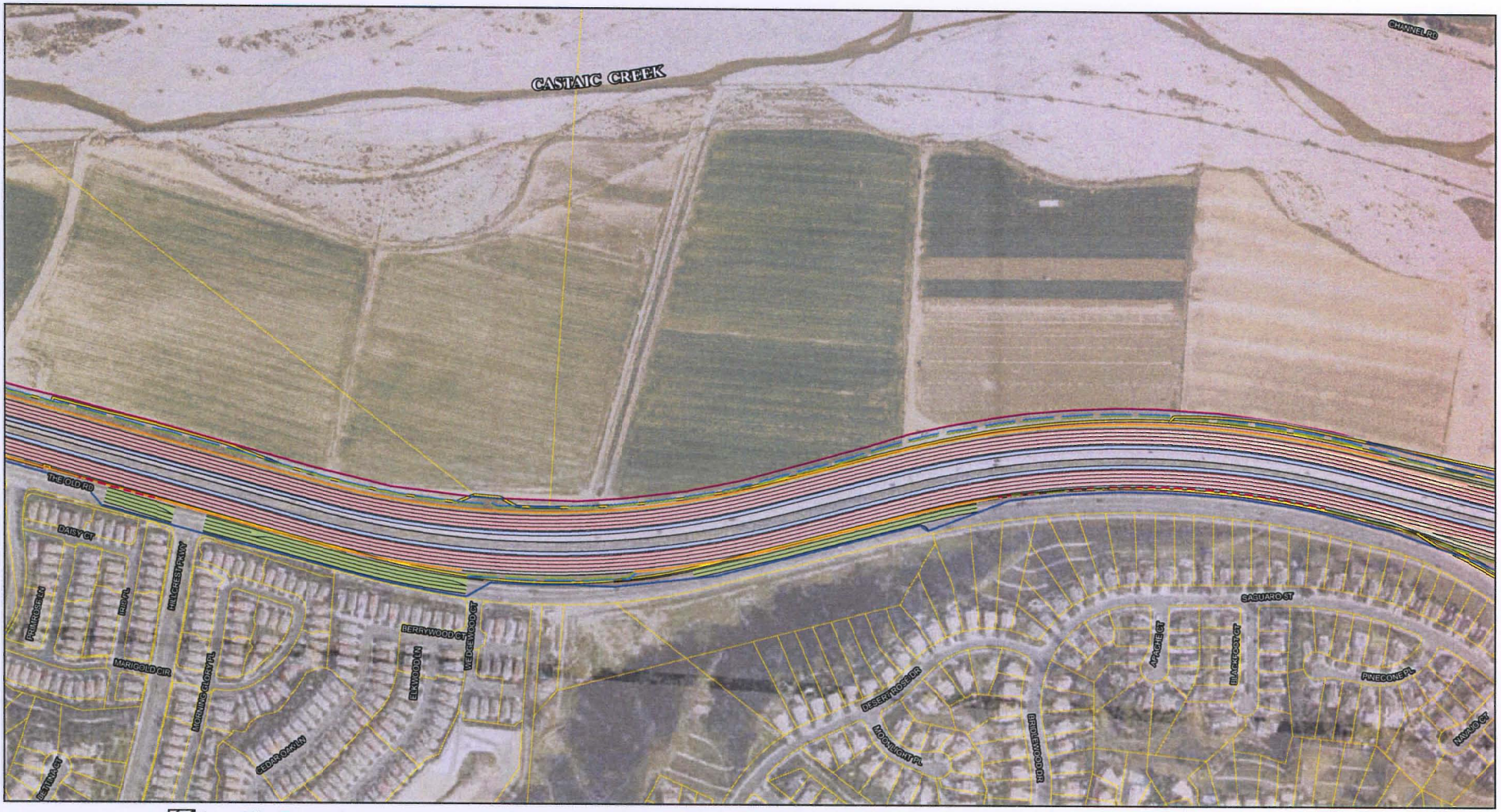
*I-5 HOV/Truck Lanes Project*
Alternative 3 - Project Features
07-LA-5 PM R45.4/R59.0
EA 2332E0




Potential Water Treatment Basin
Potential Construction Staging Area
Proposed Alignment
Existing Right-of-Way
Proposed Right-of-Way
Parcel Boundary
Disturbance Line
Temporary Construction Easement (TCE)
Structure to be Widened or Replaced
Toe of Fill
Top of Cut
Proposed Retaining Wall
Existing Retaining Wall
Proposed Drainage Improvements
Improvements by Others
Existing Length of AUX Lane/ Extend Ramp
HOV Lanes
MFL Lanes
Proposed AUX Lanes
Truck Lanes
Unimproved Lanes/No Improvements
Frontage Road Improvements

0 150 300 Feet

SOURCE: Psomas (2008).

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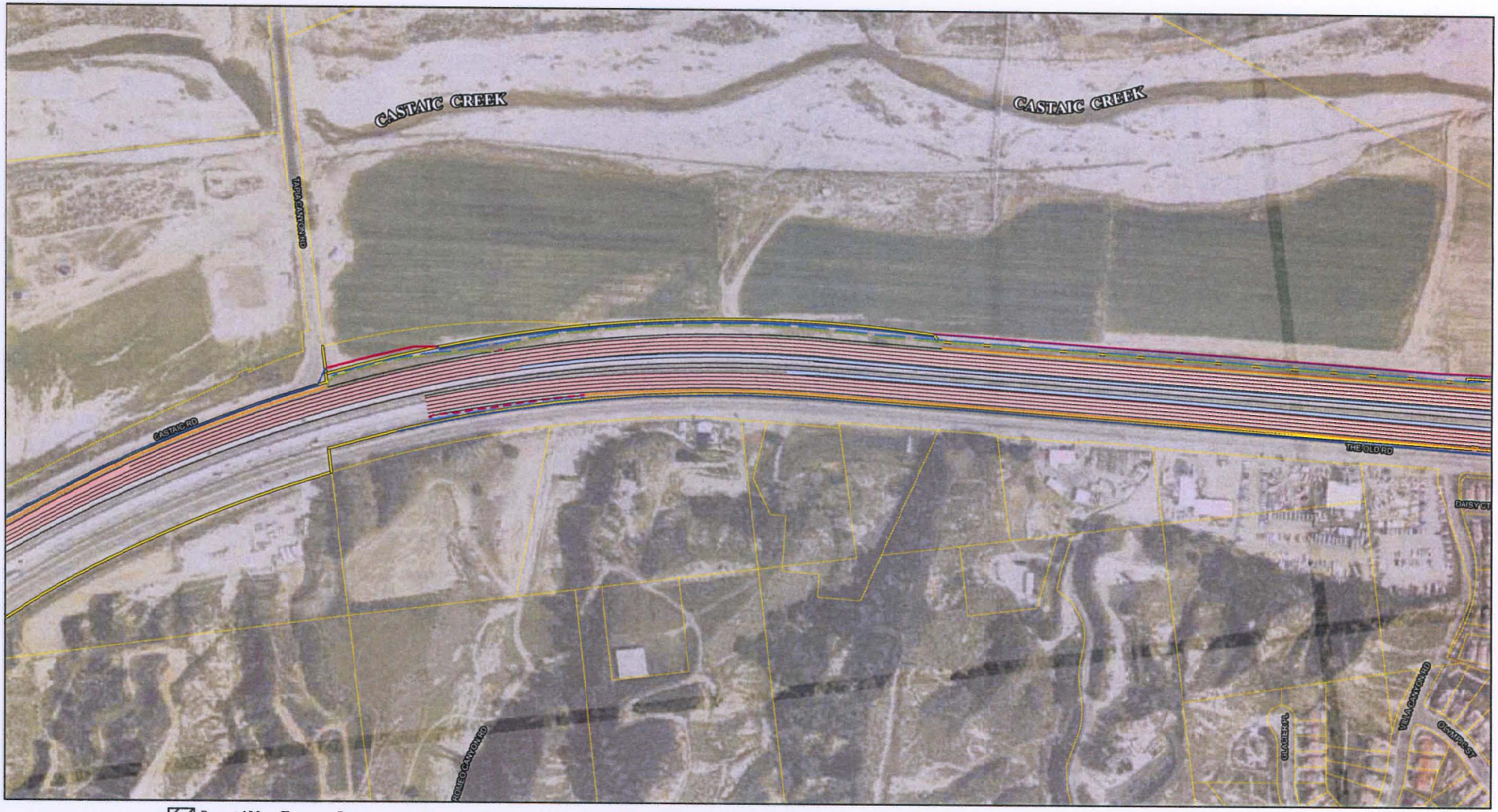
FIGURE 1.5
Sheet 15 of 17

*I-5 HOV/Truck Lanes Project*
Alternative 3 - Project Features
07-LA-5 PM R45.4/R59.0
EA 2332E0




Potential Water Treatment Basin
Potential Construction Staging Area
Proposed Alignment
Existing Right-of-Way
Proposed Right-of-Way
Parcel Boundary
Disturbance Line
Temporary Construction Easement (TCE)
Structure to be Widened or Replaced
Toe of Fill
Top of Cut
Proposed Retaining Wall
Existing Retaining Wall
Proposed Drainage Improvements
Improvements by Others
Existing Length of AUX Lane/ Extend Ramp
HOV Lanes
MFL Lanes
Proposed AUX Lanes
Truck Lanes
Unimproved Lanes/No Improvements
Frontage Road Improvements

0 150 300 Feet

SOURCE: Psomas (2008).

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FIGURE 1.5
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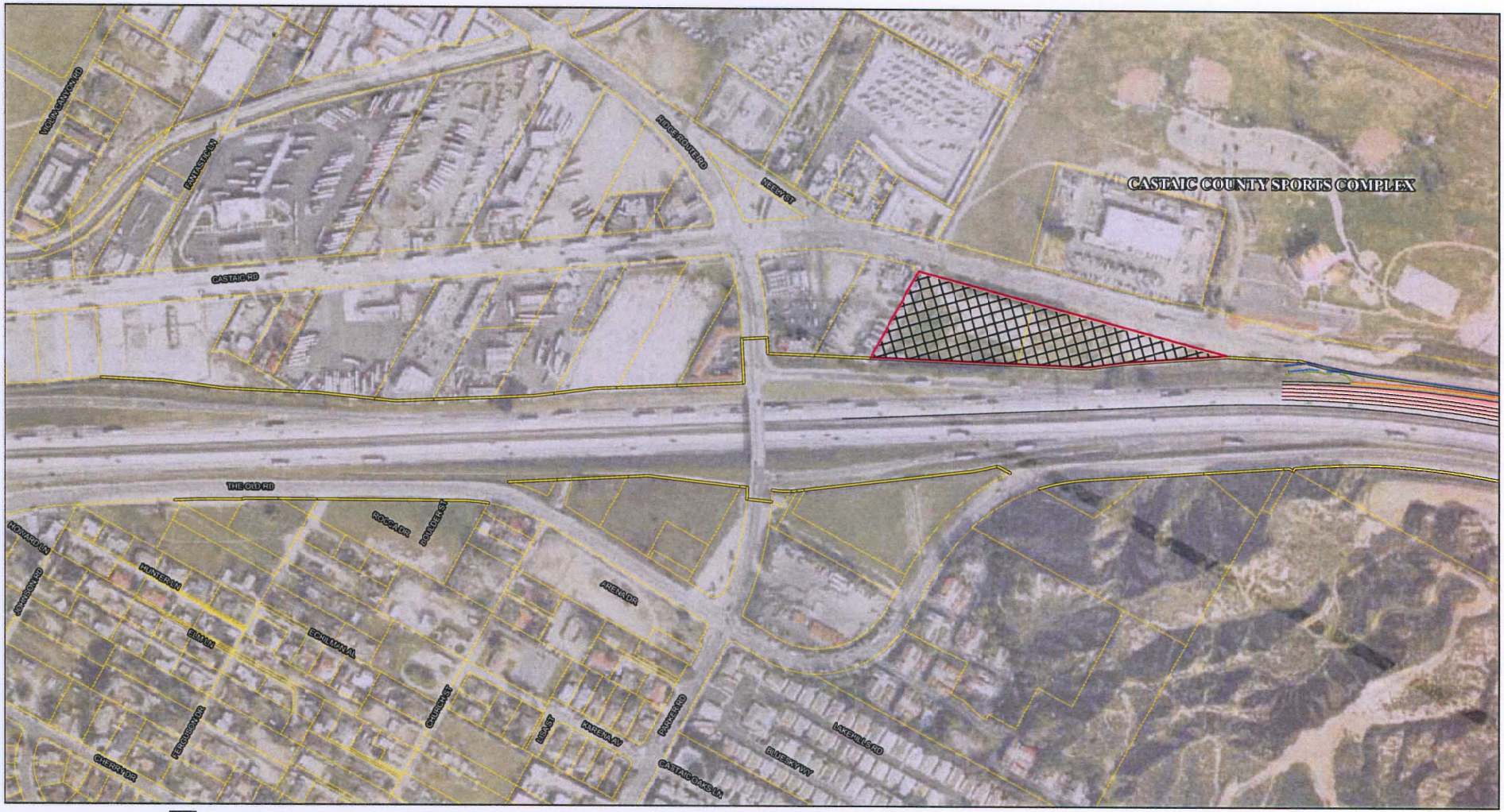
*I-5 HOV/Truck Lanes Project*
Alternative 3 - Project Features
07-LA-5 PM R45.4/R59.0
EA 2332E0




SOURCE: Psomas (2008).

I:\SIB0601\GIS\Project_Features_Alt3_Fig1-5.mxd (12/11/2008)

FIGURE 1.5
Sheet 17 of 17

*I-5 HOV/Truck Lanes Project*

Alternative 3 - Project Features

07-LA-5 PM R45.4/R59.0

EA 2332E0

**Excerpt, Section 4.8, Traffic, Newhall Ranch Resource Management and Development Plan and Spineflower Conservation Plan Environmental Impact Statement/Environmental Impact Report (SCH No. 2000011025)**

**Table 4.8-26**, Significantly Impacted Freeway Segments - Long-Range Build-Out Conditions - Volume Density Ratios, lists the volume density ratios for each of the significantly impacted freeway segments under long-range build-out conditions.

**(Revised) Table 4.8-26**
**Significantly Impacted Freeway Segments -**
**Long-Range Build-Out Conditions - Volume Density Ratios**

| Location/County | Lanes | Volume Density by Alternative[1] | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| I-5 south of Parker/Los Angeles | 8 | <45 | <45 | <45 | <45 | <45 | <45 | <45 |
| I-5 south of Hasley/Los Angeles | 8 | >45 | >45 | >45 | >45 | >45 | >45 | >45 |
| I-5 south of SR-126/Los Angeles | 8 | >45 | >45 | >45 | >45 | >45 | >45 | >45 |
| I-5 south of Rye Canyon/Los Angeles | 8 | >45 | >45 | >45 | >45 | >45 | >45 | >45 |
| I-5 south of Magic Mountain/Los Angeles | 8 | >45 | >45 | >45 | >45 | >45 | >45 | >45 |
| I-5 south of Valencia/Los Angeles | 8 | >45 | >45 | >45 | >45 | >45 | >45 | >45 |
| I-5 south of McBean/Los Angeles | 8 | >45 | >45 | >45 | >45 | >45 | >45 | >45 |
| I-5 south of Lyons/Los Angeles | 8 | >45 | >45 | >45 | >45 | >45 | >45 | >45 |
| I-5 south of Calgrove/Los Angeles | 8 | >45 | >45 | >45 | >45 | >45 | >45 | >45 |

Notes:

[1] The "45" reference in this table refers to either less than or more than 45 passenger vehicles per mile, per lane.

See Draft EIS/EIR, **Appendix 4.8**, December 2008 Traffic Report, for the complete listing of volume densities for all I-5 freeway segments.

Source: Austin-Foust Associates, Inc. - December 2008

## 4.8.9 MITIGATION MEASURES

### 4.8.9.1 Mitigation Measures Already Required by the Adopted Newhall Ranch Specific Plan EIR

The County of Los Angeles previously adopted mitigation measures to minimize traffic impacts within the Specific Plan area as part of its adoption of the Newhall Ranch Specific Plan and WRP. These measures are found in the previously certified Newhall Ranch Specific Plan Program EIR and the adopted Mitigation Monitoring Plans for the Specific Plan and WRP (May 2003), and are summarized above in **Table 4.8-1**. In addition, these mitigation measures (and related text) are set forth in full below, preceded by "SP," which stands for Specific Plan.

**On-Site** (Except SR-126 - See below)

The following mitigation is required relative to all on-site roadways and intersections except SR-126, which is discussed separately below:

**SP-4.8-1** The applicants for future subdivision maps which permit construction shall be responsible for funding and constructing all on-site traffic improvements except as otherwise provided below. The obligation to construct improvements shall not preclude the applicants' ability to seek local, State or Federal funding for these facilities.

**SP-4.8-2** Prior to the approval of each subdivision map which permits construction, the applicant for that map shall prepare a transportation performance evaluation which shall indicate the specific improvements for all on-site roadways which are necessary to provide adequate roadway and intersection capacity as well as adequate right-of-way for the subdivision and other expected traffic. Transportation performance evaluations shall be approved by Los Angeles County Department of Public Works according to standards and policies in effect at that time. The transportation performance evaluation shall form the basis for specific conditions of approval for the subdivision.

**SP-4.8-3** The applicants for future subdivisions shall provide the traffic signals at the 15 locations labeled "B" through "P" in Figure 4.8-17 as well as any additional signals warranted by future subdivision design. Signal warrants shall be prepared as part of the transportation performance evaluations noted in Mitigation 4.8-2.

**SP-4.8-4** All development within the Specific Plan shall conform to the requirements of the Los Angeles County Transportation Demand Management (TDM) Ordinance.

**SP-4.8-5** The applicants for all future subdivision maps which permit construction shall consult with the local transit provider regarding the need for, and locations of, bus pull-ins on highways within the Specific Plan area. All bus pull-in locations shall be approved by the Department of Public Works, and approved bus pull-ins shall be constructed by the applicant.

**Off-Site Arterials**

**SP-4.8-6** Prior to the recordation of the first subdivision map which permits construction, the applicant for that map shall prepare a transportation performance evaluation which shall determine the specific improvements needed to each off-site arterial and related costs in order to provide adequate roadway and intersection capacity for the expected Specific Plan and General Plan buildout traffic trips. The transportation performance evaluation shall be based on the Master Plan of Highways in effect at that time and shall be approved by the Los Angeles County Department of Public Works. The applicant shall be required to fund its fair share of improvements to these arterials, as stated on Table 4.8-18. The applicants total funding obligation shall be equitably distributed over the housing units and non-residential building square footage (*i.e.*, Business Park, Visitor-Serving, Mixed-Use, and Commercial) in the Specific Plan, and shall be a fee to be paid to the County and/or the City at each building permit. For off-site areas within the County unincorporated area, the applicant may construct improvements for credit against or in lieu of paying the fee.

**Freeways and State Highways (I-5 and SR-126 in Los Angeles County)**

**SP-4.8-7** Each future performance evaluation which shows that a future subdivision map will create significant impacts on SR-126 shall analyze the need for additional travel lanes on SR-126. If

adequate lane capacity is not available at the time of subdivision, the applicant of the subdivision shall fund or construct the improvements necessary to serve the proposed increment of development. Construction or funding of any required facilities shall not preclude the applicant's ability to seek State, Federal or local funding for these facilities.

**Congestion Management**

**SP-4.8-8** Project-specific environmental analysis for future subdivision maps which allow construction shall comply with the requirements of the Congestion Management Program in effect at the time that subdivision map is filed.

**SR-126 in Ventura County**

**SP-4.8-9** Prior to the recordation of the first subdivision map which permits construction, the applicant for that map shall prepare a transportation evaluation including all of the Specific Plan land uses which shall determine the specific improvements needed to the following intersections with SR-126 in the City of Fillmore and community of Piru in Ventura County: "A", "B", "C", "D" and "E" Streets, Old Telegraph, Olive, Central, Santa Clara, Mountain View, El Dorado Road, and Pole Creek (Fillmore), and Main/Torrey and Center (Piru). The related costs of those intersection improvements and the project's fair share shall be estimated based upon the expected Specific Plan traffic volumes. The transportation performance evaluation shall be based on the Los Angeles County Master Plan of Highways in effect at that time and shall be approved by the Los Angeles County Department of Public Works. The applicant's total funding obligation shall be equitably distributed over the housing units and non-residential building square footage (*i.e.*, Business Park, Visitor Center, Mixed Use, and Commercial) in the Specific Plan, and shall be a fee to be paid to the City of Fillmore and the County of Ventura at each building permit.

**Freeway/Highway Intersections and Interchanges**

**SP-4.8-10** The Specific Plan is responsible to construct or fund its fair-share of the intersections and interchange improvements indicated on Table 4.8-18. Each future transportation performance evaluation required by Mitigation Measure 4.8-2 which identifies a significant impact at these locations due to subdivision map-generated traffic shall address the need for additional capacity at each of these locations. If adequate capacity is not available at the time of subdivision map recordation, the performance evaluation shall determine the improvements necessary to carry Specific Plan generated traffic, as well as the fair share cost to construct such improvements. If the future subdivision is conditioned to construct a phase of improvements which results in an overpayment of the fair-share cost of the improvement, then an appropriate adjustment (offset) to the fees paid to Los Angeles County and/or City of Santa Clarita pursuant to Mitigation Measure 4.8-6 above shall be made.

**SP-4.8-11** The applicant of the Newhall Ranch Specific Plan shall participate in an I-5 developer fee program, if adopted by the Board of Supervisors for the Santa Clarita Valley.

**SP-4.8-12** The applicant of the Newhall Ranch Specific Plan shall participate in a transit fee program, if adopted for the entire Santa Clarita Valley by Los Angeles County and City of Santa Clarita.

**SP-4.8-13** Prior to the approval of each subdivision map which permits construction, the applicant for that map shall prepare a traffic analysis approved by the Los Angeles County Department of Public Works. The analysis will assess project and cumulative development (including an existing plus cumulative development scenario under the County's Traffic Impact Analysis Report Guidelines (TIA) and its Development Monitoring System (DMS)). In response to the traffic analysis, the applicant may construct off-site traffic improvements for credit against, or in lieu of paying, the mitigation fees described in Mitigation Measure 4.8-6 above. If future subdivision maps are developed in phases, a traffic study for each phase of the subdivision map may be submitted to determine the improvements needed to be constructed with that phase of development.

**Water Reclamation Plant**

**SP-5.0-36** If SR-126 is still a two-lane highway at the time of WRP construction, a construction traffic management plan shall be prepared and implemented. This plan shall address site access, staging and storage areas, hours of construction, work crew parking, warning and traffic control signs and devices, flag men, temporary detouring, *etc.*, as appropriate, to avoid a significant impact on SR-126.

**SP-5.0-37** An encroachment permit shall be obtained from Caltrans, for access to the plant site from SR-126.

### 4.8.9.2 Mitigation Measures Already Required by the Adopted VCC EIR

The County of Los Angeles adopted mitigation measures to minimize traffic impacts within the VCC planning area as part of its approval of the VCC project. These measures are found in the previously certified VCC EIR (April 1990), and are summarized in **Table 4.8-2**, above. In addition, these mitigation measures are set forth in full below, preceded by "VCC-TR," which stands for Valencia Commerce Center - Traffic.

At the time of adoption, the VCC mitigation measures represented the best available mitigation imposed by Los Angeles County. As noted in **Subsection 4.8.1.2.1**, above, additional environmental review will be conducted by Los Angeles County with respect to the VCC planning area because the applicant recently submitted the last tentative parcel map for build-out of the VCC planning area. Implementation of the previously adopted, applicable VCC mitigation measures and additional mitigation requirements (*e.g.*, measures similar to those previously adopted for the Specific Plan area and/or recommended for the proposed Project) would ensure that significant impacts to traffic/access within the VCC planning area are reduced to the extent feasible.

**VCC-TR-1** Participate in improvements to the Backer Road/I-5 Interchange.

**VCC-TR-2** Improve Backer Rd. from the I-5 Freeway to Henry Mayo Dr. (SR-126).

**VCC-TR-3** Improve Henry Mayo Drive from Backer Road to the I-5 Freeway with a minimum of two through lanes in each direction and additional turn lanes at Intersections.

**VCC-TR-4** Provide full half-street improvements on SR-126 along project frontage to Expressway Standards.

**VCC-TR-5** Provide detailed striping plans for Backer Rd. and The Old Road.

**VCC-TR-6** Entering into a secured agreement with the Department of Public Works to contribute to the cost of installing signals at the following intersections as warrants indicate:

- The Old Road/Hasley Canyon Road;
- The Old Road/Backer Road;
- The Old Road/SB I-5 ramps (relocated);
- The Old Road/Sedona Way;
- The Old Road/SR-126 EB ramps;
- The Old Road/SR-126 WB ramps;
- Backer Road/I-5 NB ramps;
- Backer Road/I-5 SB ramps;
- Backer Road/Cambridge Drive;
- Backer Road/Hasley Canyon Road north;
- Backer Road/Hasley Canyon Road south;
- Backer Road/Henry Mayo Drive; and
- Backer Road/"C" Street

**VCC-TR-7** Payment of appropriate Bridge and Thoroughfare District fees.

**VCC-TR-8** Per Al Kelm of the Department of Public Works, Traffic and Lighting Division, occupancy permits shall not be issued until Backer Road is constructed from Hasley Canyon Road to SR-126 unless a traffic study shows, to the satisfaction of the Department of Public Works that adequate capacity is available for area traffic via an alternate access to SR-126.

**VCC-TR-9** Supplemental traffic studies will be prepared as part of the individual tentative map processing.

**VCC-TR-10** Backer Road will be realigned to the north a maximum distance of 50' and average distance of 25' to allow for the construction of an 11' combination berm and wall between the homes and the road.

**VCC-TR-11** Pedestrian safety will be maintained through the construction of a paseo bridge across Backer Road, just west of the Cambridge intersection, and the placement of sidewalks along both sides of Backer Road.

**VCC-TR-12** A noise study will be conducted subsequent to the completion of Backer Road from Hasley Creek to SR-126 to determine whether restrictions to nighttime truck traffic are warranted because of single event noise impacts to residents along Backer Road.

**VCC-TR-13** Construction of 1/2 street improvements on The Old Road from Backer Rode to SR-126.

**VCC-TR-14** Entering into a secured agreement with the Department of Public Works to contribute to the cost of installing signals at the following intersections:

- Backer Road/Biscailuz Drive;
- The Old Road/Biscailuz Drive;
- The Old Road/Hasley Canyon Road;
- I-5 southbound ramps/SR-126; and
- I-5 northbound ramps/SR-126

**VCC-TR-15** Payment of appropriate Bridge and Thoroughfare District fees.

**VCC-TR-16** Supplemental traffic studies will be prepared as part of the individual tentative map processing.

**VCC-TR-17** Vacation of Hasley Canyon Road so that there is no through traffic between Backer and The Old Road.

### 4.8.9.3 Mitigation Measures Relating to the Entrada Planning Area

The County of Los Angeles has not yet prepared or released a draft EIR for the proposed development within the portion of the Entrada planning area that would be facilitated by approval of the SCP component of the proposed Project. As a result, there are no previously adopted mitigation measures for the Entrada planning area. However, the adoption and implementation of measures similar to those previously adopted for the Specific Plan area and/or recommended for the proposed Project would ensure that potential impacts to traffic/access within the Entrada planning area are reduced to the extent feasible.

### 4.8.9.4 Additional Mitigation Measures Proposed by this EIS/EIR

Based on the analysis presented above, the following mitigation measures, which are in addition to those previously adopted by the County of Los Angeles in connection with its approval of the Specific Plan, WRP, and VCC projects, are proposed to provide additional capacity at the impacted roadways throughout the Project study area. Additional capacity may be provided by constructing additional lanes, re-striping existing lanes, or implementing other roadway improvements. It should be noted that not all of the proposed mitigation measures are applicable to all of the Project alternatives. The applicability of each mitigation measure is noted in parentheses following the text of the mitigation measure. **Table 4.8-27**, Mitigation Measure Fair-Share Percentages, below, lists the applicable percentage contribution required of each Project alternative relative to each mitigation measure. The percentage is a calculation of the Project's share of the forecast increases in traffic at the identified location. (See **Appendix 4.8**, 2008 Traffic Report, Appendix E.) Each of the impacted locations is within an established (or in the case of the Westside, a proposed) bridge and thoroughfare assessment district, or within the limits of the planned I-5 improvement project. The additional measures are preceded by "TR," to designate that they are traffic-related mitigation.

**Table 4.8-27**
**Mitigation Measure Fair-Share Percentages**

| Location/County | Fair-Share Percentages by Alternative | | | | | |
|---|---|---|---|---|---|---|
| | 2 | 3 | 4 | 5 | 6 | 7 |
| Magic Mtn west of Westridge/Los Angeles | n/a[1] | n/a[1] | n/a[1] | n/a[1] | 100.0% | n/a[1] |
| Magic Mtn west of The Old Road/Los Angeles | n/a[1] | n/a[1] | n/a[1] | n/a[1] | 55.6% | 52.0% |
| The Old Road north of Rye Cyn/Los Angeles | n/a[1] | n/a[1] | n/a[1] | n/a[1] | 33.3% | 30.4% |
| The Old Road north of Magic Mtn/Los Angeles | 33.3% | 33.3% | n/a[1] | n/a[1] | 61.0% | 51.5% |
| Rye Cyn east of The Old Road/Los Angeles | 37.5% | 37.5% | 33.3% | 33.3% | 44.4% | 37.5% |
| Via Princessa east of Santa Clarita/Los Angeles | 1.5% | 1.5% | 1.5% | 1.5% | n/a[1] | n/a[1] |
| McBean south of Avenue Scott | n/a[1] | n/a[1] | n/a[1] | n/a[1] | 33.3% | n/a[1] |
| I-5 south of Parker/Los Angeles | 2.5% | 2.5% | n/a[1] | n/a[1] | n/a[1] | n/a[1] |
| I-5 south of Hasley/Los Angeles | 1.3% | 1.3% | n/a[1] | n/a[1] | 2.0% | 0.7% |
| I-5 south of SR-126/Los Angeles | 0.9% | 1.8% | 0.9% | n/a[1] | 4.4% | 0.9% |
| I-5 south of Rye Canyon/Los Angeles | 4.1% | 4.1% | n/a[1] | n/a[1] | n/a[1] | n/a[1] |
| I-5 south of Magic Mtn/Los Angeles | 4.7% | 4.7% | n/a[1] | n/a[1] | n/a[1] | n/a[1] |
| I-5 south of Valencia/Los Angeles | 7.9% | 7.9% | 4.7% | n/a[1] | 3.5% | n/a[1] |
| I-5 south of McBean/Los Angeles | 6.4% | 6.4% | 4.3% | 3.3% | 3.3% | n/a[1] |
| I-5 south of Lyons/Los Angeles | 15.9% | 14.8% | 12.7% | 12.7% | 11.5% | n/a[1] |
| I-5 south of Calgrove/Los Angeles | 14.8% | 14.8% | 12.8% | 10.7% | 10.7% | 5.1% |

Notes:

[1] Not Applicable (no impact for this alternative at this location)

See Draft EIS/EIR, **Appendix 4.8**, December 2008 Traffic Report, for summary of ADT share calculation.

Source: Austin-Foust Associates, Inc. - December 2008

**TR-1** The Project applicant shall design and construct Magic Mountain Parkway west of Westridge Parkway in a manner that increases the planned six-lane augmented roadway to an eight-lane roadway. (This mitigation measure is applicable to Alternative 6 only.)

**TR-2** The Project applicant shall contribute its fair-share of the costs to add additional capacity to Magic Mountain Parkway west of The Old Road by increasing the planned eight-lane augmented roadway to a 10-lane roadway. (This mitigation measure is applicable to Alternative 7 only.)

**TR-3** The Project applicant shall contribute its fair-share of the costs to add additional capacity to Magic Mountain Parkway west of The Old Road by increasing the planned eight-lane augmented roadway to a 10-lane augmented roadway. (This mitigation measure is applicable to Alternative 6 only.)

**TR-4** The Project applicant shall contribute its fair-share of the costs to add additional capacity to The Old Road north of Rye Canyon Road by increasing the planned six-lane roadway to a six-lane augmented roadway. (This mitigation measure is applicable to Alternatives 6 and 7 only.)

**TR-5** The Project applicant shall contribute its fair-share of the costs to add additional capacity to The Old Road north of Magic Mountain Parkway by increasing the planned six-lane roadway to a six-lane augmented roadway. (This mitigation measure is applicable to Alternatives 2, 3, and 7 only.)

**TR-6** The Project applicant shall contribute its fair-share of the costs to add additional capacity to The Old Road north of Magic Mountain Parkway by increasing the planned six-lane roadway to an eight-lane augmented roadway. (This mitigation measure is applicable to Alternative 6 only.)

**TR-7** The Project applicant shall contribute its fair-share of the costs to add additional capacity to Rye Canyon Road east of The Old Road by increasing the existing six-lane roadway to a six-lane augmented roadway. (This mitigation measure is applicable to Alternatives 2 through 7.)

**TR-8** The Project applicant shall contribute its fair-share of the costs to add additional capacity to Via Princessa east of Santa Clarita Road by increasing the planned six-lane roadway to a six-lane roadway. (This mitigation measure is applicable to Alternatives 2, 3, 4 and 5 only.)

**TR-9** The Project applicant shall contribute its fair-share of the costs to add additional capacity to McBean Parkway south of Avenue Scott by increasing the planned eight-lane roadway to an eight-lane augmented roadway. (This mitigation measure is applicable to Alternative 6 only.)

**TR-10** The Project applicant shall contribute its fair-share of the costs of adding one HOV lane in each direction to the segment of I-5 south of Parker. (This mitigation measure is applicable to Alternatives 2 and 3.)

**TR-11** The Project applicant shall contribute its fair-share of the costs of adding one HOV lane in each direction to the segment of I-5 south of Hasley. (This mitigation measure is applicable to Alternatives 2, 3, 6 and 7 only.)

**TR-12** The Project applicant shall contribute its fair-share of the costs of adding one HOV lane in each direction to the segment of I-5 south of SR-126. (This mitigation measure is applicable to Alternatives 2, 3, 4, 6 and 7 only.)

**TR-13** The Project applicant shall contribute its fair-share of the costs of adding one HOV lane in each direction to the segment of I-5 south of Rye Canyon. (This mitigation measure is applicable to Alternatives 2 and 3 only.)

**TR-14** The Project applicant shall contribute its fair-share of the costs of adding one HOV lane in each direction to the segment of I-5 south of Magic Mountain Parkway. (This mitigation measure is applicable to Alternatives 2 and 3 only.)

**TR-15** The Project applicant shall contribute its fair-share of the costs of adding one HOV lane in each direction to the segment of I-5 south of Valencia Boulevard. (This mitigation measure is applicable to Alternatives 2, 3, 4 and 6 only.)

**TR-16** The Project applicant shall contribute its fair-share of the costs of adding one HOV lane in each direction to the segment of I-5 south of McBean Parkway. (This mitigation measure is applicable to Alternatives 2, 3, 4, 5 and 6 only.)

**TR-17** The Project applicant shall contribute its fair-share of the costs of adding one HOV lane in each direction, and one truck lane in the southbound direction, to the segment of I-5 south of Lyons Avenue. (This mitigation measure is applicable to Alternatives 2, 3, 4, 5 and 6 only.)

**TR-18** The Project applicant shall contribute its fair-share of the costs of adding one HOV lane in each direction, two truck lanes in the southbound direction, and one truck lane in the northbound direction to the segment of I-5 south of Calgrove Avenue. (This mitigation measure is applicable to Alternatives 2 through 7.)

With respect to Mitigation Measures TR-10 through TR-18, Caltrans presently is implementing the I-5 HOV + Truck Lanes - SR-14 to Parker Road project, which will add the identified HOV and truck lanes to I-5. Caltrans certified the Final EIR and approved the I-5 project in September 2009. ~~is undergoing~~ The preliminary engineering and environmental studies for the project have been completed, the project is fully funded and included in the 2008 Regional Transportation Plan, and construction is anticipated to begin in 2011 and be completed ~~between 2014 and~~ in 2015. For additional information, please see Final EIS/EIR, **Appendix F4.8**, I-5 HOV/Truck Lanes Project SR-14 to Parker Road, Final Environmental Impact Report/Environmental Assessment with Finding of No Significant Impact (September 2009). The selected Project alternative, and other cumulative development, would be required to contribute its fair-share to the I-5 project, which will add: (1) one HOV lane in each direction on I-5 from the SR-14 interchange north to Parker Road; (2) truck climbing lanes in each direction from the SR-14 interchange to Calgrove Boulevard (northbound) and Pico Canyon Road/Lyons Avenue (southbound); and (3) full auxiliary lanes within portions of the Project study area. (See **(Revised) Figure 4.8-40**, Long-Range Freeway System for the Los Angeles County Area, and Draft EIS/EIR, **Appendix 4.8**, 2007 I-5 Improvement Project Study, and Transportation Concept Report, Caltrans, November 1998.)

### 4.8.9.5 Existing Plus Project Impacts Mitigation

Based on the existing plus project analysis presented herein, 14 roadway segments and one freeway segment would be significantly impacted under the proposed Project; a subset of these road segments would be significantly impacted under each of the Project alternatives.

Each of the significantly impacted segments is located within the Santa Clarita Valley portion of the study area, and each would be mitigated with: (i) construction of the new and expanded roadways built as part of the city of Santa Clarita and County of Los Angeles highway plans through the applicable Bridge and Thoroughfare Districts; (ii) construction of the roads to be built as part of the access for the proposed Project (see Draft EIS/EIR, **Appendix 4.8**, 2008 Traffic Report, Appendix B); and (iii) implementation of the specific mitigation measures identified in **Subsection 4.8.9.4**, Additional Mitigation Measures Proposed by this EIS/EIR.

**(Revised) Figure 4.8-40 Long-Range Freeway System for the Los Angeles County Area**

(AF 2008 TA Fig. 29)

Future conditions with the new and expanded roadways in place are evaluated in the long-range impacts analysis conducted for the proposed Project and the alternatives and presented in **Subsection 4.8.8**, Impacts of the Proposed Project and Alternatives. **Subsection 4.8.10**, Summary of Significance Findings, illustrates that with implementation of the identified specific Project mitigation measures, the significant impacts identified under the long-range impacts analysis would be reduced to less than significant. Thus, the analysis shows that with build-out of the city of Santa Clarita and County of Los Angeles highway plans, in combination with the mitigation measures identified in this EIS/EIR, the significant impacts identified under the existing plus project scenario would be fully mitigated and no additional or other mitigation would be necessary.

## 4.8.10 SUMMARY OF SIGNIFICANCE FINDINGS

**Table 4.8-28**, Mitigated Arterial and Freeway Segments - Long-Range Build-out Conditions - Volume/ Capacity Ratios, depicts the individual roadway segments significantly impacted by the Project alternatives, the number of lanes that would result with implementation of the proposed mitigation, and the resulting v/c ratios. As shown on **Table 4.8-28**, implementation of the proposed mitigation measures, in combination with implementation of other roadway improvements made necessary by cumulative development, would result in each of the impacted roadway segments operating at acceptable v/c and volume density ratios under the proposed Project and each alternative as a result of the increased capacity attributable to the roadway improvement mitigation. The increased capacity would accommodate the increased traffic and, thereby, reduce impacts to a level below significant. The one exception is Alternative 1, the No Action/No Project Alternative. As discussed in **Subsection 4.8.8.1**, under Alternative 1, deficient roadway conditions would continue at the following twelve locations: Via Princessa east of Santa Clarita Road, I-5 south of Hasley (SB), I-5 south of SR-126 (SB), I-5 south of Rye Canyon (SB), I-5 south of Magic Mountain (SB), I-5 south of Valencia (NB and SB), I-5 south of McBean (NB and SB), I-5 south of Lyons (NB and SB), and I-5 south of Calgrove (SB).[5:1]

[5:1] The resulting v/c ratio for Via Princessa east of Santa Clarita Road is depicted on **Table 4.8-28** because this segment would be significantly impacted by the Project alternatives and, therefore, is included within the table; the other road segments that would operate under deficient conditions under the No Action/No Project Alternative are not significantly impacted by the Project alternatives and, accordingly, not included on the table. **Appendix 4.8** includes the complete listing of v/c ratios for all study area road segments, including those segments that would operate at deficient conditions under the No Action/No Project Alternative.

**Los Angeles Daily News Article "Rail Plans Picking Up Steam Proposal Links Santa Clarita, Port Hueneme"**
**September 24, 2007**

# RAIL PLANS PICKING UP STEAM PROPOSAL LINKS SANTA CLARITA, PORT HUENEME.

*Date:* *Sep 24, 2007*
*Words:* *1247*
*Publication:* *Daily News (Los Angeles, CA)*
*ISSN:* *0279-8026*

Byline: PATRICIA FARRELL AIDEM

Staff Writer

SANTA CLARITA -- An ambitious plan to re-establish a passenger-rail line between Santa Clarita and the Ventura coast faces serious hurdles, although all sides agree an alternative is needed to the region's increasingly congested freeways.

A draft study commissioned in part by the Ventura County Transportation Commission recommends extending the existing east-west Santa Paula line to the north-south railroad that runs through Santa Clarita. There, planners hope to reclaim an abandoned rail corridor through the city's commercial and business hub.

"The most important thing is that we think about it and do some long- range planning so maybe in 30 years, if we start reserving the right-of-way now, we can do something," said Kerry Forsythe, the commission's deputy director.

For several months, commission executives have been talking up their plan with the various stakeholders to collect comments before delivering the results in October to the full panel.

The proposal got a lukewarm reception during a recent session with the Santa Clarita City Council, which objected to the route through the city's densely developed town center area.

"It's irrational," Councilwoman Laurene Weste said. "I support rail travel, but to wipe out a lifestyle, to literally impact hundreds of millions of dollars of real estate, I can't see it working."

Still, the city where commuters face a gridlocked Interstate 5 heading south to jobs joins Ventura County in its quest to study a new passenger rail spur to connect with its existing Metrolink line.

"Santa Clarita has some very important issues," said Bob Huddy, the transportation program manager for the Southern California Association of Governments. "When you put a new line in, it's a difficult proposition. Where does the alignment go? ... The grade crossings?

"Those are large issues that have to be overcome."

But what's at stake is far too important to drop because it's difficult to map an alignment, Huddy said. The rail line could carry up to 7,000 commuters a day who otherwise would head south through the Newhall Pass to the San Fernando Valley.

The line also would bolster commuter service to Ventura and Oxnard where jobs are plentiful but affordable housing scarce, said Mark Schneipp, chief economist of the California Economic Forecast at the University of California, Santa Barbara.

"You have a serious housing problem in Ventura County," Schneipp said. "We're looking at Santa Clarita to fill jobs in Ventura and Oxnard."

There are also some 60,000 homes planned in the greater region -- including the 21,000-home Newhall Ranch project, an even larger development near Gorman and smaller developments in Fillmore and Santa Paula, Schneipp said. Most of those residents will have to travel one way or the other to job centers.

$450 million project

The 211-page draft study, financed by the state Department of Transportation, urges preservation and maintenance of the right-of-way and plans for an extended rail.

The plan is to create a 52-mile corridor at an estimated cost of up to $450 million in 2005 dollars. That amounts to some $7.2 million per mile, said Ginger Gherardi, the VCTC's executive director.

Union Pacific currently operates three weekly round-trip freight trains on the line from Port Hueneme to Santa Paula.

Metrolink's Ventura County Line offers weekday commuter service from Ventura to Union Station in Los Angeles. Amtrak carries passengers through Ventura, another potential link that could entice Santa Clarita.

And in Fillmore, the Fillmore and Western Railway runs recreational excursion trains -- a murder-mystery series and holiday trips to a pumpkin patch and cut-your-own Christmas tree farm. That portion of the rail also is used frequently for filming.

The tracks now cross the farmland of Ventura County and roughly follow the bucolic Santa Clara River Valley. The VCTC has money this year to rebuild the line through Piru to the Ventura County line, where The Newhall Land and Farming Co. must reserve a 35-foot rail corridor through its Newhall Ranch project.

The main complication lies in extending tracks east across Interstate 5 and rebuilding a long-abandoned rail line through Santa Clarita to the city's main Metrolink station.

Weste suggested ending the line west of Santa Clarita -- perhaps near Newhall Ranch -- then using shuttles to transport passengers to the Metrolink station.

An elevated train "like a Disneyland tram" might also be a possibility, though extremely expensive, Councilman Frank Ferry said.

The refurbished line would be highlighted by a historic station in Saticoy -- now used as a lumber yard -- and a century-old rail bridge that was salvaged and returned to Piru by the late Scott Newhall.

Once the line is rehabilitated and extended, stops are planned in Oxnard, Ventura, the farm town of Saticoy, Santa Paula, Fillmore, Piru, Newhall Ranch and Valencia's mall before the Santa Clarita station.

Freight is an issue

Whether the rail line would carry freight trains is a sticking point. Santa Clarita, Los Angeles County and Newhall Land oppose running freight along their stretch of the line.

"No freight," Councilman Ferry said. "You can't have freight going by the mall, through the center of town." Restricting freight would be within the rights of the city or county jurisdiction, Forsythe said.

The report does peg the rail as suitable for up to three daily freight runs from Port Hueneme to Santa Clarita, but Forsythe said the focus will be on passenger service.

The final report, he said, will put less emphasis on freight. Yet much of the federal funding identified in the draft study would require the tracks be used for freight, a move Los Angeles County is eyeing carefully, said Michael Cano, transportation deputy for Supervisor Michael D. Antonovich.

"We support looking at the idea of a commuter-only rail on this line, but we're very wary of usage of this line for freight or entwining this project with any financial commitments that would open the door for freight," Cano said.

To fund acquisitions, development and maintenance, the study identified dozens of potential revenue sources, primarily federal, state and regional transportation money. It even included some unusual possibilities ranging from Defense Department funding should the line be used by the military and private naming rights for the system, its stations and individual cars.

SCAG and the VCTC say the pros of the system are multiple and center on planning to efficiently move an influx of commuters, travelers and possibly freight.

In northwestern Los Angeles County, some 50,000 more homes -- including the Newhall Ranch project -- are planned but no real solutions exist to ease traffic.

"Over time, once you get that corridor on a map, you can make decisions," Forsythe said. "We need to look at what's there today and maintain that, then look at what we can do to make this work."

pat.aidem(at)dailynews.com

(661) 257-5251

CAPTION(S):

6 photos, box, 2 maps

Photo:

(1 -- color) A train makes its way toward Ventura after leaving the Fillmore train depot. There is a proposal to upgrade the Santa Paula branch line, possibly extending it into the Santa Clarita Valley.

(2 -- color) A draft study proposes extending the existing east-west Santa Paula line to the north-south line that runs through Santa Clarita. The plan would include restoring historic bridges. An abandoned rail corridor would be reclaimed.

John Lazar/Staff Photographer

(3) Historic Saticoy Station

(4) Abandoned Santa Clara River trestle

(5) Santa Clarita MetroLink Station

(6) Fillmore Depot

Box/Map:

Proposed rail line

Source: Ventura County Transportation Commission

John Lazar/L.A. Daily News Staff Photographer

Warren Huskey/Staff Artist

Map:

Possible route

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**Excerpt from the Mission Village Draft EIR –**
**Mitigation Measures, Section 4.5**

MV 4.5-13~~9~~ The project applicant, or the current owner of the development, shall monitor the following intersections for the installation of traffic signals once the Mission Village elementary school is opened and every year thereafter for up to five years after the certificate of occupancy of the last residential unit of Mission Village (excluding age restricted/qualified residential units and residential units within the Saugus School District) is issued and the full planned occupancy of 900 students for the school is reached (or fewer students if official documentation from the Newhall School District shows no increase in student enrollment for five consecutive school years):

- A Street at B Street/CC Drive;
- Q1 Street at A Street; and
- HH Street/R Street at A Street.

The referenced monitoring shall include the submittal of annual traffic signal warrant analyses to the County Department of Public Works for review and approval. At the time, if any, traffic signals are warranted, the applicant shall enter into a secured agreement/bond with Public Works to guarantee the installation of traffic signals, design the necessary striping and signal plans, and construct the signals to the satisfaction of Public Works. Any security for the traffic signal construction submitted will be returned once the construction is completed to the satisfaction of Public Works or at the expiration of the referenced monitoring program.

MV 4.5-14~~0~~ The project shall install a traffic signal at the following location after detailed signing and striping plans and traffic signal plans have been reviewed and approved by the County Department of Public Works:

- Westridge Parkway at Old Rock Road.

MV 4.5-15~~1~~ Prior to recordation of the first tract map in Mission Village, a revised Westside Roadway Phasing Analysis (RPA), prepared and submitted by the project applicant, shall be reviewed and approved by the County Department of Public Works (DPW). This RPA shall update the previously approved RPA and identify the necessary improvements and residential unit thresholds (timing requirements) for those improvements for Mission Village based on then-current phasing assumptions. The revised RPA shall include actual traffic counts on newly constructed roadways and/or at intersections where traffic mitigation measures have been carried out. Subsequent updates of the RPA shall be prepared based on the following development thresholds:

i) 3,176 residential units and 13.17 million square feet non-residential uses;

ii) 6,066 residential units and 14.87 million square feet non-residential uses;

iii) 14,515 residential units and 16.00 million square feet non-residential uses;

iv) 21,373 residential units and 17.65 million square feet non-residential uses;

v) 25,001 residential units and 19.78 million square feet non-residential uses; and

vi) 27,615 residential units and 22.08 million square feet non-residential uses.

In addition, the applicant shall submit to DPW for review and approval an annual report, due January 30th for the prior year, identifying the number and type of residential and commercial building permits issued for Mission Village (and any other development within the Westside Santa Clarita area). The purpose of this annual report will be to track development progress against the thresholds identified in the AFA Traffic Impact Analysis and the then-current RPA.

### c. Post-Mitigation Level of Significance

**Table 4.5-21, ICU and LOS Summary – With Project Conditions with Mitigation**, depicts the level of service for each of the significantly impacted intersections, before and after implementation of the recommended mitigation measures. **Table 4.5-21** shows that, under project buildout conditions, implementation of the mitigation measures would fully mitigate the project's impacts.

Specific to the Commerce Center Drive/SR-126 intersection (Intersection 94), which is to be re-constructed as a grade-separated interchange, a project report for the interchange has been completed and as of this writing final design plans are being prepared. The interchange project will reconstruct the following three intersections: (1) Commerce Center Drive at Henry Mayo Drive (Intersection 81); (2) Commerce Center Drive at SR-126 Eastbound Ramps (Intersection 82); and (3) Commerce Center Drive at SR-126 Westbound Ramps (Intersection 83). Once the interchange project is completed, each of the three intersections will operate at LOS D or better under long-range buildout conditions that include the proposed Mission Village project. (See EIR **Appendix 4.5**, AFA Traffic Impacts Analysis, Appendix A.)

## 10. LONG-RANGE (2035) CUMULATIVE IMPACTS

### a. Introduction

As discussed in detail in this EIR, **Section 3.0, Cumulative Impact Analysis Methodology,** Section 15130(b) of the *State CEQA Guidelines* allows two methods for identifying the future projects to be considered when assessing cumulative impacts. These two methods involve:

> *(a) A list of past, present, and probable future projects producing related or cumulative impacts, including, if necessary, those projects outside the control of the agency, or*
>
> *(b) A summary of projections contained in an adopted general plan or related planning document, or in a prior environmental document which has been adopted or certified which described or evaluated regional or areawide conditions contributing to the cumulative impact.*

TRAFFIC MITIGATION AGREEMENT

FAIR SHARE PAYMENT

THIS AGREEMENT, entered into effective this ____ day of _____, 2011 by and between the State of California, acting by and through its Department of Transportation, hereinafter referred to as "Department," and Newhall Land, hereinafter referred to as "Developer," and collectively the "Parties" without regard for number or gender.

RECITALS

A. WHEREAS, Developer has proposed to develop VTTM 53108, Landmark Village, located in the County of Los Angeles, hereinafter referred to as "Proposed Development," which will be constructed on a piece of real property, which is more particularly described in Exhibit "A," attached hereto and incorporated herein by this reference; and

B. WHEREAS, the County of Los Angeles approved the Landmark Village Environmental Impact Report for the Proposed Development on , hereinafter referred to as "EIR," which determined that the Proposed Development would result in potential adverse cumulative impacts to Interstate 5 (I-5), hereinafter referred to as "Cumulative Impacts"; and

C. WHEREAS, the "EIR" has mitigation conditions, LV-4.7-17 through LV-4.7-20, that require "Developer" to contribute its fair-share of costs to "Department" to mitigate the "Cumulative Impacts"; and

D. WHEREAS, under those circumstances in which Developer will undertake mitigation improvements to Caltrans facilities (i.e., SR-126) relative to development of the Newhall Ranch Specific Plan, Department and Developer will enter into a Highway Improvement Agreement, as applicable; and

E. WHEREAS, Department will construct an improvement project for the I-5 freeway from State Route 14 (SR-14) to Parker Road, which improvements will add capacity to the freeway by adding high occupancy vehicle (HOV) lanes and truck lanes, hereinafter referred to as "Improvements"; and

F. WHEREAS, a Landmark Village (Newhall Ranch) I-5 Share Calculations memo was prepared on November 1, 2010 to determine the Proposed Development's Share of the unfunded portion of the Improvements (Shares Analysis); and

G. WHEREAS, based on that Shares Analysis, the Parties have calculated the Proposed Development's proportionate share of the unfunded portion of the total anticipated costs of Improvements, which share is estimated to be $625,661, hereinafter referred to as "Funds," as shown on the attached Exhibit "B"; and

H. WHEREAS, Developer desires to mitigate for the Proposed Development Cumulative Impacts by paying Funds to Department.

NOW THEREFORE, for good and valuable consideration, the receipt and adequacy of which are hereby acknowledged, the parties hereby agree as follows:

1. Developer agrees to pay to the Department, at time of issuance of building permit, the Funds which represent Developer's pro-rata share of the Improvements required to mitigate Cumulative Impacts to I-5 as determined in the Shares Analysis.

2. Department hereby acknowledges that upon payment in full of Funds by Developer at time of issuance of building permit, Developer will have satisfied its mitigation obligation to Department for Proposed Development Cumulative Impacts.

3. Said Funds shall remain in the State Highway Account assigned to Improvements until such time as the balance of other funds necessary to construct the required Improvements is secured.

4. Department agrees that the Funds paid by Developer pursuant to the terms of this Agreement shall be used for the purposes of constructing the required Improvements to I-5 between SR-14 and Parker Road.

5. All obligations of Department under the terms of this Agreement are subject to the appropriation of resources by the Legislature, State Budget Act authority, and the allocation of resources by the California Transportation Commission.

6. This Agreement may be executed in several counterparts and all counterparts so executed shall constitute one agreement that shall be binding on all of the parties, notwithstanding that all of the Parties are not signatory to the original or the same counterpart.

7. This Agreement shall expire upon completion of the subject Improvements to I-5.

IN WITNESS WHEREOF, THE Parties hereto have executed this Agreement as set forth below.

CALIFORNIA DEPARTMENT OF TRANSPORTATION

By: _____
Designated District Official

THE NEWHALL LAND AND FARMING COMPANY, (A California Limited Partnership), a California limited partnership

By: NWHL GP LLC, a Delaware limited liability company, its General Partner

By: LandSource Holding Company, LLC, a Delaware limited liability company, its Sole Member

By: Newhall Land Development, LLC, a Delaware limited liability company, its Sole Member

By: Newhall Holding Company, LLC, a Delaware limited liability company, its Manager

By: _____
Name: Steven D. Zimmer
Title: Executive Vice President

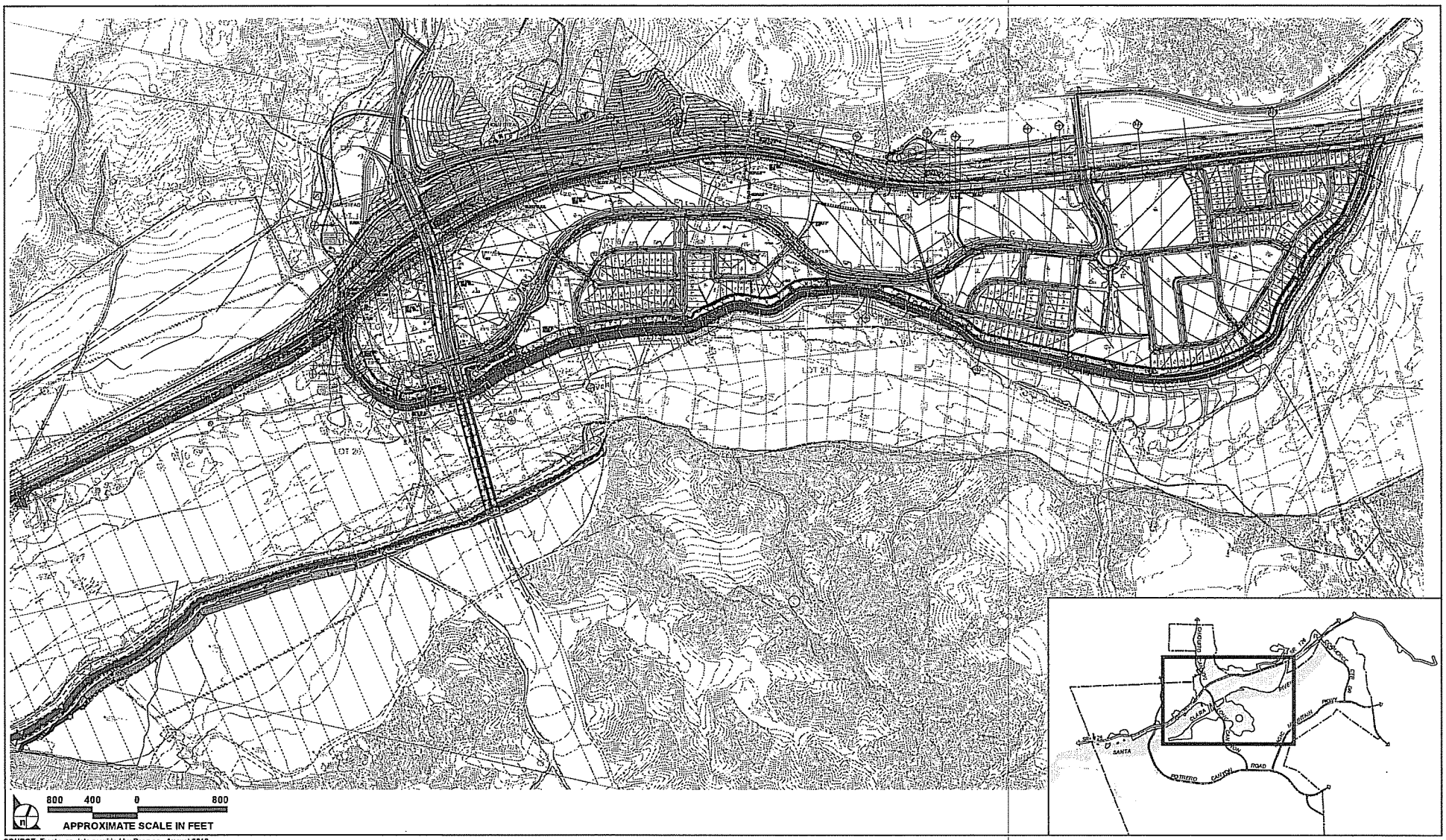
Approved as to Form and Procedure

_____
Attorney, State of California
Department of Transportation

Exhibit "A"

Landmark Village

Parcels 8, 9, 10 and portions of Parcels 7, 20, 21 of Parcel Map No. 24500-01, PMB 293-34/67.




SOURCE: Tract map data provided by Psomas - August 2010
Graphics prepared by Impact Sciences, Inc. - August 2010

FIGURE F-2

Revised Landmark Village Vesting Tentative Tract Map

32-92-08/10

**Table 1: I-5 Freeway Mitigation Share Calculations for Landmark Village**

| Location | PM Peak Hour Traffic Volumes: Total Project Volumes[1] | Net Change due to Project[2] | Project Trips Subject to Mitigation Cost[3] | Existing Volumes (2010) | Total Future Volumes (2035) | Net Increase (Net Future Trips) |
|---|---|---|---|---|---|---|
| 1. I-5 btwn Parker & Hasley Cyn | 141 | 58 | 100 | 5,500 | 17,000 | 11,500 |
| 2. I-5 btwn Hasley Cyn & SR-126 | 142 | 52 | 97 | 7,100 | 18,600 | 11,500 |
| 3. I-5 btwn SR-126 & Rye Canyon | 249 | 101 | 175 | 8,600 | 17,200 | 8,600 |
| 4. I-5 btwn Rye Canyon & Magic Mtn | 249 | 55 | 152 | 9,800 | 18,400 | 8,600 |
| 5. I-5 btwn Magic Mtn & Valencia | 191 | 31 | 111 | 10,800 | 18,000 | 7,200 |
| 6. I-5 btwn Valencia & McBean | 167 | 22 | 95 | 12,400 | 19,300 | 6,900 |
| 7. I-5 btwn McBean & Pico/Lyons | 144 | 10 | 77 | 13,000 | 18,400 | 5,400 |
| 8. I-5 btwn Pico/Lyons & Calgrove | 193 | 29 | 111 | 13,300 | 18,900 | 5,600 |
| 9. I-5 btwn Calgrove & SR-14 | 206 | 94 | 150 | 13,300 | 19,200 | 5,900 |
| *Total* | | | *1,067* (A) | | | *71,200* (B) |

| | |
|---|---|
| (C) Cost of Mitigation Measure (Unfunded Portion): | *$65,400,000.00* |
| (D) Cost per Future Trip (C/B): | *$918.54* |
| (E) Cost to Landmark Village (Gross) (A x D): | *$980,081.46* |
| (F) NLF Expenditures for I-5 PA/ED and PS&E: | *$4,400,000.00* |
| (G) Proportion Credited to Landmark Village (F X Landmark ADT/Total Newhall ADT = F X 41/509)[4]: | *$354,420.43* |
| Cost to Landmark Village (Net) (E – G): | *$625,661* |

[1] Total project volumes obtained from a select-zone model run.
[2] Net change due to project obtained by subtracting a "no-project" model run from a "with-project" model run.
[3] Project Trips subject to mitigation cost = "Net Change due to Project" plus 1/2 of the remainder of total project volumes (2 + (1 – 2)/2).
[4] Landmark ADT = 41,000; Total Newhall Westside Project ADT = 509,000 (see Table 2).

2010 & 2035 Volume Source: Mission Village TIA (October 2010)

**Los Angeles County Department of Public Works/City of Santa Clarita/Austin-Foust Associates, Inc., March 8, 2005, "Santa Clarita Valley Consolidated Traffic Model, 2004 Update and Validation"**

# SANTA CLARITA VALLEY CONSOLIDATED TRAFFIC MODEL

---

## 2004 Update and Validation

March 2005

Draft

# SANTA CLARITA VALLEY CONSOLIDATED TRAFFIC MODEL

## 2004 Update and Validation


Prepared by:

**County of Los Angeles Department of Public Works**
**in association with**
**City of Santa Clarita**

Consulting Assistance:

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March 8, 2005

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# Chapter 1.0
# INTRODUCTION

This report describes the 2004 update and validation of the Santa Clarita Valley Consolidated Traffic Model (SCVCTM). The updates to the model are summarized, the results of a base year validation are presented, and examples of traffic forecast data are also given.

## 1.1 OVERVIEW

The SCVCTM is a traffic demand model for the Santa Clarita Valley area of Los Angeles County. Encompassing the City of Santa Clarita and surrounding portions of unincorporated County, it was designed as a sub-area extraction (from regional models) that could provide detailed traffic forecasting capability within its study area. The model has the capability for peak hour as well as average daily traffic (ADT) analysis, and is used by both the City and County as a forecasting tool for a variety of traffic studies in the valley. The model meets the consistency requirements of the Congestion Management Program (CMP).

The SCVCTM was originally prepared by the City and County in 1992 and has been used for a variety of applications since that time. A major update was made in 1995 and this 2004 update includes a number of enhancements as follows:

1. Updates to the land use databases (existing and future)
2. Updates to model relationships such as external trip distribution
3. Addition of post-processing procedures for link and intersection volumes

The third of these represents a significant enhancement to the modeling capability, substantially refining the peak hour intersection turn movement forecasting procedures.

As part of this update, a comprehensive validation was carried out to compare ADT and peak hour traffic forecasts for year 2004 against the corresponding ground counts. Statistical data is presented in this report to show the results of this 2004 model validation.

## 1.2 TRAFFIC MODEL OVERVIEW

Following the original model development work in 1992, an easily understandable guide to the model was prepared (Reference 1 at the end of this chapter). The material presented there is applicable to the updated model since no changes have been made to the overall model structure. The material contained in this update report is of a more technical nature, describing the modeling processes in some detail.

The SCVCTM model area is shown in Figure 1-1. For descriptive purposes, the modeling processes in the SCVCTM can be divided into five components:

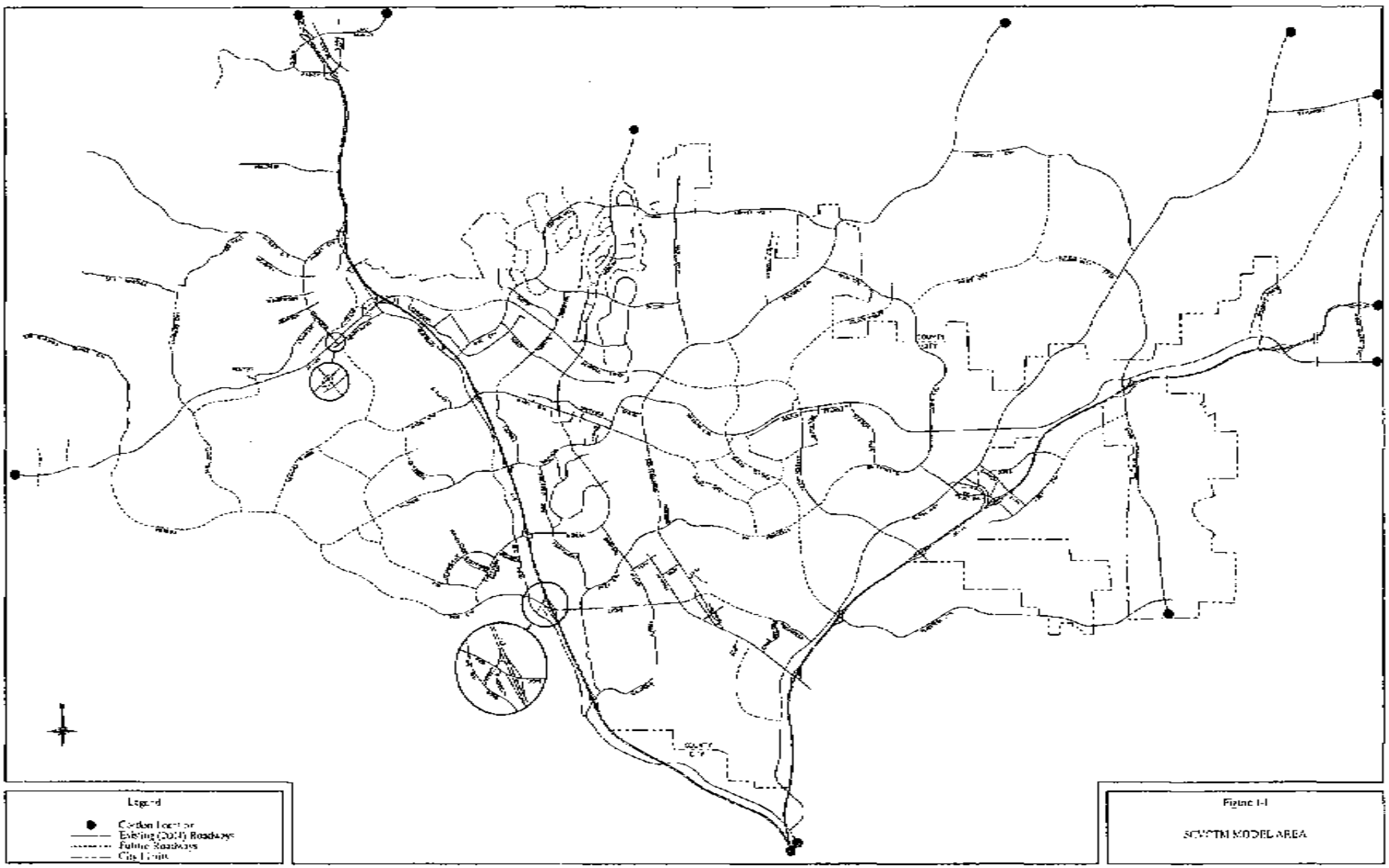
1. Network Definition
2. Trip Generation
3. Trip Distribution
4. Traffic Assignment
5. Forecast Data Refinement (Post-Processing)

The network definition component of the model follows that of traditional traffic demand models with network definitions being designed to support the level of detail in the model area. The trip generation component uses land use data as input, with trips being generated by the application of ADT and peak hour trip generation rates. Trip generation is calculated in the form of vehicle trips and no specific mode choice capability is incorporated in the model at this time.

In the trip distribution component of the model, use is made of external cordon trips to forecast internal to external trips. Through trips are also added as part of the distribution process.

The traffic assignment component portion of the SCVCTM utilizes procedures that are sensitive to the capacity of the network. Both link and intersection capacity constraints are applied in the assignment process, and intersection turn movement penalties are also incorporated into the traffic assignment.

Material contained in the following chapter of this report focuses on the SCVCTM methodology, including descriptions of the procedures used for forecast data refinement. In Chapter 3.0, summary results from the base year validation run are given together with statistical comparisons between model and count data. Forecasts for the long-range version of the model are also presented, thereby providing an example of the SCVCTM forecasting capability.


Legend
Cordon Location
Existing (2004) Roadways
Future Roadways
City Limit
Figure 1-1
SCVTM MODEL AREA

## 1.3 SCVCTM TECHNICAL NOTEBOOK

Detailed traffic model data pertaining to the SCVCTM, including traffic forecast results prepared from SCVCTM runs can be found in the SCVCTM Technical Notebook maintained by the County of Los Angeles Public Works Department and the City of Santa Clarita.

## 1.4 REFERENCES


1. "Santa Clarita Valley Consolidated Traffic Model Report," County of Los Angeles Department of Public Works, January, 1994.

2. "Santa Clarita Valley Consolidated Traffic Model, 1995 Update and Validation," Austin-Foust Associates, Inc., April 1995.

3. "National Cooperative Highway Research Program Technical Report 255 Highway Traffic Data for Urbanized Area Project Planning and Design," Transportation Research Board, 1982.

# Chapter 2.0
# TRAFFIC MODEL DESCRIPTION

This chapter contains a description of the SCVCTM. It is intended to provide an understanding of the model framework and of the principles and procedures embodied in the various model components.

## 2.1 MODEL STRUCTURE OVERVIEW

The overall model structure for the SCVCTM is illustrated in Figure 2-1 in flow chart form. Illustrated here are the five model components (highway network processing, trip generation, trip distribution, assignment, post-processing) and the interrelationships between each component.

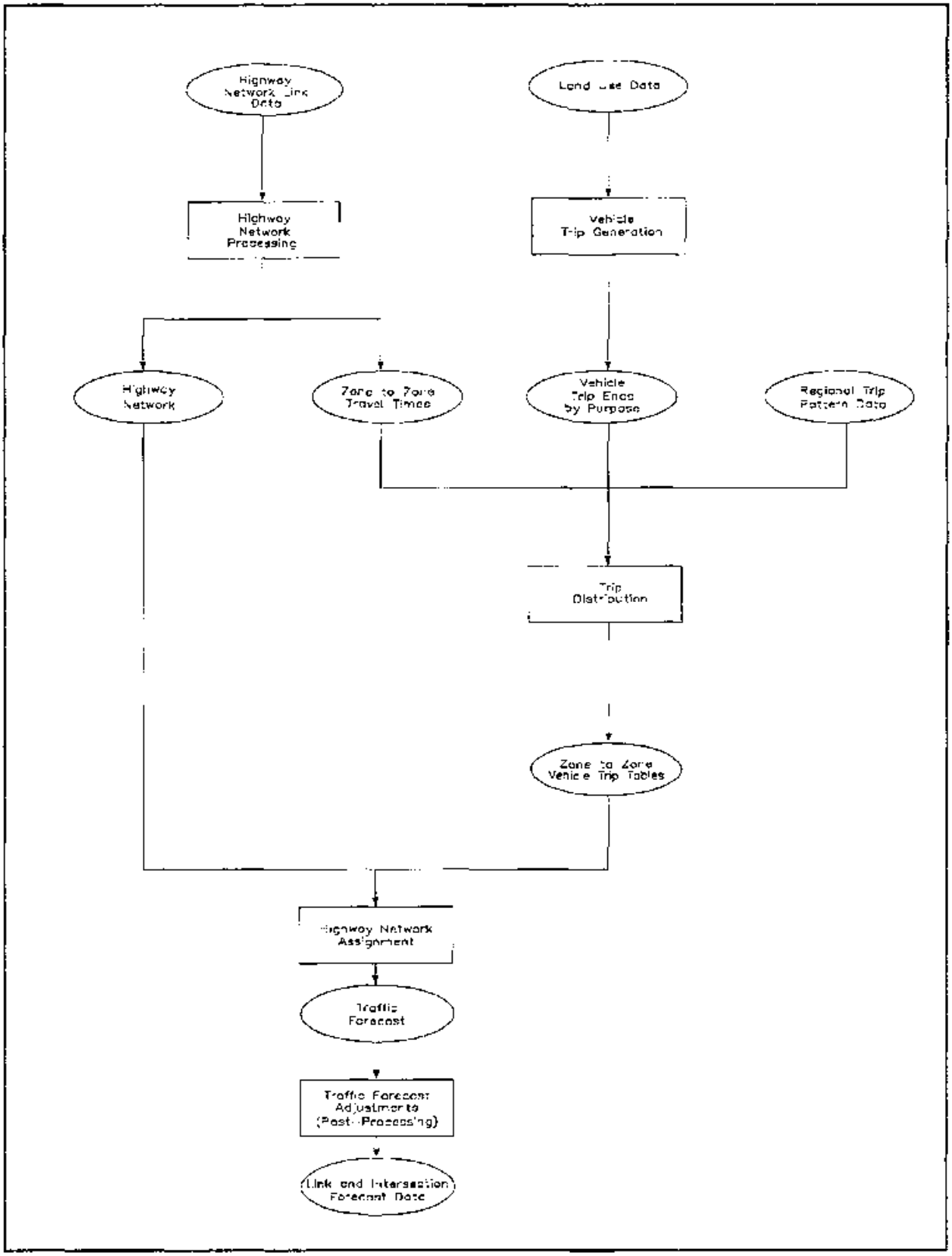
The trip generation procedure in the SCVCTM uses land use data as input. This is comprised of detailed information by floor area or acreage for various uses, and numbers of dwelling units by density classification. Trip generation rates are applied to the land use data to generate average daily traffic (ADT) tripends by trip purpose. The trip generation also creates peak hour trip generation tripends which are used after trip distribution to create peak hour trips.

The trip distribution process develops geographically defined travel patterns from the zonal trip generation estimates. The result is a set of zone-to-zone trips for the analysis area, including internal to external trips and through trips. The next part of the forecasting process consists of trip assignment in which the geographically defined travel patterns are assigned to the highway network and the final step processes the raw model output into refined forecast data. The results are in the form of both ADT link volumes and peak hour intersection turn movements.

The following sections describe the basic relationships and steps in each of these five model components.

## 2.2 THE LINK-NODE NETWORK SYSTEM

Specially coded networks provide descriptions of the highway system in the traffic forecasting area. Coding of geographic link-node networks for the SCVCTM follows the general methodology used in traffic modeling work and the following explains the various procedures involved in network preparation.




Legend

Input and Output Data

Processing Step

Figure 2-1

SCVCTM MODEL STRUCTURE

### 2.2.1 Link Attributes

In addition to the basic link attributes such as distance and speed, each link is assigned a facility type designation and a link speed classification. The facility types are as follows:

1. Freeway
2. Major Highway
3. Secondary Highway (Rural)
4. Secondary Highway (Urban)
5. Limited Secondary Highway
6. Centroid Collector
7. Expressway
8. Freeway Ramp

The link speed classification attribute is used to differentiate between links of a particular facility type that may have different speed attributes because of signal spacing or other local differences. Five classifications are available for this speed differentiation purpose, and they are allocated according to such features as number of signalized intersections, side friction (e.g., driveways), and speed limits. The following section shows how speed differences are incorporated into these speed attribute categories.

### 2.2.2 Speeds and Capacities

Link speeds and capacities are allocated according to the link attributes noted above. They are assigned to the network links during the network processing component of the SCVCTM. A speed and capacity table is used to specify the link speed and capacity for each facility type, number of lanes, and speed classification combination.

The SCVCTM assignment procedure uses a separate assignment for each of three time periods: AM peak hour, PM peak hour, and off-peak. Capacity values hence represent the equivalent time represented by the particular time period. The SCVCTM speed and capacity table is shown in Table 2-1. Within each facility type, the link classifications have speed differentials of five miles per hour to enable locations with non-average speed characteristics to be coded as such (examples are rural areas with high speeds, and urban high side friction areas with low speeds).

Table 2-1

SCVCTM NETWORK SPEED AND CAPACITY TABLE

| Facility Type | # of Lanes | Speed By Link Classifications | | | | | One Hour Capacity | Off Peak Capacity |
|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | | |
| 1 | 1-6 | 65 | 60 | 55 | 50 | 65 | 2,200 | 22,500 |
| 2 | 1-3 | 40 | 35 | 30 | 45 | 50 | 1,000 | 9,000 |
| 3 | 1-3 | 35 | 30 | 25 | 40 | 45 | 850 | 8,000 |
| 4 | 1-3 | 30 | 25 | 20 | 35 | 40 | 750 | 7,000 |
| 5 | 1-3 | 25 | 20 | 15 | 30 | 35 | 750 | 7,000 |
| 6 | 1 | 15 | 15 | 15 | 15 | 15 | 9,999[1] | 99,999[1] |
| 7 | 1-4 | 45 | 40 | 35 | 50 | 55 | 1,400 | 14,000 |
| 8 | 1-2 | 30 | 30 | 30 | 30 | 30 | 1,500 | 12,000 |

Facility Types:
1. Freeway
2. Major Highway
3. Secondary Highway (Rural)
4. Secondary Highway (Urban)
5. Limited Secondary Highway
6. Centroid Connector
7. Expressway
8. Freeway Ramp

Note: Capacities are per lane and are for one direction

[1] Centroid connector capacities are unrestricted

### 2.2.3 Intersections

The SCVCTM derives peak hour turn movement volumes for selected intersections. These intersections are entered into the model by means of an intersection specification file which denotes the network links on each leg of the intersection. Lane configurations for these intersections are also specified for use in the intersection volume/capacity feature of the SCVCTM (see discussion later in this chapter).

The coding specification for intersections is that the north-south street is named first, followed by the east-west street. This convention follows through into the post processing and level of service calculations so that turn movement references (northbound left, eastbound through, etc.) are clearly understood.

## 2.3 TRIP GENERATION

The SCVCTM generates trips from specific land use data tabulated for each traffic zone. Two sets of tripends are produced. One gives AM and PM peak hour by direction and the other gives ADT trips according to the following five trip purposes:

1. Home to Work (H-W)
2. Home to Shopping (H-S)
3. Home to Other (H-O)
4. Other to Work (O-W)
5. Other to Other (O-O)

The trip generation for each purpose is in the form of ADT vehicle "tripends" separated into "productions" and "attractions". Productions represent the trip generation at the resident end of home-based trips or the origins of non-home-based trips. Attractions represent the non-resident end of home-based trips or the destination end of non-home-based trips. Productions are often denoted as "P's" and attractions as "A's." The interaction between P's and A's creates the travel patterns that, in turn, produce the traffic demand on the circulation system. Productions and attractions are not the same as origins and destinations, and conversion to the latter is carried out in a later stage of the model.

Table 2-2 lists the land use trip rates for AM and PM peak hours together with the total ADT rate. Table 2-3 lists the factors used to split the ADT trip generation into productions and attractions by purpose.

Table 2-2

ADT AND PEAK HOUR TRIP RATE SUMMARY

| Land Use | Units | AM Peak Hour | | | PM Peak Hour | | | ADT |
|---|---|---|---|---|---|---|---|---|
| | | In | Out | Total | In | Out | Total | |
| 1. Single Family (<1du/ac) | DU | .29 | .67 | .96 | .84 | .36 | 1.20 | 9.90 |
| 2. Single Family (1-5du/ac) | DU | .19 | .56 | .75 | .64 | .37 | 1.01 | 9.90 |
| 3. Single Family (6-10du/ac) | DU | .19 | .56 | .75 | .64 | .37 | 1.01 | 9.90 |
| 4. Condominium/Townhouse | DU | .10 | .48 | .58 | .47 | .26 | .73 | 8.00 |
| 5. Apartment | DU | .08 | .43 | .51 | .41 | .21 | .62 | 6.90 |
| 6. Mobile Home | DU | .08 | .32 | .40 | .35 | .21 | .56 | 6.90 |
| 7. Senior (Active) | DU | .08 | .12 | .20 | .16 | .10 | .26 | 3.71 |
| 10. Commercial Center (>30ac) | TSF | .47 | .30 | .77 | 1.64 | 1.78 | 3.42 | 40.06 |
| 11. Commercial Center (10-30a) | TSF | .73 | .47 | 1.20 | 2.38 | 2.58 | 4.96 | 54.06 |
| 12. Commercial Center (<10ac) | TSF | 1.09 | .69 | 1.78 | 3.32 | 3.60 | 6.92 | 85.06 |
| 13. Commercial Shops | TSF | .72 | .48 | 1.20 | 1.80 | 1.80 | 3.60 | 37.06 |
| | | | | | | | | |
| 14. Hotel | ROOM | .34 | .22 | .56 | .32 | .29 | .61 | 8.23 |
| 15. Sit-Down Restaurant | TSF | 4.82 | 4.45 | 9.27 | 6.52 | 4.34 | 10.86 | 130.34 |
| 16. Fast Food Restaurant | TSF | 25.43 | 24.43 | 49.86 | 17.41 | 16.07 | 33.48 | 496.12 |
| 17. Movie Theater | SEAT | .00 | .00 | .00 | .05 | .02 | .07 | 1.76 |
| 18. Health Club | TSF | .96 | .64 | 1.60 | 2.16 | 1.44 | 3.60 | 40.00 |
| 19. Car Dealership | TSF | 1.61 | .60 | 2.21 | 1.12 | 1.68 | 2.80 | 37.5 |
| 20. Elementary/Middle School | STU | .26 | .20 | .46 | .08 | .09 | .17 | 1.45 |
| 21. High School | STU | .32 | .14 | .46 | .06 | .09 | .15 | 1.79 |
| 22. College | STU | .13 | .01 | .14 | .07 | .14 | .21 | 1.54 |
| 23. Hospital | TSF | .71 | .26 | .97 | .22 | .70 | .92 | 16.8 |
| | | | | | | | | |
| 24. Library | TSF | .76 | .30 | 1.06 | 3.40 | 3.69 | 7.09 | 84.98 |
| 25. Church | TSF | .39 | .33 | .72 | .36 | .30 | .66 | 9.30 |
| 26. Day Care | STU | .43 | .38 | .81 | .40 | .46 | .86 | 4.52 |
| 30. Industrial Park | TSF | .55 | .10 | .65 | .13 | .52 | .65 | 6.00 |
| 31. Business Park | TSF | 1.20 | .23 | 1.43 | .30 | .99 | 1.29 | 10.20 |
| 32. Manufacturing/Warehouse | TSF | .56 | .17 | .73 | .27 | .47 | .74 | 5.10 |
| 33. Science/Research | TSF | 1.03 | .21 | 1.24 | .16 | .92 | 1.08 | 10.20 |
| 34. Utilities | TSF | .00 | .00 | .00 | .00 | .00 | .00 | 2.38 |
| 35. Regional Post Office | TSF | .20 | .15 | .35 | .15 | .15 | .30 | 5.00 |
| 40. Commercial Office | TSF | 1.55 | .19 | 1.74 | .21 | 1.29 | 1.50 | 11.56 |
| | | | | | | | | |
| 41. High-Rise Office | TSF | 1.37 | .19 | 1.56 | .25 | 1.24 | 1.49 | 10.88 |
| 42. Medical Office | TSF | 1.94 | .49 | 2.43 | .99 | 2.67 | 3.66 | 34.20 |
| 43. Post Office | TSF | 4.17 | 3.85 | 8.02 | 5.50 | 5.29 | 10.79 | 108.19 |
| 50. Golf Course | AC | .15 | .06 | .21 | .10 | .20 | .30 | 7.96 |
| 51. Developed Park | AC | .00 | .00 | .00 | .03 | .04 | .07 | 2.60 |
| 52. Undeveloped Park | AC | .00 | .00 | .00 | .00 | .00 | .00 | .50 |

(continued)

Table 2-2 (continued)
ADT AND PEAK HOUR TRIP RATE SUMMARY

| Land Use | Units | AM Peak Hour | | | PM Peak Hour | | | ADT |
|---|---|---|---|---|---|---|---|---|
| | | In | Out | Total | In | Out | Total | |
| 53. Wayside Honor Ranch | SG | 3.00 | 2.00 | 5.00 | 4.00 | 6.00 | 10.00 | 100.00 |
| 54. Six Flags Magic Mtn | SG | 3.00 | 2.00 | 5.00 | 4.00 | 6.00 | 10.00 | 100.00 |
| 55. Travel Village | SG | 3.00 | 2.00 | 5.00 | 4.00 | 6.00 | 10.00 | 100.00 |
| 56. CHP Office | SG | 3.00 | 2.00 | 5.00 | 4.00 | 6.00 | 10.00 | 100.00 |
| 57. Agua Dulce Airport | SG | 3.00 | 2.00 | 5.00 | 4.00 | 6.00 | 10.00 | 100.00 |
| 58. Landfill | SG | 3.00 | 2.00 | 5.00 | 4.00 | 6.00 | 10.00 | 100.00 |
| 59. Cemex | SG | 3.60 | 3.75 | 7.35 | 2.00 | 2.25 | 4.25 | 100.00 |

Abbreviations: DU – dwelling unit
TSF – thousand square feet
Stu – student
AC – acre
SG – special generator

Table 2-3

ADT TRIP RATE AND P&A SPLITTING FACTOR SUMMARY

| Land Use Type | Units | ADT Tripend Rate | Productions/ Attractions | Splitting Factors | | | | | | P&A Total |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | H-W | H-S | H-O | O-W | O-O | Total | |
| 1. Single Family (<1du/ac) | DU | 9.9 | P's | .22 | .15 | .27 | .02 | .11 | .77 | |
| | | | A's | .00 | .00 | .10 | .02 | .11 | .23 | 1.00 |
| 2. Single Family (1-5du/ac) | DU | 9.9 | P's | .22 | .15 | .27 | .02 | .11 | .77 | |
| | | | A's | .00 | .00 | .10 | .02 | .11 | .23 | 1.00 |
| 3. Single Family (6-10du/ac) | DU | 9.9 | P's | .22 | .15 | .27 | .02 | .11 | .77 | |
| | | | A's | .00 | .00 | .10 | .02 | .11 | .23 | 1.00 |
| 4. Condominium/ Townhouse | DU | 8 | P's | .20 | .17 | .34 | .02 | .09 | .82 | |
| | | | A's | .00 | .00 | .07 | .02 | .09 | .18 | 1.00 |
| 5. Apartment | DU | 6.9 | P's | .20 | .17 | .34 | .02 | .09 | .82 | |
| | | | A's | .00 | .00 | .07 | .02 | .09 | .18 | 1.00 |
| 6. Mobile Home | DU | 6.9 | P's | .20 | .17 | .34 | .02 | .09 | .82 | |
| | | | A's | .00 | .00 | .07 | .02 | .09 | .18 | 1.00 |
| 7. Senior (Active) | DU | 3.71 | P's | .05 | .22 | .41 | .02 | .10 | .80 | |
| | | | A's | .00 | .00 | .08 | .02 | .10 | .20 | 1.00 |
| 10. Commercial Center (>30ac) | TSF | 40.06 | P's | .00 | .00 | .00 | .03 | .25 | .28 | |
| | | | A's | .09 | .20 | .15 | .03 | .25 | .72 | 1.00 |
| 11. Commercial Center (10-30a) | TSF | 54.06 | P's | .00 | .00 | .00 | .03 | .25 | .28 | |
| | | | A's | .09 | .20 | .15 | .03 | .25 | .72 | 1.00 |
| 12. Commercial Center (<10ac) | TSF | 85.06 | P's | .00 | .00 | .00 | .03 | .30 | .33 | |
| | | | A's | .06 | .15 | .13 | .03 | .30 | .67 | 1.00 |
| 13. Commercial Shops | TSF | 37.06 | P's | .00 | .00 | .00 | .03 | .30 | .33 | |
| | | | A's | .06 | .15 | .13 | .03 | .30 | .67 | 1.00 |
| 14. Hotel | Room | 8.23 | P's | .00 | .00 | .00 | .06 | .18 | .24 | |
| | | | A's | .12 | .00 | .40 | .06 | .18 | .76 | 1.00 |
| 15. Sit-Down Restaurant | TSF | 130.34 | P's | .00 | .00 | .00 | .06 | .24 | .30 | |
| | | | A's | .04 | .00 | .36 | .06 | .24 | .70 | 1.00 |
| 16. Fast Food Restaurant | TSF | 496.12 | P's | .00 | .00 | .00 | .07 | .31 | .38 | |
| | | | A's | .01 | .00 | .23 | .07 | .31 | .62 | 1.00 |
| 17. Movie Theater | Seat | 1.76 | P's | .00 | .00 | .00 | .00 | .31 | .31 | |
| | | | A's | .08 | .00 | .30 | .00 | .31 | .69 | 1.00 |
| 18. Health Club | TSF | 40 | P's | .00 | .00 | .00 | .01 | .25 | .26 | |
| | | | A's | .06 | .00 | .42 | .01 | .25 | .74 | 1.00 |
| 19. Car Dealership | TSF | 37.5 | P's | .00 | .00 | .00 | .03 | .25 | .28 | |
| | | | A's | .08 | .21 | .15 | .03 | .25 | .72 | 1.00 |
| 20. Elementary/ Middle School | STU | 1.45 | P's | .00 | .00 | .00 | .00 | .03 | .03 | |
| | | | A's | .10 | .58 | .26 | .00 | .03 | .97 | 1.00 |
| 21. High School | STU | 1.79 | P's | .00 | .00 | .00 | .00 | .03 | .03 | |
| | | | A's | .10 | .40 | .44 | .00 | .03 | .97 | 1.00 |
| 22. College | STU | 1.54 | P's | .00 | .00 | .00 | .00 | .23 | .23 | |
| | | | A's | .06 | .00 | .48 | .00 | .23 | .77 | 1.00 |

(continued)

Table 2-3 (continued)
ADT TRIP RATE AND P&A SPLITTING FACTOR SUMMARY

| Land Use Type | Units | ADT Tripend Rate | Productions/ Attractions | Splitting Factors | | | | | | P&A Total |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | H-W | H-S | H-O | O-W | O-O | Total | |
| 23. Hospital | TSF | 16.8 | P's | .00 | .00 | .00 | .00 | .05 | .05 | |
| | | | A's | .32 | .00 | .58 | .00 | .05 | .95 | 1.00 |
| 24. Library | TSF | 84.98 | P's | .00 | .00 | .00 | .09 | .17 | .26 | |
| | | | A's | .16 | .00 | .32 | .09 | .17 | .74 | 1.00 |
| 25. Church | TSF | 9.3 | P's | .00 | .00 | .00 | .05 | .10 | .15 | |
| | | | A's | .35 | .00 | .35 | .05 | .10 | .85 | 1.00 |
| 26. Day Care | STU | 4.52 | P's | .00 | .00 | .00 | .00 | .03 | .03 | |
| | | | A's | .10 | .00 | .84 | .00 | .03 | .97 | 1.00 |
| 30. Industrial Park | TSF | 6 | P's | .00 | .00 | .00 | .07 | .21 | .28 | |
| | | | A's | .39 | .00 | .05 | .07 | .21 | .72 | 1.00 |
| 31. Business Park | TSF | 10.2 | P's | .00 | .00 | .00 | .07 | .21 | .28 | |
| | | | A's | .39 | .00 | .05 | .07 | .21 | .72 | 1.00 |
| 32. Manufacturing/ Warehouse | TSF | 5.1 | P's | .00 | .00 | .00 | .07 | .21 | .28 | |
| | | | A's | .39 | .00 | .05 | .07 | .21 | .72 | 1.00 |
| 33. Science/Research | TSF | 10.2 | P's | .00 | .00 | .00 | .07 | .21 | .28 | |
| | | | A's | .39 | .00 | .05 | .07 | .21 | .72 | 1.00 |
| 34. Utilities | TSF | 2.38 | P's | .00 | .00 | .00 | .09 | .17 | .26 | |
| | | | A's | .19 | .00 | .29 | .09 | .17 | .74 | 1.00 |
| 35. Regional Post Office | TSF | 5 | P's | .00 | .00 | .00 | .07 | .21 | .28 | |
| | | | A's | .39 | .00 | .05 | .07 | .21 | .72 | 1.00 |
| 40. Commercial Office | TSF | 11.56 | P's | .00 | .00 | .00 | .11 | .18 | .29 | |
| | | | A's | .27 | .00 | .15 | .11 | .18 | .71 | 1.00 |
| 41. High-Rise Office | TSF | 10.88 | P's | .00 | .00 | .00 | .11 | .18 | .29 | |
| | | | A's | .27 | .00 | .15 | .11 | .18 | .71 | 1.00 |
| 42. Medical Office | TSF | 34.2 | P's | .00 | .00 | .00 | .03 | .26 | .29 | |
| | | | A's | .14 | .00 | .28 | .03 | .26 | .71 | 1.00 |
| 43. Post Office | TSF | 108.19 | P's | .00 | .00 | .00 | .09 | .22 | .31 | |
| | | | A's | .15 | .00 | .23 | .09 | .22 | .69 | 1.00 |
| 50. Golf Course | AC | 7.96 | P's | .00 | .00 | .00 | .00 | .27 | .27 | |
| | | | A's | .08 | .00 | .38 | .00 | .27 | .73 | 1.00 |
| 51. Developed Park | AC | 2.6 | P's | .00 | .00 | .00 | .00 | .12 | .12 | |
| | | | A's | .01 | .00 | .75 | .00 | .12 | .88 | 1.00 |
| 52. Undeveloped Park | AC | 0.5 | P's | .00 | .00 | .00 | .00 | .12 | .12 | |
| | | | A's | .01 | .00 | .75 | .00 | .12 | .88 | 1.00 |
| 53. Wayside Honor Ranch | SG | 100 | P's | .00 | .00 | .00 | .00 | .17 | .17 | |
| | | | A's | .33 | .00 | .33 | .00 | .17 | .83 | 1.00 |
| 54. Six Flags Magic Mtn | SG | 100 | P's | .00 | .00 | .00 | .01 | .18 | .19 | |
| | | | A's | .15 | .00 | .47 | .01 | .18 | .81 | 1.00 |
| 55. Travel Village | SG | 100 | P's | .00 | .00 | .00 | .01 | .25 | .26 | |
| | | | A's | .06 | .00 | .42 | .01 | .25 | .74 | 1.00 |

(continued)

Table 2-3 (continued)
ADT TRIP RATE AND P&A SPLITTING FACTOR SUMMARY

| Land Use Type | Units | ADT Tripend Rate | Productions/ Attractions | Splitting Factors | | | | | | P&A Total |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | H-W | H-S | H-O | O-W | O-O | Total | |
| 56. CHP Office | SG | 100 | P's | .00 | .00 | .00 | .11 | .18 | .29 | |
| | | | A's | .27 | .00 | .15 | .11 | .18 | .71 | 1.00 |
| 57. Agua Dulce Airport | SG | 100 | P's | .00 | .00 | .00 | .04 | .18 | .22 | |
| | | | A's | .16 | .00 | .40 | .04 | .18 | .78 | 1.00 |
| 58. Landfill | SG | 100 | P's | .00 | .00 | .00 | .11 | .18 | .29 | |
| | | | A's | .27 | .00 | .15 | .11 | .18 | .71 | 1.00 |
| 59. Cemex | SG | 100 | P's | .00 | .00 | .00 | .11 | .18 | .29 | |
| | | | A's | .27 | .00 | .15 | .11 | .18 | .71 | 1.00 |

Abbreviations: DU – dwelling unit
TSF – thousand square feet
Stu – student
AC – acre
SG – special generator

The base trip generation rates have been compiled from sources such as the Institute of Transportation Engineers (ITE) Trip Generation Manual, the County's Guidelines for the Preparation of Traffic Impact Studies, and case studies for uses unique to the area.

External trips in the SCVCTM are estimated by means of external cordon trip generation estimates. The cordon P's and A's are derived from travel pattern data and form one part of the zonal tripends by purpose derived as part of the trip generation component. After totaling the P's and A's for the complete model area, any differences between the total P's and A's for each purpose are balanced by adjusting the cordon values.

## 2.4 TRIP DISTRIBUTION

In this component of the travel forecasting model, the zonal trip productions and attractions by purpose are geographically distributed into zone-to-zone trip interchanges. The trip distribution process uses a statistical probability formula to calculate the interchange of trips between zones. This distribution formula is based upon behavioral tendencies of travelers and postulates the trip interchange between zones as being directly proportional to the relative attraction of each of the zones and inversely proportional to some function of the spatial separation (commonly called the gravity model). The measure of spatial separation is zone to zone network travel time. The relationship can be expressed as follows:

$$T_{ij} = \frac{P_i A_j F(tij)}{\sum A_j F(tij)}$$

where $T_{ij}$ = Trips from zone i to zone j
$P_i$ = Trip productions in zone i
$A_j$ = Trip attractions in zone j
tij = Travel time from zone i to zone j
F(tij) = Distribution function value for tij

Trip productions and attractions are input from the trip generation component of the model. The output from this process comprises five zone to zone "trip tables," one for each purpose. The trips in each row of each trip table represent the production to attraction trips for that zone to zone interchange.

The distribution functions (or "friction factors" as they are sometimes called) were derived from the Southern California Association of Governments (SCAG) Regional Transportation Plan (RTP) regional model, and were specially calibrated for the SCVCTM which is a land use based model (vs. the socioeconomic based SCAG RTP regional model). For trip distribution, travel times are derived from the network zone to zone times using designated network speeds. Special cordon links are coded into the network to simulate the longer distances associated with external trips. The distribution functions used in the SCVCTM are listed in Appendix B.

The production to attraction trip tables do not have any directional meaning as far as actual trips are concerned. A conversion to origin-destination trips takes place to provide the necessary directionality, and at the same time to combine the five trip purposes. The process involves deriving origin-destination trips for the following three time periods:

1. AM Peak Hour
2. PM Peak Hour
3. Off-peak Period (remainder of the day)

Five attraction-production trip tables are first produced by "inverting" the five production-attraction trip tables into attraction-production format. Conversion factors are then used for deriving the peak period trip tables from the production-attraction trip tables as shown in Table 2-4.

Table 2-4

ORIGIN-DESTINATION CONVERSION FACTORS

| | AM Peak | | | PM Peak | | | Off-Peak | | | Total | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Trip Purpose | P-A | A-P | Total | P-A | A-P | Total | P-A | A-P | Total | P-A | A-P | Total |
| Home to Work | .300 | .004 | .304 | .030 | .305 | .335 | .170 | .191 | .361 | .500 | .500 | 1.000 |
| Home to Shopping | .060 | .010 | .070 | .100 | .140 | .240 | .340 | .350 | .690 | .500 | .500 | 1.000 |
| Home to Other | .060 | .010 | .070 | .100 | .140 | .240 | .340 | .350 | .690 | .500 | .500 | 1.000 |
| Other to Work | .030 | .030 | .060 | .120 | .120 | .240 | .350 | .350 | .700 | .500 | .500 | 1.000 |
| Other to Other | .030 | .030 | .060 | .120 | .120 | .240 | .350 | .350 | .700 | .500 | .500 | 1.000 |

As a result of this time period separation process, the ADT volumes comprise a combination of the three individual time period assignments, thereby depicting the different travel patterns that occur during different times of the day.

The final step is to perform a matrix balancing process for each origin-destination trip table to ensure that the peak hour tripends for each zone exactly match the original peak hour trip generation estimates.

## 2.5 TRAFFIC ASSIGNMENT

The traffic assignment methodology used in the SCVCTM involves special procedures that respond to the detailed analysis needs of the study area. These include an incremental capacity constraint loading technique which adjusts link speeds in response to volume/capacity (V/C) ratios.

The network loading procedure is responsive to the effect of increased traffic on any part of the network and simulates the manner in which different drivers use different routes to travel from any given origin to destination. The assignment procedure involves incrementally loading portions of the total trip table during successive iterations and then adjusting network link speeds after each increment is loaded. In calculating the new link speeds, the cumulative loaded volumes are artificially expanded for the purpose of calculating the applicable V/C ratios. For example, the peak hour assignment uses eight iterations with a varying percentage of the trip table being assigned in each iteration. The incremental proportions used in the eight peak hour iterations and the five off-peak iterations are shown in Table 2-5.

Table 2-5

SCVCTM INCREMENTAL TRAFFIC ASSIGNMENT PARAMETERS

| AM and PM Assignments | | | Off-Peak Assignments | | |
|---|---|---|---|---|---|
| Iteration | Increment [1] | V/C Basis [2] | Iteration | Increment [1] | V/C Basis [2] |
| 1 | 25% | 65% | 1 | 20% | 80% |
| 2 | 20% | 75% | 2 | 20% | 90% |
| 3 | 15% | 85% | 3 | 20% | 100% |
| 4 | 10% | 95% | 4 | 20% | 100% |
| 5 | 10% | 100% | 5 | 20% | 100% |
| 6 | 10% | 100% | -- | -- | -- |
| 7 | 5% | 100% | -- | -- | -- |
| 8 | 5% | 100% | -- | -- | -- |

[1] Proportion of the total trips (overall trip table) assigned during this iteration.
[2] Inflated proportion of assigned total trips assumed for the purpose of calculating link V/C ratios.

In the SCVCTM, the speed assumptions reflect the V/C ratios on individual links. During the assignment procedure, speeds are adjusted according to link V/C ratios during each assignment iteration. In addition, individual intersection turn movement penalties are applied. The values used were derived during model calibration which involved calculating each intersection V/C value, examining the capacity

utilization of each turn movement, and then assigning a turn movement penalty. The set of turn penalties are then used as the basis for all forecasting runs of the model.

## 2.6 FORECAST DATA REFINEMENT

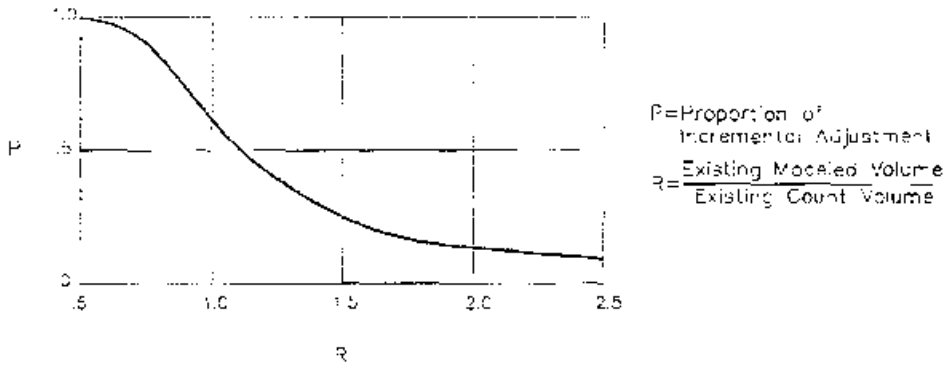
A special set of procedures is used in the SCVCTM to refine raw traffic assignment output data for a forecast year based on the methodology outlined in the National Cooperative Highway Research Program Report 255 (NCHRP 255) published by the Transportation Research Board (see Reference 3 in Section 1.4). Often referred to as "post-processing," the procedures for refining raw traffic model data as set out in NCHRP 255 are to utilize existing counts, existing model data, and future model data in the forecasting process. Essentially, the forecast data is modified based on comparing existing model data and existing counts. The basic assumption is that some of the inaccuracies in the future modeled volumes would be reflected in the existing modeled volumes and hence can be compensated for by utilizing existing count data together with the two sets (existing and future) of modeled volumes.

The NCHRP 255 procedures recognize two methods of adjustment which are referred to as the "incremental" and the "ratio" method. The incremental method takes the difference between the existing model and future model volumes and adds that difference to the existing volumes, whereas the ratio method takes the ratio of the future model to the existing model volumes and applies that ratio to the existing volumes. No guidance is given in NCHRP 255 as to which of these methods is preferable. Hence while the basic approach is described, the actual application is left to the user.

The methodology applied in the SCVCTM features a combination of the incremental and ratio methods, but with an emphasis on the incremental. It recognizes that, in general, traffic models have a better ability to estimate incremental changes rather than absolute volumes. Strict adherence to an incremental approach would imply that the additive method should be used at all times. However, in cases where the existing modeled volume is lower than a corresponding traffic count and where the future modeled volume is lower again (perhaps for legitimate reasons such as traffic diversion to another facility), then such a method can result in negative forecasted volumes.

In the SCVCTM, the proportion of incremental versus ratio adjustment is determined from the following curve:

**INCREMENTAL VERSUS RATIO ADJUSTMENT CURVE**




When the modeled existing volume is lower than the corresponding traffic count, the approach is largely an additive one. When the existing model volume is higher than the count, then there is a combination of the additive and ratio method. Essentially, the larger the difference between the existing modeled volume and the existing count, the less the incremental adjustment. In this manner, the ability to always include some incremental volume adjustment is retained regardless of the existing count versus modeled volume comparison.

For link volumes such as ADT forecasts, existing modeled volumes are compared with existing counts to determine a forecast volume adjustment in the manner described above. For adjusting intersection forecast data, a two step approach is applied. In the first step, adjustments are determined for each individual turn movement at the intersection in the same manner that link volume adjustments are determined. A second step then calculates adjusted entering and exiting leg volume forecasts based on existing count and modeled leg volumes, giving a set of "control volumes" for each leg. Finally, a balancing process is carried out to refine the turn movement volumes so that the entering and exiting volumes match the control values. Table 2-6 provides a sample summary of roadway and intersection forecast refinements using the methodology described here.

## 2.7 MODEL PROCESSING

The SCVCTM is run with the Citilabs (formerly Urban Analysis Group) TRANPLAN modeling package, augmented with some utility modules to assist in trip generation and the post-processing.

Table 2-6

FORECAST DATA REFINEMENT SAMPLES

**Sample of Forecast ADT Roadway Volume Adjustments**

| | Existing Count | Existing Modeled Volume | Forecast Volume | Adjusted Forecast Volume |
|---|---|---|---|---|
| A St east of First St | 21,000 | 23,700 | 31,300 | 28,000 |
| B St west of Second St | 17,000 | 14,300 | 24,100 | 27,000 |
| C St south of Third St | 14,000 | 15,800 | 14,300 | 13,000 |

**Sample of Forecast Peak Hour Intersection Volume Adjustments**

NORTH LEG

| | SB Left | SB Through | SB Right | Entering Total | Exiting Total |
|---|---|---|---|---|---|
| Existing Count | 50 | 500 | 200 | 750 | 800 |
| Existing Modeled Volume | 70 | 580 | 220 | 870 | 860 |
| Forecast Volume | 90 | 650 | 300 | 1,040 | 1,230 |
| Adjusted Forecast Volume | 60 | 570 | 280 | 910 | 1,150 |

EAST LEG

| | WB Left | WB Through | WB Right | Entering Total | Exiting Total |
|---|---|---|---|---|---|
| Existing Count | 100 | 450 | 50 | 600 | 550 |
| Existing Modeled Volume | 130 | 520 | 90 | 740 | 730 |
| Forecast Volume | 180 | 1,070 | 160 | 1,410 | 1,060 |
| Adjusted Forecast Volume | 140 | 950 | 90 | 1,180 | 820 |

SOUTH LEG

| | NB Left | NB Through | NB Right | Entering Total | Exiting Total |
|---|---|---|---|---|---|
| Existing Count | 150 | 600 | 50 | 800 | 750 |
| Existing Modeled Volume | 230 | 580 | 120 | 930 | 850 |
| Forecast Volume | 320 | 890 | 150 | 1,360 | 1,000 |
| Adjusted Forecast Volume | 210 | 920 | 60 | 1,190 | 890 |

WEST LEG

| | EB Left | EB Through | EB Right | Entering Total | Exiting Total |
|---|---|---|---|---|---|
| Existing Count | 150 | 450 | 150 | 750 | 800 |
| Existing Modeled Volume | 190 | 540 | 140 | 870 | 970 |
| Forecast Volume | 180 | 820 | 170 | 1,170 | 1,690 |
| Adjusted Forecast Volume | 140 | 700 | 180 | 1,020 | 1,440 |

Abbreviations: SB – southbound
WB – westbound
NB – northbound
EB – eastbound

# Chapter 3.0
# TRAFFIC MODEL FORECASTS

A base year version of the SCVCTM was prepared for model validation purposes. Existing (2004) land use data was used as input to the model, and the resulting assigned volumes compared with actual ground counts. This chapter summarizes the results of that validation run and also summarizes a set of long-range forecasts.

## 3.1 TRIP GENERATION

The base year input data contains 2004 land use data and 2004 cordon volumes. Detailed information on the base year SCVCTM land use and the peak hour and ADT trip generation for the model area can be found in the SCVCTM Technical Notebook. The long-range version of the model represents buildout of the General Plans of the City and County and can be generally considered a 2030 time frame, although buildout of the Valley could occur either earlier or later depending on realized growth rates.

As discussed in the trip generation section of the SCVCTM model description, two sets of tripends are prepared in the trip generation component of the model, peak hour inbound and outbound and ADT production-attraction trips by purpose. The productions and attractions are calculated for the total model area (including cordons), and then adjusted so that total productions equal total attractions.

A trip generation summary for 2004 and 2030 is given in Table 3-1. Included here are the peak hour trips by direction and the productions and attractions by purpose. As described in the trip generation section of Chapter 2.0, both sets of tripends are used in the modeling process.

## 3.2 CORDON VOLUMES

The 2004 and 2030 cordon volumes are listed in Table 3-2. The 2004 volumes are obtained from existing counts and the 2030 volumes from regional traffic data and demographic growth projections. The cordon volumes show an average increase of around 85 percent, somewhat higher to the north and lower to the south. The through trip component of the cordon trips show a growth of around 123 percent and the external component about 63 percent. These increases reflect the growth in regional traffic and the growth in the Santa Clarita Valley, respectively.

Table 3-1

TRIP GENERATION SUMMARY

## I. ORIGIN-DESTINATION TRIPS BY TIME PERIOD

| | AM Peak Hour | | | PM Peak Hour | | | |
|---|---|---|---|---|---|---|---|
| | In | Out | Total | In | Out | Total | ADT |
| 2004 | | | | | | | |
| Internal | 51,846 | 59,531 | 111,377 | 78,479 | 71,993 | 150,472 | 1,570,034 |
| External | 17,850 | 11,310 | 29,160 | 12,330 | 17,840 | 30,170 | 331,200 |
| TOTAL | 69,696 | 70,841 | 140,537 | 90,809 | 89,833 | 180,642 | 1,901,234 |
| | | | | | | | |
| 2030 | | | | | | | |
| Internal | 109,644 | 108,285 | 217,929 | 149,542 | 150,624 | 300,166 | 3,094,424 |
| External | 22,350 | 23,430 | 45,780 | 23,930 | 23,020 | 46,950 | 539,700 |
| TOTAL | 131,994 | 131,715 | 263,709 | 173,472 | 173,644 | 347,116 | 3,634,124 |

## II. ADT TRIPS BY PURPOSE

| | H-W | H-S | H-O | O-W | O-O | Total |
|---|---|---|---|---|---|---|
| 2004 | | | | | | |
| P's | 160,003 | 144,520 | 262,616 | 55,158 | 328,289 | 950,586 |
| A's | 160,016 | 144,478 | 262,707 | 55,158 | 328,289 | 950,648 |
| TOTAL | 320,019 | 288,998 | 525,323 | 110,316 | 656,578 | 1,901,234 |
| | | | | | | |
| 2030 | | | | | | |
| P's | 323,023 | 269,406 | 460,254 | 113,852 | 650,527 | 1,817,062 |
| A's | 323,024 | 269,343 | 460,316 | 113,852 | 650,527 | 1,817,062 |
| TOTAL | 646,047 | 538,749 | 920,570 | 227,704 | 1,301,054 | 3,634,124 |

Note: Purposes are as follows:

H-W – Home to Work
H-S – Home to Shopping
H-O – Home to Other
O-W – Other to Work
O-O – Other to Other

Table 3-2

SCVCTM CORDON VOLUMES

| | AM Peak Hour | | | | | | PM Peak Hour | | | | | | ADT | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | From Cordon | | | To Cordon | | | From Cordon | | | To Cordon | | | | | |
| Cordon Location | Ext. | Thru | Total | Ext. | Thru | Total | Ext. | Thru | Total | Ext. | Thru | Total | Ext. | Thru | Total |
| 1. I-5 NORTH | | | | | | | | | | | | | | | |
| 2004 | 360 | 800 | 1160 | 280 | 700 | 980 | 460 | 1450 | 1910 | 520 | 1300 | 1820 | 23000 | 36000 | 59000 |
| 2030 | 770 | 2350 | 3120 | 480 | 1800 | 2280 | 780 | 4000 | 4780 | 890 | 3500 | 4390 | 39000 | 103000 | 142000 |
| Increase (%) | 114 | 194 | 169 | 71 | 157 | 133 | 70 | 176 | 150 | 71 | 169 | 141 | 70 | 186 | 141 |
| 2. LAKE HUGHES ROAD | | | | | | | | | | | | | | | |
| 2004 | 120 | 0 | 120 | 80 | 0 | 80 | 100 | 0 | 100 | 120 | 0 | 120 | 2800 | 0 | 2800 |
| 2030 | 230 | 0 | 230 | 110 | 0 | 110 | 130 | 0 | 130 | 230 | 0 | 230 | 4600 | 0 | 4600 |
| Increase (%) | 92 | | 92 | 38 | | 38 | 30 | | 30 | 92 | | 92 | 64 | | 64 |
| 3. SAN FRANCISQUITO | | | | | | | | | | | | | | | |
| 2004 | 90 | 0 | 90 | 70 | 0 | 70 | 90 | 0 | 90 | 100 | 0 | 100 | 2400 | 0 | 2400 |
| 2030 | 180 | 0 | 180 | 100 | 0 | 100 | 120 | 0 | 120 | 190 | 0 | 190 | 3900 | 0 | 3900 |
| Increase (%) | 100 | | 100 | 43 | | 43 | 33 | | 33 | 90 | | 90 | 63 | | 63 |
| 4. BOUQUET CANYON ROAD | | | | | | | | | | | | | | | |
| 2004 | 140 | 0 | 140 | 130 | 0 | 130 | 150 | 0 | 150 | 170 | 0 | 170 | 4000 | 0 | 4000 |
| 2030 | 270 | 0 | 270 | 180 | 0 | 180 | 210 | 0 | 210 | 330 | 0 | 330 | 6200 | 0 | 6200 |
| Increase (%) | 93 | | 93 | 38 | | 38 | 40 | | 40 | 94 | | 94 | 55 | | 55 |
| 5. SIERRA HIGHWAY | | | | | | | | | | | | | | | |
| 2004 | 350 | 0 | 350 | 250 | 0 | 250 | 320 | 0 | 320 | 380 | 0 | 380 | 8200 | 0 | 8200 |
| 2030 | 650 | 0 | 650 | 350 | 0 | 350 | 470 | 0 | 470 | 690 | 0 | 690 | 13000 | 0 | 13000 |
| Increase (%) | 86 | | 86 | 40 | | 40 | 47 | | 47 | 82 | | 82 | 59 | | 59 |
| 6. ESCONDIDO CANYON ROAD | | | | | | | | | | | | | | | |
| 2004 | 100 | 0 | 100 | 60 | 0 | 60 | 90 | 0 | 90 | 100 | 0 | 100 | 2400 | 0 | 2400 |
| 2030 | 190 | 0 | 190 | 90 | 0 | 90 | 120 | 0 | 120 | 190 | 0 | 190 | 3700 | 0 | 3700 |
| Increase (%) | 90 | | 90 | 50 | | 50 | 33 | | 33 | 90 | | 90 | 54 | | 54 |
| 7. SR-14 NORTH | | | | | | | | | | | | | | | |
| 2004 | 1690 | 2650 | 4340 | 740 | 1050 | 1790 | 1300 | 850 | 2150 | 2090 | 2150 | 4240 | 36000 | 64000 | 100000 |
| 2030 | 5390 | 7320 | 12710 | 1100 | 1650 | 2750 | 1820 | 1300 | 3120 | 6190 | 5810 | 12000 | 85000 | 117000 | 202000 |
| Increase (%) | 219 | 176 | 193 | 49 | 57 | 54 | 40 | 53 | 45 | 196 | 170 | 183 | 136 | 83 | 102 |

(continued)

Table 3-2 (continued)
SCVCTM CORDON VOLUMES

| | AM Peak Hour | | | | | | PM Peak Hour | | | | | | ADT | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | From Cordon | | | To Cordon | | | From Cordon | | | To Cordon | | | | | |
| Cordon Location | Ext. | Thru | Total | Ext. | Thru | Total | Ext. | Thru | Total | Ext. | Thru | Total | Ext. | Thru | Total |
| 8. SOLEDAD CANYON ROAD | | | | | | | | | | | | | | | |
| 2004 | 120 | 0 | 120 | 90 | 0 | 90 | 120 | 0 | 120 | 120 | 0 | 120 | 4100 | 0 | 4100 |
| 2030 | 250 | 0 | 250 | 130 | 0 | 130 | 170 | 0 | 170 | 230 | 0 | 230 | 6300 | 0 | 6300 |
| Increase (%) | 108 | | 108 | 44 | | 44 | 42 | | 42 | 92 | | 92 | 54 | | 54 |
| 9. SAND CANYON ROAD | | | | | | | | | | | | | | | |
| 2004 | 60 | 0 | 60 | 40 | 0 | 40 | 50 | 0 | 50 | 70 | 0 | 70 | 1300 | 0 | 1300 |
| 2030 | 210 | 0 | 210 | 60 | 0 | 60 | 70 | 0 | 70 | 130 | 0 | 130 | 2000 | 0 | 2000 |
| Increase (%) | 250 | | 250 | 50 | | 50 | 40 | | 40 | 86 | | 86 | 54 | | 54 |
| 10. I-5 SOUTH | | | | | | | | | | | | | | | |
| 2004 | 7350 | 1250 | 8600 | 14730 | 2950 | 17680 | 13570 | 2950 | 16520 | 7710 | 1800 | 9510 | 215000 | 83000 | 298000 |
| 2030 | 12410 | 2700 | 15110 | 17910 | 8920 | 26830 | 16980 | 8560 | 25540 | 12180 | 4550 | 16730 | 317000 | 198000 | 515000 |
| Increase (%) | 69 | 116 | 76 | 22 | 202 | 52 | 25 | 190 | 55 | 58 | 153 | 76 | 47 | 139 | 73 |
| 11. SAN FERNANDO ROAD | | | | | | | | | | | | | | | |
| 2004 | 480 | 0 | 480 | 880 | 0 | 880 | 1040 | 0 | 1040 | 500 | 0 | 500 | 18000 | 0 | 18000 |
| 2030 | 2060 | 0 | 2060 | 1160 | 0 | 1160 | 1440 | 0 | 1440 | 1870 | 0 | 1870 | 38000 | 0 | 38000 |
| Increase (%) | 329 | | 329 | 32 | | 32 | 38 | | 38 | 274 | | 274 | 111 | | 111 |
| 12. SR-126 WEST | | | | | | | | | | | | | | | |
| 2004 | 450 | 300 | 750 | 500 | 300 | 800 | 550 | 400 | 950 | 450 | 400 | 850 | 14000 | 11000 | 25000 |
| 2030 | 850 | 450 | 1300 | 650 | 450 | 1100 | 700 | 550 | 1250 | 820 | 550 | 1370 | 21000 | 14000 | 35000 |
| Increase (%) | 89 | 50 | 73 | 30 | 50 | 38 | 27 | 38 | 32 | 82 | 38 | 61 | 50 | 27 | 40 |
| TOTAL | | | | | | | | | | | | | | | |
| 2004 | 11310 | 5000 | 16310 | 17850 | 5000 | 22850 | 17840 | 5650 | 23490 | 12330 | 5650 | 17980 | 331200 | 194000 | 525200 |
| 2030 | 23460 | 12820 | 36280 | 22320 | 12820 | 35140 | 23010 | 14410 | 37420 | 23940 | 14410 | 38350 | 539700 | 432000 | 971700 |
| Increase (%) | 107 | 156 | 122 | 25 | 156 | 54 | 29 | 155 | 59 | 94 | 155 | 113 | 63 | 123 | 85 |
| FROM/TO DIFFERENCE | | | | | | | | | | | | | | | |
| 2004 | | | | | | 6540 | | | | | | -5510 | | | |
| 2030 | | | | | | -1140 | | | | | | 930 | | | |

## 3.3 2004 VALIDATION

Figure 3-1 illustrates the 2004 ADT volumes produced by the SCVCTM for the study area together with corresponding observed volumes. Observed volumes were collected throughout the first half of 2004 and the latter half of 2003. A statistical summary of the comparison between observed and modeled link volumes is presented later in this chapter.

A screenline comparison was also carried out by comparing modeled volumes and traffic count totals for screenlines within the SCVCTM study area. A screenline is a hypothetical boundary drawn across a series of somewhat parallel roadways for the purposes of comparing trip distribution patterns. The seven screenlines utilized for this purpose are illustrated in Figure 3-2 and the total ADT modeled volumes and observed counts for each screenline are summarized in Table 3-3. The general standard used in assessing screenlines is a maximum desirable deviation of 10 percent, which is met by all of the seven screenlines analyzed. Just over half of the screenlines have a deviation of less than five percent.

As noted in Chapter 2.0, the SCVCTM has the ability to forecast peak hour intersection turn movement volumes. Intersection capacity utilization (ICU) results from data produced by the model are summarized in Table 3-4 together with the corresponding observed results. Intersection locations are illustrated in Figure 3-3, and detailed ICU calculations are contained in the SCVCTM Technical Notebook. In the next section, statistical summaries are made for the ADT and peak hour data comparisons.

### 3.3.1 Statistical Analysis

The comparison between observed and modeled volumes allows statistical measures of variation to be calculated. The variable used for these calculations is as follows:

$$V = m - c$$

where V = difference between modeled and count volumes
m = modeled volume
c = count volume

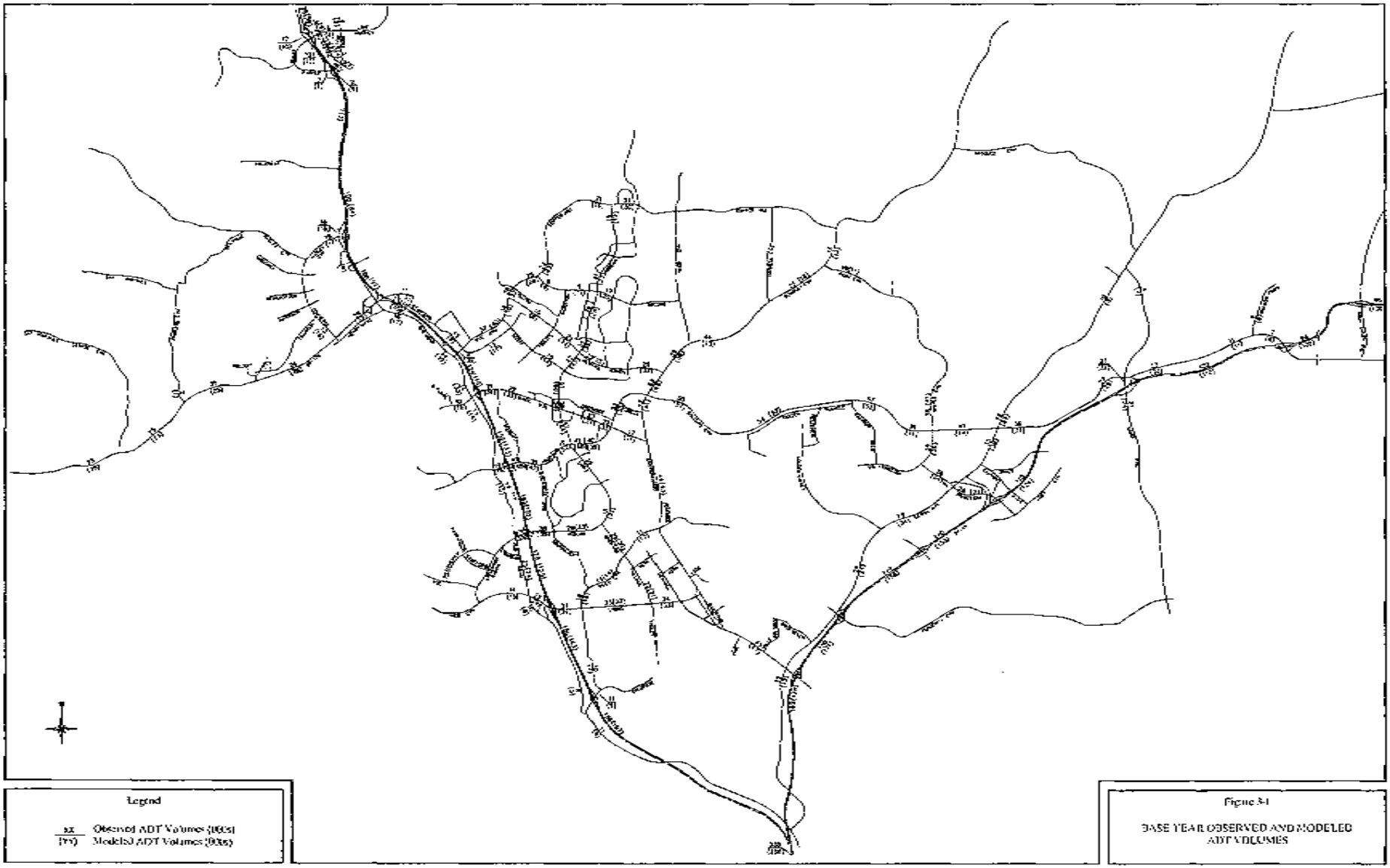



Figure 3-1

BASE YEAR OBSERVED AND MODELED ADT VOLUMES

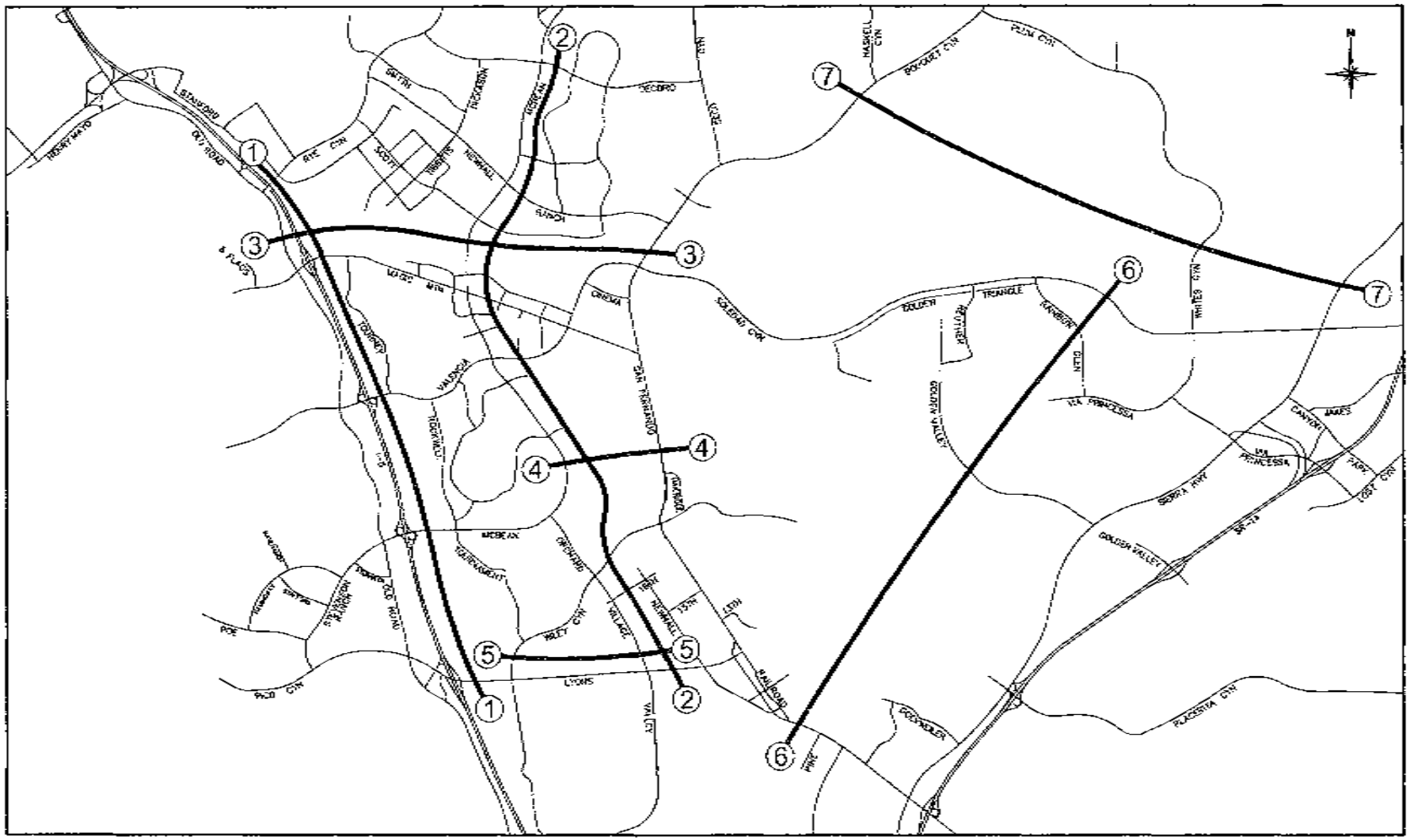



Figure 3-2

SCVCTM SCREENLINE LOCATIONS

Table 3-3

2004 SCVCTM ADT SCREENLINE SUMMARY

| | Observed Count | Modeled Volume | Difference | Percent Difference |
|---|---|---|---|---|
| Screenline #1 | 179,414 | 194,192 | 14,778 | 8.2 |
| Screenline #2 | 159,400 | 165,806 | 6,406 | 4.0 |
| Screenline #3 | 157,354 | 158,614 | 1,260 | 0.8 |
| Screenline #4 | 78,697 | 73,692 | -5,005 | -6.4 |
| Screenline #5 | 40,073 | 39,627 | -446 | -1.1 |
| Screenline #6 | 91,879 | 98,433 | 6,554 | 7.1 |
| Screenline #7 | 104,000 | 105,703 | 1,703 | 1.6 |

Note: Volumes exclude freeway trips

Table 3-4

BASE YEAR PEAK HOUR ICU COMPARISON

| Location | AM Peak Hour | | | PM Peak Hour | | |
|---|---|---|---|---|---|---|
| | Count | Modeled | Difference | Count | Modeled | Difference |
| 1. Old Road & I-5 SB Ramps | .33 | .32 | -.01 | .37 | .40 | .03 |
| 2. I-5 NB Ramps & Lake Hughes | .27 | .25 | -.02 | .47 | .39 | -.08 |
| 3. I-5 SB Ramps & Parker | .61 | .63 | .02 | .65 | .63 | -.02 |
| 4. I-5 NB Ramps & Ridge Route | .40 | .43 | .03 | .46 | .52 | .06 |
| 5. I-5 SB & Hasley Cyn | .45 | .65 | .20 | .54 | .57 | .03 |
| 6. I-5 NB & Hasley Cyn | .51 | .68 | .17 | .66 | .72 | .06 |
| 7. I-5 SB Ramps & SR-126 | .37 | .37 | .00 | .33 | .32 | -.01 |
| 8. I-5 NB Ramps & SR-126 | .65 | .80 | .15 | .71 | .77 | .06 |
| 9. The Old Rd & I-5 SB Ramps | .46 | .50 | .04 | .52 | .51 | -.01 |
| 10. I-5 SB Ramps & Magic Mtn | .51 | .61 | .10 | .48 | .50 | .02 |
| 11. I-5 NB Ramps & Magic Mtn | .68 | .71 | .03 | .69 | .67 | -.02 |
| 12. I-5 SB Ramps & Valencia | .37 | .30 | -.07 | .43 | .45 | .02 |
| 13. I-5 NB Ramps & Valencia | .48 | .45 | -.03 | .48 | .49 | .01 |
| 14. I-5 SB Ramps & Stevenson Rch | .37 | .43 | .06 | .59 | .65 | .06 |
| 15. I-5 NB Ramps & McBean | .34 | .42 | .08 | .54 | .63 | .09 |
| 16. I-5 SB/Marriott & Pico/Lyons | .53 | .45 | -.08 | .60 | .62 | .02 |
| 17. I-5 NB On/Off & Lyons Ave | .53 | .65 | .12 | .70 | .75 | .05 |
| 18. I-5 SB Ramps & Calgrove | .47 | .69 | .22 | .64 | .55 | -.09 |
| 19. I-5 NB Ramps & Calgrove | .64 | .77 | .13 | .50 | .53 | .03 |
| 20. I-5 SB On Ramp & Pico/Lyons | .35 | .39 | .04 | .46 | .44 | -.02 |
| 21. Calgrove Blvd & The Old Rd | .40 | .26 | -.14 | .45 | .35 | -0.1 |
| 25. The Old Rd & Rye Canyon | 1.10 | 1.05 | -.05 | 1.10 | 1.01 | -.09 |
| 26. The Old Rd & Magic Mountain | .70 | .63 | -.07 | .69 | .71 | .02 |
| 27. The Old Rd & Valencia | .28 | .32 | .04 | .39 | .48 | .09 |
| 29. The Old Rd & Pico Canyon | .51 | .39 | -.12 | .56 | .54 | -.02 |
| 30. Ave Stanford & Rye Canyon | .61 | .55 | -.06 | .80 | .74 | -.06 |
| 32. Ave Scott & Rye Canyon | .70 | .63 | -.07 | .71 | .68 | -.03 |
| 33. Rye/Copper Hill & NRR | .59 | .56 | -.03 | .58 | .46 | -.12 |
| 35. Copper Hill & Decoro | .58 | .54 | -.04 | .49 | .44 | -.05 |
| 36. Tourney & Valencia | .50 | .55 | .05 | .47 | .49 | .02 |
| 37. Tourney & Magic Mountain | .43 | .51 | .08 | .57 | .60 | .03 |
| 39. Ave Tibbits/Dickason & NRR | .40 | .36 | -.04 | .36 | .46 | .10 |
| 41. Dickason & Decoro | .37 | .34 | -.03 | .25 | .35 | .10 |
| 44. McBean & Valencia | .61 | .70 | .09 | .72 | .76 | .04 |
| 45. McBean & Magic Mtn | .55 | .64 | .09 | .88 | .89 | .01 |
| 47. McBean & Scott/Bridgeport | .68 | .77 | .09 | .57 | .56 | -.01 |
| 48. McBean & Newhall Ranch | .65 | .74 | .09 | .72 | .77 | .05 |
| 49. McBean Pkwy & Decoro Dr | .54 | .59 | .05 | .50 | .61 | .11 |

Table 3-4 (cont)
BASE YEAR PEAK HOUR ICU COMPARISON

| | AM Peak Hour | | | PM Peak Hour | | |
|---|---|---|---|---|---|---|
| Location | Count | Modeled | Difference | Count | Modeled | Difference |
| 50. McBean Pkwy & Copper Hill | .62 | .54 | -.08 | .80 | .60 | -.20 |
| 51. Wiley Cyn & Lyons | .43 | .63 | .20 | .74 | .64 | -.10 |
| 52. Tournament & Wiley Cyn | .37 | .43 | .06 | .45 | .37 | -.08 |
| 53. Orchard Village & Lyons | .49 | .48 | -.01 | .6 | .61 | .01 |
| 54. Orchard Village & Wiley Cyn | .38 | .49 | .11 | .57 | .61 | .04 |
| 55. Orchard Village & McBean | .57 | .50 | -.07 | .78 | .73 | -.05 |
| 57. Valencia & Magic Mtn | .62 | .62 | .00 | .72 | .87 | .15 |
| 59. Valencia & Cinema | .53 | .56 | .03 | .73 | .73 | .00 |
| 65. Bouquet & Soledad | .78 | .70 | -.08 | .99 | 1.02 | .03 |
| 66. Bouquet & Newhall Ranch | .87 | .83 | -.04 | .85 | .71 | -.14 |
| 80. Wolcott & SR-126 | .32 | .34 | .02 | .39 | .38 | -.01 |
| 89. Old Road & SR-126 WB Ramps | .31 | .32 | .01 | .30 | .25 | -.05 |
| 91. Old Road & Hasley Cyn | .70 | .67 | -.03 | .63 | .66 | .03 |
| 94. Commerce Center & SR-126 | .47 | .61 | .14 | .60 | .66 | .06 |
| 95. The Old Rd & Sedona Way | .57 | .39 | -.18 | .37 | .40 | .03 |
| 96. San Martinez Cyn & SR-126 | .29 | .33 | .04 | .38 | .37 | -.01 |
| 110. Chiquito Cyn & SR-126 | .34 | .33 | -.01 | .41 | .37 | -.04 |
| 117. SR-126 EB Ramp & Henry Mayo | .18 | .34 | .16 | .20 | .35 | .15 |
| 148. SR-14 NB & Via Princessa | .46 | .42 | -.04 | .68 | .87 | .19 |
| 149. SR-14 SB & Via Princessa | .64 | 1.02 | .38 | .49 | .61 | .12 |
| 151. Sand Cyn & SR-14 NB Ramps | .39 | .59 | .20 | .66 | .92 | .26 |
| 152. SR-14 SB Rmps & Soledad Cyn | .54 | 1.00 | .46 | .59 | .65 | .06 |
| 153. Sand Cyn & Soledad Cyn | .64 | .69 | .05 | .67 | .72 | .05 |
| 170. Sierra Hwy & Via Princessa | .59 | .65 | .06 | .62 | .74 | .12 |
| 171. Whites Cyn & Via Princessa | .50 | .47 | -.03 | .63 | .48 | -.15 |
| 172. Whites Cyn & Soledad Canyon | .86 | .84 | -.02 | .92 | .87 | -.05 |
| 173. Santa Catarina/GVR & Plum | .71 | .39 | -.32 | .66 | .45 | -.21 |
| 174. Bouquet Canyon & Plum Cyn | .69 | .33 | -.36 | .58 | .38 | -.20 |
| 176. Sierra Hwy & Soledad Cyn | .70 | .80 | .10 | .85 | .93 | .08 |
| 177. SR-14 SB On & Via Princessa | .37 | .36 | -.01 | .46 | .45 | -.01 |
| 178. Sierra Hwy & SR-14 NB Off | .46 | .44 | -.02 | .54 | .43 | -.11 |
| 180. Old Road & Sloan/Lake Hughes | .27 | .23 | -.04 | .33 | .35 | .02 |
| 181. Old Road & Parker | .43 | .33 | -0.1 | .53 | .35 | -.18 |
| 182. Castaic & Lake Hughes | .30 | .28 | -.02 | .37 | .30 | -.07 |
| 183. Ridge Route & Lake Hughes | .29 | .20 | -.09 | .18 | .15 | -.03 |
| 184. Castaic & Ridge Route | .29 | .30 | .01 | .38 | .37 | -.01 |
| 191. Sierra Hwy & Sand Cyn | .47 | .39 | -.08 | .45 | .50 | .05 |
| 194. Shadow Pines & Soledad Cyn | .27 | .35 | .08 | .35 | .43 | .08 |
| 195. Soledad Cyn & SR-14 SB | .19 | .25 | .06 | .15 | .20 | .05 |
| 196. Soledad Cyn & SR-14 NB | .24 | .41 | .17 | .26 | .45 | .19 |
| 205. Cambridge & Hasley Cyn | .46 | .55 | .09 | .34 | .33 | -.01 |

Table 3-4 (cont)
BASE YEAR PEAK HOUR ICU COMPARISON

| Location | AM Peak Hour | | | PM Peak Hour | | |
|---|---|---|---|---|---|---|
| | Count | Modeled | Difference | Count | Modeled | Difference |
| 301. Mall Entrance & Valencia | .40 | .48 | .08 | .54 | .61 | .07 |
| 303. Auto Center & Magic Mtn | .28 | .28 | .00 | .45 | .41 | -.04 |
| 304. Citrus & Magic Mtn | .36 | .33 | -.03 | .48 | .54 | .06 |
| 322. McBean & So Mall Entrance | .38 | .42 | .04 | .59 | .71 | .12 |
| 323. Citrus & Valencia | .48 | .47 | -.01 | .65 | .48 | -.17 |
| 324. Chiquella & Pico Cyn | .47 | .49 | .02 | .52 | .43 | -.09 |
| 325. Marriott Wy & The Old Rd | .32 | .13 | -.19 | .50 | .36 | -.14 |
| 326. Chiquella & The Old Rd | .32 | .47 | .15 | .58 | .57 | -.01 |
| 327. Wiley Cyn & Calgrove | .48 | .45 | -.03 | .51 | .47 | -.04 |

| | | | |
|---|---|---|---|
| AM SAMPLE SIZE | = 88 | PM SAMPLE SIZE | = 88 |
| AVERAGE COUNT | = .48 | AVERAGE COUNT | = .55 |
| AVERAGE MODELED | = .50 | AVERAGE MODELED | = .55 |
| AVERAGE DIFFERENCE | = .02 | AVERAGE DIFFERENCE | .00 |
| STANDARD DEVIATION | = .12 | STANDARD DEVIATION | = .09 |

Note: All ICUs calculated using the methodology of the City of Santa Clarita for this statistical comparison

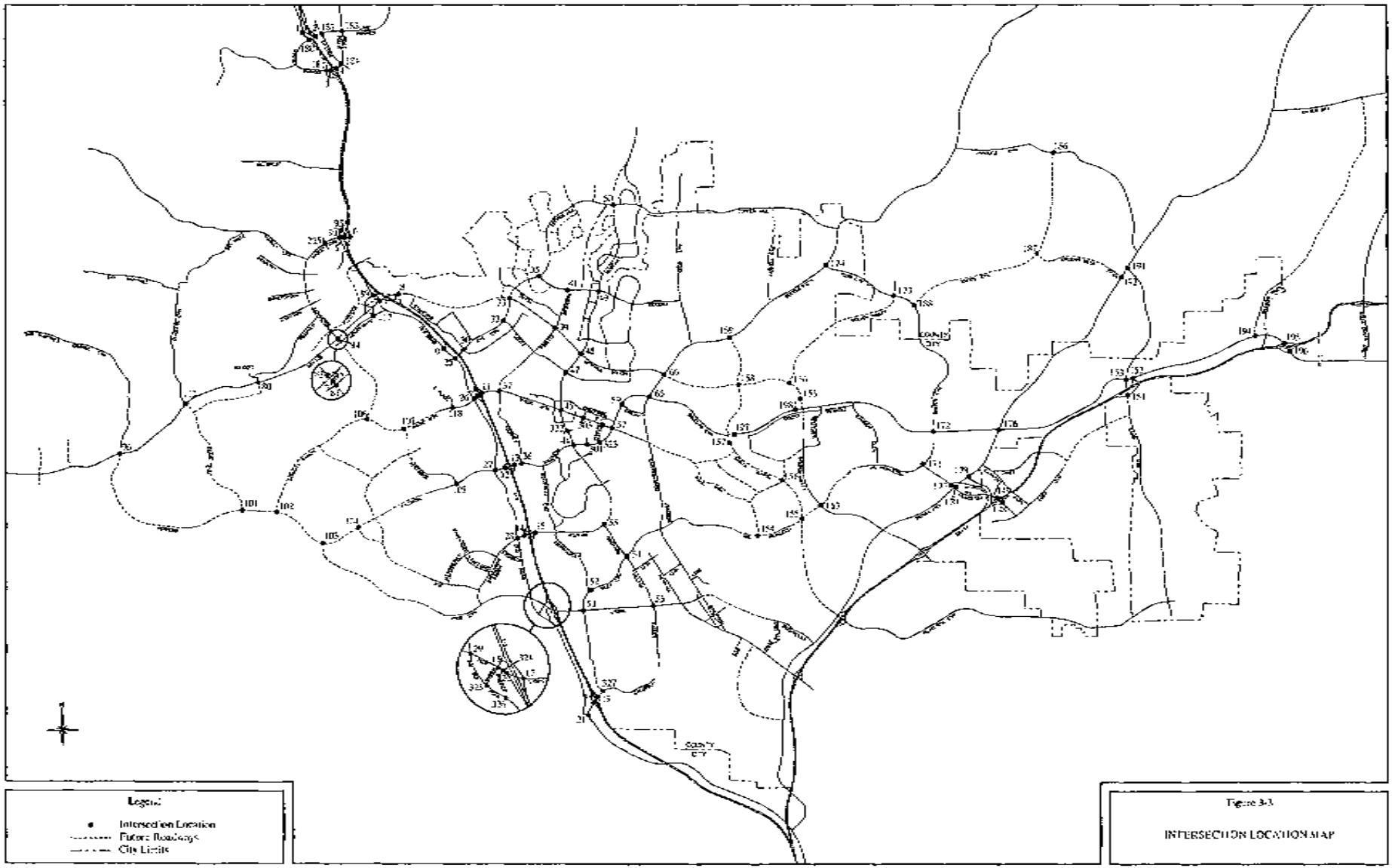



Figure 3-3

INTERSECTION LOCATION MAP

The results of this statistical analysis for a set of links and intersections in the study area are summarized as follows (detailed statistical analysis summaries can be found in Appendix D):

| | Sample Size | Average Observed | Average Modeled | Difference | Standard Deviation |
|---|---|---|---|---|---|
| ADT | 122 | 24,677 | 25,142 | 465 | 3,666 |
| AM Peak Hour | 326 | 1,311 | 1,330 | 19 | 305 |
| PM Peak Hour | 324 | 1,584 | 1,593 | 9 | 303 |
| ICUs: AM Peak Hour | 88 | .48 | .50 | .02 | .12 |
| PM Peak Hour | 88 | .55 | .55 | .00 | .09 |

The ADT results do not include freeway volumes, and are intended to show statistical variation on the study area arterial system. The peak hour statistical analysis utilizes midblock volumes derived from observed and modeled intersection approach volumes, and the ICU analysis uses the ICU comparison data presented earlier. The statistical summary indicates that the average modeled results are close to the observed and hence the total amount of traffic on the arterial roadway system appears to realistically match the counts. Statistical variation is well within acceptable limits for models of this type (5,000 - 10,000 ADT standard deviation).

The general order of magnitude of variation indicated from these results can be expressed in the form of confidence limits as follows:

| | | |
|---|---|---|
| ADT | 67% confidence limits | +/- 3,700 ADT |
| | 90% confidence limits | +/- 5,900 ADT |
| Peak Hour | 67% confidence limits | 300 VPH |
| | 90% confidence limits | 480 VPH |
| ICU | 67% confidence limits | +/- .10 |
| | 90% confidence limits | +/- .16 |

The 90 percent confidence limits represent the volume range within which 90 percent of the link volumes would fall (i.e., only 10 percent of the links would have volumes outside this range). Both the two-thirds and 90 percent confidence limits are commonly used in evaluating the reliability of data that is subject to statistical variation.

## 3.4 LONG-RANGE TRAFFIC FORECASTS

This section presents SCVCTM forecasts for the long-range version of the model. The results are based on specific land use and circulation assumptions used in a baseline version of the model. As noted earlier in this chapter, the long-range land use represents buildout of the General Plans of the City and County and can generally be considered a 2030 timeframe. Subsequent runs of SCVCTM will address individual development applications, as well as the combined (cumulative) effect of multiple proposals, and forecast data contained in technical reports for those applications will not necessarily correspond to the data presented here. Appendix E contains summaries of existing and long-range land use data by traffic zone.

Figure 3-4 shows long-range ADT traffic volumes on the circulation system. These are based on the current Master Plan of Highways for this area, and reflect the land use and external trip inputs summarized in the respective appendices.

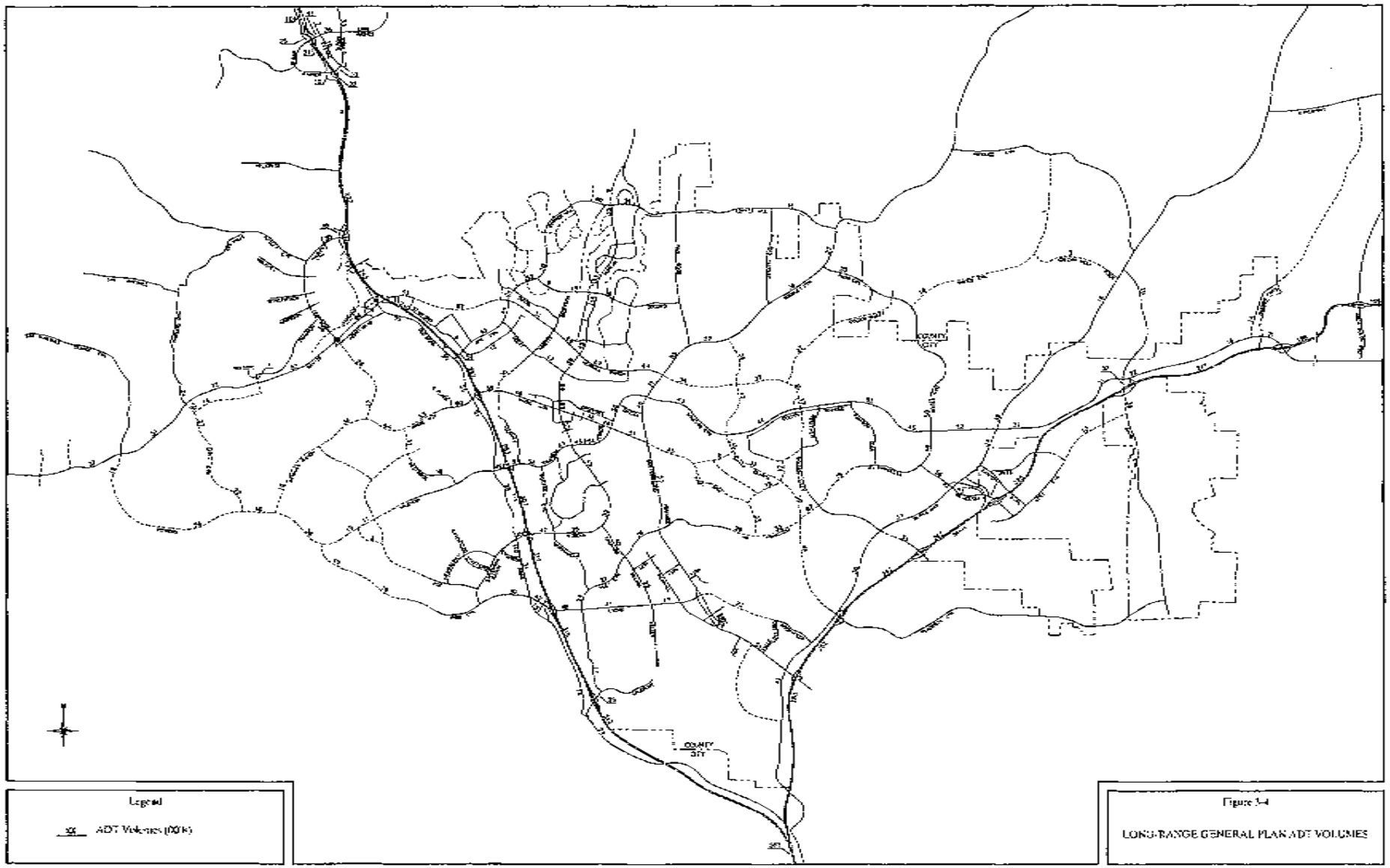



Figure 3-4

LONG-RANGE GENERAL PLAN ADT VOLUMES

# Appendix A
# TRIP GENERATION

This appendix summarizes the trip generation rates used in the Santa Clarita Valley Consolidated Traffic Model (SCVCTM), and summarizes the total model area trip generation and cordon volume summaries for the two model versions described in this report (2004 and long-range General Plan). The following tables are included in this appendix:


| | |
|---|---|
| Table A-1 | ADT and Peak Hour Trip Rate Summary |
| Table A-2 | Land Use and Trip Generation Summaries |
| Table A-3 | ADT Trip Rate and P&A Splitting Factor Summary |
| Table A-4 | Land Use and P&A Trip Generation Summaries |
| Table A-5 | Cordon Through Trips |

Table A-1

ADT AND PEAK HOUR TRIP RATE SUMMARY

| | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 1. | Single Family (<1du/ac) | DU | 0.29 | 0.67 | 0.96 | 0.84 | 0.35 | 1.20 | 9.90 |
| 2. | Single Family (1-5du/ac) | DU | 0.19 | 0.56 | 0.75 | 0.64 | 0.37 | 1.01 | 9.90 |
| 3. | Single Family (6-10du/ac) | DU | 0.19 | 0.56 | 0.75 | 0.64 | 0.37 | 1.01 | 9.90 |
| 4. | Condominium/Townhouse | DU | 0.10 | 0.48 | 0.58 | 0.47 | 0.26 | 0.73 | 8.00 |
| 5. | Apartment | DU | 0.08 | 0.43 | 0.51 | 0.41 | 0.21 | 0.62 | 6.90 |
| 6. | Mobile Home | DU | 0.08 | 0.32 | 0.40 | 0.35 | 0.21 | 0.56 | 6.90 |
| 7. | Senior (Active) | DU | 0.06 | 0.12 | 0.20 | 0.16 | 0.10 | 0.26 | 3.71 |
| 10. | Commercial Center (>30ac) | TSF | 0.47 | 0.30 | 0.77 | 1.64 | 1.78 | 3.42 | 40.06 |
| 11. | Commercial Center(10-30a) | TSF | 0.73 | 0.47 | 1.20 | 2.38 | 2.58 | 4.96 | 54.06 |
| 12. | Commercial Center (<10ac) | TSF | 1.09 | 0.69 | 1.78 | 3.32 | 3.60 | 6.92 | 85.06 |
| 13. | Commercial Shops | TSF | 0.72 | 0.48 | 1.20 | 1.80 | 1.80 | 3.60 | 37.06 |
| 14. | Hotel | ROOM | 0.34 | 0.22 | 0.56 | 0.32 | 0.29 | 0.61 | 8.23 |
| 15. | Sit-Down Restaurant | TSF | 4.82 | 4.45 | 9.27 | 6.52 | 4.34 | 10.86 | 130.34 |
| 16. | Fast Food Restaurant | TSF | 25.43 | 24.43 | 49.86 | 17.41 | 16.07 | 33.48 | 496.12 |
| 17. | Movie Theater | SEAT | 0.00 | 0.00 | 0.00 | 0.05 | 0.02 | 0.07 | 1.76 |
| 18. | Health Club | TSF | 0.96 | 0.64 | 1.60 | 2.16 | 1.44 | 3.60 | 40.00 |
| 19. | Car Dealership | TSF | 1.61 | 0.60 | 2.21 | 1.12 | 1.68 | 2.80 | 37.50 |
| 20. | Elementary/Middle School | STU | 0.26 | 0.20 | 0.46 | 0.08 | 0.09 | 0.17 | 1.45 |
| 21. | High School | STU | 0.32 | 0.14 | 0.46 | 0.06 | 0.09 | 0.15 | 1.79 |
| 22. | College | STU | 0.13 | 0.01 | 0.14 | 0.07 | 0.14 | 0.21 | 1.54 |
| 23. | Hospital | TSF | 0.71 | 0.26 | 0.97 | 0.22 | 0.70 | 0.92 | 16.80 |
| 24. | Library | TSF | 0.76 | 0.30 | 1.06 | 3.40 | 3.69 | 7.09 | 84.98 |
| 25. | Church | TSF | 0.39 | 0.33 | 0.72 | 0.36 | 0.30 | 0.66 | 9.30 |
| 26. | Day Care | STU | 0.43 | 0.38 | 0.81 | 0.40 | 0.46 | 0.86 | 4.52 |
| 30. | Industrial Park | TSF | 0.55 | 0.10 | 0.65 | 0.13 | 0.52 | 0.65 | 6.00 |
| 31. | Business Park | TSF | 1.20 | 0.23 | 1.43 | 0.30 | 0.99 | 1.29 | 10.20 |
| 32. | Manufacturing/Warehouse | TSF | 0.56 | 0.17 | 0.73 | 0.27 | 0.47 | 0.74 | 5.10 |
| 33. | Science/Research | TSF | 1.03 | 0.21 | 1.24 | 0.16 | 0.92 | 1.08 | 10.20 |
| 34. | Utilities | TSF | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2.38 |
| 35. | Regional Post Office | TSF | 0.20 | 0.15 | 0.35 | 0.15 | 0.15 | 0.30 | 5.00 |
| 40. | Commercial Office | TSF | 1.55 | 0.19 | 1.74 | 0.21 | 1.29 | 1.50 | 11.56 |
| 41. | High-Rise Office | TSF | 1.37 | 0.19 | 1.56 | 0.25 | 1.24 | 1.49 | 10.88 |
| 42. | Medical Office | TSF | 1.94 | 0.49 | 2.43 | 0.99 | 2.67 | 3.66 | 34.20 |
| 43. | Post Office | TSF | 4.17 | 3.85 | 8.02 | 5.50 | 5.29 | 10.79 | 108.19 |
| 50. | Golf Course | AC | 0.15 | 0.06 | 0.21 | 0.10 | 0.20 | 0.30 | 7.96 |
| 51. | Developed Park | AC | 0.00 | 0.00 | 0.00 | 0.03 | 0.04 | 0.07 | 2.60 |
| 52. | Undeveloped Park | AC | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.50 |
| 53. | Wayside Honor Ranch | SG | 3.00 | 2.00 | 5.00 | 4.00 | 6.00 | 10.00 | 100.00 |
| 54. | Six Flags Magic Mtn | SG | 3.00 | 2.00 | 5.00 | 4.00 | 6.00 | 10.00 | 100.00 |
| 55. | Travel Village | SG | 3.00 | 2.00 | 5.00 | 4.00 | 6.00 | 10.00 | 100.00 |

Table A-1 (cont.)

ADT AND PEAK HOUR TRIP RATE SUMMARY

| | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 56. | CHP Office | SG | 3.00 | 2.00 | 5.00 | 4.00 | 6.00 | 10.00 | 100.00 |
| 57. | Agua Dulce Airport | SG | 3.00 | 2.00 | 5.00 | 4.00 | 6.00 | 10.00 | 100.00 |
| 58. | Landfill | SG | 3.00 | 2.00 | 5.00 | 4.00 | 6.00 | 10.00 | 100.00 |
| 59. | Cemex | SG | 3.60 | 3.75 | 7.35 | 2.00 | 2.25 | 4.25 | 100.00 |

Table A-2

SCVCTM 4.0 2004 LAND USE AND TRIP GENERATION SUMMARY

| | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 1. | Single Family (<1du/ac) | 300.00 DU | 67 | 201 | 288 | 253 | 108 | 361 | 2970 |
| 2. | Single Family (1-5du/ac) | 42731.00 DU | 8126 | 23922 | 32048 | 27350 | 15811 | 43161 | 423044 |
| 3. | Single Family (6-10du/ac) | 5812.00 DU | 1104 | 3256 | 4360 | 3718 | 2152 | 5870 | 57538 |
| 4. | Condominium/Townhouse | 23519.00 DU | 2350 | 11287 | 13637 | 11055 | 6119 | 17174 | 188152 |
| 5. | Apartment | 2108.00 DU | 169 | 907 | 1076 | 863 | 442 | 1305 | 14545 |
| 6. | Mobile Home | 2464.00 DU | 197 | 789 | 985 | 865 | 519 | 1384 | 17002 |
| 10. | Commercial Center (>30ac) | 2675.04 TSF | 1258 | 803 | 2061 | 4386 | 4762 | 9148 | 107163 |
| 11. | Commercial Center(10-30a) | 4203.47 TSF | 3071 | 1973 | 5044 | 10003 | 10844 | 20847 | 227240 |
| 12. | Commercial Center (<10ac) | 1307.47 TSF | 1425 | 905 | 2330 | 4340 | 4706 | 9046 | 111212 |
| 13. | Commercial Shops | 1168.87 TSF | 840 | 561 | 1401 | 2104 | 2104 | 4208 | 43318 |
| 14. | Hotel | 985.00 ROOM | 334 | 216 | 550 | 316 | 286 | 602 | 8107 |
| 15. | Sit-Down Restaurant | 210.92 TSF | 1017 | 938 | 1955 | 1376 | 915 | 2291 | 27493 |
| 16. | Fast Food Restaurant | 47.68 TSF | 1210 | 1162 | 2372 | 829 | 763 | 1592 | 23606 |
| 17. | Movie Theater | 3300.00 SEAT | 0 | 0 | 0 | 165 | 66 | 231 | 5808 |
| 18. | Health Club | 125.00 TSF | 120 | 80 | 200 | 270 | 180 | 450 | 5000 |
| 19. | Car Dealership | 330.50 TSF | 533 | 199 | 732 | 370 | 555 | 925 | 12395 |
| 20. | Elementary/Middle School | 32506.00 STU | 8453 | 6501 | 14954 | 2602 | 2929 | 5531 | 47140 |
| 21. | High School | 13228.00 STU | 4233 | 1852 | 6085 | 794 | 1191 | 1985 | 23678 |
| 22. | College | 18379.00 STU | 2890 | 184 | 2574 | 1286 | 2573 | 3859 | 28303 |
| 23. | Hospital | 222.80 TSF | 158 | 58 | 216 | 49 | 156 | 205 | 3743 |
| 24. | Library | 53.73 TSF | 41 | 16 | 57 | 183 | 199 | 382 | 4567 |
| 25. | Church | 512.89 TSF | 202 | 171 | 373 | 183 | 154 | 337 | 4770 |
| 26. | Day Care | 460.00 STU | 199 | 175 | 374 | 184 | 212 | 396 | 2079 |
| 30. | Industrial Park | 15517.43 TSF | 8536 | 1551 | 10087 | 2019 | 8069 | 10088 | 93103 |
| 31. | Business Park | 1017.92 TSF | 1221 | 236 | 1457 | 306 | 1008 | 1314 | 10383 |
| 32. | Manufacturing/Warehouse | 1970.77 TSF | 1103 | 336 | 1439 | 534 | 926 | 1460 | 10052 |
| 34. | Utilities | 1121.24 TSF | 0 | 0 | 0 | 0 | 0 | 0 | 2668 |
| 35. | Regional Post Office | 764.00 TSF | 153 | 115 | 268 | 115 | 115 | 230 | 3829 |
| 40. | Commercial Office | 1170.75 TSF | 1816 | 223 | 2039 | 246 | 1510 | 1756 | 13533 |
| 42. | Medical Office | 133.73 TSF | 259 | 65 | 324 | 133 | 357 | 490 | 4573 |
| 43. | Post Office | 50.00 TSF | 209 | 193 | 402 | 275 | 265 | 540 | 5410 |
| 50. | Golf Course | 753.00 AC | 114 | 45 | 159 | 76 | 151 | 227 | 5994 |
| 51. | Developed Park | 250.90 AC | 0 | 0 | 0 | 7 | 11 | 18 | 652 |
| 52. | Undeveloped Park | 745.00 AC | 0 | 0 | 0 | 0 | 0 | 0 | 373 |
| 53. | Wayside Honor Ranch | 20.00 SG | 60 | 40 | 100 | 80 | 120 | 200 | 2000 |
| 54. | Six Flags Magic Mtn | 160.00 SG | 480 | 320 | 800 | 640 | 960 | 1600 | 16000 |
| 55. | Travel Village | 26.20 SG | 79 | 52 | 131 | 105 | 157 | 262 | 2620 |
| 56. | CHP Office | 55.74 SG | 167 | 111 | 278 | 223 | 334 | 557 | 5574 |
| 57. | Agua Dulce Airport | 34.06 SG | 102 | 68 | 170 | 136 | 204 | 340 | 3406 |
| 58. | Landfill | 10.00 SG | 30 | 20 | 50 | 40 | 60 | 100 | 1000 |
| | TOTAL | | 51846 | 59531 | 111377 | 78479 | 71993 | 150472 | 1570034 |

Table A-2 (cont.)

SCVCTM 4.0 LONG RANGE GP LAND USE AND TRIP GENERATION SUMMARY

| | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 1. | Single Family (<1du/ac) | 1817.00 DU | 527 | 1218 | 1745 | 1526 | 655 | 2181 | 17988 |
| 2. | Single Family (1-5du/ac) | 68913.00 DU | 13098 | 38590 | 51688 | 44105 | 25494 | 69599 | 682252 |
| 3. | Single Family (5-10du/ac) | 17629.00 DU | 3352 | 9873 | 13225 | 11281 | 6524 | 17805 | 174529 |
| 4. | Condominium/Townhouse | 39509.00 DU | 3947 | 18962 | 22909 | 18570 | 10274 | 28844 | 316072 |
| 5. | Apartment | 8510.00 DU | 683 | 3660 | 4343 | 3488 | 1785 | 5273 | 58720 |
| 6. | Mobile Home | 2565.00 DU | 205 | 821 | 1026 | 900 | 540 | 1440 | 17699 |
| 10. | Commercial Center (>30ac) | 8003.69 TSF | 3763 | 2402 | 6165 | 13126 | 14245 | 27371 | 320629 |
| 11. | Commercial Center(10-30a) | 8518.44 TSF | 6223 | 4004 | 10227 | 20276 | 21975 | 42251 | 460507 |
| 12. | Commercial Center (<10ac) | 2615.78 TSF | 2854 | 1808 | 4662 | 8687 | 9418 | 18105 | 222499 |
| 13. | Commercial Shops | 1656.71 TSF | 1190 | 798 | 1988 | 2983 | 2983 | 5966 | 61396 |
| 14. | Hotel | 1406.00 ROOM | 477 | 309 | 786 | 451 | 408 | 859 | 11572 |
| 15. | Sit-Down Restaurant | 290.19 TSF | 1399 | 1291 | 2690 | 1892 | 1259 | 3151 | 37625 |
| 16. | Fast Food Restaurant | 53.08 TSF | 1350 | 1296 | 2646 | 925 | 851 | 1776 | 26335 |
| 17. | Movie Theater | 3300.00 SEAT | 0 | 0 | 0 | 165 | 66 | 231 | 5808 |
| 18. | Health Club | 125.00 TSF | 120 | 80 | 200 | 270 | 180 | 450 | 5000 |
| 19. | Car Dealership | 441.50 TSF | 712 | 266 | 978 | 494 | 741 | 1235 | 16558 |
| 20. | Elementary/Middle School | 48591.00 STU | 12634 | 9718 | 22352 | 3889 | 4378 | 8267 | 70465 |
| 21. | High School | 23274.00 STU | 7448 | 3258 | 10706 | 1397 | 2095 | 3492 | 41661 |
| 22. | College | 25236.00 STU | 3281 | 253 | 3534 | 1766 | 3533 | 5299 | 39863 |
| 23. | Hospital | 222.80 TSF | 158 | 58 | 216 | 49 | 156 | 205 | 3743 |
| 24. | Library | 71.40 TSF | 54 | 21 | 75 | 243 | 264 | 507 | 6068 |
| 25. | Church | 635.89 TSF | 250 | 211 | 461 | 227 | 191 | 418 | 5914 |
| 26. | Day Care | 540.00 STU | 233 | 205 | 438 | 216 | 249 | 465 | 2441 |
| 30. | Industrial Park | 40298.54 TSF | 22165 | 4031 | 26196 | 5241 | 20955 | 26196 | 241791 |
| 31. | Business Park | 9113.92 TSF | 10937 | 2098 | 13035 | 2732 | 9025 | 11757 | 92962 |
| 32. | Manufacturing/Warehouse | 4043.66 TSF | 2263 | 688 | 2951 | 1094 | 1901 | 2995 | 20625 |
| 34. | Utilities | 1150.24 TSF | 0 | 0 | 0 | 0 | 0 | 0 | 2737 |
| 35. | Regional Post Office | 764.00 TSF | 153 | 115 | 268 | 115 | 115 | 230 | 3820 |
| 40. | Commercial Office | 5186.12 TSF | 8046 | 988 | 9034 | 1089 | 6694 | 7783 | 59973 |
| 42. | Medical Office | 212.29 TSF | 411 | 103 | 514 | 211 | 567 | 778 | 7260 |
| 43. | Post Office | 50.00 TSF | 209 | 193 | 402 | 275 | 265 | 540 | 5410 |
| 50. | Golf Course | 1233.00 AC | 187 | 74 | 261 | 124 | 247 | 371 | 9815 |
| 51. | Developed Park | 583.80 AC | 0 | 0 | 0 | 17 | 24 | 41 | 1318 |
| 52. | Undeveloped Park | 762.50 AC | 0 | 0 | 0 | 0 | 0 | 0 | 382 |
| 53. | Wayside Honor Ranch | 30.00 SG | 90 | 60 | 150 | 120 | 180 | 300 | 3000 |
| 54. | Six Flags Magic Mtn | 240.00 SG | 720 | 480 | 1200 | 960 | 1440 | 2400 | 24000 |
| 55. | Travel Village | 26.20 SG | 79 | 52 | 131 | 105 | 157 | 262 | 2620 |
| 56. | CHP Office | 55.74 SG | 167 | 111 | 278 | 223 | 334 | 557 | 5574 |
| 57. | Agua Dulce Airport | 51.09 SG | 153 | 102 | 255 | 204 | 307 | 511 | 5109 |
| 58. | Landfill | 20.00 SG | 60 | 40 | 100 | 80 | 120 | 200 | 2000 |
| 59. | Cemex | 12.84 SG | 46 | 48 | 94 | 26 | 29 | 55 | 1284 |
| | TOTAL | | 109644 | 108285 | 217929 | 149542 | 150624 | 300166 | 3094424 |

Table A-3

ADT TRIP RATE AND P&A SPLITTING FACTOR SUMMARY

| | Land Use Type | Units | ADT Tripend Rate | Productions/ Attractions | Splitting Factors H-W | H-S | H-O | O-W | O-O | Total | P&A Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. | Single Family (<1du/ac) | DU | 9.90 | P's | 0.22 | 0.15 | 0.27 | 0.02 | 0.11 | 0.77 | |
| | | | | A's | 0.00 | 0.00 | 0.10 | 0.02 | 0.11 | 0.23 | 1.00 |
| 2. | Single Family (1-5du/ac) | DU | 9.90 | P's | 0.22 | 0.15 | 0.27 | 0.02 | 0.11 | 0.77 | |
| | | | | A's | 0.00 | 0.00 | 0.10 | 0.02 | 0.11 | 0.23 | 1.00 |
| 3. | Single Family (6-10du/ac) | DU | 9.90 | P's | 0.22 | 0.15 | 0.27 | 0.02 | 0.11 | 0.77 | |
| | | | | A's | 0.00 | 0.00 | 0.10 | 0.02 | 0.11 | 0.23 | 1.00 |
| 4. | Condominium/Townhouse | DU | 8.00 | P's | 0.20 | 0.17 | 0.34 | 0.02 | 0.09 | 0.82 | |
| | | | | A's | 0.00 | 0.00 | 0.07 | 0.02 | 0.09 | 0.18 | 1.00 |
| 5. | Apartment | DU | 6.90 | P's | 0.20 | 0.17 | 0.34 | 0.02 | 0.09 | 0.82 | |
| | | | | A's | 0.00 | 0.00 | 0.07 | 0.02 | 0.09 | 0.18 | 1.00 |
| 6. | Mobile Home | DU | 6.90 | P's | 0.20 | 0.17 | 0.34 | 0.02 | 0.09 | 0.82 | |
| | | | | A's | 0.00 | 0.00 | 0.07 | 0.02 | 0.09 | 0.18 | 1.00 |
| 7. | Senior (Active) | DU | 3.71 | P's | 0.05 | 0.22 | 0.41 | 0.02 | 0.10 | 0.80 | |
| | | | | A's | 0.00 | 0.00 | 0.08 | 0.02 | 0.10 | 0.20 | 1.00 |
| 10. | Commercial Center (>30ac) | TSF | 40.06 | P's | 0.00 | 0.00 | 0.00 | 0.03 | 0.25 | 0.28 | |
| | | | | A's | 0.09 | 0.20 | 0.15 | 0.03 | 0.25 | 0.72 | 1.00 |
| 11. | Commercial Center(10-30a) | TSF | 54.06 | P's | 0.00 | 0.00 | 0.00 | 0.03 | 0.25 | 0.28 | |
| | | | | A's | 0.09 | 0.20 | 0.15 | 0.03 | 0.25 | 0.72 | 1.00 |
| 12. | Commercial Center (<10ac) | TSF | 85.06 | P's | 0.00 | 0.00 | 0.00 | 0.03 | 0.30 | 0.33 | |
| | | | | A's | 0.06 | 0.15 | 0.13 | 0.03 | 0.30 | 0.67 | 1.00 |
| 13. | Commercial Shops | TSF | 37.06 | P's | 0.00 | 0.00 | 0.00 | 0.03 | 0.30 | 0.33 | |
| | | | | A's | 0.06 | 0.15 | 0.13 | 0.03 | 0.30 | 0.67 | 1.00 |
| 14. | Hotel | ROOM | 8.23 | P's | 0.00 | 0.00 | 0.00 | 0.06 | 0.18 | 0.24 | |
| | | | | A's | 0.12 | 0.00 | 0.40 | 0.06 | 0.18 | 0.76 | 1.00 |
| 15. | Sit-Down Restaurant | TSF | 130.34 | P's | 0.00 | 0.00 | 0.00 | 0.06 | 0.24 | 0.30 | |
| | | | | A's | 0.04 | 0.00 | 0.36 | 0.06 | 0.24 | 0.70 | 1.00 |
| 16. | Fast Food Restaurant | TSF | 496.12 | P's | 0.00 | 0.00 | 0.00 | 0.07 | 0.31 | 0.38 | |
| | | | | A's | 0.01 | 0.00 | 0.23 | 0.07 | 0.31 | 0.62 | 1.00 |
| 17. | Movie Theater | SEAT | 1.76 | P's | 0.00 | 0.00 | 0.00 | 0.00 | 0.31 | 0.31 | |
| | | | | A's | 0.08 | 0.00 | 0.30 | 0.00 | 0.31 | 0.69 | 1.00 |
| 18. | Health Club | TSF | 40.00 | P's | 0.00 | 0.00 | 0.00 | 0.01 | 0.25 | 0.26 | |
| | | | | A's | 0.06 | 0.00 | 0.42 | 0.01 | 0.25 | 0.74 | 1.00 |
| 19. | Car Dealership | TSF | 37.60 | P's | 0.00 | 0.00 | 0.00 | 0.03 | 0.25 | 0.28 | |
| | | | | A's | 0.08 | 0.21 | 0.15 | 0.03 | 0.25 | 0.72 | 1.00 |
| 20. | Elementary/Middle School | STU | 1.45 | P's | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.03 | |
| | | | | A's | 0.10 | 0.58 | 0.26 | 0.00 | 0.03 | 0.97 | 1.00 |
| 21. | High School | STU | 1.79 | P's | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.03 | |
| | | | | A's | 0.10 | 0.40 | 0.44 | 0.00 | 0.03 | 0.97 | 1.00 |
| 22. | College | STU | 1.54 | P's | 0.00 | 0.00 | 0.00 | 0.00 | 0.23 | 0.23 | |
| | | | | A's | 0.06 | 0.00 | 0.48 | 0.00 | 0.23 | 0.77 | 1.00 |

Table A-3 (cont.)

ADT TRIP RATE AND P&A SPLITTING FACTOR SUMMARY

| | Land Use Type | Units | ADT Tripend Rate | Productions/ Attractions | Splitting Factors H-W | H-S | H-O | O-W | O-O | Total | P&A Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 23. | Hospital | TSF | 16.80 | P's | 0.00 | 0.00 | 0.00 | 0.00 | 0.05 | 0.05 | |
| | | | | A's | 0.32 | 0.00 | 0.58 | 0.00 | 0.05 | 0.95 | 1.00 |
| 24. | Library | TSF | 84.98 | P's | 0.00 | 0.00 | 0.00 | 0.09 | 0.17 | 0.26 | |
| | | | | A's | 0.16 | 0.00 | 0.32 | 0.09 | 0.17 | 0.74 | 1.00 |
| 25. | Church | TSF | 9.30 | P's | 0.00 | 0.00 | 0.00 | 0.05 | 0.10 | 0.15 | |
| | | | | A's | 0.35 | 0.00 | 0.35 | 0.05 | 0.10 | 0.85 | 1.00 |
| 26. | Day Care | STU | 4.52 | P's | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.03 | |
| | | | | A's | 0.10 | 0.00 | 0.84 | 0.00 | 0.03 | 0.97 | 1.00 |
| 30. | Industrial Park | TSF | 6.00 | P's | 0.00 | 0.00 | 0.00 | 0.07 | 0.21 | 0.28 | |
| | | | | A's | 0.39 | 0.00 | 0.05 | 0.07 | 0.21 | 0.72 | 1.00 |
| 31. | Business Park | TSF | 10.20 | P's | 0.00 | 0.00 | 0.00 | 0.07 | 0.21 | 0.28 | |
| | | | | A's | 0.39 | 0.00 | 0.05 | 0.07 | 0.21 | 0.72 | 1.00 |
| 32. | Manufacturing/Warehouse | TSF | 5.10 | P's | 0.00 | 0.00 | 0.00 | 0.07 | 0.21 | 0.28 | |
| | | | | A's | 0.39 | 0.00 | 0.05 | 0.07 | 0.21 | 0.72 | 1.00 |
| 33. | Science/Research | TSF | 10.20 | P's | 0.00 | 0.00 | 0.00 | 0.07 | 0.21 | 0.28 | |
| | | | | A's | 0.39 | 0.00 | 0.05 | 0.07 | 0.21 | 0.72 | 1.00 |
| 34. | Utilities | TSF | 2.38 | P's | 0.00 | 0.00 | 0.00 | 0.09 | 0.17 | 0.26 | |
| | | | | A's | 0.19 | 0.00 | 0.29 | 0.09 | 0.17 | 0.74 | 1.00 |
| 35. | Regional Post Office | TSF | 5.00 | P's | 0.00 | 0.00 | 0.00 | 0.07 | 0.21 | 0.28 | |
| | | | | A's | 0.39 | 0.00 | 0.05 | 0.07 | 0.21 | 0.72 | 1.00 |
| 40. | Commercial Office | TSF | 11.56 | P's | 0.00 | 0.00 | 0.00 | 0.11 | 0.18 | 0.29 | |
| | | | | A's | 0.27 | 0.00 | 0.15 | 0.11 | 0.18 | 0.71 | 1.00 |
| 41. | High-Rise Office | TSF | 10.88 | P's | 0.00 | 0.00 | 0.00 | 0.11 | 0.18 | 0.29 | |
| | | | | A's | 0.27 | 0.00 | 0.15 | 0.11 | 0.18 | 0.71 | 1.00 |
| 42. | Medical Office | TSF | 34.20 | P's | 0.00 | 0.00 | 0.00 | 0.03 | 0.26 | 0.29 | |
| | | | | A's | 0.14 | 0.00 | 0.28 | 0.03 | 0.26 | 0.71 | 1.00 |
| 43. | Post Office | TSF | 108.19 | P's | 0.00 | 0.00 | 0.00 | 0.09 | 0.22 | 0.31 | |
| | | | | A's | 0.15 | 0.00 | 0.23 | 0.09 | 0.22 | 0.69 | 1.00 |
| 50. | Golf Course | AC | 7.96 | P's | 0.00 | 0.00 | 0.00 | 0.00 | 0.27 | 0.27 | |
| | | | | A's | 0.08 | 0.00 | 0.38 | 0.00 | 0.27 | 0.73 | 1.00 |
| 51. | Developed Park | AC | 2.60 | P's | 0.00 | 0.00 | 0.00 | 0.00 | 0.12 | 0.12 | |
| | | | | A's | 0.01 | 0.00 | 0.75 | 0.00 | 0.12 | 0.88 | 1.00 |
| 52. | Undeveloped Park | AC | 0.50 | P's | 0.00 | 0.00 | 0.00 | 0.00 | 0.12 | 0.12 | |
| | | | | A's | 0.01 | 0.00 | 0.75 | 0.00 | 0.12 | 0.88 | 1.00 |
| 53. | Wayside Honor Ranch | SG | 100.00 | P's | 0.00 | 0.00 | 0.00 | 0.00 | 0.17 | 0.17 | |
| | | | | A's | 0.33 | 0.00 | 0.33 | 0.00 | 0.17 | 0.83 | 1.00 |
| 54. | Six Flags Magic Mtn | SG | 100.00 | P's | 0.00 | 0.00 | 0.00 | 0.01 | 0.18 | 0.19 | |
| | | | | A's | 0.15 | 0.00 | 0.47 | 0.01 | 0.18 | 0.81 | 1.00 |
| 55. | Travel Village | SG | 100.00 | P's | 0.00 | 0.00 | 0.00 | 0.01 | 0.25 | 0.26 | |
| | | | | A's | 0.06 | 0.00 | 0.42 | 0.01 | 0.25 | 0.74 | 1.00 |

Table A-3 (cont.)

ADT TRIP RATE AND P&A SPLITTING FACTOR SUMMARY

| | Land Use Type | Units | ADT Tripend Rate | Productions/ Attractions | Splitting Factors H-W | H-S | H-O | O-W | O-O | Total | P&A Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 56. | CHP Office | SG | 100.00 | P's | 0.00 | 0.00 | 0.00 | 0.11 | 0.18 | 0.29 | |
| | | | | A's | 0.27 | 0.00 | 0.15 | 0.11 | 0.18 | 0.71 | 1.00 |
| 57. | Agua Dulce Airport | SG | 100.00 | P's | 0.00 | 0.00 | 0.00 | 0.04 | 0.18 | 0.22 | |
| | | | | A's | 0.16 | 0.00 | 0.40 | 0.04 | 0.18 | 0.78 | 1.00 |
| 58. | Landfill | SG | 100.00 | P's | 0.00 | 0.00 | 0.00 | 0.11 | 0.18 | 0.29 | |
| | | | | A's | 0.27 | 0.00 | 0.15 | 0.11 | 0.18 | 0.71 | 1.00 |
| 59. | Cemex | SG | 100.00 | P's | 0.00 | 0.00 | 0.00 | 0.11 | 0.18 | 0.29 | |
| | | | | A's | 0.27 | 0.00 | 0.15 | 0.11 | 0.18 | 0.71 | 1.00 |

Table A-4

SCVCTM 4.0 2004 LAND USE AND TRIP GENERATION SUMMARY

| | Land Use Type | Units | Productions/ Attractions | H-W | H-S | H-O | O-W | O-O | Total | P&A Total |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. | Single Family (<1du/ac) | 300.00 DU | P's | 552 | 445 | 802 | 50 | 327 | 2286 | |
| | | | A's | 0 | 0 | 297 | 50 | 327 | 684 | 2970 |
| 2. | Single Family (1-5du/ac) | 42731.00 DU | P's | 93671 | 63460 | 114211 | 8462 | 45533 | 325737 | |
| | | | A's | 0 | 0 | 42312 | 8462 | 45533 | 97307 | 423044 |
| 3. | Single Family (6-10du/ac) | 5612.00 DU | P's | 12656 | 8632 | 15532 | 1154 | 6329 | 44303 | |
| | | | A's | 0 | 0 | 5752 | 1154 | 6329 | 13235 | 57538 |
| 4. | Condominium/Townhouse | 23519.00 DU | P's | 37628 | 31989 | 63974 | 3763 | 16932 | 154286 | |
| | | | A's | 0 | 0 | 13171 | 3763 | 16932 | 33866 | 188152 |
| 5. | Apartment | 2108.00 DU | P's | 2908 | 2474 | 4944 | 292 | 1309 | 11927 | |
| | | | A's | 0 | 0 | 1017 | 292 | 1309 | 2618 | 14545 |
| 6. | Mobile Home | 2464.00 DU | P's | 3398 | 2890 | 5783 | 341 | 1530 | 13942 | |
| | | | A's | 0 | 0 | 1189 | 341 | 1530 | 3060 | 17002 |
| 10. | Commercial Center (>30ac) | 2675.04 TSF | P's | 0 | 0 | 0 | 3215 | 26791 | 30006 | |
| | | | A's | 9645 | 21431 | 16075 | 3215 | 26791 | 77157 | 107163 |
| 11. | Commercial Center(10-30a) | 4203.47 TSF | P's | 0 | 0 | 0 | 6818 | 56813 | 63631 | |
| | | | A's | 20455 | 45437 | 34086 | 6818 | 56813 | 163609 | 227240 |
| 12. | Commercial Center (<10ac) | 1307.47 TSF | P's | 0 | 0 | 0 | 3337 | 33363 | 36700 | |
| | | | A's | 6672 | 16683 | 14457 | 3337 | 33363 | 74512 | 111212 |
| 13. | Commercial Shops | 1168.87 TSF | P's | 0 | 0 | 0 | 1299 | 12994 | 14293 | |
| | | | A's | 2598 | 6500 | 5634 | 1299 | 12994 | 29025 | 43318 |
| 14. | Hotel | 985.00 ROOM | P's | 0 | 0 | 0 | 486 | 1458 | 1944 | |
| | | | A's | 973 | 0 | 3246 | 486 | 1458 | 6163 | 8107 |
| 15. | Sit-Down Restaurant | 210.92 TSF | P's | 0 | 0 | 0 | 1649 | 6597 | 8246 | |
| | | | A's | 1100 | 0 | 9901 | 1649 | 6597 | 19247 | 27493 |
| 16. | Fast Food Restaurant | 47.58 TSF | P's | 0 | 0 | 0 | 1654 | 7317 | 8971 | |
| | | | A's | 236 | 0 | 5428 | 1654 | 7317 | 14635 | 23606 |
| 17. | Movie Theater | 3300.00 SEAT | P's | 0 | 0 | 0 | 0 | 1800 | 1800 | |
| | | | A's | 465 | 0 | 1743 | 0 | 1800 | 4008 | 5808 |
| 18. | Health Club | 125.00 TSF | P's | 0 | 0 | 0 | 50 | 1250 | 1300 | |
| | | | A's | 300 | 0 | 2100 | 50 | 1250 | 3700 | 5000 |
| 19. | Car Dealership | 330.50 TSF | P's | 0 | 0 | 0 | 372 | 3098 | 3470 | |
| | | | A's | 992 | 2604 | 1859 | 372 | 3098 | 8925 | 12395 |
| 20. | Elementary/Middle School | 32506.00 STU | P's | 0 | 0 | 0 | 0 | 1416 | 1416 | |
| | | | A's | 4714 | 27342 | 12252 | 0 | 1416 | 45724 | 47140 |
| 21. | High School | 13228.00 STU | P's | 0 | 0 | 0 | 0 | 710 | 710 | |
| | | | A's | 2369 | 9471 | 10418 | 0 | 710 | 22968 | 23678 |
| 22. | College | 18379.00 STU | P's | 0 | 0 | 0 | 0 | 6510 | 6510 | |
| | | | A's | 1698 | 0 | 13585 | 0 | 6510 | 21793 | 28303 |
| 23. | Hospital | 222.86 TSF | P's | 0 | 0 | 0 | 0 | 187 | 187 | |
| | | | A's | 1197 | 0 | 2172 | 0 | 187 | 3556 | 3743 |

Table A-4 (cont.)

SCVCTM 4.0 2004 LAND USE AND TRIP GENERATION SUMMARY

| | Land Use Type | Units | Productions/ Attractions | H-W | H-S | H-O | O-W | O-O | Total | P&A Total |
|---|---|---|---|---|---|---|---|---|---|---|
| 24. | Library | 53.73 TSF | P's | 0 | 0 | 0 | 411 | 777 | 1188 | |
| | | | A's | 730 | 0 | 1461 | 411 | 777 | 3379 | 4567 |
| 25. | Church | 512.89 TSF | P's | 0 | 0 | 0 | 240 | 479 | 719 | |
| | | | A's | 1661 | 0 | 1671 | 240 | 479 | 4051 | 4770 |
| 26. | Day Care | 460.00 STU | P's | 0 | 0 | 0 | 0 | 62 | 62 | |
| | | | A's | 209 | 0 | 1746 | 0 | 62 | 2017 | 2079 |
| 30. | Industrial Park | 15517.43 TSF | P's | 0 | 0 | 0 | 6519 | 19554 | 26073 | |
| | | | A's | 36300 | 0 | 4657 | 6519 | 19554 | 67030 | 93103 |
| 31. | Business Park | 1017.92 TSF | P's | 0 | 0 | 0 | 727 | 2180 | 2907 | |
| | | | A's | 4050 | 0 | 519 | 727 | 2180 | 7476 | 10383 |
| 32. | Manufacturing/warehouse | 1970.77 TSF | P's | 0 | 0 | 0 | 704 | 2110 | 2814 | |
| | | | A's | 3921 | 0 | 503 | 704 | 2110 | 7238 | 10052 |
| 34. | Utilities | 1121.24 TSF | P's | 0 | 0 | 0 | 240 | 452 | 692 | |
| | | | A's | 506 | 0 | 778 | 240 | 452 | 1976 | 2668 |
| 35. | Regional Post Office | 764.00 TSF | P's | 0 | 0 | 0 | 267 | 802 | 1069 | |
| | | | A's | 1491 | 0 | 191 | 267 | 802 | 2751 | 3820 |
| 40. | Commercial Office | 1170.75 TSF | P's | 0 | 0 | 0 | 1489 | 2438 | 3927 | |
| | | | A's | 3648 | 0 | 2031 | 1489 | 2438 | 9606 | 13533 |
| 42. | Medical Office | 133.73 TSF | P's | 0 | 0 | 0 | 137 | 1189 | 1326 | |
| | | | A's | 640 | 0 | 1281 | 137 | 1189 | 3247 | 4573 |
| 43. | Post Office | 50.00 TSF | P's | 0 | 0 | 0 | 487 | 1190 | 1677 | |
| | | | A's | 811 | 0 | 1245 | 487 | 1190 | 3733 | 5410 |
| 50. | Golf Course | 753.00 AC | P's | 0 | 0 | 0 | 0 | 1618 | 1618 | |
| | | | A's | 480 | 0 | 2278 | 0 | 1618 | 4376 | 5994 |
| 51. | Developed Park | 250.90 AC | P's | 0 | 0 | 0 | 0 | 78 | 78 | |
| | | | A's | 3 | 0 | 493 | 0 | 78 | 574 | 652 |
| 52. | Undeveloped Park | 745.00 AC | P's | 0 | 0 | 0 | 0 | 45 | 45 | |
| | | | A's | 4 | 0 | 279 | 0 | 45 | 328 | 373 |
| 53. | Wayside Honor Ranch | 20.00 SG | P's | 0 | 0 | 0 | 0 | 340 | 340 | |
| | | | A's | 660 | 0 | 660 | 0 | 340 | 1660 | 2000 |
| 54. | Six Flags Magic Mtn | 160.00 SG | P's | 0 | 0 | 0 | 160 | 2880 | 3040 | |
| | | | A's | 2400 | 0 | 7529 | 160 | 2880 | 12960 | 16000 |
| 55. | Travel Village | 26.20 SG | P's | 0 | 0 | 0 | 26 | 655 | 681 | |
| | | | A's | 157 | 0 | 1101 | 26 | 655 | 1939 | 2620 |
| 56. | CHP Office | 55.74 SG | P's | 0 | 0 | 0 | 613 | 1003 | 1616 | |
| | | | A's | 1506 | 0 | 836 | 613 | 1003 | 3958 | 5574 |
| 57. | Agua Dulce Airport | 34.06 SG | P's | 0 | 0 | 0 | 136 | 613 | 749 | |
| | | | A's | 545 | 0 | 1363 | 136 | 613 | 2657 | 3406 |
| 58. | Landfill | 10.00 SG | P's | 0 | 0 | 0 | 110 | 180 | 290 | |
| | | | A's | 270 | 0 | 150 | 110 | 180 | 710 | 1000 |
| | TOTAL | | P's | 150313 | 109800 | 205246 | 45218 | 271909 | 782576 | |
| | | | A's | 113406 | 129468 | 227457 | 45218 | 271909 | 787458 | 1570034 |

Table A-4

SCVCTM 4.0 LONG RANGE GP LAND USE AND TRIP GENERATION SUMMARY

| | Land Use Type | Units | Productions/ Attractions | H-W | H-S | H-O | O-W | O-O | Total | P&A Total |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. | Single Family (<1du/ac) | 1817.00 DU | P's | 3959 | 2697 | 4859 | 360 | 1977 | 13852 | |
| | | | A's | 0 | 0 | 1799 | 360 | 1977 | 4136 | 17988 |
| 2. | Single Family (1-5du/ac) | 68913.00 DU | P's | 150096 | 102341 | 184204 | 13649 | 75043 | 525333 | |
| | | | A's | 0 | 0 | 68227 | 13649 | 76043 | 156919 | 682252 |
| 3. | Single Family (6-10du/ac) | 17629.00 DU | P's | 36399 | 26180 | 47117 | 3494 | 19196 | 134386 | |
| | | | A's | 0 | 0 | 17453 | 3494 | 19196 | 40143 | 174529 |
| 4. | Condominium/Townhouse | 39509.00 DU | P's | 63209 | 53735 | 107466 | 6322 | 28446 | 259178 | |
| | | | A's | 0 | 0 | 22126 | 6322 | 28446 | 56894 | 316072 |
| 5. | Apartment | 8510.00 DU | P's | 11743 | 9985 | 19968 | 1173 | 5284 | 48153 | |
| | | | A's | 0 | 0 | 4110 | 1173 | 5284 | 10567 | 58720 |
| 6. | Mobile Home | 2565.00 DU | P's | 3537 | 3008 | 6020 | 355 | 1593 | 14513 | |
| | | | A's | 0 | 0 | 1238 | 355 | 1593 | 3186 | 17699 |
| 10. | Commercial Center (>30ac) | 8003.69 TSF | P's | 0 | 0 | 0 | 9618 | 80157 | 89775 | |
| | | | A's | 28857 | 64129 | 48093 | 9618 | 80157 | 230854 | 320629 |
| 11. | Commercial Center(10-30a) | 8518.44 TSF | P's | 0 | 0 | 0 | 13812 | 115130 | 128942 | |
| | | | A's | 41449 | 92097 | 69077 | 13812 | 115130 | 331565 | 460507 |
| 12. | Commercial Center (<10ac) | 2615.78 TSF | P's | 0 | 0 | 0 | 6679 | 66750 | 73429 | |
| | | | A's | 13350 | 33369 | 28922 | 6679 | 66750 | 149070 | 222499 |
| 13. | Commercial Shops | 1656.71 TSF | P's | 0 | 0 | 0 | 1842 | 18418 | 20260 | |
| | | | A's | 3682 | 9210 | 7984 | 1842 | 18418 | 41136 | 61396 |
| 14. | Hotel | 1406.00 ROOM | P's | 0 | 0 | 0 | 694 | 2081 | 2775 | |
| | | | A's | 1388 | 0 | 4634 | 694 | 2081 | 8797 | 11572 |
| 15. | Sit-Down Restaurant | 290.19 TSF | P's | 0 | 0 | 0 | 2268 | 9078 | 11346 | |
| | | | A's | 1513 | 0 | 13620 | 2268 | 9078 | 26479 | 37825 |
| 16. | Fast Food Restaurant | 53.08 TSF | P's | 0 | 0 | 0 | 1845 | 8163 | 10008 | |
| | | | A's | 263 | 0 | 6056 | 1845 | 8163 | 16327 | 26335 |
| 17. | Movie Theater | 3300.00 SEAT | P's | 0 | 0 | 0 | 0 | 1800 | 1800 | |
| | | | A's | 465 | 0 | 1743 | 0 | 1800 | 4008 | 5808 |
| 18. | Health Club | 125.00 TSF | P's | 0 | 0 | 0 | 50 | 1250 | 1300 | |
| | | | A's | 300 | 0 | 2100 | 50 | 1250 | 3700 | 5000 |
| 19. | Car Dealership | 441.50 TSF | P's | 0 | 0 | 0 | 497 | 4139 | 4636 | |
| | | | A's | 1325 | 3478 | 2483 | 497 | 4139 | 11922 | 16558 |
| 20. | Elementary/Middle School | 48591.00 STU | P's | 0 | 0 | 0 | 0 | 2116 | 2116 | |
| | | | A's | 7049 | 40866 | 18318 | 0 | 2116 | 68349 | 70465 |
| 21. | High School | 23274.00 STU | P's | 0 | 0 | 0 | 0 | 1249 | 1249 | |
| | | | A's | 4168 | 16664 | 18331 | 0 | 1249 | 40412 | 41661 |
| 22. | College | 25236.00 STU | P's | 0 | 0 | 0 | 0 | 8939 | 8939 | |
| | | | A's | 2332 | 0 | 18653 | 0 | 8939 | 29924 | 38863 |
| 23. | Hospital | 222.80 TSF | P's | 0 | 0 | 0 | 0 | 187 | 187 | |
| | | | A's | 1197 | 0 | 2172 | 0 | 187 | 3556 | 3743 |

Table A-4 (cont.)

SCVCTM 4.0 LONG RANGE GP LAND USE AND TRIP GENERATION SUMMARY

| | Land Use Type | Units | Productions/ Attractions | H-W | H-S | H-O | O-W | O-O | Total | P&A Total |
|---|---|---|---|---|---|---|---|---|---|---|
| 24. | Library | 71.40 TSF | P's | 0 | 0 | 0 | 546 | 1032 | 1578 | |
| | | | A's | 971 | 0 | 1941 | 546 | 1032 | 4490 | 6068 |
| 25. | Church | 635.89 TSF | P's | 0 | 0 | 0 | 297 | 592 | 889 | |
| | | | A's | 2065 | 0 | 2071 | 297 | 592 | 5025 | 5914 |
| 26. | Day Care | 540.00 STU | P's | 0 | 0 | 0 | 0 | 73 | 73 | |
| | | | A's | 245 | 0 | 2050 | 0 | 73 | 2368 | 2441 |
| 30. | Industrial Park | 40298.54 TSF | P's | 0 | 0 | 0 | 16927 | 50779 | 67706 | |
| | | | A's | 94289 | 0 | 12090 | 16927 | 50779 | 174085 | 241791 |
| 31. | Business Park | 9113.92 TSF | P's | 0 | 0 | 0 | 6510 | 19522 | 26032 | |
| | | | A's | 36249 | 0 | 4649 | 6510 | 19522 | 66930 | 92962 |
| 32. | Manufacturing/Warehouse | 4043.66 TSF | P's | 0 | 0 | 0 | 1444 | 4330 | 5774 | |
| | | | A's | 8045 | 0 | 1032 | 1444 | 4330 | 14851 | 20625 |
| 34. | Utilities | 1150.24 TSF | P's | 0 | 0 | 0 | 246 | 464 | 710 | |
| | | | A's | 519 | 0 | 798 | 246 | 464 | 2027 | 2737 |
| 35. | Regional Post Office | 764.00 TSF | P's | 0 | 0 | 0 | 267 | 802 | 1069 | |
| | | | A's | 1491 | 0 | 191 | 267 | 802 | 2751 | 3820 |
| 40. | Commercial Office | 5188.12 TSF | P's | 0 | 0 | 0 | 6598 | 10797 | 17395 | |
| | | | A's | 16186 | 0 | 8997 | 6598 | 10797 | 42578 | 59973 |
| 42. | Medical Office | 212.29 TSF | P's | 0 | 0 | 0 | 218 | 1888 | 2106 | |
| | | | A's | 1016 | 0 | 2032 | 218 | 1888 | 5154 | 7260 |
| 43. | Post Office | 50.00 TSF | P's | 0 | 0 | 0 | 487 | 1190 | 1677 | |
| | | | A's | 811 | 0 | 1245 | 487 | 1190 | 3733 | 5410 |
| 50. | Golf Course | 1233.00 AC | P's | 0 | 0 | 0 | 0 | 2649 | 2649 | |
| | | | A's | 787 | 0 | 3730 | 0 | 2649 | 7166 | 9815 |
| 51. | Developed Park | 583.80 AC | P's | 0 | 0 | 0 | 0 | 188 | 188 | |
| | | | A's | 11 | 0 | 1131 | 0 | 188 | 1330 | 1518 |
| 52. | Undeveloped Park | 762.50 AC | P's | 0 | 0 | 0 | 0 | 46 | 46 | |
| | | | A's | 4 | 0 | 286 | 0 | 46 | 336 | 382 |
| 53. | Wayside Honor Ranch | 30.00 SG | P's | 0 | 0 | 0 | 0 | 510 | 510 | |
| | | | A's | 990 | 0 | 990 | 0 | 510 | 2490 | 3000 |
| 54. | Six Flags Magic Mtn | 240.00 SG | P's | 0 | 0 | 0 | 240 | 4320 | 4560 | |
| | | | A's | 3600 | 0 | 11280 | 240 | 4320 | 19440 | 24000 |
| 55. | Travel Village | 26.20 SG | P's | 0 | 0 | 0 | 26 | 655 | 681 | |
| | | | A's | 157 | 0 | 1101 | 26 | 655 | 1939 | 2620 |
| 56. | CHP Office | 55.74 SG | P's | 0 | 0 | 0 | 613 | 1003 | 1616 | |
| | | | A's | 1506 | 0 | 836 | 613 | 1003 | 3958 | 5574 |
| 57. | Agua Dulce Airport | 51.09 SG | P's | 0 | 0 | 0 | 204 | 920 | 1124 | |
| | | | A's | 817 | 0 | 2044 | 204 | 920 | 3985 | 5109 |
| 58. | Landfill | 20.00 SG | P's | 0 | 0 | 0 | 220 | 360 | 580 | |
| | | | A's | 540 | 0 | 300 | 220 | 360 | 1420 | 2000 |

Table A-4 (cont.)

SCVCTM 4.0 LONG RANGE GP LAND USE AND TRIP GENERATION SUMMARY

| | Land Use Type | Units | Productions/ Attractions | H-W | H-S | H-O | O-W | O-O | Total | P&A Total |
|---|---|---|---|---|---|---|---|---|---|---|
| 59. | Comex | 12.84 SG | P's | 0 | 0 | 0 | 141 | 231 | 372 | |
| | | | A's | 347 | 0 | 193 | 141 | 231 | 912 | 1284 |
| | TOTAL | | P's | 270943 | 197946 | 369634 | 97642 | 553347 | 1489512 | |
| | | | A's | 277984 | 259813 | 415126 | 97642 | 553347 | 1604912 | 3094424 |

Table A-5

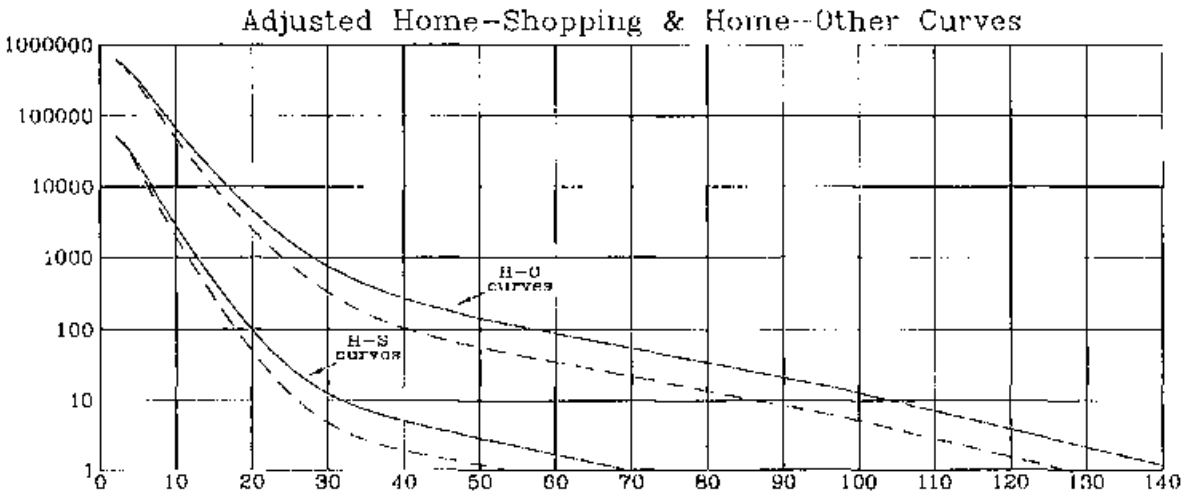
SCVCTM THROUGH-TRIPS

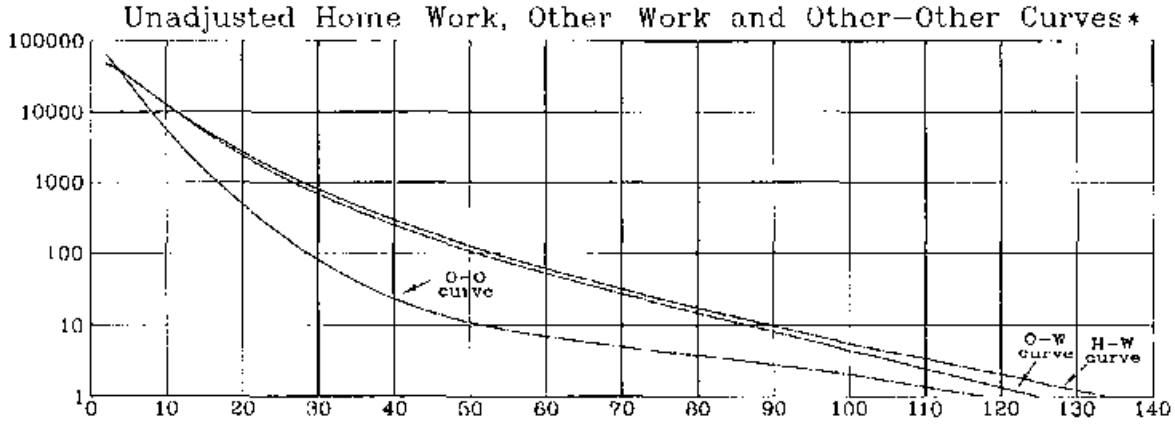
| Cordon Zones | | 2004 | | | | 2030 | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | AM | PM | Off-Peak | Total | AM | PM | Off-Peak | Total |
| 495 | 489 | 300 | 200 | 2,929 | 4,000 | 400 | 300 | 3,476 | 5,000 |
| 489 | 495 | 200 | 300 | 2,810 | 4,000 | 300 | 400 | 3,357 | 5,000 |
| 498 | 489 | 300 | 950 | 8,786 | 12,000 | 1,250 | 3,000 | 33,345 | 44,000 |
| 489 | 498 | 500 | 1,000 | 8,310 | 12,000 | 1,900 | 3,400 | 31,119 | 44,000 |
| 498 | 495 | 800 | 1,800 | 20,524 | 27,000 | 1,250 | 5,310 | 34,745 | 52,000 |
| 495 | 498 | 2,300 | 600 | 21,452 | 27,000 | 6,820 | 900 | 38,062 | 52,000 |
| 500 | 489 | 100 | 150 | 1,405 | 2,000 | 150 | 200 | 1,679 | 2,500 |
| 489 | 500 | 100 | 150 | 1,405 | 2,000 | 150 | 200 | 1,679 | 2,500 |
| 500 | 495 | 50 | 50 | 774 | 1,000 | 100 | 100 | 1,048 | 1,500 |
| 495 | 500 | 50 | 50 | 774 | 1,000 | 100 | 100 | 1,048 | 1,500 |
| 500 | 498 | 150 | 200 | 1,679 | 2,500 | 200 | 250 | 1,952 | 3,000 |
| 498 | 500 | 150 | 200 | 1,679 | 2,500 | 200 | 250 | 1,952 | 3,000 |

Note: Cordon locations are as follows:
489 I-5 (north)
495 SR-14
498 I-5 (south)
500 SR-126 (west)

# Appendix B
# TRIP DISTRIBUTION FUNCTIONS

The trip distribution functions used in the SCVCTM are illustrated in Figure B-1 and are listed in Table B-1.




* SCAG RTP functional curves for H-W, O-W and O-O are applied in the SCVCTM

Legend

SCAG RTP Functional Curve
SCVCTM Functional Curve

Figure B-1

SCAG RTP AND SCVCTM TRIP DISTRIBUTION FUNCTIONS

Table B-1

SCVCTM DISTRIBUTION FUNCTIONS

| Interval* | H-W | H-S | H-O | O-W | O-O |
|---|---|---|---|---|---|
| 1 | 43500 | 46000 | 54000 | 46000 | 72000 |
| 2 | 35500 | 40500 | 50860 | 39900 | 44500 |
| 3 | 27800 | 17890 | 27280 | 30400 | 28300 |
| 4 | 21250 | 7220 | 13450 | 23500 | 17750 |
| 5 | 15300 | 2970 | 6670 | 17450 | 10800 |
| 6 | 10650 | 1270 | 3400 | 13100 | 5390 |
| 7 | 8000 | 570 | 1798 | 7400 | 2750 |
| 8 | 5800 | 269 | 983 | 5000 | 1550 |
| 9 | 4100 | 132 | 557 | 3450 | 900 |
| 10 | 3050 | 68 | 326 | 2390 | 560 |
| 11 | 2300 | 37 | 197 | 1775 | 360 |
| 12 | 1800 | 21 | 124 | 1340 | 235 |
| 13 | 1400 | 13 | 80 | 1060 | 165 |
| 14 | 1085 | 8.1 | 54 | 810 | 120 |
| 15 | 880 | 5.6 | 38 | 650 | 90 |
| 16 | 700 | 4.1 | 28 | 530 | 69 |
| 17 | 580 | 3.3 | 21 | 420 | 55 |
| 18 | 490 | 2.7 | 17 | 346 | 44 |
| 19 | 405 | 2.3 | 14 | 285 | 36 |
| 20 | 340 | 2.0 | 11 | 235 | 30 |
| 21 | 280 | 1.8 | 9.7 | 200 | 25 |
| 22 | 235 | 1.6 | 8.4 | 165 | 22 |
| 23 | 195 | 1.5 | 7.4 | 140 | 19 |
| 24 | 165 | 1.3 | 6.6 | 123 | 16 |
| 25 | 140 | 1.2 | 5.9 | 106 | 14 |
| 26 | 118 | 1.1 | 5.4 | 95 | 12 |
| 27 | 100 | 1.0 | 4.9 | 84 | 11 |
| 28 | 87 | .9 | 4.4 | 73 | 10 |
| 29 | 75 | .9 | 4.0 | 65 | 9 |
| 30 | 66 | .8 | 3.7 | 58 | 8 |
| 31 | 55 | .7 | 3.3 | 51 | 7 |
| 32 | 49 | .7 | 3.0 | 46 | 7 |
| 33 | 43 | .6 | 2.8 | 41 | 6 |
| 34 | 37 | .6 | 2.5 | 36 | 5 |
| 35 | 33 | .5 | 2.3 | 31 | 5 |
| 36 | 28 | .5 | 2.1 | 28 | 5 |
| 37 | 25 | .4 | 1.9 | 25 | 4 |
| 38 | 22 | .4 | 1.7 | 22 | 4 |
| 39 | 19 | .4 | 1.6 | 19 | 4 |

Table B-1 (cont)
SCVCTM DISTRIBUTION FUNCTIONS

| Interval* | H-W | H-S | H-O | O-W | O-O |
|---|---|---|---|---|---|
| 40 | 17 | .3 | 1.4 | 18 | 3 |
| 41 | 15 | .3 | 1.3 | 16 | 3 |
| 42 | 14 | .3 | 1.2 | 14 | 3 |
| 43 | 12 | .2 | 1.1 | 12 | 3 |
| 44 | 11 | .2 | 1.0 | 11 | 3 |
| 45 | 10 | .2 | .9 | 10 | 3 |
| 46 | 9 | .2 | .8 | 9 | 2 |
| 47 | 8 | .2 | .7 | 9 | 2 |
| 48 | 7 | .1 | .7 | 8 | 2 |
| 49 | 7 | .1 | .6 | 7 | 2 |
| 50 | 6 | .1 | .5 | 6 | 2 |
| 51 | 6 | .1 | .5 | 6 | 2 |
| 52 | 5 | .1 | .4 | 5 | 2 |
| 53 | 5 | .1 | .4 | 4 | 2 |
| 54 | 4 | .1 | .3 | 4 | 2 |
| 55 | 4 | .1 | .3 | 3 | 2 |
| 56 | 3 | .1 | .3 | 3 | 2 |
| 57 | 3 | .1 | .2 | 2 | 1 |
| 58 | 3 | 0 | .2 | 2 | 1 |
| 59 | 3 | 0 | .2 | 2 | 1 |
| 60 | 2 | 0 | .2 | 1 | 1 |
| 61 | 2 | 0 | .2 | 1 | 1 |
| 62 | 2 | 0 | .2 | 0 | 1 |
| 63 | 2 | 0 | .1 | 0 | 1 |
| 64 | 1 | 0 | .1 | 0 | 0 |
| 65 | 1 | 0 | .1 | 0 | 0 |
| 66 | 1 | 0 | .1 | 0 | 0 |
| 67 | 1 | 0 | .1 | 0 | 0 |
| 68 | 1 | 0 | .1 | 0 | 0 |
| 69 | 0 | 0 | .1 | 0 | 0 |
| 70 | 0 | 0 | .08 | 0 | 0 |
| 71 | 0 | 0 | .06 | 0 | 0 |
| 72 | 0 | 0 | .04 | 0 | 0 |

* Two minutes per interval

Abbreviations: H-W – Home to Work; H-S – Home to Shopping; H-O – Home to Other; O-W – Other to Work; O-O – Other to Other

# Appendix C
# SCVCTM PROCESSING

This appendix describes the general processing involved in running the SCVCTM. It is not intended as a users manual, but as a guide to understanding how various software programs are used to carry out individual processing steps.

Tables C-1 through C-5 (and associated flow charts in Figures C-1 through C-5) list the software programs and related functions for components of the SCVCTM. The procedures utilize Austin-Foust Associates (AFA) VOLPAC and CITILABS/UAG TRANPLAN programs. Both VOLPAC and TRANPLAN programs are listed where appropriate. Certain steps such as assignment post-processing (VOLPAC) do not have direct TRANPLAN equivalents, and several VOLPAC steps are required to carry out the processing. VOLPAC processing steps are easily incorporated into a typical TRANPLAN batch run setup.

Table C-1

NETWORK DEVELOPMENT*

| SOFTWARE (UAG TRANPLAN) | PROGRAM OPERATIONS |
|---|---|
| **MACNET** | Edits highway network file or loaded highway network history file (large-scale editing). |
| **HNIS** | Edits highway network link and node coordinate data files (on-screen editing). |
| **HWYNET** | Builds a highway network or updates an existing one. |
| **PLOTNET** | Produces a highway network link attribute (assignment group, link group, distance, lanes, speed, time, or area type) plotter code file. |
| DATA FILES | DESCRIPTION |
| **LINK FILE** | Produced by editing programs and used as input to network build program |
| **NETWORK FILE** | Produced by network build program and input to plotting program, skim file preparation (see distribution component) and assignment program (see assignment component) |

* Figure C-1 provides a flowchart for the model's network development component.

Table C-2

TRIP GENERATION*

| SOFTWARE (AFA VOLPAC) | PROGRAM OPERATIONS |
|---|---|
| **TRIPGEN** | Generates peak hour and production and attraction (P&A) trips based on input land use and trip rates. Also summarizes peak hour and ADT cordon volumes, balances internal and cordon peak hour volumes, derives P&A cordon volumes, and balances internal and cordon P&A volumes. |

| DATA FILES | DESCRIPTION |
|---|---|
| **TRIPENDS** | Trip ends by zone for input to trip distribution. |

* Figure C-2 provides a flowchart for the model's trip generation component.

Table C-3

TRIP DISTRIBUTION*

| SOFTWARE (CAG TRANPLAN) | PROGRAM OPERATIONS |
|---|---|
| **GMODEL** | Distributes zonal trip productions and attractions by trip purpose into zone-to-zone trip interchanges. |
| **TRNSPS** | Transposes trip tables. |
| **MTABLE,UTABLE** | Factors and adds trip tables. |
| **COMPRESS** | Compresses a trip table to a sub-area trip table. |
| **FRATAR** | Factors rows and columns of a trip table using a fratar matrix balancing algorithm. |
| DATA FILES | DESCRIPTION |
| **SKIM** | Travel time skim trees |
| **TRIPENDS** | Zonal productions and attractions by trip purpose |
| **FRICTION FACTORS** | Travel time impedance factors |
| **TRIPTAB** | Output zone-to-zone trip interchanges for input to trip assignment |

* Figure C-3 provides a flowchart for the model's trip distribution component.

Table C-4

ASSIGNMENT*

| SOFTWARE (UAG TRANPLAN) | PROGRAM OPERATIONS |
|---|---|
| **HWYLOD,EQUILB** | Assigns intrazonal highway trips onto a network created by **HNIS, NWYNET, MACNET**, or by any of the loading programs (**HWYLOD, EQUILB**). Also performs select link analysis. |
| **HWYLOD, EQUILB, UTABLE** | Loads trips to and from a group of selected zones onto a network based on saved capacity restraint/incremental loading speeds from a full assignment. |
| **TURNS** | Extracts intersection volumes. |
| DATA FILES | DESCRIPTION |
| **NETWORK FILE** | Input highway network |
| **TRIP TABLE FILE** | Input highway trip table |
| **INTERSECTION DATA** | Intersection and turn penalty specifications |
| **LOADED NETWORK DATA** | Output loaded network with assigned volumes |
| **INTERSECTION DATA FILE** | Output intersection volumes |

* Figure C-4 provides a flowchart for the model's network assignment component.

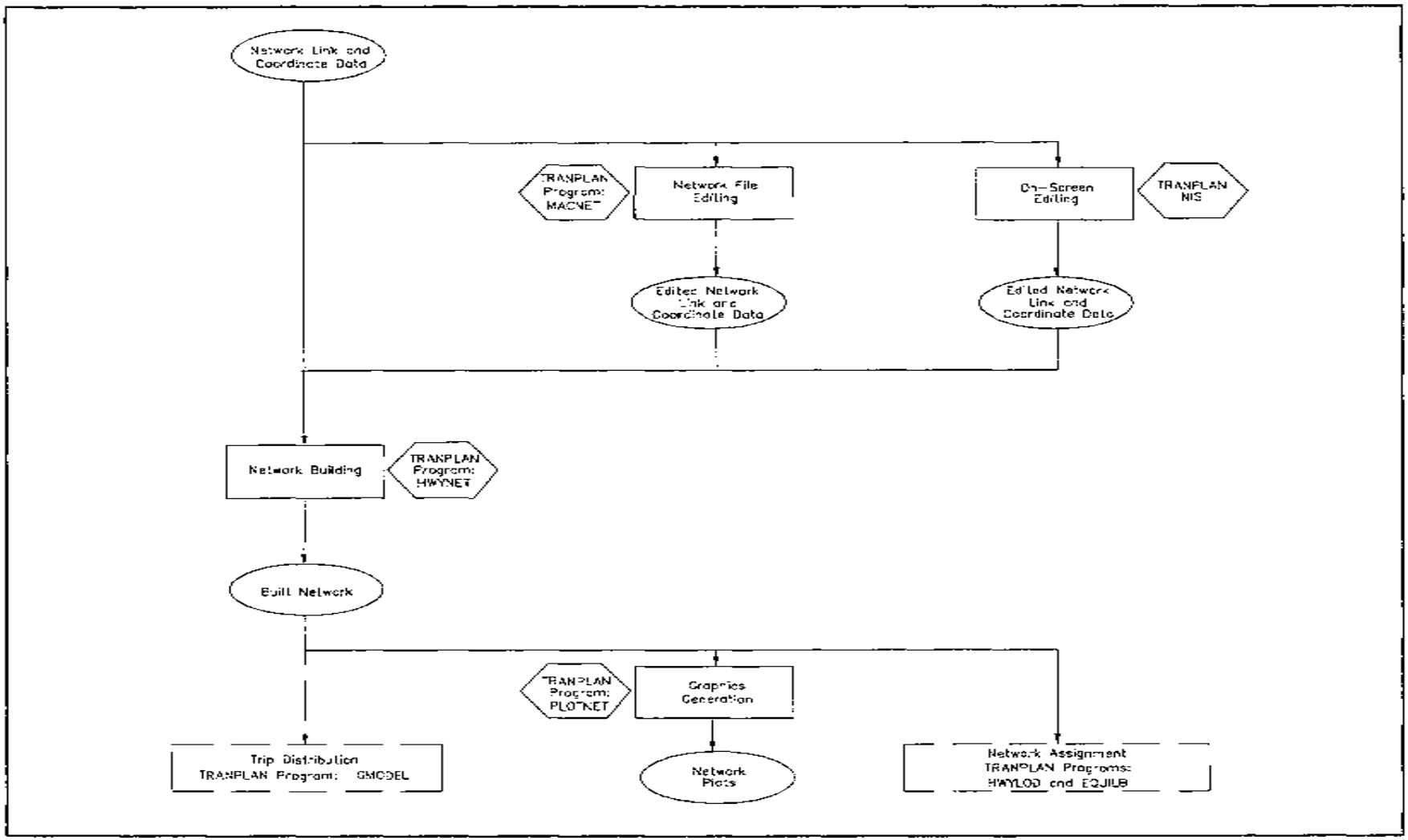
Table C-5

ASSIGNMENT POST-PROCESSING*

| SOFTWARE (AFA VOLPAC) | PROGRAM OPERATIONS |
|---|---|
| **TURNCNVT** | Combines AM and PM intersection turn volume data from the traffic assignment component with intersection lane configurations to produce a standard format intersection data file (IDF). |
| **ICUCOMP** | Calculates intersection capacity utilization (ICU) values and produces ICU calculation summaries. |
| **VOLMOD** | Factors and/or adds and/or subtracts standard format intersection data files (IDF's) or standard format link volume data files. |
| **LANEMOD** | Revises intersection lane configurations contained in a standard format intersection data file (IDF). |
| **SCRNLINE** | Combines standard format link volume data sets into screenline tabular summarizes along with link number of lanes, capacity, and volume-to-capacity (V/C) ratios. |
| **IVOL** | Adjusts forecasted intersection turn volumes based on a comparison of base year modeled volumes and base year count data. |
| **LVOL** | Adjusts forecasted link volumes based on a comparison of base year modeled volumes and base year count data. |

| DATA FILES | DESCRIPTION |
|---|---|
| **INTERSECTION DATA FILE** | AM and PM intersection turn movement volumes and lane configurations |
| **LINK DATA FILE** | ADT volumes for designated links |

* Figure C-5 provides a flowchart for the model's assignment post-processing component.

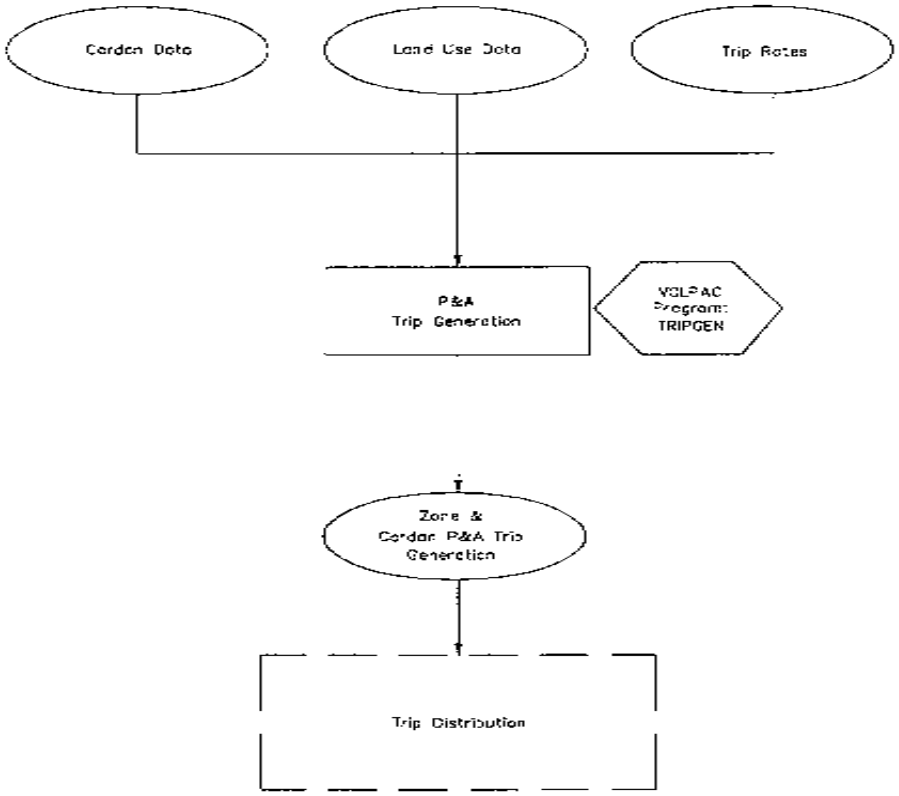



Legend

- Input and Output
- Processing Step
- Software/Program Used

Figure C-1

NETWORK DEVELOPMENT COMPONENT

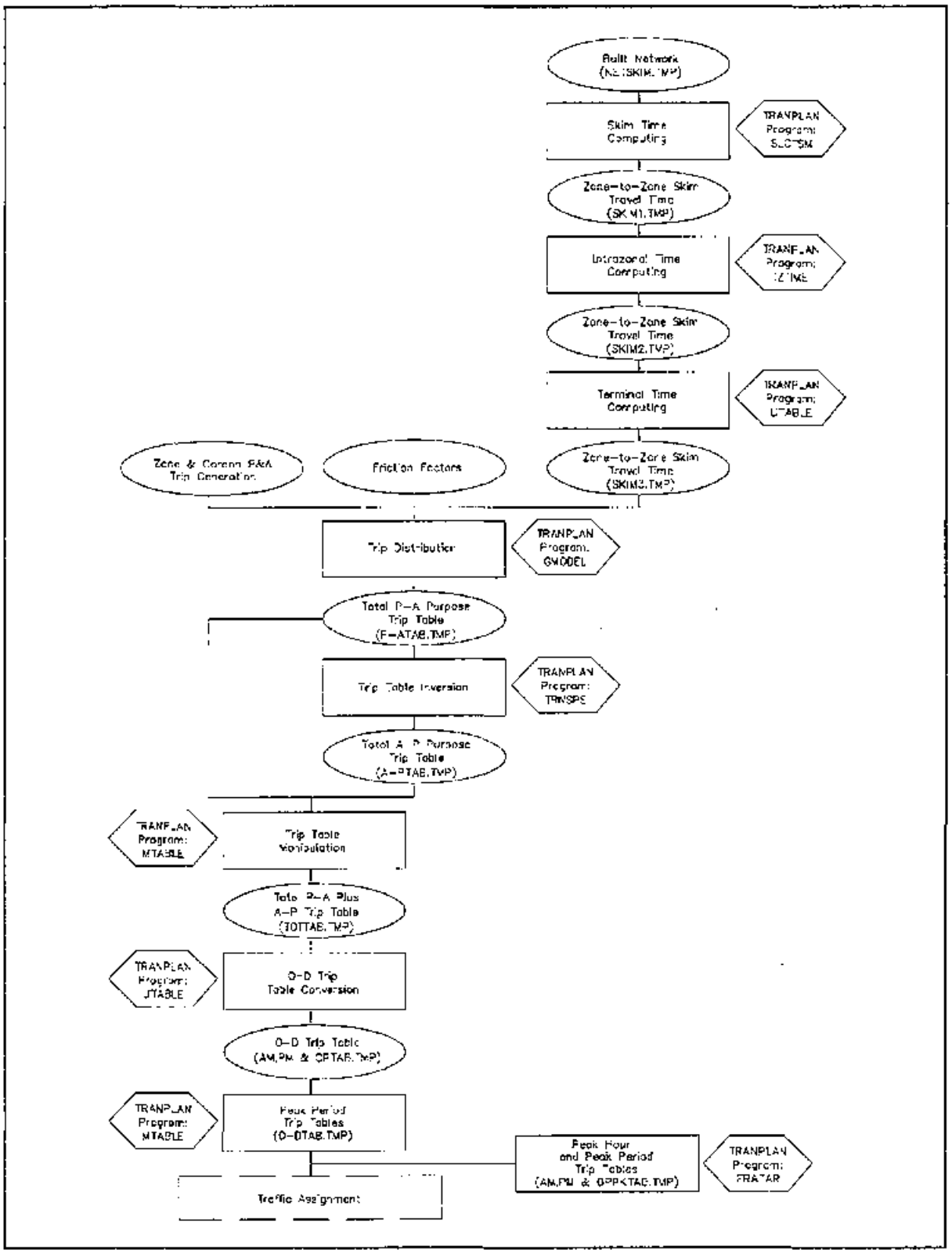



Legend

- Input and Output
- Processing Step
- Software/Program Used

Figure C-2

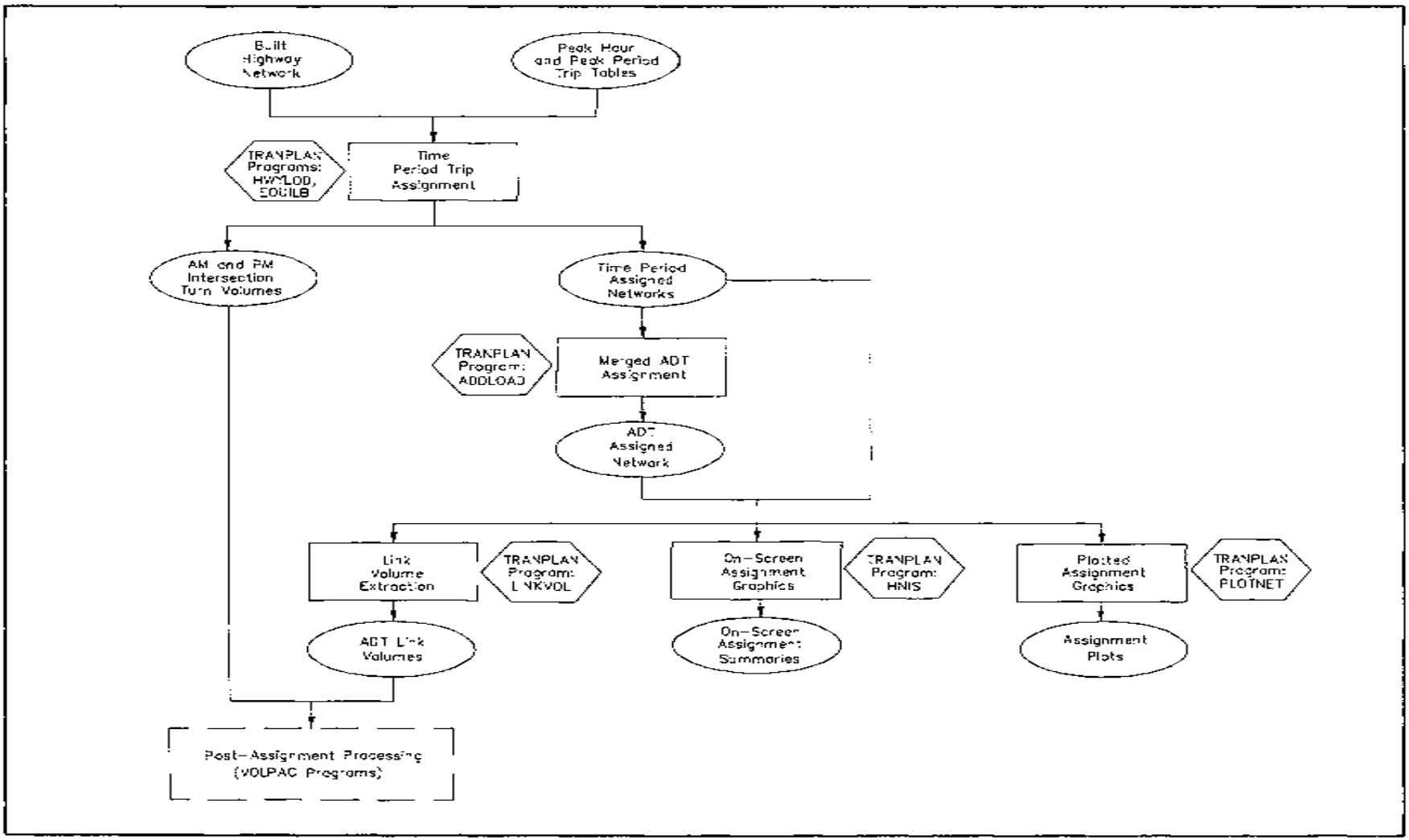
TRIP GENERATION COMPONENT




Legend
- Input and Output with Sample File Name in Parentheses
- Processing Step
- Software/Program used

Figure C-3

TRIP DISTRIBUTION COMPONENT

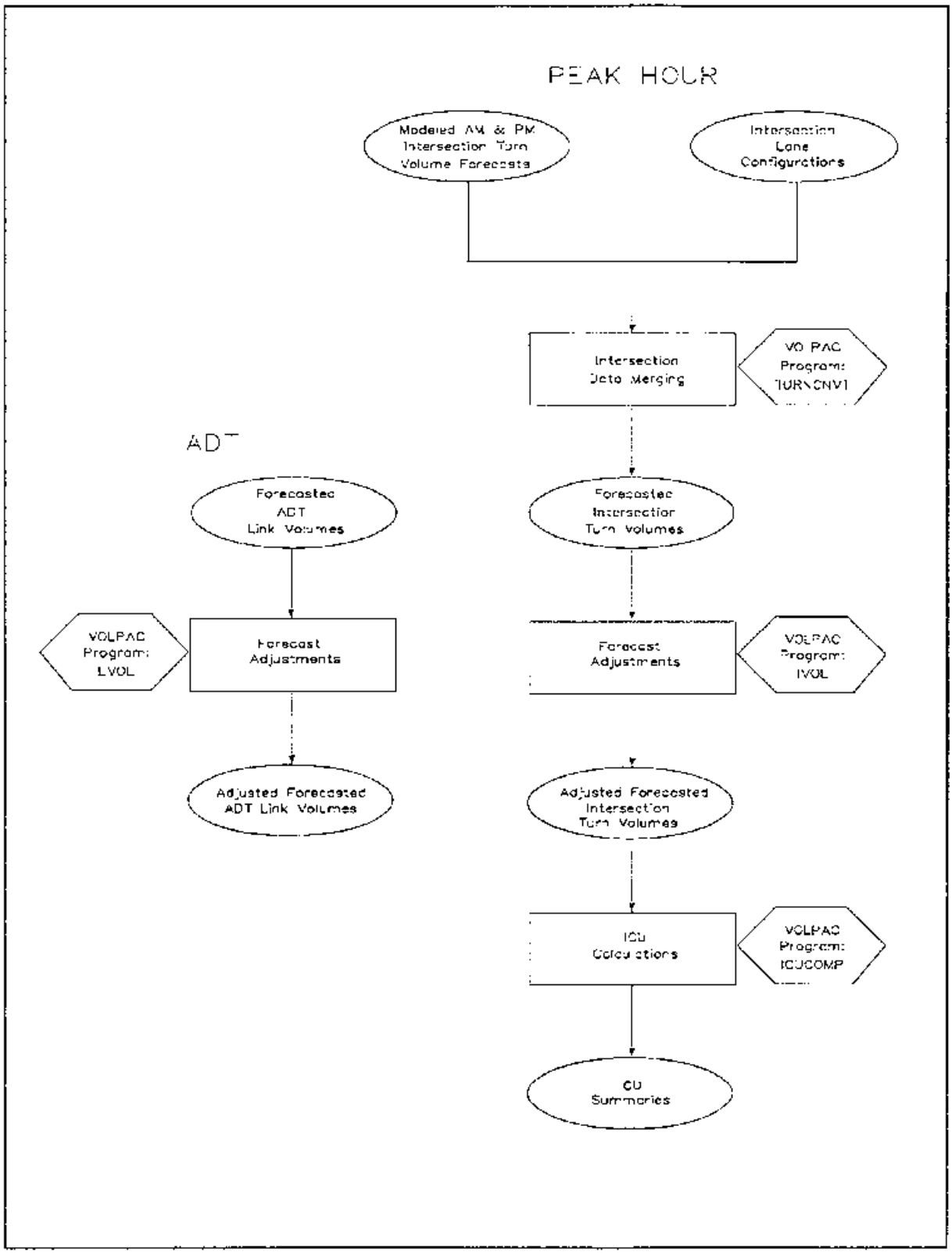



Legend

- Input and Output
- Processing Step
- Software/Program Used

Figure C-4

TRAFFIC ASSIGNMENT COMPONENT




Legend

Input and Output

Processing Step

Software/Program used

Figure C-5

POST-ASSIGNMENT PROCESSING COMPONENT

# Appendix D
# COUNT VERSUS MODEL STATISTICS

The appendix summarizes the results of the statistical analyses performed on traffic forecasts produced by the base year version of the Santa Clarita Valley Consolidated Traffic Model (SCVCTM). Modeled volumes were compared with observed counts based on calculations using the following variable:

$$V = m - c$$

where V = difference between modeled and count volumes
m = modeled volume
c = count volume

The resulting statistical measures of variation (i.e., average difference and standard deviation) serve as a guideline for evaluating the accuracy and reliability of traffic forecast data produced using the SCVCTM.

Table D-1 summarizes the statistical analysis that compares observed and modeled mid-block ADT volumes, and Table D-2 lists the statistical analysis summary that compares observed and modeled peak hour intersection approach volumes. In Table D-3, peak hour ICU values based on observed and modeled intersection volumes are compared. The average difference and standard deviation between the two data sets is listed at the end of each summary table, together with the sample size of each data set.

Table D-1

SCVCTM 2004 - ADT STATISTICAL SUMMARY

| | LOCATION | COUNT | MODELED | DIFF | %DIFF | | LOCATION | COUNT | MODELED | DIFF | %DIFF |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 6. | Chiquito Cyn n/o SR-126 | 1942 | 279 | -1663 | -86% | 97. | Valencia e/o Tourney | 38741 | 47042 | 8301 | 21% |
| 10. | Hasley Cyn w/o The Old Rd | 15622 | 17083 | 1461 | 9% | 98. | Valencia w/o McBean | 46000 | 52387 | 6387 | 14% |
| 12. | Commerce Ctr s/o Franklin Pk | 13377 | 16497 | 3120 | 23% | 99. | Valencia w/o Citrus | 40001 | 38687 | -1314 | -3% |
| 19. | Valencia e/o The Old Rd | 19286 | 15561 | -3725 | -19% | 100. | Valencia w/o Cinema | 52771 | 55344 | 2573 | 5% |
| 22. | Magic Mtn w/o Old Road | 10000 | 15708 | 5708 | 57% | 101. | Soledad e/o Bouquet Cyn | 55417 | 57320 | 1903 | 3% |
| 23. | The Old Rd n/o Hasley Cyn | 15512 | 15550 | -62 | -0% | 103. | Wiley Cyn Rd n/o Lyons | 18099 | 18395 | 296 | 2% |
| 24. | The Old Rd s/o Hasley Cyn | 10559 | 9400 | -1259 | -12% | 104. | Wiley Cyn Rd e/o Tournament | 14967 | 13778 | -1189 | -8% |
| 26. | The Old Rd s/o Henry Mayo | 16226 | 17145 | 919 | 6% | 105. | Wiley Cyn Rd e/o Orch Villg | 11205 | 12176 | 971 | 9% |
| 27. | The Old Rd n/o Rye Cyn | 32302 | 38662 | 6350 | 20% | 111. | San Fernando n/o Valle Oro | 44879 | 46543 | 1664 | 4% |
| 28. | The Old Rd n/o Magic Mtn | 33862 | 32626 | -1256 | -4% | 112. | Orchard Village s/o McBean | 29474 | 29716 | 242 | 1% |
| 29. | The Old Rd s/o Magic Mtn | 14257 | 13621 | -636 | -4% | 115. | Lyons e/o I-5 NB Ramps | 37063 | 38992 | 1929 | 5% |
| 30. | The Old Rd s/o Valencia | 17481 | 15252 | -2229 | -13% | 116. | Lyons e/o Wiley Cyn | 33081 | 32566 | -515 | -2% |
| 31. | The Old Rd s/o Stevenson Rch | 25189 | 24287 | -902 | -4% | 117. | Lyons e/o Orchard Village | 34470 | 32962 | -1508 | -4% |
| 32. | The Old Rd s/o Pico Cyn | 10315 | 8292 | -2023 | -20% | 119. | McBean n/o Orchard Village | 35000 | 30685 | -4315 | -12% |
| 34. | Pico Cyn w/o The Old Rd | 14282 | 15499 | 1217 | 9% | 126. | Bouquet e/o Seco | 44000 | 42524 | -1476 | -3% |
| 36. | McBean w/o Rockwell | 38003 | 37559 | -444 | -1% | 127. | Bouquet e/o Plum Cyn | 16000 | 12556 | -3444 | -22% |
| 37. | McBean e/o Rockwell | 26000 | 22627 | -3373 | -13% | 128. | Newhall Ranch w/o Bouquet | 28464 | 31859 | 3395 | 12% |
| 38. | McBean s/o Valencia | 39063 | 36083 | -2980 | -8% | 143. | Soledad w/o Golden Valley | 54000 | 57100 | 3100 | 6% |
| 39. | McBean s/o Town Center | 42040 | 43921 | 1881 | 4% | 144. | Soledad w/o Whites Cyn | 39000 | 44460 | 5460 | 14% |
| 40. | McBean n/o Magic Mtn | 56000 | 53614 | -2386 | -4% | 145. | Soledad e/o Whites Cyn | 41000 | 44297 | 3297 | 8% |
| 41. | McBean s/o Newhall Ranch | 47000 | 45182 | -1818 | -4% | 146. | Soledad e/o Sierra Hwy | 36000 | 36593 | 593 | 2% |
| 42. | McBean n/o Newhall Ranch | 33646 | 31554 | -2092 | -6% | 147. | Plum Cyn s/o Bouquet | 19000 | 10563 | -8437 | -44% |
| 43. | McBean n/o Decoro | 21300 | 22470 | 1470 | 7% | 149. | Whites Cyn n/o Soledad | 38000 | 41048 | 3048 | 8% |
| 45. | SR-126 w/o San Martinez | 25000 | 25043 | 43 | 0% | 150. | Whites Cyn s/o Soledad | 29000 | 25658 | -3342 | -12% |
| 47. | SR-126 e/o Chiquito Cyn | 25000 | 24852 | -148 | -1% | 153. | Princessa s/o Whites Cyn | 36000 | 33763 | -2237 | -6% |
| 48. | SR-126 w/o Commerce Center | 26000 | 27655 | 1655 | 6% | 154. | Princessa s/o Sierra Hwy | 28000 | 27362 | -638 | -2% |
| 49. | SR-126 w/o Old Road | 29000 | 32549 | 3549 | 12% | 160. | Sierra Hwy s/o Golden Vally | 24335 | 24191 | -144 | -1% |
| 50. | Newhall Ranch e/o I-5 | 11316 | 13208 | 1892 | 17% | 161. | Sierra s/o Princessa | 29000 | 33905 | 4906 | 17% |
| 52. | Newhall Ranch e/o Rye | 9672 | 8402 | -1270 | -13% | 162. | Sierra s/o Soledad | 35000 | 37700 | 2700 | 8% |
| 53. | Newhall Ranch w/o Baywood | 21802 | 24257 | 2455 | 11% | 163. | Sierra n/o Soledad | 22000 | 22131 | 131 | 1% |
| 54. | Newhall Ranch e/o McBean | 32000 | 27962 | -4038 | -13% | 164. | Sierra btw Romsen/San Fern | 11755 | 11995 | 240 | 2% |
| 62. | Rye Cyn e/o The Old Rd | 40522 | 38975 | -1547 | -4% | 170. | Ave Stanford n/o Rye Cyn | 12012 | 9091 | -2921 | -24% |
| 63. | Rye Cyn w/o Ave Scott | 37136 | 40386 | 3250 | 9% | 194. | Copper Hill w/o McBean | 20741 | 18638 | -2103 | -10% |
| 64. | Rye e/o Scott | 36000 | 38705 | 2705 | 8% | 220. | Orchard Village n/o Lyons | 21974 | 21232 | -742 | -3% |
| 65. | Copper Hill n/o Newhall Rnch | 27707 | 32007 | 4300 | 16% | 227. | Soledad e/o Rainbow Glen | 47000 | 51890 | 4890 | 10% |
| 66. | Copper Hill n/o Decoro | 22000 | 21548 | -452 | -2% | 230. | Pico Cyn e/o The Old Rd | 29345 | 38948 | 9603 | 33% |
| 67. | Copp H btwn McBr/Canterbury | 29461 | 29799 | 338 | 1% | 231. | McBean e/o The Old Rd | 27302 | 32750 | 5448 | 20% |
| 70. | Decoro e/o Copper Hill | 6000 | 8902 | 2902 | 48% | 233. | Ave Stanford se/o Rye Cyn | 11964 | 9685 | -2278 | -19% |
| 71. | Decoro e/o Dickason | 9260 | 11372 | 2112 | 23% | 240. | Wolcott n/o SR-126 | 277 | 420 | 143 | 52% |
| 72. | Decoro e/o McBean Pkwy | 17179 | 19976 | 2797 | 16% | 249. | Calgrove e/o The Old Road | 10753 | 9414 | -1339 | -12% |
| 76. | Bouquet e/o Haskell | 25000 | 16029 | -8971 | -36% | 254. | Wiley Cyn n/o Calgrove | 9623 | 6859 | -2764 | -29% |
| 78. | Bouquet Cyn w/o Seco | 59090 | 57977 | -1113 | -2% | 257. | The Old Rd n/o Calgrove | 8291 | 5290 | -3001 | -36% |
| 79. | Bouquet Cyn s/o Newhall Rnch | 62672 | 66248 | 3576 | 6% | 258. | McBean s/o Ave Scott | 60800 | 59740 | -1060 | -2% |
| 81. | San Fernando s/o Magic Mtn | 43697 | 43007 | -690 | -2% | 260. | Soledad Cyn w/o Sand Cyn | 27000 | 28533 | 1533 | 6% |
| 87. | Ave Scott w/o Channel | 14578 | 14492 | -86 | -1% | 267. | Sierra Hwy s/o Crusa Mesa | 10000 | 3249 | -6751 | -68% |
| 88. | Magic Mtn e/o I-5 | 21394 | 31095 | 9701 | 45% | 269. | Sand Cyn s/o Sierra Hwy | 4000 | 7419 | 3419 | 85% |
| 89. | Magic Mtn e/o Tourney | 27780 | 32602 | 4822 | 17% | 270. | Sand Cyn s/o SR-14 | 21000 | 23615 | 2615 | 12% |
| 90. | Magic Mtn w/o Citrus | 22546 | 24420 | 1874 | 8% | 277. | Soledad Cyn e/o Shadow Pine | 7000 | 8014 | 1014 | 14% |
| 91. | Magic Mtn w/o Bouquet | 16810 | 21036 | 4226 | 25% | 279. | Shadow Pine n/o Soledad | 8000 | 5915 | -2085 | -26% |
| 96. | Valencia e/o I-5 NB Ramps | 42432 | 47571 | 5139 | 12% | 300. | Sloan Cyn e/o The Old Road | 12163 | 9615 | -2548 | -21% |

Table D-1 (cont.)

SCVCTM 2004 - ADT STATISTICAL SUMMARY

| LOCATION | COUNT | MODELED | DIFF | %DIFF | LOCATION | COUNT | MODELED | DIFF | %DIFF |
|---|---|---|---|---|---|---|---|---|---|
| 301. Lake Hughes w/o Castaic | 20394 | 11959 | -8435 | -41% | 313. The Old Rd n/o Hillcrest | 6519 | 3036 | -3483 | -53% |
| 302. Lake Hughes w/o Diamond | 5753 | 3526 | -2227 | -39% | 314. The Old Rd s/o Calgrove | 11339 | 7684 | -3655 | -32% |
| 303. The Old Rd n/o Sloan Cyn | 10221 | 9615 | -606 | -6% | 316. Soledad Cyn e/o SR-14 SB Rp | 23000 | 19982 | -3018 | -13% |
| 305. Ridge Route n/o Lake Hughes | 4086 | 1846 | -2240 | -55% | 317. Soledad Cyn w/o Shadow Pine | 11000 | 10513 | -487 | -4% |
| 306. Ridge Route n/o Castaic | 4961 | 4131 | -830 | -17% | 318. Sand Cyn s/o Soledad Cyn | 23000 | 32227 | 9227 | 40% |
| 307. Ridge Route e/o I-5 NB Ramp | 15559 | 12123 | -3436 | -22% | 319. Valencia e/o Mcbean | 42000 | 48310 | 6310 | 15% |
| 308. Ridge Route btwn I-5 Ramps | 11319 | 9310 | -2009 | -18% | 320. Magic Mountain w/o Valencia | 22000 | 32531 | 10531 | 48% |
| 309. Parker w/o I-5 SB Ramp | 7358 | 5848 | -1510 | -21% | 321. Bouquet cyn s/o Soledad | 42000 | 40602 | -1398 | -3% |
| 310. Castaic n/o Lake Hughes | 6242 | 9261 | 3019 | 48% | 322. Mcbean s/o Copper Hill | 15000 | 16597 | 1597 | 11% |
| 311. Castaic s/o Lake Hughes | 10970 | 2212 | -8758 | -80% | 323. Copper Hill s/o Decoro | 25000 | 27907 | 2907 | 12% |
| 312. Castaic s/o Ridge Route | 1726 | 6970 | 5244 | 304% | 324. Mcbean s/o Decoro | 26000 | 27983 | 1983 | 8% |

SAMPLE SIZE = 122 AVERAGE COUNT = 24677 AVERAGE VOLUME = 25142

AVERAGE DIFFERENCE = 465

STANDARD DEVIATION = 3666.1

Table D-2

SCVCTM 2004 - TWO-WAY PEAK HOUR VOLUME STATISTICAL SUMMARY

| LOCATION | | AM PEAK HOUR NORTH LEG | AM PEAK HOUR EAST LEG | AM PEAK HOUR SOUTH LEG | AM PEAK HOUR WEST LEG | PM PEAK HOUR NORTH LEG | PM PEAK HOUR EAST LEG | PM PEAK HOUR SOUTH LEG | PM PEAK HOUR WEST LEG |
|---|---|---|---|---|---|---|---|---|---|
| 1. Old Road & I-5 SB Ramps | | | | | | | | | |
| | COUNT | 425 | 526 | 645 | 0 | 438 | 409 | 733 | 0 |
| | MODELED | 406 | 596 | 454 | 0 | 530 | 449 | 697 | 0 |
| | DIFF | -19 | 70 | -191 | -- | 92 | 40 | -36 | -- |
| | % DIFF | -4% | 13% | -30% | -- | 21% | 10% | -5% | -- |
| 2. I-5 NB Ramps & Lake Hughes | | | | | | | | | |
| | COUNT | 148 | 784 | 197 | 609 | 316 | 1244 | 649 | 949 |
| | MODELED | 42 | 602 | 244 | 500 | 60 | 888 | 660 | 778 |
| | DIFF | -106 | -182 | 47 | -109 | -256 | -356 | 11 | -171 |
| | % DIFF | -72% | -23% | 24% | -18% | -81% | -29% | 2% | -18% |
| 3. I-5 SB Ramps & Parker | | | | | | | | | |
| | COUNT | 0 | 636 | 576 | 544 | 0 | 863 | 388 | 661 |
| | MODELED | 0 | 606 | 786 | 455 | 0 | 792 | 519 | 543 |
| | DIFF | -- | -30 | 209 | -89 | -- | -71 | 131 | -118 |
| | % DIFF | -- | -5% | 36% | -16% | -- | -8% | 34% | -18% |
| 4. I-5 NB Ramps & Ridge Route | | | | | | | | | |
| | COUNT | 0 | 844 | 372 | 636 | 0 | 1091 | 570 | 867 |
| | MODELED | 0 | 838 | 370 | 606 | 0 | 1030 | 848 | 792 |
| | DIFF | -- | -6 | -2 | -30 | -- | -61 | 278 | -75 |
| | % DIFF | -- | -1% | -1% | -5% | -- | -6% | 49% | -9% |
| 5. I-5 SB & Hasley Cyn | | | | | | | | | |
| | COUNT | 173 | 702 | 936 | 1793 | 111 | 974 | 605 | 1662 |
| | MODELED | 199 | 1018 | 848 | 2065 | 102 | 1087 | 717 | 1906 |
| | DIFF | 26 | 316 | -88 | 272 | -9 | 113 | 112 | 244 |
| | % DIFF | 15% | 45% | -9% | 15% | -8% | 12% | 19% | 15% |
| 6. I-5 NB & Hasley Cyn | | | | | | | | | |
| | COUNT | 98 | 0 | 606 | 702 | 206 | 0 | 770 | 974 |
| | MODELED | 72 | 0 | 946 | 1018 | 269 | 0 | 818 | 1087 |
| | DIFF | -26 | -- | 340 | 316 | 63 | -- | 48 | 113 |
| | % DIFF | -27% | -- | 56% | 45% | 31% | -- | 6% | 12% |
| 7. I-5 SB Ramps & SR-126 | | | | | | | | | |
| | COUNT | 147 | 1247 | 639 | 2033 | 132 | 1247 | 1058 | 2437 |
| | MODELED | 133 | 1332 | 499 | 1964 | 184 | 1208 | 1146 | 2538 |
| | DIFF | -14 | 85 | -140 | -69 | 52 | -39 | 88 | 101 |
| | % DIFF | -10% | 7% | -22% | -3% | 39% | -3% | 8% | 4% |
| 8. I-5 NB Ramps & SR-126 | | | | | | | | | |
| | COUNT | 0 | 832 | 1039 | 1247 | 0 | 709 | 1112 | 1247 |
| | MODELED | 0 | 927 | 1503 | 1330 | 0 | 975 | 1379 | 1206 |
| | DIFF | -- | 95 | 464 | 83 | -- | 266 | 267 | -41 |
| | % DIFF | -- | 11% | 45% | 7% | -- | 38% | 24% | -3% |
| 9. The Old Rd & I-5 SB Ramps | | | | | | | | | |
| | COUNT | 1234 | 1249 | 2506 | 29 | 1516 | 1171 | 2678 | 29 |
| | MODELED | 1479 | 1092 | 2571 | 0 | 1575 | 1179 | 2746 | 0 |
| | DIFF | 245 | -157 | 65 | -29 | 59 | 8 | 70 | -29 |
| | % DIFF | 20% | -13% | 3% | -100% | 4% | 1% | 3% | -100% |

Table D-2 (cont.)

SCVCTM 2004 - TWO-WAY PEAK HOUR VOLUME STATISTICAL SUMMARY

| LOCATION | | AM PEAK HOUR NORTH LEG | AM PEAK HOUR EAST LEG | AM PEAK HOUR SOUTH LEG | AM PEAK HOUR WEST LEG | PM PEAK HOUR NORTH LEG | PM PEAK HOUR EAST LEG | PM PEAK HOUR SOUTH LEG | PM PEAK HOUR WEST LEG |
|---|---|---|---|---|---|---|---|---|---|
| 10. I-5 SB Ramps & Magic Mtn | | | | | | | | | |
| | COUNT | 0 | 2270 | 794 | 2034 | 0 | 2059 | 734 | 2051 |
| | MODELED | 0 | 2439 | 889 | 1972 | 0 | 2234 | 764 | 2344 |
| | DIFF | -- | 169 | 95 | -62 | -- | 165 | 30 | 293 |
| | % DIFF | -- | 7% | 12% | -3% | -- | 8% | 4% | 14% |
| 11. I-5 NB Ramps & Magic Mtn | | | | | | | | | |
| | COUNT | 0 | 1571 | 1487 | 2270 | 0 | 2094 | 1549 | 2069 |
| | MODELED | 0 | 2131 | 1279 | 2440 | 0 | 2467 | 1457 | 2234 |
| | DIFF | -- | 560 | -208 | 170 | -- | 373 | -92 | 165 |
| | % DIFF | -- | 36% | -14% | 7% | -- | 18% | -6% | 8% |
| 12. I-5 SB Ramps & Valencia | | | | | | | | | |
| | COUNT | 1664 | 2373 | 291 | 1145 | 1710 | 2437 | 357 | 1670 |
| | MODELED | 1770 | 2362 | 212 | 856 | 1529 | 2512 | 119 | 1282 |
| | DIFF | 106 | -11 | -79 | -290 | -181 | 75 | -238 | -388 |
| | % DIFF | 6% | -0% | -27% | -25% | -11% | 3% | -67% | -23% |
| 13. I-5 NB Ramps & Valencia | | | | | | | | | |
| | COUNT | 0 | 3125 | 1524 | 2373 | 0 | 3541 | 1612 | 2437 |
| | MODELED | 0 | 3411 | 1437 | 2362 | 0 | 3690 | 1756 | 2512 |
| | DIFF | -- | 286 | -87 | -11 | -- | 149 | 144 | 75 |
| | % DIFF | -- | 9% | -6% | -0% | -- | 4% | 9% | 3% |
| 14. I-5 SB Ramps & Stevenson Rch | | | | | | | | | |
| | COUNT | 875 | 1865 | 424 | 1646 | 924 | 2823 | 236 | 2423 |
| | MODELED | 999 | 2190 | 532 | 1965 | 1113 | 3155 | 237 | 2659 |
| | DIFF | 124 | 325 | 108 | 319 | 189 | 332 | 1 | 236 |
| | % DIFF | 14% | 17% | 25% | 19% | 20% | 12% | 0% | 10% |
| 15. I-5 NB Ramps & McBean | | | | | | | | | |
| | COUNT | 105 | 2240 | 866 | 1865 | 108 | 3178 | 1319 | 2823 |
| | MODELED | 302 | 2870 | 1041 | 2191 | 201 | 3725 | 1459 | 3153 |
| | DIFF | 197 | 630 | 175 | 326 | 93 | 597 | 140 | 330 |
| | % DIFF | 188% | 28% | 20% | 17% | 86% | 19% | 11% | 12% |
| 16. I-5 SB/Marriott & Pico/Lyons | | | | | | | | | |
| | COUNT | 940 | 2381 | 307 | 1608 | 846 | 2932 | 250 | 2330 |
| | MODELED | 1036 | 2501 | 0 | 1583 | 1055 | 2914 | 88 | 2475 |
| | DIFF | 96 | 120 | -307 | -25 | 209 | -18 | -162 | 145 |
| | % DIFF | 10% | 5% | -100% | -2% | 25% | -1% | -65% | 6% |
| 17. I-5 NB On/Off & Lyons Ave | | | | | | | | | |
| | COUNT | 485 | 2445 | 586 | 2194 | 628 | 3188 | 1330 | 2966 |
| | MODELED | 736 | 2690 | 761 | 2365 | 514 | 3202 | 1498 | 2965 |
| | DIFF | 251 | 245 | 175 | 171 | -114 | 14 | 168 | 20 |
| | % DIFF | 52% | 10% | 30% | 8% | -18% | 0% | 13% | 1% |
| 18. I-5 SB Ramps & Calgrove | | | | | | | | | |
| | COUNT | 277 | 947 | 518 | 766 | 229 | 1083 | 196 | 1074 |
| | MODELED | 171 | 1140 | 848 | 667 | 325 | 830 | 369 | 920 |
| | DIFF | -106 | 193 | 330 | -99 | 96 | -253 | 173 | -154 |
| | % DIFF | -38% | 20% | 64% | -13% | 42% | -23% | 88% | -14% |

Table D-2 (cont.)

SCVCTM 2004 - TWO-WAY PEAK HOUR VOLUME STATISTICAL SUMMARY

| LOCATION | | AM PEAK HOUR NORTH LEG | AM PEAK HOUR EAST LEG | AM PEAK HOUR SOUTH LEG | AM PEAK HOUR WEST LEG | PM PEAK HOUR NORTH LEG | PM PEAK HOUR EAST LEG | PM PEAK HOUR SOUTH LEG | PM PEAK HOUR WEST LEG |
|---|---|---|---|---|---|---|---|---|---|
| 19. I-5 NB Ramps & Calgrove | | | | | | | | | |
| | COUNT | 129 | 955 | 119 | 946 | 365 | 981 | 387 | 1083 |
| | MODELED | 228 | 1050 | 272 | 1138 | 266 | 1139 | 802 | 829 |
| | DIFF | 99 | 94 | 153 | 192 | -99 | 158 | 415 | -254 |
| | % DIFF | 77% | 10% | 129% | 20% | -27% | 16% | 107% | -23% |
| 20. I-5 SB On Ramp & Pico/Lyons | | | | | | | | | |
| | COUNT | 0 | 2194 | 591 | 2785 | 0 | 2966 | 332 | 3298 |
| | MODELED | 0 | 2364 | 555 | 2919 | 0 | 2986 | 467 | 3453 |
| | DIFF | -- | 170 | -35 | 134 | -- | 20 | 135 | 155 |
| | % DIFF | -- | 8% | -6% | 5% | -- | 1% | 41% | 5% |
| 21. The Old Rd & Calgrove Blvd | | | | | | | | | |
| | COUNT | 496 | 704 | 910 | 0 | 768 | 1073 | 1427 | 0 |
| | MODELED | 396 | 668 | 528 | 0 | 527 | 920 | 785 | 0 |
| | DIFF | -100 | -36 | -382 | -- | -241 | -153 | -642 | -- |
| | % DIFF | -20% | -5% | -42% | -- | -31% | -14% | -45% | -- |
| 25. The Old Rd & Rye Canyon | | | | | | | | | |
| | COUNT | 2569 | 3667 | 2887 | 0 | 2885 | 3296 | 2657 | 0 |
| | MODELED | 2592 | 3318 | 2160 | 0 | 2822 | 3319 | 2477 | 0 |
| | DIFF | 24 | -349 | -727 | -- | -63 | 23 | -180 | -- |
| | % DIFF | 1% | -10% | -25% | -- | -2% | 1% | -7% | -- |
| 26. The Old Rd & Magic Mountain | | | | | | | | | |
| | COUNT | 2631 | 1984 | 983 | 102 | 2690 | 2038 | 1269 | 157 |
| | MODELED | 2207 | 1972 | 949 | 676 | 2528 | 2343 | 1263 | 1326 |
| | DIFF | -424 | -12 | -34 | 574 | -162 | 305 | -6 | 1169 |
| | % DIFF | -16% | -1% | -3% | 563% | -6% | 15% | -0% | 745% |
| 27. The Old Rd & Valencia | | | | | | | | | |
| | COUNT | 1136 | 1146 | 997 | 717 | 1657 | 1670 | 1774 | 685 |
| | MODELED | 924 | 858 | 850 | 466 | 1335 | 1284 | 1367 | 644 |
| | DIFF | -212 | -288 | -147 | -251 | -322 | -386 | -407 | -41 |
| | % DIFF | -19% | -25% | -15% | -35% | -19% | -23% | -23% | -6% |
| 28. The Old Rd & McBean | | | | | | | | | |
| | COUNT | 858 | 1646 | 995 | 1427 | 1516 | 2423 | 2379 | 1718 |
| | MODELED | 850 | 1963 | 710 | 2101 | 1367 | 2658 | 1856 | 2411 |
| | DIFF | -8 | 317 | -285 | 674 | -149 | 236 | -523 | 693 |
| | % DIFF | -1% | 19% | -29% | 47% | -10% | 10% | -22% | 40% |
| 29. The Old Rd & Pico Canyon | | | | | | | | | |
| | COUNT | 1121 | 1642 | 787 | 1180 | 1792 | 2102 | 826 | 1064 |
| | MODELED | 819 | 1581 | 84 | 1108 | 1722 | 2478 | 667 | 1013 |
| | DIFF | -302 | -61 | -703 | -72 | -70 | 376 | -159 | -51 |
| | % DIFF | -27% | -4% | -89% | -6% | -4% | 18% | -19% | -5% |
| 30. Ave Stanford & Rye Canyon | | | | | | | | | |
| | COUNT | 661 | 2851 | 811 | 3463 | 1616 | 3096 | 964 | 3272 |
| | MODELED | 428 | 2832 | 904 | 3322 | 731 | 3048 | 902 | 3319 |
| | DIFF | -233 | -19 | 93 | -141 | -885 | -48 | -62 | 47 |
| | % DIFF | -35% | -1% | 11% | -4% | -55% | -2% | -6% | 1% |

Table D-2 (cont.)

SCVCTM 2004 - TWO-WAY PEAK HOUR VOLUME STATISTICAL SUMMARY

| LOCATION | | AM PEAK HOUR NORTH LEG | AM PEAK HOUR EAST LEG | AM PEAK HOUR SOUTH LEG | AM PEAK HOUR WEST LEG | PM PEAK HOUR NORTH LEG | PM PEAK HOUR EAST LEG | PM PEAK HOUR SOUTH LEG | PM PEAK HOUR WEST LEG |
|---|---|---|---|---|---|---|---|---|---|
| 32. Ave Scott & Rye Canyon | | | | | | | | | |
| | COUNT | 24 | 3304 | 798 | 3294 | 27 | 2758 | 700 | 2999 |
| | MODELED | 0 | 3108 | 664 | 3140 | 0 | 2912 | 700 | 3288 |
| | DIFF | -24 | -196 | -134 | -154 | -27 | 154 | 0 | 289 |
| | % DIFF | -100% | -6% | -17% | -5% | -100% | 6% | 0% | 10% |
| 33. Rye/Copper Hill & NRR | | | | | | | | | |
| | COUNT | 3281 | 826 | 3573 | 0 | 2626 | 845 | 2945 | 0 |
| | MODELED | 2554 | 722 | 3134 | 0 | 2573 | 545 | 3078 | 0 |
| | DIFF | -727 | -104 | -439 | -- | -53 | -200 | 133 | -- |
| | % DIFF | -22% | -13% | -12% | -- | -2% | -24% | 5% | -- |
| 35. Copper Hill & Decoro | | | | | | | | | |
| | COUNT | 2075 | 633 | 2282 | 0 | 1595 | 363 | 1882 | 0 |
| | MODELED | 1557 | 619 | 2130 | 0 | 1682 | 605 | 2285 | 0 |
| | DIFF | -518 | -14 | -152 | -- | 87 | 242 | 403 | -- |
| | % DIFF | -25% | -2% | -7% | -- | 5% | 67% | 21% | -- |
| 36. Tourney & Valencia | | | | | | | | | |
| | COUNT | 510 | 3033 | 0 | 3125 | 497 | 3448 | 0 | 3541 |
| | MODELED | 476 | 3372 | 0 | 3412 | 426 | 3628 | 0 | 3592 |
| | DIFF | -34 | 339 | -- | 287 | -71 | 180 | -- | 151 |
| | % DIFF | -7% | 11% | -- | 9% | -14% | 5% | -- | 4% |
| 37. Tourney & Magic Mountain | | | | | | | | | |
| | COUNT | 0 | 1787 | 382 | 1571 | 0 | 2285 | 463 | 2094 |
| | MODELED | 0 | 2345 | 510 | 2131 | 0 | 2714 | 539 | 2467 |
| | DIFF | -- | 558 | 128 | 560 | -- | 429 | 75 | 373 |
| | % DIFF | -- | 31% | 34% | 36% | -- | 19% | 16% | 18% |
| 39. Ave Tibbits/Dickason & NRR | | | | | | | | | |
| | COUNT | 1483 | 2003 | 781 | 811 | 771 | 1604 | 842 | 763 |
| | MODELED | 1278 | 2209 | 906 | 721 | 1053 | 2026 | 1041 | 646 |
| | DIFF | -205 | 206 | 125 | -90 | 282 | 422 | 199 | -117 |
| | % DIFF | -14% | 10% | 16% | -11% | 38% | 26% | 24% | -15% |
| 41. Dickason & Decoro | | | | | | | | | |
| | COUNT | 137 | 1189 | 920 | 768 | 49 | 725 | 422 | 472 |
| | MODELED | 0 | 1342 | 839 | 773 | 0 | 1218 | 704 | 822 |
| | DIFF | -137 | 153 | -81 | 5 | -49 | 493 | 282 | 350 |
| | % DIFF | -100% | 13% | -9% | 1% | -100% | 68% | 67% | 74% |
| 44. McBean & Valencia | | | | | | | | | |
| | COUNT | 2984 | 2630 | 2344 | 3058 | 3882 | 3620 | 3430 | 3790 |
| | MODELED | 3025 | 2705 | 2257 | 3559 | 3902 | 3501 | 3442 | 4203 |
| | DIFF | 41 | 75 | -87 | 501 | 20 | -119 | 12 | 413 |
| | % DIFF | 1% | 3% | -4% | 20% | 1% | -3% | 0% | 11% |
| 45. McBean & Magic Mtn | | | | | | | | | |
| | COUNT | 3962 | 1348 | 2994 | 1674 | 5311 | 1978 | 4371 | 2252 |
| | MODELED | 4589 | 1282 | 3047 | 2262 | 5268 | 2085 | 3879 | 2786 |
| | DIFF | 627 | -66 | 53 | 588 | -43 | 107 | -492 | 534 |
| | % DIFF | 16% | -5% | 2% | 35% | -1% | 5% | -11% | 24% |

Table 0-2 (cont.)

SCVCTM 2004 - TWO-WAY PEAK HOUR VOLUME STATISTICAL SUMMARY

| LOCATION | | AM PEAK HOUR NORTH LEG | AM PEAK HOUR EAST LEG | AM PEAK HOUR SOUTH LEG | AM PEAK HOUR WEST LEG | PM PEAK HOUR NORTH LEG | PM PEAK HOUR EAST LEG | PM PEAK HOUR SOUTH LEG | PM PEAK HOUR WEST LEG |
|---|---|---|---|---|---|---|---|---|---|
| 47. McBean & Scott/Bridgeport | | | | | | | | | |
| | COUNT | 3505 | 316 | 4529 | 1330 | 4560 | 294 | 5672 | 1394 |
| | MODELED | 3979 | 176 | 5040 | 1351 | 4673 | 227 | 5769 | 1317 |
| | DIFF | 474 | -140 | 511 | 21 | 113 | -67 | 97 | -77 |
| | % DIFF | 14% | -44% | 11% | 2% | 2% | -23% | 2% | -6% |
| 48. McBean & Newhall Ranch | | | | | | | | | |
| | COUNT | 2646 | 2456 | 3460 | 2107 | 2988 | 2791 | 4407 | 1816 |
| | MODELED | 2561 | 2580 | 3929 | 2205 | 3018 | 2718 | 4595 | 2023 |
| | DIFF | -85 | 125 | 469 | 99 | 30 | -73 | 188 | 207 |
| | % DIFF | -3% | 5% | 14% | 5% | 1% | -3% | 4% | 11% |
| 49. McBean Pkwy & Decoro Dr | | | | | | | | | |
| | COUNT | 1571 | 1407 | 2001 | 1099 | 1885 | 1311 | 2399 | 769 |
| | MODELED | 2099 | 1833 | 2376 | 1344 | 2462 | 1808 | 2764 | 1216 |
| | DIFF | 528 | 426 | 375 | 245 | 577 | 497 | 365 | 457 |
| | % DIFF | 34% | 30% | 19% | 22% | 31% | 38% | 15% | 60% |
| 50. McBean Pkwy & Copper Hill | | | | | | | | | |
| | COUNT | 0 | 3050 | 1515 | 2517 | 0 | 3648 | 1903 | 2127 |
| | MODELED | 0 | 2460 | 1288 | 1444 | 0 | 2775 | 1576 | 1445 |
| | DIFF | -- | -590 | -227 | -1073 | -- | -873 | -327 | -682 |
| | % DIFF | -- | -19% | -15% | -43% | -- | -24% | -17% | -32% |
| 51. Wiley Cyn & Lyons | | | | | | | | | |
| | COUNT | 990 | 1482 | 697 | 1695 | 1762 | 2737 | 1384 | 2985 |
| | MODELED | 1197 | 2122 | 830 | 2529 | 1496 | 2582 | 938 | 3188 |
| | DIFF | 207 | 640 | 133 | 834 | -266 | -155 | -446 | 203 |
| | % DIFF | 21% | 43% | 19% | 49% | -15% | -6% | -32% | 7% |
| 52. Tournament & Wiley Cyn | | | | | | | | | |
| | COUNT | 403 | 821 | 40 | 996 | 626 | 1185 | 110 | 1405 |
| | MODELED | 337 | 848 | 215 | 1124 | 439 | 1114 | 236 | 1383 |
| | DIFF | -66 | 27 | 175 | 128 | -187 | -71 | 126 | -22 |
| | % DIFF | -16% | 3% | 438% | 13% | -30% | -6% | 115% | -2% |
| 53. Orchard Village & Lyons | | | | | | | | | |
| | COUNT | 946 | 1953 | 514 | 1809 | 1456 | 2655 | 729 | 2672 |
| | MODELED | 1036 | 2143 | 505 | 1816 | 1418 | 2801 | 726 | 2219 |
| | DIFF | 90 | 190 | -9 | 7 | -38 | 146 | -3 | -453 |
| | % DIFF | 10% | 9% | -2% | 0% | -3% | 5% | -0% | -17% |
| 54. Orchard Village & Wiley Cyn | | | | | | | | | |
| | COUNT | 1428 | 580 | 1289 | 827 | 2038 | 1005 | 2053 | 1066 |
| | MODELED | 1701 | 724 | 1707 | 946 | 2415 | 982 | 2223 | 1166 |
| | DIFF | 273 | 144 | 418 | 119 | 377 | -23 | 170 | 100 |
| | % DIFF | 19% | 25% | 32% | 14% | 18% | -2% | 8% | 9% |
| 55. Orchard Village & McBean | | | | | | | | | |
| | COUNT | 180 | 2390 | 2058 | 1883 | 281 | 3386 | 2617 | 2390 |
| | MODELED | 0 | 1990 | 1980 | 1940 | 0 | 3017 | 2589 | 2624 |
| | DIFF | -180 | -400 | -78 | 57 | -281 | -369 | -28 | 234 |
| | % DIFF | -100% | -17% | -4% | 3% | -100% | -11% | -1% | 10% |

Table D-2 (cont.)

SCVCTN 2004 - TWO-WAY PEAK HOUR VOLUME STATISTICAL SUMMARY

| LOCATION | | AM PEAK HOUR NORTH LEG | AM PEAK HOUR EAST LEG | AM PEAK HOUR SOUTH LEG | AM PEAK HOUR WEST LEG | PM PEAK HOUR NORTH LEG | PM PEAK HOUR EAST LEG | PM PEAK HOUR SOUTH LEG | PM PEAK HOUR WEST LEG |
|---|---|---|---|---|---|---|---|---|---|
| 57. Valencia & Magic Mtn | | | | | | | | | |
| | COUNT | 2954 | 1015 | 2762 | 1213 | 3596 | 1338 | 3083 | 1693 |
| | MODELED | 2535 | 1419 | 2495 | 1293 | 3660 | 1917 | 3034 | 2105 |
| | DIFF | -419 | 404 | -267 | 80 | 64 | 579 | -49 | 412 |
| | % DIFF | -14% | 40% | -10% | 7% | 2% | 43% | -2% | 24% |
| 59. Valencia & Cinema | | | | | | | | | |
| | COUNT | 2771 | 197 | 2862 | 0 | 3455 | 687 | 3872 | 0 |
| | MODELED | 2843 | 151 | 2954 | 0 | 3521 | 540 | 3944 | 1 |
| | DIFF | 72 | -46 | 92 | -- | 66 | -147 | 72 | -- |
| | % DIFF | 3% | -23% | 3% | -- | 2% | -21% | 2% | -- |
| 65. Bouquet & Soledad | | | | | | | | | |
| | COUNT | 4326 | 3724 | 2815 | 3345 | 5045 | 5172 | 3317 | 4204 |
| | MODELED | 4148 | 3887 | 2534 | 2851 | 5166 | 4731 | 3228 | 3573 |
| | DIFF | -178 | 163 | -281 | -494 | 121 | -441 | -89 | -631 |
| | % DIFF | -4% | 4% | -10% | -15% | 2% | -9% | -3% | -15% |
| 66. Bouquet & Newhall Ranch | | | | | | | | | |
| | COUNT | 4036 | 463 | 4625 | 2692 | 5165 | 1047 | 5176 | 3134 |
| | MODELED | 4076 | 71 | 4110 | 2499 | 4604 | 354 | 5137 | 2753 |
| | DIFF | 40 | -392 | -515 | -193 | -561 | -693 | -39 | -381 |
| | % DIFF | 1% | -85% | -11% | -7% | -11% | -66% | -1% | -12% |
| 80. Wolcott & SR-125 | | | | | | | | | |
| | COUNT | 22 | 1399 | 9 | 1418 | 26 | 2037 | 0 | 2059 |
| | MODELED | 20 | 1534 | 0 | 1554 | 59 | 1918 | 0 | 1879 |
| | DIFF | -2 | 135 | -9 | 136 | 33 | -119 | -- | -180 |
| | % DIFF | -9% | 10% | -100% | 10% | 127% | -6% | -- | -9% |
| 89. Old Road & SR-126 WB Ramps | | | | | | | | | |
| | COUNT | 698 | 0 | 918 | 230 | 1063 | 0 | 1211 | 184 |
| | MODELED | 718 | 0 | 898 | 220 | 903 | 0 | 898 | 5 |
| | DIFF | 20 | -- | -20 | -10 | -160 | -- | -313 | -179 |
| | % DIFF | 3% | -- | -2% | -4% | -15% | -- | -26% | -97% |
| 91. Old Road & Hasley Cyn | | | | | | | | | |
| | COUNT | 1483 | 1793 | 1064 | 1310 | 1339 | 1652 | 1065 | 1052 |
| | MODELED | 1303 | 2069 | 726 | 1646 | 1390 | 1936 | 980 | 1342 |
| | DIFF | -180 | 276 | -338 | 336 | 51 | 284 | -85 | 280 |
| | % DIFF | -12% | 15% | -32% | 26% | 4% | 15% | -8% | 26% |
| 94. Commerce Center & SR-126 | | | | | | | | | |
| | COUNT | 1184 | 2273 | 315 | 1412 | 1061 | 2613 | 337 | 1913 |
| | MODELED | 1384 | 2183 | 570 | 1621 | 1462 | 2674 | 551 | 2093 |
| | DIFF | 200 | -90 | 255 | 209 | 401 | 61 | 214 | 180 |
| | % DIFF | 17% | -4% | 81% | 15% | 38% | 2% | 64% | 9% |
| 95. The Old Rd & Seaona Way | | | | | | | | | |
| | COUNT | 1291 | 0 | 1483 | 444 | 1156 | 0 | 1339 | 307 |
| | MODELED | 1209 | 0 | 1302 | 131 | 1128 | 0 | 1391 | 309 |
| | DIFF | -82 | -- | -181 | -313 | -28 | -- | 52 | 2 |
| | % DIFF | -6% | -- | -12% | -70% | -2% | -- | 4% | 1% |

Table D-2 (cont.)

SCVCTM 2004 - TWO-WAY PEAK HOUR VOLUME STATISTICAL SUMMARY

| LOCATION | | AM PEAK HOUR NORTH LEG | AM PEAK HOUR EAST LEG | AM PEAK HOUR SOUTH LEG | AM PEAK HOUR WEST LEG | PM PEAK HOUR NORTH LEG | PM PEAK HOUR EAST LEG | PM PEAK HOUR SOUTH LEG | PM PEAK HOUR WEST LEG |
|---|---|---|---|---|---|---|---|---|---|
| 96. San Martinez Cyn & SR-126 | | | | | | | | | |
| | COUNT | 8 | 1314 | 0 | 1312 | 15 | 1884 | 0 | 1873 |
| | MODELED | 0 | 1550 | 0 | 1550 | 0 | 1790 | 0 | 1790 |
| | DIFF | -8 | 236 | -- | 238 | -15 | -94 | -- | -83 |
| | % DIFF | -100% | 18% | -- | 18% | -100% | -5% | -- | -4% |
| 110. Chiquito Cyn & SR-126 | | | | | | | | | |
| | COUNT | 111 | 1470 | 7 | 1398 | 159 | 1998 | 1 | 1886 |
| | MODELED | 18 | 1536 | 0 | 1550 | 20 | 1778 | 0 | 1790 |
| | DIFF | -93 | 66 | -7 | 152 | -139 | -220 | -1 | -96 |
| | % DIFF | -84% | 4% | -100% | 11% | -87% | -11% | -100% | -5% |
| 117. SR-126 EB Ramp & Henry Mayo | | | | | | | | | |
| | COUNT | 26 | 242 | 0 | 230 | 62 | 346 | 0 | 316 |
| | MODELED | 0 | 569 | 0 | 569 | 128 | 679 | 0 | 551 |
| | DIFF | -26 | 327 | -- | 339 | 66 | 333 | -- | 235 |
| | % DIFF | -100% | 135% | -- | 147% | 106% | 96% | -- | 74% |
| 148. SR-14 NB & Via Princessa | | | | | | | | | |
| | COUNT | 367 | 655 | 422 | 1184 | 553 | 509 | 977 | 1701 |
| | MODELED | 217 | 550 | 520 | 1087 | 772 | 475 | 1122 | 1972 |
| | DIFF | -150 | -105 | 98 | -97 | 219 | -34 | 144 | 271 |
| | % DIFF | -41% | -16% | 23% | -8% | 40% | -7% | 15% | 16% |
| 149. SR-14 SB & Via Princessa | | | | | | | | | |
| | COUNT | 479 | 1184 | 913 | 2226 | 384 | 1721 | 542 | 2523 |
| | MODELED | 486 | 1087 | 1580 | 2603 | 571 | 1971 | 800 | 3138 |
| | DIFF | 7 | -97 | 667 | 377 | 187 | 250 | 258 | 615 |
| | % DIFF | 1% | -8% | 73% | 17% | 49% | 15% | 48% | 24% |
| 151. Sand Cyn & SR-14 NB Ramps | | | | | | | | | |
| | COUNT | 1436 | 237 | 1496 | 469 | 2168 | 535 | 1933 | 1267 |
| | MODELED | 1779 | 241 | 1583 | 601 | 2697 | 699 | 1974 | 1764 |
| | DIFF | 343 | 4 | 87 | 132 | 529 | 163 | 41 | 497 |
| | % DIFF | 24% | 2% | 6% | 28% | 24% | 30% | 2% | 39% |
| 152. SR-14 SB Rmps & Soledad Cyn | | | | | | | | | |
| | COUNT | 0 | 1709 | 1159 | 2258 | 0 | 1842 | 795 | 2341 |
| | MODELED | 0 | 1774 | 2312 | 2804 | 0 | 1503 | 1426 | 2497 |
| | DIFF | -- | 65 | 1153 | 546 | -- | -339 | 631 | 156 |
| | % DIFF | -- | 4% | 99% | 24% | -- | -18% | 79% | 7% |
| 153. Sand Cyn & Soledad Cyn | | | | | | | | | |
| | COUNT | 523 | 2168 | 1558 | 2103 | 668 | 2211 | 1828 | 2067 |
| | MODELED | 681 | 2805 | 1735 | 2187 | 822 | 2497 | 2497 | 2132 |
| | DIFF | 158 | 637 | 179 | 84 | 154 | 286 | 669 | 65 |
| | % DIFF | 30% | 29% | 12% | 4% | 23% | 13% | 37% | 3% |
| 170. Sierra Hwy & Via Princessa | | | | | | | | | |
| | COUNT | 1946 | 2047 | 2316 | 3163 | 2780 | 2640 | 2480 | 3482 |
| | MODELED | 1972 | 1912 | 2543 | 3391 | 2462 | 2527 | 3053 | 3672 |
| | DIFF | 26 | -135 | 227 | 228 | -318 | -113 | 573 | 190 |
| | % DIFF | 1% | -7% | 10% | 7% | -11% | -4% | 23% | 5% |

Table D-2 (cont.)

SCVCTM 2004 - TWO-WAY PEAK HOUR VOLUME STATISTICAL SUMMARY

| LOCATION | | AM PEAK HOUR NORTH LEG | AM PEAK HOUR EAST LEG | AM PEAK HOUR SOUTH LEG | AM PEAK HOUR WEST LEG | PM PEAK HOUR NORTH LEG | PM PEAK HOUR EAST LEG | PM PEAK HOUR SOUTH LEG | PM PEAK HOUR WEST LEG |
|---|---|---|---|---|---|---|---|---|---|
| 171. Whites Cyn & Via Princessa | | | | | | | | | |
| | COUNT | 1874 | 2389 | 1397 | 0 | 2896 | 3602 | 1586 | 0 |
| | MODELED | 1859 | 2272 | 641 | 0 | 2399 | 2999 | 698 | 0 |
| | DIFF | -15 | -117 | -756 | -- | -497 | -703 | -888 | -- |
| | % DIFF | -1% | -5% | -54% | -- | -17% | -20% | -56% | -- |
| 172. Whites Cyn & Soledad Canyon | | | | | | | | | |
| | COUNT | 2892 | 3254 | 2183 | 2827 | 3423 | 3559 | 2640 | 3652 |
| | MODELED | 3134 | 3107 | 1860 | 2821 | 3374 | 3322 | 2401 | 3705 |
| | DIFF | 242 | -147 | -323 | -6 | -49 | -237 | -239 | 53 |
| | % DIFF | 8% | -5% | -15% | -0% | -1% | -7% | -9% | 1% |
| 173. Santa Catarina/GVR & Plum | | | | | | | | | |
| | COUNT | 572 | 1445 | 30 | 1703 | 200 | 1789 | 0 | 1815 |
| | MODELED | 423 | 705 | 65 | 747 | 321 | 905 | 91 | 1005 |
| | DIFF | -149 | -740 | 35 | -955 | 121 | -884 | -- | -810 |
| | % DIFF | -26% | -51% | 117% | -56% | 61% | -49% | -- | -45% |
| 174. Bouquet Canyon & Plum Cyn | | | | | | | | | |
| | COUNT | 1532 | 2230 | 2620 | 152 | 1346 | 1788 | 2495 | 124 |
| | MODELED | 826 | 775 | 1125 | 0 | 1065 | 1006 | 1395 | 0 |
| | DIFF | -706 | -1455 | -1495 | -152 | -281 | -782 | -1101 | -124 |
| | % DIFF | -46% | -65% | -57% | -100% | -21% | -44% | -44% | -100% |
| 176. Sierra Hwy & Soledad Cyn | | | | | | | | | |
| | COUNT | 1555 | 2556 | 2134 | 3697 | 2029 | 2921 | 2331 | 3699 |
| | MODELED | 1380 | 2751 | 2663 | 3918 | 1849 | 3356 | 3193 | 4728 |
| | DIFF | -175 | 195 | 529 | 221 | -180 | 435 | 862 | 1029 |
| | % DIFF | -11% | 8% | 25% | 6% | -9% | 15% | 37% | 28% |
| 177. SR-14 SB On & Via Princessa | | | | | | | | | |
| | COUNT | 869 | 3163 | 0 | 2294 | 383 | 3482 | 0 | 3099 |
| | MODELED | 940 | 3393 | 0 | 2453 | 431 | 3669 | 0 | 3238 |
| | DIFF | 71 | 230 | -- | 159 | 48 | 187 | -- | 139 |
| | % DIFF | 8% | 7% | -- | 7% | 13% | 5% | -- | 4% |
| 178. Sierra Hwy & SR-14 NB Off | | | | | | | | | |
| | COUNT | 2158 | 443 | 1951 | 86 | 2904 | 1333 | 2785 | 142 |
| | MODELED | 2419 | 490 | 1971 | 0 | 2813 | 1433 | 2462 | 0 |
| | DIFF | 261 | 47 | 20 | -86 | -91 | 100 | -323 | -142 |
| | % DIFF | 12% | 11% | 1% | -100% | -3% | 8% | -12% | -100% |
| 180. Old Road & Sloan/Lake Hughes | | | | | | | | | |
| | COUNT | 614 | 609 | 317 | 118 | 720 | 949 | 341 | 158 |
| | MODELED | 454 | 501 | 92 | 17 | 697 | 778 | 111 | 36 |
| | DIFF | -160 | -108 | -225 | -101 | -23 | -171 | -230 | -122 |
| | % DIFF | -26% | -18% | -71% | -86% | -3% | -18% | -67% | -77% |
| 181. Old Road & Parker | | | | | | | | | |
| | COUNT | 284 | 455 | 628 | 467 | 350 | 691 | 597 | 468 |
| | MODELED | 92 | 456 | 182 | 376 | 111 | 543 | 185 | 499 |
| | DIFF | -192 | 1 | -446 | -91 | -239 | -148 | -412 | 31 |
| | % DIFF | -68% | 0% | -71% | -19% | -68% | -21% | -69% | 7% |

Table D-2 (cont.)

SCVCTM 2004 - TWO-WAY PEAK HOUR VOLUME STATISTICAL SUMMARY

| LOCATION | | AM PEAK HOUR | | | | PM PEAK HOUR | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | NORTH LEG | EAST LEG | SOUTH LEG | WEST LEG | NORTH LEG | EAST LEG | SOUTH LEG | WEST LEG |
| 182. Castaic & Lake Hughes | | | | | | | | | |
| | COUNT | 515 | 353 | 277 | 823 | 976 | 488 | 570 | 1244 |
| | MODELED | 244 | 364 | 50 | 602 | 858 | 120 | 160 | 868 |
| | DIFF | -271 | 11 | -227 | -221 | -118 | -368 | -410 | -376 |
| | % DIFF | -53% | 3% | -82% | -27% | -12% | -75% | -72% | -29% |
| 183. Ridge Route & Lake Hughes | | | | | | | | | |
| | COUNT | 636 | 93 | 359 | 460 | 274 | 116 | 248 | 238 |
| | MODELED | 419 | 220 | 276 | 371 | 89 | 233 | 203 | 141 |
| | DIFF | -217 | 127 | -83 | -89 | -185 | 117 | -45 | -97 |
| | % DIFF | -34% | 137% | -23% | -19% | -68% | 101% | -18% | -41% |
| 184. Castaic & Ridge Route | | | | | | | | | |
| | COUNT | 313 | 448 | 140 | 711 | 536 | 403 | 335 | 934 |
| | MODELED | 184 | 424 | 372 | 838 | 364 | 401 | 499 | 1030 |
| | DIFF | -129 | -24 | 232 | 127 | -172 | -2 | 164 | 96 |
| | % DIFF | -41% | -5% | 166% | 18% | -32% | -0% | 49% | 10% |
| 191. Sierra Hwy & Sand Cyn | | | | | | | | | |
| | COUNT | 1009 | 359 | 822 | 0 | 809 | 325 | 808 | 0 |
| | MODELED | 576 | 464 | 254 | 14 | 713 | 657 | 303 | 19 |
| | DIFF | -433 | 105 | -568 | -- | 96 | 332 | -505 | -- |
| | % DIFF | -43% | 29% | -69% | -- | -12% | 102% | -63% | -- |
| 194. Shadow Pines & Soledad Cyn | | | | | | | | | |
| | COUNT | 607 | 402 | 0 | 723 | 695 | 469 | 0 | 845 |
| | MODELED | 749 | 1035 | 0 | 968 | 955 | 927 | 0 | 655 |
| | DIFF | 142 | 633 | -- | 245 | 260 | 458 | -- | -190 |
| | % DIFF | 23% | 157% | -- | 34% | 37% | 98% | -- | -22% |
| 195. Soledad Cyn & SR-14 SB | | | | | | | | | |
| | COUNT | 379 | 82 | 302 | 225 | 446 | 87 | 323 | 64 |
| | MODELED | 1033 | 268 | 612 | 263 | 927 | 113 | 672 | 248 |
| | DIFF | 654 | 186 | 310 | 38 | 481 | 26 | 349 | 184 |
| | % DIFF | 173% | 227% | 103% | 17% | 108% | 30% | 108% | 288% |
| 196. Soledad Cyn & SR-14 NB | | | | | | | | | |
| | COUNT | 260 | 56 | 169 | 96 | 332 | 84 | 194 | 230 |
| | MODELED | 613 | 301 | 218 | 142 | 671 | 199 | 247 | 363 |
| | DIFF | 353 | 245 | 49 | 47 | 339 | 115 | 53 | 133 |
| | % DIFF | 136% | 438% | 29% | 49% | 102% | 137% | 27% | 58% |
| 205. Cambridge & Hasley Cyn | | | | | | | | | |
| | COUNT | 417 | 1316 | 373 | 1020 | 267 | 1062 | 221 | 796 |
| | MODELED | 419 | 1644 | 248 | 1429 | 446 | 1345 | 114 | 1203 |
| | DIFF | 2 | 334 | -125 | 409 | 179 | 283 | -107 | 407 |
| | % DIFF | 0% | 25% | -34% | 40% | 67% | 27% | -48% | 51% |
| 301. Mall Entrance & Valencia | | | | | | | | | |
| | COUNT | 144 | 2590 | 254 | 2630 | 412 | 3527 | 373 | 3620 |
| | MODELED | 205 | 2496 | 166 | 2701 | 529 | 3057 | 374 | 3502 |
| | DIFF | 61 | -94 | -88 | 71 | 117 | -470 | 1 | -118 |
| | % DIFF | 42% | -4% | -35% | 3% | 28% | -13% | 0% | -3% |

Table D-2 (cont.)

SCVCTM 2004 - TWO-WAY PEAK HOUR VOLUME STATISTICAL SUMMARY

| LOCATION | AM PEAK HOUR NORTH LEG | AM PEAK HOUR EAST LEG | AM PEAK HOUR SOUTH LEG | AM PEAK HOUR WEST LEG | PM PEAK HOUR NORTH LEG | PM PEAK HOUR EAST LEG | PM PEAK HOUR SOUTH LEG | PM PEAK HOUR WEST LEG |
|---|---|---|---|---|---|---|---|---|
| 303. Auto Center & Magic Mtn | | | | | | | | |
| COUNT | 212 | 1252 | 236 | 1108 | 619 | 1797 | 532 | 1682 |
| MODELED | 232 | 1217 | 164 | 1163 | 462 | 1581 | 326 | 1637 |
| DIFF | 20 | -35 | -72 | 55 | -157 | -216 | -206 | -45 |
| % DIFF | 9% | -3% | -31% | 5% | -25% | -12% | -39% | -3% |
| 304. Citrus & Magic Mtn | | | | | | | | |
| COUNT | 0 | 1207 | 223 | 1252 | 0 | 1773 | 620 | 1797 |
| MODELED | 0 | 1292 | 231 | 1217 | 0 | 2103 | 805 | 1578 |
| DIFF | -- | 85 | 8 | -35 | -- | 330 | 185 | -219 |
| % DIFF | -- | 7% | 4% | -3% | -- | 19% | 30% | -12% |
| 322. McBean & So Mall Entrance | | | | | | | | |
| COUNT | 2962 | 163 | 3089 | 117 | 3791 | 607 | 3942 | 146 |
| MODELED | 3111 | 87 | 3024 | 0 | 4000 | 684 | 3902 | 0 |
| DIFF | 149 | -73 | -65 | -117 | 209 | 77 | -40 | -146 |
| % DIFF | 5% | -46% | -2% | -100% | 6% | 13% | -1% | -100% |
| 323. Citrus & Valencia | | | | | | | | |
| COUNT | 238 | 2550 | 186 | 2590 | 641 | 3299 | 493 | 3527 |
| MODELED | 145 | 2331 | 28 | 2494 | 223 | 2686 | 162 | 3057 |
| DIFF | -93 | -219 | -158 | -96 | -418 | -613 | -331 | -470 |
| % DIFF | -39% | -9% | -85% | -4% | -65% | -19% | -67% | -13% |
| 324. Chiquella & Pico Cyn | | | | | | | | |
| COUNT | 0 | 2785 | 540 | 2529 | 0 | 3298 | 640 | 2942 |
| MODELED | 0 | 2918 | 597 | 2501 | 0 | 3455 | 540 | 2915 |
| DIFF | -- | 133 | 57 | -28 | -- | 157 | -100 | -27 |
| % DIFF | -- | 5% | 11% | -1% | -- | 5% | -16% | -1% |
| 325. Marriott Wy & The Old Rd | | | | | | | | |
| COUNT | 98 | 502 | 0 | 456 | 213 | 965 | 0 | 887 |
| MODELED | 0 | 85 | 0 | 85 | 88 | 755 | 0 | 667 |
| DIFF | -98 | -417 | -- | -371 | -125 | -211 | -- | -220 |
| % DIFF | -100% | -83% | -- | -81% | -59% | -22% | -- | -25% |
| 326. Chiquella & The Old Rd | | | | | | | | |
| COUNT | 167 | 493 | 0 | 440 | 360 | 937 | 0 | 869 |
| MODELED | 597 | 682 | 0 | 85 | 540 | 1295 | 0 | 755 |
| DIFF | 430 | 189 | -- | -355 | 180 | 358 | -- | -114 |
| % DIFF | 257% | 38% | -- | -81% | 50% | 38% | -- | -13% |
| 327. Wiley Cyn & Calgrove | | | | | | | | |
| COUNT | 835 | 186 | 11 | 910 | 899 | 358 | 20 | 941 |
| MODELED | 760 | 170 | 0 | 930 | 810 | 216 | 0 | 1026 |
| DIFF | -75 | -16 | -11 | 20 | -89 | -142 | -20 | 86 |
| % DIFF | -9% | -9% | -100% | 2% | -10% | -40% | -100% | 9% |

AM SAMPLE SIZE = 326
AVERAGE COUNT = 1311 AVERAGE MODELED = 1330
AVERAGE DIFFERENCE = 19
STANDARD DEVIATION = 305.9

PM SAMPLE SIZE= 324
AVERAGE COUNT = 1584 AVERAGE MODELED = 1593
AVERAGE DIFFERENCE = 9
STANDARD DEVIATION = 303.0

Table D-3

SCVCTM 2004 - PEAK HOUR ICU STATISTICAL SUMMARY

| LOCATION | AM PEAK HOUR COUNT | AM PEAK HOUR MODELED | AM PEAK HOUR DIFFERENCE | PM PEAK HOUR COUNT | PM PEAK HOUR MODELED | PM PEAK HOUR DIFFERENCE |
|---|---|---|---|---|---|---|
| 1. Old Road & I-5 SB Ramps | .33 | .32 | -.01 | .37 | .40 | .03 |
| 2. I-5 NB Ramps & Lake Hughes | .27 | .25 | -.02 | .47 | .39 | -.08 |
| 3. I-5 SB Ramps & Parker | .61 | .63 | .02 | .65 | .63 | -.02 |
| 4. I-5 NB Ramps & Ridge Route | .40 | .43 | .03 | .46 | .52 | .06 |
| 5. I-5 SB & Hasley Cyn | .45 | .65 | .20 | .54 | .57 | .03 |
| 6. I-5 NB & Hasley Cyn | .51 | .68 | .17 | .66 | .72 | .06 |
| 7. I-5 SB Ramps & SR-126 | .37 | .37 | .00 | .33 | .32 | -.01 |
| 8. I-5 NB Ramps & SR-126 | .65 | .80 | .15 | .71 | .77 | .06 |
| 9. The Old Rd & I-5 SB Ramps | .46 | .50 | .04 | .52 | .51 | -.01 |
| 10. I-5 SB Ramps & Magic Mtn | .51 | .61 | .10 | .48 | .50 | .02 |
| 11. I-5 NB Ramps & Magic Mtn | .68 | .71 | .03 | .69 | .67 | -.02 |
| 12. I-5 SB Ramps & Valencia | .37 | .30 | -.07 | .43 | .45 | .02 |
| 13. I-5 NB Ramps & Valencia | .48 | .45 | -.03 | .48 | .49 | .01 |
| 14. I-5 SB Ramps & Stevenson Rch | .37 | .43 | .06 | .59 | .65 | .06 |
| 15. I-5 NB Ramps & McBean | .34 | .42 | .08 | .54 | .63 | .09 |
| 16. I-5 SB/Marriott & Pico/Lyons | .53 | .45 | -.08 | .60 | .62 | .02 |
| 17. I-5 NB On/Off & Lyons Ave | .53 | .65 | .12 | .70 | .75 | .05 |
| 18. I-5 SB Ramps & Calgrove | .47 | .69 | .22 | .64 | .55 | -.09 |
| 19. I-5 NB Ramps & Calgrove | .64 | .77 | .13 | .50 | .53 | .03 |
| 20. I-5 SB On Ramp & Pico/Lyons | .35 | .39 | .04 | .46 | .44 | -.02 |
| 21. The Old Rd & Calgrove Blvd | .40 | .26 | -.14 | .45 | .35 | -.10 |
| 25. The Old Rd & Rye Canyon | 1.10 | 1.05 | -.05 | 1.10 | 1.01 | -.09 |
| 26. The Old Rd & Magic Mountain | .70 | .63 | -.07 | .69 | .71 | .02 |
| 27. The Old Rd & Valencia | .28 | 32 | .04 | .39 | .48 | .09 |
| 29. The Old Rd & Pico Canyon | .51 | .39 | -.12 | .56 | .54 | -.02 |
| 30. Ave Stanford & Rye Canyon | .61 | .55 | -.06 | .80 | .74 | -.06 |
| 32. Ave Scott & Rye Canyon | .70 | .63 | -.07 | .71 | .68 | -.03 |
| 33. Rye/Copper Hill & NRR | .59 | .56 | -.03 | .58 | .46 | -.12 |
| 35. Copper Hill & Decoro | .58 | .54 | -.04 | .49 | .44 | -.05 |
| 36. Tourney & Valencia | .50 | .55 | .05 | .47 | .49 | .02 |
| 37. Tourney & Magic Mountain | .43 | .51 | .08 | .57 | .60 | .03 |
| 39. Ave Tibbits/Dickason & NRR | .40 | .36 | -.04 | .36 | .46 | .10 |
| 41. Dickason & Decoro | .37 | .34 | -.03 | .25 | .35 | .10 |
| 44. McBean & Valencia | .61 | .70 | .09 | .72 | .76 | .04 |
| 45. McBean & Magic Mtn | .55 | .64 | .09 | .88 | .89 | .01 |
| 47. McBean & Scott/Bridgeport | .68 | .77 | .09 | .57 | .56 | -.01 |
| 48. McBean & Newhall Ranch | .65 | .74 | .09 | .72 | .77 | .05 |
| 49. McBean Pkwy & Decoro Dr | .54 | .59 | .05 | .50 | .61 | .11 |
| 50. McBean Pkwy & Copper Hill | .62 | .54 | -.08 | .80 | .60 | -.20 |
| 51. Wiley Cyn & Lyons | .43 | .63 | .20 | .74 | .64 | -.10 |
| 52. Tournament & Wiley Cyn | .37 | .43 | .06 | .45 | .37 | -.08 |
| 53. Orchard Village & Lyons | .49 | .48 | -.01 | .60 | .61 | .01 |
| 54. Orchard Village & Wiley Cyn | .38 | .49 | .11 | .57 | .61 | .04 |
| 55. Orchard Village & McBean | .57 | .50 | -.07 | .78 | .73 | -.05 |
| 57. Valencia & Magic Mtn | .62 | .62 | .00 | .72 | .87 | .15 |
| 59. Valencia & Cinema | .53 | .56 | .03 | .73 | .73 | .00 |
| 65. Bouquet & Soledad | .78 | .70 | -.08 | .99 | 1.02 | .03 |
| 66. Bouquet & Newhall Ranch | .87 | .83 | -.04 | .85 | .71 | -.14 |
| 80. Wolcott & SR-126 | .32 | .34 | .02 | .39 | .38 | -.01 |

Table D-3 (cont.)

SCVCTM 2004 - PEAK HOUR ICU STATISTICAL SUMMARY

| LOCATION | AM PEAK HOUR COUNT | AM PEAK HOUR MODELED | AM PEAK HOUR DIFFERENCE | PM PEAK HOUR COUNT | PM PEAK HOUR MODELED | PM PEAK HOUR DIFFERENCE |
|---|---|---|---|---|---|---|
| 89. Old Road & SR-126 WB Ramps | .31 | .32 | .01 | .30 | .25 | -.05 |
| 91. Old Road & Hasley Cyn | .70 | .67 | -.03 | .63 | .66 | .03 |
| 94. Commerce Center & SR-126 | .47 | .61 | .14 | .60 | .66 | .06 |
| 95. The Old Rd & Sedona Way | .57 | .39 | -.18 | .37 | .40 | .03 |
| 96. San Martinez Cyn & SR-126 | .29 | .33 | .04 | .38 | .37 | -.01 |
| 110. Chiquito Cyn & SR-126 | .34 | .33 | -.01 | .41 | .37 | -.04 |
| 117. SR-126 EB Ramp & Henry Mayo | .18 | .34 | .16 | .20 | .35 | .15 |
| 148. SR-14 NB & Via Princessa | .46 | .42 | -.04 | .68 | .87 | .19 |
| 149. SR-14 SB & Via Princessa | .64 | 1.02 | .38 | .49 | .61 | .12 |
| 151. Sand Cyn & SR-14 NB Ramps | .39 | .59 | .20 | .66 | .92 | .26 |
| 152. SR-14 SB Rmps & Soledad Cyn | .54 | 1.00 | .46 | .59 | .65 | .06 |
| 153. Sand Cyn & Soledad Cyn | .64 | .69 | .05 | .67 | .72 | .05 |
| 170. Sierra Hwy & Via Princessa | .59 | .65 | .06 | .62 | .74 | .12 |
| 171. Whites Cyn & Via Princessa | .50 | .47 | -.03 | .63 | .48 | -.15 |
| 172. Whites Cyn & Soledad Canyon | .86 | .84 | -.02 | .92 | .87 | -.05 |
| 173. Santa Catarina/GVR & Plum | .71 | .39 | -.32 | .66 | .45 | -.21 |
| 174. Bouquet Canyon & Plum Cyn | .69 | .33 | -.36 | .58 | .38 | -.20 |
| 176. Sierra Hwy & Soledad Cyn | .70 | .80 | .10 | .85 | .93 | .08 |
| 177. SR-14 SB On & Via Princessa | .37 | .36 | -.01 | .46 | .45 | -.01 |
| 178. Sierra Hwy & SR-14 NB Off | .46 | .44 | -.02 | .54 | .43 | -.11 |
| 180. Old Road & Sloan/Lake Hughe | .27 | .23 | -.04 | .33 | .35 | .02 |
| 181. Old Road & Parker | .43 | .33 | -.10 | .53 | .35 | -.18 |
| 182. Castaic & Lake Hughes | .30 | .26 | -.02 | .37 | .30 | -.07 |
| 183. Ridge Route & Lake Hughes | .29 | .20 | -.09 | .18 | .15 | -.03 |
| 184. Castaic & Ridge Route | .29 | .30 | .01 | .38 | .37 | -.01 |
| 191. Sierra Hwy & Sand Cyn | .47 | .39 | -.08 | .45 | .50 | .05 |
| 194. Shadow Pines & Soledad Cyn | .27 | .35 | .08 | .35 | .43 | .08 |
| 195. Soledad Cyn & SR-14 SB | .19 | .25 | .06 | .15 | .20 | .05 |
| 196. Soledad Cyn & SR-14 NB | .24 | .41 | .17 | .26 | .45 | .19 |
| 295. Cambridge & Hasley Cyn | .46 | .55 | .09 | .34 | .33 | -.01 |
| 301. Mall Entrance & Valencia | .40 | .48 | .08 | .54 | .61 | .07 |
| 303. Auto Center & Magic Mtn | .28 | .28 | .00 | .45 | .41 | -.04 |
| 304. Citrus & Magic Mtn | .36 | .33 | -.03 | .48 | .54 | .06 |
| 322. McBean & So Mall Entrance | .38 | .42 | .04 | .59 | .71 | .12 |
| 323. Citrus & Valencia | .48 | .47 | -.01 | .65 | .48 | -.17 |
| 324. Chiquella & Pico Cyn | .47 | .49 | .02 | .52 | .43 | -.09 |
| 325. Marriott Wy & The Old Rd | .32 | .13 | -.19 | .50 | .36 | -.14 |
| 326. Chiquella & The Old Rd | .32 | .47 | .15 | .58 | .57 | -.01 |
| 327. Wiley Cyn & Calgrove | .48 | .45 | -.03 | .51 | .47 | -.04 |

AM SAMPLE SIZE = 88
AVERAGE COUNT = .48 AVERAGE MODELED = .50
AVERAGE DIFFERENCE = .02
STANDARD DEVIATION = .12

PM SAMPLE SIZE= 88
AVERAGE COUNT = .55 AVERAGE MODELED = .55
AVERAGE DIFFERENCE = .00
STANDARD DEVIATION = .09

# Appendix E
# LAND USE SUMMARIES

A zone map for the SCVCTM is shown in Figure E-1. The model system has a total of 455 internal zones and 12 cordon zones.

Table E-1 lists the 2004 and long-range General Plan land use data by traffic zone as used in the corresponding versions of the SCVCTM described in this report.

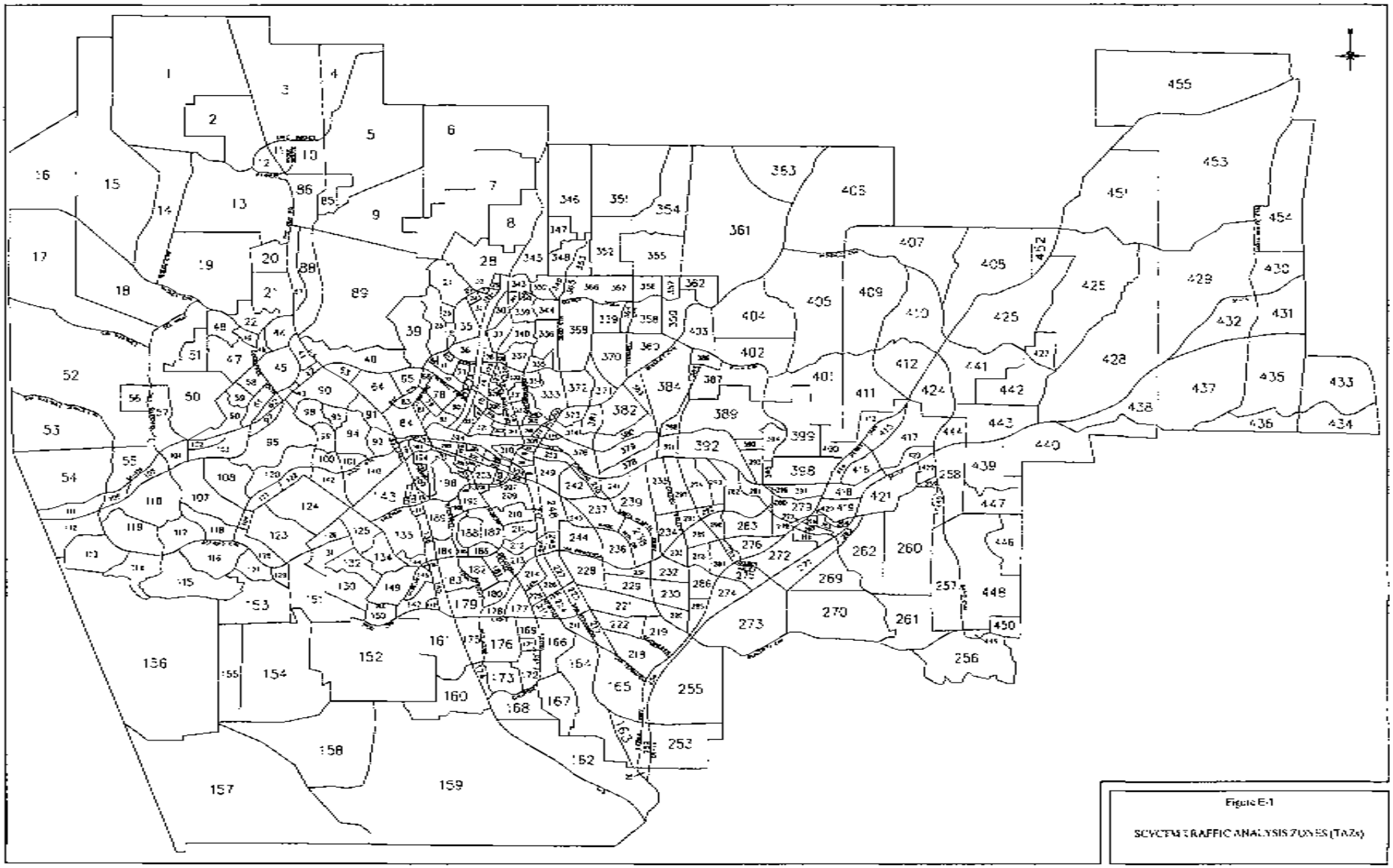


Figure E-1

SCVCEM TRAFFIC ANALYSIS ZONES (TAZs)

Table E-1
LAND USE AND TRIP GENERATION SUMMARY

| Zone | | Land Use Category | Units | 2004 Amount | 2004 ADT | Long-Range GP Amount | Long-Range GP ADT |
|---|---|---|---|---|---|---|---|
| 1 | 2. | Single Family (1-5du/ac) | DU | 145.00 | 1,436 | 367.00 | 3,633 |
| | 3. | Single Family (6-10du/ac) | DU | 200.00 | 1,980 | 200.00 | 1,980 |
| | | SUB-TOTAL | | | 3,416 | | 5,613 |
| 2 | 2. | Single Family (1-5du/ac) | DU | 336.00 | 3,326 | 535.00 | 5,297 |
| | | SUB-TOTAL | | | 3,326 | | 5,297 |
| 3 | 2. | Single Family (1-5du/ac) | DU | 641.00 | 6,346 | 3,703.00 | 36,660 |
| | 4. | Condominium/Townhouse | DU | -- | -- | 648.00 | 5,184 |
| | 11. | Commercial Center(10-30a) | TSF | 150.00 | 8,109 | 320.00 | 17,299 |
| | 20. | Elementary/Middle School | STU | 610.00 | 885 | 3,400.00 | 4,930 |
| | 21. | High School | STU | -- | -- | 2,800.00 | 5,012 |
| | 30. | Industrial Park | TSF | -- | -- | 256.79 | 1,641 |
| | 32. | Manufacturing/Warehouse | TSF | 77.49 | 395 | 77.49 | 395 |
| | | SUB-TOTAL | | | 15,735 | | 71,021 |
| 4 | 30. | Industrial Park | TSF | -- | -- | 389.00 | 2,334 |
| | | SUB-TOTAL | | | -- | | 2,334 |
| 5 | 2. | Single Family (1-5du/ac) | DU | 1.00 | 10 | 651.00 | 6,445 |
| | 4. | Condominium/Townhouse | DU | -- | -- | 100.00 | 800 |
| | 12. | Commercial Center (<10ac) | TSF | -- | -- | 25.00 | 2,127 |
| | 13. | Commercial Shops | TSF | 2.01 | 74 | 2.91 | 74 |
| | 25. | Church | TSF | 25.00 | 233 | 25.00 | 233 |
| | | SUB-TOTAL | | | 317 | | 9,679 |
| 6 | 2. | Single Family (1-5du/ac) | DU | 10.00 | 99 | 330.00 | 3,267 |
| | 4. | Condominium/Townhouse | DU | -- | -- | 141.00 | 1,128 |
| | | SUB-TOTAL | | | 99 | | 4,395 |
| 7 | 2. | Single Family (1-5du/ac) | DU | 1.00 | 10 | 321.00 | 3,178 |
| | 3. | Single Family (6-10du/ac) | DU | -- | -- | 480.00 | 4,752 |
| | 4. | Condominium/Townhouse | DU | -- | -- | 134.00 | 1,072 |
| | 20. | Elementary/Middle School | STU | -- | -- | 1,848.00 | 2,680 |
| | | SUB-TOTAL | | | 10 | | 11,682 |
| 8 | 2. | Single Family (1-5du/ac) | DU | 10.00 | 99 | 70.00 | 693 |
| | | SUB-TOTAL | | | 99 | | 693 |
| 9 | 2. | Single Family (1-5du/ac) | DU | 1.00 | 10 | 166.00 | 1,643 |
| | | SUB-TOTAL | | | 10 | | 1,643 |
| 10 | 2. | Single Family (1-5du/ac) | DU | 12.00 | 119 | 12.00 | 119 |
| | 4. | Condominium/Townhouse | DU | 184.00 | 1,472 | 184.00 | 1,472 |
| | 12. | Commercial Center (<10ac) | TSF | 20.86 | 1,774 | 20.86 | 1,774 |
| | 15. | Sit-Down Restaurant | TSF | 12.78 | 1,666 | 12.78 | 1,666 |
| | | SUB-TOTAL | | | 5,031 | | 5,031 |
| 11 | 2. | Single Family (1-5du/ac) | DU | 23.00 | 228 | 24.00 | 238 |

Table E-1 (cont.)
LAND USE AND TRIP GENERATION SUMMARY

| Zone | | Land Use Category | Units | 2004 Amount | 2004 ADT | Long-Range GP Amount | Long-Range GP ADT |
|---|---|---|---|---|---|---|---|
| 11 | 3. | Single Family (6-10du/ac) | DU | -- | -- | 84.00 | 832 |
| | 4. | Condominium/Townhouse | DU | 138.00 | 1,104 | 165.00 | 1,320 |
| | 5. | Apartment | DU | -- | -- | 72.00 | 497 |
| | 12. | Commercial Center (<10ac) | TSF | 19.46 | 1,655 | 52.76 | 4,488 |
| | 13. | Commercial Shops | TSF | 2.46 | 91 | 2.46 | 91 |
| | 15. | Sit-Down Restaurant | TSF | 7.75 | 1,010 | 7.75 | 1,010 |
| | 30. | Industrial Park | TSF | -- | -- | 41.82 | 251 |
| | 40. | Commercial Office | TSF | 1.23 | 14 | 1.23 | 14 |
| | 51. | Developed Park | AC | -- | -- | 2.00 | 5 |
| | | SUB-TOTAL | | | 4,102 | | 8,746 |
| 12 | 2. | Single Family (1-5du/ac) | DU | 213.00 | 2,109 | 213.00 | 2,109 |
| | 3. | Single Family (5-10du/ac) | DU | -- | -- | 39.00 | 386 |
| | 14. | Hotel | ROOM | -- | -- | 121.00 | 996 |
| | | SUB-TOTAL | | | 2,109 | | 3,491 |
| 13 | 2. | Single Family (1-5du/ac) | DU | 464.00 | 4,594 | 641.00 | 6,346 |
| | 4. | Condominium/Townhouse | DU | 54.00 | 432 | 54.00 | 432 |
| | 11. | Commercial Center(10-30a) | TSF | -- | -- | 114.56 | 6,193 |
| | 30. | Industrial Park | TSF | -- | -- | 32.93 | 198 |
| | 40. | Commercial Office | TSF | -- | -- | 21.82 | 252 |
| | | SUB-TOTAL | | | 5,026 | | 13,421 |
| 14 | 2. | Single Family (1-5du/ac) | DU | 19.00 | 188 | 291.00 | 2,881 |
| | 50. | Golf Course | AC | -- | -- | 150.00 | 1,194 |
| | | SUB-TOTAL | | | 188 | | 4,075 |
| 15 | 2. | Single Family (1-5du/ac) | DU | 78.00 | 772 | 294.00 | 2,911 |
| | | SUB-TOTAL | | | 772 | | 2,911 |
| 16 | 2. | Single Family (1-5du/ac) | DU | -- | -- | 14.00 | 139 |
| | | SUB-TOTAL | | | -- | | 139 |
| 17 | 2. | Single Family (1-5du/ac) | DU | 146.00 | 1,445 | 248.00 | 2,455 |
| | | SUB-TOTAL | | | 1,445 | | 2,455 |
| 18 | 2. | Single Family (1-5du/ac) | DU | 75.00 | 743 | 230.00 | 2,277 |
| | 6. | Mobile Home | DU | 113.00 | 780 | 113.00 | 780 |
| | | SUB-TOTAL | | | 1,523 | | 3,057 |
| 19 | 2. | Single Family (1-5du/ac) | DU | 1,306.00 | 12,929 | 1,577.00 | 15,612 |
| | 20. | Elementary/Middle School | STU | 2,205.00 | 3,198 | 2,205.00 | 3,198 |
| | 50. | Golf Course | AC | -- | -- | 150.00 | 1,194 |
| | | SUB-TOTAL | | | 16,127 | | 20,004 |
| 20 | 2. | Single Family (1-5du/ac) | DU | 245.00 | 2,425 | 245.00 | 2,426 |
| | 4. | Condominium/Townhouse | DU | 136.00 | 1,088 | 136.00 | 1,088 |
| | 30. | Industrial Park | TSF | 50.00 | 300 | 174.00 | 1,044 |
| | | SUB-TOTAL | | | 3,814 | | 4,558 |

Table E-1 (cont.)
LAND USE AND TRIP GENERATION SUMMARY

| Zone | | Land Use Category | Units | 2004 Amount | 2004 ADT | Long-Range GP Amount | Long-Range GP ADT |
|---|---|---|---|---|---|---|---|
| 21 | 2. | Single Family (1-5du/ac) | DU | 620.00 | 6,138 | 620.00 | 6,138 |
| | 3. | Single Family (6-10du/ac) | DU | -- | -- | 35.00 | 347 |
| | 12. | Commercial Center (<10ac) | TSF | -- | -- | 70.00 | 5,954 |
| | | SUB-TOTAL | | | 6,138 | | 12,439 |
| 22 | 2. | Single Family (1-5du/ac) | DU | 350.00 | 3,465 | 350.00 | 3,465 |
| | | SUB-TOTAL | | | 3,465 | | 3,465 |
| 23 | 2. | Single Family (1-5du/ac) | DU | -- | -- | 373.00 | 3,693 |
| | | SUB-TOTAL | | | -- | | 3,693 |
| 24 | 2. | Single Family (1-5du/ac) | DU | -- | -- | 422.00 | 4,178 |
| | | SUB-TOTAL | | | -- | | 4,178 |
| 25 | 20. | Elementary/Middle School | STU | -- | -- | 500.00 | 725 |
| | | SUB-TOTAL | | | -- | | 725 |
| 26 | 13. | Commercial Shops | TSF | -- | -- | 72.90 | 2,702 |
| | | SUB-TOTAL | | | -- | | 2,702 |
| 27 | 5. | Apartment | DU | -- | -- | 256.00 | 1,766 |
| | | SUB-TOTAL | | | -- | | 1,766 |
| 28 | 3. | Single Family (6-10du/ac) | DU | 91.00 | 901 | 400.00 | 3,960 |
| | 4. | Condominium/Townhouse | DU | -- | -- | 457.00 | 3,656 |
| | | SUB-TOTAL | | | 901 | | 7,616 |
| 29 | 5. | Apartment | DU | -- | -- | 115.00 | 794 |
| | | SUB-TOTAL | | | -- | | 794 |
| 30 | 4. | Condominium/Townhouse | DU | -- | -- | 275.00 | 2,200 |
| | | SUB-TOTAL | | | -- | | 2,200 |
| 31 | 3. | Single Family (6-10du/ac) | DU | -- | -- | 65.00 | 644 |
| | 4. | Condominium/Townhouse | DU | -- | -- | 200.00 | 1,600 |
| | 20. | Elementary/Middle School | STU | 800.00 | 1,160 | 1,500.00 | 2,175 |
| | | SUB-TOTAL | | | 1,160 | | 4,419 |
| 32 | 4. | Condominium/Townhouse | DU | -- | -- | 94.00 | 752 |
| | | SUB-TOTAL | | | -- | | 752 |
| 33 | 12. | Commercial Center (<10ac) | TSF | -- | -- | 61.00 | 5,189 |
| | | SUB-TOTAL | | | -- | | 5,189 |
| 34 | 12. | Commercial Center (<10ac) | TSF | -- | -- | 107.10 | 9,110 |
| | | SUB-TOTAL | | | -- | | 9,110 |
| 35 | 3. | Single Family (6-10du/ac) | DU | -- | -- | 616.00 | 6,098 |
| | 4. | Condominium/Townhouse | DU | -- | -- | 60.00 | 480 |
| | 5. | Apartment | DU | -- | -- | 200.00 | 1,380 |
| | | SUB-TOTAL | | | -- | | 7,958 |

Table E-1 (cont.)
LAND USE AND TRIP GENERATION SUMMARY

| Zone | | Land Use Category | Units | 2004 Amount | 2004 ADT | Long-Range GP Amount | Long-Range GP ADT |
|---|---|---|---|---|---|---|---|
| 35 | 2. | Single Family (1-5du/ac) | DU | 190.00 | 1,881 | 190.00 | 1,881 |
| | 3. | Single Family (6-10du/ac) | DU | 293.00 | 2,901 | 293.00 | 2,901 |
| | 4. | Condominium/Townhouse | DU | 268.00 | 2,144 | 268.00 | 2,144 |
| | | SUB-TOTAL | | | 6,926 | | 6,926 |
| 37 | 2. | Single Family (1-5du/ac) | DU | 212.00 | 2,099 | 212.00 | 2,099 |
| | 4. | Condominium/Townhouse | DU | 128.00 | 1,024 | 128.00 | 1,024 |
| | 25. | Church | TSF | 20.00 | 186 | 20.00 | 186 |
| | | SUB-TOTAL | | | 3,309 | | 3,309 |
| 38 | 4. | Condominium/Townhouse | DU | -- | -- | 105.00 | 840 |
| | 5. | Apartment | DU | -- | -- | 226.00 | 1,559 |
| | 12. | Commercial Center (<10ac) | TSF | -- | -- | 50.00 | 4,253 |
| | | SUB-TOTAL | | | -- | | 6,652 |
| 39 | 11. | Commercial Center(10-30a) | TSF | -- | -- | 134.00 | 7,244 |
| | 30. | Industrial Park | TSF | 35.40 | 212 | 4,016.00 | 24,096 |
| | | SUB-TOTAL | | | 212 | | 31,340 |
| 40 | 2. | Single Family (1-5du/ac) | DU | -- | -- | 45.00 | 445 |
| | 31. | Business Park | TSF | -- | -- | 116.70 | 1,190 |
| | 34. | Utilities | TSF | 10.00 | 24 | 10.00 | 24 |
| | | SUB-TOTAL | | | 24 | | 1,659 |
| 41 | 30. | Industrial Park | TSF | 91.90 | 551 | 730.00 | 4,380 |
| | | SUB-TOTAL | | | 551 | | 4,380 |
| 42 | 30. | Industrial Park | TSF | -- | -- | 275.00 | 1,650 |
| | | SUB-TOTAL | | | -- | | 1,650 |
| 43 | 30. | Industrial Park | TSF | -- | -- | 273.90 | 1,643 |
| | | SUB-TOTAL | | | -- | | 1,643 |
| 44 | 2. | Single Family (1-5du/ac) | DU | 445.00 | 4,406 | 445.00 | 4,406 |
| | 12. | Commercial Center (<10ac) | TSF | -- | -- | 25.00 | 2,127 |
| | 13. | Commercial Shops | TSF | 10.00 | 371 | 10.00 | 371 |
| | 20. | Elementary/Middle School | STU | 500.00 | 725 | 500.00 | 725 |
| | 26. | Day Care | STU | -- | -- | 80.00 | 362 |
| | | SUB-TOTAL | | | 5,502 | | 7,991 |
| 45 | 30. | Industrial Park | TSF | -- | -- | 1,960.20 | 11,761 |
| | | SUB-TOTAL | | | -- | | 11,761 |
| 46 | 13. | Commercial Shops | TSF | 77.00 | 2,854 | 77.00 | 2,854 |
| | 30. | Industrial Park | TSF | 161.65 | 970 | 445.80 | 2,675 |
| | | SUB-TOTAL | | | 3,824 | | 5,529 |
| 47 | 30. | Industrial Park | TSF | 2,403.65 | 14,422 | 4,254.10 | 25,525 |
| | | SUB-TOTAL | | | 14,422 | | 25,525 |

Table E-1
LAND USE AND TRIP GENERATION SUMMARY

| Zone | | Land Use Category | Units | 2004 Amount | 2004 ADT | Long-Range GP Amount | Long-Range GP ADT |
|---|---|---|---|---|---|---|---|
| 48 | 30. | Industrial Park | TSF | -- | -- | 720.00 | 4,320 |
| | | SUB-TOTAL | | | -- | | 4,320 |
| 49 | 30. | Industrial Park | TSF | 600.20 | 3,601 | 764.30 | 4,586 |
| | | SUB-TOTAL | | | 3,601 | | 4,586 |
| 50 | 2. | Single Family (1-5du/ac) | DU | 100.00 | 990 | 133.00 | 1,317 |
| | 58. | Landfill | SG | 10.00 | 1,000 | 20.00 | 2,000 |
| | | SUB-TOTAL | | | 1,990 | | 3,317 |
| 51 | 30. | Industrial Park | TSF | -- | -- | 1,300.00 | 7,800 |
| | | SUB-TOTAL | | | -- | | 7,800 |
| 52 | 2. | Single Family (1-5du/ac) | DU | 10.00 | 99 | 211.00 | 2,089 |
| | | SUB-TOTAL | | | 99 | | 2,089 |
| 53 | 1. | Single Family (<1du/ac) | DU | -- | -- | 250.00 | 2,475 |
| | | SUB-TOTAL | | | -- | | 2,475 |
| 54 | 2. | Single Family (1-5du/ac) | DU | -- | -- | 210.00 | 2,079 |
| | 3. | Single Family (5-10du/ac) | DU | -- | -- | 370.00 | 3,663 |
| | | SUB-TOTAL | | | -- | | 5,742 |
| 55 | 2. | Single Family (1-5du/ac) | DU | -- | -- | 100.00 | 990 |
| | 3. | Single Family (5-10du/ac) | DU | -- | -- | 330.00 | 3,267 |
| | 4. | Condominium/Townhouse | DU | -- | -- | 470.00 | 3,760 |
| | 12. | Commercial Center (<10ac) | TSF | -- | -- | 25.00 | 2,127 |
| | 51. | Developed Park | AC | -- | -- | 15.00 | 39 |
| | | SUB-TOTAL | | | -- | | 10,183 |
| 56 | 2. | Single Family (1-5du/ac) | DU | -- | -- | 60.00 | 594 |
| | | SUB-TOTAL | | | -- | | 594 |
| 57 | 12. | Commercial Center (<10ac) | TSF | -- | -- | 25.00 | 2,127 |
| | 31. | Business Park | TSF | -- | -- | 1,100.00 | 11,220 |
| | 40. | Commercial Office | TSF | -- | -- | 180.00 | 2,081 |
| | | SUB-TOTAL | | | -- | | 15,428 |
| 58 | 30. | Industrial Park | TSF | 850.20 | 5,101 | 1,051.50 | 6,309 |
| | | SUB-TOTAL | | | 5,101 | | 6,309 |
| 59 | 35. | Regional Post Office | TSF | 764.00 | 3,820 | 764.00 | 3,820 |
| | | SUB-TOTAL | | | 3,820 | | 3,820 |
| 60 | 30. | Industrial Park | TSF | -- | -- | 411.60 | 2,470 |
| | | SUB-TOTAL | | | -- | | 2,470 |
| 61 | 30. | Industrial Park | TSF | -- | -- | 744.90 | 4,469 |
| | | SUB-TOTAL | | | -- | | 4,469 |

Table E-1 (cont.)
LAND USE AND TRIP GENERATION SUMMARY

| Zone | | Land Use Category | Units | 2000 Amount | 2000 ADT | Long-Range GP Amount | Long-Range GP ADT |
|---|---|---|---|---|---|---|---|
| 62 | 30. | Industrial Park | TSF | -- | -- | 627.30 | 3,764 |
| | | SUB-TOTAL | | | -- | | 3,764 |
| 63 | 30. | Industrial Park | TSF | 250.02 | 1,500 | 575.00 | 3,450 |
| | | SUB-TOTAL | | | 1,500 | | 3,450 |
| 64 | 30. | Industrial Park | TSF | 2,742.00 | 16,452 | 3,161.48 | 18,969 |
| | | SUB-TOTAL | | | 16,452 | | 18,969 |
| 65 | 10. | Commercial Center (>30ac) | TSF | -- | -- | 150.00 | 6,009 |
| | 30. | Industrial Park | TSF | 329.00 | 1,974 | 329.00 | 1,974 |
| | | SUB-TOTAL | | | 1,974 | | 7,983 |
| 66 | 10. | Commercial Center (>30ac) | TSF | 102.60 | 4,110 | 170.45 | 6,828 |
| | 30. | Industrial Park | TSF | 329.00 | 1,974 | 329.00 | 1,974 |
| | | SUB-TOTAL | | | 6,084 | | 8,802 |
| 67 | 3. | Single Family (6-10du/ac) | DU | -- | -- | 163.00 | 1,614 |
| | 4. | Condominium/Townhouse | DU | -- | -- | 90.00 | 720 |
| | | SUB-TOTAL | | | -- | | 2,334 |
| 68 | 5. | Apartment | DU | 156.00 | 1,076 | 208.00 | 1,435 |
| | | SUB-TOTAL | | | 1,076 | | 1,435 |
| 69 | 3. | Single Family (6-10du/ac) | DU | -- | -- | 76.00 | 752 |
| | | SUB-TOTAL | | | -- | | 752 |
| 70 | 11. | Commercial Center(10-30a) | TSF | 67.00 | 3,622 | 147.00 | 7,947 |
| | 18. | Health Club | TSF | 71.00 | 2,840 | 71.00 | 2,840 |
| | 26. | Day Care | STU | 150.00 | 678 | 150.00 | 678 |
| | 30. | Industrial Park | TSF | 397.00 | 2,382 | 529.00 | 3,174 |
| | 32. | Manufacturing/Warehouse | TSF | 75.00 | 383 | 75.00 | 383 |
| | | SUB-TOTAL | | | 9,905 | | 15,022 |
| 71 | 21. | High School | STU | 3,500.00 | 5,265 | 2,500.00 | 4,475 |
| | | SUB-TOTAL | | | 6,265 | | 4,475 |
| 72 | 13. | Commercial Shops | TSF | -- | -- | 60.00 | 2,224 |
| | 20. | Elementary/Middle School | STU | 350.00 | 508 | 350.00 | 508 |
| | | SUB-TOTAL | | | 508 | | 2,732 |
| 74 | 3. | Single Family (6-10du/ac) | DU | -- | -- | 153.00 | 1,515 |
| | 4. | Condominium/Townhouse | DU | -- | -- | 147.00 | 1,176 |
| | | SUB-TOTAL | | | -- | | 2,691 |
| 75 | 4. | Condominium/Townhouse | DU | -- | -- | 149.00 | 1,192 |
| | 52. | Undeveloped Park | AC | -- | -- | 17.50 | 9 |
| | | SUB-TOTAL | | | -- | | 1,201 |
| 76 | 5. | Apartment | DU | -- | -- | 188.00 | 1,297 |

Table E-1 (cont.)
LAND USE AND TRIP GENERATION SUMMARY

| Zone | | Land Use Category | Units | 2004 Amount | 2004 ADT | Long-Range GP Amount | Long-Range GP ADT |
|---|---|---|---|---|---|---|---|
| 76 | 12. | Commercial Center (<10ac) | TSF | -- | -- | 11.00 | 936 |
| | | SUB-TOTAL | | | -- | | 2,233 |
| 78 | 30. | Industrial Park | TSF | 1,615.00 | 9,690 | 1,776.00 | 10,656 |
| | | SUB-TOTAL | | | 9,690 | | 10,656 |
| 79 | 30. | Industrial Park | TSF | 685.00 | 4,110 | 685.00 | 4,110 |
| | | SUB-TOTAL | | | 4,110 | | 4,110 |
| 80 | 30. | Industrial Park | TSF | 828.00 | 4,968 | 880.00 | 5,280 |
| | | SUB-TOTAL | | | 4,968 | | 5,280 |
| 81 | 30. | Industrial Park | TSF | 711.00 | 4,266 | 711.00 | 4,266 |
| | | SUB-TOTAL | | | 4,266 | | 4,266 |
| 82 | 30. | Industrial Park | TSF | 714.00 | 4,284 | 1,007.55 | 6,045 |
| | | SUB-TOTAL | | | 4,284 | | 6,045 |
| 83 | 30. | Industrial Park | TSF | 876.00 | 5,256 | 876.00 | 5,256 |
| | | SUB-TOTAL | | | 5,256 | | 5,256 |
| 84 | 30. | Industrial Park | TSF | 333.00 | 1,998 | 333.00 | 1,998 |
| | | SUB-TOTAL | | | 1,998 | | 1,998 |
| 86 | 2. | Single Family (1-5du/ac) | DU | 11.00 | 109 | 346.00 | 3,425 |
| | 10. | Commercial Center (>30ac) | TSF | -- | -- | 20.50 | 821 |
| | 12. | Commercial Center (<10ac) | TSF | 15.00 | 1,276 | 15.00 | 1,276 |
| | 14. | Hotel | ROOM | 36.00 | 296 | 36.00 | 296 |
| | 15. | Sit-Down Restaurant | TSF | 47.26 | 6,160 | 47.26 | 6,160 |
| | | SUB-TOTAL | | | 7,841 | | 11,978 |
| 87 | 30. | Industrial Park | TSF | -- | -- | 1,274.13 | 7,645 |
| | | SUB-TOTAL | | | -- | | 7,645 |
| 89 | 53. | Wayside Honor Ranch | SG | 20.00 | 2,000 | 30.00 | 3,000 |
| | | SUB-TOTAL | | | 2,000 | | 3,000 |
| 90 | 11. | Commercial Center(10-30a) | TSF | -- | -- | 135.00 | 7,298 |
| | 12. | Commercial Center (<10ac) | TSF | -- | -- | 65.29 | 5,554 |
| | 30. | Industrial Park | TSF | 63.88 | 383 | 1,611.20 | 9,667 |
| | 31. | Business Park | TSF | -- | -- | 533.68 | 5,444 |
| | | SUB-TOTAL | | | 383 | | 27,963 |
| 91 | 11. | Commercial Center(10-30a) | TSF | 43.38 | 2,345 | 247.38 | 13,373 |
| | | SUB-TOTAL | | | 2,345 | | 13,373 |
| 92 | 10. | Commercial Center (>30ac) | TSF | -- | -- | 809.00 | 32,048 |
| | 14. | Hotel | ROOM | -- | -- | 300.00 | 2,469 |
| | 40. | Commercial Office | TSF | -- | -- | 420.00 | 4,855 |
| | | SUB-TOTAL | | | -- | | 39,372 |

Table E-1 (cont.)
LAND USE AND TRIP GENERATION SUMMARY

| Zone | | Land Use Category | Units | 2004 Amount | 2004 ADT | Long-Range GP Amount | Long-Range GP ADT |
|---|---|---|---|---|---|---|---|
| 93 | 13. | Commercial Shops | TSF | 11.00 | 408 | 20.00 | 741 |
| | 14. | Hotel | ROOM | 169.00 | 1,391 | 169.00 | 1,391 |
| | | SUB-TOTAL | | | 1,799 | | 2,132 |
| 94 | 54. | Six Flags Magic Mtn | SG | 160.00 | 16,000 | 240.00 | 24,000 |
| | | SUB-TOTAL | | | 16,000 | | 24,000 |
| 96 | 1. | Single Family (<1du/ac) | DU | -- | -- | 73.00 | 723 |
| | 2. | Single Family (1-5du/ac) | DU | -- | -- | 73.00 | 723 |
| | 4. | Condominium/Townhouse | DU | -- | -- | 1,574.00 | 12,592 |
| | 5. | Apartment | DU | -- | -- | 370.00 | 2,553 |
| | 11. | Commercial Center(10-30a) | TSF | -- | -- | 133.65 | 7,225 |
| | 13. | Commercial Shops | TSF | -- | -- | 41.00 | 1,519 |
| | 20. | Elementary/Middle School | STU | -- | -- | 900.00 | 1,305 |
| | 40. | Commercial Office | TSF | -- | -- | 75.00 | 867 |
| | | SUB-TOTAL | | | -- | | 27,507 |
| 97 | 55. | Travel Village | SG | 26.20 | 2,620 | 26.20 | 2,620 |
| | | SUB-TOTAL | | | 2,620 | | 2,620 |
| 98 | 12. | Commercial Center (<10ac) | TSF | -- | -- | 6.20 | 527 |
| | 31. | Business Park | TSF | -- | -- | 691.50 | 7,053 |
| | | SUB-TOTAL | | | -- | | 7,580 |
| 99 | 4. | Condominium/Townhouse | DU | -- | -- | 193.00 | 1,544 |
| | 5. | Apartment | DU | -- | -- | 292.00 | 2,015 |
| | 51. | Developed Park | AC | -- | -- | 25.00 | 65 |
| | | SUB-TOTAL | | | -- | | 3,624 |
| 100 | 12. | Commercial Center (<10ac) | TSF | -- | -- | 18.00 | 1,531 |
| | 40. | Commercial Office | TSF | -- | -- | 225.00 | 2,601 |
| | | SUB-TOTAL | | | -- | | 4,132 |
| 101 | 1. | Single Family (<1du/ac) | DU | -- | -- | 20.00 | 198 |
| | | SUB-TOTAL | | | -- | | 198 |
| 102 | 3. | Single Family (6-10du/ac) | DU | -- | -- | 168.00 | 1,663 |
| | 4. | Condominium/Townhouse | DU | -- | -- | 434.00 | 3,472 |
| | 5. | Apartment | DU | -- | -- | 159.00 | 1,097 |
| | 12. | Commercial Center (<10ac) | TSF | -- | -- | 49.00 | 4,168 |
| | 13. | Commercial Shops | TSF | -- | -- | 9.50 | 352 |
| | 20. | Elementary/Middle School | STU | -- | -- | 750.00 | 1,088 |
| | 40. | Commercial Office | TSF | -- | -- | 9.50 | 110 |
| | 51. | Developed Park | AC | -- | -- | 20.90 | 54 |
| | | SUB-TOTAL | | | -- | | 12,004 |
| 103 | 3. | Single Family (6-10du/ac) | DU | -- | -- | 140.00 | 1,386 |
| | 4. | Condominium/Townhouse | DU | -- | -- | 251.00 | 2,008 |
| | 5. | Apartment | DU | -- | -- | 148.00 | 1,021 |
| | | SUB-TOTAL | | | -- | | 4,415 |

Table E-1 (cont.)
LAND USE AND TRIP GENERATION SUMMARY

| Zone | | Land Use Category | Units | 2004 Amount | 2004 ADT | Long-Range GP Amount | Long-Range GP ADT |
|---|---|---|---|---|---|---|---|
| 104 | 11. | Commercial Center(10-30a) | TSF | -- | -- | 252.00 | 13,523 |
| | 40. | Commercial Office | TSF | -- | -- | 370.00 | 4,277 |
| | | SUB-TOTAL | | | -- | | 17,800 |
| 105 | 5. | Apartment | DU | -- | -- | 144.00 | 994 |
| | 12. | Commercial Center (<10ac) | TSF | -- | -- | 27.10 | 2,305 |
| | 40. | Commercial Office | TSF | -- | -- | 315.90 | 3,652 |
| | | SUB-TOTAL | | | -- | | 6,951 |
| 106 | 12. | Commercial Center (<10ac) | TSF | -- | -- | 90.00 | 7,655 |
| | | SUB-TOTAL | | | -- | | 7,655 |
| 107 | 2. | Single Family (1-5du/ac) | DU | -- | -- | 240.00 | 2,376 |
| | 3. | Single Family (6-10du/ac) | DU | -- | -- | 993.00 | 9,831 |
| | 20. | Elementary/Middle School | STU | -- | -- | 1,200.00 | 1,740 |
| | 21. | High School | STU | -- | -- | 2,230.00 | 3,992 |
| | | SUB-TOTAL | | | -- | | 17,939 |
| 108 | 3. | Single Family (6-10du/ac) | DU | -- | -- | 840.00 | 8,316 |
| | 4. | Condominium/Townhouse | DU | -- | -- | 710.00 | 5,680 |
| | 12. | Commercial Center (<10ac) | TSF | -- | -- | 50.00 | 4,263 |
| | 20. | Elementary/Middle School | STU | -- | -- | 800.00 | 1,160 |
| | 51. | Developed Park | AC | -- | -- | 5.00 | 13 |
| | | SUB-TOTAL | | | -- | | 19,422 |
| 109 | 3. | Single Family (6-10du/ac) | DU | -- | -- | 60.00 | 594 |
| | | SUB-TOTAL | | | -- | | 594 |
| 110 | 2. | Single Family (1-5du/ac) | DU | -- | -- | 40.00 | 396 |
| | 3. | Single Family (6-10du/ac) | DU | -- | -- | 610.00 | 6,039 |
| | 20. | Elementary/Middle School | STU | -- | -- | 800.00 | 1,160 |
| | 51. | Developed Park | AC | -- | -- | 15.30 | 40 |
| | | SUB-TOTAL | | | -- | | 7,635 |
| 111 | 12. | Commercial Center (<10ac) | TSF | -- | -- | 70.00 | 5,954 |
| | 31. | Business Park | TSF | -- | -- | 630.00 | 6,426 |
| | | SUB-TOTAL | | | -- | | 12,380 |
| 113 | 2. | Single Family (1-5du/ac) | DU | -- | -- | 70.00 | 693 |
| | 3. | Single Family (6-10du/ac) | DU | -- | -- | 450.00 | 4,455 |
| | 51. | Developed Park | AC | -- | -- | 28.00 | 73 |
| | | SUB-TOTAL | | | -- | | 5,221 |
| 114 | 2. | Single Family (1-5du/ac) | DU | -- | -- | 40.00 | 396 |
| | 3. | Single Family (6-10du/ac) | DU | -- | -- | 370.00 | 3,663 |
| | | SUB-TOTAL | | | -- | | 4,059 |
| 115 | 2. | Single Family (1-5du/ac) | DU | -- | -- | 240.00 | 2,376 |
| | 3. | Single Family (6-10du/ac) | DU | -- | -- | 750.00 | 7,425 |
| | 51. | Developed Park | AC | -- | -- | 5.00 | 13 |
| | | SUB-TOTAL | | | -- | | 9,814 |

Table E-1 (cont.)
LAND USE AND TRIP GENERATION SUMMARY

| Zone | | Land Use Category | Units | 2004 Amount | 2004 ADT | Long-Range GP Amount | Long-Range GP ADT |
|---|---|---|---|---|---|---|---|
| 116 | 3. | Single Family (6-10du/ac) | DU | -- | -- | 1,167.00 | 11,553 |
| | 4. | Condominium/Townhouse | DU | -- | -- | 1,780.00 | 14,240 |
| | 11. | Commercial Center(10-30a) | TSF | -- | -- | 650.00 | 35,139 |
| | 40. | Commercial Office | TSF | -- | -- | 312.35 | 3,611 |
| | 50. | Golf Course | AC | -- | -- | 180.00 | 1,433 |
| | | SUB-TOTAL | | | -- | | 65,976 |
| 117 | 3. | Single Family (6-10du/ac) | DU | -- | -- | 220.00 | 2,178 |
| | 51. | Developed Park | AC | -- | -- | 20.00 | 52 |
| | | SUB-TOTAL | | | -- | | 2,230 |
| 118 | 3. | Single Family (6-10du/ac) | DU | -- | -- | 330.00 | 3,267 |
| | | SUB-TOTAL | | | -- | | 3,267 |
| 119 | 3. | Single Family (6-10du/ac) | DU | -- | -- | 200.00 | 1,980 |
| | 4. | Condominium/Townhouse | DU | -- | -- | 2,640.00 | 21,120 |
| | 12. | Commercial Center (<10ac) | TSF | -- | -- | 60.00 | 5,104 |
| | 51. | Developed Park | AC | -- | -- | 5.00 | 13 |
| | | SUB-TOTAL | | | -- | | 28,217 |
| 120 | 3. | Single Family (6-10du/ac) | DU | -- | -- | 217.00 | 2,148 |
| | 4. | Condominium/Townhouse | DU | -- | -- | 1,574.00 | 12,592 |
| | 5. | Apartment | DU | -- | -- | 369.00 | 2,546 |
| | 11. | Commercial Center(10-30a) | TSF | -- | -- | 133.65 | 7,225 |
| | | SUB-TOTAL | | | -- | | 24,511 |
| 122 | 2. | Single Family (1-5du/ac) | DU | -- | -- | 143.00 | 1,416 |
| | | SUB-TOTAL | | | -- | | 1,416 |
| 123 | 1. | Single Family (<1du/ac) | DU | -- | -- | 250.00 | 2,475 |
| | | SUB-TOTAL | | | -- | | 2,475 |
| 124 | 1. | Single Family (<1du/ac) | DU | -- | -- | 250.00 | 2,475 |
| | | SUB-TOTAL | | | -- | | 2,475 |
| 125 | 20. | Elementary/Middle School | STU | -- | -- | 1,200.00 | 1,740 |
| | 21. | High School | STU | -- | -- | 2,400.00 | 4,295 |
| | 51. | Developed Park | AC | -- | -- | 12.20 | 32 |
| | | SUB-TOTAL | | | -- | | 6,068 |
| 126 | 1. | Single Family (<1du/ac) | DU | -- | -- | 60.00 | 594 |
| | | SUB-TOTAL | | | -- | | 594 |
| 127 | 3. | Single Family (6-10du/ac) | DU | -- | -- | 450.00 | 4,455 |
| | 20. | Elementary/Middle School | STU | -- | -- | 800.00 | 1,160 |
| | | SUB-TOTAL | | | -- | | 5,515 |
| 128 | 2. | Single Family (1-5du/ac) | DU | -- | -- | 10.00 | 99 |
| | | SUB-TOTAL | | | -- | | 99 |

Table E-1 (cont.)
LAND USE AND TRIP GENERATION SUMMARY

| Zone | | Land Use Category | Units | 2004 Amount | 2004 ADT | Long-Range GP Amount | Long-Range GP ADT |
|---|---|---|---|---|---|---|---|
| 129 | 3. | Single Family (6-10du/ac) | DU | -- | -- | 330.00 | 3,267 |
| | | SUB-TOTAL | | | -- | | 3,267 |
| 130 | 2. | Single Family (1-5du/ac) | DU | 708.00 | 7,009 | 708.00 | 7,009 |
| | | SUB-TOTAL | | | 7,009 | | 7,009 |
| 131 | 1. | Single Family (<1du/ac) | DU | -- | -- | 70.00 | 693 |
| | | SUB-TOTAL | | | -- | | 693 |
| 132 | 2. | Single Family (1-5du/ac) | DU | 436.00 | 4,316 | 436.00 | 4,316 |
| | 20. | Elementary/Middle School | STU | 900.00 | 1,305 | 900.00 | 1,305 |
| | 51. | Developed Park | AC | 16.00 | 42 | 16.00 | 42 |
| | | SUB-TOTAL | | | 5,663 | | 5,663 |
| 133 | 11. | Commercial Center(10-30a) | TSF | 27.00 | 1,460 | 27.00 | 1,460 |
| | | SUB-TOTAL | | | 1,460 | | 1,460 |
| 134 | 2. | Single Family (1-5du/ac) | DU | 482.00 | 4,772 | 482.00 | 4,772 |
| | | SUB-TOTAL | | | 4,772 | | 4,772 |
| 135 | 2. | Single Family (1-5du/ac) | DU | 20.00 | 198 | 174.00 | 1,723 |
| | 4. | Condominium/Townhouse | DU | 172.00 | 1,376 | 172.00 | 1,376 |
| | 50. | Golf Course | AC | 208.00 | 1,656 | 208.00 | 1,656 |
| | | SUB-TOTAL | | | 3,230 | | 4,755 |
| 137 | 40. | Commercial Office | TSF | -- | -- | 72.00 | 832 |
| | | SUB-TOTAL | | | -- | | 832 |
| 138 | 11. | Commercial Center(10-30a) | TSF | 100.00 | 5,406 | 120.00 | 6,487 |
| | | SUB-TOTAL | | | 5,406 | | 6,487 |
| 139 | 5. | Apartment | DU | 96.00 | 662 | 474.00 | 3,271 |
| | | SUB-TOTAL | | | 662 | | 3,271 |
| 140 | 2. | Single Family (1-5du/ac) | DU | -- | -- | 73.00 | 723 |
| | 10. | Commercial Center (>30ac) | TSF | -- | -- | 1,445.65 | 57,913 |
| | | SUB-TOTAL | | | -- | | 58,636 |
| 141 | 15. | Sit-Down Restaurant | TSF | 20.30 | 2,646 | 20.30 | 2,646 |
| | 16. | Fast Food Restaurant | TSF | 10.10 | 5,011 | 10.10 | 5,011 |
| | | SUB-TOTAL | | | 7,657 | | 7,657 |
| 142 | 3. | Single Family (6-10du/ac) | DU | -- | -- | 72.00 | 713 |
| | 4. | Condominium/Townhouse | DU | -- | -- | 381.00 | 3,048 |
| | | SUB-TOTAL | | | -- | | 3,761 |
| 143 | 2. | Single Family (1-5du/ac) | DU | 77.00 | 762 | 96.00 | 950 |
| | 3. | Single Family (6-10du/ac) | DU | 407.00 | 4,029 | 482.00 | 4,772 |
| | 4. | Condominium/Townhouse | DU | 80.00 | 640 | 160.00 | 1,280 |
| | 20. | Elementary/Middle School | STU | -- | -- | 850.00 | 1,233 |

Table E-1 (cont.)
LAND USE AND TRIP GENERATION SUMMARY

| Zone | | Land Use Category | Units | 2004 Amount | 2004 ADT | Long-Range GP Amount | Long-Range GP ADT |
|---|---|---|---|---|---|---|---|
| 143 | 51. | Developed Park | AC | -- | -- | 7.00 | 18 |
| | | SUB-TOTAL | | | 5,431 | | 8,253 |
| 144 | 2. | Single Family (1-5du/ac) | DU | -- | -- | 6.00 | 59 |
| | | SUB-TOTAL | | | -- | | 59 |
| 145 | 10. | Commercial Center (>30ac) | TSF | 778.00 | 31,167 | 778.00 | 31,167 |
| | 12. | Commercial Center (<10ac) | TSF | 36.00 | 3,062 | 36.00 | 3,062 |
| | 13. | Commercial Shops | TSF | 45.74 | 1,695 | 45.74 | 1,695 |
| | 15. | Sit-Down Restaurant | TSF | 7.80 | 1,017 | 7.80 | 1,017 |
| | 16. | Fast Food Restaurant | TSF | 6.68 | 3,314 | 6.68 | 3,314 |
| | 32. | Manufacturing/Warehouse | TSF | 74.50 | 380 | 74.50 | 380 |
| | | SUB-TOTAL | | | 40,635 | | 40,635 |
| 146 | 2. | Single Family (1-5du/ac) | DU | 314.00 | 3,109 | 314.00 | 3,109 |
| | 4. | Condominium/Townhouse | DU | 296.00 | 2,368 | 296.00 | 2,368 |
| | | SUB-TOTAL | | | 5,477 | | 5,477 |
| 147 | 3. | Single Family (6-10du/ac) | DU | 46.00 | 455 | 140.00 | 1,386 |
| | 4. | Condominium/Townhouse | DU | -- | -- | 100.00 | 800 |
| | 5. | Apartment | DU | -- | -- | 567.00 | 3,912 |
| | 20. | Elementary/Middle School | STU | 850.00 | 1,233 | 850.00 | 1,233 |
| | 51. | Developed Park | AC | -- | -- | 5.00 | 13 |
| | | SUB-TOTAL | | | 1,688 | | 7,344 |
| 148 | 11. | Commercial Center(10-30a) | TSF | 183.88 | 9,941 | 183.88 | 9,941 |
| | 15. | Sit-Down Restaurant | TSF | 7.70 | 1,004 | 7.70 | 1,004 |
| | 16. | Fast Food Restaurant | TSF | 5.00 | 2,481 | 5.00 | 2,481 |
| | | SUB-TOTAL | | | 13,426 | | 13,426 |
| 149 | 2. | Single Family (1-5du/ac) | DU | 535.00 | 5,297 | 535.00 | 5,297 |
| | 4. | Condominium/Townhouse | DU | 500.00 | 4,000 | 500.00 | 4,000 |
| | 12. | Commercial Center (<10ac) | TSF | 34.85 | 2,964 | 34.85 | 2,964 |
| | | SUB-TOTAL | | | 12,261 | | 12,261 |
| 150 | 2. | Single Family (1-5du/ac) | DU | 114.00 | 1,129 | 114.00 | 1,129 |
| | | SUB-TOTAL | | | 1,129 | | 1,129 |
| 151 | 2. | Single Family (1-5du/ac) | DU | -- | -- | 274.00 | 2,713 |
| | | SUB-TOTAL | | | -- | | 2,713 |
| 152 | 2. | Single Family (1-5du/ac) | DU | 279.00 | 2,762 | 279.00 | 2,762 |
| | 51. | Developed Park | AC | -- | -- | 18.00 | 47 |
| | | SUB-TOTAL | | | 2,762 | | 2,809 |
| 153 | 2. | Single Family (1-5du/ac) | DU | -- | -- | 30.00 | 297 |
| | 51. | Developed Park | AC | -- | -- | 5.00 | 13 |
| | | SUB-TOTAL | | | -- | | 310 |
| 158 | 2. | Single Family (1-5du/ac) | DU | -- | -- | 100.00 | 990 |
| | | SUB-TOTAL | | | -- | | 990 |

Table E-1 (cont.)
LAND USE AND TRIP GENERATION SUMMARY

| Zone | | Land Use Category | Units | 2004 Amount | 2004 ADT | Long-Range GP Amount | Long-Range GP ADT |
|---|---|---|---|---|---|---|---|
| 159 | 2. | Single Family (1-5du/ac) | DU | 4.00 | 40 | 4.00 | 40 |
| | | SUB-TOTAL | | | 40 | | 40 |
| 160 | 1. | Single Family (<1du/ac) | DU | -- | -- | 106.00 | 1,049 |
| | | SUB-TOTAL | | | -- | | 1,049 |
| 161 | 1. | Single Family (<1du/ac) | DU | -- | -- | 60.00 | 594 |
| | 2. | Single Family (1-5du/ac) | DU | 533.00 | 5,277 | 607.00 | 6,009 |
| | 4. | Condominium/Townhouse | DU | 531.00 | 4,248 | 650.00 | 5,200 |
| | 11. | Commercial Center(10-30a) | TSF | -- | -- | 48.00 | 2,595 |
| | 12. | Commercial Center (<10ac) | TSF | 5.26 | 447 | 54.22 | 4,612 |
| | 13. | Commercial Shops | TSF | 12.50 | 463 | 12.50 | 463 |
| | 14. | Hotel | ROOM | 283.00 | 2,329 | 283.00 | 2,329 |
| | 15. | Sit-Down Restaurant | TSF | 21.10 | 2,750 | 21.10 | 2,750 |
| | 16. | Fast Food Restaurant | TSF | 16.00 | 7,938 | 16.00 | 7,938 |
| | 40. | Commercial Office | TSF | 61.66 | 713 | 282.41 | 3,265 |
| | 56. | CHP Office | SG | 55.74 | 5,574 | 55.74 | 5,574 |
| | | SUB-TOTAL | | | 29,739 | | 41,329 |
| 162 | 2. | Single Family (1-5du/ac) | DU | 83.00 | 822 | 248.00 | 2,455 |
| | 11. | Commercial Center(10-30a) | TSF | -- | -- | 102.42 | 5,537 |
| | 30. | Industrial Park | TSF | -- | -- | 240.00 | 1,440 |
| | | SUB-TOTAL | | | 822 | | 9,432 |
| 163 | 30. | Industrial Park | TSF | -- | -- | 2,567.08 | 15,402 |
| | | SUB-TOTAL | | | -- | | 15,402 |
| 164 | 2. | Single Family (1-5du/ac) | DU | 100.00 | 990 | 204.00 | 2,020 |
| | 50. | Golf Course | AC | 145.00 | 1,154 | 145.00 | 1,154 |
| | | SUB-TOTAL | | | 2,144 | | 3,174 |
| 165 | 2. | Single Family (1-5du/ac) | DU | 36.00 | 356 | 36.00 | 356 |
| | 4. | Condominium/Townhouse | DU | 80.00 | 640 | 80.00 | 640 |
| | 12. | Commercial Center (<10ac) | TSF | 30.23 | 2,571 | 30.23 | 2,571 |
| | 13. | Commercial Shops | TSF | 7.60 | 282 | 7.60 | 282 |
| | 15. | Sit-Down Restaurant | TSF | 23.95 | 3,122 | 23.95 | 3,122 |
| | 23. | Hospital | TSF | 24.66 | 414 | 24.66 | 414 |
| | 30. | Industrial Park | TSF | 12.24 | 73 | 1,890.89 | 11,345 |
| | 32. | Manufacturing/Warehouse | TSF | 2.47 | 13 | 2.47 | 13 |
| | 40. | Commercial Office | TSF | 13.81 | 160 | 13.81 | 160 |
| | | SUB-TOTAL | | | 7,631 | | 18,903 |
| 166 | 2. | Single Family (1-5du/ac) | DU | 431.00 | 4,267 | 431.00 | 4,267 |
| | 4. | Condominium/Townhouse | DU | 217.00 | 1,736 | 217.00 | 1,736 |
| | 12. | Commercial Center (<10ac) | TSF | 48.64 | 4,137 | 48.64 | 4,137 |
| | 13. | Commercial Shops | TSF | 1.38 | 51 | 1.38 | 51 |
| | 15. | Sit-Down Restaurant | TSF | 4.34 | 566 | 4.34 | 566 |
| | 23. | Hospital | TSF | 38.58 | 648 | 38.58 | 648 |
| | 32. | Manufacturing/Warehouse | TSF | 11.00 | 56 | 11.00 | 56 |
| | 40. | Commercial Office | TSF | 30.10 | 348 | 30.10 | 348 |
| | | SUB-TOTAL | | | 11,809 | | 11,809 |

Table E-1 (cont.)
LAND USE AND TRIP GENERATION SUMMARY

| Zone | | Land Use Category | Units | 2004 Amount | 2004 ADT | Long-Range GP Amount | Long-Range GP ADT |
|---|---|---|---|---|---|---|---|
| 167 | 2. | Single Family (1-5du/ac) | DU | 180.00 | 1,782 | 327.00 | 3,237 |
| | | SUB-TOTAL | | | 1,782 | | 3,237 |
| 168 | 2. | Single Family (1-5du/ac) | DU | 247.00 | 2,445 | 247.00 | 2,445 |
| | | SUB-TOTAL | | | 2,445 | | 2,445 |
| 169 | 2. | Single Family (1-5du/ac) | DU | 127.00 | 1,257 | 127.00 | 1,257 |
| | 4. | Condominium/Townhouse | DU | 94.00 | 752 | 94.00 | 752 |
| | 10. | Commercial Center (>30ac) | TSF | 200.00 | 8,012 | 200.00 | 8,012 |
| | | SUB-TOTAL | | | 10,021 | | 10,021 |
| 170 | 2. | Single Family (1-5du/ac) | DU | 163.00 | 1,614 | 163.00 | 1,614 |
| | | SUB-TOTAL | | | 1,614 | | 1,614 |
| 171 | 2. | Single Family (1-5du/ac) | DU | 32.00 | 317 | 32.00 | 317 |
| | 20. | Elementary/Middle School | STU | 675.00 | 979 | 675.00 | 979 |
| | | SUB-TOTAL | | | 1,296 | | 1,296 |
| 172 | 2. | Single Family (1-5du/ac) | DU | 185.00 | 1,831 | 185.00 | 1,831 |
| | | SUB-TOTAL | | | 1,831 | | 1,831 |
| 173 | 2. | Single Family (1-5du/ac) | DU | 336.00 | 3,326 | 386.00 | 3,821 |
| | | SUB-TOTAL | | | 3,326 | | 3,821 |
| 174 | 11. | Commercial Center(10-30a) | TSF | 35.00 | 1,892 | 337.20 | 18,229 |
| | | SUB-TOTAL | | | 1,892 | | 18,229 |
| 175 | 2. | Single Family (1-5du/ac) | DU | 162.00 | 1,604 | 162.00 | 1,604 |
| | 4. | Condominium/Townhouse | DU | 160.00 | 1,280 | 160.00 | 1,280 |
| | 11. | Commercial Center(10-30a) | TSF | 98.01 | 5,298 | 98.01 | 5,298 |
| | 20. | Elementary/Middle School | STU | 800.00 | 1,160 | 800.00 | 1,160 |
| | 34. | Utilities | TSF | 87.12 | 207 | 87.12 | 207 |
| | | SUB-TOTAL | | | 9,549 | | 9,549 |
| 176 | 2. | Single Family (1-5du/ac) | DU | 686.00 | 6,791 | 762.00 | 7,544 |
| | 4. | Condominium/Townhouse | DU | 135.00 | 1,080 | 135.00 | 1,080 |
| | 10. | Commercial Center (>30ac) | TSF | 196.02 | 7,853 | 196.02 | 7,853 |
| | 13. | Commercial Shops | TSF | 141.57 | 5,247 | 141.57 | 5,247 |
| | | SUB-TOTAL | | | 20,971 | | 21,724 |
| 177 | 2. | Single Family (1-5du/ac) | DU | 477.00 | 4,722 | 477.00 | 4,722 |
| | 3. | Single Family (6-10du/ac) | DU | -- | -- | 65.00 | 644 |
| | 4. | Condominium/Townhouse | DU | 264.00 | 2,112 | 264.00 | 2,112 |
| | 11. | Commercial Center(10-30a) | TSF | 97.57 | 5,275 | 97.57 | 5,275 |
| | 20. | Elementary/Middle School | STU | 535.00 | 776 | 535.00 | 776 |
| | | SUB-TOTAL | | | 12,885 | | 13,529 |
| 178 | 2. | Single Family (1-5du/ac) | DU | 333.00 | 3,297 | 333.00 | 3,297 |
| | 11. | Commercial Center(10-30a) | TSF | 21.78 | 1,177 | 21.78 | 1,177 |
| | 13. | Commercial Shops | TSF | 6.53 | 242 | 6.53 | 242 |

Table E-1 (cont.)
LAND USE AND TRIP GENERATION SUMMARY

| Zone | | Land Use Category | Units | 2004 Amount | 2004 ADT | Long-Range GP Amount | Long-Range GP ADT |
|---|---|---|---|---|---|---|---|
| 178 | 40. | Commercial Office | TSF | 14.81 | 171 | 50.81 | 587 |
| | | SUB-TOTAL | | | 4,887 | | 5,303 |
| 179 | 2. | Single Family (1-5du/ac) | DU | 167.00 | 1,653 | 167.00 | 1,653 |
| | 11. | Commercial Center(10-30a) | TSF | -- | -- | 24.47 | 1,323 |
| | 13. | Commercial Shops | TSF | 21.78 | 807 | 21.78 | 807 |
| | 34. | Utilities | TSF | 87.12 | 207 | 87.12 | 207 |
| | 42. | Medical Office | TSF | 24.83 | 849 | 24.83 | 849 |
| | | SUB-TOTAL | | | 3,516 | | 4,839 |
| 180 | 2. | Single Family (1-5du/ac) | DU | 428.00 | 4,237 | 428.00 | 4,237 |
| | | SUB-TOTAL | | | 4,237 | | 4,237 |
| 181 | 3. | Single Family (6-10du/ac) | DU | 282.00 | 2,792 | 282.00 | 2,792 |
| | 20. | Elementary/Middle School | STU | 775.00 | 1,124 | 775.00 | 1,124 |
| | | SUB-TOTAL | | | 3,916 | | 3,916 |
| 182 | 3. | Single Family (6-10du/ac) | DU | 276.00 | 2,732 | 276.00 | 2,732 |
| | 4. | Condominium/Townhouse | DU | 229.00 | 1,632 | 229.00 | 1,632 |
| | 6. | Mobile Home | DU | 238.00 | 1,642 | 238.00 | 1,642 |
| | 11. | Commercial Center(10-30a) | TSF | 76.23 | 4,121 | 76.23 | 4,121 |
| | 20. | Elementary/Middle School | STU | 83.00 | 120 | 83.00 | 120 |
| | 25. | Church | TSF | 17.25 | 160 | 17.25 | 160 |
| | | SUB-TOTAL | | | 10,607 | | 10,607 |
| 183 | 4. | Condominium/Townhouse | DU | 634.00 | 5,072 | 634.00 | 5,072 |
| | 12. | Commercial Center (<10ac) | TSF | -- | -- | 3.50 | 298 |
| | 22. | College | STU | 3,274.00 | 5,042 | 3,274.00 | 5,042 |
| | 50. | Golf Course | AC | 100.00 | 796 | 100.00 | 796 |
| | | SUB-TOTAL | | | 10,910 | | 11,208 |
| 184 | 40. | Commercial Office | TSF | -- | -- | 250.00 | 2,890 |
| | | SUB-TOTAL | | | -- | | 2,890 |
| 185 | 2. | Single Family (1-5du/ac) | DU | 133.00 | 1,317 | 133.00 | 1,317 |
| | 3. | Single Family (6-10du/ac) | DU | 211.00 | 2,089 | 211.00 | 2,089 |
| | | SUB-TOTAL | | | 3,406 | | 3,406 |
| 186 | 3. | Single Family (6-10du/ac) | DU | 150.00 | 1,485 | 150.00 | 1,485 |
| | 23. | Hospital | TSF | 125.24 | 2,104 | 125.24 | 2,104 |
| | 42. | Medical Office | TSF | 108.90 | 3,724 | 108.90 | 3,724 |
| | | SUB-TOTAL | | | 7,313 | | 7,313 |
| 187 | 2. | Single Family (1-5du/ac) | DU | 111.00 | 1,099 | 111.00 | 1,099 |
| | 4. | Condominium/Townhouse | DU | 307.00 | 2,456 | 307.00 | 2,456 |
| | 34. | Utilities | TSF | 217.80 | 518 | 217.80 | 518 |
| | 51. | Developed Park | AC | 14.00 | 36 | 14.00 | 36 |
| | | SUB-TOTAL | | | 4,109 | | 4,109 |
| 188 | 2. | Single Family (1-5du/ac) | DU | 72.00 | 713 | 72.00 | 713 |

Table E-1 (cont.)
LAND USE AND TRIP GENERATION SUMMARY

| Zone | | Land Use Category | Units | 2004 Amount | 2004 ADT | Long-Range GP Amount | Long-Range GP ADT |
|---|---|---|---|---|---|---|---|
| 188 | 4. | Condominium/Townhouse | DU | 216.00 | 1,728 | 216.00 | 1,728 |
| | | SUB-TOTAL | | | 2,441 | | 2,441 |
| 189 | 22. | College | STU | 13,543.00 | 20,856 | 20,000.00 | 30,800 |
| | 40. | Commercial Office | TSF | -- | -- | 28.44 | 329 |
| | | SUB-TOTAL | | | 20,856 | | 31,129 |
| 190 | 2. | Single Family (1-5du/ac) | DU | 171.00 | 1,693 | 171.00 | 1,693 |
| | | SUB-TOTAL | | | 1,693 | | 1,693 |
| 191 | 42. | Medical Office | TSF | -- | -- | 78.56 | 2,687 |
| | | SUB-TOTAL | | | -- | | 2,687 |
| 192 | 2. | Single Family (1-5du/ac) | DU | 164.00 | 1,624 | 164.00 | 1,624 |
| | 4. | Condominium/Townhouse | DU | 660.00 | 5,280 | 660.00 | 5,280 |
| | | SUB-TOTAL | | | 6,904 | | 6,904 |
| 193 | 31. | Business Park | TSF | 250.00 | 2,550 | 250.00 | 2,550 |
| | | SUB-TOTAL | | | 2,550 | | 2,550 |
| 194 | 50. | Golf Course | AC | 100.00 | 796 | 100.00 | 796 |
| | | SUB-TOTAL | | | 796 | | 796 |
| 195 | 3. | Single Family (6-10du/ac) | DU | 76.00 | 752 | 76.00 | 752 |
| | | SUB-TOTAL | | | 752 | | 752 |
| 196 | 13. | Commercial Shops | TSF | -- | -- | 16.00 | 593 |
| | | SUB-TOTAL | | | -- | | 593 |
| 197 | 31. | Business Park | TSF | -- | -- | 400.00 | 4,080 |
| | | SUB-TOTAL | | | -- | | 4,080 |
| 198 | 2. | Single Family (1-5du/ac) | DU | 179.00 | 1,772 | 179.00 | 1,772 |
| | 3. | Single Family (6-10du/ac) | DU | 152.00 | 1,505 | 152.00 | 1,505 |
| | | SUB-TOTAL | | | 3,277 | | 3,277 |
| 199 | 14. | Hotel | ROOM | 237.00 | 1,951 | 237.00 | 1,951 |
| | 15. | Sit-Down Restaurant | TSF | 5.00 | 652 | 5.00 | 652 |
| | | SUB-TOTAL | | | 2,603 | | 2,603 |
| 200 | 31. | Business Park | TSF | 385.10 | 3,928 | 578.00 | 5,896 |
| | | SUB-TOTAL | | | 3,928 | | 5,896 |
| 201 | 31. | Business Park | TSF | -- | -- | 250.00 | 2,550 |
| | | SUB-TOTAL | | | -- | | 2,550 |
| 202 | 5. | Apartment | DU | 50.00 | 345 | 560.00 | 3,864 |
| | 13. | Commercial Shops | TSF | 13.00 | 482 | 22.00 | 815 |
| | 14. | Hotel | ROOM | 250.00 | 2,058 | 250.00 | 2,058 |
| | 18. | Health Club | TSF | 54.00 | 2,160 | 54.00 | 2,160 |

Table E-1 (cont.)
LAND USE AND TRIP GENERATION SUMMARY

| Zone | | Land Use Category | Units | ----- 2004 ----- Amount | ADT | -Long-Range GP-- Amount | ADT |
|---|---|---|---|---|---|---|---|
| 202 | 40. | Commercial Office | TSF | 13.00 | 150 | 13.00 | 150 |
| | | SUB-TOTAL | | | 5,195 | | 9,047 |
| 203 | 10. | Commercial Center (>30ac) | TSF | 742.00 | 29,725 | 1,539.00 | 61,652 |
| | 40. | Commercial Office | TSF | -- | -- | 90.00 | 1,040 |
| | | SUB-TOTAL | | | 29,725 | | 62,692 |
| 204 | 13. | Commercial Shops | TSF | 62.00 | 2,298 | 62.00 | 2,298 |
| | 17. | Movie Theater | SEAT | 3,300.00 | 5,808 | 3,300.00 | 5,808 |
| | 40. | Commercial Office | TSF | 400.00 | 4,624 | 400.00 | 4,624 |
| | | SUB-TOTAL | | | 12,730 | | 12,730 |
| 205 | 11. | Commercial Center(10-30a) | TSF | 47.30 | 2,557 | 47.30 | 2,557 |
| | 24. | Library | TSF | 20.00 | 1,700 | 20.00 | 1,700 |
| | 40. | Commercial Office | TSF | 198.89 | 2,299 | 198.89 | 2,299 |
| | | SUB-TOTAL | | | 6,556 | | 6,556 |
| 206 | 11. | Commercial Center(10-30a) | TSF | 126.26 | 6,826 | 166.11 | 8,980 |
| | 15. | Sit-Down Restaurant | TSF | 15.73 | 2,050 | 21.50 | 2,802 |
| | | SUB-TOTAL | | | 8,876 | | 11,782 |
| 207 | 40. | Commercial Office | TSF | 230.00 | 2,659 | 230.00 | 2,659 |
| | | SUB-TOTAL | | | 2,659 | | 2,659 |
| 208 | 4. | Condominium/Townhouse | DU | 234.00 | 1,872 | 234.00 | 1,872 |
| | | SUB-TOTAL | | | 1,872 | | 1,872 |
| 209 | 2. | Single Family (1-5du/ac) | DU | 414.00 | 4,099 | 414.00 | 4,099 |
| | 4. | Condominium/Townhouse | DU | 352.00 | 2,816 | 352.00 | 2,816 |
| | 20. | Elementary/Middle School | STU | 800.00 | 1,160 | 800.00 | 1,160 |
| | | SUB-TOTAL | | | 8,075 | | 8,075 |
| 210 | 2. | Single Family (1-5du/ac) | DU | 205.00 | 2,029 | 205.00 | 2,029 |
| | 4. | Condominium/Townhouse | DU | 208.00 | 1,664 | 208.00 | 1,664 |
| | 11. | Commercial Center(10-30a) | TSF | 148.10 | 8,006 | 148.10 | 8,006 |
| | | SUB-TOTAL | | | 11,699 | | 11,699 |
| 211 | 2. | Single Family (1-5du/ac) | DU | 167.00 | 1,653 | 167.00 | 1,653 |
| | | SUB-TOTAL | | | 1,653 | | 1,653 |
| 212 | 2. | Single Family (1-5du/ac) | DU | 252.00 | 2,495 | 252.00 | 2,495 |
| | 4. | Condominium/Townhouse | DU | 272.00 | 2,176 | 272.00 | 2,176 |
| | 25. | Church | TSF | 18.03 | 168 | 18.03 | 168 |
| | 51. | Developed Park | AC | 4.20 | 11 | 4.20 | 11 |
| | | SUB-TOTAL | | | 4,850 | | 4,850 |
| 213 | 2. | Single Family (1-5du/ac) | DU | 275.00 | 2,723 | 275.00 | 2,723 |
| | 25. | Church | TSF | 25.09 | 233 | 25.09 | 233 |
| | | SUB-TOTAL | | | 2,956 | | 2,956 |

Table E-1 (cont.)
LAND USE AND TRIP GENERATION SUMMARY

| Zone | | Land Use Category | Units | 2004 Amount | 2004 ADT | Long-Range GP Amount | Long-Range GP ADT |
|---|---|---|---|---|---|---|---|
| 214 | 5. | Apartment | DU | 107.00 | 738 | 307.00 | 2,118 |
| | | SUB-TOTAL | | | 738 | | 2,118 |
| 215 | 2. | Single Family (1-5du/ac) | DU | 105.00 | 1,040 | 105.00 | 1,040 |
| | 4. | Condominium/Townhouse | DU | 52.00 | 416 | 52.00 | 416 |
| | 11. | Commercial Center(10-30a) | TSF | 100.00 | 5,406 | 100.00 | 5,406 |
| | 13. | Commercial Shops | TSF | 43.56 | 1,514 | 43.56 | 1,514 |
| | 21. | High School | STU | 2,928.00 | 5,241 | 2,928.00 | 5,241 |
| | 25. | Church | TSF | 50.18 | 467 | 50.18 | 467 |
| | 34. | Utilities | TSF | 47.92 | 114 | 47.92 | 114 |
| | | SUB-TOTAL | | | 14,298 | | 14,298 |
| 216 | 3. | Single Family (5-10du/ac) | DU | 22.00 | 218 | 22.00 | 218 |
| | 4. | Condominium/Townhouse | DU | 128.00 | 1,024 | 128.00 | 1,024 |
| | 11. | Commercial Center(10-30a) | TSF | 149.96 | 8,107 | 149.96 | 8,107 |
| | 40. | Commercial Office | TSF | 10.45 | 121 | 10.45 | 121 |
| | | SUB-TOTAL | | | 9,470 | | 9,470 |
| 217 | 2. | Single Family (1-5du/ac) | DU | 202.00 | 2,000 | 202.00 | 2,000 |
| | 4. | Condominium/Townhouse | DU | 16.00 | 128 | 28.00 | 224 |
| | 11. | Commercial Center(10-30a) | TSF | 65.75 | 3,554 | 65.75 | 3,554 |
| | 13. | Commercial Shops | TSF | -- | -- | 3.27 | 121 |
| | 14. | Hotel | ROOM | 10.00 | 82 | 10.00 | 82 |
| | 30. | Industrial Park | TSF | 22.44 | 135 | 22.44 | 135 |
| | 40. | Commercial Office | TSF | 22.44 | 259 | 22.44 | 259 |
| | | SUB-TOTAL | | | 6,158 | | 6,375 |
| 218 | 2. | Single Family (1-5du/ac) | DU | 307.00 | 3,039 | 360.00 | 3,564 |
| | 4. | Condominium/Townhouse | DU | 641.00 | 5,128 | 641.00 | 5,128 |
| | 6. | Mobile Home | DU | 151.00 | 1,042 | 151.00 | 1,042 |
| | 10. | Commercial Center (>30ac) | TSF | -- | -- | 327.00 | 13,100 |
| | 11. | Commercial Center(10-30a) | TSF | -- | -- | 166.52 | 9,007 |
| | 13. | Commercial Shops | TSF | 64.25 | 2,381 | 64.25 | 2,381 |
| | 25. | Church | TSF | 9.41 | 88 | 9.41 | 88 |
| | | SUB-TOTAL | | | 11,678 | | 34,310 |
| 219 | 2. | Single Family (1-5du/ac) | DU | 40.00 | 396 | 160.00 | 1,584 |
| | | SUB-TOTAL | | | 396 | | 1,584 |
| 220 | 2. | Single Family (1-5du/ac) | DU | 2.00 | 20 | 8.00 | 79 |
| | 34. | Utilities | TSF | 566.28 | 1,348 | 566.28 | 1,348 |
| | | SUB-TOTAL | | | 1,368 | | 1,427 |
| 221 | 2. | Single Family (1-5du/ac) | DU | 279.00 | 2,762 | 408.00 | 4,039 |
| | 4. | Condominium/Townhouse | DU | 6.00 | 48 | 6.00 | 48 |
| | 6. | Mobile Home | DU | 30.00 | 207 | 30.00 | 207 |
| | 22. | College | STU | 362.00 | 557 | 362.00 | 557 |
| | 25. | Church | TSF | 92.52 | 860 | 92.52 | 860 |
| | 30. | Industrial Park | TSF | 144.40 | 865 | 144.40 | 865 |
| | | SUB-TOTAL | | | 5,300 | | 6,577 |

Table E-1 (cont.)
LAND USE AND TRIP GENERATION SUMMARY

| Zone | | Land Use Category | Units | 2004 Amount | 2004 ADT | Long-Range GP Amount | Long-Range GP ADT |
|---|---|---|---|---|---|---|---|
| 222 | 2. | Single Family (1-5du/ac) | DU | 33.00 | 327 | 105.00 | 1,040 |
| | 4. | Condominium/Townhouse | DU | -- | -- | 112.00 | 896 |
| | 20. | Elementary/Middle School | STU | 750.00 | 1,088 | 750.00 | 1,088 |
| | 22. | College | STU | 1,200.00 | 1,848 | 1,600.00 | 2,464 |
| | 25. | Church | TSF | 16.70 | 155 | 16.70 | 155 |
| | 30. | Industrial Park | TSF | -- | -- | 124.15 | 745 |
| | | SUB-TOTAL | | | 3,418 | | 6,388 |
| 223 | 2. | Single Family (1-5du/ac) | DU | 19.00 | 188 | 29.00 | 287 |
| | 11. | Commercial Center(10-30a) | TSF | 43.38 | 2,345 | 43.38 | 2,345 |
| | 23. | Hospital | TSF | 4.32 | 73 | 4.32 | 73 |
| | 30. | Industrial Park | TSF | 70.36 | 422 | 70.36 | 422 |
| | 31. | Business Park | TSF | -- | -- | 437.12 | 4,459 |
| | 40. | Commercial Office | TSF | 0.36 | 4 | 0.36 | 4 |
| | | SUB-TOTAL | | | 3,032 | | 7,590 |
| 224 | 2. | Single Family (1-5du/ac) | DU | 230.00 | 2,277 | 326.00 | 3,227 |
| | 4. | Condominium/Townhouse | DU | 500.00 | 4,000 | 500.00 | 4,000 |
| | 6. | Mobile Home | DU | 30.00 | 207 | 30.00 | 207 |
| | 13. | Commercial Shops | TSF | 81.68 | 3,027 | 81.68 | 3,027 |
| | 20. | Elementary/Middle School | STU | 722.00 | 1,047 | 722.00 | 1,047 |
| | 24. | Library | TSF | 16.73 | 1,422 | 34.40 | 2,923 |
| | | SUB-TOTAL | | | 11,980 | | 14,431 |
| 225 | 2. | Single Family (1-5du/ac) | DU | 156.00 | 1,544 | 156.00 | 1,544 |
| | 4. | Condominium/Townhouse | DU | 151.00 | 1,208 | 151.00 | 1,208 |
| | 20. | Elementary/Middle School | STU | 1,608.00 | 2,332 | 1,608.00 | 2,332 |
| | 51. | Developed Park | AC | 14.00 | 36 | 14.00 | 36 |
| | | SUB-TOTAL | | | 5,120 | | 5,120 |
| 226 | 2. | Single Family (1-5du/ac) | DU | 300.00 | 2,970 | 300.00 | 2,970 |
| | 4. | Condominium/Townhouse | DU | 292.00 | 2,336 | 292.00 | 2,336 |
| | 11. | Commercial Center(10-30a) | TSF | -- | -- | 15.68 | 848 |
| | 13. | Commercial Shops | TSF | 69.70 | 2,583 | 69.70 | 2,583 |
| | 25. | Church | TSF | -- | -- | 8.00 | 74 |
| | | SUB-TOTAL | | | 7,889 | | 8,811 |
| 227 | 2. | Single Family (1-5du/ac) | DU | 172.00 | 1,703 | 172.00 | 1,703 |
| | 4. | Condominium/Townhouse | DU | 184.00 | 1,472 | 184.00 | 1,472 |
| | 31. | Business Park | TSF | -- | -- | 563.56 | 5,748 |
| | | SUB-TOTAL | | | 3,175 | | 8,923 |
| 228 | 2. | Single Family (1-5du/ac) | DU | 358.00 | 3,544 | 358.00 | 3,544 |
| | | SUB-TOTAL | | | 3,544 | | 3,544 |
| 229 | 1. | Single Family (<1du/ac) | DU | 74.00 | 733 | 74.00 | 733 |
| | 2. | Single Family (1-5du/ac) | DU | -- | -- | 104.00 | 1,030 |
| | | SUB-TOTAL | | | 733 | | 1,763 |
| 230 | 1. | Single Family (<1du/ac) | DU | 1.00 | 10 | 10.00 | 99 |
| | | SUB-TOTAL | | | 10 | | 99 |

Table E-1 (cont.)
LAND USE AND TRIP GENERATION SUMMARY

| Zone | | Land Use Category | Units | 2004 Amount | 2004 ADT | Long-Range GP Amount | Long-Range GP ADT |
|---|---|---|---|---|---|---|---|
| 231 | 2. | Single Family (1-5du/ac) | DU | -- | -- | 5.00 | 53 |
| | 4. | Condominium/Townhouse | DU | -- | -- | 51.00 | 408 |
| | 34. | Utilities | TSF | -- | -- | 29.00 | 69 |
| | | SUB-TOTAL | | | -- | | 527 |
| 232 | 1. | Single Family (<1du/ac) | DU | -- | -- | 10.00 | 99 |
| | | SUB-TOTAL | | | -- | | 99 |
| 233 | 31. | Business Park | TSF | -- | -- | 569.47 | 5,809 |
| | | SUB-TOTAL | | | -- | | 5,809 |
| 234 | 11. | Commercial Center(10-30a) | TSF | -- | -- | 100.00 | 5,406 |
| | 31. | Business Park | TSF | -- | -- | 470.24 | 4,796 |
| | | SUB-TOTAL | | | -- | | 10,202 |
| 235 | 11. | Commercial Center(10-30a) | TSF | 60.20 | 3,254 | 20.00 | 1,081 |
| | 31. | Business Park | TSF | 24.00 | 245 | 130.00 | 1,326 |
| | | SUB-TOTAL | | | 3,499 | | 2,407 |
| 236 | 2. | Single Family (1-5du/ac) | DU | -- | -- | 204.00 | 2,020 |
| | 3. | Single Family (6-10du/ac) | DU | -- | -- | 200.00 | 1,980 |
| | 20. | Elementary/Middle School | STU | -- | -- | 647.00 | 938 |
| | 51. | Developed Park | AC | -- | -- | 5.00 | 13 |
| | | SUB-TOTAL | | | -- | | 4,951 |
| 237 | 2. | Single Family (1-5du/ac) | DU | -- | -- | 225.00 | 2,228 |
| | 5. | Apartment | DU | -- | -- | 570.00 | 3,933 |
| | 40. | Commercial Office | TSF | -- | -- | 99.00 | 1,144 |
| | 51. | Developed Park | AC | -- | -- | 24.10 | 63 |
| | | SUB-TOTAL | | | -- | | 7,368 |
| 238 | 2. | Single Family (1-5du/ac) | DU | -- | -- | 163.00 | 1,614 |
| | 3. | Single Family (6-10du/ac) | DU | -- | -- | 236.30 | 2,336 |
| | 4. | Condominium/Townhouse | DU | -- | -- | 124.00 | 992 |
| | 10. | Commercial Center (>30ac) | TSF | -- | -- | 32.00 | 1,282 |
| | 11. | Commercial Center(10-30a) | TSF | -- | -- | 54.45 | 2,944 |
| | 12. | Commercial Center (<10ac) | TSF | -- | -- | 50.00 | 4,253 |
| | 15. | Sit-Down Restaurant | TSF | -- | -- | 20.00 | 2,607 |
| | 30. | Industrial Park | TSF | -- | -- | 175.00 | 1,050 |
| | 31. | Business Park | TSF | -- | -- | 227.00 | 2,315 |
| | 40. | Commercial Office | TSF | -- | -- | 86.16 | 996 |
| | 51. | Developed Park | AC | -- | -- | 25.90 | 67 |
| | | SUB-TOTAL | | | -- | | 20,456 |
| 239 | 13. | Commercial Shops | TSF | 87.12 | 3,229 | 337.29 | 12,500 |
| | 21. | High School | STU | 500.00 | 895 | 500.00 | 895 |
| | 30. | Industrial Park | TSF | 110.00 | 660 | 387.07 | 2,322 |
| | 32. | Manufacturing/Warehouse | TSF | 352.84 | 1,799 | 1,552.60 | 7,918 |
| | 40. | Commercial Office | TSF | 17.42 | 201 | 262.87 | 3,039 |
| | | SUB-TOTAL | | | 6,784 | | 26,674 |

Table E-1 (cont.)
LAND USE AND TRIP GENERATION SUMMARY

| Zone | | Land Use Category | Units | 2004 Amount | 2004 ADT | Long-Range GP Amount | Long-Range GP ADT |
|---|---|---|---|---|---|---|---|
| 240 | 10. | Commercial Center (>30ac) | TSF | -- | -- | 126.00 | 5,048 |
| | 12. | Commercial Center (<10ac) | TSF | -- | -- | 40.00 | 3,402 |
| | 15. | Sit-Down Restaurant | TSF | -- | -- | 9.50 | 1,238 |
| | 16. | Fast Food Restaurant | TSF | -- | -- | 5.50 | 2,729 |
| | | SUB-TOTAL | | | -- | | 12,417 |
| 241 | 10. | Commercial Center (>30ac) | TSF | -- | -- | 34.00 | 1,362 |
| | 15. | Sit-Down Restaurant | TSF | -- | -- | 10.00 | 1,303 |
| | | SUB-TOTAL | | | -- | | 2,665 |
| 242 | 40. | Commercial Office | TSF | -- | -- | 115.00 | 1,329 |
| | | SUB-TOTAL | | | -- | | 1,329 |
| 243 | 2. | Single Family (1-5du/ac) | DU | -- | -- | 211.00 | 2,089 |
| | 4. | Condominium/Townhouse | DU | -- | -- | 426.00 | 3,408 |
| | 5. | Apartment | DU | -- | -- | 496.00 | 3,422 |
| | 10. | Commercial Center (>30ac) | TSF | -- | -- | 75.00 | 3,005 |
| | 12. | Commercial Center (<10ac) | TSF | -- | -- | 20.00 | 1,701 |
| | 15. | Sit-Down Restaurant | TSF | -- | -- | 34.00 | 4,432 |
| | 40. | Commercial Office | TSF | -- | -- | 164.00 | 1,896 |
| | | SUB-TOTAL | | | -- | | 19,953 |
| 244 | 1. | Single Family (<1du/ac) | DU | 95.00 | 940 | 95.00 | 940 |
| | 2. | Single Family (1-5du/ac) | DU | 322.00 | 3,188 | 322.00 | 3,188 |
| | 3. | Single Family (5-10du/ac) | DU | 95.00 | 940 | 95.00 | 940 |
| | 4. | Condominium/Townhouse | DU | 157.00 | 1,256 | 157.00 | 1,256 |
| | | SUB-TOTAL | | | 6,324 | | 6,324 |
| 245 | 4. | Condominium/Townhouse | DU | 148.00 | 1,184 | 148.00 | 1,184 |
| | 30. | Industrial Park | TSF | -- | -- | 345.58 | 2,073 |
| | 32. | Manufacturing/Warehouse | TSF | 61.16 | 312 | 61.16 | 312 |
| | | SUB-TOTAL | | | 1,496 | | 3,569 |
| 246 | 12. | Commercial Center (<10ac) | TSF | -- | -- | 36.00 | 3,062 |
| | 32. | Manufacturing/Warehouse | TSF | 58.81 | 300 | 58.81 | 300 |
| | | SUB-TOTAL | | | 300 | | 3,362 |
| 247 | 11. | Commercial Center(10-30a) | TSF | 71.37 | 3,858 | 71.37 | 3,858 |
| | | SUB-TOTAL | | | 3,858 | | 3,858 |
| 248 | 2. | Single Family (1-5du/ac) | DU | 2.00 | 20 | 2.00 | 20 |
| | 4. | Condominium/Townhouse | DU | 4.00 | 32 | 4.00 | 32 |
| | 30. | Industrial Park | TSF | 882.09 | 5,293 | 882.09 | 5,293 |
| | | SUB-TOTAL | | | 5,345 | | 5,345 |
| 249 | 32. | Manufacturing/Warehouse | TSF | 291.68 | 1,488 | 291.68 | 1,488 |
| | 40. | Commercial Office | TSF | -- | -- | 150.00 | 1,734 |
| | | SUB-TOTAL | | | 1,488 | | 3,222 |
| 250 | 11. | Commercial Center(10-30a) | TSF | -- | -- | 90.66 | 4,901 |

Table E-1 (cont.)
LAND USE AND TRIP GENERATION SUMMARY

| Zone | | Land Use Category | Units | 2004 Amount | 2004 ADT | Long-Range GP Amount | Long-Range GP ADT |
|---|---|---|---|---|---|---|---|
| 250 | 13. | Commercial Shops | TSF | 58.00 | 2,149 | 58.00 | 2,149 |
| | | SUB-TOTAL | | | 2,149 | | 7,050 |
| 252 | 31. | Business Park | TSF | -- | -- | 858.00 | 8,752 |
| | | SUB-TOTAL | | | -- | | 8,752 |
| 253 | 1. | Single Family (<1du/ac) | DU | -- | -- | 84.00 | 832 |
| | | SUB-TOTAL | | | -- | | 832 |
| 254 | 11. | Commercial Center(10-30a) | TSF | -- | -- | 107.50 | 5,811 |
| | 13. | Commercial Shops | TSF | 8.71 | 323 | 8.71 | 323 |
| | | SUB-TOTAL | | | 323 | | 6,134 |
| 255 | 1. | Single Family (<1du/ac) | DU | 2.00 | 20 | 69.00 | 683 |
| | | SUB-TOTAL | | | 20 | | 683 |
| 256 | 2. | Single Family (1-5du/ac) | DU | 20.00 | 198 | 20.00 | 198 |
| | | SUB-TOTAL | | | 198 | | 198 |
| 257 | 2. | Single Family (1-5du/ac) | DU | 103.00 | 1,020 | 266.00 | 2,633 |
| | 3. | Single Family (6-10du/ac) | DU | -- | -- | 38.00 | 376 |
| | 4. | Condominium/Townhouse | DU | 11.00 | 88 | 11.00 | 88 |
| | | SUB-TOTAL | | | 1,108 | | 3,097 |
| 258 | 2. | Single Family (1-5du/ac) | DU | 54.00 | 535 | 97.00 | 960 |
| | 32. | Manufacturing/Warehouse | TSF | -- | -- | 125.00 | 638 |
| | | SUB-TOTAL | | | 535 | | 1,598 |
| 259 | 3. | Single Family (6-10du/ac) | DU | -- | -- | 14.00 | 139 |
| | 4. | Condominium/Townhouse | DU | -- | -- | 237.00 | 1,896 |
| | | SUB-TOTAL | | | -- | | 2,035 |
| 260 | 2. | Single Family (1-5du/ac) | DU | 27.00 | 267 | 402.00 | 3,980 |
| | | SUB-TOTAL | | | 267 | | 3,980 |
| 261 | 2. | Single Family (1-5du/ac) | DU | 10.00 | 99 | 295.00 | 2,921 |
| | | SUB-TOTAL | | | 99 | | 2,921 |
| 262 | 2. | Single Family (1-5du/ac) | DU | 220.00 | 2,178 | 596.00 | 5,900 |
| | 3. | Single Family (6-10du/ac) | DU | 126.00 | 1,247 | 194.00 | 1,921 |
| | 20. | Elementary/Middle School | STU | 750.00 | 1,088 | 750.00 | 1,088 |
| | | SUB-TOTAL | | | 4,513 | | 8,909 |
| 263 | 4. | Condominium/Townhouse | DU | -- | -- | 140.00 | 1,120 |
| | | SUB-TOTAL | | | -- | | 1,120 |
| 264 | 3. | Single Family (6-10du/ac) | DU | 63.00 | 624 | 63.00 | 624 |
| | | SUB-TOTAL | | | 624 | | 624 |
| 265 | 4. | Condominium/Townhouse | DU | 1,338.00 | 10,704 | 1,338.00 | 10,704 |
| | | SUB-TOTAL | | | 10,704 | | 10,704 |

Table E-1 (cont.)
LAND USE AND TRIP GENERATION SUMMARY

| Zone | | Land Use Category | Units | 2004 Amount | 2004 ADT | Long-Range GP Amount | Long-Range GP ADT |
|---|---|---|---|---|---|---|---|
| 266 | 11. | Commercial Center(10-30a) | TSF | 101.04 | 5,462 | 101.04 | 5,462 |
| | | SUB-TOTAL | | | 5,462 | | 5,462 |
| 267 | 11. | Commercial Center(10-30a) | TSF | 100.00 | 5,406 | 100.00 | 5,406 |
| | | SUB-TOTAL | | | 5,406 | | 5,406 |
| 268 | 4. | Condominium/Townhouse | DU | 400.00 | 3,200 | 400.00 | 3,200 |
| | 11. | Commercial Center(10-30a) | TSF | 182.33 | 9,857 | 182.33 | 9,857 |
| | 32. | Manufacturing/Warehouse | TSF | 75.00 | 383 | 75.00 | 383 |
| | | SUB-TOTAL | | | 13,440 | | 13,440 |
| 269 | 2. | Single Family (1-5du/ac) | DU | 173.00 | 1,713 | 671.00 | 5,643 |
| | 3. | Single Family (6-10du/ac) | DU | -- | -- | 16.00 | 158 |
| | 20. | Elementary/Middle School | STU | -- | -- | 500.00 | 725 |
| | 21. | High School | STU | -- | -- | 1,116.00 | 1,998 |
| | 51. | Developed Park | AC | 3.00 | 8 | 4.50 | 12 |
| | | SUB-TOTAL | | | 1,721 | | 9,536 |
| 270 | 1. | Single Family (<1du/ac) | DU | 8.00 | 79 | 8.00 | 79 |
| | | SUB-TOTAL | | | 79 | | 79 |
| 271 | 5. | Apartment | DU | -- | -- | 155.00 | 1,070 |
| | 10. | Commercial Center (>30ac) | TSF | -- | -- | 690.66 | 27,668 |
| | | SUB-TOTAL | | | -- | | 28,738 |
| 272 | 2. | Single Family (1-5du/ac) | DU | 665.00 | 6,583 | 665.00 | 6,583 |
| | 3. | Single Family (6-10du/ac) | DU | 154.00 | 1,525 | 302.00 | 2,990 |
| | 4. | Condominium/Townhouse | DU | 823.00 | 6,584 | 823.00 | 6,584 |
| | 12. | Commercial Center (<10ac) | TSF | 8.12 | 691 | 8.12 | 691 |
| | 20. | Elementary/Middle School | STU | 750.00 | 1,088 | 750.00 | 1,088 |
| | | SUB-TOTAL | | | 16,471 | | 17,936 |
| 273 | 2. | Single Family (1-5du/ac) | DU | 6.00 | 59 | 101.00 | 1,000 |
| | | SUB-TOTAL | | | 59 | | 1,000 |
| 274 | 2. | Single Family (1-5du/ac) | DU | -- | -- | 362.00 | 3,584 |
| | 31. | Business Park | TSF | -- | -- | 110.06 | 1,123 |
| | | SUB-TOTAL | | | -- | | 4,707 |
| 275 | 2. | Single Family (1-5du/ac) | DU | 225.00 | 2,226 | 225.00 | 2,228 |
| | | SUB-TOTAL | | | 2,228 | | 2,228 |
| 276 | 3. | Single Family (6-10du/ac) | DU | 75.00 | 743 | 75.00 | 743 |
| | 4. | Condominium/Townhouse | DU | 539.00 | 4,312 | 539.00 | 4,312 |
| | 12. | Commercial Center (<10ac) | TSF | 98.01 | 8,337 | 98.01 | 8,337 |
| | 25. | Church | TSF | 7.84 | 73 | 7.84 | 73 |
| | | SUB-TOTAL | | | 13,465 | | 13,465 |
| 277 | 12. | Commercial Center (<10ac) | TSF | 4.91 | 418 | 4.91 | 418 |
| | 15. | Sit-Down Restaurant | TSF | 3.00 | 391 | 3.00 | 391 |
| | | SUB-TOTAL | | | 809 | | 809 |

Table E-1 (cont.)
LAND USE AND TRIP GENERATION SUMMARY

| Zone | | Land Use Category | Units | 2004 Amount | 2004 ADT | Long-Range GP Amount | Long-Range GP ADT |
|---|---|---|---|---|---|---|---|
| 278 | 4. | Condominium/Townhouse | DU | 757.00 | 6,056 | 757.00 | 6,056 |
| | 12. | Commercial Center (<10ac) | TSF | 81.89 | 6,966 | 81.89 | 6,966 |
| | 50. | Golf Course | AC | 50.00 | 398 | 50.00 | 398 |
| | | SUB-TOTAL | | | 13,420 | | 13,420 |
| 279 | 6. | Mobile Home | DU | 313.00 | 2,160 | 313.00 | 2,160 |
| | 12. | Commercial Center (<10ac) | TSF | 19.33 | 1,644 | 26.33 | 2,240 |
| | 30. | Industrial Park | TSF | -- | -- | 58.00 | 348 |
| | 40. | Commercial Office | TSF | 0.20 | 2 | 0.20 | 2 |
| | | SUB-TOTAL | | | 3,806 | | 4,750 |
| 280 | 31. | Business Park | TSF | -- | -- | 38.18 | 389 |
| | | SUB-TOTAL | | | -- | | 389 |
| 281 | 31. | Business Park | TSF | -- | -- | 215.62 | 2,199 |
| | | SUB-TOTAL | | | -- | | 2,199 |
| 282 | 4. | Condominium/Townhouse | DU | 486.00 | 3,888 | 486.00 | 3,888 |
| | 11. | Commercial Center(10-30a) | TSF | 17.90 | 968 | 17.90 | 968 |
| | | SUB-TOTAL | | | 4,856 | | 4,856 |
| 283 | 2. | Single Family (1-5du/ac) | DU | 161.00 | 1,594 | 161.00 | 1,594 |
| | 4. | Condominium/Townhouse | DU | 400.00 | 3,200 | 400.00 | 3,200 |
| | 20. | Elementary/Middle School | STU | 1,116.00 | 1,618 | 1,116.00 | 1,618 |
| | | SUB-TOTAL | | | 6,412 | | 6,412 |
| 284 | 2. | Single Family (1-5du/ac) | DU | 2.00 | 20 | 46.00 | 455 |
| | 6. | Mobile Home | DU | 345.00 | 2,387 | 345.00 | 2,387 |
| | | SUB-TOTAL | | | 2,407 | | 2,842 |
| 285 | 2. | Single Family (1-5du/ac) | DU | -- | -- | 80.00 | 792 |
| | 10. | Commercial Center (>30ac) | TSF | -- | -- | 246.99 | 9,894 |
| | | SUB-TOTAL | | | -- | | 10,686 |
| 286 | 2. | Single Family (1-5du/ac) | DU | -- | -- | 82.00 | 812 |
| | | SUB-TOTAL | | | -- | | 812 |
| 287 | 3. | Single Family (6-10du/ac) | DU | -- | -- | 111.00 | 1,099 |
| | | SUB-TOTAL | | | -- | | 1,099 |
| 288 | 21. | High School | STU | -- | -- | 2,500.00 | 4,475 |
| | | SUB-TOTAL | | | -- | | 4,475 |
| 289 | 2. | Single Family (1-5du/ac) | DU | -- | -- | 55.00 | 545 |
| | 31. | Business Park | TSF | -- | -- | 57.17 | 583 |
| | | SUB-TOTAL | | | -- | | 1,128 |
| 290 | 2. | Single Family (1-5du/ac) | DU | 64.00 | 634 | 64.00 | 634 |
| | 4. | Condominium/Townhouse | DU | 93.00 | 744 | 93.00 | 744 |
| | | SUB-TOTAL | | | 1,378 | | 1,378 |

Table E-1 (cont.)
LAND USE AND TRIP GENERATION SUMMARY

| Zone | | Land Use Category | Units | 2004 Amount | 2004 ADT | Long-Range GP Amount | Long-Range GP ADT |
|---|---|---|---|---|---|---|---|
| 291 | 2. | Single Family (1-5du/ac) | DU | -- | -- | 74.00 | 733 |
| | 31. | Business Park | TSF | 8.60 | 88 | 181.63 | 1,853 |
| | | SUB-TOTAL | | | 88 | | 2,586 |
| 292 | 2. | Single Family (1-5du/ac) | DU | 161.00 | 1,594 | 161.00 | 1,594 |
| | | SUB-TOTAL | | | 1,594 | | 1,594 |
| 293 | 2. | Single Family (1-5du/ac) | DU | 133.00 | 1,317 | 133.00 | 1,317 |
| | 4. | Condominium/Townhouse | DU | 368.00 | 2,944 | 368.00 | 2,944 |
| | | SUB-TOTAL | | | 4,261 | | 4,261 |
| 294 | 5. | Apartment | DU | -- | -- | 191.00 | 1,318 |
| | 11. | Commercial Center(10-30a) | TSF | 124.35 | 6,722 | 364.30 | 19,678 |
| | 30. | Industrial Park | TSF | 210.00 | 1,260 | 210.00 | 1,260 |
| | 31. | Business Park | TSF | 294.22 | 3,001 | 349.98 | 3,570 |
| | 51. | Developed Park | AC | -- | -- | 38.00 | 99 |
| | | SUB-TOTAL | | | 10,983 | | 25,925 |
| 295 | 32. | Manufacturing/Warehouse | TSF | 372.45 | 1,899 | 1,020.58 | 5,205 |
| | 40. | Commercial Office | TSF | -- | -- | 56.00 | 647 |
| | 51. | Developed Park | AC | 21.50 | 56 | 21.50 | 56 |
| | | SUB-TOTAL | | | 1,955 | | 5,908 |
| 298 | 5. | Apartment | DU | 830.00 | 5,727 | 830.00 | 5,727 |
| | | SUB-TOTAL | | | 5,727 | | 5,727 |
| 299 | 11. | Commercial Center(10-30a) | TSF | 184.00 | 9,947 | 184.00 | 9,947 |
| | | SUB-TOTAL | | | 9,947 | | 9,947 |
| 300 | 10. | Commercial Center (>30ac) | TSF | 272.00 | 10,896 | 272.00 | 10,896 |
| | | SUB-TOTAL | | | 10,896 | | 10,896 |
| 301 | 13. | Commercial Shops | TSF | 49.24 | 1,825 | 49.24 | 1,825 |
| | 19. | Car Dealership | TSF | 66.50 | 2,494 | 66.50 | 2,494 |
| | 43. | Post Office | TSF | 50.00 | 5,410 | 50.00 | 5,410 |
| | | SUB-TOTAL | | | 9,729 | | 9,729 |
| 302 | 10. | Commercial Center (>30ac) | TSF | 384.42 | 15,400 | 384.42 | 15,400 |
| | 12. | Commercial Center (<10ac) | TSF | -- | -- | 30.00 | 2,552 |
| | 19. | Car Dealership | TSF | 31.00 | 1,163 | 31.00 | 1,163 |
| | | SUB-TOTAL | | | 16,563 | | 19,115 |
| 303 | 19. | Car Dealership | TSF | 150.00 | 5,625 | 150.00 | 5,625 |
| | | SUB-TOTAL | | | 5,625 | | 5,625 |
| 304 | 11. | Commercial Center(10-30a) | TSF | 33.00 | 1,784 | 33.00 | 1,784 |
| | 15. | Sit-Down Restaurant | TSF | 15.00 | 1,955 | 15.00 | 1,955 |
| | 19. | Car Dealership | TSF | 83.00 | 3,113 | 83.00 | 3,113 |
| | | SUB-TOTAL | | | 6,852 | | 6,852 |

Table E-1 (cont.)
LAND USE AND TRIP GENERATION SUMMARY

| Zone | | Land Use Category | Units | 2004 Amount | 2004 ADT | Long-Range GP Amount | Long-Range GP ADT |
|---|---|---|---|---|---|---|---|
| 305 | 11. | Commercial Center(10-30a) | TSF | 197.29 | 10,665 | 197.29 | 10,665 |
| | 15. | Sit-Down Restaurant | TSF | 5.36 | 699 | 5.36 | 699 |
| | 32. | Manufacturing/Warehouse | TSF | -- | -- | 100.00 | 510 |
| | | SUB-TOTAL | | | 11,364 | | 11,874 |
| 306 | 11. | Commercial Center(10-30a) | TSF | 80.50 | 4,352 | 143.90 | 7,779 |
| | 25. | Church | TSF | 36.10 | 336 | 36.10 | 336 |
| | | SUB-TOTAL | | | 4,688 | | 8,115 |
| 307 | 11. | Commercial Center(10-30a) | TSF | 128.00 | 6,920 | 128.00 | 6,920 |
| | 16. | Fast Food Restaurant | TSF | 4.80 | 2,381 | 4.80 | 2,381 |
| | | SUB-TOTAL | | | 9,301 | | 9,301 |
| 308 | 5. | Apartment | DU | 245.00 | 1,691 | 245.00 | 1,691 |
| | 12. | Commercial Center (<10ac) | TSF | 175.11 | 14,895 | 175.11 | 14,895 |
| | 15. | Sit-Down Restaurant | TSF | 5.40 | 704 | 5.40 | 704 |
| | 32. | Manufacturing/Warehouse | TSF | 29.40 | 150 | 29.40 | 150 |
| | | SUB-TOTAL | | | 17,440 | | 17,440 |
| 309 | 13. | Commercial Shops | TSF | 3.00 | 111 | 3.00 | 111 |
| | | SUB-TOTAL | | | 111 | | 111 |
| 310 | 19. | Car Dealership | TSF | -- | -- | 111.00 | 4,163 |
| | 51. | Developed Park | AC | 17.20 | 45 | 17.20 | 45 |
| | | SUB-TOTAL | | | 45 | | 4,208 |
| 311 | 3. | Single Family (6-10du/ac) | DU | 132.00 | 1,307 | 132.00 | 1,307 |
| | 4. | Condominium/Townhouse | DU | 63.00 | 504 | 63.00 | 504 |
| | | SUB-TOTAL | | | 1,811 | | 1,811 |
| 312 | 11. | Commercial Center(10-30a) | TSF | 164.40 | 8,887 | 180.00 | 9,731 |
| | 34. | Utilities | TSF | 84.00 | 200 | 84.00 | 200 |
| | | SUB-TOTAL | | | 9,087 | | 9,931 |
| 313 | 4. | Condominium/Townhouse | DU | 264.00 | 2,112 | 264.00 | 2,112 |
| | | SUB-TOTAL | | | 2,112 | | 2,112 |
| 314 | 11. | Commercial Center(10-30a) | TSF | 178.00 | 9,623 | 178.00 | 9,623 |
| | | SUB-TOTAL | | | 9,623 | | 9,623 |
| 315 | 4. | Condominium/Townhouse | DU | 582.00 | 4,656 | 582.00 | 4,656 |
| | | SUB-TOTAL | | | 4,656 | | 4,656 |
| 316 | 2. | Single Family (1-5du/ac) | DU | 121.00 | 1,198 | 121.00 | 1,198 |
| | | SUB-TOTAL | | | 1,198 | | 1,198 |
| 317 | 20. | Elementary/Middle School | STU | 924.00 | 1,340 | 924.00 | 1,340 |
| | 51. | Developed Park | AC | 18.00 | 47 | 18.00 | 47 |
| | | SUB-TOTAL | | | 1,387 | | 1,387 |

Table E-1 (cont.)
LAND USE AND TRIP GENERATION SUMMARY

| Zone | | Land Use Category | Units | 2004 Amount | 2004 ADT | Long-Range GP Amount | Long-Range GP ADT |
|---|---|---|---|---|---|---|---|
| 318 | 2. | Single Family (1-5du/ac) | DU | 21.00 | 208 | 21.00 | 208 |
| | 4. | Condominium/Townhouse | DU | 252.00 | 2,016 | 252.00 | 2,016 |
| | | SUB-TOTAL | | | 2,224 | | 2,224 |
| 319 | 13. | Commercial Shops | TSF | -- | -- | 2.00 | 74 |
| | 20. | Elementary/Middle School | STU | -- | -- | 250.00 | 363 |
| | 25. | Church | TSF | -- | -- | 80.00 | 744 |
| | 40. | Commercial Office | TSF | -- | -- | 240.00 | 2,774 |
| | | SUB-TOTAL | | | -- | | 3,955 |
| 320 | 2. | Single Family (1-5du/ac) | DU | 125.00 | 1,238 | 125.00 | 1,238 |
| | | SUB-TOTAL | | | 1,238 | | 1,238 |
| 321 | 3. | Single Family (6-10du/ac) | DU | 155.00 | 1,535 | 155.00 | 1,535 |
| | 4. | Condominium/Townhouse | DU | 66.00 | 528 | 66.00 | 528 |
| | | SUB-TOTAL | | | 2,063 | | 2,063 |
| 322 | 3. | Single Family (6-10du/ac) | DU | 87.00 | 861 | 87.00 | 861 |
| | | SUB-TOTAL | | | 861 | | 861 |
| 323 | 3. | Single Family (6-10du/ac) | DU | 161.00 | 1,594 | 161.00 | 1,594 |
| | 4. | Condominium/Townhouse | DU | 132.00 | 1,056 | 132.00 | 1,056 |
| | | SUB-TOTAL | | | 2,650 | | 2,650 |
| 325 | 3. | Single Family (6-10du/ac) | DU | -- | -- | 205.00 | 2,029 |
| | | SUB-TOTAL | | | -- | | 2,029 |
| 326 | 2. | Single Family (1-5du/ac) | DU | 101.00 | 1,000 | 101.00 | 1,000 |
| | | SUB-TOTAL | | | 1,000 | | 1,000 |
| 327 | 2. | Single Family (1-5du/ac) | DU | 105.00 | 1,040 | 105.00 | 1,040 |
| | | SUB-TOTAL | | | 1,040 | | 1,040 |
| 328 | 2. | Single Family (1-5du/ac) | DU | 110.00 | 1,089 | 110.00 | 1,089 |
| | | SUB-TOTAL | | | 1,089 | | 1,089 |
| 329 | 2. | Single Family (1-5du/ac) | DU | 50.00 | 495 | 50.00 | 495 |
| | 20. | Elementary/Middle School | STU | 924.00 | 1,340 | 924.00 | 1,340 |
| | | SUB-TOTAL | | | 1,835 | | 1,835 |
| 330 | 2. | Single Family (1-5du/ac) | DU | 143.00 | 1,416 | 143.00 | 1,416 |
| | | SUB-TOTAL | | | 1,416 | | 1,416 |
| 331 | 2. | Single Family (1-5du/ac) | DU | 167.00 | 1,653 | 167.00 | 1,653 |
| | | SUB-TOTAL | | | 1,653 | | 1,653 |
| 332 | 2. | Single Family (1-5du/ac) | DU | 114.00 | 1,129 | 114.00 | 1,129 |
| | 4. | Condominium/Townhouse | DU | 102.00 | 816 | 102.00 | 816 |
| | | SUB-TOTAL | | | 1,945 | | 1,945 |

Table E-1 (cont.)
LAND USE AND TRIP GENERATION SUMMARY

| Zone | | Land Use Category | Units | 2004 Amount | 2004 ADT | Long-Range GP Amount | Long-Range GP ADT |
|---|---|---|---|---|---|---|---|
| 333 | 2. | Single Family (1-5du/ac) | DU | 803.00 | 7,950 | 803.00 | 7,950 |
| | 4. | Condominium/Townhouse | DU | 360.00 | 2,880 | 360.00 | 2,880 |
| | 13. | Commercial Shops | TSF | 25.05 | 926 | 25.05 | 928 |
| | 20. | Elementary/Middle School | STU | 924.00 | 1,340 | 924.00 | 1,340 |
| | | SUB-TOTAL | | | 13,098 | | 13,098 |
| 334 | 2. | Single Family (1-5du/ac) | DU | 164.00 | 1,624 | 164.00 | 1,624 |
| | | SUB-TOTAL | | | 1,624 | | 1,624 |
| 335 | 2. | Single Family (1-5du/ac) | DU | 194.00 | 1,921 | 194.00 | 1,921 |
| | | SUB-TOTAL | | | 1,921 | | 1,921 |
| 336 | 2. | Single Family (1-5du/ac) | DU | 589.00 | 5,831 | 589.00 | 5,831 |
| | 20. | Elementary/Middle School | STU | 924.00 | 1,340 | 924.00 | 1,340 |
| | 51. | Developed Park | AC | 7.30 | 19 | 7.30 | 19 |
| | | SUB-TOTAL | | | 7,190 | | 7,190 |
| 337 | 2. | Single Family (1-5du/ac) | DU | 390.00 | 3,861 | 390.00 | 3,861 |
| | | SUB-TOTAL | | | 3,861 | | 3,861 |
| 338 | 11. | Commercial Center(10-30a) | TSF | 92.00 | 4,974 | 92.00 | 4,974 |
| | | SUB-TOTAL | | | 4,974 | | 4,974 |
| 339 | 2. | Single Family (1-5du/ac) | DU | 128.00 | 1,267 | 128.00 | 1,267 |
| | 3. | Single Family (6-10du/ac) | DU | 161.00 | 1,594 | 161.00 | 1,594 |
| | 20. | Elementary/Middle School | STU | 924.00 | 1,340 | 924.00 | 1,340 |
| | 51. | Developed Park | AC | 7.00 | 18 | 7.00 | 18 |
| | | SUB-TOTAL | | | 4,219 | | 4,219 |
| 340 | 2. | Single Family (1-5du/ac) | DU | 270.00 | 2,673 | 270.00 | 2,673 |
| | 3. | Single Family (6-10du/ac) | DU | 124.00 | 1,228 | 124.00 | 1,228 |
| | 4. | Condominium/Townhouse | DU | 264.00 | 2,112 | 264.00 | 2,112 |
| | | SUB-TOTAL | | | 6,013 | | 6,013 |
| 341 | 5. | Apartment | DU | 325.00 | 2,243 | 325.00 | 2,243 |
| | 26. | Day Care | STU | 260.00 | 1,175 | 260.00 | 1,175 |
| | | SUB-TOTAL | | | 3,418 | | 3,418 |
| 342 | 4. | Condominium/Townhouse | DU | 168.00 | 1,344 | 168.00 | 1,344 |
| | | SUB-TOTAL | | | 1,344 | | 1,344 |
| 343 | 2. | Single Family (1-5du/ac) | DU | 90.00 | 891 | 90.00 | 891 |
| | 3. | Single Family (6-10du/ac) | DU | 89.00 | 881 | 89.00 | 881 |
| | 4. | Condominium/Townhouse | DU | 132.00 | 1,056 | 132.00 | 1,056 |
| | | SUB-TOTAL | | | 2,828 | | 2,828 |
| 344 | 2. | Single Family (1-5du/ac) | DU | 415.00 | 4,109 | 415.00 | 4,109 |
| | 11. | Commercial Center(10-30a) | TSF | -- | -- | 40.00 | 2,162 |
| | | SUB-TOTAL | | | 4,109 | | 6,271 |

Table E-1 (cont.)
LAND USE AND TRIP GENERATION SUMMARY

| Zone | | Land Use Category | Units | 2004 Amount | 2004 ADT | Long-Range GP Amount | Long-Range GP ADT |
|---|---|---|---|---|---|---|---|
| 345 | 2. | Single Family (1-5du/ac) | DU | 23.00 | 228 | 23.00 | 228 |
| | | SUB-TOTAL | | | 228 | | 228 |
| 347 | 2. | Single Family (1-5du/ac) | DU | 313.00 | 3,099 | 313.00 | 3,099 |
| | | SUB-TOTAL | | | 3,099 | | 3,099 |
| 348 | 2. | Single Family (1-5du/ac) | DU | 517.00 | 5,118 | 517.00 | 5,118 |
| | | SUB-TOTAL | | | 5,118 | | 5,118 |
| 349 | 4. | Condominium/Townhouse | DU | 83.00 | 664 | 83.00 | 664 |
| | 12. | Commercial Center (<10ac) | TSF | 8.00 | 680 | 8.00 | 680 |
| | 26. | Day Care | STU | 50.00 | 226 | 50.00 | 226 |
| | | SUB-TOTAL | | | 1,570 | | 1,570 |
| 350 | 25. | Church | TSF | 108.61 | 1,010 | 108.61 | 1,010 |
| | | SUB-TOTAL | | | 1,010 | | 1,010 |
| 352 | 2. | Single Family (1-5du/ac) | DU | 440.00 | 4,356 | 592.00 | 5,861 |
| | | SUB-TOTAL | | | 4,356 | | 5,861 |
| 353 | 2. | Single Family (1-5du/ac) | DU | 259.00 | 2,564 | 259.00 | 2,564 |
| | | SUB-TOTAL | | | 2,564 | | 2,564 |
| 355 | 2. | Single Family (1-5du/ac) | DU | -- | -- | 500.00 | 4,950 |
| | 20. | Elementary/Middle School | STU | -- | -- | 750.00 | 1,088 |
| | 51. | Developed Park | AC | -- | -- | 5.00 | 13 |
| | | SUB-TOTAL | | | -- | | 6,051 |
| 356 | 2. | Single Family (1-5du/ac) | DU | 385.00 | 3,811 | 385.00 | 3,811 |
| | | SUB-TOTAL | | | 3,811 | | 3,811 |
| 357 | 2. | Single Family (1-5du/ac) | DU | -- | -- | 90.00 | 891 |
| | | SUB-TOTAL | | | -- | | 891 |
| 358 | 2. | Single Family (1-5du/ac) | DU | 105.00 | 1,040 | 421.00 | 4,168 |
| | 4. | Condominium/Townhouse | DU | 140.00 | 1,120 | 255.00 | 2,040 |
| | 20. | Elementary/Middle School | STU | 650.00 | 943 | 650.00 | 943 |
| | 51. | Developed Park | AC | 10.50 | 27 | 19.20 | 50 |
| | | SUB-TOTAL | | | 3,130 | | 7,201 |
| 359 | 2. | Single Family (1-5du/ac) | DU | 570.00 | 5,643 | 570.00 | 5,643 |
| | 4. | Condominium/Townhouse | DU | 192.00 | 1,536 | 192.00 | 1,536 |
| | | SUB-TOTAL | | | 7,179 | | 7,179 |
| 360 | 2. | Single Family (1-5du/ac) | DU | 538.00 | 5,326 | 538.00 | 5,326 |
| | 4. | Condominium/Townhouse | DU | 248.00 | 1,984 | 248.00 | 1,984 |
| | 12. | Commercial Center (<10ac) | TSF | 119.00 | 10,122 | 119.00 | 10,122 |
| | 20. | Elementary/Middle School | STU | 647.00 | 938 | 647.00 | 938 |
| | | SUB-TOTAL | | | 18,370 | | 18,370 |

Table E-1 (cont.)
LAND USE AND TRIP GENERATION SUMMARY

| Zone | Land Use Category | Units | 2004 Amount | 2004 ADT | Long-Range GP Amount | Long-Range GP ADT |
|---|---|---|---|---|---|---|
| 361 | 2. Single Family (1-5du/ac) | DU | 188.00 | 1,861 | 376.00 | 3,722 |
| | SUB-TOTAL | | | 1,861 | | 3,722 |
| 362 | 2. Single Family (1-5du/ac) | DU | 173.00 | 1,713 | 173.00 | 1,713 |
| | 11. Commercial Center(10-30a) | TSF | -- | -- | 68.28 | 3,691 |
| | SUB-TOTAL | | | 1,713 | | 5,404 |
| 363 | 2. Single Family (1-5du/ac) | DU | 6.00 | 59 | 44.00 | 436 |
| | SUB-TOTAL | | | 59 | | 436 |
| 364 | 3. Single Family (6-10du/ac) | DU | 199.00 | 1,970 | 199.00 | 1,970 |
| | SUB-TOTAL | | | 1,970 | | 1,970 |
| 365 | 2. Single Family (1-5du/ac) | DU | 201.00 | 1,990 | 201.00 | 1,990 |
| | 4. Condominium/Townhouse | DU | 102.00 | 816 | 102.00 | 816 |
| | 12. Commercial Center (<10ac) | TSF | 40.28 | 3,426 | 40.28 | 3,426 |
| | SUB-TOTAL | | | 6,232 | | 6,232 |
| 366 | 2. Single Family (1-5du/ac) | DU | 600.00 | 5,940 | 600.00 | 5,940 |
| | SUB-TOTAL | | | 5,940 | | 5,940 |
| 367 | 3. Single Family (6-10du/ac) | DU | 437.00 | 4,326 | 437.00 | 4,326 |
| | SUB-TOTAL | | | 4,326 | | 4,326 |
| 368 | 2. Single Family (1-5du/ac) | DU | 1,070.00 | 10,593 | 1,070.00 | 10,593 |
| | 20. Elementary/Middle School | STU | 675.00 | 979 | 675.00 | 979 |
| | 25. Church | TSF | 21.00 | 195 | 56.00 | 521 |
| | SUB-TOTAL | | | 11,767 | | 12,093 |
| 369 | 2. Single Family (1-5du/ac) | DU | 202.00 | 2,000 | 202.00 | 2,000 |
| | SUB-TOTAL | | | 2,000 | | 2,000 |
| 370 | 2. Single Family (1-5du/ac) | DU | 1,080.00 | 10,692 | 1,080.00 | 10,692 |
| | 21. High School | STU | 2,800.00 | 5,012 | 2,800.00 | 5,012 |
| | SUB-TOTAL | | | 15,704 | | 15,704 |
| 371 | 2. Single Family (1-5du/ac) | DU | 673.00 | 6,663 | 673.00 | 6,663 |
| | 20. Elementary/Middle School | STU | 687.00 | 996 | 687.00 | 996 |
| | SUB-TOTAL | | | 7,659 | | 7,659 |
| 372 | 2. Single Family (1-5du/ac) | DU | 287.00 | 2,841 | 287.00 | 2,841 |
| | 4. Condominium/Townhouse | DU | 230.00 | 1,840 | 230.00 | 1,840 |
| | 11. Commercial Center(10-30a) | TSF | 153.55 | 8,301 | 153.55 | 8,301 |
| | SUB-TOTAL | | | 12,982 | | 12,982 |
| 373 | 2. Single Family (1-5du/ac) | DU | 236.00 | 2,336 | 236.00 | 2,336 |
| | 20. Elementary/Middle School | STU | 462.00 | 670 | 462.00 | 670 |
| | 25. Church | TSF | 23.52 | 219 | 23.52 | 219 |
| | SUB-TOTAL | | | 3,225 | | 3,225 |

Table E-1 (cont.)
LAND USE AND TRIP GENERATION SUMMARY

| Zone | | Land Use Category | Units | 2004 Amount | 2004 ADT | Long-Range GP Amount | Long-Range GP ADT |
|---|---|---|---|---|---|---|---|
| 374 | 5. | Apartment | DU | -- | -- | 324.00 | 2,236 |
| | 11. | Commercial Center(10-30a) | TSF | 150.00 | 8,109 | 150.00 | 8,109 |
| | | SUB-TOTAL | | | 8,109 | | 10,345 |
| 375 | 12. | Commercial Center (<10ac) | TSF | -- | -- | 40.00 | 3,402 |
| | 16. | Fast Food Restaurant | TSF | 5.00 | 2,481 | 5.00 | 2,481 |
| | | SUB-TOTAL | | | 2,481 | | 5,883 |
| 376 | 3. | Single Family (6-10du/ac) | DU | -- | -- | 225.00 | 2,228 |
| | 51. | Developed Park | AC | -- | -- | 5.00 | 13 |
| | | SUB-TOTAL | | | -- | | 2,241 |
| 377 | 13. | Commercial Shops | TSF | 57.50 | 2,131 | 57.50 | 2,131 |
| | | SUB-TOTAL | | | 2,131 | | 2,131 |
| 378 | 6. | Mobile Home | DU | 332.00 | 2,291 | 332.00 | 2,291 |
| | 10. | Commercial Center (>30ac) | TSF | -- | -- | 500.00 | 20,330 |
| | 13. | Commercial Shops | TSF | 41.00 | 1,519 | 56.00 | 2,075 |
| | 31. | Business Park | TSF | 56.00 | 571 | 56.00 | 571 |
| | 40. | Commercial Office | TSF | -- | -- | 110.00 | 1,272 |
| | | SUB-TOTAL | | | 4,381 | | 26,239 |
| 379 | 3. | Single Family (6-10du/ac) | DU | -- | -- | 214.00 | 2,119 |
| | | SUB-TOTAL | | | -- | | 2,119 |
| 380 | 5. | Apartment | DU | -- | -- | 420.00 | 2,898 |
| | | SUB-TOTAL | | | -- | | 2,898 |
| 381 | 51. | Developed Park | AC | 50.00 | 130 | 50.00 | 130 |
| | | SUB-TOTAL | | | 130 | | 130 |
| 382 | 34. | Utilities | TSF | 21.00 | 50 | 21.00 | 50 |
| | 51. | Developed Park | AC | 50.00 | 130 | 50.00 | 130 |
| | | SUB-TOTAL | | | 180 | | 180 |
| 383 | 2. | Single Family (1-5du/ac) | DU | 231.00 | 2,287 | 257.00 | 2,544 |
| | 13. | Commercial Shops | TSF | 8.71 | 323 | 8.71 | 323 |
| | | SUB-TOTAL | | | 2,610 | | 2,867 |
| 384 | 2. | Single Family (1-5du/ac) | DU | 354.00 | 3,505 | 354.00 | 3,505 |
| | 12. | Commercial Center (<10ac) | TSF | 23.07 | 1,962 | 23.07 | 1,962 |
| | | SUB-TOTAL | | | 5,467 | | 5,467 |
| 385 | 2. | Single Family (1-5du/ac) | DU | -- | -- | 75.00 | 743 |
| | | SUB-TOTAL | | | -- | | 743 |
| 386 | 2. | Single Family (1-5du/ac) | DU | 162.00 | 1,604 | 162.00 | 1,604 |
| | | SUB-TOTAL | | | 1,604 | | 1,604 |
| 387 | 2. | Single Family (1-5du/ac) | DU | 142.00 | 1,406 | 1,015.00 | 10,049 |

Table 5-1 (cont.)
LAND USE AND TRIP GENERATION SUMMARY

| Zone | | Land Use Category | Units | 2004 Amount | 2004 ADT | Long-Range GP Amount | Long-Range GP ADT |
|---|---|---|---|---|---|---|---|
| 387 | 4. | Condominium/Townhouse | DU | 180.00 | 1,440 | 954.00 | 7,632 |
| | | SUB-TOTAL | | | 2,846 | | 17,681 |
| 388 | 1. | Single Family (<1du/ac) | DU | -- | -- | 208.00 | 2,059 |
| | | SUB-TOTAL | | | -- | | 2,059 |
| 389 | 2. | Single Family (1-5du/ac) | DU | 1,061.00 | 10,594 | 1,078.00 | 10,672 |
| | 3. | Single Family (6-10du/ac) | DU | 126.00 | 1,247 | 126.00 | 1,247 |
| | 20. | Elementary/Middle School | STU | 528.00 | 766 | 528.00 | 766 |
| | | SUB-TOTAL | | | 12,517 | | 12,685 |
| 390 | 2. | Single Family (1-5du/ac) | DU | 150.00 | 1,485 | 150.00 | 1,485 |
| | | SUB-TOTAL | | | 1,485 | | 1,485 |
| 391 | 13. | Commercial Shops | TSF | 16.33 | 605 | 16.33 | 605 |
| | 30. | Industrial Park | TSF | -- | -- | 70.00 | 420 |
| | 32. | Manufacturing/Warehouse | TSF | 376.36 | 1,919 | 376.36 | 1,919 |
| | | SUB-TOTAL | | | 2,524 | | 2,944 |
| 392 | 2. | Single Family (1-5du/ac) | DU | 323.00 | 3,198 | 323.00 | 3,198 |
| | 6. | Mobile Home | DU | 400.00 | 2,760 | 400.00 | 2,760 |
| | 11. | Commercial Center(10-30a) | TSF | -- | -- | 81.68 | 4,416 |
| | 13. | Commercial Shops | TSF | 20.80 | 771 | 20.80 | 771 |
| | 20. | Elementary/Middle School | STU | 1,000.00 | 1,450 | 1,000.00 | 1,450 |
| | | SUB-TOTAL | | | 8,179 | | 12,595 |
| 393 | 3. | Single Family (6-10du/ac) | DU | 162.00 | 1,604 | 162.00 | 1,604 |
| | 4. | Condominium/Townhouse | DU | 100.00 | 800 | 100.00 | 800 |
| | 12. | Commercial Center (<10ac) | TSF | 52.27 | 4,446 | 52.27 | 4,446 |
| | 25. | Church | TSF | 37.64 | 350 | 37.64 | 350 |
| | | SUB-TOTAL | | | 7,200 | | 7,200 |
| 394 | 2. | Single Family (1-5du/ac) | DU | 325.00 | 3,217 | 325.00 | 3,217 |
| | 20. | Elementary/Middle School | STU | 720.00 | 1,044 | 720.00 | 1,044 |
| | 21. | High School | STU | 3,500.00 | 6,265 | 3,500.00 | 6,265 |
| | 51. | Developed Park | AC | 3.20 | 8 | 3.20 | 8 |
| | | SUB-TOTAL | | | 10,534 | | 10,534 |
| 395 | 3. | Single Family (6-10du/ac) | DU | 185.00 | 1,831 | 185.00 | 1,831 |
| | 11. | Commercial Center(10-30a) | TSF | 165.53 | 8,949 | 165.53 | 8,949 |
| | 20. | Elementary/Middle School | STU | 1,505.00 | 2,182 | 1,505.00 | 2,182 |
| | | SUB-TOTAL | | | 12,962 | | 12,962 |
| 396 | 12. | Commercial Center (<10ac) | TSF | 76.23 | 6,484 | 76.23 | 6,484 |
| | | SUB-TOTAL | | | 6,484 | | 6,484 |
| 397 | 3. | Single Family (6-10du/ac) | DU | 49.00 | 485 | 49.00 | 485 |
| | 4. | Condominium/Townhouse | DU | 512.00 | 4,096 | 512.00 | 4,096 |
| | 5. | Apartment | DU | 67.00 | 462 | 67.00 | 462 |
| | 6. | Mobile Home | DU | 171.00 | 1,180 | 171.00 | 1,180 |

Table E-1 (cont.)
LAND USE AND TRIP GENERATION SUMMARY

| Zone | | Land Use Category | Units | 2004 Amount | 2004 ADT | Long-Range GP Amount | Long-Range GP ADT |
|---|---|---|---|---|---|---|---|
| 397 | 11. | Commercial Center(10-30a) | TSF | 310.98 | 16,812 | 310.98 | 16,812 |
| | 12. | Commercial Center (<10ac) | TSF | -- | -- | 74.00 | 6,294 |
| | | SUB-TOTAL | | | 23,035 | | 29,329 |
| 398 | 2. | Single Family (1-5du/ac) | DU | 1,120.00 | 11,088 | 1,120.00 | 11,088 |
| | 4. | Condominium/Townhouse | DU | 120.00 | 960 | 120.00 | 960 |
| | 12. | Commercial Center (<10ac) | TSF | 250.00 | 21,265 | 250.00 | 21,265 |
| | 13. | Commercial Shops | TSF | 2.68 | 99 | 2.68 | 99 |
| | 15. | Sit-Down Restaurant | TSF | 8.45 | 1,101 | 8.45 | 1,101 |
| | 20. | Elementary/Middle School | STU | 820.00 | 1,189 | 820.00 | 1,189 |
| | 24. | Library | TSF | 17.00 | 1,445 | 17.00 | 1,445 |
| | | SUB-TOTAL | | | 37,147 | | 37,147 |
| 399 | 2. | Single Family (1-5du/ac) | DU | 779.00 | 7,712 | 779.00 | 7,712 |
| | 3. | Single Family (6-10du/ac) | DU | 80.00 | 792 | 80.00 | 792 |
| | 20. | Elementary/Middle School | STU | 545.00 | 790 | 545.00 | 790 |
| | | SUB-TOTAL | | | 9,294 | | 9,294 |
| 400 | 2. | Single Family (1-5du/ac) | DU | -- | -- | 12.00 | 119 |
| | | SUB-TOTAL | | | -- | | 119 |
| 401 | 2. | Single Family (1-5du/ac) | DU | -- | -- | 900.00 | 8,910 |
| | 4. | Condominium/Townhouse | DU | -- | -- | 482.00 | 3,856 |
| | | SUB-TOTAL | | | -- | | 12,766 |
| 402 | 2. | Single Family (1-5du/ac) | DU | 300.00 | 2,970 | 1,129.00 | 11,177 |
| | 11. | Commercial Center(10-30a) | TSF | -- | -- | 150.00 | 8,109 |
| | 20. | Elementary/Middle School | STU | 656.00 | 951 | 656.00 | 951 |
| | | SUB-TOTAL | | | 3,921 | | 20,237 |
| 403 | 2. | Single Family (1-5du/ac) | DU | 111.00 | 1,099 | 111.00 | 1,099 |
| | 12. | Commercial Center (<10ac) | TSF | 12.00 | 1,021 | 46.00 | 3,913 |
| | | SUB-TOTAL | | | 2,120 | | 5,012 |
| 404 | 2. | Single Family (1-5du/ac) | DU | 10.00 | 99 | 170.00 | 1,683 |
| | | SUB-TOTAL | | | 99 | | 1,683 |
| 405 | 2. | Single Family (1-5du/ac) | DU | 24.00 | 238 | 296.00 | 2,930 |
| | | SUB-TOTAL | | | 238 | | 2,930 |
| 406 | 2. | Single Family (1-5du/ac) | DU | 38.00 | 376 | 353.00 | 3,495 |
| | | SUB-TOTAL | | | 376 | | 3,495 |
| 407 | 2. | Single Family (1-5du/ac) | DU | -- | -- | 47.00 | 465 |
| | | SUB-TOTAL | | | -- | | 465 |
| 408 | 2. | Single Family (1-5du/ac) | DU | 47.00 | 465 | 648.00 | 6,415 |
| | | SUB-TOTAL | | | 465 | | 6,415 |
| 409 | 2. | Single Family (1-5du/ac) | DU | -- | -- | 154.00 | 1,525 |
| | | SUB-TOTAL | | | -- | | 1,525 |

Table E-1 (cont.)
LAND USE AND TRIP GENERATION SUMMARY

| Zone | | Land Use Category | Units | 2004 Amount | 2004 ADT | Long-Range GP Amount | Long-Range GP ADT |
|---|---|---|---|---|---|---|---|
| 410 | 2. | Single Family (1-5du/ac) | DU | 25.00 | 247 | 248.00 | 2,455 |
| | 6. | Mobile Home | DU | -- | -- | 101.00 | 697 |
| | 30. | Industrial Park | TSF | -- | -- | 44.00 | 264 |
| | | SUB-TOTAL | | | 247 | | 3,416 |
| 411 | 2. | Single Family (1-5du/ac) | DU | -- | -- | 800.00 | 7,920 |
| | 20. | Elementary/Middle School | STU | -- | -- | 800.00 | 1,160 |
| | | SUB-TOTAL | | | -- | | 9,080 |
| 412 | 1. | Single Family (<1du/ac) | DU | 120.00 | 1,188 | 120.00 | 1,188 |
| | | SUB-TOTAL | | | 1,188 | | 1,188 |
| 413 | 2. | Single Family (1-5du/ac) | DU | 29.00 | 287 | 106.00 | 1,049 |
| | 4. | Concominium/Townhouse | DU | 246.00 | 1,968 | 614.00 | 4,912 |
| | 12. | Commercial Center (<10ac) | TSF | 26.94 | 2,292 | 44.60 | 3,794 |
| | 30. | Industrial Park | TSF | -- | -- | 48.54 | 291 |
| | 32. | Manufacturing/Warehouse | TSF | 45.21 | 231 | 45.21 | 231 |
| | 40. | Commercial Office | TSF | 36.59 | 423 | 36.59 | 423 |
| | | SUB-TOTAL | | | 5,201 | | 10,700 |
| 414 | 2. | Single Family (1-5du/ac) | DU | 15.00 | 149 | 40.00 | 396 |
| | 4. | Condominium/Townhouse | DU | 1,358.00 | 10,864 | 1,358.00 | 10,864 |
| | 6. | Mobile Home | DU | 250.00 | 1,725 | 250.00 | 1,725 |
| | 13. | Commercial Shops | TSF | 95.83 | 3,551 | 95.83 | 3,551 |
| | 40. | Commercial Office | TSF | -- | -- | 125.00 | 1,445 |
| | | SUB-TOTAL | | | 16,289 | | 17,981 |
| 415 | 2. | Single Family (1-5du/ac) | DU | 206.00 | 2,039 | 211.00 | 2,089 |
| | 11. | Commercial Center(10-30a) | TSF | -- | -- | 63.71 | 3,444 |
| | 30. | Industrial Park | TSF | -- | -- | 125.46 | 753 |
| | 32. | Manufacturing/Warehouse | TSF | 27.80 | 142 | 27.80 | 142 |
| | | SUB-TOTAL | | | 2,181 | | 5,428 |
| 416 | 2. | Single Family (1-5du/ac) | DU | 579.00 | 5,732 | 579.00 | 5,732 |
| | 4. | Condominium/Townhouse | DU | 148.00 | 1,184 | 148.00 | 1,184 |
| | 13. | Commercial Shops | TSF | 15.00 | 556 | 15.00 | 556 |
| | 51. | Developed Park | AC | 15.00 | 39 | 15.00 | 39 |
| | | SUB-TOTAL | | | 7,511 | | 7,511 |
| 417 | 2. | Single Family (1-5du/ac) | DU | 579.00 | 5,732 | 579.00 | 5,732 |
| | 4. | Condominium/Townhouse | DU | 149.00 | 1,192 | 149.00 | 1,192 |
| | 20. | Elementary/Middle School | STU | 760.00 | 1,102 | 760.00 | 1,102 |
| | | SUB-TOTAL | | | 8,026 | | 8,026 |
| 418 | 4. | Condominium/Townhouse | DU | 474.00 | 3,792 | 474.00 | 3,792 |
| | 5. | Apartment | DU | 232.00 | 1,601 | 232.00 | 1,601 |
| | 6. | Mobile Home | DU | 90.00 | 621 | 90.00 | 621 |
| | 11. | Commercial Center(10-30a) | TSF | 126.43 | 6,943 | 126.43 | 6,943 |
| | | SUB-TOTAL | | | 12,957 | | 12,957 |

Table E-1 (cont.)
LAND USE AND TRIP GENERATION SUMMARY

| Zone | | Land Use Category | Units | 2004 Amount | 2004 ADT | Long-Range GP Amount | Long-Range GP ADT |
|---|---|---|---|---|---|---|---|
| 419 | 2. | Single Family (1-5du/ac) | DU | -- | -- | 1,018.00 | 10,078 |
| | 4. | Condominium/Townhouse | DU | 1,834.00 | 14,672 | 1,834.00 | 14,672 |
| | | SUB-TOTAL | | | 14,672 | | 24,750 |
| 420 | 4. | Condominium/Townhouse | DU | 40.00 | 320 | 40.00 | 320 |
| | | SUB-TOTAL | | | 320 | | 320 |
| 421 | 4. | Condominium/Townhouse | DU | 752.00 | 6,016 | 752.00 | 6,016 |
| | 30. | Industrial Park | TSF | -- | -- | 300.00 | 1,800 |
| | 31. | Business Park | TSF | -- | -- | 300.00 | 3,060 |
| | | SUB-TOTAL | | | 6,016 | | 10,876 |
| 422 | 2. | Single Family (1-5du/ac) | DU | 74.00 | 733 | 76.00 | 752 |
| | 4. | Condominium/Townhouse | DU | 80.00 | 640 | 80.00 | 640 |
| | 11. | Commercial Center(10-30a) | TSF | -- | -- | 132.00 | 7,136 |
| | 12. | Commercial Center (<10ac) | TSF | 4.00 | 340 | 4.00 | 340 |
| | 20. | Elementary/Middle School | STU | 817.00 | 1,185 | 817.00 | 1,185 |
| | | SUB-TOTAL | | | 2,898 | | 10,053 |
| 423 | 2. | Single Family (1-5du/ac) | DU | 353.00 | 3,495 | 353.00 | 3,495 |
| | 3. | Single Family (6-10du/ac) | DU | -- | -- | 21.00 | 208 |
| | 12. | Commercial Center (<10ac) | TSF | 98.01 | 8,337 | 98.01 | 8,337 |
| | 40. | Commercial Office | TSF | 10.89 | 126 | 10.89 | 126 |
| | | SUB-TOTAL | | | 11,958 | | 12,166 |
| 424 | 2. | Single Family (1-5du/ac) | DU | 2.00 | 20 | 114.00 | 1,129 |
| | 4. | Condominium/Townhouse | DU | 84.00 | 672 | 194.00 | 1,552 |
| | | SUB-TOTAL | | | 692 | | 2,681 |
| 425 | 2. | Single Family (1-5du/ac) | DU | 39.00 | 386 | 241.00 | 2,386 |
| | 4. | Condominium/Townhouse | DU | -- | -- | 80.00 | 640 |
| | 51. | Developed Park | AC | -- | -- | 31.00 | 81 |
| | | SUB-TOTAL | | | 386 | | 3,107 |
| 426 | 2. | Single Family (1-5du/ac) | DU | 30.00 | 297 | 560.00 | 5,544 |
| | 3. | Single Family (6-10du/ac) | DU | 70.00 | 693 | 70.00 | 693 |
| | 32. | Manufacturing/Warehouse | TSF | 39.60 | 202 | 39.60 | 202 |
| | | SUB-TOTAL | | | 1,192 | | 6,439 |
| 427 | 2. | Single Family (1-5du/ac) | DU | 249.00 | 2,465 | 249.00 | 2,465 |
| | | SUB-TOTAL | | | 2,465 | | 2,465 |
| 428 | 2. | Single Family (1-5du/ac) | DU | 540.00 | 5,346 | 2,124.00 | 21,028 |
| | 11. | Commercial Center(10-30a) | TSF | -- | -- | 47.40 | 2,562 |
| | 12. | Commercial Center (<10ac) | TSF | -- | -- | 39.20 | 3,334 |
| | | SUB-TOTAL | | | 5,346 | | 26,924 |
| 429 | 2. | Single Family (1-5du/ac) | DU | 42.00 | 416 | 55.00 | 545 |
| | | SUB-TOTAL | | | 416 | | 545 |

Table E-1 (cont.)
LAND USE AND TRIP GENERATION SUMMARY

| Zone | | Land Use Category | Units | 2004 Amount | 2004 ADT | Long-Range GP Amount | Long-Range GP ADT |
|---|---|---|---|---|---|---|---|
| 430 | 2. | Single Family (1-5du/ac) | DU | 2.00 | 20 | 2.00 | 20 |
| | | SUB-TOTAL | | | 20 | | 20 |
| 431 | 2. | Single Family (1-5du/ac) | DU | 3.00 | 30 | 3.00 | 30 |
| | | SUB-TOTAL | | | 30 | | 30 |
| 433 | 2. | Single Family (1-5du/ac) | DU | 8.00 | 79 | 55.00 | 545 |
| | | SUB-TOTAL | | | 79 | | 545 |
| 434 | 2. | Single Family (1-5du/ac) | DU | 25.00 | 247 | 25.00 | 247 |
| | | SUB-TOTAL | | | 247 | | 247 |
| 437 | 2. | Single Family (1-5du/ac) | DU | 6.00 | 59 | 250.00 | 2,475 |
| | 4. | Condominium/Townhouse | DU | -- | -- | 13.00 | 104 |
| | 59. | Cemex | SG | -- | -- | 12.84 | 1,284 |
| | | SUB-TOTAL | | | 59 | | 3,863 |
| 438 | 4. | Condominium/Townhouse | DU | -- | -- | 13.00 | 104 |
| | | SUB-TOTAL | | | -- | | 104 |
| 439 | 2. | Single Family (1-5du/ac) | DU | 164.00 | 1,624 | 170.00 | 1,683 |
| | 3. | Single Family (6-10du/ac) | DU | 660.00 | 6,534 | 660.00 | 6,534 |
| | 11. | Commercial Center(10-30a) | TSF | -- | -- | 41.65 | 2,252 |
| | | SUB-TOTAL | | | 8,158 | | 10,469 |
| 440 | 2. | Single Family (1-5du/ac) | DU | -- | -- | 568.00 | 5,623 |
| | | SUB-TOTAL | | | -- | | 5,623 |
| 441 | 2. | Single Family (1-5du/ac) | DU | 150.00 | 1,485 | 284.00 | 2,812 |
| | 20. | Elementary/Middle School | STU | 360.00 | 522 | 360.00 | 522 |
| | | SUB-TOTAL | | | 2,007 | | 3,334 |
| 442 | 2. | Single Family (1-5du/ac) | DU | 72.00 | 713 | 336.00 | 3,326 |
| | 3. | Single Family (6-10du/ac) | DU | 216.00 | 2,138 | 216.00 | 2,138 |
| | | SUB-TOTAL | | | 2,851 | | 5,464 |
| 443 | 2. | Single Family (1-5du/ac) | DU | 499.00 | 4,940 | 763.00 | 7,554 |
| | 20. | Elementary/Middle School | STU | 985.00 | 1,428 | 985.00 | 1,428 |
| | 23. | Hospital | TSF | 30.00 | 504 | 30.00 | 504 |
| | 40. | Commercial Office | TSF | 108.90 | 1,259 | 108.90 | 1,259 |
| | | SUB-TOTAL | | | 8,131 | | 10,745 |
| 444 | 2. | Single Family (1-5du/ac) | DU | 775.00 | 7,672 | 775.00 | 7,672 |
| | 4. | Condominium/Townhouse | DU | 19.00 | 152 | 19.00 | 152 |
| | 11. | Commercial Center(10-30a) | TSF | -- | -- | 298.95 | 16,161 |
| | 25. | Church | TSF | 4.00 | 37 | 4.00 | 37 |
| | | SUB-TOTAL | | | 7,861 | | 24,022 |
| 445 | 2. | Single Family (1-5du/ac) | DU | 29.00 | 287 | 41.00 | 406 |
| | | SUB-TOTAL | | | 287 | | 406 |

Table E-1 (cont.)
LAND USE AND TRIP GENERATION SUMMARY

| Zone | | Land Use Category | Units | ----- 2004 ----- Amount | ADT | -Long-Range GP-- Amount | ADT |
|---|---|---|---|---|---|---|---|
| 446 | 2. | Single Family (1-5du/ac) | DU | 231.00 | 2,287 | 231.00 | 2,287 |
| | | SUB-TOTAL | | | 2,287 | | 2,287 |
| 447 | 50. | Golf Course | AC | 150.00 | 1,194 | 150.00 | 1,194 |
| | | SUB-TOTAL | | | 1,194 | | 1,194 |
| 448 | 2. | Single Family (1-5du/ac) | DU | 395.00 | 3,910 | 691.00 | 6,841 |
| | | SUB-TOTAL | | | 3,910 | | 6,841 |
| 449 | 2. | Single Family (1-5du/ac) | DU | 20.00 | 198 | 20.00 | 198 |
| | | SUB-TOTAL | | | 198 | | 198 |
| 450 | 2. | Single Family (1-5du/ac) | DU | -- | -- | 27.00 | 267 |
| | | SUB-TOTAL | | | -- | | 267 |
| 451 | 2. | Single Family (1-5du/ac) | DU | 40.00 | 396 | 67.00 | 663 |
| | 30. | Industrial Park | TSF | -- | -- | 47.00 | 282 |
| | | SUB-TOTAL | | | 396 | | 945 |
| 452 | 2. | Single Family (1-5du/ac) | DU | 6.00 | 59 | 38.00 | 376 |
| | | SUB-TOTAL | | | 59 | | 376 |
| 453 | 2. | Single Family (1-5du/ac) | DU | 172.00 | 1,703 | 225.00 | 2,228 |
| | 10. | Commercial Center (>30ac) | TSF | -- | -- | 16.00 | 641 |
| | 20. | Elementary/Middle School | STU | 490.00 | 711 | 490.00 | 711 |
| | | SUB-TOTAL | | | 2,414 | | 3,580 |
| 454 | 2. | Single Family (1-5du/ac) | DU | 116.00 | 1,148 | 125.00 | 1,238 |
| | 11. | Commercial Center(10-30a) | TSF | -- | -- | 34.14 | 1,846 |
| | 13. | Commercial Shops | TSF | 6.14 | 228 | 6.14 | 228 |
| | 52. | Undeveloped Park | AC | 745.00 | 373 | 745.00 | 373 |
| | 57. | Agua Dulce Airport | SG | 34.06 | 3,406 | 51.09 | 5,109 |
| | | SUB-TOTAL | | | 5,155 | | 8,794 |
| 455 | 2. | Single Family (1-5du/ac) | DU | 80.00 | 792 | 80.00 | 792 |
| | | SUB-TOTAL | | | 792 | | 792 |

Table E-1 (cont.)
LAND USE AND TRIP GENERATION SUMMARY

| Zone | | Land Use Category | Units | 2004 Amount | 2004 ADT | Long-Range GP Amount | Long-Range GP ADT |
|---|---|---|---|---|---|---|---|
| TOTAL | 1. | Single Family (<1du/ac) | DU | 300.00 | 2,970 | 1,817.00 | 17,988 |
| | 2. | Single Family (1-5du/ac) | DU | 42,731.00 | 423,044 | 68,913.00 | 682,252 |
| | 3. | Single Family (6-10du/ac) | DU | 5,812.00 | 57,538 | 17,629.00 | 174,529 |
| | 4. | Condominium/Townhouse | DU | 23,519.00 | 188,152 | 39,509.00 | 316,072 |
| | 5. | Apartment | DU | 2,108.00 | 14,545 | 8,510.00 | 58,720 |
| | 6. | Mobile Home | DU | 2,464.00 | 17,002 | 2,565.00 | 17,699 |
| | 10. | Commercial Center (>30ac) | TSF | 2,675.04 | 107,163 | 8,003.69 | 320,629 |
| | 11. | Commercial Center(10-30a) | TSF | 4,203.47 | 227,240 | 8,518.44 | 460,507 |
| | 12. | Commercial Center (<10ac) | TSF | 1,307.47 | 111,212 | 2,615.78 | 222,499 |
| | 13. | Commercial Shops | TSF | 1,168.87 | 43,318 | 1,656.71 | 61,396 |
| | 14. | Hotel | ROOM | 985.00 | 8,107 | 1,406.00 | 11,572 |
| | 15. | Sit-Down Restaurant | TSF | 210.92 | 27,493 | 290.19 | 37,825 |
| | 16. | Fast Food Restaurant | TSF | 47.58 | 23,606 | 53.08 | 26,335 |
| | 17. | Movie Theater | SEAT | 3,300.00 | 5,808 | 3,300.00 | 5,808 |
| | 18. | Health Club | TSF | 125.00 | 5,000 | 125.00 | 5,000 |
| | 19. | Car Dealership | TSF | 330.50 | 12,395 | 441.50 | 16,558 |
| | 20. | Elementary/Middle School | STU | 37,506.00 | 47,140 | 48,591.00 | 70,465 |
| | 21. | High School | STU | 13,228.00 | 23,678 | 23,274.00 | 41,661 |
| | 22. | College | STU | 18,379.00 | 28,303 | 25,236.00 | 38,863 |
| | 23. | Hospital | TSF | 222.80 | 3,743 | 222.80 | 3,743 |
| | 24. | Library | TSF | 53.73 | 4,567 | 71.49 | 6,068 |
| | 25. | Church | TSF | 512.89 | 4,770 | 635.89 | 5,914 |
| | 26. | Day Care | STU | 460.00 | 2,079 | 540.00 | 2,441 |
| | 30. | Industrial Park | TSF | 15,517.43 | 93,103 | 40,298.54 | 241,791 |
| | 31. | Business Park | TSF | 1,017.92 | 10,383 | 9,113.92 | 92,952 |
| | 32. | Manufacturing/Warehouse | TSF | 1,970.77 | 10,052 | 4,043.66 | 20,625 |
| | 34. | Utilities | TSF | 1,121.24 | 2,568 | 1,150.24 | 2,737 |
| | 35. | Regional Post Office | TSF | 764.00 | 3,820 | 764.00 | 3,820 |
| | 40. | Commercial Office | TSF | 1,170.75 | 13,533 | 5,188.12 | 59,973 |
| | 42. | Medical Office | TSF | 133.73 | 1,573 | 212.29 | 7,260 |
| | 43. | Post Office | TSF | 50.00 | 5,410 | 50.00 | 5,410 |
| | 50. | Golf Course | AC | 753.00 | 5,994 | 1,233.00 | 9,815 |
| | 51. | Developed Park | AC | 250.90 | 652 | 583.80 | 1,518 |
| | 52. | Undeveloped Park | AC | 745.00 | 373 | 762.50 | 382 |
| | 53. | Wayside Honor Ranch | SG | 20.00 | 2,000 | 30.00 | 3,000 |
| | 54. | Six Flags Magic Mtn | SG | 160.00 | 16,000 | 240.00 | 24,000 |
| | 55. | Travel Village | SG | 26.20 | 2,620 | 26.20 | 2,620 |
| | 56. | CHP Office | SG | 55.74 | 5,574 | 55.74 | 5,574 |
| | 57. | Agua Dulce Airport | SG | 34.06 | 3,406 | 51.09 | 5,109 |
| | 58. | Landfill | SG | 10.00 | 1,000 | 20.00 | 2,000 |
| | 59. | Cemex | SG | -- | -- | 12.84 | 1,284 |
| | | TOTAL | | | 1,570,034 | | 3,094,424 |

# Ventura County
# Transit Investment Study

Final Report

December 4, 2009

JACOBS

# Ventura County Transit Investment Study

**Submitted to**

**Ventura County Transportation Commission (VCTC)**

**950 County Square Drive, Suite 207**

**Ventura, CA 93003**

**December 4, 2009**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# Ventura County Transit Investment Study

## Purpose of the Study

The Ventura County Transportation Commission conducted this study to determine how to best allocate funds for projects that would enhance transit services for county residents. Initially seen as providing a methodology for prioritizing state funds that were anticipated to be available from Prop 1B, the study was modified slightly over time. Potential projects for funding under Prop 1B were incorporated into applications for federal funds available through the American Recovery and Reinvestment Act early in 2009. Accordingly, the prioritization process was modified to ensure its applicability to other funding sources.

The process for identifying and prioritizing needs was conducted by Jacobs Engineering (Jacobs) in close cooperation with the members of VCTC's Transit Operators Advisory Committee (TRANSCOM). Members not only assured the accuracy of study inputs and provided insights into numerous issues, but were critical to developing the prioritizing criteria that they will subsequently use when competing projects must be ranked. Additionally, comments on needs and priorities were sought from elected officials and the public. ***An important finding of the study is the consistent desire among all participants for better coordinated and linked transit services that largely ignore jurisdictional boundaries.***

## Study Process Overview

The study began by documenting the current services of the nine transit agencies serving the county, as well as interviewing key agency staff of the seven agencies that are based in Ventura County. These interviews gathered information about current services, known areas of need, planned improvements, and other issues affecting how service is provided. The results of these interviews are reported in an Existing Conditions Report (Appendix A).

***One of the recurring themes from agency interviews and comments from elected officials and the public was a basic need to improve linkages among the various transit systems.*** An analysis of current connections was conducted to identify opportunities for improvement. The result of this assessment is a Transit Gaps Analysis (Appendix B), which looked at four types of shortfalls in transit service: corridors between localities when no transit is operated today; geographic areas with densities that appear high enough to warrant service but that are not served today; gaps in service on different bus lines; and places where transit routes come together, but arrival and departure times are not optimal to enable convenient transfers. In combination, these captured a high-level picture of the overall availability and shortfalls of transit service from a county-wide perspective.

The Gaps Analysis provided one of the main bases for developing projects and other recommendations for an improved transit system. It also fed into the development of two

tools for use by the transit operators and VCTC: a prioritization methodology (Appendix C) and a transit forecasting methodology to test changes in service frequency (Appendix D).

Validation of the goal for more connected transit service in the county, compared with the technical perspective of the study, was garnered through a public outreach effort. In addition to one-on-one interviews with elected officials, public comments were sought through two public workshops and from an on-line survey on the VCTC website. The overarching message from across the spectrum of respondents (Appendix E) was that transit services needed to be more extensive in areas served and in hours of operation, and seamlessly connected, with more convenient and reliable transfers.

## Summary of Findings and Recommendations

**There is a basic need to improve linkages among the various transit systems.** This was a recurring issue raised from agency interviews, input from elected officials, and from a variety of public groups.

**There is an expressed willingness to cooperate among the existing service agencies**, evidenced in their common commitment to serving patrons, a desire to provide improved services to their constituents, to addressing issues in a coordinated manner when possible, and an interest in exploring opportunities for how to provide improved service.

**Near-term transit improvements can most readily be made in increments, with an overarching goal to ignore jurisdictional boundaries whenever possible.** Near-term improvements should be identified by way of a detailed evaluation of schedules and development of a better-linked, cross-jurisdictional operating plan that serves areas of high transit demand and high transit potential.

**There is interest in modifying organization structures or exploring new organizational structures** to provide transit on a countywide or an areawide basis, with the underlying goal of creating a comprehensive and seamless network. A long-term plan for transit should be undertaken that defines levels of service goals, explores options for system management, analyzes upcoming and possible funding sources, and develops strategic options for reaching the service goals.

**There is a broad public awareness that transit services must compete for limited funds from local jurisdictions, offset by a desire to identify dedicated or focused funds to create the envisioned comprehensive and seamless network.** VCTC and the operating agencies and their management should take advantage of this public support for transit by improving communication tools and building partnerships.

## Study Results

### *A. Existing Conditions*

*Transit Services:* Public transportation serving Ventura County is fragmented, with seven fixed-route bus operations, five public dial-a-ride operations, and four paratransit services restricted to disabled or senior riders. There are also two Los Angeles-based bus operators, two rail operations, and several private carriers that serve portions of the county. While in some cases the fares and schedules of connecting systems are coordinated, this is more the exception than the rule. There are even instances where adjacent systems don't connect at all; this situation is not unique to Ventura County and is understandable given the evolution of transit over time. Local transit service was established over the past 40 years incrementally, as each community developed enough density to justify it. One bus carrier, VISTA, serves primarily as in intercity connector within the County, even extending services north into Santa Barbara County and South into Los Angeles County.

Nine public agencies operate fixed-route bus service in the county at this time:

- Camarillo Area Transit (CAT): 1 route administered by the City of Camarillo
- Gold Coast Transit: the largest local operator, with 17 routes operated through a JPA with Ojai, Oxnard, Port Hueneme, Ventura, and the County of Ventura
- Los Angeles County Metropolitan Transportation Authority (Metro): 1 route operated into Ventura County
- Los Angeles Department of Transportation (LADOT): 3 weekday peak routes operated into Ventura County
- Moorpark City Transit: 2 routes administered by the Moorpark Public Transit Division
- Ojai Trolley: 2 routes operated by the Ojai Public Works Department
- Simi Valley Transit: 4 routes operated by the Simi Valley Department of Community Services
- Thousand Oaks Transit (TOT): 4 routes administered by the City of Thousand Oaks
- Ventura Intercity Service Transit Authority (VISTA): 7 routes administered by VCTC.

Together, these nine agencies operate over 40 distinct routes. All but Gold Coast Transit, Ojai Trolley, Simi Valley Transit and LA Metro utilize contracts with private companies to actually operate and/or maintain their buses.

Most of the systems in the list above operate exclusively within Ventura County, with a few exceptions. Simi Valley Transit offers weekday service into Chatsworth in Los Angeles County, while VISTA operates weekday service into Woodland Hills in Los Angeles County and daily service into Santa Barbara County. The two Los Angeles-based operators, LA Metro and LADOT, extend service into the eastern portion of Ventura County. (They are not listed in Table 1 because they would not be the recipient of transit funds anticipated to flow to Ventura

County). In addition to these nine public operators, private bus carriers serve various parts of the county. These include Greyhound and Transportes Intercalifornias, two intercity carriers whose only stops in Ventura County are located in Oxnard; and various small private operators serving airports or employment centers. Since the focus of this study is on publicly-funded improvements to publicly-operated systems, these private carriers are mentioned only in passing to give a full picture of the transit options available.

Service throughout the county tends to be offered at a low frequency, with headways of 30 to 60 minutes the most common. About a third of the lines operate only during weekdays, with a span of service from about 6:00 AM to 8:00 PM. While two thirds of the lines operate on Saturdays, only about one third is in service on Sundays. This means that many residents without access to their own automobiles must rely upon friends or taxis to drive them to their destinations when public transportation is not offered. Many probably defer such trips to those times when service is available.

There are some notable exceptions to the low frequency service described below in corridors with higher ridership. For example, Gold Coast's Route 6 offers headways as short as 20 minutes in between Oxnard and Ventura; VISTA's shuttle between the Camarillo Metrolink Station and CSUCI (California State University Channel Islands) operates 15-minute service on weekday afternoons and evenings.

| Operator | Monday-Friday | Saturday | Sunday |
|---|---|---|---|
| Camarillo Area Transit | 8:19 AM – 4:30 PM | no service | no service |
| Gold Coast Transit | H 5:00 AM -10:00 PM | 5:30 AM – 9:00 PM | 5:30 AM – 8:45 PM |
| | L 6:00 AM – 8:00 PM | 6:30 AM – 8:00 PM | 6:30 AM – 8:00 PM |
| Moorpark City Transit | 6:00 AM -- 6:00 PM | no service | no service |
| Ojai Trolley | 7:00 AM – 5:30 PM | 9:00 AM – 5:15 PM | 9:00 AM – 5:15 PM |
| Simi Valley Transit | 5:15 AM – 7:30 PM | H5:00 AM – 8:00 PM | no service |
| | | L 8:00 AM – 7:00 PM | no service |
| Thousand Oaks Transit | 6:00 AM – 6:45 PM | no service | no service |
| VISTA | H 4:15 AM – 9:00 PM | 6:45 AM – 7:30 PM | 6:45 AM – 7:30 PM |
| | L 6:00 AM – 7:30 PM | 7:00 AM – 6:00 PM | 8:00 AM – 6:00 PM* |
| | | | *Highway 126 service only |

*Note: the table above represents an approximate average of the spans of service of the individual lines of each operator. Many lines do not operate on weekends. H = higher service lines L = lower service lines*

An examination of the structure of all the fixed routes described above indicates a series of generally radial networks. Most are centered on one node of activity in the community, such as

a civic center or shopping mall. Coverage of the urbanized areas of the county by these networks, as depicted in Figure 1, appears adequate at first glance. However, without a thorough analysis of how the networks coincide with areas of high density and the location of major trip attractors, it is difficult to confirm this supposition. If the low frequency of much of this network is considered, along with restricted hours of service in many instances, then it must be concluded that much of the urbanized area has only minimal transit service. Moreover, the numerous connecting points between the lines shown on the map belie the fact that transfers may be difficult to make. This is because the schedules of the connecting lines are rarely synchronized, and the costs to make such transfers may be prohibitive for many potential users. Thus, while the map in Figure 1 gives the impression of good transit coverage, that quality exists in few parts of the county.

In addition to the bus services discussed above, there are two rail operations serving the county: both Metrolink and Amtrak share portions of the railroad network established in the 1800s. Metrolink commuter rail service is operated by the Southern California Regional Rail Authority (SCRRA), a JPA of five regional agencies including VCTC. Metrolink offers 10 trips each weekday on its Ventura County Line. This service operates into and out of Los Angeles, serving Montalvo, Oxnard, Camarillo, Moorpark, and Simi Valley in Ventura County. An 11$^{th}$ weekday trip in each direction is offered by Amtrak at these same stations (except for Montalvo). The frequency offered is relatively low due both to funding shortfalls and to constraints placed on rail service by the single track available for use north of the City of Moorpark.

Amtrak, with funding support from Caltrans, operates Pacific Surfliner service between San Louis Obispo and San Diego. This service provides four additional train trips in each direction at many of the Metrolink stations, plus one outbound and two inbound Motorcoach Throughway bus trips each weekday. On weekends when Metrolink is not in service, these same Amtrak trips are available to passengers at the stations served in Ventura County. Metrolink monthly pass holders can ride them free of charge, while others must pay standard Amtrak fares. Amtrak also provides intercity service to other parts of the state and the country. One Coast Starlight train in each direction serves the Oxnard and Simi Valley stations. The Amtrak station in Ventura is served by 5 daily Pacific Surfliner trains in each direction, but not by Metrolink. Since Amtrak is not eligible for the funds that would be available for local transit operators in the county, only Metrolink will be considered further in this study.

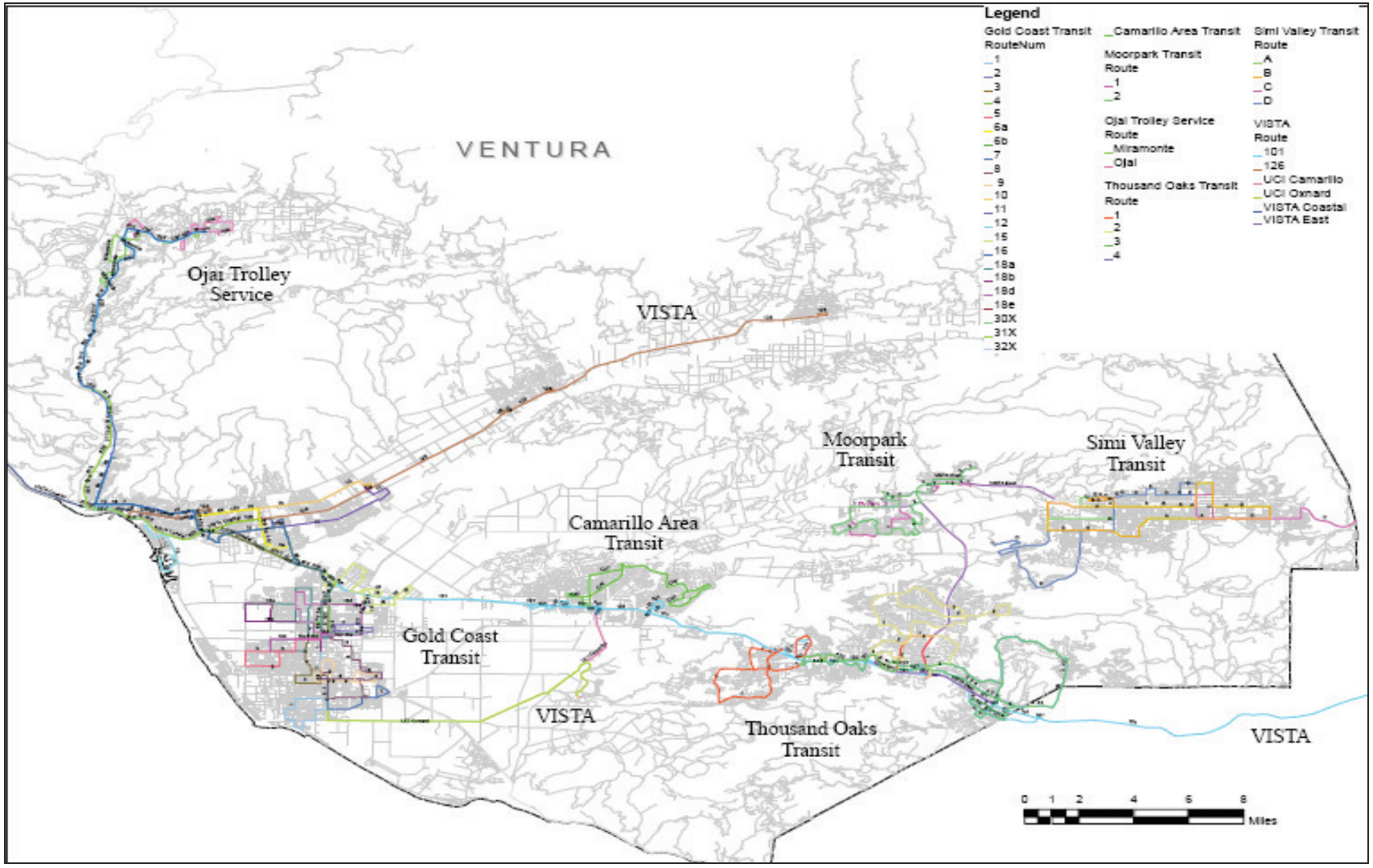



Figure 1: Ventura County Fixed-Route Transit Lines

The fixed-route bus and rail lines in Ventura County are complemented by general public Dial-A-Ride and paratransit operations that use vans or small cutaway buses in demand-responsive services. These services generally have no fixed routes or schedules, but rather pick up and drop off passengers within specific geographic areas. Trip requests are made by phone in advance, though some of the services allow ongoing reservations or subscription services for recurring journeys. These services are essential for those physically unable to access fixed-route transit and are useful for others to reach areas not well served by the fixed routes. There are eleven such paratransit operations. Seven of these serve the general public (condensed in Table 1 as the five principal operations listed below):

- Camarillo Department of Public Works administers CAT service for intra-city dial-a-ride trips
- Oxnard operates the Harbors and Beaches Dial-a-Ride serving the westernmost section of the city
- Thousand Oaks is served by a dial-a-ride administered by the City of Thousand Oaks, with some areas outside the city served by a County-administered dial-a-ride
- Ventura County Public Works Agency administers two smaller services:
    - Juvenile Center service uses a contract with a taxi company to serve the County Juvenile Facility near El Rio on Vineyard Avenue
    - Service in Oak Park, Newbury Park, and Lynn Ranch
- VISTA administers two public dial-a-rides:
    - Fillmore Dial-a-Ride serves the communities of Fillmore and Piru
    - Santa Paula Dial-a-Ride serves the community of Santa Paula.

The remaining four public paratransit operations transport only senior or disabled passengers:

- ACCESS: a senior/disabled service operated by Gold Coast Transit to serve the cities of Ojai, Oxnard, Port Hueneme, Ventura and unincorporated areas of Ventura County between these cities.
- Moorpark Dial-A-Ride: administered by the Moorpark Public Transportation Division, with a senior dial-a-ride serving Moorpark and a disabled dial-a-ride serving Moorpark intra-city trips, as well as those destined to Thousand Oaks, Camarillo and Oak Park.
- Simi Valley Transit: operated by the Simi Valley Department of Community Services to serve both intra-city trips and connecting trips to adjacent communities.
- Thousand Oaks Dial-a-Ride: administered by the City of Thousand Oaks and serving the City of Thousand Oaks, plus the unincorporated county areas of Ventu Park, Rolling Oaks, and Lynn Ranch.

As with the fixed-route operators, there are numerous privately-operated paratransit services not eligible for the transit funding contemplated as the focus of this study. These include those operated by Arc of Ventura County, Camarillo Care-A-Van, and Help of Ojai, as well as numerous taxi companies and airport shuttles. Paratransit operations are generally quite expensive in terms of the cost per rider, on the order of 10 times higher per trip than fixed-route transit. On the other hand, they are often less expensive overall than providing fixed-route service in some areas. In

places with difficult terrain or discontinuous street patterns, they may offer the only practical way that public transportation can be provided.

*Transit Facilities*: The transit facilities of note in the county include passenger stations and maintenance bases. Railroad stations in Oxnard, Camarillo, Moorpark, and Simi Valley are shared by Metrolink and Amtrak. The station in Montalvo is off the main line and is used only by Metrolink, while that in Ventura is used only by Amtrak. Several of these stations have associated bus stops, such as Oxnard and Simi Valley. However, as mentioned earlier, timed transfers between bus and rail rarely occur.

The Oxnard Transportation Center, contiguous with the Oxnard railroad station, is a major facility with timed meets between different bus lines. A similar arrangement occurs at the Thousand Oaks Community Transportation Center, a free-standing facility just off Highway 101. A smaller bus transit center is located in Ventura at the Pacific View Mall. Several park-and-ride lots are scattered throughout the county. With the exception of those at the railroad stations, however, most are oriented to carpooling rather than transit use. Smaller physical amenities, like bus stop signs, benches, and shelters, are located with considerable inconsistency. Shelters are overseen by jurisdictions, not the operators, and few stops are so equipped. Even bus stop signs are not always found at the regular stopping points of certain bus lines, and there is no uniform countywide standard.

Most of the maintenance facilities and storage yards for the county's transit and paratransit services are owned and operated by private contractors. The exceptions are those facilities operated by Gold Coast Transit in Oxnard, and by the public works departments of Ojai, Simi Valley, and Thousand Oaks. Most of these were said to be reaching their capacities and the need for larger or newer facilities were anticipated in the near future.

Fleets operated by the county's fixed-route services range from standard transit buses and over-the-road coaches, to rubber-tired trolleys and cutaways. Paratransit vehicles use mainly cutaways and vans. By and large, the fleets are relatively new, and many are powered by CNG. Ojai, Simi Valley, and VISTA would like some replacements soon.

*Planned Changes (as reported in October 2008):* Regarding near-term plans, a few systems, like Simi Valley Transit, had recently restructured routes and felt no need for more changes at the present time. Others, like Ojai Trolley, had some restructuring plans in mind, and Moorpark mentioned an upcoming consultant study of its service. Innovations in equipment appeared to be underway. Many of the bus fleets, such as Gold Coast's, Thousand Oaks', and Simi Valley's, are 100% CNG-fueled. In fact, Thousand Oaks and Gold Coast were among the first to use CNG buses. Nearly all systems were taking advantage of advanced technologies provided by VCTC. These technologies included NextBus for passenger information and operations management, as well as

the Go Ventura smart card for easier fare payment. Most the systems not currently using these technologies expressed the desire to do so. The fact that numerous metropolitan areas around the country still do not employ these technologies demonstrates the receptivity of local county operators to innovation.

*Operators' Perspective:* Transit personnel that were interviewed in each community were uniformly committed to making improvements to their systems and interested in the prospects of new funding (e.g., Prop1 B). However, most are part of very small staffs dedicated to transit, in many cases only one or two people. Their focus is, by necessity, their current systems. Several freely admitted that there was little or no long-range transit planning, since the maintenance of the existing lines took up all of their time. The County of Ventura adopted a transit vision statement in 2005, calling for creation of a seamless system. However, there has been no consensus on how to implement that vision, nor adequate funding for systematic improvements. It was hoped by many of those interviewed that this Transit Investment Study would be a first step toward that vision.

The consensus of most of the operators was that increases in the intensity of service on their existing routes would take precedent over extensions of these routes or infill with new services. This is a clear reflection of the low frequencies that typify most of the fixed-route lines in the county. Still, there was some interest in future innovation. Gold Coast and Oxnard mentioned the desirability of some form of bus rapid transit on the more heavily traveled corridors, albeit at a lower intensity of service than typically found in larger urban areas. VISTA discussed the need for limited-stop runs in the 101 corridor, as well as between Simi Valley, Moorpark, Thousand Oaks, and Ventura, which has too many time-consuming local stops. Capital needs identified for the short term varied from replacement buses to expanded maintenance bases. Feelings regarding current bus stop signs and shelters were mixed; some operators said that they had sufficient facilities, others expressed interest in upgrades, and still others were neutral.

A number of challenges were identified in the course of the interviews. Among them, the following are notable:

- There are few concentrated employment areas in most of the jurisdictions, making it difficult to focus transit services;
- The county has "too many operators and not enough coordination"; cross-county trips that require a transfer are especially onerous in terms of a passenger's time, money, and comfort;
- Though originally established to fund public transportation, the state Transit Development Act (TDA) funds allocated to Ventura County seem to be coveted for road projects; hearings on unmet needs did not necessarily result in greater allocations for transit. This is evidenced by that fact that only 58.5% of TDA is used for transit countywide;
- The agencies' governing boards seemed interested in maintaining transit service but not necessarily in expanding it. Most of these boards wish to live within the funding limits

currently available for transit and are not able to allocate additional funds because of other competing needs.

See Appendix A for additional information on Existing Conditions.

## *B. Transit Gaps Analysis*

An analysis of gaps in service that was conducted on the existing fixed-route bus transit systems operating in the county. It is based on field surveys, examination of travel and demographic data, and analysis of operating schedules at selected points in the county. Four principal forms of "gaps" were defined:

1. Corridors between service areas where no service is operated today
2. Geographic areas with densities that would warrant transit service but are unserved today
3. Gaps in the hours of service on different bus lines
4. Places where transit routes (or modes, like local bus and commuter rail) come together, but whose arrival and departure times are not coordinated; this results in sometimes lengthy waits for those wishing to make transfers or, in more extreme cases, no practical transfer opportunities at all.

This analysis was conducted as a high-level overview and identified numerous apparent gaps in transit service that later, operational studies that are beyond the scope of this study, should investigate in more detail. Among them are corridor gaps between existing transit services. Several of these may be problematic to fill because of terrain or low travel demand. Out of nine corridors evaluated, five corridors, shown on Figure 2, are recommended for further study: Fillmore-Santa Clarita, Camarillo-Moorpark (two alternate routes), Simi Valley-Thousand Oaks, and Western Oxnard-Ventura. Filling these gaps is important not to serve the land uses in between the end points (as there is little in most cases to serve), but rather to connect areas that already have transit service.

To determine the potential transit demand of each corridor for through travel, countywide travel data were sought. Total trips from one transit service area to another (even if made by automobile) could be used to judge the general magnitude of ridership that would result if transit service were available in that corridor. The 2000 U.S. Census Journey to Work data (see Table 1) were used in conjunction with daily traffic counts obtained from Ventura County and Caltrans to provide a general idea of existing trip making in each corridor. Daily traffic volumes less than 10,000 were considered a sign of relatively low demand, volumes above 30,000 as relatively high, and those in between as moderate. Of course, observed usage of a road is dependent, to an extent, on its capacity.

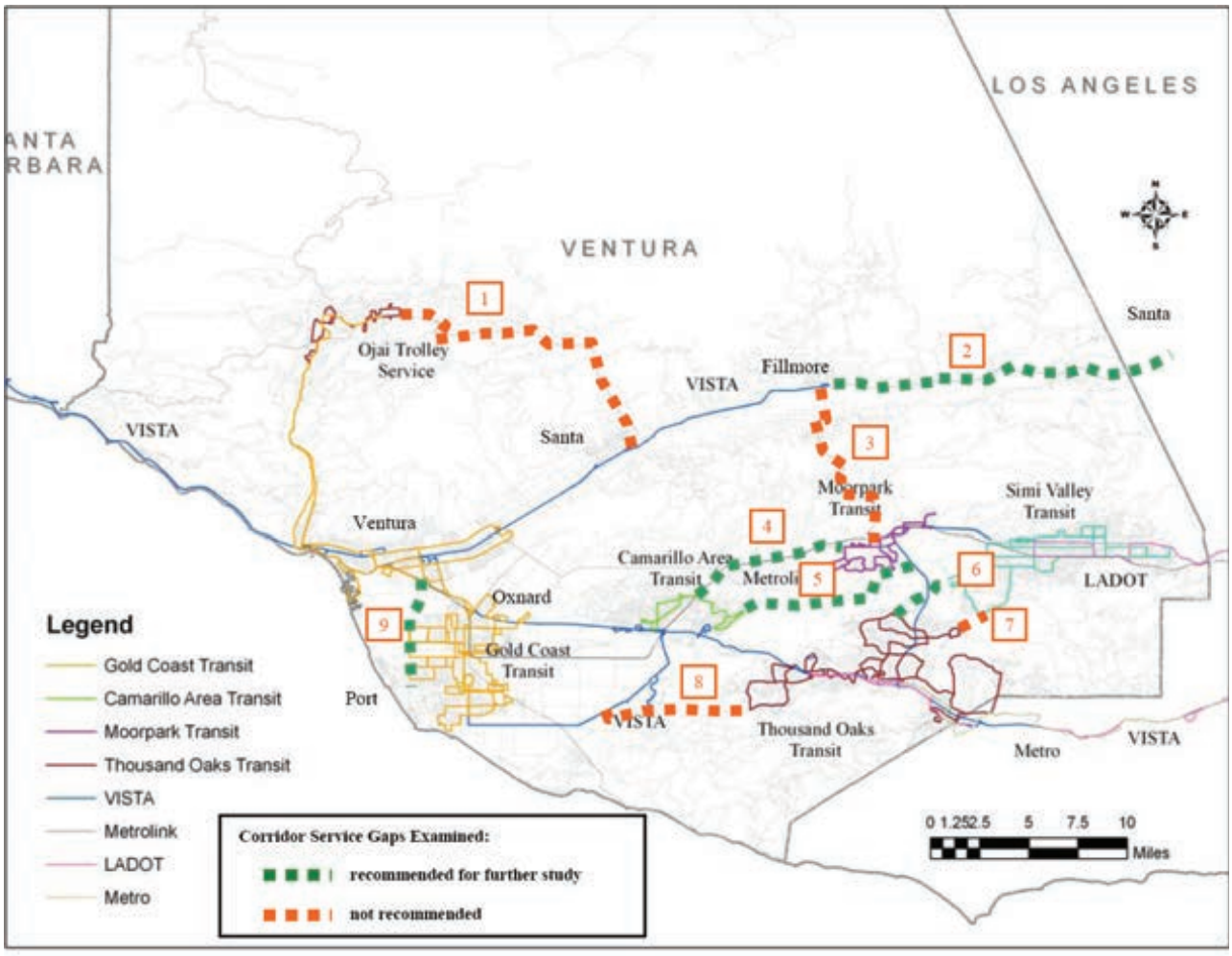



Figure 2. Ventura County Fixed-Route Bus Lines and Corridor Service Gaps

## Table 1: 2000 U.S. Census Local Journey to Work Data

| | Camarillo | Casa Conejo | Channel Islands Beach | El Rio | Fillmore | Meiners Oaks | Mira Monte | Moorpark | Oak View | Ojai | Outside of County | Oxnard | Port Hueneme | Remainder of County | City of Ventura | Santa Paula | Simi Valley | Thousand Oaks | **Grand Total** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Camarillo | 8,910 | 15 | 10 | 15 | 75 | 10 | 4 | 470 | | 40 | 4,149 | 2,905 | 815 | 2,435 | 2,740 | 120 | 695 | 2,895 | **26,303** |
| Casa Conejo | 165 | 65 | | | | | | 40 | | | 452 | 90 | 10 | 95 | 75 | 4 | 110 | 415 | **1,521** |
| Channel Islands Beach | 110 | | 235 | | 4 | | | 20 | | 10 | 398 | 375 | 70 | 75 | 350 | 15 | 25 | 120 | **1,807** |
| El Rio | 225 | | | 170 | | | | 10 | | 10 | 187 | 765 | 80 | 280 | 320 | 45 | 75 | 130 | **2,297** |
| Fillmore | 310 | | | 10 | 1,270 | | 10 | 170 | | 15 | 701 | 370 | 50 | 595 | 660 | 390 | 320 | 290 | **5,161** |
| Meiners Oaks | 80 | | | 10 | 15 | 225 | 40 | 4 | 40 | 540 | 204 | 120 | 25 | 110 | 285 | 35 | 40 | 45 | **1,818** |
| Mira Monte | 180 | | | | 15 | 55 | 265 | 10 | 60 | 610 | 309 | 225 | 55 | 255 | 735 | 40 | 25 | 105 | **2,944** |
| Moorpark | 570 | 15 | | 10 | 30 | | 4 | 2,725 | | 10 | 4,941 | 545 | 30 | 745 | 525 | 55 | 1,765 | 2,770 | **14,740** |
| Oak View | 40 | | | | | 10 | 30 | | 175 | 275 | 368 | 110 | 20 | 200 | 660 | 30 | 35 | 25 | **1,978** |
| Ojai | 80 | | | | 10 | 140 | 20 | 15 | 10 | 1,550 | 256 | 220 | 30 | 285 | 480 | 25 | 35 | 90 | **3,246** |
| Oxnard | 7,465 | 25 | 60 | 450 | 265 | 15 | 40 | 560 | 30 | 215 | 5,341 | 26,175 | 3,695 | 7,995 | 10,090 | 840 | 1,505 | 4,315 | **69,081** |
| Port Hueneme | 955 | | 10 | 25 | 35 | | 10 | 120 | | 15 | 638 | 2,510 | 2,480 | 985 | 1,380 | 70 | 175 | 370 | **9,778** |
| Remainder of County | 1,860 | 4 | 10 | 25 | 275 | 20 | 40 | 475 | 55 | 680 | 9,728 | 1,740 | 435 | 6,960 | 2,850 | 580 | 850 | 3,195 | **29,782** |
| San Buenaventura (Ventura) | 2,765 | | 40 | 110 | 170 | 50 | 110 | 275 | 50 | 605 | 6,494 | 5,460 | 1,030 | 3,490 | 24,295 | 720 | 710 | 2,300 | **48,674** |
| Santa Paula | 605 | | | 25 | 180 | | | 150 | 10 | 45 | 884 | 1,255 | 140 | 1,710 | 1,960 | 3,375 | 195 | 415 | **10,949** |
| Simi Valley | 1,310 | 4 | 10 | 25 | 35 | | 4 | 1,480 | | 65 | 24,154 | 1,055 | 125 | 1,290 | 1,355 | 115 | 19,335 | 5,440 | **55,802** |
| Thousand Oaks | 2,300 | 60 | | 15 | 60 | 20 | | 955 | 4 | 115 | 21,242 | 1,630 | 235 | 2,470 | 1,650 | 190 | 2,415 | 24,640 | **58,001** |
| Grand Total | 27,930 | 188 | 375 | 890 | 2,439 | 545 | 577 | 7,479 | 434 | 4,800 | 80,446 | 45,550 | 9,325 | 29,975 | 50,410 | 6,649 | 28,310 | 47,560 | **343,882** |

A winding two-lane highway may limit a large number of drivers from using it. However, observations in the field indicated that these roadways had generally free-flowing conditions, often at Level of Service A. While some motorists may be discouraged from using them due to grades and alignment, it did not appear that roads themselves were metering the number of cars that possibly could use them. The conclusions from both the travel demand and physical analyses of the corridors are summarized below (keyed to the numbers shown in Figure 2):

- Fillmore-Santa Clarita via State Route 126: Following Telegraph Road through the Santa Clara River Valley, this 22-mile east-west corridor avoids the mountains both north and south of it, providing a level pathway east to I-5 in Santa Clarita, as well as to several employment centers there. There were 701 work trips from Fillmore to locations outside of the county and traffic volumes of 24,000 per day indicate moderate ridership potential, and a demand-responsive service currently connects the communities of Piru and Fillmore. *Recommendation: This corridor shows some promise as a possible bus route, most likely the final leg of service that originates in Ventura.*
- Camarillo-Moorpark via Highway 118: This 12-mile east-west corridor would close the gap in transit service between Moorpark and Camarillo. It is situated on flat terrain, adjacent to farmland and railroad tracks, utilizing Somis Road and West Los Angeles Ave (Highway 118). There are 1040 work trips that occur between Camarillo and Moorpark with Daily traffic Volumes of 19,000. *Recommendation: this corridor shows potentially viable transit patronage.*
- Camarillo-Moorpark via Santa Rosa Road: This 12-mile east-west corridor passes though largely flat land, with some residential development on streets branching off its easterly portion. Again, there are 1040 work trips that occur between Camarillo and Moorpark but more significantly here, 5665 work trips that occur between Camarillo and thousand Oaks with daily traffic volumes of about 19,000 are similar to those via highway 118. *Recommendation: This corridor offers an alternative to Camarillo-Moorpark via Highway 118, above, for bus service between these communities.*
- Simi Valley-Thousand Oaks via E. Olsen Road: This is a 4-mile east-west corridor centered on Olsen and Madera roads. A bus line here would provide a shorter trip for many riders than the current transfer to VISTA's East County Service using the more circuitous routing on Highways 23 and 101. There are 7855 work trips that occur between Simi Valley and Thousand Oaks but traffic data are not available for this corridor to gauge possible transit demand; former VISTA fixed-route service here was not very successful. *Recommendation: This corridor could be retained for consideration in future analyses to determine if conditions have changed sufficiently to make it more promising to reinstate regular transit service.*
- Oxnard-Ventura via Victoria Avenue: Victoria is a wide north-south street on flat terrain. This 6-mile segment skirts the western fringe of Oxnard and Port Hueneme, and portions of it are served by terminal loops of Gold Coast Transit east-west lines. The segment between Highway 101 and W. 5$^{th}$ Street passes through agricultural uses, but areas to the south are rapidly developing with dense residential and some retail development. Should development occur along the more northerly segments, consideration should be made for using Victoria Avenue as an artery for a new north-south transit service to Ventura. There

are 15,550 work trips that occur between Oxnard and Ventura and the current traffic volumes are a high 44,000 per day, underscoring the potential for strong transit demand. *Recommendation: This corridor should be considered further for possible transit service.*

In addition, ten unserved areas appear to have the population density to justify regular fixed-route service. Many are already served by dial-a-ride operations, which may be the most cost-effective way to provide transit service there. Nonetheless, attracting "choice" riders will likely require the establishment of fixed-route service to negate the need to make reservations and shorten the time it takes to make a trip. The ten areas highlighted on Figure 3 are reasonable starting points for at least considering new or modified fixed-route (or flex-route) bus service.

1. Ventura, east of Ventura Avenue, along Seneca Street
2. Ventura, south of Telephone Road, on either side of the railroad tracks
3. Oxnard, west of Ventura Avenue, north of Gonzales Street
4. Oxnard, west of Victoria Avenue and along Silver Strand, Hollywood Beach, and along Harbor Boulevard
5. Camarillo, south of Highway 101 and north of Pleasant Valley Road (this area does not show up on the density maps but aerial photos reveal extensive residential development)
6. Camarillo, along Lewis and Flynn roads
7. Camarillo, along Upland Road
8. Thousand Oaks, along Pederson Road (currently served by just 2 morning and 2 afternoon trips of TOT Route 2B)
9. Unincorporated County at Oak Park
10. Santa Susana Knolls, near the southeast boundary of Simi Valley

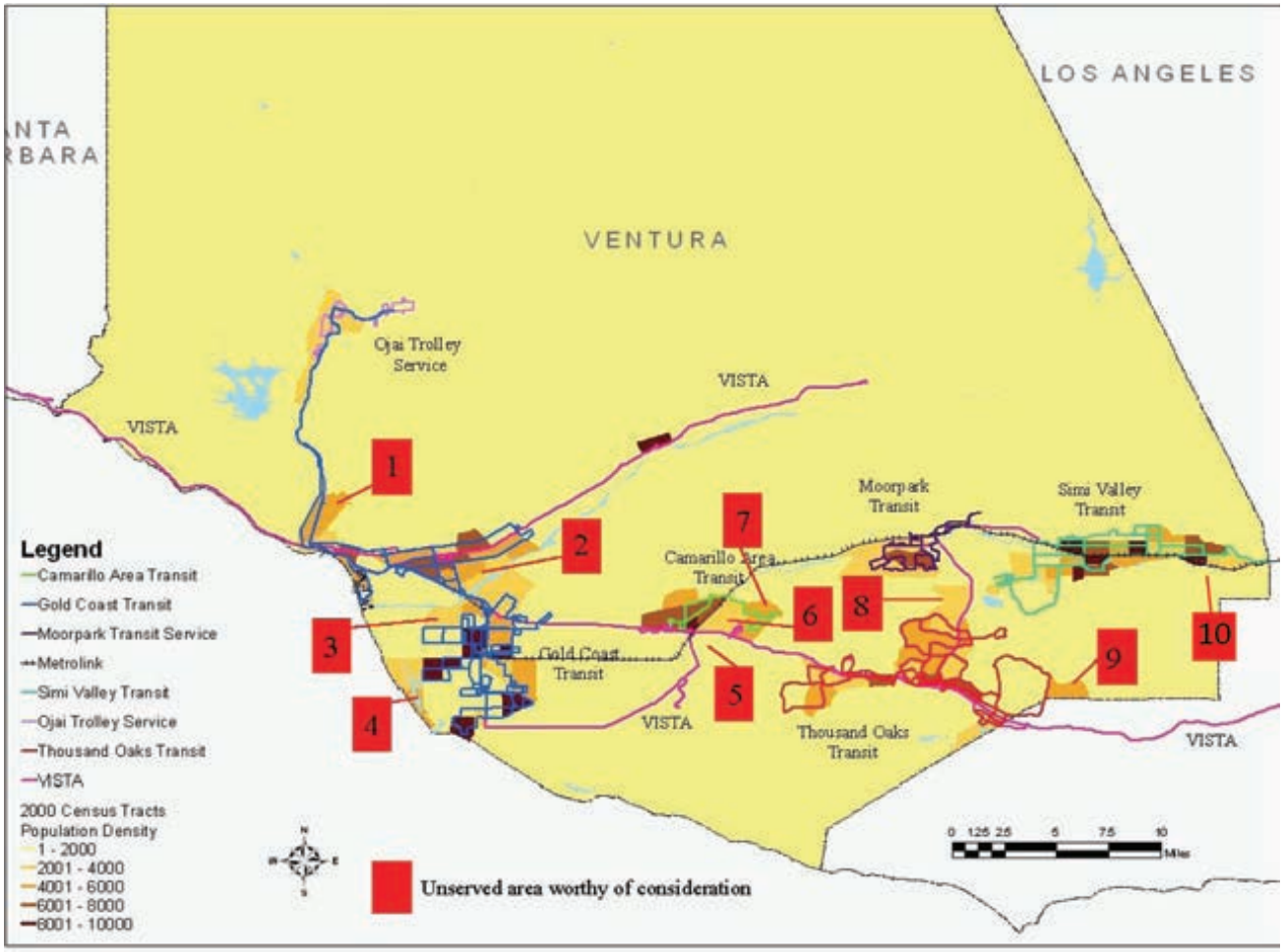



Figure 3. Population Density of Ventura County in Relation to Bus Service

All of these areas, except for number 10, are served by various senior/disabled dial-a-rides. In addition, areas 4, 5, and 7 offer general public Dial-a-Ride service for the general population. In at least one instance, area 4, the transit operator reported that the Beaches and Harbor Shuttle dial-a-ride service is considerably more cost-effective and attracts more ridership than previous fixed-route service in this location. There are no doubt other areas included in the list that have similar histories. Nevertheless, fixed-route transit service has not yet caught up with much of the new residential and commercial development. Such service, with its regularity of schedules, usually proves more attractive to discretionary riders. The ten areas discussed here should be among the first considered for such service enhancements in the future.

It must be noted that a weakness of this gaps analysis is that it assumes that a location within a quarter mile walk of a bus line is “served by transit”, regardless of the level of service of that bus line. In fact, many lines, like those in Camarillo and Moorpark, offer service frequencies of an hour or greater, and several do not operate in evenings or on weekends. When considered in this light,

there are likely many more "gaps" in service than appear at first glance on Figure 2. This issue should be investigated in more depth if and when an operations analysis is conducted on countywide transit services.

A trip that appears possible by looking at a transit map may not be in reality if a transfer is involved; if one of the lines in question has not yet started for the day or has already ended service, then a traveler would not be able to complete their trip. To get an idea of the magnitude of this gap, the spans of service of the 38 lines in the county's fixed-route bus network were laid out in charts for weekdays, Saturdays, and Sundays. The lack of service on many lines during weekends or early mornings creates a gap of a different sort than the physical gaps identified above. Transit is simply unavailable at these times unless users have access to demand-responsive service. There are gaps midday when certain peak-hour routes are not running. When considering that much of the county's fixed-route transit service is operated at relatively low frequencies, the "gap" created by low service levels could be much greater than revealed by the initial analysis. The analysis of the timing of transfers at key points in the network indicates plenty of room for improvement. At most, only 20% of bus-to-bus transfers could be considered convenient. In many cases, departing buses miss arriving buses by mere seconds. In other cases, the buses of many routes occupy bays at a transit center simultaneously, but long layovers increase the actual time it takes a transferee to continue a trip.

Riders with a choice of travel modes will want to make their transfers as expeditiously as possible, and transfer times greater than 5 to 10 minutes for bus-to-bus and 10 to 12 minutes for bus-to-rail will not be attractive to them. Improving this situation will require a new approach to how transit vehicles are scheduled throughout the county. This may, in many cases, result in higher operating costs but is sure to result in higher ridership. This, at least, is the experience elsewhere, when conversion to timed-transfers was almost always followed by an increase in riders. Ironically, building in layover time to allow for better timed meets would result in a more attractive service, likely leading to greater ridership and an increase in the overall effectiveness of the system. This is, perhaps, the single most effective measure to increase ridership among the county's transit providers. To help transit agencies assess how changes in frequency of service might affect ridership, a simple forecasting model was developed as part of this study. The model uses current schedules and ridership as a base, and applies factors gathered from national examples and research to test the effect of changing frequency of service on a route-by-route basis (Appendix D).

Passenger surveys from 2008 provided input from actual users of the transit services and reinforce a widespread desire for better connectivity. For instance, of the 146 results gathered for the Highway 101/Conejo Connection, 25 percent asked for more frequent buses, and 18 percent wanted later service. From this survey group, 61 percent did not have cars and 44 percent were using Saturday service.

For the Highway 126 service, 89 percent did not have cars. Of the 148 persons surveyed, 69 percent lived in Fillmore and 21 percent in Santa Paula. One-third were using transit for school trips; one-fourth for work; and one-fourth for shopping. Seventeen percent planned to transfer—primarily to Gold Coast Transit, VISTA Santa Paula and Fillmore Dial-a-Rides (in that order).

For service in the East County, 61 surveys showed that 67 percent of riders surveyed used the weekday bus to get to school (14% for Saturday service), and 25 per percent traveled to work (57% on Saturday). Twenty six percent of weekday riders and 12 percent of Saturday passengers had a car available for the trip. Passengers requested later service, Sunday service, better on-time performance and more frequent buses during the day.

For the Coastal Express, 73 percent of weekday riders use the bus four or more days and week and an additional 20 percent ride 2 to 4 days a week. In addition to weekday service, the most popular reasons for taking the weekend Coastal Express are 29 percent for trips to/from work and 24 percent for. While 21 percent of weekday riders had no car, 81 percent of weekend riders did not.

Also, input from the Unmet Needs public hearing should be considered. Although some of the following did not meet the feasibility or technical criteria of the Unmet Needs program, this February 2009 data provides important information about users' perspectives on the range and types of transit improvements they desire and can be segregated into three general categories, greater frequency, additional areas and general service improvements:

GREATER FREQUENCY

- Better/faster bus service from South Oxnard to north Oxnard
- Express bus service between Ojai and Ventura and/or Oxnard
- Gold Coast Transit Service after 10 pm to Ojai from Oxnard/Ventura
- Increased frequency on Gold Coast Transit Route 6, including later 6B bus service
- Gold Coast Transit Route 5 to operate later
- Weekend Service to Woodland Hills
- Earlier southbound Conejo Connection to connect with the LA Metro Orange line at 6 am; more and later Conejo Connection service
- Sunday service on the VISTA 101
- Non-stop VISTA 101 Service between "Centers" of Ventura, Oxnard, and Thousand Oaks
- More frequent VISTA EAST service between Simi Valley and City of Westlake Village
- Later morning service to UCSB, later evening service, later weekend service, more service overall
- Increased reverse commute service on the VISTA Coastal Express
- Earlier VISTA 126 Service to Fillmore

- Later VISTA 126 Service on weekends
- Weekend service on Camarillo Area Transit
- Sunday service on the Dial-A-Ride
- Thousand Oaks Transit to operate on the weekends
- Additional evening services on the Dial-A-Ride
- More frequent service on Thousand Oaks Blvd. and Moorpark Road
- Better transit services between Santa Paula and Oxnard for daily work trips
- Earlier and later VISTA 101 service to Pardee Plaza
- Mid-day service on Thousand Oaks Transit
- Increased service on Thousand Oaks Blvd. between the Oaks and Westlake Blvd.
- Either a direct bus from Camarillo to Moorpark College or Metrolink service to Moorpark with start times of 7 or 8 AM
- Additional train service between Ventura and Simi Valley
- More rail service to Santa Barbara; improved rail speeds to Santa Barbara.
- Expansion of Surfliner services
- Mid-day and weekend Metrolink Service from Montalvo to Los Angeles;
- Hourly Metrolink service
- Late night rail service from Los Angeles to Ventura County.
- Earlier bus service countywide

ADDITIONAL AREAS

- Bus service to Valentine Road area (Tech Development Center and Adult Ed school)
- Bus service at or near Gonzales and Victoria, with increased service to Oxnard High School
- Bus service at or near Lombard and Sturgis in Oxnard.
- Transit service from Oxnard to Ventura using the Victoria Corridor, to various destinations in Ventura
- Fixed route transit service on Channel Islands between Center Point Mall and Channel Islands Harbor/County Beach Communities or intermediate points
- Transit service on the Vineyard Corridor, including fixed route service to the Juvenile Justice Center and direct service from El Rio to Saticoy
- Gold Coast Transit Service from Valmore/Preble to Pacific View Mall
- Transit service from East Ventura (on Foothill corridor) to County Hospital
- Transit service to the Oxnard Airport
- Additional stop of Gold Coast Transit route 16
- Transit service to Villa Cesar Chavez
- Direct transit service from the area of Gonzales and Rose to Oxnard College

- Stops added to existing VISTA 101 service, including new stops and additional stops made by existing trips
- VISTA service from Thousand Oaks to Santa Barbara (VISTA 101 connection to Coastal Express)
- VISTA EAST service to Moorpark College
- An added Coastal Express stop at Ventura College
- VISTA Coastal Express to stop at the Santa Barbara Airport
- VISTA CSUCI service extended to the Oxnard Transportation Center (OTC)
- VISTA CSUCI service to connect Oxnard and Camarillo.
- Wants the TOT number 3 (Blue) and/or the number 4 (Red) come out a little farther like the number 3 (Blue) does in the mornings
- Thousand Oaks Transit to provide more direct service from Newbury Park to the Oaks and Westlake
- Wants bus stops at major business parks
- Bus service between Ventura and Point Mugu
- Direct commuter transit service from East Ventura to Moorpark
- Direct transit service from Moorpark to Ventura County Hospital
- Direct transit service from Moorpark to hospitals in Los Angeles County
- Weekend transit service from Thousand Oaks to soccer fields in Calabasas, Simi Valley, Camarillo, Oxnard, Ventura, and Santa Barbara.
- Commuter bus service from Thousand Oaks to Century City
- Direct (non-stop) shuttle service from central locations in each city to Oxnard, Moorpark, and Ventura Colleges
- Bus service from Fillmore to Santa Clarita
- Transit service for Somis and Santa Rosa Valley
- Direct transit service from Ventura to Agoura Hills
- An additional train stop at Haas Automation in Oxnard

SERVICE IMPROVEMENTS

- Increased bike capacity on buses
- Fare transfers between Gold Coast Transit and VISTA services
- Better connections between VISTA Coastal Express and Gold Coast Transit
- Improve reliability of VISTA 101 service
- Increased VISTA marketing
- Increased/improved signage at bus stops
- Better coordination VISTA and CAT

- Changes in the way Thousand Oaks Transit delivers service including turning all two way loops into one way loops, moving all bus lines to arterials and collectors, and using smaller buses.
- Hybrid or electric shuttles connecting rail stations, universities, parks, medical facilities, and shopping centers
- Better shelter from elements at the Ventura Transit Center
- A permanent train station at Montalvo
- An improved train station in downtown Ventura
- Better information regarding transit on website and at bus stops
- Improved ADA connections between Simi Valley and LA ACCESS

***While the above comments often represent individual needs and issues, in combination they clearly underscore the public desire for improved transit. They also show a general consistency with possible projects identified by the study team and the TRANSCOM.***

*Rail-to-Bus Transfers* were also reviewed. The focus was on buses arriving in time to meet southbound trains heading for Los Angeles. The results are summarized below:

| | |
|---|---|
| Montalvo Station: | Of 2 southbound rail departures during this period, none were conveniently served. There was only one bus arrival (of Route 6A on Bristol Road) during the hour when the two morning rail trips departed. |
| Oxnard Transit Center | Of 4 southbound rail departures during this period, 3 were conveniently served: the 6:59 train was served by 6 bus arrivals, the 7:37 train by 3 bus arrivals, and the 10:11 train by 2 bus arrivals (a total of 11 bus arrivals out of 37 bus arrivals during the hours when trains departed). [Neither of the 2 northbound rail arrivals during this period was conveniently served by a bus departure.] |
| Camarillo Station | Of 4 southbound rail departures during this period, 1 was conveniently served: the 6:30 train was served by 1 bus arrival (out of 14 bus arrivals during the hours when trains departed). [One of the 2 northbound rail arrivals during this period was conveniently served by 1 bus departure.] |
| Moorpark Station | Of 5 southbound rail departures during this period (excluding the 6:03, which would have been fed by buses in the previous time slot), |

| | |
|---|---|
| | 2 were conveniently served: the 6:41 and 8:26 trains each were served by a single bus arrival (a total of 2 bus arrivals out of 18 possible bus arrivals during the hours when trains departed). [None of the 3 northbound rail arrivals during this period was conveniently served by a bus departure.] |
| Simi Valley Station | Of 7 southbound rail departures during this period, 4 were conveniently served: the 6:53 and 7:32 trains each were served by a single bus arrival, while the 8:22 and 8:39 trains each were served by 2 bus arrivals (a total of 6 bus arrivals out of 31 possible bus arrivals during the hours when trains departed). [Each of the 3 northbound rail arrivals during this period was conveniently served by a single bus departure.] |

Additional information on the Transit Gaps Analysis process is included in Appendix B.

## *C. Prioritizing Projects*

Given that there are rarely enough funds to meet all of the needs for transit services, a means for evaluating and ranking competing projects is needed. Working closely with members of VCTC's TRANSCOM, evaluation and prioritization criteria were developed and tested. While a key premise of the evaluation process was to maintain current levels of service, relationships between transit and other jurisdictional priorities was also accounted for. The work of the committee resulted in a two-level ranking template, each with weighted criteria that reflect their views on the importance of a specific criterion. The template, shown below, was incorporated into an evaluation procedure (Appendix C). Key features of the procedure are that a proposed project is ranked by its proponents, and then is reviewed by the TRANSCOM members to reach concurrence on its priority on a county-wide basis. The process basically enables the proponent to develop strong justifications of needs and benefits so that a proposal will rank well in a priorities list; the information needed also fosters defining a project in a manner that would be very competitive for grant or other funds. Another feature of the ranking process is that projects which benefit multiple jurisdictions receive bonus points. The evaluation procedure spells out how criteria and weightings can be modified.

**EVALUATION MATRIX TEMPLATE**

| Table 2: Primary Evaluation Criteria | | | | |
|---|---|---|---|---|
| **PRIMARY CRITERIA** ***(initially ranked in order of importance by TRANSCOM in December 2008; modify as appropriate)*** | **WEIGHTS** ***(Optional; suggested range: 1-3)*** | **SAMPLE CRITERIA/ THINGS TO CONSIDER** **(*choose from among these as appropriate for the types of projects/ funding being evaluated; add other criteria as needed)*** | **POINTS** **0-5** ***(modify as appropriate)*** | **SCORE** ***(Weight multiplied by Points for those criteria chosen for use in an evaluation)*** |
| 1. Mandated Improvements | 1 | Required for ADA compliance | | |
| | 2 | Required for air quality compliance | | |
| | 3 | Necessary to support legislative mandates or contractual obligations | | |
| | 1 | Desirable to support legislative mandates | | |
| | 3 | Fulfills unmet transit needs | | |
| | 1 | Required safety improvements | | |
| | | Other | | |
| 2. Preservation of Current Levels of Service | 3 | For transit arterials, provides new improvements or maintenance at bus stops/rail stations | | |
| | 2 | Addresses scheduled replacements or vehicles. | | |
| | 1 | Transportation control devices along transit routes/rail lines | | |
| | 1 | Improves the condition of the sidewalks and streets within 250 feet of a bus stop or rail station. | | |
| | 1 | Supports projects already designated for improvement. | | |
| | 1 | Reduces the backlog of deferred maintenance of sidewalks and streets used for | | |

| Table 2: Primary Evaluation Criteria | | | | |
|---|---|---|---|---|
| **PRIMARY CRITERIA** ***(initially ranked in order of importance by TRANSCOM in December 2008; modify as appropriate)*** | **WEIGHTS** ***(Optional; suggested range: 1-3)*** | **SAMPLE CRITERIA/ THINGS TO CONSIDER** **(*choose from among these as appropriate for the types of projects/ funding being evaluated; add other criteria as needed)*** | **POINTS** **0-5** ***(modify as appropriate)*** | **SCORE** ***(Weight multiplied by Points for those criteria chosen for use in an evaluation)*** |
| | | transit. | | |
| | | Other | | |
| 3. Expansion of Transit Service (including shorter headways) | 3 | Improves current access to and from local and/or regional transit stops and rail stations. | | |
| | 3 | Serves/Connects current activity centers (e.g., employment, educational facilities, medical centers, shopping hubs, sporting venues, etc.). | | |
| | 3 | Adds or improves connectivity to other local and/or regional transit services. | | |
| | 1 | Serves anticipated growth in transit demand (e.g., in a specific region) - what time horizon? | | |
| | 2 | Improves speed and reliability of transit vehicles. | | |
| | 2 | Improves bus stop/rail station performance for buses, such as reducing transfer time. | | |
| | 3 | Likely to increase the percentage of trips made by transit and reduce the percentage by automobile. | | |
| | 3 | Provides new/improved service during peak hours. | | |
| | 2 | Provides new/improved service during off-peak hours. | | |

| Table 2: Primary Evaluation Criteria | | | | |
|---|---|---|---|---|
| **PRIMARY CRITERIA** ***(initially ranked in order of importance by TRANSCOM in December 2008; modify as appropriate)*** | **WEIGHTS** ***(Optional; suggested range: 1-3)*** | **SAMPLE CRITERIA/ THINGS TO CONSIDER** **(*choose from among these as appropriate for the types of projects/ funding being evaluated; add other criteria as needed)*** | **POINTS** **0-5** ***(modify as appropriate)*** | **SCORE** ***(Weight multiplied by Points for those criteria chosen for use in an evaluation)*** |
| | 3 | Fulfills a new, unmet transit need. | | |
| | 2 | Meets needs of special population group | | |
| | | Other | | |
| 4. Financial Sustainability | 3 | Provides matching funds | | |
| | 3 | Effects on fares and operating costs. | | |
| | 2 | Availability of ongoing operating funds. | | |
| | 1 | Likelihood for additional operating funds. | | |
| | 2 | Availability of ongoing staff to implement. | | |
| | 1 | Likelihood for additional staff. | | |
| | 1 | Degree to which need for other funding is increased. | | |
| | 1 | Degree to which need for other funding is decreased. | | |
| | | Other | | |
| 5. Readiness | 2 | Ability to procure in a timely manner. | | |
| | 1 | Status of design (if applicable). | | |
| | 1 | Need to implement in phases | | |
| | | Other | | |
| | | | TOTAL PRIMARY SCORE | |

| Table 3: Secondary Criteria | | | | |
|---|---|---|---|---|
| **SECONDARY CRITERIA** ***(initially ranked in order of importance by TRANSCOM in December 2008; modify as appropriate)*** | **WEIGHTS** ***(Optional; suggested range: 1-2)*** | **SAMPLE CRITERIA/ THINGS TO CONSIDER** (***choose from among these as appropriate for the types of projects/ funding being evaluated; add other criteria as needed)*** | **POINTS 0-5** ***(modify as appropriate)*** | **SCORE** ***(Weight multiplied by Points for those criteria chosen for use in an evaluation)*** |
| 6. Non-transit influences | 1 | Critical to other city projects/ priorities | | |
| | 1 | Supportive/desirable for other city projects/priorities. | | |
| | | Other | | |
| 7. Other | 1 | Criteria specified by funding program (if applicable and not listed elsewhere above) | | |
| 8. Bonus Points | 2 | 1 point for each additional operating agency that would be served | | |
| | | Other | | |
| | | | TOTAL SECONDARY SCORE | |

| Table 4: Other Considerations | | | | |
|---|---|---|---|---|
| **CRITERIA** *(no priority order)* | **WEIGHTS** *(Optional; suggested range: (1-2)* | **SAMPLE CRITERIA/ THINGS TO CONSIDER** (*choose from among these as appropriate for the types of projects/ funding being evaluated; add other criteria as needed)* | **POINTS** **0-5** *(modify as appropriate)* | **SCORE** *(Weight multiplied by Points for those criteria chosen for use in an evaluation)* |
| Improvements to Ride Quality | | Improves quality of transit stops, including comfort and convenience. | | |
| | | Improves information provided to users. | | |
| Safety/Security | | Eliminates or reduces a specific safety/security hazard. | | |
| | | Supports general or systemwide safety/security improvements. | | |
| Community Impacts | | Negative and positive effects, including air quality, noise, traffic, property acquisitions, and “going green”. | | |
| | | Community support/opposition. | | |
| Compatibility /conflict with Regional and Local Plans | | Part of an adopted transportation plan (e.g., congestion management, etc.). | | |
| | | Supports an adopted or pending transportation plan. | | |
| | | Supports community and economic development, business functionality, and creation or retention of employment. | | |
| | | Provides or increases access to business districts and/or employers. | | |
| | | Provides infrastructure or service to support new employment. | | |
| | | Is a required mitigation measure. | | |

| Table 4: Other Considerations | | | | |
|---|---|---|---|---|
| | | Supports local land use or transit-oriented development. | | |
| Strategic | | Necessary predecessor for subsequent projects. | | |
| | | Desirable predecessor for subsequent projects. | | |
| | | | TOTAL SCORE | |

## *D. Projects*

Transit operating agencies provided listings for desired projects during the interviews conducted in October 2008. These included new and replacement vehicles for both paratransit and fixed routes, additional or upgrade passenger stops/stations, and new or upgraded maintenance facilities. Desired improvements addressed maintaining current levels of service, improving reliability and creating the ability to expand service.

Projects from these categories were submitted for ARRA funding in early 2009. As of June 10, VCTC had received funding notices for the following 25 transit projects.

| Table 5: Candidate Projects for ARRA Funding | | |
|---|---|---|
| **Project** | **Amount** | **Responsible Agency** |
| Bus Transfer Facility at Central and Del Norte | $ 24,000 | Camarillo |
| Two Type II Buses and Three Type I Buses | $ 258,514 | Camarillo Health Care District |
| Replacement Supervisory Vehicles and Related Equipment | $ 185,000 | Gold Coast Transit |
| Eight CNG-fueled Transit Buses | $ 3,608,000 | Gold Coast Transit |
| Upgraded Farebox System | $ 600,000 | Gold Coast Transit |
| Operations Facility Modernization | $ 2,091,257 | Gold Coast Transit |
| Transit Enhancements | $ 101,723 | Gold Coast Transit |
| ADA Paratransit Operations | $ 1,000,000 | Gold Coast Transit |
| Track/Structure Restoration | $ 1,146,535 | Metrolink |
| Positive Train Control Design | $ 2,480,000 | Metrolink |
| Central Maintenance Facility Improvements & Keller Yard | $ 960,000 | Metrolink |
| Metrolink Operating Assistance | $ 582,000 | Metrolink |
| Three CNG-fueled Transit Buses | $ 1,260,000 | Moorpark |
| ADA Paratransit Operations | $ 52,175 | Moorpark |

| Table 5: Candidate Projects for ARRA Funding | | |
|---|---|---|
| **Project** | **Amount** | **Responsible Agency** |
| Three LPG-fueled Buses | $ 465,970 | Ojai |
| Replace/upgrade Deteriorated Transit Shelters | $ 484,000 | Simi Valley |
| Modernization of Transit Garage | $ 867,349 | Simi Valley |
| Three CNG-fueled Transit Buses | $ 1,380,000 | Simi Valley |
| ADA Paratransit Operations | $ 303,400 | Simi Valley |
| Five 12 passenger CNG-fueled Cutaway Vehicles | $ 425,000 | Thousand Oaks |
| Bus Stop Enhancements | $ 39,511 | Thousand Oaks |
| ADA Paratransit Operations | $ 111,240 | Thousand Oaks |
| Particulate Traps for 40 VISTA Buses | $ 400,000 | VCTC |
| Smart Card Upgrade | $ 168,000 | VCTC |
| Scales for ADA Certification | $ 10,000 | VCTC |
| Total for Transit | $6,548,645 | *14,5% of total award* |
| Highway Projects | $38,515,826 | *85.5% of total award* |
| Total ARRA Funding | $45,064,481 | |

***Some Remainder Projects***

From the desired listings of projects originally identified by operating agencies, the following are examples of some of the needs over the next few years that were not addressed by the ARRA funding. This list is not intended to be comprehensive, but rather to illustrate the breadth of needs across the county and magnitude of costs. This range of identified needs also underscores the need for the prioritization process to help assure that projects are funded in a logical and complementary manner. It also underscores the desirability for improvements in the planning process discussed elsewhere.

| Table 6: Near-Term Project Needs Not Addressed by ARRA | | |
|---|---|---|
| **Agency** | **Project** | **Estimated Cost** |
| Camarillo | 14 to 20- passenger vehicles for Dial-A-Ride (35-40 vehicles) | $ 4.0 to 6.0 M |
| Camarillo | 26 to30 passenger fixed route vehicles (5-6 vehicles) | $ 1.0 to 2.0 M |
| Camarillo | Benches/shelters/ schedules improvements | $ 250,000 |
| Camarillo | Metrolink station improvements | $ 1.0 M |
| Camarillo | Pedestrian grade separation at Metrolink station | $17.0 M |
| Gold Coast Transit | Replacement vehicles for fixed routes and paratransit | $ 2.0 to 4.0 M |
| Moorpark | Replacement vehicles for fixed routes and paratransit | $ 2.0 to 4.0 M |

| Table 6: Near-Term Project Needs Not Addressed by ARRA | | |
|---|---|---|
| **Agency** | **Project** | **Estimated Cost** |
| Moorpark | Bus Stop Enhancements | $ 200,000 |
| Ojai | Maintenance Facility | $ 500,000 |
| Ojai | Transit stop enhancements | $ 75,000 |
| Simi Valley | Replacement vehicles for fixed routes and paratransit | $ 4.0 to 6.0 M |
| Simi Valley | Farebox replacements | $ 1.0 M |
| Simi Valley | Additional Metrolink parking | $ 1.0 to 2.0 M |
| Simi Valley | Safety improvements | $ 500,000 |
| Oxnard | Bus Stop Enhancements | $ 500,000 |
| Thousand Oaks | Replacement vehicles for fixed routes and paratransit | $ 2.0 to 3.0 M |
| Thousand Oaks | Safety improvements | $ 500,000 |

***Consultant Recommendations Regarding Projects***

*Near Term*

As a precursor to specific projects beyond those that are now funded by ARRA, Jacobs recommends additional studies to build upon the issues raised and work conducted in the study. These studies are intended to more fully evaluate issues which have been looked at only from a high level.

A recurring comment from study participants was that service across jurisdictional boundaries needed to be better coordinated. This study considered this issue at a high level view in the Gaps Analysis, which documented the sensitivity of coordinating schedules at points where transit services connect. The arrival, waiting and departure times at such points are critical for patrons to make trips in which they must use multiple transit services. The ability of the transit operators to make these interconnections is complicated by sometimes competing needs to them to ensure timely service at other locations. In order to allow VCTC and the operators to begin to explore how schedule changes could affect both individual services and the connection points, a simple modeling technique was developed (Appendix D). However, to develop schedules that take into account the needs for all components of the individual systems and ensure effective interconnections, Jacobs recommends that a detailed analysis of schedules for each jurisdiction and from a system wide basis be conducted.

Closely related to developing a more effective schedule, Jacobs recommends that opportunities for enhancing interagency coordination and cooperative efforts be further explored. One of the potential outcomes of improved scheduling could well be that some trips would be much better for patrons if they did not have to make transfers. The need for transfers is driven in many cases by operating agencies not being able to cross jurisdictional boundaries. One way to optimize the trips for patrons would be to enable transit services to be focused on serving entire routes that fully link destinations without regard to geographic boundaries. Implementing this type of service could be accomplished through inter-local agreements among adjoining cities, or other means. The latter might include organizing the transit providers as operating units that serve travel demand markets, rather than being geographically focused; new or additional service-sharing on a subarea basis; or new or additional shared maintenance.

Consideration should also be given to consolidation of several existing services within sub-areas of the county, perhaps east and west. Inter-local agreements could be formed between neighboring cities with common transit needs. These inter-local agreements might take the form of combined paratransit operations, combined fixed route services, shared maintenance, shared purchasing, or other activities where better efficiencies could be realized.

During the public outreach efforts for this study, many participants lauded VCTC for inviting comment on plans and issues in a workshop setting that was accessible in terms of location and used interactive formats. The methods for invitation included both mailings and individual phone contacts, to help be sure that individuals became aware of meetings, rather than relying only on newspaper advertisements. There were also commendations for using the internet to distribute information and to seek comment. Jacobs recommends that VCTC, and the operating agencies continue and expand their public communications efforts beyond the typical public hearings on specific programs. Consideration should be given to:

- Presentations at community events
- Speakers bureau including transit agency board members
- Using social communication tools (such as Facebook and Twitter) to provide timely messages on issues and to direct recipients to the websites for more details
- Using the websites to solicit comments
- Conducting electronic town hall meetings, which are capable of accommodating thousands of listeners simultaneously at very low cost.

*Long Term*

Given the size of Ventura County and its ongoing change into a suburbanized county, creation of countywide transit service should also be considered. Additionally, the potential for a countywide

sales tax underscores the need for development of a comprehensive approach and a long-term transit plan. Both would be important to garnering voter support. Creating a countywide service could occur in a variety of ways: phased consolidation of existing operators; designation of one of the existing operators as a master operating agency to guide creating of a countywide service; change VCTC 's role to become an operating agency; create a new operating agency; or other approaches or combinations.

A long term transit plan should evaluate internal circulation in communities and across the county over time, the provision of transit connections to other parts of the region, options for operating the system elements, options for financing, and the myriad and interconnected issues needed to create a comprehensive and cost-effective service for the residents and businesses of Ventura County. There are two basic approaches to developing a long term plan—determine what incremental increases would be needed to continue current (and relatively low) levels of service, or to define high levels of transit mobility for all areas of the county and lay out the process for achieving more robust service.

The benefits of a well-crafted long term plan are not only for transit users, but have also been shown to be a critical element in attracting and retaining jobs. The availability of good transit is a top-level, "must-have" component in the ever-increasing competition among communities to attract desirable employers.

## *E. Community Outreach*

In addition to the outreach for this study, comments from the 2008 passenger surveys and the Unmet Needs public hearing held February 2, 2009 provided another validation of desires for improved transit. The Findings Report from those hearings noted "most of the testimony fell into several broad categories: expanded and/or more frequent bus service; better coordination among bus systems; improved bus service for seniors and the disabled; and increased train service."

Several efforts were undertaken to help assure that this Transit Investment Study included public comment. These included:

- Development of a survey instrument to solicit and track issues
- Development of a countywide database and organizations to be contacted regarding surveys and meetings
- One-on-one or telephone interviews with elected officials

- Development of an on-line survey of transportation issues that was posted on the VCTC website
- Published notices and made individual calls regarding public meetings
- Conducted two public outreach workshops.

***Results***

Key results of these efforts are summarized below. Additional information is contained in Appendix E.

Survey Tool: The survey instrument sought information using the following questions:

1. *What Ventura County city do you reside?*

2. *Which specific issues concern you regarding the existing public transportation services and/or infrastructure?*

3. *In your opinion, what are the most commonly cited transportation infrastructure deficiencies?*

4. *In Ventura County, which areas/communities do you believe have insufficient public transit options?*

5. *Should Ventura County be focused on pursuing local or regional transit solutions?*

6. *Which public transit projects do you believe are a priority?*

7. *In your city, do you believe there is adequate funding for public transportation? Which projects do you believe should receive funding?*

8. *Would you and/or your friends and family support a regional tax measure devoted to expanding transportation infrastructure?*

9. *In your opinion, what can VCTC do to encourage cooperation between cities to form a cohesive transportation vision?*

10. *Please identify any current issues or concerns that you are aware of in your community that may affect future transportation improvements.*

11. *What can VCTC do in their public outreach and/or information materials to encourage community members to participate in this study?*

12. *What key stakeholders/organizations would you suggest meeting with that would be interested in participating in this study?*

13. *Are there any additional transportation improvements that are needed that we have not discussed?*

Database: The database includes more than 550 individuals and organizations. Not only was this used for the study, but it provides useful information for future public outreach efforts by VCTC and the operating agencies.

Interviews with Elected Officials: One-on-one interviews were conducted with 16 elected officials about their perspectives on the transportation needs of the County. In addition to the one-on-one interviews, the surveys were used to solicit input at the January 29, 2009 meeting for elected officials hosted by the Ventura County of Governments. The most important issues with regard to the current and future transportation needs for Ventura County were (in order of prevalence):

1. Frequency of transit thereby reducing headways

2. Connectivity between east and west Ventura County

3. Accessibility to transit via more strategically based bus stops and increasing weekend/evening service

4. Service deficiencies throughout Ventura County especially in Santa Paula, Fillmore and Ojai

5. Lack of funding throughout Ventura County creating transportation challenges on both the local and regional level; however, participants largely agreeing that constituents would not support a tax measure to increase funding.

Public Meeting Notifications: Meeting notices were mailed to all persons in database, as well as others. Approximately 800 notices were mailed. The workshops were publicized in the Ventura County Star and The Acorn newspapers. Leading up to each workshop, reminder phone calls were placed to leading business groups, transportation-oriented groups, and community-based organizations to encourage attendance and participation. Several of these groups committed to distribute the workshop invitation to their membership, post the workshop information on their

membership calendar, announce the workshop at their board meeting, post the workshop information on their website, and mention the workshop in their newsletters.

On-Line Surveys: The meeting notices identified how to provide comments via the VCTC website; this has become an industry standard for enabling those who cannot attend meetings to participate. Twelve on-line surveys were submitted via the VCTC website, which ran during the entire notification process and public workshops. The on-line input is combined with the results of the workshops, below.

Public Workshops: Two workshops on this Transit Investment Study were held - April 9, 2009 in Camarillo and April 15, 2009 in Thousand Oaks. At each of these an overview of the study process was presented and visitors were provided several opportunities to provide comments. These included the questionnaire, posting of specific areas of concern on large aerial maps, and to talk with the project study team and representatives of VCTC and the operating agencies. ***There was a very favorable reaction to the workshop format and several participants asked that there be more such outreach.*** Participants represented various cities including: Ventura (15), Camarillo (14), Oxnard (5), Newbury Park (5), Ojai (3), Port Hueneme (3), Santa Paula (2), Simi Valley (2), Somis (2) and 1 each from Oak Park, Thousand Oaks, Moorpark and Buenaventura. What is noteworthy is the distances that people were willing to travel to participate

*Key Findings from the Public Workshops and On-Line Surveys*

Overall, respondents feel that public transit is slow and inconvenient. There is an overwhelming sense that connectivity around the County needs to be improved whether it is by bus, train, or bike paths. Generally residents feel that it is easier to get in their car and drive to their destination.

**Regional Issues**

1. Frequency- More frequent service would minimize the amount of time riders spend on the bus and would help promote transit as a viable transportation alternative.

2. Connectivity- Lack of connectivity and coordination between cities makes it difficult for transit riders to travel from one side of the County to the other, whether east to west or north to south. Stronger transit connections between cities need to exist to create accessibility to jobs, educational centers, government centers, etc.
3. Accessibility- Enhance accessibility by providing more busses, additional strategic bus stops and improving service during evenings and weekends. Identify job access areas that should be transit accessible.

4. Multi-modal transit center- Create a transit hub in downtown Ventura that ties

Metrolink, Amtrak, Greyhound, VISTA and future rail service.

5. Regional bus service- Combine existing transit services into one regional bus service managed by a regional authority. Respondents said this would increase the effectiveness of funding and service throughout Ventura County.

6. Expansion- Work to expand Gold Coast in the west and work on a regional system for the east County; integrate services with VISTA.

7. VCOG/VCTC- Merge VCOG and VCTC into a true regional planning and transportation agency; give the new agency power to create the Sustainable Communities Strategy required under SB 375.

**Local Issues**

1. Transit deficiencies
   a. Increase transit options specifically VISTA service in East County cities such as Ojai, Fillmore, Santa Paula, and Piru not only to connect between cities but enhance accessibility to the rest of the County.
   b. Currently, unincorporated areas outside of Ojai city limits do not have sufficient public transit options.
   c. Northwest Port Hueneme and Hueneme Bay do not have mass transit especially for seniors who reside in that region.
   d. Improve transit west of Victoria Avenue, beach communities, and Oxnard Transportation Center.
   e. No public transit from Simi Valley to Oxnard.
   f. Bus service is lacking in Port Hueneme, Thousand Oaks, and Camarillo.
   g. Cal State Channel Islands buses are too large and limited to only a few of the campus roadways.
   h. VISTA is the only option from Ventura to Santa Barbara.
   i. Increased daytime/evening and night connections with VISTA Coastal Express.

2. Dial-A-Ride programs- Protect transportation options for the aging and disabled population who depend on dial-a-ride and paratransit programs to travel throughout Ventura County.

3. Metrolink- Expand Metrolink service in Ventura County by providing a station in downtown Ventura and Thousand Oaks.

4. Bike paths- Create more bike paths and increase pedestrian pathways in every city.

5. Bus shelters- Provide more bus shelters in every city.

6. Funding- Provide funding for Ojai Trolley, Gold Coast Transit, and HELP Ojai's van service.

7. Street paving- Improve both streets and highways by repaving existing roads.

8. SR-101/ SR-23 interchange- Upgrade existing interchange to reduce bottlenecks and increase the flow of traffic.

9. SR- 118- Widen and landscape SR-118 to increase flow of traffic in Simi Valley, Thousand Oaks and Moorpark region.

10. Improvements- Improve bypass on Highway 33 through Casitas Springs to increase safety and reduce traffic.

**Funding**

The general consensus is that there is not enough funding on both the local and regional levels and there is an ongoing struggle to find resources to fund projects. Cities are faced with difficult challenges when prioritizing projects based on limited federal financial support. Furthermore, Ventura County lacks funding for both capital projects and ongoing maintenance and operations.

**Potential Tax Measure**

While more than half of those that responded at the VCOG meeting said that their constituents would not support a tax measure devoted to transportation infrastructure, more than 60% of the attendees from the community workshops said they would support a tax measure.

## *F. Other Consultant Recommendations*

Near Term

***During the public outreach efforts for this study, many participants lauded VCTC for inviting comment on plans and issues in a workshop setting that was accessible in terms of location and presentation.*** The methods for invitation included both mailings and individual phone contacts. There were also commendations for using the internet to distribute information and to seek comment. Jacobs recommends that VCTC, and the operating agencies continue and expand their public communications efforts beyond the typical public hearings on specific programs. Consideration should be given to:

- Presentations at community events
- Using social communication tools (such as Facebook and Twitter) to provide timely messages on issues and to direct recipients to the websites for more details
- Using the websites to solicit comments
- Conducting electronic town hall meetings, which are capable of accommodating thousands of listeners simultaneously at very low cost.

Increased public communications should become a hallmark for transportation planning and services. As was evident in the 2008 ridership survey and 2009 Unmet Needs public hearing, members who now use transit are willing to express their views on current services and desired improvements. The input received for this Transit Investment Study are indicative of the overall support for transit as a baseline public service that should be expanded to support the quality of life throughout Ventura County. A robust communication process is a cost-effective way to create and maintain the numerous partnerships among governments, businesses, organizations, transit advocates, and the general public that are needed to build a transit system that supports economic vitality and makes Ventura a desirable play to live, work and play.

As a way to underscore the importance that the general population places on quality transit, even during economically challenging times, consider that a recent poll in Los Angeles County indicated that, despite a worse economy than in November 2008, voters would still overwhelmingly vote for Measure R, the self-imposed transportation tax.

# Appendix A

# Existing Conditions Technical Memorandum

JACOBS™

600 Wilshire Boulevard
Suite 1000
Los Angeles, CA 90017

**Technical Memorandum**

| | |
|---|---|
| **Date** | January 20, 2009 |
| **To** | Steve DeGeorge |
| **From** | Jacobs Engineering |
| **Subject** | VCTC Transit Investment Study<br>Task 1 Deliverable: Existing Conditions Report |

## Introduction

This memorandum is the first of several being prepared for the Ventura County Transit Investment Study. This study is designed to identify and prioritize projects that could benefit public transportation in Ventura County. Information collected for this effort will be utilized to allocate funds for both short- and long-term transit needs of the County's many public transit operators. The study is sponsored by the Ventura County Transportation Commission (VCTC). Jacobs is the consulting firm chosen to carry out the technical work.

This memorandum summarizes information on existing public transportation operations in the county. It is based upon data submitted by each of the local transit operators. This material has been supplemented by face-to-face interviews with personnel from the affected public agencies and transit operators. In addition, limited field surveys were conducted to view the maintenance and station facilities used by many of these operators.

## Summary of Observations

Public transportation serving Ventura County is fragmented, with seven fixed-route bus operations, five public dial-a-ride operations, and four paratransit services restricted to disabled or senior riders. There are also two Los Angeles-based bus operators, two rail operations, and several private carriers that serve portions of the county. While in some cases the fares and schedules of connecting systems are coordinated, this is more the exception than the rule. There are even instances where adjacent systems don't connect at all, a subject that will be discussed in a subsequent technical memo analyzing gaps in the network. This situation is not unique to Ventura County and is understandable given the evolution of transit here. The area was, until relatively recently, rural in nature. Indeed, much of the county is still devoted to agriculture, and the northern half is occupied by forest reserves. Local transit service was established over the past 40

years incrementally, as each community developed enough density to justify it. One bus carrier, VISTA, serves primarily as in intercity connector within the County, even extending services north into Santa Barbara County and South into Los Angeles County.

Transit personnel that we spoke to in each community were uniformly committed to making improvements to their systems and interested in the prospects of new funding. However, most are part of very small staffs dedicated to transit--in many cases only one or two people. Their focus is, by necessity, their current systems. Several freely admitted that there was little or no long-range transit planning, since the maintenance of the existing lines took up all of their time. The County of Ventura adopted a transit vision statement in 2005, calling for creation of a seamless system. However, there has been no consensus on how to implement that vision, nor adequate funding for systematic improvements. It was hoped by many of those interviewed that this Transit Investment Study would be a first step toward that vision.

## Setting for the Study

Ventura County is located along the southwest coast of California, bounded by Los Angeles, Kern, and Santa Barbara counties (Fig. 1). At 1,845 square miles, it is only a mid-size county by California standards, but it nonetheless encompasses a vast area for local travel. Much of this area—over half—is uninhabited land comprising the Los Padres National Forest. The settled areas are along the coast, or adjacent to the principal highways: US Route 101, and State Routes 33, 118, and 126. The county's population was estimated at about 831,600 in January 2008. Its incorporated cities are Camarillo, Fillmore, Moorpark, Ojai, Oxnard, Port Hueneme, Santa Paula, Simi Valley, Thousand Oaks, and Ventura (the county seat). These cities (see Fig. 2) are the foci of the county's many public transportation systems.

Figure 1. Location of Ventura County

Topographically, the Santa Monica Mountains divide the county into a smaller eastern and larger western portion. This divide has socio-economic implications, as well, as in the eastern portion—which includes the cities of Simi Valley, Moorpark, and Thousand Oaks—incomes and auto ownership rates tend to be higher and housing more expensive than in the western portion.

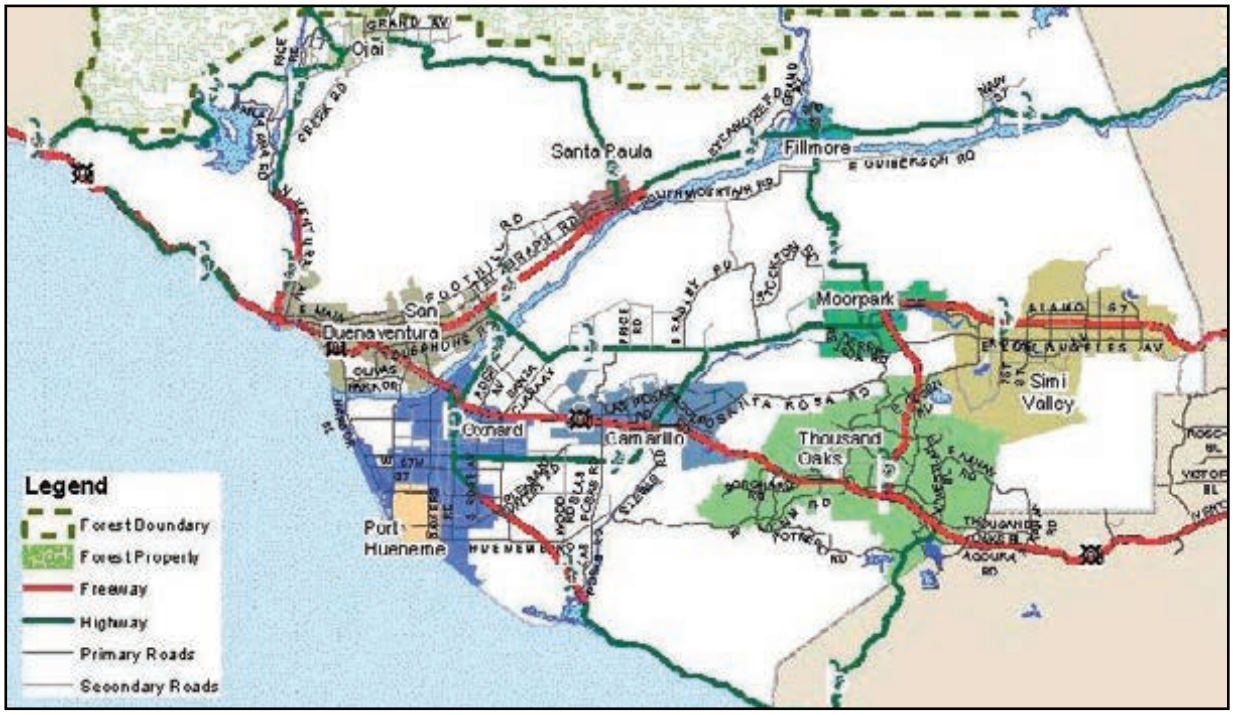



Figure 2. Cities and Major Highways of Ventura County

The earliest form of public transportation to serve the county was the railroad. Lines built in the nineteenth century to export the county's agricultural produce also provided passenger service. Trains operated to Los Angeles and points east and south, as well as to northerly destinations in California and beyond. To this network was added long-distance bus transportation in the first half of the twentieth century. These early transport systems were oriented to long-distance travel, and few locations in the county were served. Local transit got its start here in the latter half of the twentieth century, when large numbers of people began migrating to Ventura County, especially from the Los Angeles area. It was during this time that the County initiated bus service along US 101 and SR 23 to link together the communities located on these corridors. The City of Fillmore provided a similar service along SR 126 to Ventura. In 1973, several cities banded together through a joint powers agreement (JPA) to establish their own area-wide bus service, called South Coast Area Transit (SCAT). In 2007, SCAT changed its name to Gold Coast Transit; it remains the largest transit operator in the county. In 1994, the Ventura Intercity Service Transit Authority (VISTA) was established by the VCTC to provide greater connectivity throughout the county, replacing the Ventura County Interconnect operated by the County of Ventura. VCTC is responsible for the oversight and management of VISTA service.

In addition to these two operators, local public transportation services were started by various cities over time. Some of these consist of smaller bus services; others are demand-responsive (dial-a-ride) paratransit services, oriented either to senior or disabled passengers or available to the public at large. In a few cases, these public transportation services are operated by municipal departments. In most others, the municipality administers services provided under contract to a private company. VCTC serves as oversight agency for general issues related to public transportation throughout the county. Table 1 summarizes the basic operating characteristics of the local transit operators; Figure 3 provides an overall map of the fixed-route services.

Existing Fixed-Route Bus Operations

Nine public agencies operate fixed-route bus service in the county at this time:

- Camarillo Area Transit (CAT): 1 route administered by the City of Camarillo
- Gold Coast Transit: the largest local operator, with 17 routes operated through a JPA with Ojai, Oxnard, Port Hueneme, Ventura, and the County of Ventura
- Los Angeles County Metropolitan Transportation Authority (Metro): 1 route operated into Ventura County
- Los Angeles Department of Transportation (LADOT): 3 weekday peak routes operated into Ventura County
- Moorpark City Transit: 2 routes administered by the Moorpark Public Transit Division
- Ojai Trolley: 2 routes operated by the Ojai Public Works Department
- Simi Valley Transit: 4 routes operated by the Simi Valley Department of Community Services
- Thousand Oaks Transit (TOT): 4 routes administered by the City of Thousand Oaks
- Ventura Intercity Service Transit Authority (VISTA): 7 routes administered by VCTC

Together, these nine agencies operate over 40 distinct routes. All but Gold Coast Transit, Ojai Trolley, Simi Valley Transit and LA Metro utilize contracts with private companies to actually operate and/or maintain their buses.

Table 1. VCTC Transit Investment Study
**Fixed-Route and Paratransit Data for FY 2007-2008**

| Mode and Operator | Rolling Stock < 35 feet | Rolling Stock 35 feet or more | Adult Base Fare | Annual Riders | Annual Revenue Hours | Annual Revenue Miles | Annual Operating Cost | Annual Fare Revenue | Cost/ Revenue Hour | Cost/ Revenue Mile | Cost/ Rider | Riders/ Revenue Mile |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Fixed-Route Bus*** | | | | | | | | | | | | |
| Camarillo Area Transit | 1 | 0 | $1.00 | 17,864 | 2,105 | 37,159 | $89,439 | $3,606 | $42.49 | $2.41 | $5.01 | 0.48 |
| Gold Coast Transit | 0 | 46 | $1.25 | 3,495,875 | 140,057 | 1,610,734 | $12,287,553 | $2,681,149 | $87.73 | $7.63 | $3.51 | 2.17 |
| Moorpark City Transit | 5 | 0 | $1.00 | 65,539 | 5,610 | 91,724 | $172,331 | $56,852 | $30.72 | $1.88 | $2.63 | 0.71 |
| Ojai Trolley | 6 | 0 | $0.50 | 88,325 | 6,513 | 84,647 | $720,812 | $37,953 | $110.68 | $8.52 | $8.16 | 1.04 |
| Simi Valley Transit | 0 | 13 | $1.25 | 454,440 | 30,768 | 477,005 | $2,514,702 | $422,819 | $81.73 | $5.27 | $5.53 | 0.95 |
| Thousand Oaks Transit | 2 | 5 | $1.00 | 178,502 | 13,070 | 187,407 | $738,416 | $109,286 | $56.50 | $3.94 | $4.14 | 0.95 |
| VISTA (1) | 0 | 26 | $1.00 | 634,965 | 47,191 | 1,341,099 | $2,067,714 | $658,436 | $43.82 | $1.54 | $3.26 | 0.47 |
| ***Rail*** | | | | | | | | | | | | |
| Metrolink | N/A | N/A | $1.00 | 1,039,005 | 6,304 (2) | 255,673 (3) | N/A | N/A | N/A | N/A | N/A | 4.06 |
| | Rolling Stock Vans | Rolling Stock Cutaways | | | | | | | | | | |
| ***General Public Dial-a-Ride*** | | | | | | | | | | | | |
| Camarillo | 0 | 4 | $2.00 | 56,911 | 8,626 | 122,162 | $615,014 | $75,868 | $71.30 | $5.03 | $10.81 | 0.47 |
| Oak Park (Ventura County) | 0 | 6 | $1.50 | 19,990 | 5,229 | 93,615 | N/A | $33,232 | N/A | N/A | N/A | 0.21 |
| Oxnard | | 2 | $2.00 | 9,320 | 2,866 | N/A | $72,500 | $16,539 | $25.30 | N/A | $7.78 | N/A |
| Thousand Oaks (4) | (5) | (5) | $1.50 | 70,382 | 187,407 | 411,518 | $1,068,476 | $94,026 | $5.70 | $2.60 | $15.18 | 0.17 |
| VISTA | 0 | 15 | $1.50 | 210,277 | 32,076 | 352,086 | $1,072,413 | $156,747 | $33.43 | $3.05 | $5.10 | 0.60 |
| ***Senior/Disabled Dial-a-Ride*** | | | | | | | | | | | | |
| Gold Coast Access | 10 | 11 | $2.50 | 79,686 | 35,636 | 528,336 | $1,772,320 | $162,457 | $49.73 | $3.35 | $22.24 | 0.15 |
| Moorpark Paratransit | (5) | (5) | $1.50 | 2,108 | N/A | 22,342 | $54,575 | $5,720 | N/A | $2.44 | $25.89 | 0.09 |
| Simi Valley Transit | 3 | 9 | $1.50 | 43,457 | 17,976 | 199,570 | $1,267,361 | $97,708 | $70.50 | $6.35 | $29.16 | 0.22 |
| Thousand Oaks (Ventura County) (6) | (5) | (5) | $1.50 | 3,434 | 503 | 17,616 | N/A | $5,154 | N/A | N/A | N/A | 0.19 |

(1) Includes CSU shuttle routes.
(2) Annual revenue hours for Metrolink are annual revenue train hours (not car hours) for FY 2006-2007.
(3) Annual revenue miles for Metrolink are annual revenue train miles (not car miles) for FY 2006-2007.
(4) Includes data for general public DAR, senior DAR, and ADA paratransit DAR.
(5) Vehicles are shared among Moorpark, Thousand Oaks, and Westlake. Typical daily assignment is 10 vans and 3 cutaways.
(6) Data pertains only to service provided to unincorporated areas outside Thousand Oaks' city limits; for DAR within Thousands Oaks, see note (4).

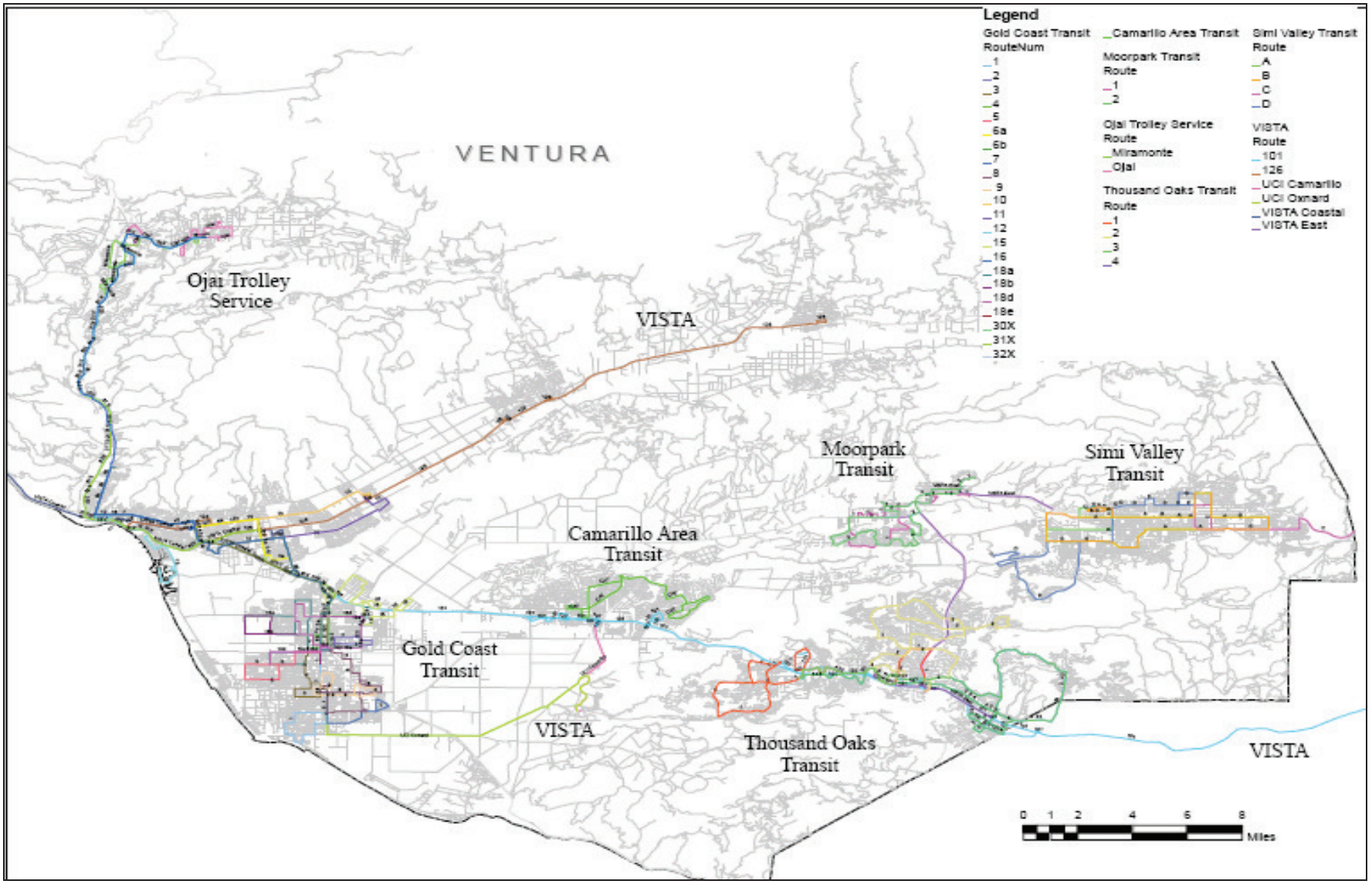



Figure 3. Ventura County Fixed-Route Transit Lines

Most of the systems in the list above operate exclusively within Ventura County, with a few exceptions. Simi Valley Transit offers weekday service into Chatsworth in Los Angeles County, while VISTA operates weekday service into Woodland Hills in Los Angeles County and daily service into Santa Barbara County. The two Los Angeles-based operators, LA Metro and LADOT, extend service into the eastern portion of Ventura County. (They are not listed in Table 1 because they would not be the recipient of transit funds anticipated to flow to Ventura County).

In addition to these nine public operators, private bus carriers serve various parts of the county. These include Greyhound and Transportes Intercalifornias, two intercity carriers whose only stops in Ventura County are located in Oxnard; and various small private operators serving airports or employment centers. Since the focus of this study is on publicly-funded improvements to publicly-operated systems, these private carriers are mentioned only in passing to give a full picture of the transit options available.

Service throughout the county tends to be offered at a low frequency, with headways of 30 to 60 minutes the most common. About a third of the lines operate only during weekdays, with a span of service from about 6:00 AM to 8:00 PM. While two thirds of the lines operate on Saturdays, only about one third is in service on Sundays. This means that many residents without access to their own automobiles must rely upon friends or taxis to drive them to their destinations when public transportation is not offered. Many probably defer such trips to those times when service is available.

Table 2. VCTC Transit Investment Study

**Average Fixed-Route Operating Hours**

| Operator | Monday-Friday | Saturday | Sunday |
|---|---|---|---|
| Camarillo Area Transit | 8:19 AM – 4:30 PM | no service | no service |
| Gold Coast Transit | H 5:00 AM – 10:00 PM | 5:30 AM – 9:00 PM | 5:30 AM – 8:45 PM |
| | L 6:00 AM – 8:00 PM | 6:30 AM – 8:00 PM | 6:30 AM – 8:00 PM |
| Moorpark City Transit | 6:00 AM – 6:00 PM | no service | no service |
| Ojai Trolley | 7:00 AM – 5:30 PM | 9:00 AM – 5:15 PM | 9:00 AM – 5:15 PM |
| Simi Valley Transit | 5:15 AM – 7:30 PM | H 5:00 AM – 8:00 PM | no service |
| | | L 8:00 AM – 7:00 PM | no service |
| Thousand Oaks Transit | 6:00 AM – 6:45 PM | no service | no service |
| VISTA | H 4:15 AM – 9:00 PM | 6:45 AM – 7:30 PM | 6:45 AM – 7:30 PM |
| | L 6:00 AM – 7:30 PM | 7:00 AM – 6:00 PM | 8:00 AM – 6:00 PM* |

*Highway 126 service only

Note: the table above represents an approximate average of the spans of service of the individual lines of each operator. Many lines do not operate on weekends. H = higher service lines L = lower service lines

There are some notable exceptions to the low frequency service described above in corridors with higher ridership. For example, Gold Coast's Route 6 offers headways as short as 15 minutes in Ventura, while its Route 1 between Oxnard and Port Hueneme operates at 20 minutes most of the day; VISTA's shuttle between the Camarillo Metrolink Station and CSUCI (California State University Channel Islands) operates 15-minute service on weekday afternoons and evenings.

Existing Rail Operations

In addition to the bus services discussed above, there are two rail operations serving the county: both Metrolink and Amtrak share portions of the railroad network established in the 1800s. Metrolink is operated by the Southern California Regional Rail Authority (SCRRA), a JPA of five regional agencies: the Los Angeles County Metropolitan Transportation Authority (Metro), the Orange County Transportation Authority, the Riverside County Transportation Commission, San Bernardino Associated Governments, and the Ventura County Transportation Commission. Passenger rail service is also provided. Metrolink offers 10 trips each weekday on its Ventura County Line. This service operates into and out of Los Angeles, serving Montalvo, Oxnard, Camarillo, Moorpark, and Simi Valley in Ventura County. An 11$^{th}$ weekday trip in each direction is offered by Amtrak at these same stations (except for Montalvo). The frequency offered is relatively low due both to funding shortfalls and to constraints placed on rail service by the single track available for use north of the City of Moorpark.

Amtrak itself, with funding support from Caltrans, operates Pacific Surfliner service between San Louis Obispo and San Diego. This service provides four additional train trips in each direction at many of the Metrolink stations, plus one outbound and two inbound Motorcoach Throughway bus trips each weekday. On weekends when Metrolink is not in service, these same Amtrak trips are available to passengers at the stations served in Ventura County. Metrolink monthly pass holders can ride them free of charge, while others must pay standard Amtrak fares. Amtrak also provides intercity service to other parts of the state and the country. One Coast Starlight train in each direction serves the Oxnard and Simi Valley stations. The Amtrak station in Ventura is served by 5 daily Pacific Surfliner trains in each direction, but not by Metrolink. Since Amtrak is not eligible for the funds that would be available for local transit operators in the county, only Metrolink will be considered further in this study.

As discussed later in this memorandum, several Metrolink stations serve as anchors for local bus lines in the vicinity. However, Metrolink does not function as the rail spine of the Ventura transit network, as its connections with buses are generally haphazard. This is due at least partly to the irregular headways on Metrolink that result from its sharing of tracks with freight and Amtrak trains. Such irregular headways do not lend themselves to timed transfers with the local bus systems.

Existing Paratransit Operations

The fixed-route bus and rail lines in Ventura County are complemented by paratransit operations that use vans or small cutaway buses in demand-responsive services. These services generally have no fixed routes or schedules, but rather pick up and drop off passengers within specific geographic areas. Trip requests are

made by phone in advance, though some of the services allow ongoing reservations or subscription services for recurring journeys. These services are essential for those physically unable to access fixed-route transit and are useful for others to reach areas not well served by the fixed routes. There are eleven such paratransit operations. Seven of these serve the general public (condensed in Table 1 as the five principal operations listed below):

- Camarillo Department of Public Works administers CAT service for intra-city dial-a-ride trips
- Oxnard operates the Harbors and Beaches Dial-a-Ride serving the westernmost section of the city
- Thousand Oaks is served by a dial-a-ride administered by the City of Thousand Oaks, with some areas outside the city served by a County-administered dial-a-ride

- Ventura County Public Works Agency administers two smaller services:
  - Juvenile Center service uses a contract with a taxi company to serve the County Juvenile Facility near El Rio on Vineyard Avenue
  - Service in Oak Park, Newbury Park, and Lynn Ranch
- VISTA administers two public dial-a-rides:
  - Fillmore Dial-a-Ride serves the communities of Fillmore and Piru
  - Santa Paula Dial-a-Ride serves the community of Santa Paula.

The remaining four public paratransit operations transport only senior or disabled passengers:

- ACCESS: a senior/disabled service operated by Gold Coast Transit to serve the cities of Ojai, Oxnard, Port Hueneme, Ventura and unincorporated areas of Ventura County between these cities.
- Moorpark Dial-A-Ride: administered by the Moorpark Public Transportation Division, with a senior dial-a-ride serving Moorpark and a disabled dial-a-ride serving Moorpark intra-city trips, as well as those destined to Thousand Oaks, Camarillo and Oak Park.
- Simi Valley Transit: operated by the Simi Valley Department of Community Services to serve both intra-city trips and connecting trips to adjacent communities.
- Thousand Oaks Dial-a-Ride: administered by the City of Thousand Oaks and serving the City of Thousand Oaks, plus the unincorporated county areas of Ventu Park, Rolling Oaks, and Lynn Ranch.

As with the fixed-route operators, there are numerous privately operated paratransit services not eligible for the transit funding contemplated as the focus of this study. These include those operated by Arc of Ventura County, Camarillo Care-A-Van, and Help of Ojai, as well as numerous taxi companies and airport shuttles.

As indicated in Table 1, paratransit operations are generally quite expensive in terms of the cost per rider, on the order of 10 times higher per trip than fixed-route transit. On the other hand, they are often less expensive overall than providing fixed-route service in some areas. In places with difficult terrain or discontinuous street patterns, they may offer the only practical way that public transportation can be provided.

The Transit Network

While a full analysis of the connectivity of the systems described above is the subject of a subsequent report in this series, a few general observations can be made at this time. First, an examination of the structure of

all the fixed routes described above indicates a series of generally radial networks. Most are centered on one node of activity in the community, such as a civic center or shopping mall. Coverage of the urbanized areas of the county by these networks, as depicted in Figure 3, appears adequate at first glance. However, without a thorough analysis of how the networks coincide with areas of high density and the location of major trip attractors, it is difficult to confirm this supposition. If the low frequency of much of this network is considered, along with restricted hours of service in many instances, then it must be concluded that much of the urbanized area has only minimal transit service. Moreover, the numerous connecting points between the lines shown on the map belie the fact that transfers may be difficult to make. This is because the schedules of the connecting lines are rarely synchronized, and the costs to make such transfers may be prohibitive for many potential users. Thus, while the map in Figure 3 gives the impression of good transit coverage, that quality exists in few parts of the county.

Capital Facilities and Equipment

The transit facilities of note in the county include passenger stations and maintenance bases. Perhaps most obvious are the railroad stations: those in Oxnard, Camarillo, Moorpark, and Simi Valley are shared by Metrolink and Amtrak. The station in Montalvo is off the main line and is used only by Metrolink, while that in Ventura is used only by Amtrak. Several of these stations have associated bus stops, such as Oxnard and Simi Valley. However, as mentioned earlier, timed transfers between bus and rail rarely occur.

The Oxnard Transportation Center, contiguous with the Oxnard railroad station, is a major facility with timed meets between different bus lines. A similar arrangement occurs at the Thousand Oaks Community Transportation Center, a free-standing facility just off Highway 101. A smaller bus transit center is located in Ventura at the Pacific View Mall. Several park-and-ride lots are scattered throughout the county. With the exception of those at the railroad stations, however, most are oriented to carpooling rather than transit use. Smaller physical amenities, like bus stop signs, benches, and shelters, are located with considerable inconsistency. Shelters are overseen by jurisdictions, not the operators, and few stops are so equipped. Even bus stop signs are not always found at the regular stopping points of certain bus lines, and there is no uniform countywide standard.

Most of the maintenance facilities and storage yards for the county's transit and paratransit services are owned and operated by private contractors. The exceptions are those facilities operated by Gold Coast Transit in Oxnard, and by the public works departments of Ojai, Simi Valley, and Thousand Oaks. Most of these were said to be reaching their capacities, and the need for larger or newer facilities were anticipated in the near future.

Fleets operated by the county's fixed-route services range from standard transit buses and over-the-road coaches, to rubber-tired trolleys and cutaways. Paratransit vehicles use mainly cutaways and vans. By and large, the fleets are relatively new, and many are powered by CNG. Ojai, Simi Valley, and VISTA would like some replacements soon, and VISTA is also interested in double-deck buses to cope with crowding on its Santa Barbara runs.

Operator Interviews

Requests were sent to each of the public transportation operators within the county for certain basic information on their systems, such as revenue hours and miles of service provided, and details of the operation of each line in their fixed-route network. In addition to collecting this objective data, it was desired to interview staff from each of the operators for information of a more subjective nature. Problems they were encountering, ideas for improvement, and insights on the future of public transportation were all elicited. Nine such interviews were held on October 27-29, 2008, conducted jointly by a representative of VCTC and of the Consultant. The overall impression given by these interviews was of earnest staffs that wish to make the most of their current systems but are limited by scarce resources and/or lack of political priority in their communities.

Staffing is small in most of these operations. VISTA, for example, has just one full-time and one part-time employee dedicated to transit operations for its sprawling cross-county system. Camarillo and Oxnard have equally small staffs. Only at Gold Coast Transit, the largest operator in terms of routes and riders, and Simi Valley Transit were multiple staff members involved in various aspects of transit administration. One reason is that except for Gold Coast, Simi Valley, and Ojai, day-to-day service matters are left to private operating companies. This allows the jurisdictions to

minimize their staffing for transit, since the contractor deals with daily operations. There are downsides to this arrangement, however. One mentioned by several of the operators is insufficient oversight of the quality and quantity of transit being provided. There is typically too few staff from a jurisdiction to monitor whether buses consistently run on time or that a sufficient level of maintenance is being provided. Lack of personnel also affects the operating agencies' ability to determine how best to maximize services or investments

Another problem mentioned was the lack of time to consider future transit planning. The efforts of most transit personnel are consumed with immediate issues, such as customer complaints, fleet replacement, and negotiating operating contracts. Even those with the luxury of long-term vision were focusing on a five- or ten-year horizon, rather than one further out. Gold Coast and Oxnard did mention the need to coordinate transit and land use planning, particularly with potential Transit Oriented Developments (TODs) and the pedestrian orientation of new developments; Gold Coast also discussed the value of Transportation Demand Management (TDM) as a tool for working with jurisdictions. For most other operators, however, the focus is on current administrative matters.

Regarding near-term plans, a few systems, like Simi Valley Transit, had recently ~~been~~ restructured its routes and felt no need for more changes at the present time. Others, like Ojai Trolley, had some restructuring plans in mind, and Moorpark mentioned an upcoming consultant study of its service. The consensus of most of the operators was that increases in the intensity of service on their existing routes would take precedent over extensions of these routes or infill with new services. This is a clear reflection of the low frequencies that typify most of the fixed-route lines in the county.

Still, there was some interest in future innovation. Gold Coast and Oxnard mentioned the desirability of some form of bus rapid transit on the more heavily traveled corridors, albeit at a lower intensity of service than typically found in larger urban areas. VISTA discussed the need for limited-stop runs in the 101

corridor, as well as between Simi Valley, Moorpark, Thousand Oaks, and Ventura, which has too many time-consuming local stops.

Innovations in equipment appeared to be underway. Many of the bus fleets, such as Gold Coast's, Thousand Oaks', and Simi Valley's, are 100% CNG-fueled. In fact, Thousand Oaks and Gold Coast were among the first to use CNG buses, and Gold Coast had even experimented with a hydrogen fuel cell bus. Nearly all systems were taking advantage of advanced technologies provided by VCTC. These technologies included NextBus for passenger information and operations management, as well as the Go Ventura smart card for easier fare payment. Many systems not currently using these technologies expressed the desire to do so. The fact that numerous metropolitan areas around the country still do not employ these technologies demonstrates the receptivity of local county operators to innovation. Capital needs in the short term varied from replacement buses to expanded maintenance bases. Feelings regarding bus stop signs and shelters were mixed; some operators said that they had sufficient facilities, others expressed interest, and still others were indifferent.

The possible consolidation of transit services was often a point of discussion, particularly in the eastern part of the county, but no consensus has been reached. Consolidation was also mentioned by operators in the western part of the county, either in the form of a west county system or as a single, county-wide transit operation but again there was no consensus on the issue.

The ridership base for most of the operators consists primarily of those without access to automobiles: students, seniors, the disabled, and lower-income workers. Certain services do attract commuter "choice riders", such as those traveling to work in Los Angeles and Santa Barbara counties. However, even on these services, a large portion of reverse commute trips are apparently made by domestics and low-income workers coming in to jobs in Ventura County.

A number of challenges were identified in the course of the interviews. Among them, the following are notable:

- There are few concentrated employment areas in most of the jurisdictions, making it difficult to focus transit services;
- The county has "too many operators and not enough coordination"; cross-county trips that require a transfer are especially onerous in terms of a passenger's time, money, and comfort;
- Though originally established to fund public transportation, the state Transit Development Act (TDA) funds allocated to Ventura County seem to be coveted for road projects; hearings on unmet needs did not necessarily result in greater allocations for transit. This is evidenced by that fact that only 58.5% of TDA is used for transit countywide;
- In most instances, transit management described governing boards (principally city councils and the county board of supervisors) that are interested in maintaining transit service but not necessarily in expanding it; most of these boards wish to live within the funding limits currently available for transit and not allocate additional funds that will compete with their other needs.

Review of Transit Plans and Policies

In addition to reviewing existing transit operations, the Consultant was charged with reviewing current transit plans and policies which can affect future transit operations. A brief synopsis of those plans is presented here.

According to the Ventura County General Plan, from 2000 to 2007 the County grew 10 percent from 750,500 to 825,512 residents. Most growth occurred within the existing cities as opposed to unincorporated areas of the County. By 2020, the plan predicts another 10 percent growth to 906,479 residents. By 2035, the Southern California Association of Governments forecasts Ventura County's population to increase to 1,014,000, or approximately 23 percent from 2007.

Major increases in population bring new transportation challenges. In the text below, the transit-related strategies of the county and regional plans are summarized.

Ventura County Transportation Vision (January 2006). The Ventura County Transportation Vision was proposed by two county supervisors in January 2006. The proposal was for the Board of Supervisor to "adopt a Transportation Vision that emphasizes alternative transportation modes and include that vision in the Goals of the County's General Plan will help move the County on a path toward greater mobility, less congestion, and reduced dependency on single occupancy vehicles." The supporting supervisors explained that the county cannot build its way out of congestion problems, even if funds to build more roads are available.

Below are the original goals for the Transportation Vision. Some elements of the vision were incorporated into the General Plan Update of September 2008 and are marked with an asterisk (*).

- Transit Vision
    - Enhance transit services
    - Increase ridership*
    - Encourage a county-wide, seamless system
- Rail Vision
    - Increase rail connectivity with transit, feeder lines, and between Los Angeles and Santa Barbara counties
- Bicycle Vision
    - Establish a system of bicycle lanes/trails linking all county cities*
    - Establish bicycle trail connections to CSUCI*
    - Establish adequate bicycle lanes on well-used bicycle routes
    - Provide adequate bicycle carrying capacity on public transit vehicles
    - Encourage provision of adequate bicycle racks and lockers*

2008 Regional Transportation Plan (May 2008). The 2008 Regional Transportation Plan (RTP) was produced by the Southern California Association of Governments (SCAG). Ventura County is one of six counties that form the scope of the plan. The RTP details major strategies for overcoming the transportation challenges of the region. According to the plan, the transit strategies in particular "target improving customer service and system reliability, achieving financial stability for operators, and enhancing the safety and security of the system for all riders and operators." The RTP goes on to expanding the transit system to close critical gaps in service and reach a greater number of potential passengers. Specific transportation measures pertain to transportation security measures and management approaches. Transit policies are interwoven throughout.

*Security*

SCAG has formed strategies to prepare for major human-caused or natural disasters. Related to transit, the plan encourages transit operators to use ITS technology for security and emergency-preparedness, educate transit-dependent groups in evacuation procedures, coordinate projects with the Department of Homeland Security, and possibly participate in a Transportation Security Working Group.

*Managing Transportation*

The RTP puts forth multiple strategies to manage transportation, forming the "mobility pyramid" (Figure 4). Three layers of the pyramid contain strategies related to transit.

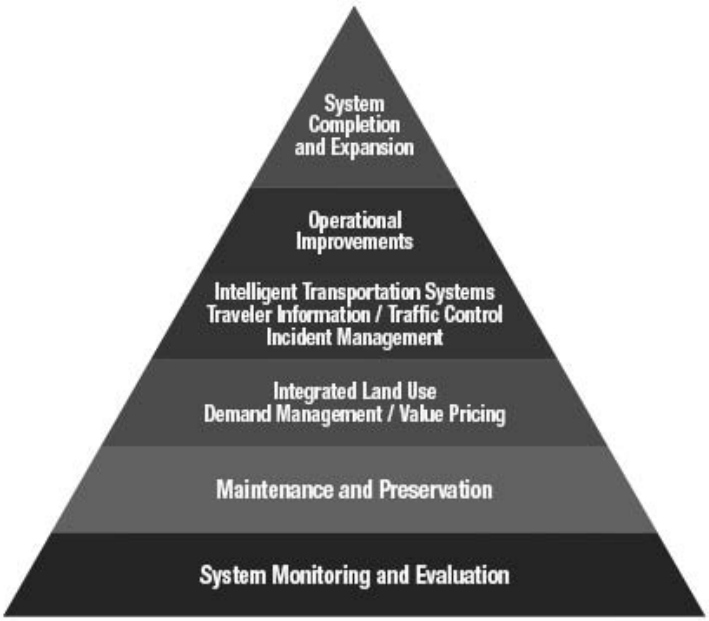



Figure 4. 2008 Regional Transportation Plan Mobility Pyramid

Within Integrated Land Use, the plan offers advisory policies to "encourage changes to the urban form that improve accessibility to transit and create more compact development, which yields a number of transportation benefits to the region, including reductions in travel time, vehicle miles traveled, vehicle hours traveled, and vehicle hours of delay, as well as increased transit use and mode share." These include:

- Identify regional strategic areas for infill and investment, including transit-oriented-development
- Develop nodes on a corridor. Many existing corridors lack the residential and commercial concentration to adequately support non-auto transit uses, without which the existing transit system cannot fully realize its potential for accommodating additional trips and relieving the transportation system. These nodes along the corridor also create vibrant, walkable communities with localized access to amenities, further reducing reliance on the automobile for a variety of trips.
- Plan for additional housing and jobs near transit. Pedestrian-friendly environments and more compact development patterns in close proximity to transit serve to support and improve transit use and ridership. Focusing housing and employment growth in transit-accessible locations through this transit-oriented development approach will serve to reduce auto use and support more multimodal travel behavior.

Within Operational Improvements and Intelligent Transportation Systems, transit operations form a key strategy for managing transportation. The RTP recommends that regional transit operators work towards the following:

- Address significant challenges to achieve better operational efficiency
- Maintain a discipline of cost recovery through a consistent fare policy

- Embrace the use of performance metrics to better serve the existing customer base
- Attract new transit users
- Work cooperatively to offer complementary services with ease of transfer between modes and operators
- Utilize new intelligent transportation system (ITS) technologies that measure system performance and offer customers reliable "on-time" performance and real-time information

Ventura County Congestion Management Plan (October 2008 Draft). The Ventura County Congestion Management Plan (CPMC) is currently being drafted by VCTC. Some elements of the plan are still being developed, such as transit performance monitoring and evaluation measures. However, the guiding policies and objectives of the plan have been created by VCTC. Transit related policies and goals come under two categories – Land Use and Transit Service. They include:

- Land Use
    - Encourage land use and transportation policies that promote transit use, bicycling, ridesharing and walking.
    - Include those agencies/departments responsible for transit, bicycle and pedestrian planning and services in the review cycle for new developments and specific plans.
- Transit Service
    - Encourage public transit services that meet local and regional mobility needs.
    - Provide, where feasible, transit service along major commute corridors and to areas of high employment.
    - Support making public transit services as convenient and easy to use as possible.
    - Further the benefits of increased transit use by supporting the conversion to clean fuel bus fleets and support facilities as part of regular vehicle replacement programs.
    - Improve the ability of passengers to transfer from one transit service to another, using technology such as Smart Card and NextBus.
    - Preserve potential and identified future transportation corridors to the maximum extent feasible.

A Compact for a Sustainable Ventura County (February 2008). The Compact for a Sustainable Ventura County is a project aimed at creating a region-wide, voluntary agreement on principles and actions to build a sustainable future. Extensive public outreach efforts were completed in order to gain the community's input on the future of their cities. The results of these efforts are detailed in this report.

Workshop participants also identified four key topics concerning the region's future: 1) managing future growth, 2) protecting its environmental and agricultural heritage, 3) preserving housing affordability and choice, and 4) maintaining an efficient and equitable transportation system. Subsequently, "building an effective multi-modal transportation system" was one of the six key goals identified by the public.

In a survey performed for the study, 69 percent of respondents "preferred a transportation system that brought people to the places they need to go by all modes and supports downtowns, even if it meant commuters continue to face congestion." To support this desire, the Compact recommended the following strategies:

- Coordination and cooperation between jurisdictions
- Form a "Livable Street" Program with established design guidelines, so that transportation investments are seamlessly integrated with the land uses they serve
- Establish a Transportation Options Fund, financed with a voter approved local sales or property tax, that would prioritize transit, bicycle, and pedestrian investments countywide

The Compact also promotes a strong relationship between housing and transit. The report states that "housing affordability could be addressed by…expedited permitting for mixed-use and affordable housing near transit…" It goes on to say that "jobs-housing balance issues can be addressed by encouraging close collaboration between transit providers, housing builders, and employers."

Overall, the sustainable future envisioned by the Compact contains denser, mixed-use communities with access to transit. The Compact also recommends that VCTC could "take a leading role in promulgating pedestrian- and bike-friendly street design standards countywide."

Conclusions

Transit in Ventura County is vital to many residents. Some of them use it for most of their daily trip-making, while others rely on it to commute to work outside the county. The demand for transit has been growing over time, as traffic congestion and the cost of operating an automobile increase. Even with this growth, however, transit faces some significant challenges if it is to increase its share of travel in the county. The distances to be traversed and the county's relatively low-density land use patterns both favor the automobile. The lack of coordination among operators, which will be documented in a later gaps analysis, only adds to the difficulties in using transit. On the positive side, most of the transit vehicles in use are relatively new, and transit staffs seem dedicated to making improvements. With the possibility of new funding, services and facilities can be made more attractive. As the jurisdictions become more interested in coordinating land use and transportation, the value of transit in reinforcing sustainability will become more obvious. The analyses to follow in this study will identify an array of improvements to attract more riders, as well as a way to prioritize such improvements.

Our outreach efforts will continue. The Consultant team will be interviewing governing boards and elected officials. The objective is to add their visions of transit and how to expand, manage, and fund it. This information will be combined with that already collected to present the full picture of transit's current situation in the county and its prospects for change.

# Appendix B

# Transit Gaps Analysis Technical Memorandum

JACOBS™

**Technical Memorandum**

600 Wilshire Boulevard
Suite 1000
Los Angeles, CA 90017

| | |
|---|---|
| **Date** | June 18, 2009 |
| **To** | Steve DeGeorge |
| **From** | William Lieberman |
| **Subject** | VCTC Transit Investment Study<br>Task 2 Deliverable: Transit Gaps Analysis |

## Introduction

This memorandum is the second of several being prepared for the Ventura County Transit Investment Study. This study is designed to identify and prioritize projects that could benefit public transportation in Ventura County. Information collected for this effort will be utilized to allocate funds for both short- and long-term transit needs of the County's many public transit operators. The study is sponsored by the Ventura County Transportation Commission (VCTC). Jacobs is the consulting firm chosen to carry out the technical work.

This memorandum summarizes an analysis of gaps in service that was conducted on the existing fixed-route bus transit systems operating in the county. It is based on field surveys, examination of travel and demographic data, and analysis of operating schedules at selected points in the county. Four principal forms of "gaps" were defined:

5. Corridors between service areas where no service is operated today;
6. Geographic areas with densities that would warrant transit service but are unserved today;
7. Gaps in the hours of service on different bus lines; and,
8. Places where transit routes (or modes, like local bus and commuter rail) come together, but whose arrival and departure times are not coordinated; this results in sometimes lengthy waits for those wishing to make transfers or, in more extreme cases, no practical transfer opportunities at all.

## Summary of Observations

This study was conducted as a high-level overview. As a result, it has identified numerous apparent gaps in transit service that later, operational studies should investigate in more detail. Among them are corridor gaps between existing transit services. Several of these may be problematic to fill because of terrain or low travel demand. Nonetheless, there are five corridors that we recommend to be studied further: Fillmore-Santa Clarita, Camarillo-Moorpark (two alternate routes), Simi Valley-Thousand Oaks, and Western Oxnard-

Ventura. Filling these gaps is important not to serve the land uses in between the end points (as there is little in most cases to serve), but rather to connect areas that already have transit service.

In addition, ten unserved areas appear to have the population density to justify regular fixed-route service. Many are already served by dial-a-ride operations, which may be the most cost-effective way to provide transit service there. Nonetheless, attracting "choice" riders will likely require the establishment of fixed-route service to negate the need to make reservations and shorten the time it takes to make a trip. The ten areas highlighted are reasonable starting points for at least considering new or modified fixed-route (or flex-route) bus service.

The lack of service on many lines during weekends or early mornings creates a gap of a different sort. Transit is simply unavailable at these times unless users have access to demand-responsive service. Moreover, when considering that much of the county's fixed-route transit service is operated at relatively low frequencies, the "gap" created by low service levels could be much greater than revealed by this initial analysis.

Finally, an analysis of the timing of transfers at key points in the network indicates plenty of room for improvement. At most, only 20% of bus-to-bus transfers could be considered convenient. In many cases, departing buses miss arriving buses by mere seconds. In other cases, the buses of many routes occupy bays at a transit center simultaneously, but long layovers increase the actual time it takes a transferee to continue a trip. Riders with a choice of travel modes will want to make their transfers as expeditiously as possible, and transfer times greater than 5 to 10 minutes for bus-to-bus and 10 to 12 minutes for bus-to-rail will not be attractive to them. Improving this situation will require a new approach to how transit vehicles are scheduled throughout the county. This may, in many cases, result in higher operating costs but is sure to result in higher ridership. This, at least, is the experience elsewhere, when conversion to timed-transfers was almost always followed by an increase in riders.

## Corridor Service Gaps

Current transit bus lines in Ventura County are arrayed on the map shown in Figure 1. It is apparent that most of them are clustered into discrete service areas in the more populated parts of the county. In many instances, there are no transit lines connecting these service areas with each other. As a result, transit patrons must sometimes resort to very circuitous routings. To address this issue, the more obvious geographical gaps between the service areas were identified, classified into nine travel corridors, and analyzed for their transit potential. This analysis consisted of two steps: (1) physical examination of the corridors themselves and (2) review of potential travel demand in those corridors.

The physical examination of each corridor began with a remote analysis using aerial photos, followed by an on-site "windshield survey." Of particular interest was the suitability of the roadway itself for accommodating regular bus service (particularly in terms of steepness and pavement width and condition). Some of these roadways were said in advance to be unsuitable for buses, but a brief reconnaissance of them was conducted anyway to give a fresh perspective. In fact, although some steep roadway sections were

encountered, most could probably be negotiated by at least a small bus, and the condition of the roadways themselves was generally good. However, it must be said that regular bus service on the steeper roads would likely be slow and would also take its toll on the buses; it could be harrowing during periods of inclement weather and at night. Use of such corridors would have to be justified by very strong transit demand.

To gauge potential demand, the nature of abutting land uses was examined. Most of the potential corridors are in rather desolate areas, surrounded by farmland or land that is undeveloped. There are few activities in the immediate vicinity that would attract or generate transit ridership. However, it's possible that there is enough travel demand at either end of each corridor for people to want to pass through it in order to bridge the gap and access destinations in the adjacent transit service area.

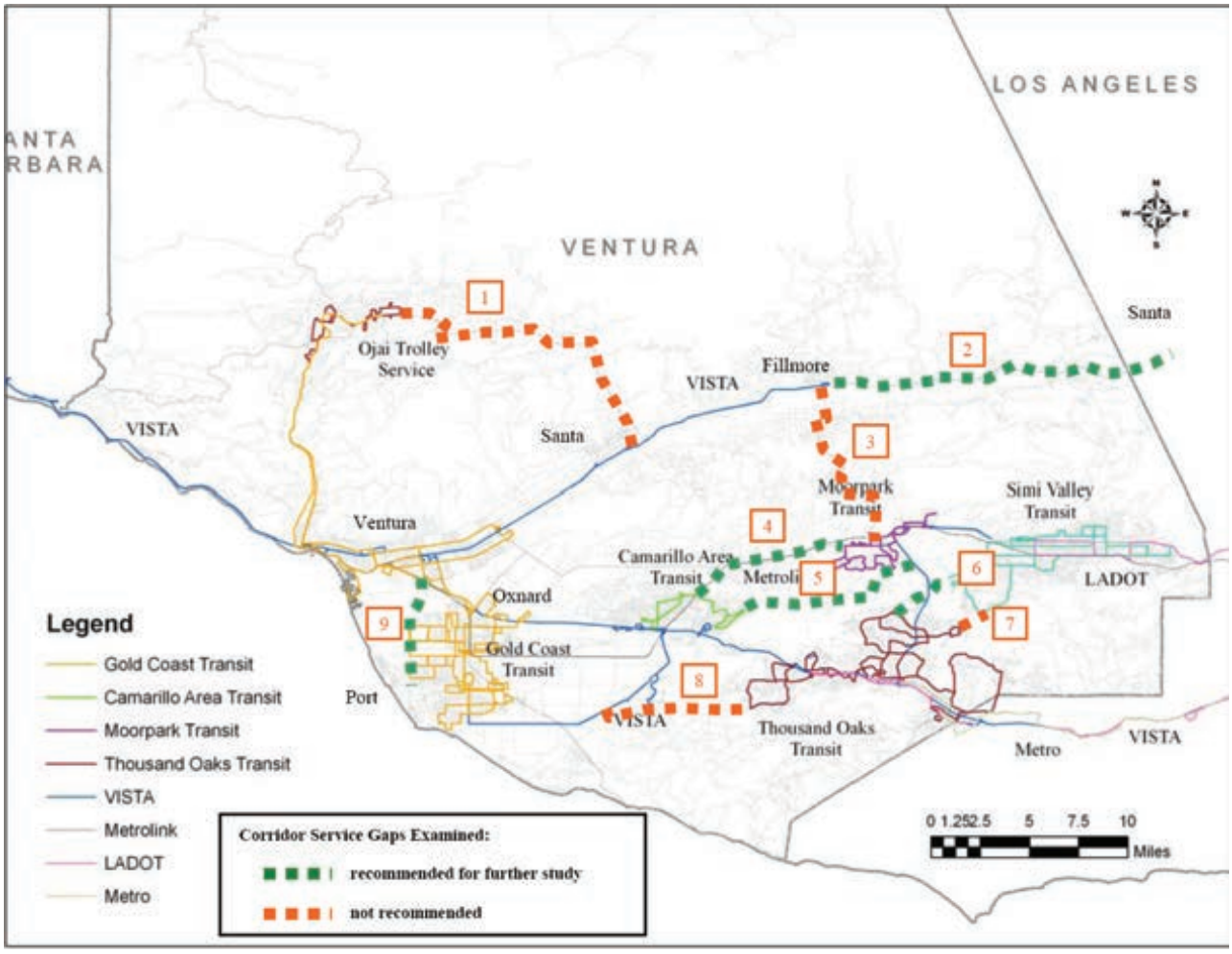



Figure 1. Ventura County Fixed-Route Bus Lines and Corridor Service Gaps

To determine the potential transit demand of each corridor for through travel, countywide travel data were sought. Total trips from one transit service area to another (even if made by automobile) could be used to judge the general magnitude of ridership that would result if transit service were available in that corridor.

Unfortunately, such data (even that from the census) were hard to come by. As a surrogate, daily traffic counts were obtained from Ventura County and Caltrans to provide a general idea of existing trip making in each corridor. Daily traffic volumes less than 10,000 were considered a sign of relatively low demand, volumes above 30,000 as relatively high, and those in between as moderate. Of course, observed usage of a road is dependent, to an extent, on its capacity. A winding two-lane highway may limit a large number of drivers from using it. However, observations in the field indicated that these roadways had generally free-flowing conditions, often at Level of Service A. While some motorists may be discouraged from using them due to grades and alignment, it did not appear that roads themselves were metering the number of cars that possibly could use them.

The conclusions from both the travel demand and physical analyses of the corridors are summarized below (keyed to the numbers shown in Figure 1):

1. Ojai-Santa Paula via State Route 150: This is a 20-mile corridor using the Ojai Santa Paula Road (some parts are called the Santa Paula Ojai Road). It traverses areas that include both flat, agricultural land, and winding, mountainous terrain. Regular operation of buses in this segment would be possible but difficult, given the grades and switchbacks involved. Daily traffic volumes of 2800 are low, indicating probable low transit demand, as well. *Recommendation: This route is one of several that were examined cursorily in spite of obvious flaws and is not recommended for further consideration.*

2. Fillmore-Santa Clarita via State Route 126: Following Telegraph Road through the Santa Clara River Valley, this 22-mile east-west corridor avoids the mountains both north and south of it, providing a level pathway east to I-5 in Santa Clarita, as well as to several employment centers there. Traffic volumes of 24,000 per day indicate moderate ridership potential, and a demand-responsive service currently connects the communities of Piru and Fillmore. *Recommendation: This corridor shows some promise as a possible bus route.*

3. Fillmore-Moorpark via State Route 23: This is a 12-mile route forming the shortest link between Fillmore/Santa Clara River Valley to the north and Moorpark/Simi Valley to the south. The terrain involves steep grades and sharp turns that are not desirable for regular transit service. Traffic volumes are relatively low, at about 7700 per day. A demand-responsive service formerly operating on this road attracted very few riders. *Recommendation: As with the first corridor examined, this route has obvious flaws and is not recommended for further analysis.*

4. Camarillo-Moorpark via Highway 118: This 12-mile east-west corridor would close the gap in transit service between Moorpark and Camarillo. It is situated on flat terrain, adjacent to farmland and railroad tracks, utilizing Somis Road and West Los Angeles Ave (Highway 118). *Recommendation: Daily traffic volumes of about 19,000 indicate potentially viable transit patronage.*

5. Camarillo-Moorpark via Santa Rosa Road: This 12-mile east-west corridor passes though largely flat land, with some residential development on streets branching off its easterly portion. Daily traffic volumes of about 19,000 are similar to those in Corridor 4. *Recommendation: This corridor offers an alternative to Corridor 4, above, for bus service between these communities.*

*6.* Simi Valley-Thousand Oaks via E. Olsen Road: This is a 4-mile east-west corridor centered on Olsen and Madera roads. A bus line here would provide a shorter trip for many riders than the current transfer to VISTA's East County Service using the more circuitous routing on Highways 23 and 101. Unfortunately, traffic data are not available for this corridor to gauge possible transit demand; former VISTA fixed-route service here was not very successful. *Recommendation: This corridor could be retained for consideration in future analyses to determine if conditions have changed sufficiently to make it more promising to reinstate regular transit service.*

*7.* Simi Valley-Thousand Oaks via North Westlake Boulevard and Circle Knoll Drive: While these areas at first appear to be connected, they are, in fact, separated by a short gap between the closest two streets (Sunset Hills Blvd in Thousand Oaks and Winncastle Street in Simi Valley). Moreover, the roadways that do exist are narrow residential streets not appropriate for standard transit buses. Given these problems, Corridor 6 (described above) would be a workable alternative to any demand for travel between these two communities. *Recommendation: This corridor need not be considered further for transit service.*

*8.* Oxnard-Thousand Oaks via Potrero Road: This 8-mile east-west corridor is served by a narrow roadway with some steep terrain. There are few abutting activities. Daily traffic volumes of 5200 indicate relatively low demand, and Highway 101 offers faster travel time between the two city centers of Oxnard and Thousand Oaks. *Recommendation: This corridor need not be considered further.*

9. Oxnard-Ventura via Victoria Avenue: Victoria is a wide north-south street on flat terrain. This 6-mile segment skirts the western fringe of Oxnard and Port Hueneme, and portions of it are served by terminal loops of Gold Coast Transit east-west lines. The segment between Highway 101 and W. 5$^{th}$ Street passes through agricultural uses, but areas to the south are rapidly developing with dense residential and some retail development. Should development occur along the more northerly segments, consideration should be made for using Victoria Avenue as an artery for a new north-south transit service to Ventura. Current traffic volumes are a high 44,000 per day, underscoring the potential for strong transit demand. *Recommendation: This corridor should be considered further for possible transit service.*

While the above analyses are not based on a highly-refined methodology, they do give an overview of the corridors holding the most promise for filling the gaps in transit service between communities. Until such time as better data are available, we recommend that corridors 2,4,5,6 and 9 be considered reasonable candidates for possible transit service. They can be a starting point for any region-wide operational study that might follow.

Unserved Areas Worthy of Consideration

A second type of gap in service is found in areas where the levels of population density are sufficient to support fixed-route transit but none is offered at the present time. There could be numerous reasons for this, such as high income levels among residents of the area, or the fact that service had been tried in the past but was unsuccessful. For the purposes of this study, a summary analysis was conducted to highlight areas where more investigation should be undertaken in the future. The results are arrayed on the map in Figure 2. It indicates that most of the higher density areas of the county are currently served (that is, within a quarter mile of a fixed bus route). There are a number of exceptions, however, indicated by the numbers on the map:

11. Ventura, east of Ventura Avenue, along Seneca Street
12. Ventura, south of Telephone Road, on either side of the railroad tracks
13. Oxnard, west of Ventura Avenue, north of Gonzales Street
14. Oxnard, west of Victoria Avenue and along Silver Strand, Hollywood Beach, and along Harbor Boulevard
15. Camarillo, south of Highway 101 and north of Pleasant Valley Road (this area does not show up on the density maps but aerial photos reveal extensive residential development)
16. Camarillo, along Lewis and Flynn roads
17. Camarillo, along Upland Road
18. Thousand Oaks, along Pederson Road (currently served by just 2 morning and 2 afternoon trips of TOT Route 2B)
19. Unincorporated County at Oak Park
20. Santa Susana Knolls, near the southeast boundary of Simi Valley (this area does not show up on the density maps but was suggested by one of the operators)

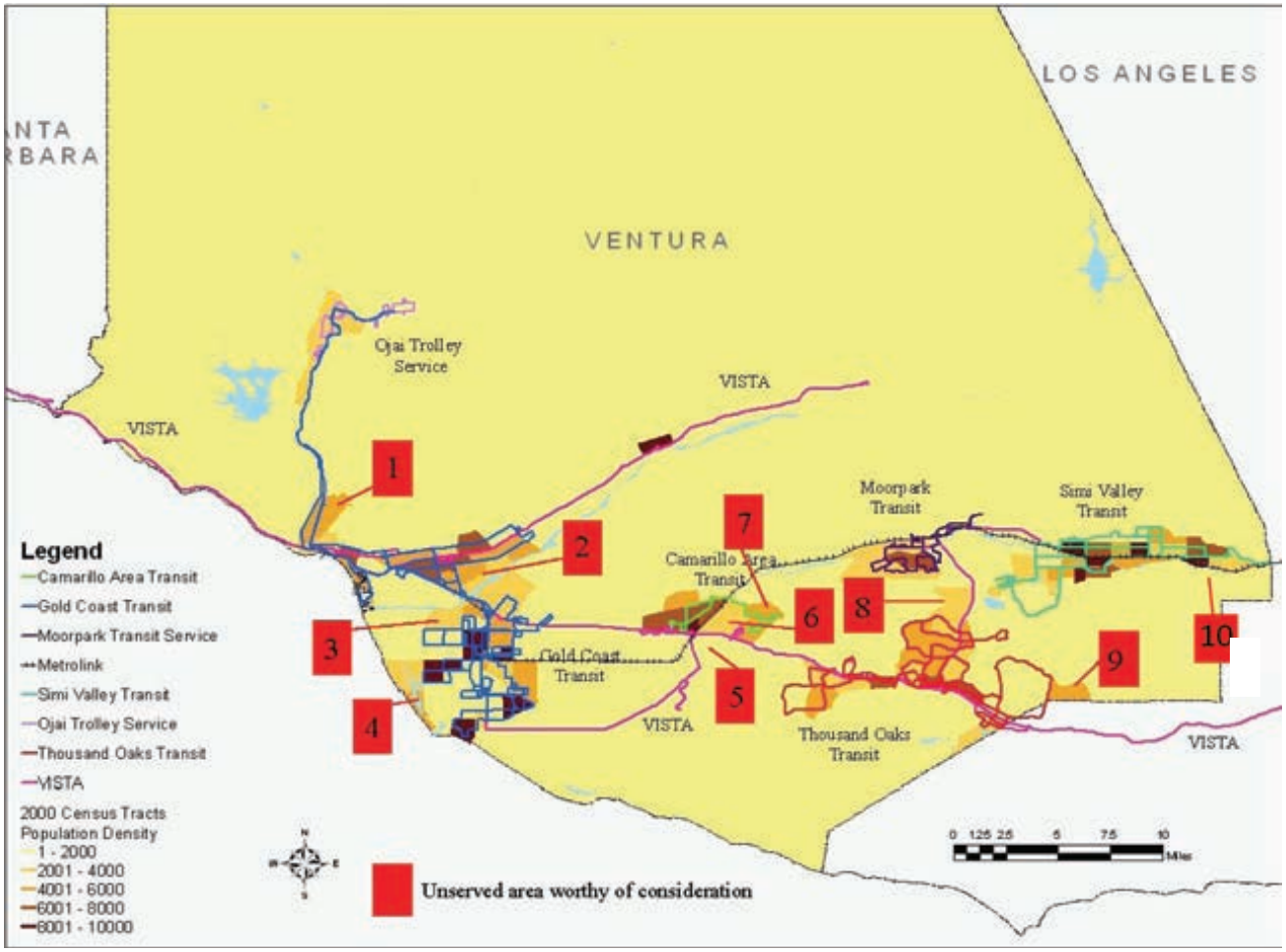



Figure 2. Population Density of Ventura County in Relation to Bus Service

All of these areas, except for 10, are served by various senior/disabled dial-a-rides. In addition, areas 4, 5, and 7 offer paratransit service for the general population. In at least one instance, area 4, the transit operator reported that the Beaches and Harbor Shuttle dial-a-ride service is considerably more cost-effective and attracts more ridership than previous fixed-route service in this location. There are no doubt other areas included in the list that have similar histories. Nevertheless, fixed-route transit service has not yet caught up with much of the new residential and commercial development. Such service, with its regularity of schedules, usually proves more attractive to discretionary riders. The ten areas discussed here should be among the first considered for such service enhancements in the future.

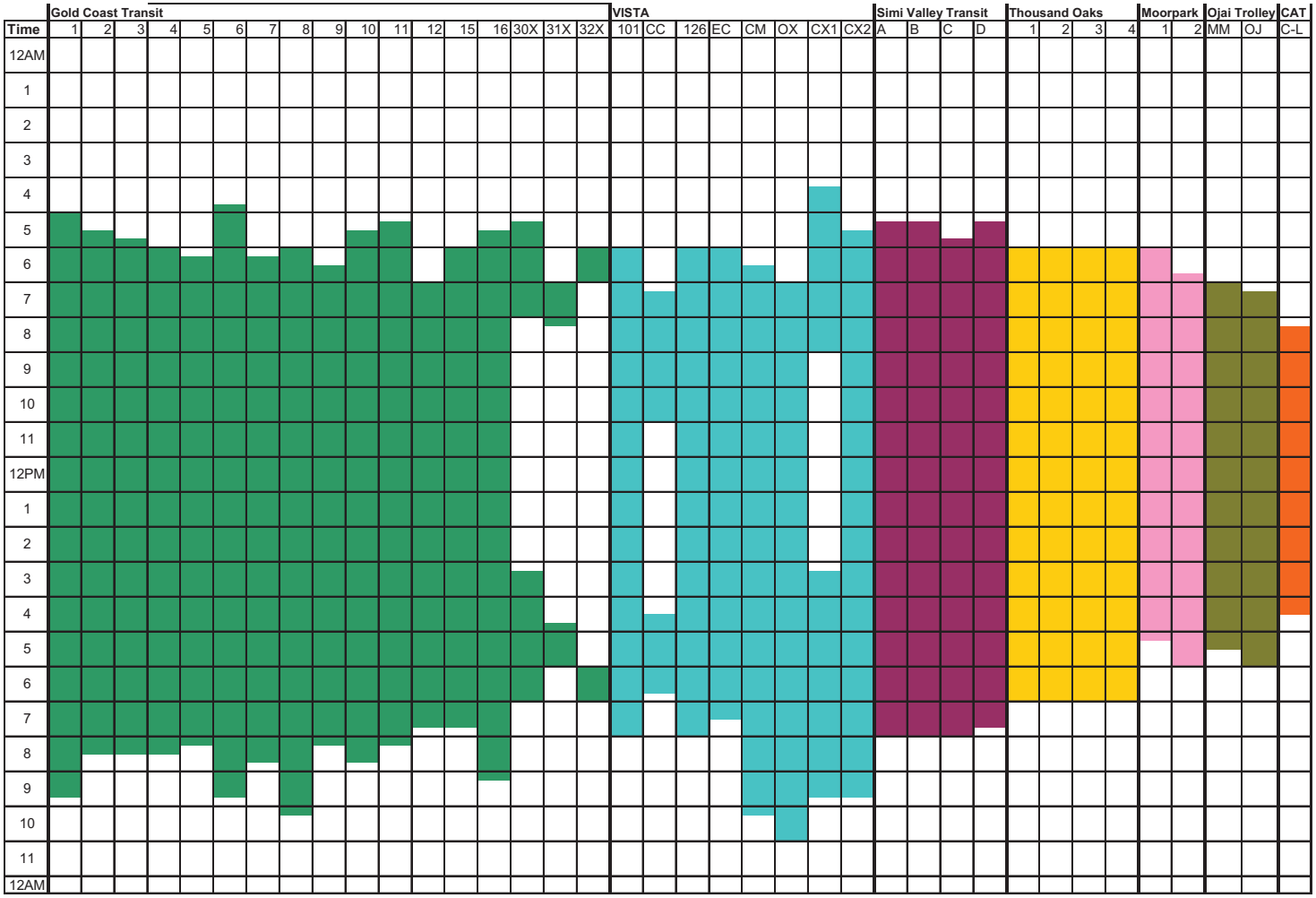
It must be noted that a weakness of this analysis is that it assumes that a location within a quarter mile walk of a bus line is "served by transit", regardless of the level of service of that bus line. In fact, many lines, like those in Camarillo and Moorpark, offer service frequencies of an hour or greater, and several do not operate in evenings or on weekends. When considered in this light, there are likely many more "gaps" in service than appear at first glance on Figure 2. This issue should be investigated in more depth if and when an operations analysis is conducted on countywide transit services.

Gaps in Span of Service

A third type of transit gap occurs when some transit lines are in service during hours that others are not. A trip that appears possible by looking at a transit map may not be in reality if a transfer is involved; if one of the lines in question has not yet started for the day or has already ended service, then a traveler would not be able to complete their trip. To get an idea of the magnitude of this gap, the spans of service of the 38 lines in the county's fixed-route bus network were laid out in charts for weekdays, Saturdays, and Sundays. As can be seen from Figures 3a through 3c, the beginning and ending of the services form a "ragged" edge, showing that not all lines are in operation simultaneously. Moreover, there are gaps midday when certain peak-hour routes are not running. On weekends, the large spaces between the bars emphasize the gaps resulting from the lack of any service at all on certain lines. (Note that each bar in these figures represents the time from the first pick-up in the morning to the last drop-off at night and, therefore, exaggerate somewhat the actual time a traveler could transfer from one line to the next. Towards the end of the day, the bus on a line shown as being in service may have already left its point of transfer with another bus, making the transfer impossible.)

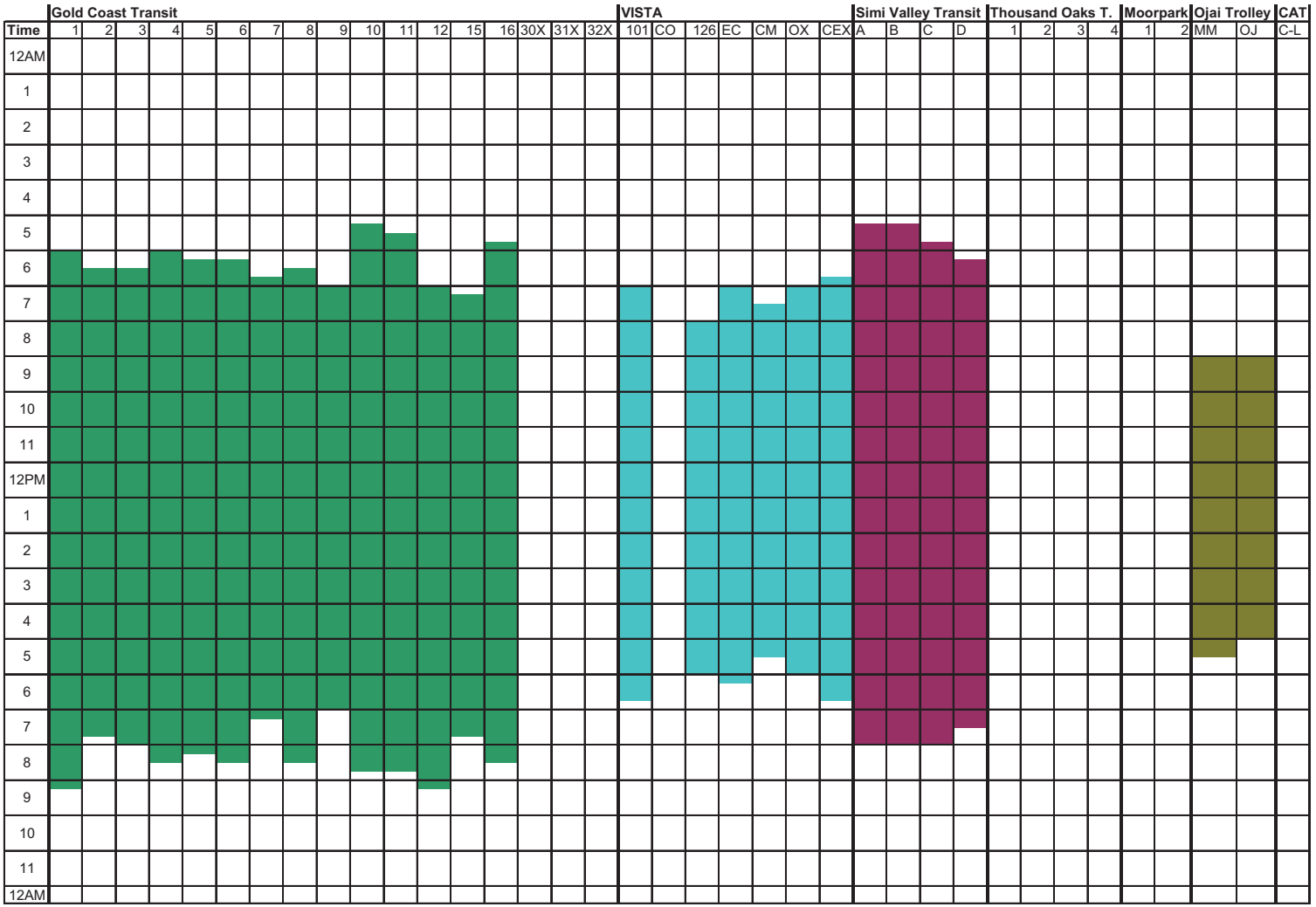
The number of lines in service at any one time is summarized in Figure 4. This figure arrays the information from Figures 3a through 3c as a cumulative total for each hour of the day. For example, at 5 AM on a weekday, only 3 lines are in service. This jumps to 26 lines by 6 AM and rises to a peak of 36 lines by 8 AM. The number of lines midday hovers around 33 to 34 until a peak of 36 lines is reached again at 5 PM, after which the number drops precipitously to 16 lines at 8 PM and 3 lines at 10 PM. On Saturdays, the maximum lines in service is only 26, and the rise and fall of service occurs over a longer period. On Sundays, only 18 lines are in service midday, with an even longer rise and fall in service.

None of these situations is unusual by themselves, as transit systems typically start and end service at different times, depending on the passenger demand on the line in question. Moreover, weekend service generally differs from that operated during weekdays. What is noticeable about Ventura County's situation is the lack of service available during the early hours when many commuters must begin their trips, and the great reduction in service on weekends. It is customary to reduce frequency during weekends, but in Ventura County, many lines are eliminated, as well. This results in no alternative for transit dependent populations unless demand-responsive service is available.




**Notes:**
Gold Coast Transit Route 12 ends at 9:10 during the summer.
VISTA routes include Highway 101 (101), Conejo Connection (CC), Highway 126 (126), CSUCI Camarillo (CM), CSUCI Oxnard (OX), and Coastal Express (CX).
VISTA Coastal Express (CX) 1 signifies Routes originating in Ventura and terminating in Goleta, or vice versa.
VISTA Coastal Express (CX) 2 signifies Routes originating in Ventura and terminating in Santa Barbara, or vice versa.
Ojai Trolley routes include Miramonte (MM) and Ojai (OJ).
Cabrillo Area Transit (CAT) route is the Community Center-Leisure Village (C-L) connection.

Figure 3a. Span of Service of Ventura County Bus Lines on Weekdays

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Ojai Trolley routes include Miramonte (MM) and Ojai (OJ).
Cabrillo Area Transit (CAT) route is the Community Center-Leisure Village (C-L) connection.

Figure 3b. Span of Service of Ventura County Bus Lines on Saturdays

*(Continued)*

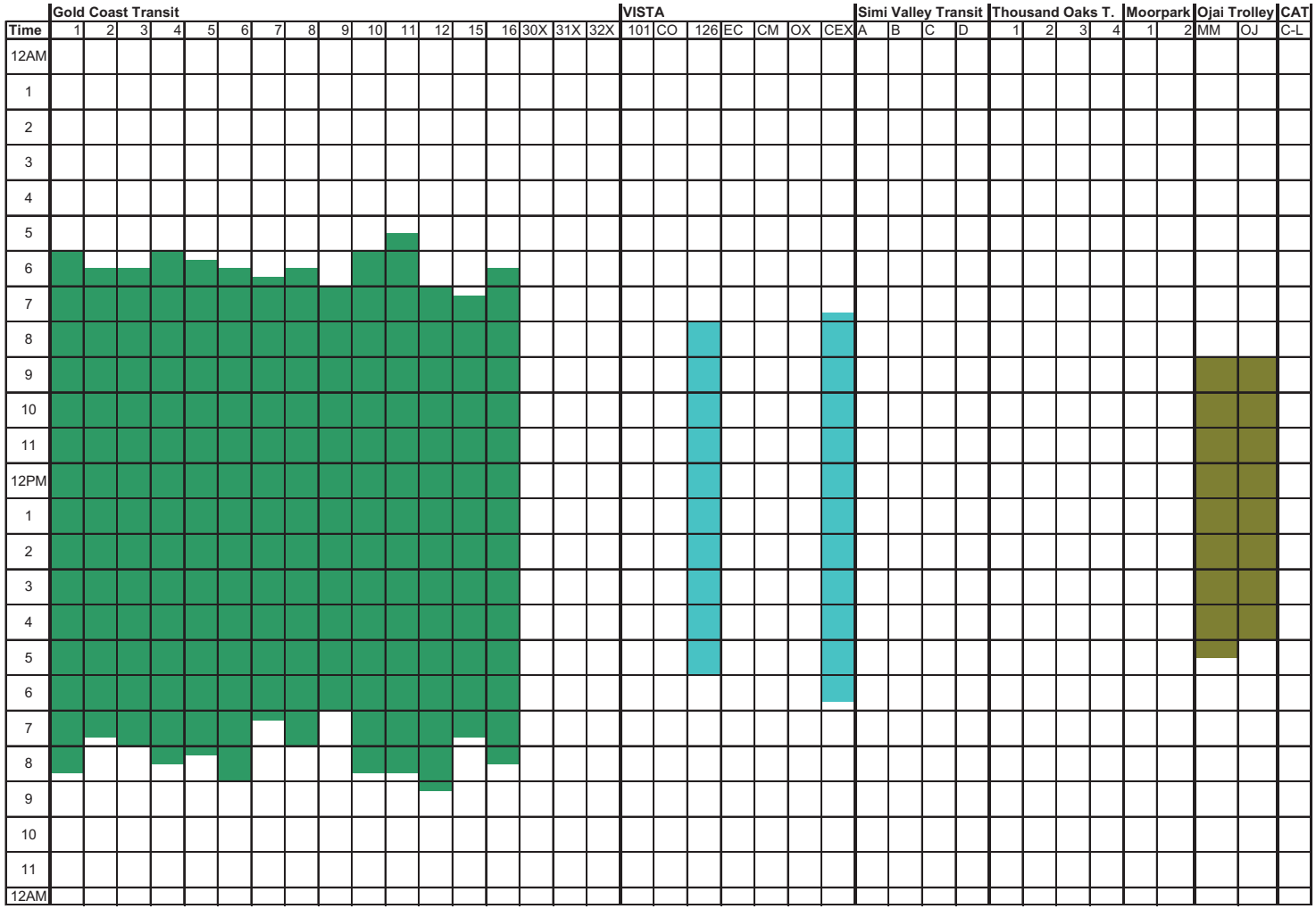


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Figure 3c. Span of Service of Ventura County Bus Lines on Sundays

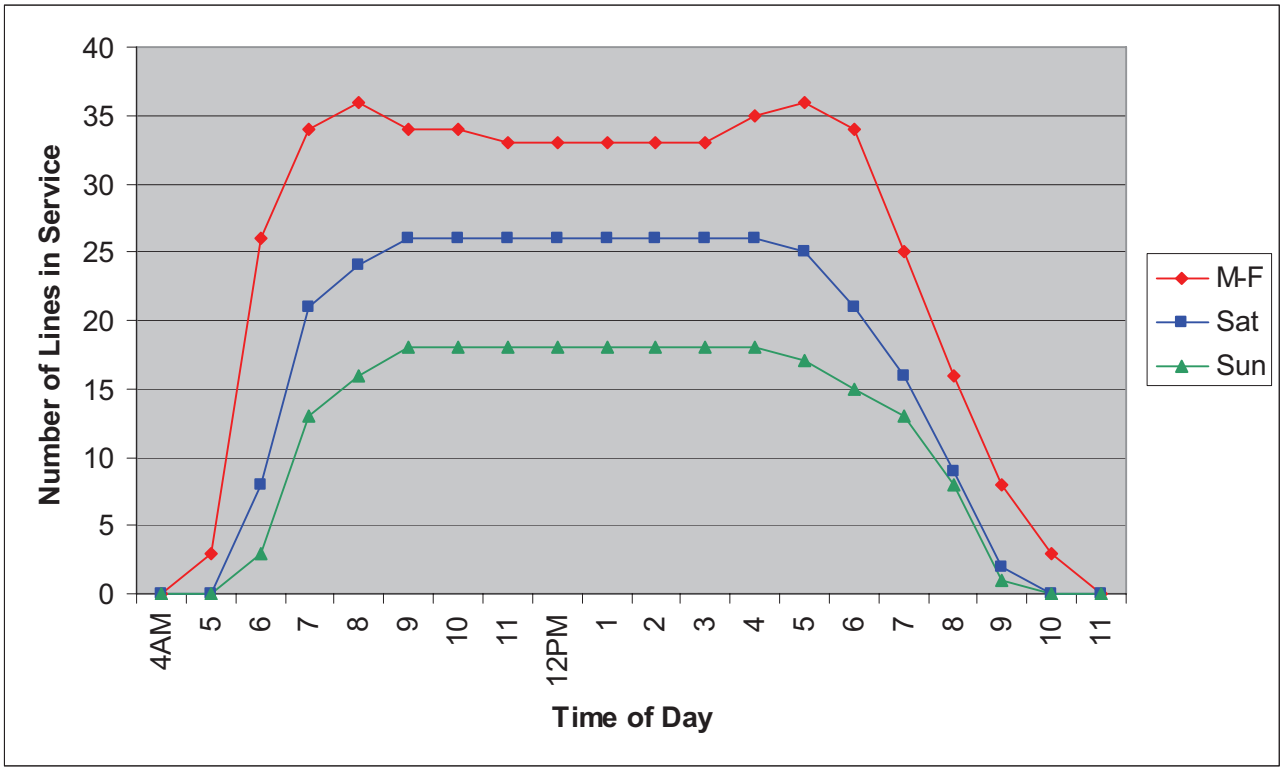


Figure 4. Cumulative Number of Bus Lines in Service at One Time in Ventura County

Gaps in Service Coordination

The fourth and final form of service gap examined by this study is that occurring when transit lines that operate to the same point do not offer convenient schedules for passengers transferring among them. While there are numerous points in the county's transit network where two or more lines cross or meet, the focus of this examination was at defined transit centers, where transfers between routes are encouraged and are most likely to occur. Three were singled out for detailed analysis: Oxnard Transit Center, Thousand Oaks Transportation Center, and Ventura Transit Center. In addition, the county's five Metrolink stations were examined to determine the degree of coordination between local buses and commuter rail. These consisted of the stations at Montalvo, Oxnard, Camarillo, Moorpark, and Simi Valley.

The results of these analyses are arrayed graphically in Figures 5a through 5h. These diagrams illustrate with colored squares or bars when different lines, bus or rail, are scheduled to be present at the station in question on a weekday from 6 AM through 12 PM or 1 PM. The diagrams are divided vertically into 5-minute intervals. Where the bars or squares overlap, it's assumed that vehicles of the lines involved are in the station simultaneously. Separate analyses were conducted for bus-to-bus and bus-to-rail transfers.

Bus-to-Bus Transfers. After the schedules were arrayed graphically, the figures were analyzed to determine which transfers could be made within a 10-minute period, as measured from the time of arrival of one bus and the time of departure of another. Ten minutes was chosen as the limit of what most passengers would

consider a "convenient" transfer (5-minutes being even more desirable but not tested). The number of convenient transfers was then divided by the number of possible transfers at the center between any two routes during that hour to derive an index of transfer convenience. (Excluded from this index were connections between an inbound and outbound bus on the same line.)

The five-minute intervals on the figures admittedly mask situations where one bus pulls out of a transit center before another bus shown in that same interval arrives. However, most bus lines have layovers at these centers, which increase their chances of overlapping with others and facilitating passenger transfers. Along this same line, some transfers may be too tight, with one bus arriving just seconds before another departs. It was assumed in the case of bus-to-bus transfers that passengers could flag drivers that were about to depart and still make their transfer. Comparisons of transfers made during the peak (6:00 AM-8:59 AM) versus off-peak portions of the survey period revealed no significant difference in transfer convenience.

The portion of bus-to-bus transfers at the three transit centers that could be considered convenient, using the technique described above, is summarized below:

Oxnard Transit Center 107 out of 432 possible transfer movements (about 25%)

Thousand Oaks Transportation Ctr. 48 out of 298 possible transfer movements (about 16%)

Ventura Transit Center 92 out of 481 possible transfer movements (about 19%)

Overall, approximately one fifth of the possible route-to-route transfers at these centers can be considered convenient. This figure should be considered optimistic, as it was based on the assumption that a passenger could transfer between two routes with very close arrival and departure times. Moreover, a 10-minute maximum transfer wait was assumed. In reality, transit systems employing timed transfers aim for a 3- to 6-minute window for transfers, as waits much longer than these are felt to be time wasted by riders with a choice of mode. This point is critical for understanding why ridership levels are not higher today and how to attract choice riders to the county's transit system in the future.

A couple of caveats about this analysis are in order. First, there may be locations on the network other than transit centers where certain bus lines make more convenient transfers. For example, several bus operators reported that connections between VISTA and TOT buses were better at The Oaks shopping mall than at the Thousand Oaks Transit Center. There are no doubt other areas where this kind of situation prevails. Travelers would have to learn this information by careful analysis of timetables, consultation with transit information operators, or word-of-mouth from other bus riders. Otherwise, transit centers are the most likely places where new or infrequent riders would choose to make transfers. Secondly, more detailed study should be performed in the future that prioritizes transfers, with those serving major and intercity trip movements receiving greater emphasis.

Bus-to-Rail Transfers. For bus-to-rail transfers, somewhat different parameters were used. This is because these transfers generally require more time on the part of passengers. The distance between bus and train platforms involves a somewhat longer walk than the bus-to-bus transfers at the transit centers listed above.

A transferring passenger's pathway across the tracks may be blocked while a train is in the station. Moreover, infrequent rail riders may have to purchase a ticket before boarding the train. For these reasons, a more precise schedule analysis was undertaken. In this case, a bus arrival (its scheduled time, not the 5-minute interval on the figure) had to occur no more than 12 minutes and no less than 4 minutes in advance of a train departure. The period examined was 6:00 AM to 11:59 AM, as there are no trains scheduled during the period from noon to 12:59 PM. Since this analysis included only the morning period, the focus was on buses arriving in time to meet southbound trains heading for Los Angeles. The results are summarized below:

| | |
|---|---|
| Montalvo Station | Of 2 southbound rail departures during this period, none were conveniently served. There was only one bus arrival (of Route 6A on Bristol Road) during the hour when the two morning rail trips departed. |
| Oxnard Transit Center | Of 4 southbound rail departures during this period, 3 were conveniently served: the 6:59 train was served by 6 bus arrivals, the 7:37 train by 3 bus arrivals, and the 10:11 train by 2 bus arrivals (a total of 11 bus arrivals out of 37 bus arrivals during the hours when trains departed). [Neither of the 2 northbound rail arrivals during this period was conveniently served by a bus departure.] |
| Camarillo Station | Of 4 southbound rail departures during this period, 1 was conveniently served: the 6:30 train was served by 1 bus arrival (out of 14 bus arrivals during the hours when trains departed). [One of the 2 northbound rail arrivals during this period was conveniently served by 1 bus departure.] |
| Moorpark Station | Of 5 southbound rail departures during this period (excluding the 6:03, which would have been fed by buses in the previous time slot), 2 were conveniently served: the 6:41 and 8:26 trains each were served by a single bus arrival (a total of 2 bus arrivals out of 18 possible bus arrivals during the hours when trains departed). [None of the 3 northbound rail arrivals during this period was conveniently served by a bus departure.] |
| Simi Valley Station | Of 7 southbound rail departures during this period, 4 were conveniently served: the 6:53 and 7:32 trains each were served by a single bus arrival, while the 8:22 and 8:39 trains each were served by 2 bus arrivals (a total of 6 bus arrivals out of 31 possible bus arrivals during the hours when trains departed). [Each of the 3 northbound rail arrivals during this period was conveniently served by a singe bus departure.] |

## Conclusions

A number of gaps in Ventura County's transit network have been identified. These should be examined in more depth in a future study. At the present time, there are at least five corridors with the potential to

close service gaps between areas already served by transit. Within the served areas, ten sub-areas show promise for fixed-route bus service, though further study may justify dial-a-ride or flex-route service instead.

At strategic points in the network where services converge, such as transit centers and commuter rail stations, most lines are not scheduled to provide convenient transfers. This is likely due to (a) the need to schedule meets elsewhere on a particular line or (b) the desire by operators to maximize the efficiency of each bus by minimizing layovers. Ironically, building in layover time to allow for better timed meets would result in a more attractive service, likely leading to greater ridership and an increase in the overall effectiveness of the system. This is, perhaps, the single most effective measure to increase ridership among the county's transit providers.

Finally, it must be noted that there are always trade-offs in transit planning between increasing the efficiency of a service and increasing its effectiveness. Some actions can increase both, but more often choices have to be made in one direction or the other. Much of today's transit service in Ventura County is the result of these kinds of decisions made incrementally over the years. It is wise to revisit such decisions periodically to determine if a change in direction is warranted. This high-level analysis of gaps has pointed out some areas in which there is potential for improvement, but it should be followed by a detailed analysis of routing and scheduling to develop more definitive recommendations.

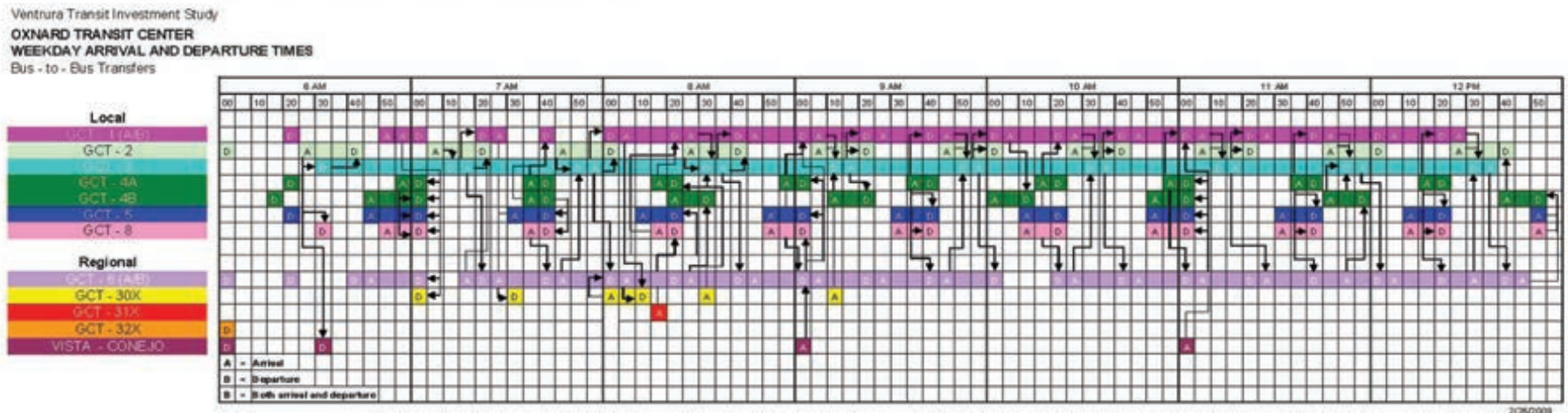


Figure 5a. Bus-to-Bus Transfers: Oxnard Transit Center

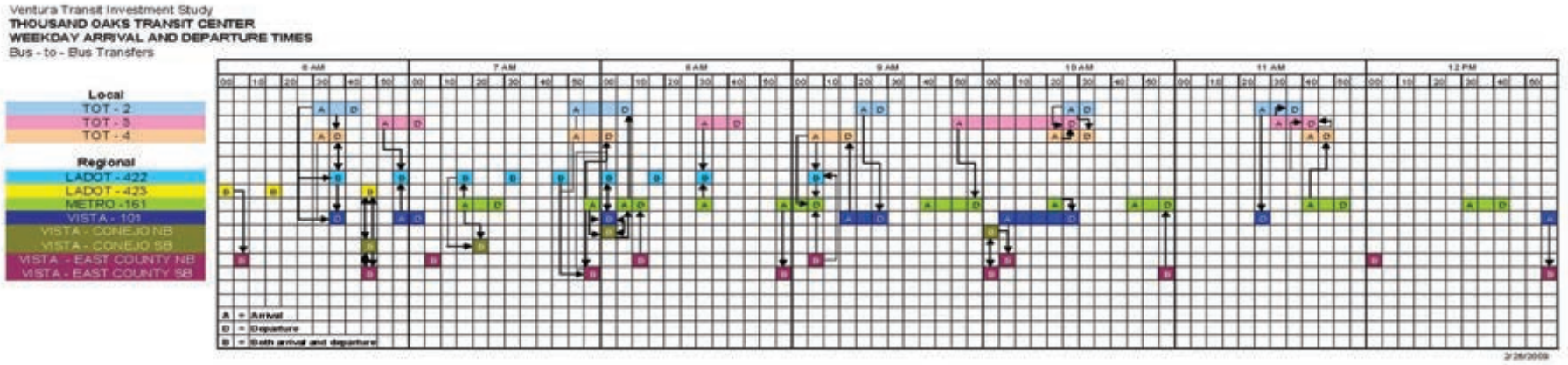


Figure 5b. Bus-to-Bus Transfers: Thousand Oaks Transportation Center

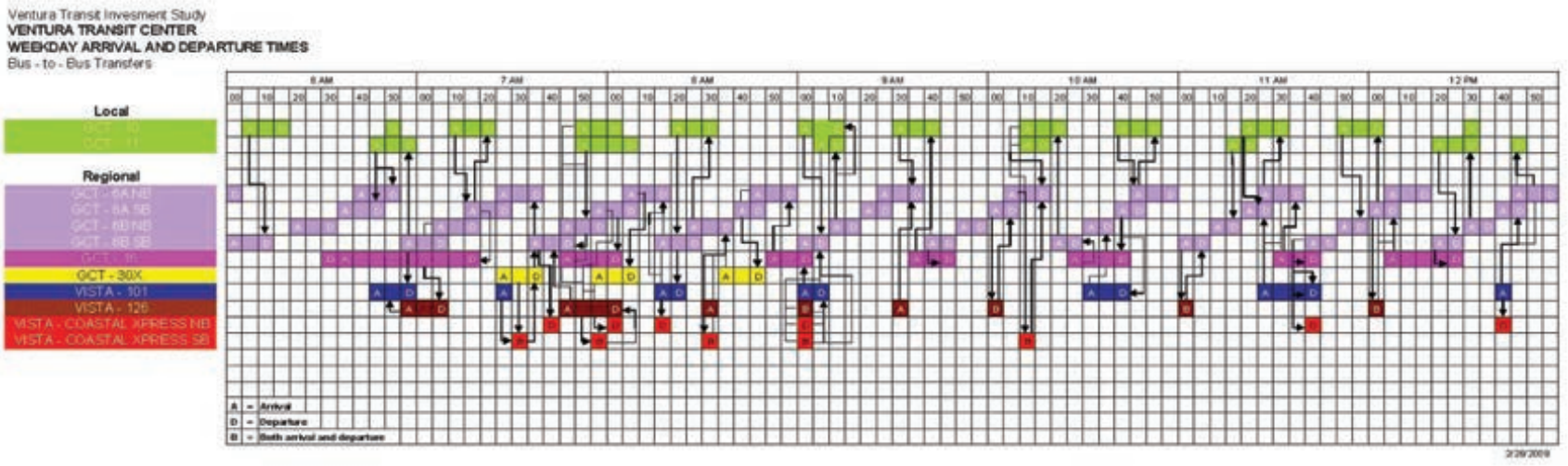


Figure 5c. Bus-to-Bus Transfers: Ventura Transit Center

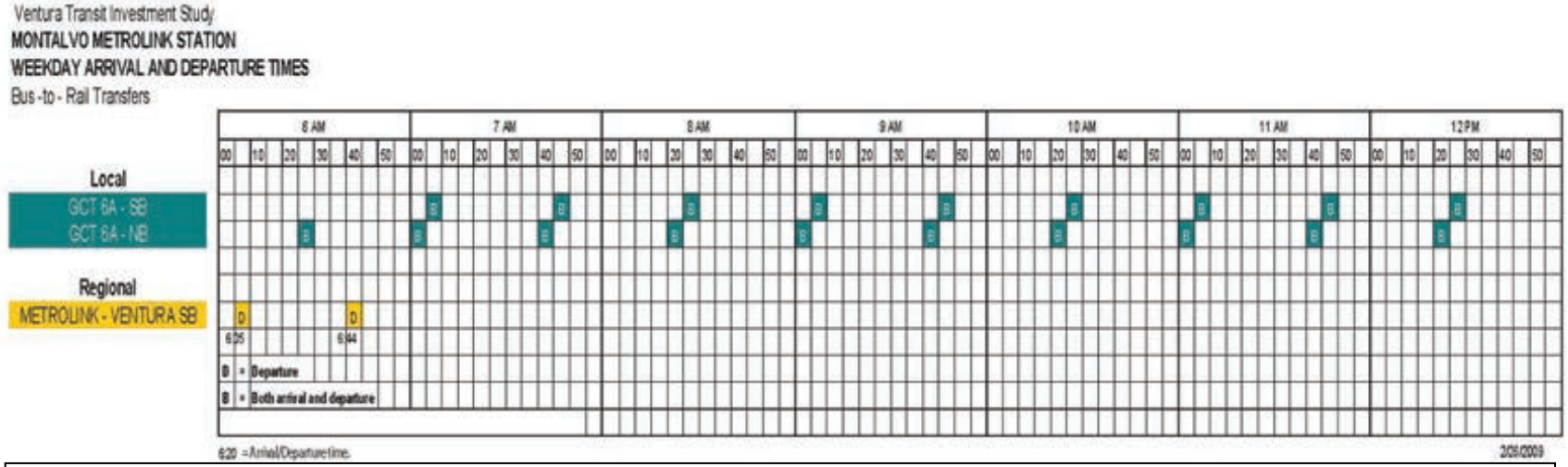


Figure 5d. Bus-to-Rail Transfers: Montalvo Station

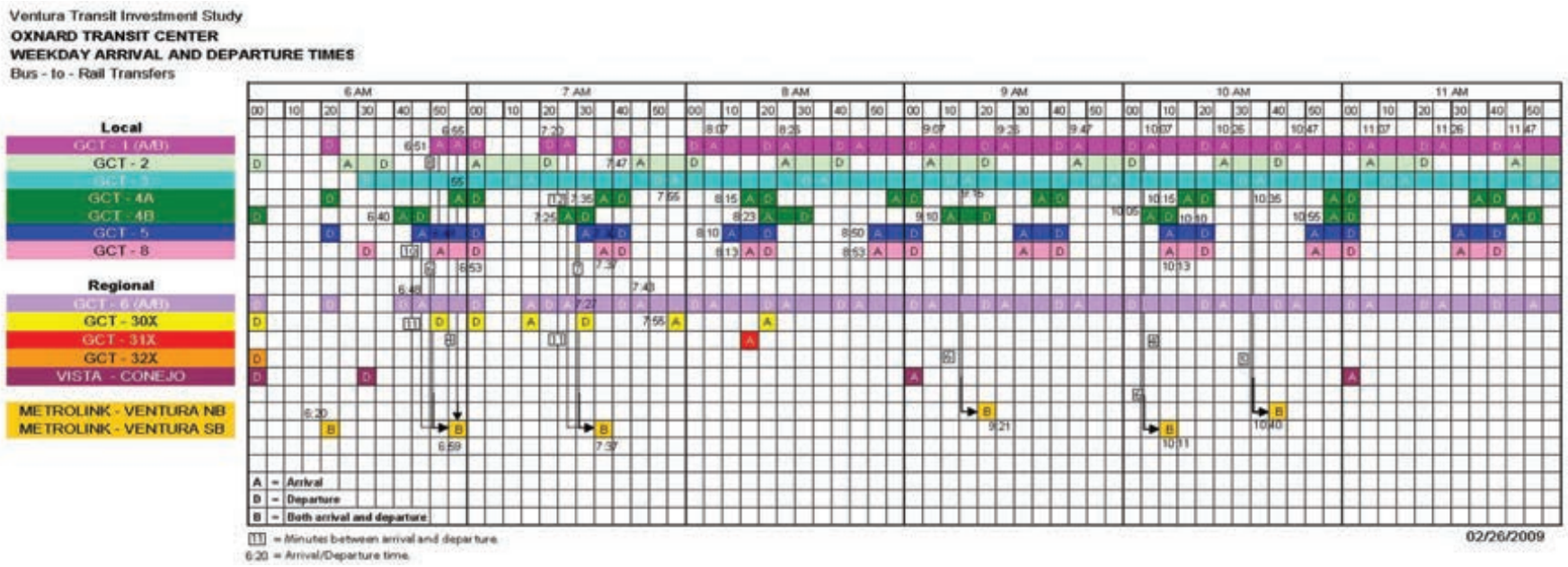


Figure 5e. Bus-to-Rail Transfers: Oxnard Station

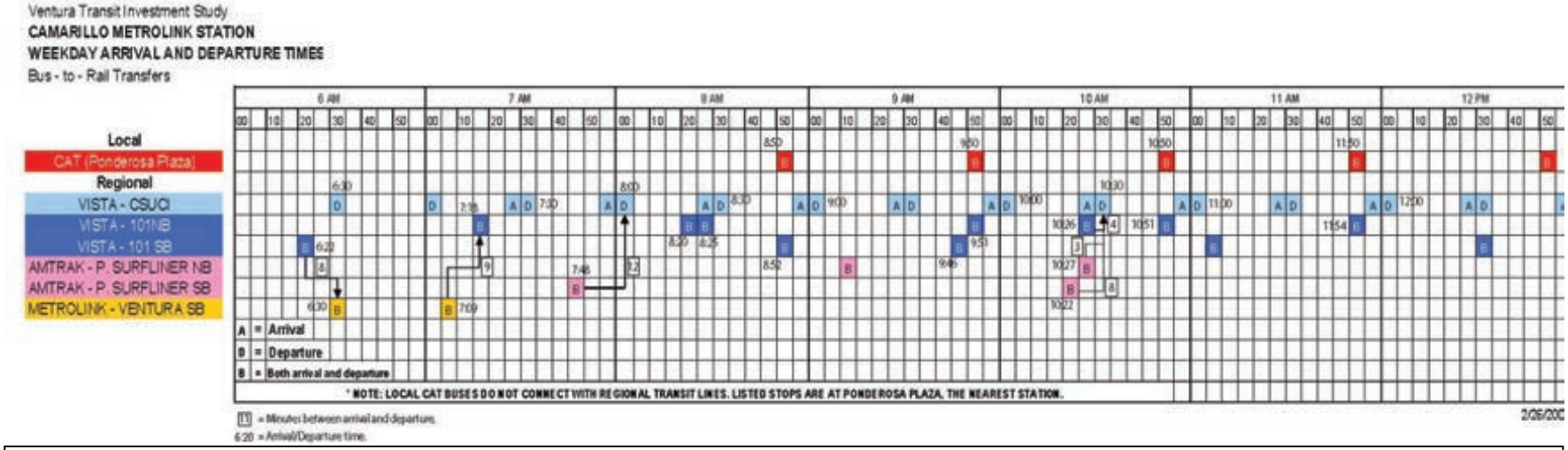


Figure 5f. Bus-to-Rail Transfers: Camarillo Station

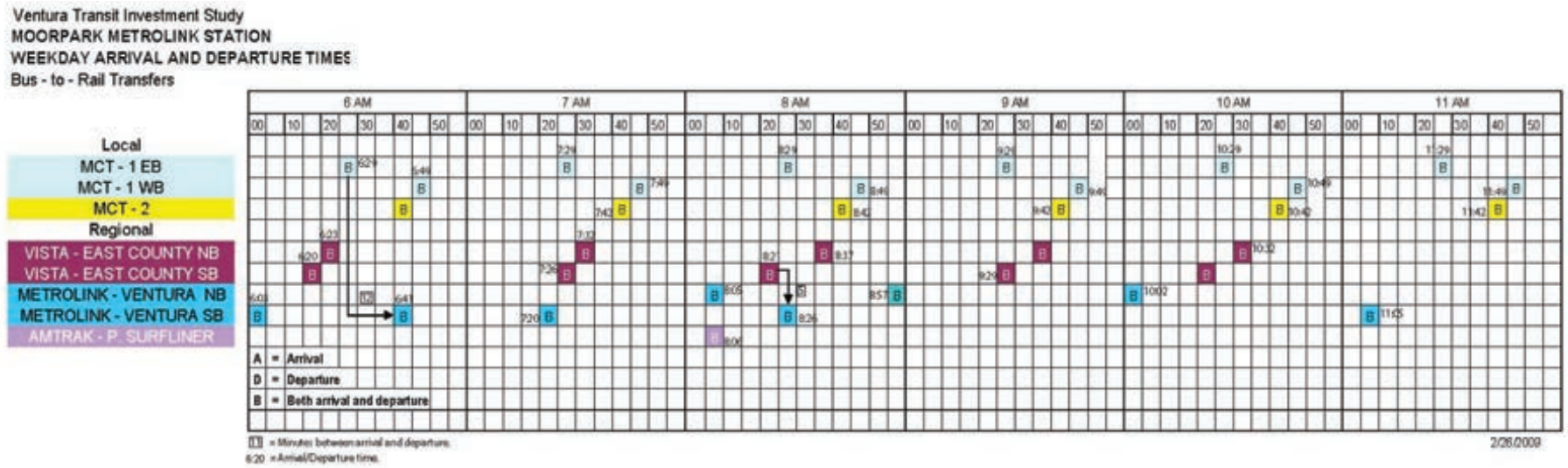


Figure 5g. Bus-to-Rail Transfers: Moorpark Station

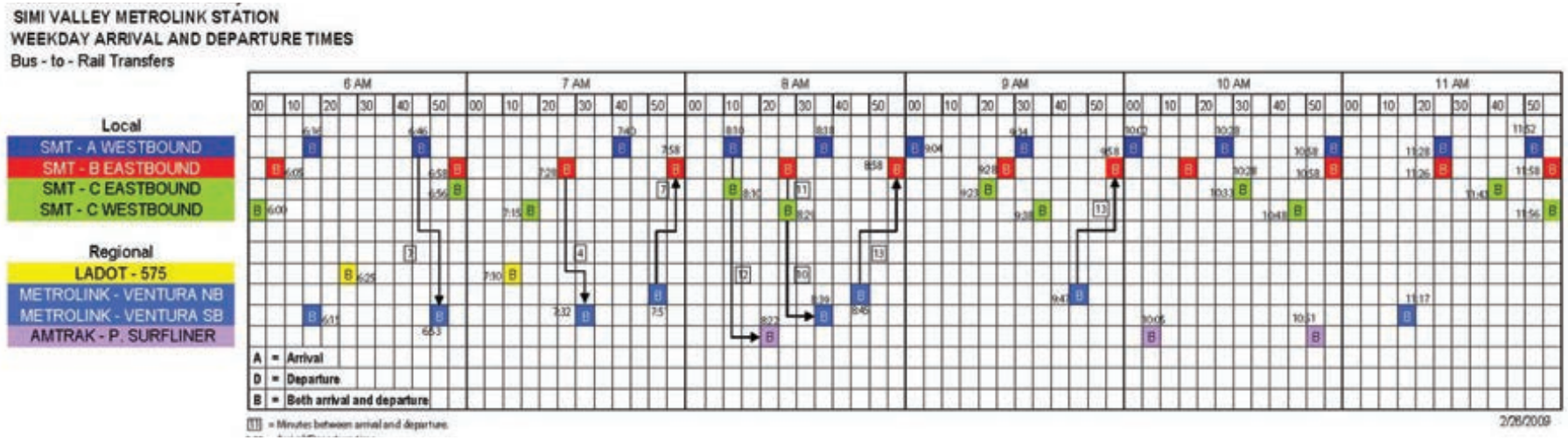


Figure 5h. Bus-to-Rail Transfers: Simi Valley Station

# Appendix C

# Project Evaluation Process

# PROCEDURE FOR EVALUATING PROPOSED CAPITAL PROJECTS BY THE VENTURA COUNTY TRANSPORTATION COMMISSION'S TRANSPORTATION OPERATORS ADVISORY COMMITTEE (TRANSCOM)

The intent of this procedure is to lay out the process of evaluating potential capital improvement projects for the various transit agencies in Ventura County. The procedure outlines the steps for defining a proposed project to enable a structured evaluation, the criteria for evaluation, and the means for conducting the evaluation. At the heart of the procedure is building consensus among the transit operating agencies on priorities for capital funding that will not only affect their particular jurisdictions, but will also contribute to improved service and mobility for all residents of the county.

## STEP 1. Defining a Proposed Project

In order for the evaluation criteria (described in Step 2) to be applied, a proposed project must be adequately defined. Proponents should use the criteria as a guideline for describing the needs to be met, features of a proposed capital investment, specific benefits for the local jurisdiction and other jurisdictions in maintaining or improving transit services, etc., much as one would do for a grant application or for a new budget item. Keep in mind that in Step 3, the proposed project will be reviewed by other transit operating agencies and that the project proponent will need to verbally "defend" their proposal. The more clearly the project description spells out what and why capital funds are being sought, as well as the expected results, the easier it will be for TRANSCOM members to conduct the evaluation and reach consensus on funding priorities. This consensus position will like give more weight to recommendations from TRANSCOM to the VCTC Board and other agencies.

## STEP 2. Evaluation Criteria

A three-level set of evaluation criteria was developed in consultation with TRANSCOM members in December 2008 and January 2009. Within the following template, these have been organized based on the priorities established by TRANSCOM as: Table 1, Primary Evaluation Criteria, Table 2 Secondary Evaluation Criteria, and Table 3 Other Considerations. The first two table focus on transit benefits and issues, while Table 3 is useful in defining the relationship between a proposed project and other issues. For Table 3, weightings are optional and can be assigned if needed to help proponents address local issues and advocate for a project.

While initially developed to prioritize applications for state funding under Proposition 1B, the criteria can be applied for other types of funding. The issues/examples listed for each of the criteria are not intended to be limited, but to provide a frame of reference for assessing a proposed project's characteristics, benefits, and constraints. Any of the cells in the criteria matrix can be modified as appropriate. For example, criteria wording can be modified or added to by proponents to more clearly respond to specific requirements for a particular source of funds. The weightings for the individual criteria and the point range shown in the template can be modified by the TRANSCOM as needed.

Responses to the criteria can be qualitative, based on professional judgment. Quantitative data to support rankings should be provided, or referenced, if available.

**TEMPLATE: BASELINE EVALUATION MATRIX**

| **TABLE 1: PRIMARY EVALUATION CRITERIA** | | | | |
|---|---|---|---|---|
| **PRIMARY CRITERIA** ***(initially ranked in order of importance by TRANSCOM in December 2008; modify as appropriate)*** | **WEIGHTS** ***(Optional; suggested range: 1-3)*** | **SAMPLE CRITERIA/ THINGS TO CONSIDER** **(*choose from among these as appropriate for the types of projects/ funding being evaluated; add other criteria as needed)*** | **POINTS** **0-5** ***(modify as appropriate)*** | **SCORE** ***(Weight multiplied by Points for those criteria chosen for use in an evaluation)*** |
| 1. Mandated Improvements | 1 | Required for ADA compliance | | |
| | 2 | Required for air quality compliance | | |
| | 3 | Necessary to support legislative mandates or contractual obligations | | |
| | 1 | Desirable to support legislative mandates | | |
| | 3 | Fulfills unmet transit needs | | |
| | 1 | Required safety improvements | | |
| | | Other | | |
| 2. Preservation of Current Levels of Service | 3 | For transit arterials, provides new improvements or maintenance at bus stops/rail stations | | |
| | 2 | Addresses scheduled replacements or vehicles. | | |
| | 1 | Transportation control devices along transit routes/rail lines | | |
| | 1 | Improves the condition of the sidewalks and streets within 250 feet of a bus stop or rail station. | | |
| | 1 | Supports projects already designated for improvement. | | |

| TABLE 1: PRIMARY EVALUATION CRITERIA | | | | |
|---|---|---|---|---|
| **PRIMARY CRITERIA** ***(initially ranked in order of importance by TRANSCOM in December 2008; modify as appropriate)*** | **WEIGHTS** ***(Optional; suggested range: 1-3)*** | **SAMPLE CRITERIA/ THINGS TO CONSIDER** (***choose from among these as appropriate for the types of projects/ funding being evaluated; add other criteria as needed)*** | **POINTS** **0-5** ***(modify as appropriate)*** | **SCORE** ***(Weight multiplied by Points for those criteria chosen for use in an evaluation)*** |
| | 1 | Reduces the backlog of deferred maintenance of sidewalks and streets used for transit. | | |
| | | Other | | |
| 3. Expansion of Transit Service (including shorter headways) | 3 | Improves current access to and from local and/or regional transit stops and rail stations. | | |
| | 3 | Serves/Connects current activity centers (e.g., employment, educational facilities, medical centers, shopping hubs, sporting venues, etc.). | | |
| | 3 | Adds or improves connectivity to other local and/or regional transit services. | | |
| | 1 | Serves anticipated growth in transit demand (e.g., in a specific region) - what time horizon? | | |
| | 2 | Improves speed and reliability of transit vehicles. | | |
| | 2 | Improves bus stop/rail station performance for buses, such as reducing transfer time. | | |
| | 3 | Likely to increase the percentage of trips made by transit and reduce the percentage by automobile. | | |
| | 3 | Provides new/improved service during peak hours. | | |
| | 2 | Provides new/improved | | |

| TABLE 1: PRIMARY EVALUATION CRITERIA | | | | |
|---|---|---|---|---|
| **PRIMARY CRITERIA** ***(initially ranked in order of importance by TRANSCOM in December 2008; modify as appropriate)*** | **WEIGHTS** ***(Optional; suggested range: 1-3)*** | **SAMPLE CRITERIA/ THINGS TO CONSIDER** (***choose from among these as appropriate for the types of projects/ funding being evaluated; add other criteria as needed)*** | **POINTS** **0-5** ***(modify as appropriate)*** | **SCORE** ***(Weight multiplied by Points for those criteria chosen for use in an evaluation)*** |
| | | service during off-peak hours. | | |
| | 3 | Fulfills a new, unmet transit need. | | |
| | 2 | Meets needs of special population group | | |
| | | Other | | |
| 4. Financial Sustainability | 3 | Provides matching funds | | |
| | 3 | Effects on fares and operating costs. | | |
| | 2 | Availability of ongoing operating funds. | | |
| | 1 | Likelihood for additional operating funds. | | |
| | 2 | Availability of ongoing staff to implement. | | |
| | 1 | Likelihood for additional staff. | | |
| | 1 | Degree to which need for other funding is increased. | | |
| | 1 | Degree to which need for other funding is decreased. | | |
| | | Other | | |
| 5. Readiness | 2 | Ability to procure in a timely manner. | | |
| | 1 | Status of design (if applicable). | | |
| | 1 | Need to implement in phases | | |
| | | Other | | |
| | | | TOTAL PRIMARY SCORE | |

| TABLE 2: SECONDARY CRITERIA | | | | |
|---|---|---|---|---|
| **SECONDARY CRITERIA** ***(initially ranked in order of importance by TRANSCOM in December 2008; modify as appropriate)*** | **WEIGHTS** ***(Optional; suggested range: 1-2)*** | **SAMPLE CRITERIA/ THINGS TO CONSIDER** **(*choose from among these as appropriate for the types of projects/ funding being evaluated; add other criteria as needed)*** | **POINTS** **0-5** ***(modify as appropriate)*** | **SCORE** ***(Weight multiplied by Points for those criteria chosen for use in an evaluation)*** |
| 6. Non-transit influences | 1 | Critical to other city projects/ priorities | | |
| | 1 | Supportive/desirable for other city projects/priorities. | | |
| | | Other | | |
| 7. Other | 1 | Criteria specified by funding program (if applicable and not listed elsewhere above) | | |
| 8. Bonus Points | 2 | 1 point for each additional operating agency that would be served | | |
| | | Other | | |
| | | | TOTAL SECONDARY SCORE | |

| TABLE 3: OTHER CONSIDERATIONS | | | | |
|---|---|---|---|---|
| **CRITERIA** *(no priority order)* | **WEIGHTS** *(Optional; suggested range: (1-2)* | **SAMPLE CRITERIA/ THINGS TO CONSIDER** **(*choose from among these as appropriate for the types of projects/ funding being evaluated; add other criteria as needed)* | **POINTS** **0-5** *(modify as appropriate)* | **SCORE** *(Weight multiplied by Points for those criteria chosen for use in an evaluation)* |
| Improvements to Ride Quality | | Improves quality of transit stops, including comfort and convenience. | | |
| | | Improves information provided to users. | | |
| Safety/Security | | Eliminates or reduces a specific safety/security hazard. | | |
| | | Supports general or systemwide safety/security improvements. | | |
| Community Impacts | | Negative and positive effects, including air quality, noise, traffic, property acquisitions, and “going green”. | | |
| | | Community support/opposition. | | |
| Compatibility /conflict with Regional and Local Plans | | Part of an adopted transportation plan (e.g., congestion management, etc.). | | |
| | | Supports an adopted or pending transportation plan. | | |
| | | Supports community and economic development, business functionality, and creation or retention of employment. | | |
| | | Provides or increases access to business districts and/or employers. | | |
| | | Provides infrastructure or service to support new employment. | | |

| TABLE 3: OTHER CONSIDERATIONS | | | | |
|---|---|---|---|---|
| | | Is a required mitigation measure. | | |
| | | Supports local land use or transit-oriented development. | | |
| Strategic | | Necessary predecessor for subsequent projects. | | |
| | | Desirable predecessor for subsequent projects. | | |
| | | | TOTAL SCORE | |

This template should be reviewed for its applicability to a proposed funding source, and adjustments made to address any specific requirements of that source. The list of sample criteria is broad enough that such adjustments should be readily accommodated within the “Sample Criteria/Things to Consider” cells. Similarly, any specific priorities or weightings accompanying a funding source can be reflected in adjustments within the “Weight” or “Points” cells. Criteria that are not applicable or appropriate for the specific evaluation being undertaken could be struck out or marked as ‘not applicable’.

STEP 3. Conducting the Evaluation

Here are the steps for carrying out a typical evaluation.

1. Review the eligibility and evaluation requirements for the source of funds. Develop a checklist of all items that need to be included in the project description. Modify the evaluation matrix as appropriate. Define the timeline and other ground rules for completing the prioritization process. *Responsible party: VCTC Staff*

2. Prepare a project description and complete an evaluation form; label this set as Proponent's Initial Request for Funding and Self-Evaluation. Include any support information that will facilitate the TRANSCOM review. This is the opportunity for the proponent to test their proposed project against the criteria and to perhaps make adjustments to increase the score. *Responsible party: Project Proponent*

3. Submit the Initial Request for Funding, supporting materials, Self-Evaluation and a blank evaluation form to other members of TRANSCOM. *Responsible parties: Project Proponent submits the Initial Request for Funding and supporting materials to VCTC staff for distribution, along with blank evaluation forms, to TRANSCOM.*

4. Review the proponent's package and score it against the evaluation criteria. *Responsible party: TRANSCOM members.*

5. Meet to review the scorings of the proponent and TRANSCOM members. Working in consultation, TRANSCOM will reach consensus on point scoring for the proposed projects. If projects must be prioritized, TRANSCOM members will use the consensus score as the initial ranking. The initial rankings will be reviewed and discussed and TRANSCOM will determine a final ranking. *Responsible parties: TRANSCOM with VCTC staff assistance.*

6. Prepare a recommendation to the VCTC Board (or other agency as appropriate) covering the prioritization of projects for specific funding sources. As appropriate, describe or summarize this procedure to explain how priorities were established. *Responsible party: VCTC staff, with TRANSCOM concurrence.*

7. Periodically conduct a review of this procedure and revise it accordingly. *Responsible parties: TRANSCOM and VCTC staff.*

# Appendix D

# Spreadsheet Transit Model Documentation

# VCTC Simple Ridership Forecast Model

## Instructions

RIDERSHIP ESTIMATE SHEET

User Inputs:

User can change and provide inputs in all areas shaded in yellow.

The User needs to enter data on the following characteristics for each route:
- Column A: Name of Transit Agency administering route
- Column B: Route name
- Column C: Route Day Type service days associated with this route breakdown
- Column D: Current ridership consistent with Route Day Type - *Required*
- Column E: Current headway in minutes - *Required*
- Column F: New headway in minutes - *Required*

*The required fields must be completed before model can produce an outputs.*

The User needs to answer Yes or No to the following questions for each route:
- Column G: Will majority of the route serve a growing economic environment?
- Column H: Will majority of the route serve middle and high income areas?
- Column I: Will majority of the route serve walkable areas?
- Column J: Will the route have timed transfers at major transfer points?

SHEET PROTECTION

All sheets are sheet protected to prevent from changing assumptions, formulas and formats. If details need to be changed please contact the Ventura County Transportation Commission.

**Data Type** Average Daily Passenger Boardings
**Current Data Month** March
**Current Data Year** 2009

User can only complete areas shaded in yellow.
* indicates field required for output calculation.

| Operator | Route Name | Day Type | Current Boardings * | Current Headway * | New Headway * | Med/high Income ? | Growing Economy? | Walkable? | Timed Transfers? | Potential Ridership | Potential % Change |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Sample Transit* | *Sample Route* | *Sun* | *200* | *60* | *15* | *Yes* | *Yes* | *No* | *Yes* | ***626*** | ***213%*** |
| Gold Coast Transit | GCT 10-11: SATICOY | Sun | 145 | 30 | 20 | Yes | Yes | Yes | No | **178** | **23%** |
| Gold Coast Transit | GCT 10-11: SATICOY | Sat | 168 | 30 | 20 | Yes | Yes | Yes | Yes | **216** | **29%** |
| Gold Coast Transit | GCT 10-11: SATICOY | M-F | 380 | 30 | | Yes | | | No | | |
| Gold Coast Transit | GCT 11-10: SATICOY | Sun | 167 | 30 | | Yes | Yes | Yes | Yes | | |
| Gold Coast Transit | GCT 11-10: SATICOY | Sat | 182 | 30 | 20 | Yes | No | Yes | No | **214** | **18%** |
| Gold Coast Transit | GCT 11-10: SATICOY | M-F | 350 | 30 | 20 | No | Yes | Yes | Yes | **431** | **23%** |
| Gold Coast Transit | GCT 12: VENTURA HARBOR | Sun | 18 | 45 | 30 | Yes | No | Yes | No | **23** | **26%** |
| Gold Coast Transit | GCT 12: VENTURA HARBOR | Sat | 62 | 45 | 30 | Yes | Yes | Yes | Yes | **90** | **47%** |
| Gold Coast Transit | GCT 12: VENTURA HARBOR | M-F | 46 | 45 | 30 | Yes | No | Yes | No | **58** | **26%** |
| Gold Coast Transit | GCT 15: EL RIO/NORTHEAST | Sun | 90 | 35 | 30 | Yes | Yes | Yes | No | **100** | **11%** |
| Gold Coast Transit | GCT 15: EL RIO/NORTHEAST | Sat | 106 | 35 | 30 | No | No | Yes | Yes | **124** | **17%** |
| Gold Coast Transit | GCT 15: EL RIO/NORTHEAST | M-F | 170 | 35 | 30 | Yes | Yes | Yes | No | **189** | **11%** |
| Gold Coast Transit | GCT 16N: OJAI-MAIN ST (NB) | Sun | 375 | 20 | 30 | No | No | Yes | No | **359** | **-4%** |
| Gold Coast Transit | GCT 16N: OJAI-MAIN ST (NB) | Sat | 366 | 20 | 15 | Yes | Yes | Yes | Yes | **397** | **9%** |
| Gold Coast Transit | GCT 16N: OJAI-MAIN ST (NB) | M-F | 569 | 20 | 15 | No | No | No | No | **583** | **2%** |
| Gold Coast Transit | GCT 16S: OJAI-MAIN ST (SB) | Sun | 157 | 20 | 30 | Yes | No | Yes | No | **147** | **-6%** |
| Gold Coast Transit | GCT 16S: OJAI-MAIN ST (SB) | Sat | 289 | 20 | 150 | Yes | No | Yes | No | **245** | **-15%** |
| Gold Coast Transit | GCT 16S: OJAI-MAIN ST (SB) | M-F | 256 | 20 | 150 | Yes | No | Yes | No | **217** | **-15%** |
| Gold Coast Transit | GCT 18AA - Oxnard High Tripper | M-F | 56 | 1440 | 1440 | Yes | Yes | yes | Yes | **64** | **15%** |
| Gold Coast Transit | GCT 18AB - Oxnard High Tripper | M-F | 25 | 1440 | 1440 | Yes | No | yes | No | **25** | **0%** |
| Gold Coast Transit | GCT 18BA - Oxnard High Tripper | M-F | 25 | 1440 | 1440 | | | | | **25** | **0%** |
| Gold Coast Transit | GCT 18BB - Oxnard High Tripper | M-F | 15 | 1440 | 1440 | | | | | **15** | **0%** |
| Gold Coast Transit | GCT 18CA - Oxnard High Tripper | M-F | 12 | 1440 | 1440 | | | | | **12** | **0%** |
| Gold Coast Transit | GCT 18CB - Oxnard High Tripper | M-F | 14 | 1440 | 1440 | Yes | No | Yes | Yes | **16** | **15%** |
| Gold Coast Transit | GCT 18DA - Oxnard High Tripper | M-F | 25 | 1440 | 1440 | | | | | **25** | **0%** |
| Gold Coast Transit | GCT 18DB - Oxnard High Tripper | M-F | 16 | 1440 | 1440 | | | | | **16** | **0%** |
| Gold Coast Transit | GCT 18EA - Oxnard High Tripper | M-F | 5 | 1440 | 1440 | | | | | **5** | **0%** |
| Gold Coast Transit | GCT 18EB - Oxnard High Tripper | M-F | 10 | 1440 | 1440 | | | | | **10** | **0%** |
| Gold Coast Transit | GCT 18FA - Oxnard High Tripper | M-F | 30 | 1440 | 1440 | | | | | **30** | **0%** |
| Gold Coast Transit | GCT 18FB - Oxnard High Tripper | M-F | 24 | 1440 | 1440 | | | | | **24** | **0%** |
| Gold Coast Transit | GCT 1A - PORT HUENEME-OTC | Sun | 291 | 20 | | | | | | | |
| Gold Coast Transit | GCT 1A - PORT HUENEME-OTC | Sat | 470 | 20 | | | | | | | |
| Gold Coast Transit | GCT 1A - PORT HUENEME-OTC | M-F | 769 | 20 | | | | | | | |
| Gold Coast Transit | GCT 1B: PORT HUENEME-OTC | Sun | 615 | 20 | | | | | | | |
| Gold Coast Transit | GCT 1B: PORT HUENEME-OTC | Sat | 749 | 20 | | | | | | | |

| | | |
|---|---|---|
| **Data Type** | Average Daily Passenger Boardings | User can only complete areas shaded in yellow. |
| **Current Data Month** | March | * indicates field required for output calculation. |
| **Current Data Year** | 2009 | |

| Operator | Route Name | Day Type | Current Boardings * | Current Headway * | New Headway * | Med/high Income ? | Growing Economy? | Walkable? | Timed Transfers? | Potential Ridership | Potential % Change |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Sample Transit* | *Sample Route* | *Sun* | *200* | *60* | *15* | *Yes* | *Yes* | *No* | *Yes* | ***626*** | ***213%*** |
| Gold Coast Transit | GCT 1B: PORT HUENEME-OTC | M-F | 801 | 20 | | | | | | | |
| Gold Coast Transit | GCT 2-3: COLONIA & SOUTHSIDE | Sun | 275 | 40 | | | | | | | |
| Gold Coast Transit | GCT 2-3: COLONIA & SOUTHSIDE | Sat | 348 | 40 | | | | | | | |
| Gold Coast Transit | GCT 2-3: COLONIA & SOUTHSIDE | M-F | 502 | 40 | | | | | | | |
| Gold Coast Transit | GCT 4A - 5: NTH OXNARD - PARKWEST | Sun | 171 | 40 | | | | | | | |
| Gold Coast Transit | GCT 4A - 5: NTH OXNARD - PARKWEST | Sat | 201 | 40 | | | | | | | |
| Gold Coast Transit | GCT 4A - 5: NTH OXNARD - PARKWEST | M-F | 681 | 40 | | | | | | | |
| Gold Coast Transit | GCT 4B: NORTH OXNARD | Sun | 176 | 40 | | | | | | | |
| Gold Coast Transit | GCT 4B: NORTH OXNARD | Sat | 338 | 40 | | | | | | | |
| Gold Coast Transit | GCT 4B: NORTH OXNARD | M-F | 433 | 40 | | | | | | | |
| Gold Coast Transit | GCT 6AN: OXNARD-VENTURA (NB) | Sun | 406 | 20 | | | | | | | |
| Gold Coast Transit | GCT 6AN: OXNARD-VENTURA (NB) | Sat | 542 | 20 | | | | | | | |
| Gold Coast Transit | GCT 6AN: OXNARD-VENTURA (NB) | M-F | 830 | 20 | | | | | | | |
| Gold Coast Transit | GCT 6AS: OXNARD-VENTURA (SB) | Sun | 300 | 20 | | | | | | | |
| Gold Coast Transit | GCT 6AS: OXNARD-VENTURA (SB) | Sat | 187 | 20 | | | | | | | |
| Gold Coast Transit | GCT 6AS: OXNARD-VENTURA (SB) | M-F | 687 | 20 | | | | | | | |
| Gold Coast Transit | GCT 6BN: OXNARD-VENTURA (NB) | Sun | 236 | 20 | | | | | | | |
| Gold Coast Transit | GCT 6BN: OXNARD-VENTURA (NB) | Sat | 369 | 20 | | | | | | | |
| Gold Coast Transit | GCT 6BN: OXNARD-VENTURA (NB) | M-F | 533 | 20 | | | | | | | |
| Gold Coast Transit | GCT 6BS: OXNARD-VENTURA (SB) | Sun | 298 | 20 | | | | | | | |
| Gold Coast Transit | GCT 6BS: OXNARD-VENTURA (SB) | Sat | 417 | 20 | | | | | | | |
| Gold Coast Transit | GCT 6BS: OXNARD-VENTURA (SB) | M-F | 657 | 20 | | | | | | | |
| Gold Coast Transit | GCT 7: SOUTH OXNARD | Sun | 32 | 40 | | | | | | | |
| Gold Coast Transit | GCT 7: SOUTH OXNARD | Sat | 44 | 40 | | | | | | | |
| Gold Coast Transit | GCT 7: SOUTH OXNARD | M-F | 34 | 40 | | | | | | | |
| Gold Coast Transit | GCT 8N: OTC | Sun | 119 | 40 | | | | | | | |
| Gold Coast Transit | GCT 8N: OTC | Sat | 101 | 40 | | | | | | | |
| Gold Coast Transit | GCT 8N: OTC | M-F | 102 | 40 | | | | | | | |
| Gold Coast Transit | GCT 8S: OXNARD COLLEGE | Sun | 156 | 40 | | | | | | | |
| Gold Coast Transit | GCT 8S: OXNARD COLLEGE | Sat | 93 | 40 | | | | | | | |
| Gold Coast Transit | GCT 8S: OXNARD COLLEGE | M-F | 467 | 40 | | | | | | | |
| Gold Coast Transit | GCT 9: GISLER/ELM | Sun | 27 | 40 | | | | | | | |
| Gold Coast Transit | GCT 9: GISLER/ELM | Sat | 80 | 40 | | | | | | | |
| Gold Coast Transit | GCT 9: GISLER/ELM | M-F | 21 | 40 | | | | | | | |
| Gold Coast Transit | GCT EXP 30XN - OTC/VCT (NB) | Sat | 0 | 40 | | | | | | | |

**Data Type** Average Daily Passenger Boardings
**Current Data Month** March
**Current Data Year** 2009

User can only complete areas shaded in yellow.
* indicates field required for output calculation.

| Operator | Route Name | Day Type | Current Boardings * | Current Headway * | New Headway * | Med/high Income ? | Growing Economy? | Walkable? | Timed Transfers? | Potential Ridership | Potential % Change |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Sample Transit* | *Sample Route* | *Sun* | *200* | *60* | *15* | *Yes* | *Yes* | *No* | *Yes* | ***626*** | ***213%*** |
| Gold Coast Transit | GCT EXP 30XN - OTC/VCT (NB) | M-F | 156 | 40 | | | | | | | |
| Gold Coast Transit | GCT EXP 30XS - VTC/OTC (SB) | M-F | 39 | 40 | | | | | | | |
| Gold Coast Transit | GCT EXP 31XN - OJAI/GVT CENTER (NB) | M-F | 12 | 2 | | | | | | | |
| Gold Coast Transit | GCT EXP 31XS - OJAI /GVT CENTER (SB) | M-F | 8 | 2 | | | | | | | |
| Gold Coast Transit | GCT EXP 32XN - OJAI/OTC (NB) | M-F | 10 | 2 | | | | | | | |
| Gold Coast Transit | GCT EXP 32XS - OJAI/OTC (SB) | M-F | 3 | 2 | | | | | | | |
| Gold Coast Transit | GCT EXP 617N: C ST - OTC ESPLANADE (NB) | M-F | 10 | 2 | | | | | | | |
| Gold Coast Transit | GCT EXP 617S: ESPLANADE - OTC (SB) | M-F | 2 | 2 | | | | | | | |
| VISTA | VISTA COASTAL EXPRESS LOOPED | Sun | 49 | 15 | | | | | | | |
| VISTA | VISTA COASTAL EXPRESS LOOPED | Sat | 82 | 15 | | | | | | | |
| VISTA | VISTA COASTAL EXPRESS LOOPED | M-F | 398 | 15 | | | | | | | |
| VISTA | VISTA COASTAL EXPRESS Sat LOOPED | Sun | 134 | 60 | | | | | | | |
| VISTA | VISTA COASTAL EXPRESS Sat LOOPED | Sat | 111 | 60 | | | | | | | |
| VISTA | VISTA CONEJO LOOPED | Sat | 0 | 4 | | | | | | | |
| VISTA | VISTA CONEJO LOOPED | M-F | 33 | 4 | | | | | | | |
| VISTA | VISTA CSUCI SHUTTLE (CAMARILLO) | Sat | 42 | 15 | | | | | | | |
| VISTA | VISTA CSUCI SHUTTLE (CAMARILLO) | M-F | 100 | 15 | | | | | | | |
| VISTA | VISTA CSUCI SHUTTLE (OXNARD ROUTE) | Sat | 18 | 60 | | | | | | | |
| VISTA | VISTA CSUCI SHUTTLE (OXNARD ROUTE) | M-F | 101 | 60 | | | | | | | |
| VISTA | VISTA EAST COUNTY MON-FRI LOOPED | Sat | 55 | 60 | | | | | | | |
| VISTA | VISTA EAST COUNTY MON-FRI LOOPED | M-F | 206 | 60 | | | | | | | |
| VISTA | VISTA HIGHWAY 101 LOOPED | Sun | 1 | 30 | | | | | | | |
| VISTA | VISTA HIGHWAY 101 LOOPED | Sat | 12 | 30 | | | | | | | |
| VISTA | VISTA HIGHWAY 101 LOOPED | M-F | 397 | 30 | | | | | | | |
| VISTA | VISTA HIGHWAY 101 Sat LOOPED | Sat | 61 | 60 | | | | | | | |
| VISTA | VISTA HIGHWAY 101 Sat LOOPED | M-F | 36 | 60 | | | | | | | |
| VISTA | VISTA HIGHWAY 126 LOOPED | Sun | 179 | 60 | | | | | | | |
| VISTA | VISTA HIGHWAY 126 LOOPED | Sat | 167 | 60 | | | | | | | |
| VISTA | VISTA HIGHWAY 126 LOOPED | M-F | 378 | 60 | | | | | | | |
| VISTA | VISTA HIGHWAY 126 Sat LOOPED | Sun | 75 | 60 | | | | | | | |
| VISTA | VISTA HIGHWAY 126 Sat LOOPED | Sat | 291 | 60 | | | | | | | |
| VISTA | VISTA SANTA PAULA COMMUTER | M-F | 44 | 2 | | | | | | | |
| Simi Valley Transit | SIMI VALLEY A | Sat | 394 | 30 | | | | | | | |
| Simi Valley Transit | SIMI VALLEY A | M-F | 773 | 30 | | | | | | | |
| Simi Valley Transit | SIMI VALLEY B | Sat | 348 | 30 | | | | | | | |

| | | |
|---|---|---|
| **Data Type** | Average Daily Passenger Boardings | User can only complete areas shaded in yellow. |
| **Current Data Month** | March | * indicates field required for output calculation. |
| **Current Data Year** | 2009 | |

| Operator | Route Name | Day Type | Current Boardings * | Current Headway * | New Headway * | Med/high Income ? | Growing Economy? | Walkable? | Timed Transfers? | Potential Ridership | Potential % Change |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Sample Transit* | *Sample Route* | *Sun* | *200* | *60* | *15* | *Yes* | *Yes* | *No* | *Yes* | ***626*** | ***213%*** |
| Simi Valley Transit | SIMI VALLEY B | M-F | 623 | 30 | | | | | | | |
| Simi Valley Transit | SIMI VALLEY C | Sat | 165 | 60 | | | | | | | |
| Simi Valley Transit | SIMI VALLEY C | M-F | 258 | 60 | | | | | | | |
| Simi Valley Transit | SIMI VALLEY D | Sat | 59 | 90 | | | | | | | |
| Simi Valley Transit | SIMI VALLEY D | M-F | 104 | 90 | | | | | | | |
| Thousand Oaks Transit | Thousand Oaks Route 1 - GOLD | M-F | 231 | 45 | | | | | | | |
| Thousand Oaks Transit | Thousand Oaks Route 2 - GREEN | M-F | 190 | 20 | | | | | | | |
| Thousand Oaks Transit | Thousand Oaks Routes 3 & 4 - RED | M-F | 135 | 45 | | | | | | | |
| Camarillo Area Transit | CAMARILLO 1 TO COMMUNITY CENTER | M-F | 66 | 60 | | | | | | | |
| Moorpark Transit | MOORPARK ROUTE 1 | M-F | 10 | 60 | | | | | | | |
| Moorpark Transit | MOORPARK ROUTE 2 | M-F | 123 | 60 | | | | | | | |

Please Contact Kim Chan at Jacobs Engineering if you need more lines.

# Model Assumptions

A route-by-route model that factors up current ridership based on the elasticity factors from the TCRP report for service frequency changes. The factors vary depending on important route characteristics, as indicated by the literature. Similarly, factors for timed transfers are used to account for bus meet improvements, scaled based on headway.

IMPORTANT NOTE: This model is very limited as it uses factors that are interpolations or averages of a few case studies. It is also not able to estimate ridership on new routes; it can only estimate new ridership on existing routes given changes in service levels. Similarly, this model should not be used to assess dramatic changes in route service level, such as peak-only commuter service with 1 or 2 buses per day upgraded to all-day service. Service changes like these are outside the ability of this model to assess.

In contrast, actual ridership depends on specific local characteristics, including but not limited to:

- Origin and destination trip patterns
- Travel time to key activity centers
- Competing transit service availability
- Population & employment densities
- Parking costs
- Transit system connectivity
- Frequency

Since this model does not directly account for any of these important factors, its results must be viewed cautiously. However, it should produce a rough order-of-magnitude estimate of ridership given service frequency changes. The model assumptions include the following five factors, based on observations of the route and the area it serves:

(1) A base elasticity of 0.3 for service improvements in a suburban environment.
(2) If the majority of the route serve a healthy and growing economic environment, then an additional elasticity of 0.2
(3) If the majority of the route serves middle and high income areas, then an additional elasticity of 0.2
(4) If the majority of the route serves walkable areas, then an additional elasticity of 0.2
(5) - For routes with a current headway of 60 minutes or greater, assume a 100% factor.
- For routes with a current headway of 31-59 minutes, assume a 75% factor.
- For routes with a current headway of 30 minutes, then assume a 50% factor
- For routes with a current headway of 16-29 minutes, then assume a 25% factor
- For routes with a current headway of 15 minutes or less, then assume a 10% factor.

To account for ridership gains with the scheduling of timed transfers for the route's major transit centers, regardless of other improvements, the following scale is proposed:

- For routes with a new headway of 60 minutes or greater, then assume a 15% factor.
- For routes with a new headway of 31-60 minutes, then assume a 12% factor.
- For routes with a new headway of 30 minutes, then assume a 10% factor.
- For routes with a new headway of 16-29 minutes, then assume a 5% factor.
- For routes with a new headway of 15 minutes or less, then assume a 1% factor.

Finally, assume a maximum cap to the system ridership increase of 300%.
These assumptions are based on our interpretation of the available research.

## Model Input Factors

The User has no need to change these factors. These are only changed if the model assumptions change.

| Factor Name | Input | Description |
|---|---|---|
| | | |
| *General Service Improvements* | | |
| Base Elasticity | 0.30 | Improvements in a suburban environment |
| | | |
| *Increase Factor due to Route Conditions* | | |
| Economic Growth | 0.20 | Majority of route serves a growing economic environment |
| Middle / High Income | 0.20 | Majority of route serves middle and high income areas |
| Walkable | 0.20 | Majority of route serves walkable areas |
| | | |
| *Increase Factor for Decreased Headways* | | |
| 60 minutes plus | 1.00 | Current headway is 60 minutes or more |
| 31-59 minutes | 0.75 | Current headway is 31-59 minutes |
| 30 minutes | 0.50 | Current headway is 30 minutes |
| 16-29 minutes | 0.25 | Current headway is 16-29 minutes |
| 15 minutes or less | 0.10 | Current headway is 15 minutes or less |
| | | |
| *Increase Factor for Timed Transfers* | | |
| 60 minutes plus | 0.15 | New headway is 60 minutes or more |
| 31-59 minutes | 0.12 | New headway is 31-59 minutes |
| 30 minutes | 0.10 | New headway is 30 minutes |
| 16-29 minutes | 0.05 | New headway is 16-29 minutes |
| 15 minutes or less | 0.01 | New headway is 15 minutes or less |

| *Maximum Increase* | | |
|---|---|---|
| 300% | 4 | |

# Appendix E

# Public Involvement Documentation

November 10, 2009

Mr. Steve DeGeorge
Ventura County Transportation Committee
950 County Square Drive, Suite 207
Ventura, CA 93003

Dear Steve:

The following is a detailed description/documentation of our work on behalf of the Ventura County Transportation Commissions' Transit Investment Study.

Introduction
Consensus Planning Group, Inc. (Consensus) was retained by Jacobs Engineering Group, Inc. to facilitate a community outreach program on behalf of the Ventura County Transportation Committee's Transit Investment Study.

The goals of the Public Participation Plan were to:

- Communicate proactively with stakeholders about the Transit Investment Study and how their participation is important in the planning process
- Ensure that Ventura County Transportation Commission (VCTC) Board Members and Elected Officials were kept apprised of the planning process and key milestones
- Educate and engage a broad-based group of stakeholders
- Elicit feedback from stakeholders regarding key transportation needs

The objectives of the Public Participation Plan were to:

- Utilize a variety of outreach techniques that make it easy for stakeholders to be informed and participate at whatever level of interest or time available
- Develop public information materials that are engaging through design and function while conveying complex technical information in clear and concise language
- Communicate with stakeholders and document the entire outreach effort

Following is a detailed report of the activities accomplished by Consensus:

- Created Public Participation Plan (Appendix 1) for the project:
  - Developed and refined draft public participation plan, including samples of an interview questionnaire and interview request letter
  - Presented and followed up with Transcom members to elicit their thoughts and obtain recommendations on who to involve in this process within their respective jurisdictions
  - Updated public participation plan based on feedback by Transcom members
  - Finalized public participation plan

- Created key stakeholders database to distribute information about the Transit Investment Study (Appendix 2) that included:
  - Ventura County of Governments study participants
  - Ventura County Transportation Commission Board members
  - Transportation-oriented groups
  - Elected officials
  - Business groups
  - Community-based organizations
  - Political organizations
  - Neighborhood associations
  - Institutions
  - Top employers
  - City Transportation/Planning Commissions

- Participated in January 29, 2009 Ventura County of Governments' (VCOG) meeting
  - Developed questionnaire for January 29 VCOG meeting (Appendix 3)
  - Staffed meeting and engaged participants to complete survey
  - Conducted follow-up calls to meeting attendees to encourage study participation
  - Prepared technical report to summarize responses from VCOG members (Appendix 4)

- Established feedback mechanism for Transit Investment Study on www.goventura.org
  - Created architecture for inclusion of Transit Investment Study on website (Appendix 5)
  - Developed web-based survey form for visitors to complete online

- Planned two community workshops to officially seek comments and feedback regarding transit needs within the county
  - Identified and secured dates and venues for workshops in Camarillo and Thousand Oaks
  - Developed community workshop strategy and format (Appendix 6)
  - Created mailing invite and printed and conducted mailing to more than 500 contacts (Appendix 7)
  - Noticed all community-based organizations and neighborhood associations, transportation-oriented groups, and local libraries in Ventura County to distribute community workshop invitation to their memberships and post invitation in public gathering sites
  - Designed and purchased Ventura County Star and Acorn advertisements in advance of the workshops (Appendix 8)
  - Revised questionnaire for community workshops (Appendix 9)
  - Drafted funding board for Funding station at workshop
  - Prepared materials for the workshops including sign-in sheets, team name tags, and VCTC commission name tags
  - Organized and staffed April 9th workshop in Camarillo and April 15th workshop in Thousand Oaks

Organizations contacted and results achieved include:

- Cabrillo Economic Development Corporation
  *Resulted in distribution of invite to all offices and properties they own*
- Ventura County Visitors and Convention Bureau
  *Resulted in calendar section of website and on upcoming events banner on the home page*
- Camarillo Council on Aging
  *Resulted in the transportation committee chair making an announcement at their committee meeting and forwarding the invite to the rest of the council*
- Ventura Agricultural Association
  *Resulted in forwarding of invite to board members and general membership of the Association*
- Ventura County Civic Alliance
  *Resulted in forwarding of invite to membership*
- Filipino American Council of Ventura County
  *Resulted in announcement at March 31 board meeting and distribution of invite to Council membership via email*
- Wilson Senior Center
  *Resulted in posting of invite in event bulletin*
- Lions Club
  *Resulted in posting of information on website*
- LULAC
  *Resulted in forwarding invite to board and announcement at upcoming meeting*
- Rotary District Office
  *Resulted in distribution of invite at all district offices*
- Senior Concerns
  *Resulted in forwarding of invite to staff and members*
- Ventura County Regional Energy Alliance
  *Resulted in forwarding of invite to staff*
- Ventura Senior Recreation Center
  *Resulted in forwarding of invite to centers and staff*
- City of Thousand Oaks Council on Aging
  *Resulted in an e-blast to more than 600 people*
- Ventura County Area Council on Aging
  *Resulted in forwarding of invite to all staff*
- Ventura County Parks Department
  *Resulted in forwarding of invite to all staff*
- Camarillo Library
  *Resulted in posting of invite on library's bulletin*
- Fillmore Library
  *Resulted in posting of invite on library's bulletin*
- Moorpark Library
  *Resulted in posting of invite on library's bulletin*
- Santa Paula Public Library/Blanchard Community Library
  *Resulted in posting of invite on library's bulletin*

- Grant R. Brimhall Library
  *Resulted in posting on invite on library's bulletin*
- Oxnard Public Library
  *Resulted in distribution of invite to all Oxnard libraries*
- Ventura County Library
  *Resulted in distribution of invite to 14 libraries in County*
- Help of Ojai
  *Resulted in posting of invite at center*
- Port Hueneme Community Center
  *Resulted in posting of invite at center*
- Moorpark Active Adult Center
  *Resulted in posting of invite on event's bulletin and forwarding of invite to all staff*
- Ojai Valley Green Coalition
  *Resulted in mention in April newsletter*

- Managed daily and weekly activities for the project including:
  - Participating in weekly team conference calls and discussions regarding community outreach activities
  - Checking the project hotline daily for inquiries about the study and workshop RSVPs

- Media relations:
  - Consensus secured an interview with the Ventura County Star showcasing the study and the workshops. Consensus created a media brief with key themes and messages and staffed the interview with Darren Kettle, VCTC Executive Director. The interview resulted in an article in the paper prior to the April 9th community workshop in Camarillo.

Conclusion and Next Steps

In today's politically sensitive and competitive funding environment, broad public participation and support is critical to the success of any major public infrastructure project. However, getting the general public to participate in the development of a project is getting ever more challenging as stakeholders spend more and more time commuting to/from work and engaged in essential daily activities. We witnessed this challenge first hand.

In order to obtain the sought-after feedback from the community and to ensure that any plans the Commission puts forth for the future of transit in the county encompass the thoughts of the residents, we recommend hosting additional workshops throughout the county. Our budget only allowed for two workshops, this limited the number of participants because of travel limitations and time constraints.

In addition, to raise awareness about the Commission throughout the county with the goal of greater participation in determining the future of transit, we suggest individual meetings with stakeholder organizations throughout the county including Chambers of Commerce, major employers, business groups, homeowner associations, community-based and social service organizations, and schools, colleges, and universities. While these groups were contacted to

participate in the study, they did not contribute in a significant way. Attending their monthly meetings or meeting with them in their locales will generate additional feedback desired for the study.

Please do not hesitate to contact me at (213) 438-1755 ext. 117 with any questions.

Sincerely,

Sara M. Costin
Director

# *Ventura County Transportation Commission*
# *Transit Investment Study*

Questionnaire Report

March 2009

# Executive Summary

Consensus Planning Group, Inc. (CPG), worked with the Ventura County Transportation Commission (VCTC) to solicit feedback from key stakeholders in Ventura County to help identify current and future transportation needs throughout the County.

At the Ventura County Council of Governments' monthly meeting on January 29, 2009 a survey was given to elected officials and other city representatives representing the ten cities of Ventura County. The survey serves as one component of VCTC's Transit Investment Study (TIS). Due to their intimate understanding of constituent issues, especially those relating to local and regional transportation issues, their feedback is critical for the TIS.

The **most important issues** to the participants with regard to the current and future transportation needs for Ventura County are (in order of prevalence):

1. Frequency of transit thereby reducing headways.
2. Connectivity between east and west Ventura County.
3. Accessibility to transit via more strategically based bus stops and increasing weekend/evening service.
4. Service deficiencies throughout Ventura County especially in Santa Paula, Fillmore and Ojai.
5. Lack of funding throughout Ventura County creating transportation challenges on both the local and regional level; however, participants largely agreeing that constituents would not support a tax measure to increase funding.

# Key Issues

**Key Issues Summary**
Based on questionnaires submitted to date, the following are the key issues raised by stakeholders:

**Regional**

1. **Frequency-** More frequent service would minimize the amount of time riders spend on the bus and would help promote transit as a viable transportation alternative.
2. **Connectivity-** Lack of connectivity and coordination between cities makes it difficult for transit riders to travel from one side of the county to the other, whether east to west or north to south. Stronger transit connections between cities need to exist to create accessibility to jobs, educational centers, government centers, etc.
3. **Accessibility**- Enhance accessibility by providing more busses, additional strategic bus stops and improving service during evenings and weekends.
4. **Multi-modal transit center**- Create a transit hub in downtown Ventura that ties Metrolink, Amtrak, Greyhound, VISTA and future rail service.
5. **Regional bus service-** Combine existing transit services into one regional bus service managed by a regional authority. Respondents said this would increase the effectiveness of funding and service throughout Ventura County.

**Local**

1. **Transit deficiencies-**
    a. Increase transit options specifically VISTA service in East County cities such as Ojai, Fillmore, Santa Paula, and Piru not only to connect between cities but enhance accessibility to the rest of the county.
    b. Currently, unincorporated areas outside of Ojai city limits do not have sufficient public transit options.
    c. Northwest Port Hueneme and Hueneme Bay do not have mass transit especially for seniors who reside in that region.
    d. Improve transit west of Victoria Avenue, beach communities, and Oxnard Transportation Center.
    e. Bus routes in Thousand Oaks are inefficient.
2. **SR-101/ SR-23 interchange**- Upgrade existing interchange to reduce bottlenecks and increase the flow of traffic.
3. **Dial-A-Ride programs**- Protect transportation options for the aging and disabled population who depend on dial-a-ride and paratransit programs to travel throughout Ventura County.
4. **SR- 118-** Widen and landscape SR-118 to increase flow of traffic in Simi Valley, Thousand Oaks and Moorpark region.

5. **Metrolink**- Expand Metrolink service in Ventura County by providing a station in downtown Ventura and Thousand Oaks.
6. **Bike paths-** Create more bike paths and increase pedestrian pathways in every city.
7. **Bus shelters-** Provide more bus shelters in every city.
8. **Funding-** Provide funding for Ojai Trolley, Gold Coast Transit, and HELP Ojai's van service.
9. **Improvements-** Improve bypass on Highway 33 through Casitas Springs to increase safety and reduce traffic.
10. **Street paving**- Improve both streets and highways by repaving existing roads.

## Funding

The general consensus is that there is not enough funding on both the local and regional levels and there is an ongoing struggle to find resources to fund projects. Cities are faced with difficult challenges when prioritizing projects based on limited federal financial support. Furthermore, Ventura County lacks funding for both capital projects and ongoing maintenance and operations.

1. **Tax Measure**
    a. More than half of the participants said that their constituents would not support a tax measure devoted to transportation infrastructure. Reasons cited include the state of the economy as well as increasing taxes on the State level, and for cities like Oxnard and Port Hueneme a ½ cent sales tax is already in place to fund transportation improvements.
    b. Those who thought their constituents would support a county wide tax measure said it would require an extensive public relations effort to educate stakeholders on the necessity and benefits of implementing such a measure. Benefits to emphasize would include increasing support for transit operations, improving transportation services for workers in the county, and highlighting how the measure will improve quality of life.

## Other concerns

1. **Geography**- The geography of Ventura County makes it difficult to develop a cohesive county wide transportation system because the region is extremely large and spread out (about 1,800 square miles) and is divided by the Conejo grade.
2. **Light rail-** Although transit is important, various participants mentioned the pursuit of light rail as a viable transportation option for the future. The Conejo grade poses an impediment to light rail, so other routes such as Highway 126 should be considered for future light rail development to transport East County residents to the Santa Clarita Valley and Ventura government and employment centers.

# Conclusion

Participants who advocated the pursuit of both regional and local transit solutions believe that by addressing both issues concurrently the most effective transportation vision will be created that tackles local and county-wide transit needs. However, participants who favored regional transit planning as Ventura County's priority believe we need to solve current deficiencies first and develop a comprehensive transportation plan for the future on a regional scale. As noted, participants sited frequency, connectivity and accessibility to transit on both a regional and local level as the largest impediment to the use of transit throughout Ventura County. Only by addressing these current and future needs will Ventura County be able to increase ridership and create a transit system that is convenient and viable. Locally, East County cities are the least connected to the rest of Ventura County and other areas such as Santa Barbara, Los Angeles and Santa Clarita. Transit service in these cities needs to be improved on a large scale by providing more routes, more buses and higher frequency of service. Although the future transportation vision of Ventura County depends largely on the availability of funding resources, participants were reluctant to advocate the implementation of a regional tax measure devoted to expanding transportation infrastructure, citing the state of the economy and increasing taxes throughout the state as existing obstacles; however, participants noted that a strategic public relations campaign that educated voters on the needs and benefits could be effective in swaying voters.

# Questionnaire Participants

| Questionnaire/Interview Participant | Organization |
|---|---|
| Linda Parks | Supervisor, Ventura County 2nd District |
| Donald J. Katz | Staff Member, Ventura County 2nd Supervisorial District |
| Kathy Long | Supervisor, Ventura County 3rd District |
| Kristy Weir | Mayor, City of Buenaventura |
| Don Waunch | Mayor, City of Camarillo |
| Kevin Kildee | Vice Mayor, City of Camarillo |
| Jennifer Herrera | City of Camarillo |
| Mark Van Dam | Mayor Pro Tem, City of Moorpark |
| Joe DeVito | Mayor, City of Ojai |
| Sylvia Muñoz-Schnopp | Councilmember, City of Port Hueneme |
| Tony Volante | Former Mayor, City of Port Hueneme |
| Judy Rice | City Clerk, City of Santa Paula |
| Fred Robinson | Councilmember, City of Santa Paula |
| John Procter | Former Councilmember, City of Santa Paula |
| Steven Sojka | Councilmember, City of Simi Valley |
| Carl Morehouse | Councilmember, City of Ventura |

# Ventura County Transportation Commission
# Transit Investment Study
# Community Outreach Findings
# May 2009

## I. Executive Summary

The Ventura County Transportation Commission (VCTC) commissioned a study to identify issues concerning existing public transportation needs and service deficiencies in Ventura County. VCTC hired Consensus Planning Group, Inc. (Consensus) to solicit feedback from stakeholders in Ventura County. Consensus utilized a variety of outreach techniques to ensure stakeholders throughout the County were informed and participated in the study. Specifically Consensus,

- Solicited elected officials to participate in one-on-one or telephone interviews.
- Created a key stakeholders database of more than 550 to distribute information about the study.
- Participated in the January 29, 2009 Ventura County of Governments' (VCOG) meeting for newly-elected officials.
- Established a feedback mechanism for the study on www.goventura.org.
- Planned two community workshops (on April 9 and April 15) to seek comments and feedback regarding transit needs within the County. Outreach for these events included a direct mail/return request piece to more than 550 residents and local/regional organizations and (2) follow-up phone calls to remind organizations about the workshops and obtain commitments.

Of the 56 surveys received at the workshops and on-line, the two most discussed issues among respondents were (1) reliability, accessibility, and frequency of transit options throughout Ventura County and (2) the need for connectivity between east and west Ventura County.

Participants at the community workshops expressed their appreciation and support for such venues to provide comments, and encouraged VCTC to host additional events throughout the County. Our sense is that many attendees had not previously participated in transportation meetings held by VCTC or the transit operating agencies.

## II. Methodology

The questionnaire was used at three stakeholder meetings:

(1) January 29, 2009 Ventura County of Governments' monthly meeting,

(2) April 9, 2009 VCTC Community Workshop in Camarillo and

(3) April 15, 2009 VCTC Community Workshop in Thousand Oaks.

The questionnaire was also available on the VCTC website (www.goventura.org). The workshops were publicized in the *Ventura County Star* and *The Acorn* newspapers. Leading up to each workshop, Consensus conducted reminder phone calls to leading business groups, transportation-oriented groups, and community-based organizations to encourage attendance and participation. Several of these groups committed to distribute the workshop invitation to their membership, post the workshop information on their membership calendar, announce the workshop at their board meeting, post the workshop information on their website, and mention the workshop in their newsletters.

Fifty-six surveys were collected from two community workshops (April 9, 2009 in Camarillo and April 15, 2009 in Thousand Oaks), at the Ventura County Council of Governments' monthly meeting on January 29, 2009, and via the www.goventura.org website.

Participants who attended the community workshops were key stakeholders, community group leaders and Ventura County residents. The participants represented various cities including:

| | |
|---|---|
| Ventura | 15 |
| Camarillo | 14 |
| Oxnard | 5 |
| Newbury Park | 5 |
| Ojai | 3 |
| Port Hueneme | 3 |
| Santa Paula | 3 |
| Simi Valley | 2 |
| Somis | 2 |
| Oak Park | 1 |
| Thousand Oaks | 1 |
| Moorpark | 1 |
| Buenaventura | 1 |

## III. Questions Asked

1. What Ventura County city do you reside?
2. Which specific issues concern you regarding the existing public transportation services and/or infrastructure?
3. In your opinion, what are the most commonly cited transportation infrastructure deficiencies?
4. In Ventura County, which areas/communities do you believe have insufficient public transit options?
5. Should Ventura County be focused on pursuing local or regional transit solutions?
6. Which public transit projects do you believe are a priority?
7. In your city, do you believe there is adequate funding for public transportation? Which projects do you believe should receive funding?
8. Would you and/or your friends and family support a regional tax measure devoted to expanding transportation infrastructure?
9. In your opinion, what can VCTC do to encourage cooperation between cities to form a cohesive transportation vision?
10. Please identify any current issues or concerns that you are aware of in your community that may affect future transportation improvements.
11. What can VCTC do in their public outreach and/or information materials to encourage community members to participate in this study?
12. What key stakeholders/organizations would you suggest meeting with that would be interested in participating in this study?
13. Are there any additional transportation improvements that are needed that we have not discussed?

## IV. Key Findings from the Public

Overall, respondents feel that public transit is slow and inconvenient. There is an overwhelming sense that connectivity around the County needs to be improved whether it is by bus, train, or bike paths. Generally residents feel that it is easier to get in their car and drive to their destination.

### Regional

1. **Frequency-** More frequent service would minimize the amount of time riders spend on the bus and would help promote transit as a viable transportation alternative.
2. **Connectivity-** Lack of connectivity and coordination between cities makes it difficult for transit riders to travel from one side of the County to the other, whether east to west or north to south. Stronger transit connections between cities need to exist to create accessibility to jobs, educational centers, government centers, etc.
3. **Accessibility**- Enhance accessibility by providing more busses, additional strategic bus stops and improving service during evenings and weekends. Identify job access areas that should be transit accessible.
4. **Multi-modal transit center**- Create a transit hub in downtown Ventura that ties Metrolink, Amtrak, Greyhound, VISTA and future rail service.
5. **Regional bus service-** Combine existing transit services into one regional bus service managed by a regional authority. Respondents said this would increase the effectiveness of funding and service throughout Ventura County.
6. **Expansion-** Work to expand Gold Coast in the west and work on a regional system for the east County; integrate services with VISTA.
7. **VCOG/VCTC-** Merge VCOG and VCTC into a true regional planning and transportation agency; give the new agency power to create the Sustainable Communities Strategy required under SB 375.

### Local

1. **Transit deficiencies-**
    a. Increase transit options specifically VISTA service in East County cities such as Ojai, Fillmore, Santa Paula, and Piru not only to connect between cities but enhance accessibility to the rest of the County.
    b. Currently, unincorporated areas outside of Ojai city limits do not have sufficient public transit options.
    c. Northwest Port Hueneme and Hueneme Bay do not have mass transit especially for seniors who reside in that region.

    d. Improve transit west of Victoria Avenue, beach communities, and Oxnard Transportation Center.
    e. No public transit from Simi Valley to Oxnard.
    f. Bus service is lacking in Port Hueneme, Thousand Oaks, and Camarillo.
    g. Cal State Channel Islands buses are too large and limited to only a few of the campus roadways.
    h. VISTA is the only option from Ventura to Santa Barbara.
    i. Increased daytime/evening and night connections with VISTA Coastal Express.
2. **Dial-A-Ride programs**- Protect transportation options for the aging and disabled population who depend on dial-a-ride and paratransit programs to travel throughout Ventura County.
3. **Metrolink**- Expand Metrolink service in Ventura County by providing a station in downtown Ventura and Thousand Oaks.
4. **Bike paths-** Create more bike paths and increase pedestrian pathways in every city.
5. **Bus shelters-** Provide more bus shelters in every city.
6. **Funding-** Provide funding for Ojai Trolley, Gold Coast Transit, and HELP Ojai's van service.
7. **Street paving**- Improve both streets and highways by repaving existing roads.
8. **SR-101/ SR-23 interchange**- Upgrade existing interchange to reduce bottlenecks and increase the flow of traffic.
9. **SR- 118-** Widen and landscape SR-118 to increase flow of traffic in Simi Valley, Thousand Oaks and Moorpark region.
10. **Improvements-** Improve bypass on Highway 33 through Casitas Springs to increase safety and reduce traffic.

## Funding

The general consensus is that there is not enough funding on both the local and regional levels and there is an ongoing struggle to find resources to fund projects. Cities are faced with difficult challenges when prioritizing projects based on limited federal financial support. Furthermore, Ventura County lacks funding for both capital projects and ongoing maintenance and operations.

## Potential Tax Measure

While more than half of those that responded at the VCOG meeting said that their constituents would not support a tax measure devoted to transportation infrastructure, more than 60% of the attendees from the community workshops said they would support a tax measure.

## V. Key Findings from Elected Officials

One-on-one interviews were conducted with 16 elected officials about their perspectives on the transportation needs of the County. The most important issues with regard to the current and future transportation needs for Ventura County were (in order of prevalence):

1. Frequency of transit thereby reducing headways.
2. Connectivity between east and west Ventura County.
3. Accessibility to transit via more strategically based bus stops and increasing weekend/evening service.
4. Service deficiencies throughout Ventura County especially in Santa Paula, Fillmore and Ojai.
5. Lack of funding throughout Ventura County creating transportation challenges on both the local and regional level; however, participants largely agreeing that constituents would not support a tax measure to increase funding.

# WESTSIDE SANTA CLARITA VALLEY

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## Roadway Phasing Analysis

NOVEMBER 2006

AUSTIN-FOUST ASSOCIATES, INC.

DRAFT

# WESTSIDE SANTA CLARITA VALLEY
# Roadway Phasing Analysis

Prepared by:

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November 14, 2006

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# WESTSIDE SANTA CLARITA VALLEY
# Roadway Phasing Analysis

The purpose of this analysis is to evaluate the phased construction of new roadways within the Westside area of the Santa Clarita Valley. Traffic volume forecasts are presented and are utilized to evaluate the proposed phasing plan.

## 1.0 BACKGROUND

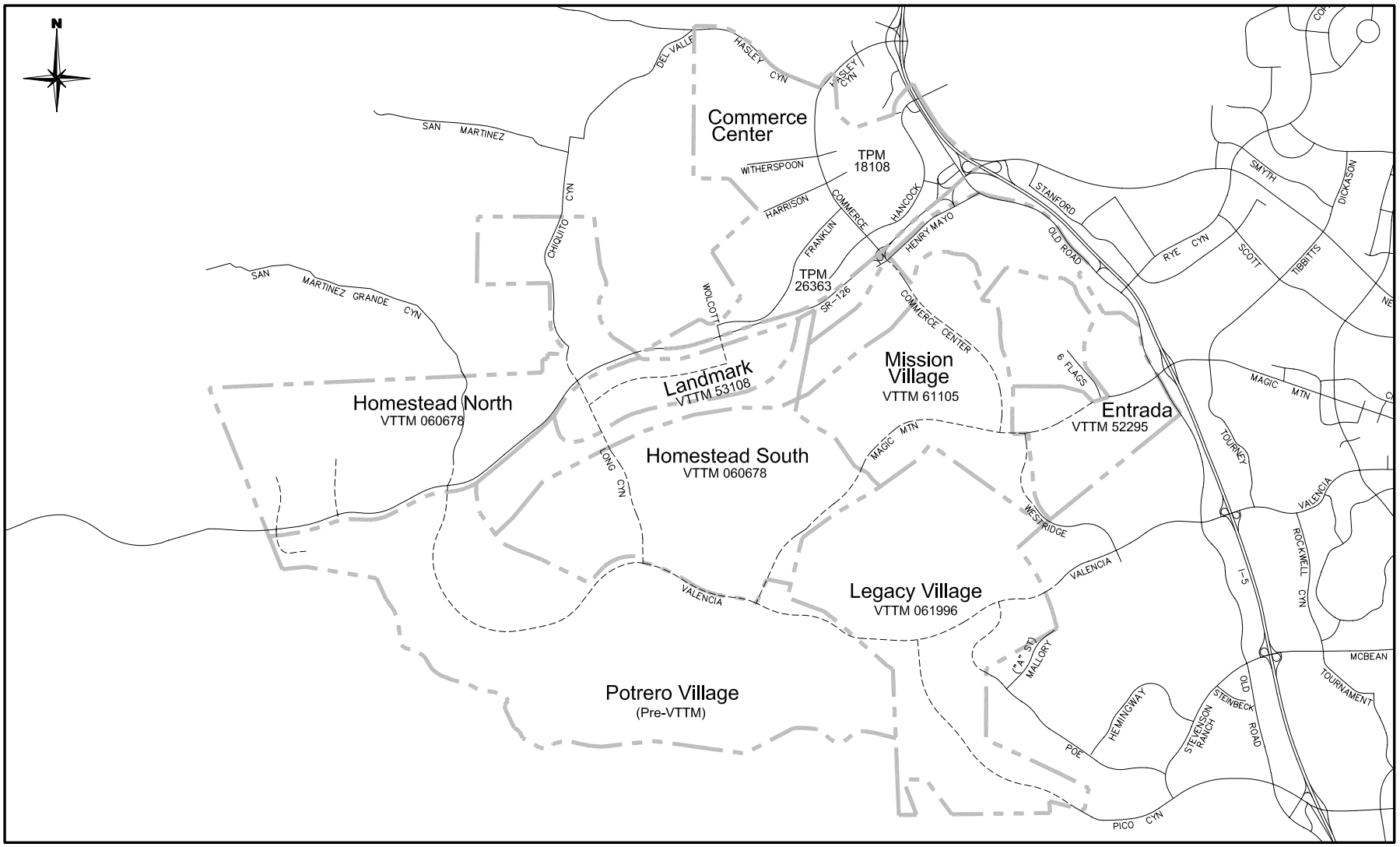
The Westside of the Santa Clarita Valley is defined for the purpose of this analysis as the general area west of the Interstate 5 freeway, north of the existing Stevenson Ranch area, south of the Hasley Canyon/Val Verde area, and east of the Ventura County line, as depicted in Figure 1. It includes the Newhall Ranch Specific Plan area and the entire area is generally under a single ownership. The Newhall Ranch Specific Plan along with Entrada, Legacy Village and the buildout of the Commerce Center represent all the projects that will build out this area over the next 25 years.

As the land development occurs, new roadway infrastructure will be constructed to serve the Westside area. New highways, which include three bridge crossings of the Santa Clara River, as well as extensions of existing highways such as Magic Mountain Parkway, Valencia Boulevard, Pico Canyon Road, and Commerce Center Drive, will provide the backbone highway system for the Westside. This analysis evaluates the phasing of that infrastructure in relation to the projected development.

## 2.0 METHODOLOGY

The timing and order of roadway construction is primarily based on the land development of the areas served by the roads. A draft master land use phasing plan has been prepared by the land owner for use with this analysis, and the plan provides the basis for the trip generation characteristics (amount and location) within the area being studied.

Several milestone years are modeled using versions of the Santa Clarita Valley Consolidated Traffic Model (SCVCTM) specially prepared for this analysis. These horizon years start at year 2011 and




Legend

- Westside Planning Area Boundaries
- Existing Roadway
- Future Roadway

Figure 1

WESTSIDE PROJECT AREA

continue through the year 2030. Detailed land use projections for the Westside area are utilized for the trip generation estimates for each of the horizon years. Outside the Westside area, trip generation estimates are interpolated using the SCVCTM Interim Year setting and Long-range Cumulative setting as the basis for the interpolation.

Figure 2 illustrates how the land use for the Westside area is projected to increase over time. Also shown in the figure is the corresponding trip generation for the same time period. Note that the Westside area as used in this analysis includes the Commerce Center, which accounts for the majority of the non-residential development of the initial years of the land use plan.

Figure 3 provides the corresponding information for the non-Westside portion of the Santa Clarita Valley. Details of the land use projections for the Westside area are provided in the following section.

## 3.0 WESTSIDE LAND USE

With the exception of the Commerce Center area, which currently has around 6.5 MSF of occupied industrial park uses, the existing condition of the Westside area is largely undeveloped. A summary of the Westside land use by development area is provided in Table 1, which shows the estimated dates for first occupancy and buildout.

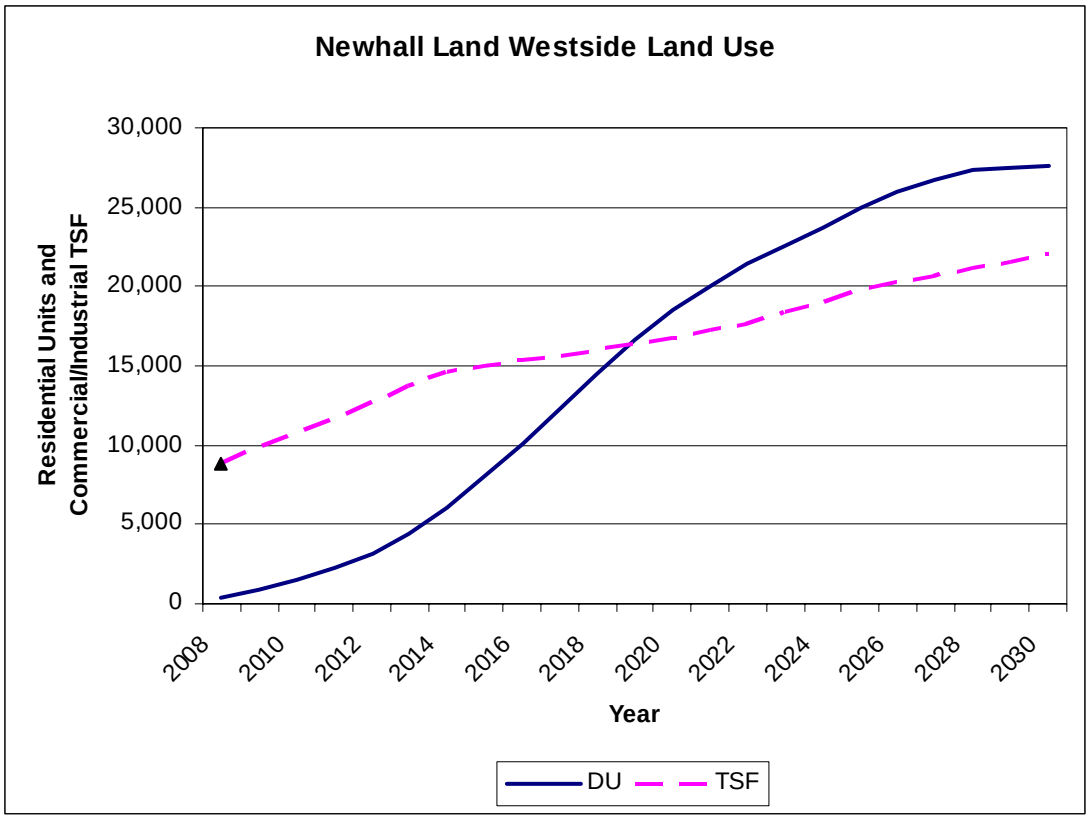
Table 2 provides a summary of occupancy projections for the Westside area. Detailed land use and trip generation estimates for each planning area are provided in Appendix A for each of the horizon years selected for analysis.

## 4.0 ROADWAY PHASING PLAN

A master phasing plan for Westside area roadways has been developed to serve the areas listed in the previous section. A total of seven distinct stages have been identified and are illustrated in Figure 4 through Figure 10.

The figures are organized such that roadway construction is identified by the years in which the construction needs to take place, which will tie in with the issuance of Certificates of Occupancy.

*text continued on Page 15*




▲Initial 9 MSF includes the existing Commerce Center plus estimated Commerce Center occupancies through 2008.

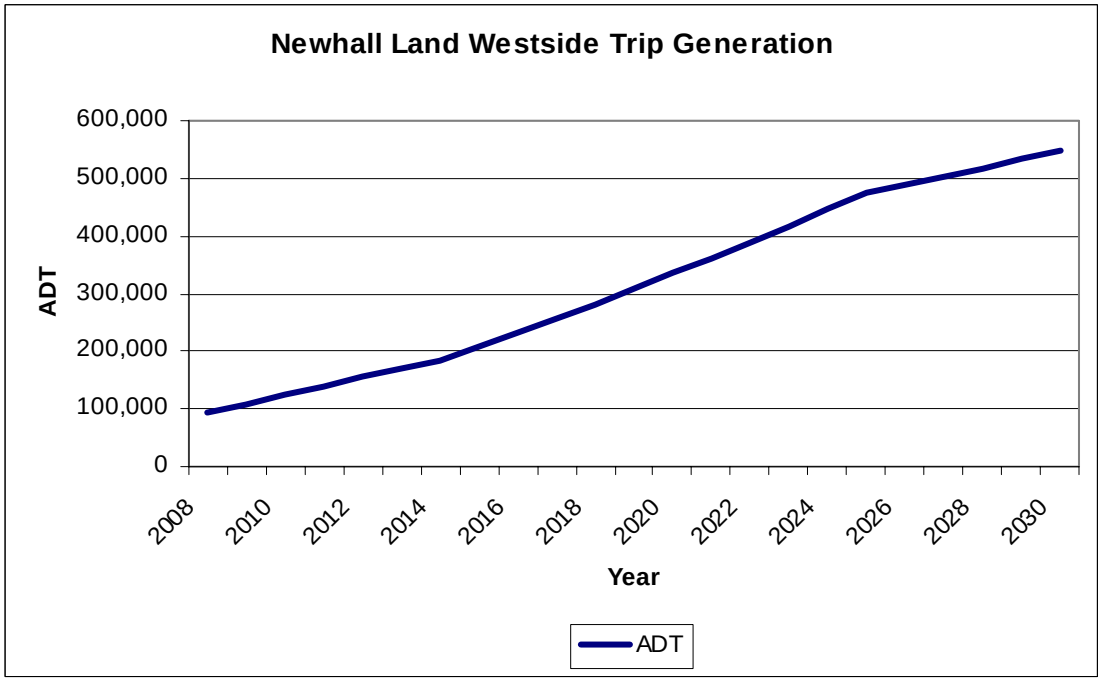
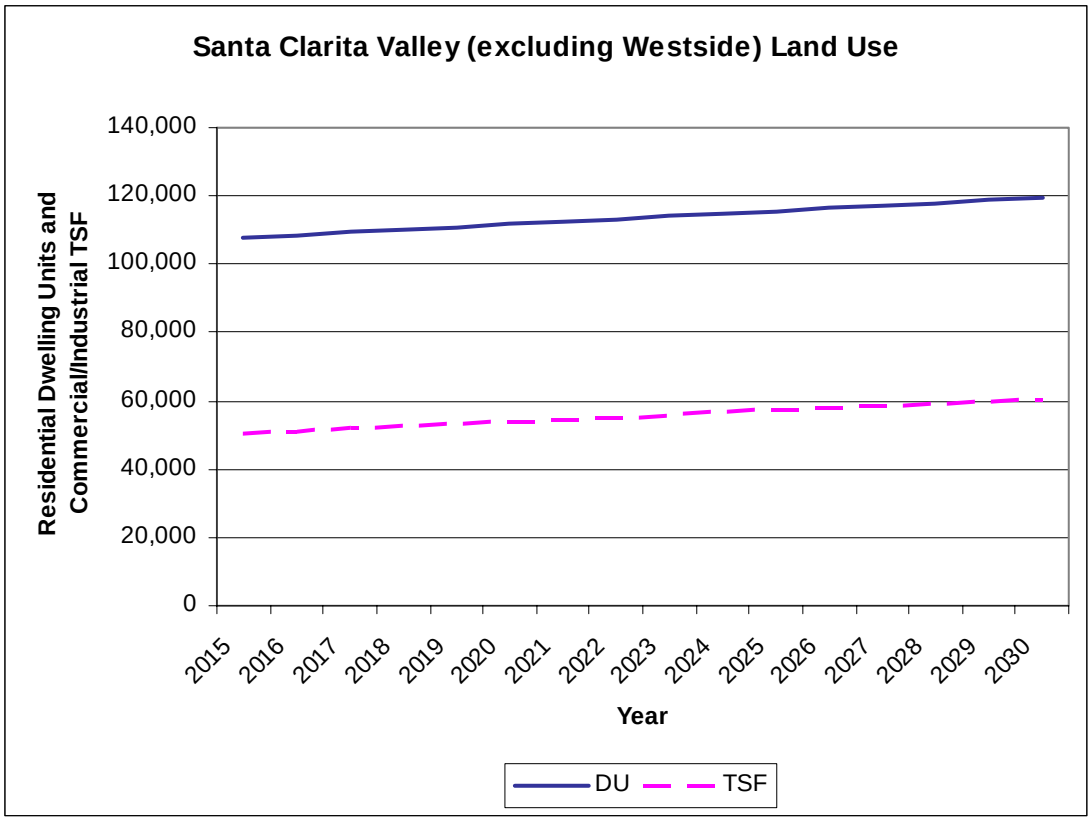



**Figure 2: Westside Land Use and ADT Growth Trends**



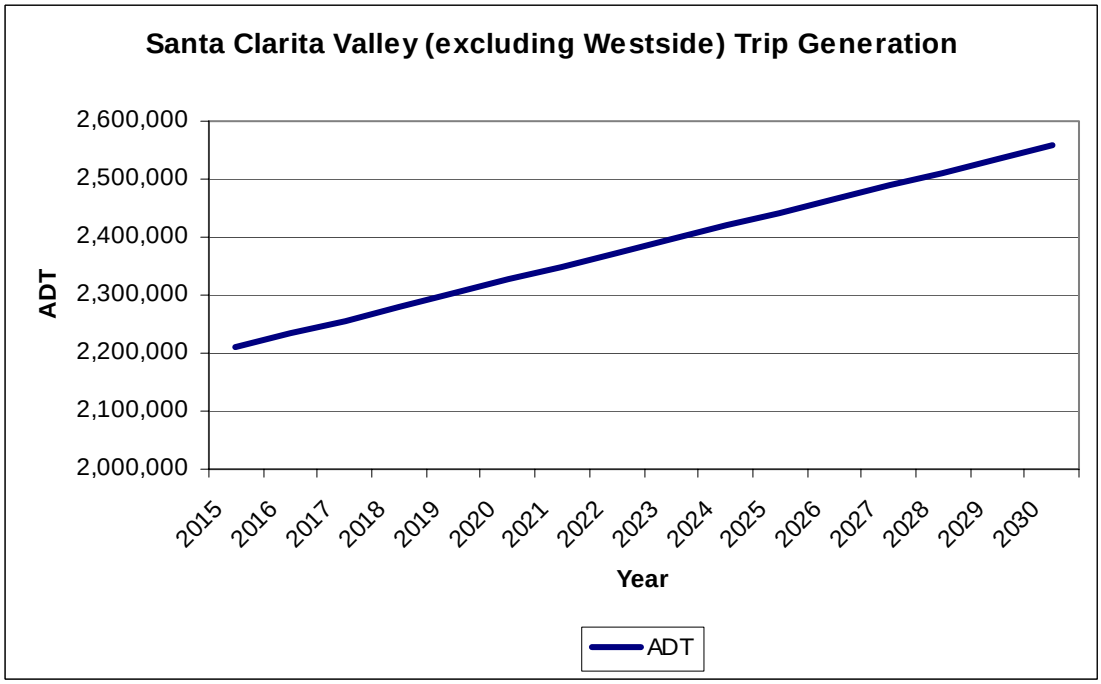




**Figure 3: Santa Clarita Valley (excluding Westside) Growth Trends**

**Table 1: Westside Land Use by Development Area**

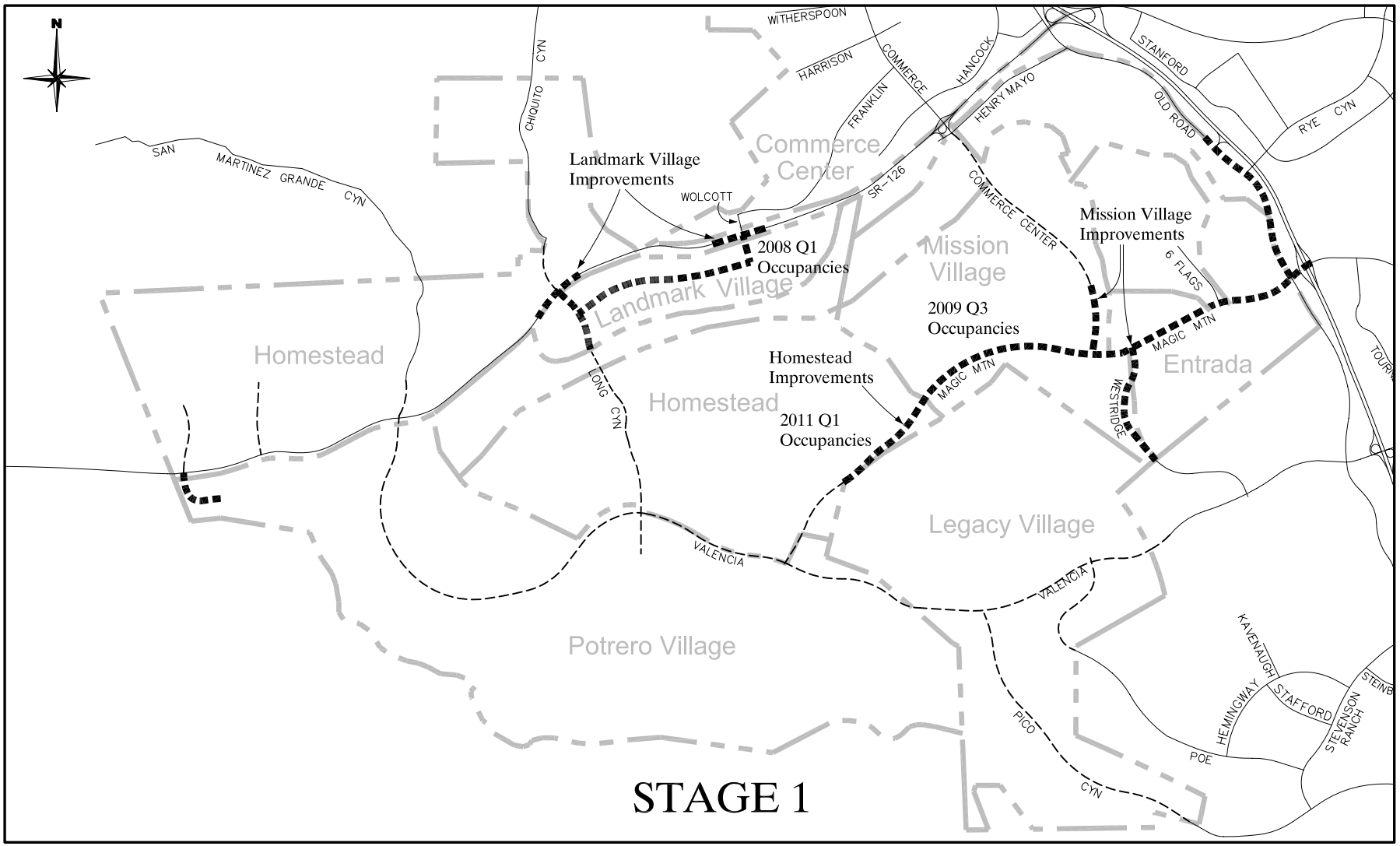
| Area/Land Use | Amount | First Occupancy | Buildout |
|---|---|---|---|
| **LANDMARK VILLAGE (NEWHALL RANCH)** | | | |
| Residential | 1,444 DU | 2008 | 2011 |
| Commercial | 1,033 TSF | 2008 | 2011 |
| **MISSION VILLAGE (NEWHALL RANCH)** | | | |
| Residential | 5,331 DU | 2009 | 2023 |
| Commercial | 1,299 TSF | 2009 | 2023 |
| **HOMESTEAD (NEWHALL RANCH)** | | | |
| Residential | 5,686 DU | 2011 | 2025 |
| Commercial | 1,330 TSF | 2023 | 2030 |
| **ENTRADA** | | | |
| Residential | 3,230 DU | 2011 | 2019 |
| Commercial | 3,285 TSF[1] | 2008 | 2030 |
| Hotel | 300 Room | 2023 | 2023 |
| **LEGACY VILLAGE (STEVENSON RANCH)** | | | |
| Residential | 3,500 DU | 2012 | 2020 |
| Commercial | 375 TSF | 2019 | 2022 |
| **POTRERO VILLAGE (NEWHALL RANCH)** | | | |
| Residential | 8,424 DU | 2013 | 2030 |
| Commercial | 1,257 TSF[2] | 2019 | 2030 |
| **COMMERCE CENTER** | | | |
| Commercial | 13,100 TSF[3,4] | existing | 2014 |
| **TOTAL** | | | |
| Residential | 27,615 DU | 2008 | 2030 |
| Commercial | 21,679 TSF | existing | 2030 |
| Hotel | 300 Room | 2023 | 2023 |

[1]VTTM 52295 only. Excludes other development by others that is part of the same traffic analysis zone.
[2]Excludes water reclamation plant.
[3]Includes existing development in the Commerce Center.
[4]Sterling Project (approximately 1.3 MSF) is not included in the above total but traffic forecasts include full occupancy of the Sterling site by 2011.

**Table 2: Westside Area Occupancy Projections**

| Location | Cumulative Occupancy Projections by Year | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2008-2011 | | 2012 | | 2013-2014 | | 2015-2018 | | 2019-2022 | | 2023-2025 | | 2026-2030 | |
| | DU | *MSF* | DU | *MSF* | DU | *MSF* | DU | *MSF* | DU | *MSF* | DU | *MSF* | DU | *MSF* |
| Landmark Village | 1,444 | *1.03* | 1,444 | *1.03* | 1,444 | *1.03* | 1,444 | *1.03* | 1,444 | *1.03* | 1,444 | *1.03* | 1,444 | *1.03* |
| Mission Village | 531 | *.29* | 932 | *.29* | 1,874 | *.31* | 3,930 | *.64* | 5,297 | *.96* | 5,331 | *1.30* | 5,331 | *1.30* |
| Homestead (No.) | -- | -- | -- | -- | -- | -- | -- | -- | 479 | -- | 1,779 | *.60* | 1,779 | *1.33* |
| Homestead (So.) | 112 | -- | 312 | -- | 851 | -- | 2,289 | -- | 3,907 | -- | 3,907 | -- | 3,907 | -- |
| Potrero Village | -- | -- | -- | -- | 114 | -- | 1,169 | -- | 3,516 | *.50* | 5,810 | *.90* | 8,424 | *1.36* |
| Legacy Village | -- | -- | 97 | -- | 597 | -- | 2,586 | -- | 3,500 | *.38* | 3,500 | *.38* | 3,500 | *.38* |
| Entrada | 150 | *.43*[1] | 391 | *.43* | 1,186 | *.43* | 3,097 | *1.23* | 3,230 | *1.68* | 3,230 | *2.47* | 3,230 | *3.58* |
| Commerce Center | -- | *10.46*[2] | -- | *11.42* | -- | *13.10* | -- | *13.10* | -- | *13.10* | -- | *13.10* | -- | *13.10* |
| Total | 2,237 | *12.21* | 3,176 | *13.17* | 6,066 | *14.87* | 14,515 | *16.00* | 21,373 | *17.65* | 25,001 | *19.78* | 27,615 | *22.08* |
| Net Increase from Previous Period | -- | -- | 939 | *.96* | 2,890 | *1.70* | 8,449 | *1.13* | 6,858 | *1.65* | 3,628 | *2.13* | 2,614 | *2.30* |

[1]Includes existing Castaic Junction area development and anticipated occupancies between existing and 2011.
[2]Includes existing Commerce Center development and anticipated occupancies between existing and 2011.

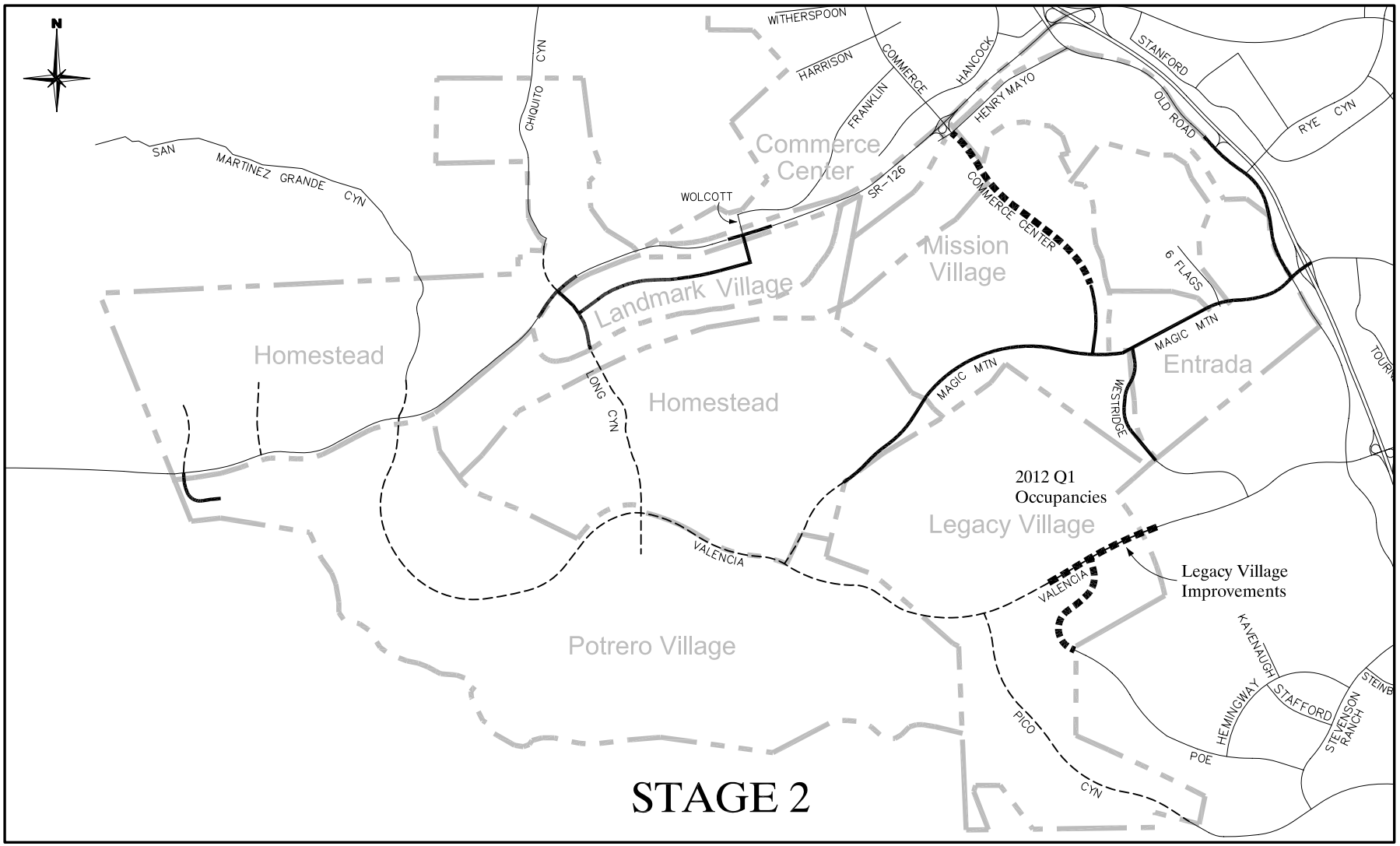



Legend

Construction This Stage
Planned Roadway (Future Stage)

Figure 4

STAGE 1 ROADWAY CONSTRUCTION (2007-2010)
- FOR OCCUPANCIES THROUGH
2,240 DU/12.2 MSF (2011)

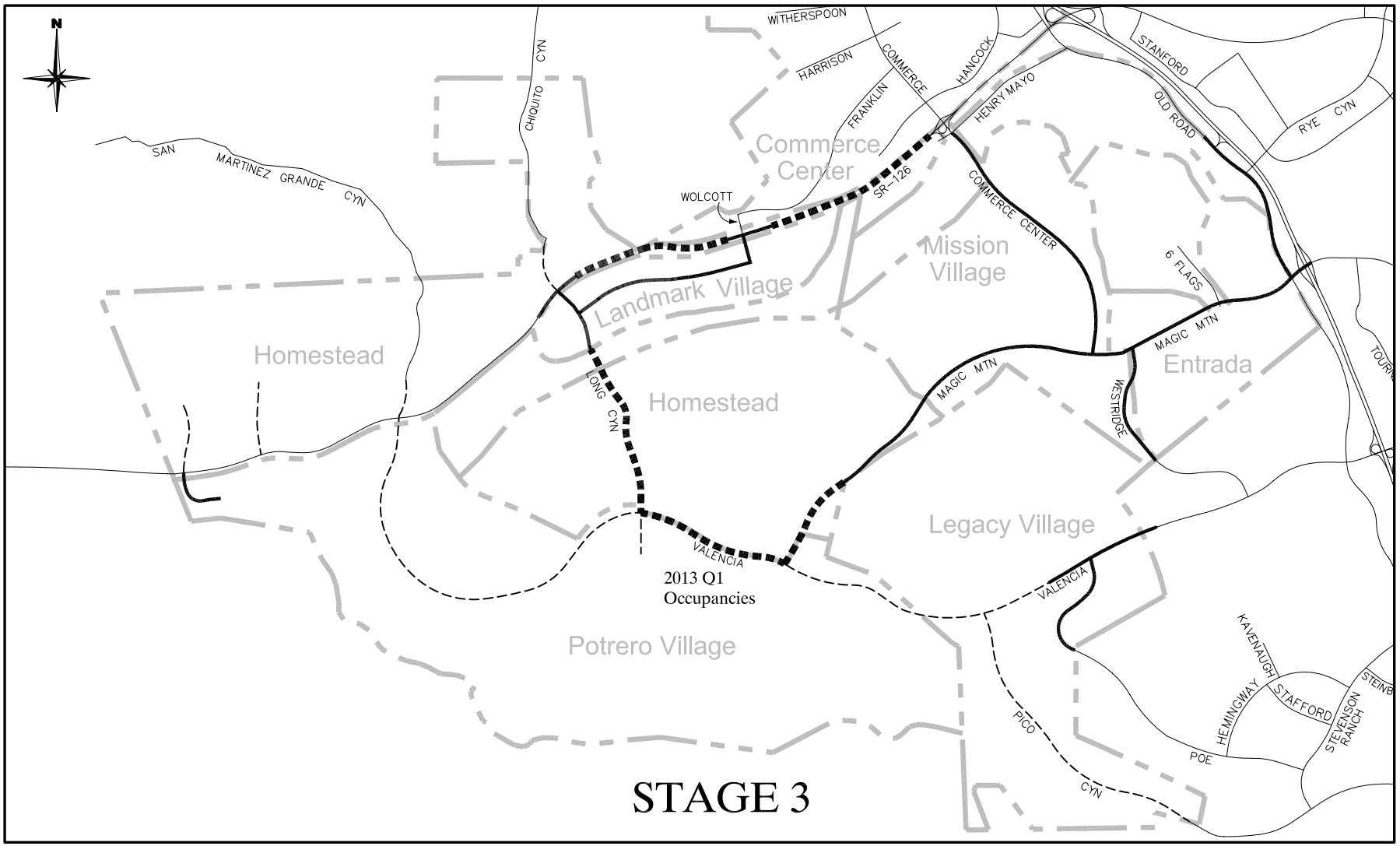



Legend

- Construction This Stage
- Constructed Previous Stage
- Planned Roadway (Future Stage)

Figure 5

STAGE 2 ROADWAY CONSTRUCTION (2010-2011)
- FOR OCCUPANCIES THROUGH
3,180 DU/13.2 MSF (2012)

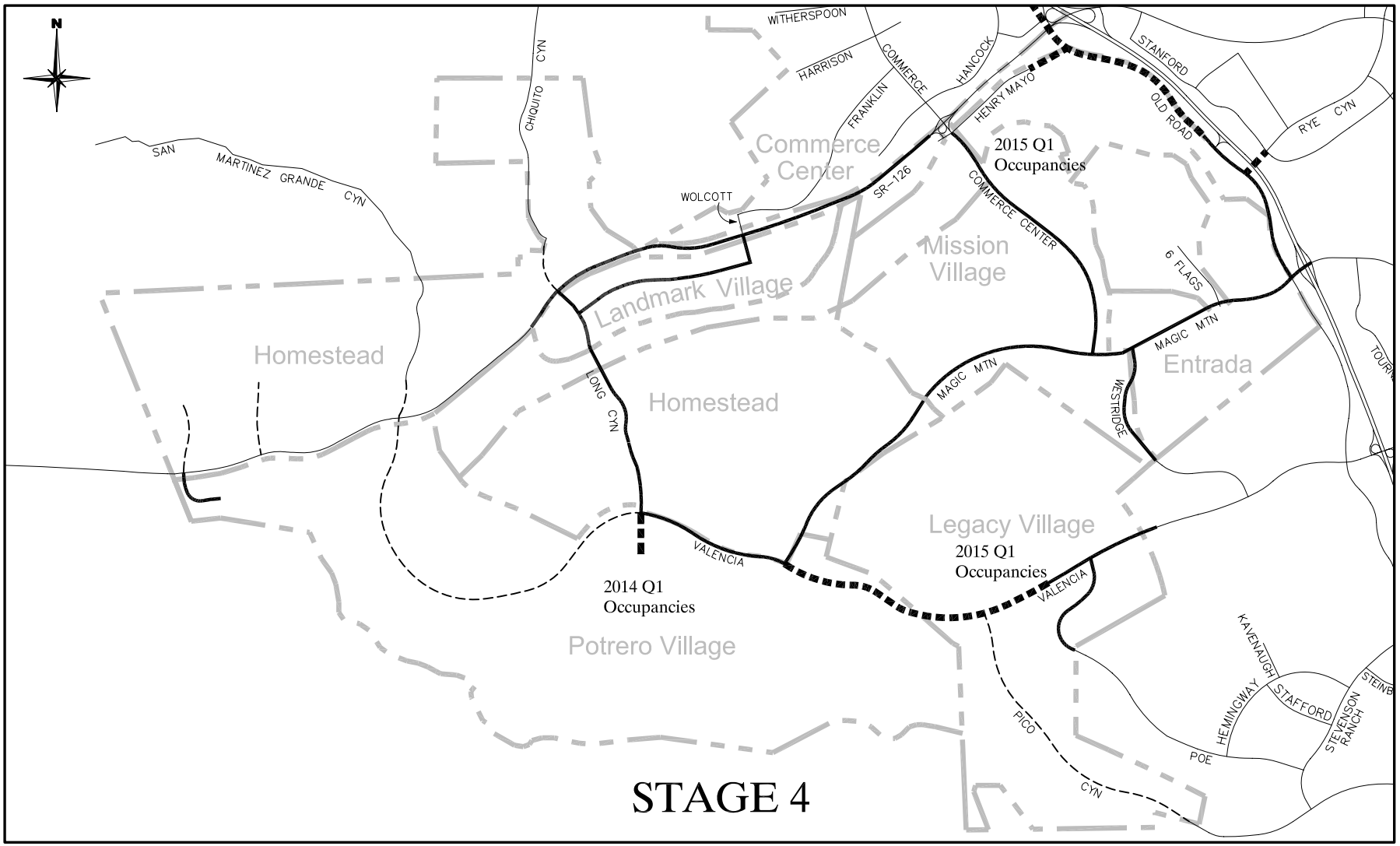



Legend

- Construction This Stage
- Constructed Previous Stage
- Planned Roadway (Future Stage)

Figure 6

STAGE 3 ROADWAY CONSTRUCTION (2012)
- FOR OCCUPANCIES THROUGH
6,070 DU/14.9 MSF (2014)

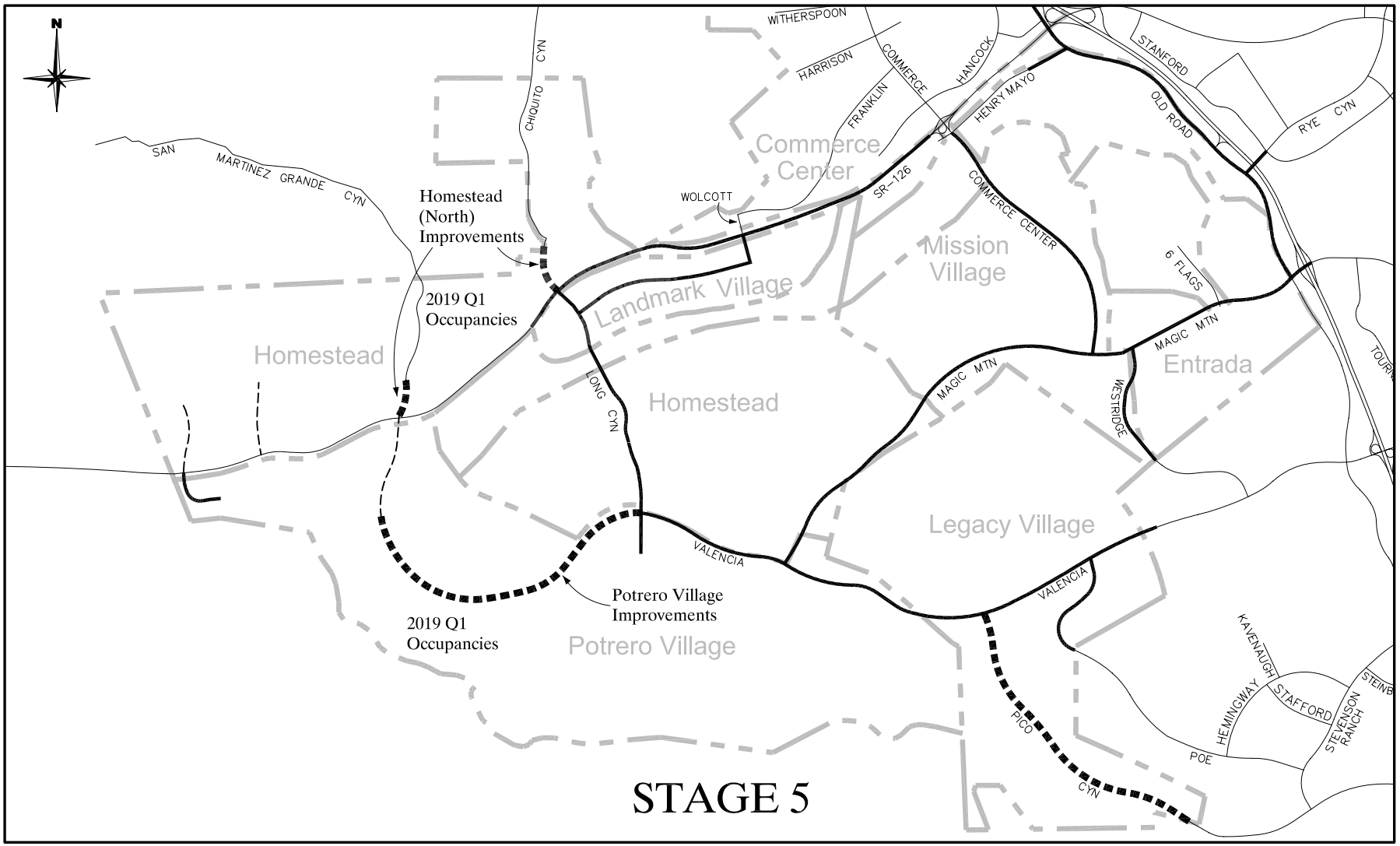



Legend

- Construction This Stage
- Constructed Previous Stage
- Planned Roadway (Future Stage)

Figure 7

STAGE 4 ROADWAY CONSTRUCTION (2013-2014)
- FOR OCCUPANCIES THROUGH
14,520 DU/16.0 MSF (2018)

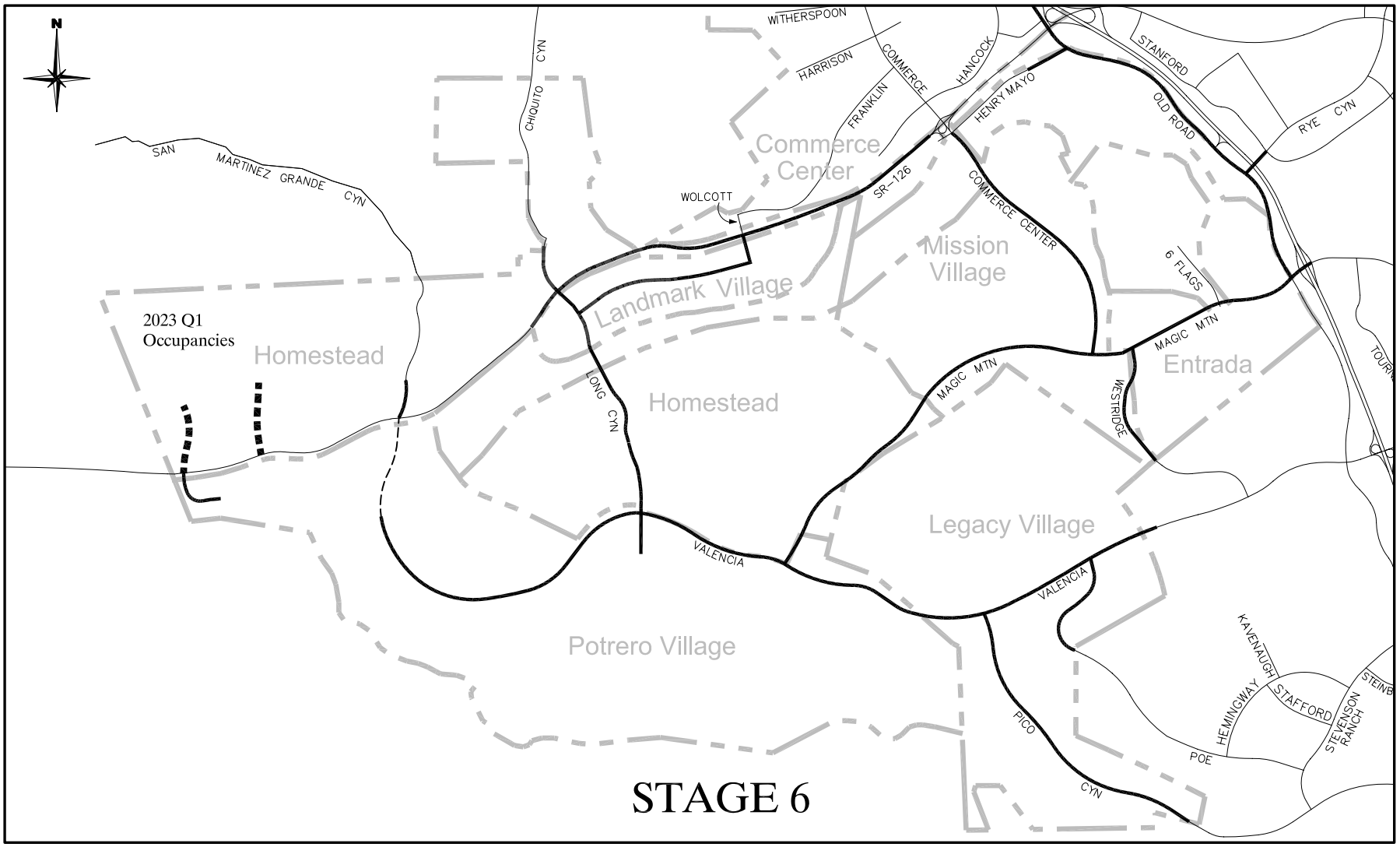



Legend

- Construction This Stage
- Constructed Previous Stage
- Planned Roadway (Future Stage)

Figure 8

STAGE 5 ROADWAY CONSTRUCTION (2015-2018)
- FOR OCCUPANCIES THROUGH
21,380 DU/17.7 MSF (2022)

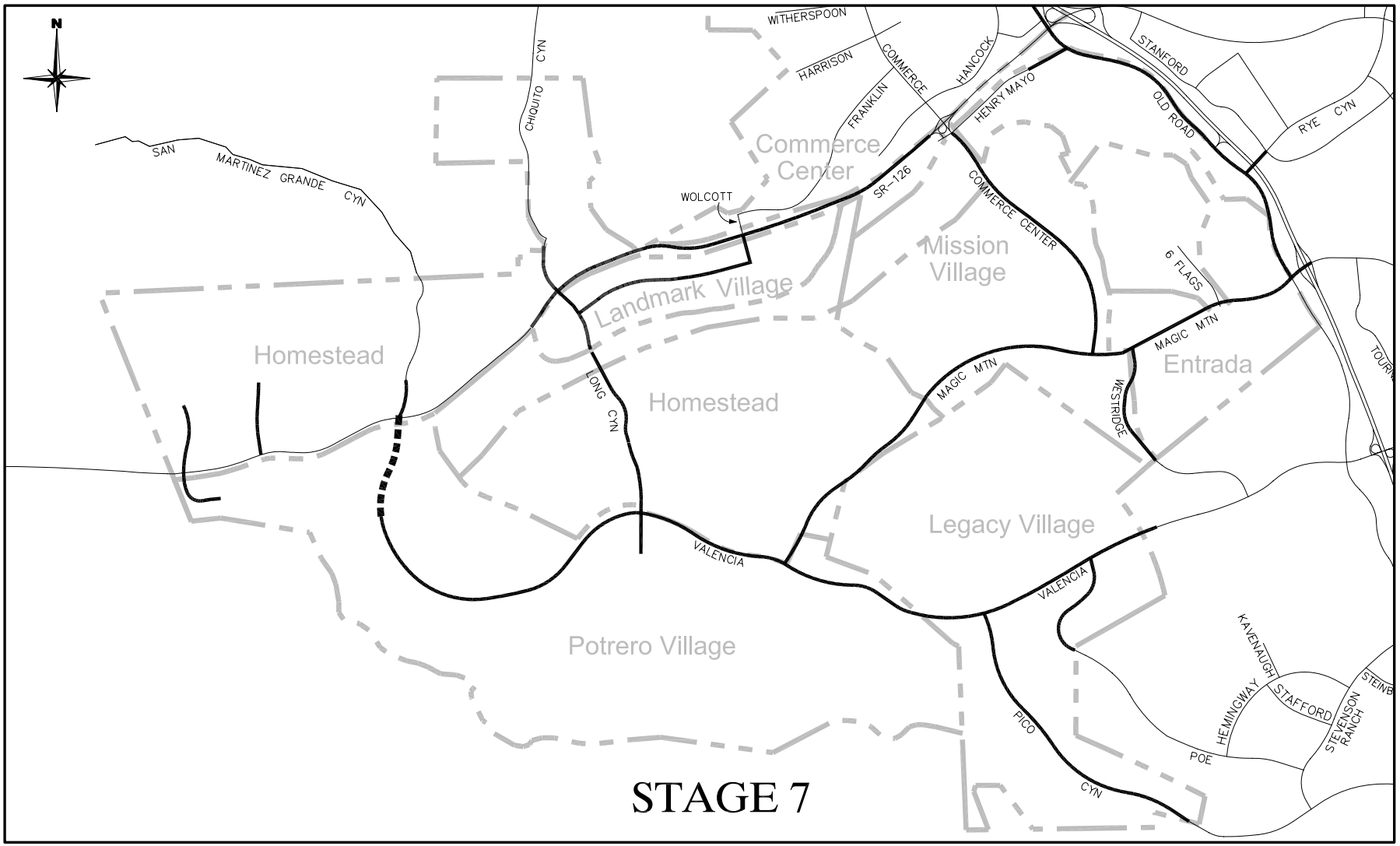



Legend

- Construction This Stage
- Constructed Previous Stage
- Planned Roadway (Future Stage)

Figure 9

STAGE 6 ROADWAY CONSTRUCTION (2019 - 2022)
- FOR OCCUPANCIES THROUGH
25,000 DU/19.8 MSF (2025)




Legend

- Construction This Stage
- Constructed Previous Stage
- Planned Roadway (Future Stage)

Figure 10

STAGE 7 ROADWAY CONSTRUCTION (2023-2030)
- FOR OCCUPANCIES THROUGH
27,620 DU/22.1 MSF (PROJECT BUILDOUT)

Completing the roadway construction by the years indicated will serve the land use plan as currently envisioned for that year and the years immediately following, after which additional infrastructure will be needed to serve additional development. Therefore, the infrastructure shown in each stage of construction will accommodate the land use development that will be occurring while the next stage of new roadways are being constructed. A description of each roadway construction stage, the estimated completion dates for the construction, and the amount of development that can be supported by that stage, is provided in Table 3.

**Table 3: Roadway Construction Stages**

| Stage | Description | Completion Date | Max DU | Max MSF |
|---|---|---|---|---|
| 1 | Construct access to Landmark Village from SR-126<br>Construct access to Water Treatment Plant from SR-126<br>Extend Magic Mountain Parkway into Mission Village<br>Extend Westridge Parkway to Magic Mountain Parkway<br>Widen The Old Road between Feedmill Road & the relocated Rye Canyon interchange<br>Extend Magic Mountain Parkway into Homestead | End of 2007<br>End of 2007<br>Mid 2009<br>Mid 2009<br>Mid 2010<br>End of 2010 | 2,237 | 12.21 |
| 2 | Construct Commerce Center Drive Bridge/connect Mission Village to SR-126<br>Extend Valencia Boulevard into Legacy Village<br>Extend Poe Parkway to Valencia Boulevard | End of 2011<br>End of 2011<br>End of 2011 | 3,176 | 13.17 |
| 3 | Extend Magic Mountain Parkway into Potrero Village<br>Construct segments of Valencia Blvd (Potrero Village) & Long Canyon Road<br>Construct Long Canyon Road Bridge/connect Homestead (South) to SR-126<br>Widen SR-126 to 8-lanes between Commerce Center Drive and Long Canyon Road | End of 2012<br>End of 2012<br>End of 2012<br>End of 2012 | 6,066 | 14.87 |
| 4 | Extend Valencia Boulevard to Potrero Village/Magic Mountain Parkway<br>Widen The Old Road between the relocated Rye Canyon interchange to just north of SR-126 | End of 2014<br>End of 2014 | 14,515 | 16.00 |
| 5 | Construct Valencia Blvd west of Long Canyon Road<br>Construct access to Homestead (North) from SR-126 at Chiquito Cyn Rd and at San Martinez Grande Cyn Rd<br>Extend Pico Canyon Road to Valencia Blvd | End of 2018<br>End of 2018<br>End of 2018 | 21,373 | 17.65 |
| 6 | Construct access to Homestead (North) from SR-126 at County Line | End of 2022 | 25,001 | 19.78 |
| 7 | Construct 3rd river crossing Bridge (Potrero/Valencia) | 2030 | 27,615 | 22.08 |

DU = Dwelling Units MSF = Million Square Feet (non-residential uses)
Max = Maximum amount of land use to be supported by Stage

The following section presents traffic model forecasts for the key stages of the phasing plan.

# 5.0 TRAFFIC FORECASTS BY PHASE

Key roadway construction stages have been modeled using the corresponding amount of land use development to be supported by the new roadways. Figures illustrate the Average Daily Traffic (ADT) volumes and the corresponding amounts of Westside land use development for each of the following scenarios:

- Year 2011 Land Use Projections with Stage 1 Roadways (Figure 11 & Figure 12)
- Year 2012 Land Use Projections with Stage 2 Roadways (Figure 13 & Figure 14)
- Year 2014 Land Use Projections with Stage 3 Roadways (Figure 15 & Figure 16)
- Year 2018 Land Use Projections with Stage 4 Roadways (Figure 17 & Figure 18)
- Year 2022 Land Use Projections with Stage 5 Roadways (Figure 19 & Figure 20)
- Year 2025 Land Use Projections with Stage 6 Roadways (Figure 21 & Figure 22)
- Year 2030 Land Use Projections with Stage 6[1] Roadways (Figure 23 & Figure 24)

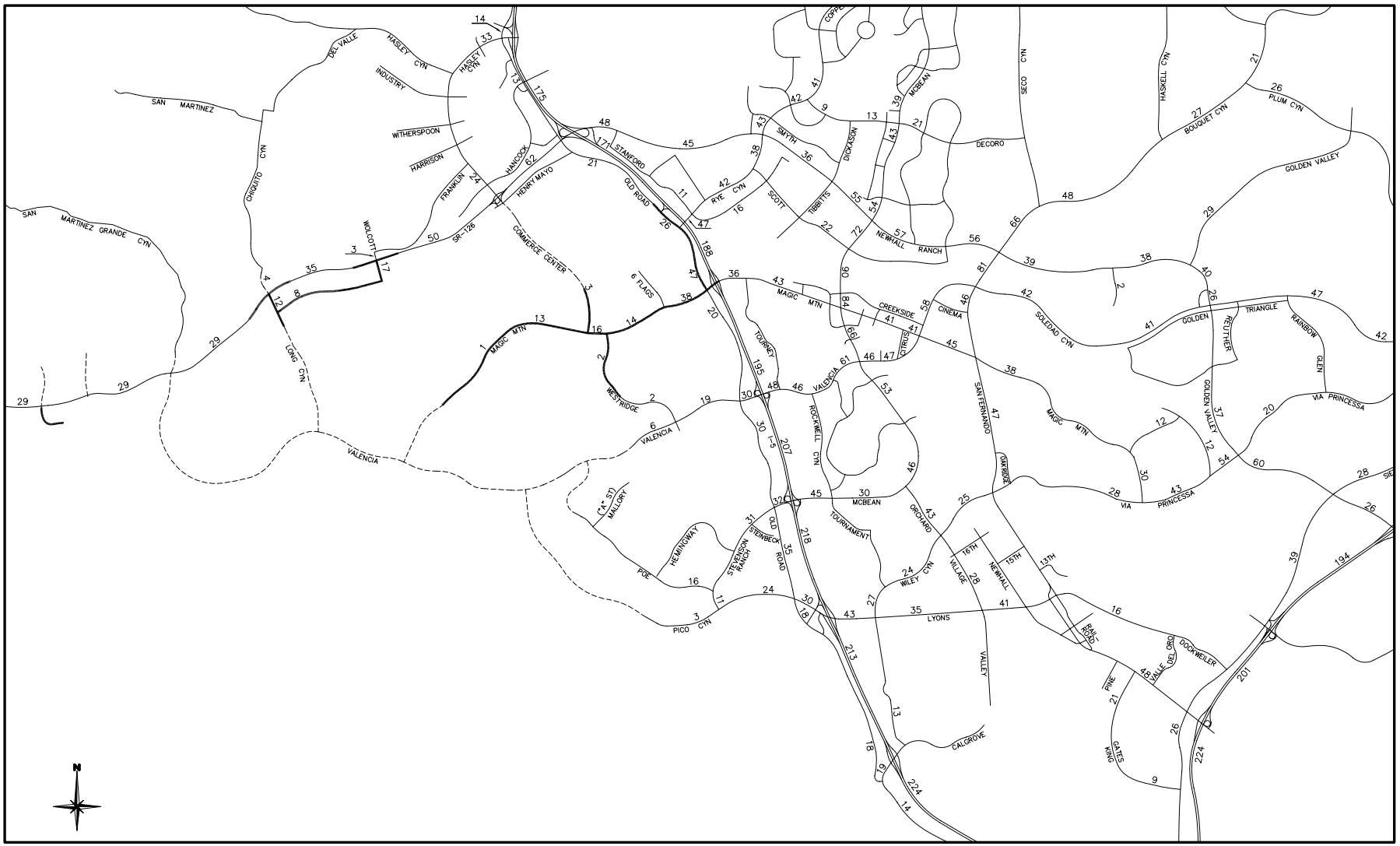
As noted earlier, the roadways shown for each phase will be adequate to support the land development up to that year. Roadway construction from the next stage will then need to be in place to accommodate the additional development of subsequent years.

In addition to the roadway improvements outlined in the previous section, various intersection specific improvements will be required as part of each stage. Table 4 lists the intersection improvements needed to maintain acceptable levels of service through buildout of the Westside area. Constructing these intersection improvements as part of the indicated stages will result in the Intersection Capacity Utilization (ICU) values shown in Table 5 and the corresponding Levels of Service (LOS) shown in Table 6 for the AM peak hour and in Table 7 for the PM peak hour. Detailed ICU worksheets are provided in Appendix B.

In all cases, levels of service are maintained at LOS D or better up to and including buildout of the Westside area with the roadways constructed during Stage 6. Stage 7 will then complete the Westside roadway network (the County Highway Plan) by constructing the 3rd Santa Clara River crossing to complete the final segment of Valencia Boulevard (Potrero Canyon Road) between SR-126 and Potrero Village.

*text continued on Page 37*

[1] Year 2030 with Stage 7 Roadways (buildout conditions) was evaluated as part of the Newhall Ranch Specific Plan EIR and is not included as part of this phasing analysis.



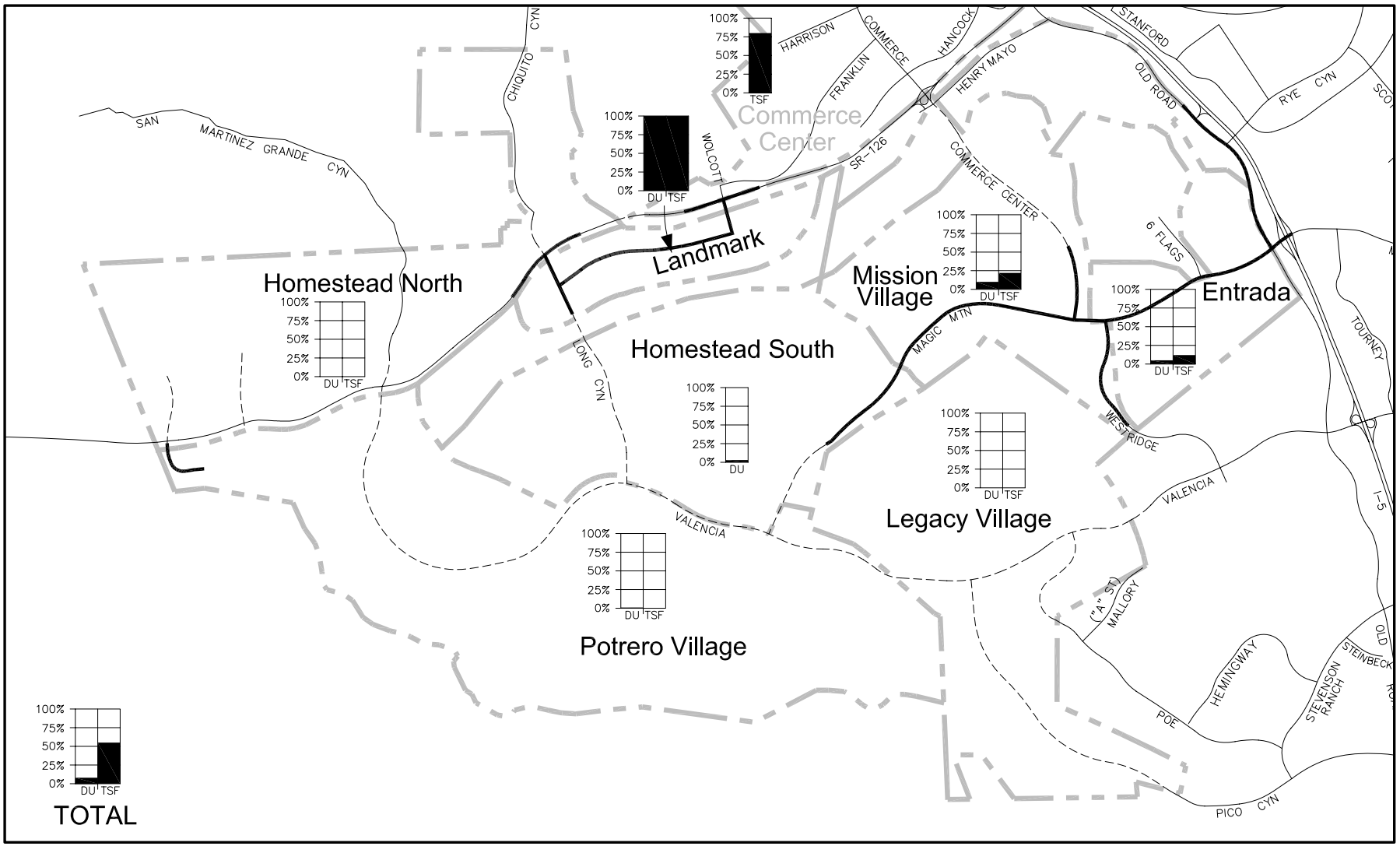

Legend

New/Upgraded Westside Roadway

Future Westside Roadway

Figure 11

AVERAGE DAILY TRAFFIC VOLUMES (000s)
-2011




Legend

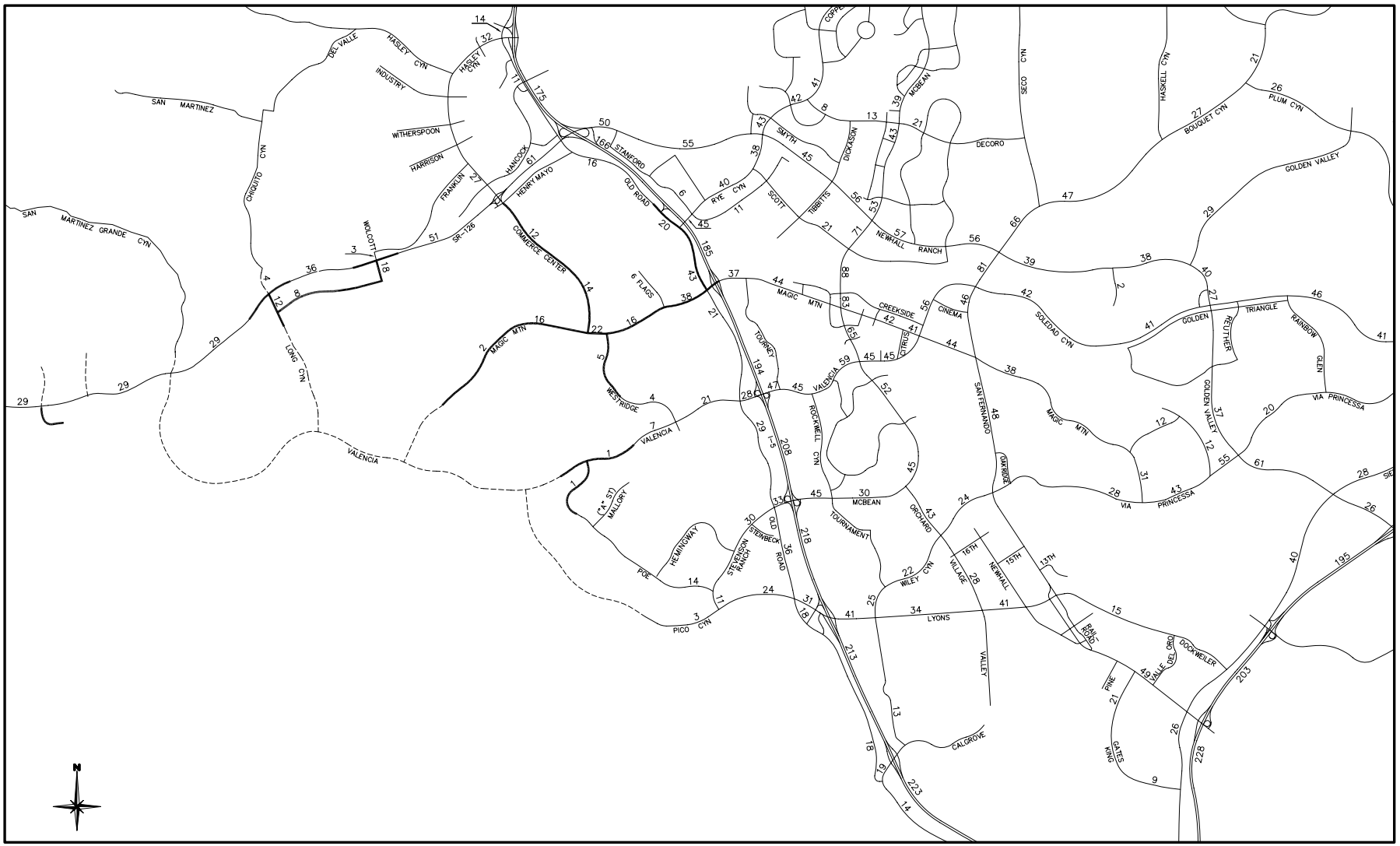
Percent Completion of Dwelling Units & Non-Res. Square Footage

Constructed Roadway

Future Roadway

Figure 12

PROJECT DEVELOPMENT BY PLANNING AREA -2011



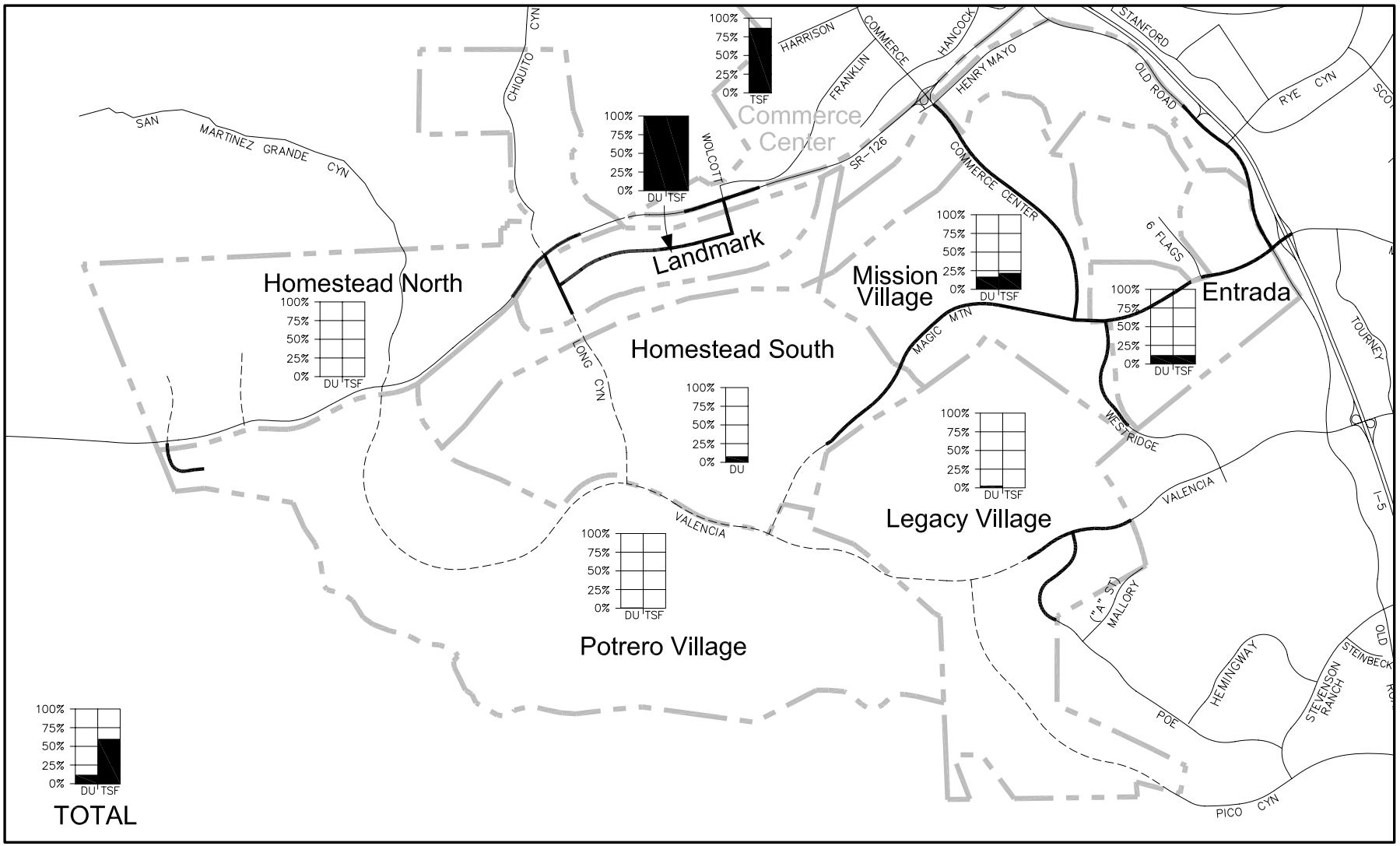

Legend

New/Upgraded Westside Roadway

Future Westside Roadway

Figure 13

AVERAGE DAILY TRAFFIC VOLUMES (000s)
-2012




Legend

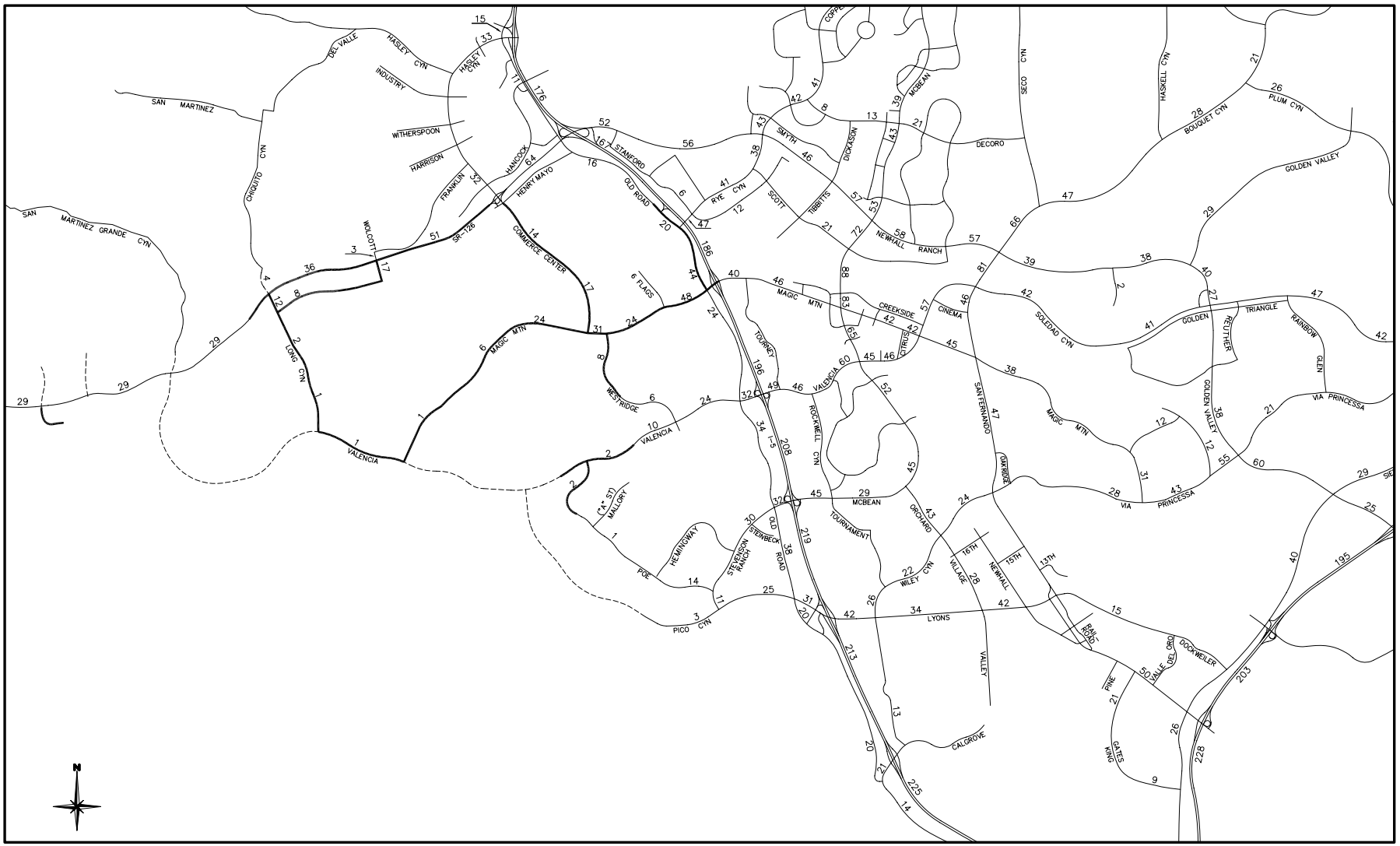
100% 75% 50% 25% 0% DU TSF Percent Completion of Dwelling Units & Non-Res. Square Footage

Constructed Roadway

Future Roadway

Figure 14

PROJECT DEVELOPMENT BY PLANNING AREA -2012



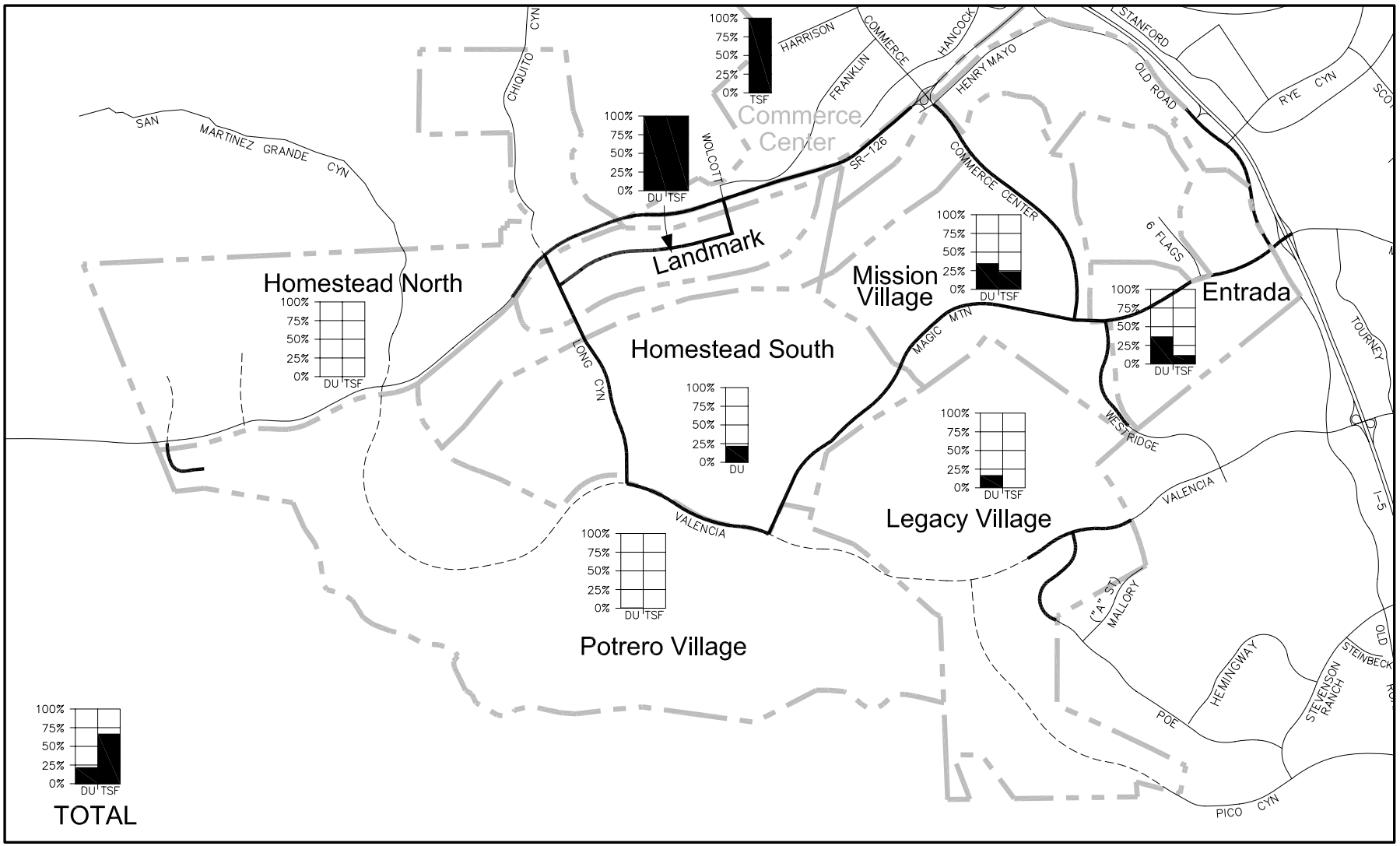

Legend

New/Upgraded Westside Roadway

Future Westside Roadway

Figure 15

AVERAGE DAILY TRAFFIC VOLUMES (000s)
-2014




Legend

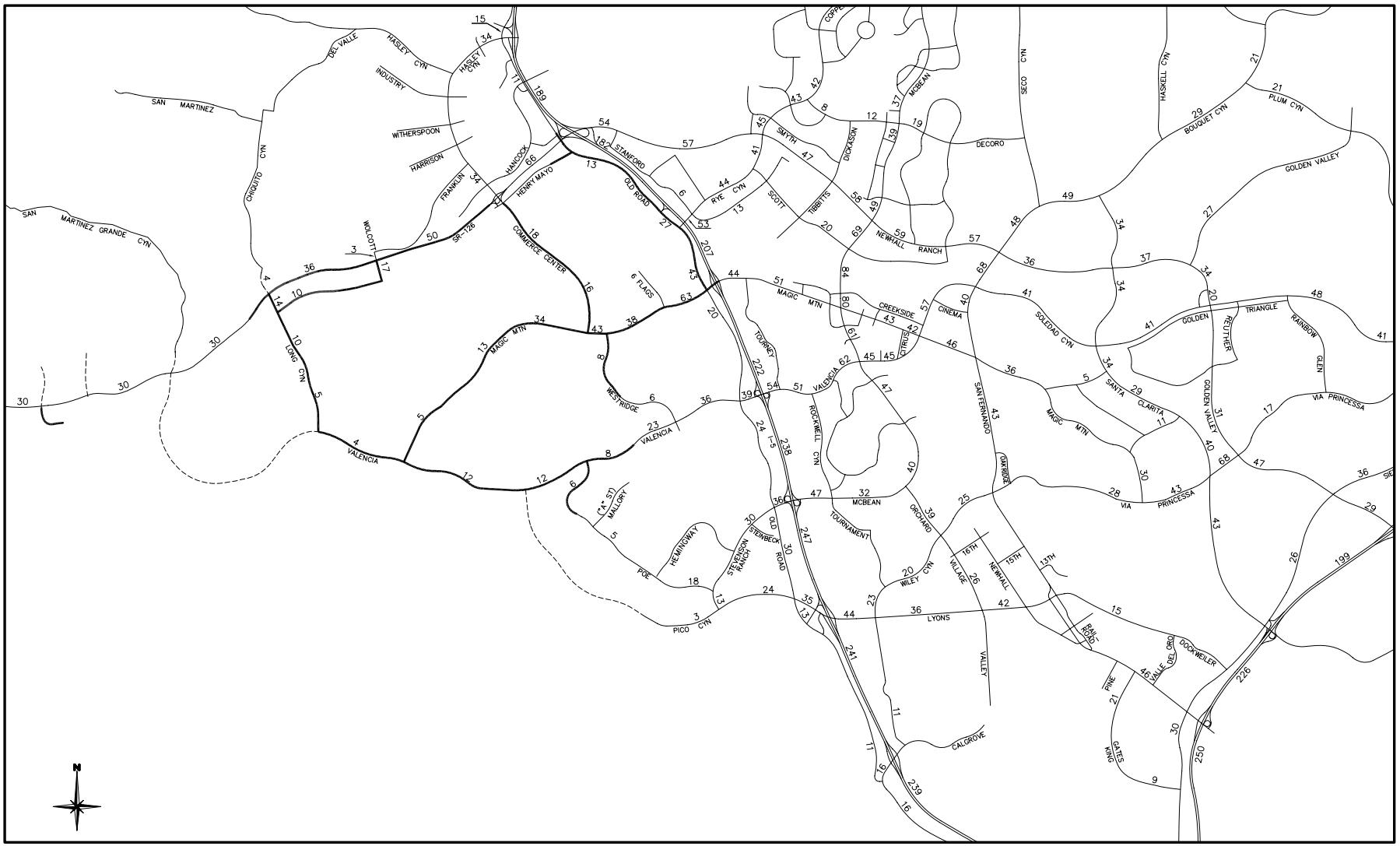
Percent Completion of Dwelling Units & Non-Res. Square Footage

Constructed Roadway

Future Roadway

Figure 16

PROJECT DEVELOPMENT BY PLANNING AREA -2014



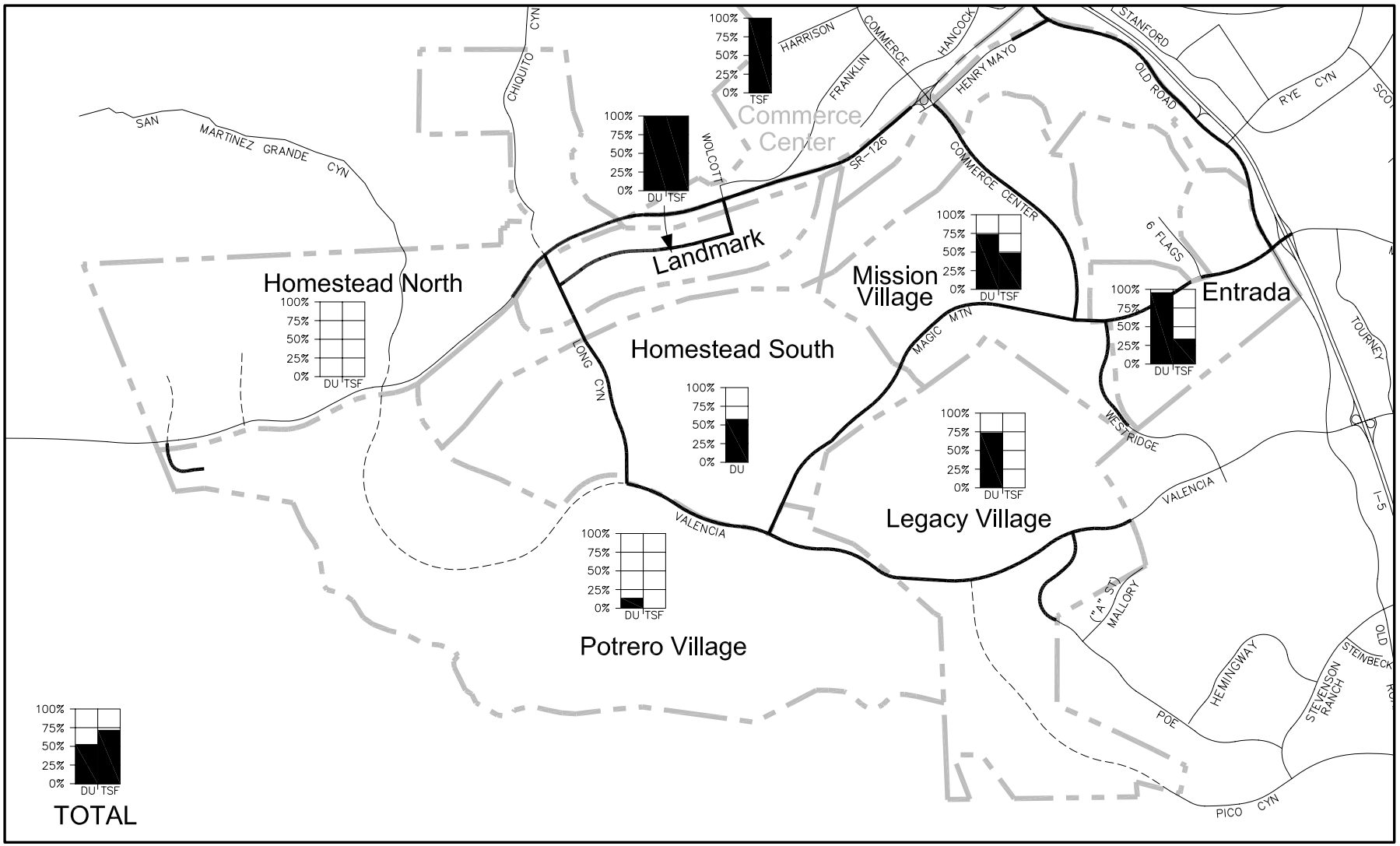

Legend

New/Upgraded Westside Roadway

Future Westside Roadway

Figure 17

AVERAGE DAILY TRAFFIC VOLUMES (000s)
-2018




Legend

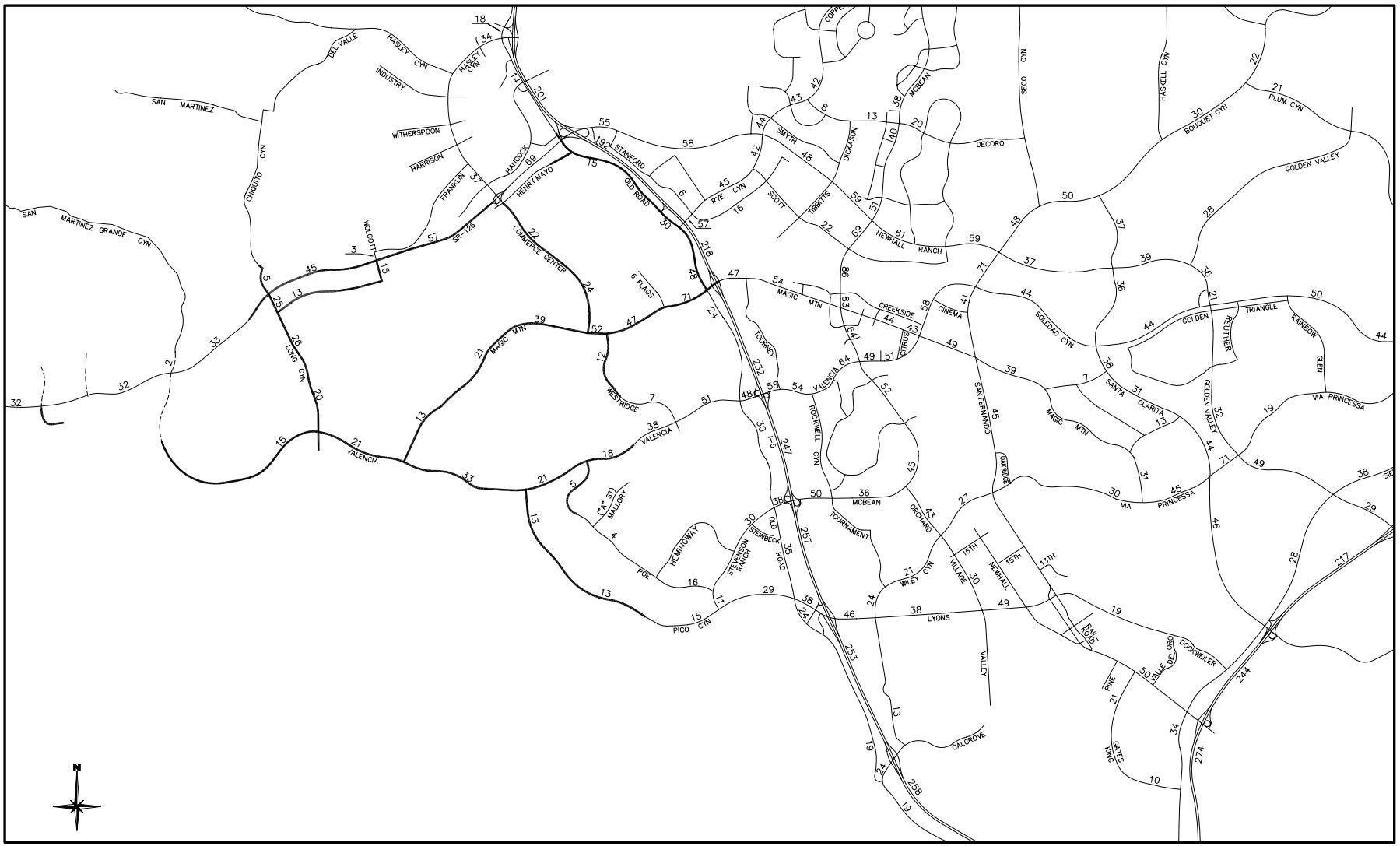
Percent Completion of Dwelling Units & Non-Res. Square Footage

Constructed Roadway

Future Roadway

Figure 18

PROJECT DEVELOPMENT BY PLANNING AREA -2018



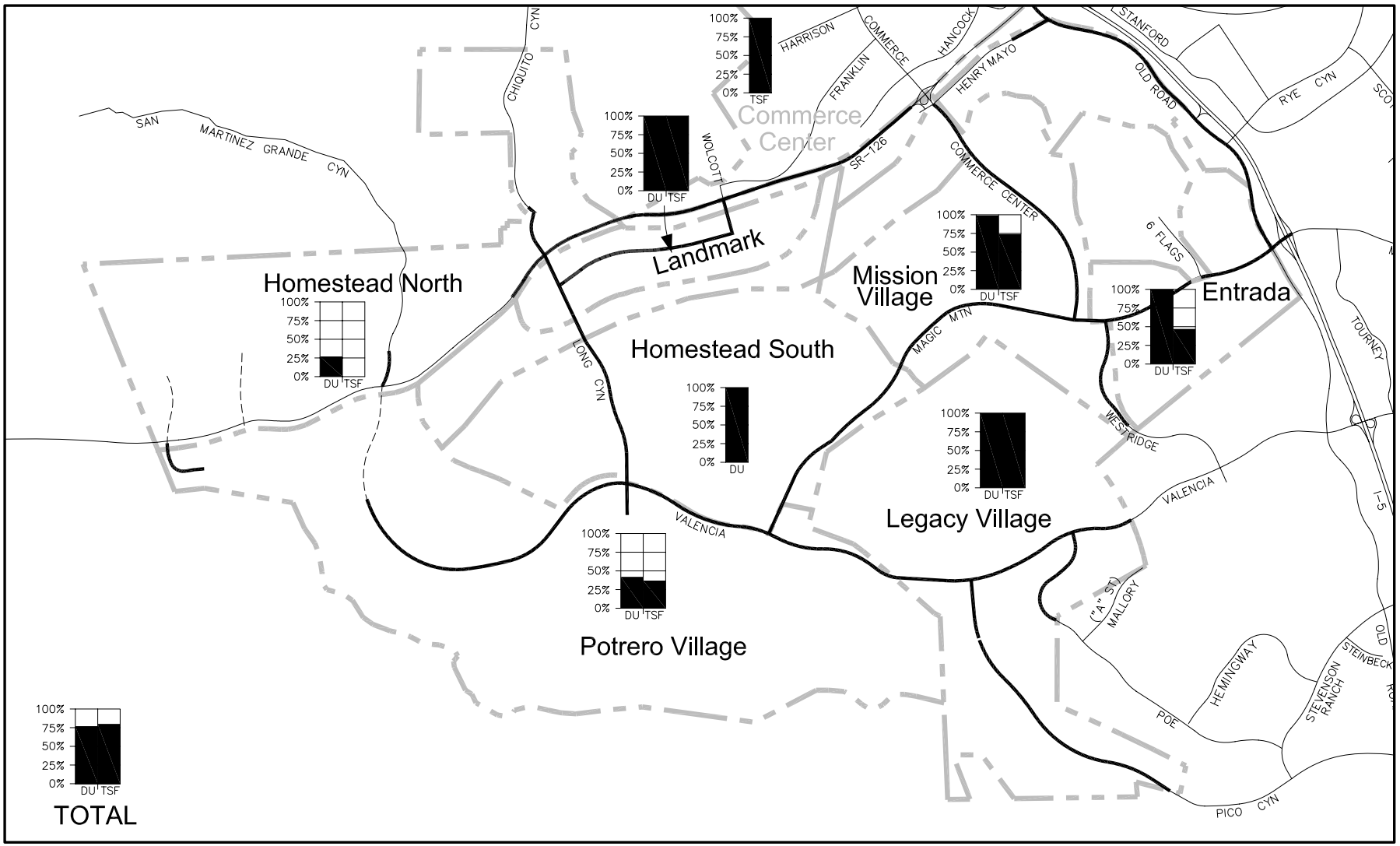

Legend

New/Upgraded Westside Roadway

Future Westside Roadway

Figure 19

AVERAGE DAILY TRAFFIC VOLUMES (000s)
-2022




Legend

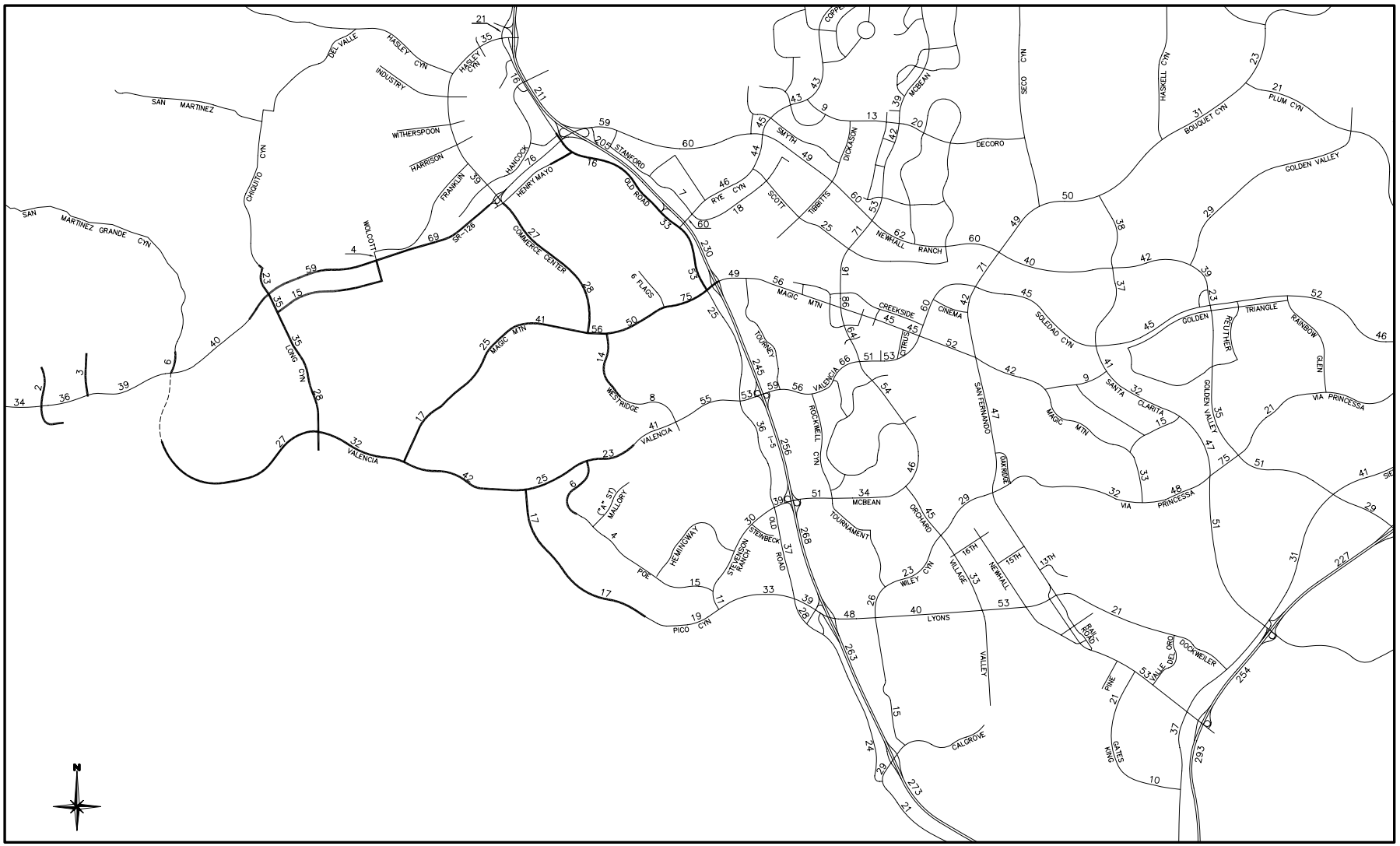
Percent Completion of Dwelling Units & Non-Res. Square Footage

Constructed Roadway

Future Roadway

Figure 20

PROJECT DEVELOPMENT BY PLANNING AREA -2022



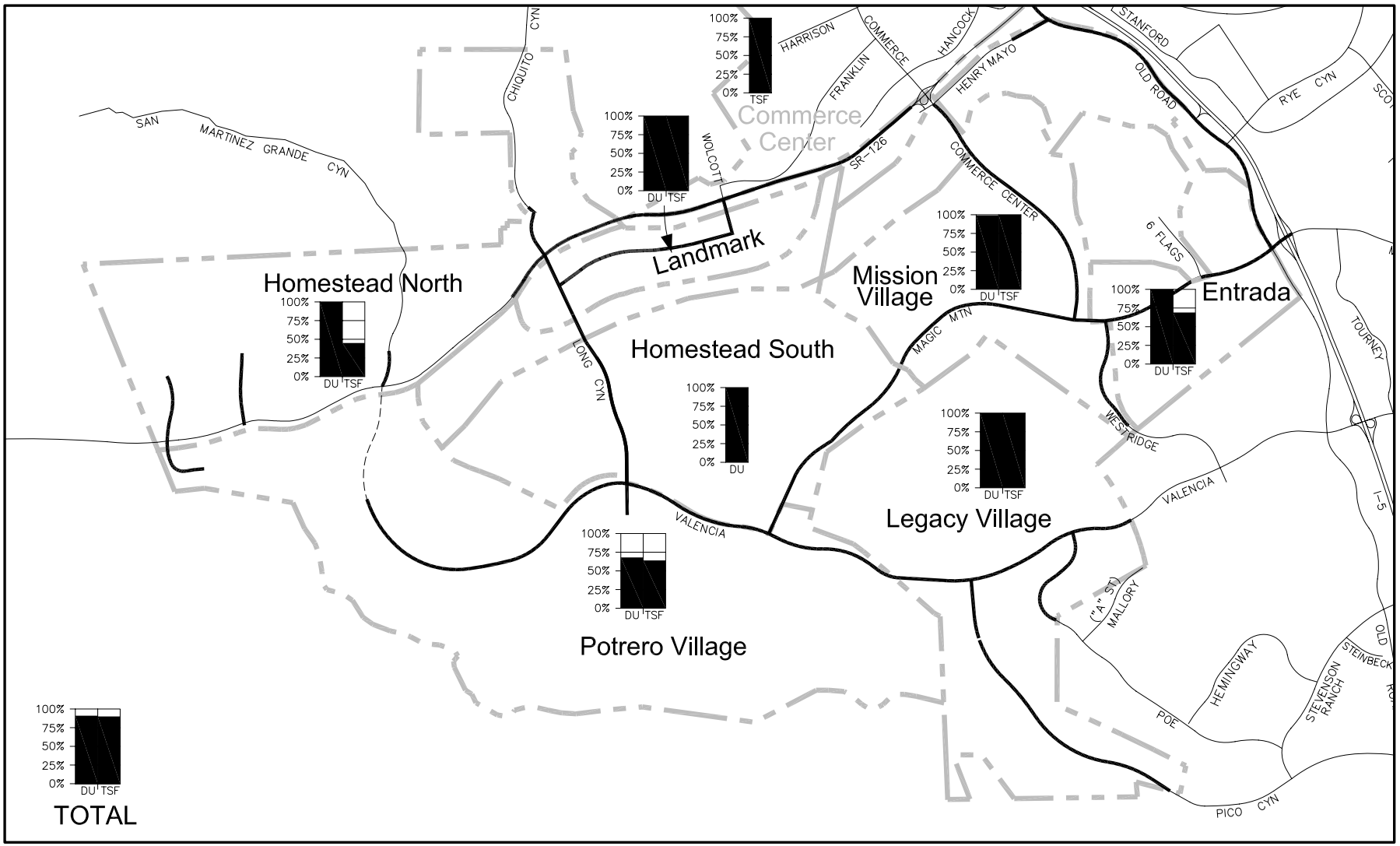

Legend

New/Upgraded Westside Roadway

Future Westside Roadway

Figure 21

AVERAGE DAILY TRAFFIC VOLUMES (000s)
-2025




Legend

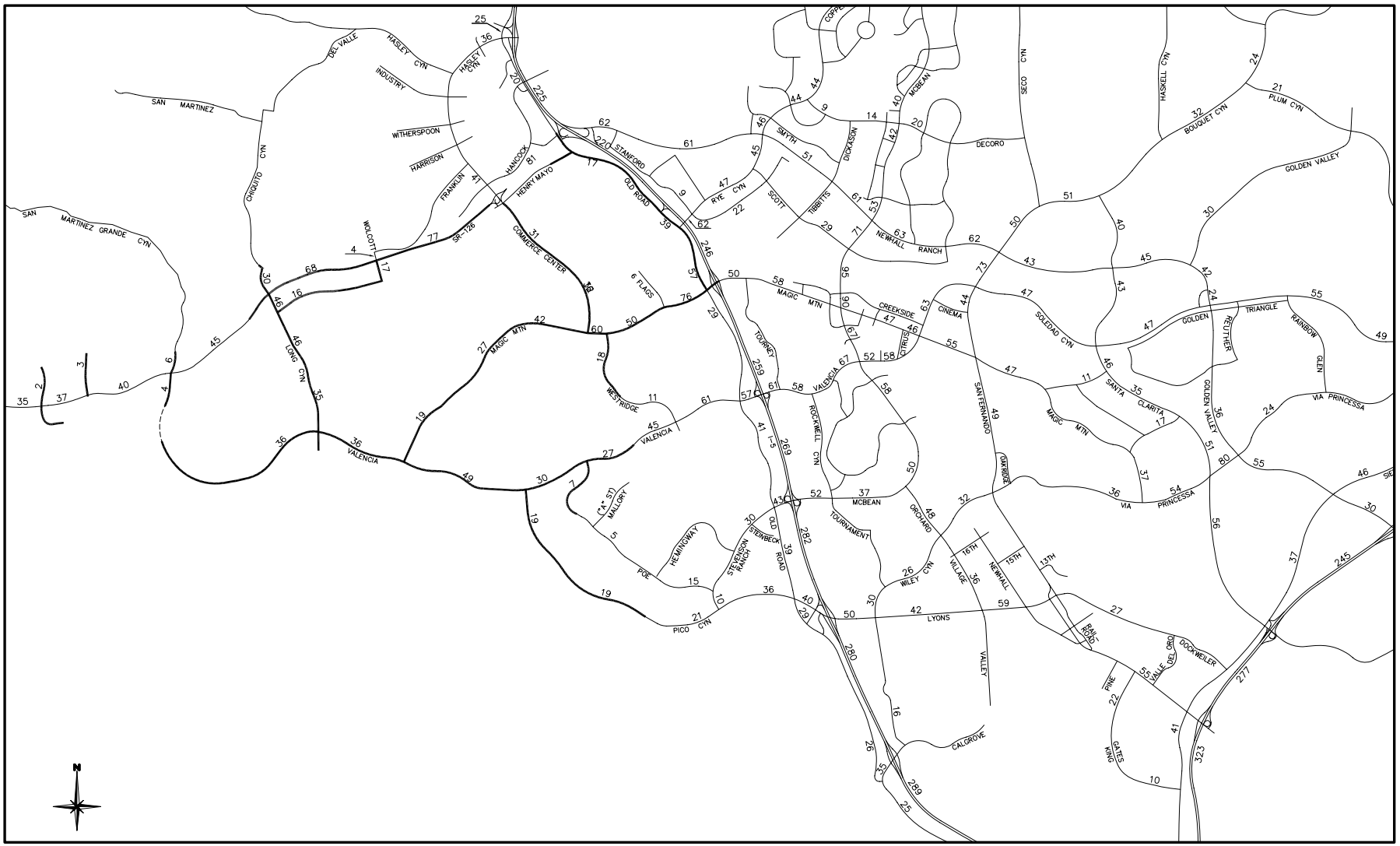
Percent Completion of Dwelling Units & Non-Res. Square Footage

Constructed Roadway

Future Roadway

Figure 22

PROJECT DEVELOPMENT BY PLANNING AREA -2025



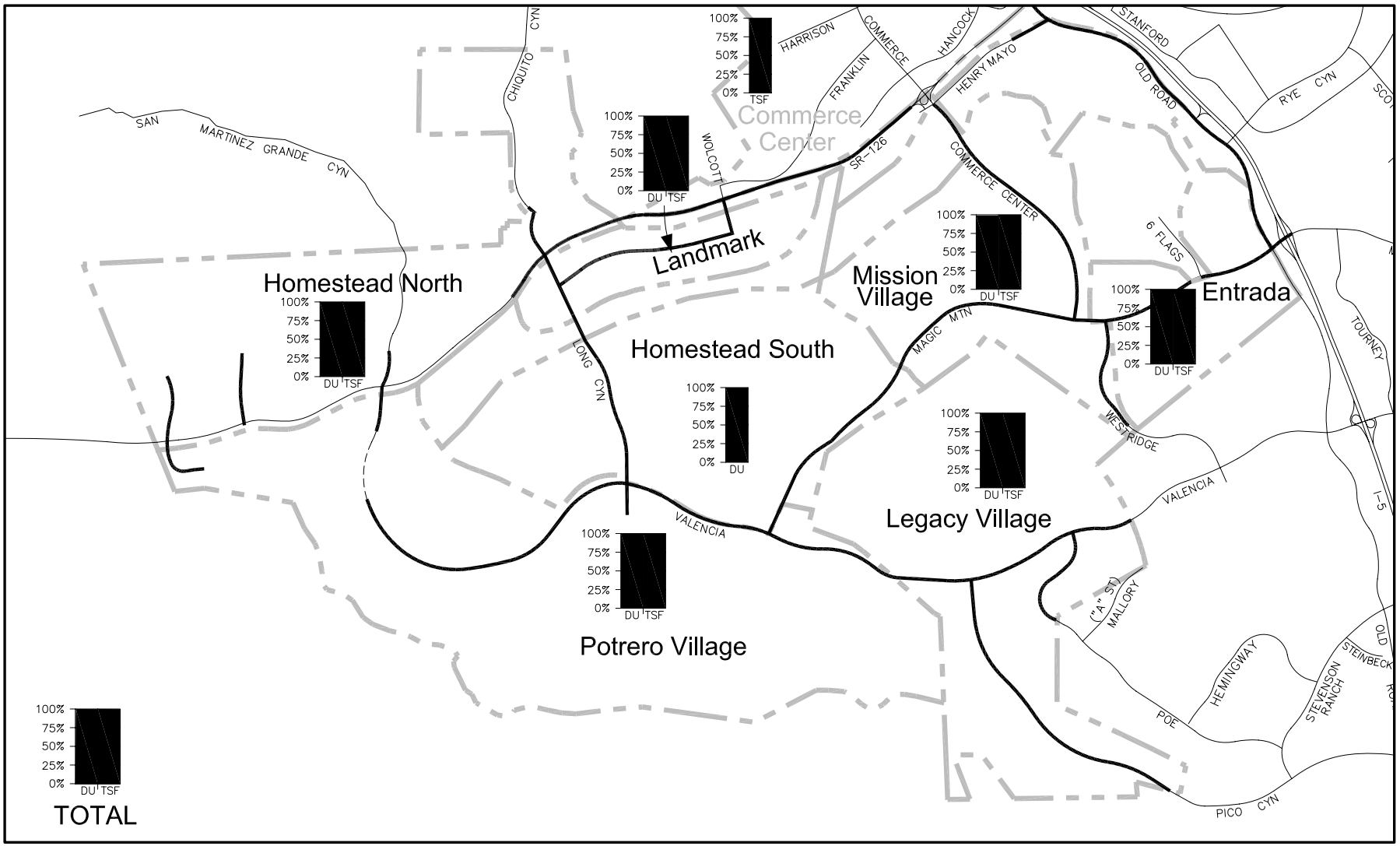

Legend

New/Upgraded Westside Roadway

Future Westside Roadway

Figure 23

AVERAGE DAILY TRAFFIC VOLUMES (000s)
-2030




Legend

100% 75% 50% 25% 0% DU TSF — Percent Completion of Dwelling Units & Non-Res. Square Footage

Constructed Roadway

Future Roadway

Figure 24

PROJECT DEVELOPMENT BY PLANNING AREA -2030

**Table 4: Intersection Improvements by Stage**

| Stage | Intersection | Improvements |
|---|---|---|
| 1 | 7. I-5 SB Ramps & SR-126 | Add 4th WBT |
| | 9. The Old Road & I-5 SB Ramps (at Rye Canyon Road) | Relocate intersection north of the existing location. Provide 1 NBL (U-Turns only), 2 NBT, 1 shared NBT/NBR, 1 NBR, 2 SBL, 3 SBT, 2 WBL, and 1 WBR |
| | 10. I-5 SB Ramps & Magic Mountain Pkwy | Add 2nd SBR, 3rd EBT, 2nd EBR, 2nd WBL, and 4th WBT (part of the Magic Mountain Interchange Phase 2 project) |
| | 11. I-5 NB Ramps & Magic Mountain Pkwy | Add shared NBL/NBR, 2nd EBL, 3rd EBT and convert 4th WBT to shared WBT/WBR (part of the Magic Mountain Interchange Phase 2 project) |
| | 25. The Old Road & Rye Canyon Road | Add 2nd & 3rd NBT, 2nd SBL, and 3rd SBT. Restripe 1st WBR to a shared WBL/WBR. |
| | 26. The Old Road & Magic Mountain Pkwy | Add 2nd NBL, 3rd NBT, 1st NBR, 2nd SBL, shared SBT/SBR, 1st SBR, 2nd EBL, 3rd & 4th EBT, 2nd WBL, and 4th WBT |
| | 28. The Old Road & McBean Pkwy | Signal modification to add a northbound right-turn overlap phase. |
| | 80. Wolcott Way & SR-126 | Add 1st NBL, 1st & 2nd NBR, 2nd SBL, 3rd EBT, 1st EBR, 2nd WBL, and 3rd WBT |
| | 81. Commerce Center Drive & Henry Mayo Drive | Add 1st EBL, 1st & 2nd EBT, and 1st WBT (part of SR-126 grade separation project) |
| | 82/83. Commerce Center Drive & SR-126 | Construct grade separation for Commerce Center Drive at SR-126 to include direct on- and off-ramps for WB SR-126, a loop on-ramp for SB Commerce Center Drive to EB SR-126, a direct on-ramp for NB Commerce Center Drive to EB SR-126, and a direct off-ramp for EB SR-126 to Commerce Center Drive |
| | 106. Commerce Center Drive & Magic Mountain Pkwy | Construct new intersection. Provide 2 SBL, 1 SBR, 2 EBL, 3 EBT, 3 WBT, and 1 WBR with right-of-way reserved for future conversion to a free-flow right-turn lane (part of the project to extend Magic Mountain Parkway to west of Commerce Center Drive) |
| | 107. Westridge Pkwy & Magic Mountain Pkwy | Construct new intersection. Provide 1 NBL, 1 shared NBL/NBR, 1 NBR, 3 EBT, 1 EBR, 2 WBL, and 3 WBT (part of the project to extend Westridge Parkway to Magic Mountain Parkway) |
| | 110. Chiquito Canyon Road/Long Canyon Road & SR-126 | Add 1st NBL, 1st & 2nd NBT, 1st & 2nd NBR, 2nd SBL, convert SBR to 1st SBT, add 2nd SBT, 1st EBR, and 1st & 2nd WBL (part of the project to construct Long Canyon Road south of SR-126) |
| | 118. Six Flags Entrance & Magic Mountain Pkwy | Add 1st SBR, 1st & 2nd EBL, 2nd, 3rd & 4th EBT, and 2nd, 3rd & 4th WBT (part of the project to extend Magic Mountain Parkway to west of Commerce Center Drive) |

**(Continued)**

**Table 4: Intersection Improvements by Stage (Continued)**

| Stage | Intersection | Improvements |
|---|---|---|
| 2 | 28. The Old Road & McBean Pkwy | Restripe southbound approach to add a 2nd SBL, signal modification to provide right-turn overlap phasing for NBR |
| | 81. Commerce Center Drive & Henry Mayo Drive | Add 1st NBL, 1st, 2nd & 3rd NBT, 2nd SBL, 1st, 2nd & 3rd SBT, 1st EBR, 1st WBL, (part of the project to extend Commerce Center Drive south over the Santa Clara River) |
| | 104. Poe Pkwy & Valencia Blvd | Construct new intersection. Provide 1 NBL, 1 NBR, 2 EBT, 1 EBR, 1 WBL, and 2 WBT (part of the project to extend Poe Parkway to Valencia Boulevard) |
| 3 | 101. Long Canyon Road & Valencia Blvd | Construct new intersection. Provide 2 SBL and 1 free-flow WBR (part of the project to construct Valencia Boulevard between Long Canyon Road & Magic Mountain Parkway) |
| | 102. Magic Mountain Pkwy & Valencia Blvd (Newhall Ranch) | Construct new intersection. Provide 1 free-flow SBR, and 2 EBL (part of the project to construct Valencia Boulevard between Long Canyon Road & Magic Mountain Parkway) |
| 4 | 25. The Old Road & Rye Canyon Road | Add 2nd & 3rd WBL |
| | 101. Long Canyon Road & Valencia Blvd | Add 1st NBT, 1st NBR, 1st SBT, and 1st WBL |
| | 102. Magic Mountain Pkwy & Valencia Blvd (Newhall Ranch) | Add 1st & 2nd NBL, 1st & 2nd NBT, 1st NBR, 1st & 2nd SBL, 1st & 2nd SBT, 1st & 2nd EBT, 1st EBR, 1st WBL, 1st & 2nd WBT, 1st WBR (part of the project to extend Valencia Boulevard west to Magic Mountain Parkway) |
| 5 | 12. I-5 SB Ramps & Valencia Blvd | Convert 2nd WBR to a shared WBT/WBR |
| | 28. The Old Road & McBean Pkwy | Add 1st WBR |
| | 96. San Martinez Grande Canyon Road & SR-126 | Add 1st SBL, and 1st WBR |
| | 101. Long Canyon Road & Valencia Blvd | Add 1st NBL, 1st SBR, 1st & 2nd EBL, 1st, 2nd & 3rd EBT, and 1st & 2nd WBT (part of the project to extend Valencia Boulevard west of Long Canyon Road) |
| | 103. Pico Canyon Road & Valencia Blvd | Construct new intersection. Provide 2 NBL, 1 NBR, 2 EBT, 1 EBR, 1 WBL, and 2 WBT (part of the project to extend Pico Canyon Road to Valencia Boulevard) |
| | 106. Commerce Center Drive & Magic Mountain Pkwy | Convert WBR to a free-flow right-turn lane |
| | 110. Chiquito Canyon Road/Long Canyon Road & SR-126 | Add 2nd NBL, 3rd SBT, 1st SBR, 2nd EBL, 3rd & 4th EBT, and 3rd WBT |

**(Continued)**

**Table 4: Intersection Improvements by Stage (Continued)**

| Stage | Intersection | Improvements |
|---|---|---|
| 6a | 14. I-5 SB Ramps & McBean Pkwy | Add 2nd SBL |
| | 17. I-5 NB Ramps & Lyons Ave | Add 1st free-flow WBR |
| 6b | 10. I-5 SB Ramps & Magic Mountain Pkwy | Convert 1st SBR to a shared SBL/SBR |
| | 16. I-5 SB Loop Ramp & Pico Canyon Road | Restripe eastbound approach to add a 3rd EBT. |
| | 18. I-5 SB Ramps & Calgrove Blvd | Add 2nd EBT and 2nd WBT |
| | 19. I-5 NB Ramps & Calgrove Blvd | Add 2nd EBT and 2nd WBT |
| | 26. The Old Road & Magic Mountain Pkwy | Add 5th EBT |
| | 29. The Old Road & Pico Canyon Road | Convert SBR to 2nd SBT |
| | 80. Wolcott & SR-126 | Add 4th EBT, 4th WBT, and right-turn overlap signal phasing for NBR |
| | 96. San Martinez Grande Canyon Road & SR-126 | Add 1st NBL, 1st NBT, 2nd SBL, 1st SBR, 1st EBR, and 1st WBL |

| | | | |
|---|---|---|---|
| NB = Northbound | NBL = NB Left-turn Lane | NBT = NB Through Lane | NBR = NB Right-turn Lane |
| SB = Southbound | SBL = SB Left-turn Lane | SBT = SB Through Lane | SBR = SB Right-turn Lane |
| EB = Eastbound | EBL = EB Left-turn Lane | EBT = EB Through Lane | EBR = EB Right-turn Lane |
| WB = Westbound | WBL = WB Left-turn Lane | WBT = WB Through Lane | WBR = WB Right-turn Lane |

See Figure B-1 for intersection locations.

**Table 5: Intersection Capacity Utilization Summary**

| Intersection | Exist. | | 2011 | | 2012 | | 2014 | | 2018 | | 2022 | | 2025 | | 2030 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | AM | PM | AM | PM | AM | PM | AM | PM | AM | PM | AM | PM | AM | PM | AM | PM |
| 7. I-5 SB Ramps & SR-126 | .42 | .31 | .79 | .59 | .77 | .65 | .77 | .67 | .75 | .64 | .73 | .66 | .74 | .70 | .77 | .75 |
| 8. I-5 NB Ramps & SR-126 | .37 | .29 | .64 | .60 | .61 | .62 | .62 | .64 | .60 | .61 | .58 | .64 | .63 | .69 | .69 | .77 |
| 9. Old Road & I-5 SB Ramps (at Rye Canyon) | .73 | .92 | .52 | .62 | .43 | .53 | .43 | .54 | .47 | .65 | .49 | .68 | .54 | .74 | .60 | .82 |
| 10. I-5 SB Ramps & Magic Mountain | .58 | .59 | .55 | .68 | .58 | .66 | .59 | .68 | .60 | .81 | .63 | .84 | .68 | .86 | .64 | .77 |
| 11. I-5 NB Ramps & Magic Mountain | .63 | .70 | .51 | .66 | .53 | .66 | .56 | .69 | .65 | .79 | .69 | .82 | .72 | .84 | .75 | .87 |
| 12. I-5 SB Ramps & Valencia | .47 | .42 | .56 | .66 | .54 | .65 | .54 | .72 | .64 | .86 | .58 | .78 | .59 | .83 | .60 | .86 |
| 13. I-5 NB Ramps & Valencia | .53 | .51 | .57 | .65 | .56 | .64 | .58 | .66 | .64 | .67 | .69 | .69 | .70 | .71 | .73 | .73 |
| 14. I-5 SB Ramps & McBean | .56 | .66 | .55 | .71 | .52 | .70 | .53 | .71 | .57 | .80 | .60 | .85 | .52 | .80 | .52 | .81 |
| 15. I-5 NB Ramps & McBean | .41 | .66 | .53 | .71 | .54 | .69 | .54 | .70 | .56 | .72 | .58 | .76 | .61 | .81 | .63 | .85 |
| 16. I-5 SB On-Loop & Lyons | .55 | .60 | .56 | .76 | .57 | .72 | .57 | .71 | .57 | .76 | .58 | .81 | .60 | .87 | .58 | .85 |
| 17. I-5 NB Ramps & Lyons | .53 | .68 | .50 | .75 | .45 | .76 | .44 | .77 | .48 | .87 | .49 | .89 | .51 | .86 | .53 | .89 |
| 18. I-5 SB Ramps & Calgrove | .49 | .64 | .68 | .66 | .66 | .70 | .66 | .70 | .70 | .74 | .74 | .82 | .77 | .89 | .60 | .68 |
| 19. I-5 NB Ramps & Calgrove | .64 | .52 | .79 | .51 | .78 | .51 | .78 | .52 | .82 | .56 | .85 | .64 | .88 | .71 | .67 | .67 |
| 20. I-5 SB Ramp & Lyons | .44 | .46 | .41 | .59 | .40 | .57 | .40 | .57 | .46 | .60 | .50 | .62 | .51 | .66 | .53 | .70 |
| 25. Old Road & Rye Canyon | .87 | .84 | .70 | .80 | .71 | .72 | .75 | .74 | .85 | .66 | .83 | .73 | .85 | .78 | .94 | .85 |
| 26. Old Road & Magic Mountain | .49 | .63 | .55 | .61 | .51 | .59 | .58 | .67 | .68 | .71 | .73 | .80 | .78 | .85 | .85 | .85 |
| 27. Old Road & Valencia | .54 | .61 | .52 | .59 | .58 | .60 | .60 | .66 | .66 | .71 | .75 | .85 | .76 | .87 | .79 | .90 |
| 28. Old Road & McBean | .48 | .72 | .59 | .89 | .56 | .84 | .55 | .86 | .57 | .77 | .58 | .77 | .57 | .77 | .55 | .82 |
| 29. Old Road & Pico | .55 | .62 | .83 | .74 | .84 | .74 | .87 | .75 | .79 | .73 | .80 | .81 | .82 | .88 | .84 | .89 |
| 80. Wolcott & SR-126 | .34 | .46 | .54 | .77 | .54 | .80 | .55 | .79 | .56 | .74 | .66 | .77 | .77 | .86 | .76 | .79 |
| 81. Commerce Center & Henry Mayo | -- | -- | .22 | .37 | .37 | .36 | .44 | .42 | .50 | .47 | .65 | .54 | .75 | .61 | .78 | .72 |
| 82. Commerce Center & SR-126 EB Ramps | -- | -- | .13 | .18 | .32 | .26 | .38 | .34 | .37 | .39 | .42 | .41 | .45 | .43 | .47 | .46 |
| 83. Commerce Center & SR-126 WB Ramps | -- | -- | .54 | .41 | .67 | .55 | .74 | .62 | .78 | .69 | .80 | .72 | .81 | .78 | .80 | .87 |
| 96. Martinez/Potrero & SR-126 | .33 | .46 | .37 | .45 | .38 | .46 | .38 | .46 | .41 | .50 | .44 | .52 | .56 | .64 | .70 | .72 |
| 101. Long Canyon & Valencia | -- | -- | -- | -- | -- | -- | .10 | .10 | .12 | .20 | .31 | .41 | .47 | .65 | .50 | .81 |
| 102. Newhall Ranch & Valencia | -- | -- | -- | -- | -- | -- | .10 | .10 | .24 | .21 | .36 | .40 | .43 | .51 | .68 | .71 |
| 103. Pico Canyon & Valencia | -- | -- | -- | -- | -- | -- | -- | -- | .26 | .29 | .53 | .59 | .63 | .74 | .66 | .80 |
| 104. Poe & Valencia | -- | -- | -- | -- | .23 | .19 | .24 | .19 | .38 | .33 | .57 | .52 | .64 | .59 | .68 | .63 |
| 105. Westridge & Valencia | .48 | .20 | .31 | .17 | .40 | .22 | .45 | .31 | .46 | .40 | .54 | .54 | .56 | .58 | .56 | .64 |
| 106. Commerce Center & Magic Mountain | -- | -- | .19 | .24 | .69 | .33 | .84 | .47 | .78 | .56 | .59 | .67 | .67 | .72 | .74 | .74 |
| 107. Westridge & Magic Mountain | -- | -- | .21 | .26 | .40 | .32 | .48 | .44 | .56 | .53 | .63 | .63 | .66 | .67 | .67 | .67 |
| 110. Chiquito Canyon & SR-126 | .38 | .44 | .56 | .58 | .58 | .58 | .58 | .58 | .59 | .59 | .69 | .63 | .87 | .90 | n/a[1] | n/a[1] |
| 118. Six Flags Entrance & Magic Mountain | -- | -- | .25 | .47 | .29 | .46 | .32 | .50 | .39 | .59 | .44 | .65 | .44 | .67 | .45 | .74 |

[1]not applicable – This scenario has been evaluated using the Highway Capacity Manual Signalized Intersection methodology (see worksheets in Appx. B)
See Figure B-1 for intersection locations.

**Table 6: AM Peak Hour Level of Service Summary**

| Intersection | Exist. | 2011 | 2012 | 2014 | 2018 | 2022 | 2025 | 2030 |
|---|---|---|---|---|---|---|---|---|
| 7. I-5 SB Ramps & SR-126 | A | C | C | C | C | C | C | C |
| 8. I-5 NB Ramps & SR-126 | A | B | B | B | A | A | B | B |
| 9. Old Road & I-5 SB Ramps (at Rye Canyon) | C | A | A | A | A | A | A | A |
| 10. I-5 SB Ramps & Magic Mountain | A | A | A | A | A | B | B | B |
| 11. I-5 NB Ramps & Magic Mountain | B | A | A | A | B | B | C | C |
| 12. I-5 SB Ramps & Valencia | A | A | A | A | B | A | A | A |
| 13. I-5 NB Ramps & Valencia | A | A | A | A | B | B | B | C |
| 14. I-5 SB Ramps & McBean | A | A | A | A | A | A | A | A |
| 15. I-5 NB Ramps & McBean | A | A | A | A | A | A | B | B |
| 16. I-5 SB On-Loop & Lyons | A | A | A | A | A | A | A | A |
| 17. I-5 NB Ramps & Lyons | A | A | A | A | A | A | A | A |
| 18. I-5 SB Ramps & Calgrove | A | B | B | B | B | C | C | A |
| 19. I-5 NB Ramps & Calgrove | B | C | C | C | D | D | D | B |
| 20. I-5 SB Ramp & Lyons | A | A | A | A | A | A | A | A |
| 25. Old Road & Rye Canyon | D | B | C | C | D | D | D | D |
| 26. Old Road & Magic Mountain | A | A | A | A | B | C | C | D |
| 27. Old Road & Valencia | A | A | A | A | B | C | C | C |
| 28. Old Road & McBean | A | A | A | A | A | A | A | A |
| 29. Old Road & Pico | A | D | D | D | C | C | D | D |
| 80. Wolcott & SR-126 | A | A | A | A | A | B | C | C |
| 81. Commerce Center & Henry Mayo | -- | A | A | A | A | B | C | C |
| 82. Commerce Center & SR-126 EB Ramps | -- | A | A | A | A | A | A | A |
| 83. Commerce Center & SR-126 WB Ramps | -- | A | B | C | C | C | D | C |
| 96. Martinez/Potrero & SR-126 | A | A | A | A | A | A | A | B |
| 101. Long Canyon & Valencia | -- | -- | -- | A | A | A | A | A |
| 102. Newhall Ranch & Valencia | -- | -- | -- | A | A | A | A | B |
| 103. Pico Canyon & Valencia | -- | -- | -- | -- | A | A | B | B |
| 104. Poe & Valencia | -- | -- | A | A | A | A | B | B |
| 105. Westridge & Valencia | A | A | A | A | A | A | A | A |
| 106. Commerce Center & Magic Mountain | -- | A | B | D | C | A | B | C |
| 107. Westridge & Magic Mountain | -- | A | A | A | A | B | B | B |
| 110. Chiquito Canyon & SR-126 | A | A | A | A | A | B | D | D |
| 118. Six Flags Entrance & Magic Mountain | -- | A | A | A | A | A | A | A |

See Figure B-1 for intersection locations.

**Table 7: PM Peak Hour Level of Service Summary**

| Intersection | Exist. | 2011 | 2012 | 2014 | 2018 | 2022 | 2025 | 2030 |
|---|---|---|---|---|---|---|---|---|
| 7. I-5 SB Ramps & SR-126 | A | A | B | B | B | B | B | C |
| 8. I-5 NB Ramps & SR-126 | A | A | B | B | B | B | B | C |
| 9. Old Road & I-5 SB Ramps (at Rye Canyon) | E | B | A | A | B | B | C | D |
| 10. I-5 SB Ramps & Magic Mountain | A | B | B | B | D | D | D | C |
| 11. I-5 NB Ramps & Magic Mountain | B | B | B | B | C | D | D | D |
| 12. I-5 SB Ramps & Valencia | A | B | B | C | D | C | D | D |
| 13. I-5 NB Ramps & Valencia | A | B | B | B | B | B | C | C |
| 14. I-5 SB Ramps & McBean | B | C | B | C | C | D | C | D |
| 15. I-5 NB Ramps & McBean | B | C | B | B | C | C | D | D |
| 16. I-5 SB On-Loop & Lyons | A | C | C | C | C | D | D | D |
| 17. I-5 NB Ramps & Lyons | B | C | C | C | D | D | D | D |
| 18. I-5 SB Ramps & Calgrove | B | B | B | B | C | D | D | B |
| 19. I-5 NB Ramps & Calgrove | A | A | A | A | A | B | C | B |
| 20. I-5 SB Ramp & Lyons | A | A | A | A | A | B | B | B |
| 25. Old Road & Rye Canyon | D | C | C | C | B | C | C | D |
| 26. Old Road & Magic Mountain | B | B | A | B | C | C | D | D |
| 27. Old Road & Valencia | B | A | A | B | C | D | D | D |
| 28. Old Road & McBean | C | D | D | D | C | C | C | D |
| 29. Old Road & Pico | B | C | C | C | C | D | D | D |
| 80. Wolcott & SR-126 | A | C | C | C | C | C | D | C |
| 81. Commerce Center & Henry Mayo | -- | A | A | A | A | A | B | C |
| 82. Commerce Center & SR-126 EB Ramps | -- | A | A | A | A | A | A | A |
| 83. Commerce Center & SR-126 WB Ramps | -- | A | A | B | B | C | C | D |
| 96. Martinez/Potrero & SR-126 | A | A | A | A | A | A | B | C |
| 101. Long Canyon & Valencia | -- | -- | -- | A | A | A | B | D |
| 102. Newhall Ranch & Valencia | -- | -- | -- | A | A | A | A | C |
| 103. Pico Canyon & Valencia | -- | -- | -- | -- | A | A | C | C |
| 104. Poe & Valencia | -- | -- | A | A | A | A | A | B |
| 105. Westridge & Valencia | A | A | A | A | A | A | A | B |
| 106. Commerce Center & Magic Mountain | -- | A | A | A | A | B | C | C |
| 107. Westridge & Magic Mountain | -- | A | A | A | A | B | B | B |
| 110. Chiquito Canyon & SR-126 | A | A | A | A | A | B | D | D |
| 118. Six Flags Entrance & Magic Mountain | -- | A | A | A | A | B | B | C |

See Figure B-1 for intersection locations.

# 6.0 NON-WESTSIDE AREAS

The original Newhall Ranch Specific Plan EIR addressed areas not covered in this analysis, such as the Ventura County communities of Fillmore and Piru, roadways within the City of Santa Clarita, and the State highway system (see Appendix D for the list of Newhall Ranch Specific Plan final mitigation measures).

Analysis for the Ventura County communities that satisfies the Specific Plan Conditions of Approval has been completed separate from this report, and an analysis of City of Santa Clarita roadways and intersections based on the traffic forecasts summarized in this report has been prepared as part of a separate document for City staff to review.

Caltrans is currently in the process of developing a comprehensive improvement program for the I-5 freeway through the Santa Clarita Valley. The project, which is in the Project Approval/Environmental Documentation (PA/ED) stage, will add a High Occupancy Vehicle (HOV) lane in each direction between SR-14 and the Parker Road interchange. The project will also add a truck lane in each direction between SR-14 and the Pico/Lyons Canyon Road interchange. It is also proposed that an early implementation project be constructed before construction begins for the full project. The early implementation project consists of the northbound HOV lane from SR-14 to the crest of the segment between SR-14 and the Calgrove interchange, as well as the southbound truck lane from the Pico/Lyons Canyon Road interchange to SR-14.

South of the SR-14 interchange, a single HOV lane in each direction is currently under construction. Direct HOV to HOV connectors between the existing SR-14 HOV lanes and the I-5 HOV lanes under construction are currently in the design stage. Ultimately, the MTA has identified the need to construct additional lanes south of the SR-14 interchange to accommodate the projected future traffic volumes. In the *North County Combined Highway Corridors Study – Final Report* (MTA, June 2004), multiple concepts to add additional capacity between SR-14 and I-210 are identified, with a recommended configuration pending the completion of subsequent design phases.

Following is the timing of the planned I-5 freeway improvements based on the anticipated construction schedule for the project currently in the PA/ED stage. As the project to add additional

capacity south of SR-14 does not have an identified time frame for construction, for the purpose of this analysis it is not presumed to be constructed until the year 2030.

- Northbound HOV Lane: SR-14 to crest of grade (south of Calgrove interchange) – 2010
- Southbound Truck Lane: Pico/Lyons Canyon interchange to SR-14 – 2010
- Complete HOV/Truck Lane project: SR-14 to Parker interchange – between 2015 & 2018
- Additional Lane(s) project: South of SR-14 – 2030

Table 8 summarizes the I-5 peak hour mainline freeway LOS values for each of the Westside phasing scenarios identified in the previous section. As with the arterial roadway forecasts presented in the previous sections, each of these scenarios includes cumulative development projections for outside the Westside area. Traffic volume forecasts for each of the scenarios, together with the I-5 improvements listed above, result in the indicated LOS values. Detailed V/C calculations are provided in Appendix C.

# 7.0 CONCLUSIONS

The construction stages outlined in this report will provide for the access needs of the Westside area by ensuring that the necessary roadway infrastructure is developed together with the phased land use development. Furthermore, the freeway improvements planned for I-5 through the Santa Clarita Valley will accommodate the projected traffic demands as the Valley builds out over the next 25 years.

A comprehensive plan such as this provides for some flexibility in regards to individual planning areas that proceed faster or slower than anticipated here. The roadway phasing plan will remain valid if the total number of units remains in line with the overall pattern assumed in this analysis, and if the placement of the development is relatively consistent with the projected plan. An update to this phasing study, such as every five years or given a substantial change to anticipated development, would provide a means to adjust the overall phasing plan as actual travel patterns evolve over time.

## Table 8: I-5 Level of Service Summary

| AM SOUTHBOUND | 2006 | 2011 | 2012 | 2014 | 2018 | 2022 | 2025 | 2030 |
|---|---|---|---|---|---|---|---|---|
| 403. I-5 s/o Parker | A | C | C | C | C | C | C | C |
| 404. I-5 s/o Hasley | B | C | C | C | C | C | C | C |
| 405. I-5 s/o SR-126 | B | C | C | C | C | C | C | C |
| 406. I-5 s/o Rye Cyn | B | C | C | C | C | C | C | D |
| 407. I-5 s/o Magic Mtn | C | C | C | C | C | C | C | D |
| 408. I-5 s/o Valencia | C | C | C | C | C | D | D | D |
| 409. I-5 s/o McBean | C | C | C | C | C | D | D | D |
| 410. I-5 s/o Lyons | D | C | C | C | C | C | C | C |
| 411. I-5 s/o Calgrove | D | C | C | C | C | C | C | C |
| 412. I-5 s/o SR-14 | E | D | D | E | E | E | E | E |

| AM NORTHBOUND | 2006 | 2011 | 2012 | 2014 | 2018 | 2022 | 2025 | 2030 |
|---|---|---|---|---|---|---|---|---|
| 403. I-5 s/o Parker | A | B | B | B | B | B | B | B |
| 404. I-5 s/o Hasley | A | C | C | C | C | C | C | C |
| 405. I-5 s/o SR-126 | B | C | C | C | C | C | C | C |
| 406. I-5 s/o Rye Cyn | B | C | C | C | C | C | C | C |
| 407. I-5 s/o Magic Mtn | C | D | D | D | C | C | D | D |
| 408. I-5 s/o Valencia | C | D | D | D | D | D | D | D |
| 409. I-5 s/o McBean | C | D | D | D | D | D | D | D |
| 410. I-5 s/o Lyons | C | D | D | D | C | C | D | D |
| 411. I-5 s/o Calgrove | C | C | C | C | C | C | C | C |
| 412. I-5 s/o SR-14 | B | B | B | B | B | C | C | C |

| PM SOUTHBOUND | 2006 | 2011 | 2012 | 2014 | 2018 | 2022 | 2025 | 2030 |
|---|---|---|---|---|---|---|---|---|
| 403. I-5 s/o Parker | A | C | C | C | C | C | C | D |
| 404. I-5 s/o Hasley | B | D | D | D | C | D | D | D |
| 405. I-5 s/o SR-126 | B | D | D | D | D | D | D | D |
| 406. I-5 s/o Rye Cyn | C | E | E | E | E | E | E | E |
| 407. I-5 s/o Magic Mtn | C | E | E | E | E | E | E | E |
| 408. I-5 s/o Valencia | D | E | E | E | E | E | E | E |
| 409. I-5 s/o McBean | D | E | E | E | E | E | E | E |
| 410. I-5 s/o Lyons | D | D | D | D | C | C | C | C |
| 411. I-5 s/o Calgrove | D | D | D | D | C | C | C | C |
| 412. I-5 s/o SR-14 | C | C | C | C | C | C | C | C |

| PM NORTHBOUND | 2006 | 2011 | 2012 | 2014 | 2018 | 2022 | 2025 | 2030 |
|---|---|---|---|---|---|---|---|---|
| 403. I-5 s/o Parker | B | D | D | D | D | D | D | D |
| 404. I-5 s/o Hasley | B | D | D | D | D | D | D | D |
| 405. I-5 s/o SR-126 | B | C | C | C | C | C | D | D |
| 406. I-5 s/o Rye Cyn | B | C | C | C | C | C | D | D |
| 407. I-5 s/o Magic Mtn | C | D | D | D | C | D | D | D |
| 408. I-5 s/o Valencia | D | D | D | D | D | D | D | D |
| 409. I-5 s/o McBean | D | D | D | D | D | D | D | D |
| 410. I-5 s/o Lyons | D | E | E | E | D | D | D | D |
| 411. I-5 s/o Calgrove | E | D | D | D | D | D | D | D |
| 412. I-5 s/o SR-14 | E | E | E | E | E | E | E | E |

Level of Service (LOS) estimated based on the following range of V/C ratios (source: Highway Capacity Manual 2000):

| LOS | V/C |
|---|---|
| A | 0.00 – 0.34 |
| B | 0.35 – 0.56 |
| C | 0.57 – 0.76 |
| D | 0.77 - 0.90 |
| E | 0.91 – 1.00 |
| F | above 1.00 |

See Appendix C for V/C calculations.

# APPENDIX A

# LAND USE AND TRIP GENERATION BY PLANNING AREA

## a. Traffic Analysis Zone (TAZ) Map

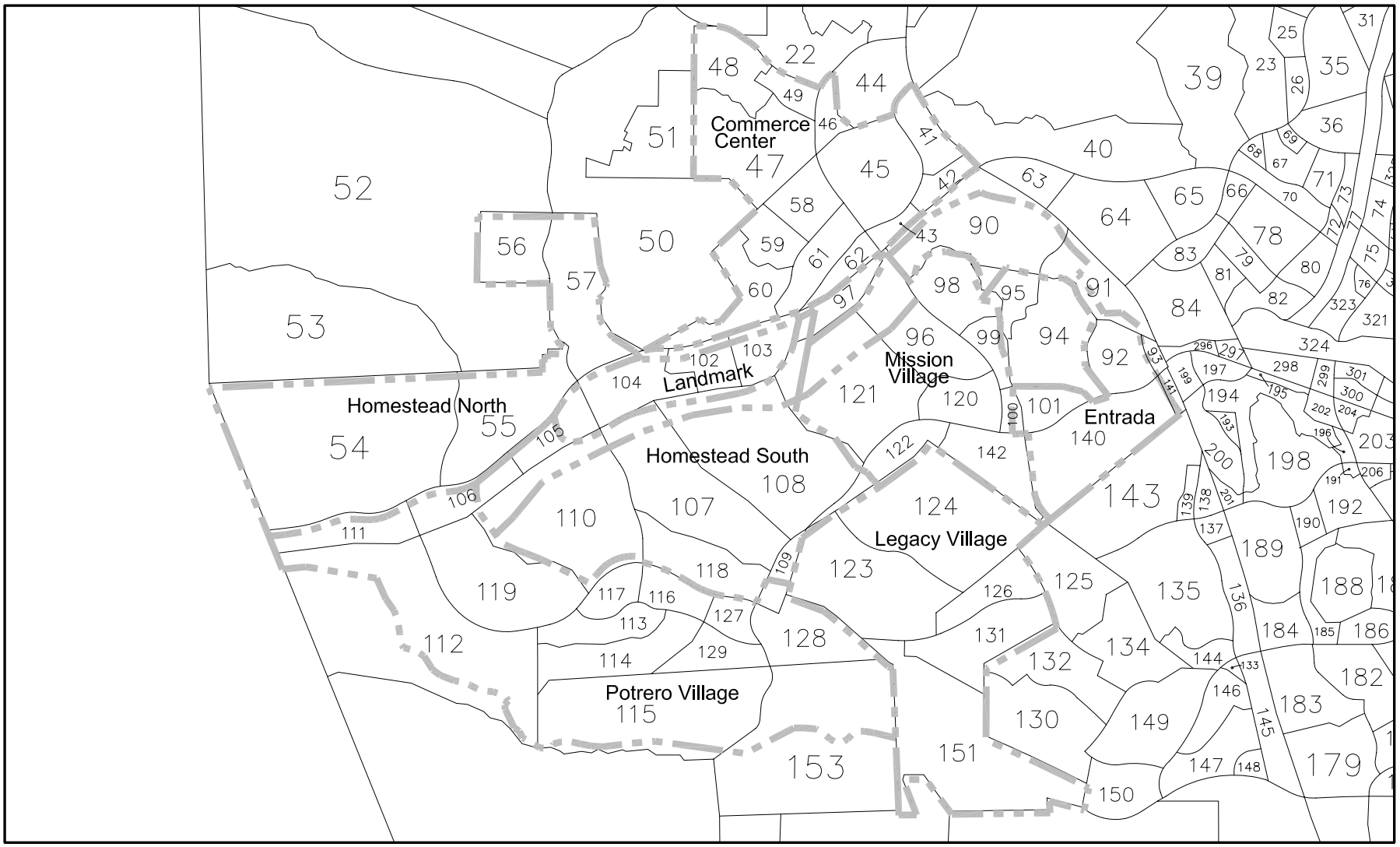



Figure A-1

SCVCTM TAZ MAP
- WESTSIDE PROJECT AREA

# APPENDIX A (Cont.)

# LAND USE AND TRIP GENERATION BY PLANNING AREA

## b. Year 2011

## LANDMARK VILLAGE (2011) ZONAL LAND USE AND TRIP GENERATION

| Zone | | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|---|
| 102 | 3. | Single Family (6-10du/ac) | 38.00 DU | 7 | 21 | 28 | 24 | 14 | 38 | 376 |
| | 4. | Condominium/Townhouse | 305.00 DU | 31 | 146 | 177 | 143 | 79 | 222 | 2440 |
| | 5. | Apartment | 155.00 DU | 12 | 67 | 79 | 64 | 33 | 97 | 1070 |
| | 12. | Commercial Center (<10ac) | 10.50 TSF | 11 | 7 | 18 | 35 | 38 | 73 | 893 |
| | 40. | Commercial Office | 9.50 TSF | 15 | 2 | 17 | 2 | 12 | 14 | 110 |
| | | SUB-TOTAL | | 76 | 243 | 319 | 268 | 176 | 444 | 4889 |
| 103 | 3. | Single Family (6-10du/ac) | 95.00 DU | 18 | 53 | 71 | 61 | 35 | 96 | 940 |
| | 4. | Condominium/Townhouse | 169.00 DU | 17 | 81 | 98 | 79 | 44 | 123 | 1352 |
| | 12. | Commercial Center (<10ac) | 38.50 TSF | 42 | 27 | 69 | 128 | 139 | 267 | 3275 |
| | 13. | Commercial Shops | 9.50 TSF | 7 | 5 | 12 | 17 | 17 | 34 | 352 |
| | 20. | Elementary/Middle School | 750.00 STU | 195 | 150 | 345 | 60 | 68 | 128 | 1088 |
| | 51. | Developed Park | 16.10 AC | 0 | 0 | 0 | 0 | 1 | 1 | 42 |
| | | SUB-TOTAL | | 279 | 316 | 595 | 345 | 304 | 649 | 7049 |
| 104 | 3. | Single Family (6-10du/ac) | 175.00 DU | 33 | 98 | 131 | 112 | 65 | 177 | 1732 |
| | 4. | Condominium/Townhouse | 211.00 DU | 21 | 101 | 122 | 99 | 55 | 154 | 1688 |
| | 5. | Apartment | 152.00 DU | 12 | 65 | 77 | 62 | 32 | 94 | 1049 |
| | 11. | Commercial Center(10-30a) | 252.00 TSF | 184 | 118 | 302 | 600 | 650 | 1250 | 13623 |
| | 40. | Commercial Office | 370.00 TSF | 574 | 70 | 644 | 78 | 477 | 555 | 4277 |
| | | SUB-TOTAL | | 824 | 452 | 1276 | 951 | 1279 | 2230 | 22369 |
| 105 | 5. | Apartment | 144.00 DU | 12 | 62 | 74 | 59 | 30 | 89 | 994 |
| | 12. | Commercial Center (<10ac) | 27.10 TSF | 30 | 19 | 49 | 90 | 98 | 188 | 2305 |
| | 40. | Commercial Office | 315.90 TSF | 490 | 60 | 550 | 66 | 408 | 474 | 3652 |
| | | SUB-TOTAL | | 532 | 141 | 673 | 215 | 536 | 751 | 6951 |

## LANDMARK VILLAGE (2011) LAND USE AND TRIP GENERATION SUMMARY

| | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 3. | Single Family (6-10du/ac) | 308.00 DU | 58 | 172 | 230 | 197 | 114 | 311 | 3048 |
| 4. | Condominium/Townhouse | 685.00 DU | 69 | 328 | 397 | 321 | 178 | 499 | 5480 |
| 5. | Apartment | 451.00 DU | 36 | 194 | 230 | 185 | 95 | 280 | 3113 |
| 11. | Commercial Center(10-30a) | 252.00 TSF | 184 | 118 | 302 | 600 | 650 | 1250 | 13623 |
| 12. | Commercial Center (<10ac) | 76.10 TSF | 83 | 53 | 136 | 253 | 275 | 528 | 6473 |
| 13. | Commercial Shops | 9.50 TSF | 7 | 5 | 12 | 17 | 17 | 34 | 352 |
| 20. | Elementary/Middle School | 750.00 STU | 195 | 150 | 345 | 60 | 68 | 128 | 1088 |
| 40. | Commercial Office | 695.40 TSF | 1079 | 132 | 1211 | 146 | 897 | 1043 | 8039 |
| 51. | Developed Park | 16.10 AC | 0 | 0 | 0 | 0 | 1 | 1 | 42 |
| | TOTAL | | 1711 | 1152 | 2863 | 1779 | 2295 | 4074 | 41258 |

MISSION VILLAGE (2011) ZONAL LAND USE AND TRIP GENERATION

| Zone | | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|---|
| 120 | 4. | Condominium/Townhouse | 531.00 DU | 53 | 255 | 308 | 250 | 138 | 388 | 4248 |
| | 11. | Commercial Center(10-30a) | 200.00 TSF | 146 | 94 | 240 | 476 | 516 | 992 | 10812 |
| | 13. | Commercial Shops | 16.00 TSF | 12 | 8 | 20 | 29 | 29 | 58 | 593 |
| | 20. | Elementary/Middle School | 400.00 STU | 104 | 80 | 184 | 32 | 36 | 68 | 580 |
| | 40. | Commercial Office | 75.00 TSF | 116 | 14 | 130 | 16 | 97 | 113 | 867 |
| | 51. | Developed Park | 8.40 AC | 0 | 0 | 0 | 0 | 0 | 0 | 22 |
| | | SUB-TOTAL | | 431 | 451 | 882 | 803 | 816 | 1619 | 17122 |

MISSION VILLAGE (2011) LAND USE AND TRIP GENERATION SUMMARY

| | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 4. | Condominium/Townhouse | 531.00 DU | 53 | 255 | 308 | 250 | 138 | 388 | 4248 |
| 11. | Commercial Center(10-30a) | 200.00 TSF | 146 | 94 | 240 | 476 | 516 | 992 | 10812 |
| 13. | Commercial Shops | 16.00 TSF | 12 | 8 | 20 | 29 | 29 | 58 | 593 |
| 20. | Elementary/Middle School | 400.00 STU | 104 | 80 | 184 | 32 | 36 | 68 | 580 |
| 40. | Commercial Office | 75.00 TSF | 116 | 14 | 130 | 16 | 97 | 113 | 867 |
| 51. | Developed Park | 8.40 AC | 0 | 0 | 0 | 0 | 0 | 0 | 22 |
| | TOTAL | | 431 | 451 | 882 | 803 | 816 | 1619 | 17122 |

HOMESTEAD S/O RIVER (2011) ZONAL LAND USE AND TRIP GENERATION

| Zone | | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|---|
| 108 | 4. | Condominium/Townhouse | 112.00 DU | 11 | 54 | 65 | 53 | 29 | 82 | 896 |
| | 51. | Developed Park | 8.70 AC | 0 | 0 | 0 | 0 | 0 | 0 | 23 |
| | | SUB-TOTAL | | 11 | 54 | 65 | 53 | 29 | 82 | 919 |

HOMESTEAD S/O RIVER (2011) LAND USE AND TRIP GENERATION SUMMARY

| | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 4. | Condominium/Townhouse | 112.00 DU | 11 | 54 | 65 | 53 | 29 | 82 | 896 |
| 51. | Developed Park | 8.70 AC | 0 | 0 | 0 | 0 | 0 | 0 | 23 |
| | TOTAL | | 11 | 54 | 65 | 53 | 29 | 82 | 919 |

## ENTRADA (2011) ZONAL LAND USE AND TRIP GENERATION

| Zone | | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|---|
| 90 | 30. | Industrial Park | 63.88 TSF | 35 | 6 | 41 | 8 | 33 | 41 | 383 |
| | 11. | Commercial Center(10-30a) | 135.00 TSF | 99 | 63 | 162 | 321 | 348 | 669 | 7298 |
| | | SUB-TOTAL | | 134 | 69 | 203 | 329 | 381 | 710 | 7681 |
| 92 | 40. | Commercial Office | 200.00 TSF | 310 | 38 | 348 | 42 | 258 | 300 | 2312 |
| | | SUB-TOTAL | | 310 | 38 | 348 | 42 | 258 | 300 | 2312 |
| 140 | 3. | Single Family (6-10du/ac) | 150.00 DU | 29 | 84 | 113 | 96 | 56 | 152 | 1485 |
| | 12. | Commercial Center (<10ac) | 28.48 TSF | 31 | 20 | 51 | 95 | 103 | 198 | 2422 |
| | | SUB-TOTAL | | 60 | 104 | 164 | 191 | 159 | 350 | 3907 |

## ENTRADA (2011) LAND USE AND TRIP GENERATION SUMMARY

| | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 3. | Single Family (6-10du/ac) | 150.00 DU | 29 | 84 | 113 | 96 | 56 | 152 | 1485 |
| 11. | Commercial Center(10-30a) | 135.00 TSF | 99 | 63 | 162 | 321 | 348 | 669 | 7298 |
| 12. | Commercial Center (<10ac) | 28.48 TSF | 31 | 20 | 51 | 95 | 103 | 198 | 2422 |
| 30. | Industrial Park | 63.88 TSF | 35 | 6 | 41 | 8 | 33 | 41 | 383 |
| 40. | Commercial Office | 200.00 TSF | 310 | 38 | 348 | 42 | 258 | 300 | 2312 |
| | TOTAL | | 504 | 211 | 715 | 562 | 798 | 1360 | 13900 |

COMMERCE CENTER (2011) ZONAL LAND USE AND TRIP GENERATION

| Zone | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 41 | 30. Industrial Park | 730.00 TSF | 402 | 73 | 475 | 95 | 380 | 475 | 4380 |
| | SUB-TOTAL | | 402 | 73 | 475 | 95 | 380 | 475 | 4380 |
| 42 | 30. Industrial Park | 275.00 TSF | 151 | 28 | 179 | 36 | 143 | 179 | 1650 |
| | SUB-TOTAL | | 151 | 28 | 179 | 36 | 143 | 179 | 1650 |
| 43 | 30. Industrial Park | 273.90 TSF | 151 | 27 | 178 | 36 | 142 | 178 | 1643 |
| | SUB-TOTAL | | 151 | 27 | 178 | 36 | 142 | 178 | 1643 |
| 45 | 30. Industrial Park | 660.20 TSF | 363 | 66 | 429 | 86 | 343 | 429 | 3961 |
| | SUB-TOTAL | | 363 | 66 | 429 | 86 | 343 | 429 | 3961 |
| 46 | 13. Commercial Shops | 77.00 TSF | 55 | 37 | 92 | 139 | 139 | 278 | 2854 |
| | 30. Industrial Park | 445.80 TSF | 245 | 45 | 290 | 58 | 232 | 290 | 2675 |
| | SUB-TOTAL | | 300 | 82 | 382 | 197 | 371 | 568 | 5529 |
| 47 | 30. Industrial Park | 3254.10 TSF | 1790 | 325 | 2115 | 423 | 1692 | 2115 | 19525 |
| | SUB-TOTAL | | 1790 | 325 | 2115 | 423 | 1692 | 2115 | 19525 |
| 48 | 30. Industrial Park | 720.00 TSF | 396 | 72 | 468 | 94 | 374 | 468 | 4320 |
| | SUB-TOTAL | | 396 | 72 | 468 | 94 | 374 | 468 | 4320 |
| 49 | 30. Industrial Park | 764.30 TSF | 420 | 76 | 496 | 99 | 397 | 496 | 4586 |
| | SUB-TOTAL | | 420 | 76 | 496 | 99 | 397 | 496 | 4586 |
| 58 | 30. Industrial Park | 1051.50 TSF | 578 | 105 | 683 | 137 | 547 | 684 | 6309 |
| | SUB-TOTAL | | 578 | 105 | 683 | 137 | 547 | 684 | 6309 |
| 59 | 35. Regional Post Office | 764.00 TSF | 153 | 115 | 268 | 115 | 115 | 230 | 3820 |
| | SUB-TOTAL | | 153 | 115 | 268 | 115 | 115 | 230 | 3820 |
| 60 | 30. Industrial Park | 411.60 TSF | 226 | 41 | 267 | 54 | 214 | 268 | 2470 |
| | SUB-TOTAL | | 226 | 41 | 267 | 54 | 214 | 268 | 2470 |
| 61 | 30. Industrial Park | 744.90 TSF | 410 | 74 | 484 | 97 | 387 | 484 | 4469 |
| | SUB-TOTAL | | 410 | 74 | 484 | 97 | 387 | 484 | 4469 |
| 62 | 30. Industrial Park | 287.30 TSF | 158 | 29 | 187 | 37 | 149 | 186 | 1724 |
| | SUB-TOTAL | | 158 | 29 | 187 | 37 | 149 | 186 | 1724 |

COMMERCE CENTER (2011) LAND USE AND TRIP GENERATION SUMMARY

| | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 13. | Commercial Shops | 77.00 TSF | 55 | 37 | 92 | 139 | 139 | 278 | 2854 |
| 30. | Industrial Park | 9618.60 TSF | 5290 | 961 | 6251 | 1252 | 5000 | 6252 | 57712 |
| 35. | Regional Post Office | 764.00 TSF | 153 | 115 | 268 | 115 | 115 | 230 | 3820 |
| | TOTAL | | 5498 | 1113 | 6611 | 1506 | 5254 | 6760 | 64386 |

TOTAL (2011) LAND USE AND TRIP GENERATION SUMMARY

| | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 3. | Single Family (6-10du/ac) | 458.00 DU | 87 | 256 | 343 | 293 | 170 | 463 | 4533 |
| 4. | Condominium/Townhouse | 1328.00 DU | 133 | 637 | 770 | 624 | 345 | 969 | 10624 |
| 5. | Apartment | 451.00 DU | 36 | 194 | 230 | 185 | 95 | 280 | 3113 |
| 11. | Commercial Center(10-30a) | 587.00 TSF | 429 | 275 | 704 | 1397 | 1514 | 2911 | 31733 |
| 12. | Commercial Center (<10ac) | 104.57 TSF | 114 | 73 | 187 | 348 | 378 | 726 | 8895 |
| 13. | Commercial Shops | 102.50 TSF | 74 | 50 | 124 | 185 | 185 | 370 | 3799 |
| 20. | Elementary/Middle School | 1150.00 STU | 299 | 230 | 529 | 92 | 104 | 196 | 1668 |
| 30. | Industrial Park | 9682.48 TSF | 5325 | 967 | 6292 | 1260 | 5033 | 6293 | 58095 |
| 35. | Regional Post Office | 764.00 TSF | 153 | 115 | 268 | 115 | 115 | 230 | 3820 |
| 40. | Commercial Office | 970.40 TSF | 1505 | 184 | 1689 | 204 | 1252 | 1456 | 11218 |
| 51. | Developed Park | 33.20 AC | 0 | 0 | 0 | 0 | 1 | 1 | 87 |
| | TOTAL | | 8155 | 2981 | 11136 | 4703 | 9192 | 13895 | 137585 |

# APPENDIX A (Cont.)

# LAND USE AND TRIP GENERATION BY PLANNING AREA

## c. Year 2012

## LANDMARK VILLAGE (2012) ZONAL LAND USE AND TRIP GENERATION

| Zone | | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|---|
| 102 | 3. | Single Family (6-10du/ac) | 38.00 DU | 7 | 21 | 28 | 24 | 14 | 38 | 376 |
| | 4. | Condominium/Townhouse | 305.00 DU | 31 | 146 | 177 | 143 | 79 | 222 | 2440 |
| | 5. | Apartment | 155.00 DU | 12 | 67 | 79 | 64 | 33 | 97 | 1070 |
| | 12. | Commercial Center (<10ac) | 10.50 TSF | 11 | 7 | 18 | 35 | 38 | 73 | 893 |
| | 40. | Commercial Office | 9.50 TSF | 15 | 2 | 17 | 2 | 12 | 14 | 110 |
| | | SUB-TOTAL | | 76 | 243 | 319 | 268 | 176 | 444 | 4889 |
| 103 | 3. | Single Family (6-10du/ac) | 95.00 DU | 18 | 53 | 71 | 61 | 35 | 96 | 940 |
| | 4. | Condominium/Townhouse | 169.00 DU | 17 | 81 | 98 | 79 | 44 | 123 | 1352 |
| | 12. | Commercial Center (<10ac) | 38.50 TSF | 42 | 27 | 69 | 128 | 139 | 267 | 3275 |
| | 13. | Commercial Shops | 9.50 TSF | 7 | 5 | 12 | 17 | 17 | 34 | 352 |
| | 20. | Elementary/Middle School | 750.00 STU | 195 | 150 | 345 | 60 | 68 | 128 | 1088 |
| | 51. | Developed Park | 16.10 AC | 0 | 0 | 0 | 0 | 1 | 1 | 42 |
| | | SUB-TOTAL | | 279 | 316 | 595 | 345 | 304 | 649 | 7049 |
| 104 | 3. | Single Family (6-10du/ac) | 175.00 DU | 33 | 98 | 131 | 112 | 65 | 177 | 1732 |
| | 4. | Condominium/Townhouse | 211.00 DU | 21 | 101 | 122 | 99 | 55 | 154 | 1688 |
| | 5. | Apartment | 152.00 DU | 12 | 65 | 77 | 62 | 32 | 94 | 1049 |
| | 11. | Commercial Center(10-30a) | 252.00 TSF | 184 | 118 | 302 | 600 | 650 | 1250 | 13623 |
| | 40. | Commercial Office | 370.00 TSF | 574 | 70 | 644 | 78 | 477 | 555 | 4277 |
| | | SUB-TOTAL | | 824 | 452 | 1276 | 951 | 1279 | 2230 | 22369 |
| 105 | 5. | Apartment | 144.00 DU | 12 | 62 | 74 | 59 | 30 | 89 | 994 |
| | 12. | Commercial Center (<10ac) | 27.10 TSF | 30 | 19 | 49 | 90 | 98 | 188 | 2305 |
| | 40. | Commercial Office | 315.90 TSF | 490 | 60 | 550 | 66 | 408 | 474 | 3652 |
| | | SUB-TOTAL | | 532 | 141 | 673 | 215 | 536 | 751 | 6951 |

## LANDMARK VILLAGE (2012) LAND USE AND TRIP GENERATION SUMMARY

| | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 3. | Single Family (6-10du/ac) | 308.00 DU | 58 | 172 | 230 | 197 | 114 | 311 | 3048 |
| 4. | Condominium/Townhouse | 685.00 DU | 69 | 328 | 397 | 321 | 178 | 499 | 5480 |
| 5. | Apartment | 451.00 DU | 36 | 194 | 230 | 185 | 95 | 280 | 3113 |
| 11. | Commercial Center(10-30a) | 252.00 TSF | 184 | 118 | 302 | 600 | 650 | 1250 | 13623 |
| 12. | Commercial Center (<10ac) | 76.10 TSF | 83 | 53 | 136 | 253 | 275 | 528 | 6473 |
| 13. | Commercial Shops | 9.50 TSF | 7 | 5 | 12 | 17 | 17 | 34 | 352 |
| 20. | Elementary/Middle School | 750.00 STU | 195 | 150 | 345 | 60 | 68 | 128 | 1088 |
| 40. | Commercial Office | 695.40 TSF | 1079 | 132 | 1211 | 146 | 897 | 1043 | 8039 |
| 51. | Developed Park | 16.10 AC | 0 | 0 | 0 | 0 | 1 | 1 | 42 |
| | TOTAL | | 1711 | 1152 | 2863 | 1779 | 2295 | 4074 | 41258 |

## MISSION VILLAGE (2012) ZONAL LAND USE AND TRIP GENERATION

| Zone | | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|---|
| 120 | 4. | Condominium/Townhouse | 932.00 DU | 93 | 447 | 540 | 438 | 242 | 680 | 7456 |
| | 11. | Commercial Center(10-30a) | 200.00 TSF | 146 | 94 | 240 | 476 | 516 | 992 | 10812 |
| | 13. | Commercial Shops | 16.00 TSF | 12 | 8 | 20 | 29 | 29 | 58 | 593 |
| | 20. | Elementary/Middle School | 600.00 STU | 156 | 120 | 276 | 48 | 54 | 102 | 870 |
| | 40. | Commercial Office | 75.00 TSF | 116 | 14 | 130 | 16 | 97 | 113 | 867 |
| | 51. | Developed Park | 8.40 AC | 0 | 0 | 0 | 0 | 0 | 0 | 22 |
| | | SUB-TOTAL | | 523 | 683 | 1206 | 1007 | 938 | 1945 | 20620 |

## MISSION VILLAGE (2012) LAND USE AND TRIP GENERATION SUMMARY

| | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 4. | Condominium/Townhouse | 932.00 DU | 93 | 447 | 540 | 438 | 242 | 680 | 7456 |
| 11. | Commercial Center(10-30a) | 200.00 TSF | 146 | 94 | 240 | 476 | 516 | 992 | 10812 |
| 13. | Commercial Shops | 16.00 TSF | 12 | 8 | 20 | 29 | 29 | 58 | 593 |
| 20. | Elementary/Middle School | 600.00 STU | 156 | 120 | 276 | 48 | 54 | 102 | 870 |
| 40. | Commercial Office | 75.00 TSF | 116 | 14 | 130 | 16 | 97 | 113 | 867 |
| 51. | Developed Park | 8.40 AC | 0 | 0 | 0 | 0 | 0 | 0 | 22 |
| | TOTAL | | 523 | 683 | 1206 | 1007 | 938 | 1945 | 20620 |

HOMESTEAD S/O RIVER (2012) ZONAL LAND USE AND TRIP GENERATION

| Zone | | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|---|
| 108 | 4. | Condominium/Townhouse | 312.00 DU | 31 | 150 | 181 | 147 | 81 | 228 | 2496 |
| | 51. | Developed Park | 8.70 AC | 0 | 0 | 0 | 0 | 0 | 0 | 23 |
| | | SUB-TOTAL | | 31 | 150 | 181 | 147 | 81 | 228 | 2519 |

HOMESTEAD S/O RIVER (2012) LAND USE AND TRIP GENERATION SUMMARY

| | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 4. | Condominium/Townhouse | 312.00 DU | 31 | 150 | 181 | 147 | 81 | 228 | 2496 |
| 51. | Developed Park | 8.70 AC | 0 | 0 | 0 | 0 | 0 | 0 | 23 |
| | TOTAL | | 31 | 150 | 181 | 147 | 81 | 228 | 2519 |

## ENTRADA (2012) ZONAL LAND USE AND TRIP GENERATION

| Zone | | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|---|
| 90 | 30. | Industrial Park | 63.88 TSF | 35 | 6 | 41 | 8 | 33 | 41 | 383 |
| | 11. | Commercial Center(10-30a) | 135.00 TSF | 99 | 63 | 162 | 321 | 348 | 669 | 7298 |
| | | SUB-TOTAL | | 134 | 69 | 203 | 329 | 381 | 710 | 7681 |
| 92 | 40. | Commercial Office | 200.00 TSF | 310 | 38 | 348 | 42 | 258 | 300 | 2312 |
| | | SUB-TOTAL | | 310 | 38 | 348 | 42 | 258 | 300 | 2312 |
| 140 | 3. | Single Family (6-10du/ac) | 391.00 DU | 74 | 219 | 293 | 250 | 145 | 395 | 3871 |
| | 12. | Commercial Center (<10ac) | 28.48 TSF | 31 | 20 | 51 | 95 | 103 | 198 | 2422 |
| | | SUB-TOTAL | | 105 | 239 | 344 | 345 | 248 | 593 | 6293 |

## ENTRADA (2012) LAND USE AND TRIP GENERATION SUMMARY

| | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 3. | Single Family (6-10du/ac) | 391.00 DU | 74 | 219 | 293 | 250 | 145 | 395 | 3871 |
| 11. | Commercial Center(10-30a) | 135.00 TSF | 99 | 63 | 162 | 321 | 348 | 669 | 7298 |
| 12. | Commercial Center (<10ac) | 28.48 TSF | 31 | 20 | 51 | 95 | 103 | 198 | 2422 |
| 30. | Industrial Park | 63.88 TSF | 35 | 6 | 41 | 8 | 33 | 41 | 383 |
| 40. | Commercial Office | 200.00 TSF | 310 | 38 | 348 | 42 | 258 | 300 | 2312 |
| | TOTAL | | 549 | 346 | 895 | 716 | 887 | 1603 | 16286 |

LEGACY VILLAGE (2012) ZONAL LAND USE AND TRIP GENERATION

| Zone | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 126 | 4. Condominium/Townhouse | 97.00 DU | 10 | 47 | 57 | 46 | 25 | 71 | 776 |
| | SUB-TOTAL | | 10 | 47 | 57 | 46 | 25 | 71 | 776 |

LEGACY VILLAGE (2012) LAND USE AND TRIP GENERATION SUMMARY

| Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|
| 4. Condominium/Townhouse | 97.00 DU | 10 | 47 | 57 | 46 | 25 | 71 | 776 |
| TOTAL | | 10 | 47 | 57 | 46 | 25 | 71 | 776 |

COMMERCE CENTER (2012) ZONAL LAND USE AND TRIP GENERATION

| Zone | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 41 | 30. Industrial Park | 730.00 TSF | 402 | 73 | 475 | 95 | 380 | 475 | 4380 |
| | SUB-TOTAL | | 402 | 73 | 475 | 95 | 380 | 475 | 4380 |
| 42 | 30. Industrial Park | 275.00 TSF | 151 | 28 | 179 | 36 | 143 | 179 | 1650 |
| | SUB-TOTAL | | 151 | 28 | 179 | 36 | 143 | 179 | 1650 |
| 43 | 30. Industrial Park | 273.90 TSF | 151 | 27 | 178 | 36 | 142 | 178 | 1643 |
| | SUB-TOTAL | | 151 | 27 | 178 | 36 | 142 | 178 | 1643 |
| 45 | 30. Industrial Park | 980.20 TSF | 539 | 98 | 637 | 127 | 510 | 637 | 5881 |
| | SUB-TOTAL | | 539 | 98 | 637 | 127 | 510 | 637 | 5881 |
| 46 | 13. Commercial Shops | 77.00 TSF | 55 | 37 | 92 | 139 | 139 | 278 | 2854 |
| | 30. Industrial Park | 445.80 TSF | 245 | 45 | 290 | 58 | 232 | 290 | 2675 |
| | SUB-TOTAL | | 300 | 82 | 382 | 197 | 371 | 568 | 5529 |
| 47 | 30. Industrial Park | 3574.10 TSF | 1966 | 357 | 2323 | 465 | 1859 | 2324 | 21445 |
| | SUB-TOTAL | | 1966 | 357 | 2323 | 465 | 1859 | 2324 | 21445 |
| 48 | 30. Industrial Park | 720.00 TSF | 396 | 72 | 468 | 94 | 374 | 468 | 4320 |
| | SUB-TOTAL | | 396 | 72 | 468 | 94 | 374 | 468 | 4320 |
| 49 | 30. Industrial Park | 764.30 TSF | 420 | 76 | 496 | 99 | 397 | 496 | 4586 |
| | SUB-TOTAL | | 420 | 76 | 496 | 99 | 397 | 496 | 4586 |
| 58 | 30. Industrial Park | 1051.50 TSF | 578 | 105 | 683 | 137 | 547 | 684 | 6309 |
| | SUB-TOTAL | | 578 | 105 | 683 | 137 | 547 | 684 | 6309 |
| 59 | 35. Regional Post Office | 764.00 TSF | 153 | 115 | 268 | 115 | 115 | 230 | 3820 |
| | SUB-TOTAL | | 153 | 115 | 268 | 115 | 115 | 230 | 3820 |
| 60 | 30. Industrial Park | 411.60 TSF | 226 | 41 | 267 | 54 | 214 | 268 | 2470 |
| | SUB-TOTAL | | 226 | 41 | 267 | 54 | 214 | 268 | 2470 |
| 61 | 30. Industrial Park | 744.90 TSF | 410 | 74 | 484 | 97 | 387 | 484 | 4469 |
| | SUB-TOTAL | | 410 | 74 | 484 | 97 | 387 | 484 | 4469 |
| 62 | 30. Industrial Park | 607.30 TSF | 334 | 61 | 395 | 79 | 316 | 395 | 3644 |
| | SUB-TOTAL | | 334 | 61 | 395 | 79 | 316 | 395 | 3644 |

COMMERCE CENTER (2012) LAND USE AND TRIP GENERATION SUMMARY

| | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 13. | Commercial Shops | 77.00 TSF | 55 | 37 | 92 | 139 | 139 | 278 | 2854 |
| 30. | Industrial Park | 10578.60 TSF | 5818 | 1057 | 6875 | 1377 | 5501 | 6878 | 63472 |
| 35. | Regional Post Office | 764.00 TSF | 153 | 115 | 268 | 115 | 115 | 230 | 3820 |
| | TOTAL | | 6026 | 1209 | 7235 | 1631 | 5755 | 7386 | 70146 |

TOTAL (2012) LAND USE AND TRIP GENERATION SUMMARY

| | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 3. | Single Family (6-10du/ac) | 699.00 DU | 132 | 391 | 523 | 447 | 259 | 706 | 6919 |
| 4. | Condominium/Townhouse | 2026.00 DU | 203 | 972 | 1175 | 952 | 526 | 1478 | 16208 |
| 5. | Apartment | 451.00 DU | 36 | 194 | 230 | 185 | 95 | 280 | 3113 |
| 11. | Commercial Center(10-30a) | 587.00 TSF | 429 | 275 | 704 | 1397 | 1514 | 2911 | 31733 |
| 12. | Commercial Center (<10ac) | 104.57 TSF | 114 | 73 | 187 | 348 | 378 | 726 | 8895 |
| 13. | Commercial Shops | 102.50 TSF | 74 | 50 | 124 | 185 | 185 | 370 | 3799 |
| 20. | Elementary/Middle School | 1350.00 STU | 351 | 270 | 621 | 108 | 122 | 230 | 1958 |
| 30. | Industrial Park | 10642.48 TSF | 5853 | 1063 | 6916 | 1385 | 5534 | 6919 | 63855 |
| 35. | Regional Post Office | 764.00 TSF | 153 | 115 | 268 | 115 | 115 | 230 | 3820 |
| 40. | Commercial Office | 970.40 TSF | 1505 | 184 | 1689 | 204 | 1252 | 1456 | 11218 |
| 51. | Developed Park | 33.20 AC | 0 | 0 | 0 | 0 | 1 | 1 | 87 |
| | TOTAL | | 8850 | 3587 | 12437 | 5326 | 9981 | 15307 | 151605 |

# APPENDIX A (Cont.)

# LAND USE AND TRIP GENERATION BY PLANNING AREA

## d. Year 2014

## LANDMARK VILLAGE (2014) ZONAL LAND USE AND TRIP GENERATION

| Zone | | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|---|
| 102 | 3. | Single Family (6-10du/ac) | 38.00 DU | 7 | 21 | 28 | 24 | 14 | 38 | 376 |
| | 4. | Condominium/Townhouse | 305.00 DU | 31 | 146 | 177 | 143 | 79 | 222 | 2440 |
| | 5. | Apartment | 155.00 DU | 12 | 67 | 79 | 64 | 33 | 97 | 1070 |
| | 12. | Commercial Center (<10ac) | 10.50 TSF | 11 | 7 | 18 | 35 | 38 | 73 | 893 |
| | 40. | Commercial Office | 9.50 TSF | 15 | 2 | 17 | 2 | 12 | 14 | 110 |
| | | SUB-TOTAL | | 76 | 243 | 319 | 268 | 176 | 444 | 4889 |
| 103 | 3. | Single Family (6-10du/ac) | 95.00 DU | 18 | 53 | 71 | 61 | 35 | 96 | 940 |
| | 4. | Condominium/Townhouse | 169.00 DU | 17 | 81 | 98 | 79 | 44 | 123 | 1352 |
| | 12. | Commercial Center (<10ac) | 38.50 TSF | 42 | 27 | 69 | 128 | 139 | 267 | 3275 |
| | 13. | Commercial Shops | 9.50 TSF | 7 | 5 | 12 | 17 | 17 | 34 | 352 |
| | 20. | Elementary/Middle School | 750.00 STU | 195 | 150 | 345 | 60 | 68 | 128 | 1088 |
| | 51. | Developed Park | 16.10 AC | 0 | 0 | 0 | 0 | 1 | 1 | 42 |
| | | SUB-TOTAL | | 279 | 316 | 595 | 345 | 304 | 649 | 7049 |
| 104 | 3. | Single Family (6-10du/ac) | 175.00 DU | 33 | 98 | 131 | 112 | 65 | 177 | 1732 |
| | 4. | Condominium/Townhouse | 211.00 DU | 21 | 101 | 122 | 99 | 55 | 154 | 1688 |
| | 5. | Apartment | 152.00 DU | 12 | 65 | 77 | 62 | 32 | 94 | 1049 |
| | 11. | Commercial Center(10-30a) | 252.00 TSF | 184 | 118 | 302 | 600 | 650 | 1250 | 13623 |
| | 40. | Commercial Office | 370.00 TSF | 574 | 70 | 644 | 78 | 477 | 555 | 4277 |
| | | SUB-TOTAL | | 824 | 452 | 1276 | 951 | 1279 | 2230 | 22369 |
| 105 | 5. | Apartment | 144.00 DU | 12 | 62 | 74 | 59 | 30 | 89 | 994 |
| | 12. | Commercial Center (<10ac) | 27.10 TSF | 30 | 19 | 49 | 90 | 98 | 188 | 2305 |
| | 40. | Commercial Office | 315.90 TSF | 490 | 60 | 550 | 66 | 408 | 474 | 3652 |
| | | SUB-TOTAL | | 532 | 141 | 673 | 215 | 536 | 751 | 6951 |

## LANDMARK VILLAGE (2014) LAND USE AND TRIP GENERATION SUMMARY

| | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 3. | Single Family (6-10du/ac) | 308.00 DU | 58 | 172 | 230 | 197 | 114 | 311 | 3048 |
| 4. | Condominium/Townhouse | 685.00 DU | 69 | 328 | 397 | 321 | 178 | 499 | 5480 |
| 5. | Apartment | 451.00 DU | 36 | 194 | 230 | 185 | 95 | 280 | 3113 |
| 11. | Commercial Center(10-30a) | 252.00 TSF | 184 | 118 | 302 | 600 | 650 | 1250 | 13623 |
| 12. | Commercial Center (<10ac) | 76.10 TSF | 83 | 53 | 136 | 253 | 275 | 528 | 6473 |
| 13. | Commercial Shops | 9.50 TSF | 7 | 5 | 12 | 17 | 17 | 34 | 352 |
| 20. | Elementary/Middle School | 750.00 STU | 195 | 150 | 345 | 60 | 68 | 128 | 1088 |
| 40. | Commercial Office | 695.40 TSF | 1079 | 132 | 1211 | 146 | 897 | 1043 | 8039 |
| 51. | Developed Park | 16.10 AC | 0 | 0 | 0 | 0 | 1 | 1 | 42 |
| | TOTAL | | 1711 | 1152 | 2863 | 1779 | 2295 | 4074 | 41258 |

## MISSION VILLAGE (2014) ZONAL LAND USE AND TRIP GENERATION

| Zone | | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|---|
| 100 | 12. | Commercial Center (<10ac) | 23.00 TSF | 25 | 16 | 41 | 76 | 83 | 159 | 1956 |
| | | SUB-TOTAL | | 25 | 16 | 41 | 76 | 83 | 159 | 1956 |
| 120 | 4. | Condominium/Townhouse | 1874.00 DU | 187 | 900 | 1087 | 881 | 487 | 1368 | 14992 |
| | 11. | Commercial Center(10-30a) | 200.00 TSF | 146 | 94 | 240 | 476 | 516 | 992 | 10812 |
| | 13. | Commercial Shops | 16.00 TSF | 12 | 8 | 20 | 29 | 29 | 58 | 593 |
| | 20. | Elementary/Middle School | 900.00 STU | 234 | 180 | 414 | 72 | 81 | 153 | 1305 |
| | 40. | Commercial Office | 75.00 TSF | 116 | 14 | 130 | 16 | 97 | 113 | 867 |
| | 51. | Developed Park | 8.40 AC | 0 | 0 | 0 | 0 | 0 | 0 | 22 |
| | | SUB-TOTAL | | 695 | 1196 | 1891 | 1474 | 1210 | 2684 | 28591 |

## MISSION VILLAGE (2014) LAND USE AND TRIP GENERATION SUMMARY

| | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 4. | Condominium/Townhouse | 1874.00 DU | 187 | 900 | 1087 | 881 | 487 | 1368 | 14992 |
| 11. | Commercial Center(10-30a) | 200.00 TSF | 146 | 94 | 240 | 476 | 516 | 992 | 10812 |
| 12. | Commercial Center (<10ac) | 23.00 TSF | 25 | 16 | 41 | 76 | 83 | 159 | 1956 |
| 13. | Commercial Shops | 16.00 TSF | 12 | 8 | 20 | 29 | 29 | 58 | 593 |
| 20. | Elementary/Middle School | 900.00 STU | 234 | 180 | 414 | 72 | 81 | 153 | 1305 |
| 40. | Commercial Office | 75.00 TSF | 116 | 14 | 130 | 16 | 97 | 113 | 867 |
| 51. | Developed Park | 8.40 AC | 0 | 0 | 0 | 0 | 0 | 0 | 22 |
| | TOTAL | | 720 | 1212 | 1932 | 1550 | 1293 | 2843 | 30547 |

HOMESTEAD S/O RIVER (2014) ZONAL LAND USE AND TRIP GENERATION

| Zone | | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|---|
| 108 | 4. | Condominium/Townhouse | 851.00 DU | 85 | 408 | 493 | 400 | 221 | 621 | 6808 |
| | 51. | Developed Park | 8.70 AC | 0 | 0 | 0 | 0 | 0 | 0 | 23 |
| | | SUB-TOTAL | | 85 | 408 | 493 | 400 | 221 | 621 | 6831 |

HOMESTEAD S/O RIVER (2014) LAND USE AND TRIP GENERATION SUMMARY

| | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 4. | Condominium/Townhouse | 851.00 DU | 85 | 408 | 493 | 400 | 221 | 621 | 6808 |
| 51. | Developed Park | 8.70 AC | 0 | 0 | 0 | 0 | 0 | 0 | 23 |
| | TOTAL | | 85 | 408 | 493 | 400 | 221 | 621 | 6831 |

POTRERO VILLAGE (2014) ZONAL LAND USE AND TRIP GENERATION

| Zone | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 128 | 3. Single Family (6-10du/ac) | 114.00 DU | 22 | 64 | 86 | 73 | 42 | 115 | 1129 |
| | SUB-TOTAL | | 22 | 64 | 86 | 73 | 42 | 115 | 1129 |

POTRERO VILLAGE (2014) LAND USE AND TRIP GENERATION SUMMARY

| Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|
| 3. Single Family (6-10du/ac) | 114.00 DU | 22 | 64 | 86 | 73 | 42 | 115 | 1129 |
| TOTAL | | 22 | 64 | 86 | 73 | 42 | 115 | 1129 |

## ENTRADA (2014) ZONAL LAND USE AND TRIP GENERATION

| Zone | | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|---|
| 90 | 30. | Industrial Park | 63.88 TSF | 35 | 6 | 41 | 8 | 33 | 41 | 383 |
| | 11. | Commercial Center(10-30a) | 135.00 TSF | 99 | 63 | 162 | 321 | 348 | 669 | 7298 |
| | | SUB-TOTAL | | 134 | 69 | 203 | 329 | 381 | 710 | 7681 |
| 92 | 40. | Commercial Office | 200.00 TSF | 310 | 38 | 348 | 42 | 258 | 300 | 2312 |
| | | SUB-TOTAL | | 310 | 38 | 348 | 42 | 258 | 300 | 2312 |
| 140 | 3. | Single Family (6-10du/ac) | 572.00 DU | 109 | 320 | 429 | 366 | 212 | 578 | 5663 |
| | 4. | Condominium/Townhouse | 614.00 DU | 61 | 295 | 356 | 289 | 160 | 449 | 4912 |
| | 12. | Commercial Center (<10ac) | 28.48 TSF | 31 | 20 | 51 | 95 | 103 | 198 | 2422 |
| | | SUB-TOTAL | | 201 | 635 | 836 | 750 | 475 | 1225 | 12997 |

## ENTRADA (2014) LAND USE AND TRIP GENERATION SUMMARY

| | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 3. | Single Family (6-10du/ac) | 572.00 DU | 109 | 320 | 429 | 366 | 212 | 578 | 5663 |
| 4. | Condominium/Townhouse | 614.00 DU | 61 | 295 | 356 | 289 | 160 | 449 | 4912 |
| 11. | Commercial Center(10-30a) | 135.00 TSF | 99 | 63 | 162 | 321 | 348 | 669 | 7298 |
| 12. | Commercial Center (<10ac) | 28.48 TSF | 31 | 20 | 51 | 95 | 103 | 198 | 2422 |
| 30. | Industrial Park | 63.88 TSF | 35 | 6 | 41 | 8 | 33 | 41 | 383 |
| 40. | Commercial Office | 200.00 TSF | 310 | 38 | 348 | 42 | 258 | 300 | 2312 |
| | TOTAL | | 645 | 742 | 1387 | 1121 | 1114 | 2235 | 22990 |

## LEGACY VILLAGE (2014) ZONAL LAND USE AND TRIP GENERATION

| Zone | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 126 | 4. Condominium/Townhouse | 585.00 DU | 59 | 281 | 340 | 275 | 152 | 427 | 4680 |
| | SUB-TOTAL | | 59 | 281 | 340 | 275 | 152 | 427 | 4680 |
| 131 | 4. Condominium/Townhouse | 12.00 DU | 1 | 6 | 7 | 6 | 3 | 9 | 96 |
| | SUB-TOTAL | | 1 | 6 | 7 | 6 | 3 | 9 | 96 |

## LEGACY VILLAGE (2014) LAND USE AND TRIP GENERATION SUMMARY

| Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|
| 4. Condominium/Townhouse | 597.00 DU | 60 | 287 | 347 | 281 | 155 | 436 | 4776 |
| TOTAL | | 60 | 287 | 347 | 281 | 155 | 436 | 4776 |

COMMERCE CENTER (2014) ZONAL LAND USE AND TRIP GENERATION

| Zone | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 41 | 30. Industrial Park | 730.00 TSF | 402 | 73 | 475 | 95 | 380 | 475 | 4380 |
| | SUB-TOTAL | | 402 | 73 | 475 | 95 | 380 | 475 | 4380 |
| 42 | 30. Industrial Park | 275.00 TSF | 151 | 28 | 179 | 36 | 143 | 179 | 1650 |
| | SUB-TOTAL | | 151 | 28 | 179 | 36 | 143 | 179 | 1650 |
| 43 | 30. Industrial Park | 273.90 TSF | 151 | 27 | 178 | 36 | 142 | 178 | 1643 |
| | SUB-TOTAL | | 151 | 27 | 178 | 36 | 142 | 178 | 1643 |
| 45 | 30. Industrial Park | 1960.20 TSF | 1078 | 196 | 1274 | 255 | 1019 | 1274 | 11761 |
| | SUB-TOTAL | | 1078 | 196 | 1274 | 255 | 1019 | 1274 | 11761 |
| 46 | 13. Commercial Shops | 77.00 TSF | 55 | 37 | 92 | 139 | 139 | 278 | 2854 |
| | 30. Industrial Park | 445.80 TSF | 245 | 45 | 290 | 58 | 232 | 290 | 2675 |
| | SUB-TOTAL | | 300 | 82 | 382 | 197 | 371 | 568 | 5529 |
| 47 | 30. Industrial Park | 4254.10 TSF | 2340 | 425 | 2765 | 553 | 2212 | 2765 | 25525 |
| | SUB-TOTAL | | 2340 | 425 | 2765 | 553 | 2212 | 2765 | 25525 |
| 48 | 30. Industrial Park | 720.00 TSF | 396 | 72 | 468 | 94 | 374 | 468 | 4320 |
| | SUB-TOTAL | | 396 | 72 | 468 | 94 | 374 | 468 | 4320 |
| 49 | 30. Industrial Park | 764.30 TSF | 420 | 76 | 496 | 99 | 397 | 496 | 4586 |
| | SUB-TOTAL | | 420 | 76 | 496 | 99 | 397 | 496 | 4586 |
| 58 | 30. Industrial Park | 1051.50 TSF | 578 | 105 | 683 | 137 | 547 | 684 | 6309 |
| | SUB-TOTAL | | 578 | 105 | 683 | 137 | 547 | 684 | 6309 |
| 59 | 35. Regional Post Office | 764.00 TSF | 153 | 115 | 268 | 115 | 115 | 230 | 3820 |
| | SUB-TOTAL | | 153 | 115 | 268 | 115 | 115 | 230 | 3820 |
| 60 | 30. Industrial Park | 411.60 TSF | 226 | 41 | 267 | 54 | 214 | 268 | 2470 |
| | SUB-TOTAL | | 226 | 41 | 267 | 54 | 214 | 268 | 2470 |
| 61 | 30. Industrial Park | 744.90 TSF | 410 | 74 | 484 | 97 | 387 | 484 | 4469 |
| | SUB-TOTAL | | 410 | 74 | 484 | 97 | 387 | 484 | 4469 |
| 62 | 30. Industrial Park | 627.30 TSF | 345 | 63 | 408 | 82 | 326 | 408 | 3764 |
| | SUB-TOTAL | | 345 | 63 | 408 | 82 | 326 | 408 | 3764 |

COMMERCE CENTER (2014) LAND USE AND TRIP GENERATION SUMMARY

| | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 13. | Commercial Shops | 77.00 TSF | 55 | 37 | 92 | 139 | 139 | 278 | 2854 |
| 30. | Industrial Park | 12258.60 TSF | 6742 | 1225 | 7967 | 1596 | 6373 | 7969 | 73552 |
| 35. | Regional Post Office | 764.00 TSF | 153 | 115 | 268 | 115 | 115 | 230 | 3820 |
| | TOTAL | | 6950 | 1377 | 8327 | 1850 | 6627 | 8477 | 80226 |

TOTAL (2014) LAND USE AND TRIP GENERATION SUMMARY

| | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 3. | Single Family (6-10du/ac) | 994.00 DU | 189 | 556 | 745 | 636 | 368 | 1004 | 9840 |
| 4. | Condominium/Townhouse | 4621.00 DU | 462 | 2218 | 2680 | 2172 | 1201 | 3373 | 36968 |
| 5. | Apartment | 451.00 DU | 36 | 194 | 230 | 185 | 95 | 280 | 3113 |
| 11. | Commercial Center(10-30a) | 587.00 TSF | 429 | 275 | 704 | 1397 | 1514 | 2911 | 31733 |
| 12. | Commercial Center (<10ac) | 127.57 TSF | 139 | 89 | 228 | 424 | 461 | 885 | 10851 |
| 13. | Commercial Shops | 102.50 TSF | 74 | 50 | 124 | 185 | 185 | 370 | 3799 |
| 20. | Elementary/Middle School | 1650.00 STU | 429 | 330 | 759 | 132 | 149 | 281 | 2393 |
| 30. | Industrial Park | 12322.48 TSF | 6777 | 1231 | 8008 | 1604 | 6406 | 8010 | 73935 |
| 35. | Regional Post Office | 764.00 TSF | 153 | 115 | 268 | 115 | 115 | 230 | 3820 |
| 40. | Commercial Office | 970.40 TSF | 1505 | 184 | 1689 | 204 | 1252 | 1456 | 11218 |
| 51. | Developed Park | 33.20 AC | 0 | 0 | 0 | 0 | 1 | 1 | 87 |
| | TOTAL | | 10193 | 5242 | 15435 | 7054 | 11747 | 18801 | 187757 |

# APPENDIX A (Cont.)

# LAND USE AND TRIP GENERATION BY PLANNING AREA

## e. Year 2018

## LANDMARK VILLAGE (2018) ZONAL LAND USE AND TRIP GENERATION

| Zone | | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|---|
| 102 | 3. | Single Family (6-10du/ac) | 38.00 DU | 7 | 21 | 28 | 24 | 14 | 38 | 376 |
| | 4. | Condominium/Townhouse | 305.00 DU | 31 | 146 | 177 | 143 | 79 | 222 | 2440 |
| | 5. | Apartment | 155.00 DU | 12 | 67 | 79 | 64 | 33 | 97 | 1070 |
| | 12. | Commercial Center (<10ac) | 10.50 TSF | 11 | 7 | 18 | 35 | 38 | 73 | 893 |
| | 40. | Commercial Office | 9.50 TSF | 15 | 2 | 17 | 2 | 12 | 14 | 110 |
| | | SUB-TOTAL | | 76 | 243 | 319 | 268 | 176 | 444 | 4889 |
| 103 | 3. | Single Family (6-10du/ac) | 95.00 DU | 18 | 53 | 71 | 61 | 35 | 96 | 940 |
| | 4. | Condominium/Townhouse | 169.00 DU | 17 | 81 | 98 | 79 | 44 | 123 | 1352 |
| | 12. | Commercial Center (<10ac) | 38.50 TSF | 42 | 27 | 69 | 128 | 139 | 267 | 3275 |
| | 13. | Commercial Shops | 9.50 TSF | 7 | 5 | 12 | 17 | 17 | 34 | 352 |
| | 20. | Elementary/Middle School | 750.00 STU | 195 | 150 | 345 | 60 | 68 | 128 | 1088 |
| | 51. | Developed Park | 16.10 AC | 0 | 0 | 0 | 0 | 1 | 1 | 42 |
| | | SUB-TOTAL | | 279 | 316 | 595 | 345 | 304 | 649 | 7049 |
| 104 | 3. | Single Family (6-10du/ac) | 175.00 DU | 33 | 98 | 131 | 112 | 65 | 177 | 1732 |
| | 4. | Condominium/Townhouse | 211.00 DU | 21 | 101 | 122 | 99 | 55 | 154 | 1688 |
| | 5. | Apartment | 152.00 DU | 12 | 65 | 77 | 62 | 32 | 94 | 1049 |
| | 11. | Commercial Center(10-30a) | 252.00 TSF | 184 | 118 | 302 | 600 | 650 | 1250 | 13623 |
| | 40. | Commercial Office | 370.00 TSF | 574 | 70 | 644 | 78 | 477 | 555 | 4277 |
| | | SUB-TOTAL | | 824 | 452 | 1276 | 951 | 1279 | 2230 | 22369 |
| 105 | 5. | Apartment | 144.00 DU | 12 | 62 | 74 | 59 | 30 | 89 | 994 |
| | 12. | Commercial Center (<10ac) | 27.10 TSF | 30 | 19 | 49 | 90 | 98 | 188 | 2305 |
| | 40. | Commercial Office | 315.90 TSF | 490 | 60 | 550 | 66 | 408 | 474 | 3652 |
| | | SUB-TOTAL | | 532 | 141 | 673 | 215 | 536 | 751 | 6951 |

## LANDMARK VILLAGE (2018) LAND USE AND TRIP GENERATION SUMMARY

| | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 3. | Single Family (6-10du/ac) | 308.00 DU | 58 | 172 | 230 | 197 | 114 | 311 | 3048 |
| 4. | Condominium/Townhouse | 685.00 DU | 69 | 328 | 397 | 321 | 178 | 499 | 5480 |
| 5. | Apartment | 451.00 DU | 36 | 194 | 230 | 185 | 95 | 280 | 3113 |
| 11. | Commercial Center(10-30a) | 252.00 TSF | 184 | 118 | 302 | 600 | 650 | 1250 | 13623 |
| 12. | Commercial Center (<10ac) | 76.10 TSF | 83 | 53 | 136 | 253 | 275 | 528 | 6473 |
| 13. | Commercial Shops | 9.50 TSF | 7 | 5 | 12 | 17 | 17 | 34 | 352 |
| 20. | Elementary/Middle School | 750.00 STU | 195 | 150 | 345 | 60 | 68 | 128 | 1088 |
| 40. | Commercial Office | 695.40 TSF | 1079 | 132 | 1211 | 146 | 897 | 1043 | 8039 |
| 51. | Developed Park | 16.10 AC | 0 | 0 | 0 | 0 | 1 | 1 | 42 |
| | TOTAL | | 1711 | 1152 | 2863 | 1779 | 2295 | 4074 | 41258 |

MISSION VILLAGE (2018) ZONAL LAND USE AND TRIP GENERATION

| Zone | | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|---|
| 96 | 2. | Single Family (1-5du/ac) | 123.00 DU | 23 | 69 | 92 | 79 | 46 | 125 | 1218 |
| | 4. | Condominium/Townhouse | 855.00 DU | 86 | 410 | 496 | 402 | 222 | 624 | 6840 |
| | | SUB-TOTAL | | 109 | 479 | 588 | 481 | 268 | 749 | 8058 |
| 98 | 12. | Commercial Center (<10ac) | 6.20 TSF | 7 | 4 | 11 | 21 | 22 | 43 | 527 |
| | 31. | Business Park | 250.00 TSF | 300 | 58 | 358 | 75 | 248 | 323 | 2550 |
| | | SUB-TOTAL | | 307 | 62 | 369 | 96 | 270 | 366 | 3077 |
| 99 | 51. | Developed Park | 20.20 AC | 0 | 0 | 0 | 1 | 1 | 2 | 53 |
| | | SUB-TOTAL | | 0 | 0 | 0 | 1 | 1 | 2 | 53 |
| 100 | 12. | Commercial Center (<10ac) | 23.00 TSF | 25 | 16 | 41 | 76 | 83 | 159 | 1956 |
| | | SUB-TOTAL | | 25 | 16 | 41 | 76 | 83 | 159 | 1956 |
| 120 | 4. | Condominium/Townhouse | 2425.00 DU | 243 | 1164 | 1407 | 1140 | 631 | 1771 | 19400 |
| | 11. | Commercial Center(10-30a) | 267.30 TSF | 195 | 126 | 321 | 636 | 690 | 1326 | 14450 |
| | 13. | Commercial Shops | 16.00 TSF | 12 | 8 | 20 | 29 | 29 | 58 | 593 |
| | 20. | Elementary/Middle School | 900.00 STU | 234 | 180 | 414 | 72 | 81 | 153 | 1305 |
| | 40. | Commercial Office | 75.00 TSF | 116 | 14 | 130 | 16 | 97 | 113 | 867 |
| | 51. | Developed Park | 8.40 AC | 0 | 0 | 0 | 0 | 0 | 0 | 22 |
| | | SUB-TOTAL | | 800 | 1492 | 2292 | 1893 | 1528 | 3421 | 36637 |
| 122 | 4. | Condominium/Townhouse | 176.00 DU | 18 | 84 | 102 | 83 | 46 | 129 | 1408 |
| | | SUB-TOTAL | | 18 | 84 | 102 | 83 | 46 | 129 | 1408 |
| 142 | 4. | Condominium/Townhouse | 351.00 DU | 35 | 168 | 203 | 165 | 91 | 256 | 2808 |
| | | SUB-TOTAL | | 35 | 168 | 203 | 165 | 91 | 256 | 2808 |

MISSION VILLAGE (2018) LAND USE AND TRIP GENERATION SUMMARY

| | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 2. | Single Family (1-5du/ac) | 123.00 DU | 23 | 69 | 92 | 79 | 46 | 125 | 1218 |
| 4. | Condominium/Townhouse | 3807.00 DU | 382 | 1826 | 2208 | 1790 | 990 | 2780 | 30456 |
| 11. | Commercial Center(10-30a) | 267.30 TSF | 195 | 126 | 321 | 636 | 690 | 1326 | 14450 |
| 12. | Commercial Center (<10ac) | 29.20 TSF | 32 | 20 | 52 | 97 | 105 | 202 | 2483 |
| 13. | Commercial Shops | 16.00 TSF | 12 | 8 | 20 | 29 | 29 | 58 | 593 |
| 20. | Elementary/Middle School | 900.00 STU | 234 | 180 | 414 | 72 | 81 | 153 | 1305 |
| 31. | Business Park | 250.00 TSF | 300 | 58 | 358 | 75 | 248 | 323 | 2550 |
| 40. | Commercial Office | 75.00 TSF | 116 | 14 | 130 | 16 | 97 | 113 | 867 |
| 51. | Developed Park | 28.60 AC | 0 | 0 | 0 | 1 | 1 | 2 | 75 |
| | TOTAL | | 1294 | 2301 | 3595 | 2795 | 2287 | 5082 | 53997 |

HOMESTEAD S/O RIVER (2018) ZONAL LAND USE AND TRIP GENERATION

| Zone | | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|---|
| 107 | 2. | Single Family (1-5du/ac) | 461.00 DU | 88 | 258 | 346 | 295 | 171 | 466 | 4564 |
| | | SUB-TOTAL | | 88 | 258 | 346 | 295 | 171 | 466 | 4564 |
| 108 | 4. | Condominium/Townhouse | 1828.00 DU | 183 | 877 | 1060 | 859 | 475 | 1334 | 14624 |
| | 20. | Elementary/Middle School | 600.00 STU | 156 | 120 | 276 | 48 | 54 | 102 | 870 |
| | 51. | Developed Park | 8.70 AC | 0 | 0 | 0 | 0 | 0 | 0 | 23 |
| | | SUB-TOTAL | | 339 | 997 | 1336 | 907 | 529 | 1436 | 15517 |

HOMESTEAD S/O RIVER (2018) LAND USE AND TRIP GENERATION SUMMARY

| | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 2. | Single Family (1-5du/ac) | 461.00 DU | 88 | 258 | 346 | 295 | 171 | 466 | 4564 |
| 4. | Condominium/Townhouse | 1828.00 DU | 183 | 877 | 1060 | 859 | 475 | 1334 | 14624 |
| 20. | Elementary/Middle School | 600.00 STU | 156 | 120 | 276 | 48 | 54 | 102 | 870 |
| 51. | Developed Park | 8.70 AC | 0 | 0 | 0 | 0 | 0 | 0 | 23 |
| | TOTAL | | 427 | 1255 | 1682 | 1202 | 700 | 1902 | 20081 |

## POTRERO VILLAGE (2018) ZONAL LAND USE AND TRIP GENERATION

| Zone | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 127 | 4. Condominium/Townhouse | 542.00 DU | 54 | 260 | 314 | 255 | 141 | 396 | 4336 |
| | SUB-TOTAL | | 54 | 260 | 314 | 255 | 141 | 396 | 4336 |
| 128 | 3. Single Family (6-10du/ac) | 450.00 DU | 86 | 252 | 338 | 288 | 167 | 455 | 4455 |
| | SUB-TOTAL | | 86 | 252 | 338 | 288 | 167 | 455 | 4455 |
| 129 | 3. Single Family (6-10du/ac) | 177.00 DU | 34 | 99 | 133 | 113 | 65 | 178 | 1752 |
| | SUB-TOTAL | | 34 | 99 | 133 | 113 | 65 | 178 | 1752 |

## POTRERO VILLAGE (2018) LAND USE AND TRIP GENERATION SUMMARY

| Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|
| 3. Single Family (6-10du/ac) | 627.00 DU | 120 | 351 | 471 | 401 | 232 | 633 | 6207 |
| 4. Condominium/Townhouse | 542.00 DU | 54 | 260 | 314 | 255 | 141 | 396 | 4336 |
| TOTAL | | 174 | 611 | 785 | 656 | 373 | 1029 | 10543 |

## ENTRADA (2018) ZONAL LAND USE AND TRIP GENERATION

| Zone | | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|---|
| 90 | 5. | Apartment | 408.00 DU | 33 | 175 | 208 | 167 | 86 | 253 | 2815 |
| | 11. | Commercial Center(10-30a) | 135.00 TSF | 99 | 63 | 162 | 321 | 348 | 669 | 7298 |
| | 30. | Industrial Park | 63.88 TSF | 35 | 6 | 41 | 8 | 33 | 41 | 383 |
| | 40. | Commercial Office | 200.00 TSF | 310 | 38 | 348 | 42 | 258 | 300 | 2312 |
| | | SUB-TOTAL | | 477 | 282 | 759 | 538 | 725 | 1263 | 12808 |
| 92 | 4. | Condominium/Townhouse | 867.00 DU | 87 | 416 | 503 | 407 | 225 | 632 | 6936 |
| | 10. | Commercial Center (>30ac) | 350.00 TSF | 165 | 105 | 270 | 574 | 623 | 1197 | 14021 |
| | 40. | Commercial Office | 250.00 TSF | 388 | 48 | 436 | 53 | 323 | 376 | 2890 |
| | | SUB-TOTAL | | 640 | 569 | 1209 | 1034 | 1171 | 2205 | 23847 |
| 140 | 3. | Single Family (6-10du/ac) | 572.00 DU | 109 | 320 | 429 | 366 | 212 | 578 | 5663 |
| | 4. | Condominium/Townhouse | 1250.00 DU | 125 | 600 | 725 | 588 | 325 | 913 | 10000 |
| | 12. | Commercial Center (<10ac) | 28.48 TSF | 31 | 20 | 51 | 95 | 103 | 198 | 2422 |
| | | SUB-TOTAL | | 265 | 940 | 1205 | 1049 | 640 | 1689 | 18085 |

## ENTRADA (2018) LAND USE AND TRIP GENERATION SUMMARY

| | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 3. | Single Family (6-10du/ac) | 572.00 DU | 109 | 320 | 429 | 366 | 212 | 578 | 5663 |
| 4. | Condominium/Townhouse | 2117.00 DU | 212 | 1016 | 1228 | 995 | 550 | 1545 | 16936 |
| 5. | Apartment | 408.00 DU | 33 | 175 | 208 | 167 | 86 | 253 | 2815 |
| 10. | Commercial Center (>30ac) | 350.00 TSF | 165 | 105 | 270 | 574 | 623 | 1197 | 14021 |
| 11. | Commercial Center(10-30a) | 135.00 TSF | 99 | 63 | 162 | 321 | 348 | 669 | 7298 |
| 12. | Commercial Center (<10ac) | 28.48 TSF | 31 | 20 | 51 | 95 | 103 | 198 | 2422 |
| 30. | Industrial Park | 63.88 TSF | 35 | 6 | 41 | 8 | 33 | 41 | 383 |
| 40. | Commercial Office | 450.00 TSF | 698 | 86 | 784 | 95 | 581 | 676 | 5202 |
| | TOTAL | | 1382 | 1791 | 3173 | 2621 | 2536 | 5157 | 54740 |

## LEGACY VILLAGE (2018) ZONAL LAND USE AND TRIP GENERATION

| Zone | | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|---|
| 124 | 7. | Senior (Active) | 801.00 DU | 64 | 96 | 160 | 128 | 80 | 208 | 2972 |
| | | SUB-TOTAL | | 64 | 96 | 160 | 128 | 80 | 208 | 2972 |
| 126 | 4. | Condominium/Townhouse | 585.00 DU | 59 | 281 | 340 | 275 | 152 | 427 | 4680 |
| | | SUB-TOTAL | | 59 | 281 | 340 | 275 | 152 | 427 | 4680 |
| 131 | 4. | Condominium/Townhouse | 1200.00 DU | 120 | 576 | 696 | 564 | 312 | 876 | 9600 |
| | 20. | Elementary/Middle School | 900.00 STU | 234 | 180 | 414 | 72 | 81 | 153 | 1305 |
| | | SUB-TOTAL | | 354 | 756 | 1110 | 636 | 393 | 1029 | 10905 |

## LEGACY VILLAGE (2018) LAND USE AND TRIP GENERATION SUMMARY

| | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 4. | Condominium/Townhouse | 1785.00 DU | 179 | 857 | 1036 | 839 | 464 | 1303 | 14280 |
| 7. | Senior (Active) | 801.00 DU | 64 | 96 | 160 | 128 | 80 | 208 | 2972 |
| 20. | Elementary/Middle School | 900.00 STU | 234 | 180 | 414 | 72 | 81 | 153 | 1305 |
| | TOTAL | | 477 | 1133 | 1610 | 1039 | 625 | 1664 | 18557 |

COMMERCE CENTER (2018) ZONAL LAND USE AND TRIP GENERATION

| Zone | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 41 | 30. Industrial Park | 730.00 TSF | 402 | 73 | 475 | 95 | 380 | 475 | 4380 |
| | SUB-TOTAL | | 402 | 73 | 475 | 95 | 380 | 475 | 4380 |
| 42 | 30. Industrial Park | 275.00 TSF | 151 | 28 | 179 | 36 | 143 | 179 | 1650 |
| | SUB-TOTAL | | 151 | 28 | 179 | 36 | 143 | 179 | 1650 |
| 43 | 30. Industrial Park | 273.90 TSF | 151 | 27 | 178 | 36 | 142 | 178 | 1643 |
| | SUB-TOTAL | | 151 | 27 | 178 | 36 | 142 | 178 | 1643 |
| 45 | 30. Industrial Park | 1960.20 TSF | 1078 | 196 | 1274 | 255 | 1019 | 1274 | 11761 |
| | SUB-TOTAL | | 1078 | 196 | 1274 | 255 | 1019 | 1274 | 11761 |
| 46 | 13. Commercial Shops | 77.00 TSF | 55 | 37 | 92 | 139 | 139 | 278 | 2854 |
| | 30. Industrial Park | 445.80 TSF | 245 | 45 | 290 | 58 | 232 | 290 | 2675 |
| | SUB-TOTAL | | 300 | 82 | 382 | 197 | 371 | 568 | 5529 |
| 47 | 30. Industrial Park | 4254.10 TSF | 2340 | 425 | 2765 | 553 | 2212 | 2765 | 25525 |
| | SUB-TOTAL | | 2340 | 425 | 2765 | 553 | 2212 | 2765 | 25525 |
| 48 | 30. Industrial Park | 720.00 TSF | 396 | 72 | 468 | 94 | 374 | 468 | 4320 |
| | SUB-TOTAL | | 396 | 72 | 468 | 94 | 374 | 468 | 4320 |
| 49 | 30. Industrial Park | 764.30 TSF | 420 | 76 | 496 | 99 | 397 | 496 | 4586 |
| | SUB-TOTAL | | 420 | 76 | 496 | 99 | 397 | 496 | 4586 |
| 58 | 30. Industrial Park | 1051.50 TSF | 578 | 105 | 683 | 137 | 547 | 684 | 6309 |
| | SUB-TOTAL | | 578 | 105 | 683 | 137 | 547 | 684 | 6309 |
| 59 | 35. Regional Post Office | 764.00 TSF | 153 | 115 | 268 | 115 | 115 | 230 | 3820 |
| | SUB-TOTAL | | 153 | 115 | 268 | 115 | 115 | 230 | 3820 |
| 60 | 30. Industrial Park | 411.60 TSF | 226 | 41 | 267 | 54 | 214 | 268 | 2470 |
| | SUB-TOTAL | | 226 | 41 | 267 | 54 | 214 | 268 | 2470 |
| 61 | 30. Industrial Park | 744.90 TSF | 410 | 74 | 484 | 97 | 387 | 484 | 4469 |
| | SUB-TOTAL | | 410 | 74 | 484 | 97 | 387 | 484 | 4469 |
| 62 | 30. Industrial Park | 627.30 TSF | 345 | 63 | 408 | 82 | 326 | 408 | 3764 |
| | SUB-TOTAL | | 345 | 63 | 408 | 82 | 326 | 408 | 3764 |

COMMERCE CENTER (2018) LAND USE AND TRIP GENERATION SUMMARY

| | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 13. | Commercial Shops | 77.00 TSF | 55 | 37 | 92 | 139 | 139 | 278 | 2854 |
| 30. | Industrial Park | 12258.60 TSF | 6742 | 1225 | 7967 | 1596 | 6373 | 7969 | 73552 |
| 35. | Regional Post Office | 764.00 TSF | 153 | 115 | 268 | 115 | 115 | 230 | 3820 |
| | TOTAL | | 6950 | 1377 | 8327 | 1850 | 6627 | 8477 | 80226 |

TOTAL (2018) LAND USE AND TRIP GENERATION SUMMARY

| | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 2. | Single Family (1-5du/ac) | 584.00 DU | 111 | 327 | 438 | 374 | 217 | 591 | 5782 |
| 3. | Single Family (6-10du/ac) | 1507.00 DU | 287 | 843 | 1130 | 964 | 558 | 1522 | 14918 |
| 4. | Condominium/Townhouse | 10764.00 DU | 1079 | 5164 | 6243 | 5059 | 2798 | 7857 | 86112 |
| 5. | Apartment | 859.00 DU | 69 | 369 | 438 | 352 | 181 | 533 | 5928 |
| 7. | Senior (Active) | 801.00 DU | 64 | 96 | 160 | 128 | 80 | 208 | 2972 |
| 10. | Commercial Center (>30ac) | 350.00 TSF | 165 | 105 | 270 | 574 | 623 | 1197 | 14021 |
| 11. | Commercial Center(10-30a) | 654.30 TSF | 478 | 307 | 785 | 1557 | 1688 | 3245 | 35371 |
| 12. | Commercial Center (<10ac) | 133.77 TSF | 146 | 93 | 239 | 445 | 483 | 928 | 11378 |
| 13. | Commercial Shops | 102.50 TSF | 74 | 50 | 124 | 185 | 185 | 370 | 3799 |
| 20. | Elementary/Middle School | 3150.00 STU | 819 | 630 | 1449 | 252 | 284 | 536 | 4568 |
| 30. | Industrial Park | 12322.48 TSF | 6777 | 1231 | 8008 | 1604 | 6406 | 8010 | 73935 |
| 31. | Business Park | 250.00 TSF | 300 | 58 | 358 | 75 | 248 | 323 | 2550 |
| 35. | Regional Post Office | 764.00 TSF | 153 | 115 | 268 | 115 | 115 | 230 | 3820 |
| 40. | Commercial Office | 1220.40 TSF | 1893 | 232 | 2125 | 257 | 1575 | 1832 | 14108 |
| 51. | Developed Park | 53.40 AC | 0 | 0 | 0 | 1 | 2 | 3 | 140 |
| | TOTAL | | 12415 | 9620 | 22035 | 11942 | 15443 | 27385 | 279402 |

# APPENDIX A (Cont.)

# LAND USE AND TRIP GENERATION BY PLANNING AREA

## f. Year 2022

## LANDMARK VILLAGE (2022) ZONAL LAND USE AND TRIP GENERATION

| Zone | | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|---|
| 102 | 3. | Single Family (6-10du/ac) | 38.00 DU | 7 | 21 | 28 | 24 | 14 | 38 | 376 |
| | 4. | Condominium/Townhouse | 305.00 DU | 31 | 146 | 177 | 143 | 79 | 222 | 2440 |
| | 5. | Apartment | 155.00 DU | 12 | 67 | 79 | 64 | 33 | 97 | 1070 |
| | 12. | Commercial Center (<10ac) | 10.50 TSF | 11 | 7 | 18 | 35 | 38 | 73 | 893 |
| | 40. | Commercial Office | 9.50 TSF | 15 | 2 | 17 | 2 | 12 | 14 | 110 |
| | | SUB-TOTAL | | 76 | 243 | 319 | 268 | 176 | 444 | 4889 |
| 103 | 3. | Single Family (6-10du/ac) | 95.00 DU | 18 | 53 | 71 | 61 | 35 | 96 | 940 |
| | 4. | Condominium/Townhouse | 169.00 DU | 17 | 81 | 98 | 79 | 44 | 123 | 1352 |
| | 12. | Commercial Center (<10ac) | 38.50 TSF | 42 | 27 | 69 | 128 | 139 | 267 | 3275 |
| | 13. | Commercial Shops | 9.50 TSF | 7 | 5 | 12 | 17 | 17 | 34 | 352 |
| | 20. | Elementary/Middle School | 750.00 STU | 195 | 150 | 345 | 60 | 68 | 128 | 1088 |
| | 51. | Developed Park | 16.10 AC | 0 | 0 | 0 | 0 | 1 | 1 | 42 |
| | | SUB-TOTAL | | 279 | 316 | 595 | 345 | 304 | 649 | 7049 |
| 104 | 3. | Single Family (6-10du/ac) | 175.00 DU | 33 | 98 | 131 | 112 | 65 | 177 | 1732 |
| | 4. | Condominium/Townhouse | 211.00 DU | 21 | 101 | 122 | 99 | 55 | 154 | 1688 |
| | 5. | Apartment | 152.00 DU | 12 | 65 | 77 | 62 | 32 | 94 | 1049 |
| | 11. | Commercial Center(10-30a) | 252.00 TSF | 184 | 118 | 302 | 600 | 650 | 1250 | 13623 |
| | 40. | Commercial Office | 370.00 TSF | 574 | 70 | 644 | 78 | 477 | 555 | 4277 |
| | | SUB-TOTAL | | 824 | 452 | 1276 | 951 | 1279 | 2230 | 22369 |
| 105 | 5. | Apartment | 144.00 DU | 12 | 62 | 74 | 59 | 30 | 89 | 994 |
| | 12. | Commercial Center (<10ac) | 27.10 TSF | 30 | 19 | 49 | 90 | 98 | 188 | 2305 |
| | 40. | Commercial Office | 315.90 TSF | 490 | 60 | 550 | 66 | 408 | 474 | 3652 |
| | | SUB-TOTAL | | 532 | 141 | 673 | 215 | 536 | 751 | 6951 |

## LANDMARK VILLAGE (2022) LAND USE AND TRIP GENERATION SUMMARY

| | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 3. | Single Family (6-10du/ac) | 308.00 DU | 58 | 172 | 230 | 197 | 114 | 311 | 3048 |
| 4. | Condominium/Townhouse | 685.00 DU | 69 | 328 | 397 | 321 | 178 | 499 | 5480 |
| 5. | Apartment | 451.00 DU | 36 | 194 | 230 | 185 | 95 | 280 | 3113 |
| 11. | Commercial Center(10-30a) | 252.00 TSF | 184 | 118 | 302 | 600 | 650 | 1250 | 13623 |
| 12. | Commercial Center (<10ac) | 76.10 TSF | 83 | 53 | 136 | 253 | 275 | 528 | 6473 |
| 13. | Commercial Shops | 9.50 TSF | 7 | 5 | 12 | 17 | 17 | 34 | 352 |
| 20. | Elementary/Middle School | 750.00 STU | 195 | 150 | 345 | 60 | 68 | 128 | 1088 |
| 40. | Commercial Office | 695.40 TSF | 1079 | 132 | 1211 | 146 | 897 | 1043 | 8039 |
| 51. | Developed Park | 16.10 AC | 0 | 0 | 0 | 0 | 1 | 1 | 42 |
| | TOTAL | | 1711 | 1152 | 2863 | 1779 | 2295 | 4074 | 41258 |

MISSION VILLAGE (2022) ZONAL LAND USE AND TRIP GENERATION

| Zone | | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|---|
| 96 | 2. | Single Family (1-5du/ac) | 123.00 DU | 23 | 69 | 92 | 79 | 46 | 125 | 1218 |
| | 4. | Condominium/Townhouse | 881.00 DU | 88 | 423 | 511 | 414 | 229 | 643 | 7048 |
| | | SUB-TOTAL | | 111 | 492 | 603 | 493 | 275 | 768 | 8266 |
| 98 | 12. | Commercial Center (<10ac) | 6.20 TSF | 7 | 4 | 11 | 21 | 22 | 43 | 527 |
| | 31. | Business Park | 350.00 TSF | 420 | 81 | 501 | 105 | 347 | 452 | 3570 |
| | | SUB-TOTAL | | 427 | 85 | 512 | 126 | 369 | 495 | 4097 |
| 99 | 4. | Condominium/Townhouse | 436.00 DU | 44 | 209 | 253 | 205 | 113 | 318 | 3488 |
| | 51. | Developed Park | 20.20 AC | 0 | 0 | 0 | 1 | 1 | 2 | 53 |
| | | SUB-TOTAL | | 44 | 209 | 253 | 206 | 114 | 320 | 3541 |
| 100 | 12. | Commercial Center (<10ac) | 23.00 TSF | 25 | 16 | 41 | 76 | 83 | 159 | 1956 |
| | 40. | Commercial Office | 220.00 TSF | 341 | 42 | 383 | 46 | 284 | 330 | 2543 |
| | | SUB-TOTAL | | 366 | 58 | 424 | 122 | 367 | 489 | 4499 |
| 120 | 4. | Condominium/Townhouse | 2425.00 DU | 243 | 1164 | 1407 | 1140 | 631 | 1771 | 19400 |
| | 11. | Commercial Center(10-30a) | 267.30 TSF | 195 | 126 | 321 | 636 | 690 | 1326 | 14450 |
| | 13. | Commercial Shops | 16.00 TSF | 12 | 8 | 20 | 29 | 29 | 58 | 593 |
| | 20. | Elementary/Middle School | 900.00 STU | 234 | 180 | 414 | 72 | 81 | 153 | 1305 |
| | 40. | Commercial Office | 75.00 TSF | 116 | 14 | 130 | 16 | 97 | 113 | 867 |
| | 51. | Developed Park | 8.40 AC | 0 | 0 | 0 | 0 | 0 | 0 | 22 |
| | | SUB-TOTAL | | 800 | 1492 | 2292 | 1893 | 1528 | 3421 | 36637 |
| 121 | 2. | Single Family (1-5du/ac) | 168.00 DU | 32 | 94 | 126 | 108 | 62 | 170 | 1663 |
| | 4. | Condominium/Townhouse | 418.00 DU | 42 | 201 | 243 | 196 | 109 | 305 | 3344 |
| | | SUB-TOTAL | | 74 | 295 | 369 | 304 | 171 | 475 | 5007 |
| 122 | 4. | Condominium/Townhouse | 176.00 DU | 18 | 84 | 102 | 83 | 46 | 129 | 1408 |
| | | SUB-TOTAL | | 18 | 84 | 102 | 83 | 46 | 129 | 1408 |
| 142 | 4. | Condominium/Townhouse | 670.00 DU | 67 | 322 | 389 | 315 | 174 | 489 | 5360 |
| | | SUB-TOTAL | | 67 | 322 | 389 | 315 | 174 | 489 | 5360 |

MISSION VILLAGE (2022) LAND USE AND TRIP GENERATION SUMMARY

| | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 2. | Single Family (1-5du/ac) | 291.00 DU | 55 | 163 | 218 | 187 | 108 | 295 | 2881 |
| 4. | Condominium/Townhouse | 5006.00 DU | 502 | 2403 | 2905 | 2353 | 1302 | 3655 | 40048 |
| 11. | Commercial Center(10-30a) | 267.30 TSF | 195 | 126 | 321 | 636 | 690 | 1326 | 14450 |
| 12. | Commercial Center (<10ac) | 29.20 TSF | 32 | 20 | 52 | 97 | 105 | 202 | 2483 |
| 13. | Commercial Shops | 16.00 TSF | 12 | 8 | 20 | 29 | 29 | 58 | 593 |
| 20. | Elementary/Middle School | 900.00 STU | 234 | 180 | 414 | 72 | 81 | 153 | 1305 |
| 31. | Business Park | 350.00 TSF | 420 | 81 | 501 | 105 | 347 | 452 | 3570 |
| 40. | Commercial Office | 295.00 TSF | 457 | 56 | 513 | 62 | 381 | 443 | 3410 |
| 51. | Developed Park | 28.60 AC | 0 | 0 | 0 | 1 | 1 | 2 | 75 |
| | TOTAL | | 1907 | 3037 | 4944 | 3542 | 3044 | 6586 | 68815 |

## HOMESTEAD S/O RIVER (2022) ZONAL LAND USE AND TRIP GENERATION

| Zone | | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|---|
| 107 | 2. | Single Family (1-5du/ac) | 461.00 DU | 88 | 258 | 346 | 295 | 171 | 466 | 4564 |
| | 4. | Condominium/Townhouse | 326.00 DU | 33 | 156 | 189 | 153 | 85 | 238 | 2608 |
| | 20. | Elementary/Middle School | 700.00 STU | 182 | 140 | 322 | 56 | 63 | 119 | 1015 |
| | 21. | High School | 1300.00 STU | 416 | 182 | 598 | 78 | 117 | 195 | 2327 |
| | 51. | Developed Park | 20.50 AC | 0 | 0 | 0 | 1 | 1 | 2 | 53 |
| | | SUB-TOTAL | | 719 | 736 | 1455 | 583 | 437 | 1020 | 10567 |
| 108 | 4. | Condominium/Townhouse | 2189.00 DU | 219 | 1051 | 1270 | 1029 | 569 | 1598 | 17512 |
| | 20. | Elementary/Middle School | 900.00 STU | 234 | 180 | 414 | 72 | 81 | 153 | 1305 |
| | 51. | Developed Park | 8.70 AC | 0 | 0 | 0 | 0 | 0 | 0 | 23 |
| | | SUB-TOTAL | | 453 | 1231 | 1684 | 1101 | 650 | 1751 | 18840 |
| 109 | 3. | Single Family (6-10du/ac) | 38.00 DU | 7 | 21 | 28 | 24 | 14 | 38 | 376 |
| | | SUB-TOTAL | | 7 | 21 | 28 | 24 | 14 | 38 | 376 |
| 110 | 2. | Single Family (1-5du/ac) | 184.00 DU | 35 | 103 | 138 | 118 | 68 | 186 | 1822 |
| | 4. | Condominium/Townhouse | 548.00 DU | 55 | 263 | 318 | 258 | 142 | 400 | 4384 |
| | 51. | Developed Park | 9.40 AC | 0 | 0 | 0 | 0 | 0 | 0 | 24 |
| | | SUB-TOTAL | | 90 | 366 | 456 | 376 | 210 | 586 | 6230 |
| 118 | 4. | Condominium/Townhouse | 161.00 DU | 16 | 77 | 93 | 76 | 42 | 118 | 1288 |
| | | SUB-TOTAL | | 16 | 77 | 93 | 76 | 42 | 118 | 1288 |

## HOMESTEAD S/O RIVER (2022) LAND USE AND TRIP GENERATION SUMMARY

| | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 2. | Single Family (1-5du/ac) | 645.00 DU | 123 | 361 | 484 | 413 | 239 | 652 | 6386 |
| 3. | Single Family (6-10du/ac) | 38.00 DU | 7 | 21 | 28 | 24 | 14 | 38 | 376 |
| 4. | Condominium/Townhouse | 3224.00 DU | 323 | 1547 | 1870 | 1516 | 838 | 2354 | 25792 |
| 20. | Elementary/Middle School | 1600.00 STU | 416 | 320 | 736 | 128 | 144 | 272 | 2320 |
| 21. | High School | 1300.00 STU | 416 | 182 | 598 | 78 | 117 | 195 | 2327 |
| 51. | Developed Park | 38.60 AC | 0 | 0 | 0 | 1 | 1 | 2 | 100 |
| | TOTAL | | 1285 | 2431 | 3716 | 2160 | 1353 | 3513 | 37301 |

HOMESTEAD N/O RIVER (2022) ZONAL LAND USE AND TRIP GENERATION

| Zone | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 55 | 3. Single Family (6-10du/ac) | 164.00 DU | 31 | 92 | 123 | 105 | 61 | 166 | 1624 |
| | 4. Condominium/Townhouse | 315.00 DU | 32 | 151 | 183 | 148 | 82 | 230 | 2520 |
| | SUB-TOTAL | | 63 | 243 | 306 | 253 | 143 | 396 | 4144 |

HOMESTEAD N/O RIVER (2022) LAND USE AND TRIP GENERATION SUMMARY

| Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|
| 3. Single Family (6-10du/ac) | 164.00 DU | 31 | 92 | 123 | 105 | 61 | 166 | 1624 |
| 4. Condominium/Townhouse | 315.00 DU | 32 | 151 | 183 | 148 | 82 | 230 | 2520 |
| TOTAL | | 63 | 243 | 306 | 253 | 143 | 396 | 4144 |

POTRERO VILLAGE (2022) ZONAL LAND USE AND TRIP GENERATION

| Zone | | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|---|
| 111 | 34. | Utilities | 100.00 TSF | 0 | 0 | 0 | 0 | 0 | 0 | 238 |
| | | SUB-TOTAL | | 0 | 0 | 0 | 0 | 0 | 0 | 238 |
| 112 | 2. | Single Family (1-5du/ac) | 90.00 DU | 17 | 50 | 67 | 58 | 33 | 91 | 891 |
| | 3. | Single Family (6-10du/ac) | 156.00 DU | 30 | 87 | 117 | 100 | 58 | 158 | 1544 |
| | 50. | Golf Course | 180.00 AC | 27 | 11 | 38 | 18 | 36 | 54 | 1433 |
| | | SUB-TOTAL | | 74 | 148 | 222 | 176 | 127 | 303 | 3868 |
| 115 | 3. | Single Family (6-10du/ac) | 424.00 DU | 81 | 237 | 318 | 271 | 157 | 428 | 4198 |
| | | SUB-TOTAL | | 81 | 237 | 318 | 271 | 157 | 428 | 4198 |
| 116 | 4. | Condominium/Townhouse | 400.00 DU | 40 | 192 | 232 | 188 | 104 | 292 | 3200 |
| | 11. | Commercial Center(10-30a) | 200.00 TSF | 146 | 94 | 240 | 476 | 516 | 992 | 10812 |
| | | SUB-TOTAL | | 186 | 286 | 472 | 664 | 620 | 1284 | 14012 |
| 117 | 4. | Condominium/Townhouse | 400.00 DU | 40 | 192 | 232 | 188 | 104 | 292 | 3200 |
| | 11. | Commercial Center(10-30a) | 200.00 TSF | 146 | 94 | 240 | 476 | 516 | 992 | 10812 |
| | | SUB-TOTAL | | 186 | 286 | 472 | 664 | 620 | 1284 | 14012 |
| 119 | 5. | Apartment | 531.00 DU | 42 | 228 | 270 | 218 | 112 | 330 | 3664 |
| | | SUB-TOTAL | | 42 | 228 | 270 | 218 | 112 | 330 | 3664 |
| 127 | 4. | Condominium/Townhouse | 888.00 DU | 89 | 426 | 515 | 417 | 231 | 648 | 7104 |
| | | SUB-TOTAL | | 89 | 426 | 515 | 417 | 231 | 648 | 7104 |
| 128 | 3. | Single Family (6-10du/ac) | 450.00 DU | 86 | 252 | 338 | 288 | 167 | 455 | 4455 |
| | | SUB-TOTAL | | 86 | 252 | 338 | 288 | 167 | 455 | 4455 |
| 129 | 3. | Single Family (6-10du/ac) | 177.00 DU | 34 | 99 | 133 | 113 | 65 | 178 | 1752 |
| | | SUB-TOTAL | | 34 | 99 | 133 | 113 | 65 | 178 | 1752 |

POTRERO VILLAGE (2022) LAND USE AND TRIP GENERATION SUMMARY

| | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 2. | Single Family (1-5du/ac) | 90.00 DU | 17 | 50 | 67 | 58 | 33 | 91 | 891 |
| 3. | Single Family (6-10du/ac) | 1207.00 DU | 231 | 675 | 906 | 772 | 447 | 1219 | 11949 |
| 4. | Condominium/Townhouse | 1688.00 DU | 169 | 810 | 979 | 793 | 439 | 1232 | 13504 |
| 5. | Apartment | 531.00 DU | 42 | 228 | 270 | 218 | 112 | 330 | 3664 |
| 11. | Commercial Center(10-30a) | 400.00 TSF | 292 | 188 | 480 | 952 | 1032 | 1984 | 21624 |
| 34. | Utilities | 100.00 TSF | 0 | 0 | 0 | 0 | 0 | 0 | 238 |
| 50. | Golf Course | 180.00 AC | 27 | 11 | 38 | 18 | 36 | 54 | 1433 |
| | TOTAL | | 778 | 1962 | 2740 | 2811 | 2099 | 4910 | 53303 |

## ENTRADA (2022) ZONAL LAND USE AND TRIP GENERATION

| Zone | | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|---|
| 90 | 5. | Apartment | 408.00 DU | 33 | 175 | 208 | 167 | 86 | 253 | 2815 |
| | 10. | Commercial Center (>30ac) | 200.00 TSF | 94 | 60 | 154 | 328 | 356 | 684 | 8012 |
| | 11. | Commercial Center(10-30a) | 135.00 TSF | 99 | 63 | 162 | 321 | 348 | 669 | 7298 |
| | 30. | Industrial Park | 63.88 TSF | 35 | 6 | 41 | 8 | 33 | 41 | 383 |
| | 40. | Commercial Office | 300.00 TSF | 465 | 57 | 522 | 63 | 387 | 450 | 3468 |
| | | SUB-TOTAL | | 726 | 361 | 1087 | 887 | 1210 | 2097 | 21976 |
| 92 | 4. | Condominium/Townhouse | 1000.00 DU | 100 | 480 | 580 | 470 | 260 | 730 | 8000 |
| | 10. | Commercial Center (>30ac) | 400.00 TSF | 188 | 120 | 308 | 656 | 712 | 1368 | 16024 |
| | 40. | Commercial Office | 250.00 TSF | 388 | 48 | 436 | 53 | 323 | 376 | 2890 |
| | | SUB-TOTAL | | 676 | 648 | 1324 | 1179 | 1295 | 2474 | 26914 |
| 101 | 10. | Commercial Center (>30ac) | 200.00 TSF | 94 | 60 | 154 | 328 | 356 | 684 | 8012 |
| | | SUB-TOTAL | | 94 | 60 | 154 | 328 | 356 | 684 | 8012 |
| 140 | 3. | Single Family (6-10du/ac) | 572.00 DU | 109 | 320 | 429 | 366 | 212 | 578 | 5663 |
| | 4. | Condominium/Townhouse | 1250.00 DU | 125 | 600 | 725 | 588 | 325 | 913 | 10000 |
| | 12. | Commercial Center (<10ac) | 28.48 TSF | 31 | 20 | 51 | 95 | 103 | 198 | 2422 |
| | | SUB-TOTAL | | 265 | 940 | 1205 | 1049 | 640 | 1689 | 18085 |

## ENTRADA (2022) LAND USE AND TRIP GENERATION SUMMARY

| | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 3. | Single Family (6-10du/ac) | 572.00 DU | 109 | 320 | 429 | 366 | 212 | 578 | 5663 |
| 4. | Condominium/Townhouse | 2250.00 DU | 225 | 1080 | 1305 | 1058 | 585 | 1643 | 18000 |
| 5. | Apartment | 408.00 DU | 33 | 175 | 208 | 167 | 86 | 253 | 2815 |
| 10. | Commercial Center (>30ac) | 800.00 TSF | 376 | 240 | 616 | 1312 | 1424 | 2736 | 32048 |
| 11. | Commercial Center(10-30a) | 135.00 TSF | 99 | 63 | 162 | 321 | 348 | 669 | 7298 |
| 12. | Commercial Center (<10ac) | 28.48 TSF | 31 | 20 | 51 | 95 | 103 | 198 | 2422 |
| 30. | Industrial Park | 63.88 TSF | 35 | 6 | 41 | 8 | 33 | 41 | 383 |
| 40. | Commercial Office | 550.00 TSF | 853 | 105 | 958 | 116 | 710 | 826 | 6358 |
| | TOTAL | | 1761 | 2009 | 3770 | 3443 | 3501 | 6944 | 74987 |

## LEGACY VILLAGE (2022) ZONAL LAND USE AND TRIP GENERATION

| Zone | | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|---|
| 123 | 3. | Single Family (6-10du/ac) | 440.00 DU | 84 | 246 | 330 | 282 | 163 | 445 | 4356 |
| | | SUB-TOTAL | | 84 | 246 | 330 | 282 | 163 | 445 | 4356 |
| 124 | 7. | Senior (Active) | 1000.00 DU | 80 | 120 | 200 | 160 | 100 | 260 | 3710 |
| | | SUB-TOTAL | | 80 | 120 | 200 | 160 | 100 | 260 | 3710 |
| 126 | 4. | Condominium/Townhouse | 585.00 DU | 59 | 281 | 340 | 275 | 152 | 427 | 4680 |
| | 11. | Commercial Center(10-30a) | 150.00 TSF | 110 | 71 | 181 | 357 | 387 | 744 | 8109 |
| | 40. | Commercial Office | 225.00 TSF | 349 | 43 | 392 | 47 | 290 | 337 | 2601 |
| | | SUB-TOTAL | | 518 | 395 | 913 | 679 | 829 | 1508 | 15390 |
| 131 | 4. | Condominium/Townhouse | 1400.00 DU | 140 | 672 | 812 | 658 | 364 | 1022 | 11200 |
| | 20. | Elementary/Middle School | 900.00 STU | 234 | 180 | 414 | 72 | 81 | 153 | 1305 |
| | | SUB-TOTAL | | 374 | 852 | 1226 | 730 | 445 | 1175 | 12505 |
| 151 | 2. | Single Family (1-5du/ac) | 75.00 DU | 14 | 42 | 56 | 48 | 28 | 76 | 743 |
| | | SUB-TOTAL | | 14 | 42 | 56 | 48 | 28 | 76 | 743 |

## LEGACY VILLAGE (2022) LAND USE AND TRIP GENERATION SUMMARY

| | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 2. | Single Family (1-5du/ac) | 75.00 DU | 14 | 42 | 56 | 48 | 28 | 76 | 743 |
| 3. | Single Family (6-10du/ac) | 440.00 DU | 84 | 246 | 330 | 282 | 163 | 445 | 4356 |
| 4. | Condominium/Townhouse | 1985.00 DU | 199 | 953 | 1152 | 933 | 516 | 1449 | 15880 |
| 7. | Senior (Active) | 1000.00 DU | 80 | 120 | 200 | 160 | 100 | 260 | 3710 |
| 11. | Commercial Center(10-30a) | 150.00 TSF | 110 | 71 | 181 | 357 | 387 | 744 | 8109 |
| 20. | Elementary/Middle School | 900.00 STU | 234 | 180 | 414 | 72 | 81 | 153 | 1305 |
| 40. | Commercial Office | 225.00 TSF | 349 | 43 | 392 | 47 | 290 | 337 | 2601 |
| | TOTAL | | 1070 | 1655 | 2725 | 1899 | 1565 | 3464 | 36704 |

COMMERCE CENTER (2022) ZONAL LAND USE AND TRIP GENERATION

| Zone | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 41 | 30. Industrial Park | 730.00 TSF | 402 | 73 | 475 | 95 | 380 | 475 | 4380 |
| | SUB-TOTAL | | 402 | 73 | 475 | 95 | 380 | 475 | 4380 |
| 42 | 30. Industrial Park | 275.00 TSF | 151 | 28 | 179 | 36 | 143 | 179 | 1650 |
| | SUB-TOTAL | | 151 | 28 | 179 | 36 | 143 | 179 | 1650 |
| 43 | 30. Industrial Park | 273.90 TSF | 151 | 27 | 178 | 36 | 142 | 178 | 1643 |
| | SUB-TOTAL | | 151 | 27 | 178 | 36 | 142 | 178 | 1643 |
| 45 | 30. Industrial Park | 1960.20 TSF | 1078 | 196 | 1274 | 255 | 1019 | 1274 | 11761 |
| | SUB-TOTAL | | 1078 | 196 | 1274 | 255 | 1019 | 1274 | 11761 |
| 46 | 13. Commercial Shops | 77.00 TSF | 55 | 37 | 92 | 139 | 139 | 278 | 2854 |
| | 30. Industrial Park | 445.80 TSF | 245 | 45 | 290 | 58 | 232 | 290 | 2675 |
| | SUB-TOTAL | | 300 | 82 | 382 | 197 | 371 | 568 | 5529 |
| 47 | 30. Industrial Park | 4254.10 TSF | 2340 | 425 | 2765 | 553 | 2212 | 2765 | 25525 |
| | SUB-TOTAL | | 2340 | 425 | 2765 | 553 | 2212 | 2765 | 25525 |
| 48 | 30. Industrial Park | 720.00 TSF | 396 | 72 | 468 | 94 | 374 | 468 | 4320 |
| | SUB-TOTAL | | 396 | 72 | 468 | 94 | 374 | 468 | 4320 |
| 49 | 30. Industrial Park | 764.30 TSF | 420 | 76 | 496 | 99 | 397 | 496 | 4586 |
| | SUB-TOTAL | | 420 | 76 | 496 | 99 | 397 | 496 | 4586 |
| 58 | 30. Industrial Park | 1051.50 TSF | 578 | 105 | 683 | 137 | 547 | 684 | 6309 |
| | SUB-TOTAL | | 578 | 105 | 683 | 137 | 547 | 684 | 6309 |
| 59 | 35. Regional Post Office | 764.00 TSF | 153 | 115 | 268 | 115 | 115 | 230 | 3820 |
| | SUB-TOTAL | | 153 | 115 | 268 | 115 | 115 | 230 | 3820 |
| 60 | 30. Industrial Park | 411.60 TSF | 226 | 41 | 267 | 54 | 214 | 268 | 2470 |
| | SUB-TOTAL | | 226 | 41 | 267 | 54 | 214 | 268 | 2470 |
| 61 | 30. Industrial Park | 744.90 TSF | 410 | 74 | 484 | 97 | 387 | 484 | 4469 |
| | SUB-TOTAL | | 410 | 74 | 484 | 97 | 387 | 484 | 4469 |
| 62 | 30. Industrial Park | 627.30 TSF | 345 | 63 | 408 | 82 | 326 | 408 | 3764 |
| | SUB-TOTAL | | 345 | 63 | 408 | 82 | 326 | 408 | 3764 |

COMMERCE CENTER (2022) LAND USE AND TRIP GENERATION SUMMARY

| | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 13. | Commercial Shops | 77.00 TSF | 55 | 37 | 92 | 139 | 139 | 278 | 2854 |
| 30. | Industrial Park | 12258.60 TSF | 6742 | 1225 | 7967 | 1596 | 6373 | 7969 | 73552 |
| 35. | Regional Post Office | 764.00 TSF | 153 | 115 | 268 | 115 | 115 | 230 | 3820 |
| | TOTAL | | 6950 | 1377 | 8327 | 1850 | 6627 | 8477 | 80226 |

TOTAL (2022) LAND USE AND TRIP GENERATION SUMMARY

| | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 2. | Single Family (1-5du/ac) | 1101.00 DU | 209 | 616 | 825 | 706 | 408 | 1114 | 10901 |
| 3. | Single Family (6-10du/ac) | 2729.00 DU | 520 | 1526 | 2046 | 1746 | 1011 | 2757 | 27016 |
| 4. | Condominium/Townhouse | 15153.00 DU | 1519 | 7272 | 8791 | 7122 | 3940 | 11062 | 121224 |
| 5. | Apartment | 1390.00 DU | 111 | 597 | 708 | 570 | 293 | 863 | 9592 |
| 7. | Senior (Active) | 1000.00 DU | 80 | 120 | 200 | 160 | 100 | 260 | 3710 |
| 10. | Commercial Center (>30ac) | 800.00 TSF | 376 | 240 | 616 | 1312 | 1424 | 2736 | 32048 |
| 11. | Commercial Center(10-30a) | 1204.30 TSF | 880 | 566 | 1446 | 2866 | 3107 | 5973 | 65104 |
| 12. | Commercial Center (<10ac) | 133.77 TSF | 146 | 93 | 239 | 445 | 483 | 928 | 11378 |
| 13. | Commercial Shops | 102.50 TSF | 74 | 50 | 124 | 185 | 185 | 370 | 3799 |
| 20. | Elementary/Middle School | 4150.00 STU | 1079 | 830 | 1909 | 332 | 374 | 706 | 6018 |
| 21. | High School | 1300.00 STU | 416 | 182 | 598 | 78 | 117 | 195 | 2327 |
| 30. | Industrial Park | 12322.48 TSF | 6777 | 1231 | 8008 | 1604 | 6406 | 8010 | 73935 |
| 31. | Business Park | 350.00 TSF | 420 | 81 | 501 | 105 | 347 | 452 | 3570 |
| 34. | Utilities | 100.00 TSF | 0 | 0 | 0 | 0 | 0 | 0 | 238 |
| 35. | Regional Post Office | 764.00 TSF | 153 | 115 | 268 | 115 | 115 | 230 | 3820 |
| 40. | Commercial Office | 1765.40 TSF | 2738 | 336 | 3074 | 371 | 2278 | 2649 | 20408 |
| 50. | Golf Course | 180.00 AC | 27 | 11 | 38 | 18 | 36 | 54 | 1433 |
| 51. | Developed Park | 83.30 AC | 0 | 0 | 0 | 2 | 3 | 5 | 217 |
| | TOTAL | | 15525 | 13866 | 29391 | 17737 | 20627 | 38364 | 396738 |

# APPENDIX A (Cont.)

# LAND USE AND TRIP GENERATION BY PLANNING AREA

## g. Year 2025

## LANDMARK VILLAGE (2025) ZONAL LAND USE AND TRIP GENERATION

| Zone | | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|---|
| 102 | 3. | Single Family (6-10du/ac) | 38.00 DU | 7 | 21 | 28 | 24 | 14 | 38 | 376 |
| | 4. | Condominium/Townhouse | 305.00 DU | 31 | 146 | 177 | 143 | 79 | 222 | 2440 |
| | 5. | Apartment | 155.00 DU | 12 | 67 | 79 | 64 | 33 | 97 | 1070 |
| | 12. | Commercial Center (<10ac) | 10.50 TSF | 11 | 7 | 18 | 35 | 38 | 73 | 893 |
| | 40. | Commercial Office | 9.50 TSF | 15 | 2 | 17 | 2 | 12 | 14 | 110 |
| | | SUB-TOTAL | | 76 | 243 | 319 | 268 | 176 | 444 | 4889 |
| 103 | 3. | Single Family (6-10du/ac) | 95.00 DU | 18 | 53 | 71 | 61 | 35 | 96 | 940 |
| | 4. | Condominium/Townhouse | 169.00 DU | 17 | 81 | 98 | 79 | 44 | 123 | 1352 |
| | 12. | Commercial Center (<10ac) | 38.50 TSF | 42 | 27 | 69 | 128 | 139 | 267 | 3275 |
| | 13. | Commercial Shops | 9.50 TSF | 7 | 5 | 12 | 17 | 17 | 34 | 352 |
| | 20. | Elementary/Middle School | 750.00 STU | 195 | 150 | 345 | 60 | 68 | 128 | 1088 |
| | 51. | Developed Park | 16.10 AC | 0 | 0 | 0 | 0 | 1 | 1 | 42 |
| | | SUB-TOTAL | | 279 | 316 | 595 | 345 | 304 | 649 | 7049 |
| 104 | 3. | Single Family (6-10du/ac) | 175.00 DU | 33 | 98 | 131 | 112 | 65 | 177 | 1732 |
| | 4. | Condominium/Townhouse | 211.00 DU | 21 | 101 | 122 | 99 | 55 | 154 | 1688 |
| | 5. | Apartment | 152.00 DU | 12 | 65 | 77 | 62 | 32 | 94 | 1049 |
| | 11. | Commercial Center(10-30a) | 252.00 TSF | 184 | 118 | 302 | 600 | 650 | 1250 | 13623 |
| | 40. | Commercial Office | 370.00 TSF | 574 | 70 | 644 | 78 | 477 | 555 | 4277 |
| | | SUB-TOTAL | | 824 | 452 | 1276 | 951 | 1279 | 2230 | 22369 |
| 105 | 5. | Apartment | 144.00 DU | 12 | 62 | 74 | 59 | 30 | 89 | 994 |
| | 12. | Commercial Center (<10ac) | 27.10 TSF | 30 | 19 | 49 | 90 | 98 | 188 | 2305 |
| | 40. | Commercial Office | 315.90 TSF | 490 | 60 | 550 | 66 | 408 | 474 | 3652 |
| | | SUB-TOTAL | | 532 | 141 | 673 | 215 | 536 | 751 | 6951 |

## LANDMARK VILLAGE (2025) LAND USE AND TRIP GENERATION SUMMARY

| | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 3. | Single Family (6-10du/ac) | 308.00 DU | 58 | 172 | 230 | 197 | 114 | 311 | 3048 |
| 4. | Condominium/Townhouse | 685.00 DU | 69 | 328 | 397 | 321 | 178 | 499 | 5480 |
| 5. | Apartment | 451.00 DU | 36 | 194 | 230 | 185 | 95 | 280 | 3113 |
| 11. | Commercial Center(10-30a) | 252.00 TSF | 184 | 118 | 302 | 600 | 650 | 1250 | 13623 |
| 12. | Commercial Center (<10ac) | 76.10 TSF | 83 | 53 | 136 | 253 | 275 | 528 | 6473 |
| 13. | Commercial Shops | 9.50 TSF | 7 | 5 | 12 | 17 | 17 | 34 | 352 |
| 20. | Elementary/Middle School | 750.00 STU | 195 | 150 | 345 | 60 | 68 | 128 | 1088 |
| 40. | Commercial Office | 695.40 TSF | 1079 | 132 | 1211 | 146 | 897 | 1043 | 8039 |
| 51. | Developed Park | 16.10 AC | 0 | 0 | 0 | 0 | 1 | 1 | 42 |
| | TOTAL | | 1711 | 1152 | 2863 | 1779 | 2295 | 4074 | 41258 |

MISSION VILLAGE (2025) ZONAL LAND USE AND TRIP GENERATION

| Zone | | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|---|
| 96 | 2. | Single Family (1-5du/ac) | 123.00 DU | 23 | 69 | 92 | 79 | 46 | 125 | 1218 |
| | 4. | Condominium/Townhouse | 881.00 DU | 88 | 423 | 511 | 414 | 229 | 643 | 7048 |
| | | SUB-TOTAL | | 111 | 492 | 603 | 493 | 275 | 768 | 8266 |
| 98 | 12. | Commercial Center (<10ac) | 6.20 TSF | 7 | 4 | 11 | 21 | 22 | 43 | 527 |
| | 31. | Business Park | 691.50 TSF | 830 | 159 | 989 | 207 | 685 | 892 | 7053 |
| | | SUB-TOTAL | | 837 | 163 | 1000 | 228 | 707 | 935 | 7580 |
| 99 | 4. | Condominium/Townhouse | 470.00 DU | 47 | 226 | 273 | 221 | 122 | 343 | 3760 |
| | 51. | Developed Park | 20.20 AC | 0 | 0 | 0 | 1 | 1 | 2 | 53 |
| | | SUB-TOTAL | | 47 | 226 | 273 | 222 | 123 | 345 | 3813 |
| 100 | 12. | Commercial Center (<10ac) | 23.00 TSF | 25 | 16 | 41 | 76 | 83 | 159 | 1956 |
| | 40. | Commercial Office | 220.00 TSF | 341 | 42 | 383 | 46 | 284 | 330 | 2543 |
| | | SUB-TOTAL | | 366 | 58 | 424 | 122 | 367 | 489 | 4499 |
| 120 | 4. | Condominium/Townhouse | 2425.00 DU | 243 | 1164 | 1407 | 1140 | 631 | 1771 | 19400 |
| | 11. | Commercial Center(10-30a) | 267.30 TSF | 195 | 126 | 321 | 636 | 690 | 1326 | 14450 |
| | 13. | Commercial Shops | 16.00 TSF | 12 | 8 | 20 | 29 | 29 | 58 | 593 |
| | 20. | Elementary/Middle School | 900.00 STU | 234 | 180 | 414 | 72 | 81 | 153 | 1305 |
| | 40. | Commercial Office | 75.00 TSF | 116 | 14 | 130 | 16 | 97 | 113 | 867 |
| | 51. | Developed Park | 8.40 AC | 0 | 0 | 0 | 0 | 0 | 0 | 22 |
| | | SUB-TOTAL | | 800 | 1492 | 2292 | 1893 | 1528 | 3421 | 36637 |
| 121 | 2. | Single Family (1-5du/ac) | 168.00 DU | 32 | 94 | 126 | 108 | 62 | 170 | 1663 |
| | 4. | Condominium/Townhouse | 418.00 DU | 42 | 201 | 243 | 196 | 109 | 305 | 3344 |
| | | SUB-TOTAL | | 74 | 295 | 369 | 304 | 171 | 475 | 5007 |
| 122 | 4. | Condominium/Townhouse | 176.00 DU | 18 | 84 | 102 | 83 | 46 | 129 | 1408 |
| | | SUB-TOTAL | | 18 | 84 | 102 | 83 | 46 | 129 | 1408 |
| 142 | 4. | Condominium/Townhouse | 670.00 DU | 67 | 322 | 389 | 315 | 174 | 489 | 5360 |
| | | SUB-TOTAL | | 67 | 322 | 389 | 315 | 174 | 489 | 5360 |

MISSION VILLAGE (2025) LAND USE AND TRIP GENERATION SUMMARY

| | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 2. | Single Family (1-5du/ac) | 291.00 DU | 55 | 163 | 218 | 187 | 108 | 295 | 2881 |
| 4. | Condominium/Townhouse | 5040.00 DU | 505 | 2420 | 2925 | 2369 | 1311 | 3680 | 40320 |
| 11. | Commercial Center(10-30a) | 267.30 TSF | 195 | 126 | 321 | 636 | 690 | 1326 | 14450 |
| 12. | Commercial Center (<10ac) | 29.20 TSF | 32 | 20 | 52 | 97 | 105 | 202 | 2483 |
| 13. | Commercial Shops | 16.00 TSF | 12 | 8 | 20 | 29 | 29 | 58 | 593 |
| 20. | Elementary/Middle School | 900.00 STU | 234 | 180 | 414 | 72 | 81 | 153 | 1305 |
| 31. | Business Park | 691.50 TSF | 830 | 159 | 989 | 207 | 685 | 892 | 7053 |
| 40. | Commercial Office | 295.00 TSF | 457 | 56 | 513 | 62 | 381 | 443 | 3410 |
| 51. | Developed Park | 28.60 AC | 0 | 0 | 0 | 1 | 1 | 2 | 75 |
| | TOTAL | | 2320 | 3132 | 5452 | 3660 | 3391 | 7051 | 72570 |

## HOMESTEAD S/O RIVER (2025) ZONAL LAND USE AND TRIP GENERATION

| Zone | | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|---|
| 107 | 2. | Single Family (1-5du/ac) | 461.00 DU | 88 | 258 | 346 | 295 | 171 | 466 | 4564 |
| | 4. | Condominium/Townhouse | 326.00 DU | 33 | 156 | 189 | 153 | 85 | 238 | 2608 |
| | 20. | Elementary/Middle School | 1000.00 STU | 260 | 200 | 460 | 80 | 90 | 170 | 1450 |
| | 21. | High School | 2000.00 STU | 640 | 280 | 920 | 120 | 180 | 300 | 3580 |
| | 51. | Developed Park | 20.50 AC | 0 | 0 | 0 | 1 | 1 | 2 | 53 |
| | | SUB-TOTAL | | 1021 | 894 | 1915 | 649 | 527 | 1176 | 12255 |
| 108 | 4. | Condominium/Townhouse | 2189.00 DU | 219 | 1051 | 1270 | 1029 | 569 | 1598 | 17512 |
| | 20. | Elementary/Middle School | 900.00 STU | 234 | 180 | 414 | 72 | 81 | 153 | 1305 |
| | 51. | Developed Park | 8.70 AC | 0 | 0 | 0 | 0 | 0 | 0 | 23 |
| | | SUB-TOTAL | | 453 | 1231 | 1684 | 1101 | 650 | 1751 | 18840 |
| 109 | 3. | Single Family (6-10du/ac) | 38.00 DU | 7 | 21 | 28 | 24 | 14 | 38 | 376 |
| | | SUB-TOTAL | | 7 | 21 | 28 | 24 | 14 | 38 | 376 |
| 110 | 2. | Single Family (1-5du/ac) | 184.00 DU | 35 | 103 | 138 | 118 | 68 | 186 | 1822 |
| | 4. | Condominium/Townhouse | 548.00 DU | 55 | 263 | 318 | 258 | 142 | 400 | 4384 |
| | 20. | Elementary/Middle School | 900.00 STU | 234 | 180 | 414 | 72 | 81 | 153 | 1305 |
| | 51. | Developed Park | 9.40 AC | 0 | 0 | 0 | 0 | 0 | 0 | 24 |
| | | SUB-TOTAL | | 324 | 546 | 870 | 448 | 291 | 739 | 7535 |
| 118 | 4. | Condominium/Townhouse | 161.00 DU | 16 | 77 | 93 | 76 | 42 | 118 | 1288 |
| | | SUB-TOTAL | | 16 | 77 | 93 | 76 | 42 | 118 | 1288 |

## HOMESTEAD S/O RIVER (2025) LAND USE AND TRIP GENERATION SUMMARY

| | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 2. | Single Family (1-5du/ac) | 645.00 DU | 123 | 361 | 484 | 413 | 239 | 652 | 6386 |
| 3. | Single Family (6-10du/ac) | 38.00 DU | 7 | 21 | 28 | 24 | 14 | 38 | 376 |
| 4. | Condominium/Townhouse | 3224.00 DU | 323 | 1547 | 1870 | 1516 | 838 | 2354 | 25792 |
| 20. | Elementary/Middle School | 2800.00 STU | 728 | 560 | 1288 | 224 | 252 | 476 | 4060 |
| 21. | High School | 2000.00 STU | 640 | 280 | 920 | 120 | 180 | 300 | 3580 |
| 51. | Developed Park | 38.60 AC | 0 | 0 | 0 | 1 | 1 | 2 | 100 |
| | TOTAL | | 1821 | 2769 | 4590 | 2298 | 1524 | 3822 | 40294 |

## HOMESTEAD N/O RIVER (2025) ZONAL LAND USE AND TRIP GENERATION

| Zone | | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|---|
| 54 | 3. | Single Family (6-10du/ac) | 62.00 DU | 12 | 35 | 47 | 40 | 23 | 63 | 614 |
| | 4. | Condominium/Townhouse | 589.00 DU | 59 | 283 | 342 | 277 | 153 | 430 | 4712 |
| | | SUB-TOTAL | | 71 | 318 | 389 | 317 | 176 | 493 | 5326 |
| 55 | 3. | Single Family (6-10du/ac) | 164.00 DU | 31 | 92 | 123 | 105 | 61 | 166 | 1624 |
| | 4. | Condominium/Townhouse | 922.00 DU | 92 | 443 | 535 | 433 | 240 | 673 | 7376 |
| | 51. | Developed Park | 5.80 AC | 0 | 0 | 0 | 0 | 0 | 0 | 15 |
| | | SUB-TOTAL | | 123 | 535 | 658 | 538 | 301 | 839 | 9015 |
| 56 | 2. | Single Family (1-5du/ac) | 19.00 DU | 4 | 11 | 15 | 12 | 7 | 19 | 188 |
| | 4. | Condominium/Townhouse | 23.00 DU | 2 | 11 | 13 | 11 | 6 | 17 | 184 |
| | | SUB-TOTAL | | 6 | 22 | 28 | 23 | 13 | 36 | 372 |
| 57 | 12. | Commercial Center (<10ac) | 55.40 TSF | 60 | 38 | 98 | 184 | 199 | 383 | 4712 |
| | 31. | Business Park | 439.60 TSF | 528 | 101 | 629 | 132 | 435 | 567 | 4484 |
| | 40. | Commercial Office | 105.00 TSF | 163 | 20 | 183 | 22 | 135 | 157 | 1214 |
| | | SUB-TOTAL | | 751 | 159 | 910 | 338 | 769 | 1107 | 10410 |

## HOMESTEAD N/O RIVER (2025) LAND USE AND TRIP GENERATION SUMMARY

| | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 2. | Single Family (1-5du/ac) | 19.00 DU | 4 | 11 | 15 | 12 | 7 | 19 | 188 |
| 3. | Single Family (6-10du/ac) | 226.00 DU | 43 | 127 | 170 | 145 | 84 | 229 | 2238 |
| 4. | Condominium/Townhouse | 1534.00 DU | 153 | 737 | 890 | 721 | 399 | 1120 | 12272 |
| 12. | Commercial Center (<10ac) | 55.40 TSF | 60 | 38 | 98 | 184 | 199 | 383 | 4712 |
| 31. | Business Park | 439.60 TSF | 528 | 101 | 629 | 132 | 435 | 567 | 4484 |
| 40. | Commercial Office | 105.00 TSF | 163 | 20 | 183 | 22 | 135 | 157 | 1214 |
| 51. | Developed Park | 5.80 AC | 0 | 0 | 0 | 0 | 0 | 0 | 15 |
| | TOTAL | | 951 | 1034 | 1985 | 1216 | 1259 | 2475 | 25123 |

POTRERO VILLAGE (2025) ZONAL LAND USE AND TRIP GENERATION

| Zone | | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|---|
| 111 | 34. | Utilities | 100.00 TSF | 0 | 0 | 0 | 0 | 0 | 0 | 238 |
| | | SUB-TOTAL | | 0 | 0 | 0 | 0 | 0 | 0 | 238 |
| 112 | 2. | Single Family (1-5du/ac) | 90.00 DU | 17 | 50 | 67 | 58 | 33 | 91 | 891 |
| | 3. | Single Family (6-10du/ac) | 156.00 DU | 30 | 87 | 117 | 100 | 58 | 158 | 1544 |
| | 50. | Golf Course | 180.00 AC | 27 | 11 | 38 | 18 | 36 | 54 | 1433 |
| | | SUB-TOTAL | | 74 | 148 | 222 | 176 | 127 | 303 | 3868 |
| 115 | 3. | Single Family (6-10du/ac) | 603.00 DU | 115 | 338 | 453 | 386 | 223 | 609 | 5970 |
| | | SUB-TOTAL | | 115 | 338 | 453 | 386 | 223 | 609 | 5970 |
| 116 | 4. | Condominium/Townhouse | 1000.00 DU | 100 | 480 | 580 | 470 | 260 | 730 | 8000 |
| | 11. | Commercial Center(10-30a) | 400.00 TSF | 292 | 188 | 480 | 952 | 1032 | 1984 | 21624 |
| | | SUB-TOTAL | | 392 | 668 | 1060 | 1422 | 1292 | 2714 | 29624 |
| 117 | 4. | Condominium/Townhouse | 1000.00 DU | 100 | 480 | 580 | 470 | 260 | 730 | 8000 |
| | 11. | Commercial Center(10-30a) | 400.00 TSF | 292 | 188 | 480 | 952 | 1032 | 1984 | 21624 |
| | | SUB-TOTAL | | 392 | 668 | 1060 | 1422 | 1292 | 2714 | 29624 |
| 119 | 5. | Apartment | 1022.00 DU | 82 | 439 | 521 | 419 | 215 | 634 | 7052 |
| | | SUB-TOTAL | | 82 | 439 | 521 | 419 | 215 | 634 | 7052 |
| 127 | 4. | Condominium/Townhouse | 888.00 DU | 89 | 426 | 515 | 417 | 231 | 648 | 7104 |
| | | SUB-TOTAL | | 89 | 426 | 515 | 417 | 231 | 648 | 7104 |
| 128 | 3. | Single Family (6-10du/ac) | 450.00 DU | 86 | 252 | 338 | 288 | 167 | 455 | 4455 |
| | | SUB-TOTAL | | 86 | 252 | 338 | 288 | 167 | 455 | 4455 |
| 129 | 3. | Single Family (6-10du/ac) | 177.00 DU | 34 | 99 | 133 | 113 | 65 | 178 | 1752 |
| | | SUB-TOTAL | | 34 | 99 | 133 | 113 | 65 | 178 | 1752 |
| 153 | 3. | Single Family (6-10du/ac) | 424.00 DU | 81 | 237 | 318 | 271 | 157 | 428 | 4198 |
| | | SUB-TOTAL | | 81 | 237 | 318 | 271 | 157 | 428 | 4198 |

POTRERO VILLAGE (2025) LAND USE AND TRIP GENERATION SUMMARY

| | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 2. | Single Family (1-5du/ac) | 90.00 DU | 17 | 50 | 67 | 58 | 33 | 91 | 891 |
| 3. | Single Family (6-10du/ac) | 1810.00 DU | 346 | 1013 | 1359 | 1158 | 670 | 1828 | 17919 |
| 4. | Condominium/Townhouse | 2888.00 DU | 289 | 1386 | 1675 | 1357 | 751 | 2108 | 23104 |
| 5. | Apartment | 1022.00 DU | 82 | 439 | 521 | 419 | 215 | 634 | 7052 |
| 11. | Commercial Center(10-30a) | 800.00 TSF | 584 | 376 | 960 | 1904 | 2064 | 3968 | 43248 |
| 34. | Utilities | 100.00 TSF | 0 | 0 | 0 | 0 | 0 | 0 | 238 |
| 50. | Golf Course | 180.00 AC | 27 | 11 | 38 | 18 | 36 | 54 | 1433 |
| | TOTAL | | 1345 | 3275 | 4620 | 4914 | 3769 | 8683 | 93885 |

## ENTRADA (2025) ZONAL LAND USE AND TRIP GENERATION

| Zone | | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|---|
| 90 | 5. | Apartment | 408.00 DU | 33 | 175 | 208 | 167 | 86 | 253 | 2815 |
| | 10. | Commercial Center (>30ac) | 300.00 TSF | 141 | 90 | 231 | 492 | 534 | 1026 | 12018 |
| | 11. | Commercial Center(10-30a) | 135.00 TSF | 99 | 63 | 162 | 321 | 348 | 669 | 7298 |
| | 30. | Industrial Park | 263.88 TSF | 145 | 26 | 171 | 34 | 137 | 171 | 1583 |
| | 40. | Commercial Office | 400.00 TSF | 620 | 76 | 696 | 84 | 516 | 600 | 4624 |
| | | SUB-TOTAL | | 1038 | 430 | 1468 | 1098 | 1621 | 2719 | 28338 |
| 92 | 4. | Condominium/Townhouse | 1000.00 DU | 100 | 480 | 580 | 470 | 260 | 730 | 8000 |
| | 10. | Commercial Center (>30ac) | 550.00 TSF | 259 | 165 | 424 | 902 | 979 | 1881 | 22033 |
| | 14. | Hotel | 300.00 ROOM | 102 | 66 | 168 | 96 | 87 | 183 | 2469 |
| | 40. | Commercial Office | 300.00 TSF | 465 | 57 | 522 | 63 | 387 | 450 | 3468 |
| | | SUB-TOTAL | | 926 | 768 | 1694 | 1531 | 1713 | 3244 | 35970 |
| 101 | 10. | Commercial Center (>30ac) | 388.30 TSF | 183 | 116 | 299 | 637 | 691 | 1328 | 15555 |
| | | SUB-TOTAL | | 183 | 116 | 299 | 637 | 691 | 1328 | 15555 |
| 140 | 3. | Single Family (6-10du/ac) | 572.00 DU | 109 | 320 | 429 | 366 | 212 | 578 | 5663 |
| | 4. | Condominium/Townhouse | 1250.00 DU | 125 | 600 | 725 | 588 | 325 | 913 | 10000 |
| | 12. | Commercial Center (<10ac) | 28.48 TSF | 31 | 20 | 51 | 95 | 103 | 198 | 2422 |
| | | SUB-TOTAL | | 265 | 940 | 1205 | 1049 | 640 | 1689 | 18085 |

## ENTRADA (2025) LAND USE AND TRIP GENERATION SUMMARY

| | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 3. | Single Family (6-10du/ac) | 572.00 DU | 109 | 320 | 429 | 366 | 212 | 578 | 5663 |
| 4. | Condominium/Townhouse | 2250.00 DU | 225 | 1080 | 1305 | 1058 | 585 | 1643 | 18000 |
| 5. | Apartment | 408.00 DU | 33 | 175 | 208 | 167 | 86 | 253 | 2815 |
| 10. | Commercial Center (>30ac) | 1238.30 TSF | 583 | 371 | 954 | 2031 | 2204 | 4235 | 49606 |
| 11. | Commercial Center(10-30a) | 135.00 TSF | 99 | 63 | 162 | 321 | 348 | 669 | 7298 |
| 12. | Commercial Center (<10ac) | 28.48 TSF | 31 | 20 | 51 | 95 | 103 | 198 | 2422 |
| 14. | Hotel | 300.00 ROOM | 102 | 66 | 168 | 96 | 87 | 183 | 2469 |
| 30. | Industrial Park | 263.88 TSF | 145 | 26 | 171 | 34 | 137 | 171 | 1583 |
| 40. | Commercial Office | 700.00 TSF | 1085 | 133 | 1218 | 147 | 903 | 1050 | 8092 |
| | TOTAL | | 2412 | 2254 | 4666 | 4315 | 4665 | 8980 | 97948 |

## LEGACY VILLAGE (2025) ZONAL LAND USE AND TRIP GENERATION

| Zone | | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|---|
| 123 | 3. | Single Family (6-10du/ac) | 440.00 DU | 84 | 246 | 330 | 282 | 163 | 445 | 4356 |
| | | SUB-TOTAL | | 84 | 246 | 330 | 282 | 163 | 445 | 4356 |
| 124 | 7. | Senior (Active) | 1000.00 DU | 80 | 120 | 200 | 160 | 100 | 260 | 3710 |
| | | SUB-TOTAL | | 80 | 120 | 200 | 160 | 100 | 260 | 3710 |
| 126 | 4. | Condominium/Townhouse | 585.00 DU | 59 | 281 | 340 | 275 | 152 | 427 | 4680 |
| | 11. | Commercial Center(10-30a) | 150.00 TSF | 110 | 71 | 181 | 357 | 387 | 744 | 8109 |
| | 40. | Commercial Office | 225.00 TSF | 349 | 43 | 392 | 47 | 290 | 337 | 2601 |
| | | SUB-TOTAL | | 518 | 395 | 913 | 679 | 829 | 1508 | 15390 |
| 131 | 4. | Condominium/Townhouse | 1400.00 DU | 140 | 672 | 812 | 658 | 364 | 1022 | 11200 |
| | 20. | Elementary/Middle School | 900.00 STU | 234 | 180 | 414 | 72 | 81 | 153 | 1305 |
| | | SUB-TOTAL | | 374 | 852 | 1226 | 730 | 445 | 1175 | 12505 |
| 151 | 2. | Single Family (1-5du/ac) | 75.00 DU | 14 | 42 | 56 | 48 | 28 | 76 | 743 |
| | | SUB-TOTAL | | 14 | 42 | 56 | 48 | 28 | 76 | 743 |

## LEGACY VILLAGE (2025) LAND USE AND TRIP GENERATION SUMMARY

| | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 2. | Single Family (1-5du/ac) | 75.00 DU | 14 | 42 | 56 | 48 | 28 | 76 | 743 |
| 3. | Single Family (6-10du/ac) | 440.00 DU | 84 | 246 | 330 | 282 | 163 | 445 | 4356 |
| 4. | Condominium/Townhouse | 1985.00 DU | 199 | 953 | 1152 | 933 | 516 | 1449 | 15880 |
| 7. | Senior (Active) | 1000.00 DU | 80 | 120 | 200 | 160 | 100 | 260 | 3710 |
| 11. | Commercial Center(10-30a) | 150.00 TSF | 110 | 71 | 181 | 357 | 387 | 744 | 8109 |
| 20. | Elementary/Middle School | 900.00 STU | 234 | 180 | 414 | 72 | 81 | 153 | 1305 |
| 40. | Commercial Office | 225.00 TSF | 349 | 43 | 392 | 47 | 290 | 337 | 2601 |
| | TOTAL | | 1070 | 1655 | 2725 | 1899 | 1565 | 3464 | 36704 |

COMMERCE CENTER (2025) ZONAL LAND USE AND TRIP GENERATION

| Zone | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 41 | 30. Industrial Park | 730.00 TSF | 402 | 73 | 475 | 95 | 380 | 475 | 4380 |
| | SUB-TOTAL | | 402 | 73 | 475 | 95 | 380 | 475 | 4380 |
| 42 | 30. Industrial Park | 275.00 TSF | 151 | 28 | 179 | 36 | 143 | 179 | 1650 |
| | SUB-TOTAL | | 151 | 28 | 179 | 36 | 143 | 179 | 1650 |
| 43 | 30. Industrial Park | 273.90 TSF | 151 | 27 | 178 | 36 | 142 | 178 | 1643 |
| | SUB-TOTAL | | 151 | 27 | 178 | 36 | 142 | 178 | 1643 |
| 45 | 30. Industrial Park | 1960.20 TSF | 1078 | 196 | 1274 | 255 | 1019 | 1274 | 11761 |
| | SUB-TOTAL | | 1078 | 196 | 1274 | 255 | 1019 | 1274 | 11761 |
| 46 | 13. Commercial Shops | 77.00 TSF | 55 | 37 | 92 | 139 | 139 | 278 | 2854 |
| | 30. Industrial Park | 445.80 TSF | 245 | 45 | 290 | 58 | 232 | 290 | 2675 |
| | SUB-TOTAL | | 300 | 82 | 382 | 197 | 371 | 568 | 5529 |
| 47 | 30. Industrial Park | 4254.10 TSF | 2340 | 425 | 2765 | 553 | 2212 | 2765 | 25525 |
| | SUB-TOTAL | | 2340 | 425 | 2765 | 553 | 2212 | 2765 | 25525 |
| 48 | 30. Industrial Park | 720.00 TSF | 396 | 72 | 468 | 94 | 374 | 468 | 4320 |
| | SUB-TOTAL | | 396 | 72 | 468 | 94 | 374 | 468 | 4320 |
| 49 | 30. Industrial Park | 764.30 TSF | 420 | 76 | 496 | 99 | 397 | 496 | 4586 |
| | SUB-TOTAL | | 420 | 76 | 496 | 99 | 397 | 496 | 4586 |
| 58 | 30. Industrial Park | 1051.50 TSF | 578 | 105 | 683 | 137 | 547 | 684 | 6309 |
| | SUB-TOTAL | | 578 | 105 | 683 | 137 | 547 | 684 | 6309 |
| 59 | 35. Regional Post Office | 764.00 TSF | 153 | 115 | 268 | 115 | 115 | 230 | 3820 |
| | SUB-TOTAL | | 153 | 115 | 268 | 115 | 115 | 230 | 3820 |
| 60 | 30. Industrial Park | 411.60 TSF | 226 | 41 | 267 | 54 | 214 | 268 | 2470 |
| | SUB-TOTAL | | 226 | 41 | 267 | 54 | 214 | 268 | 2470 |
| 61 | 30. Industrial Park | 744.90 TSF | 410 | 74 | 484 | 97 | 387 | 484 | 4469 |
| | SUB-TOTAL | | 410 | 74 | 484 | 97 | 387 | 484 | 4469 |
| 62 | 30. Industrial Park | 627.30 TSF | 345 | 63 | 408 | 82 | 326 | 408 | 3764 |
| | SUB-TOTAL | | 345 | 63 | 408 | 82 | 326 | 408 | 3764 |

COMMERCE CENTER (2025) LAND USE AND TRIP GENERATION SUMMARY

| | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 13. | Commercial Shops | 77.00 TSF | 55 | 37 | 92 | 139 | 139 | 278 | 2854 |
| 30. | Industrial Park | 12258.60 TSF | 6742 | 1225 | 7967 | 1596 | 6373 | 7969 | 73552 |
| 35. | Regional Post Office | 764.00 TSF | 153 | 115 | 268 | 115 | 115 | 230 | 3820 |
| | TOTAL | | 6950 | 1377 | 8327 | 1850 | 6627 | 8477 | 80226 |

TOTAL (2025) LAND USE AND TRIP GENERATION SUMMARY

| | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 2. | Single Family (1-5du/ac) | 1120.00 DU | 213 | 627 | 840 | 718 | 415 | 1133 | 11089 |
| 3. | Single Family (6-10du/ac) | 3394.00 DU | 647 | 1899 | 2546 | 2172 | 1257 | 3429 | 33600 |
| 4. | Condominium/Townhouse | 17606.00 DU | 1763 | 8451 | 10214 | 8275 | 4578 | 12853 | 140848 |
| 5. | Apartment | 1881.00 DU | 151 | 808 | 959 | 771 | 396 | 1167 | 12980 |
| 7. | Senior (Active) | 1000.00 DU | 80 | 120 | 200 | 160 | 100 | 260 | 3710 |
| 10. | Commercial Center (>30ac) | 1238.30 TSF | 583 | 371 | 954 | 2031 | 2204 | 4235 | 49606 |
| 11. | Commercial Center(10-30a) | 1604.30 TSF | 1172 | 754 | 1926 | 3818 | 4139 | 7957 | 86728 |
| 12. | Commercial Center (<10ac) | 189.18 TSF | 206 | 131 | 337 | 629 | 682 | 1311 | 16090 |
| 13. | Commercial Shops | 102.50 TSF | 74 | 50 | 124 | 185 | 185 | 370 | 3799 |
| 14. | Hotel | 300.00 ROOM | 102 | 66 | 168 | 96 | 87 | 183 | 2469 |
| 20. | Elementary/Middle School | 5350.00 STU | 1391 | 1070 | 2461 | 428 | 482 | 910 | 7758 |
| 21. | High School | 2000.00 STU | 640 | 280 | 920 | 120 | 180 | 300 | 3580 |
| 30. | Industrial Park | 12522.48 TSF | 6887 | 1251 | 8138 | 1630 | 6510 | 8140 | 75135 |
| 31. | Business Park | 1131.10 TSF | 1358 | 260 | 1618 | 339 | 1120 | 1459 | 11537 |
| 34. | Utilities | 100.00 TSF | 0 | 0 | 0 | 0 | 0 | 0 | 238 |
| 35. | Regional Post Office | 764.00 TSF | 153 | 115 | 268 | 115 | 115 | 230 | 3820 |
| 40. | Commercial Office | 2020.40 TSF | 3133 | 384 | 3517 | 424 | 2606 | 3030 | 23356 |
| 50. | Golf Course | 180.00 AC | 27 | 11 | 38 | 18 | 36 | 54 | 1433 |
| 51. | Developed Park | 89.10 AC | 0 | 0 | 0 | 2 | 3 | 5 | 232 |
| | TOTAL | | 18580 | 16648 | 35228 | 21931 | 25095 | 47026 | 488008 |

# APPENDIX A (Cont.)

# LAND USE AND TRIP GENERATION BY PLANNING AREA

## h. Year 2030 (Buildout)

## LANDMARK VILLAGE (2030) ZONAL LAND USE AND TRIP GENERATION

| Zone | | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|---|
| 102 | 3. | Single Family (6-10du/ac) | 38.00 DU | 7 | 21 | 28 | 24 | 14 | 38 | 376 |
| | 4. | Condominium/Townhouse | 305.00 DU | 31 | 146 | 177 | 143 | 79 | 222 | 2440 |
| | 5. | Apartment | 155.00 DU | 12 | 67 | 79 | 64 | 33 | 97 | 1070 |
| | 12. | Commercial Center (<10ac) | 10.50 TSF | 11 | 7 | 18 | 35 | 38 | 73 | 893 |
| | 40. | Commercial Office | 9.50 TSF | 15 | 2 | 17 | 2 | 12 | 14 | 110 |
| | | SUB-TOTAL | | 76 | 243 | 319 | 268 | 176 | 444 | 4889 |
| 103 | 3. | Single Family (6-10du/ac) | 95.00 DU | 18 | 53 | 71 | 61 | 35 | 96 | 940 |
| | 4. | Condominium/Townhouse | 169.00 DU | 17 | 81 | 98 | 79 | 44 | 123 | 1352 |
| | 12. | Commercial Center (<10ac) | 38.50 TSF | 42 | 27 | 69 | 128 | 139 | 267 | 3275 |
| | 13. | Commercial Shops | 9.50 TSF | 7 | 5 | 12 | 17 | 17 | 34 | 352 |
| | 20. | Elementary/Middle School | 750.00 STU | 195 | 150 | 345 | 60 | 68 | 128 | 1088 |
| | 51. | Developed Park | 16.10 AC | 0 | 0 | 0 | 0 | 1 | 1 | 42 |
| | | SUB-TOTAL | | 279 | 316 | 595 | 345 | 304 | 649 | 7049 |
| 104 | 3. | Single Family (6-10du/ac) | 175.00 DU | 33 | 98 | 131 | 112 | 65 | 177 | 1732 |
| | 4. | Condominium/Townhouse | 211.00 DU | 21 | 101 | 122 | 99 | 55 | 154 | 1688 |
| | 5. | Apartment | 152.00 DU | 12 | 65 | 77 | 62 | 32 | 94 | 1049 |
| | 11. | Commercial Center(10-30a) | 252.00 TSF | 184 | 118 | 302 | 600 | 650 | 1250 | 13623 |
| | 40. | Commercial Office | 370.00 TSF | 574 | 70 | 644 | 78 | 477 | 555 | 4277 |
| | | SUB-TOTAL | | 824 | 452 | 1276 | 951 | 1279 | 2230 | 22369 |
| 105 | 5. | Apartment | 144.00 DU | 12 | 62 | 74 | 59 | 30 | 89 | 994 |
| | 12. | Commercial Center (<10ac) | 27.10 TSF | 30 | 19 | 49 | 90 | 98 | 188 | 2305 |
| | 40. | Commercial Office | 315.90 TSF | 490 | 60 | 550 | 66 | 408 | 474 | 3652 |
| | | SUB-TOTAL | | 532 | 141 | 673 | 215 | 536 | 751 | 6951 |

## LANDMARK VILLAGE (2030) LAND USE AND TRIP GENERATION SUMMARY

| | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 3. | Single Family (6-10du/ac) | 308.00 DU | 58 | 172 | 230 | 197 | 114 | 311 | 3048 |
| 4. | Condominium/Townhouse | 685.00 DU | 69 | 328 | 397 | 321 | 178 | 499 | 5480 |
| 5. | Apartment | 451.00 DU | 36 | 194 | 230 | 185 | 95 | 280 | 3113 |
| 11. | Commercial Center(10-30a) | 252.00 TSF | 184 | 118 | 302 | 600 | 650 | 1250 | 13623 |
| 12. | Commercial Center (<10ac) | 76.10 TSF | 83 | 53 | 136 | 253 | 275 | 528 | 6473 |
| 13. | Commercial Shops | 9.50 TSF | 7 | 5 | 12 | 17 | 17 | 34 | 352 |
| 20. | Elementary/Middle School | 750.00 STU | 195 | 150 | 345 | 60 | 68 | 128 | 1088 |
| 40. | Commercial Office | 695.40 TSF | 1079 | 132 | 1211 | 146 | 897 | 1043 | 8039 |
| 51. | Developed Park | 16.10 AC | 0 | 0 | 0 | 0 | 1 | 1 | 42 |
| | TOTAL | | 1711 | 1152 | 2863 | 1779 | 2295 | 4074 | 41258 |

MISSION VILLAGE (2030) ZONAL LAND USE AND TRIP GENERATION

| Zone | | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|---|
| 96 | 2. | Single Family (1-5du/ac) | 123.00 DU | 23 | 69 | 92 | 79 | 46 | 125 | 1218 |
| | 4. | Condominium/Townhouse | 881.00 DU | 88 | 423 | 511 | 414 | 229 | 643 | 7048 |
| | | SUB-TOTAL | | 111 | 492 | 603 | 493 | 275 | 768 | 8266 |
| 98 | 12. | Commercial Center (<10ac) | 6.20 TSF | 7 | 4 | 11 | 21 | 22 | 43 | 527 |
| | 31. | Business Park | 691.50 TSF | 830 | 159 | 989 | 207 | 685 | 892 | 7053 |
| | | SUB-TOTAL | | 837 | 163 | 1000 | 228 | 707 | 935 | 7580 |
| 99 | 4. | Condominium/Townhouse | 470.00 DU | 47 | 226 | 273 | 221 | 122 | 343 | 3760 |
| | 51. | Developed Park | 20.20 AC | 0 | 0 | 0 | 1 | 1 | 2 | 53 |
| | | SUB-TOTAL | | 47 | 226 | 273 | 222 | 123 | 345 | 3813 |
| 100 | 12. | Commercial Center (<10ac) | 23.00 TSF | 25 | 16 | 41 | 76 | 83 | 159 | 1956 |
| | 40. | Commercial Office | 220.00 TSF | 341 | 42 | 383 | 46 | 284 | 330 | 2543 |
| | | SUB-TOTAL | | 366 | 58 | 424 | 122 | 367 | 489 | 4499 |
| 120 | 4. | Condominium/Townhouse | 2425.00 DU | 243 | 1164 | 1407 | 1140 | 631 | 1771 | 19400 |
| | 11. | Commercial Center(10-30a) | 267.30 TSF | 195 | 126 | 321 | 636 | 690 | 1326 | 14450 |
| | 13. | Commercial Shops | 16.00 TSF | 12 | 8 | 20 | 29 | 29 | 58 | 593 |
| | 20. | Elementary/Middle School | 900.00 STU | 234 | 180 | 414 | 72 | 81 | 153 | 1305 |
| | 40. | Commercial Office | 75.00 TSF | 116 | 14 | 130 | 16 | 97 | 113 | 867 |
| | 51. | Developed Park | 8.40 AC | 0 | 0 | 0 | 0 | 0 | 0 | 22 |
| | | SUB-TOTAL | | 800 | 1492 | 2292 | 1893 | 1528 | 3421 | 36637 |
| 121 | 2. | Single Family (1-5du/ac) | 168.00 DU | 32 | 94 | 126 | 108 | 62 | 170 | 1663 |
| | 4. | Condominium/Townhouse | 418.00 DU | 42 | 201 | 243 | 196 | 109 | 305 | 3344 |
| | | SUB-TOTAL | | 74 | 295 | 369 | 304 | 171 | 475 | 5007 |
| 122 | 4. | Condominium/Townhouse | 176.00 DU | 18 | 84 | 102 | 83 | 46 | 129 | 1408 |
| | | SUB-TOTAL | | 18 | 84 | 102 | 83 | 46 | 129 | 1408 |
| 142 | 4. | Condominium/Townhouse | 670.00 DU | 67 | 322 | 389 | 315 | 174 | 489 | 5360 |
| | | SUB-TOTAL | | 67 | 322 | 389 | 315 | 174 | 489 | 5360 |

MISSION VILLAGE (2030) LAND USE AND TRIP GENERATION SUMMARY

| | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 2. | Single Family (1-5du/ac) | 291.00 DU | 55 | 163 | 218 | 187 | 108 | 295 | 2881 |
| 4. | Condominium/Townhouse | 5040.00 DU | 505 | 2420 | 2925 | 2369 | 1311 | 3680 | 40320 |
| 11. | Commercial Center(10-30a) | 267.30 TSF | 195 | 126 | 321 | 636 | 690 | 1326 | 14450 |
| 12. | Commercial Center (<10ac) | 29.20 TSF | 32 | 20 | 52 | 97 | 105 | 202 | 2483 |
| 13. | Commercial Shops | 16.00 TSF | 12 | 8 | 20 | 29 | 29 | 58 | 593 |
| 20. | Elementary/Middle School | 900.00 STU | 234 | 180 | 414 | 72 | 81 | 153 | 1305 |
| 31. | Business Park | 691.50 TSF | 830 | 159 | 989 | 207 | 685 | 892 | 7053 |
| 40. | Commercial Office | 295.00 TSF | 457 | 56 | 513 | 62 | 381 | 443 | 3410 |
| 51. | Developed Park | 28.60 AC | 0 | 0 | 0 | 1 | 1 | 2 | 75 |
| | TOTAL | | 2320 | 3132 | 5452 | 3660 | 3391 | 7051 | 72570 |

## HOMESTEAD S/O RIVER (2030) ZONAL LAND USE AND TRIP GENERATION

| Zone | | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|---|
| 107 | 2. | Single Family (1-5du/ac) | 461.00 DU | 88 | 258 | 346 | 295 | 171 | 466 | 4564 |
| | 4. | Condominium/Townhouse | 326.00 DU | 33 | 156 | 189 | 153 | 85 | 238 | 2608 |
| | 20. | Elementary/Middle School | 1200.00 STU | 312 | 240 | 552 | 96 | 108 | 204 | 1740 |
| | 21. | High School | 2400.00 STU | 768 | 336 | 1104 | 144 | 216 | 360 | 4296 |
| | 51. | Developed Park | 20.50 AC | 0 | 0 | 0 | 1 | 1 | 2 | 53 |
| | | SUB-TOTAL | | 1201 | 990 | 2191 | 689 | 581 | 1270 | 13261 |
| 108 | 4. | Condominium/Townhouse | 2189.00 DU | 219 | 1051 | 1270 | 1029 | 569 | 1598 | 17512 |
| | 20. | Elementary/Middle School | 900.00 STU | 234 | 180 | 414 | 72 | 81 | 153 | 1305 |
| | 51. | Developed Park | 8.70 AC | 0 | 0 | 0 | 0 | 0 | 0 | 23 |
| | | SUB-TOTAL | | 453 | 1231 | 1684 | 1101 | 650 | 1751 | 18840 |
| 109 | 3. | Single Family (6-10du/ac) | 38.00 DU | 7 | 21 | 28 | 24 | 14 | 38 | 376 |
| | | SUB-TOTAL | | 7 | 21 | 28 | 24 | 14 | 38 | 376 |
| 110 | 2. | Single Family (1-5du/ac) | 184.00 DU | 35 | 103 | 138 | 118 | 68 | 186 | 1822 |
| | 4. | Condominium/Townhouse | 548.00 DU | 55 | 263 | 318 | 258 | 142 | 400 | 4384 |
| | 20. | Elementary/Middle School | 900.00 STU | 234 | 180 | 414 | 72 | 81 | 153 | 1305 |
| | 51. | Developed Park | 9.40 AC | 0 | 0 | 0 | 0 | 0 | 0 | 24 |
| | | SUB-TOTAL | | 324 | 546 | 870 | 448 | 291 | 739 | 7535 |
| 118 | 4. | Condominium/Townhouse | 161.00 DU | 16 | 77 | 93 | 76 | 42 | 118 | 1288 |
| | | SUB-TOTAL | | 16 | 77 | 93 | 76 | 42 | 118 | 1288 |

## HOMESTEAD S/O RIVER (2030) LAND USE AND TRIP GENERATION SUMMARY

| | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 2. | Single Family (1-5du/ac) | 645.00 DU | 123 | 361 | 484 | 413 | 239 | 652 | 6386 |
| 3. | Single Family (6-10du/ac) | 38.00 DU | 7 | 21 | 28 | 24 | 14 | 38 | 376 |
| 4. | Condominium/Townhouse | 3224.00 DU | 323 | 1547 | 1870 | 1516 | 838 | 2354 | 25792 |
| 20. | Elementary/Middle School | 3000.00 STU | 780 | 600 | 1380 | 240 | 270 | 510 | 4350 |
| 21. | High School | 2400.00 STU | 768 | 336 | 1104 | 144 | 216 | 360 | 4296 |
| 51. | Developed Park | 38.60 AC | 0 | 0 | 0 | 1 | 1 | 2 | 100 |
| | TOTAL | | 2001 | 2865 | 4866 | 2338 | 1578 | 3916 | 41300 |

## HOMESTEAD N/O RIVER (2030) ZONAL LAND USE AND TRIP GENERATION

| Zone | | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|---|
| 54 | 3. | Single Family (6-10du/ac) | 62.00 DU | 12 | 35 | 47 | 40 | 23 | 63 | 614 |
| | 4. | Condominium/Townhouse | 589.00 DU | 59 | 283 | 342 | 277 | 153 | 430 | 4712 |
| | | SUB-TOTAL | | 71 | 318 | 389 | 317 | 176 | 493 | 5326 |
| 55 | 3. | Single Family (6-10du/ac) | 164.00 DU | 31 | 92 | 123 | 105 | 61 | 166 | 1624 |
| | 4. | Condominium/Townhouse | 922.00 DU | 92 | 443 | 535 | 433 | 240 | 673 | 7376 |
| | 51. | Developed Park | 5.80 AC | 0 | 0 | 0 | 0 | 0 | 0 | 15 |
| | | SUB-TOTAL | | 123 | 535 | 658 | 538 | 301 | 839 | 9015 |
| 56 | 2. | Single Family (1-5du/ac) | 19.00 DU | 4 | 11 | 15 | 12 | 7 | 19 | 188 |
| | 4. | Condominium/Townhouse | 23.00 DU | 2 | 11 | 13 | 11 | 6 | 17 | 184 |
| | | SUB-TOTAL | | 6 | 22 | 28 | 23 | 13 | 36 | 372 |
| 57 | 12. | Commercial Center (<10ac) | 55.40 TSF | 60 | 38 | 98 | 184 | 199 | 383 | 4712 |
| | 31. | Business Park | 1169.60 TSF | 1404 | 269 | 1673 | 351 | 1158 | 1509 | 11930 |
| | 40. | Commercial Office | 105.00 TSF | 163 | 20 | 183 | 22 | 135 | 157 | 1214 |
| | | SUB-TOTAL | | 1627 | 327 | 1954 | 557 | 1492 | 2049 | 17856 |

## HOMESTEAD N/O RIVER (2030) LAND USE AND TRIP GENERATION SUMMARY

| | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 2. | Single Family (1-5du/ac) | 19.00 DU | 4 | 11 | 15 | 12 | 7 | 19 | 188 |
| 3. | Single Family (6-10du/ac) | 226.00 DU | 43 | 127 | 170 | 145 | 84 | 229 | 2238 |
| 4. | Condominium/Townhouse | 1534.00 DU | 153 | 737 | 890 | 721 | 399 | 1120 | 12272 |
| 12. | Commercial Center (<10ac) | 55.40 TSF | 60 | 38 | 98 | 184 | 199 | 383 | 4712 |
| 31. | Business Park | 1169.60 TSF | 1404 | 269 | 1673 | 351 | 1158 | 1509 | 11930 |
| 40. | Commercial Office | 105.00 TSF | 163 | 20 | 183 | 22 | 135 | 157 | 1214 |
| 51. | Developed Park | 5.80 AC | 0 | 0 | 0 | 0 | 0 | 0 | 15 |
| | TOTAL | | 1827 | 1202 | 3029 | 1435 | 1982 | 3417 | 32569 |

POTRERO VILLAGE (2030) ZONAL LAND USE AND TRIP GENERATION

| Zone | | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|---|
| 106 | 5. | Apartment | 520.00 DU | 42 | 224 | 266 | 213 | 109 | 322 | 3588 |
| | | SUB-TOTAL | | 42 | 224 | 266 | 213 | 109 | 322 | 3588 |
| 111 | 34. | Utilities | 100.00 TSF | 0 | 0 | 0 | 0 | 0 | 0 | 238 |
| | | SUB-TOTAL | | 0 | 0 | 0 | 0 | 0 | 0 | 238 |
| 112 | 2. | Single Family (1-5du/ac) | 90.00 DU | 17 | 50 | 67 | 58 | 33 | 91 | 891 |
| | 3. | Single Family (6-10du/ac) | 156.00 DU | 30 | 87 | 117 | 100 | 58 | 158 | 1544 |
| | 50. | Golf Course | 180.00 AC | 27 | 11 | 38 | 18 | 36 | 54 | 1433 |
| | | SUB-TOTAL | | 74 | 148 | 222 | 176 | 127 | 303 | 3868 |
| 113 | 4. | Condominium/Townhouse | 354.00 DU | 35 | 170 | 205 | 166 | 92 | 258 | 2832 |
| | | SUB-TOTAL | | 35 | 170 | 205 | 166 | 92 | 258 | 2832 |
| 114 | 4. | Condominium/Townhouse | 560.00 DU | 56 | 269 | 325 | 263 | 146 | 409 | 4480 |
| | | SUB-TOTAL | | 56 | 269 | 325 | 263 | 146 | 409 | 4480 |
| 115 | 3. | Single Family (6-10du/ac) | 603.00 DU | 115 | 338 | 453 | 386 | 223 | 609 | 5970 |
| | | SUB-TOTAL | | 115 | 338 | 453 | 386 | 223 | 609 | 5970 |
| 116 | 4. | Condominium/Townhouse | 1262.00 DU | 126 | 606 | 732 | 593 | 328 | 921 | 10096 |
| | 11. | Commercial Center(10-30a) | 628.50 TSF | 459 | 295 | 754 | 1496 | 1622 | 3118 | 33977 |
| | | SUB-TOTAL | | 585 | 901 | 1486 | 2089 | 1950 | 4039 | 44073 |
| 117 | 4. | Condominium/Townhouse | 1261.00 DU | 126 | 605 | 731 | 593 | 328 | 921 | 10088 |
| | 11. | Commercial Center(10-30a) | 628.50 TSF | 459 | 295 | 754 | 1496 | 1622 | 3118 | 33977 |
| | | SUB-TOTAL | | 585 | 900 | 1485 | 2089 | 1950 | 4039 | 44065 |
| 119 | 5. | Apartment | 1679.00 DU | 134 | 722 | 856 | 688 | 353 | 1041 | 11585 |
| | | SUB-TOTAL | | 134 | 722 | 856 | 688 | 353 | 1041 | 11585 |
| 127 | 4. | Condominium/Townhouse | 888.00 DU | 89 | 426 | 515 | 417 | 231 | 648 | 7104 |
| | | SUB-TOTAL | | 89 | 426 | 515 | 417 | 231 | 648 | 7104 |
| 128 | 3. | Single Family (6-10du/ac) | 450.00 DU | 86 | 252 | 338 | 288 | 167 | 455 | 4455 |
| | | SUB-TOTAL | | 86 | 252 | 338 | 288 | 167 | 455 | 4455 |
| 129 | 3. | Single Family (6-10du/ac) | 177.00 DU | 34 | 99 | 133 | 113 | 65 | 178 | 1752 |
| | | SUB-TOTAL | | 34 | 99 | 133 | 113 | 65 | 178 | 1752 |
| 153 | 3. | Single Family (6-10du/ac) | 424.00 DU | 81 | 237 | 318 | 271 | 157 | 428 | 4198 |
| | | SUB-TOTAL | | 81 | 237 | 318 | 271 | 157 | 428 | 4198 |

POTRERO VILLAGE (2030) LAND USE AND TRIP GENERATION SUMMARY

| | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 2. | Single Family (1-5du/ac) | 90.00 DU | 17 | 50 | 67 | 58 | 33 | 91 | 891 |
| 3. | Single Family (6-10du/ac) | 1810.00 DU | 346 | 1013 | 1359 | 1158 | 670 | 1828 | 17919 |
| 4. | Condominium/Townhouse | 4325.00 DU | 432 | 2076 | 2508 | 2032 | 1125 | 3157 | 34600 |
| 5. | Apartment | 2199.00 DU | 176 | 946 | 1122 | 901 | 462 | 1363 | 15173 |
| 11. | Commercial Center(10-30a) | 1257.00 TSF | 918 | 590 | 1508 | 2992 | 3244 | 6236 | 67954 |
| 34. | Utilities | 100.00 TSF | 0 | 0 | 0 | 0 | 0 | 0 | 238 |
| 50. | Golf Course | 180.00 AC | 27 | 11 | 38 | 18 | 36 | 54 | 1433 |
| | TOTAL | | 1916 | 4686 | 6602 | 7159 | 5570 | 12729 | 138208 |

## ENTRADA (2030) ZONAL LAND USE AND TRIP GENERATION

| Zone | | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|---|
| 90 | 5. | Apartment | 408.00 DU | 33 | 175 | 208 | 167 | 86 | 253 | 2815 |
| | 10. | Commercial Center (>30ac) | 400.00 TSF | 188 | 120 | 308 | 656 | 712 | 1368 | 16024 |
| | 11. | Commercial Center(10-30a) | 135.00 TSF | 99 | 63 | 162 | 321 | 348 | 669 | 7298 |
| | 30. | Industrial Park | 543.88 TSF | 299 | 54 | 353 | 71 | 283 | 354 | 3263 |
| | 40. | Commercial Office | 773.02 TSF | 1198 | 147 | 1345 | 162 | 997 | 1159 | 8936 |
| | | SUB-TOTAL | | 1817 | 559 | 2376 | 1377 | 2426 | 3803 | 38336 |
| 92 | 4. | Condominium/Townhouse | 1000.00 DU | 100 | 480 | 580 | 470 | 260 | 730 | 8000 |
| | 10. | Commercial Center (>30ac) | 800.00 TSF | 376 | 240 | 616 | 1312 | 1424 | 2736 | 32048 |
| | 14. | Hotel | 300.00 ROOM | 102 | 66 | 168 | 96 | 87 | 183 | 2469 |
| | 40. | Commercial Office | 400.00 TSF | 620 | 76 | 696 | 84 | 516 | 600 | 4624 |
| | | SUB-TOTAL | | 1198 | 862 | 2060 | 1962 | 2287 | 4249 | 47141 |
| 95 | 11. | Commercial Center(10-30a) | 115.21 TSF | 84 | 54 | 138 | 274 | 297 | 571 | 6228 |
| | | SUB-TOTAL | | 84 | 54 | 138 | 274 | 297 | 571 | 6228 |
| 101 | 10. | Commercial Center (>30ac) | 388.30 TSF | 183 | 116 | 299 | 637 | 691 | 1328 | 15555 |
| | | SUB-TOTAL | | 183 | 116 | 299 | 637 | 691 | 1328 | 15555 |
| 140 | 3. | Single Family (6-10du/ac) | 572.00 DU | 109 | 320 | 429 | 366 | 212 | 578 | 5663 |
| | 4. | Condominium/Townhouse | 1250.00 DU | 125 | 600 | 725 | 588 | 325 | 913 | 10000 |
| | 12. | Commercial Center (<10ac) | 28.48 TSF | 31 | 20 | 51 | 95 | 103 | 198 | 2422 |
| | | SUB-TOTAL | | 265 | 940 | 1205 | 1049 | 640 | 1689 | 18085 |

## ENTRADA (2030) LAND USE AND TRIP GENERATION SUMMARY

| | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 3. | Single Family (6-10du/ac) | 572.00 DU | 109 | 320 | 429 | 366 | 212 | 578 | 5663 |
| 4. | Condominium/Townhouse | 2250.00 DU | 225 | 1080 | 1305 | 1058 | 585 | 1643 | 18000 |
| 5. | Apartment | 408.00 DU | 33 | 175 | 208 | 167 | 86 | 253 | 2815 |
| 10. | Commercial Center (>30ac) | 1588.30 TSF | 747 | 476 | 1223 | 2605 | 2827 | 5432 | 63627 |
| 11. | Commercial Center(10-30a) | 250.21 TSF | 183 | 117 | 300 | 595 | 645 | 1240 | 13526 |
| 12. | Commercial Center (<10ac) | 28.48 TSF | 31 | 20 | 51 | 95 | 103 | 198 | 2422 |
| 14. | Hotel | 300.00 ROOM | 102 | 66 | 168 | 96 | 87 | 183 | 2469 |
| 30. | Industrial Park | 543.88 TSF | 299 | 54 | 353 | 71 | 283 | 354 | 3263 |
| 40. | Commercial Office | 1173.02 TSF | 1818 | 223 | 2041 | 246 | 1513 | 1759 | 13560 |
| | TOTAL | | 3547 | 2531 | 6078 | 5299 | 6341 | 11640 | 125345 |

## LEGACY VILLAGE (2030) ZONAL LAND USE AND TRIP GENERATION

| Zone | | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|---|
| 123 | 3. | Single Family (6-10du/ac) | 440.00 DU | 84 | 246 | 330 | 282 | 163 | 445 | 4356 |
| | | SUB-TOTAL | | 84 | 246 | 330 | 282 | 163 | 445 | 4356 |
| 124 | 7. | Senior (Active) | 1000.00 DU | 80 | 120 | 200 | 160 | 100 | 260 | 3710 |
| | | SUB-TOTAL | | 80 | 120 | 200 | 160 | 100 | 260 | 3710 |
| 126 | 4. | Condominium/Townhouse | 585.00 DU | 59 | 281 | 340 | 275 | 152 | 427 | 4680 |
| | 11. | Commercial Center(10-30a) | 150.00 TSF | 110 | 71 | 181 | 357 | 387 | 744 | 8109 |
| | 40. | Commercial Office | 225.00 TSF | 349 | 43 | 392 | 47 | 290 | 337 | 2601 |
| | | SUB-TOTAL | | 518 | 395 | 913 | 679 | 829 | 1508 | 15390 |
| 131 | 4. | Condominium/Townhouse | 1400.00 DU | 140 | 672 | 812 | 658 | 364 | 1022 | 11200 |
| | 20. | Elementary/Middle School | 900.00 STU | 234 | 180 | 414 | 72 | 81 | 153 | 1305 |
| | | SUB-TOTAL | | 374 | 852 | 1226 | 730 | 445 | 1175 | 12505 |
| 151 | 2. | Single Family (1-5du/ac) | 75.00 DU | 14 | 42 | 56 | 48 | 28 | 76 | 743 |
| | | SUB-TOTAL | | 14 | 42 | 56 | 48 | 28 | 76 | 743 |

## LEGACY VILLAGE (2030) LAND USE AND TRIP GENERATION SUMMARY

| | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 2. | Single Family (1-5du/ac) | 75.00 DU | 14 | 42 | 56 | 48 | 28 | 76 | 743 |
| 3. | Single Family (6-10du/ac) | 440.00 DU | 84 | 246 | 330 | 282 | 163 | 445 | 4356 |
| 4. | Condominium/Townhouse | 1985.00 DU | 199 | 953 | 1152 | 933 | 516 | 1449 | 15880 |
| 7. | Senior (Active) | 1000.00 DU | 80 | 120 | 200 | 160 | 100 | 260 | 3710 |
| 11. | Commercial Center(10-30a) | 150.00 TSF | 110 | 71 | 181 | 357 | 387 | 744 | 8109 |
| 20. | Elementary/Middle School | 900.00 STU | 234 | 180 | 414 | 72 | 81 | 153 | 1305 |
| 40. | Commercial Office | 225.00 TSF | 349 | 43 | 392 | 47 | 290 | 337 | 2601 |
| | TOTAL | | 1070 | 1655 | 2725 | 1899 | 1565 | 3464 | 36704 |

COMMERCE CENTER (2030) ZONAL LAND USE AND TRIP GENERATION

| Zone | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 41 | 30. Industrial Park | 730.00 TSF | 402 | 73 | 475 | 95 | 380 | 475 | 4380 |
| | SUB-TOTAL | | 402 | 73 | 475 | 95 | 380 | 475 | 4380 |
| 42 | 30. Industrial Park | 275.00 TSF | 151 | 28 | 179 | 36 | 143 | 179 | 1650 |
| | SUB-TOTAL | | 151 | 28 | 179 | 36 | 143 | 179 | 1650 |
| 43 | 30. Industrial Park | 273.90 TSF | 151 | 27 | 178 | 36 | 142 | 178 | 1643 |
| | SUB-TOTAL | | 151 | 27 | 178 | 36 | 142 | 178 | 1643 |
| 45 | 30. Industrial Park | 1960.20 TSF | 1078 | 196 | 1274 | 255 | 1019 | 1274 | 11761 |
| | SUB-TOTAL | | 1078 | 196 | 1274 | 255 | 1019 | 1274 | 11761 |
| 46 | 13. Commercial Shops | 77.00 TSF | 55 | 37 | 92 | 139 | 139 | 278 | 2854 |
| | 30. Industrial Park | 445.80 TSF | 245 | 45 | 290 | 58 | 232 | 290 | 2675 |
| | SUB-TOTAL | | 300 | 82 | 382 | 197 | 371 | 568 | 5529 |
| 47 | 30. Industrial Park | 4254.10 TSF | 2340 | 425 | 2765 | 553 | 2212 | 2765 | 25525 |
| | SUB-TOTAL | | 2340 | 425 | 2765 | 553 | 2212 | 2765 | 25525 |
| 48 | 30. Industrial Park | 720.00 TSF | 396 | 72 | 468 | 94 | 374 | 468 | 4320 |
| | SUB-TOTAL | | 396 | 72 | 468 | 94 | 374 | 468 | 4320 |
| 49 | 30. Industrial Park | 764.30 TSF | 420 | 76 | 496 | 99 | 397 | 496 | 4586 |
| | SUB-TOTAL | | 420 | 76 | 496 | 99 | 397 | 496 | 4586 |
| 58 | 30. Industrial Park | 1051.50 TSF | 578 | 105 | 683 | 137 | 547 | 684 | 6309 |
| | SUB-TOTAL | | 578 | 105 | 683 | 137 | 547 | 684 | 6309 |
| 59 | 35. Regional Post Office | 764.00 TSF | 153 | 115 | 268 | 115 | 115 | 230 | 3820 |
| | SUB-TOTAL | | 153 | 115 | 268 | 115 | 115 | 230 | 3820 |
| 60 | 30. Industrial Park | 411.60 TSF | 226 | 41 | 267 | 54 | 214 | 268 | 2470 |
| | SUB-TOTAL | | 226 | 41 | 267 | 54 | 214 | 268 | 2470 |
| 61 | 30. Industrial Park | 744.90 TSF | 410 | 74 | 484 | 97 | 387 | 484 | 4469 |
| | SUB-TOTAL | | 410 | 74 | 484 | 97 | 387 | 484 | 4469 |
| 62 | 30. Industrial Park | 627.30 TSF | 345 | 63 | 408 | 82 | 326 | 408 | 3764 |
| | SUB-TOTAL | | 345 | 63 | 408 | 82 | 326 | 408 | 3764 |

COMMERCE CENTER (2030) LAND USE AND TRIP GENERATION SUMMARY

| | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 13. | Commercial Shops | 77.00 TSF | 55 | 37 | 92 | 139 | 139 | 278 | 2854 |
| 30. | Industrial Park | 12258.60 TSF | 6742 | 1225 | 7967 | 1596 | 6373 | 7969 | 73552 |
| 35. | Regional Post Office | 764.00 TSF | 153 | 115 | 268 | 115 | 115 | 230 | 3820 |
| | TOTAL | | 6950 | 1377 | 8327 | 1850 | 6627 | 8477 | 80226 |

TOTAL (2030) LAND USE AND TRIP GENERATION SUMMARY

| | Land Use Type | Units | -- AM Peak Hour -- In | Out | Total | -- PM Peak Hour -- In | Out | Total | ADT |
|---|---|---|---|---|---|---|---|---|---|
| 2. | Single Family (1-5du/ac) | 1120.00 DU | 213 | 627 | 840 | 718 | 415 | 1133 | 11089 |
| 3. | Single Family (6-10du/ac) | 3394.00 DU | 647 | 1899 | 2546 | 2172 | 1257 | 3429 | 33600 |
| 4. | Condominium/Townhouse | 19043.00 DU | 1906 | 9141 | 11047 | 8950 | 4952 | 13902 | 152344 |
| 5. | Apartment | 3058.00 DU | 245 | 1315 | 1560 | 1253 | 643 | 1896 | 21101 |
| 7. | Senior (Active) | 1000.00 DU | 80 | 120 | 200 | 160 | 100 | 260 | 3710 |
| 10. | Commercial Center (>30ac) | 1588.30 TSF | 747 | 476 | 1223 | 2605 | 2827 | 5432 | 63627 |
| 11. | Commercial Center(10-30a) | 2176.51 TSF | 1590 | 1022 | 2612 | 5180 | 5616 | 10796 | 117662 |
| 12. | Commercial Center (<10ac) | 189.18 TSF | 206 | 131 | 337 | 629 | 682 | 1311 | 16090 |
| 13. | Commercial Shops | 102.50 TSF | 74 | 50 | 124 | 185 | 185 | 370 | 3799 |
| 14. | Hotel | 300.00 ROOM | 102 | 66 | 168 | 96 | 87 | 183 | 2469 |
| 20. | Elementary/Middle School | 5550.00 STU | 1443 | 1110 | 2553 | 444 | 500 | 944 | 8048 |
| 21. | High School | 2400.00 STU | 768 | 336 | 1104 | 144 | 216 | 360 | 4296 |
| 30. | Industrial Park | 12802.48 TSF | 7041 | 1279 | 8320 | 1667 | 6656 | 8323 | 76815 |
| 31. | Business Park | 1861.10 TSF | 2234 | 428 | 2662 | 558 | 1843 | 2401 | 18983 |
| 34. | Utilities | 100.00 TSF | 0 | 0 | 0 | 0 | 0 | 0 | 238 |
| 35. | Regional Post Office | 764.00 TSF | 153 | 115 | 268 | 115 | 115 | 230 | 3820 |
| 40. | Commercial Office | 2493.42 TSF | 3866 | 474 | 4340 | 523 | 3216 | 3739 | 28824 |
| 50. | Golf Course | 180.00 AC | 27 | 11 | 38 | 18 | 36 | 54 | 1433 |
| 51. | Developed Park | 89.10 AC | 0 | 0 | 0 | 2 | 3 | 5 | 232 |
| | TOTAL | | 21342 | 18600 | 39942 | 25419 | 29349 | 54768 | 568180 |

# APPENDIX B
# INTERSECTION CAPACITY UTILIZATION WORKSHEETS

Peak hour intersection volume/capacity ratios are calculated by means of intersection capacity utilization (ICU) values. ICU calculations were performed for the intersections shown in Figure B-1.

The procedure is based on the critical movement methodology, and shows the amount of capacity utilized by each critical move. A "de-facto" right-turn lane is used in the ICU calculation for cases where a curb lane is wide enough to separately serve both through and right-turn traffic (typically with a width of 19 feet from curb to outside of through-lane with parking prohibited during peak periods). Such lanes are treated the same as striped right-turn lanes during the ICU calculations, but they are denoted on the ICU calculation worksheets using the letter "d" in place of a numerical entry for right-turn lanes.

The methodology also incorporates a check for right-turn capacity utilization. Both right-turn-on-green (RTOG) and right-turn-on-red (RTOR) capacity availability are calculated and checked against the total right-turn capacity need. If insufficient capacity is available, then an adjustment is made to the total capacity utilization value. The following example shows how this adjustment is made.

**Example of Right-turn Capacity Utilization For Northbound Right**

1. Right-Turn-On-Green (RTOG)

If NBT is critical move, then:
RTOG = V/C (NBT)
Otherwise,
RTOG = V/C (NBL) + V/C (SBT) - V/C (SBL)

2. Right-Turn-On-Red (RTOR)

If WBL is critical move, then:
RTOR = V/C (WBL)
Otherwise,
RTOR = V/C (EBL) + V/C (WBT) - V/C (EBT)

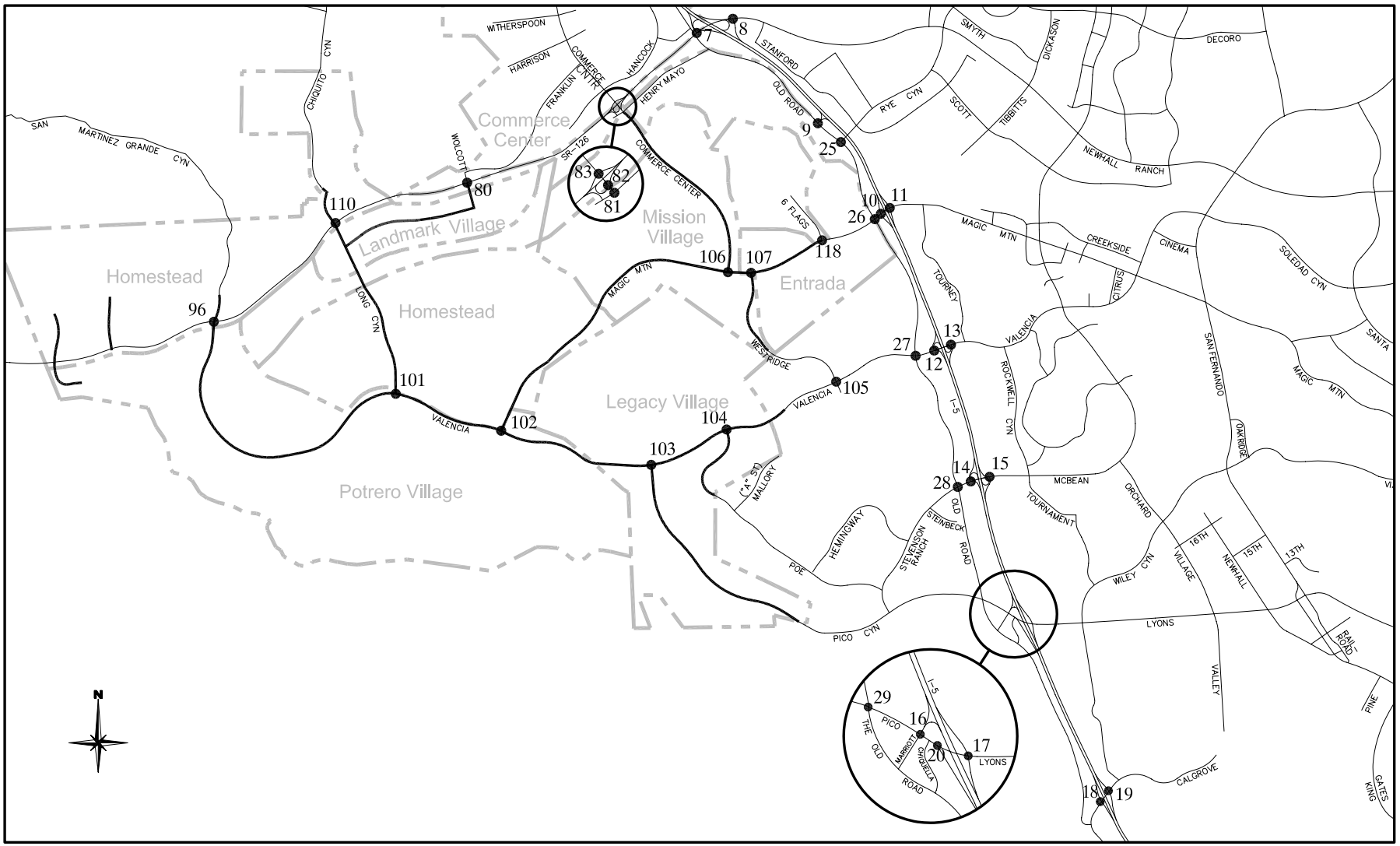



Figure B-1

INTERSECTION STUDY LOCATIONS

3. Right-Turn Overlap Adjustment

If the northbound right is assumed to overlap with the adjacent westbound left, adjustments to the RTOG and RTOR values are made as follows:

RTOG = RTOG + V/C (WBL)
RTOR = RTOR - V/C (WBL)

4. Total Right-Turn Capacity (RTC) Availability For NBR

RTC = RTOG + factor x RTOR
Where factor = RTOR saturation flow factor (typically 75%)

5. Right-turn Adjustment for ICU Calculation

Right-turn adjustment is then as follows: Additional ICU = V/C (NBR) - RTC

A zero or negative value indicates that adequate capacity is available and no adjustment is necessary. A positive value indicates that the available RTOR and RTOG capacity does not adequately accommodate the right-turn V/C, therefore the right-turn is essentially considered to be a critical movement. In such cases, the right-turn adjustment is noted on the ICU worksheet and it is included in the total capacity utilization value. When it is determined that a right-turn adjustment is required for more than one right-turn movement, the word "multi" is printed on the worksheet instead of an actual right-turn movement reference, and the right-turn adjustments are cumulatively added to the total capacity utilization value. In such cases, further operational evaluation is typically carried out to determine if under actual operational conditions, the critical right-turns would operate simultaneously, and therefore a right-turn adjustment credit should be applied.

**Shared Lane V/C Methodology**

For intersection approaches where shared usage of a lane is permitted by more than one turn movement (e.g., left/through, through/right, left/through/right), the individual turn volumes are evaluated to determine whether dedication of the shared lane is warranted to any one given turn movement. The following example demonstrates how this evaluation is carried out:

**Example of Shared Lane Utilization for Shared Left/Through Lane**

1. Average Lane Volume (ALV)

$$ALV = \frac{\text{Left-Turn Volume + Through Volume}}{\text{Total Left + Through Approach Lanes (including shared lane)}}.$$

2. ALV for Each Approach

$$ALV\ (Left) = \frac{\text{Left-Turn Volume}}{\text{Left Approach Lanes (including shared lane)}}.$$

$$ALV\ (Through) = \frac{\text{Through Volume}}{\text{Through Approach Lanes (including shared lane)}}.$$

3. Lane Dedication is Warranted

If ALV (Left) is greater than ALV then full dedication of the shared lane to the left-turn approach is warranted. Left-turn and through V/C ratios for this case are calculated as follows:

$$V/C\ (Left) = \frac{\text{Left-Turn Volume}}{\text{Left Approach Capacity (including shared lane)}}.$$

$$V/C\ (Through) = \frac{\text{Through Volume}}{\text{Through Approach Capacity (excluding shared lane)}}.$$

Similarly, if ALV (Through) is greater than ALV then full dedication to the through approach is warranted, and left-turn and through V/C ratios are calculated as follows:

$$V/C\ (Left) = \frac{\text{Left-Turn Volume}}{\text{Left Approach Capacity (excluding shared lane)}}.$$

$$V/C\ (Through) = \frac{\text{Through Volume}}{\text{Through Approach Capacity (including shared lane)}}.$$

4. Lane Dedication is not Warranted

If ALV (Left) and ALV (Through) are both less than ALV, the left/through lane is assumed to be truly shared and each left, left/through or through approach lane carries an evenly distributed volume of traffic equal to ALV. A combined left/through V/C ratio is calculated as follows:

$$\text{V/C (Left/Through)} = \frac{\text{Left-Turn Volume + Through Volume}}{\text{Total Left + Through Approach Capacity (including shared lane)}}.$$

This V/C (Left/Through) ratio is assigned as the V/C (Through) ratio for the critical movement analysis and ICU summary listing.

If split phasing has not been designated for this approach, the relative proportion of V/C (Through) that is attributed to the left-turn volume is estimated as follows:

If approach has more than one left-turn (including shared lane), then:

$$\text{V/C (Left)} = \text{V/C (Through)}$$

If approach has only one left-turn lane (shared lane), then:

$$\text{V/C (Left)} = \frac{\text{Left-Turn Volume}}{\text{Single Approach Lane Capacity}}.$$

If this left-turn movement is determined to be a critical movement, the V/C (Left) value is posted in brackets on the ICU summary printout.

These same steps are carried out for shared through/right lanes. If full dedication of a shared through/right lane to the right-turn movement is warranted, the right-turn V/C value calculated in step three is checked against the RTOR and RTOG capacity availability if the option to include right-turns in the V/C ratio calculations is selected. If the V/C value that is determined using the shared lane methodology described here is reduced due to RTOR and RTOG capacity availability, the V/C value for the through/right lanes is posted in brackets.

When an approach contains more than one shared lane (e.g., left/through and through/right), steps one and two listed above are carried out for the three turn movements combined. Step four is carried out if dedication is not warranted for either of the shared lanes. If dedication of one of the shared lanes is warranted to one movement or another, step three is carried out for the two movements involved, and then steps one through four are repeated for the two movements involved in the other shared lane.

**7. I-5 SB Ramps & SR-126**

**Existing Count**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 2 | 3500 | 219 | .06* | 80 | .02* |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 2 | 3500 | 153 | .04 | 185 | .05 |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 4 | 7000 | 281 | .04 | 532 | .08 |
| EBR | f | | 617 | | 1260 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 3 | 5250 | 1343 | .26* | 848 | .16* |
| WBR | f | | 10 | | 196 | |
| Right Turn Adjustment | | | | | SBR | .03* |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.42** | | **.31** |

**SCVCTM 4.1 2011 with Stage 1 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 2 | 3500 | 1020 | .29* | 780 | .22* |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 2 | 3500 | 400 | .11 | 220 | .06 |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 4 | 7000 | 640 | .09 | 1780 | .25 |
| EBR | f | | 1130 | | 1380 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 4 | 7000 | 2800 | .40* | 1870 | .27* |
| WBR | f | | 20 | | 80 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.79** | | **.59** |

**SCVCTM 4.1 2012 with Stage 2 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 2 | 3500 | 1010 | .29* | 930 | .27* |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 2 | 3500 | 440 | .13 | 260 | .07 |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 4 | 7000 | 700 | .10 | 1950 | .28* |
| EBR | f | | 1060 | | 1320 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 4 | 7000 | 2650 | .38* | 1870 | .27 |
| WBR | f | | 20 | | 140 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.77** | | **.65** |

**SCVCTM 4.1 2014 with Stage 3 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 2 | 3500 | 980 | .28* | 930 | .27* |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 2 | 3500 | 430 | .12 | 280 | .08 |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 4 | 7000 | 760 | .11 | 2090 | .30* |
| EBR | f | | 1090 | | 1250 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 4 | 7000 | 2700 | .39* | 1910 | .27 |
| WBR | f | | 10 | | 140 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.77** | | **.67** |

**7. I-5 SB Ramps & SR-126**

**SCVCTM 4.1 2018 with Stage 4 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 2 | 3500 | 980 | .28* | 850 | .24* |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 2 | 3500 | 460 | .13 | 340 | .10 |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 4 | 7000 | 930 | .13 | 2070 | .30* |
| EBR | f | | 1100 | | 1300 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 4 | 7000 | 2570 | .37* | 1860 | .27 |
| WBR | f | | 20 | | 300 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.75** | | **.64** |

**SCVCTM 4.1 2022 with Stage 5 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 2 | 3500 | 950 | .27* | 860 | .25* |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 2 | 3500 | 510 | .15 | 450 | .13 |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 4 | 7000 | 1290 | .18 | 2200 | .31* |
| EBR | f | | 1240 | | 1240 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 4 | 7000 | 2500 | .36* | 2110 | .30 |
| WBR | f | | 20 | | 280 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.73** | | **.66** |

**SCVCTM 4.1 2025 with Stage 6a Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 2 | 3500 | 890 | .25* | 830 | .24* |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 2 | 3500 | 590 | .17 | 510 | .15 |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 4 | 7000 | 1510 | .22 | 2500 | .36* |
| EBR | f | | 1420 | | 1360 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 4 | 7000 | 2750 | .39* | 2480 | .35 |
| WBR | f | | 30 | | 260 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.74** | | **.70** |

**SCVCTM 4.1 2030 with 6b Imp./no Potrero Bridge**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 2 | 3500 | 840 | .24* | 880 | .25* |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 2 | 3500 | 660 | .19 | 530 | .15 |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 4 | 7000 | 1630 | .23 | 2810 | .40* |
| EBR | f | | 1550 | | 1420 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 4 | 7000 | 3010 | .43* | 2700 | .39 |
| WBR | f | | 30 | | 260 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.77** | | **.75** |

**8. I-5 NB Ramps & SR-126**

**Existing Count**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 3 | 5250 | 1061 | .20* | 638 | .12* |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 1 | 1750 | 231 | .13 | 50 | .03 |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 4 | 7000 | 425 | .06 | 514 | .07* |
| EBR | f | | 73 | | 189 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 3 | 5250 | 363 | .07* | 311 | .06 |
| WBR | f | | 145 | | 334 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.37** | | **.29** |

**SCVCTM 4.1 2011 with Stage 1 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 3 | 5250 | 1240 | .24* | 1210 | .23* |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 1 | 1750 | 30 | .02 | 20 | .01 |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 4 | 7000 | 1290 | .18 | 1880 | .27* |
| EBR | f | | 150 | | 470 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 3 | 5250 | 1590 | .30* | 720 | .14 |
| WBR | f | | 290 | | 670 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.64** | | **.60** |

**SCVCTM 4.1 2012 with Stage 2 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 3 | 5250 | 960 | .18* | 1150 | .22* |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 1 | 1750 | 60 | .03 | 10 | .01 |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 4 | 7000 | 1340 | .19 | 2120 | .30* |
| EBR | f | | 170 | | 510 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 3 | 5250 | 1720 | .33* | 850 | .16 |
| WBR | f | | 320 | | 700 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.61** | | **.62** |

**SCVCTM 4.1 2014 with Stage 3 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 3 | 5250 | 960 | .18* | 1170 | .22* |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 1 | 1750 | 60 | .03 | 10 | .01 |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 4 | 7000 | 1340 | .19 | 2240 | .32* |
| EBR | f | | 190 | | 520 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 3 | 5250 | 1760 | .34* | 860 | .16 |
| WBR | f | | 310 | | 690 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.62** | | **.64** |

**8. I-5 NB Ramps & SR-126**

**SCVCTM 4.1 2018 with Stage 4 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 3 | 5250 | 940 | .18* | 1090 | .21* |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 1 | 1750 | 90 | .05 | 10 | .01 |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 4 | 7000 | 1440 | .21 | 2130 | .30* |
| EBR | f | | 250 | | 560 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 3 | 5250 | 1660 | .32* | 1050 | .20 |
| WBR | f | | 330 | | 700 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.60** | | **.61** |

**SCVCTM 4.1 2022 with Stage 5 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 3 | 5250 | 910 | .17* | 1200 | .23* |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 1 | 1750 | 90 | .05 | 10 | .01 |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 4 | 7000 | 1650 | .24 | 2180 | .31* |
| EBR | f | | 330 | | 640 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 3 | 5250 | 1630 | .31* | 1170 | .22 |
| WBR | f | | 350 | | 700 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.58** | | **.64** |

**SCVCTM 4.1 2025 with Stage 6a Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 3 | 5250 | 1000 | .19* | 1380 | .26* |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 1 | 1750 | 90 | .05 | 10 | .01 |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 4 | 7000 | 1740 | .25 | 2330 | .33* |
| EBR | f | | 400 | | 750 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 3 | 5250 | 1800 | .34* | 1330 | .25 |
| WBR | f | | 360 | | 700 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.63** | | **.69** |

**SCVCTM 4.1 2030 with 6b Imp./no Potrero Bridge**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 3 | 5250 | 1040 | .20* | 1500 | .29* |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 1 | 1750 | 120 | .07 | 20 | .01 |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 4 | 7000 | 1760 | .25 | 2630 | .38* |
| EBR | f | | 450 | | 800 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 3 | 5250 | 2030 | .39* | 1450 | .28 |
| WBR | f | | 370 | | 710 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.69** | | **.77** |

**9. Rye/Old Rd & I-5 SB Ramps**

**Existing Count**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1750 | 43 | .02 | 22 | .01* |
| NBT | 2 | 3500 | 675 | .19* | 425 | .12 |
| NBR | 1 | 1750 | 1013 | .58 | 1325 | .76 |
| SBL | 1 | 1750 | 51 | .03* | 83 | .05 |
| SBT | 2 | 3500 | 598 | .17 | 699 | .20* |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 0 | 0 | 0 | | 0 | |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 1.5 | | 294 | | 164 | |
| WBT | 0 | 3500 | 0 | .08* | 0 | .05* |
| WBR | 0.5 | | 2 | | 2 | |
| Right Turn Adjustment | | | NBR | .33* | NBR | .56* |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.73** | | **.92** |

**SCVCTM 4.1 2011 with Stage 1 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1750 | 30 | .02 | 30 | .02 |
| NBT | 2 | 3500 | 870 | .25* | 840 | .24* |
| NBR | 2 | 3500 | 580 | .17 | 770 | .22 |
| SBL | 2 | 3500 | 140 | .04* | 720 | .21* |
| SBT | 3 | 5250 | 150 | .03 | 650 | .12 |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 0 | 0 | 0 | | 0 | |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 2 | 3500 | 470 | .13* | 260 | .07* |
| WBT | 0 | 0 | 0 | | 0 | |
| WBR | 1 | 1750 | 10 | .01 | 10 | .01 |
| Clearance Interval | | | | .10* | | .10* |
| Note: Assumes Right-Turn Overlap for NBR | | | | | | |
| **TOTAL CAPACITY UTILIZATION** | | | | **.52** | | **.62** |

**SCVCTM 4.1 2012 with Stage 2 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1750 | 30 | .02 | 30 | .02 |
| NBT | 2 | 3500 | 620 | .18* | 690 | .20* |
| NBR | 2 | 3500 | 650 | .19 | 650 | .19 |
| SBL | 2 | 3500 | 130 | .04* | 710 | .20* |
| SBT | 3 | 5250 | 120 | .02 | 500 | .10 |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 0 | 0 | 0 | | 0 | |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 2 | 3500 | 400 | .11* | 90 | .03* |
| WBT | 0 | 0 | 0 | | 0 | |
| WBR | 1 | 1750 | 10 | .01 | 10 | .01 |
| Clearance Interval | | | | .10* | | .10* |
| Note: Assumes Right-Turn Overlap for NBR | | | | | | |
| **TOTAL CAPACITY UTILIZATION** | | | | **.43** | | **.53** |

**SCVCTM 4.1 2014 with Stage 3 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1750 | 30 | .02 | 30 | .02 |
| NBT | 2 | 3500 | 680 | .19* | 680 | .19* |
| NBR | 2 | 3500 | 700 | .20 | 740 | .21 |
| SBL | 2 | 3500 | 120 | .03* | 730 | .21* |
| SBT | 3 | 5250 | 110 | .02 | 550 | .10 |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 0 | 0 | 0 | | 0 | |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 2 | 3500 | 400 | .11* | 140 | .04* |
| WBT | 0 | 0 | 0 | | 0 | |
| WBR | 1 | 1750 | 10 | .01 | 10 | .01 |
| Clearance Interval | | | | .10* | | .10* |
| Note: Assumes Right-Turn Overlap for NBR | | | | | | |
| **TOTAL CAPACITY UTILIZATION** | | | | **.43** | | **.54** |

**9. Rye/Old Rd & I-5 SB Ramps**

**SCVCTM 4.1 2018 with Stage 4 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1750 | 30 | .02 | 30 | .02 |
| NBT | 2 | 3500 | 760 | .22* | 740 | .21* |
| NBR | 2 | 3500 | 830 | .24 | 1050 | .30 |
| SBL | 2 | 3500 | 180 | .05* | 880 | .25* |
| SBT | 3 | 5250 | 170 | .03 | 440 | .08 |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 0 | 0 | 0 | | 0 | |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 2 | 3500 | 360 | .10* | 160 | .05* |
| WBT | 0 | 0 | 0 | | 0 | |
| WBR | 1 | 1750 | 10 | .01 | 10 | .01 |
| Right Turn Adjustment | | | | | NBR | .04* |
| Clearance Interval | | | | .10* | | .10* |

Note: Assumes Right-Turn Overlap for NBR

**TOTAL CAPACITY UTILIZATION** **.47** **.65**

**SCVCTM 4.1 2022 with Stage 5 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1750 | 30 | .02 | 30 | .02 |
| NBT | 2 | 3500 | 800 | .23* | 900 | .26* |
| NBR | 2 | 3500 | 840 | .24 | 1000 | .29 |
| SBL | 2 | 3500 | 210 | .06* | 900 | .26* |
| SBT | 3 | 5250 | 200 | .04 | 510 | .10 |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 0 | 0 | 0 | | 0 | |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 2 | 3500 | 360 | .10* | 210 | .06* |
| WBT | 0 | 0 | 0 | | 0 | |
| WBR | 1 | 1750 | 10 | .01 | 10 | .01 |
| Clearance Interval | | | | .10* | | .10* |

Note: Assumes Right-Turn Overlap for NBR

**TOTAL CAPACITY UTILIZATION** **.49** **.68**

**SCVCTM 4.1 2025 with Stage 6a Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1750 | 30 | .02 | 30 | .02 |
| NBT | 2 | 3500 | 870 | .25* | 1010 | .29* |
| NBR | 2 | 3500 | 790 | .23 | 1030 | .29 |
| SBL | 2 | 3500 | 230 | .07* | 950 | .27* |
| SBT | 3 | 5250 | 250 | .05 | 580 | .11 |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 0 | 0 | 0 | | 0 | |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 2 | 3500 | 420 | .12* | 290 | .08* |
| WBT | 0 | 0 | 0 | | 0 | |
| WBR | 1 | 1750 | 10 | .01 | 10 | .01 |
| Clearance Interval | | | | .10* | | .10* |

Note: Assumes Right-Turn Overlap for NBR

**TOTAL CAPACITY UTILIZATION** **.54** **.74**

**SCVCTM 4.1 2030 with 6b Imp./no Potrero Bridge**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1750 | 30 | .02 | 30 | .02 |
| NBT | 2 | 3500 | 1030 | .29* | 1130 | .32* |
| NBR | 2 | 3500 | 730 | .21 | 1050 | .30 |
| SBL | 2 | 3500 | 280 | .08* | 1030 | .29* |
| SBT | 3 | 5250 | 310 | .06 | 660 | .13 |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 0 | 0 | 0 | | 0 | |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 2 | 3500 | 470 | .13* | 390 | .11* |
| WBT | 0 | 0 | 0 | | 0 | |
| WBR | 1 | 1750 | 10 | .01 | 20 | .01 |
| Clearance Interval | | | | .10* | | .10* |

Note: Assumes Right-Turn Overlap for NBR

**TOTAL CAPACITY UTILIZATION** **.60** **.82**

**10. I-5 SB Ramps & Magic Mtn**

**Existing Count**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 1.5 | | 432 | | 358 | |
| SBT | 0.5 | 3500 | 0 | .12* | 0 | .10* |
| SBR | 1 | 1750 | 32 | .02 | 57 | .03 |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 2 | 3500 | 291 | .08* | 439 | .13* |
| EBR | f | | 104 | | 251 | |
| WBL | 1 | 1750 | 498 | .28* | 454 | .26* |
| WBT | 3 | 5250 | 1442 | .27 | 1267 | .24 |
| WBR | 0 | 0 | 0 | | 0 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.58** | | **.59** |

**SCVCTM 4.1 2011 with Stage 1 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 2 | 3500 | 640 | .18* | 1260 | .36* |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 2 | 3500 | 60 | .02 | 40 | .01 |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 3 | 5250 | 370 | .07 | 980 | .19 |
| EBR | 2 | 3500 | 680 | .19 | 810 | .23 |
| WBL | 2 | 3500 | 60 | .02 | 30 | .01 |
| WBT | 4 | 7000 | 1870 | .27* | 1560 | .22* |
| WBR | 0 | 0 | 0 | | 0 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.55** | | **.68** |

**SCVCTM 4.1 2012 with Stage 2 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 2 | 3500 | 640 | .18* | 1160 | .33* |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 2 | 3500 | 60 | .02 | 50 | .01 |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 3 | 5250 | 410 | .08 | 930 | .18 |
| EBR | 2 | 3500 | 670 | .19 | 780 | .22 |
| WBL | 2 | 3500 | 60 | .02 | 30 | .01 |
| WBT | 4 | 7000 | 2080 | .30* | 1600 | .23* |
| WBR | 0 | 0 | 0 | | 0 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.58** | | **.66** |

**SCVCTM 4.1 2014 with Stage 3 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 2 | 3500 | 640 | .18* | 1120 | .32* |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 2 | 3500 | 60 | .02 | 50 | .01 |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 3 | 5250 | 570 | .11 | 1060 | .20 |
| EBR | 2 | 3500 | 850 | .24 | 820 | .23 |
| WBL | 2 | 3500 | 60 | .02 | 30 | .01 |
| WBT | 4 | 7000 | 2160 | .31* | 1810 | .26* |
| WBR | 0 | 0 | 0 | | 0 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.59** | | **.68** |

**10. I-5 SB Ramps & Magic Mtn**

**SCVCTM 4.1 2018 with Stage 4 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 2 | 3500 | 680 | .19* | 1250 | .36* |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 2 | 3500 | 100 | .03 | 60 | .02 |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 3 | 5250 | 950 | .18 | 1200 | .23 |
| EBR | 2 | 3500 | 1120 | .32 | 1070 | .31 |
| WBL | 2 | 3500 | 50 | .01 | 40 | .01 |
| WBT | 4 | 7000 | 2180 | .31* | 2460 | .35* |
| WBR | 0 | 0 | 0 | | 0 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.60** | | **.81** |

**SCVCTM 4.1 2022 with Stage 5 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 2 | 3500 | 750 | .21* | 1240 | .35* |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 2 | 3500 | 100 | .03 | 80 | .02 |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 3 | 5250 | 1100 | .21 | 1350 | .26 |
| EBR | 2 | 3500 | 1200 | .34 | 1100 | .31 |
| WBL | 2 | 3500 | 40 | .01 | 30 | .01 |
| WBT | 4 | 7000 | 2250 | .32* | 2720 | .39* |
| WBR | 0 | 0 | 0 | | 0 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.63** | | **.84** |

**SCVCTM 4.1 2025 with Stage 6a Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 2 | 3500 | 820 | .23* | 1270 | .36* |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 2 | 3500 | 90 | .03 | 80 | .02 |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 3 | 5250 | 1160 | .22 | 1480 | .28 |
| EBR | 2 | 3500 | 1230 | .35 | 1160 | .33 |
| WBL | 2 | 3500 | 30 | .01 | 30 | .01 |
| WBT | 4 | 7000 | 2420 | .35* | 2830 | .40* |
| WBR | 0 | 0 | 0 | | 0 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.68** | | **.86** |

**SCVCTM 4.1 2030 with 6b Imp./no Potrero Bridge**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 2.5 | | 920 | .18* | 1320 | .25* |
| SBT | 0 | 7000 | 0 | | 0 | |
| SBR | 1.5 | | 60 | .03 | 80 | .05 |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 3 | 5250 | 1220 | .23 | 1620 | .31 |
| EBR | 2 | 3500 | 1270 | .36 | 1200 | .34 |
| WBL | 2 | 3500 | 20 | .01 | 20 | .01 |
| WBT | 4 | 7000 | 2530 | .36* | 2950 | .42* |
| WBR | 0 | 0 | 0 | | 0 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.64** | | **.77** |

**11. I-5 NB Ramps & Magic Mtn**

**Existing Count**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1.5 | | 1147 | {.33}* | 1181 | {.34}* |
| NBT | 0.5 | 3500 | 2 | .33 | 7 | .34 |
| NBR | 1 | 1750 | 363 | .21 | 695 | .40 |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 1 | 1750 | 21 | .01 | 39 | .02 |
| EBT | 2 | 3500 | 703 | .20* | 698 | .20* |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 4 | 7000 | 793 | .11 | 578 | .08 |
| WBR | f | | 279 | | 413 | |
| Right Turn Adjustment | | | | | NBR | .06* |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.63** | | **.70** |

**SCVCTM 4.1 2011 with Stage 1 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 2.5 | | 1220 | .23* | 960 | .18* |
| NBT | 0 | 7000 | 0 | | 0 | |
| NBR | 1.5 | | 100 | .06 | 280 | .16 |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 2 | 3500 | 60 | .02 | 260 | .07 |
| EBT | 3 | 5250 | 950 | .18* | 1990 | .38* |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 3.5 | 8750 | 710 | .14 | 630 | .12 |
| WBR | 1.5 | | 940 | .27 | 800 | .23 |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.51** | | **.66** |

**SCVCTM 4.1 2012 with Stage 2 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 2.5 | | 1260 | .24* | 980 | .19* |
| NBT | 0 | 7000 | 0 | | 0 | |
| NBR | 1.5 | | 100 | .06 | 280 | .16 |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 2 | 3500 | 50 | .01 | 140 | .04 |
| EBT | 3 | 5250 | 1000 | .19* | 1950 | .37* |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 3.5 | 8750 | 880 | {.14} | 650 | .12 |
| WBR | 1.5 | | 670 | | 760 | .22 |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.53** | | **.66** |

**SCVCTM 4.1 2014 with Stage 3 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 2.5 | | 1270 | .24* | 1030 | .20* |
| NBT | 0 | 7000 | 0 | | 0 | |
| NBR | 1.5 | | 100 | .06 | 270 | .15 |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 2 | 3500 | 60 | .02 | 140 | .04 |
| EBT | 3 | 5250 | 1150 | .22* | 2030 | .39* |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 3.5 | 8750 | 930 | {.15} | 810 | .15 |
| WBR | 1.5 | | 690 | | 750 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.56** | | **.69** |

**11. I-5 NB Ramps & Magic Mtn**

**SCVCTM 4.1 2018 with Stage 4 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 2.5 | | 1350 | .26* | 1340 | .26* |
| NBT | 0 | 7000 | 0 | | 0 | |
| NBR | 1.5 | | 90 | .05 | 110 | .06 |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 2 | 3500 | 90 | .03 | 180 | .05 |
| EBT | 3 | 5250 | 1540 | .29* | 2270 | .43* |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 3.5 | 8750 | 870 | {.15} | 1160 | {.18} |
| WBR | 1.5 | | 770 | | 740 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.65** | | **.79** |

**SCVCTM 4.1 2022 with Stage 5 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 2.5 | | 1350 | .26* | 1370 | .26* |
| NBT | 0 | 7000 | 0 | | 0 | |
| NBR | 1.5 | | 100 | .06 | 100 | .06 |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 2 | 3500 | 100 | .03 | 200 | .06 |
| EBT | 3 | 5250 | 1750 | .33* | 2390 | .46* |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 3.5 | 8750 | 940 | {.17} | 1380 | {.21} |
| WBR | 1.5 | | 880 | | 780 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.69** | | **.82** |

**SCVCTM 4.1 2025 with Stage 6a Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 2.5 | | 1370 | .26* | 1390 | .26* |
| NBT | 0 | 7000 | 0 | | 0 | |
| NBR | 1.5 | | 90 | .05 | 90 | .05 |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 2 | 3500 | 100 | .03 | 230 | .07 |
| EBT | 3 | 5250 | 1870 | .36* | 2520 | .48* |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 3.5 | 8750 | 1090 | {.18} | 1470 | {.23} |
| WBR | 1.5 | | 860 | | 850 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.72** | | **.84** |

**SCVCTM 4.1 2030 with 6b Imp./no Potrero Bridge**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 2.5 | | 1400 | .27* | 1410 | .27* |
| NBT | 0 | 7000 | 0 | | 0 | |
| NBR | 1.5 | | 90 | .05 | 80 | .05 |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 2 | 3500 | 130 | .04 | 280 | .08 |
| EBT | 3 | 5250 | 2020 | .38* | 2650 | .50* |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 3.5 | 8750 | 1150 | {.19} | 1560 | {.24} |
| WBR | 1.5 | | 900 | | 870 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.75** | | **.87** |

**12. I-5 SB Ramps & Valencia**

**Existing Count**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 2 | 3500 | 209 | .06* | 236 | .07* |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 1 | 1750 | 262 | .15 | 54 | .03 |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 3 | 5250 | 586 | .11 | 498 | .09 |
| EBR | f | | 407 | | 127 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 2 | 3500 | 760 | .22* | 878 | .25* |
| WBR | f | | 844 | | 1029 | |
| Right Turn Adjustment | | | SBR | .09* | | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.47** | | **.42** |

**SCVCTM 4.1 2011 with Stage 1 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 2 | 3500 | 330 | .09* | 380 | .11* |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 1 | 1750 | 260 | .15 | 380 | .22 |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 3 | 5250 | 470 | .09 | 670 | .13 |
| EBR | f | | 440 | | 390 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 2 | 3500 | 1070 | .31* | 1190 | .34* |
| WBR | f | | 1510 | | 1010 | |
| Right Turn Adjustment | | | SBR | .06* | SBR | .11* |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.56** | | **.66** |

**SCVCTM 4.1 2012 with Stage 2 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 2 | 3500 | 350 | .10* | 350 | .10* |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 1 | 1750 | 210 | .12 | 330 | .19 |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 3 | 5250 | 440 | .08 | 650 | .12 |
| EBR | f | | 450 | | 400 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 2 | 3500 | 1120 | .32* | 1250 | .36* |
| WBR | f | | 1380 | | 1000 | |
| Right Turn Adjustment | | | SBR | .02* | SBR | .09* |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.54** | | **.65** |

**SCVCTM 4.1 2014 with Stage 3 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 2 | 3500 | 360 | .10* | 380 | .11* |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 1 | 1750 | 210 | .12 | 370 | .21 |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 3 | 5250 | 510 | .10 | 710 | .14 |
| EBR | f | | 470 | | 350 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 2 | 3500 | 1120 | .32* | 1440 | .41* |
| WBR | f | | 1360 | | 950 | |
| Right Turn Adjustment | | | SBR | .02* | SBR | .10* |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.54** | | **.72** |

**12. I-5 SB Ramps & Valencia**

**SCVCTM 4.1 2018 with Stage 4 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 2 | 3500 | 370 | .11* | 420 | .12* |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 1 | 1750 | 270 | .15 | 410 | .23 |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 3 | 5250 | 820 | .16 | 790 | .15 |
| EBR | f | | 690 | | 570 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 2 | 3500 | 1360 | .39* | 1850 | .53* |
| WBR | f | | 1180 | | 990 | |
| Right Turn Adjustment | | | SBR | .04* | SBR | .11* |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.64** | | **.86** |

**SCVCTM 4.1 2022 with Stage 5 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 2 | 3500 | 350 | .10* | 390 | .11* |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 1 | 1750 | 320 | .18 | 470 | .27 |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 3 | 5250 | 1080 | .21 | 1080 | .21 |
| EBR | f | | 920 | | 740 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 3 | 5250 | 1580 | .30* | 2140 | .41* |
| WBR | f | | 1170 | | 920 | |
| Right Turn Adjustment | | | SBR | .08* | SBR | .16* |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.58** | | **.78** |

**SCVCTM 4.1 2025 with Stage 6a Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 2 | 3500 | 370 | .11* | 440 | .13* |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 1 | 1750 | 320 | .18 | 550 | .31 |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 3 | 5250 | 1110 | .21 | 1240 | .24 |
| EBR | f | | 970 | | 790 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 3 | 5250 | 1620 | .31* | 2220 | .42* |
| WBR | f | | 1140 | | 870 | |
| Right Turn Adjustment | | | SBR | .07* | SBR | .18* |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.59** | | **.83** |

**SCVCTM 4.1 2030 with 6b Imp./no Potrero Bridge**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 2 | 3500 | 350 | .10* | 450 | .13* |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 1 | 1750 | 340 | .19 | 570 | .33 |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 3 | 5250 | 1190 | .23 | 1390 | .26 |
| EBR | f | | 910 | | 510 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 3 | 5250 | 1650 | .31* | 2280 | .43* |
| WBR | f | | 1190 | | 890 | |
| Right Turn Adjustment | | | SBR | .09* | SBR | .20* |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.60** | | **.86** |

**13. I-5 NB Ramps & Valencia**

**Existing Count**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 2 | 3500 | 291 | .08* | 273 | .08* |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 2 | 3500 | 945 | .27 | 876 | .25 |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 3 | 5250 | 697 | .16 | 668 | .14 |
| EBR | 0 | 0 | 157 | | 79 | |
| WBL | 2 | 3500 | 80 | .02 | 147 | .04 |
| WBT | 4 | 7000 | 1266 | .18* | 1645 | .24* |
| WBR | 0 | 0 | 0 | | 0 | |
| Right Turn Adjustment | | | NBR | .17* | NBR | .09* |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.53** | | **.51** |

**SCVCTM 4.1 2011 with Stage 1 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 2 | 3500 | 480 | .14* | 210 | .06* |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 2 | 3500 | 970 | .28 | 1170 | .33 |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 3 | 5250 | 700 | .15 | 860 | .20 |
| EBR | 0 | 0 | 100 | | 190 | |
| WBL | 2 | 3500 | 280 | .08 | 290 | .08 |
| WBT | 4 | 7000 | 2130 | .30* | 2010 | .29* |
| WBR | 0 | 0 | 0 | | 0 | |
| Right Turn Adjustment | | | NBR | .03* | NBR | .20* |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.57** | | **.65** |

**SCVCTM 4.1 2012 with Stage 2 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 2 | 3500 | 510 | .15* | 230 | .07* |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 2 | 3500 | 970 | .28 | 1170 | .33 |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 3 | 5250 | 720 | .15 | 830 | .19 |
| EBR | 0 | 0 | 70 | | 180 | |
| WBL | 2 | 3500 | 270 | .08 | 290 | .08 |
| WBT | 4 | 7000 | 2010 | .29* | 2030 | .29* |
| WBR | 0 | 0 | 0 | | 0 | |
| Right Turn Adjustment | | | NBR | .02* | NBR | .18* |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.56** | | **.64** |

**SCVCTM 4.1 2014 with Stage 3 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 2 | 3500 | 510 | .15* | 300 | .09* |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 2 | 3500 | 970 | .28 | 1140 | .33 |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 3 | 5250 | 810 | .17 | 910 | .21 |
| EBR | 0 | 0 | 70 | | 190 | |
| WBL | 2 | 3500 | 270 | .08 | 280 | .08 |
| WBT | 4 | 7000 | 2020 | .29* | 2110 | .30* |
| WBR | 0 | 0 | 0 | | 0 | |
| Right Turn Adjustment | | | NBR | .04* | NBR | .17* |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.58** | | **.66** |

**13. I-5 NB Ramps & Valencia**

**SCVCTM 4.1 2018 with Stage 4 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 2 | 3500 | 610 | .17* | 470 | .13* |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 2 | 3500 | 1030 | .29 | 1100 | .31 |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 3 | 5250 | 1120 | .23* | 1060 | .23 |
| EBR | 0 | 0 | 100 | | 160 | |
| WBL | 2 | 3500 | 270 | .08* | 270 | .08 |
| WBT | 4 | 7000 | 1990 | .28 | 2380 | .34* |
| WBR | 0 | 0 | 0 | | 0 | |
| Right Turn Adjustment | | | NBR | .06* | NBR | .10* |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.64** | | **.67** |

**SCVCTM 4.1 2022 with Stage 5 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 2 | 3500 | 710 | .20* | 460 | .13* |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 2 | 3500 | 1010 | .29 | 980 | .28 |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 3 | 5250 | 1360 | .28* | 1320 | .29 |
| EBR | 0 | 0 | 110 | | 180 | |
| WBL | 2 | 3500 | 290 | .08* | 270 | .08 |
| WBT | 4 | 7000 | 2120 | .30 | 2620 | .37* |
| WBR | 0 | 0 | 0 | | 0 | |
| Right Turn Adjustment | | | NBR | .03* | NBR | .09* |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.69** | | **.69** |

**SCVCTM 4.1 2025 with Stage 6a Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 2 | 3500 | 700 | .20* | 480 | .14* |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 2 | 3500 | 1020 | .29 | 920 | .26 |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 3 | 5250 | 1430 | .29* | 1510 | .33* |
| EBR | 0 | 0 | 110 | | 200 | |
| WBL | 2 | 3500 | 310 | .09* | 270 | .08* |
| WBT | 4 | 7000 | 2160 | .31 | 2650 | .38 |
| WBR | 0 | 0 | 0 | | 0 | |
| Right Turn Adjustment | | | NBR | .02* | NBR | .06* |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.70** | | **.71** |

**SCVCTM 4.1 2030 with 6b Imp./no Potrero Bridge**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 2 | 3500 | 670 | .19* | 480 | .14* |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 2 | 3500 | 1050 | .30 | 880 | .25 |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 3 | 5250 | 1460 | .30* | 1660 | .36* |
| EBR | 0 | 0 | 120 | | 230 | |
| WBL | 2 | 3500 | 440 | .13* | 300 | .09* |
| WBT | 4 | 7000 | 2260 | .32 | 2740 | .39 |
| WBR | 0 | 0 | 0 | | 0 | |
| Right Turn Adjustment | | | NBR | .01* | NBR | .04* |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.73** | | **.73** |

**14. I-5 SB Ramps & McBean**

**Existing Count**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 1 | 1750 | 144 | .08* | 406 | .23* |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 1 | 1750 | 57 | .03 | 451 | .26 |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 2 | 3500 | 627 | .18 | 950 | .27 |
| EBR | 1 | 1750 | 374 | .21 | 93 | .05 |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 2 | 3500 | 1326 | .38* | 1043 | .30* |
| WBR | 1 | 1750 | 215 | .12 | 480 | .27 |
| Right Turn Adjustment | | | | | SBR | .03* |
| Clearance Interval | | | | .10* | | .10* |

Note: Assumes Right-Turn Overlap for WBR

**TOTAL CAPACITY UTILIZATION** **.56** **.66**

**SCVCTM 4.1 2011 with Stage 1 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 1 | 1750 | 210 | .12* | 350 | .20* |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 1 | 1750 | 290 | .17 | 320 | .18 |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 2 | 3500 | 1140 | .33* | 1360 | .39 |
| EBR | 1 | 1750 | 370 | .21 | 250 | .14 |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 2 | 3500 | 530 | .15 | 1430 | .41* |
| WBR | 1 | 1750 | 450 | .26 | 300 | .17 |
| Clearance Interval | | | | .10* | | .10* |

Note: Assumes Right-Turn Overlap for WBR

**TOTAL CAPACITY UTILIZATION** **.55** **.71**

**SCVCTM 4.1 2012 with Stage 2 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 1 | 1750 | 230 | .13* | 330 | .19* |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 1 | 1750 | 290 | .17 | 300 | .17 |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 2 | 3500 | 1020 | .29* | 1370 | .39 |
| EBR | 1 | 1750 | 380 | .22 | 350 | .20 |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 2 | 3500 | 580 | .17 | 1450 | .41* |
| WBR | 1 | 1750 | 450 | .26 | 310 | .18 |
| Clearance Interval | | | | .10* | | .10* |

Note: Assumes Right-Turn Overlap for WBR

**TOTAL CAPACITY UTILIZATION** **.52** **.70**

**SCVCTM 4.1 2014 with Stage 3 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 1 | 1750 | 240 | .14* | 350 | .20* |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 1 | 1750 | 280 | .16 | 210 | .12 |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 2 | 3500 | 1010 | .29* | 1350 | .39 |
| EBR | 1 | 1750 | 380 | .22 | 370 | .21 |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 2 | 3500 | 600 | .17 | 1440 | .41* |
| WBR | 1 | 1750 | 450 | .26 | 340 | .19 |
| Clearance Interval | | | | .10* | | .10* |

Note: Assumes Right-Turn Overlap for WBR

**TOTAL CAPACITY UTILIZATION** **.53** **.71**

**14. I-5 SB Ramps & McBean**

**SCVCTM 4.1 2018 with Stage 4 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 1 | 1750 | 290 | .17* | 460 | .26* |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 1 | 1750 | 310 | .18 | 390 | .22 |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 2 | 3500 | 1060 | .30* | 1340 | .38 |
| EBR | 1 | 1750 | 390 | .22 | 160 | .09 |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 2 | 3500 | 580 | .17 | 1550 | .44* |
| WBR | 1 | 1750 | 440 | .25 | 310 | .18 |
| Clearance Interval | | | | .10* | | .10* |

Note: Assumes Right-Turn Overlap for WBR

**TOTAL CAPACITY UTILIZATION** **.57** **.80**

**SCVCTM 4.1 2022 with Stage 5 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 1 | 1750 | 330 | .19* | 450 | .26* |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 1 | 1750 | 270 | .15 | 360 | .21 |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 2 | 3500 | 1080 | .31* | 1360 | .39 |
| EBR | 1 | 1750 | 380 | .22 | 190 | .11 |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 2 | 3500 | 670 | .19 | 1730 | .49* |
| WBR | 1 | 1750 | 450 | .26 | 320 | .18 |
| Clearance Interval | | | | .10* | | .10* |

Note: Assumes Right-Turn Overlap for WBR

**TOTAL CAPACITY UTILIZATION** **.60** **.85**

**SCVCTM 4.1 2025 with Stage 6a Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 2 | 3500 | 380 | .11* | 550 | .16* |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 1 | 1750 | 260 | .15 | 340 | .19 |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 2 | 3500 | 1070 | .31* | 1310 | .37 |
| EBR | 1 | 1750 | 370 | .21 | 180 | .10 |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 2 | 3500 | 710 | .20 | 1790 | .51* |
| WBR | 1 | 1750 | 440 | .25 | 310 | .18 |
| Right Turn Adjustment | | | | | SBR | .03* |
| Clearance Interval | | | | .10* | | .10* |

Note: Assumes Right-Turn Overlap for WBR

**TOTAL CAPACITY UTILIZATION** **.52** **.80**

**SCVCTM 4.1 2030 with 6b Imp./no Potrero Bridge**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 2 | 3500 | 420 | .12* | 540 | .15* |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 1 | 1750 | 250 | .14 | 340 | .19 |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 2 | 3500 | 1060 | .30* | 1340 | .38 |
| EBR | 1 | 1750 | 360 | .21 | 270 | .15 |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 2 | 3500 | 800 | .23 | 1810 | .52* |
| WBR | 1 | 1750 | 430 | .25 | 320 | .18 |
| Right Turn Adjustment | | | | | SBR | .04* |
| Clearance Interval | | | | .10* | | .10* |

Note: Assumes Right-Turn Overlap for WBR

**TOTAL CAPACITY UTILIZATION** **.52** **.81**

**15. I-5 NB Ramps & McBean**

**Existing Count**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 2 | 3500 | 135 | .04* | 338 | .10* |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 2 | 3500 | 284 | .08 | 742 | .21 |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 2 | 3500 | 633 | .18 | 1213 | .35* |
| EBR | 1 | 1750 | 133 | .08 | 142 | .08 |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 3 | 5250 | 1406 | .27* | 1185 | .23 |
| WBR | 1 | 1750 | 101 | .06 | 122 | .07 |
| Right Turn Adjustment | | | | | NBR | .11* |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.41** | | **.66** |

**SCVCTM 4.1 2011 with Stage 1 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 2 | 3500 | 90 | .03* | 410 | .12* |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 2 | 3500 | 520 | .15 | 710 | .20 |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 2 | 3500 | 990 | .28* | 1430 | .41* |
| EBR | 1 | 1750 | 370 | .21 | 280 | .16 |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 3 | 5250 | 890 | .17 | 1290 | .25 |
| WBR | 1 | 1750 | 120 | .07 | 170 | .10 |
| Right Turn Adjustment | | | NBR | .12* | NBR | .08* |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.53** | | **.71** |

**SCVCTM 4.1 2012 with Stage 2 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 2 | 3500 | 110 | .03* | 430 | .12* |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 2 | 3500 | 540 | .15 | 640 | .18 |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 2 | 3500 | 1000 | .29* | 1420 | .41* |
| EBR | 1 | 1750 | 270 | .15 | 280 | .16 |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 3 | 5250 | 930 | .18 | 1300 | .25 |
| WBR | 1 | 1750 | 110 | .06 | 170 | .10 |
| Right Turn Adjustment | | | NBR | .12* | NBR | .06* |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.54** | | **.69** |

**SCVCTM 4.1 2014 with Stage 3 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 2 | 3500 | 110 | .03* | 420 | .12* |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 2 | 3500 | 520 | .15 | 670 | .19 |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 2 | 3500 | 1020 | .29* | 1450 | .41* |
| EBR | 1 | 1750 | 250 | .14 | 260 | .15 |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 3 | 5250 | 950 | .18 | 1340 | .26 |
| WBR | 1 | 1750 | 110 | .06 | 170 | .10 |
| Right Turn Adjustment | | | NBR | .12* | NBR | .07* |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.54** | | **.70** |

**15. I-5 NB Ramps & McBean**

**SCVCTM 4.1 2018 with Stage 4 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 2 | 3500 | 100 | .03* | 430 | .12* |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 2 | 3500 | 520 | .15 | 670 | .19 |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 2 | 3500 | 1090 | .31* | 1510 | .43* |
| EBR | 1 | 1750 | 280 | .16 | 290 | .17 |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 3 | 5250 | 930 | .18 | 1390 | .26 |
| WBR | 1 | 1750 | 120 | .07 | 190 | .11 |
| Right Turn Adjustment | | | NBR | .12* | NBR | .07* |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.56** | | **.72** |

**SCVCTM 4.1 2022 with Stage 5 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 2 | 3500 | 120 | .03* | 530 | .15* |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 2 | 3500 | 530 | .15 | 820 | .23 |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 2 | 3500 | 1160 | .33* | 1520 | .43* |
| EBR | 1 | 1750 | 270 | .15 | 290 | .17 |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 3 | 5250 | 1020 | .19 | 1480 | .28 |
| WBR | 1 | 1750 | 130 | .07 | 210 | .12 |
| Right Turn Adjustment | | | NBR | .12* | NBR | .08* |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.58** | | **.76** |

**SCVCTM 4.1 2025 with Stage 6a Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 2 | 3500 | 90 | .03* | 470 | .13* |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 2 | 3500 | 560 | .16 | 890 | .25 |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 2 | 3500 | 1210 | .35* | 1600 | .46* |
| EBR | 1 | 1750 | 250 | .14 | 270 | .15 |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 3 | 5250 | 1080 | .21 | 1600 | .30 |
| WBR | 1 | 1750 | 160 | .09 | 230 | .13 |
| Right Turn Adjustment | | | NBR | .13* | NBR | .12* |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.61** | | **.81** |

**SCVCTM 4.1 2030 with 6b Imp./no Potrero Bridge**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 2 | 3500 | 100 | .03* | 480 | .14* |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 2 | 3500 | 640 | .18 | 970 | .28 |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 2 | 3500 | 1220 | .35* | 1630 | .47* |
| EBR | 1 | 1750 | 250 | .14 | 250 | .14 |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 3 | 5250 | 1150 | .22 | 1610 | .31 |
| WBR | 1 | 1750 | 170 | .10 | 270 | .15 |
| Right Turn Adjustment | | | NBR | .15* | NBR | .14* |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.63** | | **.85** |

**16. I-5 SB Loop & Lyons**

**Existing Count**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 1 | 1750 | 67 | .04 | 68 | .04 |
| SBL | 1.5 | | 332 | | 375 | |
| SBT | 0.5 | 3500 | 136 | .13* | 71 | .13* |
| SBR | 1 | 1750 | 45 | .03 | 118 | .07 |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 2 | 3500 | 895 | .27* | 873 | .27 |
| EBR | 0 | 0 | 56 | | 58 | |
| WBL | 1 | 1750 | 48 | .03* | 53 | .03 |
| WBT | 2 | 3500 | 612 | .17 | 1281 | .37* |
| WBR | 1 | 1750 | 427 | .24 | 282 | .16 |
| Right Turn Adjustment | | | NBR | .02* | | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.55** | | **.60** |

**SCVCTM 4.1 2011 with Stage 1 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 1 | 1750 | 70 | .04 | 70 | .04 |
| SBL | 1.5 | | 460 | | 460 | |
| SBT | 0.5 | 3500 | 10 | .13* | 310 | .22* |
| SBR | 1 | 1750 | 410 | .23 | 10 | .01 |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 2 | 3500 | 530 | .16 | 1150 | .34* |
| EBR | 0 | 0 | 30 | | 50 | |
| WBL | 1 | 1750 | 30 | .02 | 170 | .10* |
| WBT | 2 | 3500 | 800 | .23* | 1180 | .34 |
| WBR | 1 | 1750 | 380 | .22 | 120 | .07 |
| Right Turn Adjustment | | | SBR | .10* | | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.56** | | **.76** |

**SCVCTM 4.1 2012 with Stage 2 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 1 | 1750 | 60 | .03 | 70 | .04 |
| SBL | 1.5 | | 490 | | 410 | |
| SBT | 0.5 | 3500 | 10 | .14* | 280 | .20* |
| SBR | 1 | 1750 | 430 | .25 | 10 | .01 |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 2 | 3500 | 500 | .15 | 1100 | .33* |
| EBR | 0 | 0 | 30 | | 50 | |
| WBL | 1 | 1750 | 30 | .02 | 160 | .09* |
| WBT | 2 | 3500 | 760 | .22* | 1150 | .33 |
| WBR | 1 | 1750 | 280 | .16 | 110 | .06 |
| Right Turn Adjustment | | | SBR | .11* | | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.57** | | **.72** |

**SCVCTM 4.1 2014 with Stage 3 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 1 | 1750 | 60 | .03 | 70 | .04 |
| SBL | 1.5 | | 520 | | 440 | |
| SBT | 0.5 | 3500 | 10 | .15* | 290 | .21* |
| SBR | 1 | 1750 | 430 | .25 | 10 | .01 |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 2 | 3500 | 490 | .15 | 1070 | .32* |
| EBR | 0 | 0 | 30 | | 50 | |
| WBL | 1 | 1750 | 30 | .02 | 140 | .08* |
| WBT | 2 | 3500 | 770 | .22* | 1190 | .34 |
| WBR | 1 | 1750 | 290 | .17 | 100 | .06 |
| Right Turn Adjustment | | | SBR | .10* | | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.57** | | **.71** |

**16. I-5 SB Loop & Lyons**

**SCVCTM 4.1 2018 with Stage 4 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 1 | 1750 | 60 | .03 | 70 | .04 |
| SBL | 1.5 | | 660 | | 560 | |
| SBT | 0.5 | 3500 | 10 | .19* | 330 | .25* |
| SBR | 1 | 1750 | 440 | .25 | 10 | .01 |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 2 | 3500 | 560 | .17 | 1090 | .33* |
| EBR | 0 | 0 | 30 | | 50 | |
| WBL | 1 | 1750 | 30 | .02 | 140 | .08* |
| WBT | 2 | 3500 | 760 | .22* | 1260 | .36 |
| WBR | 1 | 1750 | 260 | .15 | 110 | .06 |
| Right Turn Adjustment | | | SBR | .06* | | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.57** | | **.76** |

**SCVCTM 4.1 2022 with Stage 5 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 1 | 1750 | 60 | .03 | 70 | .04 |
| SBL | 1.5 | | 720 | | 540 | |
| SBT | 0.5 | 3500 | 10 | .21* | 320 | .25* |
| SBR | 1 | 1750 | 430 | .25 | 10 | .01 |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 2 | 3500 | 620 | .19 | 1260 | .37* |
| EBR | 0 | 0 | 30 | | 50 | |
| WBL | 1 | 1750 | 30 | .02 | 150 | .09* |
| WBT | 2 | 3500 | 800 | .23* | 1480 | .42 |
| WBR | 1 | 1750 | 260 | .15 | 110 | .06 |
| Right Turn Adjustment | | | SBR | .04* | | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.58** | | **.81** |

**SCVCTM 4.1 2025 with Stage 6a Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 1 | 1750 | 70 | .04 | 70 | .04 |
| SBL | 1.5 | | 710 | | 580 | |
| SBT | 0.5 | 3500 | 10 | .21* | 300 | .25* |
| SBR | 1 | 1750 | 420 | .24 | 10 | .01 |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 2 | 3500 | 740 | .22* | 1410 | .42* |
| EBR | 0 | 0 | 30 | | 50 | |
| WBL | 1 | 1750 | 30 | .02* | 170 | .10* |
| WBT | 2 | 3500 | 850 | .24 | 1610 | .46 |
| WBR | 1 | 1750 | 250 | .14 | 110 | .06 |
| Right Turn Adjustment | | | Multi | .05* | | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.60** | | **.87** |

**SCVCTM 4.1 2030 with 6b Imp./no Potrero Bridge**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 1 | 1750 | 70 | .04 | 70 | .04 |
| SBL | 1.5 | | 770 | | 610 | |
| SBT | 0.5 | 3500 | 10 | .22* | 310 | .26* |
| SBR | 1 | 1750 | 400 | .23 | 10 | .01 |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 3 | 5250 | 820 | .16 | 1520 | .30 |
| EBR | 0 | 0 | 30 | | 50 | |
| WBL | 1 | 1750 | 30 | .02 | 170 | .10 |
| WBT | 2 | 3500 | 890 | .25* | 1700 | .49* |
| WBR | 1 | 1750 | 250 | .14 | 110 | .06 |
| Right Turn Adjustment | | | SBR | .01* | | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.58** | | **.85** |

**17. I-5 NB Ramps & Lyons**

**Existing Count**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1.5 | | 251 | {.07}* | 685 | {.20}* |
| NBT | 0.5 | 3500 | 1 | .07 | 0 | .20 |
| NBR | f | | 334 | | 645 | |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 1 | 1750 | 158 | .09* | 183 | .10* |
| EBT | 2 | 3500 | 719 | .21 | 1081 | .31 |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 3 | 5250 | 1066 | .27* | 1017 | .28* |
| WBR | 0 | 0 | 326 | | 445 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.53** | | **.68** |

**SCVCTM 4.1 2011 with Stage 1 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1.5 | | 100 | {.03}* | 530 | {.15}* |
| NBT | 0.5 | 3500 | 10 | .03 | 0 | .15 |
| NBR | f | | 170 | | 410 | |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 1 | 1750 | 90 | .05* | 160 | .09 |
| EBT | 2 | 3500 | 950 | .27 | 1590 | .45* |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 3 | 5250 | 1120 | .32* | 930 | .27 |
| WBR | 0 | 0 | 550 | | 720 | .41 |
| Right Turn Adjustment | | | | | WBR | .05* |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.50** | | **.75** |

**SCVCTM 4.1 2012 with Stage 2 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1.5 | | 100 | {.03}* | 540 | {.15}* |
| NBT | 0.5 | 3500 | 10 | .03 | 0 | .15 |
| NBR | f | | 170 | | 350 | |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 1 | 1750 | 80 | .05* | 160 | .09 |
| EBT | 2 | 3500 | 950 | .27 | 1510 | .43* |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 3 | 5250 | 980 | .27* | 880 | .25 |
| WBR | 0 | 0 | 430 | | 730 | .42 |
| Right Turn Adjustment | | | | | WBR | .08* |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.45** | | **.76** |

**SCVCTM 4.1 2014 with Stage 3 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1.5 | | 100 | {.03}* | 530 | {.15}* |
| NBT | 0.5 | 3500 | 10 | .03 | 0 | .15 |
| NBR | f | | 170 | | 340 | |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 1 | 1750 | 70 | .04* | 160 | .09 |
| EBT | 2 | 3500 | 980 | .28 | 1520 | .43* |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 3 | 5250 | 990 | .27* | 880 | .25 |
| WBR | 0 | 0 | 440 | | 750 | .43 |
| Right Turn Adjustment | | | | | WBR | .09* |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.44** | | **.77** |

**17. I-5 NB Ramps & Lyons**

**SCVCTM 4.1 2018 with Stage 4 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1.5 | | 100 | {.03}* | 580 | {.17}* |
| NBT | 0.5 | 3500 | 10 | .03 | 0 | .17 |
| NBR | f | | 170 | | 320 | |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 1 | 1750 | 110 | .06* | 170 | .10 |
| EBT | 2 | 3500 | 1130 | .32 | 1600 | .46* |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 3 | 5250 | 950 | .27* | 910 | .26 |
| WBR | 0 | 0 | 510 | .29 | 870 | .50 |
| Right Turn Adjustment | | | WBR | .02* | WBR | .14* |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.48** | | **.87** |

**SCVCTM 4.1 2022 with Stage 5 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1.5 | | 100 | {.03}* | 660 | {.19}* |
| NBT | 0.5 | 3500 | 10 | .03 | 0 | .19 |
| NBR | f | | 160 | | 340 | |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 1 | 1750 | 110 | .06 | 150 | .09 |
| EBT | 2 | 3500 | 1270 | .36* | 1690 | .48* |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 3 | 5250 | 990 | .28 | 1100 | .31 |
| WBR | 0 | 0 | 500 | .29 | 890 | .51 |
| Right Turn Adjustment | | | | | WBR | .12* |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.49** | | **.89** |

**SCVCTM 4.1 2025 with Stage 6a Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1.5 | | 130 | {.04}* | 790 | {.23}* |
| NBT | 0.5 | 3500 | 10 | .04 | 0 | .23 |
| NBR | f | | 160 | | 340 | |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 1 | 1750 | 110 | .06 | 140 | .08 |
| EBT | 2 | 3500 | 1300 | .37* | 1850 | .53* |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 3 | 5250 | 1010 | .19 | 1140 | .22 |
| WBR | f | | 510 | | 910 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.51** | | **.86** |

**SCVCTM 4.1 2030 with 6b Imp./no Potrero Bridge**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1.5 | | 120 | {.04}* | 760 | {.22}* |
| NBT | 0.5 | 3500 | 10 | .04 | 0 | .22 |
| NBR | f | | 160 | | 370 | |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 1 | 1750 | 110 | .06 | 140 | .08 |
| EBT | 2 | 3500 | 1380 | .39* | 1980 | .57* |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 3 | 5250 | 1090 | .21 | 1270 | .24 |
| WBR | f | | 530 | | 950 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.53** | | **.89** |

**18. I-5 SB Ramps & Calgrove**

**Existing Count**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 0.5 | | 21 | | 91 | |
| SBT | 0.5 | 1750 | 1 | .01* | 3 | .05* |
| SBR | 1 | 1750 | 255 | .15 | 135 | .08 |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 1 | 1750 | 110 | .11* | 657 | .42* |
| EBR | 0 | 0 | 74 | | 70 | |
| WBL | 1 | 1750 | 466 | .27* | 123 | .07* |
| WBT | 1 | 1750 | 350 | .20 | 212 | .12 |
| WBR | 0 | 0 | 0 | | 0 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.49** | | **.64** |

**SCVCTM 4.1 2011 with Stage 1 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 0.5 | | 30 | | 130 | |
| SBT | 0.5 | 1750 | 10 | .02* | 10 | .08* |
| SBR | 1 | 1750 | 270 | .15 | 230 | .13 |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 1 | 1750 | 370 | .33* | 660 | .42* |
| EBR | 0 | 0 | 200 | | 80 | |
| WBL | 1 | 1750 | 400 | .23* | 100 | .06* |
| WBT | 1 | 1750 | 430 | .25 | 180 | .10 |
| WBR | 0 | 0 | 0 | | 0 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.68** | | **.66** |

**SCVCTM 4.1 2012 with Stage 2 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 0.5 | | 30 | | 130 | |
| SBT | 0.5 | 1750 | 10 | .02* | 10 | .08* |
| SBR | 1 | 1750 | 280 | .16 | 220 | .13 |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 1 | 1750 | 350 | .31* | 680 | .46* |
| EBR | 0 | 0 | 200 | | 130 | |
| WBL | 1 | 1750 | 400 | .23* | 110 | .06* |
| WBT | 1 | 1750 | 450 | .26 | 180 | .10 |
| WBR | 0 | 0 | 0 | | 0 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.66** | | **.70** |

**SCVCTM 4.1 2014 with Stage 3 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 0.5 | | 30 | | 130 | |
| SBT | 0.5 | 1750 | 10 | .02* | 10 | .08* |
| SBR | 1 | 1750 | 290 | .17 | 200 | .11 |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 1 | 1750 | 340 | .31* | 670 | .46* |
| EBR | 0 | 0 | 200 | | 130 | |
| WBL | 1 | 1750 | 400 | .23* | 110 | .06* |
| WBT | 1 | 1750 | 450 | .26 | 180 | .10 |
| WBR | 0 | 0 | 0 | | 0 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.66** | | **.70** |

**18. I-5 SB Ramps & Calgrove**

**SCVCTM 4.1 2018 with Stage 4 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 0.5 | | 30 | | 160 | |
| SBT | 0.5 | 1750 | 10 | .02* | 10 | .10* |
| SBR | 1 | 1750 | 350 | .20 | 380 | .22 |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 1 | 1750 | 410 | .35* | 740 | .47* |
| EBR | 0 | 0 | 210 | | 80 | |
| WBL | 1 | 1750 | 400 | .23* | 120 | .07* |
| WBT | 1 | 1750 | 450 | .26 | 160 | .09 |
| WBR | 0 | 0 | 0 | | 0 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.70** | | **.74** |

**SCVCTM 4.1 2022 with Stage 5 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 0.5 | | 40 | | 180 | |
| SBT | 0.5 | 1750 | 10 | .03* | 10 | .11* |
| SBR | 1 | 1750 | 380 | .22 | 380 | .22 |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 1 | 1750 | 440 | .38* | 830 | .53* |
| EBR | 0 | 0 | 230 | | 90 | |
| WBL | 1 | 1750 | 400 | .23* | 140 | .08* |
| WBT | 1 | 1750 | 470 | .27 | 260 | .15 |
| WBR | 0 | 0 | 0 | | 0 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.74** | | **.82** |

**SCVCTM 4.1 2025 with Stage 6a Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 0.5 | | 50 | | 210 | |
| SBT | 0.5 | 1750 | 10 | .03* | 10 | .13* |
| SBR | 1 | 1750 | 410 | .23 | 390 | .22 |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 1 | 1750 | 480 | .41* | 900 | .57* |
| EBR | 0 | 0 | 240 | | 90 | |
| WBL | 1 | 1750 | 400 | .23* | 160 | .09* |
| WBT | 1 | 1750 | 500 | .29 | 280 | .16 |
| WBR | 0 | 0 | 0 | | 0 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.77** | | **.89** |

**SCVCTM 4.1 2030 with 6b Imp./no Potrero Bridge**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 0.5 | | 50 | | 220 | |
| SBT | 0.5 | 1750 | 10 | .03* | 10 | .13* |
| SBR | 1 | 1750 | 450 | .26 | 450 | .26 |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 2 | 3500 | 550 | .24* | 1020 | .34* |
| EBR | 0 | 0 | 290 | | 160 | |
| WBL | 1 | 1750 | 400 | .23* | 190 | .11* |
| WBT | 2 | 3500 | 530 | .15 | 360 | .10 |
| WBR | 0 | 0 | 0 | | 0 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.60** | | **.68** |

**19. I-5 NB Ramps & Calgrove**

**Existing Count**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0.5 | | 45 | {.03}* | 123 | {.07}* |
| NBT | 0.5 | 1750 | 4 | .03 | 0 | .07 |
| NBR | 1 | 1750 | 70 | .04 | 264 | .15 |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 1 | 1750 | 70 | .04* | 304 | .17* |
| EBT | 1 | 1750 | 60 | .03 | 444 | .25 |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 1 | 1750 | 771 | .47* | 212 | .16* |
| WBR | 0 | 0 | 55 | | 61 | |
| Right Turn Adjustment | | | | | NBR | .02* |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.64** | | **.52** |

**SCVCTM 4.1 2011 with Stage 1 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0.5 | | 110 | {.06}* | 120 | {.07}* |
| NBT | 0.5 | 1750 | 0 | .06 | 0 | .07 |
| NBR | 1 | 1750 | 30 | .02 | 210 | .12 |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 1 | 1750 | 290 | .17* | 300 | .17* |
| EBT | 1 | 1750 | 90 | .05 | 500 | .29 |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 1 | 1750 | 740 | .46* | 150 | .13* |
| WBR | 0 | 0 | 60 | | 80 | |
| Right Turn Adjustment | | | | | NBR | .04* |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.79** | | **.51** |

**SCVCTM 4.1 2012 with Stage 2 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0.5 | | 130 | {.07}* | 120 | {.07}* |
| NBT | 0.5 | 1750 | 0 | .07 | 0 | .07 |
| NBR | 1 | 1750 | 40 | .02 | 210 | .12 |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 1 | 1750 | 270 | .15* | 300 | .17* |
| EBT | 1 | 1750 | 90 | .05 | 510 | .29 |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 1 | 1750 | 740 | .46* | 170 | .14* |
| WBR | 0 | 0 | 60 | | 80 | |
| Right Turn Adjustment | | | | | NBR | .03* |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.78** | | **.51** |

**SCVCTM 4.1 2014 with Stage 3 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0.5 | | 130 | {.07}* | 120 | {.07}* |
| NBT | 0.5 | 1750 | 0 | .07 | 0 | .07 |
| NBR | 1 | 1750 | 40 | .02 | 210 | .12 |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 1 | 1750 | 270 | .15* | 290 | .17* |
| EBT | 1 | 1750 | 80 | .05 | 500 | .29 |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 1 | 1750 | 740 | .46* | 180 | .15* |
| WBR | 0 | 0 | 70 | | 80 | |
| Right Turn Adjustment | | | | | NBR | .03* |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.78** | | **.52** |

**19. I-5 NB Ramps & Calgrove**

**SCVCTM 4.1 2018 with Stage 4 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0.5 | | 130 | {.07}* | 80 | {.05}* |
| NBT | 0.5 | 1750 | 0 | .07 | 0 | .05 |
| NBR | 1 | 1750 | 40 | .02 | 230 | .13 |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 1 | 1750 | 310 | .18* | 340 | .19* |
| EBT | 1 | 1750 | 110 | .06 | 560 | .32 |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 1 | 1750 | 760 | .47* | 200 | .18* |
| WBR | 0 | 0 | 70 | | 110 | |
| Right Turn Adjustment | | | | | NBR | .04* |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.82** | | **.56** |

**SCVCTM 4.1 2022 with Stage 5 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0.5 | | 130 | {.07}* | 140 | {.08}* |
| NBT | 0.5 | 1750 | 0 | .07 | 0 | .08 |
| NBR | 1 | 1750 | 50 | .03 | 270 | .15 |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 1 | 1750 | 330 | .19* | 400 | .23* |
| EBT | 1 | 1750 | 120 | .07 | 610 | .35 |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 1 | 1750 | 780 | .49* | 250 | .23* |
| WBR | 0 | 0 | 80 | | 150 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.85** | | **.64** |

**SCVCTM 4.1 2025 with Stage 6a Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0.5 | | 140 | {.08}* | 160 | {.09}* |
| NBT | 0.5 | 1750 | 0 | .08 | 0 | .09 |
| NBR | 1 | 1750 | 60 | .03 | 290 | .17 |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 1 | 1750 | 350 | .20* | 440 | .25* |
| EBT | 1 | 1750 | 150 | .09 | 670 | .38 |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 1 | 1750 | 790 | .50* | 290 | .27* |
| WBR | 0 | 0 | 90 | | 180 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.88** | | **.71** |

**SCVCTM 4.1 2030 with 6b Imp./no Potrero Bridge**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0.5 | | 160 | {.09}* | 200 | {.11}* |
| NBT | 0.5 | 1750 | 0 | .09 | 0 | .11 |
| NBR | 1 | 1750 | 70 | .04 | 330 | .19 |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 1 | 1750 | 390 | .22* | 510 | .29* |
| EBT | 2 | 3500 | 180 | .05 | 750 | .21 |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 2 | 3500 | 820 | .26* | 360 | .17* |
| WBR | 0 | 0 | 100 | | 220 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.67** | | **.67** |

**20. I-5 SB Ramp & Lyons**

**Existing Count**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 2 | 3500 | 877 | .25 | 1264 | .36* |
| EBR | 1 | 1750 | 591 | .34 | 332 | .19 |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 3 | 5250 | 1317 | .25* | 1702 | .32 |
| WBR | 0 | 0 | 0 | | 0 | |
| Right Turn Adjustment | | | EBR | .09* | | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.44** | | **.46** |

**SCVCTM 4.1 2011 with Stage 1 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 2 | 3500 | 1070 | .31* | 1730 | .49* |
| EBR | 1 | 1750 | 370 | .21 | 190 | .11 |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 3 | 5250 | 1220 | .23 | 1470 | .28 |
| WBR | 0 | 0 | 0 | | 0 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.41** | | **.59** |

**SCVCTM 4.1 2012 with Stage 2 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 2 | 3500 | 1050 | .30* | 1660 | .47* |
| EBR | 1 | 1750 | 370 | .21 | 160 | .09 |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 3 | 5250 | 1080 | .21 | 1420 | .27 |
| WBR | 0 | 0 | 0 | | 0 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.40** | | **.57** |

**SCVCTM 4.1 2014 with Stage 3 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 2 | 3500 | 1060 | .30* | 1660 | .47* |
| EBR | 1 | 1750 | 380 | .22 | 150 | .09 |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 3 | 5250 | 1090 | .21 | 1410 | .27 |
| WBR | 0 | 0 | 0 | | 0 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.40** | | **.57** |

**20. I-5 SB Ramp & Lyons**

**SCVCTM 4.1 2018 with Stage 4 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 2 | 3500 | 1270 | .36* | 1760 | .50* |
| EBR | 1 | 1750 | 380 | .22 | 210 | .12 |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 3 | 5250 | 1050 | .20 | 1490 | .28 |
| WBR | 0 | 0 | 0 | | 0 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.46** | | **.60** |

**SCVCTM 4.1 2022 with Stage 5 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 2 | 3500 | 1410 | .40* | 1830 | .52* |
| EBR | 1 | 1750 | 370 | .21 | 230 | .13 |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 3 | 5250 | 1090 | .21 | 1760 | .34 |
| WBR | 0 | 0 | 0 | | 0 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.50** | | **.62** |

**SCVCTM 4.1 2025 with Stage 6a Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 2 | 3500 | 1440 | .41* | 1970 | .56* |
| EBR | 1 | 1750 | 450 | .26 | 260 | .15 |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 3 | 5250 | 1130 | .22 | 1920 | .37 |
| WBR | 0 | 0 | 0 | | 0 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.51** | | **.66** |

**SCVCTM 4.1 2030 with 6b Imp./no Potrero Bridge**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 2 | 3500 | 1520 | .43* | 2100 | .60* |
| EBR | 1 | 1750 | 530 | .30 | 270 | .15 |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 3 | 5250 | 1200 | .23 | 2030 | .39 |
| WBR | 0 | 0 | 0 | | 0 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.53** | | **.70** |

**25. Old Road & Rye**

**Existing Count**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 1 | 1600 | 378 | .24* | 302 | .19* |
| NBR | f | | 1614 | | 1551 | |
| SBL | 1 | 1600 | 602 | .38* | 483 | .30* |
| SBT | 2 | 3200 | 288 | .09 | 339 | .11 |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 0 | 0 | 0 | | 0 | |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 1 | 1600 | 247 | .15* | 398 | .25* |
| WBT | 0 | 0 | 0 | | 0 | |
| WBR | f | | 1336 | | 1445 | |
| Clearance Interval | | | | .10* | | .10* |

**TOTAL CAPACITY UTILIZATION** **.87** **.84**

**SCVCTM 4.1 2011 with Stage 1 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 3 | 4800 | 800 | .17* | 610 | .13* |
| NBR | 2 | 3200 | 1700 | .53 | 1260 | .39 |
| SBL | 2 | 2880 | 210 | .07* | 450 | .16* |
| SBT | 3 | 4800 | 320 | .07 | 670 | .14 |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 0 | 0 | 0 | | 0 | |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 1.5 | | 870 | | 1140 | |
| WBT | 0 | 4800 | 0 | {.36}* | 0 | {.41}* |
| WBR | 1.5 | | 920 | | 1020 | |
| Clearance Interval | | | | .10* | | .10* |

Note: Assumes Right-Turn Overlap for NBR

**TOTAL CAPACITY UTILIZATION** **.70** **.80**

**SCVCTM 4.1 2012 with Stage 2 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 3 | 4800 | 480 | .10* | 530 | .11* |
| NBR | 2 | 3200 | 1720 | .54 | 1290 | .40 |
| SBL | 2 | 2880 | 200 | .07* | 290 | .10* |
| SBT | 3 | 4800 | 230 | .05 | 480 | .10 |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 0 | 0 | 0 | | 0 | |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 1.5 | | 790 | | 1230 | |
| WBT | 0 | 4800 | 0 | {.35}* | 0 | {.41}* |
| WBR | 1.5 | | 970 | | 850 | |
| Right Turn Adjustment | | | NBR | .09* | | |
| Clearance Interval | | | | .10* | | .10* |

Note: Assumes Right-Turn Overlap for NBR

**TOTAL CAPACITY UTILIZATION** **.71** **.72**

**SCVCTM 4.1 2014 with Stage 3 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 3 | 4800 | 470 | .10* | 530 | .11* |
| NBR | 2 | 3200 | 1870 | .58 | 1300 | .41 |
| SBL | 2 | 2880 | 190 | .07* | 330 | .11* |
| SBT | 3 | 4800 | 240 | .05 | 550 | .11 |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 0 | 0 | 0 | | 0 | |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 1.5 | | 740 | | 1230 | |
| WBT | 0 | 4800 | 0 | {.37}* | 0 | {.42}* |
| WBR | 1.5 | | 1120 | | 930 | |
| Right Turn Adjustment | | | NBR | .11* | | |
| Clearance Interval | | | | .10* | | .10* |

Note: Assumes Right-Turn Overlap for NBR

**TOTAL CAPACITY UTILIZATION** **.75** **.74**

**25. Old Road & Rye**

**SCVCTM 4.1 2018 with Stage 4 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 3 | 4800 | 500 | .10* | 590 | .12* |
| NBR | 2 | 3200 | 2100 | .66 | 1420 | .44 |
| SBL | 2 | 2880 | 220 | .08* | 350 | .12* |
| SBT | 3 | 4800 | 240 | .05 | 460 | .10 |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 0 | 0 | 0 | | 0 | |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 3 | 4320 | 660 | .15* | 1230 | .28* |
| WBT | 0 | 0 | 0 | | 0 | |
| WBR | 2 | 3200 | 1340 | .42 | 1200 | .38 |
| Right Turn Adjustment | | | Multi | .41* | NBR | .04* |
| Clearance Interval | | | | .10* | | .10* |

Note: Assumes Right-Turn Overlap for WBR NBR

**TOTAL CAPACITY UTILIZATION** **.84** **.66**

**SCVCTM 4.1 2022 with Stage 5 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 3 | 4800 | 520 | .11* | 720 | .15* |
| NBR | 2 | 3200 | 2090 | .65 | 1490 | .47 |
| SBL | 2 | 2880 | 240 | .08* | 450 | .16* |
| SBT | 3 | 4800 | 250 | .05 | 500 | .10 |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 0 | 0 | 0 | | 0 | |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 3 | 4320 | 780 | .18* | 1370 | .32* |
| WBT | 0 | 0 | 0 | | 0 | |
| WBR | 2 | 3200 | 1380 | .43 | 1210 | .38 |
| Right Turn Adjustment | | | Multi | .36* | | |
| Clearance Interval | | | | .10* | | .10* |

Note: Assumes Right-Turn Overlap for WBR NBR

**TOTAL CAPACITY UTILIZATION** **.83** **.73**

**SCVCTM 4.1 2025 with Stage 6a Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 3 | 4800 | 560 | .12* | 780 | .16* |
| NBR | 2 | 3200 | 2090 | .65 | 1540 | .48 |
| SBL | 2 | 2880 | 290 | .10* | 580 | .20* |
| SBT | 3 | 4800 | 300 | .06 | 560 | .12 |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 0 | 0 | 0 | | 0 | |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 3 | 4320 | 830 | .19* | 1360 | .31* |
| WBT | 0 | 0 | 0 | | 0 | |
| WBR | 2 | 3200 | 1380 | .43 | 1320 | .41 |
| Right Turn Adjustment | | | Multi | .34* | NBR | .01* |
| Clearance Interval | | | | .10* | | .10* |

Note: Assumes Right-Turn Overlap for WBR NBR

**TOTAL CAPACITY UTILIZATION** **.85** **.78**

**SCVCTM 4.1 2030 with 6b Imp./no Potrero Bridge**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 3 | 4800 | 700 | .15* | 860 | .18* |
| NBR | 2 | 3200 | 2030 | .63 | 1610 | .50 |
| SBL | 2 | 2880 | 340 | .12* | 710 | .25* |
| SBT | 3 | 4800 | 380 | .08 | 670 | .14 |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 0 | 0 | 0 | | 0 | |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 3 | 4320 | 980 | .23* | 1380 | .32* |
| WBT | 0 | 0 | 0 | | 0 | |
| WBR | 2 | 3200 | 1400 | .44 | 1400 | .44 |
| Right Turn Adjustment | | | Multi | .25* | | |
| Clearance Interval | | | | .10* | | .10* |

Note: Assumes Right-Turn Overlap for WBR NBR

**TOTAL CAPACITY UTILIZATION** **.85** **.85**

**26. Old Road & Magic Mtn**

**Existing Count**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1.5 | | 19 | .01 | 24 | .02 |
| NBT | 1.5 | 4800 | 510 | .16* | 557 | .17* |
| NBR | d | 1600 | 53 | .03 | 175 | .11 |
| SBL | 1.5 | | 216 | | 375 | |
| SBT | 1.5 | 4800 | 351 | .12* | 512 | .20* |
| SBR | 0 | | 5 | | 62 | |
| EBL | 1 | 1600 | 26 | .02 | 22 | .01 |
| EBT | 2 | 3200 | 38 | .01* | 76 | .02* |
| EBR | 1 | 1600 | 9 | .01 | 16 | .01 |
| WBL | 1 | 1600 | 156 | .10* | 218 | .14* |
| WBT | 3 | 4800 | 15 | .00 | 7 | .00 |
| WBR | f | | 1249 | | 1079 | |
| Clearance Interval | | | | .10* | | .10* |

Note: Assumes N/S Split Phasing

**TOTAL CAPACITY UTILIZATION** **.49** **.63**

**SCVCTM 4.1 2011 with Stage 1 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 2 | 2880 | 120 | .04 | 150 | .05* |
| NBT | 3 | 4800 | 580 | .12* | 330 | .07 |
| NBR | 1 | 1600 | 150 | .09 | 120 | .08 |
| SBL | 2 | 2880 | 410 | .14* | 430 | .15 |
| SBT | 2.5 | 6400 | 120 | .04 | 820 | {.20}* |
| SBR | 1.5 | | 310 | .10 | 640 | |
| EBL | 2 | 2880 | 320 | .11* | 410 | .14 |
| EBT | 4 | 6400 | 490 | .08 | 1250 | .20* |
| EBR | 1 | 1600 | 30 | .02 | 230 | .14 |
| WBL | 2 | 2880 | 190 | .07 | 170 | .06* |
| WBT | 4 | 6400 | 520 | .08* | 620 | .10 |
| WBR | f | | 1230 | | 810 | |
| Clearance Interval | | | | .10* | | .10* |

**TOTAL CAPACITY UTILIZATION** **.55** **.61**

**SCVCTM 4.1 2012 with Stage 2 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 2 | 2880 | 140 | .05 | 190 | .07* |
| NBT | 3 | 4800 | 500 | .10* | 320 | .07 |
| NBR | 1 | 1600 | 150 | .09 | 110 | .07 |
| SBL | 2 | 2880 | 300 | .10* | 460 | .16 |
| SBT | 2.5 | 6400 | 120 | .04 | 860 | {.18}* |
| SBR | 1.5 | | 250 | .08 | 470 | |
| EBL | 2 | 2880 | 240 | .08* | 380 | .13 |
| EBT | 4 | 6400 | 620 | .10 | 1140 | .18* |
| EBR | 1 | 1600 | 30 | .02 | 370 | .23 |
| WBL | 2 | 2880 | 190 | .07 | 170 | .06* |
| WBT | 4 | 6400 | 810 | .13* | 670 | .10 |
| WBR | f | | 1140 | | 810 | |
| Clearance Interval | | | | .10* | | .10* |

**TOTAL CAPACITY UTILIZATION** **.51** **.59**

**SCVCTM 4.1 2014 with Stage 3 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 2 | 2880 | 150 | .05 | 230 | .08* |
| NBT | 3 | 4800 | 530 | .11* | 330 | .07 |
| NBR | 1 | 1600 | 150 | .09 | 100 | .06 |
| SBL | 2 | 2880 | 240 | .08* | 400 | .14 |
| SBT | 2.5 | 6400 | 120 | {.03} | 870 | {.21}* |
| SBR | 1.5 | | 270 | | 610 | |
| EBL | 2 | 2880 | 390 | .14* | 410 | .14* |
| EBT | 4 | 6400 | 1030 | .16 | 1380 | .22 |
| EBR | 1 | 1600 | 40 | .03 | 450 | .28 |
| WBL | 2 | 2880 | 190 | .07 | 160 | .06 |
| WBT | 4 | 6400 | 950 | .15* | 910 | .14* |
| WBR | f | | 1070 | | 780 | |
| Clearance Interval | | | | .10* | | .10* |

**TOTAL CAPACITY UTILIZATION** **.58** **.67**

**26. Old Road & Magic Mtn**

**SCVCTM 4.1 2018 with Stage 4 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 2 | 2880 | 190 | .07 | 200 | .07* |
| NBT | 3 | 4800 | 550 | .11* | 350 | .07 |
| NBR | 1 | 1600 | 150 | .09 | 100 | .06 |
| SBL | 2 | 2880 | 340 | .12* | 490 | .17 |
| SBT | 2.5 | 6400 | 80 | {.02} | 580 | .18* |
| SBR | 1.5 | | 290 | | 810 | .25 |
| EBL | 2 | 2880 | 570 | .20* | 470 | .16* |
| EBT | 4 | 6400 | 1590 | .25 | 1680 | .26 |
| EBR | 1 | 1600 | 80 | .05 | 240 | .15 |
| WBL | 2 | 2880 | 180 | .06 | 160 | .06 |
| WBT | 4 | 6400 | 990 | .15* | 1260 | .20* |
| WBR | f | | 1110 | | 1100 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.68** | | **.71** |

**SCVCTM 4.1 2022 with Stage 5 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 2 | 2880 | 190 | .07 | 210 | .07* |
| NBT | 3 | 4800 | 570 | .12* | 410 | .09 |
| NBR | 1 | 1600 | 140 | .09 | 100 | .06 |
| SBL | 2 | 2880 | 370 | .13* | 500 | .17 |
| SBT | 2.5 | 6400 | 90 | .03 | 660 | .21* |
| SBR | 1.5 | | 390 | .12 | 890 | .28 |
| EBL | 2 | 2880 | 600 | .21* | 560 | .19* |
| EBT | 4 | 6400 | 1790 | .28 | 1850 | .29 |
| EBR | 1 | 1600 | 90 | .06 | 300 | .19 |
| WBL | 2 | 2880 | 170 | .06 | 170 | .06 |
| WBT | 4 | 6400 | 1100 | .17* | 1470 | .23* |
| WBR | f | | 1080 | | 1150 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.73** | | **.80** |

**SCVCTM 4.1 2025 with Stage 6a Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 2 | 2880 | 240 | .08 | 310 | .11* |
| NBT | 3 | 4800 | 570 | .12* | 350 | .07 |
| NBR | 1 | 1600 | 140 | .09 | 90 | .06 |
| SBL | 2 | 2880 | 440 | .15* | 620 | .22 |
| SBT | 2.5 | 6400 | 90 | .03 | 660 | .21* |
| SBR | 1.5 | | 410 | .13 | 900 | .28 |
| EBL | 2 | 2880 | 640 | .22* | 580 | .20* |
| EBT | 4 | 6400 | 1810 | .28 | 1930 | .30 |
| EBR | 1 | 1600 | 100 | .06 | 330 | .21 |
| WBL | 2 | 2880 | 170 | .06 | 160 | .06 |
| WBT | 4 | 6400 | 1190 | .19* | 1500 | .23* |
| WBR | f | | 1140 | | 1250 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.78** | | **.85** |

**SCVCTM 4.1 2030 with 6b Imp./no Potrero Bridge**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 2 | 2880 | 290 | .10 | 430 | .15* |
| NBT | 3 | 4800 | 590 | .12* | 340 | .07 |
| NBR | 1 | 1600 | 140 | .09 | 100 | .06 |
| SBL | 2 | 2880 | 550 | .19* | 660 | .23 |
| SBT | 2.5 | 6400 | 90 | .03 | 560 | .18* |
| SBR | 1.5 | | 490 | .15 | 960 | .30 |
| EBL | 2 | 2880 | 630 | .22* | 580 | .20* |
| EBT | 5 | 8000 | 1800 | .23 | 2050 | .26 |
| EBR | 1 | 1600 | 110 | .07 | 480 | .30 |
| WBL | 2 | 2880 | 160 | .06 | 140 | .05 |
| WBT | 4 | 6400 | 1150 | .18* | 1500 | .23* |
| WBR | f | | 1280 | | 1390 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.81** | | **.86** |

**27. Old Road & Valencia**

**Existing Count**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 2 | 2880 | 486 | .17* | 261 | .09 |
| NBT | 3 | 4800 | 345 | .07 | 766 | .16* |
| NBR | 1 | 1600 | 69 | .04 | 432 | .27 |
| SBL | 2 | 2880 | 159 | .06 | 379 | .13* |
| SBT | 3 | 4800 | 306 | .06* | 765 | .16 |
| SBR | 1 | 1600 | 164 | .10 | 145 | .09 |
| EBL | 2 | 2880 | 210 | .07* | 206 | .07 |
| EBT | 4 | 6400 | 579 | .09 | 377 | .06* |
| EBR | 1 | 1600 | 183 | .11 | 175 | .11 |
| WBL | 2 | 2880 | 298 | .10 | 463 | .16* |
| WBT | 3 | 4800 | 679 | .14* | 388 | .08 |
| WBR | f | | 363 | | 463 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.54** | | **.61** |

**SCVCTM 4.1 2011 with Stage 1 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 2 | 2880 | 330 | .11* | 150 | .05* |
| NBT | 3 | 4800 | 250 | .05 | 560 | .12 |
| NBR | 1 | 1600 | 70 | .04 | 310 | .19 |
| SBL | 2 | 2880 | 150 | .05 | 300 | .10 |
| SBT | 3 | 4800 | 180 | .04* | 810 | .17* |
| SBR | 1 | 1600 | 120 | .08 | 80 | .05 |
| EBL | 2 | 2880 | 170 | .06* | 100 | .03 |
| EBT | 4 | 6400 | 720 | .11 | 450 | .07* |
| EBR | 1 | 1600 | 250 | .16 | 150 | .09 |
| WBL | 2 | 2880 | 80 | .03 | 570 | .20* |
| WBT | 3 | 4800 | 1000 | .21* | 630 | .13 |
| WBR | f | | 260 | | 370 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.52** | | **.59** |

**SCVCTM 4.1 2012 with Stage 2 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 2 | 2880 | 490 | .17* | 150 | .05* |
| NBT | 3 | 4800 | 190 | .04 | 570 | .12 |
| NBR | 1 | 1600 | 40 | .03 | 310 | .19 |
| SBL | 2 | 2880 | 140 | .05 | 290 | .10 |
| SBT | 3 | 4800 | 180 | .04* | 980 | .20* |
| SBR | 1 | 1600 | 130 | .08 | 90 | .06 |
| EBL | 2 | 2880 | 170 | .06* | 100 | .03 |
| EBT | 4 | 6400 | 730 | .11 | 450 | .07* |
| EBR | 1 | 1600 | 190 | .12 | 140 | .09 |
| WBL | 2 | 2880 | 70 | .02 | 520 | .18* |
| WBT | 3 | 4800 | 1020 | .21* | 690 | .14 |
| WBR | f | | 250 | | 370 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.58** | | **.60** |

**SCVCTM 4.1 2014 with Stage 3 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 2 | 2880 | 530 | .18* | 210 | .07* |
| NBT | 3 | 4800 | 210 | .04 | 600 | .13 |
| NBR | 1 | 1600 | 40 | .03 | 320 | .20 |
| SBL | 2 | 2880 | 140 | .05 | 300 | .10 |
| SBT | 3 | 4800 | 180 | .04* | 1060 | .22* |
| SBR | 1 | 1600 | 130 | .08 | 110 | .07 |
| EBL | 2 | 2880 | 190 | .07* | 110 | .04 |
| EBT | 4 | 6400 | 830 | .13 | 450 | .07* |
| EBR | 1 | 1600 | 230 | .14 | 200 | .13 |
| WBL | 2 | 2880 | 80 | .03 | 540 | .19* |
| WBT | 3 | 4800 | 1020 | .21* | 870 | .18 |
| WBR | f | | 250 | | 390 | |
| Right Turn Adjustment | | | | | EBR | .01* |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.60** | | **.66** |

**27. Old Road & Valencia**

**SCVCTM 4.1 2018 with Stage 4 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 2 | 2880 | 400 | .14* | 320 | .11 |
| NBT | 3 | 4800 | 170 | .04 | 590 | .12* |
| NBR | 1 | 1600 | 30 | .02 | 210 | .13 |
| SBL | 2 | 2880 | 140 | .05 | 310 | .11* |
| SBT | 3 | 4800 | 180 | .04* | 460 | .10 |
| SBR | 1 | 1600 | 120 | .08 | 180 | .11 |
| EBL | 2 | 2880 | 290 | .10* | 160 | .06* |
| EBT | 4 | 6400 | 1420 | .22 | 860 | .13 |
| EBR | 1 | 1600 | 290 | .18 | 170 | .11 |
| WBL | 2 | 2880 | 70 | .02 | 340 | .12 |
| WBT | 3 | 4800 | 1330 | .28* | 1520 | .32* |
| WBR | f | | 240 | | 370 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.66** | | **.71** |

**SCVCTM 4.1 2022 with Stage 5 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 2 | 2880 | 480 | .17* | 500 | .17* |
| NBT | 3 | 4800 | 160 | .03 | 670 | .14 |
| NBR | 1 | 1600 | 20 | .01 | 200 | .13 |
| SBL | 2 | 2880 | 140 | .05 | 300 | .10 |
| SBT | 3 | 4800 | 180 | .04* | 580 | .12* |
| SBR | 1 | 1600 | 150 | .09 | 200 | .13 |
| EBL | 2 | 2880 | 330 | .11* | 210 | .07* |
| EBT | 4 | 6400 | 1970 | .31 | 1360 | .21 |
| EBR | 1 | 1600 | 330 | .21 | 280 | .18 |
| WBL | 2 | 2880 | 80 | .03 | 330 | .11 |
| WBT | 3 | 4800 | 1590 | .33* | 1890 | .39* |
| WBR | f | | 240 | | 350 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.75** | | **.85** |

**SCVCTM 4.1 2025 with Stage 6a Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 2 | 2880 | 500 | .17* | 480 | .17* |
| NBT | 3 | 4800 | 190 | .04 | 700 | .15 |
| NBR | 1 | 1600 | 30 | .02 | 240 | .15 |
| SBL | 2 | 2880 | 140 | .05 | 360 | .13 |
| SBT | 3 | 4800 | 190 | .04* | 550 | .11* |
| SBR | 1 | 1600 | 150 | .09 | 200 | .13 |
| EBL | 2 | 2880 | 320 | .11* | 210 | .07* |
| EBT | 4 | 6400 | 2050 | .32 | 1470 | .23 |
| EBR | 1 | 1600 | 360 | .23 | 330 | .21 |
| WBL | 2 | 2880 | 70 | .02 | 360 | .13 |
| WBT | 3 | 4800 | 1620 | .34* | 2020 | .42* |
| WBR | f | | 260 | | 350 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.76** | | **.87** |

**SCVCTM 4.1 2030 with 6b Imp./no Potrero Bridge**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 2 | 2880 | 550 | .19* | 490 | .17 |
| NBT | 3 | 4800 | 230 | .05 | 800 | .17* |
| NBR | 1 | 1600 | 40 | .03 | 280 | .18 |
| SBL | 2 | 2880 | 140 | .05 | 360 | .13* |
| SBT | 3 | 4800 | 200 | .04* | 580 | .12 |
| SBR | 1 | 1600 | 160 | .10 | 200 | .13 |
| EBL | 2 | 2880 | 340 | .12* | 210 | .07* |
| EBT | 4 | 6400 | 2060 | .32 | 1310 | .20 |
| EBR | 1 | 1600 | 330 | .21 | 580 | .36 |
| WBL | 2 | 2880 | 70 | .02 | 400 | .14 |
| WBT | 3 | 4800 | 1650 | .34* | 2040 | .43* |
| WBR | f | | 280 | | 370 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.79** | | **.90** |

**28. Old Road & McBean**

**Existing Count**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1600 | 47 | .03* | 178 | .11* |
| NBT | 3 | 4800 | 178 | .04 | 505 | .11 |
| NBR | 1 | 1600 | 138 | .09 | 592 | .37 |
| SBL | 1 | 1600 | 62 | .04 | 166 | .10 |
| SBT | 2 | 3200 | 250 | .08* | 397 | .12* |
| SBR | 1 | 1600 | 73 | .05 | 231 | .14 |
| EBL | 1 | 1600 | 141 | .09 | 170 | .11* |
| EBT | 3 | 4800 | 852 | .18* | 437 | .09 |
| EBR | 1 | 1600 | 128 | .08 | 114 | .07 |
| WBL | 2 | 2880 | 254 | .09* | 593 | .21 |
| WBT | 2 | 3200 | 186 | .11 | 588 | .20* |
| WBR | 0 | 0 | 154 | | 47 | |
| Right Turn Adjustment | | | | | NBR | .08* |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.48** | | **.72** |

**SCVCTM 4.1 2011 with Stage 1 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1600 | 90 | .06* | 150 | .09* |
| NBT | 3 | 4800 | 280 | .06 | 630 | .13 |
| NBR | 1 | 1600 | 360 | .23 | 770 | .48 |
| SBL | 1 | 1600 | 50 | .03 | 320 | .20 |
| SBT | 2 | 3200 | 220 | .07* | 790 | .25* |
| SBR | 1 | 1600 | 30 | .02 | 260 | .16 |
| EBL | 1 | 1600 | 130 | .08 | 160 | .10* |
| EBT | 3 | 4800 | 1120 | .23* | 510 | .11 |
| EBR | 1 | 1600 | 120 | .08 | 110 | .07 |
| WBL | 2 | 2880 | 270 | .09* | 790 | .27 |
| WBT | 2 | 3200 | 260 | .16 | 870 | .29* |
| WBR | 0 | 0 | 270 | .17 | 70 | |
| Right Turn Adjustment | | | NBR | .04* | NBR | .06* |
| Clearance Interval | | | | .10* | | .10* |
| Note: Assumes Right-Turn Overlap for NBR | | | | | | |
| **TOTAL CAPACITY UTILIZATION** | | | | **.59** | | **.89** |

**SCVCTM 4.1 2012 with Stage 2 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1600 | 80 | .05* | 150 | .09* |
| NBT | 3 | 4800 | 340 | .07 | 640 | .13 |
| NBR | 1 | 1600 | 380 | .24 | 770 | .48 |
| SBL | 2 | 2880 | 40 | .01 | 420 | .15 |
| SBT | 2 | 3200 | 180 | .06* | 840 | .26* |
| SBR | 1 | 1600 | 10 | .01 | 210 | .13 |
| EBL | 1 | 1600 | 110 | .07 | 150 | .09* |
| EBT | 3 | 4800 | 1000 | .21* | 510 | .11 |
| EBR | 1 | 1600 | 130 | .08 | 110 | .07 |
| WBL | 2 | 2880 | 300 | .10* | 800 | .28 |
| WBT | 2 | 3200 | 250 | .16 | 860 | .30* |
| WBR | 0 | 0 | 300 | .19 | 90 | |
| Right Turn Adjustment | | | NBR | .04* | | |
| Clearance Interval | | | | .10* | | .10* |
| Note: Assumes Right-Turn Overlap for NBR | | | | | | |
| **TOTAL CAPACITY UTILIZATION** | | | | **.56** | | **.84** |

**SCVCTM 4.1 2014 with Stage 3 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1600 | 80 | .05* | 150 | .09* |
| NBT | 3 | 4800 | 380 | .08 | 700 | .15 |
| NBR | 1 | 1600 | 370 | .23 | 760 | .48 |
| SBL | 2 | 2880 | 60 | .02 | 470 | .16 |
| SBT | 2 | 3200 | 200 | .06* | 900 | .28* |
| SBR | 1 | 1600 | 10 | .01 | 250 | .16 |
| EBL | 1 | 1600 | 110 | .07 | 160 | .10* |
| EBT | 3 | 4800 | 980 | .20* | 500 | .10 |
| EBR | 1 | 1600 | 130 | .08 | 110 | .07 |
| WBL | 2 | 2880 | 290 | .10* | 730 | .25 |
| WBT | 2 | 3200 | 250 | .16 | 810 | .29* |
| WBR | 0 | 0 | 310 | .19 | 110 | |
| Right Turn Adjustment | | | NBR | .04* | | |
| Clearance Interval | | | | .10* | | .10* |
| Note: Assumes Right-Turn Overlap for NBR | | | | | | |
| **TOTAL CAPACITY UTILIZATION** | | | | **.55** | | **.86** |

**28. Old Road & McBean**

**SCVCTM 4.1 2018 with Stage 4 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1600 | 80 | .05* | 120 | .08* |
| NBT | 3 | 4800 | 220 | .05 | 670 | .14 |
| NBR | 1 | 1600 | 350 | .22 | 760 | .48 |
| SBL | 2 | 2880 | 110 | .04 | 200 | .07 |
| SBT | 2 | 3200 | 210 | .07* | 500 | .16* |
| SBR | 1 | 1600 | 10 | .01 | 140 | .09 |
| EBL | 1 | 1600 | 80 | .05 | 130 | .08* |
| EBT | 3 | 4800 | 1020 | .21* | 510 | .11 |
| EBR | 1 | 1600 | 120 | .08 | 100 | .06 |
| WBL | 2 | 2880 | 310 | .11* | 820 | .28 |
| WBT | 2 | 3200 | 250 | .16 | 930 | .35* |
| WBR | 0 | 0 | 320 | .20 | 180 | |
| Right Turn Adjustment | | | NBR | .03* | | |
| Clearance Interval | | | | .10* | | .10* |

Note: Assumes Right-Turn Overlap for NBR

**TOTAL CAPACITY UTILIZATION** **.57** **.77**

**SCVCTM 4.1 2022 with Stage 5 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1600 | 70 | .04* | 120 | .08* |
| NBT | 3 | 4800 | 220 | .05 | 730 | .15 |
| NBR | 1 | 1600 | 350 | .22 | 740 | .46 |
| SBL | 2 | 2880 | 130 | .05 | 290 | .10 |
| SBT | 2 | 3200 | 230 | .07* | 590 | .18* |
| SBR | 1 | 1600 | 10 | .01 | 170 | .11 |
| EBL | 1 | 1600 | 80 | .05 | 130 | .08 |
| EBT | 3 | 4800 | 1010 | .21* | 510 | .11* |
| EBR | 1 | 1600 | 110 | .07 | 100 | .06 |
| WBL | 2 | 2880 | 300 | .10* | 810 | .28* |
| WBT | 2 | 3200 | 240 | .08 | 890 | .28 |
| WBR | 1 | 1600 | 390 | .24 | 370 | .23 |
| Right Turn Adjustment | | | NBR | .06* | NBR | .02* |
| Clearance Interval | | | | .10* | | .10* |

Note: Assumes Right-Turn Overlap for NBR

**TOTAL CAPACITY UTILIZATION** **.58** **.77**

**SCVCTM 4.1 2025 with Stage 6a Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1600 | 70 | .04* | 110 | .07* |
| NBT | 3 | 4800 | 260 | .05 | 770 | .16 |
| NBR | 1 | 1600 | 330 | .21 | 700 | .44 |
| SBL | 2 | 2880 | 150 | .05 | 280 | .10 |
| SBT | 2 | 3200 | 240 | .08* | 670 | .21* |
| SBR | 1 | 1600 | 10 | .01 | 160 | .10 |
| EBL | 1 | 1600 | 90 | .06 | 140 | .09 |
| EBT | 3 | 4800 | 990 | .21* | 490 | .10* |
| EBR | 1 | 1600 | 110 | .07 | 90 | .06 |
| WBL | 2 | 2880 | 310 | .11* | 830 | .29* |
| WBT | 2 | 3200 | 250 | .08 | 920 | .29 |
| WBR | 1 | 1600 | 390 | .24 | 360 | .23 |
| Right Turn Adjustment | | | NBR | .03* | | |
| Clearance Interval | | | | .10* | | .10* |

Note: Assumes Right-Turn Overlap for NBR

**TOTAL CAPACITY UTILIZATION** **.57** **.77**

**SCVCTM 4.1 2030 with 6b Imp./no Potrero Bridge**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1600 | 70 | .04* | 120 | .08 |
| NBT | 3 | 4800 | 300 | .06 | 870 | .18* |
| NBR | 1 | 1600 | 320 | .20 | 690 | .43 |
| SBL | 2 | 2880 | 140 | .05 | 440 | .15* |
| SBT | 2 | 3200 | 230 | .07* | 790 | .25 |
| SBR | 1 | 1600 | 10 | .01 | 170 | .11 |
| EBL | 1 | 1600 | 100 | .06 | 160 | .10 |
| EBT | 3 | 4800 | 980 | .20* | 470 | .10* |
| EBR | 1 | 1600 | 110 | .07 | 90 | .06 |
| WBL | 2 | 2880 | 320 | .11* | 830 | .29* |
| WBT | 2 | 3200 | 250 | .08 | 910 | .28 |
| WBR | 1 | 1600 | 450 | .28 | 410 | .26 |
| Right Turn Adjustment | | | NBR | .03* | | |
| Clearance Interval | | | | .10* | | .10* |

Note: Assumes Right-Turn Overlap for NBR

**TOTAL CAPACITY UTILIZATION** **.55** **.82**

**29. Old Road & Pico**

**Existing Count**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1600 | 65 | .04* | 106 | .07 |
| NBT | 2 | 3200 | 169 | .08 | 349 | .13* |
| NBR | 0 | 0 | 84 | | 56 | |
| SBL | 2 | 2880 | 288 | .10 | 467 | .16* |
| SBT | 1 | 1600 | 301 | .19* | 222 | .14 |
| SBR | 1 | 1600 | 19 | .01 | 29 | .02 |
| EBL | 1 | 1600 | 52 | .03 | 61 | .04* |
| EBT | 2 | 3200 | 607 | .19* | 251 | .08 |
| EBR | 1 | 1600 | 117 | .07 | 23 | .01 |
| WBL | 1 | 1600 | 51 | .03* | 70 | .04 |
| WBT | 2 | 3200 | 320 | .10 | 594 | .19* |
| WBR | f | | 292 | | 664 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.55** | | **.62** |

**SCVCTM 4.1 2011 with Stage 1 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1600 | 70 | .04 | 400 | .25 |
| NBT | 2 | 3200 | 230 | .09* | 610 | .26* |
| NBR | 0 | 0 | 50 | | 220 | |
| SBL | 2 | 2880 | 300 | .10* | 600 | .21* |
| SBT | 1 | 1600 | 150 | .09 | 280 | .18 |
| SBR | 1 | 1600 | 150 | .09 | 270 | .17 |
| EBL | 1 | 1600 | 360 | .23* | 60 | .04* |
| EBT | 2 | 3200 | 260 | .08 | 140 | .04 |
| EBR | 1 | 1600 | 50 | .03 | 60 | .04 |
| WBL | 1 | 1600 | 10 | .01 | 70 | .04 |
| WBT | 2 | 3200 | 1000 | .31* | 430 | .13* |
| WBR | f | | 250 | | 600 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.83** | | **.74** |

**SCVCTM 4.1 2012 with Stage 2 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1600 | 70 | .04 | 400 | .25* |
| NBT | 2 | 3200 | 260 | .10* | 610 | .26 |
| NBR | 0 | 0 | 50 | | 210 | |
| SBL | 2 | 2880 | 300 | .10* | 580 | .20 |
| SBT | 1 | 1600 | 150 | .09 | 350 | .22* |
| SBR | 1 | 1600 | 140 | .09 | 290 | .18 |
| EBL | 1 | 1600 | 390 | .24* | 60 | .04* |
| EBT | 2 | 3200 | 230 | .07 | 130 | .04 |
| EBR | 1 | 1600 | 50 | .03 | 60 | .04 |
| WBL | 1 | 1600 | 10 | .01 | 70 | .04 |
| WBT | 2 | 3200 | 970 | .30* | 410 | .13* |
| WBR | f | | 260 | | 600 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.84** | | **.74** |

**SCVCTM 4.1 2014 with Stage 3 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1600 | 70 | .04 | 380 | .24* |
| NBT | 2 | 3200 | 280 | .10* | 640 | .25 |
| NBR | 0 | 0 | 50 | | 150 | |
| SBL | 2 | 2880 | 290 | .10* | 560 | .19 |
| SBT | 1 | 1600 | 150 | .09 | 350 | .22* |
| SBR | 1 | 1600 | 150 | .09 | 290 | .18 |
| EBL | 1 | 1600 | 410 | .26* | 70 | .04* |
| EBT | 2 | 3200 | 220 | .07 | 190 | .06 |
| EBR | 1 | 1600 | 50 | .03 | 60 | .04 |
| WBL | 1 | 1600 | 10 | .01 | 50 | .03 |
| WBT | 2 | 3200 | 980 | .31* | 480 | .15* |
| WBR | f | | 250 | | 600 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.87** | | **.75** |

**29. Old Road & Pico**

**SCVCTM 4.1 2018 with Stage 4 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1600 | 100 | .06 | 410 | .26 |
| NBT | 2 | 3200 | 210 | .08* | 570 | .25* |
| NBR | 0 | 0 | 50 | | 220 | |
| SBL | 2 | 2880 | 300 | .10* | 520 | .18* |
| SBT | 1 | 1600 | 150 | .09 | 230 | .14 |
| SBR | 1 | 1600 | 140 | .09 | 170 | .11 |
| EBL | 1 | 1600 | 310 | .19* | 60 | .04* |
| EBT | 2 | 3200 | 280 | .09 | 180 | .06 |
| EBR | 1 | 1600 | 50 | .03 | 70 | .04 |
| WBL | 1 | 1600 | 10 | .01 | 90 | .06 |
| WBT | 2 | 3200 | 1020 | .32* | 500 | .16* |
| WBR | f | | 220 | | 610 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.79** | | **.73** |

**SCVCTM 4.1 2022 with Stage 5 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1600 | 120 | .08* | 440 | .28* |
| NBT | 2 | 3200 | 210 | .08 | 600 | .23 |
| NBR | 0 | 0 | 50 | | 150 | |
| SBL | 2 | 2880 | 290 | .10 | 540 | .19 |
| SBT | 1 | 1600 | 160 | .10* | 270 | .17* |
| SBR | 1 | 1600 | 140 | .09 | 180 | .11 |
| EBL | 1 | 1600 | 300 | .19* | 60 | .04* |
| EBT | 2 | 3200 | 360 | .11 | 370 | .12 |
| EBR | 1 | 1600 | 70 | .04 | 90 | .06 |
| WBL | 1 | 1600 | 10 | .01 | 100 | .06 |
| WBT | 2 | 3200 | 1040 | .33* | 690 | .22* |
| WBR | f | | 220 | | 620 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.80** | | **.81** |

**SCVCTM 4.1 2025 with Stage 6a Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1600 | 140 | .09* | 400 | .25* |
| NBT | 2 | 3200 | 230 | .09 | 620 | .24 |
| NBR | 0 | 0 | 50 | | 150 | |
| SBL | 2 | 2880 | 290 | .10 | 570 | .20 |
| SBT | 1 | 1600 | 160 | .10* | 370 | .23* |
| SBR | 1 | 1600 | 160 | .10 | 160 | .10 |
| EBL | 1 | 1600 | 300 | .19* | 60 | .04* |
| EBT | 2 | 3200 | 480 | .15 | 460 | .14 |
| EBR | 1 | 1600 | 80 | .05 | 110 | .07 |
| WBL | 1 | 1600 | 10 | .01 | 80 | .05 |
| WBT | 2 | 3200 | 1100 | .34* | 830 | .26* |
| WBR | f | | 220 | | 610 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.82** | | **.88** |

**SCVCTM 4.1 2030 with 6b Imp./no Potrero Bridge**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1600 | 140 | .09* | 410 | .26 |
| NBT | 2 | 3200 | 240 | .09 | 670 | .26* |
| NBR | 0 | 0 | 50 | | 150 | |
| SBL | 2 | 2880 | 280 | .10 | 610 | .21* |
| SBT | 2 | 3200 | 170 | .11* | 460 | .18 |
| SBR | 0 | 0 | 170 | | 120 | |
| EBL | 1 | 1600 | 310 | .19* | 70 | .04* |
| EBT | 2 | 3200 | 570 | .18 | 520 | .16 |
| EBR | 1 | 1600 | 90 | .06 | 220 | .14 |
| WBL | 1 | 1600 | 10 | .01 | 80 | .05 |
| WBT | 2 | 3200 | 1110 | .35* | 890 | .28* |
| WBR | f | | 240 | | 640 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.84** | | **.89** |

**80. Wolcott & SR-126**

**Existing Count**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 1 | | 0 | |
| NBT | 1 | 1600 | 3 | .00 | 0 | .00 |
| NBR | 0 | 0 | 3 | | 0 | |
| SBL | 1.5 | | 1 | | 9 | |
| SBT | 0.5 | 3200 | 1 | .00* | 0 | .00* |
| SBR | 1 | 1600 | 5 | .00 | 21 | .01 |
| EBL | 1 | 1600 | 14 | .01* | 2 | .00 |
| EBT | 2 | 3200 | 655 | .21 | 1150 | .36* |
| EBR | 0 | 0 | 6 | | 0 | |
| WBL | 1 | 1600 | 3 | .00 | 1 | .00 |
| WBT | 2 | 3200 | 748 | .23* | 870 | .27 |
| WBR | 1 | 1600 | 2 | .00 | 6 | .00 |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.34** | | **.46** |

**SCVCTM 4.1 2011 with Stage 1 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1600 | 10 | .01 | 10 | .01 |
| NBT | 1 | 1600 | 90 | .06* | 10 | .01* |
| NBR | 2 | 3200 | 320 | .10 | 810 | .25 |
| SBL | 2 | 2880 | 10 | .00 | 180 | .06* |
| SBT | 1 | 1600 | 20 | .01 | 50 | .03 |
| SBR | 1 | 1600 | 10 | .01 | 60 | .04 |
| EBL | 1 | 1600 | 130 | .08 | 10 | .01 |
| EBT | 3 | 4800 | 910 | .19* | 1500 | .31* |
| EBR | 1 | 1600 | 10 | .01 | 10 | .01 |
| WBL | 2 | 2880 | 550 | .19* | 610 | .21* |
| WBT | 3 | 4800 | 1180 | .25 | 1310 | .27 |
| WBR | 1 | 1600 | 160 | .10 | 10 | .01 |
| Right Turn Adjustment | | | | | NBR | .08* |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.54** | | **.77** |

**SCVCTM 4.1 2012 with Stage 2 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1600 | 10 | .01 | 10 | .01 |
| NBT | 1 | 1600 | 100 | .06* | 10 | .01* |
| NBR | 2 | 3200 | 320 | .10 | 820 | .26 |
| SBL | 2 | 2880 | 10 | .00 | 190 | .07* |
| SBT | 1 | 1600 | 20 | .01 | 40 | .03 |
| SBR | 1 | 1600 | 10 | .01 | 60 | .04 |
| EBL | 1 | 1600 | 130 | .08 | 10 | .01 |
| EBT | 3 | 4800 | 930 | .19* | 1520 | .32* |
| EBR | 1 | 1600 | 10 | .01 | 10 | .01 |
| WBL | 2 | 2880 | 550 | .19* | 620 | .22* |
| WBT | 3 | 4800 | 1230 | .26 | 1350 | .28 |
| WBR | 1 | 1600 | 170 | .11 | 10 | .01 |
| Right Turn Adjustment | | | | | NBR | .08* |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.54** | | **.80** |

**SCVCTM 4.1 2014 with Stage 3 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1600 | 10 | .01 | 10 | .01 |
| NBT | 1 | 1600 | 110 | .07* | 10 | .01* |
| NBR | 2 | 3200 | 310 | .10 | 810 | .25 |
| SBL | 2 | 2880 | 10 | .00 | 210 | .07* |
| SBT | 1 | 1600 | 20 | .01 | 40 | .03 |
| SBR | 1 | 1600 | 10 | .01 | 70 | .04 |
| EBL | 1 | 1600 | 200 | .13 | 10 | .01 |
| EBT | 3 | 4800 | 940 | .20* | 1540 | .32* |
| EBR | 1 | 1600 | 10 | .01 | 10 | .01 |
| WBL | 2 | 2880 | 530 | .18* | 620 | .22* |
| WBT | 3 | 4800 | 1190 | .25 | 1330 | .28 |
| WBR | 1 | 1600 | 180 | .11 | 10 | .01 |
| Right Turn Adjustment | | | | | NBR | .07* |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.55** | | **.79** |

**80. Wolcott & SR-126**

**SCVCTM 4.1 2018 with Stage 4 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1600 | 10 | .01 | 10 | .01 |
| NBT | 1 | 1600 | 90 | .06* | 10 | .01* |
| NBR | 2 | 3200 | 320 | .10 | 750 | .23 |
| SBL | 2 | 2880 | 10 | .00 | 210 | .07* |
| SBT | 1 | 1600 | 20 | .01 | 40 | .03 |
| SBR | 1 | 1600 | 10 | .01 | 90 | .06 |
| EBL | 1 | 1600 | 270 | .17 | 10 | .01 |
| EBT | 3 | 4800 | 1090 | .23* | 1410 | .29* |
| EBR | 1 | 1600 | 10 | .01 | 10 | .01 |
| WBL | 2 | 2880 | 480 | .17* | 610 | .21* |
| WBT | 3 | 4800 | 940 | .20 | 1390 | .29 |
| WBR | 1 | 1600 | 180 | .11 | 10 | .01 |
| Right Turn Adjustment | | | | | NBR | .06* |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.56** | | **.74** |

**SCVCTM 4.1 2022 with Stage 5 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1600 | 10 | .01 | 10 | .01 |
| NBT | 1 | 1600 | 70 | .04* | 10 | .01* |
| NBR | 2 | 3200 | 330 | .10 | 650 | .20 |
| SBL | 2 | 2880 | 20 | .01* | 190 | .07* |
| SBT | 1 | 1600 | 10 | .01 | 30 | .02 |
| SBR | 1 | 1600 | 20 | .01 | 150 | .09 |
| EBL | 1 | 1600 | 380 | .24 | 10 | .01 |
| EBT | 3 | 4800 | 1750 | .36* | 1670 | .35* |
| EBR | 1 | 1600 | 10 | .01 | 10 | .01 |
| WBL | 2 | 2880 | 430 | .15* | 570 | .20* |
| WBT | 3 | 4800 | 1080 | .23 | 2000 | .42 |
| WBR | 1 | 1600 | 170 | .11 | 10 | .01 |
| Right Turn Adjustment | | | | | NBR | .04* |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.66** | | **.77** |

**SCVCTM 4.1 2025 with Stage 6a Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1600 | 10 | .01 | 10 | .01 |
| NBT | 1 | 1600 | 60 | .04* | 10 | .01* |
| NBR | 2 | 3200 | 320 | .10 | 620 | .19 |
| SBL | 2 | 2880 | 10 | .00 | 170 | .06* |
| SBT | 1 | 1600 | 10 | .01 | 30 | .02 |
| SBR | 1 | 1600 | 30 | .02 | 190 | .12 |
| EBL | 1 | 1600 | 440 | .28 | 10 | .01 |
| EBT | 3 | 4800 | 2330 | .49* | 2230 | .46* |
| EBR | 1 | 1600 | 10 | .01 | 10 | .01 |
| WBL | 2 | 2880 | 390 | .14* | 550 | .19* |
| WBT | 3 | 4800 | 1550 | .32 | 2730 | .57 |
| WBR | 1 | 1600 | 140 | .09 | 10 | .01 |
| Right Turn Adjustment | | | | | NBR | .04* |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.77** | | **.86** |

**SCVCTM 4.1 2030 with 6b Imp./no Potrero Bridge**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1600 | 10 | .01 | 10 | .01 |
| NBT | 1 | 1600 | 60 | .04* | 10 | .01* |
| NBR | 2 | 3200 | 310 | .10 | 610 | .19 |
| SBL | 2 | 2880 | 10 | .00 | 160 | .06* |
| SBT | 1 | 1600 | 10 | .01 | 40 | .03 |
| SBR | 1 | 1600 | 30 | .02 | 250 | .16 |
| EBL | 1 | 1600 | 490 | .31* | 10 | .01 |
| EBT | 4 | 6400 | 2680 | .42 | 2690 | .42* |
| EBR | 1 | 1600 | 10 | .01 | 10 | .01 |
| WBL | 2 | 2880 | 390 | .14 | 540 | .19* |
| WBT | 4 | 6400 | 1960 | .31* | 3120 | .49 |
| WBR | 1 | 1600 | 140 | .09 | 10 | .01 |
| Right Turn Adjustment | | | | | SBR | .01* |
| Clearance Interval | | | | .10* | | .10* |
| Note: Assumes Right-Turn Overlap for NBR | | | | | | |
| **TOTAL CAPACITY UTILIZATION** | | | | **.76** | | **.79** |

**81. Commerce Ctr & Henry Mayo**

**SCVCTM 4.1 2011 with Stage 1 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 1 | 1600 | 10 | .01* | 190 | .12* |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 1 | 1600 | 20 | .01 | 60 | .04 |
| EBL | 1 | 1600 | 80 | .05* | 230 | .14* |
| EBT | 2 | 3200 | 20 | .01 | 160 | .05 |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 1 | 1600 | 20 | .01* | 20 | .01* |
| WBR | 1 | 1600 | 110 | .07 | 70 | .04 |
| Right Turn Adjustment | | | WBR | .05* | | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.22** | | **.37** |

**SCVCTM 4.1 2012 with Stage 2 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1600 | 20 | .01 | 10 | .01 |
| NBT | 3 | 4800 | 1020 | .21* | 260 | .06* |
| NBR | 0 | 0 | 10 | | 10 | |
| SBL | 2 | 2880 | 0 | .00 | 140 | .05* |
| SBT | 3 | 4800 | 60 | .02 | 320 | .08 |
| SBR | 0 | 0 | 20 | | 70 | |
| EBL | 1 | 1600 | 80 | .05* | 230 | .14* |
| EBT | 2 | 3200 | 20 | .01 | 60 | .02 |
| EBR | 1 | 1600 | 90 | .06 | 220 | .14 |
| WBL | 1.5 | | 0 | | 20 | |
| WBT | 0.5 | 3200 | 10 | .01* | 10 | .01* |
| WBR | 1 | 1600 | 20 | .01 | 40 | .03 |
| Clearance Interval | | | | .10* | | .10* |
| Note: Assumes E/W Split Phasing | | | | | | |
| **TOTAL CAPACITY UTILIZATION** | | | | **.37** | | **.36** |

**SCVCTM 4.1 2014 with Stage 3 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1600 | 20 | .01 | 10 | .01 |
| NBT | 3 | 4800 | 1320 | .28* | 270 | .06* |
| NBR | 0 | 0 | 20 | | 10 | |
| SBL | 2 | 2880 | 0 | .00 | 190 | .07* |
| SBT | 3 | 4800 | 90 | .02 | 520 | .12 |
| SBR | 0 | 0 | 20 | | 60 | |
| EBL | 1 | 1600 | 80 | .05* | 260 | .16* |
| EBT | 2 | 3200 | 30 | .01 | 50 | .02 |
| EBR | 1 | 1600 | 80 | .05 | 280 | .18 |
| WBL | 1.5 | | 10 | .01 | 40 | |
| WBT | 0.5 | 3200 | 20 | .01* | 10 | .02* |
| WBR | 1 | 1600 | 20 | .01 | 40 | .03 |
| Right Turn Adjustment | | | | | EBR | .01* |
| Clearance Interval | | | | .10* | | .10* |
| Note: Assumes E/W Split Phasing | | | | | | |
| **TOTAL CAPACITY UTILIZATION** | | | | **.44** | | **.42** |

**81. Commerce Ctr & Henry Mayo**

**SCVCTM 4.1 2018 with Stage 4 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1600 | 20 | .01 | 20 | .01* |
| NBT | 3 | 4800 | 1340 | .29* | 480 | .11 |
| NBR | 0 | 0 | 70 | | 40 | |
| SBL | 2 | 2880 | 10 | .00 | 140 | .05 |
| SBT | 3 | 4800 | 170 | .04 | 740 | .17* |
| SBR | 0 | 0 | 20 | | 60 | |
| EBL | 1 | 1600 | 130 | .08* | 260 | .16* |
| EBT | 2 | 3200 | 60 | .02 | 40 | .01 |
| EBR | 1 | 1600 | 80 | .05 | 210 | .13 |
| WBL | 1.5 | | 40 | | 100 | |
| WBT | 0.5 | 3200 | 10 | .02* | 10 | .03* |
| WBR | 1 | 1600 | 40 | .03 | 60 | .04 |
| Right Turn Adjustment | | | WBR | .01* | | |
| Clearance Interval | | | | .10* | | .10* |
| Note: Assumes E/W Split Phasing | | | | | | |

**TOTAL CAPACITY UTILIZATION** **.50** **.47**

**SCVCTM 4.1 2022 with Stage 5 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1600 | 20 | .01 | 20 | .01* |
| NBT | 3 | 4800 | 1440 | .32* | 660 | .15 |
| NBR | 0 | 0 | 110 | | 80 | |
| SBL | 2 | 2880 | 20 | .01* | 50 | .02 |
| SBT | 3 | 4800 | 230 | .05 | 890 | .20* |
| SBR | 0 | 0 | 20 | | 60 | |
| EBL | 1 | 1600 | 320 | .20* | 290 | .18* |
| EBT | 2 | 3200 | 120 | .04 | 60 | .02 |
| EBR | 1 | 1600 | 120 | .08 | 230 | .14 |
| WBL | 1.5 | | 60 | | 150 | |
| WBT | 0.5 | 3200 | 10 | .02* | 10 | .05* |
| WBR | 1 | 1600 | 50 | .03 | 110 | .07 |
| Clearance Interval | | | | .10* | | .10* |
| Note: Assumes E/W Split Phasing | | | | | | |

**TOTAL CAPACITY UTILIZATION** **.65** **.54**

**SCVCTM 4.1 2025 with Stage 6a Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1600 | 20 | .01 | 20 | .01 |
| NBT | 3 | 4800 | 1540 | .35* | 890 | .21* |
| NBR | 0 | 0 | 140 | | 110 | |
| SBL | 2 | 2880 | 20 | .01* | 60 | .02* |
| SBT | 3 | 4800 | 300 | .07 | 950 | .21 |
| SBR | 0 | 0 | 20 | | 50 | |
| EBL | 1 | 1600 | 400 | .25* | 300 | .19* |
| EBT | 2 | 3200 | 170 | .05 | 90 | .03 |
| EBR | 1 | 1600 | 200 | .13 | 320 | .20 |
| WBL | 1.5 | | 110 | | 220 | |
| WBT | 0.5 | 3200 | 10 | .04* | 10 | .07* |
| WBR | 1 | 1600 | 60 | .04 | 180 | .11 |
| Right Turn Adjustment | | | | | WBR | .02* |
| Clearance Interval | | | | .10* | | .10* |
| Note: Assumes E/W Split Phasing | | | | | | |

**TOTAL CAPACITY UTILIZATION** **.75** **.61**

**SCVCTM 4.1 2030 with 6b Imp./no Potrero Bridge**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1600 | 20 | .01 | 20 | .01 |
| NBT | 3 | 4800 | 1620 | .39* | 980 | .23* |
| NBR | 0 | 0 | 240 | | 140 | |
| SBL | 2 | 2880 | 70 | .02* | 70 | .02* |
| SBT | 3 | 4800 | 280 | .06 | 1040 | .23 |
| SBR | 0 | 0 | 20 | | 50 | |
| EBL | 1 | 1600 | 380 | .24* | 300 | .19* |
| EBT | 2 | 3200 | 250 | .08 | 140 | .04 |
| EBR | 1 | 1600 | 220 | .14 | 380 | .24 |
| WBL | 1.5 | | 90 | | 300 | |
| WBT | 0.5 | 3200 | 10 | .03* | 10 | .10* |
| WBR | 1 | 1600 | 80 | .05 | 270 | .17 |
| Right Turn Adjustment | | | | | Multi | .08* |
| Clearance Interval | | | | .10* | | .10* |
| Note: Assumes E/W Split Phasing | | | | | | |

**TOTAL CAPACITY UTILIZATION** **.78** **.72**

**82. Commerce Ctr & SR-126 EB Rmp**

**SCVCTM 4.1 2011 with Stage 1 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 3 | 4800 | 160 | .03* | 230 | .05 |
| NBR | f | | 30 | | 80 | |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 2 | 3200 | 40 | .01 | 250 | .08* |
| SBR | f | | 340 | | 1160 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 0 | 0 | 0 | | 0 | |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 0 | 0 | 0 | | 0 | |
| WBR | 0 | 0 | 0 | | 0 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.13** | | **.18** |

**SCVCTM 4.1 2012 with Stage 2 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 3 | 4800 | 1050 | .22* | 400 | .08 |
| NBR | f | | 70 | | 120 | |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 2 | 3200 | 90 | .03 | 520 | .16* |
| SBR | f | | 380 | | 1300 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 0 | 0 | 0 | | 0 | |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 0 | 0 | 0 | | 0 | |
| WBR | 0 | 0 | 0 | | 0 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.32** | | **.26** |

**SCVCTM 4.1 2014 with Stage 3 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 3 | 4800 | 1320 | .28* | 440 | .09 |
| NBR | f | | 90 | | 130 | |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 2 | 3200 | 120 | .04 | 780 | .24* |
| SBR | f | | 420 | | 1400 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 0 | 0 | 0 | | 0 | |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 0 | 0 | 0 | | 0 | |
| WBR | 0 | 0 | 0 | | 0 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.38** | | **.34** |

**82. Commerce Ctr & SR-126 EB Rmp**

**SCVCTM 4.1 2018 with Stage 4 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 3 | 4800 | 1310 | .27* | 540 | .11 |
| NBR | f | | 200 | | 250 | |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 2 | 3200 | 200 | .06 | 940 | .29* |
| SBR | f | | 420 | | 1430 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 0 | 0 | 0 | | 0 | |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 0 | 0 | 0 | | 0 | |
| WBR | 0 | 0 | 0 | | 0 | |
| Clearance Interval | | | | .10* | | .10* |

**TOTAL CAPACITY UTILIZATION** **.37** **.39**

**SCVCTM 4.1 2022 with Stage 5 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 3 | 4800 | 1520 | .32* | 740 | .15 |
| NBR | f | | 300 | | 320 | |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 2 | 3200 | 260 | .08 | 1000 | .31* |
| SBR | f | | 400 | | 1370 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 0 | 0 | 0 | | 0 | |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 0 | 0 | 0 | | 0 | |
| WBR | 0 | 0 | 0 | | 0 | |
| Clearance Interval | | | | .10* | | .10* |

**TOTAL CAPACITY UTILIZATION** **.42** **.41**

**SCVCTM 4.1 2025 with Stage 6a Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 3 | 4800 | 1690 | .35* | 950 | .20 |
| NBR | f | | 320 | | 420 | |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 2 | 3200 | 340 | .11 | 1060 | .33* |
| SBR | f | | 380 | | 1330 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 0 | 0 | 0 | | 0 | |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 0 | 0 | 0 | | 0 | |
| WBR | 0 | 0 | 0 | | 0 | |
| Clearance Interval | | | | .10* | | .10* |

**TOTAL CAPACITY UTILIZATION** **.45** **.43**

**SCVCTM 4.1 2030 with 6b Imp./no Potrero Bridge**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 3 | 4800 | 1760 | .37* | 1130 | .24 |
| NBR | f | | 330 | | 410 | |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 2 | 3200 | 370 | .12 | 1160 | .36* |
| SBR | f | | 330 | | 1400 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 0 | 0 | 0 | | 0 | |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 0 | 0 | 0 | | 0 | |
| WBR | 0 | 0 | 0 | | 0 | |
| Clearance Interval | | | | .10* | | .10* |

**TOTAL CAPACITY UTILIZATION** **.47** **.46**

**83. Commerce Ctr & SR-126 WB Rmps**

**SCVCTM 4.1 2011 with Stage 1 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 2 | 2880 | 90 | .03* | 50 | .02* |
| NBT | 3 | 4800 | 80 | .02 | 180 | .04 |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 3 | 4800 | 360 | .08* | 1360 | .28* |
| SBR | 1 | 1600 | 110 | .07 | 220 | .14 |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 0 | 0 | 0 | | 0 | |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 2 | 2880 | 20 | .01* | 40 | .01* |
| WBT | 0 | 0 | 0 | | 0 | |
| WBR | 2 | 3200 | 1270 | .40 | 460 | .14 |
| Right Turn Adjustment | | | WBR | .32* | | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.54** | | **.41** |

**SCVCTM 4.1 2012 with Stage 2 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 2 | 2880 | 290 | .10* | 140 | .05* |
| NBT | 3 | 4800 | 760 | .16 | 250 | .05 |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 3 | 4800 | 430 | .09* | 1710 | .36* |
| SBR | 1 | 1600 | 110 | .07 | 240 | .15 |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 0 | 0 | 0 | | 0 | |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 2 | 2880 | 40 | .01* | 110 | .04* |
| WBT | 0 | 0 | 0 | | 0 | |
| WBR | 2 | 3200 | 1280 | .40 | 510 | .16 |
| Right Turn Adjustment | | | WBR | .37* | | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.67** | | **.55** |

**SCVCTM 4.1 2014 with Stage 3 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 2 | 2880 | 270 | .09 | 120 | .04* |
| NBT | 3 | 4800 | 1050 | .22* | 320 | .07 |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 3 | 4800 | 490 | .10 | 2040 | .43* |
| SBR | 1 | 1600 | 120 | .08 | 270 | .17 |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 0 | 0 | 0 | | 0 | |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 2 | 2880 | 40 | .01* | 140 | .05* |
| WBT | 0 | 0 | 0 | | 0 | |
| WBR | 2 | 3200 | 1350 | .42 | 550 | .17 |
| Right Turn Adjustment | | | WBR | .41* | | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.74** | | **.62** |

**83. Commerce Ctr & SR-126 WB Rmps**

**SCVCTM 4.1 2018 with Stage 4 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 2 | 2880 | 170 | .06 | 160 | .06* |
| NBT | 3 | 4800 | 1150 | .24* | 380 | .08 |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 3 | 4800 | 520 | .11 | 2140 | .45* |
| SBR | 1 | 1600 | 120 | .08 | 320 | .20 |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 0 | 0 | 0 | | 0 | |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 2 | 2880 | 100 | .03* | 230 | .08* |
| WBT | 0 | 0 | 0 | | 0 | |
| WBR | 2 | 3200 | 1420 | .44 | 510 | .16 |
| Right Turn Adjustment | | | WBR | .41* | | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.78** | | **.69** |

**SCVCTM 4.1 2022 with Stage 5 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 2 | 2880 | 200 | .07 | 270 | .09* |
| NBT | 3 | 4800 | 1320 | .28* | 480 | .10 |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 3 | 4800 | 540 | .11 | 2080 | .43* |
| SBR | 1 | 1600 | 140 | .09 | 500 | .31 |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 0 | 0 | 0 | | 0 | |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 2 | 2880 | 110 | .04* | 290 | .10* |
| WBT | 0 | 0 | 0 | | 0 | |
| WBR | 2 | 3200 | 1350 | .42 | 540 | .17 |
| Right Turn Adjustment | | | WBR | .38* | | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.80** | | **.72** |

**SCVCTM 4.1 2025 with Stage 6a Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 2 | 2880 | 260 | .09 | 410 | .14* |
| NBT | 3 | 4800 | 1430 | .30* | 530 | .11 |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 3 | 4800 | 560 | .12 | 2060 | .43* |
| SBR | 1 | 1600 | 160 | .10 | 610 | .38 |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 0 | 0 | 0 | | 0 | |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 2 | 2880 | 150 | .05* | 320 | .11* |
| WBT | 0 | 0 | 0 | | 0 | |
| WBR | 2 | 3200 | 1300 | .41 | 510 | .16 |
| Right Turn Adjustment | | | WBR | .36* | | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.81** | | **.78** |

**SCVCTM 4.1 2030 with 6b Imp./no Potrero Bridge**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 2 | 2880 | 310 | .11 | 550 | .19* |
| NBT | 3 | 4800 | 1440 | .30* | 580 | .12 |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 3 | 4800 | 560 | .12 | 2220 | .46* |
| SBR | 1 | 1600 | 180 | .11 | 630 | .39 |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 0 | 0 | 0 | | 0 | |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 2 | 2880 | 140 | .05* | 340 | .12* |
| WBT | 0 | 0 | 0 | | 0 | |
| WBR | 2 | 3200 | 1280 | .40 | 520 | .16 |
| Right Turn Adjustment | | | WBR | .35* | | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.80** | | **.87** |

**96. Martinez/Potrero & SR-126**

**Existing Count**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 0 | 0 | 3 | | 7 | |
| SBT | 1 | 1600 | 0 | .00* | 0 | .01* |
| SBR | 0 | 0 | 2 | | 4 | |
| EBL | 1 | 1600 | 1 | .00 | 2 | .00 |
| EBT | 2 | 3200 | 592 | .19 | 1126 | .35* |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 2 | 3200 | 738 | .23* | 796 | .25 |
| WBR | 0 | 0 | 2 | | 4 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.33** | | **.46** |

**SCVCTM 4.1 2011 with Stage 1 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 0 | 0 | 10 | | 10 | |
| SBT | 1 | 1600 | 0 | .01* | 0 | .01* |
| SBR | 0 | 0 | 10 | | 10 | |
| EBL | 1 | 1600 | 10 | .01 | 0 | .00 |
| EBT | 2 | 3200 | 840 | .26* | 1010 | .32 |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 2 | 3200 | 680 | .22 | 1090 | .34* |
| WBR | 0 | 0 | 10 | | 0 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.37** | | **.45** |

**SCVCTM 4.1 2012 with Stage 2 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 0 | 0 | 10 | | 10 | |
| SBT | 1 | 1600 | 0 | .01* | 0 | .01* |
| SBR | 0 | 0 | 10 | | 10 | |
| EBL | 1 | 1600 | 10 | .01 | 0 | .00 |
| EBT | 2 | 3200 | 860 | .27* | 1020 | .32 |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 2 | 3200 | 710 | .23 | 1110 | .35* |
| WBR | 0 | 0 | 10 | | 0 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.38** | | **.46** |

**SCVCTM 4.1 2014 with Stage 3 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 0 | 0 | 10 | | 10 | |
| SBT | 1 | 1600 | 0 | .01* | 0 | .01* |
| SBR | 0 | 0 | 10 | | 10 | |
| EBL | 1 | 1600 | 10 | .01 | 0 | .00 |
| EBT | 2 | 3200 | 860 | .27* | 1020 | .32 |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 2 | 3200 | 700 | .22 | 1110 | .35* |
| WBR | 0 | 0 | 10 | | 0 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.38** | | **.46** |

**96. Martinez/Potrero & SR-126**

**SCVCTM 4.1 2018 with Stage 4 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 0 | 0 | 30 | | 20 | |
| SBT | 1 | 1600 | 0 | .03* | 0 | .02* |
| SBR | 0 | 0 | 10 | | 10 | |
| EBL | 1 | 1600 | 10 | .01 | 10 | .01* |
| EBT | 2 | 3200 | 890 | .28* | 1050 | .33 |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 2 | 3200 | 740 | .23 | 1140 | .37* |
| WBR | 0 | 0 | 10 | | 40 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.41** | | **.50** |

**SCVCTM 4.1 2022 with Stage 5 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 1 | 1600 | 70 | .04* | 40 | .03* |
| SBT | 1 | 1600 | 0 | .01 | 0 | .01 |
| SBR | 0 | 0 | 20 | | 10 | |
| EBL | 1 | 1600 | 10 | .01 | 10 | .01* |
| EBT | 2 | 3200 | 960 | .30* | 1130 | .35 |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 2 | 3200 | 810 | .25 | 1230 | .38* |
| WBR | 1 | 1600 | 30 | .02 | 70 | .04 |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.44** | | **.52** |

**SCVCTM 4.1 2025 with Stage 6a Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 1 | 1600 | 90 | .06* | 50 | .03* |
| SBT | 1 | 1600 | 0 | .02 | 0 | .01 |
| SBR | 0 | 0 | 30 | | 20 | |
| EBL | 1 | 1600 | 20 | .01 | 30 | .02* |
| EBT | 2 | 3200 | 1270 | .40* | 1330 | .42 |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 2 | 3200 | 900 | .28 | 1570 | .49* |
| WBR | 1 | 1600 | 40 | .03 | 120 | .08 |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.56** | | **.64** |

**SCVCTM 4.1 2030 with 6b Imp./no Potrero Bridge**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1600 | 10 | .01 | 10 | .01 |
| NBT | 1 | 1600 | 10 | .12* | 10 | .06* |
| NBR | 0 | 0 | 180 | | 90 | |
| SBL | 2 | 2880 | 130 | .05* | 70 | .02* |
| SBT | 1 | 1600 | 0 | .00 | 10 | .01 |
| SBR | 1 | 1600 | 30 | .02 | 20 | .01 |
| EBL | 1 | 1600 | 20 | .01 | 30 | .02* |
| EBT | 2 | 3200 | 1320 | .41* | 1350 | .42 |
| EBR | 1 | 1600 | 10 | .01 | 10 | .01 |
| WBL | 1 | 1600 | 30 | .02* | 180 | .11 |
| WBT | 2 | 3200 | 920 | .29 | 1670 | .52* |
| WBR | 1 | 1600 | 50 | .03 | 170 | .11 |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.70** | | **.72** |

**101. Long Cyn & Potrero Cyn**

**SCVCTM 4.1 2014 with Stage 3 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 2 | 2880 | 0 | .00 | 10 | .00 |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 0 | 0 | 0 | | 0 | |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 0 | 0 | 0 | | 0 | |
| WBR | f | | 20 | | 20 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.10** | | **.10** |

**101. Long Cyn & Potrero Cyn**

**SCVCTM 4.1 2018 with Stage 4 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 1 | 1600 | 0 | .00* | 0 | .00* |
| NBR | 1 | 1600 | 0 | .00 | 0 | .00 |
| SBL | 2 | 2880 | 70 | .02* | 280 | .10* |
| SBT | 1 | 1600 | 0 | .00 | 0 | .00 |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 0 | 0 | 0 | | 0 | |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 1 | 1600 | 0 | .00 | 0 | .00 |
| WBT | 0 | 0 | 0 | | 0 | |
| WBR | f | | 440 | | 170 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.12** | | **.20** |

**SCVCTM 4.1 2022 with Stage 5 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1600 | 0 | .00 | 0 | .00 |
| NBT | 1 | 1600 | 0 | .00* | 0 | .00 |
| NBR | 1 | 1600 | 0 | .00 | 0 | .00 |
| SBL | 2 | 2880 | 110 | .04* | 350 | .12 |
| SBT | 0.5 | 3200 | 0 | .00 | 0 | {.13}* |
| SBR | 1.5 | | 140 | | 590 | |
| EBL | 2 | 2880 | 440 | .15* | 400 | .14* |
| EBT | 3 | 4800 | 140 | .03 | 80 | .02 |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 1 | 1600 | 0 | .00 | 0 | .00 |
| WBT | 2 | 3200 | 60 | .02* | 140 | .04* |
| WBR | f | | 480 | | 240 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.31** | | **.41** |

**SCVCTM 4.1 2025 with Stage 6a Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1600 | 0 | .00 | 0 | .00 |
| NBT | 1 | 1600 | 0 | .00* | 0 | .00 |
| NBR | 1 | 1600 | 0 | .00 | 0 | .00 |
| SBL | 2 | 2880 | 140 | .05* | 450 | .16 |
| SBT | 0.5 | 3200 | 0 | .00 | 0 | {.23}* |
| SBR | 1.5 | | 240 | | 1000 | |
| EBL | 2 | 2880 | 860 | .30* | 620 | .22* |
| EBT | 3 | 4800 | 200 | .04 | 280 | .06 |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 1 | 1600 | 0 | .00 | 0 | .00 |
| WBT | 2 | 3200 | 60 | .02* | 310 | .10* |
| WBR | f | | 520 | | 320 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.47** | | **.65** |

**SCVCTM 4.1 2030 with 6b Imp./no Potrero Bridge**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1600 | 0 | .00 | 0 | .00 |
| NBT | 1 | 1600 | 0 | .00* | 0 | .00 |
| NBR | 1 | 1600 | 0 | .00 | 0 | .00 |
| SBL | 2 | 2880 | 240 | .08* | 470 | .16 |
| SBT | 0.5 | 3200 | 0 | .00 | 0 | {.26}* |
| SBR | 1.5 | | 320 | | 1160 | |
| EBL | 2 | 2880 | 900 | .31* | 780 | .27* |
| EBT | 3 | 4800 | 100 | .02 | 510 | .11 |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 1 | 1600 | 0 | .00 | 0 | .00 |
| WBT | 2 | 3200 | 40 | .01* | 560 | .18* |
| WBR | f | | 570 | | 450 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.50** | | **.81** |

**102. Newhall Ranch & Potrero Cyn**

**SCVCTM 4.1 2014 with Stage 3 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | f | | 20 | | 20 | |
| EBL | 2 | 2880 | 10 | .00 | 10 | .00 |
| EBT | 0 | 0 | 0 | | 0 | |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 0 | 0 | 0 | | 0 | |
| WBR | 0 | 0 | 0 | | 0 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.10** | | **.10** |

**102. Newhall Ranch & Potrero Cyn**

**SCVCTM 4.1 2018 with Stage 4 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 2 | 2880 | 0 | .00 | 0 | .00 |
| NBT | 2 | 3200 | 0 | .00* | 0 | .00* |
| NBR | 1 | 1600 | 0 | .00 | 0 | .00 |
| SBL | 2 | 2880 | 100 | .03* | 90 | .03* |
| SBT | 2 | 3200 | 0 | .00 | 0 | .00 |
| SBR | f | | 20 | | 20 | |
| EBL | 2 | 2880 | 0 | .00 | 10 | .00 |
| EBT | 2 | 3200 | 50 | .02 | 220 | .07* |
| EBR | 1 | 1600 | 0 | .00 | 0 | .00 |
| WBL | 1 | 1600 | 0 | .00 | 0 | .00 |
| WBT | 2 | 3200 | 340 | .11* | 120 | .04 |
| WBR | 1 | 1600 | 70 | .04 | 160 | .10 |
| Right Turn Adjustment | | | | | WBR | .01* |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.24** | | **.21** |

**SCVCTM 4.1 2022 with Stage 5 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 2 | 2880 | 0 | .00 | 0 | .00 |
| NBT | 2 | 3200 | 0 | .00* | 0 | .00* |
| NBR | 1 | 1600 | 0 | .00 | 0 | .00 |
| SBL | 2 | 2880 | 290 | .10* | 170 | .06* |
| SBT | 2 | 3200 | 0 | .00 | 0 | .00 |
| SBR | f | | 100 | | 180 | |
| EBL | 2 | 2880 | 70 | .02* | 140 | .05* |
| EBT | 2 | 3200 | 410 | .13 | 610 | .19 |
| EBR | 1 | 1600 | 0 | .00 | 0 | .00 |
| WBL | 1 | 1600 | 0 | .00 | 0 | .00 |
| WBT | 2 | 3200 | 450 | .14* | 620 | .19* |
| WBR | 1 | 1600 | 210 | .13 | 310 | .19 |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.36** | | **.40** |

**SCVCTM 4.1 2025 with Stage 6a Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 2 | 2880 | 0 | .00 | 0 | .00 |
| NBT | 2 | 3200 | 0 | .00* | 0 | .00* |
| NBR | 1 | 1600 | 0 | .00 | 0 | .00 |
| SBL | 2 | 2880 | 280 | .10* | 190 | .07* |
| SBT | 2 | 3200 | 0 | .00 | 0 | .00 |
| SBR | f | | 120 | | 280 | |
| EBL | 2 | 2880 | 130 | .05* | 230 | .08* |
| EBT | 2 | 3200 | 690 | .22 | 880 | .28 |
| EBR | 1 | 1600 | 0 | .00 | 0 | .00 |
| WBL | 1 | 1600 | 0 | .00 | 0 | .00 |
| WBT | 2 | 3200 | 580 | .18* | 830 | .26* |
| WBR | 1 | 1600 | 250 | .16 | 320 | .20 |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.43** | | **.51** |

**SCVCTM 4.1 2030 with 6b Imp./no Potrero Bridge**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 2 | 2880 | 40 | .01 | 30 | .01* |
| NBT | 2 | 3200 | 320 | .10* | 190 | .06 |
| NBR | 1 | 1600 | 350 | .22 | 340 | .21 |
| SBL | 2 | 2880 | 310 | .11* | 180 | .06 |
| SBT | 2 | 3200 | 80 | .03 | 340 | .11* |
| SBR | f | | 150 | | 420 | |
| EBL | 2 | 2880 | 220 | .08* | 280 | .10 |
| EBT | 2 | 3200 | 750 | .23 | 950 | .30* |
| EBR | 1 | 1600 | 20 | .01 | 80 | .05 |
| WBL | 1 | 1600 | 90 | .06 | 280 | .18* |
| WBT | 2 | 3200 | 690 | .22* | 990 | .31 |
| WBR | 1 | 1600 | 300 | .19 | 310 | .19 |
| Right Turn Adjustment | | | NBR | .07* | NBR | .01* |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.68** | | **.71** |

**103. Pico Cyn & Valencia**

**SCVCTM 4.1 2018 with Stage 4 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 2 | 2880 | 0 | .00 | 0 | .00 |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 1 | 1600 | 0 | .00 | 0 | .00 |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 2 | 3200 | 470 | .15 | 510 | .16 |
| EBR | 1 | 1600 | 0 | .00 | 0 | .00 |
| WBL | 1 | 1600 | 0 | .00 | 0 | .00 |
| WBT | 2 | 3200 | 500 | .16* | 610 | .19* |
| WBR | 0 | 0 | 0 | | 0 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.26** | | **.29** |

**SCVCTM 4.1 2022 with Stage 5 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 2 | 2880 | 150 | .05* | 380 | .13* |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 1 | 1600 | 20 | .01 | 20 | .01 |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 2 | 3200 | 1170 | .37* | 840 | .26 |
| EBR | 1 | 1600 | 140 | .09 | 270 | .17 |
| WBL | 1 | 1600 | 10 | .01* | 20 | .01 |
| WBT | 2 | 3200 | 660 | .21 | 1160 | .36* |
| WBR | 0 | 0 | 0 | | 0 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.53** | | **.59** |

**SCVCTM 4.1 2025 with Stage 6a Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 2 | 2880 | 230 | .08* | 600 | .21* |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 1 | 1600 | 20 | .01 | 10 | .01 |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 2 | 3200 | 1400 | .44* | 1050 | .33 |
| EBR | 1 | 1600 | 260 | .16 | 390 | .24 |
| WBL | 1 | 1600 | 10 | .01* | 20 | .01 |
| WBT | 2 | 3200 | 760 | .24 | 1370 | .43* |
| WBR | 0 | 0 | 0 | | 0 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.63** | | **.74** |

**SCVCTM 4.1 2030 with 6b Imp./no Potrero Bridge**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 2 | 2880 | 260 | .09* | 670 | .23* |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 1 | 1600 | 10 | .01 | 10 | .01 |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 2 | 3200 | 1460 | .46* | 1060 | .33 |
| EBR | 1 | 1600 | 380 | .24 | 560 | .35 |
| WBL | 1 | 1600 | 10 | .01* | 20 | .01 |
| WBT | 2 | 3200 | 870 | .27 | 1490 | .47* |
| WBR | 0 | 0 | 0 | | 0 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.66** | | **.80** |

**104. Poe & Valencia**

**SCVCTM 4.1 2012 with Stage 2 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1600 | 0 | .00 | 0 | .00 |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 1 | 1600 | 190 | .12 | 20 | .01 |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 2 | 3200 | 0 | .00* | 0 | .00* |
| EBR | 1 | 1600 | 0 | .00 | 0 | .00 |
| WBL | 1 | 1600 | 70 | .04* | 140 | .09* |
| WBT | 2 | 3200 | 0 | .00 | 0 | .00 |
| WBR | 0 | 0 | 0 | | 0 | |
| Right Turn Adjustment | | | NBR | .09* | | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.23** | | **.19** |

**SCVCTM 4.1 2014 with Stage 3 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1600 | 0 | .00 | 0 | .00 |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 1 | 1600 | 200 | .13 | 40 | .03 |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 2 | 3200 | 0 | .00* | 0 | .00* |
| EBR | 1 | 1600 | 0 | .00 | 0 | .00 |
| WBL | 1 | 1600 | 70 | .04* | 150 | .09* |
| WBT | 2 | 3200 | 0 | .00 | 0 | .00 |
| WBR | 0 | 0 | 0 | | 0 | |
| Right Turn Adjustment | | | NBR | .10* | | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.24** | | **.19** |

**104. Poe & Valencia**

**SCVCTM 4.1 2018 with Stage 4 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1600 | 190 | .12* | 150 | .09* |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 1 | 1600 | 140 | .09 | 40 | .03 |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 2 | 3200 | 380 | .12* | 300 | .09* |
| EBR | 1 | 1600 | 90 | .06 | 210 | .13 |
| WBL | 1 | 1600 | 60 | .04* | 80 | .05* |
| WBT | 2 | 3200 | 310 | .10 | 460 | .14 |
| WBR | 0 | 0 | 0 | | 0 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.38** | | **.33** |

**SCVCTM 4.1 2022 with Stage 5 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1600 | 160 | .10* | 140 | .09* |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 1 | 1600 | 160 | .10 | 60 | .04 |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 2 | 3200 | 1070 | .33* | 680 | .21 |
| EBR | 1 | 1600 | 120 | .08 | 180 | .11 |
| WBL | 1 | 1600 | 60 | .04* | 70 | .04 |
| WBT | 2 | 3200 | 500 | .16 | 1040 | .33* |
| WBR | 0 | 0 | 0 | | 0 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.57** | | **.52** |

**SCVCTM 4.1 2025 with Stage 6a Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1600 | 180 | .11* | 170 | .11* |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 1 | 1600 | 150 | .09 | 60 | .04 |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 2 | 3200 | 1280 | .40* | 840 | .26 |
| EBR | 1 | 1600 | 130 | .08 | 220 | .14 |
| WBL | 1 | 1600 | 50 | .03* | 80 | .05 |
| WBT | 2 | 3200 | 580 | .18 | 1220 | .38* |
| WBR | 0 | 0 | 0 | | 0 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.64** | | **.59** |

**SCVCTM 4.1 2030 with 6b Imp./no Potrero Bridge**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1600 | 210 | .13* | 180 | .11* |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 1 | 1600 | 150 | .09 | 70 | .04 |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 2 | 3200 | 1340 | .42* | 820 | .26 |
| EBR | 1 | 1600 | 130 | .08 | 250 | .16 |
| WBL | 1 | 1600 | 40 | .03* | 100 | .06 |
| WBT | 2 | 3200 | 670 | .21 | 1330 | .42* |
| WBR | 0 | 0 | 0 | | 0 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.68** | | **.63** |

**105. Westridge & Valencia**

**Existing Count**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1600 | 36 | .02 | 1 | .00 |
| NBT | 1 | 1600 | 1 | .00* | 3 | .00* |
| NBR | 1 | 1600 | 47 | .03 | 30 | .02 |
| SBL | 2 | 2880 | 335 | .12* | 100 | .03* |
| SBT | 1 | 1600 | 9 | .01 | 2 | .00 |
| SBR | 1 | 1600 | 26 | .02 | 0 | .00 |
| EBL | 1 | 1600 | 4 | .00 | 2 | .00 |
| EBT | 3 | 4800 | 985 | .21 | 209 | .04* |
| EBR | 0 | 0 | 15 | | 3 | |
| WBL | 1 | 1600 | 29 | .02 | 23 | .01* |
| WBT | 3 | 4800 | 1230 | .26* | 157 | .03 |
| WBR | 1 | 1600 | 61 | .04 | 120 | .08 |
| Right Turn Adjustment | | | | | Multi | .02* |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.48** | | **.20** |

**SCVCTM 4.1 2011 with Stage 1 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1600 | 0 | .00 | 0 | .00 |
| NBT | 1 | 1600 | 0 | .00 | 0 | .00 |
| NBR | 1 | 1600 | 0 | .00 | 0 | .00 |
| SBL | 2 | 2880 | 0 | .00 | 0 | .00 |
| SBT | 1 | 1600 | 0 | .00* | 0 | .00* |
| SBR | 1 | 1600 | 20 | .01 | 10 | .01 |
| EBL | 1 | 1600 | 20 | .01* | 10 | .01* |
| EBT | 3 | 4800 | 480 | .10 | 280 | .06 |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 1 | 1600 | 0 | .00 | 0 | .00 |
| WBT | 3 | 4800 | 940 | .20* | 220 | .05* |
| WBR | 1 | 1600 | 50 | .03 | 100 | .06 |
| Right Turn Adjustment | | | | | WBR | .01* |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.31** | | **.17** |

**SCVCTM 4.1 2012 with Stage 2 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1600 | 0 | .00 | 0 | .00 |
| NBT | 1 | 1600 | 0 | .00 | 0 | .00 |
| NBR | 1 | 1600 | 0 | .00 | 0 | .00 |
| SBL | 2 | 2880 | 10 | .00 | 10 | .00 |
| SBT | 1 | 1600 | 0 | .00* | 0 | .00* |
| SBR | 1 | 1600 | 60 | .04 | 50 | .03 |
| EBL | 1 | 1600 | 110 | .07* | 30 | .02* |
| EBT | 3 | 4800 | 510 | .11 | 280 | .06 |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 1 | 1600 | 0 | .00 | 0 | .00 |
| WBT | 3 | 4800 | 860 | .18* | 310 | .06* |
| WBR | 1 | 1600 | 360 | .23 | 140 | .09 |
| Right Turn Adjustment | | | WBR | .05* | Multi | .04* |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.40** | | **.22** |

**SCVCTM 4.1 2014 with Stage 3 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1600 | 0 | .00 | 0 | .00 |
| NBT | 1 | 1600 | 0 | .00* | 0 | .00 |
| NBR | 1 | 1600 | 0 | .00 | 0 | .00 |
| SBL | 2 | 2880 | 30 | .01* | 10 | .00 |
| SBT | 1 | 1600 | 0 | .00 | 0 | .00* |
| SBR | 1 | 1600 | 90 | .06 | 60 | .04 |
| EBL | 1 | 1600 | 130 | .08* | 40 | .03* |
| EBT | 3 | 4800 | 640 | .13 | 360 | .08 |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 1 | 1600 | 0 | .00 | 0 | .00 |
| WBT | 3 | 4800 | 840 | .18* | 450 | .09* |
| WBR | 1 | 1600 | 430 | .27 | 260 | .16 |
| Right Turn Adjustment | | | WBR | .08* | Multi | .09* |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.45** | | **.31** |

**105. Westridge & Valencia**

**SCVCTM 4.1 2018 with Stage 4 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1600 | 0 | .00 | 0 | .00 |
| NBT | 1 | 1600 | 0 | .00* | 0 | .00* |
| NBR | 1 | 1600 | 0 | .00 | 0 | .00 |
| SBL | 2 | 2880 | 80 | .03* | 30 | .01* |
| SBT | 1 | 1600 | 0 | .00 | 0 | .00 |
| SBR | 1 | 1600 | 80 | .05 | 50 | .03 |
| EBL | 1 | 1600 | 130 | .08* | 40 | .03* |
| EBT | 3 | 4800 | 1370 | .29 | 820 | .17 |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 1 | 1600 | 0 | .00 | 0 | .00 |
| WBT | 3 | 4800 | 1180 | .25* | 1260 | .26* |
| WBR | 1 | 1600 | 270 | .17 | 320 | .20 |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.46** | | **.40** |

**SCVCTM 4.1 2022 with Stage 5 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1600 | 0 | .00 | 0 | .00 |
| NBT | 1 | 1600 | 0 | .00* | 0 | .00* |
| NBR | 1 | 1600 | 0 | .00 | 0 | .00 |
| SBL | 2 | 2880 | 80 | .03* | 50 | .02* |
| SBT | 1 | 1600 | 0 | .00 | 0 | .00 |
| SBR | 1 | 1600 | 90 | .06 | 60 | .04 |
| EBL | 1 | 1600 | 130 | .08 | 40 | .03* |
| EBT | 3 | 4800 | 1990 | .41* | 1460 | .30 |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 1 | 1600 | 0 | .00 | 0 | .00 |
| WBT | 3 | 4800 | 1530 | .32 | 1880 | .39* |
| WBR | 1 | 1600 | 290 | .18 | 320 | .20 |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.54** | | **.54** |

**SCVCTM 4.1 2025 with Stage 6a Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1600 | 0 | .00 | 0 | .00 |
| NBT | 1 | 1600 | 0 | .00* | 0 | .00* |
| NBR | 1 | 1600 | 0 | .00 | 0 | .00 |
| SBL | 2 | 2880 | 60 | .02* | 100 | .03* |
| SBT | 1 | 1600 | 0 | .00 | 0 | .00 |
| SBR | 1 | 1600 | 90 | .06 | 70 | .04 |
| EBL | 1 | 1600 | 140 | .09 | 40 | .03* |
| EBT | 3 | 4800 | 2120 | .44* | 1580 | .33 |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 1 | 1600 | 0 | .00 | 0 | .00 |
| WBT | 3 | 4800 | 1560 | .33 | 2010 | .42* |
| WBR | 1 | 1600 | 320 | .20 | 310 | .19 |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.56** | | **.58** |

**SCVCTM 4.1 2030 with 6b Imp./no Potrero Bridge**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1600 | 0 | .00 | 0 | .00 |
| NBT | 1 | 1600 | 0 | .00* | 0 | .00* |
| NBR | 1 | 1600 | 0 | .00 | 0 | .00 |
| SBL | 2 | 2880 | 60 | .02* | 230 | .08* |
| SBT | 1 | 1600 | 0 | .00 | 0 | .00 |
| SBR | 1 | 1600 | 80 | .05 | 90 | .06 |
| EBL | 1 | 1600 | 140 | .09 | 50 | .03* |
| EBT | 3 | 4800 | 2130 | .44* | 1540 | .32 |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 1 | 1600 | 0 | .00 | 0 | .00 |
| WBT | 3 | 4800 | 1610 | .34 | 2070 | .43* |
| WBR | 1 | 1600 | 350 | .22 | 300 | .19 |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.56** | | **.64** |

**106. Commerce Center & Magic Mtn**

**SCVCTM 4.1 2011 with Stage 1 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 2 | 2880 | 0 | .00 | 0 | .00 |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 1 | 1600 | 0 | .00 | 0 | .00 |
| EBL | 2 | 2880 | 0 | .00 | 0 | .00 |
| EBT | 3 | 4800 | 420 | .09* | 650 | .14 |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 3 | 4800 | 360 | .08 | 670 | .14* |
| WBR | 1 | 1600 | 0 | .00 | 0 | .00 |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.19** | | **.24** |

**SCVCTM 4.1 2012 with Stage 2 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 2 | 2880 | 70 | .02* | 270 | .09* |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 1 | 1600 | 90 | .06 | 50 | .03 |
| EBL | 2 | 2880 | 240 | .08* | 20 | .01* |
| EBT | 3 | 4800 | 440 | .09 | 590 | .12 |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 3 | 4800 | 340 | .07* | 600 | .13* |
| WBR | 1 | 1600 | 810 | .51 | 100 | .06 |
| Right Turn Adjustment | | | WBR | .42* | | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.69** | | **.33** |

**SCVCTM 4.1 2014 with Stage 3 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 2 | 2880 | 80 | .03* | 460 | .16* |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 1 | 1600 | 100 | .06 | 80 | .05 |
| EBL | 2 | 2880 | 240 | .08 | 10 | .00 |
| EBT | 3 | 4800 | 850 | .18* | 790 | .16 |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 3 | 4800 | 460 | .10 | 990 | .21* |
| WBR | 1 | 1600 | 1040 | .65 | 140 | .09 |
| Right Turn Adjustment | | | WBR | .53* | | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.84** | | **.47** |

**106. Commerce Center & Magic Mtn**

**SCVCTM 4.1 2018 with Stage 4 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 2 | 2880 | 280 | .10* | 500 | .17* |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 1 | 1600 | 120 | .08 | 200 | .13 |
| EBL | 2 | 2880 | 240 | .08 | 40 | .01* |
| EBT | 3 | 4800 | 1260 | .26* | 1010 | .21 |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 3 | 4800 | 580 | .12 | 1330 | .28* |
| WBR | 1 | 1600 | 920 | .58 | 400 | .25 |
| Right Turn Adjustment | | | WBR | .32* | | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.78** | | **.56** |

**SCVCTM 4.1 2022 with Stage 5 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 2 | 2880 | 580 | .20* | 750 | .26* |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 1 | 1600 | 160 | .10 | 360 | .23 |
| EBL | 2 | 2880 | 400 | .14* | 110 | .04* |
| EBT | 3 | 4800 | 1230 | .26 | 1140 | .24 |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 3 | 4800 | 710 | .15* | 1280 | .27* |
| WBR | f | | 1110 | | 790 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.59** | | **.67** |

**SCVCTM 4.1 2025 with Stage 6a Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 2 | 2880 | 700 | .24* | 900 | .31* |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 1 | 1600 | 190 | .12 | 430 | .27 |
| EBL | 2 | 2880 | 490 | .17* | 130 | .05* |
| EBT | 3 | 4800 | 1200 | .25 | 1170 | .24 |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 3 | 4800 | 750 | .16* | 1240 | .26* |
| WBR | f | | 1280 | | 920 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.67** | | **.72** |

**SCVCTM 4.1 2030 with 6b Imp./no Potrero Bridge**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 2 | 2880 | 790 | .27* | 1010 | .35* |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 1 | 1600 | 190 | .12 | 520 | .33 |
| EBL | 2 | 2880 | 610 | .21* | 150 | .05* |
| EBT | 3 | 4800 | 1090 | .23 | 1220 | .25 |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 3 | 4800 | 760 | .16* | 1140 | .24* |
| WBR | f | | 1360 | | 1140 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.74** | | **.74** |

**107. Westridge & Magic Mtn**

**SCVCTM 4.1 2011 with Stage 1 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1.5 | | 80 | .03* | 110 | .03* |
| NBT | 0 | 4800 | 0 | | 0 | |
| NBR | 1.5 | | 10 | .01 | 10 | .01 |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 3 | 4800 | 400 | .08* | 640 | .13* |
| EBR | 1 | 1600 | 20 | .01 | 10 | .01 |
| WBL | 2 | 2880 | 0 | .00 | 10 | .00 |
| WBT | 3 | 4800 | 280 | .06 | 560 | .12 |
| WBR | 0 | 0 | 0 | | 0 | |
| Clearance Interval | | | | .10* | | .10* |

Note: Assumes Right-Turn Overlap for EBR

**TOTAL CAPACITY UTILIZATION** **.21** **.26**

**SCVCTM 4.1 2012 with Stage 2 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1.5 | | 540 | .17* | 180 | .06* |
| NBT | 0 | 4800 | 0 | | 0 | |
| NBR | 1.5 | | 10 | | 10 | .01 |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 3 | 4800 | 430 | .09 | 760 | .16* |
| EBR | 1 | 1600 | 80 | .05 | 100 | .06 |
| WBL | 2 | 2880 | 0 | .00 | 10 | .00 |
| WBT | 3 | 4800 | 610 | .13* | 530 | .11 |
| WBR | 0 | 0 | 0 | | 0 | |
| Clearance Interval | | | | .10* | | .10* |

Note: Assumes Right-Turn Overlap for EBR

**TOTAL CAPACITY UTILIZATION** **.40** **.32**

**SCVCTM 4.1 2014 with Stage 3 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1.5 | | 670 | .21* | 320 | .10* |
| NBT | 0 | 4800 | 0 | | 0 | |
| NBR | 1.5 | | 20 | .01 | 10 | |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 3 | 4800 | 800 | .17 | 1100 | .23* |
| EBR | 1 | 1600 | 140 | .09 | 150 | .09 |
| WBL | 2 | 2880 | 10 | .00 | 20 | .01* |
| WBT | 3 | 4800 | 830 | .17* | 800 | .17 |
| WBR | 0 | 0 | 0 | | 0 | |
| Clearance Interval | | | | .10* | | .10* |

Note: Assumes Right-Turn Overlap for EBR

**TOTAL CAPACITY UTILIZATION** **.48** **.44**

**107. Westridge & Magic Mtn**

**SCVCTM 4.1 2018 with Stage 4 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1.5 | | 500 | .16* | 340 | .11* |
| NBT | 0 | 4800 | 0 | | 0 | |
| NBR | 1.5 | | 100 | .06 | 40 | |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 3 | 4800 | 1380 | .29* | 1380 | .29* |
| EBR | 1 | 1600 | 160 | .10 | 130 | .08 |
| WBL | 2 | 2880 | 20 | .01* | 90 | .03* |
| WBT | 3 | 4800 | 990 | .21 | 1380 | .29 |
| WBR | 0 | 0 | 0 | | 0 | |
| Clearance Interval | | | | .10* | | .10* |

Note: Assumes Right-Turn Overlap for EBR

**TOTAL CAPACITY UTILIZATION** **.56** **.53**

**SCVCTM 4.1 2022 with Stage 5 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1.5 | | 570 | .18* | 370 | .12* |
| NBT | 0 | 4800 | 0 | | 0 | |
| NBR | 1.5 | | 180 | .11 | 100 | .06 |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 3 | 4800 | 1630 | .34* | 1700 | .35* |
| EBR | 1 | 1600 | 180 | .11 | 190 | .12 |
| WBL | 2 | 2880 | 30 | .01* | 180 | .06* |
| WBT | 3 | 4800 | 1250 | .26 | 1700 | .35 |
| WBR | 0 | 0 | 0 | | 0 | |
| Clearance Interval | | | | .10* | | .10* |

Note: Assumes Right-Turn Overlap for EBR

**TOTAL CAPACITY UTILIZATION** **.63** **.63**

**SCVCTM 4.1 2025 with Stage 6a Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1.5 | | 610 | .19* | 370 | .12* |
| NBT | 0 | 4800 | 0 | | 0 | |
| NBR | 1.5 | | 200 | .13 | 110 | .07 |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 3 | 4800 | 1740 | .36* | 1810 | .38* |
| EBR | 1 | 1600 | 160 | .10 | 260 | .16 |
| WBL | 2 | 2880 | 30 | .01* | 200 | .07* |
| WBT | 3 | 4800 | 1420 | .30 | 1790 | .37 |
| WBR | 0 | 0 | 0 | | 0 | |
| Clearance Interval | | | | .10* | | .10* |

Note: Assumes Right-Turn Overlap for EBR

**TOTAL CAPACITY UTILIZATION** **.66** **.67**

**SCVCTM 4.1 2030 with 6b Imp./no Potrero Bridge**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1.5 | | 650 | .20* | 380 | .12* |
| NBT | 0 | 4800 | 0 | | 0 | |
| NBR | 1.5 | | 210 | .13 | 120 | .08 |
| SBL | 0 | 0 | 0 | | 0 | |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 0 | 0 | 0 | | 0 | |
| EBL | 0 | 0 | 0 | | 0 | |
| EBT | 3 | 4800 | 1730 | .36* | 1800 | .38* |
| EBR | 1 | 1600 | 150 | .09 | 430 | .27 |
| WBL | 2 | 2880 | 30 | .01* | 210 | .07* |
| WBT | 3 | 4800 | 1460 | .30 | 1910 | .40 |
| WBR | 0 | 0 | 0 | | 0 | |
| Clearance Interval | | | | .10* | | .10* |

Note: Assumes Right-Turn Overlap for EBR

**TOTAL CAPACITY UTILIZATION** **.67** **.67**

**110. Chiquito Cyn & SR-126**

**Existing Count**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 1 | 1600 | 0 | .00* | 0 | .00* |
| NBR | 0 | 0 | 1 | | 0 | |
| SBL | 1 | 1600 | 72 | .05* | 31 | .02* |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 1 | 1600 | 12 | .01 | 14 | .01 |
| EBL | 1 | 1600 | 4 | .00 | 21 | .01 |
| EBT | 2 | 3200 | 592 | .19 | 1035 | .32* |
| EBR | 0 | 0 | 1 | | 1 | |
| WBL | 0 | 0 | 0 | | 1 | |
| WBT | 2 | 3200 | 737 | .23* | 770 | .24 |
| WBR | 1 | 1600 | 25 | .02 | 52 | .03 |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.38** | | **.44** |

**SCVCTM 4.1 2011 with Stage 1 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1600 | 30 | .02* | 70 | .04* |
| NBT | 2 | 3200 | 20 | .01 | 80 | .03 |
| NBR | 2 | 3200 | 270 | .08 | 480 | .15 |
| SBL | 2 | 2880 | 70 | .02 | 50 | .02 |
| SBT | 2 | 3200 | 60 | .03* | 40 | .02* |
| SBR | 0 | 0 | 30 | | 20 | |
| EBL | 1 | 1600 | 20 | .01 | 30 | .02 |
| EBT | 2 | 3200 | 780 | .24* | 940 | .29* |
| EBR | 1 | 1600 | 80 | .05 | 50 | .03 |
| WBL | 2 | 2880 | 500 | .17* | 280 | .10* |
| WBT | 2 | 3200 | 680 | .21 | 1000 | .31 |
| WBR | 1 | 1600 | 20 | .01 | 90 | .06 |
| Right Turn Adjustment | | | | | NBR | .03* |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.56** | | **.58** |

**SCVCTM 4.1 2012 with Stage 2 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1600 | 30 | .02* | 70 | .04* |
| NBT | 2 | 3200 | 20 | .01 | 80 | .03 |
| NBR | 2 | 3200 | 270 | .08 | 490 | .15 |
| SBL | 2 | 2880 | 70 | .02 | 50 | .02 |
| SBT | 2 | 3200 | 60 | .03* | 40 | .02* |
| SBR | 0 | 0 | 30 | | 20 | |
| EBL | 1 | 1600 | 20 | .01 | 40 | .03 |
| EBT | 2 | 3200 | 800 | .25* | 940 | .29* |
| EBR | 1 | 1600 | 80 | .05 | 40 | .03 |
| WBL | 2 | 2880 | 510 | .18* | 290 | .10* |
| WBT | 2 | 3200 | 720 | .23 | 1030 | .32 |
| WBR | 1 | 1600 | 20 | .01 | 90 | .06 |
| Right Turn Adjustment | | | | | NBR | .03* |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.58** | | **.58** |

**SCVCTM 4.1 2014 with Stage 3 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1600 | 40 | .03* | 80 | .05* |
| NBT | 2 | 3200 | 30 | .01 | 70 | .02 |
| NBR | 2 | 3200 | 350 | .11 | 490 | .15 |
| SBL | 2 | 2880 | 70 | .02 | 50 | .02 |
| SBT | 2 | 3200 | 50 | .03* | 40 | .02* |
| SBR | 0 | 0 | 30 | | 20 | |
| EBL | 1 | 1600 | 20 | .01 | 30 | .02 |
| EBT | 2 | 3200 | 800 | .25* | 940 | .29* |
| EBR | 1 | 1600 | 70 | .04 | 50 | .03 |
| WBL | 2 | 2880 | 480 | .17* | 280 | .10* |
| WBT | 2 | 3200 | 700 | .22 | 1020 | .32 |
| WBR | 1 | 1600 | 20 | .01 | 90 | .06 |
| Right Turn Adjustment | | | | | NBR | .02* |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.58** | | **.58** |

**110. Chiquito Cyn & SR-126**

**SCVCTM 4.1 2018 with Stage 4 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 1 | 1600 | 140 | .09* | 110 | .07* |
| NBT | 2 | 3200 | 40 | .01 | 80 | .03 |
| NBR | 2 | 3200 | 560 | .18 | 390 | .12 |
| SBL | 2 | 2880 | 80 | .03 | 50 | .02 |
| SBT | 2 | 3200 | 60 | .03* | 70 | .03* |
| SBR | 0 | 0 | 30 | | 20 | |
| EBL | 1 | 1600 | 20 | .01 | 30 | .02 |
| EBT | 2 | 3200 | 820 | .26* | 910 | .28* |
| EBR | 1 | 1600 | 100 | .06 | 130 | .08 |
| WBL | 2 | 2880 | 260 | .09* | 320 | .11* |
| WBT | 2 | 3200 | 660 | .21 | 1060 | .33 |
| WBR | 1 | 1600 | 20 | .01 | 100 | .06 |
| Right Turn Adjustment | | | NBR | .02* | | |
| Clearance Interval | | | | .10* | | .10* |

**TOTAL CAPACITY UTILIZATION** **.59** **.59**

**SCVCTM 4.1 2022 with Stage 5 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 2 | 2880 | 190 | .07 | 170 | .06 |
| NBT | 2 | 3200 | 80 | .03* | 180 | .06* |
| NBR | 2 | 3200 | 1190 | .37 | 560 | .18 |
| SBL | 2 | 2880 | 220 | .08* | 120 | .04* |
| SBT | 3 | 4800 | 130 | .03 | 160 | .03 |
| SBR | 1 | 1600 | 30 | .02 | 20 | .01 |
| EBL | 2 | 2880 | 20 | .01 | 40 | .01 |
| EBT | 4 | 6400 | 880 | .14* | 930 | .15* |
| EBR | 1 | 1600 | 160 | .10 | 200 | .13 |
| WBL | 2 | 2880 | 330 | .11* | 800 | .28* |
| WBT | 3 | 4800 | 700 | .15 | 1110 | .23 |
| WBR | 1 | 1600 | 60 | .04 | 240 | .15 |
| Right Turn Adjustment | | | NBR | .23* | | |
| Clearance Interval | | | | .10* | | .10* |
| Note: Assumes Right-Turn Overlap for NBR | | | | | | |

**TOTAL CAPACITY UTILIZATION** **.69** **.63**

**SCVCTM 4.1 2025 with Stage 6a Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 2 | 2880 | 220 | .08 | 280 | .10 |
| NBT | 2 | 3200 | 320 | .10* | 340 | .11* |
| NBR | 2 | 3200 | 1420 | .44 | 640 | .20 |
| SBL | 2 | 2880 | 460 | .16* | 520 | .18* |
| SBT | 3 | 4800 | 250 | .05 | 420 | .09 |
| SBR | 1 | 1600 | 40 | .03 | 60 | .04 |
| EBL | 2 | 2880 | 60 | .02 | 50 | .02 |
| EBT | 4 | 6400 | 1100 | .17* | 1030 | .16* |
| EBR | 1 | 1600 | 250 | .16 | 280 | .18 |
| WBL | 2 | 2880 | 390 | .14* | 1000 | .35* |
| WBT | 3 | 4800 | 760 | .16 | 1350 | .28 |
| WBR | 1 | 1600 | 430 | .27 | 560 | .35 |
| Right Turn Adjustment | | | NBR | .20* | | |
| Clearance Interval | | | | .10* | | .10* |
| Note: Assumes Right-Turn Overlap for NBR | | | | | | |

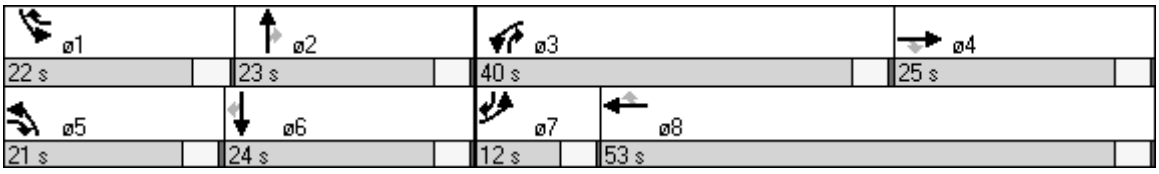
**TOTAL CAPACITY UTILIZATION** **.87** **.90**

**SCVCTM 4.1 2030 with 6b Imp./no Potrero Bridge**
(See HCM delay worksheets on following pages)

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Volume (vph) | 120 | 1250 | 330 | 440 | 790 | 780 | 260 | 560 | 1640 | 510 | 290 | 50 |
| Turn Type | Prot | | pm+ov | Prot | | pm+ov | Prot | | pm+ov | Prot | | pm+ov |
| Protected Phases | 7 | 4 | 5 | 3 | 8 | 1 | 5 | 2 | 3 | 1 | 6 | 7 |
| Permitted Phases | | | 4 | | | 8 | | | 2 | | | 6 |
| Detector Phases | 7 | 4 | 5 | 3 | 8 | 1 | 5 | 2 | 3 | 1 | 6 | 7 |
| Minimum Initial (s) | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Minimum Split (s) | 8.0 | 20.0 | 8.0 | 8.0 | 20.0 | 8.0 | 8.0 | 20.0 | 8.0 | 8.0 | 20.0 | 8.0 |
| Total Split (s) | 12.0 | 25.0 | 21.0 | 40.0 | 53.0 | 22.0 | 21.0 | 23.0 | 40.0 | 22.0 | 24.0 | 12.0 |
| Total Split (%) | 10.9% | 22.7% | 19.1% | 36.4% | 48.2% | 20.0% | 19.1% | 20.9% | 36.4% | 20.0% | 21.8% | 10.9% |
| Yellow Time (s) | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 |
| All-Red Time (s) | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| Lead/Lag | Lead | Lag | Lead | Lead | Lag | Lead | Lead | Lag | Lead | Lead | Lag | Lead |
| Lead-Lag Optimize? | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Recall Mode | None | None | None | None | None | None | None | Max | None | None | Max | None |
| Act Effct Green (s) | 7.7 | 21.0 | 38.7 | 36.0 | 49.3 | 71.3 | 13.7 | 19.0 | 59.0 | 18.0 | 23.3 | 35.0 |
| Actuated g/C Ratio | 0.07 | 0.19 | 0.35 | 0.33 | 0.45 | 0.65 | 0.12 | 0.17 | 0.54 | 0.16 | 0.21 | 0.32 |
| v/c Ratio | 0.50 | 1.02 | 0.50 | 0.39 | 0.35 | 0.75 | 0.61 | 0.92 | 1.09 | 0.91 | 0.27 | 0.09 |
| Control Delay | 56.6 | 75.6 | 15.5 | 29.8 | 20.5 | 18.1 | 51.5 | 66.1 | 79.1 | 66.7 | 37.7 | 8.5 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 56.6 | 75.6 | 15.5 | 29.8 | 20.5 | 18.1 | 51.5 | 66.1 | 79.1 | 66.7 | 37.7 | 8.5 |
| LOS | E | E | B | C | C | B | D | E | E | E | D | A |
| Approach Delay | | 62.6 | | | 21.6 | | | 73.2 | | | 53.4 | |
| Approach LOS | | E | | | C | | | E | | | D | |

| Intersection Summary | |
|---|---|
| Cycle Length: 110 | |
| Actuated Cycle Length: 110 | |
| Natural Cycle: 110 | |
| Control Type: Actuated-Uncoordinated | |
| Maximum v/c Ratio: 1.09 | |
| Intersection Signal Delay: 53.5 | Intersection LOS: D |
| Analysis Period (min) 15 | |

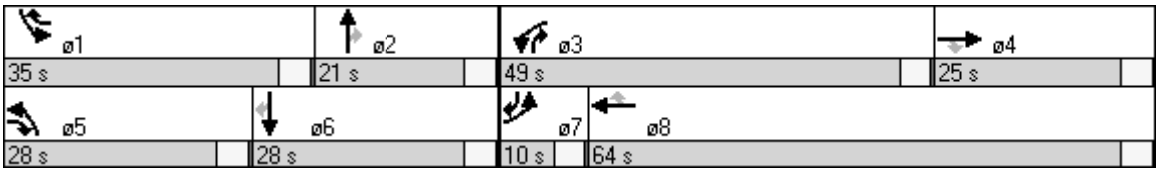
Splits and Phases: 3: SR-126 & Chiquito Canyon



| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Volume (vph) | 70 | 1080 | 360 | 1220 | 1530 | 620 | 400 | 380 | 740 | 820 | 620 | 110 |
| Turn Type | Prot | | pm+ov | Prot | | pm+ov | Prot | | pm+ov | Prot | | pm+ov |
| Protected Phases | 7 | 4 | 5 | 3 | 8 | 1 | 5 | 2 | 3 | 1 | 6 | 7 |
| Permitted Phases | | | 4 | | | 8 | | | 2 | | | 6 |
| Detector Phases | 7 | 4 | 5 | 3 | 8 | 1 | 5 | 2 | 3 | 1 | 6 | 7 |
| Minimum Initial (s) | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Minimum Split (s) | 8.0 | 20.0 | 8.0 | 8.0 | 20.0 | 8.0 | 8.0 | 20.0 | 8.0 | 8.0 | 20.0 | 8.0 |
| Total Split (s) | 10.0 | 25.0 | 28.0 | 49.0 | 64.0 | 35.0 | 28.0 | 21.0 | 49.0 | 35.0 | 28.0 | 10.0 |
| Total Split (%) | 7.7% | 19.2% | 21.5% | 37.7% | 49.2% | 26.9% | 21.5% | 16.2% | 37.7% | 26.9% | 21.5% | 7.7% |
| Yellow Time (s) | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 |
| All-Red Time (s) | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| Lead/Lag | Lead | Lag | Lead | Lead | Lag | Lead | Lead | Lag | Lead | Lead | Lag | Lead |
| Lead-Lag Optimize? | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Recall Mode | None | None | None | None | None | None | None | Max | None | None | Max | None |
| Act Effct Green (s) | 6.0 | 21.0 | 45.6 | 45.0 | 60.0 | 95.0 | 20.6 | 17.0 | 66.0 | 31.0 | 27.4 | 37.4 |
| Actuated g/C Ratio | 0.05 | 0.16 | 0.35 | 0.35 | 0.46 | 0.73 | 0.16 | 0.13 | 0.51 | 0.24 | 0.21 | 0.29 |
| v/c Ratio | 0.44 | 1.04 | 0.64 | 1.03 | 0.65 | 0.53 | 0.74 | 0.82 | 0.52 | 1.00 | 0.58 | 0.23 |
| Control Delay | 69.5 | 92.3 | 40.0 | 75.0 | 28.6 | 8.8 | 60.4 | 70.3 | 22.7 | 81.1 | 49.2 | 29.4 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 69.5 | 92.3 | 40.0 | 75.0 | 28.6 | 8.8 | 60.4 | 70.3 | 22.7 | 81.1 | 49.2 | 29.4 |
| LOS | E | F | D | E | C | A | E | E | C | F | D | C |
| Approach Delay | | 78.8 | | | 41.8 | | | 44.5 | | | 64.7 | |
| Approach LOS | | E | | | D | | | D | | | E | |

| Intersection Summary | |
|---|---|
| Cycle Length: 130 | |
| Actuated Cycle Length: 130 | |
| Natural Cycle: 130 | |
| Control Type: Actuated-Uncoordinated | |
| Maximum v/c Ratio: 1.04 | |
| Intersection Signal Delay: 53.8 | Intersection LOS: D |
| Analysis Period (min) 15 | |

Splits and Phases: 3: SR-126 & Chiquito Canyon



**118. Six Flags & Magic Mtn**

**SCVCTM 4.1 2011 with Stage 1 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 3 | 4320 | 390 | .09* | 1200 | .28* |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 1 | 1600 | 10 | .01 | 50 | .03 |
| EBL | 2 | 2880 | 20 | .01 | 40 | .01 |
| EBT | 4 | 6400 | 380 | .06* | 590 | .09* |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 4 | 6400 | 270 | .04 | 520 | .08 |
| WBR | f | | 620 | | 780 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.25** | | **.47** |

**SCVCTM 4.1 2012 with Stage 2 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 3 | 4320 | 370 | .09* | 1140 | .26* |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 1 | 1600 | 40 | .03 | 110 | .07 |
| EBL | 2 | 2880 | 50 | .02* | 90 | .03 |
| EBT | 4 | 6400 | 380 | .06 | 630 | .10* |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 4 | 6400 | 540 | .08* | 410 | .06 |
| WBR | f | | 600 | | 730 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.29** | | **.46** |

**SCVCTM 4.1 2014 with Stage 3 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 3 | 4320 | 370 | .09* | 1110 | .26* |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 1 | 1600 | 40 | .03 | 140 | .09 |
| EBL | 2 | 2880 | 70 | .02* | 100 | .03 |
| EBT | 4 | 6400 | 720 | .11 | 890 | .14* |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 4 | 6400 | 690 | .11* | 640 | .10 |
| WBR | f | | 580 | | 700 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.32** | | **.50** |

**118. Six Flags & Magic Mtn**

**SCVCTM 4.1 2018 with Stage 4 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 3 | 4320 | 360 | .08* | 1060 | .25* |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 1 | 1600 | 50 | .03 | 200 | .13 |
| EBL | 2 | 2880 | 100 | .03 | 140 | .05* |
| EBT | 4 | 6400 | 1350 | .21* | 1140 | .18 |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 4 | 6400 | 800 | .13 | 1200 | .19* |
| WBR | f | | 560 | | 660 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.39** | | **.59** |

**SCVCTM 4.1 2022 with Stage 5 Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 3 | 4320 | 330 | .08* | 1000 | .23* |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 1 | 1600 | 80 | .05 | 260 | .16 |
| EBL | 2 | 2880 | 130 | .05 | 180 | .06* |
| EBT | 4 | 6400 | 1640 | .26* | 1590 | .25 |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 4 | 6400 | 1080 | .17 | 1640 | .26* |
| WBR | f | | 530 | | 640 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.44** | | **.65** |

**SCVCTM 4.1 2025 with Stage 6a Improvements**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 3 | 4320 | 320 | .07* | 980 | .23* |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 1 | 1600 | 90 | .06 | 280 | .18 |
| EBL | 2 | 2880 | 150 | .05 | 180 | .06* |
| EBT | 4 | 6400 | 1750 | .27* | 1810 | .28 |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 4 | 6400 | 1270 | .20 | 1810 | .28* |
| WBR | f | | 510 | | 620 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.44** | | **.67** |

**SCVCTM 4.1 2030 with 6b Imp./no Potrero Bridge**

| | LANES | CAPACITY | AM PK HOUR VOL | AM PK HOUR V/C | PM PK HOUR VOL | PM PK HOUR V/C |
|---|---|---|---|---|---|---|
| NBL | 0 | 0 | 0 | | 0 | |
| NBT | 0 | 0 | 0 | | 0 | |
| NBR | 0 | 0 | 0 | | 0 | |
| SBL | 3 | 4320 | 360 | .08* | 1180 | .27* |
| SBT | 0 | 0 | 0 | | 0 | |
| SBR | 1 | 1600 | 100 | .06 | 330 | .21 |
| EBL | 2 | 2880 | 160 | .06 | 220 | .08* |
| EBT | 4 | 6400 | 1740 | .27* | 1760 | .28 |
| EBR | 0 | 0 | 0 | | 0 | |
| WBL | 0 | 0 | 0 | | 0 | |
| WBT | 4 | 6400 | 1290 | .20 | 1880 | .29* |
| WBR | f | | 560 | | 810 | |
| Clearance Interval | | | | .10* | | .10* |
| **TOTAL CAPACITY UTILIZATION** | | | | **.45** | | **.74** |

# APPENDIX C

# I-5 FREEWAY MAINLINE V/C CALCULATIONS

## V/C Calculations
## AM Peak Hour - Northbound

| | Total | Mixed-Flow Lanes | | | | HOV Lanes | | | | Truck Lanes | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Location** | **Vol** | **Lanes** | **Cap/Ln** | **Vol** | **V/C** | **Lanes** | **Cap/Ln** | **Vol** | **V/C** | **Lanes** | **Cap/Ln** | **Vol** | **V/C** |
| **2006** | | | | | | | | | | | | | |
| 403. I-5 s/o Parker | 1,570 | 4 | 1,800 | 1,570 | 0.22 | - | - | - | - | - | - | - | - |
| 404. I-5 s/o Hasley | 2,170 | 4 | 1,950 | 2,170 | 0.28 | - | - | - | - | - | - | - | - |
| 405. I-5 s/o SR-126 | 3,340 | 4 | 1,950 | 3,340 | 0.43 | - | - | - | - | - | - | - | - |
| 406. I-5 s/o Rye Cyn | 3,340 | 4 | 1,950 | 3,340 | 0.43 | - | - | - | - | - | - | - | - |
| 407. I-5 s/o Magic Mtn | 4,490 | 4 | 1,950 | 4,490 | 0.58 | - | - | - | - | - | - | - | - |
| 408. I-5 s/o Valencia | 5,430 | 4 | 1,950 | 5,430 | 0.70 | - | - | - | - | - | - | - | - |
| 409. I-5 s/o McBean | 5,560 | 4 | 1,950 | 5,560 | 0.71 | - | - | - | - | - | - | - | - |
| 410. I-5 s/o Lyons | 5,620 | 4 | 1,950 | 5,620 | 0.72 | - | - | - | - | - | - | - | - |
| 411. I-5 s/o Calgrove | 5,600 | 4 | 1,900 | 5,600 | 0.74 | - | - | - | - | - | - | - | - |
| 412. I-5 s/o SR-14 | 7,390 | 6 | 2,000 | 6,651 | 0.55 | - | - | - | - | 2 | 1,300 | 739 | 0.28 |
| **2011** | | | | | | | | | | | | | |
| 403. I-5 s/o Parker | 2,989 | 4 | 1,800 | 2,989 | 0.42 | - | - | - | - | - | - | - | - |
| 404. I-5 s/o Hasley | 4,688 | 4 | 1,950 | 4,688 | 0.60 | - | - | - | - | - | - | - | - |
| 405. I-5 s/o SR-126 | 5,934 | 4 | 1,950 | 5,934 | 0.76 | - | - | - | - | - | - | - | - |
| 406. I-5 s/o Rye Cyn | 5,934 | 4 | 1,950 | 5,934 | 0.76 | - | - | - | - | - | - | - | - |
| 407. I-5 s/o Magic Mtn | 6,248 | 4 | 1,950 | 6,248 | 0.80 | - | - | - | - | - | - | - | - |
| 408. I-5 s/o Valencia | 6,865 | 4 | 1,950 | 6,865 | 0.88 | - | - | - | - | - | - | - | - |
| 409. I-5 s/o McBean | 6,619 | 4 | 1,950 | 6,619 | 0.85 | - | - | - | - | - | - | - | - |
| 410. I-5 s/o Lyons | 6,272 | 4 | 1,950 | 6,272 | 0.80 | - | - | - | - | - | - | - | - |
| 411. I-5 s/o Calgrove | 5,953 | 4 | 1,900 | 5,358 | 0.70 | 1 | 2,000 | 595 | 0.30 | - | - | - | - |
| 412. I-5 s/o SR-14 | 8,006 | 6 | 2,000 | 6,325 | 0.53 | 1 | 2,000 | 801 | 0.40 | 2 | 1,300 | 881 | 0.34 |
| **2012** | | | | | | | | | | | | | |
| 403. I-5 s/o Parker | 3,000 | 4 | 1,800 | 3,000 | 0.42 | - | - | - | - | - | - | - | - |
| 404. I-5 s/o Hasley | 4,558 | 4 | 1,950 | 4,558 | 0.58 | - | - | - | - | - | - | - | - |
| 405. I-5 s/o SR-126 | 5,452 | 4 | 1,950 | 5,452 | 0.70 | - | - | - | - | - | - | - | - |
| 406. I-5 s/o Rye Cyn | 5,452 | 4 | 1,950 | 5,452 | 0.70 | - | - | - | - | - | - | - | - |
| 407. I-5 s/o Magic Mtn | 6,088 | 4 | 1,950 | 6,088 | 0.78 | - | - | - | - | - | - | - | - |
| 408. I-5 s/o Valencia | 6,803 | 4 | 1,950 | 6,803 | 0.87 | - | - | - | - | - | - | - | - |
| 409. I-5 s/o McBean | 6,757 | 4 | 1,950 | 6,757 | 0.87 | - | - | - | - | - | - | - | - |
| 410. I-5 s/o Lyons | 6,402 | 4 | 1,950 | 6,402 | 0.82 | - | - | - | - | - | - | - | - |
| 411. I-5 s/o Calgrove | 6,023 | 4 | 1,900 | 5,421 | 0.71 | 1 | 2,000 | 602 | 0.30 | - | - | - | - |
| 412. I-5 s/o SR-14 | 8,006 | 6 | 2,000 | 6,325 | 0.53 | 1 | 2,000 | 801 | 0.40 | 2 | 1,300 | 881 | 0.34 |
| **2014** | | | | | | | | | | | | | |
| 403. I-5 s/o Parker | 3,043 | 4 | 1,800 | 3,043 | 0.42 | - | - | - | - | - | - | - | - |
| 404. I-5 s/o Hasley | 4,669 | 4 | 1,950 | 4,669 | 0.60 | - | - | - | - | - | - | - | - |
| 405. I-5 s/o SR-126 | 5,552 | 4 | 1,950 | 5,552 | 0.71 | - | - | - | - | - | - | - | - |
| 406. I-5 s/o Rye Cyn | 5,552 | 4 | 1,950 | 5,552 | 0.71 | - | - | - | - | - | - | - | - |
| 407. I-5 s/o Magic Mtn | 6,174 | 4 | 1,950 | 6,174 | 0.79 | - | - | - | - | - | - | - | - |
| 408. I-5 s/o Valencia | 6,866 | 4 | 1,950 | 6,866 | 0.88 | - | - | - | - | - | - | - | - |
| 409. I-5 s/o McBean | 6,803 | 4 | 1,950 | 6,803 | 0.87 | - | - | - | - | - | - | - | - |
| 410. I-5 s/o Lyons | 6,451 | 4 | 1,950 | 6,451 | 0.83 | - | - | - | - | - | - | - | - |
| 411. I-5 s/o Calgrove | 6,073 | 4 | 1,900 | 5,466 | 0.72 | 1 | 2,000 | 607 | 0.30 | - | - | - | - |
| 412. I-5 s/o SR-14 | 8,093 | 6 | 2,000 | 6,393 | 0.53 | 1 | 2,000 | 809 | 0.40 | 2 | 1,300 | 890 | 0.34 |

## V/C Calculations
## AM Peak Hour - Northbound

| | Total | Mixed-Flow Lanes | | | | HOV Lanes | | | | Truck Lanes | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Vol | Lanes | Cap/Ln | Vol | V/C | Lanes | Cap/Ln | Vol | V/C | Lanes | Cap/Ln | Vol | V/C |
| **2018** | | | | | | | | | | | | | |
| 403. I-5 s/o Parker | 3,334 | 4 | 1,800 | 3,001 | 0.42 | 1 | 2,000 | 333 | 0.17 | - | - | - | - |
| 404. I-5 s/o Hasley | 5,018 | 4 | 1,950 | 4,516 | 0.58 | 1 | 2,000 | 502 | 0.25 | - | - | - | - |
| 405. I-5 s/o SR-126 | 5,844 | 4 | 1,950 | 5,260 | 0.67 | 1 | 2,000 | 584 | 0.29 | - | - | - | - |
| 406. I-5 s/o Rye Cyn | 5,844 | 4 | 1,950 | 5,260 | 0.67 | 1 | 2,000 | 584 | 0.29 | - | - | - | - |
| 407. I-5 s/o Magic Mtn | 6,432 | 4 | 1,950 | 5,789 | 0.74 | 1 | 2,000 | 643 | 0.32 | - | - | - | - |
| 408. I-5 s/o Valencia | 7,227 | 4 | 1,950 | 6,504 | 0.83 | 1 | 2,000 | 723 | 0.36 | - | - | - | - |
| 409. I-5 s/o McBean | 7,115 | 4 | 1,950 | 6,404 | 0.82 | 1 | 2,000 | 712 | 0.36 | - | - | - | - |
| 410. I-5 s/o Lyons | 6,622 | 4 | 1,950 | 5,960 | 0.76 | 1 | 2,000 | 662 | 0.33 | - | - | - | - |
| 411. I-5 s/o Calgrove | 6,167 | 4 | 2,000 | 4,872 | 0.61 | 1 | 2,000 | 617 | 0.31 | 1 | 1,300 | 678 | 0.52 |
| 412. I-5 s/o SR-14 | 8,422 | 6 | 2,000 | 6,653 | 0.55 | 1 | 2,000 | 842 | 0.42 | 2 | 1,300 | 926 | 0.36 |
| **2022** | | | | | | | | | | | | | |
| 403. I-5 s/o Parker | 3,615 | 4 | 1,800 | 3,254 | 0.45 | 1 | 2,000 | 362 | 0.18 | - | - | - | - |
| 404. I-5 s/o Hasley | 5,303 | 4 | 1,950 | 4,773 | 0.61 | 1 | 2,000 | 530 | 0.27 | - | - | - | - |
| 405. I-5 s/o SR-126 | 5,995 | 4 | 1,950 | 5,276 | 0.68 | 1 | 2,000 | 719 | 0.36 | - | - | - | - |
| 406. I-5 s/o Rye Cyn | 5,995 | 4 | 1,950 | 5,276 | 0.68 | 1 | 2,000 | 719 | 0.36 | - | - | - | - |
| 407. I-5 s/o Magic Mtn | 6,468 | 4 | 1,950 | 5,692 | 0.73 | 1 | 2,000 | 776 | 0.39 | - | - | - | - |
| 408. I-5 s/o Valencia | 7,297 | 4 | 1,950 | 6,421 | 0.82 | 1 | 2,000 | 876 | 0.44 | - | - | - | - |
| 409. I-5 s/o McBean | 7,195 | 4 | 1,950 | 6,332 | 0.81 | 1 | 2,000 | 863 | 0.43 | - | - | - | - |
| 410. I-5 s/o Lyons | 6,696 | 4 | 1,950 | 5,892 | 0.76 | 1 | 2,000 | 804 | 0.40 | - | - | - | - |
| 411. I-5 s/o Calgrove | 6,209 | 4 | 2,000 | 4,781 | 0.60 | 1 | 2,000 | 745 | 0.37 | 1 | 1,300 | 683 | 0.53 |
| 412. I-5 s/o SR-14 | 8,812 | 6 | 2,000 | 6,785 | 0.57 | 1 | 2,000 | 1,057 | 0.53 | 2 | 1,300 | 969 | 0.37 |
| **2025** | | | | | | | | | | | | | |
| 403. I-5 s/o Parker | 3,887 | 4 | 1,800 | 3,498 | 0.49 | 1 | 2,000 | 389 | 0.19 | - | - | - | - |
| 404. I-5 s/o Hasley | 5,597 | 4 | 1,950 | 5,037 | 0.65 | 1 | 2,000 | 560 | 0.28 | - | - | - | - |
| 405. I-5 s/o SR-126 | 6,330 | 4 | 1,950 | 5,570 | 0.71 | 1 | 2,000 | 760 | 0.38 | - | - | - | - |
| 406. I-5 s/o Rye Cyn | 6,330 | 4 | 1,950 | 5,570 | 0.71 | 1 | 2,000 | 760 | 0.38 | - | - | - | - |
| 407. I-5 s/o Magic Mtn | 6,825 | 4 | 1,950 | 6,006 | 0.77 | 1 | 2,000 | 819 | 0.41 | - | - | - | - |
| 408. I-5 s/o Valencia | 7,625 | 4 | 1,950 | 6,710 | 0.86 | 1 | 2,000 | 915 | 0.46 | - | - | - | - |
| 409. I-5 s/o McBean | 7,453 | 4 | 1,950 | 6,559 | 0.84 | 1 | 2,000 | 894 | 0.45 | - | - | - | - |
| 410. I-5 s/o Lyons | 6,961 | 4 | 1,950 | 6,126 | 0.79 | 1 | 2,000 | 835 | 0.42 | - | - | - | - |
| 411. I-5 s/o Calgrove | 6,462 | 4 | 2,000 | 4,976 | 0.62 | 1 | 2,000 | 775 | 0.39 | 1 | 1,300 | 711 | 0.55 |
| 412. I-5 s/o SR-14 | 9,156 | 6 | 2,000 | 7,050 | 0.59 | 1 | 2,000 | 1,099 | 0.55 | 2 | 1,300 | 1,007 | 0.39 |
| **2030** | | | | | | | | | | | | | |
| 403. I-5 s/o Parker | 4,382 | 4 | 1,800 | 3,988 | 0.55 | 1 | 2,000 | 394 | 0.20 | - | - | - | - |
| 404. I-5 s/o Hasley | 6,055 | 4 | 1,950 | 5,450 | 0.70 | 1 | 2,000 | 606 | 0.30 | - | - | - | - |
| 405. I-5 s/o SR-126 | 6,690 | 4 | 1,950 | 5,887 | 0.75 | 1 | 2,000 | 803 | 0.40 | - | - | - | - |
| 406. I-5 s/o Rye Cyn | 6,690 | 4 | 1,950 | 5,887 | 0.75 | 1 | 2,000 | 803 | 0.40 | - | - | - | - |
| 407. I-5 s/o Magic Mtn | 7,048 | 4 | 1,950 | 6,202 | 0.80 | 1 | 2,000 | 846 | 0.42 | - | - | - | - |
| 408. I-5 s/o Valencia | 7,763 | 4 | 1,950 | 6,831 | 0.88 | 1 | 2,000 | 932 | 0.47 | - | - | - | - |
| 409. I-5 s/o McBean | 7,698 | 4 | 1,950 | 6,774 | 0.87 | 1 | 2,000 | 924 | 0.46 | - | - | - | - |
| 410. I-5 s/o Lyons | 7,181 | 4 | 1,950 | 6,319 | 0.81 | 1 | 2,000 | 862 | 0.43 | - | - | - | - |
| 411. I-5 s/o Calgrove | 6,590 | 4 | 2,000 | 5,074 | 0.63 | 1 | 2,000 | 791 | 0.40 | 1 | 1,300 | 725 | 0.56 |
| 412. I-5 s/o SR-14 | 9,185 | 6 | 2,000 | 6,797 | 0.57 | 2 | 2,000 | 1,194 | 0.30 | 2 | 1,300 | 1,194 | 0.46 |

## V/C Calculations
## AM Peak Hour - Southbound

| | Total | Mixed-Flow Lanes | | | | HOV Lanes | | | | Truck Lanes | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Location** | **Vol** | **Lanes** | **Cap/Ln** | **Vol** | **V/C** | **Lanes** | **Cap/Ln** | **Vol** | **V/C** | **Lanes** | **Cap/Ln** | **Vol** | **V/C** |
| **2006** | | | | | | | | | | | | | |
| 403. I-5 s/o Parker | 2,210 | 4 | 1,800 | 2,210 | 0.31 | - | - | - | - | - | - | - | - |
| 404. I-5 s/o Hasley | 3,110 | 4 | 1,950 | 3,110 | 0.40 | - | - | - | - | - | - | - | - |
| 405. I-5 s/o SR-126 | 3,420 | 4 | 1,950 | 3,420 | 0.44 | - | - | - | - | - | - | - | - |
| 406. I-5 s/o Rye Cyn | 4,200 | 4 | 1,950 | 4,200 | 0.54 | - | - | - | - | - | - | - | - |
| 407. I-5 s/o Magic Mtn | 4,490 | 4 | 1,950 | 4,490 | 0.58 | - | - | - | - | - | - | - | - |
| 408. I-5 s/o Valencia | 5,310 | 4 | 1,950 | 5,310 | 0.68 | - | - | - | - | - | - | - | - |
| 409. I-5 s/o McBean | 5,730 | 4 | 1,950 | 5,730 | 0.73 | - | - | - | - | - | - | - | - |
| 410. I-5 s/o Lyons | 6,320 | 4 | 1,950 | 6,320 | 0.81 | - | - | - | - | - | - | - | - |
| 411. I-5 s/o Calgrove | 6,610 | 4 | 1,900 | 6,610 | 0.87 | - | - | - | - | - | - | - | - |
| 412. I-5 s/o SR-14 | 13,270 | 6 | 2,000 | 11,810 | 0.98 | - | - | - | - | 2 | 1,300 | 1,460 | 0.56 |
| **2011** | | | | | | | | | | | | | |
| 403. I-5 s/o Parker | 4,591 | 4 | 1,800 | 4,591 | 0.64 | - | - | - | - | - | - | - | - |
| 404. I-5 s/o Hasley | 5,276 | 4 | 1,950 | 5,276 | 0.68 | - | - | - | - | - | - | - | - |
| 405. I-5 s/o SR-126 | 4,946 | 4 | 1,950 | 4,946 | 0.63 | - | - | - | - | - | - | - | - |
| 406. I-5 s/o Rye Cyn | 4,910 | 4 | 1,950 | 4,910 | 0.63 | - | - | - | - | - | - | - | - |
| 407. I-5 s/o Magic Mtn | 4,956 | 4 | 1,950 | 4,956 | 0.64 | - | - | - | - | - | - | - | - |
| 408. I-5 s/o Valencia | 5,814 | 4 | 1,950 | 5,814 | 0.75 | - | - | - | - | - | - | - | - |
| 409. I-5 s/o McBean | 5,778 | 4 | 1,950 | 5,778 | 0.74 | - | - | - | - | - | - | - | - |
| 410. I-5 s/o Lyons | 6,448 | 4 | 2,000 | 5,739 | 0.72 | - | - | - | - | 1 | 1,300 | 709 | 0.55 |
| 411. I-5 s/o Calgrove | 6,657 | 4 | 2,000 | 5,925 | 0.74 | - | - | - | - | 1 | 1,300 | 732 | 0.56 |
| 412. I-5 s/o SR-14 | 13,907 | 6 | 2,000 | 10,708 | 0.89 | 1 | 2,000 | 1,669 | 0.83 | 2 | 1,300 | 1,530 | 0.59 |
| **2012** | | | | | | | | | | | | | |
| 403. I-5 s/o Parker | 4,615 | 4 | 1,800 | 4,615 | 0.64 | - | - | - | - | - | - | - | - |
| 404. I-5 s/o Hasley | 5,286 | 4 | 1,950 | 5,286 | 0.68 | - | - | - | - | - | - | - | - |
| 405. I-5 s/o SR-126 | 4,858 | 4 | 1,950 | 4,858 | 0.62 | - | - | - | - | - | - | - | - |
| 406. I-5 s/o Rye Cyn | 4,959 | 4 | 1,950 | 4,959 | 0.64 | - | - | - | - | - | - | - | - |
| 407. I-5 s/o Magic Mtn | 4,982 | 4 | 1,950 | 4,982 | 0.64 | - | - | - | - | - | - | - | - |
| 408. I-5 s/o Valencia | 5,748 | 4 | 1,950 | 5,748 | 0.74 | - | - | - | - | - | - | - | - |
| 409. I-5 s/o McBean | 5,787 | 4 | 1,950 | 5,787 | 0.74 | - | - | - | - | - | - | - | - |
| 410. I-5 s/o Lyons | 6,474 | 4 | 2,000 | 5,762 | 0.72 | - | - | - | - | 1 | 1,300 | 712 | 0.55 |
| 411. I-5 s/o Calgrove | 6,667 | 4 | 2,000 | 5,934 | 0.74 | - | - | - | - | 1 | 1,300 | 733 | 0.56 |
| 412. I-5 s/o SR-14 | 14,034 | 6 | 2,000 | 10,806 | 0.90 | 1 | 2,000 | 1,684 | 0.84 | 2 | 1,300 | 1,544 | 0.59 |
| **2014** | | | | | | | | | | | | | |
| 403. I-5 s/o Parker | 4,639 | 4 | 1,800 | 4,639 | 0.64 | - | - | - | - | - | - | - | - |
| 404. I-5 s/o Hasley | 5,216 | 4 | 1,950 | 5,216 | 0.67 | - | - | - | - | - | - | - | - |
| 405. I-5 s/o SR-126 | 4,839 | 4 | 1,950 | 4,839 | 0.62 | - | - | - | - | - | - | - | - |
| 406. I-5 s/o Rye Cyn | 4,979 | 4 | 1,950 | 4,979 | 0.64 | - | - | - | - | - | - | - | - |
| 407. I-5 s/o Magic Mtn | 5,186 | 4 | 1,950 | 5,186 | 0.66 | - | - | - | - | - | - | - | - |
| 408. I-5 s/o Valencia | 5,939 | 4 | 1,950 | 5,939 | 0.76 | - | - | - | - | - | - | - | - |
| 409. I-5 s/o McBean | 5,806 | 4 | 1,950 | 5,806 | 0.74 | - | - | - | - | - | - | - | - |
| 410. I-5 s/o Lyons | 6,525 | 4 | 2,000 | 5,807 | 0.73 | - | - | - | - | 1 | 1,300 | 718 | 0.55 |
| 411. I-5 s/o Calgrove | 6,686 | 4 | 2,000 | 5,951 | 0.74 | - | - | - | - | 1 | 1,300 | 735 | 0.57 |
| 412. I-5 s/o SR-14 | 14,236 | 6 | 2,000 | 10,962 | 0.91 | 1 | 2,000 | 1,708 | 0.85 | 2 | 1,300 | 1,566 | 0.60 |

## V/C Calculations
## AM Peak Hour - Southbound

| | Total | Mixed-Flow Lanes | | | | HOV Lanes | | | | Truck Lanes | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Location** | **Vol** | **Lanes** | **Cap/Ln** | **Vol** | **V/C** | **Lanes** | **Cap/Ln** | **Vol** | **V/C** | **Lanes** | **Cap/Ln** | **Vol** | **V/C** |
| **2018** | | | | | | | | | | | | | |
| 403. I-5 s/o Parker | 4,910 | 4 | 1,800 | 4,419 | 0.61 | 1 | 2,000 | 491 | 0.25 | - | - | - | - |
| 404. I-5 s/o Hasley | 5,536 | 4 | 1,950 | 4,982 | 0.64 | 1 | 2,000 | 554 | 0.28 | - | - | - | - |
| 405. I-5 s/o SR-126 | 5,154 | 4 | 1,950 | 4,639 | 0.59 | 1 | 2,000 | 515 | 0.26 | - | - | - | - |
| 406. I-5 s/o Rye Cyn | 5,517 | 4 | 1,950 | 4,965 | 0.64 | 1 | 2,000 | 552 | 0.28 | - | - | - | - |
| 407. I-5 s/o Magic Mtn | 5,911 | 4 | 1,950 | 5,320 | 0.68 | 1 | 2,000 | 591 | 0.30 | - | - | - | - |
| 408. I-5 s/o Valencia | 6,614 | 4 | 1,950 | 5,953 | 0.76 | 1 | 2,000 | 661 | 0.33 | - | - | - | - |
| 409. I-5 s/o McBean | 6,380 | 4 | 1,950 | 5,742 | 0.74 | 1 | 2,000 | 638 | 0.32 | - | - | - | - |
| 410. I-5 s/o Lyons | 6,628 | 4 | 2,000 | 5,236 | 0.65 | 1 | 2,000 | 663 | 0.33 | 1 | 1,300 | 729 | 0.56 |
| 411. I-5 s/o Calgrove | 6,724 | 4 | 2,000 | 5,312 | 0.66 | 1 | 2,000 | 672 | 0.34 | 1 | 1,300 | 740 | 0.57 |
| 412. I-5 s/o SR-14 | 15,158 | 6 | 2,000 | 11,672 | 0.97 | 1 | 2,000 | 1,819 | 0.91 | 2 | 1,300 | 1,667 | 0.64 |
| **2022** | | | | | | | | | | | | | |
| 403. I-5 s/o Parker | 5,260 | 4 | 1,800 | 4,734 | 0.66 | 1 | 2,000 | 526 | 0.26 | - | - | - | - |
| 404. I-5 s/o Hasley | 5,914 | 4 | 1,950 | 5,323 | 0.68 | 1 | 2,000 | 591 | 0.30 | - | - | - | - |
| 405. I-5 s/o SR-126 | 5,636 | 4 | 1,950 | 4,960 | 0.64 | 1 | 2,000 | 676 | 0.34 | - | - | - | - |
| 406. I-5 s/o Rye Cyn | 6,037 | 4 | 1,950 | 5,313 | 0.68 | 1 | 2,000 | 724 | 0.36 | - | - | - | - |
| 407. I-5 s/o Magic Mtn | 6,430 | 4 | 1,950 | 5,658 | 0.73 | 1 | 2,000 | 772 | 0.39 | - | - | - | - |
| 408. I-5 s/o Valencia | 7,329 | 4 | 1,950 | 6,450 | 0.83 | 1 | 2,000 | 879 | 0.44 | - | - | - | - |
| 409. I-5 s/o McBean | 7,084 | 4 | 1,950 | 6,234 | 0.80 | 1 | 2,000 | 850 | 0.43 | - | - | - | - |
| 410. I-5 s/o Lyons | 6,730 | 4 | 2,000 | 5,182 | 0.65 | 1 | 2,000 | 808 | 0.40 | 1 | 1,300 | 740 | 0.57 |
| 411. I-5 s/o Calgrove | 6,762 | 4 | 2,000 | 5,207 | 0.65 | 1 | 2,000 | 811 | 0.41 | 1 | 1,300 | 744 | 0.57 |
| 412. I-5 s/o SR-14 | 16,111 | 6 | 2,000 | 11,922 | 0.99 | 1 | 2,000 | 1,933 | 0.97 | 2 | 1,300 | 2,256 | 0.87 |
| **2025** | | | | | | | | | | | | | |
| 403. I-5 s/o Parker | 5,574 | 4 | 1,800 | 5,017 | 0.70 | 1 | 2,000 | 557 | 0.28 | - | - | - | - |
| 404. I-5 s/o Hasley | 6,193 | 4 | 1,950 | 5,574 | 0.71 | 1 | 2,000 | 619 | 0.31 | - | - | - | - |
| 405. I-5 s/o SR-126 | 6,072 | 4 | 1,950 | 5,343 | 0.69 | 1 | 2,000 | 729 | 0.36 | - | - | - | - |
| 406. I-5 s/o Rye Cyn | 6,382 | 4 | 1,950 | 5,616 | 0.72 | 1 | 2,000 | 766 | 0.38 | - | - | - | - |
| 407. I-5 s/o Magic Mtn | 6,740 | 4 | 1,950 | 5,931 | 0.76 | 1 | 2,000 | 809 | 0.40 | - | - | - | - |
| 408. I-5 s/o Valencia | 7,633 | 4 | 1,950 | 6,717 | 0.86 | 1 | 2,000 | 916 | 0.46 | - | - | - | - |
| 409. I-5 s/o McBean | 7,320 | 4 | 1,950 | 6,442 | 0.83 | 1 | 2,000 | 878 | 0.44 | - | - | - | - |
| 410. I-5 s/o Lyons | 6,807 | 4 | 2,000 | 5,241 | 0.66 | 1 | 2,000 | 817 | 0.41 | 1 | 1,300 | 749 | 0.58 |
| 411. I-5 s/o Calgrove | 6,790 | 4 | 2,000 | 5,228 | 0.65 | 1 | 2,000 | 815 | 0.41 | 1 | 1,300 | 747 | 0.57 |
| 412. I-5 s/o SR-14 | 16,597 | 6 | 2,000 | 12,033 | 1.00 | 1 | 2,000 | 1,992 | 1.00 | 2 | 1,300 | 2,573 | 0.99 |
| **2030** | | | | | | | | | | | | | |
| 403. I-5 s/o Parker | 5,845 | 4 | 1,800 | 5,261 | 0.73 | 1 | 2,000 | 585 | 0.29 | - | - | - | - |
| 404. I-5 s/o Hasley | 6,518 | 4 | 1,950 | 5,866 | 0.75 | 1 | 2,000 | 652 | 0.33 | - | - | - | - |
| 405. I-5 s/o SR-126 | 6,483 | 4 | 1,950 | 5,705 | 0.73 | 1 | 2,000 | 778 | 0.39 | - | - | - | - |
| 406. I-5 s/o Rye Cyn | 6,884 | 4 | 1,950 | 6,058 | 0.78 | 1 | 2,000 | 826 | 0.41 | - | - | - | - |
| 407. I-5 s/o Magic Mtn | 7,152 | 4 | 1,950 | 6,222 | 0.80 | 1 | 2,000 | 930 | 0.46 | - | - | - | - |
| 408. I-5 s/o Valencia | 8,071 | 4 | 1,950 | 7,022 | 0.90 | 1 | 2,000 | 1,049 | 0.52 | - | - | - | - |
| 409. I-5 s/o McBean | 7,779 | 4 | 1,950 | 6,768 | 0.87 | 1 | 2,000 | 1,011 | 0.51 | - | - | - | - |
| 410. I-5 s/o Lyons | 7,373 | 4 | 2,000 | 5,603 | 0.70 | 1 | 2,000 | 958 | 0.48 | 1 | 1,300 | 811 | 0.62 |
| 411. I-5 s/o Calgrove | 7,360 | 4 | 2,000 | 5,594 | 0.70 | 1 | 2,000 | 957 | 0.48 | 1 | 1,300 | 810 | 0.62 |
| 412. I-5 s/o SR-14 | 17,608 | 6 | 2,000 | 11,463 | 0.96 | 2 | 2,000 | 3,768 | 0.94 | 2 | 1,300 | 2,377 | 0.91 |

## V/C Calculations
## PM Peak Hour - Northbound

| | Total | Mixed-Flow Lanes | | | | HOV Lanes | | | | Truck Lanes | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Location** | **Vol** | **Lanes** | **Cap/Ln** | **Vol** | **V/C** | **Lanes** | **Cap/Ln** | **Vol** | **V/C** | **Lanes** | **Cap/Ln** | **Vol** | **V/C** |
| **2006** | | | | | | | | | | | | | |
| 403. I-5 s/o Parker | 2,790 | 4 | 1,800 | 2,790 | 0.39 | - | - | - | - | - | - | - | - |
| 404. I-5 s/o Hasley | 3,620 | 4 | 1,950 | 3,620 | 0.46 | - | - | - | - | - | - | - | - |
| 405. I-5 s/o SR-126 | 4,080 | 4 | 1,950 | 4,080 | 0.52 | - | - | - | - | - | - | - | - |
| 406. I-5 s/o Rye Cyn | 4,080 | 4 | 1,950 | 4,080 | 0.52 | - | - | - | - | - | - | - | - |
| 407. I-5 s/o Magic Mtn | 5,270 | 4 | 1,950 | 5,270 | 0.68 | - | - | - | - | - | - | - | - |
| 408. I-5 s/o Valencia | 6,050 | 4 | 1,950 | 6,050 | 0.78 | - | - | - | - | - | - | - | - |
| 409. I-5 s/o McBean | 6,610 | 4 | 1,950 | 6,610 | 0.85 | - | - | - | - | - | - | - | - |
| 410. I-5 s/o Lyons | 7,020 | 4 | 1,950 | 7,020 | 0.90 | - | - | - | - | - | - | - | - |
| 411. I-5 s/o Calgrove | 6,970 | 4 | 1,900 | 6,970 | 0.92 | - | - | - | - | - | - | - | - |
| 412. I-5 s/o SR-14 | 13,710 | 6 | 2,000 | 11,928 | 0.99 | - | - | - | - | 2 | 1,300 | 1,782 | 0.69 |
| **2011** | | | | | | | | | | | | | |
| 403. I-5 s/o Parker | 5,954 | 4 | 1,800 | 5,954 | 0.83 | - | - | - | - | - | - | - | - |
| 404. I-5 s/o Hasley | 6,472 | 4 | 1,950 | 6,472 | 0.83 | - | - | - | - | - | - | - | - |
| 405. I-5 s/o SR-126 | 5,952 | 4 | 1,950 | 5,952 | 0.76 | - | - | - | - | - | - | - | - |
| 406. I-5 s/o Rye Cyn | 5,952 | 4 | 1,950 | 5,952 | 0.76 | - | - | - | - | - | - | - | - |
| 407. I-5 s/o Magic Mtn | 6,130 | 4 | 1,950 | 6,130 | 0.79 | - | - | - | - | - | - | - | - |
| 408. I-5 s/o Valencia | 6,561 | 4 | 1,950 | 6,561 | 0.84 | - | - | - | - | - | - | - | - |
| 409. I-5 s/o McBean | 6,802 | 4 | 1,950 | 6,802 | 0.87 | - | - | - | - | - | - | - | - |
| 410. I-5 s/o Lyons | 7,169 | 4 | 1,950 | 7,169 | 0.92 | - | - | - | - | - | - | - | - |
| 411. I-5 s/o Calgrove | 7,108 | 4 | 1,900 | 6,397 | 0.84 | 1 | 2,000 | 711 | 0.36 | - | - | - | - |
| 412. I-5 s/o SR-14 | 13,932 | 6 | 2,000 | 11,006 | 0.92 | 1 | 2,000 | 1,393 | 0.70 | 2 | 1,300 | 1,533 | 0.59 |
| **2012** | | | | | | | | | | | | | |
| 403. I-5 s/o Parker | 5,942 | 4 | 1,800 | 5,942 | 0.83 | - | - | - | - | - | - | - | - |
| 404. I-5 s/o Hasley | 6,459 | 4 | 1,950 | 6,459 | 0.83 | - | - | - | - | - | - | - | - |
| 405. I-5 s/o SR-126 | 5,757 | 4 | 1,950 | 5,757 | 0.74 | - | - | - | - | - | - | - | - |
| 406. I-5 s/o Rye Cyn | 5,757 | 4 | 1,950 | 5,757 | 0.74 | - | - | - | - | - | - | - | - |
| 407. I-5 s/o Magic Mtn | 6,121 | 4 | 1,950 | 6,121 | 0.78 | - | - | - | - | - | - | - | - |
| 408. I-5 s/o Valencia | 6,593 | 4 | 1,950 | 6,593 | 0.85 | - | - | - | - | - | - | - | - |
| 409. I-5 s/o McBean | 6,841 | 4 | 1,950 | 6,841 | 0.88 | - | - | - | - | - | - | - | - |
| 410. I-5 s/o Lyons | 7,199 | 4 | 1,950 | 7,199 | 0.92 | - | - | - | - | - | - | - | - |
| 411. I-5 s/o Calgrove | 7,135 | 4 | 1,900 | 6,422 | 0.84 | 1 | 2,000 | 714 | 0.36 | - | - | - | - |
| 412. I-5 s/o SR-14 | 13,976 | 6 | 2,000 | 11,041 | 0.92 | 1 | 2,000 | 1,398 | 0.70 | 2 | 1,300 | 1,537 | 0.59 |
| **2014** | | | | | | | | | | | | | |
| 403. I-5 s/o Parker | 6,009 | 4 | 1,800 | 6,009 | 0.83 | - | - | - | - | - | - | - | - |
| 404. I-5 s/o Hasley | 6,433 | 4 | 1,950 | 6,433 | 0.82 | - | - | - | - | - | - | - | - |
| 405. I-5 s/o SR-126 | 5,757 | 4 | 1,950 | 5,757 | 0.74 | - | - | - | - | - | - | - | - |
| 406. I-5 s/o Rye Cyn | 5,757 | 4 | 1,950 | 5,757 | 0.74 | - | - | - | - | - | - | - | - |
| 407. I-5 s/o Magic Mtn | 6,157 | 4 | 1,950 | 6,157 | 0.79 | - | - | - | - | - | - | - | - |
| 408. I-5 s/o Valencia | 6,659 | 4 | 1,950 | 6,659 | 0.85 | - | - | - | - | - | - | - | - |
| 409. I-5 s/o McBean | 6,917 | 4 | 1,950 | 6,917 | 0.89 | - | - | - | - | - | - | - | - |
| 410. I-5 s/o Lyons | 7,258 | 4 | 1,950 | 7,258 | 0.93 | - | - | - | - | - | - | - | - |
| 411. I-5 s/o Calgrove | 7,190 | 4 | 1,900 | 6,471 | 0.85 | 1 | 2,000 | 719 | 0.36 | - | - | - | - |
| 412. I-5 s/o SR-14 | 14,065 | 6 | 2,000 | 11,111 | 0.93 | 1 | 2,000 | 1,407 | 0.70 | 2 | 1,300 | 1,547 | 0.60 |

## V/C Calculations
## PM Peak Hour - Northbound

| | Total | Mixed-Flow Lanes | | | | HOV Lanes | | | | Truck Lanes | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Vol | Lanes | Cap/Ln | Vol | V/C | Lanes | Cap/Ln | Vol | V/C | Lanes | Cap/Ln | Vol | V/C |
| **2018** | | | | | | | | | | | | | |
| 403. I-5 s/o Parker | 6,247 | 4 | 1,800 | 5,622 | 0.78 | 1 | 2,000 | 625 | 0.31 | - | - | - | - |
| 404. I-5 s/o Hasley | 6,796 | 4 | 1,950 | 6,116 | 0.78 | 1 | 2,000 | 680 | 0.34 | - | - | - | - |
| 405. I-5 s/o SR-126 | 5,980 | 4 | 1,950 | 5,382 | 0.69 | 1 | 2,000 | 598 | 0.30 | - | - | - | - |
| 406. I-5 s/o Rye Cyn | 5,980 | 4 | 1,950 | 5,382 | 0.69 | 1 | 2,000 | 598 | 0.30 | - | - | - | - |
| 407. I-5 s/o Magic Mtn | 6,517 | 4 | 1,950 | 5,865 | 0.75 | 1 | 2,000 | 652 | 0.33 | - | - | - | - |
| 408. I-5 s/o Valencia | 7,187 | 4 | 1,950 | 6,468 | 0.83 | 1 | 2,000 | 719 | 0.36 | - | - | - | - |
| 409. I-5 s/o McBean | 7,071 | 4 | 1,950 | 6,364 | 0.82 | 1 | 2,000 | 707 | 0.35 | - | - | - | - |
| 410. I-5 s/o Lyons | 7,377 | 4 | 1,950 | 6,639 | 0.85 | 1 | 2,000 | 738 | 0.37 | - | - | - | - |
| 411. I-5 s/o Calgrove | 7,300 | 4 | 2,000 | 6,570 | 0.82 | 1 | 2,000 | 730 | 0.37 | 1 | 1,300 | 803 | 0.62 |
| 412. I-5 s/o SR-14 | 14,242 | 6 | 2,000 | 11,251 | 0.94 | 1 | 2,000 | 1,424 | 0.71 | 2 | 1,300 | 1,567 | 0.60 |
| **2022** | | | | | | | | | | | | | |
| 403. I-5 s/o Parker | 6,733 | 4 | 1,800 | 6,060 | 0.84 | 1 | 2,000 | 673 | 0.34 | - | - | - | - |
| 404. I-5 s/o Hasley | 7,317 | 4 | 1,950 | 6,585 | 0.84 | 1 | 2,000 | 732 | 0.37 | - | - | - | - |
| 405. I-5 s/o SR-126 | 6,520 | 4 | 1,950 | 5,738 | 0.74 | 1 | 2,000 | 782 | 0.39 | - | - | - | - |
| 406. I-5 s/o Rye Cyn | 6,520 | 4 | 1,950 | 5,738 | 0.74 | 1 | 2,000 | 782 | 0.39 | - | - | - | - |
| 407. I-5 s/o Magic Mtn | 7,013 | 4 | 1,950 | 6,171 | 0.79 | 1 | 2,000 | 842 | 0.42 | - | - | - | - |
| 408. I-5 s/o Valencia | 7,527 | 4 | 1,950 | 6,624 | 0.85 | 1 | 2,000 | 903 | 0.45 | - | - | - | - |
| 409. I-5 s/o McBean | 7,619 | 4 | 1,950 | 6,705 | 0.86 | 1 | 2,000 | 914 | 0.46 | - | - | - | - |
| 410. I-5 s/o Lyons | 7,496 | 4 | 1,950 | 6,596 | 0.85 | 1 | 2,000 | 900 | 0.45 | - | - | - | - |
| 411. I-5 s/o Calgrove | 7,410 | 4 | 2,000 | 6,521 | 0.82 | 1 | 2,000 | 889 | 0.44 | 1 | 1,300 | 815 | 0.63 |
| 412. I-5 s/o SR-14 | 15,261 | 6 | 2,000 | 11,751 | 0.98 | 1 | 2,000 | 1,831 | 0.92 | 2 | 1,300 | 1,679 | 0.65 |
| **2025** | | | | | | | | | | | | | |
| 403. I-5 s/o Parker | 7,150 | 4 | 1,800 | 6,435 | 0.89 | 1 | 2,000 | 715 | 0.36 | - | - | - | - |
| 404. I-5 s/o Hasley | 7,754 | 4 | 1,950 | 6,979 | 0.89 | 1 | 2,000 | 775 | 0.39 | - | - | - | - |
| 405. I-5 s/o SR-126 | 6,997 | 4 | 1,950 | 6,157 | 0.79 | 1 | 2,000 | 840 | 0.42 | - | - | - | - |
| 406. I-5 s/o Rye Cyn | 6,997 | 4 | 1,950 | 6,157 | 0.79 | 1 | 2,000 | 840 | 0.42 | - | - | - | - |
| 407. I-5 s/o Magic Mtn | 7,392 | 4 | 1,950 | 6,505 | 0.83 | 1 | 2,000 | 887 | 0.44 | - | - | - | - |
| 408. I-5 s/o Valencia | 7,825 | 4 | 1,950 | 6,886 | 0.88 | 1 | 2,000 | 939 | 0.47 | - | - | - | - |
| 409. I-5 s/o McBean | 7,933 | 4 | 1,950 | 6,981 | 0.90 | 1 | 2,000 | 952 | 0.48 | - | - | - | - |
| 410. I-5 s/o Lyons | 7,923 | 4 | 1,950 | 6,972 | 0.89 | 1 | 2,000 | 951 | 0.48 | - | - | - | - |
| 411. I-5 s/o Calgrove | 7,797 | 4 | 2,000 | 6,861 | 0.86 | 1 | 2,000 | 936 | 0.47 | 1 | 1,300 | 858 | 0.66 |
| 412. I-5 s/o SR-14 | 15,842 | 6 | 2,000 | 11,882 | 0.99 | 1 | 2,000 | 1,901 | 0.95 | 2 | 1,300 | 2,059 | 0.79 |
| **2030** | | | | | | | | | | | | | |
| 403. I-5 s/o Parker | 7,344 | 4 | 1,800 | 6,463 | 0.90 | 1 | 2,000 | 881 | 0.44 | - | - | - | - |
| 404. I-5 s/o Hasley | 8,050 | 4 | 1,950 | 7,004 | 0.90 | 1 | 2,000 | 1,047 | 0.52 | - | - | - | - |
| 405. I-5 s/o SR-126 | 7,365 | 4 | 1,950 | 6,334 | 0.81 | 1 | 2,000 | 1,031 | 0.52 | - | - | - | - |
| 406. I-5 s/o Rye Cyn | 7,365 | 4 | 1,950 | 6,334 | 0.81 | 1 | 2,000 | 1,031 | 0.52 | - | - | - | - |
| 407. I-5 s/o Magic Mtn | 7,787 | 4 | 1,950 | 6,775 | 0.87 | 1 | 2,000 | 1,012 | 0.51 | - | - | - | - |
| 408. I-5 s/o Valencia | 8,235 | 4 | 1,950 | 7,000 | 0.90 | 1 | 2,000 | 1,235 | 0.62 | - | - | - | - |
| 409. I-5 s/o McBean | 8,397 | 4 | 1,950 | 7,053 | 0.90 | 1 | 2,000 | 1,344 | 0.67 | - | - | - | - |
| 410. I-5 s/o Lyons | 8,407 | 4 | 1,950 | 7,020 | 0.90 | 1 | 2,000 | 1,387 | 0.69 | - | - | - | - |
| 411. I-5 s/o Calgrove | 8,269 | 4 | 2,000 | 7,111 | 0.89 | 1 | 2,000 | 1,158 | 0.58 | 1 | 1,300 | 910 | 0.70 |
| 412. I-5 s/o SR-14 | 16,720 | 6 | 2,000 | 11,035 | 0.92 | 2 | 2,000 | 3,511 | 0.88 | 2 | 1,300 | 2,174 | 0.84 |

## V/C Calculations
## PM Peak Hour - Southbound

| | Total | Mixed-Flow Lanes | | | | HOV Lanes | | | | Truck Lanes | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Vol | Lanes | Cap/Ln | Vol | V/C | Lanes | Cap/Ln | Vol | V/C | Lanes | Cap/Ln | Vol | V/C |
| **2006** | | | | | | | | | | | | | |
| 403. I-5 s/o Parker | 2,420 | 4 | 1,800 | 2,420 | 0.34 | - | - | - | - | - | - | - | - |
| 404. I-5 s/o Hasley | 3,010 | 4 | 1,950 | 3,010 | 0.39 | - | - | - | - | - | - | - | - |
| 405. I-5 s/o SR-126 | 4,150 | 4 | 1,950 | 4,150 | 0.53 | - | - | - | - | - | - | - | - |
| 406. I-5 s/o Rye Cyn | 5,350 | 4 | 1,950 | 5,350 | 0.69 | - | - | - | - | - | - | - | - |
| 407. I-5 s/o Magic Mtn | 5,600 | 4 | 1,950 | 5,600 | 0.72 | - | - | - | - | - | - | - | - |
| 408. I-5 s/o Valencia | 6,420 | 4 | 1,950 | 6,420 | 0.82 | - | - | - | - | - | - | - | - |
| 409. I-5 s/o McBean | 6,450 | 4 | 1,950 | 6,450 | 0.83 | - | - | - | - | - | - | - | - |
| 410. I-5 s/o Lyons | 6,460 | 4 | 1,950 | 6,460 | 0.83 | - | - | - | - | - | - | - | - |
| 411. I-5 s/o Calgrove | 6,410 | 4 | 1,900 | 6,410 | 0.84 | - | - | - | - | - | - | - | - |
| 412. I-5 s/o SR-14 | 9,180 | 6 | 2,000 | 8,262 | 0.69 | - | - | - | - | 2 | 1,300 | 918 | 0.35 |
| **2011** | | | | | | | | | | | | | |
| 403. I-5 s/o Parker | 4,575 | 4 | 1,800 | 4,575 | 0.64 | - | - | - | - | - | - | - | - |
| 404. I-5 s/o Hasley | 6,130 | 4 | 1,950 | 6,130 | 0.79 | - | - | - | - | - | - | - | - |
| 405. I-5 s/o SR-126 | 6,815 | 4 | 1,950 | 6,815 | 0.87 | - | - | - | - | - | - | - | - |
| 406. I-5 s/o Rye Cyn | 7,802 | 4 | 1,950 | 7,802 | 1.00 | - | - | - | - | - | - | - | - |
| 407. I-5 s/o Magic Mtn | 7,336 | 4 | 1,950 | 7,336 | 0.94 | - | - | - | - | - | - | - | - |
| 408. I-5 s/o Valencia | 7,773 | 4 | 1,950 | 7,773 | 1.00 | - | - | - | - | - | - | - | - |
| 409. I-5 s/o McBean | 7,491 | 4 | 1,950 | 7,491 | 0.96 | - | - | - | - | - | - | - | - |
| 410. I-5 s/o Lyons | 6,937 | 4 | 2,000 | 6,174 | 0.77 | - | - | - | - | 1 | 1,300 | 763 | 0.59 |
| 411. I-5 s/o Calgrove | 7,045 | 4 | 2,000 | 6,270 | 0.78 | - | - | - | - | 1 | 1,300 | 775 | 0.60 |
| 412. I-5 s/o SR-14 | 9,483 | 6 | 2,000 | 7,681 | 0.64 | 1 | 2,000 | 853 | 0.43 | 2 | 1,300 | 948 | 0.36 |
| **2012** | | | | | | | | | | | | | |
| 403. I-5 s/o Parker | 4,596 | 4 | 1,800 | 4,596 | 0.64 | - | - | - | - | - | - | - | - |
| 404. I-5 s/o Hasley | 6,117 | 4 | 1,950 | 6,117 | 0.78 | - | - | - | - | - | - | - | - |
| 405. I-5 s/o SR-126 | 6,619 | 4 | 1,950 | 6,619 | 0.85 | - | - | - | - | - | - | - | - |
| 406. I-5 s/o Rye Cyn | 7,705 | 4 | 1,950 | 7,705 | 0.99 | - | - | - | - | - | - | - | - |
| 407. I-5 s/o Magic Mtn | 7,302 | 4 | 1,950 | 7,302 | 0.94 | - | - | - | - | - | - | - | - |
| 408. I-5 s/o Valencia | 7,818 | 4 | 1,950 | 7,818 | 1.00 | - | - | - | - | - | - | - | - |
| 409. I-5 s/o McBean | 7,674 | 4 | 1,950 | 7,674 | 0.98 | - | - | - | - | - | - | - | - |
| 410. I-5 s/o Lyons | 7,162 | 4 | 2,000 | 6,374 | 0.80 | - | - | - | - | 1 | 1,300 | 788 | 0.61 |
| 411. I-5 s/o Calgrove | 7,172 | 4 | 2,000 | 6,383 | 0.80 | - | - | - | - | 1 | 1,300 | 789 | 0.61 |
| 412. I-5 s/o SR-14 | 9,544 | 6 | 2,000 | 7,731 | 0.64 | 1 | 2,000 | 859 | 0.43 | 2 | 1,300 | 954 | 0.37 |
| **2014** | | | | | | | | | | | | | |
| 403. I-5 s/o Parker | 4,660 | 4 | 1,800 | 4,660 | 0.65 | - | - | - | - | - | - | - | - |
| 404. I-5 s/o Hasley | 6,257 | 4 | 1,950 | 6,257 | 0.80 | - | - | - | - | - | - | - | - |
| 405. I-5 s/o SR-126 | 6,663 | 4 | 1,950 | 6,663 | 0.85 | - | - | - | - | - | - | - | - |
| 406. I-5 s/o Rye Cyn | 7,794 | 4 | 1,950 | 7,794 | 1.00 | - | - | - | - | - | - | - | - |
| 407. I-5 s/o Magic Mtn | 7,475 | 4 | 1,950 | 7,475 | 0.96 | - | - | - | - | - | - | - | - |
| 408. I-5 s/o Valencia | 7,828 | 4 | 1,950 | 7,828 | 1.00 | - | - | - | - | - | - | - | - |
| 409. I-5 s/o McBean | 7,827 | 4 | 1,950 | 7,827 | 1.00 | - | - | - | - | - | - | - | - |
| 410. I-5 s/o Lyons | 7,235 | 4 | 2,000 | 6,439 | 0.80 | - | - | - | - | 1 | 1,300 | 796 | 0.61 |
| 411. I-5 s/o Calgrove | 7,280 | 4 | 2,000 | 6,479 | 0.81 | - | - | - | - | 1 | 1,300 | 801 | 0.62 |
| 412. I-5 s/o SR-14 | 9,752 | 6 | 2,000 | 7,899 | 0.66 | 1 | 2,000 | 878 | 0.44 | 2 | 1,300 | 975 | 0.38 |

## V/C Calculations
## PM Peak Hour - Southbound

| | Total | Mixed-Flow Lanes | | | | HOV Lanes | | | | Truck Lanes | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Location** | **Vol** | **Lanes** | **Cap/Ln** | **Vol** | **V/C** | **Lanes** | **Cap/Ln** | **Vol** | **V/C** | **Lanes** | **Cap/Ln** | **Vol** | **V/C** |
| **2018** | | | | | | | | | | | | | |
| 403. I-5 s/o Parker | 5,013 | 4 | 1,800 | 4,512 | 0.63 | 1 | 2,000 | 501 | 0.25 | - | - | - | - |
| 404. I-5 s/o Hasley | 6,651 | 4 | 1,950 | 5,853 | 0.75 | 1 | 2,000 | 798 | 0.40 | - | - | - | - |
| 405. I-5 s/o SR-126 | 7,291 | 4 | 1,950 | 6,124 | 0.79 | 1 | 2,000 | 1,167 | 0.58 | - | - | - | - |
| 406. I-5 s/o Rye Cyn | 8,844 | 4 | 1,950 | 7,429 | 0.95 | 1 | 2,000 | 1,415 | 0.71 | - | - | - | - |
| 407. I-5 s/o Magic Mtn | 8,644 | 4 | 1,950 | 7,261 | 0.93 | 1 | 2,000 | 1,383 | 0.69 | - | - | - | - |
| 408. I-5 s/o Valencia | 9,179 | 4 | 1,950 | 7,710 | 0.99 | 1 | 2,000 | 1,469 | 0.73 | - | - | - | - |
| 409. I-5 s/o McBean | 8,586 | 4 | 1,950 | 7,212 | 0.92 | 1 | 2,000 | 1,374 | 0.69 | - | - | - | - |
| 410. I-5 s/o Lyons | 7,899 | 4 | 2,000 | 5,766 | 0.72 | 1 | 2,000 | 1,264 | 0.63 | 1 | 1,300 | 869 | 0.67 |
| 411. I-5 s/o Calgrove | 7,658 | 4 | 2,000 | 5,590 | 0.70 | 1 | 2,000 | 1,225 | 0.61 | 1 | 1,300 | 842 | 0.65 |
| 412. I-5 s/o SR-14 | 10,257 | 6 | 2,000 | 8,000 | 0.67 | 1 | 2,000 | 1,231 | 0.62 | 2 | 1,300 | 1,026 | 0.39 |
| **2022** | | | | | | | | | | | | | |
| 403. I-5 s/o Parker | 5,453 | 4 | 1,800 | 4,908 | 0.68 | 1 | 2,000 | 545 | 0.27 | - | - | - | - |
| 404. I-5 s/o Hasley | 7,063 | 4 | 1,950 | 6,215 | 0.80 | 1 | 2,000 | 848 | 0.42 | - | - | - | - |
| 405. I-5 s/o SR-126 | 7,500 | 4 | 1,950 | 6,150 | 0.79 | 1 | 2,000 | 1,350 | 0.68 | - | - | - | - |
| 406. I-5 s/o Rye Cyn | 8,956 | 4 | 1,950 | 7,344 | 0.94 | 1 | 2,000 | 1,612 | 0.81 | - | - | - | - |
| 407. I-5 s/o Magic Mtn | 8,773 | 4 | 1,950 | 7,194 | 0.92 | 1 | 2,000 | 1,579 | 0.79 | - | - | - | - |
| 408. I-5 s/o Valencia | 9,358 | 4 | 1,950 | 7,674 | 0.98 | 1 | 2,000 | 1,684 | 0.84 | - | - | - | - |
| 409. I-5 s/o McBean | 8,851 | 4 | 1,950 | 7,258 | 0.93 | 1 | 2,000 | 1,593 | 0.80 | - | - | - | - |
| 410. I-5 s/o Lyons | 8,221 | 4 | 2,000 | 5,919 | 0.74 | 1 | 2,000 | 1,398 | 0.70 | 1 | 1,300 | 904 | 0.70 |
| 411. I-5 s/o Calgrove | 7,999 | 4 | 2,000 | 5,759 | 0.72 | 1 | 2,000 | 1,360 | 0.68 | 1 | 1,300 | 880 | 0.68 |
| 412. I-5 s/o SR-14 | 10,914 | 6 | 2,000 | 8,404 | 0.70 | 1 | 2,000 | 1,419 | 0.71 | 2 | 1,300 | 1,091 | 0.42 |
| **2025** | | | | | | | | | | | | | |
| 403. I-5 s/o Parker | 5,792 | 4 | 1,800 | 5,213 | 0.72 | 1 | 2,000 | 579 | 0.29 | - | - | - | - |
| 404. I-5 s/o Hasley | 7,419 | 4 | 1,950 | 6,529 | 0.84 | 1 | 2,000 | 890 | 0.45 | - | - | - | - |
| 405. I-5 s/o SR-126 | 7,938 | 4 | 1,950 | 6,350 | 0.81 | 1 | 2,000 | 1,588 | 0.79 | - | - | - | - |
| 406. I-5 s/o Rye Cyn | 9,357 | 4 | 1,950 | 7,486 | 0.96 | 1 | 2,000 | 1,871 | 0.94 | - | - | - | - |
| 407. I-5 s/o Magic Mtn | 9,191 | 4 | 1,950 | 7,353 | 0.94 | 1 | 2,000 | 1,838 | 0.92 | - | - | - | - |
| 408. I-5 s/o Valencia | 9,658 | 4 | 1,950 | 7,726 | 0.99 | 1 | 2,000 | 1,932 | 0.97 | - | - | - | - |
| 409. I-5 s/o McBean | 9,045 | 4 | 1,950 | 7,236 | 0.93 | 1 | 2,000 | 1,809 | 0.90 | - | - | - | - |
| 410. I-5 s/o Lyons | 8,439 | 4 | 2,000 | 6,076 | 0.76 | 1 | 2,000 | 1,435 | 0.72 | 1 | 1,300 | 928 | 0.71 |
| 411. I-5 s/o Calgrove | 8,201 | 4 | 2,000 | 5,905 | 0.74 | 1 | 2,000 | 1,394 | 0.70 | 1 | 1,300 | 902 | 0.69 |
| 412. I-5 s/o SR-14 | 11,384 | 6 | 2,000 | 8,766 | 0.73 | 1 | 2,000 | 1,480 | 0.74 | 2 | 1,300 | 1,138 | 0.44 |
| **2030** | | | | | | | | | | | | | |
| 403. I-5 s/o Parker | 6,733 | 4 | 1,800 | 5,723 | 0.79 | 1 | 2,000 | 1,010 | 0.50 | - | - | - | - |
| 404. I-5 s/o Hasley | 8,227 | 4 | 1,950 | 6,993 | 0.90 | 1 | 2,000 | 1,234 | 0.62 | - | - | - | - |
| 405. I-5 s/o SR-126 | 8,703 | 4 | 1,950 | 6,962 | 0.89 | 1 | 2,000 | 1,741 | 0.87 | - | - | - | - |
| 406. I-5 s/o Rye Cyn | 9,828 | 4 | 1,950 | 7,823 | 1.00 | 1 | 2,000 | 2,005 | 1.00 | - | - | - | - |
| 407. I-5 s/o Magic Mtn | 9,723 | 4 | 1,950 | 7,740 | 0.99 | 1 | 2,000 | 1,983 | 0.99 | - | - | - | - |
| 408. I-5 s/o Valencia | 9,832 | 4 | 1,950 | 7,826 | 1.00 | 1 | 2,000 | 2,006 | 1.00 | - | - | - | - |
| 409. I-5 s/o McBean | 9,519 | 4 | 1,950 | 7,615 | 0.98 | 1 | 2,000 | 1,904 | 0.95 | - | - | - | - |
| 410. I-5 s/o Lyons | 8,877 | 4 | 2,000 | 6,081 | 0.76 | 1 | 2,000 | 1,775 | 0.89 | 1 | 1,300 | 1,021 | 0.79 |
| 411. I-5 s/o Calgrove | 8,794 | 4 | 2,000 | 6,024 | 0.75 | 1 | 2,000 | 1,759 | 0.88 | 1 | 1,300 | 1,011 | 0.78 |
| 412. I-5 s/o SR-14 | 11,623 | 6 | 2,000 | 7,787 | 0.65 | 2 | 2,000 | 2,325 | 0.58 | 2 | 1,300 | 1,511 | 0.58 |

# APPENDIX D

## NEWHALL RANCH SPECIFIC PLAN – TRAFFIC MITIGATION MEASURES

SP 4.8-1 The applicants for future subdivision maps which permit construction shall be responsible for funding and constructing all on-site traffic improvements except as otherwise provided below. The obligation to construct improvements shall not preclude the applicants' ability to seek local, state, or federal funding for these facilities.

SP 4.8-2 Prior to the approval of each subdivision map which permits construction, the applicant for that map shall prepare a transportation performance evaluation which shall indicate the specific improvements for all on-site roadways which are necessary to provide adequate roadway and intersection capacity as well as adequate right-of-way for the subdivision and other expected traffic. Transportation performance evaluations shall be approved by Los Angeles County Department of Public Works according to standards and policies in effect at that time. The transportation performance evaluation shall form the basis for specific conditions of approval for the subdivision.

SP 4.8-3 The applicants for future subdivisions shall provide the traffic signals at the 15 locations labeled B through P in Figure 4.8-17 [of the Newhall Ranch Specific Plan Final EIR] as well as any additional signals warranted by future subdivision design. Signal warrants shall be prepared as part of the transportation performance evaluations noted in Mitigation 4.8-2 [of the Newhall Ranch Specific Plan Final EIR].

SP 4.8-4 All development within the Specific Plan shall conform to the requirements of the Los Angeles County Transportation Demand Management (TDM) Ordinance.

SP 4.8-5 The applicants for all future subdivision maps which permit construction shall consult with the local transit provider regarding the need for, and locations of, bus pull-ins on highways within the Specific Plan area. All bus pull-in locations shall be approved by the Department of Public Works, and approved bus pull-ins shall be constructed by the applicant.

SP 4.8-6 Prior to the recordation of the first subdivision map which permits construction, the applicant for that map shall prepare a transportation performance evaluation which shall determine the specific needed improvements of each off-site arterial and related costs in order to provide adequate roadway and intersection capacity for the expected Specific Plan and General Plan buildout traffic trips. The transportation performance evaluation

shall be based on the Master Plan of Highways in effect at that time and shall be approved by the Los Angeles County Department of Public Works. The applicant shall be required to fund its fair share of improvements to these arterials, as stated on Table 4.8-18 of the Newhall Ranch Specific Plan Final EIR. The applicants total funding obligation shall be equitably distributed over the housing units and non-residential building square footage (i.e., Business Park, Visitor-Serving, Mixed-Use, and Commercial) in the Specific Plan, and shall be a fee to be paid to the County and/or the City at each building permit. For off-site areas within the County unincorporated area, the applicant may construct improvements for credit against or in lieu of paying the fee.

**(3) I-5 and SR-126 in Los Angeles County**

SP 4.8-7 Each future performance evaluation which shows that a future subdivision map will create significant impacts on SR-126 shall analyze the need for additional travel lanes on SR-126. If adequate lane capacity is not available at the time of subdivision, the applicant of the subdivision shall fund or construct the improvements necessary to serve the proposed increment of development. Construction or funding of any required facilities shall not preclude the applicant's ability to seek state, federal, or local funding for these facilities.

SP 4.8-8 Project-specific environmental analysis for future subdivision maps which allow construction shall comply with the requirements of the *Congestion Management Program* in effect at the time that subdivision map is filed.

SP 4.8-9 Prior to the recordation of the first subdivision map which permits construction, the applicant for that map shall prepare a transportation evaluation including all of the Specific Plan land uses which shall determine the specific improvements needed to the following intersections with SR-126 in the City of Fillmore and community of Piru in Ventura County: A, B, C, D and E Streets, Old Telegraph, Olive, Central, Santa Clara, Mountain View, El Dorado Road, and Pole Creek (Fillmore), and Main/Torrey and Center (Piru). The related costs of those intersection improvements and the project's fair share shall be estimated based upon the expected Specific Plan traffic volumes. The transportation performance evaluation shall be based on the Los Angeles *County Master Plan of Highways* in effect at that time and shall be approved by the Los Angeles County Department of Public Works. The applicant's total funding obligation shall be equitably distributed over the housing units and non-residential building square footage (i.e.,

Business Park, Visitor Center, Mixed Use, and Commercial) in the Specific Plan, and shall be a fee to be paid to the City of Fillmore and the County of Ventura at each building permit.

SP 4.8-10 The Specific Plan is responsible to construct or fund its fair-share of the intersections and interchange improvements indicated on Table 4.8-18 of the Newhall Ranch Specific Plan Final EIR. Each future transportation performance evaluation required by Mitigation 4.8-2 of the Newhall Ranch Specific Plan Final EIR which identifies a significant impact at these locations due to subdivision map-generated traffic shall address the need for additional capacity at each of these locations. If adequate capacity is not available at the time of subdivision map recordation, the performance evaluation shall determine the improvements necessary to carry Specific Plan generated traffic, as well as the fair share cost to construct such improvements. If the future subdivision is conditioned to construct a phase of improvements which results in an overpayment of the fair-share cost of the improvement, then an appropriate adjustment (offset) to the fees paid to Los Angeles County and/or City of Santa Clarita pursuant to Mitigation Measure 4.8-6 above shall be made.

SP 4.8-11 The applicant of the Newhall Ranch Specific Plan shall participate in an I-5 developer fee program, if adopted by the Board of Supervisors for the Santa Clarita Valley.

SP 4.8-12 The applicant of the Newhall Ranch Specific Plan shall participate in a transit fee program, if adopted for the entire Santa Clarita Valley by Los Angeles County and City of Santa Clarita.

SP 4.8-13 Prior to the approval of each subdivision map which permits construction, the applicant for that map shall prepare a traffic analysis approved by the Los Angeles County Department of Public Works. The analysis will assess project and cumulative development (including an existing plus cumulative development scenario under the County's Traffic Impact Analysis Report Guidelines (TIA) and its Development Monitoring System (DMS)). In response to the traffic analysis, the applicant may construct off-site traffic improvements for credit against, or in lieu of paying, the mitigation fees described in Mitigation Measure 4.8-6 of the Newhall Ranch Specific Plan Final EIR. If future subdivision maps are developed in phases, a traffic study for each phase of the subdivision map may be submitted to determine the improvements needed to be constructed with that phase of development.

# APPENDIX F4.9

## Air Quality Analyses and Calculations

# LANDMARK VILLAGE

# Supplemental
# Localized Significance Thresholds Analysis

**Prepared for:**

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**Prepared by:**

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Santa Clarita, California 93012

**August 2010**

## 1.0 THRESHOLDS OF SIGNIFICANCE

The South Coast Air Quality Management District (SCAQMD) recommends the evaluation of localized air quality impacts to sensitive receptors in the immediate vicinity of the project site. The thresholds are based on the difference between the maximum monitored ambient pollutant concentrations and the California Ambient Air Quality Standards (CAAQS) or National Ambient Air Quality Standards (NAAQS). Therefore, the thresholds depend upon the concentrations of pollutants monitored locally with respect to a project site. For pollutants that already exceed the CAAQS or NAAQS (e.g., PM10 and PM2.5), the thresholds are based on standards established by the SCAQMD in the *Final Localized Significance Threshold Methodology*. This evaluation requires that anticipated ambient air concentrations, determined using a computer-based air quality dispersion model, be compared to localized significance thresholds for PM10, PM2.5, $NO_2$, and CO.[1] The significance threshold for PM10 represents compliance with Rule 403 (Fugitive Dust) and Rule 1303 (New Source Review Requirements), while the thresholds for $NO_2$ and CO represent the allowable increase in concentrations above background levels in the vicinity of the project that would not cause or contribute to an exceedance of the relevant ambient air quality standards. The significance thresholds for PM2.5 are intended to constrain emissions so as to aid in the progress toward attainment of the ambient air quality standards.[2] The applicable thresholds are shown below in **Table 1**, **Localized Significance Thresholds for Santa Clarita Valley (Source Receptor Area 13).**

## 2.0 CALCULATION OF EMISSIONS

Unmitigated construction emissions during grading and other earthwork activities were estimated based on the URBEMIS2007 (Version 9.2.4) Environmental Management Software. Model input parameters were based on information and activity levels provided by the project applicant. Where information was not available, model default values recommended by the SCAQMD or data from similar projects were used. The results indicate that the maximum on-site daily emissions of $NO_X$, CO, PM10 and PM2.5 are anticipated to occur during the initial stages of construction. This is primarily the result of grading activities for both the Landmark Village project site and the Utility Corridor. Emission calculations are provided in **Appendix A**.

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1 South Coast Air Quality Management District, *Final Localized Significance Threshold Methodology*, (2008).

2 South Coast Air Quality Management District, *Final Methodology to Calculate Particulate Matter (PM) 2.5 and PM 2.5 Significance Thresholds*, (2006).

**Table 1**
**Localized Significance Thresholds for Santa Clarita Valley (Source Receptor Area 13)**

| Construction LST | Pollutant (concentration) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | $NO_2$ 1-hour | | CO 1-hour | | CO 8-hours | | $PM_{10}$ 24-hours | $PM_{2.5}$ 24-hours |
| | µg/m³ | ppm | µg/m³ | ppm | µg/m³ | ppm | µg/m³ | µg/m³ |
| CAAQS/NAAQS[1] | 188 | 0.100 | 23,000 | 20 | 10,000 | 9.0 | 10.4 | 10.4 |
| Peak Background[2] | 115 | 0.061 | 2,300 | 2 | 1,444 | 1.3 | NA | NA |
| LSTs[3] | 73 | 0.039 | 20,700 | 18 | 8,556 | 7.7 | 10.4 | 10.4 |

*NA = not applicable*

*Source: South Coast Air Quality Management District, Final Localized Significance Threshold Methodology, (2008), Appendix C.*

[1] *California has not adopted a 24-hour standard for $PM_{2.5}$; the 24-hour $PM_{2.5}$ standard shown is the national standard. The U.S. EPA adopted a 1-hour standard for $NO_2$ that is lower than the California standard; therefore, the national standard is used for $NO_2$. All other standards are the California standards*

[2] *The peak background concentration for $NO_2$ is based on the 3-year average of the 98th-percentile of the annual distribution of daily maximum 1-hour concentrations for 2006 through 2008. All other peak background concentrations are based on the maximum concentrations between 2006 and 2008.*

[3] *LSTs for $NO_2$ and CO are the differences between the more stringent of the CAAQS or NAAQS and the peak background concentration.*

## 3.0 LOCALIZED SIGNIFICANCE THRESHOLD ANALYSIS

### 3.1 Modeling Approach

Per the recommendation of the SCAQMD, ambient $NO_x$, CO, PM10, and PM2.5 concentrations due to the construction of the proposed project were analyzed using methods described in its LST Methodology. The U.S. EPA and SCAQMD-approved dispersion model, AERMOD,[3] was used to model the air quality impacts of $NO_x$, CO, PM10, and PM2.5 emissions. AERMOD can estimate the air quality impacts of single or multiple point, area, or volume sources using historical meteorological conditions. Volume sources were used to represent the emissions from trucks and heavy-duty construction equipment. Area sources were used to model fugitive dust emissions of PM10 and PM2.5.

3 Lakes Environmental, ISC-AERMOD VIEW Software.

For the purpose of the dispersion modeling, the maximum daily emissions that could occur due to construction activities from any construction phase were selected for the LST analysis. It was assumed that an average workday was 8 hours. Therefore, the maximum daily emissions were divided by 8 to obtain maximum emission rates in units of pounds per hour.

### 3.2 Modeling Results

The results of the LST dispersion modeling are presented below in **Table 2, Localized Significance Threshold Analysis**. The modeling results presented below are based on conservative assumptions. Construction emissions were based on conservative assumptions and do not fully take into account emissions reductions that would occur from CARB regulations that are scheduled to be implemented over the coming years. As shown in **Table 2,** construction of the project would not generate on-site emissions in excess of the site-specific localized significance thresholds for CO. Construction of the project would generate on-site emissions in excess of the threshold for $NO_2$, PM10, and PM2.5 at sensitive receptors adjacent to the project site.

In accordance with the SCAQMD methodology, the impacts are evaluated for receptor locations in which a person could be located for a period of time equal to the averaging period of each pollutant. For example, workplace receptors were evaluated for pollutants with an averaging period of 1- and 8-hours, but not for 24-hours. Residential receptors were evaluated for all pollutants listed above because a person could be located at a residential land use for 1-, 8- and 24-hours. School receptors were conservatively evaluated for all pollutants listed above.

**Table 2**
**Localized Significance Threshold Analysis**

| Construction LST | Maximum Modeled Concentrations (micrograms per cubic meter; parts per million) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | $NO_2$ 1-hour | | CO 1-hour | | CO 8-hour | | PM10 24-hour | PM2.5 24-hour |
| | µg/m³ | ppm | µg/m³ | ppm | µg/m³ | ppm | µg/m³ | µg/m³ |
| LSTs[1] | 73 | 0.039 | 20,700 | 18 | 8,556 | 7.7 | 10.4 | 10.4 |
| Draft EIR Results | 483 | 0.257 | 1,787 | 2 | 244 | 0.2 | 56.1 | NA |
| AERMOD Results | 324 | 0.172 | 561 | < 1 | 70 | < 0.1 | 34.1 | 12.8 |
| Exceeds Threshold? | **YES** | | NO | | NO | | **YES** | **YES** |

*Source: Impact Sciences, Inc. Emissions calculations are provided in **Appendix A**.*

[1] *South Coast Air Quality Management District,* Final Localized Significance Threshold Methodology, *(2008).*

## 4.0 CONCLUSIONS

The LST analysis was conducted to estimate worst-case ambient air quality impacts during construction at the Landmark Village project site and Utility Corridor. As shown in **Table 2,** construction of the proposed project would not generate on-site emissions in excess of the site-specific LST for CO. Construction of the proposed project would generate on-site emissions that would potentially exceed the LST criteria for $NO_2$, PM10, and PM2.5 for off-site receptors. Therefore, based on this assessment, the localized impacts for $NO_2$, PM10, and PM2.5 would be potentially significant during the construction of the proposed Landmark Village project and Utility Corridor when construction activity is taking place near off-site sensitive receptors. It should be noted that the results presented above are based on data that was known at the time this analysis was conducted as well as reasonable and conservative assumptions. Actual impacts during project construction may be different depending on several factors including the actual level of construction activity and actual meteorological conditions.

# APPENDIX A

## LST Model Calculations

**Landmark Village**
**AERMOD Dispersion Model**
**SCAQMD Localized Significance Threshold Modeling**

**Table LST-1**
**Maximum On-Site Emissions**

| Construction Emissions[1] | | $NO_X$ (lbs/day) | CO (lbs/day) | PM10 Dust (lbs/day) | PM10 Exh (lbs/day) | PM10 (lbs/day) | PM2.5 Dust (lbs/day) | PM2.5 Exh (lbs/day) | PM2.5 (lbs/day) |
|---|---|---|---|---|---|---|---|---|---|
| Landmark Village + Utility Corridor | | | | | | | | | |
| Weeks | 1 through 19 | 988.69 | 424.21 | 1,876.83 | 43.04 | 1,919.87 | 391.96 | 39.59 | 431.55 |
| Weeks | 20 through 39 | 1,608.00 | 687.30 | 2,355.10 | 72.31 | 2,427.41 | 491.84 | 66.52 | 558.36 |
| Weeks | 40 through 46 | 2,333.34 | 968.81 | 2,355.23 | 106.28 | 2,461.51 | 491.87 | 97.77 | 589.64 |
| Weeks | 47 through 91 | 1,344.65 | 544.60 | - | 63.24 | 63.24 | - | 58.18 | 58.18 |
| Weeks | 92 | 1,423.18 | 596.23 | - | 67.05 | 67.05 | - | 61.69 | 61.69 |
| Weeks | 93 through 144 | 1,306.46 | 549.45 | - | 61.50 | 61.50 | - | 56.58 | 56.58 |
| Weeks | 145 through 158 | 1,124.77 | 493.05 | - | 53.72 | 53.72 | - | 49.42 | 49.42 |
| Weeks | 159 through 178 | 545.10 | 245.76 | - | 25.70 | 25.70 | - | 23.65 | 23.65 |
| Weeks | 179 through 196 | 471.70 | 210.80 | - | 22.01 | 22.01 | - | 20.25 | 20.25 |
| Weeks | 197 through 210 | 321.07 | 141.33 | - | 14.77 | 14.77 | - | 13.59 | 13.59 |
| Weeks | 211 through 220 | 209.01 | 97.71 | - | 9.21 | 9.21 | - | 8.48 | 8.48 |
| Weeks | 221 through 235 | 128.12 | 58.05 | - | 5.41 | 5.41 | - | 4.97 | 4.97 |
| Year | 2015+ | 214.46 | 105.32 | - | 8.68 | 8.68 | - | 7.98 | 7.98 |
| Maximum Emissions | | 2,333.34 | 968.81 | 2,355.23 | 106.28 | 2,461.51 | 491.87 | 97.77 | 589.64 |
| Max. Utility Corridor Portion of Emissions | | 38.91 | 18.49 | 75.23 | 1.90 | 77.13 | 15.71 | 1.75 | 17.46 |

Source:
1. Emission estimates from URBEMIS2007, Version 9.2.4.

**Landmark Village**
**AERMOD Dispersion Model**
**SCAQMD Localized Significance Threshold Modeling**

**Table LST-2**
**AERMOD Source Characteristics**

| Emission Source | Source Type | Release Height (m) | Length of Side X (m) | Length of Side Y (m) | Initial Vertical (m) | Initial Lateral (m) | Initial Vertical (m) | Exit Temperature (F) | Inside Diameter (ft) | Exit Flow Rate ($ft^3/s$) |
|---|---|---|---|---|---|---|---|---|---|---|
| Landmark Village | | | | | | | | | | |
| Construction Off-Road | Volume | 5.00 | 220.37 | 220.37 | 1.16 | 51.25 | n/a | n/a | n/a | n/a |
| Construction Fugitive Dust | Area | 0.00 | 220.37 | 220.37 | n/a | n/a | 1.00 | n/a | n/a | n/a |
| Utility Corridor | | | | | | | | | | |
| Construction Off-Road | Volume | 5.00 | 30 to 50 | 30 to 50 | 1.16 | 6.98 to 11.63 | n/a | n/a | n/a | n/a |
| Construction Fugitive Dust | Area | 0.00 | Polygon | Polygon | n/a | n/a | 1.00 | n/a | n/a | n/a |

**Landmark Village**
**AERMOD Dispersion Model**
**SCAQMD Localized Significance Threshold Modeling**

**Table LST-3**
**Calculated AERMOD Source Emission Rates**

| Emissions Source | | Model Source Group | Source ID | Source Type | Number of Sources | Averaging Period (hours/day) | Modeled Emission Rates | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | $NO_x$ | | CO | | PM10 (Dust) | | PM10 (Exh) | | PM2.5 (Dust) | | PM2.5 (Exh) | |
| | | | | | | | (lbs/day) | (g/s) | (lbs/day) | (g/s) | (lbs/day) | (g/s) | (lbs/day) | (g/s) | (lbs/day) | (g/s) | (lbs/day) | (g/s) |
| Landmark Village | | | | | | | | | | | | | | | | | | |
| Construction Off-Road | | West | W01 | Volume | 1 | 8 | 2,294.43 | 3.61E+01 | 950.32 | 1.50E+01 | - | 0.00E+00 | 104.38 | 1.64E+00 | - | 0.00E+00 | 96.02 | 1.51E+00 |
| Construction Fugitive Dust | | West | W02 | Area | 1 | 8 | - | 0.00E+00 | - | 0.00E+00 | 2,280.00 | 3.59E+01 | - | 0.00E+00 | 476.16 | 7.50E+00 | - | 0.00E+00 |
| Utility Corridor | | | | | | | | | | | | | | | | | | |
| Construction Off-Road | | West | U01-13 | Volume | 13 | 8 | 38.91 | 4.71E-02 | 18.49 | 2.24E-02 | - | 0.00E+00 | 1.90 | 2.30E-03 | - | 0.00E+00 | 1.75 | 2.12E-03 |
| Construction Fugitive Dust | | | | | | | | | | | | | | | | | | |
| Square Meters | 17,955.0 | West | U14 | Area | 1 | 8 | - | 0.00E+00 | - | 0.00E+00 | 41.72 | 6.57E-01 | - | 0.00E+00 | 8.71 | 1.37E-01 | - | 0.00E+00 |
| Square Meters | 7,792.5 | West | U15 | Area | 1 | 8 | - | 0.00E+00 | - | 0.00E+00 | 18.11 | 2.85E-01 | - | 0.00E+00 | 3.78 | 5.96E-02 | - | 0.00E+00 |
| Square Meters | 6,627.5 | West | U16 | Area | 1 | 8 | - | 0.00E+00 | - | 0.00E+00 | 15.40 | 2.43E-01 | - | 0.00E+00 | 3.22 | 5.07E-02 | - | 0.00E+00 |

**Landmark Village**
**AERMOD Dispersion Model**
**SCAQMD Localized Significance Threshold Modeling**

**Table LST-4**
**$NO_2$ 1-hour Daily Average**
**Design value for all station , 2005-2008**
**(average of the 98th percentile value in a 3-year period)**

| | | Design Value | | 98th percentile, ppb | | | |
|---|---|---|---|---|---|---|---|
| Stn # | City | 2005-2007 | 2006-2008 | 2005 | 2006 | 2007 | 2008 |
| 60 | AZUS | 83 | 84 | 77 | 84 | 87 | 82 |
| 69 | BURK | 75 | 76 | 79 | 72 | 74 | 83 |
| 72 | LGBH | 74 | 78 | 76 | 69 | 77 | 88 |
| 74 | RESE | 60 | 60 | 64 | 57 | 59 | 63 |
| 75 | POMA | 80 | 83 | 77 | 84 | 78 | 87 |
| 84 | LYNN | 79 | 79 | 81 | 85 | 71 | 82 |
| 85 | PICO** | 84 | 87 | 75 | 88 | 88 | 85 |
| 87 | CELA | 84 | 84 | 81 | 83 | 87 | 82 |
| 88 | PASA | 73 | 73 | 75 | 73 | 71 | 74 |
| **90** | **SCLR** | **61** | **61** | **61** | **60** | **63** | **60** |
| 91 | WSLA | 63 | 64 | 63 | 62 | 64 | 66 |
| 591 | GLEN | 78 | 76 | 75 | 79 | 79 | 71 |
| 820 | HAWT | 71 | 72 | 71 | 72 | 69 | 76 |
| 3176 | ANAH | 66 | 67 | 70 | 68 | 61 | 73 |
| 3177 | LAHB | 73 | 73 | 73 | 77 | 70 | 73 |
| 3195 | CSTA | 62 | 62 | 63 | 62 | 60 | 64 |
| 4137 | PLSP | 50 | 49 | 49 | 50 | 51 | 45 |
| 4144 | RIVR | 64 | 65 | 66 | 64 | 63 | 67 |
| 4158 | ELSI | 53 | 52 | 53 | 54 | 51 | 50 |
| 4164 | BNAP | 65 | 63 | 65 | 66 | 64 | 58 |
| 5175 | UPLA | 83 | 77 | 86 | 88 | 74 | 69 |
| 5197 | FONT | 80 | 77 | 88 | 80 | 72 | 79 |
| 5203 | SNBO | 71 | 69 | 70 | 73 | 69 | 64 |
| 5212 | MLOM | 69 | 73 | 66 | 70 | 70 | 79 |
| 5214 | MRLM | 51 | 61 | 35 | 61 | 58 | 64 |

Source:
1. South Coast Air Quality Management District, (2010).

Notes:
** Incomplete data for 2005 and 2006.

**Landmark Village**
**AERMOD Dispersion Model**
**SCAQMD Localized Significance Threshold Modeling**

**Table LST-5**
**Maximum Modeled Impacts at Sensitive Receptors**

| Model Scenario | Receptor | Maximum Modeled Impacts | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | $NO_2$ | | CO | | | | PM10 | PM2.5 |
| | | 1-Hr | | 1-Hr | | 8-Hr | | 24-Hr | 24-Hr |
| | | µg/m$^3$ | ppm | µg/m$^3$ | ppm | µg/m$^3$ | ppm | µg/m$^3$ | µg/m$^3$ |
| **Elevated Terrain / Meteorological Data Year: 2005-2007** | | | | | | | | | |
| **Construction** | | | | | | | | | |
| **LST Impacts** | Residential | 247.46 | 0.13 | 183.17 | 0.16 | 23.18 | 0.02 | 28.71 | 10.42 |
| *UTM Coordinate* | *Easting* | | *351,400* | | *348,000* | | *348,000* | *350,700* | *350,700* |
| *UTM Coordinate* | *Northing* | | *3,813,500* | | *3,812,200* | | *3,812,200* | *3,813,500* | *3,813,500* |
| **LST Impacts** | Workplace | 324.11 | 0.17 | 561.29 | 0.49 | 70.16 | 0.06 | | |
| *UTM Coordinate* | *Easting* | | *353,800* | | *350,300* | | *350,300* | | |
| *UTM Coordinate* | *Northing* | | *3,810,900* | | *3,811,600* | | *3,811,600* | | |
| **LST Impacts** | Student | 229.32 | 0.12 | 134.00 | 0.12 | 17.70 | 0.02 | 19.97 | 7.21 |
| *UTM Coordinate* | *Easting* | | *351,300* | | *351,300* | | *353,800* | *351,300* | *351,300* |
| *UTM Coordinate* | *Northing* | | *3,813,300* | | *3,813,300* | | *3,808,300* | *3,813,300* | *3,813,300* |
| **Flat Terrain / Meteorological Data Year: 2005-2007** | | | | | | | | | |
| **Construction** | | | | | | | | | |
| **LST Impacts** | Residential | 132.90 | 0.07 | 270.22 | 0.24 | 34.34 | 0.03 | 34.09 | 12.83 |
| *UTM Coordinate* | *Easting* | | *351,100* | | *352,800* | | *353,400* | *353,400* | *353,500* |
| *UTM Coordinate* | *Northing* | | *3,813,000* | | *3,807,000* | | *3,808,600* | *3,808,600* | *3,808,500* |
| **LST Impacts** | Workplace | 222.69 | 0.12 | 344.33 | 0.30 | 45.25 | 0.04 | | |
| *UTM Coordinate* | *Easting* | | *349,600* | | *350,200* | | *350,100* | | |
| *UTM Coordinate* | *Northing* | | *3,812,500* | | *3,811,500* | | *3,811,700* | | |
| **LST Impacts** | Student | 113.17 | 0.06 | 222.01 | 0.19 | 32.05 | 0.03 | 33.60 | 12.26 |
| *UTM Coordinate* | *Easting* | | *351,300* | | *353,800* | | *353,800* | *353,700* | *353,800* |
| *UTM Coordinate* | *Northing* | | *3,813,300* | | *3,808,300* | | *3,808,300* | *3,808,400* | *3,808,300* |
| **Maximum Values** | | **324.11** | **0.172** | **561.29** | **0.49** | **70.16** | **0.06** | **34.09** | **12.83** |

Source: Lakes-Environmental, ISC-AERMOD View, Version 6.6.0, (2010).

# APPENDIX B

## AERMOD Dispersion Modeling Files
## (Available electronically upon request)

# LANDMARK VILLAGE

# Supplemental Construction Health Risk Assessment

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**August 2010**

## SUMMARY

The proposed Landmark Village project would result in the development of single-family and multi-family residences, mixed-use residential/commercial development, commercial/retail uses, office uses, school uses, parks, and recreational areas. Construction of the project would result in emissions of diesel particulate matter (DPM), which may potentially result in adverse health impacts to nearby sensitive receptors.

This health risk assessment (HRA) evaluates the health impacts of DPM emitted by diesel-fueled equipment associated with construction of the proposed project. The South Coast Air Quality Management District (SCAQMD) recommends the following significance thresholds for health risk assessments of projects being reviewed under the California Environmental Quality Act (CEQA):

- Criterion 1: a lifetime probability of contracting cancer greater than 10 in 1 million ($10 \times 10^{-6}$); and
- Criterion 2: a health hazard index of 1 for evaluating the non-carcinogenic effects of toxic air contaminants.

Using the SCAQMD's thresholds of significance, the HRA finds that the maximum anticipated cancer risk associated with the construction of the project is 0.3 in 1 million at the maximally exposed individual (MEI) receptor. The assessment also finds that the chronic Hazard Index for non-cancer health impacts is well below 1 at any modeled receptor point. Since health impacts are less than SCAQMD significance thresholds, the health impacts associated with construction of the project are considered to be less than significant.

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**Appendices**


A HRA Model Calculations

B AERMOD Dispersion Modeling Files (Available electronically upon request)

# 1.0 GENERAL

## 1.1 Purpose

The proposed Landmark Village project is located south of the Santa Clara River and State Route 126 (SR-126) and west of the Golden State Freeway (Interstate 5). The South Coast Air Quality Management District (SCAQMD) is the local agency responsible for air quality planning and control in this region as well as throughout the populated areas of Los Angeles, Riverside, and San Bernardino Counties and all of Orange County.

Construction of the project would result in emissions of diesel particulate matter (DPM) that could potentially result in adverse health impacts to sensitive receptors located in the vicinity of the project site. On August 27, 1998, the California Air Resources Board (CARB) designated diesel particulate matter (DPM) emissions from diesel-fueled engines as a toxic air contaminant (TAC) because some of the exhaust constituents that make up DPM, such as arsenic, benzene, and nickel, are known to cause cancer in humans. Exposure to DPM also can cause non-cancer health effects, including respiratory symptoms, changes in lung function, and cardiovascular disease. The SCAQMD has not adopted a methodology for evaluating construction-related health impacts because typical construction activity is short-term and temporary. However, the proposed project would result in construction activity over approximately seven years. Therefore, in the interest of full disclosure under CEQA, this analysis determined the potential for adverse health impacts due to DPM emissions from construction activities.

Sources utilized in the health risk assessment (HRA) for the project include the SCAQMD's *California Environmental Quality Act (CEQA) Air Quality Handbook* ("CEQA Handbook") and Office of Environmental Health Hazard Assessment's (OEHHA) *Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments*[1], and the URBEMIS2007 Environmental Management Software. Air quality modeling conducted for the analysis was conducted using the AERMOD model, which is a Gaussian dispersion model and is approved for use in air quality analyses by the U.S. Environmental Protection Agency (EPA) and the SCAQMD.

## 1.2 Project Description

The proposed project consists of the development of single-family and multi-family residences, mixed-use residential/commercial development, commercial/retail uses, office uses, school uses, parks, and recreational areas. The proposed project also includes facilities and infrastructure proposed to support

1 California Environmental Protection Agency, Office of Environmental Health Hazard Assessment, *Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments*, (2003).

the project, including roads, trails, drainage improvements, potable water systems, sanitary sewer system and dry utility systems.

### 1.3 Thresholds of Significance

The SCAQMD CEQA Handbook recommends that the following thresholds be used to determine the potential to expose off-site receptors to significant health risks from project operations. The SCAQMD developed these thresholds to evaluate the significance of operational-related TAC emissions, assuming a maximum lifetime exposure period of 70 years. As noted above, construction would last for several years. Therefore, the analysis assumes that TAC emissions would be generated during construction activity, after which time TAC emissions would no longer be emitted.

- Criterion 1: a lifetime probability of contracting cancer greater than 10 in 1 million ($10 \times 10^{-6}$); and
- Criterion 2: a health hazard index of 1 for evaluating the non-carcinogenic effects of toxic air contaminants.

These thresholds apply to the Maximally Exposed Individual (MEI), which is the receptor that is exposed to the highest concentration of TACs as determined by dispersion modeling. The thresholds are assessed using the methodologies described in the Office of Environmental Health Hazard Assessment (OEHHA) *Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments*[2] (OEHHA Guidance). For Criterion 1, the OEHHA Guidance recommends that a 70-year exposure duration be used for determining lifetime residential cancer risks (7 days per week, 50 weeks per year).[3] This ensures that a person residing in the vicinity of a facility for a lifetime will be included in the evaluation of risk posed by that facility. In addition to the lifetime cancer risk, additional exposure periods may be evaluated. The OEHHA Guidance provides direction with respect to the evaluation of cancer risk calculations for shorter-term exposures (i.e., less than a maximum lifetime exposure period of 70 years). The standard default assumption for workplace exposure is 5 days per week, 49 weeks per year, for 40 years.[4] The assumption for student exposure is 180 days, which corresponds to number of days in a typical school year, for 9 years. The OEHHA Guidance recommends that the short-term exposure last for a minimum of 9 years.[5]

For Criterion 2, the non-carcinogenic effects of TACs are evaluated for acute and chronic impacts, which take into account effects from exposure pathways. A receptor may be exposed to TACs via one or more of

2 California Environmental Protection Agency, Office of Environmental Health Hazard Assessment, *Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments*, (2003).

3 Ibid., p. 8-3.

4 Ibid., p. 8-5.

5 Ibid., p. 8-4.

the following pathways: (1) inhalation, (2) ingestion, and/or (3) dermal (skin absorption). OEHHA has not identified acute (short-term) non-cancer health impact factors for DPM. However, OEHHA has identified chronic (long-term) non-cancer health impact factors for DPM via the inhalation pathway. OEHHA has not identified non-cancer health impact factors for DPM from exposure via the ingestion or dermal pathways. Therefore, the non-carcinogenic effects of DPM are evaluated for chronic impacts via inhalation. Chronic non-cancer inhalation impacts are evaluated over an annual exposure period.

The project's estimated health impacts will be evaluated with respect to these criteria. This analysis evaluates the incremental increase in ambient levels of DPM that would result from construction of the proposed project and quantifies the potential health risk in the vicinity of the project.

## 2.0 CALCULATION OF EMISSIONS

Unmitigated construction emissions were estimated based on the URBEMIS2007 (Version 9.2.4) Environmental Management Software. Model input parameters were based on information and activity levels provided by the project applicant. Where information was not available, model default values recommended by the SCAQMD or data from similar projects were used. Exhaust emissions of PM10 from on-site equipment was used to represent DPM emissions. Only emissions from on-site equipment and activity were considered in the analysis. **Table 1, Estimated Unmitigated On-Site Construction DPM Emissions**, presents the estimated on-site construction emissions for DPM. For the purposes of modeling cancer risk, the daily emissions of DPM as calculated from the URBEMIS2007 model were summed and averaged over the representative exposure durations (i.e., 70 years, 40 years and 9 years) to obtain emissions rates in units of grams per second. For the purposes of modeling chronic non-cancer health impacts, the year with the maximum emissions of DPM as calculated from the URBEMIS2007 model were used and averaged over the exposure durations (i.e., 1 year) to obtain emissions rates in units of grams per second. Because construction would involve a variety of activities, such as grading, utilities trenching, street paving, and building construction, the emissions listed in **Table 1** were summed over each unique combination of activities.

**Table 1**
**Estimated Unmitigated On-Site Construction DPM Emissions**

| Construction Year | Primary Activities | Duration (Work Days) | On-Site DPM Emissions (lbs/day) | On-Site DPM Emissions (total lbs) |
|---|---|---|---|---|
| Landmark Village and Utility Corridor | | | | |
| 2010 | Week 1-19 | 95 | 43.04 | 4,088.80 |
| 2010 | Week 20-39 | 100 | 72.31 | 7,231.00 |
| 2010 | Week 40-46 | 35 | 106.28 | 3,719.80 |
| 2010 | Week 47-91 | 30 | 63.24 | 1,897.20 |
| 2011 | Week 47-91 | 195 | 58.36 | 11,380.20 |
| 2011 | Week 92 | 5 | 67.05 | 335.25 |
| 2011 | Week 93-144 | 60 | 61.50 | 3,690.00 |
| 2012 | Week 93-144 | 210 | 57.79 | 12,135.90 |
| 2012 | Week 145-158 | 51 | 53.72 | 2,739.72 |
| 2013 | Week 145-158 | 19 | 49.29 | 936.51 |
| 2013 | Week 159-178 | 100 | 25.70 | 2,570.00 |
| 2013 | Week 179-196 | 90 | 22.01 | 1,980.90 |
| 2013 | Week 197-210 | 52 | 14.77 | 768.04 |
| 2014 | Week 197-210 | 18 | 13.02 | 234.36 |
| 2014 | Week 211-220 | 50 | 9.21 | 460.50 |
| 2014 | Week 221-235 | 75 | 5.41 | 405.75 |
| 2015 | Week 236+ | 259 | 8.68 | 2,248.12 |
| 2016 | Week 236+ | 261 | 8.00 | 2,088.00 |
| 2017 | Week 236+ | 180 | 6.97 | 1,254.60 |
| **Landmark Village: Total Emissions** | | | | **59,692.15** |
| **Utility Corridor: Total Emissions** | | | | **472.50** |
| **Landmark Village: Maximum 1-Year Emissions** | | | | **16,687.90** |
| **Utility Corridor: Maximum 1-Year Emissions** | | | | **248.90** |

*Source: Impact Sciences, Inc. Emissions calculations are provided in **Appendix A**.*
*Totals in the table may not appear to add exactly due to rounding in the computer model calculations.*

## 3.0 HEATH RISK ASSESSMENT

### 3.1 Modeling Approach

Concentrations of DPM due to the construction of the proposed project were modeled using the U.S. Environmental Protection Agency (EPA) and SCAQMD-approved dispersion model, AERMOD.[6] AERMOD can estimate the air quality impacts of single or multiple point, area, or volume sources using historical meteorological conditions. Volume sources were used to represent the emissions from trucks and heavy-duty construction equipment.

#### 3.1.1 Modeled Scenarios

Construction activity could take place at any location on the Landmark Village project site. In order to model the incremental increase in cancer risk to off-site receptors, the modeling sources were placed throughout the Landmark Village project site and the portion of the Utility Corridor adjacent to the Landmark Village site. This is a simplified representation of the actual construction conditions. However, because cancer risk is based on long-term exposures, it is appropriate to simplify the model and assume that the DPM emissions would be distributed equally throughout the Landmark Village project site. A graphical representation of this modeling scenario is presented in **Figure 1, Model Source Groups to Evaluate Cancer Risks**.

In order to model the incremental increase in non-cancer chronic health impacts to off-site receptors, a representative worst-case modeling source group was defined. The worst-case modeling source group placed emission sources at the northeastern portion of both the Landmark Village site and the Utility Corridor. This area is nearest to off-site sensitive receptors, and thus would result in worst-case impacts. Locating the sources in this area would allow the model to determine the maximum non-cancer chronic health impacts to nearby sensitive receptors. A graphical representation of this modeling scenario is presented in **Figure 2, Model Source Groups to Evaluate Non-Cancer Chronic Health Impacts**.

#### 3.1.2 Source Characteristics

Volume sources were used to represent emissions from construction equipment. For evaluating cancer risk, Landmark Village consisted of 25 volume sources, which were given a 5-meter release height and a 1.16-meter initial vertical dimension. The volume sources for the Utility Corridor were set up using the line source function in the AERMOD software. For evaluating non-cancer health impacts, the volume sources for Landmark Village consisted of a single volume source, which was given a 5-meter release

6 Lakes Environmental, ISC-AERMOD VIEW Software.

height and a 1.16-meter initial vertical dimension. The volume sources for the Utility Corridor consisted of 13 volume sources, which were given a 5-meter release height and a 1.16-meter initial vertical dimension. The emission factors used in the AERMOD model are listed below in **Table 2, AERMOD Emission Factors**. These emission factors were calculated from the total emissions presented previously in **Table 1** and divided by the exposure duration periods (i.e., 70 years, 40 years, 9 years, and 1 year) and the number of individual volume source. The factors also assume that DPM is emitted for 8 hours per day. The factors are presented in scientific notation (e.g., 1.47E-03 is equal to 0.00147). Detailed emission rate calculations for the volume sources are presented in **Appendix A**.

**Table 2**
**AERMOD Emission Factors**

| Model Source Group | Emission Factor (grams per second) |
|---|---|
| Cancer Risk: 70-Year Exposure | |
| Landmark Village | 1.47E-03 |
| Utility Corridor | 2.91E-04 |
| Cancer Risk: 40-Year Exposure | |
| Landmark Village | 2.58E-03 |
| Utility Corridor | 5.10E-04 |
| Cancer Risk: 9-Year Exposure | |
| Landmark Village | 1.14E-02 |
| Utility Corridor | 2.27E-03 |
| Non-Cancer Chronic: 1-Year | |
| Landmark Village | 7.20E-01 |
| Utility Corridor | 8.26E-04 |

*Source: Impact Sciences, Inc. Emissions calculations are provided in **Appendix A**.*
*Totals in the table may not appear to add exactly due to rounding in the computer model calculations.*

### 3.1.3 Receptors

Discrete Cartesian receptors were used to determine air quality impacts in the vicinity of the project site. Field receptors were placed at 100-meter intervals outside the boundary of the Landmark Village project site to cover the nearby community of Val Verde, California and other nearby receptors including the nearest schools, offices, and residences. Due to the size of the project site and the number of model runs required, this receptor grid was determined to provide a balanced approach with respect to receptor coverage and model run times. This receptor grid is also consistent with SCAQMD recommended

guidance for AERMOD.[7] A graphical representation of the receptor grid is presented in **Figure 3, Landmark Village Receptor Grid to Evaluate Cancer Risks and Non-Cancer Health Impacts**.

### 3.1.4 Meteorological Data

The monitoring station located in Source Receptor Area 13 was used in the analysis. Monitoring data were obtained from SCAQMD website.[8] These files were developed by the SCAQMD using site specific surface characteristics (i.e., surface albedo, surface roughness, and Bowen ratio) obtained using AERSURFACE. The surface wind directions are presented graphically in a polar diagram generated by the Wind Rose software. This diagram is shown in **Figure 4, Wind Rose for the Santa Clarita Monitoring Station**. The SCAQMD provides three years worth of meteorological data (from 2005 to 2007), which is representative of typical meteorological conditions in the project area.

### 3.1.5 Terrain Data

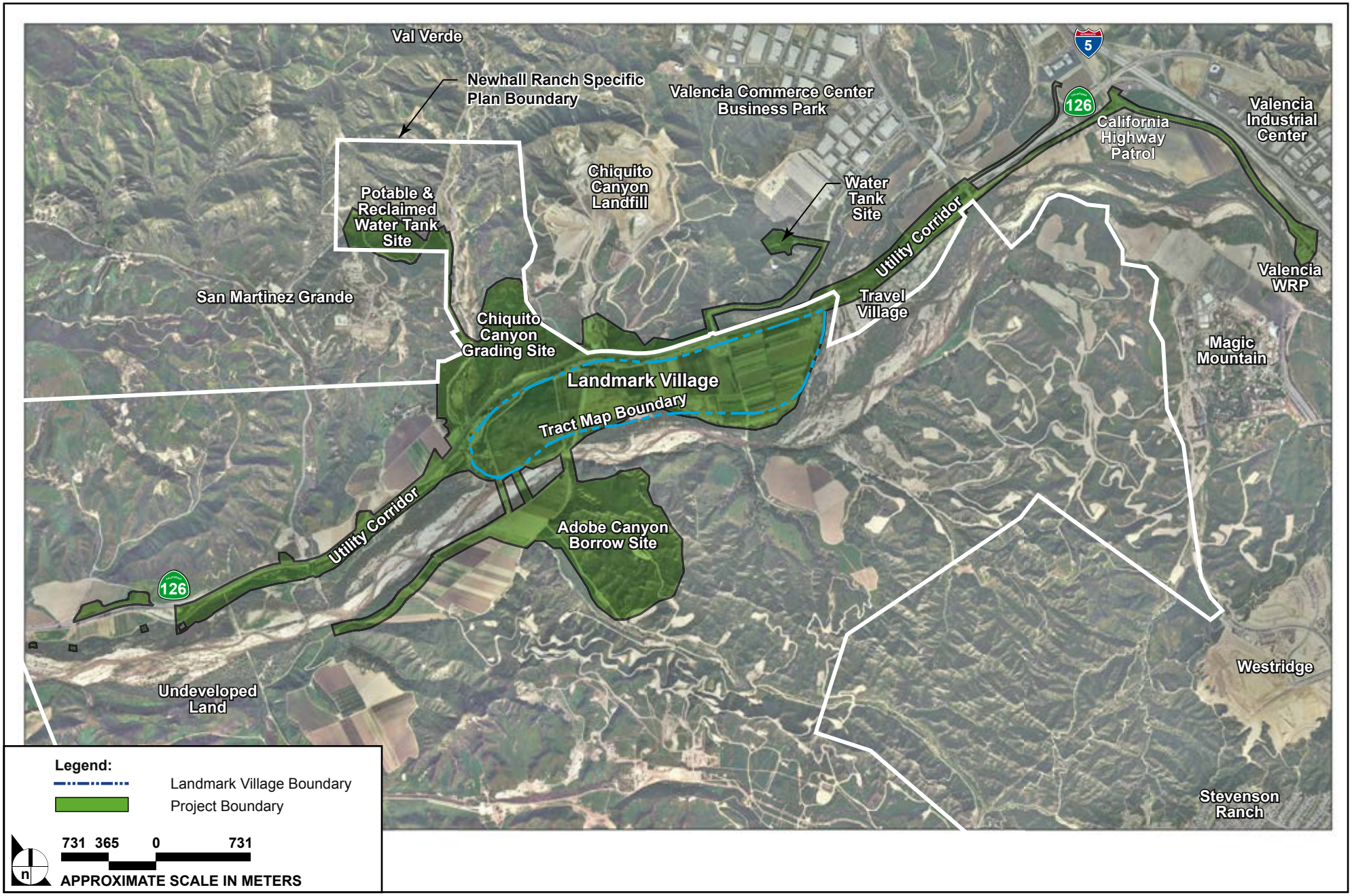
According to the U.S. EPA *AERMOD Implementation Guide*,[9] for cases in which receptor elevations are lower than the base elevation of the source, AERMOD will predict concentrations that are less than what would be estimated from an otherwise identical flat terrain situation. While this is appropriate and realistic in most cases, for cases of down-sloping terrain where the plume is terrain-following, AERMOD will tend to underestimate concentrations when terrain effects are taken into account. This situation is potentially applicable to the project site since the surrounding region contains numerous hills and elevation changes and surrounding receptors may be located at higher and lower elevations than the emission sources. Therefore, in order to avoid underestimating concentrations in such situations, the SCAQMD recommends that AERMOD should be run twice – once using the elevated terrain option and a second time using the flat terrain option. The maximum ground-level concentration from both runs should be reported. Therefore, modeling runs were set up for both terrain options.

---

7 Refer to the SCAQMD AERMOD modeling guidance website: http://www.aqmd.gov/smog/metdata/AERMOD_ModelingGuidance.html

8 South Coast Air Quality Management District, "AQMD Meteorological Data for AERMOD," http://www.aqmd.gov/smog/metdata/AERMOD.html. 2010.

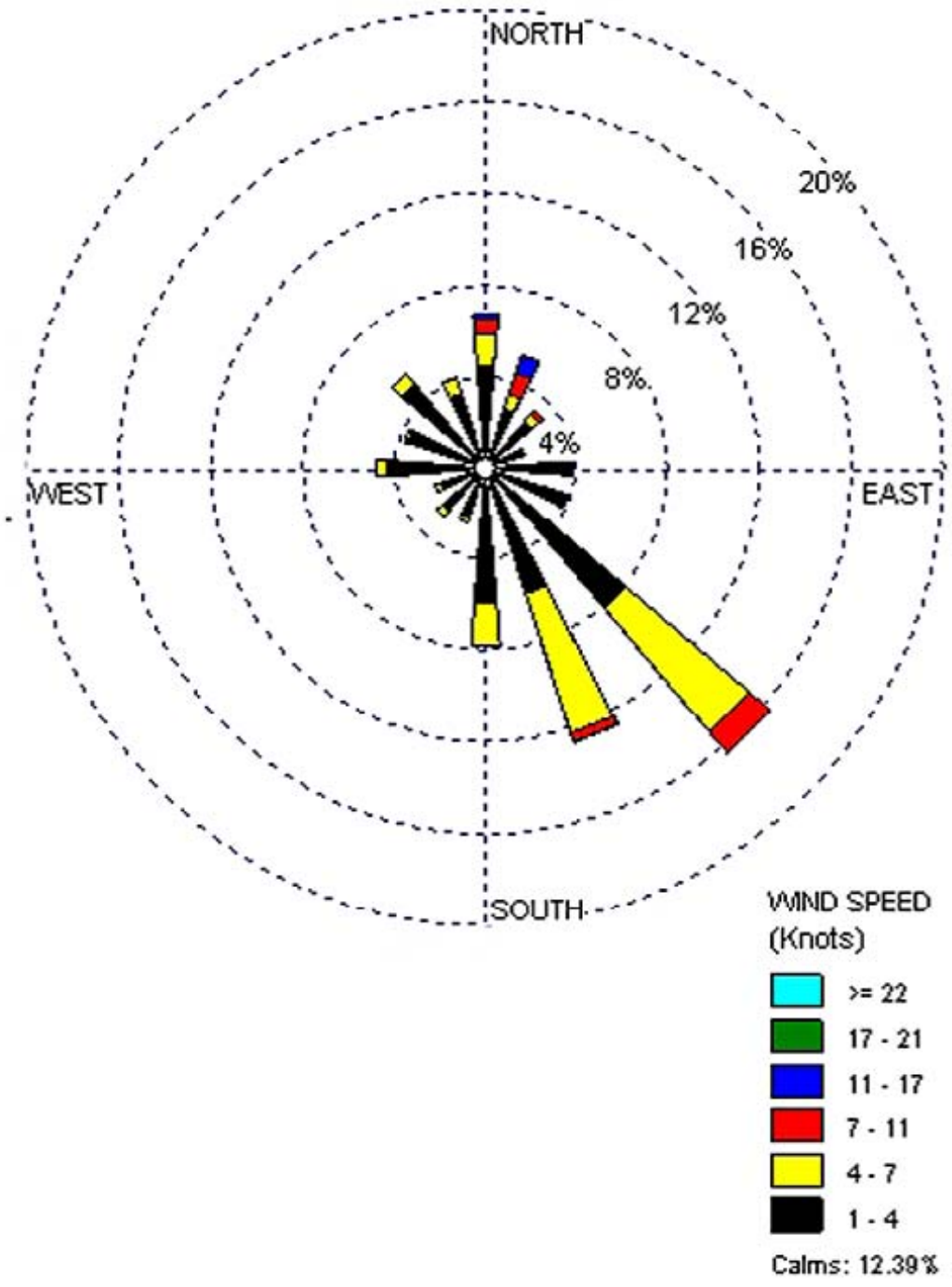
9 U.S. Environmental Protection Agency, *AERMOD Implementation Guide*, (2009).




**SOURCE:** Impact Sciences, Inc. – May 2006

FIGURE **1**

# Conceptual Site Plan




**SOURCE:** Impact Sciences, Inc. – May 2006

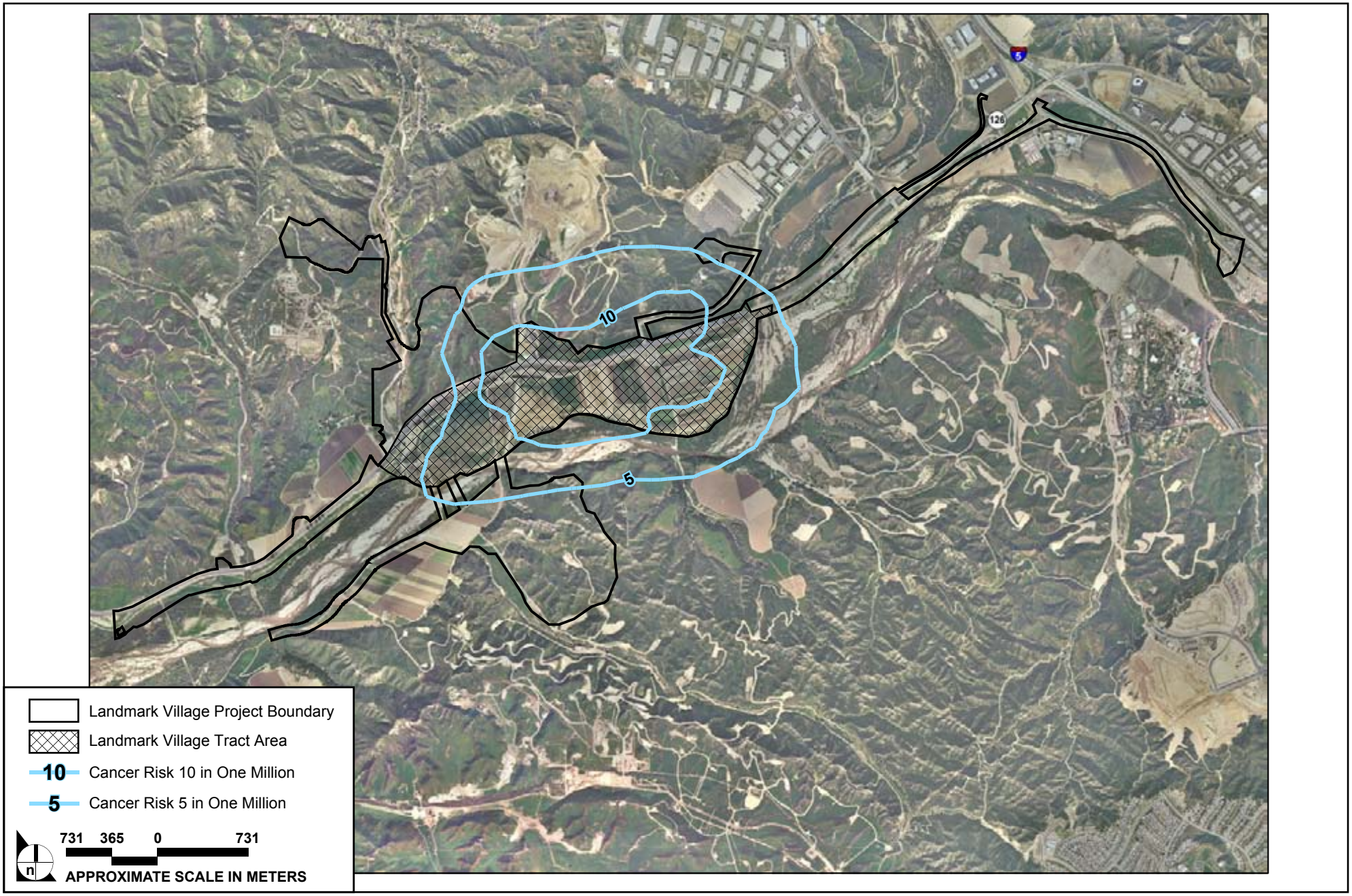
FIGURE **2**

Wind Rose for the Newhall Monitoring Station

**SOURCE:** Impact Sciences, Inc. – May 2006

FIGURE 3

Sensitive Receptors Near the Project Site




**SOURCE:** Impact Sciences, Inc. – May 2006

FIGURE **4**

Model Impacts of Diesel Particulate Matter

Terrain heights receptors were derived from digital terrain elevations developed by the U.S. Geological Survey (USGS) by using its Digital Elevation Model (DEM). The DEM data provides terrain elevations with 1-meter vertical resolution and 10-meter or 30-meter horizontal resolution based on a Universal Transverse Mercator (UTM) coordinate system, referenced to an appropriate map projection as needed (e.g., North American Datum of 1927 (NAD 27), NAD 83, or World Geodetic System of 1984 (WGS 84)).

### 3.1.6 Model Options

The SCAQMD requires that AERMOD be run using U.S. EPA regulatory default options, unless non-default options are justified. AERMOD was run using U.S. EPA regulatory default options. As noted above, both flat and elevated terrain options were modeled. Additional modeling options are listed below:

- Urban dispersion (Los Angeles County population of 9,862,049, as per SCAQMD guidance);[10]
- Averaging periods: Annual;
- Flagpole receptor heights: 0 meter (corresponding to ground-level concentrations); and
- No building downwash (no point sources modeled).

## 3.2 Modeling Results

### 3.2.1 Cancer Risk

The health impacts are based on the methodologies described in the OEHHA Guidance.[11] The following equations are used to calculate the cancer risk due to inhalation using the modeled DPM concentrations:[12]

Equation 1: Risk = Dose Inhalation × Inhalation Potency Factor

where:

Equation 2: $\text{Dose Inhalation} = C_{AIR} \times DBR \times A \times EF \times ED \times 10^{-6} / AT$

where:

$C_{AIR}$ = concentration in microgram per cubic meter
DBR = breathing rate in liter per kilogram of body weight per day
A = inhalation absorption factor (1 for DPM)

---

10 Refer to the SCAQMD AERMOD modeling guidance website: http://www.aqmd.gov/smog/metdata/AERMOD_ModelingGuidance.html

11 California Environmental Protection Agency, Office of Environmental Health Hazard Assessment, *Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments*, (2003).

12 Ibid.

EF = exposure frequency in days per year
ED = exposure duration in years
AT = averaging time period over which exposure is averaged in days (25,550 days for 70 years)

In accordance with CARB policy,[13] a breathing rate equal to the 80th percentile should be used in single-point risk management decisions, such as those subject to a threshold or standard, for which the cancer risk is entirely associated with inhalation and residential cancer risk are being evaluated. These two criteria are met for this assessment. Thus, a breathing rate of 302 liters per kilogram of body weight per day was used for the residential cancer risk calculations. The breathing rate for workers and students are different. Typical workers do not engage in strenuous activities and thus a lower breathing rate should be used, according to the OEHHA Guidance. Students are presumed to be children, who have much higher breathing rates than adults. Therefore, breathing rates of 149 and 581 liters per kilogram of body weight per day was used for the workplace and student cancer risk calculations.

The risk is calculated by multiplying the dose by inhalation potency factor. The Unit Risk Value for DPM recommended by the Scientific Review Panel is $3.0 \times 10^{-4}$ per microgram per cubic meter ($\mu g/m^3$).[14] This value corresponds to a Cancer Potency Factor of 1.1 per milligram/kilogram (body weight) per day (mg/kg-day). The Unit Risk Value means that for receptors with an annual average concentration of 1 $\mu g/m^3$ in the ambient air, the probability of contracting cancer over a 70-year lifetime of exposure is 300 in 1 million. This Unit Risk Value considers exposure via inhalation only. The potential exposure through other pathways (e.g., ingestion) requires substance and site-specific data, and the specific parameters for diesel exhaust are not known for these pathways.[15] The Unit Risk Value also assumes that a person is exposed continuously for 70 years. This approach is intended to result in conservative (i.e., health protective) estimates of health impacts and is used for the sensitive receptors previously identified. In order to calculate risk directly as a modeling output, a multiplying factor was derived based on the information discussed above. This multiplying factor, when multiplied by the concentration that the dispersion model calculates, results in risk in 1 million at a particular receptor. The multiplying factors were calculated as follows:

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13 California Environmental Protection Agency, Office of Environmental Health Hazard Assessment, *Recommended Interim Risk Management Policy for Inhalation-Based Residential Cancer Risk*, (2003).

14 Ibid., *Initial Statement of Reasons for Rulemaking, Proposed Identification of Diesel Exhaust as a Toxic Air Contaminant*, (1998).

15 California Air Resources Board, *Report to the Air Resources Board on the Proposed Identification of Diesel Exhaust as a Toxic Air Contaminant, Part A Exposure Assessment (as approved by the Scientific Review Panel)*, April 1998.

Multiplying factor (residential receptor) = CPF × (DBR × A × EF × ED × $10^{-6}$ / AT) × $10^{6}$

= 1.1 (mg/kg-day)$^{-1}$ × (302 L/kg body weight-day × 1 × 350 day/yr × 70 yr ×$10^{-6}$ / 25,550 days) × $10^{6}$

= 318.55 ($\mu g/m^3$)$^{-1}$

Multiplying factor (workplace receptor) = 1.1 (mg/kg-day)$^{-1}$ × (149 L/kg body weight-day × 1 × 245 day/yr × 40 yr ×$10^{-6}$ / 25,550 days) × $10^{6}$

= 62.87 ($\mu g/m^3$)$^{-1}$

Multiplying factor (student receptor) = 1.1 (mg/kg-day)$^{-1}$ × (581 L/kg body weight-day × 1 × 180 day/yr × 9 yr ×$10^{-6}$ / 25,550 days) × $10^{6}$

= 40.52 ($\mu g/m^3$)$^{-1}$

**Table 3, Summary of Maximum Modeled DPM Concentrations and Cancer Risks**, shows the maximum modeled cancer risk for the maximally exposed individual resulting from the project-related DPM emissions. The values are presented in scientific notation (e.g., 9.20E-04 is equal to 0.000920). The values shown in **Table 3** indicate that the cancer risks, as a result of construction of the proposed project, would be less than 10 in 1 million. This is considered a less than significant impact.

**Table 3**
**Summary of Maximum Modeled DPM Concentrations and Cancer Risks**

| Receptor | Modeled DPM Concentration (micrograms/cubic meter) | Cancer Risk (in 1 million) | Significance Threshold | Exceeds Threshold? |
|---|---|---|---|---|
| Residential | 9.20E-04 | 0.3 | 10 in 1 million | NO |
| Workplace | 2.22E-04 | 0.1 | 10 in 1 million | NO |
| Student | 2.04E-03 | 0.1 | 10 in 1 million | NO |

*Source: Impact Sciences, Inc. Detailed calculations are available in **Appendix A**.*

### 3.2.2 Chronic Hazard Index

In addition to the potential cancer risk, DPM has chronic (i.e., long term) non-cancer health impacts. The chronic non-cancer Hazard Indices for the proposed project were calculated by dividing the maximum modeled annual average concentrations of DPM, using the year with the greatest emissions (2012), by the Reference Exposure Level (REL). The DPM concentrations represent the worst-case year; therefore, the

chronic non-cancer Hazard Indices for 2015 represents the maximum non-cancer chronic health impacts. Detailed calculations are provided in **Appendix A**.

OEHHA has recommended an ambient concentration of 5 micrograms per cubic meter ($\mu g/m^3$) as the chronic inhalation REL for DPM exhaust. The REL is the concentration at or below which no adverse health effects are anticipated. The inhalation REL for acute (i.e., short-term) effects from DPM is currently under study and OEHHA has not determined a value to be used to estimate acute DPM health impacts. Therefore, acute health impacts have not been estimated.

The maximum chronic Hazard Indices at the MEIs are shown in **Table 4, Summary of Maximum Modeled DPM Concentrations and Non-Cancer Health Impacts**. The results are based on the highest concentrations at any receptor point in each of the four modeled scenarios. Therefore, the results are considered to be conservative. The values are presented in scientific notation (e.g., 9.19E-03 is equal to 0.00919). As shown, the chronic Hazard Indices at the MEIs are less than the SCAQMD's significance threshold of 1 for non-cancer health impacts. This is considered a less than significant impact.

**Table 4**
**Summary of Maximum Modeled DPM Concentrations and Non-Cancer Health Impacts**

| Receptor | Modeled DPM Concentration (micrograms/cubic meter) | Maximum Chronic Hazard Index | Significance Threshold | Exceeds Threshold? |
|---|---|---|---|---|
| Residential | 9.19E-03 | 1.84E-03 | 1 | NO |
| Workplace | 1.06E-01 | 2.12E-02 | 1 | NO |
| Student | 6.95E-03 | 1.39E-03 | 1 | NO |

*Source: Impact Sciences, Inc. Detailed calculations are available in **Appendix A**.*

## 4.0 CONCLUSIONS

Based on this analysis, the health impacts resulting from the proposed project would not exceed the SCAQMD significance threshold of an incremental cancer risk of 10 in 1 million since the maximum anticipated cancer risk is 0.3 in 1 million at the MEI receptor. In addition, the chronic Hazard Indices for non-cancer health impacts are well below the significance threshold of 1 at all sensitive receptor points associated with each modeled source group. Based on this assessment, the health impacts associated with construction of the proposed project would result in an impact that is considered less than significant.

It should be noted that these health impacts were based on conservative (i.e., health protective) assumptions, as explained in this analysis, and do not fully take into account the reductions in diesel emissions from construction equipment. Sources of DPM are subject to increasingly stringent emission standards, many of which will take effect in upcoming years. Therefore, the emissions used to calculate cancer risks and non-cancer health impacts are conservative estimates.

For sensitive receptors, this health risk assessment is based on a lifetime exposure of 70 years. According to the OEHHA health risk assessment guidance manual, 30 years represents a "high-end" estimate of the length of time that a person resides in one location. Using the calculations in the OEHHA Guidance manual, the cancer risk associated with a 30-year exposure period would be 30/70 of the 70-year cancer risk. Accordingly, the cancer risk at the maximally impacted residential receptor would be 0.1 in 1 million for a 30-year exposure period.

# APPENDIX A

## HRA Model Calculations

**Landmark Village**
**Maximum Individual Cancer Risk and Noncarcinogenic Hazards**
**AERMOD Model**

**Table HRA-1**
**Emissions Estimates**

| Period | Primary Activities | | Source | Exhaust DPM Emissions (pounds/day) | Duration (days) | Total Emissions (pounds) |
|---|---|---|---|---|---|---|
| Landmark Village + Utility Corridor | | | | | | |
| 2010 | Week 1-19 | Grading | Off-Road Diesel | 43.04 | 95 | 4,088.80 |
| 2010 | Week 20-39 | Grading | Off-Road Diesel | 72.31 | 100 | 7,231.00 |
| 2010 | Week 40-46 | Grading, Building Construction, Paving | Off-Road Diesel | 106.28 | 35 | 3,719.80 |
| 2010 | Week 47-91 | Building Construction, Paving | Off-Road Diesel | 63.24 | 30 | 1,897.20 |
| 2011 | Week 47-91 | Building Construction, Paving | Off-Road Diesel | 58.36 | 195 | 11,380.20 |
| 2011 | Week 92 | Building Construction, Paving | Off-Road Diesel | 67.05 | 5 | 335.25 |
| 2011 | Week 93-144 | Building Construction, Paving | Off-Road Diesel | 61.50 | 60 | 3,690.00 |
| 2012 | Week 93-144 | Building Construction, Paving | Off-Road Diesel | 57.79 | 210 | 12,135.90 |
| 2012 | Week 145-158 | Building Construction, Paving | Off-Road Diesel | 53.72 | 51 | 2,739.72 |
| 2013 | Week 145-158 | Building Construction, Paving | Off-Road Diesel | 49.29 | 19 | 936.51 |
| 2013 | Week 159-178 | Building Construction | Off-Road Diesel | 25.70 | 100 | 2,570.00 |
| 2013 | Week 179-196 | Building Construction | Off-Road Diesel | 22.01 | 90 | 1,980.90 |
| 2013 | Week 197-210 | Building Construction | Off-Road Diesel | 14.77 | 52 | 768.04 |
| 2014 | Week 197-210 | Building Construction | Off-Road Diesel | 13.02 | 18 | 234.36 |
| 2014 | Week 211-220 | Building Construction | Off-Road Diesel | 9.21 | 50 | 460.50 |
| 2014 | Week 221-235 | Building Construction | Off-Road Diesel | 5.41 | 75 | 405.75 |
| 2015 | Year 2015+ | Building Construction | Off-Road Diesel | 8.68 | 259 | 2,248.12 |
| 2016 | Year 2015+ | Building Construction | Off-Road Diesel | 8.00 | 261 | 2,088.00 |
| 2017 | Year 2015+ | Building Construction | Off-Road Diesel | 6.97 | 180 | 1,254.60 |
| | | Landmark Village Total Emissions (LVTE) | | | | 59,692.15 |
| | | Utility Corridor Total Emissions (UCTE) | | | | 472.50 |
| | | Landmark Village Maximum Annual Emissions (LVME) | | | | 16,687.90 |
| | | Utility Corridor Maximum Emissions (UCME) | | | | 248.90 |

Source: Diesel particulate matter emissions were obtained from URBEMIS2007 (on-site PM10 exhaust emissions).

**Landmark Village**
**Maximum Individual Cancer Risk and Noncarcinogenic Hazards**
**AERMOD Model**

**Table HRA-2**
**Average Emissions (Grams per Second, 70-Year Period)**

| Source (number of sources) | EF (g/s) | TE (pounds) | Unit Conversions | | | | |
|---|---|---|---|---|---|---|---|
| | | | Years | Days/year | Hours/day | Seconds/hour | Grams/pound |
| Landmark Village (25 Vol) | 1.4718E-03 | 59,692.15 | 70 | 365 | 8 | 3,600 | 453.5924 |
| Utility Corridor (Line) | 2.9126E-04 | 472.50 | 70 | 365 | 8 | 3,600 | 453.5924 |

Equation: Emission Factor (EF) = TE ÷ 70 years ÷ 365 days/year ÷ 8 hours/day ÷ 3600 seconds/hour × 453.5924 grams/pound ÷ Number of Sources

**Table HRA-3**
**Average Emissions (Grams per Second, 40-Year Period)**

| Source (number of sources) | EF (g/s) | TE (pounds) | Unit Conversions | | | | |
|---|---|---|---|---|---|---|---|
| | | | Years | Days/year | Hours/day | Seconds/hour | Grams/pound |
| Landmark Village (25 Vol) | 2.5757E-03 | 59,692.15 | 40 | 365 | 8 | 3,600 | 453.5924 |
| Utility Corridor (Line) | 5.0971E-04 | 472.50 | 40 | 365 | 8 | 3,600 | 453.5924 |

Equation: Emission Factor (EF) = TE ÷ 40 years ÷ 365 days/year ÷ 8 hours/day ÷ 3600 seconds/hour × 453.5924 grams/pound ÷ Number of Sources

**Table HRA-4**
**Conversion to Grams per Second (Maximum Emissions for any 9-Year Period-Student Receptor)**

| Source (number of sources) | EF (g/s) | TE (pounds) | Unit Conversions | | | | |
|---|---|---|---|---|---|---|---|
| | | | Years | Days/year | Hours/day | Seconds/hour | Grams/pound |
| Landmark Village (25 Vol) | 1.1448E-02 | 59,692.15 | 9 | 365 | 8 | 3,600 | 453.5924 |
| Utility Corridor (Line) | 2.2654E-03 | 472.50 | 9 | 365 | 8 | 3,600 | 453.5924 |

Equation: Emission Factor (EF) = TE ÷ 9 year ÷ 365 days/year ÷ 8 hours/day ÷ 3600 seconds/hour × 453.5924 grams/pound ÷ Number of Sources

**Table HRA-5**
**Conversion to Grams per Second (Maximum Emissions for any Year)**

| Source (number of sources) | EF (g/s) | ME (pounds) | Unit Conversions | | | | |
|---|---|---|---|---|---|---|---|
| | | | Years | Days/year | Hours/day | Seconds/hour | Grams/pound |
| Landmark Village (1 Vol) | 7.2008E-01 | 16,687.90 | 1 | 365 | 8 | 3,600 | 453.5924 |
| Utility Corridor (13 Vol) | 8.2616E-04 | 248.90 | 1 | 365 | 8 | 3,600 | 453.5924 |

Equation: Emission Factor (EF) = ME ÷ 1 year ÷ 365 days/year ÷ 8 hours/day ÷ 3600 seconds/hour × 453.5924 grams/pound ÷ Number of Sources

**Landmark Village**
**Maximum Individual Cancer Risk and Noncarcinogenic Hazards**
**SCREEN3 Model**

**Table HRA-6**
**Maximum Individual Cancer Risk (MICR)**

| Receptor | Pollutant | CPF | $C_{AIR,ANN}$ | DBR | A | EF | ED | AT | Mult Factor | MICR | Threshold | Over? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Residential - Elevated | DPM | 1.10E+00 | 7.90E-04 | 302 | 1 | 350 | 70 | 25550 | 318.55 | 0.3 | 10 | NO |
| Residential - Flat | DPM | 1.10E+00 | 9.20E-04 | 302 | 1 | 350 | 70 | 25550 | 318.55 | 0.3 | 10 | NO |
| Workplace - Elevated | DPM | 1.10E+00 | 2.03E-03 | 149 | 1 | 245 | 40 | 25550 | 62.87 | 0.1 | 10 | NO |
| Worker - Flat | DPM | 1.10E+00 | 2.22E-03 | 149 | 1 | 245 | 40 | 25550 | 62.87 | 0.1 | 10 | NO |
| Student - Elevated | DPM | 1.10E+00 | 1.63E-03 | 581 | 1 | 180 | 9 | 25550 | 40.52 | 0.1 | 10 | NO |
| Student - Flat | DPM | 1.10E+00 | 2.04E-03 | 581 | 1 | 180 | 9 | 25550 | 40.52 | 0.1 | 10 | NO |

Exposure factors used to calculate cancer risk:

CPF — Cancer Potency Factor $(mg/kg\text{-}day)^{-1}$.

$C_{AIR,ANN}$ — Annual concentration ($\mu g/m^3$). The US EPA recommends multiplying the SCREEN3 1-hour concentrations by 0.03 to determine annual average concentrations.

DBR — Daily breathing rate (L/kg (body weight) per day).

DBR Sources:

1. California Air Resources Board and Office of Environmental Health Hazard Assessment, *Recommended Interim Risk Management Policy for Inhalation-Based Residential Cancer Risk* , (2003).
2. California Environmental Protection Agency, Office of Environmental Health Hazard Assessment, *Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments* , (2003).
3. California Environmental Protection Agency, Office of Environmental Health Hazard Assessment, Integrated Risk Assessment Section, *Guidance for School Site Risk Assessment Pursuant to Health and Safety Code Section 901(f): Guidance for Assessing Exposures and Health Risks at Existing and Proposed School Sites* , (2003).

A — Inhalation absorption factor (default = 1).

EF — Exposure frequency (days/year).

ED — Exposure duration (years).

AT — Average time period over which exposure is averaged in days (days).

Mult Factor — Multiplying Factor = $CPF \times (DBR \times A \times EF \times ED \times 10^{-6} / AT) \times 10^{6}$.

**Landmark Village**
**Maximum Individual Cancer Risk and Noncarcinogenic Hazards**
**SCREEN3 Model**

**Table HRA-7**
**Maximum Non-carcinogenic (Chronic) Hazards / Toxicological Endpoints***

| Source Group | Pollutant | CREL | $C_{AIR,ANN}$ | HQ | RESP | CNS/PNS | CV/BL | IMMUN | KIDN | GI/LV | REPRO | EYES | Threshold | Over? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Residential - Elevated | DPM | 5.00E+00 | 7.23E-03 | 1.45E-03 | 1.45E-03 | - | - | - | - | - | - | - | 1 | NO |
| Residential - Flat | DPM | 5.00E+00 | 9.19E-03 | 1.84E-03 | 1.84E-03 | - | - | - | - | - | - | - | 1 | NO |
| Workplace - Elevated | DPM | 5.00E+00 | 1.05E-01 | 2.10E-02 | 2.10E-02 | - | - | - | - | - | - | - | 1 | NO |
| Worker - Flat | DPM | 5.00E+00 | 1.06E-01 | 2.12E-02 | 2.12E-02 | - | - | - | - | - | - | - | 1 | NO |
| Student - Elevated | DPM | 5.00E+00 | 6.03E-03 | 1.21E-03 | 1.21E-03 | - | - | - | - | - | - | - | 1 | NO |
| Student - Flat | DPM | 5.00E+00 | 6.95E-03 | 1.39E-03 | 1.39E-03 | - | - | - | - | - | - | - | 1 | NO |

Where:

| | |
|---|---|
| CREL | Chronic Reference Exposure Level |
| HQ | Hazard Quotient |

* Key to Toxicological Endpoints

| | |
|---|---|
| RESP | Respiratory System. |
| CNS/PNS | Central/Peripheral Nervous System. |
| CV/BL | Cardiovascular/Blood System. |
| IMMUN | Immune System. |
| KIDN | Kidney. |
| GI/LV | Gastrointestinal System/Liver. |
| REPRO | Reproductive System. |
| EYES | Eye irritation and/or other effects. |

# APPENDIX B

## AERMOD Dispersion Modeling Files
## (Available electronically upon request)

**5/27/2010 05:29:45 PM**

Urbemis 2007 Version 9.2.4

Combined Summer Emissions Reports (Pounds/Day)

File Name: Z:\Alan Sako\032.92A Landmark Village\Recirculated DEIR\URBEMIS2007 Update\Landmark Recirc Construction wk001-019.urb924
Project Name: Landmark Village - Construction
Project Location: South Coast AQMD
On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006
Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| 2010 TOTALS (lbs/day unmitigated) | 117.27 | 1,068.47 | 475.33 | 0.13 | 13,276.02 | 46.32 | 13,322.34 | 2,772.62 | 42.61 | 2,815.23 |
| 2010 TOTALS (lbs/day mitigated) | 117.27 | 1,068.47 | 475.33 | 0.13 | 1,877.30 | 46.32 | 1,923.62 | 392.12 | 42.61 | 434.73 |

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 1/4/2010-5/14/2010 Active Days: 95 | **117.27** | **1,068.47** | **475.33** | **0.13** | **13,276.02** | **46.32** | **13,322.34** | **2,772.62** | **42.61** | **2,815.23** |
| Mass Grading 01/04/2010-05/14/2010 | 117.27 | 1,068.47 | 475.33 | 0.13 | 13,276.02 | 46.32 | 13,322.34 | 2,772.62 | 42.61 | 2,815.23 |
| Mass Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 13,275.54 | 0.00 | 13,275.54 | 2,772.46 | 0.00 | 2,772.46 |
| Mass Grading Off Road Diesel | 110.58 | 988.69 | 424.21 | 0.00 | 0.00 | 43.04 | 43.04 | 0.00 | 39.59 | 39.59 |
| Mass Grading On Road Diesel | 6.03 | 78.54 | 30.16 | 0.10 | 0.36 | 3.22 | 3.57 | 0.12 | 2.96 | 3.08 |
| Mass Grading Worker Trips | 0.66 | 1.24 | 20.96 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |

Phase Assumptions

Phase: Mass Grading 1/4/2010 - 5/14/2010 - Grading
Total Acres Disturbed: 0
Maximum Daily Acreage Disturbed: 2.51
Fugitive Dust Level of Detail: Low
Onsite Cut/Fill: 18260.9 cubic yards/day; Offsite Cut/Fill: 25217.4 cubic yards/day
On Road Truck Travel (VMT): 2521.74
Off-Road Equipment:
10 Crawler Tractors (147 hp) operating at a 0.64 load factor for 8 hours per day
1 Crushing/Processing Equip (142 hp) operating at a 0.78 load factor for 8 hours per day
4 Graders (174 hp) operating at a 0.61 load factor for 6 hours per day
15 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day
4 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day
9 Rollers (95 hp) operating at a 0.56 load factor for 8 hours per day
1 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day
36 Scrapers (313 hp) operating at a 0.72 load factor for 8 hours per day

**5/27/2010 05:29:45 PM**

Construction Mitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Summer Pounds Per Day, Mitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 1/4/2010-5/14/2010 Active Days: 95 | **117.27** | **1,068.47** | **475.33** | **0.13** | 1,877.30 | **46.32** | 1,923.62 | 392.12 | **42.61** | 434.73 |
| Mass Grading 01/04/2010-05/14/2010 | 117.27 | 1,068.47 | 475.33 | 0.13 | 1,877.30 | 46.32 | 1,923.62 | 392.12 | 42.61 | 434.73 |
| Mass Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 1,876.83 | 0.00 | 1,876.83 | 391.96 | 0.00 | 391.96 |
| Mass Grading Off Road Diesel | 110.58 | 988.69 | 424.21 | 0.00 | 0.00 | 43.04 | 43.04 | 0.00 | 39.59 | 39.59 |
| Mass Grading On Road Diesel | 6.03 | 78.54 | 30.16 | 0.10 | 0.36 | 3.22 | 3.57 | 0.12 | 2.96 | 3.08 |
| Mass Grading Worker Trips | 0.66 | 1.24 | 20.96 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |

Construction Related Mitigation Measures

The following mitigation measures apply to Phase: Mass Grading 1/4/2010 - 5/14/2010 - Grading

For Soil Stablizing Measures, the Water exposed surfaces 3x daily watering mitigation reduces emissions by:

PM10: 61% PM25: 61%

For Soil Stablizing Measures, the Equipment loading/unloading mitigation reduces emissions by:

PM10: 69% PM25: 69%

For Unpaved Roads Measures, the Reduce speed on unpaved roads to less than 15 mph mitigation reduces emissions by:

PM10: 44% PM25: 44%

For Unpaved Roads Measures, the Manage haul road dust 3x daily watering mitigation reduces emissions by:

PM10: 61% PM25: 61%

**5/27/2010 05:29:58 PM**

Urbemis 2007 Version 9.2.4

Combined Winter Emissions Reports (Pounds/Day)

File Name: Z:\Alan Sako\032.92A Landmark Village\Recirculated DEIR\URBEMIS2007 Update\Landmark Recirc Construction wk001-019.urb924

Project Name: Landmark Village - Construction

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| 2010 TOTALS (lbs/day unmitigated) | 117.27 | 1,068.47 | 475.33 | 0.13 | 13,276.02 | 46.32 | 13,322.34 | 2,772.62 | 42.61 | 2,815.23 |
| 2010 TOTALS (lbs/day mitigated) | 117.27 | 1,068.47 | 475.33 | 0.13 | 1,877.30 | 46.32 | 1,923.62 | 392.12 | 42.61 | 434.73 |

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Winter Pounds Per Day, Unmitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 1/4/2010-5/14/2010 Active Days: 95 | **117.27** | **1,068.47** | **475.33** | **0.13** | **13,276.02** | **46.32** | **13,322.34** | **2,772.62** | **42.61** | **2,815.23** |
| Mass Grading 01/04/2010-05/14/2010 | 117.27 | 1,068.47 | 475.33 | 0.13 | 13,276.02 | 46.32 | 13,322.34 | 2,772.62 | 42.61 | 2,815.23 |
| Mass Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 13,275.54 | 0.00 | 13,275.54 | 2,772.46 | 0.00 | 2,772.46 |
| Mass Grading Off Road Diesel | 110.58 | 988.69 | 424.21 | 0.00 | 0.00 | 43.04 | 43.04 | 0.00 | 39.59 | 39.59 |
| Mass Grading On Road Diesel | 6.03 | 78.54 | 30.16 | 0.10 | 0.36 | 3.22 | 3.57 | 0.12 | 2.96 | 3.08 |
| Mass Grading Worker Trips | 0.66 | 1.24 | 20.96 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |

**5/27/2010 05:29:58 PM**

Phase Assumptions

Phase: Mass Grading 1/4/2010 - 5/14/2010 - Grading

Total Acres Disturbed: 0

Maximum Daily Acreage Disturbed: 2.51

Fugitive Dust Level of Detail: Low

Onsite Cut/Fill: 18260.9 cubic yards/day; Offsite Cut/Fill: 25217.4 cubic yards/day

On Road Truck Travel (VMT): 2521.74

Off-Road Equipment:

10 Crawler Tractors (147 hp) operating at a 0.64 load factor for 8 hours per day

1 Crushing/Processing Equip (142 hp) operating at a 0.78 load factor for 8 hours per day

4 Graders (174 hp) operating at a 0.61 load factor for 6 hours per day

15 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day

4 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day

9 Rollers (95 hp) operating at a 0.56 load factor for 8 hours per day

1 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day

36 Scrapers (313 hp) operating at a 0.72 load factor for 8 hours per day

Construction Mitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Winter Pounds Per Day, Mitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 1/4/2010-5/14/2010 Active Days: 95 | **117.27** | **1,068.47** | **475.33** | **0.13** | 1,877.30 | **46.32** | 1,923.62 | 392.12 | **42.61** | 434.73 |
| Mass Grading 01/04/2010-05/14/2010 | 117.27 | 1,068.47 | 475.33 | 0.13 | 1,877.30 | 46.32 | 1,923.62 | 392.12 | 42.61 | 434.73 |
| Mass Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 1,876.83 | 0.00 | 1,876.83 | 391.96 | 0.00 | 391.96 |
| Mass Grading Off Road Diesel | 110.58 | 988.69 | 424.21 | 0.00 | 0.00 | 43.04 | 43.04 | 0.00 | 39.59 | 39.59 |
| Mass Grading On Road Diesel | 6.03 | 78.54 | 30.16 | 0.10 | 0.36 | 3.22 | 3.57 | 0.12 | 2.96 | 3.08 |
| Mass Grading Worker Trips | 0.66 | 1.24 | 20.96 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |

**5/27/2010 05:29:58 PM**

Construction Related Mitigation Measures

The following mitigation measures apply to Phase: Mass Grading 1/4/2010 - 5/14/2010 - Grading

For Soil Stablizing Measures, the Water exposed surfaces 3x daily watering mitigation reduces emissions by:

PM10: 61% PM25: 61%

For Soil Stablizing Measures, the Equipment loading/unloading mitigation reduces emissions by:

PM10: 69% PM25: 69%

For Unpaved Roads Measures, the Reduce speed on unpaved roads to less than 15 mph mitigation reduces emissions by:

PM10: 44% PM25: 44%

For Unpaved Roads Measures, the Manage haul road dust 3x daily watering mitigation reduces emissions by:

PM10: 61% PM25: 61%

**5/27/2010 05:31:17 PM**

Urbemis 2007 Version 9.2.4

Combined Summer Emissions Reports (Pounds/Day)

File Name: Z:\Alan Sako\032.92A Landmark Village\Recirculated DEIR\URBEMIS2007 Update\Landmark Recirc Construction wk020-039.urb924
Project Name: Landmark Village - Construction
Project Location: South Coast AQMD
On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006
Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| 2010 TOTALS (lbs/day unmitigated) | 191.69 | 1,700.58 | 764.59 | 0.17 | 13,275.49 | 76.14 | 13,351.63 | 2,772.54 | 70.04 | 2,842.57 |
| 2010 TOTALS (lbs/day mitigated) | 191.69 | 1,700.58 | 764.59 | 0.17 | 2,355.75 | 76.14 | 2,431.89 | 492.06 | 70.04 | 562.10 |

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 5/17/2010-10/1/2010 Active Days: 100 | **191.69** | **1,700.58** | **764.59** | **0.17** | **13,275.49** | **76.14** | **13,351.63** | **2,772.54** | **70.04** | **2,842.57** |
| Asphalt 05/17/2010-10/01/2010 | 73.87 | 624.88 | 286.48 | 0.03 | 0.14 | 29.52 | 29.66 | 0.05 | 27.15 | 27.20 |
| Paving Off-Gas | 1.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Off Road Diesel | 71.85 | 619.31 | 263.09 | 0.00 | 0.00 | 29.27 | 29.27 | 0.00 | 26.93 | 26.93 |
| Paving On Road Diesel | 0.33 | 4.29 | 1.65 | 0.01 | 0.02 | 0.18 | 0.20 | 0.01 | 0.16 | 0.17 |
| Paving Worker Trips | 0.68 | 1.28 | 21.75 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |
| Fine Grading 05/17/2010-10/01/2010 | 0.55 | 7.23 | 2.78 | 0.01 | 0.03 | 0.30 | 0.33 | 0.01 | 0.27 | 0.28 |
| Fine Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Off Road Diesel | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading On Road Diesel | 0.55 | 7.23 | 2.78 | 0.01 | 0.03 | 0.30 | 0.33 | 0.01 | 0.27 | 0.28 |
| Fine Grading Worker Trips | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mass Grading 05/17/2010-10/01/2010 | 117.27 | 1,068.47 | 475.33 | 0.13 | 13,275.32 | 46.32 | 13,321.64 | 2,772.48 | 42.61 | 2,815.09 |
| Mass Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 13,274.84 | 0.00 | 13,274.84 | 2,772.32 | 0.00 | 2,772.32 |
| Mass Grading Off Road Diesel | 110.58 | 988.69 | 424.21 | 0.00 | 0.00 | 43.04 | 43.04 | 0.00 | 39.59 | 39.59 |
| Mass Grading On Road Diesel | 6.03 | 78.54 | 30.16 | 0.10 | 0.36 | 3.22 | 3.57 | 0.12 | 2.96 | 3.08 |
| Mass Grading Worker Trips | 0.66 | 1.24 | 20.96 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |

Phase Assumptions

Phase: Fine Grading 5/17/2010 - 10/1/2010 - Surrogate for Paving On-Road Trucks
Total Acres Disturbed: 0
Maximum Daily Acreage Disturbed: 0
Fugitive Dust Level of Detail: Default
0 lbs per acre-day
On Road Truck Travel (VMT): 232.14
Off-Road Equipment:

Phase: Mass Grading 5/17/2010 - 10/1/2010 - Grading
Total Acres Disturbed: 0
Maximum Daily Acreage Disturbed: 2.44
Fugitive Dust Level of Detail: Low
Onsite Cut/Fill: 18260.9 cubic yards/day; Offsite Cut/Fill: 25217.4 cubic yards/day
On Road Truck Travel (VMT): 2521.74
Off-Road Equipment:
10 Crawler Tractors (147 hp) operating at a 0.64 load factor for 8 hours per day
1 Crushing/Processing Equip (142 hp) operating at a 0.78 load factor for 8 hours per day
4 Graders (174 hp) operating at a 0.61 load factor for 6 hours per day
15 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day
4 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day
9 Rollers (95 hp) operating at a 0.56 load factor for 8 hours per day
1 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day
36 Scrapers (313 hp) operating at a 0.72 load factor for 8 hours per day

Phase: Paving 5/17/2010 - 10/1/2010 - Asphalt Paving
Acres to be Paved: 38.37
Off-Road Equipment:
8 Excavators (168 hp) operating at a 0.57 load factor for 8 hours per day
4 Graders (174 hp) operating at a 0.61 load factor for 8 hours per day
3 Off Highway Tractors (267 hp) operating at a 0.65 load factor for 8 hours per day
14 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day
18 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day
2 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day
8 Rollers (95 hp) operating at a 0.56 load factor for 6 hours per day
6 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day
6 Scrapers (313 hp) operating at a 0.72 load factor for 8 hours per day
4 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 0 hours per day
10 Trenchers (63 hp) operating at a 0.75 load factor for 8 hours per day

Construction Mitigated Detail Report:
CONSTRUCTION EMISSION ESTIMATES Summer Pounds Per Day, Mitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 5/17/2010-10/1/2010 Active Days: 100 | **191.69** | **1,700.58** | **764.59** | **0.17** | 2,355.75 | **76.14** | 2,431.89 | 492.06 | **70.04** | 562.10 |
| Asphalt 05/17/2010-10/01/2010 | 73.87 | 624.88 | 286.48 | 0.03 | 0.14 | 29.52 | 29.66 | 0.05 | 27.15 | 27.20 |
| Paving Off-Gas | 1.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Off Road Diesel | 71.85 | 619.31 | 263.09 | 0.00 | 0.00 | 29.27 | 29.27 | 0.00 | 26.93 | 26.93 |
| Paving On Road Diesel | 0.33 | 4.29 | 1.65 | 0.01 | 0.02 | 0.18 | 0.20 | 0.01 | 0.16 | 0.17 |
| Paving Worker Trips | 0.68 | 1.28 | 21.75 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |

**5/27/2010 05:31:17 PM**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Fine Grading 05/17/2010-10/01/2010 | 0.55 | 7.23 | 2.78 | 0.01 | 0.03 | 0.30 | 0.33 | 0.01 | 0.27 | 0.28 |
| Fine Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Off Road Diesel | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading On Road Diesel | 0.55 | 7.23 | 2.78 | 0.01 | 0.03 | 0.30 | 0.33 | 0.01 | 0.27 | 0.28 |
| Fine Grading Worker Trips | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mass Grading 05/17/2010-10/01/2010 | 117.27 | 1,068.47 | 475.33 | 0.13 | 2,355.58 | 46.32 | 2,401.90 | 492.00 | 42.61 | 534.61 |
| Mass Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 2,355.10 | 0.00 | 2,355.10 | 491.84 | 0.00 | 491.84 |
| Mass Grading Off Road Diesel | 110.58 | 988.69 | 424.21 | 0.00 | 0.00 | 43.04 | 43.04 | 0.00 | 39.59 | 39.59 |
| Mass Grading On Road Diesel | 6.03 | 78.54 | 30.16 | 0.10 | 0.36 | 3.22 | 3.57 | 0.12 | 2.96 | 3.08 |
| Mass Grading Worker Trips | 0.66 | 1.24 | 20.96 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |

Construction Related Mitigation Measures

The following mitigation measures apply to Phase: Mass Grading 5/17/2010 - 10/1/2010 - Grading

For Soil Stablizing Measures, the Water exposed surfaces 3x daily watering mitigation reduces emissions by:

PM10: 61% PM25: 61%

For Soil Stablizing Measures, the Equipment loading/unloading mitigation reduces emissions by:

PM10: 69% PM25: 69%

For Unpaved Roads Measures, the Manage haul road dust 3x daily watering mitigation reduces emissions by:

PM10: 61% PM25: 61%

**5/27/2010 05:31:30 PM**

Urbemis 2007 Version 9.2.4

Combined Winter Emissions Reports (Pounds/Day)

File Name: Z:\Alan Sako\032.92A Landmark Village\Recirculated DEIR\URBEMIS2007 Update\Landmark Recirc Construction wk020-039.urb924

Project Name: Landmark Village - Construction

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| 2010 TOTALS (lbs/day unmitigated) | 191.69 | 1,700.58 | 764.59 | 0.17 | 13,275.49 | 76.14 | 13,351.63 | 2,772.54 | 70.04 | 2,842.57 |
| 2010 TOTALS (lbs/day mitigated) | 191.69 | 1,700.58 | 764.59 | 0.17 | 2,355.75 | 76.14 | 2,431.89 | 492.06 | 70.04 | 562.10 |

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Winter Pounds Per Day, Unmitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 5/17/2010-10/1/2010 Active Days: 100 | **191.69** | **1,700.58** | **764.59** | **0.17** | **13,275.49** | **76.14** | **13,351.63** | **2,772.54** | **70.04** | **2,842.57** |
| Asphalt 05/17/2010-10/01/2010 | 73.87 | 624.88 | 286.48 | 0.03 | 0.14 | 29.52 | 29.66 | 0.05 | 27.15 | 27.20 |
| Paving Off-Gas | 1.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Off Road Diesel | 71.85 | 619.31 | 263.09 | 0.00 | 0.00 | 29.27 | 29.27 | 0.00 | 26.93 | 26.93 |
| Paving On Road Diesel | 0.33 | 4.29 | 1.65 | 0.01 | 0.02 | 0.18 | 0.20 | 0.01 | 0.16 | 0.17 |
| Paving Worker Trips | 0.68 | 1.28 | 21.75 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |
| Fine Grading 05/17/2010-10/01/2010 | 0.55 | 7.23 | 2.78 | 0.01 | 0.03 | 0.30 | 0.33 | 0.01 | 0.27 | 0.28 |
| Fine Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Off Road Diesel | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading On Road Diesel | 0.55 | 7.23 | 2.78 | 0.01 | 0.03 | 0.30 | 0.33 | 0.01 | 0.27 | 0.28 |
| Fine Grading Worker Trips | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mass Grading 05/17/2010-10/01/2010 | 117.27 | 1,068.47 | 475.33 | 0.13 | 13,275.32 | 46.32 | 13,321.64 | 2,772.48 | 42.61 | 2,815.09 |
| Mass Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 13,274.84 | 0.00 | 13,274.84 | 2,772.32 | 0.00 | 2,772.32 |
| Mass Grading Off Road Diesel | 110.58 | 988.69 | 424.21 | 0.00 | 0.00 | 43.04 | 43.04 | 0.00 | 39.59 | 39.59 |
| Mass Grading On Road Diesel | 6.03 | 78.54 | 30.16 | 0.10 | 0.36 | 3.22 | 3.57 | 0.12 | 2.96 | 3.08 |
| Mass Grading Worker Trips | 0.66 | 1.24 | 20.96 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |

**5/27/2010 05:31:30 PM**

Phase Assumptions

Phase: Fine Grading 5/17/2010 - 10/1/2010 - Surrogate for Paving On-Road Trucks
Total Acres Disturbed: 0
Maximum Daily Acreage Disturbed: 0
Fugitive Dust Level of Detail: Default
0 lbs per acre-day
On Road Truck Travel (VMT): 232.14
Off-Road Equipment:

Phase: Mass Grading 5/17/2010 - 10/1/2010 - Grading
Total Acres Disturbed: 0
Maximum Daily Acreage Disturbed: 2.44
Fugitive Dust Level of Detail: Low
Onsite Cut/Fill: 18260.9 cubic yards/day; Offsite Cut/Fill: 25217.4 cubic yards/day
On Road Truck Travel (VMT): 2521.74
Off-Road Equipment:
10 Crawler Tractors (147 hp) operating at a 0.64 load factor for 8 hours per day
1 Crushing/Processing Equip (142 hp) operating at a 0.78 load factor for 8 hours per day
4 Graders (174 hp) operating at a 0.61 load factor for 6 hours per day
15 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day
4 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day
9 Rollers (95 hp) operating at a 0.56 load factor for 8 hours per day
1 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day
36 Scrapers (313 hp) operating at a 0.72 load factor for 8 hours per day

Phase: Paving 5/17/2010 - 10/1/2010 - Asphalt Paving
Acres to be Paved: 38.37
Off-Road Equipment:
8 Excavators (168 hp) operating at a 0.57 load factor for 8 hours per day
4 Graders (174 hp) operating at a 0.61 load factor for 8 hours per day
3 Off Highway Tractors (267 hp) operating at a 0.65 load factor for 8 hours per day
14 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day
18 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day
2 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day
8 Rollers (95 hp) operating at a 0.56 load factor for 6 hours per day
6 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day
6 Scrapers (313 hp) operating at a 0.72 load factor for 8 hours per day
4 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 0 hours per day
10 Trenchers (63 hp) operating at a 0.75 load factor for 8 hours per day

**5/27/2010 05:31:30 PM**

Construction Mitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Winter Pounds Per Day, Mitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 5/17/2010-10/1/2010 Active Days: 100 | **191.69** | **1,700.58** | **764.59** | **0.17** | 2,355.75 | **76.14** | 2,431.89 | 492.06 | **70.04** | 562.10 |
| Asphalt 05/17/2010-10/01/2010 | 73.87 | 624.88 | 286.48 | 0.03 | 0.14 | 29.52 | 29.66 | 0.05 | 27.15 | 27.20 |
| Paving Off-Gas | 1.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Off Road Diesel | 71.85 | 619.31 | 263.09 | 0.00 | 0.00 | 29.27 | 29.27 | 0.00 | 26.93 | 26.93 |
| Paving On Road Diesel | 0.33 | 4.29 | 1.65 | 0.01 | 0.02 | 0.18 | 0.20 | 0.01 | 0.16 | 0.17 |
| Paving Worker Trips | 0.68 | 1.28 | 21.75 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |
| Fine Grading 05/17/2010-10/01/2010 | 0.55 | 7.23 | 2.78 | 0.01 | 0.03 | 0.30 | 0.33 | 0.01 | 0.27 | 0.28 |
| Fine Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Off Road Diesel | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading On Road Diesel | 0.55 | 7.23 | 2.78 | 0.01 | 0.03 | 0.30 | 0.33 | 0.01 | 0.27 | 0.28 |
| Fine Grading Worker Trips | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mass Grading 05/17/2010-10/01/2010 | 117.27 | 1,068.47 | 475.33 | 0.13 | 2,355.58 | 46.32 | 2,401.90 | 492.00 | 42.61 | 534.61 |
| Mass Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 2,355.10 | 0.00 | 2,355.10 | 491.84 | 0.00 | 491.84 |
| Mass Grading Off Road Diesel | 110.58 | 988.69 | 424.21 | 0.00 | 0.00 | 43.04 | 43.04 | 0.00 | 39.59 | 39.59 |
| Mass Grading On Road Diesel | 6.03 | 78.54 | 30.16 | 0.10 | 0.36 | 3.22 | 3.57 | 0.12 | 2.96 | 3.08 |
| Mass Grading Worker Trips | 0.66 | 1.24 | 20.96 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |

Construction Related Mitigation Measures

The following mitigation measures apply to Phase: Mass Grading 5/17/2010 - 10/1/2010 - Grading

For Soil Stablizing Measures, the Water exposed surfaces 3x daily watering mitigation reduces emissions by:

PM10: 61% PM25: 61%

For Soil Stablizing Measures, the Equipment loading/unloading mitigation reduces emissions by:

PM10: 69% PM25: 69%

For Unpaved Roads Measures, the Manage haul road dust 3x daily watering mitigation reduces emissions by:

PM10: 61% PM25: 61%

**5/27/2010 05:49:54 PM**

Urbemis 2007 Version 9.2.4

Combined Summer Emissions Reports (Pounds/Day)

File Name: Z:\Alan Sako\032.92A Landmark Village\Recirculated DEIR\URBEMIS2007 Update\Landmark Recirc Construction wk040-046.urb924
Project Name: Landmark Village - Construction
Project Location: South Coast AQMD
On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006
Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| 2010 TOTALS (lbs/day unmitigated) | 303.71 | 2,428.89 | 1,058.30 | 0.18 | 13,276.26 | 110.24 | 13,386.50 | 2,772.71 | 101.41 | 2,874.12 |
| 2010 TOTALS (lbs/day mitigated) | 303.71 | 2,428.89 | 1,058.30 | 0.18 | 2,355.95 | 110.24 | 2,466.19 | 492.11 | 101.41 | 593.52 |

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 10/4/2010-11/19/2010 Active Days: 35 | **303.71** | **2,428.89** | **1,058.30** | **0.18** | **13,276.26** | **110.24** | **13,386.50** | **2,772.71** | **101.41** | **2,874.12** |
| Asphalt 10/04/2010-11/19/2010 | 73.87 | 624.88 | 286.48 | 0.03 | 0.14 | 29.52 | 29.66 | 0.05 | 27.15 | 27.20 |
| Paving Off-Gas | 1.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Off Road Diesel | 71.85 | 619.31 | 263.09 | 0.00 | 0.00 | 29.27 | 29.27 | 0.00 | 26.93 | 26.93 |
| Paving On Road Diesel | 0.33 | 4.29 | 1.65 | 0.01 | 0.02 | 0.18 | 0.20 | 0.01 | 0.16 | 0.17 |
| Paving Worker Trips | 0.68 | 1.28 | 21.75 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |
| Building 10/04/2010-11/19/2010 | 80.32 | 728.25 | 292.63 | 0.02 | 0.07 | 34.10 | 34.16 | 0.02 | 31.37 | 31.39 |
| Building Off Road Diesel | 79.83 | 725.34 | 281.51 | 0.00 | 0.00 | 33.97 | 33.97 | 0.00 | 31.25 | 31.25 |
| Building Vendor Trips | 0.20 | 2.36 | 1.83 | 0.00 | 0.02 | 0.10 | 0.11 | 0.01 | 0.09 | 0.10 |
| Building Worker Trips | 0.29 | 0.55 | 9.29 | 0.01 | 0.05 | 0.03 | 0.08 | 0.02 | 0.03 | 0.04 |
| Coating 10/04/2010-11/19/2010 | 31.69 | 0.06 | 1.08 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |
| Architectural Coating | 31.66 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.03 | 0.06 | 1.08 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |
| Fine Grading 10/04/2010-11/19/2010 | 0.55 | 7.23 | 2.78 | 0.01 | 0.03 | 0.30 | 0.33 | 0.01 | 0.27 | 0.28 |
| Fine Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Off Road Diesel | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading On Road Diesel | 0.55 | 7.23 | 2.78 | 0.01 | 0.03 | 0.30 | 0.33 | 0.01 | 0.27 | 0.28 |
| Fine Grading Worker Trips | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mass Grading 10/04/2010-11/19/2010 | 117.27 | 1,068.47 | 475.33 | 0.13 | 13,276.02 | 46.32 | 13,322.34 | 2,772.62 | 42.61 | 2,815.23 |
| Mass Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 13,275.54 | 0.00 | 13,275.54 | 2,772.46 | 0.00 | 2,772.46 |
| Mass Grading Off Road Diesel | 110.58 | 988.69 | 424.21 | 0.00 | 0.00 | 43.04 | 43.04 | 0.00 | 39.59 | 39.59 |
| Mass Grading On Road Diesel | 6.03 | 78.54 | 30.16 | 0.10 | 0.36 | 3.22 | 3.57 | 0.12 | 2.96 | 3.08 |
| Mass Grading Worker Trips | 0.66 | 1.24 | 20.96 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |

Phase Assumptions

Phase: Fine Grading 10/4/2010 - 11/19/2010 - Surrogate for Paving On-Road Trucks
Total Acres Disturbed: 0
Maximum Daily Acreage Disturbed: 0
Fugitive Dust Level of Detail: Default
0 lbs per acre-day
On Road Truck Travel (VMT): 232.15
Off-Road Equipment:

Phase: Mass Grading 10/4/2010 - 11/19/2010 - Grading
Total Acres Disturbed: 0
Maximum Daily Acreage Disturbed: 2.51
Fugitive Dust Level of Detail: Low
Onsite Cut/Fill: 18260.9 cubic yards/day; Offsite Cut/Fill: 25217.4 cubic yards/day
On Road Truck Travel (VMT): 2521.74
Off-Road Equipment:
10 Crawler Tractors (147 hp) operating at a 0.64 load factor for 8 hours per day
1 Crushing/Processing Equip (142 hp) operating at a 0.78 load factor for 8 hours per day
4 Graders (174 hp) operating at a 0.61 load factor for 6 hours per day
15 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day
4 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day
9 Rollers (95 hp) operating at a 0.56 load factor for 8 hours per day
1 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day
36 Scrapers (313 hp) operating at a 0.72 load factor for 8 hours per day

Phase: Paving 10/4/2010 - 11/19/2010 - Asphalt Paving
Acres to be Paved: 13.43
Off-Road Equipment:
8 Excavators (168 hp) operating at a 0.57 load factor for 8 hours per day
4 Graders (174 hp) operating at a 0.61 load factor for 8 hours per day
3 Off Highway Tractors (267 hp) operating at a 0.65 load factor for 8 hours per day
14 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day
18 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day
2 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day
8 Rollers (95 hp) operating at a 0.56 load factor for 6 hours per day
6 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day
6 Scrapers (313 hp) operating at a 0.72 load factor for 8 hours per day
4 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 0 hours per day
10 Trenchers (63 hp) operating at a 0.75 load factor for 8 hours per day

**5/27/2010 05:49:54 PM**

Phase: Building Construction 10/4/2010 - 11/19/2010 - Building Construction

Off-Road Equipment:

9 Cranes (399 hp) operating at a 0.43 load factor for 6 hours per day
1 Graders (174 hp) operating at a 0.61 load factor for 8 hours per day
6 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day
70 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day
3 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day
11 Rough Terrain Forklifts (93 hp) operating at a 0.6 load factor for 8 hours per day
7 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day
2 Skid Steer Loaders (44 hp) operating at a 0.55 load factor for 8 hours per day
13 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 8 hours per day
9 Trenchers (63 hp) operating at a 0.75 load factor for 8 hours per day

Phase: Architectural Coating 10/4/2010 - 11/19/2010 - Architectural Coating

Rule: Residential Interior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 100
Rule: Residential Interior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 50
Rule: Residential Exterior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 250
Rule: Residential Exterior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 100
Rule: Nonresidential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250
Rule: Nonresidential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Construction Mitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Summer Pounds Per Day, Mitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 10/4/2010-11/19/2010 Active Days: 35 | **303.71** | **2,428.89** | **1,058.30** | **0.18** | 2,355.95 | **110.24** | 2,466.19 | 492.11 | **101.41** | 593.52 |
| Asphalt 10/04/2010-11/19/2010 | 73.87 | 624.88 | 286.48 | 0.03 | 0.14 | 29.52 | 29.66 | 0.05 | 27.15 | 27.20 |
| Paving Off-Gas | 1.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Off Road Diesel | 71.85 | 619.31 | 263.09 | 0.00 | 0.00 | 29.27 | 29.27 | 0.00 | 26.93 | 26.93 |
| Paving On Road Diesel | 0.33 | 4.29 | 1.65 | 0.01 | 0.02 | 0.18 | 0.20 | 0.01 | 0.16 | 0.17 |
| Paving Worker Trips | 0.68 | 1.28 | 21.75 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |
| Building 10/04/2010-11/19/2010 | 80.32 | 728.25 | 292.63 | 0.02 | 0.07 | 34.10 | 34.16 | 0.02 | 31.37 | 31.39 |
| Building Off Road Diesel | 79.83 | 725.34 | 281.51 | 0.00 | 0.00 | 33.97 | 33.97 | 0.00 | 31.25 | 31.25 |
| Building Vendor Trips | 0.20 | 2.36 | 1.83 | 0.00 | 0.02 | 0.10 | 0.11 | 0.01 | 0.09 | 0.10 |
| Building Worker Trips | 0.29 | 0.55 | 9.29 | 0.01 | 0.05 | 0.03 | 0.08 | 0.02 | 0.03 | 0.04 |
| Coating 10/04/2010-11/19/2010 | 31.69 | 0.06 | 1.08 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |
| Architectural Coating | 31.66 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.03 | 0.06 | 1.08 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |
| Fine Grading 10/04/2010-11/19/2010 | 0.55 | 7.23 | 2.78 | 0.01 | 0.03 | 0.30 | 0.33 | 0.01 | 0.27 | 0.28 |
| Fine Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Off Road Diesel | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading On Road Diesel | 0.55 | 7.23 | 2.78 | 0.01 | 0.03 | 0.30 | 0.33 | 0.01 | 0.27 | 0.28 |
| Fine Grading Worker Trips | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**5/27/2010 05:49:54 PM**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Mass Grading 10/04/2010-11/19/2010 | 117.27 | 1,068.47 | 475.33 | 0.13 | 2,355.70 | 46.32 | 2,402.02 | 492.02 | 42.61 | 534.63 |
| Mass Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 2,355.23 | 0.00 | 2,355.23 | 491.87 | 0.00 | 491.87 |
| Mass Grading Off Road Diesel | 110.58 | 988.69 | 424.21 | 0.00 | 0.00 | 43.04 | 43.04 | 0.00 | 39.59 | 39.59 |
| Mass Grading On Road Diesel | 6.03 | 78.54 | 30.16 | 0.10 | 0.36 | 3.22 | 3.57 | 0.12 | 2.96 | 3.08 |
| Mass Grading Worker Trips | 0.66 | 1.24 | 20.96 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |

Construction Related Mitigation Measures

The following mitigation measures apply to Phase: Mass Grading 10/4/2010 - 11/19/2010 - Grading

For Soil Stablizing Measures, the Water exposed surfaces 3x daily watering mitigation reduces emissions by:

PM10: 61% PM25: 61%

For Soil Stablizing Measures, the Equipment loading/unloading mitigation reduces emissions by:

PM10: 69% PM25: 69%

For Unpaved Roads Measures, the Manage haul road dust 3x daily watering mitigation reduces emissions by:

PM10: 61% PM25: 61%

**5/27/2010 05:50:06 PM**

Urbemis 2007 Version 9.2.4

Combined Winter Emissions Reports (Pounds/Day)

File Name: Z:\Alan Sako\032.92A Landmark Village\Recirculated DEIR\URBEMIS2007 Update\Landmark Recirc Construction wk040-046.urb924

Project Name: Landmark Village - Construction

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| 2010 TOTALS (lbs/day unmitigated) | 303.71 | 2,428.89 | 1,058.30 | 0.18 | 13,276.26 | 110.24 | 13,386.50 | 2,772.71 | 101.41 | 2,874.12 |
| 2010 TOTALS (lbs/day mitigated) | 303.71 | 2,428.89 | 1,058.30 | 0.18 | 2,355.95 | 110.24 | 2,466.19 | 492.11 | 101.41 | 593.52 |

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Winter Pounds Per Day, Unmitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 10/4/2010-11/19/2010 Active Days: 35 | **303.71** | **2,428.89** | **1,058.30** | **0.18** | **13,276.26** | **110.24** | **13,386.50** | **2,772.71** | **101.41** | **2,874.12** |
| Asphalt 10/04/2010-11/19/2010 | 73.87 | 624.88 | 286.48 | 0.03 | 0.14 | 29.52 | 29.66 | 0.05 | 27.15 | 27.20 |
| Paving Off-Gas | 1.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Off Road Diesel | 71.85 | 619.31 | 263.09 | 0.00 | 0.00 | 29.27 | 29.27 | 0.00 | 26.93 | 26.93 |
| Paving On Road Diesel | 0.33 | 4.29 | 1.65 | 0.01 | 0.02 | 0.18 | 0.20 | 0.01 | 0.16 | 0.17 |
| Paving Worker Trips | 0.68 | 1.28 | 21.75 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |
| Building 10/04/2010-11/19/2010 | 80.32 | 728.25 | 292.63 | 0.02 | 0.07 | 34.10 | 34.16 | 0.02 | 31.37 | 31.39 |
| Building Off Road Diesel | 79.83 | 725.34 | 281.51 | 0.00 | 0.00 | 33.97 | 33.97 | 0.00 | 31.25 | 31.25 |
| Building Vendor Trips | 0.20 | 2.36 | 1.83 | 0.00 | 0.02 | 0.10 | 0.11 | 0.01 | 0.09 | 0.10 |
| Building Worker Trips | 0.29 | 0.55 | 9.29 | 0.01 | 0.05 | 0.03 | 0.08 | 0.02 | 0.03 | 0.04 |
| Coating 10/04/2010-11/19/2010 | 31.69 | 0.06 | 1.08 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |
| Architectural Coating | 31.66 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.03 | 0.06 | 1.08 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |

**5/27/2010 05:50:06 PM**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Fine Grading 10/04/2010-11/19/2010 | 0.55 | 7.23 | 2.78 | 0.01 | 0.03 | 0.30 | 0.33 | 0.01 | 0.27 | 0.28 |
| Fine Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Off Road Diesel | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading On Road Diesel | 0.55 | 7.23 | 2.78 | 0.01 | 0.03 | 0.30 | 0.33 | 0.01 | 0.27 | 0.28 |
| Fine Grading Worker Trips | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mass Grading 10/04/2010-11/19/2010 | 117.27 | 1,068.47 | 475.33 | 0.13 | 13,276.02 | 46.32 | 13,322.34 | 2,772.62 | 42.61 | 2,815.23 |
| Mass Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 13,275.54 | 0.00 | 13,275.54 | 2,772.46 | 0.00 | 2,772.46 |
| Mass Grading Off Road Diesel | 110.58 | 988.69 | 424.21 | 0.00 | 0.00 | 43.04 | 43.04 | 0.00 | 39.59 | 39.59 |
| Mass Grading On Road Diesel | 6.03 | 78.54 | 30.16 | 0.10 | 0.36 | 3.22 | 3.57 | 0.12 | 2.96 | 3.08 |
| Mass Grading Worker Trips | 0.66 | 1.24 | 20.96 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |

Phase Assumptions

Phase: Fine Grading 10/4/2010 - 11/19/2010 - Surrogate for Paving On-Road Trucks

Total Acres Disturbed: 0

Maximum Daily Acreage Disturbed: 0

Fugitive Dust Level of Detail: Default

0 lbs per acre-day

On Road Truck Travel (VMT): 232.15

Off-Road Equipment:

Phase: Mass Grading 10/4/2010 - 11/19/2010 - Grading

Total Acres Disturbed: 0

Maximum Daily Acreage Disturbed: 2.51

Fugitive Dust Level of Detail: Low

Onsite Cut/Fill: 18260.9 cubic yards/day; Offsite Cut/Fill: 25217.4 cubic yards/day

On Road Truck Travel (VMT): 2521.74

Off-Road Equipment:

10 Crawler Tractors (147 hp) operating at a 0.64 load factor for 8 hours per day

1 Crushing/Processing Equip (142 hp) operating at a 0.78 load factor for 8 hours per day

4 Graders (174 hp) operating at a 0.61 load factor for 6 hours per day

15 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day

4 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day

9 Rollers (95 hp) operating at a 0.56 load factor for 8 hours per day

1 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day

36 Scrapers (313 hp) operating at a 0.72 load factor for 8 hours per day

**5/27/2010 05:50:06 PM**

Phase: Paving 10/4/2010 - 11/19/2010 - Asphalt Paving
Acres to be Paved: 13.43
Off-Road Equipment:
8 Excavators (168 hp) operating at a 0.57 load factor for 8 hours per day
4 Graders (174 hp) operating at a 0.61 load factor for 8 hours per day
3 Off Highway Tractors (267 hp) operating at a 0.65 load factor for 8 hours per day
14 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day
18 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day
2 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day
8 Rollers (95 hp) operating at a 0.56 load factor for 6 hours per day
6 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day
6 Scrapers (313 hp) operating at a 0.72 load factor for 8 hours per day
4 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 0 hours per day
10 Trenchers (63 hp) operating at a 0.75 load factor for 8 hours per day

Phase: Building Construction 10/4/2010 - 11/19/2010 - Building Construction
Off-Road Equipment:
9 Cranes (399 hp) operating at a 0.43 load factor for 6 hours per day
1 Graders (174 hp) operating at a 0.61 load factor for 8 hours per day
6 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day
70 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day
3 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day
11 Rough Terrain Forklifts (93 hp) operating at a 0.6 load factor for 8 hours per day
7 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day
2 Skid Steer Loaders (44 hp) operating at a 0.55 load factor for 8 hours per day
13 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 8 hours per day
9 Trenchers (63 hp) operating at a 0.75 load factor for 8 hours per day

Phase: Architectural Coating 10/4/2010 - 11/19/2010 - Architectural Coating
Rule: Residential Interior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 100
Rule: Residential Interior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 50
Rule: Residential Exterior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 250
Rule: Residential Exterior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 100
Rule: Nonresidential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250
Rule: Nonresidential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

**5/27/2010 05:50:06 PM**

Construction Mitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Winter Pounds Per Day, Mitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 10/4/2010-11/19/2010 Active Days: 35 | **303.71** | **2,428.89** | **1,058.30** | **0.18** | 2,355.95 | **110.24** | 2,466.19 | 492.11 | **101.41** | 593.52 |
| Asphalt 10/04/2010-11/19/2010 | 73.87 | 624.88 | 286.48 | 0.03 | 0.14 | 29.52 | 29.66 | 0.05 | 27.15 | 27.20 |
| Paving Off-Gas | 1.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Off Road Diesel | 71.85 | 619.31 | 263.09 | 0.00 | 0.00 | 29.27 | 29.27 | 0.00 | 26.93 | 26.93 |
| Paving On Road Diesel | 0.33 | 4.29 | 1.65 | 0.01 | 0.02 | 0.18 | 0.20 | 0.01 | 0.16 | 0.17 |
| Paving Worker Trips | 0.68 | 1.28 | 21.75 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |
| Building 10/04/2010-11/19/2010 | 80.32 | 728.25 | 292.63 | 0.02 | 0.07 | 34.10 | 34.16 | 0.02 | 31.37 | 31.39 |
| Building Off Road Diesel | 79.83 | 725.34 | 281.51 | 0.00 | 0.00 | 33.97 | 33.97 | 0.00 | 31.25 | 31.25 |
| Building Vendor Trips | 0.20 | 2.36 | 1.83 | 0.00 | 0.02 | 0.10 | 0.11 | 0.01 | 0.09 | 0.10 |
| Building Worker Trips | 0.29 | 0.55 | 9.29 | 0.01 | 0.05 | 0.03 | 0.08 | 0.02 | 0.03 | 0.04 |
| Coating 10/04/2010-11/19/2010 | 31.69 | 0.06 | 1.08 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |
| Architectural Coating | 31.66 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.03 | 0.06 | 1.08 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |
| Fine Grading 10/04/2010-11/19/2010 | 0.55 | 7.23 | 2.78 | 0.01 | 0.03 | 0.30 | 0.33 | 0.01 | 0.27 | 0.28 |
| Fine Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Off Road Diesel | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading On Road Diesel | 0.55 | 7.23 | 2.78 | 0.01 | 0.03 | 0.30 | 0.33 | 0.01 | 0.27 | 0.28 |
| Fine Grading Worker Trips | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mass Grading 10/04/2010-11/19/2010 | 117.27 | 1,068.47 | 475.33 | 0.13 | 2,355.70 | 46.32 | 2,402.02 | 492.02 | 42.61 | 534.63 |
| Mass Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 2,355.23 | 0.00 | 2,355.23 | 491.87 | 0.00 | 491.87 |
| Mass Grading Off Road Diesel | 110.58 | 988.69 | 424.21 | 0.00 | 0.00 | 43.04 | 43.04 | 0.00 | 39.59 | 39.59 |
| Mass Grading On Road Diesel | 6.03 | 78.54 | 30.16 | 0.10 | 0.36 | 3.22 | 3.57 | 0.12 | 2.96 | 3.08 |
| Mass Grading Worker Trips | 0.66 | 1.24 | 20.96 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |

Construction Related Mitigation Measures

The following mitigation measures apply to Phase: Mass Grading 10/4/2010 - 11/19/2010 - Grading

For Soil Stablizing Measures, the Water exposed surfaces 3x daily watering mitigation reduces emissions by:

PM10: 61% PM25: 61%

For Soil Stablizing Measures, the Equipment loading/unloading mitigation reduces emissions by:

PM10: 69% PM25: 69%

For Unpaved Roads Measures, the Manage haul road dust 3x daily watering mitigation reduces emissions by:

PM10: 61% PM25: 61%

**5/27/2010 05:41:26 PM**

Urbemis 2007 Version 9.2.4

Combined Summer Emissions Reports (Pounds/Day)

File Name: Z:\Alan Sako\032.92A Landmark Village\Recirculated DEIR\URBEMIS2007 Update\Landmark Recirc Construction wk047-091.urb924
Project Name: Landmark Village - Construction
Project Location: South Coast AQMD
On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006
Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| 2010 TOTALS (lbs/day unmitigated) | 188.97 | 1,376.08 | 642.89 | 0.14 | 0.61 | 64.61 | 65.22 | 0.22 | 59.42 | 59.63 |
| 2011 TOTALS (lbs/day unmitigated) | 177.97 | 1,273.29 | 612.89 | 0.14 | 0.61 | 59.61 | 60.22 | 0.22 | 54.82 | 55.03 |

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 11/22/2010-12/31/2010 Active Days: 30 | **188.97** | **1,376.08** | **642.89** | **0.14** | **0.61** | **64.61** | **65.22** | **0.22** | **59.42** | **59.63** |
| Asphalt 11/22/2010-09/30/2011 | 73.87 | 624.88 | 286.48 | 0.03 | 0.14 | 29.52 | 29.66 | 0.05 | 27.15 | 27.20 |
| Paving Off-Gas | 1.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Off Road Diesel | 71.85 | 619.31 | 263.09 | 0.00 | 0.00 | 29.27 | 29.27 | 0.00 | 26.93 | 26.93 |
| Paving On Road Diesel | 0.33 | 4.29 | 1.65 | 0.01 | 0.02 | 0.18 | 0.20 | 0.01 | 0.16 | 0.17 |
| Paving Worker Trips | 0.68 | 1.28 | 21.75 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |
| Building 11/22/2010-09/30/2011 | 83.00 | 743.90 | 352.56 | 0.10 | 0.43 | 34.79 | 35.22 | 0.15 | 31.99 | 32.14 |
| Building Off Road Diesel | 79.83 | 725.34 | 281.51 | 0.00 | 0.00 | 33.97 | 33.97 | 0.00 | 31.25 | 31.25 |
| Building Vendor Trips | 1.31 | 15.06 | 11.69 | 0.03 | 0.10 | 0.63 | 0.73 | 0.03 | 0.58 | 0.61 |
| Building Worker Trips | 1.87 | 3.50 | 59.36 | 0.07 | 0.33 | 0.19 | 0.52 | 0.12 | 0.16 | 0.28 |
| Coating 11/22/2010-09/30/2011 | 31.55 | 0.06 | 1.07 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |
| Architectural Coating | 31.51 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.03 | 0.06 | 1.07 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |
| Fine Grading 11/22/2010-09/30/2011 | 0.55 | 7.23 | 2.78 | 0.01 | 0.03 | 0.30 | 0.33 | 0.01 | 0.27 | 0.28 |
| Fine Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Off Road Diesel | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading On Road Diesel | 0.55 | 7.23 | 2.78 | 0.01 | 0.03 | 0.30 | 0.33 | 0.01 | 0.27 | 0.28 |
| Fine Grading Worker Trips | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Time Slice 1/3/2011-9/30/2011 Active Days: 195 | 177.97 | 1,273.29 | 612.89 | **0.14** | **0.61** | 59.61 | 60.22 | **0.22** | 54.82 | 55.03 |
| Asphalt 11/22/2010-09/30/2011 | 69.29 | 580.85 | 273.31 | 0.03 | 0.14 | 27.19 | 27.33 | 0.05 | 25.01 | 25.06 |
| Paving Off-Gas | 1.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Off Road Diesel | 67.35 | 575.82 | 251.58 | 0.00 | 0.00 | 26.96 | 26.96 | 0.00 | 24.81 | 24.81 |
| Paving On Road Diesel | 0.30 | 3.86 | 1.49 | 0.01 | 0.02 | 0.16 | 0.17 | 0.01 | 0.14 | 0.15 |
| Paving Worker Trips | 0.62 | 1.17 | 20.24 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |

**5/27/2010 05:41:26 PM**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Building 11/22/2010-09/30/2011 | 76.63 | 685.87 | 336.08 | 0.10 | 0.43 | 32.15 | 32.59 | 0.15 | 29.57 | 29.72 |
| Building Off Road Diesel | 73.72 | 669.10 | 270.00 | 0.00 | 0.00 | 31.40 | 31.40 | 0.00 | 28.89 | 28.89 |
| Building Vendor Trips | 1.20 | 13.57 | 10.84 | 0.03 | 0.10 | 0.56 | 0.66 | 0.03 | 0.51 | 0.55 |
| Building Worker Trips | 1.70 | 3.20 | 55.25 | 0.07 | 0.33 | 0.19 | 0.52 | 0.12 | 0.16 | 0.28 |
| Coating 11/22/2010-09/30/2011 | 31.54 | 0.06 | 1.00 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |
| Architectural Coating | 31.51 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.03 | 0.06 | 1.00 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |
| Fine Grading 11/22/2010-09/30/2011 | 0.51 | 6.51 | 2.50 | 0.01 | 0.03 | 0.26 | 0.29 | 0.01 | 0.24 | 0.25 |
| Fine Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Off Road Diesel | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading On Road Diesel | 0.51 | 6.51 | 2.50 | 0.01 | 0.03 | 0.26 | 0.29 | 0.01 | 0.24 | 0.25 |
| Fine Grading Worker Trips | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

Phase Assumptions

Phase: Fine Grading 11/22/2010 - 9/30/2011 - Surrogate for Paving On-Road Trucks
Total Acres Disturbed: 0
Maximum Daily Acreage Disturbed: 0
Fugitive Dust Level of Detail: Default
0 lbs per acre-day
On Road Truck Travel (VMT): 232.16
Off-Road Equipment:

Phase: Paving 11/22/2010 - 9/30/2011 - Asphalt Paving
Acres to be Paved: 86.34
Off-Road Equipment:
8 Excavators (168 hp) operating at a 0.57 load factor for 8 hours per day
4 Graders (174 hp) operating at a 0.61 load factor for 8 hours per day
3 Off Highway Tractors (267 hp) operating at a 0.65 load factor for 8 hours per day
14 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day
18 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day
2 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day
8 Rollers (95 hp) operating at a 0.56 load factor for 6 hours per day
6 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day
6 Scrapers (313 hp) operating at a 0.72 load factor for 8 hours per day
4 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 0 hours per day
10 Trenchers (63 hp) operating at a 0.75 load factor for 8 hours per day

**5/27/2010 05:41:26 PM**

Phase: Building Construction 11/22/2010 - 9/30/2011 - Building Construction

Off-Road Equipment:

9 Cranes (399 hp) operating at a 0.43 load factor for 6 hours per day
1 Graders (174 hp) operating at a 0.61 load factor for 8 hours per day
6 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day
70 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day
3 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day
11 Rough Terrain Forklifts (93 hp) operating at a 0.6 load factor for 8 hours per day
7 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day
2 Skid Steer Loaders (44 hp) operating at a 0.55 load factor for 8 hours per day
13 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 8 hours per day
9 Trenchers (63 hp) operating at a 0.75 load factor for 8 hours per day

Phase: Architectural Coating 11/22/2010 - 9/30/2011 - Architectural Coating

Rule: Residential Interior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 100
Rule: Residential Interior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 50
Rule: Residential Exterior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 250
Rule: Residential Exterior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 100
Rule: Nonresidential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250
Rule: Nonresidential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Construction Mitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Summer Pounds Per Day, Mitigated

Construction Related Mitigation Measures

**5/27/2010 05:42:29 PM**

Urbemis 2007 Version 9.2.4

Combined Winter Emissions Reports (Pounds/Day)

File Name: Z:\Alan Sako\032.92A Landmark Village\Recirculated DEIR\URBEMIS2007 Update\Landmark Recirc Construction wk047-091.urb924

Project Name: Landmark Village - Construction

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| 2010 TOTALS (lbs/day unmitigated) | 188.97 | 1,376.08 | 642.89 | 0.14 | 0.61 | 64.61 | 65.22 | 0.22 | 59.42 | 59.63 |
| 2011 TOTALS (lbs/day unmitigated) | 177.97 | 1,273.29 | 612.89 | 0.14 | 0.61 | 59.61 | 60.22 | 0.22 | 54.82 | 55.03 |

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Winter Pounds Per Day, Unmitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 11/22/2010-12/31/2010 Active Days: 30 | **188.97** | **1,376.08** | **642.89** | **0.14** | **0.61** | **64.61** | **65.22** | **0.22** | **59.42** | **59.63** |
| Asphalt 11/22/2010-09/30/2011 | 73.87 | 624.88 | 286.48 | 0.03 | 0.14 | 29.52 | 29.66 | 0.05 | 27.15 | 27.20 |
| Paving Off-Gas | 1.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Off Road Diesel | 71.85 | 619.31 | 263.09 | 0.00 | 0.00 | 29.27 | 29.27 | 0.00 | 26.93 | 26.93 |
| Paving On Road Diesel | 0.33 | 4.29 | 1.65 | 0.01 | 0.02 | 0.18 | 0.20 | 0.01 | 0.16 | 0.17 |
| Paving Worker Trips | 0.68 | 1.28 | 21.75 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |
| Building 11/22/2010-09/30/2011 | 83.00 | 743.90 | 352.56 | 0.10 | 0.43 | 34.79 | 35.22 | 0.15 | 31.99 | 32.14 |
| Building Off Road Diesel | 79.83 | 725.34 | 281.51 | 0.00 | 0.00 | 33.97 | 33.97 | 0.00 | 31.25 | 31.25 |
| Building Vendor Trips | 1.31 | 15.06 | 11.69 | 0.03 | 0.10 | 0.63 | 0.73 | 0.03 | 0.58 | 0.61 |
| Building Worker Trips | 1.87 | 3.50 | 59.36 | 0.07 | 0.33 | 0.19 | 0.52 | 0.12 | 0.16 | 0.28 |
| Coating 11/22/2010-09/30/2011 | 31.55 | 0.06 | 1.07 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |
| Architectural Coating | 31.51 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.03 | 0.06 | 1.07 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |

**5/27/2010 05:42:29 PM**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Fine Grading 11/22/2010-09/30/2011 | 0.55 | 7.23 | 2.78 | 0.01 | 0.03 | 0.30 | 0.33 | 0.01 | 0.27 | 0.28 |
| Fine Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Off Road Diesel | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading On Road Diesel | 0.55 | 7.23 | 2.78 | 0.01 | 0.03 | 0.30 | 0.33 | 0.01 | 0.27 | 0.28 |
| Fine Grading Worker Trips | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Time Slice 1/3/2011-9/30/2011 Active Days: 195 | 177.97 | 1,273.29 | 612.89 | **0.14** | **0.61** | 59.61 | 60.22 | **0.22** | 54.82 | 55.03 |
| Asphalt 11/22/2010-09/30/2011 | 69.29 | 580.85 | 273.31 | 0.03 | 0.14 | 27.19 | 27.33 | 0.05 | 25.01 | 25.06 |
| Paving Off-Gas | 1.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Off Road Diesel | 67.35 | 575.82 | 251.58 | 0.00 | 0.00 | 26.96 | 26.96 | 0.00 | 24.81 | 24.81 |
| Paving On Road Diesel | 0.30 | 3.86 | 1.49 | 0.01 | 0.02 | 0.16 | 0.17 | 0.01 | 0.14 | 0.15 |
| Paving Worker Trips | 0.62 | 1.17 | 20.24 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |
| Building 11/22/2010-09/30/2011 | 76.63 | 685.87 | 336.08 | 0.10 | 0.43 | 32.15 | 32.59 | 0.15 | 29.57 | 29.72 |
| Building Off Road Diesel | 73.72 | 669.10 | 270.00 | 0.00 | 0.00 | 31.40 | 31.40 | 0.00 | 28.89 | 28.89 |
| Building Vendor Trips | 1.20 | 13.57 | 10.84 | 0.03 | 0.10 | 0.56 | 0.66 | 0.03 | 0.51 | 0.55 |
| Building Worker Trips | 1.70 | 3.20 | 55.25 | 0.07 | 0.33 | 0.19 | 0.52 | 0.12 | 0.16 | 0.28 |
| Coating 11/22/2010-09/30/2011 | 31.54 | 0.06 | 1.00 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |
| Architectural Coating | 31.51 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.03 | 0.06 | 1.00 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |
| Fine Grading 11/22/2010-09/30/2011 | 0.51 | 6.51 | 2.50 | 0.01 | 0.03 | 0.26 | 0.29 | 0.01 | 0.24 | 0.25 |
| Fine Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Off Road Diesel | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading On Road Diesel | 0.51 | 6.51 | 2.50 | 0.01 | 0.03 | 0.26 | 0.29 | 0.01 | 0.24 | 0.25 |
| Fine Grading Worker Trips | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

Phase Assumptions

Phase: Fine Grading 11/22/2010 - 9/30/2011 - Surrogate for Paving On-Road Trucks

Total Acres Disturbed: 0

Maximum Daily Acreage Disturbed: 0

Fugitive Dust Level of Detail: Default

0 lbs per acre-day

On Road Truck Travel (VMT): 232.16

Off-Road Equipment:

**5/27/2010 05:42:29 PM**

Phase: Paving 11/22/2010 - 9/30/2011 - Asphalt Paving
Acres to be Paved: 86.34
Off-Road Equipment:
8 Excavators (168 hp) operating at a 0.57 load factor for 8 hours per day
4 Graders (174 hp) operating at a 0.61 load factor for 8 hours per day
3 Off Highway Tractors (267 hp) operating at a 0.65 load factor for 8 hours per day
14 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day
18 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day
2 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day
8 Rollers (95 hp) operating at a 0.56 load factor for 6 hours per day
6 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day
6 Scrapers (313 hp) operating at a 0.72 load factor for 8 hours per day
4 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 0 hours per day
10 Trenchers (63 hp) operating at a 0.75 load factor for 8 hours per day

Phase: Building Construction 11/22/2010 - 9/30/2011 - Building Construction
Off-Road Equipment:
9 Cranes (399 hp) operating at a 0.43 load factor for 6 hours per day
1 Graders (174 hp) operating at a 0.61 load factor for 8 hours per day
6 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day
70 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day
3 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day
11 Rough Terrain Forklifts (93 hp) operating at a 0.6 load factor for 8 hours per day
7 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day
2 Skid Steer Loaders (44 hp) operating at a 0.55 load factor for 8 hours per day
13 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 8 hours per day
9 Trenchers (63 hp) operating at a 0.75 load factor for 8 hours per day

Phase: Architectural Coating 11/22/2010 - 9/30/2011 - Architectural Coating
Rule: Residential Interior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 100
Rule: Residential Interior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 50
Rule: Residential Exterior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 250
Rule: Residential Exterior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 100
Rule: Nonresidential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250
Rule: Nonresidential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Construction Mitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Winter Pounds Per Day, Mitigated

Construction Related Mitigation Measures

**5/27/2010 05:48:13 PM**

Urbemis 2007 Version 9.2.4

Combined Summer Emissions Reports (Pounds/Day)

File Name: Z:\Alan Sako\032.92A Landmark Village\Recirculated DEIR\URBEMIS2007 Update\Landmark Recirc Construction wk092.urb924
Project Name: Landmark Village - Construction
Project Location: South Coast AQMD
On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006
Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| 2011 TOTALS (lbs/day unmitigated) | 196.86 | 1,435.16 | 622.94 | 0.05 | 0.19 | 67.56 | 67.75 | 0.07 | 62.15 | 62.21 |

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 10/3/2011-10/7/2011 Active Days: 5 | **196.86** | **1,435.16** | **622.94** | **0.05** | **0.19** | **67.56** | **67.75** | **0.07** | **62.15** | **62.21** |
| Asphalt 10/03/2011-10/07/2011 | 69.29 | 580.85 | 273.31 | 0.03 | 0.14 | 27.19 | 27.33 | 0.05 | 25.01 | 25.06 |
| Paving Off-Gas | 1.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Off Road Diesel | 67.35 | 575.82 | 251.58 | 0.00 | 0.00 | 26.96 | 26.96 | 0.00 | 24.81 | 24.81 |
| Paving On Road Diesel | 0.30 | 3.86 | 1.49 | 0.01 | 0.02 | 0.16 | 0.17 | 0.01 | 0.14 | 0.15 |
| Paving Worker Trips | 0.62 | 1.17 | 20.24 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |
| Building 10/03/2011-10/07/2011 | 95.09 | 847.74 | 346.13 | 0.00 | 0.01 | 40.10 | 40.11 | 0.00 | 36.90 | 36.90 |
| Building Off Road Diesel | 95.02 | 847.36 | 344.65 | 0.00 | 0.00 | 40.09 | 40.09 | 0.00 | 36.88 | 36.88 |
| Building Vendor Trips | 0.03 | 0.30 | 0.24 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 |
| Building Worker Trips | 0.04 | 0.07 | 1.24 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |
| Coating 10/03/2011-10/07/2011 | 31.97 | 0.06 | 1.00 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |
| Architectural Coating | 31.94 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.03 | 0.06 | 1.00 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |
| Fine Grading 10/03/2011-10/07/2011 | 0.51 | 6.51 | 2.50 | 0.01 | 0.03 | 0.26 | 0.29 | 0.01 | 0.24 | 0.25 |
| Fine Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Off Road Diesel | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading On Road Diesel | 0.51 | 6.51 | 2.50 | 0.01 | 0.03 | 0.26 | 0.29 | 0.01 | 0.24 | 0.25 |
| Fine Grading Worker Trips | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

Phase Assumptions

Phase: Fine Grading 10/3/2011 - 10/7/2011 - Surrogate for Paving On-Road Trucks
Total Acres Disturbed: 0
Maximum Daily Acreage Disturbed: 0
Fugitive Dust Level of Detail: Default
0 lbs per acre-day
On Road Truck Travel (VMT): 232.32
Off-Road Equipment:

**5/27/2010 05:48:13 PM**

Phase: Paving 10/3/2011 - 10/7/2011 - Asphalt Paving
Acres to be Paved: 1.92
Off-Road Equipment:
8 Excavators (168 hp) operating at a 0.57 load factor for 8 hours per day
4 Graders (174 hp) operating at a 0.61 load factor for 8 hours per day
3 Off Highway Tractors (267 hp) operating at a 0.65 load factor for 8 hours per day
14 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day
18 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day
2 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day
8 Rollers (95 hp) operating at a 0.56 load factor for 6 hours per day
6 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day
6 Scrapers (313 hp) operating at a 0.72 load factor for 8 hours per day
4 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 0 hours per day
10 Trenchers (63 hp) operating at a 0.75 load factor for 8 hours per day

Phase: Building Construction 10/3/2011 - 10/7/2011 - Building Construction
Off-Road Equipment:
9 Cranes (399 hp) operating at a 0.43 load factor for 6 hours per day
3 Graders (174 hp) operating at a 0.61 load factor for 8 hours per day
13 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day
76 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day
5 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day
13 Rough Terrain Forklifts (93 hp) operating at a 0.6 load factor for 8 hours per day
10 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day
2 Skid Steer Loaders (44 hp) operating at a 0.55 load factor for 8 hours per day
15 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 8 hours per day
11 Trenchers (63 hp) operating at a 0.75 load factor for 8 hours per day

Phase: Architectural Coating 10/3/2011 - 10/7/2011 - Architectural Coating
Rule: Residential Interior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 100
Rule: Residential Interior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 50
Rule: Residential Exterior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 250
Rule: Residential Exterior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 100
Rule: Nonresidential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250
Rule: Nonresidential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Construction Mitigated Detail Report:
CONSTRUCTION EMISSION ESTIMATES Summer Pounds Per Day, Mitigated

Construction Related Mitigation Measures

**5/27/2010 05:48:27 PM**

Urbemis 2007 Version 9.2.4

Combined Winter Emissions Reports (Pounds/Day)

File Name: Z:\Alan Sako\032.92A Landmark Village\Recirculated DEIR\URBEMIS2007 Update\Landmark Recirc Construction wk092.urb924

Project Name: Landmark Village - Construction

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| 2011 TOTALS (lbs/day unmitigated) | 196.86 | 1,435.16 | 622.94 | 0.05 | 0.19 | 67.56 | 67.75 | 0.07 | 62.15 | 62.21 |

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Winter Pounds Per Day, Unmitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 10/3/2011-10/7/2011 Active Days: 5 | **196.86** | **1,435.16** | **622.94** | **0.05** | **0.19** | **67.56** | **67.75** | **0.07** | **62.15** | **62.21** |
| Asphalt 10/03/2011-10/07/2011 | 69.29 | 580.85 | 273.31 | 0.03 | 0.14 | 27.19 | 27.33 | 0.05 | 25.01 | 25.06 |
| Paving Off-Gas | 1.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Off Road Diesel | 67.35 | 575.82 | 251.58 | 0.00 | 0.00 | 26.96 | 26.96 | 0.00 | 24.81 | 24.81 |
| Paving On Road Diesel | 0.30 | 3.86 | 1.49 | 0.01 | 0.02 | 0.16 | 0.17 | 0.01 | 0.14 | 0.15 |
| Paving Worker Trips | 0.62 | 1.17 | 20.24 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |
| Building 10/03/2011-10/07/2011 | 95.09 | 847.74 | 346.13 | 0.00 | 0.01 | 40.10 | 40.11 | 0.00 | 36.90 | 36.90 |
| Building Off Road Diesel | 95.02 | 847.36 | 344.65 | 0.00 | 0.00 | 40.09 | 40.09 | 0.00 | 36.88 | 36.88 |
| Building Vendor Trips | 0.03 | 0.30 | 0.24 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 |
| Building Worker Trips | 0.04 | 0.07 | 1.24 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |
| Coating 10/03/2011-10/07/2011 | 31.97 | 0.06 | 1.00 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |
| Architectural Coating | 31.94 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.03 | 0.06 | 1.00 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |
| Fine Grading 10/03/2011-10/07/2011 | 0.51 | 6.51 | 2.50 | 0.01 | 0.03 | 0.26 | 0.29 | 0.01 | 0.24 | 0.25 |
| Fine Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Off Road Diesel | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading On Road Diesel | 0.51 | 6.51 | 2.50 | 0.01 | 0.03 | 0.26 | 0.29 | 0.01 | 0.24 | 0.25 |
| Fine Grading Worker Trips | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**5/27/2010 05:48:27 PM**

Phase Assumptions

Phase: Fine Grading 10/3/2011 - 10/7/2011 - Surrogate for Paving On-Road Trucks
Total Acres Disturbed: 0
Maximum Daily Acreage Disturbed: 0
Fugitive Dust Level of Detail: Default
0 lbs per acre-day
On Road Truck Travel (VMT): 232.32
Off-Road Equipment:

Phase: Paving 10/3/2011 - 10/7/2011 - Asphalt Paving
Acres to be Paved: 1.92
Off-Road Equipment:
8 Excavators (168 hp) operating at a 0.57 load factor for 8 hours per day
4 Graders (174 hp) operating at a 0.61 load factor for 8 hours per day
3 Off Highway Tractors (267 hp) operating at a 0.65 load factor for 8 hours per day
14 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day
18 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day
2 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day
8 Rollers (95 hp) operating at a 0.56 load factor for 6 hours per day
6 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day
6 Scrapers (313 hp) operating at a 0.72 load factor for 8 hours per day
4 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 0 hours per day
10 Trenchers (63 hp) operating at a 0.75 load factor for 8 hours per day

Phase: Building Construction 10/3/2011 - 10/7/2011 - Building Construction
Off-Road Equipment:
9 Cranes (399 hp) operating at a 0.43 load factor for 6 hours per day
3 Graders (174 hp) operating at a 0.61 load factor for 8 hours per day
13 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day
76 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day
5 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day
13 Rough Terrain Forklifts (93 hp) operating at a 0.6 load factor for 8 hours per day
10 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day
2 Skid Steer Loaders (44 hp) operating at a 0.55 load factor for 8 hours per day
15 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 8 hours per day
11 Trenchers (63 hp) operating at a 0.75 load factor for 8 hours per day

**5/27/2010 05:48:27 PM**

Phase: Architectural Coating 10/3/2011 - 10/7/2011 - Architectural Coating

Rule: Residential Interior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 100

Rule: Residential Interior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 50

Rule: Residential Exterior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 250

Rule: Residential Exterior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 100

Rule: Nonresidential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Rule: Nonresidential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Construction Mitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Winter Pounds Per Day, Mitigated

Construction Related Mitigation Measures

**5/27/2010 05:59:12 PM**

Urbemis 2007 Version 9.2.4

Combined Summer Emissions Reports (Pounds/Day)

File Name: Z:\Alan Sako\032.92A Landmark Village\Recirculated DEIR\URBEMIS2007 Update\Landmark Recirc Construction wk093-144.urb924
Project Name: Landmark Village - Construction
Project Location: South Coast AQMD
On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006
Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| 2011 TOTALS (lbs/day unmitigated) | 177.84 | 1,326.41 | 642.49 | 0.14 | 0.60 | 62.41 | 63.01 | 0.21 | 57.39 | 57.61 |
| 2012 TOTALS (lbs/day unmitigated) | 170.22 | 1,228.45 | 616.13 | 0.14 | 0.60 | 58.64 | 59.23 | 0.21 | 53.92 | 54.13 |

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 10/10/2011-12/30/2011 Active Days: 60 | **177.84** | **1,326.41** | **642.49** | **0.14** | **0.60** | **62.41** | **63.01** | **0.21** | **57.39** | **57.61** |
| Asphalt 10/10/2011-10/19/2012 | 68.00 | 577.06 | 271.85 | 0.03 | 0.12 | 27.04 | 27.16 | 0.04 | 24.87 | 24.91 |
| Paving Off-Gas | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Off Road Diesel | 67.35 | 575.82 | 251.58 | 0.00 | 0.00 | 26.96 | 26.96 | 0.00 | 24.81 | 24.81 |
| Paving On Road Diesel | 0.01 | 0.07 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Worker Trips | 0.62 | 1.17 | 20.24 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |
| Building 10/10/2011-10/19/2012 | 84.62 | 749.18 | 369.70 | 0.11 | 0.47 | 35.37 | 35.83 | 0.17 | 32.52 | 32.69 |
| Building Off Road Diesel | 81.44 | 730.64 | 297.87 | 0.00 | 0.00 | 34.54 | 34.54 | 0.00 | 31.77 | 31.77 |
| Building Vendor Trips | 1.34 | 15.06 | 12.00 | 0.03 | 0.11 | 0.62 | 0.73 | 0.04 | 0.57 | 0.61 |
| Building Worker Trips | 1.84 | 3.47 | 59.82 | 0.08 | 0.36 | 0.21 | 0.57 | 0.13 | 0.18 | 0.31 |
| Coating 10/10/2011-10/19/2012 | 25.22 | 0.05 | 0.90 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 25.19 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.03 | 0.05 | 0.90 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Fine Grading 10/10/2011-10/19/2012 | 0.01 | 0.12 | 0.05 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Fine Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Off Road Diesel | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading On Road Diesel | 0.01 | 0.12 | 0.05 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Fine Grading Worker Trips | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Time Slice 1/2/2012-10/19/2012 Active Days: 210 | 170.22 | 1,228.45 | 616.13 | **0.14** | **0.60** | 58.64 | 59.23 | **0.21** | 53.92 | 54.13 |
| Asphalt 10/10/2011-10/19/2012 | 64.77 | 536.47 | 260.69 | 0.03 | 0.12 | 25.20 | 25.32 | 0.04 | 23.18 | 23.22 |
| Paving Off-Gas | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Off Road Diesel | 64.18 | 535.33 | 241.83 | 0.00 | 0.00 | 25.12 | 25.12 | 0.00 | 23.11 | 23.11 |
| Paving On Road Diesel | 0.01 | 0.06 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Worker Trips | 0.57 | 1.08 | 18.83 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |

**5/27/2010 05:59:12 PM**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Building 10/10/2011-10/19/2012 | 80.23 | 691.83 | 354.57 | 0.11 | 0.47 | 33.43 | 33.90 | 0.17 | 30.74 | 30.91 |
| Building Off Road Diesel | 77.33 | 675.20 | 287.82 | 0.00 | 0.00 | 32.67 | 32.67 | 0.00 | 30.06 | 30.06 |
| Building Vendor Trips | 1.22 | 13.45 | 11.10 | 0.03 | 0.11 | 0.55 | 0.66 | 0.04 | 0.50 | 0.54 |
| Building Worker Trips | 1.68 | 3.18 | 55.65 | 0.08 | 0.36 | 0.21 | 0.57 | 0.13 | 0.18 | 0.31 |
| Coating 10/10/2011-10/19/2012 | 25.21 | 0.05 | 0.84 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 25.19 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.03 | 0.05 | 0.84 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Fine Grading 10/10/2011-10/19/2012 | 0.01 | 0.11 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Off Road Diesel | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading On Road Diesel | 0.01 | 0.11 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Worker Trips | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

Phase Assumptions

Phase: Fine Grading 10/10/2011 - 10/19/2012 - Surrogate for Paving On-Road Trucks
Total Acres Disturbed: 0
Maximum Daily Acreage Disturbed: 0
Fugitive Dust Level of Detail: Default
0 lbs per acre-day
On Road Truck Travel (VMT): 4.3
Off-Road Equipment:

Phase: Paving 10/10/2011 - 10/19/2012 - Asphalt Paving
Acres to be Paved: 1.92
Off-Road Equipment:
8 Excavators (168 hp) operating at a 0.57 load factor for 8 hours per day
4 Graders (174 hp) operating at a 0.61 load factor for 8 hours per day
3 Off Highway Tractors (267 hp) operating at a 0.65 load factor for 8 hours per day
14 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day
18 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day
2 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day
8 Rollers (95 hp) operating at a 0.56 load factor for 6 hours per day
6 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day
6 Scrapers (313 hp) operating at a 0.72 load factor for 8 hours per day
4 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 0 hours per day
10 Trenchers (63 hp) operating at a 0.75 load factor for 8 hours per day

**5/27/2010 05:59:12 PM**

Phase: Building Construction 10/10/2011 - 10/19/2012 - Building Construction

Off-Road Equipment:

8 Cranes (399 hp) operating at a 0.43 load factor for 6 hours per day
2 Graders (174 hp) operating at a 0.61 load factor for 8 hours per day
9 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day
70 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day
4 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day
12 Rough Terrain Forklifts (93 hp) operating at a 0.6 load factor for 8 hours per day
10 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day
2 Skid Steer Loaders (44 hp) operating at a 0.55 load factor for 8 hours per day
13 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 8 hours per day
9 Trenchers (63 hp) operating at a 0.75 load factor for 8 hours per day

Phase: Architectural Coating 10/10/2011 - 10/19/2012 - Architectural Coating

Rule: Residential Interior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 100
Rule: Residential Interior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 50
Rule: Residential Exterior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 250
Rule: Residential Exterior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 100
Rule: Nonresidential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250
Rule: Nonresidential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Construction Mitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Summer Pounds Per Day, Mitigated

Construction Related Mitigation Measures

**5/27/2010 05:59:33 PM**

Urbemis 2007 Version 9.2.4

Combined Winter Emissions Reports (Pounds/Day)

File Name: Z:\Alan Sako\032.92A Landmark Village\Recirculated DEIR\URBEMIS2007 Update\Landmark Recirc Construction wk093-144.urb924

Project Name: Landmark Village - Construction

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| 2011 TOTALS (lbs/day unmitigated) | 177.84 | 1,326.41 | 642.49 | 0.14 | 0.60 | 62.41 | 63.01 | 0.21 | 57.39 | 57.61 |
| 2012 TOTALS (lbs/day unmitigated) | 170.22 | 1,228.45 | 616.13 | 0.14 | 0.60 | 58.64 | 59.23 | 0.21 | 53.92 | 54.13 |

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Winter Pounds Per Day, Unmitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 10/10/2011-12/30/2011 Active Days: 60 | **177.84** | **1,326.41** | **642.49** | **0.14** | **0.60** | **62.41** | **63.01** | **0.21** | **57.39** | **57.61** |
| Asphalt 10/10/2011-10/19/2012 | 68.00 | 577.06 | 271.85 | 0.03 | 0.12 | 27.04 | 27.16 | 0.04 | 24.87 | 24.91 |
| Paving Off-Gas | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Off Road Diesel | 67.35 | 575.82 | 251.58 | 0.00 | 0.00 | 26.96 | 26.96 | 0.00 | 24.81 | 24.81 |
| Paving On Road Diesel | 0.01 | 0.07 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Worker Trips | 0.62 | 1.17 | 20.24 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |
| Building 10/10/2011-10/19/2012 | 84.62 | 749.18 | 369.70 | 0.11 | 0.47 | 35.37 | 35.83 | 0.17 | 32.52 | 32.69 |
| Building Off Road Diesel | 81.44 | 730.64 | 297.87 | 0.00 | 0.00 | 34.54 | 34.54 | 0.00 | 31.77 | 31.77 |
| Building Vendor Trips | 1.34 | 15.06 | 12.00 | 0.03 | 0.11 | 0.62 | 0.73 | 0.04 | 0.57 | 0.61 |
| Building Worker Trips | 1.84 | 3.47 | 59.82 | 0.08 | 0.36 | 0.21 | 0.57 | 0.13 | 0.18 | 0.31 |
| Coating 10/10/2011-10/19/2012 | 25.22 | 0.05 | 0.90 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 25.19 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.03 | 0.05 | 0.90 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |

**5/27/2010 05:59:33 PM**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Fine Grading 10/10/2011-10/19/2012 | 0.01 | 0.12 | 0.05 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Fine Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Off Road Diesel | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading On Road Diesel | 0.01 | 0.12 | 0.05 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Fine Grading Worker Trips | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Time Slice 1/2/2012-10/19/2012 Active Days: 210 | 170.22 | 1,228.45 | 616.13 | **0.14** | **0.60** | 58.64 | 59.23 | **0.21** | 53.92 | 54.13 |
| Asphalt 10/10/2011-10/19/2012 | 64.77 | 536.47 | 260.69 | 0.03 | 0.12 | 25.20 | 25.32 | 0.04 | 23.18 | 23.22 |
| Paving Off-Gas | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Off Road Diesel | 64.18 | 535.33 | 241.83 | 0.00 | 0.00 | 25.12 | 25.12 | 0.00 | 23.11 | 23.11 |
| Paving On Road Diesel | 0.01 | 0.06 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Worker Trips | 0.57 | 1.08 | 18.83 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |
| Building 10/10/2011-10/19/2012 | 80.23 | 691.83 | 354.57 | 0.11 | 0.47 | 33.43 | 33.90 | 0.17 | 30.74 | 30.91 |
| Building Off Road Diesel | 77.33 | 675.20 | 287.82 | 0.00 | 0.00 | 32.67 | 32.67 | 0.00 | 30.06 | 30.06 |
| Building Vendor Trips | 1.22 | 13.45 | 11.10 | 0.03 | 0.11 | 0.55 | 0.66 | 0.04 | 0.50 | 0.54 |
| Building Worker Trips | 1.68 | 3.18 | 55.65 | 0.08 | 0.36 | 0.21 | 0.57 | 0.13 | 0.18 | 0.31 |
| Coating 10/10/2011-10/19/2012 | 25.21 | 0.05 | 0.84 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 25.19 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.03 | 0.05 | 0.84 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Fine Grading 10/10/2011-10/19/2012 | 0.01 | 0.11 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Off Road Diesel | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading On Road Diesel | 0.01 | 0.11 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Worker Trips | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

Phase Assumptions

Phase: Fine Grading 10/10/2011 - 10/19/2012 - Surrogate for Paving On-Road Trucks

Total Acres Disturbed: 0

Maximum Daily Acreage Disturbed: 0

Fugitive Dust Level of Detail: Default

0 lbs per acre-day

On Road Truck Travel (VMT): 4.3

Off-Road Equipment:

**5/27/2010 05:59:33 PM**

Phase: Paving 10/10/2011 - 10/19/2012 - Asphalt Paving
Acres to be Paved: 1.92
Off-Road Equipment:
8 Excavators (168 hp) operating at a 0.57 load factor for 8 hours per day
4 Graders (174 hp) operating at a 0.61 load factor for 8 hours per day
3 Off Highway Tractors (267 hp) operating at a 0.65 load factor for 8 hours per day
14 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day
18 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day
2 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day
8 Rollers (95 hp) operating at a 0.56 load factor for 6 hours per day
6 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day
6 Scrapers (313 hp) operating at a 0.72 load factor for 8 hours per day
4 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 0 hours per day
10 Trenchers (63 hp) operating at a 0.75 load factor for 8 hours per day

Phase: Building Construction 10/10/2011 - 10/19/2012 - Building Construction
Off-Road Equipment:
8 Cranes (399 hp) operating at a 0.43 load factor for 6 hours per day
2 Graders (174 hp) operating at a 0.61 load factor for 8 hours per day
9 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day
70 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day
4 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day
12 Rough Terrain Forklifts (93 hp) operating at a 0.6 load factor for 8 hours per day
10 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day
2 Skid Steer Loaders (44 hp) operating at a 0.55 load factor for 8 hours per day
13 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 8 hours per day
9 Trenchers (63 hp) operating at a 0.75 load factor for 8 hours per day

Phase: Architectural Coating 10/10/2011 - 10/19/2012 - Architectural Coating
Rule: Residential Interior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 100
Rule: Residential Interior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 50
Rule: Residential Exterior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 250
Rule: Residential Exterior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 100
Rule: Nonresidential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250
Rule: Nonresidential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Construction Mitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Winter Pounds Per Day, Mitigated

Construction Related Mitigation Measures

**5/27/2010 06:04:40 PM**

Urbemis 2007 Version 9.2.4

Combined Summer Emissions Reports (Pounds/Day)

File Name: Z:\Alan Sako\032.92A Landmark Village\Recirculated DEIR\URBEMIS2007 Update\Landmark Recirc Construction wk145-158.urb924
Project Name: Landmark Village - Construction
Project Location: South Coast AQMD
On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006
Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| 2012 TOTALS (lbs/day unmitigated) | 160.25 | 1,139.61 | 534.31 | 0.07 | 0.31 | 54.37 | 54.67 | 0.11 | 50.01 | 50.11 |
| 2013 TOTALS (lbs/day unmitigated) | 153.53 | 1,056.37 | 518.33 | 0.07 | 0.31 | 49.87 | 50.18 | 0.11 | 45.87 | 45.98 |

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 10/22/2012-12/31/2012 Active Days: 51 | **160.25** | **1,139.61** | **534.31** | **0.07** | **0.31** | **54.37** | **54.67** | **0.11** | **50.01** | **50.11** |
| Asphalt 10/22/2012-01/25/2013 | 66.03 | 539.84 | 261.99 | 0.03 | 0.14 | 25.33 | 25.47 | 0.05 | 23.30 | 23.35 |
| Paving Off-Gas | 1.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Off Road Diesel | 64.18 | 535.33 | 241.83 | 0.00 | 0.00 | 25.12 | 25.12 | 0.00 | 23.11 | 23.11 |
| Paving On Road Diesel | 0.28 | 3.44 | 1.33 | 0.01 | 0.02 | 0.14 | 0.16 | 0.01 | 0.12 | 0.13 |
| Paving Worker Trips | 0.57 | 1.08 | 18.83 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |
| Building 10/22/2012-01/25/2013 | 67.59 | 593.92 | 269.21 | 0.03 | 0.13 | 28.81 | 28.93 | 0.04 | 26.50 | 26.54 |
| Building Off Road Diesel | 66.80 | 589.44 | 251.22 | 0.00 | 0.00 | 28.60 | 28.60 | 0.00 | 26.31 | 26.31 |
| Building Vendor Trips | 0.33 | 3.62 | 2.99 | 0.01 | 0.03 | 0.15 | 0.18 | 0.01 | 0.14 | 0.15 |
| Building Worker Trips | 0.45 | 0.86 | 15.00 | 0.02 | 0.10 | 0.06 | 0.15 | 0.04 | 0.05 | 0.08 |
| Coating 10/22/2012-01/25/2013 | 26.18 | 0.05 | 0.87 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 26.15 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.03 | 0.05 | 0.87 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Fine Grading 10/22/2012-01/25/2013 | 0.47 | 5.80 | 2.24 | 0.01 | 0.03 | 0.23 | 0.26 | 0.01 | 0.21 | 0.22 |
| Fine Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Off Road Diesel | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading On Road Diesel | 0.47 | 5.80 | 2.24 | 0.01 | 0.03 | 0.23 | 0.26 | 0.01 | 0.21 | 0.22 |
| Fine Grading Worker Trips | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Time Slice 1/1/2013-1/25/2013 Active Days: 19 | 153.53 | 1,056.37 | 518.33 | **0.07** | **0.31** | 49.87 | 50.18 | **0.11** | 45.87 | 45.98 |
| Asphalt 10/22/2012-01/25/2013 | 63.16 | 502.13 | 253.10 | 0.03 | 0.14 | 23.78 | 23.92 | 0.05 | 21.87 | 21.92 |
| Paving Off-Gas | 1.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Off Road Diesel | 61.39 | 498.12 | 234.42 | 0.00 | 0.00 | 23.59 | 23.59 | 0.00 | 21.71 | 21.71 |
| Paving On Road Diesel | 0.25 | 3.03 | 1.18 | 0.01 | 0.02 | 0.12 | 0.14 | 0.01 | 0.11 | 0.11 |
| Paving Worker Trips | 0.52 | 0.98 | 17.50 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |

**5/27/2010 06:04:40 PM**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Building 10/22/2012-01/25/2013 | 63.77 | 549.08 | 262.44 | 0.03 | 0.13 | 25.89 | 26.02 | 0.04 | 23.81 | 23.86 |
| Building Off Road Diesel | 63.06 | 545.10 | 245.76 | 0.00 | 0.00 | 25.70 | 25.70 | 0.00 | 23.65 | 23.65 |
| Building Vendor Trips | 0.30 | 3.20 | 2.75 | 0.01 | 0.03 | 0.13 | 0.16 | 0.01 | 0.12 | 0.13 |
| Building Worker Trips | 0.41 | 0.78 | 13.94 | 0.02 | 0.10 | 0.06 | 0.15 | 0.04 | 0.05 | 0.08 |
| Coating 10/22/2012-01/25/2013 | 26.17 | 0.05 | 0.81 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 26.15 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.02 | 0.05 | 0.81 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Fine Grading 10/22/2012-01/25/2013 | 0.42 | 5.11 | 1.98 | 0.01 | 0.03 | 0.20 | 0.23 | 0.01 | 0.18 | 0.19 |
| Fine Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Off Road Diesel | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading On Road Diesel | 0.42 | 5.11 | 1.98 | 0.01 | 0.03 | 0.20 | 0.23 | 0.01 | 0.18 | 0.19 |
| Fine Grading Worker Trips | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

Phase Assumptions

Phase: Fine Grading 10/22/2012 - 1/25/2013 - Surrogate for Paving On-Road Trucks
Total Acres Disturbed: 0
Maximum Daily Acreage Disturbed: 0
Fugitive Dust Level of Detail: Default
0 lbs per acre-day
On Road Truck Travel (VMT): 232.15
Off-Road Equipment:

Phase: Paving 10/22/2012 - 1/25/2013 - Asphalt Paving
Acres to be Paved: 26.86
Off-Road Equipment:
8 Excavators (168 hp) operating at a 0.57 load factor for 8 hours per day
4 Graders (174 hp) operating at a 0.61 load factor for 8 hours per day
3 Off Highway Tractors (267 hp) operating at a 0.65 load factor for 8 hours per day
14 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day
18 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day
2 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day
8 Rollers (95 hp) operating at a 0.56 load factor for 6 hours per day
6 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day
6 Scrapers (313 hp) operating at a 0.72 load factor for 8 hours per day
4 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 0 hours per day
10 Trenchers (63 hp) operating at a 0.75 load factor for 8 hours per day

**5/27/2010 06:04:40 PM**

Phase: Building Construction 10/22/2012 - 1/25/2013 - Building Construction

Off-Road Equipment:

8 Cranes (399 hp) operating at a 0.43 load factor for 6 hours per day
1 Graders (174 hp) operating at a 0.61 load factor for 8 hours per day
5 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day
67 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day
3 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day
11 Rough Terrain Forklifts (93 hp) operating at a 0.6 load factor for 8 hours per day
9 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day
2 Skid Steer Loaders (44 hp) operating at a 0.55 load factor for 8 hours per day
12 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 8 hours per day
8 Trenchers (63 hp) operating at a 0.75 load factor for 8 hours per day

Phase: Architectural Coating 10/22/2012 - 1/25/2013 - Architectural Coating

Rule: Residential Interior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 100
Rule: Residential Interior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 50
Rule: Residential Exterior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 250
Rule: Residential Exterior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 100
Rule: Nonresidential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250
Rule: Nonresidential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Construction Mitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Summer Pounds Per Day, Mitigated

Construction Related Mitigation Measures

**5/27/2010 06:05:01 PM**

Urbemis 2007 Version 9.2.4

Combined Winter Emissions Reports (Pounds/Day)

File Name: Z:\Alan Sako\032.92A Landmark Village\Recirculated DEIR\URBEMIS2007 Update\Landmark Recirc Construction wk145-158.urb924

Project Name: Landmark Village - Construction

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| 2012 TOTALS (lbs/day unmitigated) | 160.25 | 1,139.61 | 534.31 | 0.07 | 0.31 | 54.37 | 54.67 | 0.11 | 50.01 | 50.11 |
| 2013 TOTALS (lbs/day unmitigated) | 153.53 | 1,056.37 | 518.33 | 0.07 | 0.31 | 49.87 | 50.18 | 0.11 | 45.87 | 45.98 |

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Winter Pounds Per Day, Unmitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 10/22/2012-12/31/2012 Active Days: 51 | **160.25** | **1,139.61** | **534.31** | **0.07** | **0.31** | **54.37** | **54.67** | **0.11** | **50.01** | **50.11** |
| Asphalt 10/22/2012-01/25/2013 | 66.03 | 539.84 | 261.99 | 0.03 | 0.14 | 25.33 | 25.47 | 0.05 | 23.30 | 23.35 |
| Paving Off-Gas | 1.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Off Road Diesel | 64.18 | 535.33 | 241.83 | 0.00 | 0.00 | 25.12 | 25.12 | 0.00 | 23.11 | 23.11 |
| Paving On Road Diesel | 0.28 | 3.44 | 1.33 | 0.01 | 0.02 | 0.14 | 0.16 | 0.01 | 0.12 | 0.13 |
| Paving Worker Trips | 0.57 | 1.08 | 18.83 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |
| Building 10/22/2012-01/25/2013 | 67.59 | 593.92 | 269.21 | 0.03 | 0.13 | 28.81 | 28.93 | 0.04 | 26.50 | 26.54 |
| Building Off Road Diesel | 66.80 | 589.44 | 251.22 | 0.00 | 0.00 | 28.60 | 28.60 | 0.00 | 26.31 | 26.31 |
| Building Vendor Trips | 0.33 | 3.62 | 2.99 | 0.01 | 0.03 | 0.15 | 0.18 | 0.01 | 0.14 | 0.15 |
| Building Worker Trips | 0.45 | 0.86 | 15.00 | 0.02 | 0.10 | 0.06 | 0.15 | 0.04 | 0.05 | 0.08 |
| Coating 10/22/2012-01/25/2013 | 26.18 | 0.05 | 0.87 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 26.15 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.03 | 0.05 | 0.87 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |

**5/27/2010 06:05:01 PM**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Fine Grading 10/22/2012-01/25/2013 | 0.47 | 5.80 | 2.24 | 0.01 | 0.03 | 0.23 | 0.26 | 0.01 | 0.21 | 0.22 |
| Fine Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Off Road Diesel | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading On Road Diesel | 0.47 | 5.80 | 2.24 | 0.01 | 0.03 | 0.23 | 0.26 | 0.01 | 0.21 | 0.22 |
| Fine Grading Worker Trips | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Time Slice 1/1/2013-1/25/2013 Active Days: 19 | 153.53 | 1,056.37 | 518.33 | **0.07** | **0.31** | 49.87 | 50.18 | **0.11** | 45.87 | 45.98 |
| Asphalt 10/22/2012-01/25/2013 | 63.16 | 502.13 | 253.10 | 0.03 | 0.14 | 23.78 | 23.92 | 0.05 | 21.87 | 21.92 |
| Paving Off-Gas | 1.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Off Road Diesel | 61.39 | 498.12 | 234.42 | 0.00 | 0.00 | 23.59 | 23.59 | 0.00 | 21.71 | 21.71 |
| Paving On Road Diesel | 0.25 | 3.03 | 1.18 | 0.01 | 0.02 | 0.12 | 0.14 | 0.01 | 0.11 | 0.11 |
| Paving Worker Trips | 0.52 | 0.98 | 17.50 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |
| Building 10/22/2012-01/25/2013 | 63.77 | 549.08 | 262.44 | 0.03 | 0.13 | 25.89 | 26.02 | 0.04 | 23.81 | 23.86 |
| Building Off Road Diesel | 63.06 | 545.10 | 245.76 | 0.00 | 0.00 | 25.70 | 25.70 | 0.00 | 23.65 | 23.65 |
| Building Vendor Trips | 0.30 | 3.20 | 2.75 | 0.01 | 0.03 | 0.13 | 0.16 | 0.01 | 0.12 | 0.13 |
| Building Worker Trips | 0.41 | 0.78 | 13.94 | 0.02 | 0.10 | 0.06 | 0.15 | 0.04 | 0.05 | 0.08 |
| Coating 10/22/2012-01/25/2013 | 26.17 | 0.05 | 0.81 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 26.15 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.02 | 0.05 | 0.81 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Fine Grading 10/22/2012-01/25/2013 | 0.42 | 5.11 | 1.98 | 0.01 | 0.03 | 0.20 | 0.23 | 0.01 | 0.18 | 0.19 |
| Fine Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Off Road Diesel | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading On Road Diesel | 0.42 | 5.11 | 1.98 | 0.01 | 0.03 | 0.20 | 0.23 | 0.01 | 0.18 | 0.19 |
| Fine Grading Worker Trips | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

Phase Assumptions

Phase: Fine Grading 10/22/2012 - 1/25/2013 - Surrogate for Paving On-Road Trucks

Total Acres Disturbed: 0

Maximum Daily Acreage Disturbed: 0

Fugitive Dust Level of Detail: Default

0 lbs per acre-day

On Road Truck Travel (VMT): 232.15

Off-Road Equipment:

**5/27/2010 06:05:01 PM**

Phase: Paving 10/22/2012 - 1/25/2013 - Asphalt Paving
Acres to be Paved: 26.86
Off-Road Equipment:
8 Excavators (168 hp) operating at a 0.57 load factor for 8 hours per day
4 Graders (174 hp) operating at a 0.61 load factor for 8 hours per day
3 Off Highway Tractors (267 hp) operating at a 0.65 load factor for 8 hours per day
14 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day
18 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day
2 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day
8 Rollers (95 hp) operating at a 0.56 load factor for 6 hours per day
6 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day
6 Scrapers (313 hp) operating at a 0.72 load factor for 8 hours per day
4 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 0 hours per day
10 Trenchers (63 hp) operating at a 0.75 load factor for 8 hours per day

Phase: Building Construction 10/22/2012 - 1/25/2013 - Building Construction
Off-Road Equipment:
8 Cranes (399 hp) operating at a 0.43 load factor for 6 hours per day
1 Graders (174 hp) operating at a 0.61 load factor for 8 hours per day
5 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day
67 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day
3 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day
11 Rough Terrain Forklifts (93 hp) operating at a 0.6 load factor for 8 hours per day
9 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day
2 Skid Steer Loaders (44 hp) operating at a 0.55 load factor for 8 hours per day
12 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 8 hours per day
8 Trenchers (63 hp) operating at a 0.75 load factor for 8 hours per day

Phase: Architectural Coating 10/22/2012 - 1/25/2013 - Architectural Coating
Rule: Residential Interior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 100
Rule: Residential Interior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 50
Rule: Residential Exterior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 250
Rule: Residential Exterior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 100
Rule: Nonresidential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250
Rule: Nonresidential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Construction Mitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Winter Pounds Per Day, Mitigated

Construction Related Mitigation Measures

**5/27/2010 06:16:03 PM**

Urbemis 2007 Version 9.2.4

Combined Summer Emissions Reports (Pounds/Day)

File Name: Z:\Alan Sako\032.92A Landmark Village\Recirculated DEIR\URBEMIS2007 Update\Landmark Recirc Construction wk159-178.urb924
Project Name: Landmark Village - Construction
Project Location: South Coast AQMD
On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006
Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| 2013 TOTALS (lbs/day unmitigated) | 91.64 | 551.13 | 271.68 | 0.05 | 0.20 | 25.99 | 26.18 | 0.07 | 23.90 | 23.97 |

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 1/28/2013-6/14/2013 Active Days: 100 | **91.64** | **551.13** | **271.68** | **0.05** | **0.20** | **25.99** | **26.18** | **0.07** | **23.90** | **23.97** |
| Building 01/28/2013-06/14/2013 | 64.13 | 551.08 | 270.83 | 0.04 | 0.19 | 25.98 | 26.17 | 0.07 | 23.90 | 23.96 |
| Building Off Road Diesel | 63.06 | 545.10 | 245.76 | 0.00 | 0.00 | 25.70 | 25.70 | 0.00 | 23.65 | 23.65 |
| Building Vendor Trips | 0.45 | 4.81 | 4.13 | 0.01 | 0.04 | 0.20 | 0.24 | 0.01 | 0.18 | 0.19 |
| Building Worker Trips | 0.62 | 1.17 | 20.94 | 0.03 | 0.15 | 0.08 | 0.23 | 0.05 | 0.07 | 0.12 |
| Coating 01/28/2013-06/14/2013 | 27.51 | 0.05 | 0.85 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |
| Architectural Coating | 27.49 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.03 | 0.05 | 0.85 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |

Phase Assumptions

Phase: Building Construction 1/28/2013 - 6/14/2013 - Building Construction

Off-Road Equipment:

8 Cranes (399 hp) operating at a 0.43 load factor for 6 hours per day
1 Graders (174 hp) operating at a 0.61 load factor for 8 hours per day
5 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day
67 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day
3 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day
11 Rough Terrain Forklifts (93 hp) operating at a 0.6 load factor for 8 hours per day
9 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day
2 Skid Steer Loaders (44 hp) operating at a 0.55 load factor for 8 hours per day
12 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 8 hours per day
8 Trenchers (63 hp) operating at a 0.75 load factor for 8 hours per day

**5/27/2010 06:16:03 PM**

Phase: Architectural Coating 1/28/2013 - 6/14/2013 - Architectural Coating
Rule: Residential Interior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 100
Rule: Residential Interior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 50
Rule: Residential Exterior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 250
Rule: Residential Exterior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 100
Rule: Nonresidential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250
Rule: Nonresidential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Construction Mitigated Detail Report:
CONSTRUCTION EMISSION ESTIMATES Summer Pounds Per Day, Mitigated

Construction Related Mitigation Measures

**5/27/2010 06:16:32 PM**

Urbemis 2007 Version 9.2.4

Combined Winter Emissions Reports (Pounds/Day)

File Name: Z:\Alan Sako\032.92A Landmark Village\Recirculated DEIR\URBEMIS2007 Update\Landmark Recirc Construction wk159-178.urb924

Project Name: Landmark Village - Construction

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| 2013 TOTALS (lbs/day unmitigated) | 91.64 | 551.13 | 271.68 | 0.05 | 0.20 | 25.99 | 26.18 | 0.07 | 23.90 | 23.97 |

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Winter Pounds Per Day, Unmitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 1/28/2013-6/14/2013 Active Days: 100 | **91.64** | **551.13** | **271.68** | **0.05** | **0.20** | **25.99** | **26.18** | **0.07** | **23.90** | **23.97** |
| Building 01/28/2013-06/14/2013 | 64.13 | 551.08 | 270.83 | 0.04 | 0.19 | 25.98 | 26.17 | 0.07 | 23.90 | 23.96 |
| Building Off Road Diesel | 63.06 | 545.10 | 245.76 | 0.00 | 0.00 | 25.70 | 25.70 | 0.00 | 23.65 | 23.65 |
| Building Vendor Trips | 0.45 | 4.81 | 4.13 | 0.01 | 0.04 | 0.20 | 0.24 | 0.01 | 0.18 | 0.19 |
| Building Worker Trips | 0.62 | 1.17 | 20.94 | 0.03 | 0.15 | 0.08 | 0.23 | 0.05 | 0.07 | 0.12 |
| Coating 01/28/2013-06/14/2013 | 27.51 | 0.05 | 0.85 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |
| Architectural Coating | 27.49 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.03 | 0.05 | 0.85 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |

**5/27/2010 06:16:32 PM**

Phase Assumptions

Phase: Building Construction 1/28/2013 - 6/14/2013 - Building Construction

Off-Road Equipment:

8 Cranes (399 hp) operating at a 0.43 load factor for 6 hours per day

1 Graders (174 hp) operating at a 0.61 load factor for 8 hours per day

5 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day

67 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day

3 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day

11 Rough Terrain Forklifts (93 hp) operating at a 0.6 load factor for 8 hours per day

9 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day

2 Skid Steer Loaders (44 hp) operating at a 0.55 load factor for 8 hours per day

12 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 8 hours per day

8 Trenchers (63 hp) operating at a 0.75 load factor for 8 hours per day

Phase: Architectural Coating 1/28/2013 - 6/14/2013 - Architectural Coating

Rule: Residential Interior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 100

Rule: Residential Interior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 50

Rule: Residential Exterior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 250

Rule: Residential Exterior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 100

Rule: Nonresidential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Rule: Nonresidential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Construction Mitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Winter Pounds Per Day, Mitigated

Construction Related Mitigation Measures

**5/27/2010 06:27:13 PM**

Urbemis 2007 Version 9.2.4

Combined Summer Emissions Reports (Pounds/Day)

File Name: Z:\Alan Sako\032.92A Landmark Village\Recirculated DEIR\URBEMIS2007 Update\Landmark Recirc Construction wk179-196.urb924
Project Name: Landmark Village - Construction
Project Location: South Coast AQMD
On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006
Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| 2013 TOTALS (lbs/day unmitigated) | 80.61 | 476.87 | 233.03 | 0.04 | 0.17 | 22.25 | 22.42 | 0.06 | 20.47 | 20.53 |

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 6/17/2013-10/18/2013 Active Days: 90 | **80.61** | **476.87** | **233.03** | **0.04** | **0.17** | **22.25** | **22.42** | **0.06** | **20.47** | **20.53** |
| Building 06/17/2013-10/18/2013 | 54.66 | 476.82 | 232.22 | 0.04 | 0.16 | 22.25 | 22.41 | 0.06 | 20.46 | 20.52 |
| Building Off Road Diesel | 53.75 | 471.70 | 210.80 | 0.00 | 0.00 | 22.01 | 22.01 | 0.00 | 20.25 | 20.25 |
| Building Vendor Trips | 0.38 | 4.11 | 3.53 | 0.01 | 0.04 | 0.17 | 0.20 | 0.01 | 0.15 | 0.17 |
| Building Worker Trips | 0.53 | 1.00 | 17.88 | 0.03 | 0.12 | 0.07 | 0.20 | 0.04 | 0.06 | 0.11 |
| Coating 06/17/2013-10/18/2013 | 25.95 | 0.05 | 0.81 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 25.93 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.02 | 0.05 | 0.81 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |

Phase Assumptions

Phase: Building Construction 6/17/2013 - 10/18/2013 - Building Construction
Off-Road Equipment:
8 Cranes (399 hp) operating at a 0.43 load factor for 6 hours per day
2 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day
64 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day
2 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day
10 Rough Terrain Forklifts (93 hp) operating at a 0.6 load factor for 8 hours per day
7 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day
2 Skid Steer Loaders (44 hp) operating at a 0.55 load factor for 8 hours per day
11 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 8 hours per day
7 Trenchers (63 hp) operating at a 0.75 load factor for 8 hours per day

Phase: Architectural Coating 6/17/2013 - 10/18/2013 - Architectural Coating
Rule: Residential Interior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 100
Rule: Residential Interior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 50
Rule: Residential Exterior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 250
Rule: Residential Exterior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 100
Rule: Nonresidential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250
Rule: Nonresidential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Construction Mitigated Detail Report:
CONSTRUCTION EMISSION ESTIMATES Summer Pounds Per Day, Mitigated

Construction Related Mitigation Measures

**5/27/2010 06:27:45 PM**

Urbemis 2007 Version 9.2.4

Combined Winter Emissions Reports (Pounds/Day)

File Name: Z:\Alan Sako\032.92A Landmark Village\Recirculated DEIR\URBEMIS2007 Update\Landmark Recirc Construction wk179-196.urb924

Project Name: Landmark Village - Construction

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| 2013 TOTALS (lbs/day unmitigated) | 80.61 | 476.87 | 233.03 | 0.04 | 0.17 | 22.25 | 22.42 | 0.06 | 20.47 | 20.53 |

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Winter Pounds Per Day, Unmitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 6/17/2013-10/18/2013 Active Days: 90 | **80.61** | **476.87** | **233.03** | **0.04** | **0.17** | **22.25** | **22.42** | **0.06** | **20.47** | **20.53** |
| Building 06/17/2013-10/18/2013 | 54.66 | 476.82 | 232.22 | 0.04 | 0.16 | 22.25 | 22.41 | 0.06 | 20.46 | 20.52 |
| Building Off Road Diesel | 53.75 | 471.70 | 210.80 | 0.00 | 0.00 | 22.01 | 22.01 | 0.00 | 20.25 | 20.25 |
| Building Vendor Trips | 0.38 | 4.11 | 3.53 | 0.01 | 0.04 | 0.17 | 0.20 | 0.01 | 0.15 | 0.17 |
| Building Worker Trips | 0.53 | 1.00 | 17.88 | 0.03 | 0.12 | 0.07 | 0.20 | 0.04 | 0.06 | 0.11 |
| Coating 06/17/2013-10/18/2013 | 25.95 | 0.05 | 0.81 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 25.93 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.02 | 0.05 | 0.81 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |

**5/27/2010 06:27:45 PM**

Phase Assumptions

Phase: Building Construction 6/17/2013 - 10/18/2013 - Building Construction

Off-Road Equipment:

8 Cranes (399 hp) operating at a 0.43 load factor for 6 hours per day

2 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day

64 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day

2 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day

10 Rough Terrain Forklifts (93 hp) operating at a 0.6 load factor for 8 hours per day

7 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day

2 Skid Steer Loaders (44 hp) operating at a 0.55 load factor for 8 hours per day

11 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 8 hours per day

7 Trenchers (63 hp) operating at a 0.75 load factor for 8 hours per day

Phase: Architectural Coating 6/17/2013 - 10/18/2013 - Architectural Coating

Rule: Residential Interior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 100

Rule: Residential Interior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 50

Rule: Residential Exterior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 250

Rule: Residential Exterior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 100

Rule: Nonresidential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Rule: Nonresidential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Construction Mitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Winter Pounds Per Day, Mitigated

Construction Related Mitigation Measures

**5/27/2010 06:34:07 PM**

Urbemis 2007 Version 9.2.4

Combined Summer Emissions Reports (Pounds/Day)

File Name: Z:\Alan Sako\032.92A Landmark Village\Recirculated DEIR\URBEMIS2007 Update\Landmark Recirc Construction wk197-210.urb924
Project Name: Landmark Village - Construction
Project Location: South Coast AQMD
On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006
Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| 2013 TOTALS (lbs/day unmitigated) | 53.65 | 323.81 | 151.89 | 0.02 | 0.08 | 14.90 | 14.98 | 0.03 | 13.70 | 13.73 |
| 2014 TOTALS (lbs/day unmitigated) | 51.53 | 292.33 | 147.19 | 0.02 | 0.08 | 13.14 | 13.22 | 0.03 | 12.08 | 12.11 |

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 10/21/2013-12/31/2013 Active Days: 52 | **53.65** | **323.81** | **151.89** | **0.02** | **0.08** | **14.90** | **14.98** | **0.03** | **13.70** | **13.73** |
| Building 10/21/2013-01/24/2014 | 36.95 | 323.79 | 151.43 | 0.02 | 0.08 | 14.89 | 14.97 | 0.03 | 13.70 | 13.73 |
| Building Off Road Diesel | 36.50 | 321.07 | 141.33 | 0.00 | 0.00 | 14.77 | 14.77 | 0.00 | 13.59 | 13.59 |
| Building Vendor Trips | 0.21 | 2.26 | 1.94 | 0.01 | 0.02 | 0.09 | 0.11 | 0.01 | 0.08 | 0.09 |
| Building Worker Trips | 0.24 | 0.46 | 8.16 | 0.01 | 0.06 | 0.03 | 0.09 | 0.02 | 0.03 | 0.05 |
| Coating 10/21/2013-01/24/2014 | 16.69 | 0.03 | 0.46 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 16.68 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.01 | 0.03 | 0.46 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Time Slice 1/1/2014-1/24/2014 Active Days: 18 | 51.53 | 292.33 | 147.19 | **0.02** | **0.08** | 13.14 | 13.22 | **0.03** | 12.08 | 12.11 |
| Building 10/21/2013-01/24/2014 | 34.84 | 292.30 | 146.76 | 0.02 | 0.08 | 13.14 | 13.21 | 0.03 | 12.08 | 12.11 |
| Building Off Road Diesel | 34.43 | 289.90 | 137.36 | 0.00 | 0.00 | 13.02 | 13.02 | 0.00 | 11.98 | 11.98 |
| Building Vendor Trips | 0.19 | 1.98 | 1.79 | 0.01 | 0.02 | 0.08 | 0.10 | 0.01 | 0.07 | 0.08 |
| Building Worker Trips | 0.22 | 0.42 | 7.60 | 0.01 | 0.06 | 0.04 | 0.09 | 0.02 | 0.03 | 0.05 |
| Coating 10/21/2013-01/24/2014 | 16.69 | 0.02 | 0.43 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 16.68 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.01 | 0.02 | 0.43 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |

**5/27/2010 06:34:07 PM**

Phase Assumptions

Phase: Building Construction 10/21/2013 - 1/24/2014 - Building Construction
Off-Road Equipment:
5 Cranes (399 hp) operating at a 0.43 load factor for 6 hours per day
2 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day
44 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day
2 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day
7 Rough Terrain Forklifts (93 hp) operating at a 0.6 load factor for 8 hours per day
4 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day
2 Skid Steer Loaders (44 hp) operating at a 0.55 load factor for 8 hours per day
6 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 8 hours per day
4 Trenchers (63 hp) operating at a 0.75 load factor for 8 hours per day

Phase: Architectural Coating 10/21/2013 - 1/24/2014 - Architectural Coating
Rule: Residential Interior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 100
Rule: Residential Interior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 50
Rule: Residential Exterior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 250
Rule: Residential Exterior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 100
Rule: Nonresidential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250
Rule: Nonresidential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Construction Mitigated Detail Report:
CONSTRUCTION EMISSION ESTIMATES Summer Pounds Per Day, Mitigated

Construction Related Mitigation Measures

**5/27/2010 06:34:34 PM**

Urbemis 2007 Version 9.2.4

Combined Winter Emissions Reports (Pounds/Day)

File Name: Z:\Alan Sako\032.92A Landmark Village\Recirculated DEIR\URBEMIS2007 Update\Landmark Recirc Construction wk197-210.urb924

Project Name: Landmark Village - Construction

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| 2013 TOTALS (lbs/day unmitigated) | 53.65 | 323.81 | 151.89 | 0.02 | 0.08 | 14.90 | 14.98 | 0.03 | 13.70 | 13.73 |
| 2014 TOTALS (lbs/day unmitigated) | 51.53 | 292.33 | 147.19 | 0.02 | 0.08 | 13.14 | 13.22 | 0.03 | 12.08 | 12.11 |

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Winter Pounds Per Day, Unmitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 10/21/2013-12/31/2013 Active Days: 52 | **53.65** | **323.81** | **151.89** | **0.02** | **0.08** | **14.90** | **14.98** | **0.03** | **13.70** | **13.73** |
| Building 10/21/2013-01/24/2014 | 36.95 | 323.79 | 151.43 | 0.02 | 0.08 | 14.89 | 14.97 | 0.03 | 13.70 | 13.73 |
| Building Off Road Diesel | 36.50 | 321.07 | 141.33 | 0.00 | 0.00 | 14.77 | 14.77 | 0.00 | 13.59 | 13.59 |
| Building Vendor Trips | 0.21 | 2.26 | 1.94 | 0.01 | 0.02 | 0.09 | 0.11 | 0.01 | 0.08 | 0.09 |
| Building Worker Trips | 0.24 | 0.46 | 8.16 | 0.01 | 0.06 | 0.03 | 0.09 | 0.02 | 0.03 | 0.05 |
| Coating 10/21/2013-01/24/2014 | 16.69 | 0.03 | 0.46 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 16.68 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.01 | 0.03 | 0.46 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Time Slice 1/1/2014-1/24/2014 Active Days: 18 | 51.53 | 292.33 | 147.19 | **0.02** | **0.08** | 13.14 | 13.22 | **0.03** | 12.08 | 12.11 |
| Building 10/21/2013-01/24/2014 | 34.84 | 292.30 | 146.76 | 0.02 | 0.08 | 13.14 | 13.21 | 0.03 | 12.08 | 12.11 |
| Building Off Road Diesel | 34.43 | 289.90 | 137.36 | 0.00 | 0.00 | 13.02 | 13.02 | 0.00 | 11.98 | 11.98 |
| Building Vendor Trips | 0.19 | 1.98 | 1.79 | 0.01 | 0.02 | 0.08 | 0.10 | 0.01 | 0.07 | 0.08 |
| Building Worker Trips | 0.22 | 0.42 | 7.60 | 0.01 | 0.06 | 0.04 | 0.09 | 0.02 | 0.03 | 0.05 |
| Coating 10/21/2013-01/24/2014 | 16.69 | 0.02 | 0.43 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 16.68 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.01 | 0.02 | 0.43 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |

**5/27/2010 06:34:34 PM**

Phase Assumptions

Phase: Building Construction 10/21/2013 - 1/24/2014 - Building Construction

Off-Road Equipment:

5 Cranes (399 hp) operating at a 0.43 load factor for 6 hours per day

2 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day

44 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day

2 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day

7 Rough Terrain Forklifts (93 hp) operating at a 0.6 load factor for 8 hours per day

4 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day

2 Skid Steer Loaders (44 hp) operating at a 0.55 load factor for 8 hours per day

6 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 8 hours per day

4 Trenchers (63 hp) operating at a 0.75 load factor for 8 hours per day

Phase: Architectural Coating 10/21/2013 - 1/24/2014 - Architectural Coating

Rule: Residential Interior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 100

Rule: Residential Interior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 50

Rule: Residential Exterior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 250

Rule: Residential Exterior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 100

Rule: Nonresidential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Rule: Nonresidential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Construction Mitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Winter Pounds Per Day, Mitigated

Construction Related Mitigation Measures

**5/27/2010 06:38:58 PM**

Urbemis 2007 Version 9.2.4

Combined Summer Emissions Reports (Pounds/Day)

File Name: Z:\Alan Sako\032.92A Landmark Village\Recirculated DEIR\URBEMIS2007 Update\Landmark Recirc Construction wk211-220.urb924
Project Name: Landmark Village - Construction
Project Location: South Coast AQMD
On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006
Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| 2014 TOTALS (lbs/day unmitigated) | 35.75 | 209.78 | 101.08 | 0.01 | 0.03 | 9.25 | 9.28 | 0.01 | 8.51 | 8.52 |

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 1/27/2014-4/4/2014 Active Days: 50 | **35.75** | **209.78** | **101.08** | **0.01** | **0.03** | **9.25** | **9.28** | **0.01** | **8.51** | **8.52** |
| Building 01/27/2014-04/04/2014 | 24.92 | 209.77 | 100.88 | 0.01 | 0.03 | 9.25 | 9.28 | 0.01 | 8.51 | 8.52 |
| Building Off Road Diesel | 24.79 | 209.01 | 97.71 | 0.00 | 0.00 | 9.21 | 9.21 | 0.00 | 8.48 | 8.48 |
| Building Vendor Trips | 0.06 | 0.62 | 0.56 | 0.00 | 0.01 | 0.02 | 0.03 | 0.00 | 0.02 | 0.02 |
| Building Worker Trips | 0.08 | 0.14 | 2.61 | 0.00 | 0.02 | 0.01 | 0.03 | 0.01 | 0.01 | 0.02 |
| Coating 01/27/2014-04/04/2014 | 10.82 | 0.01 | 0.21 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 10.82 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.01 | 0.01 | 0.21 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

Phase Assumptions

Phase: Building Construction 1/27/2014 - 4/4/2014 - Building Construction

Off-Road Equipment:

3 Cranes (399 hp) operating at a 0.43 load factor for 6 hours per day
2 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day
32 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day
2 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day
5 Rough Terrain Forklifts (93 hp) operating at a 0.6 load factor for 8 hours per day
3 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day
2 Skid Steer Loaders (44 hp) operating at a 0.55 load factor for 8 hours per day
3 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 8 hours per day
2 Trenchers (63 hp) operating at a 0.75 load factor for 8 hours per day

**5/27/2010 06:38:58 PM**

Phase: Architectural Coating 1/27/2014 - 4/4/2014 - Architectural Coating
Rule: Residential Interior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 100
Rule: Residential Interior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 50
Rule: Residential Exterior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 250
Rule: Residential Exterior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 100
Rule: Nonresidential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250
Rule: Nonresidential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Construction Mitigated Detail Report:
CONSTRUCTION EMISSION ESTIMATES Summer Pounds Per Day, Mitigated

Construction Related Mitigation Measures

**5/27/2010 06:39:16 PM**

Urbemis 2007 Version 9.2.4

Combined Winter Emissions Reports (Pounds/Day)

File Name: Z:\Alan Sako\032.92A Landmark Village\Recirculated DEIR\URBEMIS2007 Update\Landmark Recirc Construction wk211-220.urb924

Project Name: Landmark Village - Construction

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| 2014 TOTALS (lbs/day unmitigated) | 35.75 | 209.78 | 101.08 | 0.01 | 0.03 | 9.25 | 9.28 | 0.01 | 8.51 | 8.52 |

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Winter Pounds Per Day, Unmitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 1/27/2014-4/4/2014 Active Days: 50 | **35.75** | **209.78** | **101.08** | **0.01** | **0.03** | **9.25** | **9.28** | **0.01** | **8.51** | **8.52** |
| Building 01/27/2014-04/04/2014 | 24.92 | 209.77 | 100.88 | 0.01 | 0.03 | 9.25 | 9.28 | 0.01 | 8.51 | 8.52 |
| Building Off Road Diesel | 24.79 | 209.01 | 97.71 | 0.00 | 0.00 | 9.21 | 9.21 | 0.00 | 8.48 | 8.48 |
| Building Vendor Trips | 0.06 | 0.62 | 0.56 | 0.00 | 0.01 | 0.02 | 0.03 | 0.00 | 0.02 | 0.02 |
| Building Worker Trips | 0.08 | 0.14 | 2.61 | 0.00 | 0.02 | 0.01 | 0.03 | 0.01 | 0.01 | 0.02 |
| Coating 01/27/2014-04/04/2014 | 10.82 | 0.01 | 0.21 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 10.82 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.01 | 0.01 | 0.21 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**5/27/2010 06:39:16 PM**

Phase Assumptions

Phase: Building Construction 1/27/2014 - 4/4/2014 - Building Construction

Off-Road Equipment:

3 Cranes (399 hp) operating at a 0.43 load factor for 6 hours per day

2 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day

32 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day

2 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day

5 Rough Terrain Forklifts (93 hp) operating at a 0.6 load factor for 8 hours per day

3 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day

2 Skid Steer Loaders (44 hp) operating at a 0.55 load factor for 8 hours per day

3 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 8 hours per day

2 Trenchers (63 hp) operating at a 0.75 load factor for 8 hours per day

Phase: Architectural Coating 1/27/2014 - 4/4/2014 - Architectural Coating

Rule: Residential Interior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 100

Rule: Residential Interior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 50

Rule: Residential Exterior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 250

Rule: Residential Exterior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 100

Rule: Nonresidential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Rule: Nonresidential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Construction Mitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Winter Pounds Per Day, Mitigated

Construction Related Mitigation Measures

**5/27/2010 06:42:57 PM**

Urbemis 2007 Version 9.2.4

Combined Summer Emissions Reports (Pounds/Day)

File Name: Z:\Alan Sako\032.92A Landmark Village\Recirculated DEIR\URBEMIS2007 Update\Landmark Recirc Construction wk221-235.urb924
Project Name: Landmark Village - Construction
Project Location: South Coast AQMD
On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006
Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| 2014 TOTALS (lbs/day unmitigated) | 22.02 | 128.35 | 59.47 | 0.00 | 0.01 | 5.42 | 5.43 | 0.00 | 4.98 | 4.99 |

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 4/7/2014-7/18/2014 Active Days: 75 | **22.02** | **128.35** | **59.47** | **0.00** | **0.01** | **5.42** | **5.43** | **0.00** | **4.98** | **4.99** |
| Building 04/07/2014-07/18/2014 | 15.20 | 128.35 | 59.41 | 0.00 | 0.01 | 5.42 | 5.43 | 0.00 | 4.98 | 4.99 |
| Building Off Road Diesel | 15.15 | 128.12 | 58.05 | 0.00 | 0.00 | 5.41 | 5.41 | 0.00 | 4.97 | 4.97 |
| Building Vendor Trips | 0.02 | 0.16 | 0.15 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 |
| Building Worker Trips | 0.03 | 0.07 | 1.20 | 0.00 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.01 |
| Coating 04/07/2014-07/18/2014 | 6.82 | 0.00 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 6.82 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.00 | 0.00 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

Phase Assumptions

Phase: Building Construction 4/7/2014 - 7/18/2014 - Building Construction

Off-Road Equipment:

1 Cranes (399 hp) operating at a 0.43 load factor for 6 hours per day
2 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day
20 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day
2 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day
3 Rough Terrain Forklifts (93 hp) operating at a 0.6 load factor for 8 hours per day
2 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day
2 Skid Steer Loaders (44 hp) operating at a 0.55 load factor for 8 hours per day

**5/27/2010 06:42:57 PM**

Phase: Architectural Coating 4/7/2014 - 7/18/2014 - Architectural Coating
Rule: Residential Interior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 100
Rule: Residential Interior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 50
Rule: Residential Exterior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 250
Rule: Residential Exterior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 100
Rule: Nonresidential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250
Rule: Nonresidential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Construction Mitigated Detail Report:
CONSTRUCTION EMISSION ESTIMATES Summer Pounds Per Day, Mitigated

Construction Related Mitigation Measures

**5/27/2010 06:43:18 PM**

Urbemis 2007 Version 9.2.4

Combined Winter Emissions Reports (Pounds/Day)

File Name: Z:\Alan Sako\032.92A Landmark Village\Recirculated DEIR\URBEMIS2007 Update\Landmark Recirc Construction wk221-235.urb924

Project Name: Landmark Village - Construction

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| 2014 TOTALS (lbs/day unmitigated) | 22.02 | 128.35 | 59.47 | 0.00 | 0.01 | 5.42 | 5.43 | 0.00 | 4.98 | 4.99 |

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Winter Pounds Per Day, Unmitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 4/7/2014-7/18/2014 Active Days: 75 | **22.02** | **128.35** | **59.47** | **0.00** | **0.01** | **5.42** | **5.43** | **0.00** | **4.98** | **4.99** |
| Building 04/07/2014-07/18/2014 | 15.20 | 128.35 | 59.41 | 0.00 | 0.01 | 5.42 | 5.43 | 0.00 | 4.98 | 4.99 |
| Building Off Road Diesel | 15.15 | 128.12 | 58.05 | 0.00 | 0.00 | 5.41 | 5.41 | 0.00 | 4.97 | 4.97 |
| Building Vendor Trips | 0.02 | 0.16 | 0.15 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 |
| Building Worker Trips | 0.03 | 0.07 | 1.20 | 0.00 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.01 |
| Coating 04/07/2014-07/18/2014 | 6.82 | 0.00 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 6.82 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.00 | 0.00 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**5/27/2010 06:43:18 PM**

Phase Assumptions

Phase: Building Construction 4/7/2014 - 7/18/2014 - Building Construction

Off-Road Equipment:

1 Cranes (399 hp) operating at a 0.43 load factor for 6 hours per day

2 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day

20 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day

2 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day

3 Rough Terrain Forklifts (93 hp) operating at a 0.6 load factor for 8 hours per day

2 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day

2 Skid Steer Loaders (44 hp) operating at a 0.55 load factor for 8 hours per day

Phase: Architectural Coating 4/7/2014 - 7/18/2014 - Architectural Coating

Rule: Residential Interior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 100

Rule: Residential Interior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 50

Rule: Residential Exterior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 250

Rule: Residential Exterior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 100

Rule: Nonresidential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Rule: Nonresidential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Construction Mitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Winter Pounds Per Day, Mitigated

Construction Related Mitigation Measures

Urbemis 2007 Version 9.2.4

Combined Summer Emissions Reports (Pounds/Day)

File Name: Z:\Alan Sako\032.92A Landmark Village\Recirculated DEIR\URBEMIS2007 Update\Landmark Recirc Construction 2015.urb924
Project Name: Landmark Village - Construction
Project Location: South Coast AQMD
On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006
Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| 2015 TOTALS (lbs/day unmitigated) | 50.59 | 220.62 | 143.93 | 0.08 | 0.33 | 9.02 | 9.35 | 0.12 | 8.29 | 8.40 |
| 2016 TOTALS (lbs/day unmitigated) | 48.87 | 195.79 | 139.56 | 0.08 | 0.33 | 8.33 | 8.66 | 0.12 | 7.65 | 7.77 |
| 2017 TOTALS (lbs/day unmitigated) | 47.22 | 174.59 | 135.80 | 0.08 | 0.33 | 7.28 | 7.61 | 0.12 | 6.68 | 6.80 |

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 1/5/2015-12/31/2015 Active Days: 259 | **50.59** | **220.62** | **143.93** | 0.08 | 0.33 | **9.02** | **9.35** | 0.12 | **8.29** | **8.40** |
| Building 01/05/2015-09/08/2017 | 28.30 | 220.61 | 143.74 | 0.08 | 0.33 | 9.02 | 9.35 | 0.12 | 8.29 | 8.40 |
| Building Off Road Diesel | 26.90 | 214.46 | 105.32 | 0.00 | 0.00 | 8.68 | 8.68 | 0.00 | 7.98 | 7.98 |
| Building Vendor Trips | 0.43 | 4.29 | 4.33 | 0.01 | 0.05 | 0.17 | 0.23 | 0.02 | 0.16 | 0.18 |
| Building Worker Trips | 0.97 | 1.86 | 34.09 | 0.06 | 0.27 | 0.17 | 0.45 | 0.10 | 0.15 | 0.24 |
| Coating 01/05/2015-09/08/2017 | 22.28 | 0.01 | 0.19 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 22.28 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.01 | 0.01 | 0.19 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Time Slice 1/1/2016-12/30/2016 Active Days: 261 | 48.87 | 195.79 | 139.56 | 0.08 | 0.33 | 8.33 | 8.66 | 0.12 | 7.65 | 7.77 |
| Building 01/05/2015-09/08/2017 | 26.58 | 195.78 | 139.38 | 0.08 | 0.33 | 8.33 | 8.66 | 0.12 | 7.65 | 7.76 |
| Building Off Road Diesel | 25.30 | 190.28 | 103.51 | 0.00 | 0.00 | 8.00 | 8.00 | 0.00 | 7.36 | 7.36 |
| Building Vendor Trips | 0.39 | 3.79 | 4.03 | 0.01 | 0.05 | 0.15 | 0.21 | 0.02 | 0.14 | 0.16 |
| Building Worker Trips | 0.89 | 1.72 | 31.84 | 0.06 | 0.27 | 0.17 | 0.45 | 0.10 | 0.15 | 0.24 |
| Coating 01/05/2015-09/08/2017 | 22.28 | 0.01 | 0.18 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 22.28 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.00 | 0.01 | 0.18 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Time Slice 1/2/2017-9/8/2017 Active Days: 180 | 47.22 | 174.59 | 135.80 | 0.08 | 0.33 | 7.28 | 7.61 | 0.12 | 6.68 | 6.80 |
| Building 01/05/2015-09/08/2017 | 24.93 | 174.59 | 135.63 | 0.08 | 0.33 | 7.28 | 7.61 | 0.12 | 6.68 | 6.80 |
| Building Off Road Diesel | 23.76 | 169.63 | 102.19 | 0.00 | 0.00 | 6.97 | 6.97 | 0.00 | 6.41 | 6.41 |
| Building Vendor Trips | 0.36 | 3.37 | 3.75 | 0.01 | 0.05 | 0.14 | 0.19 | 0.02 | 0.13 | 0.14 |
| Building Worker Trips | 0.82 | 1.59 | 29.69 | 0.06 | 0.27 | 0.17 | 0.45 | 0.10 | 0.15 | 0.24 |
| Coating 01/05/2015-09/08/2017 | 22.28 | 0.01 | 0.17 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 22.28 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.00 | 0.01 | 0.17 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

Phase Assumptions

Phase: Building Construction 1/5/2015 - 9/8/2017 - Building Construction
Off-Road Equipment:
3 Cranes (399 hp) operating at a 0.43 load factor for 6 hours per day
6 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day
33 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day
3 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day
6 Rough Terrain Forklifts (93 hp) operating at a 0.6 load factor for 8 hours per day
2 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day
5 Skid Steer Loaders (44 hp) operating at a 0.55 load factor for 8 hours per day

Phase: Architectural Coating 1/5/2015 - 9/8/2017 - Architectural Coating
Rule: Residential Interior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 100
Rule: Residential Interior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 50
Rule: Residential Exterior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 250
Rule: Residential Exterior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 100
Rule: Nonresidential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250
Rule: Nonresidential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Construction Mitigated Detail Report:
CONSTRUCTION EMISSION ESTIMATES Summer Pounds Per Day, Mitigated

Construction Related Mitigation Measures

**5/27/2010 06:55:29 PM**

Urbemis 2007 Version 9.2.4

Combined Winter Emissions Reports (Pounds/Day)

File Name: Z:\Alan Sako\032.92A Landmark Village\Recirculated DEIR\URBEMIS2007 Update\Landmark Recirc Construction 2015.urb924

Project Name: Landmark Village - Construction

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| 2015 TOTALS (lbs/day unmitigated) | 50.59 | 220.62 | 143.93 | 0.08 | 0.33 | 9.02 | 9.35 | 0.12 | 8.29 | 8.40 |
| 2016 TOTALS (lbs/day unmitigated) | 48.87 | 195.79 | 139.56 | 0.08 | 0.33 | 8.33 | 8.66 | 0.12 | 7.65 | 7.77 |
| 2017 TOTALS (lbs/day unmitigated) | 47.22 | 174.59 | 135.80 | 0.08 | 0.33 | 7.28 | 7.61 | 0.12 | 6.68 | 6.80 |

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Winter Pounds Per Day, Unmitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 1/5/2015-12/31/2015 Active Days: 259 | **50.59** | **220.62** | **143.93** | 0.08 | 0.33 | **9.02** | **9.35** | 0.12 | **8.29** | **8.40** |
| Building 01/05/2015-09/08/2017 | 28.30 | 220.61 | 143.74 | 0.08 | 0.33 | 9.02 | 9.35 | 0.12 | 8.29 | 8.40 |
| Building Off Road Diesel | 26.90 | 214.46 | 105.32 | 0.00 | 0.00 | 8.68 | 8.68 | 0.00 | 7.98 | 7.98 |
| Building Vendor Trips | 0.43 | 4.29 | 4.33 | 0.01 | 0.05 | 0.17 | 0.23 | 0.02 | 0.16 | 0.18 |
| Building Worker Trips | 0.97 | 1.86 | 34.09 | 0.06 | 0.27 | 0.17 | 0.45 | 0.10 | 0.15 | 0.24 |
| Coating 01/05/2015-09/08/2017 | 22.28 | 0.01 | 0.19 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 22.28 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.01 | 0.01 | 0.19 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**5/27/2010 06:55:29 PM**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 1/1/2016-12/30/2016 Active Days: 261 | 48.87 | 195.79 | 139.56 | 0.08 | 0.33 | 8.33 | 8.66 | 0.12 | 7.65 | 7.77 |
| Building 01/05/2015-09/08/2017 | 26.58 | 195.78 | 139.38 | 0.08 | 0.33 | 8.33 | 8.66 | 0.12 | 7.65 | 7.76 |
| Building Off Road Diesel | 25.30 | 190.28 | 103.51 | 0.00 | 0.00 | 8.00 | 8.00 | 0.00 | 7.36 | 7.36 |
| Building Vendor Trips | 0.39 | 3.79 | 4.03 | 0.01 | 0.05 | 0.15 | 0.21 | 0.02 | 0.14 | 0.16 |
| Building Worker Trips | 0.89 | 1.72 | 31.84 | 0.06 | 0.27 | 0.17 | 0.45 | 0.10 | 0.15 | 0.24 |
| Coating 01/05/2015-09/08/2017 | 22.28 | 0.01 | 0.18 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 22.28 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.00 | 0.01 | 0.18 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Time Slice 1/2/2017-9/8/2017 Active Days: 180 | 47.22 | 174.59 | 135.80 | 0.08 | 0.33 | 7.28 | 7.61 | 0.12 | 6.68 | 6.80 |
| Building 01/05/2015-09/08/2017 | 24.93 | 174.59 | 135.63 | 0.08 | 0.33 | 7.28 | 7.61 | 0.12 | 6.68 | 6.80 |
| Building Off Road Diesel | 23.76 | 169.63 | 102.19 | 0.00 | 0.00 | 6.97 | 6.97 | 0.00 | 6.41 | 6.41 |
| Building Vendor Trips | 0.36 | 3.37 | 3.75 | 0.01 | 0.05 | 0.14 | 0.19 | 0.02 | 0.13 | 0.14 |
| Building Worker Trips | 0.82 | 1.59 | 29.69 | 0.06 | 0.27 | 0.17 | 0.45 | 0.10 | 0.15 | 0.24 |
| Coating 01/05/2015-09/08/2017 | 22.28 | 0.01 | 0.17 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 22.28 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.00 | 0.01 | 0.17 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

Phase Assumptions

Phase: Building Construction 1/5/2015 - 9/8/2017 - Building Construction

Off-Road Equipment:

3 Cranes (399 hp) operating at a 0.43 load factor for 6 hours per day

6 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day

33 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day

3 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day

6 Rough Terrain Forklifts (93 hp) operating at a 0.6 load factor for 8 hours per day

2 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day

5 Skid Steer Loaders (44 hp) operating at a 0.55 load factor for 8 hours per day

**5/27/2010 06:55:29 PM**

Phase: Architectural Coating 1/5/2015 - 9/8/2017 - Architectural Coating

Rule: Residential Interior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 100

Rule: Residential Interior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 50

Rule: Residential Exterior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 250

Rule: Residential Exterior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 100

Rule: Nonresidential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Rule: Nonresidential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Construction Mitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Winter Pounds Per Day, Mitigated

Construction Related Mitigation Measures

**URBEMIS2007 Calculations, Construction with Mitigation**

**9/17/2010 12:07:49 PM**

Urbemis 2007 Version 9.2.4

Combined Summer Emissions Reports (Pounds/Day)

File Name: Z:\Air Quality\032.225 Landmark Village Recirculated\URBEMIS2007 Construction - Mitigated\Landmark Recirc Construction wk001-019.urb924

Project Name: Landmark Village - Construction

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| 2010 TOTALS (lbs/day unmitigated) | 117.27 | 1,068.47 | 475.33 | 0.13 | 13,276.02 | 46.32 | 13,322.34 | 2,772.62 | 42.61 | 2,815.23 |
| 2010 TOTALS (lbs/day mitigated) | 117.27 | 920.16 | 475.33 | 0.13 | 1,877.30 | 14.04 | 1,891.35 | 392.12 | 12.91 | 405.03 |

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 1/4/2010-5/14/2010 Active Days: 95 | **117.27** | **1,068.47** | **475.33** | **0.13** | **13,276.02** | **46.32** | **13,322.34** | **2,772.62** | **42.61** | **2,815.23** |
| Mass Grading 01/04/2010-05/14/2010 | 117.27 | 1,068.47 | 475.33 | 0.13 | 13,276.02 | 46.32 | 13,322.34 | 2,772.62 | 42.61 | 2,815.23 |
| Mass Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 13,275.54 | 0.00 | 13,275.54 | 2,772.46 | 0.00 | 2,772.46 |
| Mass Grading Off Road Diesel | 110.58 | 988.69 | 424.21 | 0.00 | 0.00 | 43.04 | 43.04 | 0.00 | 39.59 | 39.59 |
| Mass Grading On Road Diesel | 6.03 | 78.54 | 30.16 | 0.10 | 0.36 | 3.22 | 3.57 | 0.12 | 2.96 | 3.08 |
| Mass Grading Worker Trips | 0.66 | 1.24 | 20.96 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |

Phase Assumptions

Phase: Mass Grading 1/4/2010 - 5/14/2010 - Grading

Total Acres Disturbed: 0

Maximum Daily Acreage Disturbed: 2.51

Fugitive Dust Level of Detail: Low

Onsite Cut/Fill: 18260.9 cubic yards/day; Offsite Cut/Fill: 25217.4 cubic yards/day

On Road Truck Travel (VMT): 2521.74

Off-Road Equipment:

10 Crawler Tractors (147 hp) operating at a 0.64 load factor for 8 hours per day

1 Crushing/Processing Equip (142 hp) operating at a 0.78 load factor for 8 hours per day

4 Graders (174 hp) operating at a 0.61 load factor for 6 hours per day

15 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day

4 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day

9 Rollers (95 hp) operating at a 0.56 load factor for 8 hours per day

1 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day

36 Scrapers (313 hp) operating at a 0.72 load factor for 8 hours per day

**9/17/2010 12:07:49 PM**

Construction Mitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Summer Pounds Per Day, Mitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 1/4/2010-5/14/2010 Active Days: 95 | **117.27** | 920.16 | **475.33** | **0.13** | 1,877.30 | 14.04 | 1,891.35 | 392.12 | 12.91 | 405.03 |
| Mass Grading 01/04/2010-05/14/2010 | 117.27 | 920.16 | 475.33 | 0.13 | 1,877.30 | 14.04 | 1,891.35 | 392.12 | 12.91 | 405.03 |
| Mass Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 1,876.83 | 0.00 | 1,876.83 | 391.96 | 0.00 | 391.96 |
| Mass Grading Off Road Diesel | 110.58 | 840.39 | 424.21 | 0.00 | 0.00 | 10.76 | 10.76 | 0.00 | 9.90 | 9.90 |
| Mass Grading On Road Diesel | 6.03 | 78.54 | 30.16 | 0.10 | 0.36 | 3.22 | 3.57 | 0.12 | 2.96 | 3.08 |
| Mass Grading Worker Trips | 0.66 | 1.24 | 20.96 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |

Construction Related Mitigation Measures

The following mitigation measures apply to Phase: Mass Grading 1/4/2010 - 5/14/2010 - Grading

For Soil Stablizing Measures, the Water exposed surfaces 3x daily watering mitigation reduces emissions by:

PM10: 61% PM25: 61%

For Soil Stablizing Measures, the Equipment loading/unloading mitigation reduces emissions by:

PM10: 69% PM25: 69%

For Unpaved Roads Measures, the Reduce speed on unpaved roads to less than 15 mph mitigation reduces emissions by:

PM10: 44% PM25: 44%

For Unpaved Roads Measures, the Manage haul road dust 3x daily watering mitigation reduces emissions by:

PM10: 61% PM25: 61%

For Graders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Graders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Crawler Tractors, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Crawler Tractors, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Crushing/Processing Equip, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Crushing/Processing Equip, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Off Highway Trucks, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Off Highway Trucks, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Other Equipment, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

**9/17/2010 12:07:49 PM**

For Other Equipment, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Rollers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Rollers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Scrapers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Scrapers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

**9/17/2010 12:08:29 PM**

Urbemis 2007 Version 9.2.4

Combined Winter Emissions Reports (Pounds/Day)

File Name: Z:\Air Quality\032.225 Landmark Village Recirculated\URBEMIS2007 Construction - Mitigated\Landmark Recirc Construction wk001-019.urb924

Project Name: Landmark Village - Construction

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| 2010 TOTALS (lbs/day unmitigated) | 117.27 | 1,068.47 | 475.33 | 0.13 | 13,276.02 | 46.32 | 13,322.34 | 2,772.62 | 42.61 | 2,815.23 |
| 2010 TOTALS (lbs/day mitigated) | 117.27 | 920.16 | 475.33 | 0.13 | 1,877.30 | 14.04 | 1,891.35 | 392.12 | 12.91 | 405.03 |

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Winter Pounds Per Day, Unmitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 1/4/2010-5/14/2010 Active Days: 95 | **117.27** | **1,068.47** | **475.33** | **0.13** | **13,276.02** | **46.32** | **13,322.34** | **2,772.62** | **42.61** | **2,815.23** |
| Mass Grading 01/04/2010-05/14/2010 | 117.27 | 1,068.47 | 475.33 | 0.13 | 13,276.02 | 46.32 | 13,322.34 | 2,772.62 | 42.61 | 2,815.23 |
| Mass Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 13,275.54 | 0.00 | 13,275.54 | 2,772.46 | 0.00 | 2,772.46 |
| Mass Grading Off Road Diesel | 110.58 | 988.69 | 424.21 | 0.00 | 0.00 | 43.04 | 43.04 | 0.00 | 39.59 | 39.59 |
| Mass Grading On Road Diesel | 6.03 | 78.54 | 30.16 | 0.10 | 0.36 | 3.22 | 3.57 | 0.12 | 2.96 | 3.08 |
| Mass Grading Worker Trips | 0.66 | 1.24 | 20.96 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |

**9/17/2010 12:08:29 PM**

Phase Assumptions

Phase: Mass Grading 1/4/2010 - 5/14/2010 - Grading

Total Acres Disturbed: 0

Maximum Daily Acreage Disturbed: 2.51

Fugitive Dust Level of Detail: Low

Onsite Cut/Fill: 18260.9 cubic yards/day; Offsite Cut/Fill: 25217.4 cubic yards/day

On Road Truck Travel (VMT): 2521.74

Off-Road Equipment:

10 Crawler Tractors (147 hp) operating at a 0.64 load factor for 8 hours per day

1 Crushing/Processing Equip (142 hp) operating at a 0.78 load factor for 8 hours per day

4 Graders (174 hp) operating at a 0.61 load factor for 6 hours per day

15 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day

4 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day

9 Rollers (95 hp) operating at a 0.56 load factor for 8 hours per day

1 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day

36 Scrapers (313 hp) operating at a 0.72 load factor for 8 hours per day

Construction Mitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Winter Pounds Per Day, Mitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 1/4/2010-5/14/2010 Active Days: 95 | **117.27** | 920.16 | **475.33** | **0.13** | 1,877.30 | 14.04 | 1,891.35 | 392.12 | 12.91 | 405.03 |
| Mass Grading 01/04/2010-05/14/2010 | 117.27 | 920.16 | 475.33 | 0.13 | 1,877.30 | 14.04 | 1,891.35 | 392.12 | 12.91 | 405.03 |
| Mass Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 1,876.83 | 0.00 | 1,876.83 | 391.96 | 0.00 | 391.96 |
| Mass Grading Off Road Diesel | 110.58 | 840.39 | 424.21 | 0.00 | 0.00 | 10.76 | 10.76 | 0.00 | 9.90 | 9.90 |
| Mass Grading On Road Diesel | 6.03 | 78.54 | 30.16 | 0.10 | 0.36 | 3.22 | 3.57 | 0.12 | 2.96 | 3.08 |
| Mass Grading Worker Trips | 0.66 | 1.24 | 20.96 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |

**9/17/2010 12:08:29 PM**

Construction Related Mitigation Measures

The following mitigation measures apply to Phase: Mass Grading 1/4/2010 - 5/14/2010 - Grading

For Soil Stablizing Measures, the Water exposed surfaces 3x daily watering mitigation reduces emissions by:

PM10: 61% PM25: 61%

For Soil Stablizing Measures, the Equipment loading/unloading mitigation reduces emissions by:

PM10: 69% PM25: 69%

For Unpaved Roads Measures, the Reduce speed on unpaved roads to less than 15 mph mitigation reduces emissions by:

PM10: 44% PM25: 44%

For Unpaved Roads Measures, the Manage haul road dust 3x daily watering mitigation reduces emissions by:

PM10: 61% PM25: 61%

For Graders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Graders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Crawler Tractors, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Crawler Tractors, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Crushing/Processing Equip, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Crushing/Processing Equip, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Off Highway Trucks, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Off Highway Trucks, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Other Equipment, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Other Equipment, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Rollers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Rollers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Scrapers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Scrapers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

**9/17/2010 12:10:25 PM**

Urbemis 2007 Version 9.2.4

Combined Summer Emissions Reports (Pounds/Day)

File Name: Z:\Air Quality\032.225 Landmark Village Recirculated\URBEMIS2007 Construction - Mitigated\Landmark Recirc Construction wk020-039.urb924

Project Name: Landmark Village - Construction

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| 2010 TOTALS (lbs/day unmitigated) | 191.69 | 1,700.58 | 764.59 | 0.17 | 13,275.49 | 76.14 | 13,351.63 | 2,772.54 | 70.04 | 2,842.57 |
| 2010 TOTALS (lbs/day mitigated) | 191.69 | 1,459.38 | 764.59 | 0.17 | 2,355.75 | 21.90 | 2,377.65 | 492.06 | 20.14 | 512.20 |

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 5/17/2010-10/1/2010 Active Days: 100 | **191.69** | **1,700.58** | **764.59** | **0.17** | **13,275.49** | **76.14** | **13,351.63** | **2,772.54** | **70.04** | **2,842.57** |
| Asphalt 05/17/2010-10/01/2010 | 73.87 | 624.88 | 286.48 | 0.03 | 0.14 | 29.52 | 29.66 | 0.05 | 27.15 | 27.20 |
| Paving Off-Gas | 1.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Off Road Diesel | 71.85 | 619.31 | 263.09 | 0.00 | 0.00 | 29.27 | 29.27 | 0.00 | 26.93 | 26.93 |
| Paving On Road Diesel | 0.33 | 4.29 | 1.65 | 0.01 | 0.02 | 0.18 | 0.20 | 0.01 | 0.16 | 0.17 |
| Paving Worker Trips | 0.68 | 1.28 | 21.75 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |
| Fine Grading 05/17/2010-10/01/2010 | 0.55 | 7.23 | 2.78 | 0.01 | 0.03 | 0.30 | 0.33 | 0.01 | 0.27 | 0.28 |
| Fine Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Off Road Diesel | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading On Road Diesel | 0.55 | 7.23 | 2.78 | 0.01 | 0.03 | 0.30 | 0.33 | 0.01 | 0.27 | 0.28 |
| Fine Grading Worker Trips | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mass Grading 05/17/2010-10/01/2010 | 117.27 | 1,068.47 | 475.33 | 0.13 | 13,275.32 | 46.32 | 13,321.64 | 2,772.48 | 42.61 | 2,815.09 |
| Mass Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 13,274.84 | 0.00 | 13,274.84 | 2,772.32 | 0.00 | 2,772.32 |
| Mass Grading Off Road Diesel | 110.58 | 988.69 | 424.21 | 0.00 | 0.00 | 43.04 | 43.04 | 0.00 | 39.59 | 39.59 |
| Mass Grading On Road Diesel | 6.03 | 78.54 | 30.16 | 0.10 | 0.36 | 3.22 | 3.57 | 0.12 | 2.96 | 3.08 |
| Mass Grading Worker Trips | 0.66 | 1.24 | 20.96 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |

**9/17/2010 12:10:25 PM**

Phase Assumptions

Phase: Fine Grading 5/17/2010 - 10/1/2010 - Surrogate for Paving On-Road Trucks
Total Acres Disturbed: 0
Maximum Daily Acreage Disturbed: 0
Fugitive Dust Level of Detail: Default
  0 lbs per acre-day
On Road Truck Travel (VMT): 232.14
Off-Road Equipment:

Phase: Mass Grading 5/17/2010 - 10/1/2010 - Grading
Total Acres Disturbed: 0
Maximum Daily Acreage Disturbed: 2.44
Fugitive Dust Level of Detail: Low
  Onsite Cut/Fill:  18260.9 cubic yards/day;  Offsite Cut/Fill: 25217.4 cubic yards/day
On Road Truck Travel (VMT): 2521.74
Off-Road Equipment:
10 Crawler Tractors (147 hp) operating at a 0.64 load factor for 8 hours per day
1 Crushing/Processing Equip (142 hp) operating at a 0.78 load factor for 8 hours per day
4 Graders (174 hp) operating at a 0.61 load factor for 6 hours per day
15 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day
4 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day
9 Rollers (95 hp) operating at a 0.56 load factor for 8 hours per day
1 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day
36 Scrapers (313 hp) operating at a 0.72 load factor for 8 hours per day

Phase: Paving 5/17/2010 - 10/1/2010 - Asphalt Paving
Acres to be Paved: 38.37
Off-Road Equipment:
8 Excavators (168 hp) operating at a 0.57 load factor for 8 hours per day
4 Graders (174 hp) operating at a 0.61 load factor for 8 hours per day
3 Off Highway Tractors (267 hp) operating at a 0.65 load factor for 8 hours per day
14 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day
18 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day
2 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day
8 Rollers (95 hp) operating at a 0.56 load factor for 6 hours per day
6 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day
6 Scrapers (313 hp) operating at a 0.72 load factor for 8 hours per day
4 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 0 hours per day
10 Trenchers (63 hp) operating at a 0.75 load factor for 8 hours per day

**9/17/2010 12:10:25 PM**

Construction Mitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Summer Pounds Per Day, Mitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 5/17/2010-10/1/2010 Active Days: 100 | **191.69** | 1,459.38 | **764.59** | **0.17** | 2,355.75 | 21.90 | 2,377.65 | 492.06 | 20.14 | 512.20 |
| Asphalt 05/17/2010-10/01/2010 | 73.87 | 531.98 | 286.48 | 0.03 | 0.14 | 7.56 | 7.71 | 0.05 | 6.95 | 7.00 |
| Paving Off-Gas | 1.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Off Road Diesel | 71.85 | 526.41 | 263.09 | 0.00 | 0.00 | 7.32 | 7.32 | 0.00 | 6.73 | 6.73 |
| Paving On Road Diesel | 0.33 | 4.29 | 1.65 | 0.01 | 0.02 | 0.18 | 0.20 | 0.01 | 0.16 | 0.17 |
| Paving Worker Trips | 0.68 | 1.28 | 21.75 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |
| Fine Grading 05/17/2010-10/01/2010 | 0.55 | 7.23 | 2.78 | 0.01 | 0.03 | 0.30 | 0.33 | 0.01 | 0.27 | 0.28 |
| Fine Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Off Road Diesel | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading On Road Diesel | 0.55 | 7.23 | 2.78 | 0.01 | 0.03 | 0.30 | 0.33 | 0.01 | 0.27 | 0.28 |
| Fine Grading Worker Trips | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mass Grading 05/17/2010-10/01/2010 | 117.27 | 920.16 | 475.33 | 0.13 | 2,355.58 | 14.04 | 2,369.62 | 492.00 | 12.91 | 504.91 |
| Mass Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 2,355.10 | 0.00 | 2,355.10 | 491.84 | 0.00 | 491.84 |
| Mass Grading Off Road Diesel | 110.58 | 840.39 | 424.21 | 0.00 | 0.00 | 10.76 | 10.76 | 0.00 | 9.90 | 9.90 |
| Mass Grading On Road Diesel | 6.03 | 78.54 | 30.16 | 0.10 | 0.36 | 3.22 | 3.57 | 0.12 | 2.96 | 3.08 |
| Mass Grading Worker Trips | 0.66 | 1.24 | 20.96 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |

Construction Related Mitigation Measures

The following mitigation measures apply to Phase: Mass Grading 5/17/2010 - 10/1/2010 - Grading

For Soil Stablizing Measures, the Water exposed surfaces 3x daily watering mitigation reduces emissions by:

PM10: 61% PM25: 61%

For Soil Stablizing Measures, the Equipment loading/unloading mitigation reduces emissions by:

PM10: 69% PM25: 69%

For Unpaved Roads Measures, the Manage haul road dust 3x daily watering mitigation reduces emissions by:

PM10: 61% PM25: 61%

For Graders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Graders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Crawler Tractors, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Crawler Tractors, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Crushing/Processing Equip, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

**9/17/2010 12:10:25 PM**

For Crushing/Processing Equip, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%
For Off Highway Trucks, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%
For Off Highway Trucks, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%
For Other Equipment, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%
For Other Equipment, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%
For Rollers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%
For Rollers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%
For Rubber Tired Loaders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%
For Rubber Tired Loaders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%
For Scrapers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%
For Scrapers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%
The following mitigation measures apply to Phase: Paving 5/17/2010 - 10/1/2010 - Asphalt Paving
For Excavators, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%
For Excavators, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%
For Graders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%
For Graders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%
For Off Highway Tractors, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%
For Off Highway Tractors, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%
For Off Highway Trucks, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%
For Off Highway Trucks, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%
For Other Equipment, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

**9/17/2010 12:10:25 PM**

For Other Equipment, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Pavers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Pavers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Rollers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Rollers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Scrapers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Scrapers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Tractors/Loaders/Backhoes, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Tractors/Loaders/Backhoes, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Trenchers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Trenchers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

**9/17/2010 12:11:26 PM**

Urbemis 2007 Version 9.2.4

Combined Winter Emissions Reports (Pounds/Day)

File Name: Z:\Air Quality\032.225 Landmark Village Recirculated\URBEMIS2007 Construction - Mitigated\Landmark Recirc Construction wk020-039.urb924

Project Name: Landmark Village - Construction

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| 2010 TOTALS (lbs/day unmitigated) | 191.69 | 1,700.58 | 764.59 | 0.17 | 13,275.49 | 76.14 | 13,351.63 | 2,772.54 | 70.04 | 2,842.57 |
| 2010 TOTALS (lbs/day mitigated) | 191.69 | 1,459.38 | 764.59 | 0.17 | 2,355.75 | 21.90 | 2,377.65 | 492.06 | 20.14 | 512.20 |

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Winter Pounds Per Day, Unmitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 5/17/2010-10/1/2010 Active Days: 100 | **191.69** | **1,700.58** | **764.59** | **0.17** | **13,275.49** | **76.14** | **13,351.63** | **2,772.54** | **70.04** | **2,842.57** |
| Asphalt 05/17/2010-10/01/2010 | 73.87 | 624.88 | 286.48 | 0.03 | 0.14 | 29.52 | 29.66 | 0.05 | 27.15 | 27.20 |
| Paving Off-Gas | 1.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Off Road Diesel | 71.85 | 619.31 | 263.09 | 0.00 | 0.00 | 29.27 | 29.27 | 0.00 | 26.93 | 26.93 |
| Paving On Road Diesel | 0.33 | 4.29 | 1.65 | 0.01 | 0.02 | 0.18 | 0.20 | 0.01 | 0.16 | 0.17 |
| Paving Worker Trips | 0.68 | 1.28 | 21.75 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |
| Fine Grading 05/17/2010-10/01/2010 | 0.55 | 7.23 | 2.78 | 0.01 | 0.03 | 0.30 | 0.33 | 0.01 | 0.27 | 0.28 |
| Fine Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Off Road Diesel | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading On Road Diesel | 0.55 | 7.23 | 2.78 | 0.01 | 0.03 | 0.30 | 0.33 | 0.01 | 0.27 | 0.28 |
| Fine Grading Worker Trips | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mass Grading 05/17/2010-10/01/2010 | 117.27 | 1,068.47 | 475.33 | 0.13 | 13,275.32 | 46.32 | 13,321.64 | 2,772.48 | 42.61 | 2,815.09 |
| Mass Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 13,274.84 | 0.00 | 13,274.84 | 2,772.32 | 0.00 | 2,772.32 |
| Mass Grading Off Road Diesel | 110.58 | 988.69 | 424.21 | 0.00 | 0.00 | 43.04 | 43.04 | 0.00 | 39.59 | 39.59 |
| Mass Grading On Road Diesel | 6.03 | 78.54 | 30.16 | 0.10 | 0.36 | 3.22 | 3.57 | 0.12 | 2.96 | 3.08 |
| Mass Grading Worker Trips | 0.66 | 1.24 | 20.96 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |

**9/17/2010 12:11:26 PM**

Phase Assumptions

Phase: Fine Grading 5/17/2010 - 10/1/2010 - Surrogate for Paving On-Road Trucks
Total Acres Disturbed: 0
Maximum Daily Acreage Disturbed: 0
Fugitive Dust Level of Detail: Default
0 lbs per acre-day
On Road Truck Travel (VMT): 232.14
Off-Road Equipment:

Phase: Mass Grading 5/17/2010 - 10/1/2010 - Grading
Total Acres Disturbed: 0
Maximum Daily Acreage Disturbed: 2.44
Fugitive Dust Level of Detail: Low
Onsite Cut/Fill: 18260.9 cubic yards/day; Offsite Cut/Fill: 25217.4 cubic yards/day
On Road Truck Travel (VMT): 2521.74
Off-Road Equipment:
10 Crawler Tractors (147 hp) operating at a 0.64 load factor for 8 hours per day
1 Crushing/Processing Equip (142 hp) operating at a 0.78 load factor for 8 hours per day
4 Graders (174 hp) operating at a 0.61 load factor for 6 hours per day
15 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day
4 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day
9 Rollers (95 hp) operating at a 0.56 load factor for 8 hours per day
1 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day
36 Scrapers (313 hp) operating at a 0.72 load factor for 8 hours per day

Phase: Paving 5/17/2010 - 10/1/2010 - Asphalt Paving
Acres to be Paved: 38.37
Off-Road Equipment:
8 Excavators (168 hp) operating at a 0.57 load factor for 8 hours per day
4 Graders (174 hp) operating at a 0.61 load factor for 8 hours per day
3 Off Highway Tractors (267 hp) operating at a 0.65 load factor for 8 hours per day
14 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day
18 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day
2 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day
8 Rollers (95 hp) operating at a 0.56 load factor for 6 hours per day
6 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day
6 Scrapers (313 hp) operating at a 0.72 load factor for 8 hours per day
4 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 0 hours per day
10 Trenchers (63 hp) operating at a 0.75 load factor for 8 hours per day

**9/17/2010 12:11:26 PM**

Construction Mitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Winter Pounds Per Day, Mitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 5/17/2010-10/1/2010 Active Days: 100 | **191.69** | 1,459.38 | **764.59** | **0.17** | 2,355.75 | 21.90 | 2,377.65 | 492.06 | 20.14 | 512.20 |
| Asphalt 05/17/2010-10/01/2010 | 73.87 | 531.98 | 286.48 | 0.03 | 0.14 | 7.56 | 7.71 | 0.05 | 6.95 | 7.00 |
| Paving Off-Gas | 1.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Off Road Diesel | 71.85 | 526.41 | 263.09 | 0.00 | 0.00 | 7.32 | 7.32 | 0.00 | 6.73 | 6.73 |
| Paving On Road Diesel | 0.33 | 4.29 | 1.65 | 0.01 | 0.02 | 0.18 | 0.20 | 0.01 | 0.16 | 0.17 |
| Paving Worker Trips | 0.68 | 1.28 | 21.75 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |
| Fine Grading 05/17/2010-10/01/2010 | 0.55 | 7.23 | 2.78 | 0.01 | 0.03 | 0.30 | 0.33 | 0.01 | 0.27 | 0.28 |
| Fine Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Off Road Diesel | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading On Road Diesel | 0.55 | 7.23 | 2.78 | 0.01 | 0.03 | 0.30 | 0.33 | 0.01 | 0.27 | 0.28 |
| Fine Grading Worker Trips | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mass Grading 05/17/2010-10/01/2010 | 117.27 | 920.16 | 475.33 | 0.13 | 2,355.58 | 14.04 | 2,369.62 | 492.00 | 12.91 | 504.91 |
| Mass Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 2,355.10 | 0.00 | 2,355.10 | 491.84 | 0.00 | 491.84 |
| Mass Grading Off Road Diesel | 110.58 | 840.39 | 424.21 | 0.00 | 0.00 | 10.76 | 10.76 | 0.00 | 9.90 | 9.90 |
| Mass Grading On Road Diesel | 6.03 | 78.54 | 30.16 | 0.10 | 0.36 | 3.22 | 3.57 | 0.12 | 2.96 | 3.08 |
| Mass Grading Worker Trips | 0.66 | 1.24 | 20.96 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |

Construction Related Mitigation Measures

The following mitigation measures apply to Phase: Mass Grading 5/17/2010 - 10/1/2010 - Grading

For Soil Stablizing Measures, the Water exposed surfaces 3x daily watering mitigation reduces emissions by:

PM10: 61% PM25: 61%

For Soil Stablizing Measures, the Equipment loading/unloading mitigation reduces emissions by:

PM10: 69% PM25: 69%

For Unpaved Roads Measures, the Manage haul road dust 3x daily watering mitigation reduces emissions by:

PM10: 61% PM25: 61%

For Graders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Graders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Crawler Tractors, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Crawler Tractors, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Crushing/Processing Equip, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

**9/17/2010 12:11:26 PM**

For Crushing/Processing Equip, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%
For Off Highway Trucks, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%
For Off Highway Trucks, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%
For Other Equipment, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%
For Other Equipment, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%
For Rollers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%
For Rollers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%
For Rubber Tired Loaders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%
For Rubber Tired Loaders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%
For Scrapers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%
For Scrapers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%
The following mitigation measures apply to Phase: Paving 5/17/2010 - 10/1/2010 - Asphalt Paving
For Excavators, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%
For Excavators, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%
For Graders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%
For Graders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%
For Off Highway Tractors, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%
For Off Highway Tractors, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%
For Off Highway Trucks, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%
For Off Highway Trucks, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%
For Other Equipment, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

**9/17/2010 12:11:26 PM**

For Other Equipment, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Pavers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Pavers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Rollers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Rollers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Scrapers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Scrapers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Tractors/Loaders/Backhoes, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Tractors/Loaders/Backhoes, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Trenchers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Trenchers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

**9/17/2010 12:20:14 PM**

Urbemis 2007 Version 9.2.4

Combined Summer Emissions Reports (Pounds/Day)

File Name: Z:\Air Quality\032.225 Landmark Village Recirculated\URBEMIS2007 Construction - Mitigated\Landmark Recirc Construction wk040-046.urb924

Project Name: Landmark Village - Construction

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| 2010 TOTALS (lbs/day unmitigated) | 303.71 | 2,428.89 | 1,058.30 | 0.18 | 13,276.26 | 110.24 | 13,386.50 | 2,772.71 | 101.41 | 2,874.12 |
| 2010 TOTALS (lbs/day mitigated) | 303.71 | 2,078.89 | 1,058.30 | 0.18 | 2,355.95 | 30.53 | 2,386.48 | 492.11 | 28.07 | 520.18 |

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 10/4/2010-11/19/2010 Active Days: 35 | **303.71** | **2,428.89** | **1,058.30** | **0.18** | **13,276.26** | **110.24** | **13,386.50** | **2,772.71** | **101.41** | **2,874.12** |
| Asphalt 10/04/2010-11/19/2010 | 73.87 | 624.88 | 286.48 | 0.03 | 0.14 | 29.52 | 29.66 | 0.05 | 27.15 | 27.20 |
| Paving Off-Gas | 1.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Off Road Diesel | 71.85 | 619.31 | 263.09 | 0.00 | 0.00 | 29.27 | 29.27 | 0.00 | 26.93 | 26.93 |
| Paving On Road Diesel | 0.33 | 4.29 | 1.65 | 0.01 | 0.02 | 0.18 | 0.20 | 0.01 | 0.16 | 0.17 |
| Paving Worker Trips | 0.68 | 1.28 | 21.75 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |
| Building 10/04/2010-11/19/2010 | 80.32 | 728.25 | 292.63 | 0.02 | 0.07 | 34.10 | 34.16 | 0.02 | 31.37 | 31.39 |
| Building Off Road Diesel | 79.83 | 725.34 | 281.51 | 0.00 | 0.00 | 33.97 | 33.97 | 0.00 | 31.25 | 31.25 |
| Building Vendor Trips | 0.20 | 2.36 | 1.83 | 0.00 | 0.02 | 0.10 | 0.11 | 0.01 | 0.09 | 0.10 |
| Building Worker Trips | 0.29 | 0.55 | 9.29 | 0.01 | 0.05 | 0.03 | 0.08 | 0.02 | 0.03 | 0.04 |
| Coating 10/04/2010-11/19/2010 | 31.69 | 0.06 | 1.08 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |
| Architectural Coating | 31.66 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.03 | 0.06 | 1.08 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |

**9/17/2010 12:20:14 PM**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Fine Grading 10/04/2010-11/19/2010 | 0.55 | 7.23 | 2.78 | 0.01 | 0.03 | 0.30 | 0.33 | 0.01 | 0.27 | 0.28 |
| Fine Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Off Road Diesel | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading On Road Diesel | 0.55 | 7.23 | 2.78 | 0.01 | 0.03 | 0.30 | 0.33 | 0.01 | 0.27 | 0.28 |
| Fine Grading Worker Trips | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mass Grading 10/04/2010-11/19/2010 | 117.27 | 1,068.47 | 475.33 | 0.13 | 13,276.02 | 46.32 | 13,322.34 | 2,772.62 | 42.61 | 2,815.23 |
| Mass Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 13,275.54 | 0.00 | 13,275.54 | 2,772.46 | 0.00 | 2,772.46 |
| Mass Grading Off Road Diesel | 110.58 | 988.69 | 424.21 | 0.00 | 0.00 | 43.04 | 43.04 | 0.00 | 39.59 | 39.59 |
| Mass Grading On Road Diesel | 6.03 | 78.54 | 30.16 | 0.10 | 0.36 | 3.22 | 3.57 | 0.12 | 2.96 | 3.08 |
| Mass Grading Worker Trips | 0.66 | 1.24 | 20.96 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |

Phase Assumptions

Phase: Fine Grading 10/4/2010 - 11/19/2010 - Surrogate for Paving On-Road Trucks

Total Acres Disturbed: 0

Maximum Daily Acreage Disturbed: 0

Fugitive Dust Level of Detail: Default

0 lbs per acre-day

On Road Truck Travel (VMT): 232.15

Off-Road Equipment:

Phase: Mass Grading 10/4/2010 - 11/19/2010 - Grading

Total Acres Disturbed: 0

Maximum Daily Acreage Disturbed: 2.51

Fugitive Dust Level of Detail: Low

Onsite Cut/Fill: 18260.9 cubic yards/day; Offsite Cut/Fill: 25217.4 cubic yards/day

On Road Truck Travel (VMT): 2521.74

Off-Road Equipment:

10 Crawler Tractors (147 hp) operating at a 0.64 load factor for 8 hours per day

1 Crushing/Processing Equip (142 hp) operating at a 0.78 load factor for 8 hours per day

4 Graders (174 hp) operating at a 0.61 load factor for 6 hours per day

15 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day

4 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day

9 Rollers (95 hp) operating at a 0.56 load factor for 8 hours per day

1 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day

36 Scrapers (313 hp) operating at a 0.72 load factor for 8 hours per day

**9/17/2010 12:20:14 PM**

Phase: Paving 10/4/2010 - 11/19/2010 - Asphalt Paving
Acres to be Paved: 13.43
Off-Road Equipment:
8 Excavators (168 hp) operating at a 0.57 load factor for 8 hours per day
4 Graders (174 hp) operating at a 0.61 load factor for 8 hours per day
3 Off Highway Tractors (267 hp) operating at a 0.65 load factor for 8 hours per day
14 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day
18 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day
2 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day
8 Rollers (95 hp) operating at a 0.56 load factor for 6 hours per day
6 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day
6 Scrapers (313 hp) operating at a 0.72 load factor for 8 hours per day
4 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 0 hours per day
10 Trenchers (63 hp) operating at a 0.75 load factor for 8 hours per day

Phase: Building Construction 10/4/2010 - 11/19/2010 - Building Construction
Off-Road Equipment:
9 Cranes (399 hp) operating at a 0.43 load factor for 6 hours per day
1 Graders (174 hp) operating at a 0.61 load factor for 8 hours per day
6 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day
70 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day
3 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day
11 Rough Terrain Forklifts (93 hp) operating at a 0.6 load factor for 8 hours per day
7 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day
2 Skid Steer Loaders (44 hp) operating at a 0.55 load factor for 8 hours per day
13 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 8 hours per day
9 Trenchers (63 hp) operating at a 0.75 load factor for 8 hours per day

Phase: Architectural Coating 10/4/2010 - 11/19/2010 - Architectural Coating
Rule: Residential Interior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 100
Rule: Residential Interior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 50
Rule: Residential Exterior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 250
Rule: Residential Exterior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 100
Rule: Nonresidential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250
Rule: Nonresidential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

**9/17/2010 12:20:14 PM**

Construction Mitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Summer Pounds Per Day, Mitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 10/4/2010-11/19/2010 Active Days: 35 | **303.71** | 2,078.89 | **1,058.30** | **0.18** | 2,355.95 | 30.53 | 2,386.48 | 492.11 | 28.07 | 520.18 |
| Asphalt 10/04/2010-11/19/2010 | 73.87 | 531.98 | 286.48 | 0.03 | 0.14 | 7.56 | 7.71 | 0.05 | 6.95 | 7.00 |
| Paving Off-Gas | 1.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Off Road Diesel | 71.85 | 526.41 | 263.09 | 0.00 | 0.00 | 7.32 | 7.32 | 0.00 | 6.73 | 6.73 |
| Paving On Road Diesel | 0.33 | 4.29 | 1.65 | 0.01 | 0.02 | 0.18 | 0.20 | 0.01 | 0.16 | 0.17 |
| Paving Worker Trips | 0.68 | 1.28 | 21.75 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |
| Building 10/04/2010-11/19/2010 | 80.32 | 619.45 | 292.63 | 0.02 | 0.07 | 8.62 | 8.69 | 0.02 | 7.93 | 7.95 |
| Building Off Road Diesel | 79.83 | 616.54 | 281.51 | 0.00 | 0.00 | 8.49 | 8.49 | 0.00 | 7.81 | 7.81 |
| Building Vendor Trips | 0.20 | 2.36 | 1.83 | 0.00 | 0.02 | 0.10 | 0.11 | 0.01 | 0.09 | 0.10 |
| Building Worker Trips | 0.29 | 0.55 | 9.29 | 0.01 | 0.05 | 0.03 | 0.08 | 0.02 | 0.03 | 0.04 |
| Coating 10/04/2010-11/19/2010 | 31.69 | 0.06 | 1.08 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |
| Architectural Coating | 31.66 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.03 | 0.06 | 1.08 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |
| Fine Grading 10/04/2010-11/19/2010 | 0.55 | 7.23 | 2.78 | 0.01 | 0.03 | 0.30 | 0.33 | 0.01 | 0.27 | 0.28 |
| Fine Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Off Road Diesel | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading On Road Diesel | 0.55 | 7.23 | 2.78 | 0.01 | 0.03 | 0.30 | 0.33 | 0.01 | 0.27 | 0.28 |
| Fine Grading Worker Trips | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mass Grading 10/04/2010-11/19/2010 | 117.27 | 920.16 | 475.33 | 0.13 | 2,355.70 | 14.04 | 2,369.74 | 492.02 | 12.91 | 504.94 |
| Mass Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 2,355.23 | 0.00 | 2,355.23 | 491.87 | 0.00 | 491.87 |
| Mass Grading Off Road Diesel | 110.58 | 840.39 | 424.21 | 0.00 | 0.00 | 10.76 | 10.76 | 0.00 | 9.90 | 9.90 |
| Mass Grading On Road Diesel | 6.03 | 78.54 | 30.16 | 0.10 | 0.36 | 3.22 | 3.57 | 0.12 | 2.96 | 3.08 |
| Mass Grading Worker Trips | 0.66 | 1.24 | 20.96 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |

Construction Related Mitigation Measures

The following mitigation measures apply to Phase: Mass Grading 10/4/2010 - 11/19/2010 - Grading

For Soil Stablizing Measures, the Water exposed surfaces 3x daily watering mitigation reduces emissions by:

PM10: 61% PM25: 61%

For Soil Stablizing Measures, the Equipment loading/unloading mitigation reduces emissions by:

PM10: 69% PM25: 69%

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For Unpaved Roads Measures, the Manage haul road dust 3x daily watering mitigation reduces emissions by:
PM10: 61% PM25: 61%

For Graders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Graders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Crawler Tractors, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Crawler Tractors, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Crushing/Processing Equip, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Crushing/Processing Equip, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Off Highway Trucks, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Off Highway Trucks, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Other Equipment, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Other Equipment, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Rollers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Rollers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Scrapers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Scrapers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

The following mitigation measures apply to Phase: Paving 10/4/2010 - 11/19/2010 - Asphalt Paving

For Excavators, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Excavators, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Graders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

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For Graders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Off Highway Tractors, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Off Highway Tractors, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Off Highway Trucks, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Off Highway Trucks, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Other Equipment, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Other Equipment, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Pavers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Pavers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Rollers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Rollers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Scrapers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Scrapers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Tractors/Loaders/Backhoes, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Tractors/Loaders/Backhoes, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Trenchers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Trenchers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

The following mitigation measures apply to Phase: Building Construction 10/4/2010 - 11/19/2010 - Building Construction

For Cranes, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

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For Cranes, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Tractors/Loaders/Backhoes, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Tractors/Loaders/Backhoes, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Graders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Graders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Off Highway Trucks, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Off Highway Trucks, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Other Equipment, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Other Equipment, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Pavers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Pavers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Rough Terrain Forklifts, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Rough Terrain Forklifts, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Skid Steer Loaders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Skid Steer Loaders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Trenchers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Trenchers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

**9/17/2010 12:21:08 PM**

Urbemis 2007 Version 9.2.4

Combined Winter Emissions Reports (Pounds/Day)

File Name: Z:\Air Quality\032.225 Landmark Village Recirculated\URBEMIS2007 Construction - Mitigated\Landmark Recirc Construction wk040-046.urb924

Project Name: Landmark Village - Construction

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| 2010 TOTALS (lbs/day unmitigated) | 303.71 | 2,428.89 | 1,058.30 | 0.18 | 13,276.26 | 110.24 | 13,386.50 | 2,772.71 | 101.41 | 2,874.12 |
| 2010 TOTALS (lbs/day mitigated) | 303.71 | 2,078.89 | 1,058.30 | 0.18 | 2,355.95 | 30.53 | 2,386.48 | 492.11 | 28.07 | 520.18 |

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Winter Pounds Per Day, Unmitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 10/4/2010-11/19/2010 Active Days: 35 | **303.71** | **2,428.89** | **1,058.30** | **0.18** | **13,276.26** | **110.24** | **13,386.50** | **2,772.71** | **101.41** | **2,874.12** |
| Asphalt 10/04/2010-11/19/2010 | 73.87 | 624.88 | 286.48 | 0.03 | 0.14 | 29.52 | 29.66 | 0.05 | 27.15 | 27.20 |
| Paving Off-Gas | 1.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Off Road Diesel | 71.85 | 619.31 | 263.09 | 0.00 | 0.00 | 29.27 | 29.27 | 0.00 | 26.93 | 26.93 |
| Paving On Road Diesel | 0.33 | 4.29 | 1.65 | 0.01 | 0.02 | 0.18 | 0.20 | 0.01 | 0.16 | 0.17 |
| Paving Worker Trips | 0.68 | 1.28 | 21.75 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |
| Building 10/04/2010-11/19/2010 | 80.32 | 728.25 | 292.63 | 0.02 | 0.07 | 34.10 | 34.16 | 0.02 | 31.37 | 31.39 |
| Building Off Road Diesel | 79.83 | 725.34 | 281.51 | 0.00 | 0.00 | 33.97 | 33.97 | 0.00 | 31.25 | 31.25 |
| Building Vendor Trips | 0.20 | 2.36 | 1.83 | 0.00 | 0.02 | 0.10 | 0.11 | 0.01 | 0.09 | 0.10 |
| Building Worker Trips | 0.29 | 0.55 | 9.29 | 0.01 | 0.05 | 0.03 | 0.08 | 0.02 | 0.03 | 0.04 |
| Coating 10/04/2010-11/19/2010 | 31.69 | 0.06 | 1.08 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |
| Architectural Coating | 31.66 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.03 | 0.06 | 1.08 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |

**9/17/2010 12:21:08 PM**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Fine Grading 10/04/2010-11/19/2010 | 0.55 | 7.23 | 2.78 | 0.01 | 0.03 | 0.30 | 0.33 | 0.01 | 0.27 | 0.28 |
| Fine Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Off Road Diesel | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading On Road Diesel | 0.55 | 7.23 | 2.78 | 0.01 | 0.03 | 0.30 | 0.33 | 0.01 | 0.27 | 0.28 |
| Fine Grading Worker Trips | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mass Grading 10/04/2010-11/19/2010 | 117.27 | 1,068.47 | 475.33 | 0.13 | 13,276.02 | 46.32 | 13,322.34 | 2,772.62 | 42.61 | 2,815.23 |
| Mass Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 13,275.54 | 0.00 | 13,275.54 | 2,772.46 | 0.00 | 2,772.46 |
| Mass Grading Off Road Diesel | 110.58 | 988.69 | 424.21 | 0.00 | 0.00 | 43.04 | 43.04 | 0.00 | 39.59 | 39.59 |
| Mass Grading On Road Diesel | 6.03 | 78.54 | 30.16 | 0.10 | 0.36 | 3.22 | 3.57 | 0.12 | 2.96 | 3.08 |
| Mass Grading Worker Trips | 0.66 | 1.24 | 20.96 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |

Phase Assumptions

Phase: Fine Grading 10/4/2010 - 11/19/2010 - Surrogate for Paving On-Road Trucks

Total Acres Disturbed: 0

Maximum Daily Acreage Disturbed: 0

Fugitive Dust Level of Detail: Default

0 lbs per acre-day

On Road Truck Travel (VMT): 232.15

Off-Road Equipment:

Phase: Mass Grading 10/4/2010 - 11/19/2010 - Grading

Total Acres Disturbed: 0

Maximum Daily Acreage Disturbed: 2.51

Fugitive Dust Level of Detail: Low

Onsite Cut/Fill: 18260.9 cubic yards/day; Offsite Cut/Fill: 25217.4 cubic yards/day

On Road Truck Travel (VMT): 2521.74

Off-Road Equipment:

10 Crawler Tractors (147 hp) operating at a 0.64 load factor for 8 hours per day

1 Crushing/Processing Equip (142 hp) operating at a 0.78 load factor for 8 hours per day

4 Graders (174 hp) operating at a 0.61 load factor for 6 hours per day

15 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day

4 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day

9 Rollers (95 hp) operating at a 0.56 load factor for 8 hours per day

1 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day

36 Scrapers (313 hp) operating at a 0.72 load factor for 8 hours per day

**9/17/2010 12:21:08 PM**

Phase: Paving 10/4/2010 - 11/19/2010 - Asphalt Paving
Acres to be Paved: 13.43
Off-Road Equipment:
8 Excavators (168 hp) operating at a 0.57 load factor for 8 hours per day
4 Graders (174 hp) operating at a 0.61 load factor for 8 hours per day
3 Off Highway Tractors (267 hp) operating at a 0.65 load factor for 8 hours per day
14 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day
18 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day
2 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day
8 Rollers (95 hp) operating at a 0.56 load factor for 6 hours per day
6 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day
6 Scrapers (313 hp) operating at a 0.72 load factor for 8 hours per day
4 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 0 hours per day
10 Trenchers (63 hp) operating at a 0.75 load factor for 8 hours per day

Phase: Building Construction 10/4/2010 - 11/19/2010 - Building Construction
Off-Road Equipment:
9 Cranes (399 hp) operating at a 0.43 load factor for 6 hours per day
1 Graders (174 hp) operating at a 0.61 load factor for 8 hours per day
6 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day
70 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day
3 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day
11 Rough Terrain Forklifts (93 hp) operating at a 0.6 load factor for 8 hours per day
7 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day
2 Skid Steer Loaders (44 hp) operating at a 0.55 load factor for 8 hours per day
13 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 8 hours per day
9 Trenchers (63 hp) operating at a 0.75 load factor for 8 hours per day

Phase: Architectural Coating 10/4/2010 - 11/19/2010 - Architectural Coating
Rule: Residential Interior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 100
Rule: Residential Interior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 50
Rule: Residential Exterior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 250
Rule: Residential Exterior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 100
Rule: Nonresidential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250
Rule: Nonresidential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

**9/17/2010 12:21:08 PM**

Construction Mitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Winter Pounds Per Day, Mitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 10/4/2010-11/19/2010 Active Days: 35 | **303.71** | 2,078.89 | **1,058.30** | **0.18** | 2,355.95 | 30.53 | 2,386.48 | 492.11 | 28.07 | 520.18 |
| Asphalt 10/04/2010-11/19/2010 | 73.87 | 531.98 | 286.48 | 0.03 | 0.14 | 7.56 | 7.71 | 0.05 | 6.95 | 7.00 |
| Paving Off-Gas | 1.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Off Road Diesel | 71.85 | 526.41 | 263.09 | 0.00 | 0.00 | 7.32 | 7.32 | 0.00 | 6.73 | 6.73 |
| Paving On Road Diesel | 0.33 | 4.29 | 1.65 | 0.01 | 0.02 | 0.18 | 0.20 | 0.01 | 0.16 | 0.17 |
| Paving Worker Trips | 0.68 | 1.28 | 21.75 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |
| Building 10/04/2010-11/19/2010 | 80.32 | 619.45 | 292.63 | 0.02 | 0.07 | 8.62 | 8.69 | 0.02 | 7.93 | 7.95 |
| Building Off Road Diesel | 79.83 | 616.54 | 281.51 | 0.00 | 0.00 | 8.49 | 8.49 | 0.00 | 7.81 | 7.81 |
| Building Vendor Trips | 0.20 | 2.36 | 1.83 | 0.00 | 0.02 | 0.10 | 0.11 | 0.01 | 0.09 | 0.10 |
| Building Worker Trips | 0.29 | 0.55 | 9.29 | 0.01 | 0.05 | 0.03 | 0.08 | 0.02 | 0.03 | 0.04 |
| Coating 10/04/2010-11/19/2010 | 31.69 | 0.06 | 1.08 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |
| Architectural Coating | 31.66 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.03 | 0.06 | 1.08 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |
| Fine Grading 10/04/2010-11/19/2010 | 0.55 | 7.23 | 2.78 | 0.01 | 0.03 | 0.30 | 0.33 | 0.01 | 0.27 | 0.28 |
| Fine Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Off Road Diesel | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading On Road Diesel | 0.55 | 7.23 | 2.78 | 0.01 | 0.03 | 0.30 | 0.33 | 0.01 | 0.27 | 0.28 |
| Fine Grading Worker Trips | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mass Grading 10/04/2010-11/19/2010 | 117.27 | 920.16 | 475.33 | 0.13 | 2,355.70 | 14.04 | 2,369.74 | 492.02 | 12.91 | 504.94 |
| Mass Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 2,355.23 | 0.00 | 2,355.23 | 491.87 | 0.00 | 491.87 |
| Mass Grading Off Road Diesel | 110.58 | 840.39 | 424.21 | 0.00 | 0.00 | 10.76 | 10.76 | 0.00 | 9.90 | 9.90 |
| Mass Grading On Road Diesel | 6.03 | 78.54 | 30.16 | 0.10 | 0.36 | 3.22 | 3.57 | 0.12 | 2.96 | 3.08 |
| Mass Grading Worker Trips | 0.66 | 1.24 | 20.96 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |

Construction Related Mitigation Measures

The following mitigation measures apply to Phase: Mass Grading 10/4/2010 - 11/19/2010 - Grading

For Soil Stablizing Measures, the Water exposed surfaces 3x daily watering mitigation reduces emissions by:

PM10: 61% PM25: 61%

For Soil Stablizing Measures, the Equipment loading/unloading mitigation reduces emissions by:

PM10: 69% PM25: 69%

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For Unpaved Roads Measures, the Manage haul road dust 3x daily watering mitigation reduces emissions by:
PM10: 61% PM25: 61%
For Graders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%
For Graders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%
For Crawler Tractors, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%
For Crawler Tractors, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%
For Crushing/Processing Equip, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%
For Crushing/Processing Equip, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%
For Off Highway Trucks, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%
For Off Highway Trucks, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%
For Other Equipment, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%
For Other Equipment, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%
For Rollers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%
For Rollers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%
For Rubber Tired Loaders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%
For Rubber Tired Loaders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%
For Scrapers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%
For Scrapers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%
The following mitigation measures apply to Phase: Paving 10/4/2010 - 11/19/2010 - Asphalt Paving
For Excavators, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%
For Excavators, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%
For Graders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

**9/17/2010 12:21:08 PM**

For Graders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Off Highway Tractors, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Off Highway Tractors, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Off Highway Trucks, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Off Highway Trucks, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Other Equipment, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Other Equipment, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Pavers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Pavers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Rollers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Rollers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Scrapers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Scrapers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Tractors/Loaders/Backhoes, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Tractors/Loaders/Backhoes, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Trenchers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Trenchers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

The following mitigation measures apply to Phase: Building Construction 10/4/2010 - 11/19/2010 - Building Construction

For Cranes, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

**9/17/2010 12:21:08 PM**

For Cranes, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Tractors/Loaders/Backhoes, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Tractors/Loaders/Backhoes, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Graders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Graders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Off Highway Trucks, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Off Highway Trucks, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Other Equipment, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Other Equipment, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Pavers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Pavers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Rough Terrain Forklifts, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Rough Terrain Forklifts, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Skid Steer Loaders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Skid Steer Loaders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Trenchers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Trenchers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

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Urbemis 2007 Version 9.2.4

Combined Summer Emissions Reports (Pounds/Day)

File Name: Z:\Air Quality\032.225 Landmark Village Recirculated\URBEMIS2007 Construction - Mitigated\Landmark Recirc Construction wk047-091.urb924

Project Name: Landmark Village - Construction

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| 2010 TOTALS (lbs/day unmitigated) | 188.97 | 1,376.08 | 642.89 | 0.14 | 0.61 | 64.61 | 65.22 | 0.22 | 59.42 | 59.63 |
| 2010 TOTALS (lbs/day mitigated) | 188.97 | 1,174.38 | 642.89 | 0.14 | 0.61 | 17.18 | 17.79 | 0.22 | 15.78 | 16.00 |
| 2011 TOTALS (lbs/day unmitigated) | 177.97 | 1,273.29 | 612.89 | 0.14 | 0.61 | 59.61 | 60.22 | 0.22 | 54.82 | 55.03 |
| 2011 TOTALS (lbs/day mitigated) | 177.97 | 1,086.55 | 612.89 | 0.14 | 0.61 | 15.83 | 16.44 | 0.22 | 14.54 | 14.76 |

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 11/22/2010-12/31/2010 Active Days: 30 | **188.97** | **1,376.08** | **642.89** | **0.14** | **0.61** | **64.61** | **65.22** | **0.22** | **59.42** | **59.63** |
| Asphalt 11/22/2010-09/30/2011 | 73.87 | 624.88 | 286.48 | 0.03 | 0.14 | 29.52 | 29.66 | 0.05 | 27.15 | 27.20 |
| Paving Off-Gas | 1.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Off Road Diesel | 71.85 | 619.31 | 263.09 | 0.00 | 0.00 | 29.27 | 29.27 | 0.00 | 26.93 | 26.93 |
| Paving On Road Diesel | 0.33 | 4.29 | 1.65 | 0.01 | 0.02 | 0.18 | 0.20 | 0.01 | 0.16 | 0.17 |
| Paving Worker Trips | 0.68 | 1.28 | 21.75 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |
| Building 11/22/2010-09/30/2011 | 83.00 | 743.90 | 352.56 | 0.10 | 0.43 | 34.79 | 35.22 | 0.15 | 31.99 | 32.14 |
| Building Off Road Diesel | 79.83 | 725.34 | 281.51 | 0.00 | 0.00 | 33.97 | 33.97 | 0.00 | 31.25 | 31.25 |
| Building Vendor Trips | 1.31 | 15.06 | 11.69 | 0.03 | 0.10 | 0.63 | 0.73 | 0.03 | 0.58 | 0.61 |
| Building Worker Trips | 1.87 | 3.50 | 59.36 | 0.07 | 0.33 | 0.19 | 0.52 | 0.12 | 0.16 | 0.28 |

**9/17/2010 01:29:12 PM**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Coating 11/22/2010-09/30/2011 | 31.55 | 0.06 | 1.07 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |
| Architectural Coating | 31.51 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.03 | 0.06 | 1.07 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |
| Fine Grading 11/22/2010-09/30/2011 | 0.55 | 7.23 | 2.78 | 0.01 | 0.03 | 0.30 | 0.33 | 0.01 | 0.27 | 0.28 |
| Fine Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Off Road Diesel | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading On Road Diesel | 0.55 | 7.23 | 2.78 | 0.01 | 0.03 | 0.30 | 0.33 | 0.01 | 0.27 | 0.28 |
| Fine Grading Worker Trips | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Time Slice 1/3/2011-9/30/2011 Active Days: 195 | 177.97 | 1,273.29 | 612.89 | **0.14** | **0.61** | 59.61 | 60.22 | **0.22** | 54.82 | 55.03 |
| Asphalt 11/22/2010-09/30/2011 | 69.29 | 580.85 | 273.31 | 0.03 | 0.14 | 27.19 | 27.33 | 0.05 | 25.01 | 25.06 |
| Paving Off-Gas | 1.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Off Road Diesel | 67.35 | 575.82 | 251.58 | 0.00 | 0.00 | 26.96 | 26.96 | 0.00 | 24.81 | 24.81 |
| Paving On Road Diesel | 0.30 | 3.86 | 1.49 | 0.01 | 0.02 | 0.16 | 0.17 | 0.01 | 0.14 | 0.15 |
| Paving Worker Trips | 0.62 | 1.17 | 20.24 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |
| Building 11/22/2010-09/30/2011 | 76.63 | 685.87 | 336.08 | 0.10 | 0.43 | 32.15 | 32.59 | 0.15 | 29.57 | 29.72 |
| Building Off Road Diesel | 73.72 | 669.10 | 270.00 | 0.00 | 0.00 | 31.40 | 31.40 | 0.00 | 28.89 | 28.89 |
| Building Vendor Trips | 1.20 | 13.57 | 10.84 | 0.03 | 0.10 | 0.56 | 0.66 | 0.03 | 0.51 | 0.55 |
| Building Worker Trips | 1.70 | 3.20 | 55.25 | 0.07 | 0.33 | 0.19 | 0.52 | 0.12 | 0.16 | 0.28 |
| Coating 11/22/2010-09/30/2011 | 31.54 | 0.06 | 1.00 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |
| Architectural Coating | 31.51 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.03 | 0.06 | 1.00 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |
| Fine Grading 11/22/2010-09/30/2011 | 0.51 | 6.51 | 2.50 | 0.01 | 0.03 | 0.26 | 0.29 | 0.01 | 0.24 | 0.25 |
| Fine Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Off Road Diesel | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading On Road Diesel | 0.51 | 6.51 | 2.50 | 0.01 | 0.03 | 0.26 | 0.29 | 0.01 | 0.24 | 0.25 |
| Fine Grading Worker Trips | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**9/17/2010 01:29:12 PM**

Phase Assumptions

Phase: Fine Grading 11/22/2010 - 9/30/2011 - Surrogate for Paving On-Road Trucks
Total Acres Disturbed: 0
Maximum Daily Acreage Disturbed: 0
Fugitive Dust Level of Detail: Default
0 lbs per acre-day
On Road Truck Travel (VMT): 232.16
Off-Road Equipment:

Phase: Paving 11/22/2010 - 9/30/2011 - Asphalt Paving
Acres to be Paved: 86.34
Off-Road Equipment:
8 Excavators (168 hp) operating at a 0.57 load factor for 8 hours per day
4 Graders (174 hp) operating at a 0.61 load factor for 8 hours per day
3 Off Highway Tractors (267 hp) operating at a 0.65 load factor for 8 hours per day
14 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day
18 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day
2 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day
8 Rollers (95 hp) operating at a 0.56 load factor for 6 hours per day
6 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day
6 Scrapers (313 hp) operating at a 0.72 load factor for 8 hours per day
4 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 0 hours per day
10 Trenchers (63 hp) operating at a 0.75 load factor for 8 hours per day

Phase: Building Construction 11/22/2010 - 9/30/2011 - Building Construction
Off-Road Equipment:
9 Cranes (399 hp) operating at a 0.43 load factor for 6 hours per day
1 Graders (174 hp) operating at a 0.61 load factor for 8 hours per day
6 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day
70 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day
3 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day
11 Rough Terrain Forklifts (93 hp) operating at a 0.6 load factor for 8 hours per day
7 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day
2 Skid Steer Loaders (44 hp) operating at a 0.55 load factor for 8 hours per day
13 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 8 hours per day
9 Trenchers (63 hp) operating at a 0.75 load factor for 8 hours per day

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Phase: Architectural Coating 11/22/2010 - 9/30/2011 - Architectural Coating

Rule: Residential Interior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 100

Rule: Residential Interior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 50

Rule: Residential Exterior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 250

Rule: Residential Exterior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 100

Rule: Nonresidential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Rule: Nonresidential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Construction Mitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Summer Pounds Per Day, Mitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 11/22/2010-12/31/2010 Active Days: 30 | **188.97** | 1,174.38 | **642.89** | **0.14** | **0.61** | 17.18 | 17.79 | **0.22** | 15.78 | 16.00 |
| Asphalt 11/22/2010-09/30/2011 | 73.87 | 531.98 | 286.48 | 0.03 | 0.14 | 7.56 | 7.71 | 0.05 | 6.95 | 7.00 |
| Paving Off-Gas | 1.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Off Road Diesel | 71.85 | 526.41 | 263.09 | 0.00 | 0.00 | 7.32 | 7.32 | 0.00 | 6.73 | 6.73 |
| Paving On Road Diesel | 0.33 | 4.29 | 1.65 | 0.01 | 0.02 | 0.18 | 0.20 | 0.01 | 0.16 | 0.17 |
| Paving Worker Trips | 0.68 | 1.28 | 21.75 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |
| Building 11/22/2010-09/30/2011 | 83.00 | 635.10 | 352.56 | 0.10 | 0.43 | 9.31 | 9.74 | 0.15 | 8.55 | 8.70 |
| Building Off Road Diesel | 79.83 | 616.54 | 281.51 | 0.00 | 0.00 | 8.49 | 8.49 | 0.00 | 7.81 | 7.81 |
| Building Vendor Trips | 1.31 | 15.06 | 11.69 | 0.03 | 0.10 | 0.63 | 0.73 | 0.03 | 0.58 | 0.61 |
| Building Worker Trips | 1.87 | 3.50 | 59.36 | 0.07 | 0.33 | 0.19 | 0.52 | 0.12 | 0.16 | 0.28 |
| Coating 11/22/2010-09/30/2011 | 31.55 | 0.06 | 1.07 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |
| Architectural Coating | 31.51 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.03 | 0.06 | 1.07 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |
| Fine Grading 11/22/2010-09/30/2011 | 0.55 | 7.23 | 2.78 | 0.01 | 0.03 | 0.30 | 0.33 | 0.01 | 0.27 | 0.28 |
| Fine Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Off Road Diesel | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading On Road Diesel | 0.55 | 7.23 | 2.78 | 0.01 | 0.03 | 0.30 | 0.33 | 0.01 | 0.27 | 0.28 |
| Fine Grading Worker Trips | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**9/17/2010 01:29:12 PM**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 1/3/2011-9/30/2011 Active Days: 195 | 177.97 | 1,086.55 | 612.89 | **0.14** | **0.61** | 15.83 | 16.44 | **0.22** | 14.54 | 14.76 |
| Asphalt 11/22/2010-09/30/2011 | 69.29 | 494.48 | 273.31 | 0.03 | 0.14 | 6.97 | 7.11 | 0.05 | 6.40 | 6.45 |
| Paving Off-Gas | 1.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Off Road Diesel | 67.35 | 489.44 | 251.58 | 0.00 | 0.00 | 6.74 | 6.74 | 0.00 | 6.20 | 6.20 |
| Paving On Road Diesel | 0.30 | 3.86 | 1.49 | 0.01 | 0.02 | 0.16 | 0.17 | 0.01 | 0.14 | 0.15 |
| Paving Worker Trips | 0.62 | 1.17 | 20.24 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |
| Building 11/22/2010-09/30/2011 | 76.63 | 585.51 | 336.08 | 0.10 | 0.43 | 8.60 | 9.03 | 0.15 | 7.90 | 8.05 |
| Building Off Road Diesel | 73.72 | 568.73 | 270.00 | 0.00 | 0.00 | 7.85 | 7.85 | 0.00 | 7.22 | 7.22 |
| Building Vendor Trips | 1.20 | 13.57 | 10.84 | 0.03 | 0.10 | 0.56 | 0.66 | 0.03 | 0.51 | 0.55 |
| Building Worker Trips | 1.70 | 3.20 | 55.25 | 0.07 | 0.33 | 0.19 | 0.52 | 0.12 | 0.16 | 0.28 |
| Coating 11/22/2010-09/30/2011 | 31.54 | 0.06 | 1.00 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |
| Architectural Coating | 31.51 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.03 | 0.06 | 1.00 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |
| Fine Grading 11/22/2010-09/30/2011 | 0.51 | 6.51 | 2.50 | 0.01 | 0.03 | 0.26 | 0.29 | 0.01 | 0.24 | 0.25 |
| Fine Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Off Road Diesel | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading On Road Diesel | 0.51 | 6.51 | 2.50 | 0.01 | 0.03 | 0.26 | 0.29 | 0.01 | 0.24 | 0.25 |
| Fine Grading Worker Trips | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

Construction Related Mitigation Measures

The following mitigation measures apply to Phase: Paving 11/22/2010 - 9/30/2011 - Asphalt Paving

For Excavators, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Excavators, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Graders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Graders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Off Highway Tractors, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Off Highway Tractors, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

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For Off Highway Trucks, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Off Highway Trucks, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Other Equipment, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Other Equipment, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Pavers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Pavers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Rollers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Rollers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Scrapers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Scrapers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Tractors/Loaders/Backhoes, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Tractors/Loaders/Backhoes, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Trenchers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Trenchers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

The following mitigation measures apply to Phase: Building Construction 11/22/2010 - 9/30/2011 - Building Construction

For Cranes, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Cranes, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

**9/17/2010 01:29:12 PM**

For Tractors/Loaders/Backhoes, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%
For Tractors/Loaders/Backhoes, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%
For Graders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%
For Graders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%
For Off Highway Trucks, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%
For Off Highway Trucks, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%
For Other Equipment, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%
For Other Equipment, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%
For Pavers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%
For Pavers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%
For Rough Terrain Forklifts, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%
For Rough Terrain Forklifts, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%
For Rubber Tired Loaders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%
For Rubber Tired Loaders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%
For Skid Steer Loaders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%
For Skid Steer Loaders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%
For Trenchers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%
For Trenchers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

**9/17/2010 01:36:07 PM**

Urbemis 2007 Version 9.2.4

Combined Winter Emissions Reports (Pounds/Day)

File Name: Z:\Air Quality\032.225 Landmark Village Recirculated\URBEMIS2007 Construction - Mitigated\Landmark Recirc Construction wk047-091.urb924

Project Name: Landmark Village - Construction

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| 2010 TOTALS (lbs/day unmitigated) | 188.97 | 1,376.08 | 642.89 | 0.14 | 0.61 | 64.61 | 65.22 | 0.22 | 59.42 | 59.63 |
| 2010 TOTALS (lbs/day mitigated) | 188.97 | 1,174.38 | 642.89 | 0.14 | 0.61 | 17.18 | 17.79 | 0.22 | 15.78 | 16.00 |
| 2011 TOTALS (lbs/day unmitigated) | 177.97 | 1,273.29 | 612.89 | 0.14 | 0.61 | 59.61 | 60.22 | 0.22 | 54.82 | 55.03 |
| 2011 TOTALS (lbs/day mitigated) | 177.97 | 1,086.55 | 612.89 | 0.14 | 0.61 | 15.83 | 16.44 | 0.22 | 14.54 | 14.76 |

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Winter Pounds Per Day, Unmitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 11/22/2010-12/31/2010 Active Days: 30 | **188.97** | **1,376.08** | **642.89** | **0.14** | **0.61** | **64.61** | **65.22** | **0.22** | **59.42** | **59.63** |
| Asphalt 11/22/2010-09/30/2011 | 73.87 | 624.88 | 286.48 | 0.03 | 0.14 | 29.52 | 29.66 | 0.05 | 27.15 | 27.20 |
| Paving Off-Gas | 1.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Off Road Diesel | 71.85 | 619.31 | 263.09 | 0.00 | 0.00 | 29.27 | 29.27 | 0.00 | 26.93 | 26.93 |
| Paving On Road Diesel | 0.33 | 4.29 | 1.65 | 0.01 | 0.02 | 0.18 | 0.20 | 0.01 | 0.16 | 0.17 |
| Paving Worker Trips | 0.68 | 1.28 | 21.75 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |
| Building 11/22/2010-09/30/2011 | 83.00 | 743.90 | 352.56 | 0.10 | 0.43 | 34.79 | 35.22 | 0.15 | 31.99 | 32.14 |
| Building Off Road Diesel | 79.83 | 725.34 | 281.51 | 0.00 | 0.00 | 33.97 | 33.97 | 0.00 | 31.25 | 31.25 |
| Building Vendor Trips | 1.31 | 15.06 | 11.69 | 0.03 | 0.10 | 0.63 | 0.73 | 0.03 | 0.58 | 0.61 |
| Building Worker Trips | 1.87 | 3.50 | 59.36 | 0.07 | 0.33 | 0.19 | 0.52 | 0.12 | 0.16 | 0.28 |

**9/17/2010 01:36:07 PM**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Coating 11/22/2010-09/30/2011 | 31.55 | 0.06 | 1.07 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |
| Architectural Coating | 31.51 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.03 | 0.06 | 1.07 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |
| Fine Grading 11/22/2010-09/30/2011 | 0.55 | 7.23 | 2.78 | 0.01 | 0.03 | 0.30 | 0.33 | 0.01 | 0.27 | 0.28 |
| Fine Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Off Road Diesel | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading On Road Diesel | 0.55 | 7.23 | 2.78 | 0.01 | 0.03 | 0.30 | 0.33 | 0.01 | 0.27 | 0.28 |
| Fine Grading Worker Trips | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Time Slice 1/3/2011-9/30/2011 Active Days: 195 | 177.97 | 1,273.29 | 612.89 | **0.14** | **0.61** | 59.61 | 60.22 | **0.22** | 54.82 | 55.03 |
| Asphalt 11/22/2010-09/30/2011 | 69.29 | 580.85 | 273.31 | 0.03 | 0.14 | 27.19 | 27.33 | 0.05 | 25.01 | 25.06 |
| Paving Off-Gas | 1.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Off Road Diesel | 67.35 | 575.82 | 251.58 | 0.00 | 0.00 | 26.96 | 26.96 | 0.00 | 24.81 | 24.81 |
| Paving On Road Diesel | 0.30 | 3.86 | 1.49 | 0.01 | 0.02 | 0.16 | 0.17 | 0.01 | 0.14 | 0.15 |
| Paving Worker Trips | 0.62 | 1.17 | 20.24 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |
| Building 11/22/2010-09/30/2011 | 76.63 | 685.87 | 336.08 | 0.10 | 0.43 | 32.15 | 32.59 | 0.15 | 29.57 | 29.72 |
| Building Off Road Diesel | 73.72 | 669.10 | 270.00 | 0.00 | 0.00 | 31.40 | 31.40 | 0.00 | 28.89 | 28.89 |
| Building Vendor Trips | 1.20 | 13.57 | 10.84 | 0.03 | 0.10 | 0.56 | 0.66 | 0.03 | 0.51 | 0.55 |
| Building Worker Trips | 1.70 | 3.20 | 55.25 | 0.07 | 0.33 | 0.19 | 0.52 | 0.12 | 0.16 | 0.28 |
| Coating 11/22/2010-09/30/2011 | 31.54 | 0.06 | 1.00 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |
| Architectural Coating | 31.51 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.03 | 0.06 | 1.00 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |
| Fine Grading 11/22/2010-09/30/2011 | 0.51 | 6.51 | 2.50 | 0.01 | 0.03 | 0.26 | 0.29 | 0.01 | 0.24 | 0.25 |
| Fine Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Off Road Diesel | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading On Road Diesel | 0.51 | 6.51 | 2.50 | 0.01 | 0.03 | 0.26 | 0.29 | 0.01 | 0.24 | 0.25 |
| Fine Grading Worker Trips | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**9/17/2010 01:36:07 PM**

Phase Assumptions

Phase: Fine Grading 11/22/2010 - 9/30/2011 - Surrogate for Paving On-Road Trucks
Total Acres Disturbed: 0
Maximum Daily Acreage Disturbed: 0
Fugitive Dust Level of Detail: Default
0 lbs per acre-day
On Road Truck Travel (VMT): 232.16
Off-Road Equipment:

Phase: Paving 11/22/2010 - 9/30/2011 - Asphalt Paving
Acres to be Paved: 86.34
Off-Road Equipment:
8 Excavators (168 hp) operating at a 0.57 load factor for 8 hours per day
4 Graders (174 hp) operating at a 0.61 load factor for 8 hours per day
3 Off Highway Tractors (267 hp) operating at a 0.65 load factor for 8 hours per day
14 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day
18 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day
2 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day
8 Rollers (95 hp) operating at a 0.56 load factor for 6 hours per day
6 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day
6 Scrapers (313 hp) operating at a 0.72 load factor for 8 hours per day
4 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 0 hours per day
10 Trenchers (63 hp) operating at a 0.75 load factor for 8 hours per day

Phase: Building Construction 11/22/2010 - 9/30/2011 - Building Construction
Off-Road Equipment:
9 Cranes (399 hp) operating at a 0.43 load factor for 6 hours per day
1 Graders (174 hp) operating at a 0.61 load factor for 8 hours per day
6 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day
70 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day
3 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day
11 Rough Terrain Forklifts (93 hp) operating at a 0.6 load factor for 8 hours per day
7 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day
2 Skid Steer Loaders (44 hp) operating at a 0.55 load factor for 8 hours per day
13 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 8 hours per day
9 Trenchers (63 hp) operating at a 0.75 load factor for 8 hours per day

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Phase: Architectural Coating 11/22/2010 - 9/30/2011 - Architectural Coating

Rule: Residential Interior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 100

Rule: Residential Interior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 50

Rule: Residential Exterior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 250

Rule: Residential Exterior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 100

Rule: Nonresidential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Rule: Nonresidential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Construction Mitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Winter Pounds Per Day, Mitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 11/22/2010-12/31/2010 Active Days: 30 | **188.97** | 1,174.38 | **642.89** | **0.14** | **0.61** | 17.18 | 17.79 | **0.22** | 15.78 | 16.00 |
| Asphalt 11/22/2010-09/30/2011 | 73.87 | 531.98 | 286.48 | 0.03 | 0.14 | 7.56 | 7.71 | 0.05 | 6.95 | 7.00 |
| Paving Off-Gas | 1.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Off Road Diesel | 71.85 | 526.41 | 263.09 | 0.00 | 0.00 | 7.32 | 7.32 | 0.00 | 6.73 | 6.73 |
| Paving On Road Diesel | 0.33 | 4.29 | 1.65 | 0.01 | 0.02 | 0.18 | 0.20 | 0.01 | 0.16 | 0.17 |
| Paving Worker Trips | 0.68 | 1.28 | 21.75 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |
| Building 11/22/2010-09/30/2011 | 83.00 | 635.10 | 352.56 | 0.10 | 0.43 | 9.31 | 9.74 | 0.15 | 8.55 | 8.70 |
| Building Off Road Diesel | 79.83 | 616.54 | 281.51 | 0.00 | 0.00 | 8.49 | 8.49 | 0.00 | 7.81 | 7.81 |
| Building Vendor Trips | 1.31 | 15.06 | 11.69 | 0.03 | 0.10 | 0.63 | 0.73 | 0.03 | 0.58 | 0.61 |
| Building Worker Trips | 1.87 | 3.50 | 59.36 | 0.07 | 0.33 | 0.19 | 0.52 | 0.12 | 0.16 | 0.28 |
| Coating 11/22/2010-09/30/2011 | 31.55 | 0.06 | 1.07 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |
| Architectural Coating | 31.51 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.03 | 0.06 | 1.07 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |
| Fine Grading 11/22/2010-09/30/2011 | 0.55 | 7.23 | 2.78 | 0.01 | 0.03 | 0.30 | 0.33 | 0.01 | 0.27 | 0.28 |
| Fine Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Off Road Diesel | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading On Road Diesel | 0.55 | 7.23 | 2.78 | 0.01 | 0.03 | 0.30 | 0.33 | 0.01 | 0.27 | 0.28 |
| Fine Grading Worker Trips | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**9/17/2010 01:36:07 PM**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 1/3/2011-9/30/2011 Active Days: 195 | 177.97 | 1,086.55 | 612.89 | **0.14** | **0.61** | 15.83 | 16.44 | **0.22** | 14.54 | 14.76 |
| Asphalt 11/22/2010-09/30/2011 | 69.29 | 494.48 | 273.31 | 0.03 | 0.14 | 6.97 | 7.11 | 0.05 | 6.40 | 6.45 |
| Paving Off-Gas | 1.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Off Road Diesel | 67.35 | 489.44 | 251.58 | 0.00 | 0.00 | 6.74 | 6.74 | 0.00 | 6.20 | 6.20 |
| Paving On Road Diesel | 0.30 | 3.86 | 1.49 | 0.01 | 0.02 | 0.16 | 0.17 | 0.01 | 0.14 | 0.15 |
| Paving Worker Trips | 0.62 | 1.17 | 20.24 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |
| Building 11/22/2010-09/30/2011 | 76.63 | 585.51 | 336.08 | 0.10 | 0.43 | 8.60 | 9.03 | 0.15 | 7.90 | 8.05 |
| Building Off Road Diesel | 73.72 | 568.73 | 270.00 | 0.00 | 0.00 | 7.85 | 7.85 | 0.00 | 7.22 | 7.22 |
| Building Vendor Trips | 1.20 | 13.57 | 10.84 | 0.03 | 0.10 | 0.56 | 0.66 | 0.03 | 0.51 | 0.55 |
| Building Worker Trips | 1.70 | 3.20 | 55.25 | 0.07 | 0.33 | 0.19 | 0.52 | 0.12 | 0.16 | 0.28 |
| Coating 11/22/2010-09/30/2011 | 31.54 | 0.06 | 1.00 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |
| Architectural Coating | 31.51 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.03 | 0.06 | 1.00 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |
| Fine Grading 11/22/2010-09/30/2011 | 0.51 | 6.51 | 2.50 | 0.01 | 0.03 | 0.26 | 0.29 | 0.01 | 0.24 | 0.25 |
| Fine Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Off Road Diesel | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading On Road Diesel | 0.51 | 6.51 | 2.50 | 0.01 | 0.03 | 0.26 | 0.29 | 0.01 | 0.24 | 0.25 |
| Fine Grading Worker Trips | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

Construction Related Mitigation Measures

The following mitigation measures apply to Phase: Paving 11/22/2010 - 9/30/2011 - Asphalt Paving

For Excavators, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Excavators, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Graders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Graders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Off Highway Tractors, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Off Highway Tractors, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

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For Off Highway Trucks, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Off Highway Trucks, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Other Equipment, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Other Equipment, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Pavers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Pavers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Rollers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Rollers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Scrapers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Scrapers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Tractors/Loaders/Backhoes, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Tractors/Loaders/Backhoes, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Trenchers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Trenchers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

The following mitigation measures apply to Phase: Building Construction 11/22/2010 - 9/30/2011 - Building Construction

For Cranes, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Cranes, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

**9/17/2010 01:36:07 PM**

For Tractors/Loaders/Backhoes, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Tractors/Loaders/Backhoes, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Graders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Graders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Off Highway Trucks, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Off Highway Trucks, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Other Equipment, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Other Equipment, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Pavers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Pavers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Rough Terrain Forklifts, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Rough Terrain Forklifts, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Skid Steer Loaders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Skid Steer Loaders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Trenchers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Trenchers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

**9/17/2010 01:41:49 PM**

Urbemis 2007 Version 9.2.4

Combined Summer Emissions Reports (Pounds/Day)

File Name: Z:\Air Quality\032.225 Landmark Village Recirculated\URBEMIS2007 Construction - Mitigated\Landmark Recirc Construction wk092.urb924

Project Name: Landmark Village - Construction

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| 2011 TOTALS (lbs/day unmitigated) | 196.86 | 1,435.16 | 622.94 | 0.05 | 0.19 | 67.56 | 67.75 | 0.07 | 62.15 | 62.21 |
| 2011 TOTALS (lbs/day mitigated) | 196.86 | 1,221.69 | 622.94 | 0.05 | 0.19 | 17.27 | 17.46 | 0.07 | 15.88 | 15.95 |

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 10/3/2011-10/7/2011 Active Days: 5 | **196.86** | **1,435.16** | **622.94** | **0.05** | **0.19** | **67.56** | **67.75** | **0.07** | **62.15** | **62.21** |
| Asphalt 10/03/2011-10/07/2011 | 69.29 | 580.85 | 273.31 | 0.03 | 0.14 | 27.19 | 27.33 | 0.05 | 25.01 | 25.06 |
| Paving Off-Gas | 1.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Off Road Diesel | 67.35 | 575.82 | 251.58 | 0.00 | 0.00 | 26.96 | 26.96 | 0.00 | 24.81 | 24.81 |
| Paving On Road Diesel | 0.30 | 3.86 | 1.49 | 0.01 | 0.02 | 0.16 | 0.17 | 0.01 | 0.14 | 0.15 |
| Paving Worker Trips | 0.62 | 1.17 | 20.24 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |
| Building 10/03/2011-10/07/2011 | 95.09 | 847.74 | 346.13 | 0.00 | 0.01 | 40.10 | 40.11 | 0.00 | 36.90 | 36.90 |
| Building Off Road Diesel | 95.02 | 847.36 | 344.65 | 0.00 | 0.00 | 40.09 | 40.09 | 0.00 | 36.88 | 36.88 |
| Building Vendor Trips | 0.03 | 0.30 | 0.24 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 |
| Building Worker Trips | 0.04 | 0.07 | 1.24 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |
| Coating 10/03/2011-10/07/2011 | 31.97 | 0.06 | 1.00 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |
| Architectural Coating | 31.94 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.03 | 0.06 | 1.00 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |

**9/17/2010 01:41:49 PM**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Fine Grading 10/03/2011-10/07/2011 | 0.51 | 6.51 | 2.50 | 0.01 | 0.03 | 0.26 | 0.29 | 0.01 | 0.24 | 0.25 |
| Fine Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Off Road Diesel | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading On Road Diesel | 0.51 | 6.51 | 2.50 | 0.01 | 0.03 | 0.26 | 0.29 | 0.01 | 0.24 | 0.25 |
| Fine Grading Worker Trips | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

Phase Assumptions

Phase: Fine Grading 10/3/2011 - 10/7/2011 - Surrogate for Paving On-Road Trucks

Total Acres Disturbed: 0

Maximum Daily Acreage Disturbed: 0

Fugitive Dust Level of Detail: Default

0 lbs per acre-day

On Road Truck Travel (VMT): 232.32

Off-Road Equipment:

Phase: Paving 10/3/2011 - 10/7/2011 - Asphalt Paving

Acres to be Paved: 1.92

Off-Road Equipment:

8 Excavators (168 hp) operating at a 0.57 load factor for 8 hours per day

4 Graders (174 hp) operating at a 0.61 load factor for 8 hours per day

3 Off Highway Tractors (267 hp) operating at a 0.65 load factor for 8 hours per day

14 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day

18 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day

2 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day

8 Rollers (95 hp) operating at a 0.56 load factor for 6 hours per day

6 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day

6 Scrapers (313 hp) operating at a 0.72 load factor for 8 hours per day

4 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 0 hours per day

10 Trenchers (63 hp) operating at a 0.75 load factor for 8 hours per day

**9/17/2010 01:41:49 PM**

Phase: Building Construction 10/3/2011 - 10/7/2011 - Building Construction

Off-Road Equipment:

9 Cranes (399 hp) operating at a 0.43 load factor for 6 hours per day

3 Graders (174 hp) operating at a 0.61 load factor for 8 hours per day

13 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day

76 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day

5 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day

13 Rough Terrain Forklifts (93 hp) operating at a 0.6 load factor for 8 hours per day

10 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day

2 Skid Steer Loaders (44 hp) operating at a 0.55 load factor for 8 hours per day

15 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 8 hours per day

11 Trenchers (63 hp) operating at a 0.75 load factor for 8 hours per day

Phase: Architectural Coating 10/3/2011 - 10/7/2011 - Architectural Coating

Rule: Residential Interior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 100

Rule: Residential Interior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 50

Rule: Residential Exterior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 250

Rule: Residential Exterior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 100

Rule: Nonresidential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Rule: Nonresidential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Construction Mitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Summer Pounds Per Day, Mitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 10/3/2011-10/7/2011 Active Days: 5 | **196.86** | 1,221.69 | **622.94** | **0.05** | **0.19** | 17.27 | 17.46 | **0.07** | 15.88 | 15.95 |
| Asphalt 10/03/2011-10/07/2011 | 69.29 | 494.48 | 273.31 | 0.03 | 0.14 | 6.97 | 7.11 | 0.05 | 6.40 | 6.45 |
| Paving Off-Gas | 1.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Off Road Diesel | 67.35 | 489.44 | 251.58 | 0.00 | 0.00 | 6.74 | 6.74 | 0.00 | 6.20 | 6.20 |
| Paving On Road Diesel | 0.30 | 3.86 | 1.49 | 0.01 | 0.02 | 0.16 | 0.17 | 0.01 | 0.14 | 0.15 |
| Paving Worker Trips | 0.62 | 1.17 | 20.24 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |
| Building 10/03/2011-10/07/2011 | 95.09 | 720.64 | 346.13 | 0.00 | 0.01 | 10.04 | 10.05 | 0.00 | 9.24 | 9.24 |
| Building Off Road Diesel | 95.02 | 720.26 | 344.65 | 0.00 | 0.00 | 10.02 | 10.02 | 0.00 | 9.22 | 9.22 |
| Building Vendor Trips | 0.03 | 0.30 | 0.24 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 |
| Building Worker Trips | 0.04 | 0.07 | 1.24 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |

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| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Coating 10/03/2011-10/07/2011 | 31.97 | 0.06 | 1.00 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |
| Architectural Coating | 31.94 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.03 | 0.06 | 1.00 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |
| Fine Grading 10/03/2011-10/07/2011 | 0.51 | 6.51 | 2.50 | 0.01 | 0.03 | 0.26 | 0.29 | 0.01 | 0.24 | 0.25 |
| Fine Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Off Road Diesel | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading On Road Diesel | 0.51 | 6.51 | 2.50 | 0.01 | 0.03 | 0.26 | 0.29 | 0.01 | 0.24 | 0.25 |
| Fine Grading Worker Trips | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

Construction Related Mitigation Measures

The following mitigation measures apply to Phase: Paving 10/3/2011 - 10/7/2011 - Asphalt Paving

For Excavators, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Excavators, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Graders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Graders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Off Highway Tractors, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Off Highway Tractors, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Off Highway Trucks, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Off Highway Trucks, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Other Equipment, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Other Equipment, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Pavers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Pavers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

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For Rollers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Rollers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Scrapers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Scrapers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Tractors/Loaders/Backhoes, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Tractors/Loaders/Backhoes, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Trenchers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Trenchers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

The following mitigation measures apply to Phase: Building Construction 10/3/2011 - 10/7/2011 - Building Construction

For Cranes, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Cranes, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Tractors/Loaders/Backhoes, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Tractors/Loaders/Backhoes, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Graders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Graders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Off Highway Trucks, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Off Highway Trucks, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

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For Other Equipment, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Other Equipment, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Pavers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Pavers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Rough Terrain Forklifts, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Rough Terrain Forklifts, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Skid Steer Loaders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Skid Steer Loaders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Trenchers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Trenchers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

**9/17/2010 01:42:48 PM**

Urbemis 2007 Version 9.2.4

Combined Winter Emissions Reports (Pounds/Day)

File Name: Z:\Air Quality\032.225 Landmark Village Recirculated\URBEMIS2007 Construction - Mitigated\Landmark Recirc Construction wk092.urb924

Project Name: Landmark Village - Construction

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| 2011 TOTALS (lbs/day unmitigated) | 196.86 | 1,435.16 | 622.94 | 0.05 | 0.19 | 67.56 | 67.75 | 0.07 | 62.15 | 62.21 |
| 2011 TOTALS (lbs/day mitigated) | 196.86 | 1,221.69 | 622.94 | 0.05 | 0.19 | 17.27 | 17.46 | 0.07 | 15.88 | 15.95 |

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Winter Pounds Per Day, Unmitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 10/3/2011-10/7/2011 Active Days: 5 | **196.86** | **1,435.16** | **622.94** | **0.05** | **0.19** | **67.56** | **67.75** | **0.07** | **62.15** | **62.21** |
| Asphalt 10/03/2011-10/07/2011 | 69.29 | 580.85 | 273.31 | 0.03 | 0.14 | 27.19 | 27.33 | 0.05 | 25.01 | 25.06 |
| Paving Off-Gas | 1.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Off Road Diesel | 67.35 | 575.82 | 251.58 | 0.00 | 0.00 | 26.96 | 26.96 | 0.00 | 24.81 | 24.81 |
| Paving On Road Diesel | 0.30 | 3.86 | 1.49 | 0.01 | 0.02 | 0.16 | 0.17 | 0.01 | 0.14 | 0.15 |
| Paving Worker Trips | 0.62 | 1.17 | 20.24 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |
| Building 10/03/2011-10/07/2011 | 95.09 | 847.74 | 346.13 | 0.00 | 0.01 | 40.10 | 40.11 | 0.00 | 36.90 | 36.90 |
| Building Off Road Diesel | 95.02 | 847.36 | 344.65 | 0.00 | 0.00 | 40.09 | 40.09 | 0.00 | 36.88 | 36.88 |
| Building Vendor Trips | 0.03 | 0.30 | 0.24 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 |
| Building Worker Trips | 0.04 | 0.07 | 1.24 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |
| Coating 10/03/2011-10/07/2011 | 31.97 | 0.06 | 1.00 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |
| Architectural Coating | 31.94 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.03 | 0.06 | 1.00 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |

**9/17/2010 01:42:48 PM**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Fine Grading 10/03/2011-10/07/2011 | 0.51 | 6.51 | 2.50 | 0.01 | 0.03 | 0.26 | 0.29 | 0.01 | 0.24 | 0.25 |
| Fine Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Off Road Diesel | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading On Road Diesel | 0.51 | 6.51 | 2.50 | 0.01 | 0.03 | 0.26 | 0.29 | 0.01 | 0.24 | 0.25 |
| Fine Grading Worker Trips | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

Phase Assumptions

Phase: Fine Grading 10/3/2011 - 10/7/2011 - Surrogate for Paving On-Road Trucks
Total Acres Disturbed: 0
Maximum Daily Acreage Disturbed: 0
Fugitive Dust Level of Detail: Default
0 lbs per acre-day
On Road Truck Travel (VMT): 232.32
Off-Road Equipment:

Phase: Paving 10/3/2011 - 10/7/2011 - Asphalt Paving
Acres to be Paved: 1.92
Off-Road Equipment:
8 Excavators (168 hp) operating at a 0.57 load factor for 8 hours per day
4 Graders (174 hp) operating at a 0.61 load factor for 8 hours per day
3 Off Highway Tractors (267 hp) operating at a 0.65 load factor for 8 hours per day
14 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day
18 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day
2 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day
8 Rollers (95 hp) operating at a 0.56 load factor for 6 hours per day
6 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day
6 Scrapers (313 hp) operating at a 0.72 load factor for 8 hours per day
4 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 0 hours per day
10 Trenchers (63 hp) operating at a 0.75 load factor for 8 hours per day

Phase: Building Construction 10/3/2011 - 10/7/2011 - Building Construction
Off-Road Equipment:
9 Cranes (399 hp) operating at a 0.43 load factor for 6 hours per day
3 Graders (174 hp) operating at a 0.61 load factor for 8 hours per day
13 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day
76 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day
5 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day
13 Rough Terrain Forklifts (93 hp) operating at a 0.6 load factor for 8 hours per day
10 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day
2 Skid Steer Loaders (44 hp) operating at a 0.55 load factor for 8 hours per day
15 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 8 hours per day
11 Trenchers (63 hp) operating at a 0.75 load factor for 8 hours per day

**9/17/2010 01:42:48 PM**

Phase: Architectural Coating 10/3/2011 - 10/7/2011 - Architectural Coating

Rule: Residential Interior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 100

Rule: Residential Interior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 50

Rule: Residential Exterior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 250

Rule: Residential Exterior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 100

Rule: Nonresidential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Rule: Nonresidential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Construction Mitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Winter Pounds Per Day, Mitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 10/3/2011-10/7/2011 Active Days: 5 | **196.86** | 1,221.69 | **622.94** | **0.05** | **0.19** | 17.27 | 17.46 | **0.07** | 15.88 | 15.95 |
| Asphalt 10/03/2011-10/07/2011 | 69.29 | 494.48 | 273.31 | 0.03 | 0.14 | 6.97 | 7.11 | 0.05 | 6.40 | 6.45 |
| Paving Off-Gas | 1.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Off Road Diesel | 67.35 | 489.44 | 251.58 | 0.00 | 0.00 | 6.74 | 6.74 | 0.00 | 6.20 | 6.20 |
| Paving On Road Diesel | 0.30 | 3.86 | 1.49 | 0.01 | 0.02 | 0.16 | 0.17 | 0.01 | 0.14 | 0.15 |
| Paving Worker Trips | 0.62 | 1.17 | 20.24 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |
| Building 10/03/2011-10/07/2011 | 95.09 | 720.64 | 346.13 | 0.00 | 0.01 | 10.04 | 10.05 | 0.00 | 9.24 | 9.24 |
| Building Off Road Diesel | 95.02 | 720.26 | 344.65 | 0.00 | 0.00 | 10.02 | 10.02 | 0.00 | 9.22 | 9.22 |
| Building Vendor Trips | 0.03 | 0.30 | 0.24 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 |
| Building Worker Trips | 0.04 | 0.07 | 1.24 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |
| Coating 10/03/2011-10/07/2011 | 31.97 | 0.06 | 1.00 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |
| Architectural Coating | 31.94 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.03 | 0.06 | 1.00 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |
| Fine Grading 10/03/2011-10/07/2011 | 0.51 | 6.51 | 2.50 | 0.01 | 0.03 | 0.26 | 0.29 | 0.01 | 0.24 | 0.25 |
| Fine Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Off Road Diesel | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading On Road Diesel | 0.51 | 6.51 | 2.50 | 0.01 | 0.03 | 0.26 | 0.29 | 0.01 | 0.24 | 0.25 |
| Fine Grading Worker Trips | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

Construction Related Mitigation Measures

The following mitigation measures apply to Phase: Paving 10/3/2011 - 10/7/2011 - Asphalt Paving

For Excavators, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Excavators, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

**9/17/2010 01:42:48 PM**

For Graders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Graders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Off Highway Tractors, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Off Highway Tractors, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Off Highway Trucks, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Off Highway Trucks, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Other Equipment, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Other Equipment, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Pavers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Pavers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Rollers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Rollers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Scrapers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Scrapers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Tractors/Loaders/Backhoes, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Tractors/Loaders/Backhoes, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Trenchers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Trenchers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

The following mitigation measures apply to Phase: Building Construction 10/3/2011 - 10/7/2011 - Building Construction

For Cranes, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

**9/17/2010 01:42:48 PM**

For Cranes, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Tractors/Loaders/Backhoes, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Tractors/Loaders/Backhoes, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Graders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Graders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Off Highway Trucks, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Off Highway Trucks, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Other Equipment, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Other Equipment, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Pavers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Pavers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Rough Terrain Forklifts, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Rough Terrain Forklifts, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Skid Steer Loaders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Skid Steer Loaders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Trenchers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Trenchers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

**9/17/2010 01:47:55 PM**

Urbemis 2007 Version 9.2.4

Combined Summer Emissions Reports (Pounds/Day)

File Name: Z:\Air Quality\032.225 Landmark Village Recirculated\URBEMIS2007 Construction - Mitigated\Landmark Recirc Construction wk093-144.urb924

Project Name: Landmark Village - Construction

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| 2011 TOTALS (lbs/day unmitigated) | 177.84 | 1,326.41 | 642.49 | 0.14 | 0.60 | 62.41 | 63.01 | 0.21 | 57.39 | 57.61 |
| 2011 TOTALS (lbs/day mitigated) | 177.84 | 1,130.44 | 642.49 | 0.14 | 0.60 | 16.29 | 16.88 | 0.21 | 14.96 | 15.17 |
| 2012 TOTALS (lbs/day unmitigated) | 170.22 | 1,228.45 | 616.13 | 0.14 | 0.60 | 58.64 | 59.23 | 0.21 | 53.92 | 54.13 |
| 2012 TOTALS (lbs/day mitigated) | 170.22 | 1,046.87 | 616.13 | 0.14 | 0.60 | 15.29 | 15.89 | 0.21 | 14.04 | 14.25 |

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 10/10/2011-12/30/2011 Active Days: 60 | **177.84** | **1,326.41** | **642.49** | **0.14** | **0.60** | **62.41** | **63.01** | **0.21** | **57.39** | **57.61** |
| Asphalt 10/10/2011-10/19/2012 | 68.00 | 577.06 | 271.85 | 0.03 | 0.12 | 27.04 | 27.16 | 0.04 | 24.87 | 24.91 |
| Paving Off-Gas | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Off Road Diesel | 67.35 | 575.82 | 251.58 | 0.00 | 0.00 | 26.96 | 26.96 | 0.00 | 24.81 | 24.81 |
| Paving On Road Diesel | 0.01 | 0.07 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Worker Trips | 0.62 | 1.17 | 20.24 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |
| Building 10/10/2011-10/19/2012 | 84.62 | 749.18 | 369.70 | 0.11 | 0.47 | 35.37 | 35.83 | 0.17 | 32.52 | 32.69 |
| Building Off Road Diesel | 81.44 | 730.64 | 297.87 | 0.00 | 0.00 | 34.54 | 34.54 | 0.00 | 31.77 | 31.77 |
| Building Vendor Trips | 1.34 | 15.06 | 12.00 | 0.03 | 0.11 | 0.62 | 0.73 | 0.04 | 0.57 | 0.61 |
| Building Worker Trips | 1.84 | 3.47 | 59.82 | 0.08 | 0.36 | 0.21 | 0.57 | 0.13 | 0.18 | 0.31 |

**9/17/2010 01:47:55 PM**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Coating 10/10/2011-10/19/2012 | 25.22 | 0.05 | 0.90 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 25.19 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.03 | 0.05 | 0.90 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Fine Grading 10/10/2011-10/19/2012 | 0.01 | 0.12 | 0.05 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Fine Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Off Road Diesel | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading On Road Diesel | 0.01 | 0.12 | 0.05 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Fine Grading Worker Trips | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Time Slice 1/2/2012-10/19/2012 Active Days: 210 | 170.22 | 1,228.45 | 616.13 | **0.14** | **0.60** | 58.64 | 59.23 | **0.21** | 53.92 | 54.13 |
| Asphalt 10/10/2011-10/19/2012 | 64.77 | 536.47 | 260.69 | 0.03 | 0.12 | 25.20 | 25.32 | 0.04 | 23.18 | 23.22 |
| Paving Off-Gas | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Off Road Diesel | 64.18 | 535.33 | 241.83 | 0.00 | 0.00 | 25.12 | 25.12 | 0.00 | 23.11 | 23.11 |
| Paving On Road Diesel | 0.01 | 0.06 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Worker Trips | 0.57 | 1.08 | 18.83 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |
| Building 10/10/2011-10/19/2012 | 80.23 | 691.83 | 354.57 | 0.11 | 0.47 | 33.43 | 33.90 | 0.17 | 30.74 | 30.91 |
| Building Off Road Diesel | 77.33 | 675.20 | 287.82 | 0.00 | 0.00 | 32.67 | 32.67 | 0.00 | 30.06 | 30.06 |
| Building Vendor Trips | 1.22 | 13.45 | 11.10 | 0.03 | 0.11 | 0.55 | 0.66 | 0.04 | 0.50 | 0.54 |
| Building Worker Trips | 1.68 | 3.18 | 55.65 | 0.08 | 0.36 | 0.21 | 0.57 | 0.13 | 0.18 | 0.31 |
| Coating 10/10/2011-10/19/2012 | 25.21 | 0.05 | 0.84 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 25.19 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.03 | 0.05 | 0.84 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Fine Grading 10/10/2011-10/19/2012 | 0.01 | 0.11 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Off Road Diesel | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading On Road Diesel | 0.01 | 0.11 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Worker Trips | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**9/17/2010 01:47:55 PM**

Phase Assumptions

Phase: Fine Grading 10/10/2011 - 10/19/2012 - Surrogate for Paving On-Road Trucks
Total Acres Disturbed: 0
Maximum Daily Acreage Disturbed: 0
Fugitive Dust Level of Detail: Default
0 lbs per acre-day
On Road Truck Travel (VMT): 4.3
Off-Road Equipment:

Phase: Paving 10/10/2011 - 10/19/2012 - Asphalt Paving
Acres to be Paved: 1.92
Off-Road Equipment:
8 Excavators (168 hp) operating at a 0.57 load factor for 8 hours per day
4 Graders (174 hp) operating at a 0.61 load factor for 8 hours per day
3 Off Highway Tractors (267 hp) operating at a 0.65 load factor for 8 hours per day
14 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day
18 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day
2 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day
8 Rollers (95 hp) operating at a 0.56 load factor for 6 hours per day
6 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day
6 Scrapers (313 hp) operating at a 0.72 load factor for 8 hours per day
4 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 0 hours per day
10 Trenchers (63 hp) operating at a 0.75 load factor for 8 hours per day

Phase: Building Construction 10/10/2011 - 10/19/2012 - Building Construction
Off-Road Equipment:
8 Cranes (399 hp) operating at a 0.43 load factor for 6 hours per day
2 Graders (174 hp) operating at a 0.61 load factor for 8 hours per day
9 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day
70 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day
4 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day
12 Rough Terrain Forklifts (93 hp) operating at a 0.6 load factor for 8 hours per day
10 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day
2 Skid Steer Loaders (44 hp) operating at a 0.55 load factor for 8 hours per day
13 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 8 hours per day
9 Trenchers (63 hp) operating at a 0.75 load factor for 8 hours per day

**9/17/2010 01:47:55 PM**

Phase: Architectural Coating 10/10/2011 - 10/19/2012 - Architectural Coating

Rule: Residential Interior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 100

Rule: Residential Interior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 50

Rule: Residential Exterior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 250

Rule: Residential Exterior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 100

Rule: Nonresidential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Rule: Nonresidential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Construction Mitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Summer Pounds Per Day, Mitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 10/10/2011-12/30/2011 Active Days: 60 | **177.84** | 1,130.44 | **642.49** | **0.14** | **0.60** | 16.29 | 16.88 | **0.21** | 14.96 | 15.17 |
| Asphalt 10/10/2011-10/19/2012 | 68.00 | 490.69 | 271.85 | 0.03 | 0.12 | 6.81 | 6.94 | 0.04 | 6.26 | 6.31 |
| Paving Off-Gas | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Off Road Diesel | 67.35 | 489.44 | 251.58 | 0.00 | 0.00 | 6.74 | 6.74 | 0.00 | 6.20 | 6.20 |
| Paving On Road Diesel | 0.01 | 0.07 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Worker Trips | 0.62 | 1.17 | 20.24 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |
| Building 10/10/2011-10/19/2012 | 84.62 | 639.58 | 369.70 | 0.11 | 0.47 | 9.46 | 9.93 | 0.17 | 8.69 | 8.86 |
| Building Off Road Diesel | 81.44 | 621.05 | 297.87 | 0.00 | 0.00 | 8.63 | 8.63 | 0.00 | 7.94 | 7.94 |
| Building Vendor Trips | 1.34 | 15.06 | 12.00 | 0.03 | 0.11 | 0.62 | 0.73 | 0.04 | 0.57 | 0.61 |
| Building Worker Trips | 1.84 | 3.47 | 59.82 | 0.08 | 0.36 | 0.21 | 0.57 | 0.13 | 0.18 | 0.31 |
| Coating 10/10/2011-10/19/2012 | 25.22 | 0.05 | 0.90 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 25.19 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.03 | 0.05 | 0.90 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Fine Grading 10/10/2011-10/19/2012 | 0.01 | 0.12 | 0.05 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Fine Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Off Road Diesel | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading On Road Diesel | 0.01 | 0.12 | 0.05 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Fine Grading Worker Trips | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**9/17/2010 01:47:55 PM**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 1/2/2012-10/19/2012 Active Days: 210 | 170.22 | 1,046.87 | 616.13 | **0.14** | **0.60** | 15.29 | 15.89 | **0.21** | 14.04 | 14.25 |
| Asphalt 10/10/2011-10/19/2012 | 64.77 | 456.17 | 260.69 | 0.03 | 0.12 | 6.35 | 6.48 | 0.04 | 5.84 | 5.88 |
| Paving Off-Gas | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Off Road Diesel | 64.18 | 455.03 | 241.83 | 0.00 | 0.00 | 6.28 | 6.28 | 0.00 | 5.78 | 5.78 |
| Paving On Road Diesel | 0.01 | 0.06 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Worker Trips | 0.57 | 1.08 | 18.83 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |
| Building 10/10/2011-10/19/2012 | 80.23 | 590.55 | 354.57 | 0.11 | 0.47 | 8.93 | 9.40 | 0.17 | 8.19 | 8.36 |
| Building Off Road Diesel | 77.33 | 573.92 | 287.82 | 0.00 | 0.00 | 8.17 | 8.17 | 0.00 | 7.52 | 7.52 |
| Building Vendor Trips | 1.22 | 13.45 | 11.10 | 0.03 | 0.11 | 0.55 | 0.66 | 0.04 | 0.50 | 0.54 |
| Building Worker Trips | 1.68 | 3.18 | 55.65 | 0.08 | 0.36 | 0.21 | 0.57 | 0.13 | 0.18 | 0.31 |
| Coating 10/10/2011-10/19/2012 | 25.21 | 0.05 | 0.84 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 25.19 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.03 | 0.05 | 0.84 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Fine Grading 10/10/2011-10/19/2012 | 0.01 | 0.11 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Off Road Diesel | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading On Road Diesel | 0.01 | 0.11 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Worker Trips | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

Construction Related Mitigation Measures

The following mitigation measures apply to Phase: Paving 10/10/2011 - 10/19/2012 - Asphalt Paving

For Excavators, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Excavators, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Graders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Graders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Off Highway Tractors, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

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For Off Highway Tractors, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Off Highway Trucks, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Off Highway Trucks, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Other Equipment, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Other Equipment, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Pavers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Pavers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Rollers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Rollers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Scrapers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Scrapers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Tractors/Loaders/Backhoes, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Tractors/Loaders/Backhoes, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Trenchers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Trenchers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

The following mitigation measures apply to Phase: Building Construction 10/10/2011 - 10/19/2012 - Building Construction

For Cranes, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

**9/17/2010 01:47:55 PM**

For Cranes, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Tractors/Loaders/Backhoes, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Tractors/Loaders/Backhoes, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Graders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Graders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Off Highway Trucks, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Off Highway Trucks, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Other Equipment, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Other Equipment, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Pavers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Pavers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Rough Terrain Forklifts, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Rough Terrain Forklifts, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Skid Steer Loaders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Skid Steer Loaders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Trenchers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Trenchers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

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Urbemis 2007 Version 9.2.4

Combined Winter Emissions Reports (Pounds/Day)

File Name: Z:\Air Quality\032.225 Landmark Village Recirculated\URBEMIS2007 Construction - Mitigated\Landmark Recirc Construction wk093-144.urb924

Project Name: Landmark Village - Construction

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| 2011 TOTALS (lbs/day unmitigated) | 177.84 | 1,326.41 | 642.49 | 0.14 | 0.60 | 62.41 | 63.01 | 0.21 | 57.39 | 57.61 |
| 2011 TOTALS (lbs/day mitigated) | 177.84 | 1,130.44 | 642.49 | 0.14 | 0.60 | 16.29 | 16.88 | 0.21 | 14.96 | 15.17 |
| 2012 TOTALS (lbs/day unmitigated) | 170.22 | 1,228.45 | 616.13 | 0.14 | 0.60 | 58.64 | 59.23 | 0.21 | 53.92 | 54.13 |
| 2012 TOTALS (lbs/day mitigated) | 170.22 | 1,046.87 | 616.13 | 0.14 | 0.60 | 15.29 | 15.89 | 0.21 | 14.04 | 14.25 |

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Winter Pounds Per Day, Unmitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 10/10/2011-12/30/2011 Active Days: 60 | **177.84** | **1,326.41** | **642.49** | **0.14** | **0.60** | **62.41** | **63.01** | **0.21** | **57.39** | **57.61** |
| Asphalt 10/10/2011-10/19/2012 | 68.00 | 577.06 | 271.85 | 0.03 | 0.12 | 27.04 | 27.16 | 0.04 | 24.87 | 24.91 |
| Paving Off-Gas | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Off Road Diesel | 67.35 | 575.82 | 251.58 | 0.00 | 0.00 | 26.96 | 26.96 | 0.00 | 24.81 | 24.81 |
| Paving On Road Diesel | 0.01 | 0.07 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Worker Trips | 0.62 | 1.17 | 20.24 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |
| Building 10/10/2011-10/19/2012 | 84.62 | 749.18 | 369.70 | 0.11 | 0.47 | 35.37 | 35.83 | 0.17 | 32.52 | 32.69 |
| Building Off Road Diesel | 81.44 | 730.64 | 297.87 | 0.00 | 0.00 | 34.54 | 34.54 | 0.00 | 31.77 | 31.77 |
| Building Vendor Trips | 1.34 | 15.06 | 12.00 | 0.03 | 0.11 | 0.62 | 0.73 | 0.04 | 0.57 | 0.61 |
| Building Worker Trips | 1.84 | 3.47 | 59.82 | 0.08 | 0.36 | 0.21 | 0.57 | 0.13 | 0.18 | 0.31 |

**9/17/2010 01:48:44 PM**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Coating 10/10/2011-10/19/2012 | 25.22 | 0.05 | 0.90 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 25.19 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.03 | 0.05 | 0.90 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Fine Grading 10/10/2011-10/19/2012 | 0.01 | 0.12 | 0.05 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Fine Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Off Road Diesel | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading On Road Diesel | 0.01 | 0.12 | 0.05 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Fine Grading Worker Trips | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Time Slice 1/2/2012-10/19/2012 Active Days: 210 | 170.22 | 1,228.45 | 616.13 | **0.14** | **0.60** | 58.64 | 59.23 | **0.21** | 53.92 | 54.13 |
| Asphalt 10/10/2011-10/19/2012 | 64.77 | 536.47 | 260.69 | 0.03 | 0.12 | 25.20 | 25.32 | 0.04 | 23.18 | 23.22 |
| Paving Off-Gas | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Off Road Diesel | 64.18 | 535.33 | 241.83 | 0.00 | 0.00 | 25.12 | 25.12 | 0.00 | 23.11 | 23.11 |
| Paving On Road Diesel | 0.01 | 0.06 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Worker Trips | 0.57 | 1.08 | 18.83 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |
| Building 10/10/2011-10/19/2012 | 80.23 | 691.83 | 354.57 | 0.11 | 0.47 | 33.43 | 33.90 | 0.17 | 30.74 | 30.91 |
| Building Off Road Diesel | 77.33 | 675.20 | 287.82 | 0.00 | 0.00 | 32.67 | 32.67 | 0.00 | 30.06 | 30.06 |
| Building Vendor Trips | 1.22 | 13.45 | 11.10 | 0.03 | 0.11 | 0.55 | 0.66 | 0.04 | 0.50 | 0.54 |
| Building Worker Trips | 1.68 | 3.18 | 55.65 | 0.08 | 0.36 | 0.21 | 0.57 | 0.13 | 0.18 | 0.31 |
| Coating 10/10/2011-10/19/2012 | 25.21 | 0.05 | 0.84 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 25.19 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.03 | 0.05 | 0.84 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Fine Grading 10/10/2011-10/19/2012 | 0.01 | 0.11 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Off Road Diesel | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading On Road Diesel | 0.01 | 0.11 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Worker Trips | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**9/17/2010 01:48:44 PM**

Phase Assumptions

Phase: Fine Grading 10/10/2011 - 10/19/2012 - Surrogate for Paving On-Road Trucks
Total Acres Disturbed: 0
Maximum Daily Acreage Disturbed: 0
Fugitive Dust Level of Detail: Default
0 lbs per acre-day
On Road Truck Travel (VMT): 4.3
Off-Road Equipment:

Phase: Paving 10/10/2011 - 10/19/2012 - Asphalt Paving
Acres to be Paved: 1.92
Off-Road Equipment:
8 Excavators (168 hp) operating at a 0.57 load factor for 8 hours per day
4 Graders (174 hp) operating at a 0.61 load factor for 8 hours per day
3 Off Highway Tractors (267 hp) operating at a 0.65 load factor for 8 hours per day
14 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day
18 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day
2 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day
8 Rollers (95 hp) operating at a 0.56 load factor for 6 hours per day
6 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day
6 Scrapers (313 hp) operating at a 0.72 load factor for 8 hours per day
4 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 0 hours per day
10 Trenchers (63 hp) operating at a 0.75 load factor for 8 hours per day

Phase: Building Construction 10/10/2011 - 10/19/2012 - Building Construction
Off-Road Equipment:
8 Cranes (399 hp) operating at a 0.43 load factor for 6 hours per day
2 Graders (174 hp) operating at a 0.61 load factor for 8 hours per day
9 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day
70 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day
4 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day
12 Rough Terrain Forklifts (93 hp) operating at a 0.6 load factor for 8 hours per day
10 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day
2 Skid Steer Loaders (44 hp) operating at a 0.55 load factor for 8 hours per day
13 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 8 hours per day
9 Trenchers (63 hp) operating at a 0.75 load factor for 8 hours per day

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Phase: Architectural Coating 10/10/2011 - 10/19/2012 - Architectural Coating

Rule: Residential Interior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 100

Rule: Residential Interior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 50

Rule: Residential Exterior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 250

Rule: Residential Exterior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 100

Rule: Nonresidential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Rule: Nonresidential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Construction Mitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Winter Pounds Per Day, Mitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 10/10/2011-12/30/2011 Active Days: 60 | **177.84** | 1,130.44 | **642.49** | **0.14** | **0.60** | 16.29 | 16.88 | **0.21** | 14.96 | 15.17 |
| Asphalt 10/10/2011-10/19/2012 | 68.00 | 490.69 | 271.85 | 0.03 | 0.12 | 6.81 | 6.94 | 0.04 | 6.26 | 6.31 |
| Paving Off-Gas | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Off Road Diesel | 67.35 | 489.44 | 251.58 | 0.00 | 0.00 | 6.74 | 6.74 | 0.00 | 6.20 | 6.20 |
| Paving On Road Diesel | 0.01 | 0.07 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Worker Trips | 0.62 | 1.17 | 20.24 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |
| Building 10/10/2011-10/19/2012 | 84.62 | 639.58 | 369.70 | 0.11 | 0.47 | 9.46 | 9.93 | 0.17 | 8.69 | 8.86 |
| Building Off Road Diesel | 81.44 | 621.05 | 297.87 | 0.00 | 0.00 | 8.63 | 8.63 | 0.00 | 7.94 | 7.94 |
| Building Vendor Trips | 1.34 | 15.06 | 12.00 | 0.03 | 0.11 | 0.62 | 0.73 | 0.04 | 0.57 | 0.61 |
| Building Worker Trips | 1.84 | 3.47 | 59.82 | 0.08 | 0.36 | 0.21 | 0.57 | 0.13 | 0.18 | 0.31 |
| Coating 10/10/2011-10/19/2012 | 25.22 | 0.05 | 0.90 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 25.19 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.03 | 0.05 | 0.90 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Fine Grading 10/10/2011-10/19/2012 | 0.01 | 0.12 | 0.05 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Fine Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Off Road Diesel | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading On Road Diesel | 0.01 | 0.12 | 0.05 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Fine Grading Worker Trips | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**9/17/2010 01:48:44 PM**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 1/2/2012-10/19/2012 Active Days: 210 | 170.22 | 1,046.87 | 616.13 | **0.14** | **0.60** | 15.29 | 15.89 | **0.21** | 14.04 | 14.25 |
| Asphalt 10/10/2011-10/19/2012 | 64.77 | 456.17 | 260.69 | 0.03 | 0.12 | 6.35 | 6.48 | 0.04 | 5.84 | 5.88 |
| Paving Off-Gas | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Off Road Diesel | 64.18 | 455.03 | 241.83 | 0.00 | 0.00 | 6.28 | 6.28 | 0.00 | 5.78 | 5.78 |
| Paving On Road Diesel | 0.01 | 0.06 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Worker Trips | 0.57 | 1.08 | 18.83 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |
| Building 10/10/2011-10/19/2012 | 80.23 | 590.55 | 354.57 | 0.11 | 0.47 | 8.93 | 9.40 | 0.17 | 8.19 | 8.36 |
| Building Off Road Diesel | 77.33 | 573.92 | 287.82 | 0.00 | 0.00 | 8.17 | 8.17 | 0.00 | 7.52 | 7.52 |
| Building Vendor Trips | 1.22 | 13.45 | 11.10 | 0.03 | 0.11 | 0.55 | 0.66 | 0.04 | 0.50 | 0.54 |
| Building Worker Trips | 1.68 | 3.18 | 55.65 | 0.08 | 0.36 | 0.21 | 0.57 | 0.13 | 0.18 | 0.31 |
| Coating 10/10/2011-10/19/2012 | 25.21 | 0.05 | 0.84 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 25.19 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.03 | 0.05 | 0.84 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Fine Grading 10/10/2011-10/19/2012 | 0.01 | 0.11 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Off Road Diesel | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading On Road Diesel | 0.01 | 0.11 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Worker Trips | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

Construction Related Mitigation Measures

The following mitigation measures apply to Phase: Paving 10/10/2011 - 10/19/2012 - Asphalt Paving

For Excavators, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Excavators, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Graders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Graders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Off Highway Tractors, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Off Highway Tractors, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

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For Off Highway Trucks, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Off Highway Trucks, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Other Equipment, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Other Equipment, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Pavers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Pavers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Rollers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Rollers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Scrapers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Scrapers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Tractors/Loaders/Backhoes, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Tractors/Loaders/Backhoes, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Trenchers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Trenchers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

The following mitigation measures apply to Phase: Building Construction 10/10/2011 - 10/19/2012 - Building Construction

For Cranes, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Cranes, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

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For Tractors/Loaders/Backhoes, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Tractors/Loaders/Backhoes, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Graders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Graders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Off Highway Trucks, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Off Highway Trucks, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Other Equipment, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Other Equipment, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Pavers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Pavers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Rough Terrain Forklifts, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Rough Terrain Forklifts, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Skid Steer Loaders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Skid Steer Loaders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Trenchers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Trenchers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

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Urbemis 2007 Version 9.2.4

Combined Summer Emissions Reports (Pounds/Day)

File Name: Z:\Air Quality\032.225 Landmark Village Recirculated\URBEMIS2007 Construction - Mitigated\Landmark Recirc Construction wk145-158.urb924

Project Name: Landmark Village - Construction

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| 2012 TOTALS (lbs/day unmitigated) | 160.25 | 1,139.61 | 534.31 | 0.07 | 0.31 | 54.37 | 54.67 | 0.11 | 50.01 | 50.11 |
| 2012 TOTALS (lbs/day mitigated) | 160.25 | 970.89 | 534.31 | 0.07 | 0.31 | 14.07 | 14.38 | 0.11 | 12.94 | 13.04 |
| 2013 TOTALS (lbs/day unmitigated) | 153.53 | 1,056.37 | 518.33 | 0.07 | 0.31 | 49.87 | 50.18 | 0.11 | 45.87 | 45.98 |
| 2013 TOTALS (lbs/day mitigated) | 153.53 | 899.89 | 518.33 | 0.07 | 0.31 | 12.90 | 13.21 | 0.11 | 11.86 | 11.96 |

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 10/22/2012-12/31/2012 Active Days: 51 | **160.25** | **1,139.61** | **534.31** | **0.07** | **0.31** | **54.37** | **54.67** | **0.11** | **50.01** | **50.11** |
| Asphalt 10/22/2012-01/25/2013 | 66.03 | 539.84 | 261.99 | 0.03 | 0.14 | 25.33 | 25.47 | 0.05 | 23.30 | 23.35 |
| Paving Off-Gas | 1.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Off Road Diesel | 64.18 | 535.33 | 241.83 | 0.00 | 0.00 | 25.12 | 25.12 | 0.00 | 23.11 | 23.11 |
| Paving On Road Diesel | 0.28 | 3.44 | 1.33 | 0.01 | 0.02 | 0.14 | 0.16 | 0.01 | 0.12 | 0.13 |
| Paving Worker Trips | 0.57 | 1.08 | 18.83 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |
| Building 10/22/2012-01/25/2013 | 67.59 | 593.92 | 269.21 | 0.03 | 0.13 | 28.81 | 28.93 | 0.04 | 26.50 | 26.54 |
| Building Off Road Diesel | 66.80 | 589.44 | 251.22 | 0.00 | 0.00 | 28.60 | 28.60 | 0.00 | 26.31 | 26.31 |
| Building Vendor Trips | 0.33 | 3.62 | 2.99 | 0.01 | 0.03 | 0.15 | 0.18 | 0.01 | 0.14 | 0.15 |
| Building Worker Trips | 0.45 | 0.86 | 15.00 | 0.02 | 0.10 | 0.06 | 0.15 | 0.04 | 0.05 | 0.08 |

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| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Coating 10/22/2012-01/25/2013 | 26.18 | 0.05 | 0.87 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 26.15 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.03 | 0.05 | 0.87 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Fine Grading 10/22/2012-01/25/2013 | 0.47 | 5.80 | 2.24 | 0.01 | 0.03 | 0.23 | 0.26 | 0.01 | 0.21 | 0.22 |
| Fine Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Off Road Diesel | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading On Road Diesel | 0.47 | 5.80 | 2.24 | 0.01 | 0.03 | 0.23 | 0.26 | 0.01 | 0.21 | 0.22 |
| Fine Grading Worker Trips | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Time Slice 1/1/2013-1/25/2013 Active Days: 19 | 153.53 | 1,056.37 | 518.33 | **0.07** | **0.31** | 49.87 | 50.18 | **0.11** | 45.87 | 45.98 |
| Asphalt 10/22/2012-01/25/2013 | 63.16 | 502.13 | 253.10 | 0.03 | 0.14 | 23.78 | 23.92 | 0.05 | 21.87 | 21.92 |
| Paving Off-Gas | 1.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Off Road Diesel | 61.39 | 498.12 | 234.42 | 0.00 | 0.00 | 23.59 | 23.59 | 0.00 | 21.71 | 21.71 |
| Paving On Road Diesel | 0.25 | 3.03 | 1.18 | 0.01 | 0.02 | 0.12 | 0.14 | 0.01 | 0.11 | 0.11 |
| Paving Worker Trips | 0.52 | 0.98 | 17.50 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |
| Building 10/22/2012-01/25/2013 | 63.77 | 549.08 | 262.44 | 0.03 | 0.13 | 25.89 | 26.02 | 0.04 | 23.81 | 23.86 |
| Building Off Road Diesel | 63.06 | 545.10 | 245.76 | 0.00 | 0.00 | 25.70 | 25.70 | 0.00 | 23.65 | 23.65 |
| Building Vendor Trips | 0.30 | 3.20 | 2.75 | 0.01 | 0.03 | 0.13 | 0.16 | 0.01 | 0.12 | 0.13 |
| Building Worker Trips | 0.41 | 0.78 | 13.94 | 0.02 | 0.10 | 0.06 | 0.15 | 0.04 | 0.05 | 0.08 |
| Coating 10/22/2012-01/25/2013 | 26.17 | 0.05 | 0.81 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 26.15 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.02 | 0.05 | 0.81 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Fine Grading 10/22/2012-01/25/2013 | 0.42 | 5.11 | 1.98 | 0.01 | 0.03 | 0.20 | 0.23 | 0.01 | 0.18 | 0.19 |
| Fine Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Off Road Diesel | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading On Road Diesel | 0.42 | 5.11 | 1.98 | 0.01 | 0.03 | 0.20 | 0.23 | 0.01 | 0.18 | 0.19 |
| Fine Grading Worker Trips | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

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Phase Assumptions

Phase: Fine Grading 10/22/2012 - 1/25/2013 - Surrogate for Paving On-Road Trucks
Total Acres Disturbed: 0
Maximum Daily Acreage Disturbed: 0
Fugitive Dust Level of Detail: Default
0 lbs per acre-day
On Road Truck Travel (VMT): 232.15
Off-Road Equipment:

Phase: Paving 10/22/2012 - 1/25/2013 - Asphalt Paving
Acres to be Paved: 26.86
Off-Road Equipment:
8 Excavators (168 hp) operating at a 0.57 load factor for 8 hours per day
4 Graders (174 hp) operating at a 0.61 load factor for 8 hours per day
3 Off Highway Tractors (267 hp) operating at a 0.65 load factor for 8 hours per day
14 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day
18 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day
2 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day
8 Rollers (95 hp) operating at a 0.56 load factor for 6 hours per day
6 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day
6 Scrapers (313 hp) operating at a 0.72 load factor for 8 hours per day
4 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 0 hours per day
10 Trenchers (63 hp) operating at a 0.75 load factor for 8 hours per day

Phase: Building Construction 10/22/2012 - 1/25/2013 - Building Construction
Off-Road Equipment:
8 Cranes (399 hp) operating at a 0.43 load factor for 6 hours per day
1 Graders (174 hp) operating at a 0.61 load factor for 8 hours per day
5 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day
67 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day
3 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day
11 Rough Terrain Forklifts (93 hp) operating at a 0.6 load factor for 8 hours per day
9 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day
2 Skid Steer Loaders (44 hp) operating at a 0.55 load factor for 8 hours per day
12 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 8 hours per day
8 Trenchers (63 hp) operating at a 0.75 load factor for 8 hours per day

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Phase: Architectural Coating 10/22/2012 - 1/25/2013 - Architectural Coating

Rule: Residential Interior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 100

Rule: Residential Interior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 50

Rule: Residential Exterior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 250

Rule: Residential Exterior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 100

Rule: Nonresidential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Rule: Nonresidential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Construction Mitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Summer Pounds Per Day, Mitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 10/22/2012-12/31/2012 Active Days: 51 | **160.25** | 970.89 | **534.31** | **0.07** | **0.31** | 14.07 | 14.38 | **0.11** | 12.94 | 13.04 |
| Asphalt 10/22/2012-01/25/2013 | 66.03 | 459.54 | 261.99 | 0.03 | 0.14 | 6.49 | 6.63 | 0.05 | 5.96 | 6.01 |
| Paving Off-Gas | 1.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Off Road Diesel | 64.18 | 455.03 | 241.83 | 0.00 | 0.00 | 6.28 | 6.28 | 0.00 | 5.78 | 5.78 |
| Paving On Road Diesel | 0.28 | 3.44 | 1.33 | 0.01 | 0.02 | 0.14 | 0.16 | 0.01 | 0.12 | 0.13 |
| Paving Worker Trips | 0.57 | 1.08 | 18.83 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |
| Building 10/22/2012-01/25/2013 | 67.59 | 505.50 | 269.21 | 0.03 | 0.13 | 7.35 | 7.48 | 0.04 | 6.76 | 6.81 |
| Building Off Road Diesel | 66.80 | 501.02 | 251.22 | 0.00 | 0.00 | 7.15 | 7.15 | 0.00 | 6.58 | 6.58 |
| Building Vendor Trips | 0.33 | 3.62 | 2.99 | 0.01 | 0.03 | 0.15 | 0.18 | 0.01 | 0.14 | 0.15 |
| Building Worker Trips | 0.45 | 0.86 | 15.00 | 0.02 | 0.10 | 0.06 | 0.15 | 0.04 | 0.05 | 0.08 |
| Coating 10/22/2012-01/25/2013 | 26.18 | 0.05 | 0.87 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 26.15 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.03 | 0.05 | 0.87 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Fine Grading 10/22/2012-01/25/2013 | 0.47 | 5.80 | 2.24 | 0.01 | 0.03 | 0.23 | 0.26 | 0.01 | 0.21 | 0.22 |
| Fine Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Off Road Diesel | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading On Road Diesel | 0.47 | 5.80 | 2.24 | 0.01 | 0.03 | 0.23 | 0.26 | 0.01 | 0.21 | 0.22 |
| Fine Grading Worker Trips | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

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| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 1/1/2013-1/25/2013 Active Days: 19 | 153.53 | 899.89 | 518.33 | **0.07** | **0.31** | 12.90 | 13.21 | **0.11** | 11.86 | 11.96 |
| Asphalt 10/22/2012-01/25/2013 | 63.16 | 427.41 | 253.10 | 0.03 | 0.14 | 6.09 | 6.23 | 0.05 | 5.59 | 5.64 |
| Paving Off-Gas | 1.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Off Road Diesel | 61.39 | 423.40 | 234.42 | 0.00 | 0.00 | 5.90 | 5.90 | 0.00 | 5.43 | 5.43 |
| Paving On Road Diesel | 0.25 | 3.03 | 1.18 | 0.01 | 0.02 | 0.12 | 0.14 | 0.01 | 0.11 | 0.11 |
| Paving Worker Trips | 0.52 | 0.98 | 17.50 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |
| Building 10/22/2012-01/25/2013 | 63.77 | 467.31 | 262.44 | 0.03 | 0.13 | 6.61 | 6.74 | 0.04 | 6.08 | 6.12 |
| Building Off Road Diesel | 63.06 | 463.33 | 245.76 | 0.00 | 0.00 | 6.43 | 6.43 | 0.00 | 5.91 | 5.91 |
| Building Vendor Trips | 0.30 | 3.20 | 2.75 | 0.01 | 0.03 | 0.13 | 0.16 | 0.01 | 0.12 | 0.13 |
| Building Worker Trips | 0.41 | 0.78 | 13.94 | 0.02 | 0.10 | 0.06 | 0.15 | 0.04 | 0.05 | 0.08 |
| Coating 10/22/2012-01/25/2013 | 26.17 | 0.05 | 0.81 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 26.15 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.02 | 0.05 | 0.81 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Fine Grading 10/22/2012-01/25/2013 | 0.42 | 5.11 | 1.98 | 0.01 | 0.03 | 0.20 | 0.23 | 0.01 | 0.18 | 0.19 |
| Fine Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Off Road Diesel | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading On Road Diesel | 0.42 | 5.11 | 1.98 | 0.01 | 0.03 | 0.20 | 0.23 | 0.01 | 0.18 | 0.19 |
| Fine Grading Worker Trips | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

Construction Related Mitigation Measures

The following mitigation measures apply to Phase: Paving 10/22/2012 - 1/25/2013 - Asphalt Paving

For Excavators, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Excavators, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Graders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Graders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Off Highway Tractors, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Off Highway Tractors, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Off Highway Trucks, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

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For Off Highway Trucks, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Other Equipment, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Other Equipment, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Pavers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Pavers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Rollers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Rollers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Scrapers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Scrapers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Tractors/Loaders/Backhoes, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Tractors/Loaders/Backhoes, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Trenchers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Trenchers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

The following mitigation measures apply to Phase: Building Construction 10/22/2012 - 1/25/2013 - Building Construction

For Cranes, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Cranes, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Tractors/Loaders/Backhoes, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Tractors/Loaders/Backhoes, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

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For Graders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Graders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Off Highway Trucks, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Off Highway Trucks, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Other Equipment, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Other Equipment, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Pavers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Pavers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Rough Terrain Forklifts, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Rough Terrain Forklifts, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Skid Steer Loaders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Skid Steer Loaders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Trenchers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Trenchers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

**9/17/2010 01:58:15 PM**

Urbemis 2007 Version 9.2.4

Combined Winter Emissions Reports (Pounds/Day)

File Name: Z:\Air Quality\032.225 Landmark Village Recirculated\URBEMIS2007 Construction - Mitigated\Landmark Recirc Construction wk145-158.urb924

Project Name: Landmark Village - Construction

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| 2012 TOTALS (lbs/day unmitigated) | 160.25 | 1,139.61 | 534.31 | 0.07 | 0.31 | 54.37 | 54.67 | 0.11 | 50.01 | 50.11 |
| 2012 TOTALS (lbs/day mitigated) | 160.25 | 970.89 | 534.31 | 0.07 | 0.31 | 14.07 | 14.38 | 0.11 | 12.94 | 13.04 |
| 2013 TOTALS (lbs/day unmitigated) | 153.53 | 1,056.37 | 518.33 | 0.07 | 0.31 | 49.87 | 50.18 | 0.11 | 45.87 | 45.98 |
| 2013 TOTALS (lbs/day mitigated) | 153.53 | 899.89 | 518.33 | 0.07 | 0.31 | 12.90 | 13.21 | 0.11 | 11.86 | 11.96 |

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Winter Pounds Per Day, Unmitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 10/22/2012-12/31/2012 Active Days: 51 | **160.25** | **1,139.61** | **534.31** | **0.07** | **0.31** | **54.37** | **54.67** | **0.11** | **50.01** | **50.11** |
| Asphalt 10/22/2012-01/25/2013 | 66.03 | 539.84 | 261.99 | 0.03 | 0.14 | 25.33 | 25.47 | 0.05 | 23.30 | 23.35 |
| Paving Off-Gas | 1.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Off Road Diesel | 64.18 | 535.33 | 241.83 | 0.00 | 0.00 | 25.12 | 25.12 | 0.00 | 23.11 | 23.11 |
| Paving On Road Diesel | 0.28 | 3.44 | 1.33 | 0.01 | 0.02 | 0.14 | 0.16 | 0.01 | 0.12 | 0.13 |
| Paving Worker Trips | 0.57 | 1.08 | 18.83 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |
| Building 10/22/2012-01/25/2013 | 67.59 | 593.92 | 269.21 | 0.03 | 0.13 | 28.81 | 28.93 | 0.04 | 26.50 | 26.54 |
| Building Off Road Diesel | 66.80 | 589.44 | 251.22 | 0.00 | 0.00 | 28.60 | 28.60 | 0.00 | 26.31 | 26.31 |
| Building Vendor Trips | 0.33 | 3.62 | 2.99 | 0.01 | 0.03 | 0.15 | 0.18 | 0.01 | 0.14 | 0.15 |
| Building Worker Trips | 0.45 | 0.86 | 15.00 | 0.02 | 0.10 | 0.06 | 0.15 | 0.04 | 0.05 | 0.08 |

**9/17/2010 01:58:15 PM**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Coating 10/22/2012-01/25/2013 | 26.18 | 0.05 | 0.87 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 26.15 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.03 | 0.05 | 0.87 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Fine Grading 10/22/2012-01/25/2013 | 0.47 | 5.80 | 2.24 | 0.01 | 0.03 | 0.23 | 0.26 | 0.01 | 0.21 | 0.22 |
| Fine Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Off Road Diesel | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading On Road Diesel | 0.47 | 5.80 | 2.24 | 0.01 | 0.03 | 0.23 | 0.26 | 0.01 | 0.21 | 0.22 |
| Fine Grading Worker Trips | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Time Slice 1/1/2013-1/25/2013 Active Days: 19 | 153.53 | 1,056.37 | 518.33 | **0.07** | **0.31** | 49.87 | 50.18 | **0.11** | 45.87 | 45.98 |
| Asphalt 10/22/2012-01/25/2013 | 63.16 | 502.13 | 253.10 | 0.03 | 0.14 | 23.78 | 23.92 | 0.05 | 21.87 | 21.92 |
| Paving Off-Gas | 1.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Off Road Diesel | 61.39 | 498.12 | 234.42 | 0.00 | 0.00 | 23.59 | 23.59 | 0.00 | 21.71 | 21.71 |
| Paving On Road Diesel | 0.25 | 3.03 | 1.18 | 0.01 | 0.02 | 0.12 | 0.14 | 0.01 | 0.11 | 0.11 |
| Paving Worker Trips | 0.52 | 0.98 | 17.50 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |
| Building 10/22/2012-01/25/2013 | 63.77 | 549.08 | 262.44 | 0.03 | 0.13 | 25.89 | 26.02 | 0.04 | 23.81 | 23.86 |
| Building Off Road Diesel | 63.06 | 545.10 | 245.76 | 0.00 | 0.00 | 25.70 | 25.70 | 0.00 | 23.65 | 23.65 |
| Building Vendor Trips | 0.30 | 3.20 | 2.75 | 0.01 | 0.03 | 0.13 | 0.16 | 0.01 | 0.12 | 0.13 |
| Building Worker Trips | 0.41 | 0.78 | 13.94 | 0.02 | 0.10 | 0.06 | 0.15 | 0.04 | 0.05 | 0.08 |
| Coating 10/22/2012-01/25/2013 | 26.17 | 0.05 | 0.81 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 26.15 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.02 | 0.05 | 0.81 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Fine Grading 10/22/2012-01/25/2013 | 0.42 | 5.11 | 1.98 | 0.01 | 0.03 | 0.20 | 0.23 | 0.01 | 0.18 | 0.19 |
| Fine Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Off Road Diesel | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading On Road Diesel | 0.42 | 5.11 | 1.98 | 0.01 | 0.03 | 0.20 | 0.23 | 0.01 | 0.18 | 0.19 |
| Fine Grading Worker Trips | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**9/17/2010 01:58:15 PM**

Phase Assumptions

Phase: Fine Grading 10/22/2012 - 1/25/2013 - Surrogate for Paving On-Road Trucks
Total Acres Disturbed: 0
Maximum Daily Acreage Disturbed: 0
Fugitive Dust Level of Detail: Default
0 lbs per acre-day
On Road Truck Travel (VMT): 232.15
Off-Road Equipment:

Phase: Paving 10/22/2012 - 1/25/2013 - Asphalt Paving
Acres to be Paved: 26.86
Off-Road Equipment:
8 Excavators (168 hp) operating at a 0.57 load factor for 8 hours per day
4 Graders (174 hp) operating at a 0.61 load factor for 8 hours per day
3 Off Highway Tractors (267 hp) operating at a 0.65 load factor for 8 hours per day
14 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day
18 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day
2 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day
8 Rollers (95 hp) operating at a 0.56 load factor for 6 hours per day
6 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day
6 Scrapers (313 hp) operating at a 0.72 load factor for 8 hours per day
4 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 0 hours per day
10 Trenchers (63 hp) operating at a 0.75 load factor for 8 hours per day

Phase: Building Construction 10/22/2012 - 1/25/2013 - Building Construction
Off-Road Equipment:
8 Cranes (399 hp) operating at a 0.43 load factor for 6 hours per day
1 Graders (174 hp) operating at a 0.61 load factor for 8 hours per day
5 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day
67 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day
3 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day
11 Rough Terrain Forklifts (93 hp) operating at a 0.6 load factor for 8 hours per day
9 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day
2 Skid Steer Loaders (44 hp) operating at a 0.55 load factor for 8 hours per day
12 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 8 hours per day
8 Trenchers (63 hp) operating at a 0.75 load factor for 8 hours per day

**9/17/2010 01:58:15 PM**

Phase: Architectural Coating 10/22/2012 - 1/25/2013 - Architectural Coating

Rule: Residential Interior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 100

Rule: Residential Interior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 50

Rule: Residential Exterior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 250

Rule: Residential Exterior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 100

Rule: Nonresidential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Rule: Nonresidential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Construction Mitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Winter Pounds Per Day, Mitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 10/22/2012-12/31/2012 Active Days: 51 | **160.25** | 970.89 | **534.31** | **0.07** | **0.31** | 14.07 | 14.38 | **0.11** | 12.94 | 13.04 |
| Asphalt 10/22/2012-01/25/2013 | 66.03 | 459.54 | 261.99 | 0.03 | 0.14 | 6.49 | 6.63 | 0.05 | 5.96 | 6.01 |
| Paving Off-Gas | 1.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Off Road Diesel | 64.18 | 455.03 | 241.83 | 0.00 | 0.00 | 6.28 | 6.28 | 0.00 | 5.78 | 5.78 |
| Paving On Road Diesel | 0.28 | 3.44 | 1.33 | 0.01 | 0.02 | 0.14 | 0.16 | 0.01 | 0.12 | 0.13 |
| Paving Worker Trips | 0.57 | 1.08 | 18.83 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |
| Building 10/22/2012-01/25/2013 | 67.59 | 505.50 | 269.21 | 0.03 | 0.13 | 7.35 | 7.48 | 0.04 | 6.76 | 6.81 |
| Building Off Road Diesel | 66.80 | 501.02 | 251.22 | 0.00 | 0.00 | 7.15 | 7.15 | 0.00 | 6.58 | 6.58 |
| Building Vendor Trips | 0.33 | 3.62 | 2.99 | 0.01 | 0.03 | 0.15 | 0.18 | 0.01 | 0.14 | 0.15 |
| Building Worker Trips | 0.45 | 0.86 | 15.00 | 0.02 | 0.10 | 0.06 | 0.15 | 0.04 | 0.05 | 0.08 |
| Coating 10/22/2012-01/25/2013 | 26.18 | 0.05 | 0.87 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 26.15 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.03 | 0.05 | 0.87 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Fine Grading 10/22/2012-01/25/2013 | 0.47 | 5.80 | 2.24 | 0.01 | 0.03 | 0.23 | 0.26 | 0.01 | 0.21 | 0.22 |
| Fine Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Off Road Diesel | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading On Road Diesel | 0.47 | 5.80 | 2.24 | 0.01 | 0.03 | 0.23 | 0.26 | 0.01 | 0.21 | 0.22 |
| Fine Grading Worker Trips | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**9/17/2010 01:58:15 PM**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 1/1/2013-1/25/2013 Active Days: 19 | 153.53 | 899.89 | 518.33 | **0.07** | **0.31** | 12.90 | 13.21 | **0.11** | 11.86 | 11.96 |
| Asphalt 10/22/2012-01/25/2013 | 63.16 | 427.41 | 253.10 | 0.03 | 0.14 | 6.09 | 6.23 | 0.05 | 5.59 | 5.64 |
| Paving Off-Gas | 1.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Paving Off Road Diesel | 61.39 | 423.40 | 234.42 | 0.00 | 0.00 | 5.90 | 5.90 | 0.00 | 5.43 | 5.43 |
| Paving On Road Diesel | 0.25 | 3.03 | 1.18 | 0.01 | 0.02 | 0.12 | 0.14 | 0.01 | 0.11 | 0.11 |
| Paving Worker Trips | 0.52 | 0.98 | 17.50 | 0.03 | 0.12 | 0.07 | 0.19 | 0.04 | 0.06 | 0.10 |
| Building 10/22/2012-01/25/2013 | 63.77 | 467.31 | 262.44 | 0.03 | 0.13 | 6.61 | 6.74 | 0.04 | 6.08 | 6.12 |
| Building Off Road Diesel | 63.06 | 463.33 | 245.76 | 0.00 | 0.00 | 6.43 | 6.43 | 0.00 | 5.91 | 5.91 |
| Building Vendor Trips | 0.30 | 3.20 | 2.75 | 0.01 | 0.03 | 0.13 | 0.16 | 0.01 | 0.12 | 0.13 |
| Building Worker Trips | 0.41 | 0.78 | 13.94 | 0.02 | 0.10 | 0.06 | 0.15 | 0.04 | 0.05 | 0.08 |
| Coating 10/22/2012-01/25/2013 | 26.17 | 0.05 | 0.81 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 26.15 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.02 | 0.05 | 0.81 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Fine Grading 10/22/2012-01/25/2013 | 0.42 | 5.11 | 1.98 | 0.01 | 0.03 | 0.20 | 0.23 | 0.01 | 0.18 | 0.19 |
| Fine Grading Dust | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading Off Road Diesel | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fine Grading On Road Diesel | 0.42 | 5.11 | 1.98 | 0.01 | 0.03 | 0.20 | 0.23 | 0.01 | 0.18 | 0.19 |
| Fine Grading Worker Trips | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

Construction Related Mitigation Measures

The following mitigation measures apply to Phase: Paving 10/22/2012 - 1/25/2013 - Asphalt Paving

For Excavators, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Excavators, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Graders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Graders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Off Highway Tractors, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

**9/17/2010 01:58:15 PM**

For Off Highway Tractors, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Off Highway Trucks, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Off Highway Trucks, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Other Equipment, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Other Equipment, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Pavers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Pavers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Rollers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Rollers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Scrapers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Scrapers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Tractors/Loaders/Backhoes, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Tractors/Loaders/Backhoes, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Trenchers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Trenchers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

The following mitigation measures apply to Phase: Building Construction 10/22/2012 - 1/25/2013 - Building Construction

For Cranes, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

**9/17/2010 01:58:15 PM**

For Cranes, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Tractors/Loaders/Backhoes, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Tractors/Loaders/Backhoes, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Graders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Graders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Off Highway Trucks, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Off Highway Trucks, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Other Equipment, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Other Equipment, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Pavers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Pavers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Rough Terrain Forklifts, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Rough Terrain Forklifts, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Skid Steer Loaders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Skid Steer Loaders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

For Trenchers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:
NOX: 15% PM10: 50% PM25: 50%

For Trenchers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:
PM10: 50% PM25: 50%

**9/17/2010 02:02:34 PM**

Urbemis 2007 Version 9.2.4

Combined Summer Emissions Reports (Pounds/Day)

File Name: Z:\Air Quality\032.225 Landmark Village Recirculated\URBEMIS2007 Construction - Mitigated\Landmark Recirc Construction wk159-178.urb924

Project Name: Landmark Village - Construction

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| 2013 TOTALS (lbs/day unmitigated) | 91.64 | 551.13 | 271.68 | 0.05 | 0.20 | 25.99 | 26.18 | 0.07 | 23.90 | 23.97 |
| 2013 TOTALS (lbs/day mitigated) | 91.64 | 469.36 | 271.68 | 0.05 | 0.20 | 6.71 | 6.91 | 0.07 | 6.16 | 6.23 |

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 1/28/2013-6/14/2013 Active Days: 100 | **91.64** | **551.13** | **271.68** | **0.05** | **0.20** | **25.99** | **26.18** | **0.07** | **23.90** | **23.97** |
| Building 01/28/2013-06/14/2013 | 64.13 | 551.08 | 270.83 | 0.04 | 0.19 | 25.98 | 26.17 | 0.07 | 23.90 | 23.96 |
| Building Off Road Diesel | 63.06 | 545.10 | 245.76 | 0.00 | 0.00 | 25.70 | 25.70 | 0.00 | 23.65 | 23.65 |
| Building Vendor Trips | 0.45 | 4.81 | 4.13 | 0.01 | 0.04 | 0.20 | 0.24 | 0.01 | 0.18 | 0.19 |
| Building Worker Trips | 0.62 | 1.17 | 20.94 | 0.03 | 0.15 | 0.08 | 0.23 | 0.05 | 0.07 | 0.12 |
| Coating 01/28/2013-06/14/2013 | 27.51 | 0.05 | 0.85 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |
| Architectural Coating | 27.49 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.03 | 0.05 | 0.85 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |

**9/17/2010 02:02:34 PM**

Phase Assumptions

Phase: Building Construction 1/28/2013 - 6/14/2013 - Building Construction

Off-Road Equipment:

8 Cranes (399 hp) operating at a 0.43 load factor for 6 hours per day

1 Graders (174 hp) operating at a 0.61 load factor for 8 hours per day

5 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day

67 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day

3 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day

11 Rough Terrain Forklifts (93 hp) operating at a 0.6 load factor for 8 hours per day

9 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day

2 Skid Steer Loaders (44 hp) operating at a 0.55 load factor for 8 hours per day

12 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 8 hours per day

8 Trenchers (63 hp) operating at a 0.75 load factor for 8 hours per day

Phase: Architectural Coating 1/28/2013 - 6/14/2013 - Architectural Coating

Rule: Residential Interior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 100

Rule: Residential Interior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 50

Rule: Residential Exterior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 250

Rule: Residential Exterior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 100

Rule: Nonresidential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Rule: Nonresidential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Construction Mitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Summer Pounds Per Day, Mitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 1/28/2013-6/14/2013 Active Days: 100 | **91.64** | 469.36 | **271.68** | **0.05** | **0.20** | 6.71 | 6.91 | **0.07** | 6.16 | 6.23 |
| Building 01/28/2013-06/14/2013 | 64.13 | 469.32 | 270.83 | 0.04 | 0.19 | 6.71 | 6.90 | 0.07 | 6.16 | 6.23 |
| Building Off Road Diesel | 63.06 | 463.33 | 245.76 | 0.00 | 0.00 | 6.43 | 6.43 | 0.00 | 5.91 | 5.91 |
| Building Vendor Trips | 0.45 | 4.81 | 4.13 | 0.01 | 0.04 | 0.20 | 0.24 | 0.01 | 0.18 | 0.19 |
| Building Worker Trips | 0.62 | 1.17 | 20.94 | 0.03 | 0.15 | 0.08 | 0.23 | 0.05 | 0.07 | 0.12 |
| Coating 01/28/2013-06/14/2013 | 27.51 | 0.05 | 0.85 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |
| Architectural Coating | 27.49 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.03 | 0.05 | 0.85 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |

**9/17/2010 02:02:34 PM**

Construction Related Mitigation Measures

The following mitigation measures apply to Phase: Building Construction 1/28/2013 - 6/14/2013 - Building Construction

For Cranes, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Cranes, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Tractors/Loaders/Backhoes, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Tractors/Loaders/Backhoes, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Graders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Graders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Off Highway Trucks, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Off Highway Trucks, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Other Equipment, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Other Equipment, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Pavers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Pavers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Rough Terrain Forklifts, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Rough Terrain Forklifts, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Skid Steer Loaders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Skid Steer Loaders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Trenchers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Trenchers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

**9/17/2010 02:03:16 PM**

Urbemis 2007 Version 9.2.4

Combined Winter Emissions Reports (Pounds/Day)

File Name: Z:\Air Quality\032.225 Landmark Village Recirculated\URBEMIS2007 Construction - Mitigated\Landmark Recirc Construction wk159-178.urb924

Project Name: Landmark Village - Construction

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| 2013 TOTALS (lbs/day unmitigated) | 91.64 | 551.13 | 271.68 | 0.05 | 0.20 | 25.99 | 26.18 | 0.07 | 23.90 | 23.97 |
| 2013 TOTALS (lbs/day mitigated) | 91.64 | 469.36 | 271.68 | 0.05 | 0.20 | 6.71 | 6.91 | 0.07 | 6.16 | 6.23 |

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Winter Pounds Per Day, Unmitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 1/28/2013-6/14/2013 Active Days: 100 | **91.64** | **551.13** | **271.68** | **0.05** | **0.20** | **25.99** | **26.18** | **0.07** | **23.90** | **23.97** |
| Building 01/28/2013-06/14/2013 | 64.13 | 551.08 | 270.83 | 0.04 | 0.19 | 25.98 | 26.17 | 0.07 | 23.90 | 23.96 |
| Building Off Road Diesel | 63.06 | 545.10 | 245.76 | 0.00 | 0.00 | 25.70 | 25.70 | 0.00 | 23.65 | 23.65 |
| Building Vendor Trips | 0.45 | 4.81 | 4.13 | 0.01 | 0.04 | 0.20 | 0.24 | 0.01 | 0.18 | 0.19 |
| Building Worker Trips | 0.62 | 1.17 | 20.94 | 0.03 | 0.15 | 0.08 | 0.23 | 0.05 | 0.07 | 0.12 |
| Coating 01/28/2013-06/14/2013 | 27.51 | 0.05 | 0.85 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |
| Architectural Coating | 27.49 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.03 | 0.05 | 0.85 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |

**9/17/2010 02:03:16 PM**

Phase Assumptions

Phase: Building Construction 1/28/2013 - 6/14/2013 - Building Construction

Off-Road Equipment:

8 Cranes (399 hp) operating at a 0.43 load factor for 6 hours per day

1 Graders (174 hp) operating at a 0.61 load factor for 8 hours per day

5 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day

67 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day

3 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day

11 Rough Terrain Forklifts (93 hp) operating at a 0.6 load factor for 8 hours per day

9 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day

2 Skid Steer Loaders (44 hp) operating at a 0.55 load factor for 8 hours per day

12 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 8 hours per day

8 Trenchers (63 hp) operating at a 0.75 load factor for 8 hours per day

Phase: Architectural Coating 1/28/2013 - 6/14/2013 - Architectural Coating

Rule: Residential Interior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 100

Rule: Residential Interior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 50

Rule: Residential Exterior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 250

Rule: Residential Exterior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 100

Rule: Nonresidential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Rule: Nonresidential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Construction Mitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Winter Pounds Per Day, Mitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 1/28/2013-6/14/2013 Active Days: 100 | **91.64** | 469.36 | **271.68** | **0.05** | **0.20** | 6.71 | 6.91 | **0.07** | 6.16 | 6.23 |
| Building 01/28/2013-06/14/2013 | 64.13 | 469.32 | 270.83 | 0.04 | 0.19 | 6.71 | 6.90 | 0.07 | 6.16 | 6.23 |
| Building Off Road Diesel | 63.06 | 463.33 | 245.76 | 0.00 | 0.00 | 6.43 | 6.43 | 0.00 | 5.91 | 5.91 |
| Building Vendor Trips | 0.45 | 4.81 | 4.13 | 0.01 | 0.04 | 0.20 | 0.24 | 0.01 | 0.18 | 0.19 |
| Building Worker Trips | 0.62 | 1.17 | 20.94 | 0.03 | 0.15 | 0.08 | 0.23 | 0.05 | 0.07 | 0.12 |
| Coating 01/28/2013-06/14/2013 | 27.51 | 0.05 | 0.85 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |
| Architectural Coating | 27.49 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.03 | 0.05 | 0.85 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 |

**9/17/2010 02:03:16 PM**

Construction Related Mitigation Measures

The following mitigation measures apply to Phase: Building Construction 1/28/2013 - 6/14/2013 - Building Construction

For Cranes, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Cranes, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Tractors/Loaders/Backhoes, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Tractors/Loaders/Backhoes, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Graders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Graders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Off Highway Trucks, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Off Highway Trucks, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Other Equipment, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Other Equipment, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Pavers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Pavers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Rough Terrain Forklifts, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Rough Terrain Forklifts, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Skid Steer Loaders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Skid Steer Loaders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Trenchers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Trenchers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

**9/17/2010 02:08:47 PM**

Urbemis 2007 Version 9.2.4

Combined Summer Emissions Reports (Pounds/Day)

File Name: Z:\Air Quality\032.225 Landmark Village Recirculated\URBEMIS2007 Construction - Mitigated\Landmark Recirc Construction wk179-196.urb924

Project Name: Landmark Village - Construction

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| 2013 TOTALS (lbs/day unmitigated) | 80.61 | 476.87 | 233.03 | 0.04 | 0.17 | 22.25 | 22.42 | 0.06 | 20.47 | 20.53 |
| 2013 TOTALS (lbs/day mitigated) | 80.61 | 406.11 | 233.03 | 0.04 | 0.17 | 5.75 | 5.91 | 0.06 | 5.28 | 5.34 |

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 6/17/2013-10/18/2013 Active Days: 90 | **80.61** | **476.87** | **233.03** | **0.04** | **0.17** | **22.25** | **22.42** | **0.06** | **20.47** | **20.53** |
| Building 06/17/2013-10/18/2013 | 54.66 | 476.82 | 232.22 | 0.04 | 0.16 | 22.25 | 22.41 | 0.06 | 20.46 | 20.52 |
| Building Off Road Diesel | 53.75 | 471.70 | 210.80 | 0.00 | 0.00 | 22.01 | 22.01 | 0.00 | 20.25 | 20.25 |
| Building Vendor Trips | 0.38 | 4.11 | 3.53 | 0.01 | 0.04 | 0.17 | 0.20 | 0.01 | 0.15 | 0.17 |
| Building Worker Trips | 0.53 | 1.00 | 17.88 | 0.03 | 0.12 | 0.07 | 0.20 | 0.04 | 0.06 | 0.11 |
| Coating 06/17/2013-10/18/2013 | 25.95 | 0.05 | 0.81 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 25.93 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.02 | 0.05 | 0.81 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |

**9/17/2010 02:08:47 PM**

Phase Assumptions

Phase: Building Construction 6/17/2013 - 10/18/2013 - Building Construction

Off-Road Equipment:

8 Cranes (399 hp) operating at a 0.43 load factor for 6 hours per day

2 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day

64 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day

2 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day

10 Rough Terrain Forklifts (93 hp) operating at a 0.6 load factor for 8 hours per day

7 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day

2 Skid Steer Loaders (44 hp) operating at a 0.55 load factor for 8 hours per day

11 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 8 hours per day

7 Trenchers (63 hp) operating at a 0.75 load factor for 8 hours per day

Phase: Architectural Coating 6/17/2013 - 10/18/2013 - Architectural Coating

Rule: Residential Interior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 100

Rule: Residential Interior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 50

Rule: Residential Exterior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 250

Rule: Residential Exterior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 100

Rule: Nonresidential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Rule: Nonresidential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Construction Mitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Summer Pounds Per Day, Mitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 6/17/2013-10/18/2013 Active Days: 90 | **80.61** | 406.11 | **233.03** | **0.04** | **0.17** | 5.75 | 5.91 | **0.06** | 5.28 | 5.34 |
| Building 06/17/2013-10/18/2013 | 54.66 | 406.06 | 232.22 | 0.04 | 0.16 | 5.74 | 5.90 | 0.06 | 5.28 | 5.33 |
| Building Off Road Diesel | 53.75 | 400.95 | 210.80 | 0.00 | 0.00 | 5.50 | 5.50 | 0.00 | 5.06 | 5.06 |
| Building Vendor Trips | 0.38 | 4.11 | 3.53 | 0.01 | 0.04 | 0.17 | 0.20 | 0.01 | 0.15 | 0.17 |
| Building Worker Trips | 0.53 | 1.00 | 17.88 | 0.03 | 0.12 | 0.07 | 0.20 | 0.04 | 0.06 | 0.11 |
| Coating 06/17/2013-10/18/2013 | 25.95 | 0.05 | 0.81 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 25.93 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.02 | 0.05 | 0.81 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |

**9/17/2010 02:08:47 PM**

Construction Related Mitigation Measures

The following mitigation measures apply to Phase: Building Construction 6/17/2013 - 10/18/2013 - Building Construction

For Cranes, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Cranes, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Tractors/Loaders/Backhoes, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Tractors/Loaders/Backhoes, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Off Highway Trucks, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Off Highway Trucks, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Other Equipment, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Other Equipment, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Pavers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Pavers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Rough Terrain Forklifts, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Rough Terrain Forklifts, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Skid Steer Loaders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Skid Steer Loaders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Trenchers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Trenchers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

**9/17/2010 02:10:36 PM**

Urbemis 2007 Version 9.2.4

Combined Winter Emissions Reports (Pounds/Day)

File Name: Z:\Air Quality\032.225 Landmark Village Recirculated\URBEMIS2007 Construction - Mitigated\Landmark Recirc Construction wk179-196.urb924

Project Name: Landmark Village - Construction

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| 2013 TOTALS (lbs/day unmitigated) | 80.61 | 476.87 | 233.03 | 0.04 | 0.17 | 22.25 | 22.42 | 0.06 | 20.47 | 20.53 |
| 2013 TOTALS (lbs/day mitigated) | 80.61 | 406.11 | 233.03 | 0.04 | 0.17 | 5.75 | 5.91 | 0.06 | 5.28 | 5.34 |

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Winter Pounds Per Day, Unmitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 6/17/2013-10/18/2013 Active Days: 90 | **80.61** | **476.87** | **233.03** | **0.04** | **0.17** | **22.25** | **22.42** | **0.06** | **20.47** | **20.53** |
| Building 06/17/2013-10/18/2013 | 54.66 | 476.82 | 232.22 | 0.04 | 0.16 | 22.25 | 22.41 | 0.06 | 20.46 | 20.52 |
| Building Off Road Diesel | 53.75 | 471.70 | 210.80 | 0.00 | 0.00 | 22.01 | 22.01 | 0.00 | 20.25 | 20.25 |
| Building Vendor Trips | 0.38 | 4.11 | 3.53 | 0.01 | 0.04 | 0.17 | 0.20 | 0.01 | 0.15 | 0.17 |
| Building Worker Trips | 0.53 | 1.00 | 17.88 | 0.03 | 0.12 | 0.07 | 0.20 | 0.04 | 0.06 | 0.11 |
| Coating 06/17/2013-10/18/2013 | 25.95 | 0.05 | 0.81 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 25.93 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.02 | 0.05 | 0.81 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |

**9/17/2010 02:10:36 PM**

Phase Assumptions

Phase: Building Construction 6/17/2013 - 10/18/2013 - Building Construction

Off-Road Equipment:

8 Cranes (399 hp) operating at a 0.43 load factor for 6 hours per day

2 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day

64 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day

2 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day

10 Rough Terrain Forklifts (93 hp) operating at a 0.6 load factor for 8 hours per day

7 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day

2 Skid Steer Loaders (44 hp) operating at a 0.55 load factor for 8 hours per day

11 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 8 hours per day

7 Trenchers (63 hp) operating at a 0.75 load factor for 8 hours per day

Phase: Architectural Coating 6/17/2013 - 10/18/2013 - Architectural Coating

Rule: Residential Interior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 100

Rule: Residential Interior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 50

Rule: Residential Exterior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 250

Rule: Residential Exterior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 100

Rule: Nonresidential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Rule: Nonresidential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Construction Mitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Winter Pounds Per Day, Mitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 6/17/2013-10/18/2013 Active Days: 90 | **80.61** | 406.11 | **233.03** | **0.04** | **0.17** | 5.75 | 5.91 | **0.06** | 5.28 | 5.34 |
| Building 06/17/2013-10/18/2013 | 54.66 | 406.06 | 232.22 | 0.04 | 0.16 | 5.74 | 5.90 | 0.06 | 5.28 | 5.33 |
| Building Off Road Diesel | 53.75 | 400.95 | 210.80 | 0.00 | 0.00 | 5.50 | 5.50 | 0.00 | 5.06 | 5.06 |
| Building Vendor Trips | 0.38 | 4.11 | 3.53 | 0.01 | 0.04 | 0.17 | 0.20 | 0.01 | 0.15 | 0.17 |
| Building Worker Trips | 0.53 | 1.00 | 17.88 | 0.03 | 0.12 | 0.07 | 0.20 | 0.04 | 0.06 | 0.11 |
| Coating 06/17/2013-10/18/2013 | 25.95 | 0.05 | 0.81 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 25.93 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.02 | 0.05 | 0.81 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |

**9/17/2010 02:10:36 PM**

Construction Related Mitigation Measures

The following mitigation measures apply to Phase: Building Construction 6/17/2013 - 10/18/2013 - Building Construction

For Cranes, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Cranes, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Tractors/Loaders/Backhoes, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Tractors/Loaders/Backhoes, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Off Highway Trucks, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Off Highway Trucks, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Other Equipment, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Other Equipment, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Pavers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Pavers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Rough Terrain Forklifts, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Rough Terrain Forklifts, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Skid Steer Loaders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Skid Steer Loaders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Trenchers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Trenchers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

**9/17/2010 02:15:01 PM**

Urbemis 2007 Version 9.2.4

Combined Summer Emissions Reports (Pounds/Day)

File Name: Z:\Air Quality\032.225 Landmark Village Recirculated\URBEMIS2007 Construction - Mitigated\Landmark Recirc Construction wk197-210.urb924

Project Name: Landmark Village - Construction

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| 2013 TOTALS (lbs/day unmitigated) | 53.65 | 323.81 | 151.89 | 0.02 | 0.08 | 14.90 | 14.98 | 0.03 | 13.70 | 13.73 |
| 2013 TOTALS (lbs/day mitigated) | 53.65 | 275.65 | 151.89 | 0.02 | 0.08 | 3.82 | 3.90 | 0.03 | 3.51 | 3.54 |
| 2014 TOTALS (lbs/day unmitigated) | 51.53 | 292.33 | 147.19 | 0.02 | 0.08 | 13.14 | 13.22 | 0.03 | 12.08 | 12.11 |
| 2014 TOTALS (lbs/day mitigated) | 51.53 | 248.84 | 147.19 | 0.02 | 0.08 | 3.37 | 3.45 | 0.03 | 3.10 | 3.13 |

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 10/21/2013-12/31/2013 Active Days: 52 | **53.65** | **323.81** | **151.89** | **0.02** | **0.08** | **14.90** | **14.98** | **0.03** | **13.70** | **13.73** |
| Building 10/21/2013-01/24/2014 | 36.95 | 323.79 | 151.43 | 0.02 | 0.08 | 14.89 | 14.97 | 0.03 | 13.70 | 13.73 |
| Building Off Road Diesel | 36.50 | 321.07 | 141.33 | 0.00 | 0.00 | 14.77 | 14.77 | 0.00 | 13.59 | 13.59 |
| Building Vendor Trips | 0.21 | 2.26 | 1.94 | 0.01 | 0.02 | 0.09 | 0.11 | 0.01 | 0.08 | 0.09 |
| Building Worker Trips | 0.24 | 0.46 | 8.16 | 0.01 | 0.06 | 0.03 | 0.09 | 0.02 | 0.03 | 0.05 |
| Coating 10/21/2013-01/24/2014 | 16.69 | 0.03 | 0.46 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 16.68 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.01 | 0.03 | 0.46 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Time Slice 1/1/2014-1/24/2014 Active Days: 18 | 51.53 | 292.33 | 147.19 | **0.02** | **0.08** | 13.14 | 13.22 | **0.03** | 12.08 | 12.11 |
| Building 10/21/2013-01/24/2014 | 34.84 | 292.30 | 146.76 | 0.02 | 0.08 | 13.14 | 13.21 | 0.03 | 12.08 | 12.11 |
| Building Off Road Diesel | 34.43 | 289.90 | 137.36 | 0.00 | 0.00 | 13.02 | 13.02 | 0.00 | 11.98 | 11.98 |
| Building Vendor Trips | 0.19 | 1.98 | 1.79 | 0.01 | 0.02 | 0.08 | 0.10 | 0.01 | 0.07 | 0.08 |
| Building Worker Trips | 0.22 | 0.42 | 7.60 | 0.01 | 0.06 | 0.04 | 0.09 | 0.02 | 0.03 | 0.05 |
| Coating 10/21/2013-01/24/2014 | 16.69 | 0.02 | 0.43 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 16.68 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.01 | 0.02 | 0.43 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |

**9/17/2010 02:15:01 PM**

Phase Assumptions

Phase: Building Construction 10/21/2013 - 1/24/2014 - Building Construction

Off-Road Equipment:

5 Cranes (399 hp) operating at a 0.43 load factor for 6 hours per day

2 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day

44 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day

2 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day

7 Rough Terrain Forklifts (93 hp) operating at a 0.6 load factor for 8 hours per day

4 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day

2 Skid Steer Loaders (44 hp) operating at a 0.55 load factor for 8 hours per day

6 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 8 hours per day

4 Trenchers (63 hp) operating at a 0.75 load factor for 8 hours per day

Phase: Architectural Coating 10/21/2013 - 1/24/2014 - Architectural Coating

Rule: Residential Interior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 100

Rule: Residential Interior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 50

Rule: Residential Exterior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 250

Rule: Residential Exterior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 100

Rule: Nonresidential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Rule: Nonresidential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Construction Mitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Summer Pounds Per Day, Mitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 10/21/2013-12/31/2013 Active Days: 52 | **53.65** | 275.65 | **151.89** | **0.02** | **0.08** | 3.82 | 3.90 | **0.03** | 3.51 | 3.54 |
| Building 10/21/2013-01/24/2014 | 36.95 | 275.63 | 151.43 | 0.02 | 0.08 | 3.82 | 3.89 | 0.03 | 3.51 | 3.54 |
| Building Off Road Diesel | 36.50 | 272.91 | 141.33 | 0.00 | 0.00 | 3.69 | 3.69 | 0.00 | 3.40 | 3.40 |
| Building Vendor Trips | 0.21 | 2.26 | 1.94 | 0.01 | 0.02 | 0.09 | 0.11 | 0.01 | 0.08 | 0.09 |
| Building Worker Trips | 0.24 | 0.46 | 8.16 | 0.01 | 0.06 | 0.03 | 0.09 | 0.02 | 0.03 | 0.05 |
| Coating 10/21/2013-01/24/2014 | 16.69 | 0.03 | 0.46 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 16.68 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.01 | 0.03 | 0.46 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Time Slice 1/1/2014-1/24/2014 Active Days: 18 | 51.53 | 248.84 | 147.19 | **0.02** | **0.08** | 3.37 | 3.45 | **0.03** | 3.10 | 3.13 |
| Building 10/21/2013-01/24/2014 | 34.84 | 248.82 | 146.76 | 0.02 | 0.08 | 3.37 | 3.45 | 0.03 | 3.10 | 3.13 |
| Building Off Road Diesel | 34.43 | 246.42 | 137.36 | 0.00 | 0.00 | 3.25 | 3.25 | 0.00 | 2.99 | 2.99 |
| Building Vendor Trips | 0.19 | 1.98 | 1.79 | 0.01 | 0.02 | 0.08 | 0.10 | 0.01 | 0.07 | 0.08 |
| Building Worker Trips | 0.22 | 0.42 | 7.60 | 0.01 | 0.06 | 0.04 | 0.09 | 0.02 | 0.03 | 0.05 |
| Coating 10/21/2013-01/24/2014 | 16.69 | 0.02 | 0.43 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 16.68 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.01 | 0.02 | 0.43 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |

**9/17/2010 02:15:01 PM**

Construction Related Mitigation Measures

The following mitigation measures apply to Phase: Building Construction 10/21/2013 - 1/24/2014 - Building Construction

For Cranes, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Cranes, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Tractors/Loaders/Backhoes, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Tractors/Loaders/Backhoes, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Off Highway Trucks, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Off Highway Trucks, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Other Equipment, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Other Equipment, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Pavers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Pavers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Rough Terrain Forklifts, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Rough Terrain Forklifts, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Skid Steer Loaders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Skid Steer Loaders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Trenchers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Trenchers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

**9/17/2010 02:15:34 PM**

Urbemis 2007 Version 9.2.4

Combined Winter Emissions Reports (Pounds/Day)

File Name: Z:\Air Quality\032.225 Landmark Village Recirculated\URBEMIS2007 Construction - Mitigated\Landmark Recirc Construction wk197-210.urb924

Project Name: Landmark Village - Construction

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| 2013 TOTALS (lbs/day unmitigated) | 53.65 | 323.81 | 151.89 | 0.02 | 0.08 | 14.90 | 14.98 | 0.03 | 13.70 | 13.73 |
| 2013 TOTALS (lbs/day mitigated) | 53.65 | 275.65 | 151.89 | 0.02 | 0.08 | 3.82 | 3.90 | 0.03 | 3.51 | 3.54 |
| 2014 TOTALS (lbs/day unmitigated) | 51.53 | 292.33 | 147.19 | 0.02 | 0.08 | 13.14 | 13.22 | 0.03 | 12.08 | 12.11 |
| 2014 TOTALS (lbs/day mitigated) | 51.53 | 248.84 | 147.19 | 0.02 | 0.08 | 3.37 | 3.45 | 0.03 | 3.10 | 3.13 |

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Winter Pounds Per Day, Unmitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 10/21/2013-12/31/2013 Active Days: 52 | **53.65** | **323.81** | **151.89** | **0.02** | **0.08** | **14.90** | **14.98** | **0.03** | **13.70** | **13.73** |
| Building 10/21/2013-01/24/2014 | 36.95 | 323.79 | 151.43 | 0.02 | 0.08 | 14.89 | 14.97 | 0.03 | 13.70 | 13.73 |
| Building Off Road Diesel | 36.50 | 321.07 | 141.33 | 0.00 | 0.00 | 14.77 | 14.77 | 0.00 | 13.59 | 13.59 |
| Building Vendor Trips | 0.21 | 2.26 | 1.94 | 0.01 | 0.02 | 0.09 | 0.11 | 0.01 | 0.08 | 0.09 |
| Building Worker Trips | 0.24 | 0.46 | 8.16 | 0.01 | 0.06 | 0.03 | 0.09 | 0.02 | 0.03 | 0.05 |
| Coating 10/21/2013-01/24/2014 | 16.69 | 0.03 | 0.46 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 16.68 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.01 | 0.03 | 0.46 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Time Slice 1/1/2014-1/24/2014 Active Days: 18 | 51.53 | 292.33 | 147.19 | **0.02** | **0.08** | 13.14 | 13.22 | **0.03** | 12.08 | 12.11 |
| Building 10/21/2013-01/24/2014 | 34.84 | 292.30 | 146.76 | 0.02 | 0.08 | 13.14 | 13.21 | 0.03 | 12.08 | 12.11 |
| Building Off Road Diesel | 34.43 | 289.90 | 137.36 | 0.00 | 0.00 | 13.02 | 13.02 | 0.00 | 11.98 | 11.98 |
| Building Vendor Trips | 0.19 | 1.98 | 1.79 | 0.01 | 0.02 | 0.08 | 0.10 | 0.01 | 0.07 | 0.08 |
| Building Worker Trips | 0.22 | 0.42 | 7.60 | 0.01 | 0.06 | 0.04 | 0.09 | 0.02 | 0.03 | 0.05 |
| Coating 10/21/2013-01/24/2014 | 16.69 | 0.02 | 0.43 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 16.68 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.01 | 0.02 | 0.43 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |

**9/17/2010 02:15:34 PM**

Phase Assumptions

Phase: Building Construction 10/21/2013 - 1/24/2014 - Building Construction

Off-Road Equipment:

5 Cranes (399 hp) operating at a 0.43 load factor for 6 hours per day

2 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day

44 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day

2 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day

7 Rough Terrain Forklifts (93 hp) operating at a 0.6 load factor for 8 hours per day

4 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day

2 Skid Steer Loaders (44 hp) operating at a 0.55 load factor for 8 hours per day

6 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 8 hours per day

4 Trenchers (63 hp) operating at a 0.75 load factor for 8 hours per day

Phase: Architectural Coating 10/21/2013 - 1/24/2014 - Architectural Coating

Rule: Residential Interior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 100

Rule: Residential Interior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 50

Rule: Residential Exterior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 250

Rule: Residential Exterior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 100

Rule: Nonresidential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Rule: Nonresidential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Construction Mitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Winter Pounds Per Day, Mitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 10/21/2013-12/31/2013 Active Days: 52 | **53.65** | 275.65 | **151.89** | **0.02** | **0.08** | 3.82 | 3.90 | **0.03** | 3.51 | 3.54 |
| Building 10/21/2013-01/24/2014 | 36.95 | 275.63 | 151.43 | 0.02 | 0.08 | 3.82 | 3.89 | 0.03 | 3.51 | 3.54 |
| Building Off Road Diesel | 36.50 | 272.91 | 141.33 | 0.00 | 0.00 | 3.69 | 3.69 | 0.00 | 3.40 | 3.40 |
| Building Vendor Trips | 0.21 | 2.26 | 1.94 | 0.01 | 0.02 | 0.09 | 0.11 | 0.01 | 0.08 | 0.09 |
| Building Worker Trips | 0.24 | 0.46 | 8.16 | 0.01 | 0.06 | 0.03 | 0.09 | 0.02 | 0.03 | 0.05 |
| Coating 10/21/2013-01/24/2014 | 16.69 | 0.03 | 0.46 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 16.68 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.01 | 0.03 | 0.46 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Time Slice 1/1/2014-1/24/2014 Active Days: 18 | 51.53 | 248.84 | 147.19 | **0.02** | **0.08** | 3.37 | 3.45 | **0.03** | 3.10 | 3.13 |
| Building 10/21/2013-01/24/2014 | 34.84 | 248.82 | 146.76 | 0.02 | 0.08 | 3.37 | 3.45 | 0.03 | 3.10 | 3.13 |
| Building Off Road Diesel | 34.43 | 246.42 | 137.36 | 0.00 | 0.00 | 3.25 | 3.25 | 0.00 | 2.99 | 2.99 |
| Building Vendor Trips | 0.19 | 1.98 | 1.79 | 0.01 | 0.02 | 0.08 | 0.10 | 0.01 | 0.07 | 0.08 |
| Building Worker Trips | 0.22 | 0.42 | 7.60 | 0.01 | 0.06 | 0.04 | 0.09 | 0.02 | 0.03 | 0.05 |
| Coating 10/21/2013-01/24/2014 | 16.69 | 0.02 | 0.43 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 16.68 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.01 | 0.02 | 0.43 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |

**9/17/2010 02:15:34 PM**

Construction Related Mitigation Measures

The following mitigation measures apply to Phase: Building Construction 10/21/2013 - 1/24/2014 - Building Construction

For Cranes, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Cranes, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Tractors/Loaders/Backhoes, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Tractors/Loaders/Backhoes, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Off Highway Trucks, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Off Highway Trucks, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Other Equipment, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Other Equipment, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Pavers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Pavers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Rough Terrain Forklifts, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Rough Terrain Forklifts, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Skid Steer Loaders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Skid Steer Loaders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Trenchers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Trenchers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

**9/17/2010 02:31:14 PM**

Urbemis 2007 Version 9.2.4

Combined Summer Emissions Reports (Pounds/Day)

File Name: Z:\Air Quality\032.225 Landmark Village Recirculated\URBEMIS2007 Construction - Mitigated\Landmark Recirc Construction wk211-220.urb924

Project Name: Landmark Village - Construction

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| 2014 TOTALS (lbs/day unmitigated) | 35.75 | 209.78 | 101.08 | 0.01 | 0.03 | 9.25 | 9.28 | 0.01 | 8.51 | 8.52 |
| 2014 TOTALS (lbs/day mitigated) | 35.75 | 178.43 | 101.08 | 0.01 | 0.03 | 2.34 | 2.37 | 0.01 | 2.15 | 2.16 |

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 1/27/2014-4/4/2014 Active Days: 50 | **35.75** | **209.78** | **101.08** | **0.01** | **0.03** | **9.25** | **9.28** | **0.01** | **8.51** | **8.52** |
| Building 01/27/2014-04/04/2014 | 24.92 | 209.77 | 100.88 | 0.01 | 0.03 | 9.25 | 9.28 | 0.01 | 8.51 | 8.52 |
| Building Off Road Diesel | 24.79 | 209.01 | 97.71 | 0.00 | 0.00 | 9.21 | 9.21 | 0.00 | 8.48 | 8.48 |
| Building Vendor Trips | 0.06 | 0.62 | 0.56 | 0.00 | 0.01 | 0.02 | 0.03 | 0.00 | 0.02 | 0.02 |
| Building Worker Trips | 0.08 | 0.14 | 2.61 | 0.00 | 0.02 | 0.01 | 0.03 | 0.01 | 0.01 | 0.02 |
| Coating 01/27/2014-04/04/2014 | 10.82 | 0.01 | 0.21 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 10.82 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.01 | 0.01 | 0.21 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**9/17/2010 02:31:14 PM**

Phase Assumptions

Phase: Building Construction 1/27/2014 - 4/4/2014 - Building Construction

Off-Road Equipment:

3 Cranes (399 hp) operating at a 0.43 load factor for 6 hours per day

2 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day

32 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day

2 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day

5 Rough Terrain Forklifts (93 hp) operating at a 0.6 load factor for 8 hours per day

3 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day

2 Skid Steer Loaders (44 hp) operating at a 0.55 load factor for 8 hours per day

3 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 8 hours per day

2 Trenchers (63 hp) operating at a 0.75 load factor for 8 hours per day

Phase: Architectural Coating 1/27/2014 - 4/4/2014 - Architectural Coating

Rule: Residential Interior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 100

Rule: Residential Interior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 50

Rule: Residential Exterior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 250

Rule: Residential Exterior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 100

Rule: Nonresidential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Rule: Nonresidential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Construction Mitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Summer Pounds Per Day, Mitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 1/27/2014-4/4/2014 Active Days: 50 | **35.75** | 178.43 | **101.08** | **0.01** | **0.03** | 2.34 | 2.37 | **0.01** | 2.15 | 2.16 |
| Building 01/27/2014-04/04/2014 | 24.92 | 178.42 | 100.88 | 0.01 | 0.03 | 2.34 | 2.37 | 0.01 | 2.15 | 2.16 |
| Building Off Road Diesel | 24.79 | 177.66 | 97.71 | 0.00 | 0.00 | 2.30 | 2.30 | 0.00 | 2.12 | 2.12 |
| Building Vendor Trips | 0.06 | 0.62 | 0.56 | 0.00 | 0.01 | 0.02 | 0.03 | 0.00 | 0.02 | 0.02 |
| Building Worker Trips | 0.08 | 0.14 | 2.61 | 0.00 | 0.02 | 0.01 | 0.03 | 0.01 | 0.01 | 0.02 |
| Coating 01/27/2014-04/04/2014 | 10.82 | 0.01 | 0.21 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 10.82 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.01 | 0.01 | 0.21 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**9/17/2010 02:31:14 PM**

Construction Related Mitigation Measures

The following mitigation measures apply to Phase: Building Construction 1/27/2014 - 4/4/2014 - Building Construction

For Cranes, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Cranes, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Tractors/Loaders/Backhoes, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Tractors/Loaders/Backhoes, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Off Highway Trucks, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Off Highway Trucks, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Other Equipment, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Other Equipment, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Pavers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Pavers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Rough Terrain Forklifts, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Rough Terrain Forklifts, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Skid Steer Loaders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Skid Steer Loaders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Trenchers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Trenchers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

**9/17/2010 02:32:02 PM**

Urbemis 2007 Version 9.2.4

Combined Winter Emissions Reports (Pounds/Day)

File Name: Z:\Air Quality\032.225 Landmark Village Recirculated\URBEMIS2007 Construction - Mitigated\Landmark Recirc Construction wk211-220.urb924

Project Name: Landmark Village - Construction

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| 2014 TOTALS (lbs/day unmitigated) | 35.75 | 209.78 | 101.08 | 0.01 | 0.03 | 9.25 | 9.28 | 0.01 | 8.51 | 8.52 |
| 2014 TOTALS (lbs/day mitigated) | 35.75 | 178.43 | 101.08 | 0.01 | 0.03 | 2.34 | 2.37 | 0.01 | 2.15 | 2.16 |

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Winter Pounds Per Day, Unmitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 1/27/2014-4/4/2014 Active Days: 50 | **35.75** | **209.78** | **101.08** | **0.01** | **0.03** | **9.25** | **9.28** | **0.01** | **8.51** | **8.52** |
| Building 01/27/2014-04/04/2014 | 24.92 | 209.77 | 100.88 | 0.01 | 0.03 | 9.25 | 9.28 | 0.01 | 8.51 | 8.52 |
| Building Off Road Diesel | 24.79 | 209.01 | 97.71 | 0.00 | 0.00 | 9.21 | 9.21 | 0.00 | 8.48 | 8.48 |
| Building Vendor Trips | 0.06 | 0.62 | 0.56 | 0.00 | 0.01 | 0.02 | 0.03 | 0.00 | 0.02 | 0.02 |
| Building Worker Trips | 0.08 | 0.14 | 2.61 | 0.00 | 0.02 | 0.01 | 0.03 | 0.01 | 0.01 | 0.02 |
| Coating 01/27/2014-04/04/2014 | 10.82 | 0.01 | 0.21 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 10.82 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.01 | 0.01 | 0.21 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**9/17/2010 02:32:02 PM**

Phase Assumptions

Phase: Building Construction 1/27/2014 - 4/4/2014 - Building Construction

Off-Road Equipment:

3 Cranes (399 hp) operating at a 0.43 load factor for 6 hours per day

2 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day

32 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day

2 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day

5 Rough Terrain Forklifts (93 hp) operating at a 0.6 load factor for 8 hours per day

3 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day

2 Skid Steer Loaders (44 hp) operating at a 0.55 load factor for 8 hours per day

3 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 8 hours per day

2 Trenchers (63 hp) operating at a 0.75 load factor for 8 hours per day

Phase: Architectural Coating 1/27/2014 - 4/4/2014 - Architectural Coating

Rule: Residential Interior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 100

Rule: Residential Interior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 50

Rule: Residential Exterior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 250

Rule: Residential Exterior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 100

Rule: Nonresidential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Rule: Nonresidential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Construction Mitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Winter Pounds Per Day, Mitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 1/27/2014-4/4/2014 Active Days: 50 | **35.75** | 178.43 | **101.08** | **0.01** | **0.03** | 2.34 | 2.37 | **0.01** | 2.15 | 2.16 |
| Building 01/27/2014-04/04/2014 | 24.92 | 178.42 | 100.88 | 0.01 | 0.03 | 2.34 | 2.37 | 0.01 | 2.15 | 2.16 |
| Building Off Road Diesel | 24.79 | 177.66 | 97.71 | 0.00 | 0.00 | 2.30 | 2.30 | 0.00 | 2.12 | 2.12 |
| Building Vendor Trips | 0.06 | 0.62 | 0.56 | 0.00 | 0.01 | 0.02 | 0.03 | 0.00 | 0.02 | 0.02 |
| Building Worker Trips | 0.08 | 0.14 | 2.61 | 0.00 | 0.02 | 0.01 | 0.03 | 0.01 | 0.01 | 0.02 |
| Coating 01/27/2014-04/04/2014 | 10.82 | 0.01 | 0.21 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 10.82 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.01 | 0.01 | 0.21 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**9/17/2010 02:32:02 PM**

Construction Related Mitigation Measures

The following mitigation measures apply to Phase: Building Construction 1/27/2014 - 4/4/2014 - Building Construction

For Cranes, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Cranes, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Tractors/Loaders/Backhoes, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Tractors/Loaders/Backhoes, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Off Highway Trucks, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Off Highway Trucks, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Other Equipment, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Other Equipment, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Pavers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Pavers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Rough Terrain Forklifts, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Rough Terrain Forklifts, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Skid Steer Loaders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Skid Steer Loaders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Trenchers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Trenchers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

**9/17/2010 02:35:10 PM**

Urbemis 2007 Version 9.2.4

Combined Summer Emissions Reports (Pounds/Day)

File Name: Z:\Air Quality\032.225 Landmark Village Recirculated\URBEMIS2007 Construction - Mitigated\Landmark Recirc Construction wk221-235.urb924

Project Name: Landmark Village - Construction

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| 2014 TOTALS (lbs/day unmitigated) | 22.02 | 128.35 | 59.47 | 0.00 | 0.01 | 5.42 | 5.43 | 0.00 | 4.98 | 4.99 |
| 2014 TOTALS (lbs/day mitigated) | 22.02 | 109.14 | 59.47 | 0.00 | 0.01 | 1.36 | 1.38 | 0.00 | 1.25 | 1.26 |

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 4/7/2014-7/18/2014 Active Days: 75 | **22.02** | **128.35** | **59.47** | **0.00** | **0.01** | **5.42** | **5.43** | **0.00** | **4.98** | **4.99** |
| Building 04/07/2014-07/18/2014 | 15.20 | 128.35 | 59.41 | 0.00 | 0.01 | 5.42 | 5.43 | 0.00 | 4.98 | 4.99 |
| Building Off Road Diesel | 15.15 | 128.12 | 58.05 | 0.00 | 0.00 | 5.41 | 5.41 | 0.00 | 4.97 | 4.97 |
| Building Vendor Trips | 0.02 | 0.16 | 0.15 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 |
| Building Worker Trips | 0.03 | 0.07 | 1.20 | 0.00 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.01 |
| Coating 04/07/2014-07/18/2014 | 6.82 | 0.00 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 6.82 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.00 | 0.00 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**9/17/2010 02:35:10 PM**

Phase Assumptions

Phase: Building Construction 4/7/2014 - 7/18/2014 - Building Construction

Off-Road Equipment:

1 Cranes (399 hp) operating at a 0.43 load factor for 6 hours per day

2 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day

20 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day

2 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day

3 Rough Terrain Forklifts (93 hp) operating at a 0.6 load factor for 8 hours per day

2 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day

2 Skid Steer Loaders (44 hp) operating at a 0.55 load factor for 8 hours per day

Phase: Architectural Coating 4/7/2014 - 7/18/2014 - Architectural Coating

Rule: Residential Interior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 100

Rule: Residential Interior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 50

Rule: Residential Exterior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 250

Rule: Residential Exterior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 100

Rule: Nonresidential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Rule: Nonresidential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Construction Mitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Summer Pounds Per Day, Mitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 4/7/2014-7/18/2014 Active Days: 75 | **22.02** | 109.14 | **59.47** | **0.00** | **0.01** | 1.36 | 1.38 | **0.00** | 1.25 | 1.26 |
| Building 04/07/2014-07/18/2014 | 15.20 | 109.13 | 59.41 | 0.00 | 0.01 | 1.36 | 1.37 | 0.00 | 1.25 | 1.26 |
| Building Off Road Diesel | 15.15 | 108.91 | 58.05 | 0.00 | 0.00 | 1.35 | 1.35 | 0.00 | 1.24 | 1.24 |
| Building Vendor Trips | 0.02 | 0.16 | 0.15 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 |
| Building Worker Trips | 0.03 | 0.07 | 1.20 | 0.00 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.01 |
| Coating 04/07/2014-07/18/2014 | 6.82 | 0.00 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 6.82 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.00 | 0.00 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**9/17/2010 02:35:10 PM**

Construction Related Mitigation Measures

The following mitigation measures apply to Phase: Building Construction 4/7/2014 - 7/18/2014 - Building Construction

For Cranes, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Cranes, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Off Highway Trucks, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Off Highway Trucks, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Other Equipment, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Other Equipment, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Pavers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Pavers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Rough Terrain Forklifts, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Rough Terrain Forklifts, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Skid Steer Loaders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Skid Steer Loaders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

**9/17/2010 02:35:46 PM**

Urbemis 2007 Version 9.2.4

Combined Winter Emissions Reports (Pounds/Day)

File Name: Z:\Air Quality\032.225 Landmark Village Recirculated\URBEMIS2007 Construction - Mitigated\Landmark Recirc Construction wk221-235.urb924

Project Name: Landmark Village - Construction

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| 2014 TOTALS (lbs/day unmitigated) | 22.02 | 128.35 | 59.47 | 0.00 | 0.01 | 5.42 | 5.43 | 0.00 | 4.98 | 4.99 |
| 2014 TOTALS (lbs/day mitigated) | 22.02 | 109.14 | 59.47 | 0.00 | 0.01 | 1.36 | 1.38 | 0.00 | 1.25 | 1.26 |

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Winter Pounds Per Day, Unmitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 4/7/2014-7/18/2014 Active Days: 75 | **22.02** | **128.35** | **59.47** | **0.00** | **0.01** | **5.42** | **5.43** | **0.00** | **4.98** | **4.99** |
| Building 04/07/2014-07/18/2014 | 15.20 | 128.35 | 59.41 | 0.00 | 0.01 | 5.42 | 5.43 | 0.00 | 4.98 | 4.99 |
| Building Off Road Diesel | 15.15 | 128.12 | 58.05 | 0.00 | 0.00 | 5.41 | 5.41 | 0.00 | 4.97 | 4.97 |
| Building Vendor Trips | 0.02 | 0.16 | 0.15 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 |
| Building Worker Trips | 0.03 | 0.07 | 1.20 | 0.00 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.01 |
| Coating 04/07/2014-07/18/2014 | 6.82 | 0.00 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 6.82 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.00 | 0.00 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

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Phase Assumptions

Phase: Building Construction 4/7/2014 - 7/18/2014 - Building Construction

Off-Road Equipment:

1 Cranes (399 hp) operating at a 0.43 load factor for 6 hours per day

2 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day

20 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day

2 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day

3 Rough Terrain Forklifts (93 hp) operating at a 0.6 load factor for 8 hours per day

2 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day

2 Skid Steer Loaders (44 hp) operating at a 0.55 load factor for 8 hours per day

Phase: Architectural Coating 4/7/2014 - 7/18/2014 - Architectural Coating

Rule: Residential Interior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 100

Rule: Residential Interior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 50

Rule: Residential Exterior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 250

Rule: Residential Exterior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 100

Rule: Nonresidential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Rule: Nonresidential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Construction Mitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Winter Pounds Per Day, Mitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 4/7/2014-7/18/2014 Active Days: 75 | **22.02** | 109.14 | **59.47** | **0.00** | **0.01** | 1.36 | 1.38 | **0.00** | 1.25 | 1.26 |
| Building 04/07/2014-07/18/2014 | 15.20 | 109.13 | 59.41 | 0.00 | 0.01 | 1.36 | 1.37 | 0.00 | 1.25 | 1.26 |
| Building Off Road Diesel | 15.15 | 108.91 | 58.05 | 0.00 | 0.00 | 1.35 | 1.35 | 0.00 | 1.24 | 1.24 |
| Building Vendor Trips | 0.02 | 0.16 | 0.15 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 |
| Building Worker Trips | 0.03 | 0.07 | 1.20 | 0.00 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.01 |
| Coating 04/07/2014-07/18/2014 | 6.82 | 0.00 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 6.82 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.00 | 0.00 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

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Construction Related Mitigation Measures

The following mitigation measures apply to Phase: Building Construction 4/7/2014 - 7/18/2014 - Building Construction

For Cranes, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Cranes, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Off Highway Trucks, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Off Highway Trucks, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Other Equipment, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Other Equipment, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Pavers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Pavers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Rough Terrain Forklifts, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Rough Terrain Forklifts, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Skid Steer Loaders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Skid Steer Loaders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

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Urbemis 2007 Version 9.2.4

Combined Summer Emissions Reports (Pounds/Day)

File Name: Z:\Air Quality\032.225 Landmark Village Recirculated\URBEMIS2007 Construction - Mitigated\Landmark Recirc Construction 2015.urb924

Project Name: Landmark Village - Construction

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| 2015 TOTALS (lbs/day unmitigated) | 50.59 | 220.62 | 143.93 | 0.08 | 0.33 | 9.02 | 9.35 | 0.12 | 8.29 | 8.40 |
| 2015 TOTALS (lbs/day mitigated) | 50.59 | 188.45 | 143.93 | 0.08 | 0.33 | 2.52 | 2.84 | 0.12 | 2.30 | 2.42 |
| 2016 TOTALS (lbs/day unmitigated) | 48.87 | 195.79 | 139.56 | 0.08 | 0.33 | 8.33 | 8.66 | 0.12 | 7.65 | 7.77 |
| 2016 TOTALS (lbs/day mitigated) | 48.87 | 167.25 | 139.56 | 0.08 | 0.33 | 2.33 | 2.66 | 0.12 | 2.13 | 2.24 |
| 2017 TOTALS (lbs/day unmitigated) | 47.22 | 174.59 | 135.80 | 0.08 | 0.33 | 7.28 | 7.61 | 0.12 | 6.68 | 6.80 |
| 2017 TOTALS (lbs/day mitigated) | 47.22 | 149.15 | 135.80 | 0.08 | 0.33 | 2.05 | 2.38 | 0.12 | 1.87 | 1.99 |

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 1/5/2015-12/31/2015 Active Days: 259 | **50.59** | **220.62** | **143.93** | **0.08** | **0.33** | **9.02** | **9.35** | **0.12** | **8.29** | **8.40** |
| Building 01/05/2015-09/08/2017 | 28.30 | 220.61 | 143.74 | 0.08 | 0.33 | 9.02 | 9.35 | 0.12 | 8.29 | 8.40 |
| Building Off Road Diesel | 26.90 | 214.46 | 105.32 | 0.00 | 0.00 | 8.68 | 8.68 | 0.00 | 7.98 | 7.98 |
| Building Vendor Trips | 0.43 | 4.29 | 4.33 | 0.01 | 0.05 | 0.17 | 0.23 | 0.02 | 0.16 | 0.18 |
| Building Worker Trips | 0.97 | 1.86 | 34.09 | 0.06 | 0.27 | 0.17 | 0.45 | 0.10 | 0.15 | 0.24 |
| Coating 01/05/2015-09/08/2017 | 22.28 | 0.01 | 0.19 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 22.28 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.01 | 0.01 | 0.19 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

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| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 1/1/2016-12/30/2016 Active Days: 261 | 48.87 | 195.79 | 139.56 | **0.08** | **0.33** | 8.33 | 8.66 | **0.12** | 7.65 | 7.77 |
| Building 01/05/2015-09/08/2017 | 26.58 | 195.78 | 139.38 | 0.08 | 0.33 | 8.33 | 8.66 | 0.12 | 7.65 | 7.76 |
| Building Off Road Diesel | 25.30 | 190.28 | 103.51 | 0.00 | 0.00 | 8.00 | 8.00 | 0.00 | 7.36 | 7.36 |
| Building Vendor Trips | 0.39 | 3.79 | 4.03 | 0.01 | 0.05 | 0.15 | 0.21 | 0.02 | 0.14 | 0.16 |
| Building Worker Trips | 0.89 | 1.72 | 31.84 | 0.06 | 0.27 | 0.17 | 0.45 | 0.10 | 0.15 | 0.24 |
| Coating 01/05/2015-09/08/2017 | 22.28 | 0.01 | 0.18 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 22.28 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.00 | 0.01 | 0.18 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Time Slice 1/2/2017-9/8/2017 Active Days: 180 | 47.22 | 174.59 | 135.80 | **0.08** | **0.33** | 7.28 | 7.61 | **0.12** | 6.68 | 6.80 |
| Building 01/05/2015-09/08/2017 | 24.93 | 174.59 | 135.63 | 0.08 | 0.33 | 7.28 | 7.61 | 0.12 | 6.68 | 6.80 |
| Building Off Road Diesel | 23.76 | 169.63 | 102.19 | 0.00 | 0.00 | 6.97 | 6.97 | 0.00 | 6.41 | 6.41 |
| Building Vendor Trips | 0.36 | 3.37 | 3.75 | 0.01 | 0.05 | 0.14 | 0.19 | 0.02 | 0.13 | 0.14 |
| Building Worker Trips | 0.82 | 1.59 | 29.69 | 0.06 | 0.27 | 0.17 | 0.45 | 0.10 | 0.15 | 0.24 |
| Coating 01/05/2015-09/08/2017 | 22.28 | 0.01 | 0.17 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 22.28 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.00 | 0.01 | 0.17 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

Phase Assumptions

Phase: Building Construction 1/5/2015 - 9/8/2017 - Building Construction

Off-Road Equipment:

3 Cranes (399 hp) operating at a 0.43 load factor for 6 hours per day

6 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day

33 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day

3 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day

6 Rough Terrain Forklifts (93 hp) operating at a 0.6 load factor for 8 hours per day

2 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day

5 Skid Steer Loaders (44 hp) operating at a 0.55 load factor for 8 hours per day

Phase: Architectural Coating 1/5/2015 - 9/8/2017 - Architectural Coating

Rule: Residential Interior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 100

Rule: Residential Interior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 50

Rule: Residential Exterior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 250

Rule: Residential Exterior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 100

Rule: Nonresidential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Rule: Nonresidential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

**9/17/2010 12:01:08 PM**

Construction Mitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Summer Pounds Per Day, Mitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 1/5/2015-12/31/2015 Active Days: 259 | **50.59** | 188.45 | **143.93** | **0.08** | **0.33** | 2.52 | 2.84 | **0.12** | 2.30 | 2.42 |
| Building 01/05/2015-09/08/2017 | 28.30 | 188.44 | 143.74 | 0.08 | 0.33 | 2.52 | 2.84 | 0.12 | 2.30 | 2.42 |
| Building Off Road Diesel | 26.90 | 182.29 | 105.32 | 0.00 | 0.00 | 2.17 | 2.17 | 0.00 | 2.00 | 2.00 |
| Building Vendor Trips | 0.43 | 4.29 | 4.33 | 0.01 | 0.05 | 0.17 | 0.23 | 0.02 | 0.16 | 0.18 |
| Building Worker Trips | 0.97 | 1.86 | 34.09 | 0.06 | 0.27 | 0.17 | 0.45 | 0.10 | 0.15 | 0.24 |
| Coating 01/05/2015-09/08/2017 | 22.28 | 0.01 | 0.19 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 22.28 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.01 | 0.01 | 0.19 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Time Slice 1/1/2016-12/30/2016 Active Days: 261 | 48.87 | 167.25 | 139.56 | **0.08** | **0.33** | 2.33 | 2.66 | **0.12** | 2.13 | 2.24 |
| Building 01/05/2015-09/08/2017 | 26.58 | 167.24 | 139.38 | 0.08 | 0.33 | 2.33 | 2.65 | 0.12 | 2.13 | 2.24 |
| Building Off Road Diesel | 25.30 | 161.74 | 103.51 | 0.00 | 0.00 | 2.00 | 2.00 | 0.00 | 1.84 | 1.84 |
| Building Vendor Trips | 0.39 | 3.79 | 4.03 | 0.01 | 0.05 | 0.15 | 0.21 | 0.02 | 0.14 | 0.16 |
| Building Worker Trips | 0.89 | 1.72 | 31.84 | 0.06 | 0.27 | 0.17 | 0.45 | 0.10 | 0.15 | 0.24 |
| Coating 01/05/2015-09/08/2017 | 22.28 | 0.01 | 0.18 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 22.28 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.00 | 0.01 | 0.18 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Time Slice 1/2/2017-9/8/2017 Active Days: 180 | 47.22 | 149.15 | 135.80 | **0.08** | **0.33** | 2.05 | 2.38 | **0.12** | 1.87 | 1.99 |
| Building 01/05/2015-09/08/2017 | 24.93 | 149.14 | 135.63 | 0.08 | 0.33 | 2.05 | 2.38 | 0.12 | 1.87 | 1.99 |
| Building Off Road Diesel | 23.76 | 144.19 | 102.19 | 0.00 | 0.00 | 1.74 | 1.74 | 0.00 | 1.60 | 1.60 |
| Building Vendor Trips | 0.36 | 3.37 | 3.75 | 0.01 | 0.05 | 0.14 | 0.19 | 0.02 | 0.13 | 0.14 |
| Building Worker Trips | 0.82 | 1.59 | 29.69 | 0.06 | 0.27 | 0.17 | 0.45 | 0.10 | 0.15 | 0.24 |
| Coating 01/05/2015-09/08/2017 | 22.28 | 0.01 | 0.17 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 22.28 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.00 | 0.01 | 0.17 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**9/17/2010 12:01:08 PM**

Construction Related Mitigation Measures

The following mitigation measures apply to Phase: Building Construction 1/5/2015 - 9/8/2017 - Building Construction

For Cranes, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Cranes, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Off Highway Trucks, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Off Highway Trucks, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Other Equipment, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Other Equipment, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Pavers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Pavers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Rough Terrain Forklifts, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Rough Terrain Forklifts, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Skid Steer Loaders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Skid Steer Loaders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

**9/17/2010 12:01:42 PM**

Urbemis 2007 Version 9.2.4

Combined Winter Emissions Reports (Pounds/Day)

File Name: Z:\Air Quality\032.225 Landmark Village Recirculated\URBEMIS2007 Construction - Mitigated\Landmark Recirc Construction 2015.urb924

Project Name: Landmark Village - Construction

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| 2015 TOTALS (lbs/day unmitigated) | 50.59 | 220.62 | 143.93 | 0.08 | 0.33 | 9.02 | 9.35 | 0.12 | 8.29 | 8.40 |
| 2015 TOTALS (lbs/day mitigated) | 50.59 | 188.45 | 143.93 | 0.08 | 0.33 | 2.52 | 2.84 | 0.12 | 2.30 | 2.42 |
| 2016 TOTALS (lbs/day unmitigated) | 48.87 | 195.79 | 139.56 | 0.08 | 0.33 | 8.33 | 8.66 | 0.12 | 7.65 | 7.77 |
| 2016 TOTALS (lbs/day mitigated) | 48.87 | 167.25 | 139.56 | 0.08 | 0.33 | 2.33 | 2.66 | 0.12 | 2.13 | 2.24 |
| 2017 TOTALS (lbs/day unmitigated) | 47.22 | 174.59 | 135.80 | 0.08 | 0.33 | 7.28 | 7.61 | 0.12 | 6.68 | 6.80 |
| 2017 TOTALS (lbs/day mitigated) | 47.22 | 149.15 | 135.80 | 0.08 | 0.33 | 2.05 | 2.38 | 0.12 | 1.87 | 1.99 |

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Winter Pounds Per Day, Unmitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 1/5/2015-12/31/2015 Active Days: 259 | **50.59** | **220.62** | **143.93** | **0.08** | **0.33** | **9.02** | **9.35** | **0.12** | **8.29** | **8.40** |
| Building 01/05/2015-09/08/2017 | 28.30 | 220.61 | 143.74 | 0.08 | 0.33 | 9.02 | 9.35 | 0.12 | 8.29 | 8.40 |
| Building Off Road Diesel | 26.90 | 214.46 | 105.32 | 0.00 | 0.00 | 8.68 | 8.68 | 0.00 | 7.98 | 7.98 |
| Building Vendor Trips | 0.43 | 4.29 | 4.33 | 0.01 | 0.05 | 0.17 | 0.23 | 0.02 | 0.16 | 0.18 |
| Building Worker Trips | 0.97 | 1.86 | 34.09 | 0.06 | 0.27 | 0.17 | 0.45 | 0.10 | 0.15 | 0.24 |
| Coating 01/05/2015-09/08/2017 | 22.28 | 0.01 | 0.19 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 22.28 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.01 | 0.01 | 0.19 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**9/17/2010 12:01:42 PM**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 1/1/2016-12/30/2016 Active Days: 261 | 48.87 | 195.79 | 139.56 | **0.08** | **0.33** | 8.33 | 8.66 | **0.12** | 7.65 | 7.77 |
| Building 01/05/2015-09/08/2017 | 26.58 | 195.78 | 139.38 | 0.08 | 0.33 | 8.33 | 8.66 | 0.12 | 7.65 | 7.76 |
| Building Off Road Diesel | 25.30 | 190.28 | 103.51 | 0.00 | 0.00 | 8.00 | 8.00 | 0.00 | 7.36 | 7.36 |
| Building Vendor Trips | 0.39 | 3.79 | 4.03 | 0.01 | 0.05 | 0.15 | 0.21 | 0.02 | 0.14 | 0.16 |
| Building Worker Trips | 0.89 | 1.72 | 31.84 | 0.06 | 0.27 | 0.17 | 0.45 | 0.10 | 0.15 | 0.24 |
| Coating 01/05/2015-09/08/2017 | 22.28 | 0.01 | 0.18 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 22.28 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.00 | 0.01 | 0.18 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Time Slice 1/2/2017-9/8/2017 Active Days: 180 | 47.22 | 174.59 | 135.80 | **0.08** | **0.33** | 7.28 | 7.61 | **0.12** | 6.68 | 6.80 |
| Building 01/05/2015-09/08/2017 | 24.93 | 174.59 | 135.63 | 0.08 | 0.33 | 7.28 | 7.61 | 0.12 | 6.68 | 6.80 |
| Building Off Road Diesel | 23.76 | 169.63 | 102.19 | 0.00 | 0.00 | 6.97 | 6.97 | 0.00 | 6.41 | 6.41 |
| Building Vendor Trips | 0.36 | 3.37 | 3.75 | 0.01 | 0.05 | 0.14 | 0.19 | 0.02 | 0.13 | 0.14 |
| Building Worker Trips | 0.82 | 1.59 | 29.69 | 0.06 | 0.27 | 0.17 | 0.45 | 0.10 | 0.15 | 0.24 |
| Coating 01/05/2015-09/08/2017 | 22.28 | 0.01 | 0.17 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 22.28 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.00 | 0.01 | 0.17 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

Phase Assumptions

Phase: Building Construction 1/5/2015 - 9/8/2017 - Building Construction

Off-Road Equipment:

3 Cranes (399 hp) operating at a 0.43 load factor for 6 hours per day

6 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day

33 Other Equipment (190 hp) operating at a 0.62 load factor for 8 hours per day

3 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day

6 Rough Terrain Forklifts (93 hp) operating at a 0.6 load factor for 8 hours per day

2 Rubber Tired Loaders (164 hp) operating at a 0.54 load factor for 8 hours per day

5 Skid Steer Loaders (44 hp) operating at a 0.55 load factor for 8 hours per day

Phase: Architectural Coating 1/5/2015 - 9/8/2017 - Architectural Coating

Rule: Residential Interior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 100

Rule: Residential Interior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 50

Rule: Residential Exterior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 250

Rule: Residential Exterior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 100

Rule: Nonresidential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Rule: Nonresidential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

**9/17/2010 12:01:42 PM**

Construction Mitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Winter Pounds Per Day, Mitigated

| | ROG | NOx | CO | SO2 | PM10 Dust | PM10 Exhaust | PM10 | PM2.5 Dust | PM2.5 Exhaust | PM2.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time Slice 1/5/2015-12/31/2015 Active Days: 259 | **50.59** | 188.45 | **143.93** | **0.08** | **0.33** | 2.52 | 2.84 | **0.12** | 2.30 | 2.42 |
| Building 01/05/2015-09/08/2017 | 28.30 | 188.44 | 143.74 | 0.08 | 0.33 | 2.52 | 2.84 | 0.12 | 2.30 | 2.42 |
| Building Off Road Diesel | 26.90 | 182.29 | 105.32 | 0.00 | 0.00 | 2.17 | 2.17 | 0.00 | 2.00 | 2.00 |
| Building Vendor Trips | 0.43 | 4.29 | 4.33 | 0.01 | 0.05 | 0.17 | 0.23 | 0.02 | 0.16 | 0.18 |
| Building Worker Trips | 0.97 | 1.86 | 34.09 | 0.06 | 0.27 | 0.17 | 0.45 | 0.10 | 0.15 | 0.24 |
| Coating 01/05/2015-09/08/2017 | 22.28 | 0.01 | 0.19 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 22.28 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.01 | 0.01 | 0.19 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Time Slice 1/1/2016-12/30/2016 Active Days: 261 | 48.87 | 167.25 | 139.56 | **0.08** | **0.33** | 2.33 | 2.66 | **0.12** | 2.13 | 2.24 |
| Building 01/05/2015-09/08/2017 | 26.58 | 167.24 | 139.38 | 0.08 | 0.33 | 2.33 | 2.65 | 0.12 | 2.13 | 2.24 |
| Building Off Road Diesel | 25.30 | 161.74 | 103.51 | 0.00 | 0.00 | 2.00 | 2.00 | 0.00 | 1.84 | 1.84 |
| Building Vendor Trips | 0.39 | 3.79 | 4.03 | 0.01 | 0.05 | 0.15 | 0.21 | 0.02 | 0.14 | 0.16 |
| Building Worker Trips | 0.89 | 1.72 | 31.84 | 0.06 | 0.27 | 0.17 | 0.45 | 0.10 | 0.15 | 0.24 |
| Coating 01/05/2015-09/08/2017 | 22.28 | 0.01 | 0.18 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 22.28 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.00 | 0.01 | 0.18 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Time Slice 1/2/2017-9/8/2017 Active Days: 180 | 47.22 | 149.15 | 135.80 | **0.08** | **0.33** | 2.05 | 2.38 | **0.12** | 1.87 | 1.99 |
| Building 01/05/2015-09/08/2017 | 24.93 | 149.14 | 135.63 | 0.08 | 0.33 | 2.05 | 2.38 | 0.12 | 1.87 | 1.99 |
| Building Off Road Diesel | 23.76 | 144.19 | 102.19 | 0.00 | 0.00 | 1.74 | 1.74 | 0.00 | 1.60 | 1.60 |
| Building Vendor Trips | 0.36 | 3.37 | 3.75 | 0.01 | 0.05 | 0.14 | 0.19 | 0.02 | 0.13 | 0.14 |
| Building Worker Trips | 0.82 | 1.59 | 29.69 | 0.06 | 0.27 | 0.17 | 0.45 | 0.10 | 0.15 | 0.24 |
| Coating 01/05/2015-09/08/2017 | 22.28 | 0.01 | 0.17 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Architectural Coating | 22.28 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coating Worker Trips | 0.00 | 0.01 | 0.17 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**9/17/2010 12:01:42 PM**

Construction Related Mitigation Measures

The following mitigation measures apply to Phase: Building Construction 1/5/2015 - 9/8/2017 - Building Construction

For Cranes, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Cranes, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Off Highway Trucks, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Off Highway Trucks, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Other Equipment, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Other Equipment, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Pavers, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Pavers, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Rough Terrain Forklifts, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Rough Terrain Forklifts, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Rubber Tired Loaders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

For Skid Steer Loaders, the Use Aqueous Diesel Fuel mitigation reduces emissions by:

NOX: 15% PM10: 50% PM25: 50%

For Skid Steer Loaders, the Diesel Particulate Filter (DPF) 2nd Tier mitigation reduces emissions by:

PM10: 50% PM25: 50%

**5/27/2010 03:45:00 PM**

Urbemis 2007 Version 9.2.4

Combined Summer Emissions Reports (Pounds/Day)

File Name: Z:\Alan Sako\032.92A Landmark Village\Recirculated DEIR\URBEMIS2007 Update\Landmark Recirc Operational.urb924

Project Name: Landmark - Operational - Recirculated DEIR

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

AREA SOURCE EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 | PM2.5 |
|---|---|---|---|---|---|---|
| TOTALS (lbs/day, unmitigated) | 93.70 | 31.98 | 55.66 | 0.00 | 0.17 | 0.17 |

OPERATIONAL (VEHICLE) EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 | PM2.5 |
|---|---|---|---|---|---|---|
| TOTALS (lbs/day, unmitigated) | 185.52 | 216.70 | 1,989.02 | 2.63 | 426.36 | 83.31 |

SUM OF AREA SOURCE AND OPERATIONAL EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 | PM2.5 |
|---|---|---|---|---|---|---|
| TOTALS (lbs/day, unmitigated) | 279.22 | 248.68 | 2,044.68 | 2.63 | 426.53 | 83.48 |

**5/27/2010 03:45:00 PM**

Area Source Unmitigated Detail Report:

AREA SOURCE EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

| Source | ROG | NOx | CO | SO2 | PM10 | PM2.5 |
|---|---|---|---|---|---|---|
| Natural Gas | 2.40 | 31.52 | 16.92 | 0.00 | 0.06 | 0.06 |
| Hearth - No Summer Emissions | | | | | | |
| Landscape | 5.75 | 0.46 | 38.74 | 0.00 | 0.11 | 0.11 |
| Consumer Products | 75.56 | | | | | |
| Architectural Coatings | 9.99 | | | | | |
| TOTALS (lbs/day, unmitigated) | 93.70 | 31.98 | 55.66 | 0.00 | 0.17 | 0.17 |

Area Source Changes to Defaults

Percent residential using natural gas changed from 78% to 100%

Percentage of residences with wood stoves changed from 10% to 0%

Percentage of residences with wood fireplaces changed from 5% to 0%

Percentage of residences with natural gas fireplaces changed from 85% to 100%

The number of persons per household for consumer product use changed from 3 persons to 3.06 persons

Operational Unmitigated Detail Report:

OPERATIONAL EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

| Source | ROG | NOX | CO | SO2 | PM10 | PM25 |
|---|---|---|---|---|---|---|
| Single family housing | 27.24 | 32.67 | 307.20 | 0.41 | 65.89 | 12.87 |
| Apartments low rise | 15.46 | 17.53 | 164.84 | 0.22 | 35.36 | 6.91 |
| Condo/townhouse general | 15.29 | 17.78 | 167.17 | 0.22 | 35.86 | 7.01 |
| Elementary school | 8.93 | 5.51 | 50.30 | 0.07 | 10.73 | 2.10 |
| City park | 0.35 | 0.29 | 2.63 | 0.00 | 0.58 | 0.11 |
| Free-standing discount store | 48.65 | 56.46 | 504.09 | 0.65 | 106.27 | 20.78 |
| Regnl shop. center | 24.03 | 29.76 | 265.66 | 0.35 | 57.20 | 11.17 |
| Strip mall | 1.27 | 1.43 | 12.80 | 0.02 | 2.69 | 0.53 |
| Office park | 44.30 | 55.27 | 514.33 | 0.69 | 111.78 | 21.83 |
| TOTALS (lbs/day, unmitigated) | 185.52 | 216.70 | 1,989.02 | 2.63 | 426.36 | 83.31 |

**5/27/2010 03:45:00 PM**

Operational Settings:

Includes correction for passby trips

Includes the following double counting adjustment for internal trips:

Residential Trip % Reduction: 26.38  Nonresidential Trip % Reduction: 10.81

Analysis Year: 2014  Temperature (F): 80  Season: Summer

Emfac: Version  : Emfac2007 V2.3 Nov 1 2006

Summary of Land Uses

| Land Use Type | Acreage | Trip Rate | Unit Type | No. Units | Total Trips | Total VMT |
|---|---|---|---|---|---|---|
| Single family housing | 197.00 | 7.29 | dwelling units | 591.00 | 4,307.64 | 38,101.06 |
| Apartments low rise | 28.44 | 5.08 | dwelling units | 455.00 | 2,311.41 | 20,444.42 |
| Condo/townhouse general | 24.88 | 5.89 | dwelling units | 398.00 | 2,344.17 | 20,734.21 |
| Elementary school | | 1.29 | students | 750.00 | 969.96 | 6,202.22 |
| City park | | 2.32 | acres | 20.90 | 48.47 | 335.87 |
| Free-standing discount store | | 48.22 | 1000 sq ft | 252.00 | 12,150.67 | 61,437.25 |
| Regnl shop. center | | 75.87 | 1000 sq ft | 76.10 | 5,773.43 | 33,077.46 |
| Strip mall | | 33.05 | 1000 sq ft | 9.50 | 314.02 | 1,553.95 |
| Office park | | 10.31 | 1000 sq ft | 702.40 | 7,242.12 | 64,645.92 |
| | | | | | 35,461.89 | 246,532.36 |

Vehicle Fleet Mix

| Vehicle Type | Percent Type | Non-Catalyst | Catalyst | Diesel |
|---|---|---|---|---|
| Light Auto | 51.1 | 0.4 | 99.4 | 0.2 |
| Light Truck < 3750 lbs | 7.3 | 1.4 | 95.9 | 2.7 |
| Light Truck 3751-5750 lbs | 23.1 | 0.4 | 99.6 | 0.0 |
| Med Truck 5751-8500 lbs | 10.8 | 0.9 | 99.1 | 0.0 |
| Lite-Heavy Truck 8501-10,000 lbs | 1.7 | 0.0 | 82.4 | 17.6 |
| Lite-Heavy Truck 10,001-14,000 lbs | 0.5 | 0.0 | 60.0 | 40.0 |
| Med-Heavy Truck 14,001-33,000 lbs | 0.9 | 0.0 | 22.2 | 77.8 |
| Heavy-Heavy Truck 33,001-60,000 lbs | 0.6 | 0.0 | 0.0 | 100.0 |
| Other Bus | 0.1 | 0.0 | 0.0 | 100.0 |
| Urban Bus | 0.1 | 0.0 | 0.0 | 100.0 |
| Motorcycle | 2.8 | 50.0 | 50.0 | 0.0 |
| School Bus | 0.1 | 0.0 | 0.0 | 100.0 |
| Motor Home | 0.9 | 0.0 | 88.9 | 11.1 |

**5/27/2010 03:45:00 PM**

Travel Conditions

| | Residential | | | Commercial | | |
|---|---|---|---|---|---|---|
| | Home-Work | Home-Shop | Home-Other | Commute | Non-Work | Customer |
| Urban Trip Length (miles) | 12.7 | 7.0 | 9.5 | 13.3 | 7.4 | 8.9 |
| Rural Trip Length (miles) | 17.6 | 12.1 | 14.9 | 15.4 | 9.6 | 12.6 |
| Trip speeds (mph) | 30.0 | 30.0 | 30.0 | 30.0 | 30.0 | 30.0 |
| % of Trips - Residential | 32.9 | 18.0 | 49.1 | | | |
| | | | | | | |
| % of Trips - Commercial (by land use) | | | | | | |
| Elementary school | | | | 20.0 | 10.0 | 70.0 |
| City park | | | | 5.0 | 2.5 | 92.5 |
| Free-standing discount store | | | | 2.0 | 1.0 | 97.0 |
| Regnl shop. center | | | | 2.0 | 1.0 | 97.0 |
| Strip mall | | | | 2.0 | 1.0 | 97.0 |
| Office park | | | | 48.0 | 24.0 | 28.0 |

**5/27/2010 03:45:06 PM**

Urbemis 2007 Version 9.2.4

Combined Winter Emissions Reports (Pounds/Day)

File Name: Z:\Alan Sako\032.92A Landmark Village\Recirculated DEIR\URBEMIS2007 Update\Landmark Recirc Operational.urb924

Project Name: Landmark - Operational - Recirculated DEIR

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

AREA SOURCE EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 | PM2.5 |
|---|---|---|---|---|---|---|
| TOTALS (lbs/day, unmitigated) | 88.51 | 41.14 | 21.01 | 0.06 | 0.84 | 0.83 |

OPERATIONAL (VEHICLE) EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 | PM2.5 |
|---|---|---|---|---|---|---|
| TOTALS (lbs/day, unmitigated) | 202.00 | 260.33 | 1,925.72 | 2.16 | 426.36 | 83.31 |

SUM OF AREA SOURCE AND OPERATIONAL EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 | PM2.5 |
|---|---|---|---|---|---|---|
| TOTALS (lbs/day, unmitigated) | 290.51 | 301.47 | 1,946.73 | 2.22 | 427.20 | 84.14 |

Area Source Unmitigated Detail Report:

AREA SOURCE EMISSION ESTIMATES Winter Pounds Per Day, Unmitigated

| Source | ROG | NOx | CO | SO2 | PM10 | PM2.5 |
|---|---|---|---|---|---|---|
| Natural Gas | 2.40 | 31.52 | 16.92 | 0.00 | 0.06 | 0.06 |
| Hearth | 0.56 | 9.62 | 4.09 | 0.06 | 0.78 | 0.77 |
| Landscaping - No Winter Emissions | | | | | | |
| Consumer Products | 75.56 | | | | | |
| Architectural Coatings | 9.99 | | | | | |
| TOTALS (lbs/day, unmitigated) | 88.51 | 41.14 | 21.01 | 0.06 | 0.84 | 0.83 |

**5/27/2010 03:45:06 PM**

Area Source Changes to Defaults

Percent residential using natural gas changed from 78% to 100%

Percentage of residences with wood stoves changed from 10% to 0%

Percentage of residences with wood fireplaces changed from 5% to 0%

Percentage of residences with natural gas fireplaces changed from 85% to 100%

The number of persons per household for consumer product use changed from 3 persons to 3.06 persons

Operational Unmitigated Detail Report:

OPERATIONAL EMISSION ESTIMATES Winter Pounds Per Day, Unmitigated

| Source | ROG | NOX | CO | SO2 | PM10 | PM25 |
|---|---|---|---|---|---|---|
| Single family housing | 28.78 | 39.30 | 293.66 | 0.34 | 65.89 | 12.87 |
| Apartments low rise | 15.84 | 21.09 | 157.57 | 0.18 | 35.36 | 6.91 |
| Condo/townhouse general | 15.88 | 21.39 | 159.80 | 0.18 | 35.86 | 7.01 |
| Elementary school | 7.22 | 6.62 | 48.91 | 0.05 | 10.73 | 2.10 |
| City park | 0.31 | 0.35 | 2.56 | 0.00 | 0.58 | 0.11 |
| Free-standing discount store | 56.45 | 67.65 | 499.47 | 0.54 | 106.27 | 20.78 |
| Regnl shop. center | 27.90 | 35.70 | 261.01 | 0.29 | 57.20 | 11.17 |
| Strip mall | 1.46 | 1.72 | 12.70 | 0.01 | 2.69 | 0.53 |
| Office park | 48.16 | 66.51 | 490.04 | 0.57 | 111.78 | 21.83 |
| TOTALS (lbs/day, unmitigated) | 202.00 | 260.33 | 1,925.72 | 2.16 | 426.36 | 83.31 |

Operational Settings:

Includes correction for passby trips

Includes the following double counting adjustment for internal trips:

Residential Trip % Reduction: 26.38  Nonresidential Trip % Reduction: 10.81

Analysis Year: 2014  Temperature (F): 60  Season: Winter

Emfac: Version  : Emfac2007 V2.3 Nov 1 2006

**5/27/2010 03:45:06 PM**

Summary of Land Uses

| Land Use Type | Acreage | Trip Rate | Unit Type | No. Units | Total Trips | Total VMT |
|---|---|---|---|---|---|---|
| Single family housing | 197.00 | 7.29 | dwelling units | 591.00 | 4,307.64 | 38,101.06 |
| Apartments low rise | 28.44 | 5.08 | dwelling units | 455.00 | 2,311.41 | 20,444.42 |
| Condo/townhouse general | 24.88 | 5.89 | dwelling units | 398.00 | 2,344.17 | 20,734.21 |
| Elementary school | | 1.29 | students | 750.00 | 969.96 | 6,202.22 |
| City park | | 2.32 | acres | 20.90 | 48.47 | 335.87 |
| Free-standing discount store | | 48.22 | 1000 sq ft | 252.00 | 12,150.67 | 61,437.25 |
| Regnl shop. center | | 75.87 | 1000 sq ft | 76.10 | 5,773.43 | 33,077.46 |
| Strip mall | | 33.05 | 1000 sq ft | 9.50 | 314.02 | 1,553.95 |
| Office park | | 10.31 | 1000 sq ft | 702.40 | 7,242.12 | 64,645.92 |
| | | | | | 35,461.89 | 246,532.36 |

Vehicle Fleet Mix

| Vehicle Type | Percent Type | Non-Catalyst | Catalyst | Diesel |
|---|---|---|---|---|
| Light Auto | 51.1 | 0.4 | 99.4 | 0.2 |
| Light Truck < 3750 lbs | 7.3 | 1.4 | 95.9 | 2.7 |
| Light Truck 3751-5750 lbs | 23.1 | 0.4 | 99.6 | 0.0 |
| Med Truck 5751-8500 lbs | 10.8 | 0.9 | 99.1 | 0.0 |
| Lite-Heavy Truck 8501-10,000 lbs | 1.7 | 0.0 | 82.4 | 17.6 |
| Lite-Heavy Truck 10,001-14,000 lbs | 0.5 | 0.0 | 60.0 | 40.0 |
| Med-Heavy Truck 14,001-33,000 lbs | 0.9 | 0.0 | 22.2 | 77.8 |
| Heavy-Heavy Truck 33,001-60,000 lbs | 0.6 | 0.0 | 0.0 | 100.0 |
| Other Bus | 0.1 | 0.0 | 0.0 | 100.0 |
| Urban Bus | 0.1 | 0.0 | 0.0 | 100.0 |
| Motorcycle | 2.8 | 50.0 | 50.0 | 0.0 |
| School Bus | 0.1 | 0.0 | 0.0 | 100.0 |
| Motor Home | 0.9 | 0.0 | 88.9 | 11.1 |

**5/27/2010 03:45:06 PM**

Travel Conditions

| | Residential | | | Commercial | | |
|---|---|---|---|---|---|---|
| | Home-Work | Home-Shop | Home-Other | Commute | Non-Work | Customer |
| Urban Trip Length (miles) | 12.7 | 7.0 | 9.5 | 13.3 | 7.4 | 8.9 |
| Rural Trip Length (miles) | 17.6 | 12.1 | 14.9 | 15.4 | 9.6 | 12.6 |
| Trip speeds (mph) | 30.0 | 30.0 | 30.0 | 30.0 | 30.0 | 30.0 |
| % of Trips - Residential | 32.9 | 18.0 | 49.1 | | | |
| | | | | | | |
| % of Trips - Commercial (by land use) | | | | | | |
| Elementary school | | | | 20.0 | 10.0 | 70.0 |
| City park | | | | 5.0 | 2.5 | 92.5 |
| Free-standing discount store | | | | 2.0 | 1.0 | 97.0 |
| Regnl shop. center | | | | 2.0 | 1.0 | 97.0 |
| Strip mall | | | | 2.0 | 1.0 | 97.0 |
| Office park | | | | 48.0 | 24.0 | 28.0 |

**URBEMIS2007 Calculations, Operational with Mitigation**

Estimated Summertime Emissions Reductions Efficiencies
Landmark Village Emissions With Implementation of Newhall Ranch Specific Plan FEIR Air Quality Mitigation Measures

| | Input Fields |
|---|---|

| | | Unmitigated Emissions in Pounds per Day | | | | |
|---|---|---|---|---|---|---|
| **LAND USE** | | **CO** | **VOC** | **$NO_X$** | **$PM_{10}$** | **$PM_{2.5}$** |
| Single Family Residential Uses | Vehicular Sources | 307.20 | 27.24 | 32.67 | 65.89 | 12.87 |
| | Area Sources | 31.63 | 38.78 | 12.64 | 0.09 | 0.09 |
| Multi-Family Residential Uses | Vehicular Sources | 332.01 | 30.75 | 35.31 | 71.22 | 13.92 |
| | Area Sources | 7.65 | 47.17 | 10.76 | 0.03 | 0.03 |
| Commercial/Office/Institutional Uses | Vehicular Sources | 1,349.81 | 127.53 | 148.72 | 289.25 | 56.52 |
| | Area Sources | 16.38 | 7.75 | 8.58 | 0.05 | 0.05 |
| **Total Emissions** | Vehicular Sources | 1,989.02 | 185.52 | 216.70 | 426.36 | 83.31 |
| | Area Sources | 55.66 | 93.70 | 31.98 | 0.17 | 0.17 |
| | **Total Non-Reduced Emissions** | **2,044.68** | **279.22** | **248.68** | **426.53** | **83.48** |

| Recommended Measures already incorporated into Project are marked "No" | | | Emission Reduction Efficiency | | | | | Reduced Emissions in Pounds per Day | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Yes** | **No** | **MEASURES, EFFICIENCIES, AND REDUCTIONS** | **CO** | **VOC** | **$NO_X$** | **$PM_{10}$** | **$PM_{2.5}$** | **CO** | **VOC** | **$NO_X$** | **$PM_{10}$** | **$PM_{2.5}$** |
| **Stationary Sources** | | | | | | | | | | | | |
| *All Residential Uses* | | | | | | | | | | | | |
| X | | Use solar or low emission water heaters | 10.0% | 11.0% | 9.5% | 4.5% | 4.5% | 3.93 | 9.45 | 2.22 | 0.01 | 0.01 |
| X | | Use built-in-energy-efficient appliances | 3.0% | 2.5% | 3.0% | 6.5% | 6.5% | 1.18 | 2.15 | 0.70 | 0.01 | 0.01 |
| X | | Provide shade trees to reduce heating/cooling needs | 0.0% | 0.0% | 0.0% | 0.5% | 0.5% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| X | | Use energy-efficient and automated controls for air conditioners | 0.0% | 0.0% | 0.0% | 0.5% | 0.5% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| X | | Use double-glass paned windows | 4.5% | 4.5% | 4.0% | 2.5% | 2.5% | 1.77 | 3.87 | 0.94 | 0.00 | 0.00 |
| | X | Provide ventilation systems for enclosed parking facilities | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| X | | Use lighting controls and energy efficient lighting | 0.0% | 0.0% | 0.0% | 0.5% | 0.5% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Use fuel cells in residential subdivisions to produce heat and electricity | 1.0% | 0.0% | 1.5% | 7.0% | 7.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| X | | Orient buildings to the north | 13.5% | 14.0% | 13.0% | 10.5% | 10.5% | 5.30 | 12.03 | 3.04 | 0.01 | 0.01 |
| X | | Use light-colored roof materials to reflect heat | 1.5% | 1.5% | 1.5% | 1.5% | 1.5% | 0.59 | 1.29 | 0.35 | 0.00 | 0.00 |
| X | | Comply with Title 24 | 13.0% | 14.0% | 13.0% | 7.5% | 7.5% | 5.11 | 12.03 | 3.04 | 0.01 | 0.01 |
| *Multi-Family Residential Uses* | | | | | | | | | | | | |
| X | | Use central water heating systems | 8.5% | 9.0% | 8.0% | 4.0% | 4.0% | 0.65 | 4.25 | 0.86 | 0.00 | 0.00 |
| *Commercial, Office, Institutional Uses* | | | | | | | | | | | | |
| X | | Use solar or low emission water heaters | 0.5% | 0.5% | 0.5% | 0.5% | 0.5% | 0.08 | 0.04 | 0.04 | 0.00 | 0.00 |
| X | | Use central water heating systems | 0.5% | 0.5% | 0.5% | 0.5% | 0.5% | 0.08 | 0.04 | 0.04 | 0.00 | 0.00 |
| X | | Provide shade trees to reduce heating/cooling needs | 0.5% | 0.5% | 0.5% | 1.0% | 1.0% | 0.08 | 0.04 | 0.04 | 0.00 | 0.00 |
| X | | Use energy-efficient and automated controls for air conditioners | 1.0% | 1.0% | 1.0% | 1.5% | 1.5% | 0.16 | 0.08 | 0.09 | 0.00 | 0.00 |
| X | | Use double-glass paned windows | 3.0% | 3.5% | 3.0% | 2.5% | 2.5% | 0.49 | 0.27 | 0.26 | 0.00 | 0.00 |
| X | | Use energy-efficient low-sodium parking lights | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Provide ventilation systems for enclosed parking facilities | 0.0% | 0.0% | 0.0% | 0.5% | 0.5% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| X | | Use lighting controls and energy efficient lighting | 7.0% | 3.0% | 8.5% | 19.5% | 19.5% | 1.15 | 0.23 | 0.73 | 0.01 | 0.01 |
| X | | Use light-colored roof materials to reflect heat | 1.0% | 1.0% | 1.0% | 0.5% | 0.5% | 0.16 | 0.08 | 0.09 | 0.00 | 0.00 |
| X | | Comply with Title 24 | 9.5% | 10.0% | 9.0% | 7.0% | 7.0% | 1.56 | 0.78 | 0.77 | 0.00 | 0.00 |
| X | | Orient buildings to the north | 12.5% | 11.0% | 13.5% | 17.5% | 17.5% | 2.05 | 0.85 | 1.16 | 0.01 | 0.01 |
| *Industrial Uses* | | | | | | | | | | | | |
| | X | Provide shade trees to reduce heating/cooling needs | 0.0% | 0.0% | 0.0% | 0.5% | 0.5% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Use energy-efficient and automated controls for air conditioners | 0.0% | 0.0% | 0.0% | 1.0% | 1.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Use double-glass paned windows | 0.0% | 0.0% | 0.5% | 1.0% | 1.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Use energy-efficient low-sodium parking lights | 0.0% | 0.0% | 0.5% | 1.0% | 1.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Provide ventilation systems for enclosed parking facilities | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Use lightin constrols and energy efficient lighting | 0.5% | 0.0% | 1.0% | 2.5% | 2.5% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Use light-colored roof materials to reflect heat | 0.0% | 0.0% | 0.0% | 0.5% | 0.5% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Orient buildings to the north | 2.5% | 2.0% | 3.0% | 5.5% | 5.5% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Comply with Title 24 | 0.5% | 0.0% | 1.0% | 3.0% | 3.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Improved storage and handling of source materials | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Materials substitution (e.g., use water-based paints, life cycle analysis) | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Utilize efficient manufacturing processes | 1.5% | 0.5% | 2.0% | 6.0% | 6.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Resource recovery systems | 3.0% | 3.5% | 3.0% | 1.5% | 1.5% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**Mobile-Sources**

*Residential Uses*

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | X | Allow satellite telecommunications centers in residential subdivisions | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Shuttle service from residential subdivisions to commercial core areas | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| X | | Construct bus passenger benches and shelters | 0.2% | 0.2% | 0.2% | 0.2% | 0.2% | 1.28 | 0.12 | 0.14 | 0.27 | 0.05 |
| X | | Construct pedestrian facility improvements | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.64 | 0.06 | 0.07 | 0.14 | 0.03 |
| X | | Retail services within or adjacent to residential subdivisions | 1.3% | 1.0% | 1.3% | 1.3% | 1.3% | 8.31 | 0.58 | 0.88 | 1.78 | 0.35 |
| | X | Shuttle to major rail transit centers or multi-modal stations | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| X | | Contribute to regional transit systems | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| X | | Synchronize traffic lights on streets impacted by development | 4.0% | 4.0% | 4.0% | 4.0% | 4.0% | 25.57 | 2.32 | 2.72 | 5.48 | 1.07 |
| X | | Construct bicycle trails | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.64 | 0.06 | 0.07 | 0.14 | 0.03 |

*Commercial, Office and Insitutional Uses*

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| X | | Preferential parking spaces for carpools and vanpools | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 1.35 | 0.13 | 0.15 | 0.29 | 0.06 |
| X | | Implement on-site circulation plan in parking lots | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| X | | Provide separate windows for fast-food restaurants | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Provide video-conference facilities | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Set up resident worker training programs to improve job/housing balance | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Implement home dispatching system for employees | 0.1% | 0.0% | 0.1% | 0.1% | 0.1% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Minimize use of fleet vehicles during smog alerts | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Use low emission fleet vehicles | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Reduce employee parking spaces for those business not under Rule 2202 | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Lunch shuttle service from a worksite to food establishments | 0.5% | 0.4% | 0.5% | 0.5% | 0.5% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Implement compressed work-week schedules | 1.0% | 0.8% | 1.0% | 1.0% | 1.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Trip reduction plan to achieve 1.5 AVR for businesses | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Utilize satellite offices rather than regular worksite to reduce VMT | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Establish a home-based telecommuting program | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Provide or contribute to child care and after school facilities | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| X | | Offer travel incentives such as discounts on purchases for transit riders | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Provide on-site employee services such as cafeteria, banks, etc. | 0.3% | 0.2% | 0.3% | 0.3% | 0.3% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Shuttle service from residential core area to the worksite | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| X | | Construct bus passenger benches and shelters | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 1.35 | 0.13 | 0.15 | 0.29 | 0.06 |
| X | | Pricing structure for single-occupancy employee parking | 2.0% | 1.5% | 2.0% | 2.0% | 2.0% | 27.00 | 1.91 | 2.97 | 5.79 | 1.13 |
| X | | Residential units within or adjacent to commercial developments | 4.0% | 3.1% | 4.0% | 4.0% | 4.0% | 53.99 | 3.95 | 5.95 | 11.57 | 2.26 |
| X | | Utilize excess parking as park-n-ride or contribute to park-n-ride | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 1.35 | 0.13 | 0.15 | 0.29 | 0.06 |
| X | | Construct bicycle facility improvements | 0.3% | 0.2% | 0.3% | 0.3% | 0.3% | 4.05 | 0.26 | 0.45 | 0.87 | 0.17 |
| X | | Construct pedestrian facility improvements | 0.2% | 0.2% | 0.2% | 0.2% | 0.2% | 2.70 | 0.26 | 0.30 | 0.58 | 0.11 |
| | X | Shuttle to major rail transit centers or multi-modal stations | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| X | | Contribute to regional transit systems | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Charge visitors to park | 2.0% | 1.5% | 2.0% | 2.0% | 2.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| X | | Synchronize traffic lights on streets impacted by development | 4.0% | 4.0% | 4.0% | 4.0% | 4.0% | 53.99 | 5.10 | 5.95 | 11.57 | 2.26 |
| X | | Reschedule truck deliveries and pickups for off-peak hours | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| X | | Paid parking at walkup kiosks | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| X | | On-site truck loading zones | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| X | | Implement or contribute to public outreach programs | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| X | | Provide commuter information areas | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 1.35 | 0.13 | 0.15 | 0.29 | 0.06 |

*Industrial Uses*

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | X | Preferential parking spaces for carpools and vanpools | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Implement on-site circulation plan in parking lots | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Set up resident worker training programs to improve job/housing balance | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Implement home dispatching system for employees | 0.1% | 0.0% | 0.1% | 0.1% | 0.1% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Minimize use of fleet vehicles during smog alerts | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Use low emission fleet vehicles | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Provide commuter information areas | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Reduce employee parking spaces for those business not under Rule 2202 | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Implement compressed work-week schedules | 1.0% | 0.8% | 1.0% | 1.0% | 1.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Offer loans or other incentives to employees who move locally | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Trip reduction plan to achieve 1.5 AVR for businesses | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Provide or contribute to child care and after school facilities | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Provide on-site employee services such as cafeteria, banks, etc. | 0.3% | 0.2% | 0.3% | 0.3% | 0.3% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Shuttle service from residential core area to the worksite | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Construct bus passenger benches and shelters | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Pricing structure for single-occupancy employee parking | 2.0% | 1.5% | 2.0% | 2.0% | 2.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Utilize excess parking as park-n-ride or contribute to park-n-ride | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Construct bicycle facility improvements | 0.3% | 0.2% | 0.3% | 0.3% | 0.3% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Construct pedestrian facility improvements | 0.2% | 0.2% | 0.2% | 0.2% | 0.2% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Shuttle to major rail transit centers or multi-modal stations | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Contribute to regional transit systems | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Synchronize traffic lights on streets impacted by development | 4.0% | 4.0% | 4.0% | 4.0% | 4.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Reschedule truck deliveries and pickups for off-peak hours | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Lunch shuttle system from worksite to food establishments | 0.5% | 0.4% | 0.5% | 0.5% | 0.5% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | On-site truck loading zones | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Install aerodynamic add-on devices to heavy-duty trucks | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Implement or contribute to public outreach programs | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Reduce ship cruising speeds in the inner harbor | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Use low-emission fuels or electrify airport ground service vehicles | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Engine tuning for marine vessels | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Reduce number of aircraft engines used during idling | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Install monitoring system to control airport shuttles | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Use centralized ground power systems for airport service vehicles | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | | Reduction in Stationary Sources Emissions (Pounds per Day) | | | | | | 24.34 | 47.47 | 14.37 | 0.07 | 0.07 |
| | | Reduction in Mobile Sources Emissions (Pounds per Day) | | | | | | 183.56 | 15.12 | 20.09 | 39.34 | 7.69 |
| | | Total Reduction in Emissions Based on Newhall Ranch FEIR Measures (Pounds per Day) | | | | | | 207.90 | 62.59 | 34.46 | 39.41 | 7.76 |
| | | Percentage Reduced Based on Newhall Ranch FEIR Measures | | | | | | 10.17% | 22.42% | 13.86% | 9.24% | 9.29% |
| | | Total Reduced Stationary Source Emissions | | | | | | 31.32 | 46.23 | 17.61 | 0.10 | 0.10 |
| | | Total Reduced Mobile Source Emissions | | | | | | 1,805.46 | 170.40 | 196.61 | 387.02 | 75.62 |
| | | TOTAL REDUCED EMISSIONS | | | | | | 1,836.78 | 216.63 | 214.22 | 387.12 | 75.72 |
| | | SCAQMD Thresholds | | | | | | 550.00 | 55.00 | 55.00 | 150.00 | 55.00 |
| | | Project Air Quality Impacts Significant? | | | | | | YES | YES | YES | YES | YES |

Estimated Wintertime Emissions Reductions Efficiencies
Landmark Village Emissions With Implementation of Newhall Ranch Specific Plan FEIR Air Quality Mitigation Measures

Input Fields

| LAND USE | | Unmitigated Emissions in Pounds per Day | | | | |
|---|---|---|---|---|---|---|
| | | CO | VOC | $NO_X$ | $PM_{10}$ | $PM_{2.5}$ |
| Single Family Residential Uses | Vehicular Sources | 293.66 | 28.78 | 39.30 | 65.89 | 12.87 |
| | Area Sources | 7.34 | 34.30 | 17.24 | 0.42 | 0.41 |
| Multi-Family Residential Uses | Vehicular Sources | 317.37 | 31.72 | 42.48 | 71.22 | 13.92 |
| | Area Sources | 6.57 | 47.20 | 15.44 | 0.40 | 0.40 |
| Commercial/Office/Institutional Uses | Vehicular Sources | 1,314.69 | 141.50 | 178.55 | 289.25 | 56.52 |
| | Area Sources | 7.11 | 7.01 | 8.46 | 0.02 | 0.02 |
| **Total Emissions** | Vehicular Sources | 1,925.72 | 202.00 | 260.33 | 426.36 | 83.31 |
| | Area Sources | 21.02 | 88.51 | 41.14 | 0.84 | 0.83 |
| | **Total Non-Reduced Emissions** | **1,946.74** | **290.51** | **301.47** | **427.20** | **84.14** |

| Recommended Measures already incorporated into Project are marked "No" | | | Emission Reduction Efficiency | | | | | Reduced Emissions in Pounds per Day | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Yes | No | MEASURES, EFFICIENCIES, AND REDUCTIONS | CO | VOC | $NO_X$ | $PM_{10}$ | $PM_{2.5}$ | CO | VOC | $NO_X$ | $PM_{10}$ | $PM_{2.5}$ |
| **Stationary Sources** | | | | | | | | | | | | |
| *All Residential Uses* | | | | | | | | | | | | |
| X | | Use solar or low emission water heaters | 10.0% | 11.0% | 9.5% | 4.5% | 4.5% | 1.39 | 8.97 | 3.10 | 0.04 | 0.04 |
| X | | Use built-in-energy-efficient appliances | 3.0% | 2.5% | 3.0% | 6.5% | 6.5% | 0.42 | 2.04 | 0.98 | 0.05 | 0.05 |
| X | | Provide shade trees to reduce heating/cooling needs | 0.0% | 0.0% | 0.0% | 0.5% | 0.5% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| X | | Use energy-efficient and automated controls for air conditioners | 0.0% | 0.0% | 0.0% | 0.5% | 0.5% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| X | | Use double-glass paned windows | 4.5% | 4.5% | 4.0% | 2.5% | 2.5% | 0.63 | 3.67 | 1.31 | 0.02 | 0.02 |
| | X | Provide ventilation systems for enclosed parking facilities | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| X | | Use lighting controls and energy efficient lighting | 0.0% | 0.0% | 0.0% | 0.5% | 0.5% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Use fuel cells in residential subdivisions to produce heat and electicity | 1.0% | 0.0% | 1.5% | 7.0% | 7.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| X | | Orient buildings to the north | 13.5% | 14.0% | 13.0% | 10.5% | 10.5% | 1.88 | 11.41 | 4.25 | 0.09 | 0.09 |
| X | | Use light-colored roof materials to reflect heat | 1.5% | 1.5% | 1.5% | 1.5% | 1.5% | 0.21 | 1.22 | 0.49 | 0.01 | 0.01 |
| X | | Comply with Title 24 | 13.0% | 14.0% | 13.0% | 7.5% | 7.5% | 1.81 | 11.41 | 4.25 | 0.06 | 0.06 |
| *Multi-Family Residential Uses* | | | | | | | | | | | | |
| X | | Use central water heating systems | 8.5% | 9.0% | 8.0% | 4.0% | 4.0% | 0.56 | 4.25 | 1.24 | 0.02 | 0.02 |
| *Commercial, Office, Institutional Uses* | | | | | | | | | | | | |
| X | | Use solar or low emission water heaters | 0.5% | 0.5% | 0.5% | 0.5% | 0.5% | 0.04 | 0.04 | 0.04 | 0.00 | 0.00 |
| X | | Use central water heating systems | 0.5% | 0.5% | 0.5% | 0.5% | 0.5% | 0.04 | 0.04 | 0.04 | 0.00 | 0.00 |
| X | | Provide shade trees to reduce heating/cooling needs | 0.5% | 0.5% | 0.5% | 1.0% | 1.0% | 0.04 | 0.04 | 0.04 | 0.00 | 0.00 |
| X | | Use energy-efficient and automated controls for air conditioners | 1.0% | 1.0% | 1.0% | 1.5% | 1.5% | 0.07 | 0.07 | 0.08 | 0.00 | 0.00 |
| X | | Use double-glass paned windows | 3.0% | 3.5% | 3.0% | 2.5% | 2.5% | 0.21 | 0.25 | 0.25 | 0.00 | 0.00 |
| X | | Use energy-efficient low-sodium parking lights | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Provide ventilation systems for enclosed parking facilities | 0.0% | 0.0% | 0.0% | 0.5% | 0.5% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| X | | Use lighting controls and energy efficient lighting | 7.0% | 3.0% | 8.5% | 19.5% | 19.5% | 0.50 | 0.21 | 0.72 | 0.00 | 0.00 |
| X | | Use light-colored roof materials to reflect heat | 1.0% | 1.0% | 1.0% | 0.5% | 0.5% | 0.07 | 0.07 | 0.08 | 0.00 | 0.00 |
| X | | Comply with Title 24 | 9.5% | 10.0% | 9.0% | 7.0% | 7.0% | 0.68 | 0.70 | 0.76 | 0.00 | 0.00 |
| X | | Orient buildings to the north | 12.5% | 11.0% | 13.5% | 17.5% | 17.5% | 0.89 | 0.77 | 1.14 | 0.00 | 0.00 |
| *Industrial Uses* | | | | | | | | | | | | |
| | X | Provide shade trees to reduce heating/cooling needs | 0.0% | 0.0% | 0.0% | 0.5% | 0.5% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Use energy-efficient and automated controls for air conditioners | 0.0% | 0.0% | 0.0% | 1.0% | 1.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Use double-glass paned windows | 0.0% | 0.0% | 0.5% | 1.0% | 1.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Use energy-efficient low-sodium parking lights | 0.0% | 0.0% | 0.5% | 1.0% | 1.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Provide ventilation systems for enclosed parking facilities | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Use lightin constrols and energy efficient lighting | 0.5% | 0.0% | 1.0% | 2.5% | 2.5% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Use light-colored roof materials to reflect heat | 0.0% | 0.0% | 0.0% | 0.5% | 0.5% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Orient buildings to the north | 2.5% | 2.0% | 3.0% | 5.5% | 5.5% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Comply with Title 24 | 0.5% | 0.0% | 1.0% | 3.0% | 3.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Improved storage and handling of source materials | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Materials substitution (e.g., use water-based paints, life cycle analysis) | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Utilize efficient manufacturing processes | 1.5% | 0.5% | 2.0% | 6.0% | 6.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Resource recovery systems | 3.0% | 3.5% | 3.0% | 1.5% | 1.5% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**Mobile-Sources**

*Residential Uses*

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | X | Allow satellite telecommunications centers in residential subdivisions | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Shuttle service from residential subdivisions to commercial core areas | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| X | | Construct bus passenger benches and shelters | 0.2% | 0.2% | 0.2% | 0.2% | 0.2% | 1.22 | 0.12 | 0.16 | 0.27 | 0.05 |
| X | | Construct pedestrian facility improvements | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.61 | 0.06 | 0.08 | 0.14 | 0.03 |
| X | | Retail services within or adjacent to residential subdivisions | 1.3% | 1.0% | 1.3% | 1.3% | 1.3% | 7.94 | 0.61 | 1.06 | 1.78 | 0.35 |
| | X | Shuttle to major rail transit centers or multi-modal stations | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| X | | Contribute to regional transit systems | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| X | | Synchronize traffic lights on streets impacted by development | 4.0% | 4.0% | 4.0% | 4.0% | 4.0% | 24.44 | 2.42 | 3.27 | 5.48 | 1.07 |
| X | | Construct bicycle trails | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.61 | 0.06 | 0.08 | 0.14 | 0.03 |

*Commercial, Office and Insitutional Uses*

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| X | | Preferential parking spaces for carpools and vanpools | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 1.31 | 0.14 | 0.18 | 0.29 | 0.06 |
| X | | Implement on-site circulation plan in parking lots | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| X | | Provide separate windows for fast-food restaurants | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Provide video-conference facilities | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Set up resident worker training programs to improve job/housing balance | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Implement home dispatching system for employees | 0.1% | 0.0% | 0.1% | 0.1% | 0.1% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Minimize use of fleet vehicles during smog alerts | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Use low emission fleet vehicles | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Reduce employee parking spaces for those business not under Rule 2202 | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Lunch shuttle service from a worksite to food establishments | 0.5% | 0.4% | 0.5% | 0.5% | 0.5% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Implement compressed work-week schedules | 1.0% | 0.8% | 1.0% | 1.0% | 1.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Trip reduction plan to achieve 1.5 AVR for businesses | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Utilize satellite offices rather than regular worksite to reduce VMT | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Establish a home-based telecommuting program | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Provide or contribute to child care and after school facilities | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| X | | Offer travel incentives such as discounts on purchases for transit riders | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Provide on-site employee services such as cafeteria, banks, etc. | 0.3% | 0.2% | 0.3% | 0.3% | 0.3% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Shuttle service from residential core area to the worksite | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| X | | Construct bus passenger benches and shelters | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 1.31 | 0.14 | 0.18 | 0.29 | 0.06 |
| X | | Pricing structure for single-occupancy employee parking | 2.0% | 1.5% | 2.0% | 2.0% | 2.0% | 26.29 | 2.12 | 3.57 | 5.79 | 1.13 |
| X | | Residential units within or adjacent to commercial developments | 4.0% | 3.1% | 4.0% | 4.0% | 4.0% | 52.59 | 4.39 | 7.14 | 11.57 | 2.26 |
| X | | Utilize excess parking as park-n-ride or contribute to park-n-ride | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 1.31 | 0.14 | 0.18 | 0.29 | 0.06 |
| X | | Construct bicycle facility improvements | 0.3% | 0.2% | 0.3% | 0.3% | 0.3% | 3.94 | 0.28 | 0.54 | 0.87 | 0.17 |
| X | | Construct pedestrian facility improvements | 0.2% | 0.2% | 0.2% | 0.2% | 0.2% | 2.63 | 0.28 | 0.36 | 0.58 | 0.11 |
| | X | Shuttle to major rail transit centers or multi-modal stations | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| X | | Contribute to regional transit systems | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Charge visitors to park | 2.0% | 1.5% | 2.0% | 2.0% | 2.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| X | | Synchronize traffic lights on streets impacted by development | 4.0% | 4.0% | 4.0% | 4.0% | 4.0% | 52.59 | 5.66 | 7.14 | 11.57 | 2.26 |
| X | | Reschedule truck deliveries and pickups for off-peak hours | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| X | | Paid parking at walkup kiosks | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| X | | On-site truck loading zones | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| X | | Implement or contribute to public outreach programs | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| X | | Provide commuter information areas | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 1.31 | 0.14 | 0.18 | 0.29 | 0.06 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Industrial Uses* | | | | | | | | | | | | |
| | X | Preferential parking spaces for carpools and vanpools | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Implement on-site circulation plan in parking lots | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Set up resident worker training programs to improve job/housing balance | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Implement home dispatching system for employees | 0.1% | 0.0% | 0.1% | 0.1% | 0.1% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Minimize use of fleet vehicles during smog alerts | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Use low emission fleet vehicles | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Provide commuter information areas | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Reduce employee parking spaces for those business not under Rule 2202 | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Implement compressed work-week schedules | 1.0% | 0.8% | 1.0% | 1.0% | 1.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Offer loans or other incentives to employees who move locally | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Trip reduction plan to achieve 1.5 AVR for businesses | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Provide or contribute to child care and after school facilities | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Provide on-site employee services such as cafeteria, banks, etc. | 0.3% | 0.2% | 0.3% | 0.3% | 0.3% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Shuttle service from residential core area to the worksite | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Construct bus passenger benches and shelters | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Pricing structure for single-occupancy employee parking | 2.0% | 1.5% | 2.0% | 2.0% | 2.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Utilize excess parking as park-n-ride or contribute to park-n-ride | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Construct bicycle facility improvements | 0.3% | 0.2% | 0.3% | 0.3% | 0.3% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Construct pedestrian facility improvements | 0.2% | 0.2% | 0.2% | 0.2% | 0.2% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Shuttle to major rail transit centers or multi-modal stations | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Contribute to regional transit systems | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Synchronize traffic lights on streets impacted by development | 4.0% | 4.0% | 4.0% | 4.0% | 4.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Reschedule truck deliveries and pickups for off-peak hours | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Lunch shuttle system from worksite to food establishments | 0.5% | 0.4% | 0.5% | 0.5% | 0.5% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | On-site truck loading zones | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Install aerodynamic add-on devices to heavy-duty trucks | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Implement or contribute to public outreach programs | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Reduce ship cruising speeds in the inner harbor | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Use low-emission fuels or electrify airport ground service vehicles | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Engine tuning for marine vessels | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Reduce number of aircraft engines used during idling | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Install monitoring system to control airport shuttles | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | X | Use centralized ground power systems for airport service vehicles | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | | | | | | | Reduction in Stationary Sources Emissions (Pounds per Day) | 9.41 | 45.13 | 18.79 | 0.31 | 0.31 |
| | | | | | | | Reduction in Mobile Sources Emissions (Pounds per Day) | 178.13 | 16.57 | 24.12 | 39.34 | 7.69 |
| | | | | | | | Total Reduction in Emissions Based on Newhall Ranch FEIR Measures (Pounds per Day) | 187.54 | 61.70 | 42.91 | 39.65 | 7.99 |
| | | | | | | | Percentage Reduced Based on Newhall Ranch FEIR Measures | 9.63% | 21.24% | 14.23% | 9.28% | 9.50% |
| | | | | | | | Total Reduced Stationary Source Emissions | 11.61 | 43.38 | 22.35 | 0.53 | 0.52 |
| | | | | | | | Total Reduced Mobile Source Emissions | 1,747.59 | 185.43 | 236.21 | 387.02 | 75.62 |
| | | | | | | | TOTAL REDUCED EMISSIONS | 1,759.20 | 228.81 | 258.56 | 387.55 | 76.15 |
| | | | | | | | SCAQMD Thresholds | 550.00 | 55.00 | 55.00 | 150.00 | 55.00 |
| | | | | | | | Project Air Quality Impacts Significant? | YES | YES | YES | YES | YES |

**9/21/2010 12:22:22 PM**

Urbemis 2007 Version 9.2.4

Combined Summer Emissions Reports (Pounds/Day)

File Name: Z:\Air Quality\032.225 Landmark Village Recirculated\URBEMIS2007 Operational - separate land uses\Landmark Recirc Operatior

Project Name: Landmark - Operational - Recirculated DEIR - Single Family Residential

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

AREA SOURCE EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 | PM2.5 |
|---|---|---|---|---|---|---|
| TOTALS (lbs/day, unmitigated) | 38.78 | 12.64 | 31.63 | 0.00 | 0.09 | 0.09 |

OPERATIONAL (VEHICLE) EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 | PM2.5 |
|---|---|---|---|---|---|---|
| TOTALS (lbs/day, unmitigated) | 35.70 | 44.37 | 417.25 | 0.55 | 89.50 | 17.49 |

SUM OF AREA SOURCE AND OPERATIONAL EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 | PM2.5 |
|---|---|---|---|---|---|---|
| TOTALS (lbs/day, unmitigated) | 74.48 | 57.01 | 448.88 | 0.55 | 89.59 | 17.58 |

**9/21/2010 12:22:22 PM**

Area Source Unmitigated Detail Report:

AREA SOURCE EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

| Source | ROG | NOx | CO | SO2 | PM10 | PM2.5 |
|---|---|---|---|---|---|---|
| Natural Gas | 0.95 | 12.34 | 5.25 | 0.00 | 0.02 | 0.02 |
| Hearth - No Summer Emissions | | | | | | |
| Landscape | 4.77 | 0.30 | 26.38 | 0.00 | 0.07 | 0.07 |
| Consumer Products | 30.92 | | | | | |
| Architectural Coatings | 2.14 | | | | | |
| TOTALS (lbs/day, unmitigated) | 38.78 | 12.64 | 31.63 | 0.00 | 0.09 | 0.09 |

Area Source Changes to Defaults

Percent residential using natural gas changed from 78% to 100%

Percentage of residences with wood stoves changed from 10% to 0%

Percentage of residences with wood fireplaces changed from 5% to 0%

Percentage of residences with natural gas fireplaces changed from 85% to 100%

The number of persons per household for consumer product use changed from 3 persons to 3.06 persons

Operational Unmitigated Detail Report:

OPERATIONAL EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

| Source | ROG | NOX | CO | SO2 | PM10 | PM25 |
|---|---|---|---|---|---|---|
| Single family housing | 35.70 | 44.37 | 417.25 | 0.55 | 89.50 | 17.49 |
| TOTALS (lbs/day, unmitigated) | 35.70 | 44.37 | 417.25 | 0.55 | 89.50 | 17.49 |

**9/21/2010 12:22:22 PM**

Operational Settings:

Includes correction for passby trips

Includes the following double counting adjustment for internal trips:

Residential Trip % Reduction: 0.00  Nonresidential Trip % Reduction: 0.00

Analysis Year: 2014  Temperature (F): 80  Season: Summer

Emfac: Version  : Emfac2007 V2.3 Nov 1 2006

Summary of Land Uses

| Land Use Type | Acreage | Trip Rate | Unit Type | No. Units | Total Trips | Total VMT |
|---|---|---|---|---|---|---|
| Single family housing | 197.00 | 9.90 | dwelling units | 591.00 | 5,850.90 | 51,751.22 |
| | | | | | 5,850.90 | 51,751.22 |

Vehicle Fleet Mix

| Vehicle Type | Percent Type | Non-Catalyst | Catalyst | Diesel |
|---|---|---|---|---|
| Light Auto | 51.1 | 0.4 | 99.4 | 0.2 |
| Light Truck < 3750 lbs | 7.3 | 1.4 | 95.9 | 2.7 |
| Light Truck 3751-5750 lbs | 23.1 | 0.4 | 99.6 | 0.0 |
| Med Truck 5751-8500 lbs | 10.8 | 0.9 | 99.1 | 0.0 |
| Lite-Heavy Truck 8501-10,000 lbs | 1.7 | 0.0 | 82.4 | 17.6 |
| Lite-Heavy Truck 10,001-14,000 lbs | 0.5 | 0.0 | 60.0 | 40.0 |
| Med-Heavy Truck 14,001-33,000 lbs | 0.9 | 0.0 | 22.2 | 77.8 |
| Heavy-Heavy Truck 33,001-60,000 lbs | 0.6 | 0.0 | 0.0 | 100.0 |
| Other Bus | 0.1 | 0.0 | 0.0 | 100.0 |
| Urban Bus | 0.1 | 0.0 | 0.0 | 100.0 |
| Motorcycle | 2.8 | 50.0 | 50.0 | 0.0 |
| School Bus | 0.1 | 0.0 | 0.0 | 100.0 |
| Motor Home | 0.9 | 0.0 | 88.9 | 11.1 |

**9/21/2010 12:22:22 PM**

Travel Conditions

| | Residential | | | Commercial | | |
|---|---|---|---|---|---|---|
| | Home-Work | Home-Shop | Home-Other | Commute | Non-Work | Customer |
| Urban Trip Length (miles) | 12.7 | 7.0 | 9.5 | 13.3 | 7.4 | 8.9 |
| Rural Trip Length (miles) | 17.6 | 12.1 | 14.9 | 15.4 | 9.6 | 12.6 |
| Trip speeds (mph) | 30.0 | 30.0 | 30.0 | 30.0 | 30.0 | 30.0 |
| % of Trips - Residential | 32.9 | 18.0 | 49.1 | | | |

% of Trips - Commercial (by land use)

**9/21/2010 12:23:02 PM**

Urbemis 2007 Version 9.2.4

Combined Winter Emissions Reports (Pounds/Day)

File Name: Z:\Air Quality\032.225 Landmark Village Recirculated\URBEMIS2007 Operational - separate land uses\Landmark Recirc Operatior

Project Name: Landmark - Operational - Recirculated DEIR - Single Family Residential

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

AREA SOURCE EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 | PM2.5 |
|---|---|---|---|---|---|---|
| TOTALS (lbs/day, unmitigated) | 34.30 | 17.24 | 7.34 | 0.03 | 0.42 | 0.41 |

OPERATIONAL (VEHICLE) EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 | PM2.5 |
|---|---|---|---|---|---|---|
| TOTALS (lbs/day, unmitigated) | 38.49 | 53.39 | 398.86 | 0.46 | 89.50 | 17.49 |

SUM OF AREA SOURCE AND OPERATIONAL EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 | PM2.5 |
|---|---|---|---|---|---|---|
| TOTALS (lbs/day, unmitigated) | 72.79 | 70.63 | 406.20 | 0.49 | 89.92 | 17.90 |

**9/21/2010 12:23:02 PM**

Area Source Unmitigated Detail Report:

AREA SOURCE EMISSION ESTIMATES Winter Pounds Per Day, Unmitigated

| Source | ROG | NOx | CO | SO2 | PM10 | PM2.5 |
|---|---|---|---|---|---|---|
| Natural Gas | 0.95 | 12.34 | 5.25 | 0.00 | 0.02 | 0.02 |
| Hearth | 0.29 | 4.90 | 2.09 | 0.03 | 0.40 | 0.39 |
| Landscaping - No Winter Emissions | | | | | | |
| Consumer Products | 30.92 | | | | | |
| Architectural Coatings | 2.14 | | | | | |
| TOTALS (lbs/day, unmitigated) | 34.30 | 17.24 | 7.34 | 0.03 | 0.42 | 0.41 |

Area Source Changes to Defaults

Percent residential using natural gas changed from 78% to 100%

Percentage of residences with wood stoves changed from 10% to 0%

Percentage of residences with wood fireplaces changed from 5% to 0%

Percentage of residences with natural gas fireplaces changed from 85% to 100%

The number of persons per household for consumer product use changed from 3 persons to 3.06 persons

Operational Unmitigated Detail Report:

OPERATIONAL EMISSION ESTIMATES Winter Pounds Per Day, Unmitigated

| Source | ROG | NOX | CO | SO2 | PM10 | PM25 |
|---|---|---|---|---|---|---|
| Single family housing | 38.49 | 53.39 | 398.86 | 0.46 | 89.50 | 17.49 |
| TOTALS (lbs/day, unmitigated) | 38.49 | 53.39 | 398.86 | 0.46 | 89.50 | 17.49 |

**9/21/2010 12:23:02 PM**

Operational Settings:

Includes correction for passby trips

Includes the following double counting adjustment for internal trips:

Residential Trip % Reduction: 0.00  Nonresidential Trip % Reduction: 0.00

Analysis Year: 2014  Temperature (F): 60  Season: Winter

Emfac: Version  : Emfac2007 V2.3 Nov 1 2006

Summary of Land Uses

| Land Use Type | Acreage | Trip Rate | Unit Type | No. Units | Total Trips | Total VMT |
|---|---|---|---|---|---|---|
| Single family housing | 197.00 | 9.90 | dwelling units | 591.00 | 5,850.90 | 51,751.22 |
| | | | | | 5,850.90 | 51,751.22 |

Vehicle Fleet Mix

| Vehicle Type | Percent Type | Non-Catalyst | Catalyst | Diesel |
|---|---|---|---|---|
| Light Auto | 51.1 | 0.4 | 99.4 | 0.2 |
| Light Truck < 3750 lbs | 7.3 | 1.4 | 95.9 | 2.7 |
| Light Truck 3751-5750 lbs | 23.1 | 0.4 | 99.6 | 0.0 |
| Med Truck 5751-8500 lbs | 10.8 | 0.9 | 99.1 | 0.0 |
| Lite-Heavy Truck 8501-10,000 lbs | 1.7 | 0.0 | 82.4 | 17.6 |
| Lite-Heavy Truck 10,001-14,000 lbs | 0.5 | 0.0 | 60.0 | 40.0 |
| Med-Heavy Truck 14,001-33,000 lbs | 0.9 | 0.0 | 22.2 | 77.8 |
| Heavy-Heavy Truck 33,001-60,000 lbs | 0.6 | 0.0 | 0.0 | 100.0 |
| Other Bus | 0.1 | 0.0 | 0.0 | 100.0 |
| Urban Bus | 0.1 | 0.0 | 0.0 | 100.0 |
| Motorcycle | 2.8 | 50.0 | 50.0 | 0.0 |
| School Bus | 0.1 | 0.0 | 0.0 | 100.0 |
| Motor Home | 0.9 | 0.0 | 88.9 | 11.1 |

**9/21/2010 12:23:02 PM**

Travel Conditions

| | Residential | | | Commercial | | |
|---|---|---|---|---|---|---|
| | Home-Work | Home-Shop | Home-Other | Commute | Non-Work | Customer |
| Urban Trip Length (miles) | 12.7 | 7.0 | 9.5 | 13.3 | 7.4 | 8.9 |
| Rural Trip Length (miles) | 17.6 | 12.1 | 14.9 | 15.4 | 9.6 | 12.6 |
| Trip speeds (mph) | 30.0 | 30.0 | 30.0 | 30.0 | 30.0 | 30.0 |
| % of Trips - Residential | 32.9 | 18.0 | 49.1 | | | |

% of Trips - Commercial (by land use)

**9/21/2010 12:24:49 PM**

Urbemis 2007 Version 9.2.4

Combined Summer Emissions Reports (Pounds/Day)

File Name: Z:\Air Quality\032.225 Landmark Village Recirculated\URBEMIS2007 Operational - separate land uses\Landmark Recirc Operatio

Project Name: Landmark - Operational - Recirculated DEIR - Multi-Family Residential

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

AREA SOURCE EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 | PM2.5 |
|---|---|---|---|---|---|---|
| TOTALS (lbs/day, unmitigated) | 47.17 | 10.76 | 7.65 | 0.00 | 0.03 | 0.03 |

OPERATIONAL (VEHICLE) EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 | PM2.5 |
|---|---|---|---|---|---|---|
| TOTALS (lbs/day, unmitigated) | 39.90 | 47.96 | 450.95 | 0.60 | 96.72 | 18.90 |

SUM OF AREA SOURCE AND OPERATIONAL EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 | PM2.5 |
|---|---|---|---|---|---|---|
| TOTALS (lbs/day, unmitigated) | 87.07 | 58.72 | 458.60 | 0.60 | 96.75 | 18.93 |

**9/21/2010 12:24:49 PM**

Area Source Unmitigated Detail Report:

AREA SOURCE EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

| Source | ROG | NOx | CO | SO2 | PM10 | PM2.5 |
|---|---|---|---|---|---|---|
| Natural Gas | 0.83 | 10.72 | 4.56 | 0.00 | 0.02 | 0.02 |
| Hearth - No Summer Emissions | | | | | | |
| Landscape | 0.25 | 0.04 | 3.09 | 0.00 | 0.01 | 0.01 |
| Consumer Products | 44.63 | | | | | |
| Architectural Coatings | 1.46 | | | | | |
| TOTALS (lbs/day, unmitigated) | 47.17 | 10.76 | 7.65 | 0.00 | 0.03 | 0.03 |

Area Source Changes to Defaults

Percent residential using natural gas changed from 78% to 100%

Percentage of residences with wood stoves changed from 10% to 0%

Percentage of residences with wood fireplaces changed from 5% to 0%

Percentage of residences with natural gas fireplaces changed from 85% to 100%

The number of persons per household for consumer product use changed from 3 persons to 3.06 persons

Operational Unmitigated Detail Report:

OPERATIONAL EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

| Source | ROG | NOX | CO | SO2 | PM10 | PM25 |
|---|---|---|---|---|---|---|
| Apartments low rise | 20.00 | 23.81 | 223.89 | 0.30 | 48.02 | 9.38 |
| Condo/townhouse general | 19.90 | 24.15 | 227.06 | 0.30 | 48.70 | 9.52 |
| TOTALS (lbs/day, unmitigated) | 39.90 | 47.96 | 450.95 | 0.60 | 96.72 | 18.90 |

**9/21/2010 12:24:49 PM**

Operational Settings:

Includes correction for passby trips

Includes the following double counting adjustment for internal trips:

Residential Trip % Reduction: 0.00  Nonresidential Trip % Reduction: 0.00

Analysis Year: 2014  Temperature (F): 80  Season: Summer

Emfac: Version  : Emfac2007 V2.3 Nov 1 2006

Summary of Land Uses

| Land Use Type | Acreage | Trip Rate | Unit Type | No. Units | Total Trips | Total VMT |
|---|---|---|---|---|---|---|
| Apartments low rise | 28.44 | 6.90 | dwelling units | 455.00 | 3,139.50 | 27,768.88 |
| Condo/townhouse general | 24.88 | 8.00 | dwelling units | 398.00 | 3,184.00 | 28,162.48 |
| | | | | | 6,323.50 | 55,931.36 |

Vehicle Fleet Mix

| Vehicle Type | Percent Type | Non-Catalyst | Catalyst | Diesel |
|---|---|---|---|---|
| Light Auto | 51.1 | 0.4 | 99.4 | 0.2 |
| Light Truck < 3750 lbs | 7.3 | 1.4 | 95.9 | 2.7 |
| Light Truck 3751-5750 lbs | 23.1 | 0.4 | 99.6 | 0.0 |
| Med Truck 5751-8500 lbs | 10.8 | 0.9 | 99.1 | 0.0 |
| Lite-Heavy Truck 8501-10,000 lbs | 1.7 | 0.0 | 82.4 | 17.6 |
| Lite-Heavy Truck 10,001-14,000 lbs | 0.5 | 0.0 | 60.0 | 40.0 |
| Med-Heavy Truck 14,001-33,000 lbs | 0.9 | 0.0 | 22.2 | 77.8 |
| Heavy-Heavy Truck 33,001-60,000 lbs | 0.6 | 0.0 | 0.0 | 100.0 |
| Other Bus | 0.1 | 0.0 | 0.0 | 100.0 |
| Urban Bus | 0.1 | 0.0 | 0.0 | 100.0 |
| Motorcycle | 2.8 | 50.0 | 50.0 | 0.0 |
| School Bus | 0.1 | 0.0 | 0.0 | 100.0 |
| Motor Home | 0.9 | 0.0 | 88.9 | 11.1 |

**9/21/2010 12:24:49 PM**

Travel Conditions

| | Residential | | | Commercial | | |
|---|---|---|---|---|---|---|
| | Home-Work | Home-Shop | Home-Other | Commute | Non-Work | Customer |
| Urban Trip Length (miles) | 12.7 | 7.0 | 9.5 | 13.3 | 7.4 | 8.9 |
| Rural Trip Length (miles) | 17.6 | 12.1 | 14.9 | 15.4 | 9.6 | 12.6 |
| Trip speeds (mph) | 30.0 | 30.0 | 30.0 | 30.0 | 30.0 | 30.0 |
| % of Trips - Residential | 32.9 | 18.0 | 49.1 | | | |

% of Trips - Commercial (by land use)

**9/21/2010 12:25:12 PM**

Urbemis 2007 Version 9.2.4

Combined Winter Emissions Reports (Pounds/Day)

File Name: Z:\Air Quality\032.225 Landmark Village Recirculated\URBEMIS2007 Operational - separate land uses\Landmark Recirc Operatio

Project Name: Landmark - Operational - Recirculated DEIR - Multi-Family Residential

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

AREA SOURCE EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 | PM2.5 |
|---|---|---|---|---|---|---|
| TOTALS (lbs/day, unmitigated) | 47.20 | 15.44 | 6.57 | 0.03 | 0.40 | 0.40 |

OPERATIONAL (VEHICLE) EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 | PM2.5 |
|---|---|---|---|---|---|---|
| TOTALS (lbs/day, unmitigated) | 42.21 | 57.70 | 431.08 | 0.50 | 96.72 | 18.90 |

SUM OF AREA SOURCE AND OPERATIONAL EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 | PM2.5 |
|---|---|---|---|---|---|---|
| TOTALS (lbs/day, unmitigated) | 89.41 | 73.14 | 437.65 | 0.53 | 97.12 | 19.30 |

**9/21/2010 12:25:12 PM**

Area Source Unmitigated Detail Report:

AREA SOURCE EMISSION ESTIMATES Winter Pounds Per Day, Unmitigated

| Source | ROG | NOx | CO | SO2 | PM10 | PM2.5 |
|---|---|---|---|---|---|---|
| Natural Gas | 0.83 | 10.72 | 4.56 | 0.00 | 0.02 | 0.02 |
| Hearth | 0.28 | 4.72 | 2.01 | 0.03 | 0.38 | 0.38 |
| Landscaping - No Winter Emissions | | | | | | |
| Consumer Products | 44.63 | | | | | |
| Architectural Coatings | 1.46 | | | | | |
| TOTALS (lbs/day, unmitigated) | 47.20 | 15.44 | 6.57 | 0.03 | 0.40 | 0.40 |

Area Source Changes to Defaults

Percent residential using natural gas changed from 78% to 100%

Percentage of residences with wood stoves changed from 10% to 0%

Percentage of residences with wood fireplaces changed from 5% to 0%

Percentage of residences with natural gas fireplaces changed from 85% to 100%

The number of persons per household for consumer product use changed from 3 persons to 3.06 persons

Operational Unmitigated Detail Report:

OPERATIONAL EMISSION ESTIMATES Winter Pounds Per Day, Unmitigated

| Source | ROG | NOX | CO | SO2 | PM10 | PM25 |
|---|---|---|---|---|---|---|
| Apartments low rise | 21.05 | 28.65 | 214.02 | 0.25 | 48.02 | 9.38 |
| Condo/townhouse general | 21.16 | 29.05 | 217.06 | 0.25 | 48.70 | 9.52 |
| TOTALS (lbs/day, unmitigated) | 42.21 | 57.70 | 431.08 | 0.50 | 96.72 | 18.90 |

**9/21/2010 12:25:12 PM**

Operational Settings:

Includes correction for passby trips

Includes the following double counting adjustment for internal trips:

Residential Trip % Reduction: 0.00  Nonresidential Trip % Reduction: 0.00

Analysis Year: 2014  Temperature (F): 60  Season: Winter

Emfac: Version  : Emfac2007 V2.3 Nov 1 2006

Summary of Land Uses

| Land Use Type | Acreage | Trip Rate | Unit Type | No. Units | Total Trips | Total VMT |
|---|---|---|---|---|---|---|
| Apartments low rise | 28.44 | 6.90 | dwelling units | 455.00 | 3,139.50 | 27,768.88 |
| Condo/townhouse general | 24.88 | 8.00 | dwelling units | 398.00 | 3,184.00 | 28,162.48 |
| | | | | | 6,323.50 | 55,931.36 |

Vehicle Fleet Mix

| Vehicle Type | Percent Type | Non-Catalyst | Catalyst | Diesel |
|---|---|---|---|---|
| Light Auto | 51.1 | 0.4 | 99.4 | 0.2 |
| Light Truck < 3750 lbs | 7.3 | 1.4 | 95.9 | 2.7 |
| Light Truck 3751-5750 lbs | 23.1 | 0.4 | 99.6 | 0.0 |
| Med Truck 5751-8500 lbs | 10.8 | 0.9 | 99.1 | 0.0 |
| Lite-Heavy Truck 8501-10,000 lbs | 1.7 | 0.0 | 82.4 | 17.6 |
| Lite-Heavy Truck 10,001-14,000 lbs | 0.5 | 0.0 | 60.0 | 40.0 |
| Med-Heavy Truck 14,001-33,000 lbs | 0.9 | 0.0 | 22.2 | 77.8 |
| Heavy-Heavy Truck 33,001-60,000 lbs | 0.6 | 0.0 | 0.0 | 100.0 |
| Other Bus | 0.1 | 0.0 | 0.0 | 100.0 |
| Urban Bus | 0.1 | 0.0 | 0.0 | 100.0 |
| Motorcycle | 2.8 | 50.0 | 50.0 | 0.0 |
| School Bus | 0.1 | 0.0 | 0.0 | 100.0 |
| Motor Home | 0.9 | 0.0 | 88.9 | 11.1 |

**9/21/2010 12:25:12 PM**

Travel Conditions

| | Residential | | | Commercial | | |
|---|---|---|---|---|---|---|
| | Home-Work | Home-Shop | Home-Other | Commute | Non-Work | Customer |
| Urban Trip Length (miles) | 12.7 | 7.0 | 9.5 | 13.3 | 7.4 | 8.9 |
| Rural Trip Length (miles) | 17.6 | 12.1 | 14.9 | 15.4 | 9.6 | 12.6 |
| Trip speeds (mph) | 30.0 | 30.0 | 30.0 | 30.0 | 30.0 | 30.0 |
| % of Trips - Residential | 32.9 | 18.0 | 49.1 | | | |

% of Trips - Commercial (by land use)

**9/21/2010 12:27:17 PM**

Urbemis 2007 Version 9.2.4

Combined Summer Emissions Reports (Pounds/Day)

File Name: Z:\Air Quality\032.225 Landmark Village Recirculated\URBEMIS2007 Operational - separate land uses\Landmark Recirc Operatio Commercial.urb924

Project Name: Landmark - Operational - Recirculated DEIR - Commercial

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

AREA SOURCE EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 | PM2.5 |
|---|---|---|---|---|---|---|
| TOTALS (lbs/day, unmitigated) | 7.75 | 8.58 | 16.38 | 0.00 | 0.05 | 0.05 |

OPERATIONAL (VEHICLE) EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 | PM2.5 |
|---|---|---|---|---|---|---|
| TOTALS (lbs/day, unmitigated) | 141.64 | 166.76 | 1,513.37 | 1.98 | 324.28 | 63.36 |

SUM OF AREA SOURCE AND OPERATIONAL EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 | PM2.5 |
|---|---|---|---|---|---|---|
| TOTALS (lbs/day, unmitigated) | 149.39 | 175.34 | 1,529.75 | 1.98 | 324.33 | 63.41 |

**9/21/2010 12:27:17 PM**

Area Source Unmitigated Detail Report:

AREA SOURCE EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

| Source | ROG | NOx | CO | SO2 | PM10 | PM2.5 |
|---|---|---|---|---|---|---|
| Natural Gas | 0.61 | 8.46 | 7.11 | 0.00 | 0.02 | 0.02 |
| Hearth - No Summer Emissions | | | | | | |
| Landscape | 0.74 | 0.12 | 9.27 | 0.00 | 0.03 | 0.03 |
| Consumer Products | 0.00 | | | | | |
| Architectural Coatings | 6.40 | | | | | |
| TOTALS (lbs/day, unmitigated) | 7.75 | 8.58 | 16.38 | 0.00 | 0.05 | 0.05 |

Area Source Changes to Defaults

Percent residential using natural gas changed from 78% to 100%

Percentage of residences with wood stoves changed from 10% to 0%

Percentage of residences with wood fireplaces changed from 5% to 0%

Percentage of residences with natural gas fireplaces changed from 85% to 100%

The number of persons per household for consumer product use changed from 3 persons to 3.06 persons

Operational Unmitigated Detail Report:

OPERATIONAL EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

| Source | ROG | NOX | CO | SO2 | PM10 | PM25 |
|---|---|---|---|---|---|---|
| Elementary school | 9.46 | 6.18 | 56.39 | 0.07 | 12.03 | 2.35 |
| City park | 0.37 | 0.33 | 2.95 | 0.00 | 0.65 | 0.13 |
| Free-standing discount store | 54.36 | 63.30 | 565.17 | 0.73 | 119.14 | 23.29 |
| Regnl shop. center | 26.89 | 33.37 | 297.85 | 0.39 | 64.13 | 12.53 |
| Strip mall | 1.41 | 1.61 | 14.35 | 0.02 | 3.01 | 0.59 |
| Office park | 49.15 | 61.97 | 576.66 | 0.77 | 125.32 | 24.47 |
| TOTALS (lbs/day, unmitigated) | 141.64 | 166.76 | 1,513.37 | 1.98 | 324.28 | 63.36 |

**9/21/2010 12:27:17 PM**

Operational Settings:

Includes correction for passby trips

Includes the following double counting adjustment for internal trips:

Residential Trip % Reduction: 0.00  Nonresidential Trip % Reduction: 0.00

Analysis Year: 2014  Temperature (F): 80  Season: Summer

Emfac: Version  : Emfac2007 V2.3 Nov 1 2006

Summary of Land Uses

| Land Use Type | Acreage | Trip Rate | Unit Type | No. Units | Total Trips | Total VMT |
|---|---|---|---|---|---|---|
| Elementary school | | 1.45 | students | 750.00 | 1,087.50 | 6,953.82 |
| City park | | 2.60 | acres | 20.90 | 54.34 | 376.57 |
| Free-standing discount store | | 54.06 | 1000 sq ft | 252.00 | 13,623.12 | 68,882.38 |
| Regnl shop. center | | 85.06 | 1000 sq ft | 76.10 | 6,473.07 | 37,085.88 |
| Strip mall | | 37.06 | 1000 sq ft | 9.50 | 352.07 | 1,742.26 |
| Office park | | 11.56 | 1000 sq ft | 702.40 | 8,119.74 | 72,479.89 |
| | | | | | 29,709.84 | 187,520.80 |

Vehicle Fleet Mix

| Vehicle Type | Percent Type | Non-Catalyst | Catalyst | Diesel |
|---|---|---|---|---|
| Light Auto | 51.1 | 0.4 | 99.4 | 0.2 |
| Light Truck < 3750 lbs | 7.3 | 1.4 | 95.9 | 2.7 |
| Light Truck 3751-5750 lbs | 23.1 | 0.4 | 99.6 | 0.0 |
| Med Truck 5751-8500 lbs | 10.8 | 0.9 | 99.1 | 0.0 |
| Lite-Heavy Truck 8501-10,000 lbs | 1.7 | 0.0 | 82.4 | 17.6 |
| Lite-Heavy Truck 10,001-14,000 lbs | 0.5 | 0.0 | 60.0 | 40.0 |
| Med-Heavy Truck 14,001-33,000 lbs | 0.9 | 0.0 | 22.2 | 77.8 |
| Heavy-Heavy Truck 33,001-60,000 lbs | 0.6 | 0.0 | 0.0 | 100.0 |
| Other Bus | 0.1 | 0.0 | 0.0 | 100.0 |
| Urban Bus | 0.1 | 0.0 | 0.0 | 100.0 |
| Motorcycle | 2.8 | 50.0 | 50.0 | 0.0 |
| School Bus | 0.1 | 0.0 | 0.0 | 100.0 |
| Motor Home | 0.9 | 0.0 | 88.9 | 11.1 |

**9/21/2010 12:27:17 PM**

Travel Conditions

| | Residential | | | Commercial | | |
|---|---|---|---|---|---|---|
| | Home-Work | Home-Shop | Home-Other | Commute | Non-Work | Customer |
| Urban Trip Length (miles) | 12.7 | 7.0 | 9.5 | 13.3 | 7.4 | 8.9 |
| Rural Trip Length (miles) | 17.6 | 12.1 | 14.9 | 15.4 | 9.6 | 12.6 |
| Trip speeds (mph) | 30.0 | 30.0 | 30.0 | 30.0 | 30.0 | 30.0 |
| % of Trips - Residential | 32.9 | 18.0 | 49.1 | | | |
| | | | | | | |
| % of Trips - Commercial (by land use) | | | | | | |
| Elementary school | | | | 20.0 | 10.0 | 70.0 |
| City park | | | | 5.0 | 2.5 | 92.5 |
| Free-standing discount store | | | | 2.0 | 1.0 | 97.0 |
| Regnl shop. center | | | | 2.0 | 1.0 | 97.0 |
| Strip mall | | | | 2.0 | 1.0 | 97.0 |
| Office park | | | | 48.0 | 24.0 | 28.0 |

**9/21/2010 12:27:37 PM**

Urbemis 2007 Version 9.2.4

Combined Winter Emissions Reports (Pounds/Day)

File Name: Z:\Air Quality\032.225 Landmark Village Recirculated\URBEMIS2007 Operational - separate land uses\Landmark Recirc Operatio Commercial.urb924

Project Name: Landmark - Operational - Recirculated DEIR - Commercial

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

AREA SOURCE EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 | PM2.5 |
|---|---|---|---|---|---|---|
| TOTALS (lbs/day, unmitigated) | 7.01 | 8.46 | 7.11 | 0.00 | 0.02 | 0.02 |

OPERATIONAL (VEHICLE) EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 | PM2.5 |
|---|---|---|---|---|---|---|
| TOTALS (lbs/day, unmitigated) | 158.02 | 200.20 | 1,474.01 | 1.66 | 324.28 | 63.36 |

SUM OF AREA SOURCE AND OPERATIONAL EMISSION ESTIMATES

| | ROG | NOx | CO | SO2 | PM10 | PM2.5 |
|---|---|---|---|---|---|---|
| TOTALS (lbs/day, unmitigated) | 165.03 | 208.66 | 1,481.12 | 1.66 | 324.30 | 63.38 |

**9/21/2010 12:27:37 PM**

Area Source Unmitigated Detail Report:

AREA SOURCE EMISSION ESTIMATES Winter Pounds Per Day, Unmitigated

| Source | ROG | NOx | CO | SO2 | PM10 | PM2.5 |
|---|---|---|---|---|---|---|
| Natural Gas | 0.61 | 8.46 | 7.11 | 0.00 | 0.02 | 0.02 |
| Hearth | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Landscaping - No Winter Emissions | | | | | | |
| Consumer Products | 0.00 | | | | | |
| Architectural Coatings | 6.40 | | | | | |
| TOTALS (lbs/day, unmitigated) | 7.01 | 8.46 | 7.11 | 0.00 | 0.02 | 0.02 |

Area Source Changes to Defaults

Percent residential using natural gas changed from 78% to 100%

Percentage of residences with wood stoves changed from 10% to 0%

Percentage of residences with wood fireplaces changed from 5% to 0%

Percentage of residences with natural gas fireplaces changed from 85% to 100%

The number of persons per household for consumer product use changed from 3 persons to 3.06 persons

Operational Unmitigated Detail Report:

OPERATIONAL EMISSION ESTIMATES Winter Pounds Per Day, Unmitigated

| Source | ROG | NOX | CO | SO2 | PM10 | PM25 |
|---|---|---|---|---|---|---|
| Elementary school | 7.84 | 7.42 | 54.84 | 0.06 | 12.03 | 2.35 |
| City park | 0.34 | 0.40 | 2.86 | 0.00 | 0.65 | 0.13 |
| Free-standing discount store | 63.20 | 75.85 | 560.00 | 0.61 | 119.14 | 23.29 |
| Regnl shop. center | 31.26 | 40.03 | 292.64 | 0.33 | 64.13 | 12.53 |
| Strip mall | 1.63 | 1.93 | 14.24 | 0.02 | 3.01 | 0.59 |
| Office park | 53.75 | 74.57 | 549.43 | 0.64 | 125.32 | 24.47 |
| TOTALS (lbs/day, unmitigated) | 158.02 | 200.20 | 1,474.01 | 1.66 | 324.28 | 63.36 |

**9/21/2010 12:27:37 PM**

Operational Settings:

Includes correction for passby trips

Includes the following double counting adjustment for internal trips:

Residential Trip % Reduction: 0.00  Nonresidential Trip % Reduction: 0.00

Analysis Year: 2014  Temperature (F): 60  Season: Winter

Emfac: Version  : Emfac2007 V2.3 Nov 1 2006

Summary of Land Uses

| Land Use Type | Acreage | Trip Rate | Unit Type | No. Units | Total Trips | Total VMT |
|---|---|---|---|---|---|---|
| Elementary school | | 1.45 | students | 750.00 | 1,087.50 | 6,953.82 |
| City park | | 2.60 | acres | 20.90 | 54.34 | 376.57 |
| Free-standing discount store | | 54.06 | 1000 sq ft | 252.00 | 13,623.12 | 68,882.38 |
| Regnl shop. center | | 85.06 | 1000 sq ft | 76.10 | 6,473.07 | 37,085.88 |
| Strip mall | | 37.06 | 1000 sq ft | 9.50 | 352.07 | 1,742.26 |
| Office park | | 11.56 | 1000 sq ft | 702.40 | 8,119.74 | 72,479.89 |
| | | | | | 29,709.84 | 187,520.80 |

Vehicle Fleet Mix

| Vehicle Type | Percent Type | Non-Catalyst | Catalyst | Diesel |
|---|---|---|---|---|
| Light Auto | 51.1 | 0.4 | 99.4 | 0.2 |
| Light Truck < 3750 lbs | 7.3 | 1.4 | 95.9 | 2.7 |
| Light Truck 3751-5750 lbs | 23.1 | 0.4 | 99.6 | 0.0 |
| Med Truck 5751-8500 lbs | 10.8 | 0.9 | 99.1 | 0.0 |
| Lite-Heavy Truck 8501-10,000 lbs | 1.7 | 0.0 | 82.4 | 17.6 |
| Lite-Heavy Truck 10,001-14,000 lbs | 0.5 | 0.0 | 60.0 | 40.0 |
| Med-Heavy Truck 14,001-33,000 lbs | 0.9 | 0.0 | 22.2 | 77.8 |
| Heavy-Heavy Truck 33,001-60,000 lbs | 0.6 | 0.0 | 0.0 | 100.0 |
| Other Bus | 0.1 | 0.0 | 0.0 | 100.0 |
| Urban Bus | 0.1 | 0.0 | 0.0 | 100.0 |
| Motorcycle | 2.8 | 50.0 | 50.0 | 0.0 |
| School Bus | 0.1 | 0.0 | 0.0 | 100.0 |
| Motor Home | 0.9 | 0.0 | 88.9 | 11.1 |

**9/21/2010 12:27:37 PM**

Travel Conditions

| | Residential | | | Commercial | | |
|---|---|---|---|---|---|---|
| | Home-Work | Home-Shop | Home-Other | Commute | Non-Work | Customer |
| Urban Trip Length (miles) | 12.7 | 7.0 | 9.5 | 13.3 | 7.4 | 8.9 |
| Rural Trip Length (miles) | 17.6 | 12.1 | 14.9 | 15.4 | 9.6 | 12.6 |
| Trip speeds (mph) | 30.0 | 30.0 | 30.0 | 30.0 | 30.0 | 30.0 |
| % of Trips - Residential | 32.9 | 18.0 | 49.1 | | | |
| | | | | | | |
| % of Trips - Commercial (by land use) | | | | | | |
| Elementary school | | | | 20.0 | 10.0 | 70.0 |
| City park | | | | 5.0 | 2.5 | 92.5 |
| Free-standing discount store | | | | 2.0 | 1.0 | 97.0 |
| Regnl shop. center | | | | 2.0 | 1.0 | 97.0 |
| Strip mall | | | | 2.0 | 1.0 | 97.0 |
| Office park | | | | 48.0 | 24.0 | 28.0 |

**CO Hotspots, With and Without Potrero Bridge**

## BAY AREA AQMD SIMPLIFIED CALINE4 ANALYSIS; UPDATED WITH EMFAC2007

| | |
|---|---|
| Project Title: | Landmark Village |
| Intersection: | Long Canyon and Landmark Village "A" Street |
| Analysis Condition: | 2030 Buildout without Potrero Bridge |
| Nearest Air Monitoring Station measuring CO: | SRA 13 (Santa Clarita Valley) |
| Background 1-hour CO Concentration (ppm): | 5.0 |
| Background 8-hour CO Concentration (ppm): | 3.7 |
| Persistence Factor: | 0.7 |
| Analysis Year: | 2030 |

| | | Roadway Type | No. of Lanes | Approach/Departure Speed A.M. | Approach/Departure Speed P.M. |
|---|---|---|---|---|---|
| North-South Roadway: | Long Canyon | AT GRADE | 6 | 5 | 5 |
| East-West Roadway: | Landmark Village "A" Street | AT GRADE | 0 | 5 | 5 |

EMFAC2007 COMPOSITE EMISSION FACTORS FOR CO

Air Basin: South Coast County: Los Angeles
Assumes lowest mean wintertime temperature of 47 degrees F and 30% humidity.

| | Average Speed (miles per hour) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Year | 5 | 8 | 11 | 14 | 17 | 20 | 23 | 26 | 29 | 32 |
| 2008 | 8.877 | 7.732 | 6.829 | 6.108 | 5.526 | 5.057 | 4.682 | 4.371 | 4.114 | 3.903 |
| 2009 | 8.018 | 6.995 | 6.187 | 5.54 | 5.017 | 4.597 | 4.259 | 3.979 | 3.746 | 3.554 |
| 2010 | 7.25 | 6.339 | 5.617 | 5.037 | 4.568 | 4.191 | 3.887 | 3.635 | 3.424 | 3.249 |
| 2011 | 6.578 | 5.765 | 5.118 | 4.598 | 4.176 | 3.836 | 3.563 | 3.334 | 3.142 | 2.983 |
| 2012 | 5.983 | 5.255 | 4.674 | 4.206 | 3.826 | 3.519 | 3.273 | 3.066 | 2.891 | 2.745 |
| 2013 | 5.437 | 4.787 | 4.267 | 3.846 | 3.504 | 3.228 | 3.006 | 2.818 | 2.66 | 2.526 |
| 2014 | 4.963 | 4.38 | 3.911 | 3.531 | 3.222 | 2.972 | 2.771 | 2.601 | 2.456 | 2.333 |
| 2015 | 4.534 | 4.01 | 3.588 | 3.244 | 2.964 | 2.739 | 2.556 | 2.401 | 2.269 | 2.157 |
| 2020 | 3.038 | 2.713 | 2.448 | 2.23 | 2.052 | 1.908 | 1.791 | 1.689 | 1.601 | 1.525 |
| 2025 | 2.234 | 2.008 | 1.821 | 1.667 | 1.54 | 1.438 | 1.355 | 1.283 | 1.219 | 1.163 |
| 2030 | 1.84 | 1.657 | 1.506 | 1.381 | 1.278 | 1.196 | 1.13 | 1.071 | 1.02 | 0.975 |
| 2035 | 1.625 | 1.464 | 1.331 | 1.221 | 1.131 | 1.06 | 1.002 | 0.952 | 0.907 | 0.868 |
| 2040 | 1.509 | 1.358 | 1.233 | 1.13 | 1.047 | 0.981 | 0.928 | 0.882 | 0.842 | 0.806 |

PEAK HOUR TURNING VOLUMES

A.M. Peak

| | | | | |
|---|---|---|---|---|
| | N | | | |
| | 8 | 544 | 207 | |
| W | < | v | > | E |
| 105 | ^ | | ^ | 188 |
| 11 | > | | < | 22 |
| 17 | v | | v | 105 |
| | < | ^ | > | |
| | 204 | 2,184 | 218 | |
| | S | | | |

P.M. Peak

| | | | | |
|---|---|---|---|---|
| | N | | | |
| | 30 | 1,620 | 529 | |
| W | < | v | > | E |
| 335 | ^ | | ^ | 412 |
| 20 | > | | < | 38 |
| 80 | v | | v | 366 |
| | < | ^ | > | |
| | 41 | 596 | 143 | |
| | S | | | |

Representative Traffic Volumes (Vehicles per Hour)

| | | | |
|---|---|---|---|
| N-S Road | 3,272 | N-S Road | 3,522 |
| E-W Road | 751 | E-W Road | 1,508 |
| Primary Road = | N-S Road | Primary Road = | N-S Road |

ROADWAY CO CONTRIBUTIONS

| Roadway | Reference CO Concentrations 0 Feet | 25 Feet | 50 Feet | | Traffic Volume | | Emission Factor | | |
|---|---|---|---|---|---|---|---|---|---|
| A.M. Peak Hour | | | | | | | | | |
| N-S Road | 9.5 | 6.1 | 4.9 | * | 3,272 | * | 1.84 | ÷ | 100,000 |
| E-W Road | 0.0 | 0.0 | 0.0 | * | 751 | * | 1.84 | ÷ | 100,000 |
| P.M. Peak Hour | | | | | | | | | |
| N-S Road | 9.5 | 6.1 | 4.9 | * | 3,522 | * | 1.84 | ÷ | 100,000 |
| E-W Road | 0.0 | 0.0 | 0.0 | * | 1,508 | * | 1.84 | ÷ | 100,000 |

TOTAL CO CONCENTRATIONS (ppm)

| | A.M. Peak Hour | P.M. Peak Hour | 8-Hour |
|---|---|---|---|
| 0 Feet from Roadway Edge | 5.6 | 5.6 | 4.1 |
| 25 Feet from Roadway Edge | 5.4 | 5.4 | 4.0 |
| 50 Feet from Roadway Edge | 5.3 | 5.3 | 3.9 |

## BAY AREA AQMD SIMPLIFIED CALINE4 ANALYSIS; UPDATED WITH EMFAC2007

| | |
|---|---|
| Project Title: | Landmark Village |
| Intersection: | Long Canyon and Landmark Village "A" Street |
| Analysis Condition: | 2030 Buildout with Potrero Bridge |
| Nearest Air Monitoring Station measuring CO: | SRA 13 (Santa Clarita Valley) |
| Background 1-hour CO Concentration (ppm): | 5.0 |
| Background 8-hour CO Concentration (ppm): | 3.7 |
| Persistence Factor: | 0.7 |
| Analysis Year: | 2030 |

| | | Roadway Type | No. of Lanes | Approach/Departure Speed A.M. | Approach/Departure Speed P.M. |
|---|---|---|---|---|---|
| North-South Roadway: | Long Canyon | AT GRADE | 4 | 5 | 5 |
| East-West Roadway: | Landmark Village "A" Street | AT GRADE | 0 | 5 | 5 |

EMFAC2007 COMPOSITE EMISSION FACTORS FOR CO

Air Basin: South Coast County: Los Angeles
Assumes lowest mean wintertime temperature of 47 degrees F and 30% humidity.

| | Average Speed (miles per hour) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Year | 5 | 8 | 11 | 14 | 17 | 20 | 23 | 26 | 29 | 32 |
| 2008 | 8.877 | 7.732 | 6.829 | 6.108 | 5.526 | 5.057 | 4.682 | 4.371 | 4.114 | 3.903 |
| 2009 | 8.018 | 6.995 | 6.187 | 5.54 | 5.017 | 4.597 | 4.259 | 3.979 | 3.746 | 3.554 |
| 2010 | 7.25 | 6.339 | 5.617 | 5.037 | 4.568 | 4.191 | 3.887 | 3.635 | 3.424 | 3.249 |
| 2011 | 6.578 | 5.765 | 5.118 | 4.598 | 4.176 | 3.836 | 3.563 | 3.334 | 3.142 | 2.983 |
| 2012 | 5.983 | 5.255 | 4.674 | 4.206 | 3.826 | 3.519 | 3.273 | 3.066 | 2.891 | 2.745 |
| 2013 | 5.437 | 4.787 | 4.267 | 3.846 | 3.504 | 3.228 | 3.006 | 2.818 | 2.66 | 2.526 |
| 2014 | 4.963 | 4.38 | 3.911 | 3.531 | 3.222 | 2.972 | 2.771 | 2.601 | 2.456 | 2.333 |
| 2015 | 4.534 | 4.01 | 3.588 | 3.244 | 2.964 | 2.739 | 2.556 | 2.401 | 2.269 | 2.157 |
| 2020 | 3.038 | 2.713 | 2.448 | 2.23 | 2.052 | 1.908 | 1.791 | 1.689 | 1.601 | 1.525 |
| 2025 | 2.234 | 2.008 | 1.821 | 1.667 | 1.54 | 1.438 | 1.355 | 1.283 | 1.219 | 1.163 |
| 2030 | 1.84 | 1.657 | 1.506 | 1.381 | 1.278 | 1.196 | 1.13 | 1.071 | 1.02 | 0.975 |
| 2035 | 1.625 | 1.464 | 1.331 | 1.221 | 1.131 | 1.06 | 1.002 | 0.952 | 0.907 | 0.868 |
| 2040 | 1.509 | 1.358 | 1.233 | 1.13 | 1.047 | 0.981 | 0.928 | 0.882 | 0.842 | 0.806 |

PEAK HOUR TURNING VOLUMES

A.M. Peak

| | | | | |
|---|---|---|---|---|
| | N | | | |
| | 8 | 281 | 207 | |
| W | < | v | > | E |
| 105 | ^ | | ^ | 188 |
| 11 | > | | < | 22 |
| 17 | v | | v | 105 |
| | < | ^ | > | |
| | 204 | 1,405 | 218 | |
| | S | | | |

P.M. Peak

| | | | | |
|---|---|---|---|---|
| | N | | | |
| | 30 | 1,112 | 529 | |
| W | < | v | > | E |
| 335 | ^ | | ^ | 412 |
| 20 | > | | < | 38 |
| 80 | v | | v | 366 |
| | < | ^ | > | |
| | 41 | 486 | 143 | |
| | S | | | |

Representative Traffic Volumes (Vehicles per Hour)

| | | | |
|---|---|---|---|
| N-S Road | 2,230 | N-S Road | 2,904 |
| E-W Road | 751 | E-W Road | 1,508 |
| Primary Road = | N-S Road | Primary Road = | N-S Road |

ROADWAY CO CONTRIBUTIONS

| Roadway | Reference CO Concentrations 0 Feet | 25 Feet | 50 Feet | | Traffic Volume | | Emission Factor | | |
|---|---|---|---|---|---|---|---|---|---|
| A.M. Peak Hour | | | | | | | | | |
| N-S Road | 11.9 | 7.0 | 5.4 | * | 2,230 | * | 1.84 | ÷ | 100,000 |
| E-W Road | 0.0 | 0.0 | 0.0 | * | 751 | * | 1.84 | ÷ | 100,000 |
| P.M. Peak Hour | | | | | | | | | |
| N-S Road | 11.9 | 7.0 | 5.4 | * | 2,904 | * | 1.84 | ÷ | 100,000 |
| E-W Road | 0.0 | 0.0 | 0.0 | * | 1,508 | * | 1.84 | ÷ | 100,000 |

TOTAL CO CONCENTRATIONS (ppm)

| | A.M. Peak Hour | P.M. Peak Hour | 8-Hour |
|---|---|---|---|
| 0 Feet from Roadway Edge | 5.5 | 5.6 | 4.1 |
| 25 Feet from Roadway Edge | 5.3 | 5.4 | 4.0 |
| 50 Feet from Roadway Edge | 5.2 | 5.3 | 3.9 |

**Landmark Village CNFL at Off-Site Noise Sensitive Land Uses - Cumulative Plus Project Conditions – 2030 With and Without Potrero Bridge**

**Landmark Village**
**CNEL at Off-Site Noise-Sensitive Land Uses**
**Cumulative Plus Project Conditions - 2030 With and Without Potrero Bridge**

| ROADWAY NAME<br>Segment | Number of Lanes in Each Direction | Median Width | ADT Volume | Design Speed (mph) | Distance From Edge of Pavemt | Alpha (1) Factor | Barrier Attn. dB(A) | Vehicle Mix<br>Medium Trucks | <br>Heavy Trucks | dB(A) CNEL |
|---|---|---|---|---|---|---|---|---|---|---|
| 2030 Building Without Potrero Bridge | | | | | | | | | | |
| Long Canyon - North of Landmark Village "A" Street | 3 | 0 | 46,000 | 55 | 100 | 0.5 | 0 | 11.4% | 3.9% | 66.1 |
| Long Canyon - South of Landmark Village "A" Street | 3 | 0 | 46,000 | 55 | 100 | 0.5 | 0 | 11.4% | 3.9% | 66.1 |
| Landmark Village "A" Street - East of Long Canyon | 2 | 0 | 16,000 | 45 | 100 | 0.5 | 0 | 11.4% | 3.9% | 60.3 |
| 2030 Building With Potrero Bridge | | | | | | | | | | |
| Long Canyon - North of Landmark Village "A" Street | 3 | 0 | 36,000 | 55 | 100 | 0.5 | 0 | 11.4% | 3.9% | 65.1 |
| Long Canyon - South of Landmark Village "A" Street | 3 | 0 | 37,000 | 55 | 100 | 0.5 | 0 | 11.4% | 3.9% | 65.2 |
| Landmark Village "A" Street - East of Long Canyon | 2 | 0 | 16,000 | 45 | 100 | 0.5 | 0 | 11.4% | 3.9% | 60.3 |

**Notes:**

(1) Alpha Factor: Coefficient of absorption relating to the effects of the ground surface. An alpha factor of 0 indicates that the site is an acoustically "hard" site, such as aspalt. An alpha factor of 0.5 indicates that the site is an acoustically "soft" site such, as heavily vegetated ground cover.

(2) ADT volumes from Austin-Foust Associates, Inc., Memorandum - Potrero Canyon Road Bridge, July 1, 2010.

(3) Vehicle mix from California Air Resources Board, EMFAC2007 on-road vehicle emissions model (in URBEMIS2007) for 2030.

| **Assumed 24-Hour Traffic Distribution:** | **Day** | **Evening** | **Night** | **Total** |
|---|---|---|---|---|
| Total ADT Volumes | 77.70% | 12.70% | 9.60% | 100.00% |
| Medium-Duty Trucks | 87.43% | 5.05% | 7.52% | 100.00% |
| Heavy-Duty Trucks | 89.10% | 2.84% | 8.06% | 100.00% |

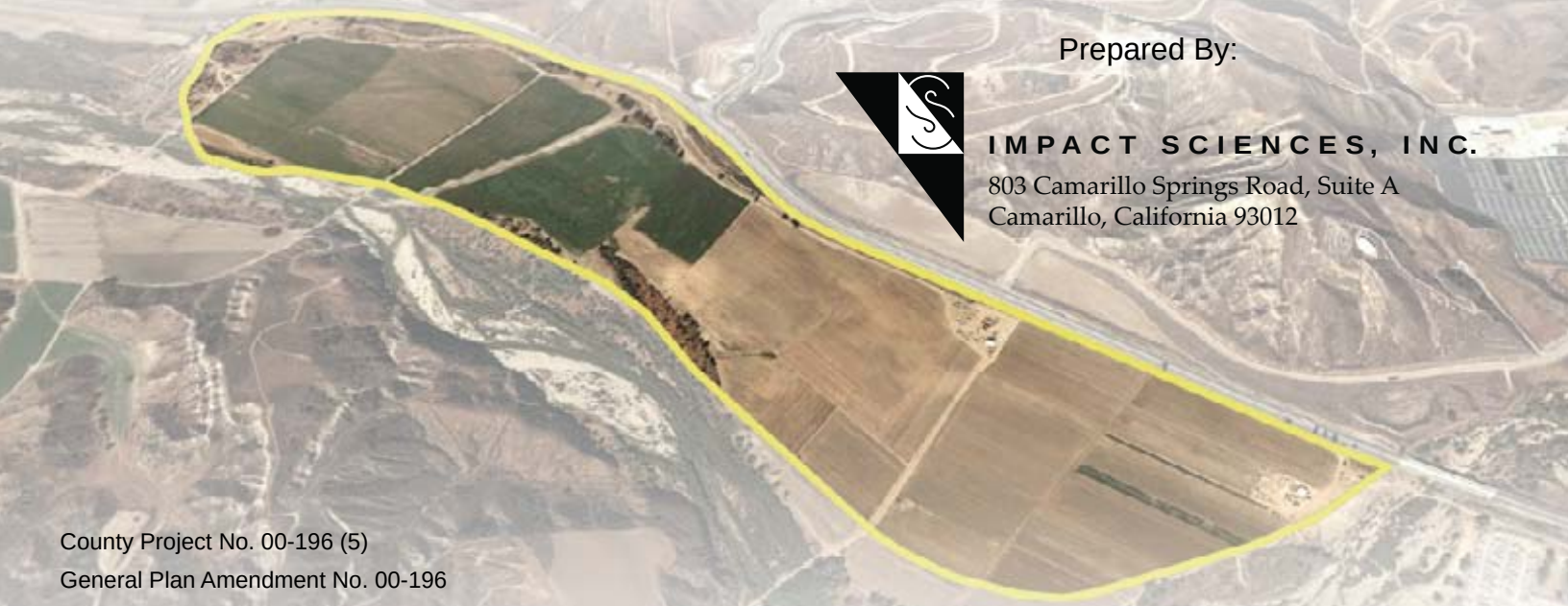
County of Los Angeles

# Revised Final Environmental Impact Report

SCH No. 2004021002

## Volume V
## Appendices F4.10 - F4.23

# LANDMARK VILLAGE



Prepared By:


IMPACT SCIENCES, INC.
803 Camarillo Springs Road, Suite A
Camarillo, California 93012


County Project No. 00-196 (5)
General Plan Amendment No. 00-196
Sub Plan Amendment No. 00-196
Specific Plan Amendment No. 00-196
Vesting Tentative Tract Map No. 53108
SEA Conditional Use Permit No. 200500112
Oak Tree Permit No. 00-196
Off-Site Materials Transport Approval No. CUP00-196
Conditional Use Permit (Off-Site Grading) CUP00-196

NEWHALL RANCH
Newhall Ranch Company

September 2011

# Landmark Village

# Revised Final Environmental Impact Report

# SCH No. 2004021002

# Volume V

# Appendices F4.10 – F4.23

**Prepared for:**

Los Angeles County
Department of Regional Planning
320 West Temple Street
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**Prepared by:**

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**September 2011**

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Letters to Valencia Water Company and Newhall County Water District Regarding Well Monitoring from the California Department of Public Health, dated August 4, 2011

Summary of Water Quality Compliance Monitoring Results for Valencia Commerce Center Well E-15, 2006–2009

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2010 Urban Water Management Plan

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Semitropic Water Storage District, December 31, 2010, Letter to Newhall Land and Farming

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## Water Service

**2003-2008 Agricultural Water Spreadsheets**

**Newhall Ranch Specific Plan**
**2003 Annual Report**
**Los Angeles County Agriculture Water Use**
Mitigation Measure 4.11 -15

| Crop Type | Total Irrigated Acres | Adjusted CIMIS Water Use (af/ac) | Adjusted CIMIS Water Use (af/yr) | %of Water use by Crop | Total Pumped Water Based on SCE (af) | Allocation of Total Pumped Water By Crop (af/yr) | Acre Feet/ Year per Acre of Crop | LA Co. Irrigated Crops (acres) | LA Co. Crop Share Of Actual Pumped Water (af/yr) | LA Co. Crop Share Using Adjusted CIMIS (af/yr) |
|---|---|---|---|---|---|---|---|---|---|---|
| Citrus(furrow) | 59 | 6.31 | 372 | 2.64% | 12,286 | 325 | 5.51 | | | |
| Citrus(micro) | 492 | 4.73 | 2327 | 16.53% | | 2,030 | 4.13 | | | |
| Sudan Grass | 388 | 10.81 | 4194 | 29.79% | | 3,660 | 9.43 | 388 | 3,660 | 4,194 |
| Vegetables | 931 | 7.72 | 7187 | 51.04% | | 6,271 | 6.74 | 581 | 3,914 | 4,485 |
| **Totals** | | | | **100.00%** | | **12,286** | | **969** | **7,573** | **8,680** |

**Newhall Ranch Specific Plan**
**2004 Annual Report**
**Los Angeles County Agriculture Water Use**
Mitigation Measure 4.11 -15

| Crop Type | Total Irrigated Acres | Adjusted CIMIS Water Use (af/ac) | Adjusted CIMIS Water Use (af/yr) | %of Water use by Crop | Total Pumped Water Based on SCE (af) | Allocation of Total Pumped Water By Crop (af/yr) | Acre Feet/ Year per Acre of Crop | LA Co. Irrigated Crops (acres) | LA Co. Crop Share Of Actual Pumped Water (af/yr) | LA Co. Crop Share Using Adjusted CIMIS (af/yr) |
|---|---|---|---|---|---|---|---|---|---|---|
| Citrus | 340 | 4.92 | 1673 | 10.86% | 12,828 | 1,393 | 4.10 | | | |
| Irrigated Hay | 160 | 2.95 | 472 | 3.06% | | 393 | 2.46 | 160 | 393 | 472 |
| Irrigated Pasture | 174 | 11.26 | 1959 | 12.72% | | 1,632 | 9.38 | 174 | 1,632 | 1,959 |
| Vegetables | 1,392 | 8.04 | 11192 | 72.67% | | 9,322 | 6.70 | 627 | 4,199 | 5,041 |
| Nursery | 30 | 3.52 | 106 | 0.69% | | 88 | 2.93 | | - | - |
| **Totals** | | | | **100.00%** | | **12,828** | | **961** | **6,224** | **7,472** |

**Newhall Ranch Specific Plan**
**2005 Annual Report**
**Los Angeles County Agriculture Water Use**
Mitigation Measure 4.11 -15

| Crop Type | Total Irrigated Acres | Adjusted CIMIS Water Use (af/ac) | Adjusted CIMIS Water Use (af/yr) | %of Water use by Crop | Total Pumped Water Based on SCE (af) | Allocation of Total Pumped Water By Crop (af/yr) | Acre Feet/ Year per Acre of Crop | LA Co. Irrigated Crops (acres) | LA Co. Crop Share Of Actual Pumped Water (af/yr) | LA Co. Crop Share Using Adjusted CIMIS (af/yr) |
|---|---|---|---|---|---|---|---|---|---|---|
| Citrus | 308 | 3.69 | 1137 | 12.61% | 8,800 | 1,110 | 3.60 | | | |
| Irrigated Hay | 160 | 6.03 | 965 | 10.70% | | 942 | 5.89 | 160 | 942 | 965 |
| Irrigated Pasture | 174 | 7.03 | 1223 | 13.57% | | 1,194 | 6.86 | 175 | 1,201 | 1,230 |
| Vegetables | 907 | 6.03 | 5469 | 60.68% | | 5,340 | 5.89 | 278 | 1,637 | 1,676 |
| Nursery | 83 | 2.64 | 219 | 2.43% | | 214 | 2.58 | | | - |
| **Totals** | | | | **100.00%** | | **8,800** | | **613** | **3,780** | **3,871** |

**Newhall Ranch Specific Plan**
**2006 Annual Report**
**Los Angeles County Agriculture Water Use**
Mitigation Measure 4.11 -15

| Crop Type | Total Irrigated Acres | Adjusted CIMIS Water Use (af/ac) | Adjusted CIMIS Water Use (af/yr) | %of Water use by Crop | Total Pumped Water Based on SCE (af) | Allocation of Total Pumped Water By Crop (af/yr) | Acre Feet/ Year per Acre of Crop | LA Co. Irrigated Crops (acres) | LA Co. Crop Share Of Actual Pumped Water (af/yr) | LA Co. Crop Share Using Adjusted CIMIS (af/yr) |
|---|---|---|---|---|---|---|---|---|---|---|
| Citrus | 278 | 4.07 | 1131 | 9.44% | 13,709 | 1,295 | 4.66 | | | |
| Irrigated Hay | 233 | 6.65 | 1549 | 12.93% | | 1,773 | 7.61 | 205 | 1,560 | 1,363 |
| Sudan Grass (double Crop) | | 0 | 0 | 0.00% | | - | | | | |
| Irrigated Pasture | 231 | 7.76 | 1793 | 14.96% | | 2,051 | 8.88 | 231 | 2,051 | 1,793 |
| Vegetables | 923 | 6.65 | 6138 | 51.23% | | 7,023 | 7.61 | 285 | 2,168 | 1,895 |
| Sod | 119 | 6.65 | 791 | 6.60% | | 905 | 7.61 | 119 | 905 | 791 |
| Nursery | 199 | 2.91 | 579 | 4.83% | | 663 | 3.33 | | | - |
| **Totals** | | | | **100.00%** | | **13,709** | | **840** | **6,685** | **5,842** |

**Newhall Ranch Specific Plan**
**2007 Annual Report**
**Los Angeles County Agriculture Water Use**
Mitigation Measure 4.11 -15

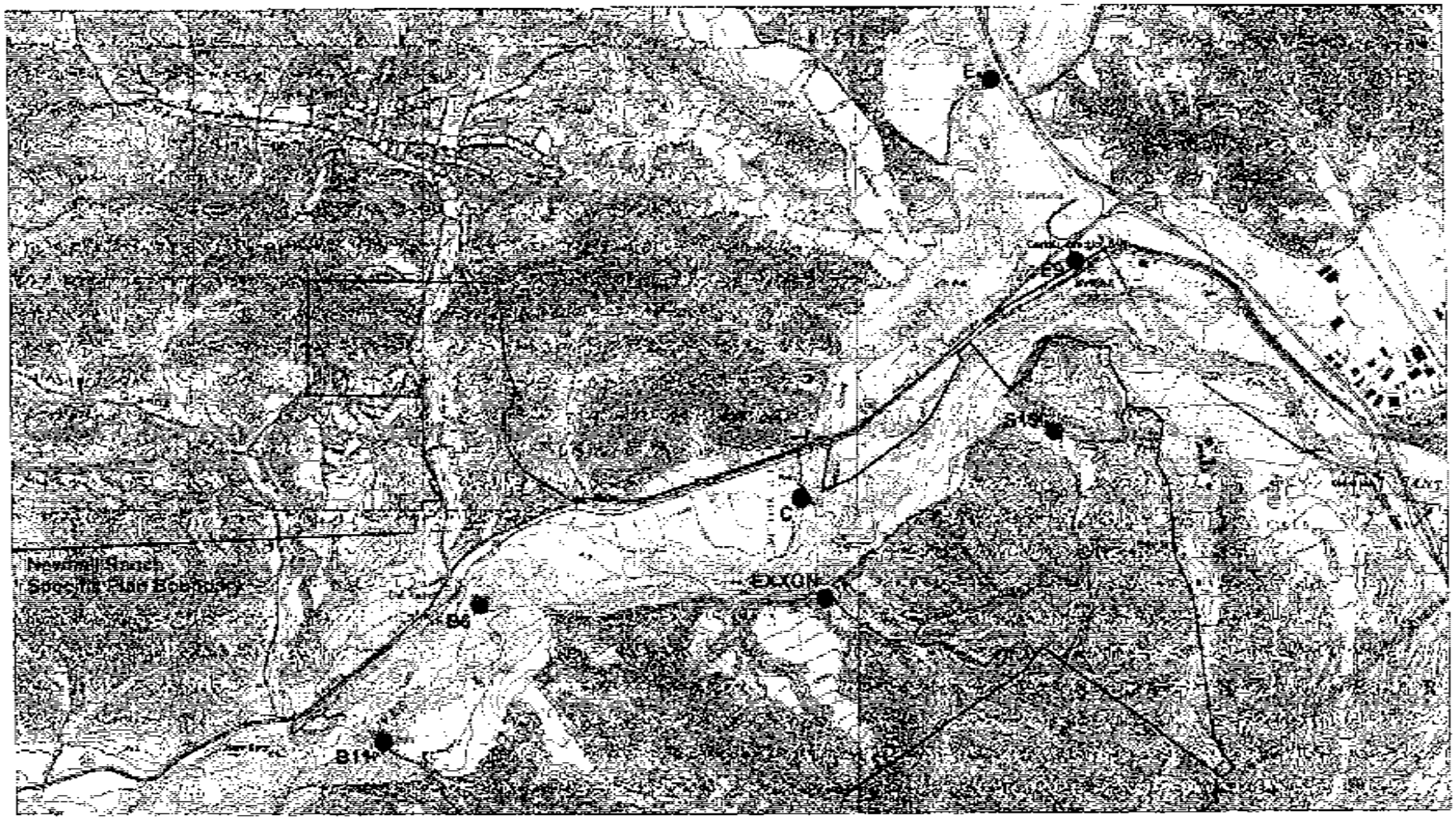
| Crop Type | Total Irrigated Acres | Adjusted CIMIS Water Use (af/ac) | Adjusted CIMIS Water Use (af/yr) | %of Water use by Crop | Total Pumped Water Based on SCE (af) | Allocation of Total Pumped Water By Crop (af/yr) | Acre Feet/ Year per Acre of Crop | LA Co. Irrigated Crops (acres) | LA Co. Crop Share Of Actual Pumped Water (af/yr) | LA Co. Crop Share Using Adjusted CIMIS (af/yr) |
|---|---|---|---|---|---|---|---|---|---|---|
| Citrus | 278 | 4.45 | 1237 | 8.88% | 11,781 | 1,046 | 3.76 | | | |
| Alfalfa | 205 | 7.27 | 1490 | 10.70% | | 1,261 | 6.15 | 205 | 1,261 | 1,490 |
| Irrigated Hay | 28 | 7.27 | 204 | 1.46% | | 172 | 6.15 | | | |
| Sudan Grass (double Crop) | | 0 | 0 | 0.00% | | - | | | | |
| Irrigated Pasture | 231 | 8.48 | 1959 | 14.07% | | 1,657 | 7.17 | 231 | 1,657 | 1,959 |
| Vegetables | 1,037 | 7.27 | 7539 | 54.13% | | 6,377 | 6.15 | 355 | 2,183 | 2,581 |
| Sod | 119 | 7.27 | 865 | 6.21% | | 732 | 6.15 | 119 | 732 | 865 |
| Nursery | 199 | 3.18 | 633 | 4.54% | | 535 | 2.69 | | | |
| **Totals** | | | | **100.00%** | | **11,781** | | **910** | **5,833** | **6,895** |

**Newhall Ranch Specific Plan**
**2008 Annual Report**
**Los Angeles County Agriculture Water Use**
Mitigation Measure 4.11 -15

| Crop Type | Total Irrigated Acres | Adjusted CIMIS Water Use (af/ac) | Adjusted CIMIS Water Use (af/yr) | %of Water use by Crop | Total Pumped Water Based on SCE (af) | Allocation of Total Pumped Water By Crop (af/yr) | Acre Feet/ Year per Acre of Crop | LA Co. Irrigated Crops (acres) | LA Co. Crop Share Of Actual Pumped Water (af/yr) | LA Co. Crop Share Using Adjusted CIMIS (af/yr) |
|---|---|---|---|---|---|---|---|---|---|---|
| Citrus | 273 | 4.63 | 1264 | 10.31% | 10,633 | 1,096 | 4.01 | | | |
| Alfalfa | 82 | 7.57 | 621 | 5.06% | | 538 | 6.56 | 82 | 538 | 621 |
| Irrigated Hay | 28 | 7.57 | 212 | 1.73% | | 184 | 6.56 | | | |
| Sudan Grass (double Crop) | | 0 | 0 | 0.00% | | - | | | | |
| Irrigated Pasture | 231 | 8.83 | 2040 | 16.63% | | 1,769 | 7.66 | 231 | 1,769 | 2,040 |
| Vegetables | 825 | 7.57 | 6245 | 50.93% | | 5,416 | 6.56 | 142 | 932 | 1,075 |
| Sod | 168 | 7.27 | 1221 | 9.96% | | 1,059 | 6.30 | 168 | 1,059 | 1,221 |
| Nursery | 199 | 3.31 | 659 | 5.37% | | 571 | 2.87 | | - | |
| **Totals** | | | | **100.00%** | | **10,633** | | **623** | **4,298** | **4,957** |

**Water Quality Data from Newhall Ranch Additional Administrative Record (AAR-107:116214-276)**

# ADDITIONAL NEWHALL RANCH AGRICULTURAL WELL WATER QUALITY DATA (2000-2001)




AG WELL LOCATION MAP
MAY 2003

0 1,550 3,100 (Feet)

116215

**SILLIKER LABORATORIES**
**OF SOUTHERN CALIFORNIA**
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Carson, CA 90746
310-637-7121 Fax 310-637-2953
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**CERTIFICATE OF ANALYSIS**

| | |
|---|---|
| COA No.: | SCA-15024195-0 |
| Supersedes: | None |
| COA Date: | 5/24/00 |
| Page 1 of 2 | |

TO:
Mr. Ross Sensenmaier
Project Manager
Columbia Analytical Services
6325 Canoga Avenue
Canoga Park, CA 91303

| | |
|---|---|
| Received From: | Canoga Park, CA |
| Received Date: | 5/17/00 |
| P.O.# / ID: | L2001744 |
| Location of Test: (except where noted) | Carson, CA |

## Analytical Results

| | | | | | |
|---|---|---|---|---|---|
| Desc. 1: | Log #: L2001744 | Desc. 4: | Sample Date:05/17/00 | Laboratory ID: | 150130536 |
| Desc. 2: | Well E | Desc. 5: | Sample Time:1015 | Condition Rec'd: | NORMAL |
| Desc. 3: | Sampler:Not Given | Desc. 6: | Matrix: Water | Temp Rec'd (°C): | 4.8 |

| Analyte | Result | Units | Method Reference | Test Date | Loc. |
|---|---|---|---|---|---|
| Coliforms - 10X10 ml MPN | <1.1 | /100mL | SMEWW, 19th ed. | 5/19/00 | |
| E. coli - 10X10 ml MPN | <1.1 | /100mL | SMEWW, 19th ed. | 5/19/00 | |
| Heterotrophic Plate Count | 8.0 | /mL | SMEWW 18th ed. | 5/19/00 | |

| | | | | | |
|---|---|---|---|---|---|
| Desc. 1: | Log #: L2001744 | Desc. 4: | Sample Date:05/17/00 | Laboratory ID: | 150130537 |
| Desc. 2: | E-9 | Desc. 5: | Sample Time:1030 | Condition Rec'd: | NORMAL |
| Desc. 3: | Sampler:Not Given | Desc. 6: | Matrix: Water | Temp Rec'd (°C): | 4.8 |

| Analyte | Result | Units | Method Reference | Test Date | Loc. |
|---|---|---|---|---|---|
| Coliforms - 10X10 ml MPN | <1.1 | /100mL | SMEWW, 19th ed. | 5/19/00 | |
| E. coli - 10X10 ml MPN | <1.1 | /100mL | SMEWW, 19th ed. | 5/19/00 | |
| Heterotrophic Plate Count | 10 | /mL | SMEWW 18th ed. | 5/19/00 | |

| | | | | | |
|---|---|---|---|---|---|
| Desc. 1: | Log #: L2001744 | Desc. 4: | Sample Date:05/17/00 | Laboratory ID: | 150130538 |
| Desc. 2: | C Well | Desc. 5: | Sample Time:1045 | Condition Rec'd: | NORMAL |
| Desc. 3: | Sampler:Not Given | Desc. 6: | Matrix: Water | Temp Rec'd (°C): | 4.8 |

| Analyte | Result | Units | Method Reference | Test Date | Loc. |
|---|---|---|---|---|---|
| Coliforms - 10X10 ml MPN | <1.1 | /100mL | SMEWW, 19th ed. | 5/19/00 | |
| E. coli - 10X10 ml MPN | <1.1 | /100mL | SMEWW, 19th ed. | 5/19/00 | |
| Heterotrophic Plate Count | 50 | /mL | SMEWW 18th ed. | 5/19/00 | |

| | | | | | |
|---|---|---|---|---|---|
| Desc. 1: | Log #: L2001744 | Desc. 4: | Sample Date:05/17/00 | Laboratory ID: | 150130539 |
| Desc. 2: | B-6 | Desc. 5: | Sample Time:1110 | Condition Rec'd: | NORMAL |
| Desc. 3: | Sampler:Not Given | Desc. 6: | Matrix: Water | Temp Rec'd (°C): | 4.8 |

| Analyte | Result | Units | Method Reference | Test Date | Loc. |
|---|---|---|---|---|---|
| Coliforms - 10X10 ml MPN | <1.1 | /100mL | SMEWW, 19th ed. | 5/19/00 | |
| E. coli - 10X10 ml MPN | <1.1 | /100mL | SMEWW, 19th ed. | 5/19/00 | |
| Heterotrophic Plate Count | 10 | /mL | SMEWW 18th ed. | 5/19/00 | |

| | | | | | |
|---|---|---|---|---|---|
| Desc. 1: | Log #: L2001744 | Desc. 4: | Sample Date:05/17/00 | Laboratory ID: | 150130540 |
| Desc. 2: | B-11 | Desc. 5: | Sample Time:1200 | Condition Rec'd: | NORMAL |
| Desc. 3: | Sampler:Not Given | Desc. 6: | Matrix: Water | Temp Rec'd (°C): | 4.8 |

| Analyte | Result | Units | Method Reference | Test Date | Loc. |
|---|---|---|---|---|---|
| Coliforms - 10X10 ml MPN | <1.1 | /100mL | SMEWW, 19th ed. | 5/19/00 | |
| E. coli - 10X10 ml MPN | <1.1 | /100mL | SMEWW, 19th ed. | 5/19/00 | |
| Heterotrophic Plate Count | <1 | /mL | SMEWW 18th ed. | 5/19/00 | |

The results of these tests relate only to the samples tested. This report shall not be reproduced except in full, without the written approval of the laboratory.

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# CERTIFICATE OF ANALYSIS

| | |
|---|---|
| COA No.: | SCA-15024185-0 |
| Supersedes: | None |
| COA Date | 5/24/00 |
| Page 2 of 2 | |

TO:
Mr. Ross Senstermeker
Project Manager
Columbia Analytical Services
5925 Canoga Avenue
Canoga Park, CA 91303

| | |
|---|---|
| Received From: | Canoga Park, CA |
| Received Date: | 5/17/00 |
| P.O.# / ID: | L2001744 |
| Location of Test: (except where noted) | Carson, CA |

## Analytical Results

| | | | | | |
|---|---|---|---|---|---|
| Desc. 1: | Log #: L2001744 | Desc. 4: | Sample Date: 5/17/00 | Laboratory ID: | 150185241 |
| Desc. 2: | S-158 | Desc. 5: | Sample Time: 1230 | Condition Rec'd: | NORMAL |
| Desc. 3: | Sampler: Not Given | Desc. 6: | Matrix: Water | Temp Rec'd (°C): | 4.8 |

| Analyte | Result | Units | Method Reference | Test Date | Loc. |
|---|---|---|---|---|---|
| Coliforms - 10X10 ml MPN | <1.1 | /100mL | SMEWW, 18th ed. | 5/19/00 | |
| E. coli - 10X10 ml MPN | <1.1 | /100mL | SMEWW, 19th ed. | 5/18/00 | |
| Heterotrophic Plate Count | 1.0 | /mL | SMEWW 18th ed. | 5/19/00 | |

COA Comment: This water complies with State of California and the U.S. Public Health Services regulations for potable water as analyzed by Silliker Laboratories.

Melissa Callochia — Lab Director

The results of these tests relate only to the samples tested. This report shall not be reproduced except in full, without the written approval of the laboratory.

116217

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Newhall Land and Farming Company | **Service Request:** | L2001744 |
| **Project:** | Newhall Ranch | **Date Collected:** | 5/17/00 |
| **Sample Matrix:** | Water | **Date Received:** | 5/17/00 |

Metals

| | | | |
|---|---|---|---|
| Sample Name: | WELL E | Units: | mg/L (ppm) |
| Lab Code: | L2001744-001 | Basis: | NA |
| Test Notes: | | | |

| Analyte | Prep Method | Analysis Method | MRL | Dilution Factor | Date Digested | Date Analyzed | Result | Result Notes |
|---|---|---|---|---|---|---|---|---|
| Aluminum, Total | METHOD | 200.7 | 0.1 | 1 | 5/18/00 | 5/18/00 | ND | |
| Arsenic, Total | METHOD | 206.2 | 0.005 | 1 | 5/23/00 | 5/23/00 | ND | |
| Barium, Total | METHOD | 200.7 | 0.02 | 1 | 5/18/00 | 5/18/00 | 0.02 | |
| Boron, Total | METHOD | 200.7 | 0.05 | 1 | 5/18/00 | 5/18/00 | 0.42 | |
| Cadmium, Total | METHOD | 200.7 | 0.005 | 1 | 5/18/00 | 5/18/00 | ND | |
| Calcium, Total | METHOD | 200.7 | 0.05 | 1 | 5/18/00 | 5/18/00 | 87 | |
| Chromium, Total | METHOD | 200.7 | 0.01 | 1 | 5/18/00 | 5/18/00 | ND | |
| Copper, Total | METHOD | 200.7 | 0.01 | 1 | 5/18/00 | 5/18/00 | ND | |
| Iron, Total | METHOD | 200.7 | 0.1 | 1 | 5/18/00 | 5/18/00 | ND | |
| Magnesium, Total | METHOD | 200.7 | 0.1 | 1 | 5/18/00 | 5/18/00 | 29 | |
| Manganese, Total | METHOD | 200.7 | 0.01 | 1 | 5/18/00 | 5/18/00 | ND | |
| Mercury, Total | METHOD | 245.1 | 0.0005 | 1 | 5/23/00 | 5/23/00 | ND | |
| Nickel, Total | METHOD | 200.7 | 0.04 | 1 | 5/18/00 | 5/18/00 | ND | |
| Selenium, Total | METHOD | 270.2 | 0.005 | 1 | 5/23/00 | 5/23/00 | ND | |
| Silver, Total | METHOD | 200.7 | 0.01 | 1 | 5/18/00 | 5/18/00 | ND | |
| Sodium, Total | METHOD | 200.7 | 0.5 | 1 | 5/18/00 | 5/18/00 | 97 | |
| Thallium, Total | METHOD | 200.7 | 0.1 | 1 | 5/18/00 | 5/18/00 | ND | |
| Zinc, Total | METHOD | 200.7 | 0.02 | 1 | 5/18/00 | 5/18/00 | ND | |

Approved By: _____ Date: 5/24/00

# COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Newhall Land and Farming Company | **Service Request:** | L2001744 |
| **Project:** | Newhall Ranch | **Date Collected:** | 5/17/00 |
| **Sample Matrix:** | Water | **Date Received:** | 5/17/00 |

Metals

| | | | |
|---|---|---|---|
| Sample Name: | E-9 | Units: | mg/L (ppm) |
| Lab Code: | L2001744-002 | Basis: | NA |
| Test Notes: | | | |

| Analyte | Prep Method | Analysis Method | MRL | Dilution Factor | Date Digested | Date Analyzed | Result | Result Notes |
|---|---|---|---|---|---|---|---|---|
| Aluminum, Total | METHOD | 200.7 | 0.1 | 1 | 5/18/00 | 5/18/00 | ND | |
| Arsenic, Total | METHOD | 206.2 | 0.005 | 1 | 5/23/00 | 5/23/00 | ND | |
| Barium, Total | METHOD | 200.7 | 0.02 | 1 | 5/18/00 | 5/18/00 | 0.03 | |
| Boron, Total | METHOD | 200.7 | 0.05 | 1 | 5/18/00 | 5/18/00 | 0.36 | |
| Cadmium, Total | METHOD | 200.7 | 0.005 | 1 | 5/18/00 | 5/18/00 | ND | |
| Calcium, Total | METHOD | 200.7 | 0.05 | 1 | 5/18/00 | 5/18/00 | 93 | |
| Chromium, Total | METHOD | 200.7 | 0.01 | 1 | 5/18/00 | 5/18/00 | ND | |
| Copper, Total | METHOD | 200.7 | 0.01 | 1 | 5/18/00 | 5/18/00 | ND | |
| Iron, Total | METHOD | 200.7 | 0.1 | 1 | 5/18/00 | 5/18/00 | 0.3 | |
| Magnesium, Total | METHOD | 200.7 | 0.1 | 1 | 5/18/00 | 5/18/00 | 35 | |
| Manganese, Total | METHOD | 200.7 | 0.01 | 1 | 5/18/00 | 5/18/00 | 0.08 | |
| Mercury, Total | METHOD | 245.1 | 0.0005 | 1 | 5/23/00 | 5/23/00 | ND | |
| Nickel, Total | METHOD | 200.7 | 0.04 | 1 | 5/18/00 | 5/18/00 | ND | |
| Selenium, Total | METHOD | 270.2 | 0.005 | 1 | 5/23/00 | 5/23/00 | ND | |
| Silver, Total | METHOD | 200.7 | 0.01 | 1 | 5/18/00 | 5/18/00 | ND | |
| Sodium, Total | METHOD | 200.7 | 0.5 | 1 | 5/18/00 | 5/18/00 | 74 | |
| Thallium, Total | METHOD | 200.7 | 0.1 | 1 | 5/18/00 | 5/18/00 | ND | |
| Zinc, Total | METHOD | 200.7 | 0.02 | 1 | 5/18/00 | 5/18/00 | 0.04 | |

Approved By: BJS Date: 5/24/00

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

| | | | |
|---|---|---|---|
| Client: | Newhall Land and Farming Company | Service Request: | L2001744 |
| Project: | Newhall Ranch | Date Collected: | 5/17/00 |
| Sample Matrix: | Water | Date Received: | 5/17/00 |

Metals

| | | | |
|---|---|---|---|
| Sample Name: | C WELL | Units: | mg/L (ppm) |
| Lab Code: | L2001744-003 | Basis: | NA |
| Test Notes: | | | |

| Analyte | Prep Method | Analysis Method | MRL | Dilution Factor | Date Digested | Date Analyzed | Result | Result Notes |
|---|---|---|---|---|---|---|---|---|
| Aluminum, Total | METHOD | 200.7 | 0.1 | 1 | 5/18/00 | 5/18/00 | ND | |
| Arsenic, Total | METHOD | 206.2 | 0.005 | 1 | 5/23/00 | 5/23/00 | ND | |
| Barium, Total | METHOD | 200.7 | 0.02 | 1 | 5/18/00 | 5/18/00 | 0.02 | |
| Boron, Total | METHOD | 200.7 | 0.05 | 1 | 5/18/00 | 5/18/00 | 0.40 | |
| Cadmium, Total | METHOD | 200.7 | 0.005 | 1 | 5/18/00 | 5/18/00 | ND | |
| Calcium, Total | METHOD | 200.7 | 0.05 | 1 | 5/18/00 | 5/18/00 | 100 | |
| Chromium, Total | METHOD | 200.7 | 0.01 | 1 | 5/18/00 | 5/18/00 | ND | |
| Copper, Total | METHOD | 200.7 | 0.01 | 1 | 5/18/00 | 5/18/00 | ND | |
| Iron, Total | METHOD | 200.7 | 0.1 | 1 | 5/18/00 | 5/18/00 | ND | |
| Magnesium, Total | METHOD | 200.7 | 0.1 | 1 | 5/18/00 | 5/18/00 | 36 | |
| Manganese, Total | METHOD | 200.7 | 0.01 | 1 | 5/18/00 | 5/18/00 | ND | |
| Mercury, Total | METHOD | 245.1 | 0.0005 | 1 | 5/23/00 | 5/23/00 | ND | |
| Nickel, Total | METHOD | 200.7 | 0.04 | 1 | 5/18/00 | 5/18/00 | ND | |
| Selenium, Total | METHOD | 270.2 | 0.005 | 1 | 5/23/00 | 5/23/00 | ND | |
| Silver, Total | METHOD | 200.7 | 0.01 | 1 | 5/18/00 | 5/18/00 | ND | |
| Sodium, Total | METHOD | 200.7 | 0.5 | 1 | 5/18/00 | 5/18/00 | 98 | |
| Thallium, Total | METHOD | 200.7 | 0.1 | 1 | 5/18/00 | 5/18/00 | ND | |
| Zinc, Total | METHOD | 200.7 | 0.02 | 1 | 5/18/00 | 5/18/00 | ND | |

Approved By: _____ Date: _____



116220

# COLUMBIA ANALYTICAL SERVICES, INC.

## Analytical Report

Client: Newhall Land and Farming Company
Project: Newhall Ranch
Sample Matrix: Water

Service Request: L2001744
Date Collected: 5/17/00
Date Received: 5/17/00

### Metals

Sample Name: B-6
Lab Code: L2001744-004
Test Notes:

Units: mg/L (ppm)
Basis: NA

| Analyte | Prep Method | Analysis Method | MRL | Dilution Factor | Date Digested | Date Analyzed | Result | Result Notes |
|---|---|---|---|---|---|---|---|---|
| Aluminum, Total | METHOD | 200.7 | 0.1 | 1 | 5/18/00 | 5/18/00 | ND | |
| Arsenic, Total | METHOD | 206.2 | 0.005 | 1 | 5/23/00 | 5/23/00 | ND | |
| Barium, Total | METHOD | 200.7 | 0.02 | 1 | 5/18/00 | 5/18/00 | 0.03 | |
| Boron, Total | METHOD | 200.7 | 0.05 | 1 | 5/18/00 | 5/18/00 | 0.49 | |
| Cadmium, Total | METHOD | 200.7 | 0.005 | 1 | 5/18/00 | 5/18/00 | ND | |
| Calcium, Total | METHOD | 200.7 | 0.05 | 1 | 5/18/00 | 5/18/00 | 130 | |
| Chromium, Total | METHOD | 200.7 | 0.01 | 1 | 5/18/00 | 5/18/00 | ND | |
| Copper, Total | METHOD | 200.7 | 0.01 | 1 | 5/18/00 | 5/18/00 | ND | |
| Iron, Total | METHOD | 200.7 | 0.1 | 1 | 5/18/00 | 5/18/00 | 0.7 | |
| Magnesium, Total | METHOD | 200.7 | 0.1 | 1 | 5/18/00 | 5/18/00 | 43 | |
| Manganese, Total | METHOD | 200.7 | 0.01 | 1 | 5/18/00 | 5/18/00 | ND | |
| Mercury, Total | METHOD | 245.1 | 0.0005 | 1 | 5/23/00 | 5/23/00 | ND | |
| Nickel, Total | METHOD | 200.7 | 0.04 | 1 | 5/18/00 | 5/18/00 | ND | |
| Selenium, Total | METHOD | 270.2 | 0.005 | 1 | 5/23/00 | 5/23/00 | ND | |
| Silver, Total | METHOD | 200.7 | 0.01 | 1 | 5/18/00 | 5/18/00 | ND | |
| Sodium, Total | METHOD | 200.7 | 0.5 | 1 | 5/18/00 | 5/18/00 | 120 | |
| Thallium, Total | METHOD | 200.7 | 0.1 | 1 | 5/18/00 | 5/18/00 | ND | |
| Zinc, Total | METHOD | 200.7 | 0.02 | 1 | 5/18/00 | 5/18/00 | ND | |

Approved By: [illegible] Date: 5/24/00

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

| | | | |
|---|---|---|---|
| Client: | Newhall Land and Farming Company | Service Request: | L2001744 |
| Project: | Newhall Ranch | Date Collected: | 5/17/00 |
| Sample Matrix: | Water | Date Received: | 5/17/00 |

Metals

| | | | |
|---|---|---|---|
| Sample Name: | B-11 | Units: | mg/L (ppm) |
| Lab Code: | L2001744-005 | Basis: | NA |
| Test Notes: | | | |

| Analyte | Prep Method | Analysis Method | MRL | Dilution Factor | Date Digested | Date Analyzed | Result | Result Notes |
|---|---|---|---|---|---|---|---|---|
| Aluminum, Total | METHOD | 200.7 | 0.1 | 1 | 5/18/00 | 5/18/00 | ND | |
| Arsenic, Total | METHOD | 206.2 | 0.005 | 1 | 5/23/00 | 5/23/00 | ND | |
| Barium, Total | METHOD | 200.7 | 0.02 | 1 | 5/18/00 | 5/18/00 | ND | |
| Boron, Total | METHOD | 200.7 | 0.05 | 1 | 5/18/00 | 5/18/00 | 0.61 | |
| Cadmium, Total | METHOD | 200.7 | 0.005 | 1 | 5/18/00 | 5/18/00 | ND | |
| Calcium, Total | METHOD | 200.7 | 0.05 | 1 | 5/18/00 | 5/18/00 | 110 | |
| Chromium, Total | METHOD | 200.7 | 0.01 | 1 | 5/18/00 | 5/18/00 | ND | |
| Copper, Total | METHOD | 200.7 | 0.01 | 1 | 5/18/00 | 5/18/00 | ND | |
| Iron, Total | METHOD | 200.7 | 0.1 | 1 | 5/18/00 | 5/18/00 | 0.1 | |
| Magnesium, Total | METHOD | 200.7 | 0.1 | 1 | 5/18/00 | 5/18/00 | 35 | |
| Manganese, Total | METHOD | 200.7 | 0.01 | 1 | 5/18/00 | 5/18/00 | 0.10 | |
| Mercury, Total | METHOD | 245.1 | 0.0005 | 1 | 5/23/00 | 5/23/00 | ND | |
| Nickel, Total | METHOD | 200.7 | 0.04 | 1 | 5/18/00 | 5/18/00 | ND | |
| Selenium, Total | METHOD | 270.2 | 0.005 | 1 | 5/23/00 | 5/23/00 | ND | |
| Silver, Total | METHOD | 200.7 | 0.01 | 1 | 5/18/00 | 5/18/00 | ND | |
| Sodium, Total | METHOD | 200.7 | 0.5 | 1 | 5/18/00 | 5/18/00 | 130 | |
| Thallium, Total | METHOD | 200.7 | 0.1 | 1 | 5/18/00 | 5/18/00 | ND | |
| Zinc, Total | METHOD | 200.7 | 0.02 | 1 | 5/18/00 | 5/18/00 | ND | |

Approved By: _____ Date: 5/24/00

# COLUMBIA ANALYTICAL SERVICES, INC.

## Analytical Report

| | | | |
|---|---|---|---|
| Client: | Newhall Land and Farming Company | Service Request: | L2001744 |
| Project: | Newhall Ranch | Date Collected: | 5/17/00 |
| Sample Matrix: | Water | Date Received: | 5/17/00 |

## Metals

| | | | |
|---|---|---|---|
| Sample Name: | B-156 | Units: | mg/L (ppm) |
| Lab Code: | L2001744-006 | Basis: | NA |
| Test Notes: | | | |

| Analyte | Prep Method | Analysis Method | MRL | Dilution Factor | Date Digested | Date Analyzed | Result | Result Notes |
|---|---|---|---|---|---|---|---|---|
| Aluminum, Total | METHOD | 200.7 | 0.1 | 1 | 5/18/00 | 5/18/00 | ND | |
| Arsenic, Total | METHOD | 206.2 | 0.005 | 1 | 5/23/00 | 5/23/00 | ND | |
| Barium, Total | METHOD | 200.7 | 0.02 | 1 | 5/18/00 | 5/18/00 | ND | |
| Boron, Total | METHOD | 200.7 | 0.05 | 1 | 5/18/00 | 5/18/00 | 0.25 | |
| Cadmium, Total | METHOD | 200.7 | 0.005 | 1 | 5/18/00 | 5/18/00 | ND | |
| Calcium, Total | METHOD | 200.7 | 0.05 | 1 | 5/18/00 | 5/18/00 | 110 | |
| Chromium, Total | METHOD | 200.7 | 0.01 | 1 | 5/18/00 | 5/18/00 | ND | |
| Copper, Total | METHOD | 200.7 | 0.01 | 1 | 5/18/00 | 5/18/00 | ND | |
| Iron, Total | METHOD | 200.7 | 0.1 | 1 | 5/18/00 | 5/18/00 | ND | |
| Magnesium, Total | METHOD | 200.7 | 0.1 | 1 | 5/18/00 | 5/18/00 | 38 | |
| Manganese, Total | METHOD | 200.7 | 0.01 | 1 | 5/18/00 | 5/18/00 | ND | |
| Mercury, Total | METHOD | 245.1 | 0.0005 | 1 | 5/23/00 | 5/23/00 | ND | |
| Nickel, Total | METHOD | 200.7 | 0.04 | 1 | 5/18/00 | 5/18/00 | ND | |
| Selenium, Total | METHOD | 270.2 | 0.005 | 1 | 5/23/00 | 5/23/00 | ND | |
| Silver, Total | METHOD | 200.7 | 0.01 | 1 | 5/18/00 | 5/18/00 | ND | |
| Sodium, Total | METHOD | 200.7 | 0.5 | 1 | 5/18/00 | 5/18/00 | 79 | |
| Thallium, Total | METHOD | 200.7 | 0.1 | 1 | 5/18/00 | 5/18/00 | ND | |
| Zinc, Total | METHOD | 200.7 | 0.02 | 1 | 5/18/00 | 5/18/00 | 0.04 | |

Approved By: [signature] Date: 5/24/00

# COLUMBIA ANALYTICAL SERVICES, INC.

## Analytical Report

Client: Newhall Land and Farming Company
Project: Newhall Ranch
Sample Matrix: Water

Service Request: L2001744
Date Collected: 5/17/00
Date Received: 5/17/00

## Inorganic Parameters

Sample Name: WELL E
Lab Code: L2001744-001
Test Notes:

Basis: NA

| Analyte | Units | Analysis Method | MRL | Dilution Factor | Date Extracted | Date Analyzed | Result | Result Notes |
|---|---|---|---|---|---|---|---|---|
| Alkalinity as CaCO3, Total | mg/L (ppm) | SM 2320B | 10 | 1 | NA | 5/18/00 | 200 | |
| Chloride | mg/L (ppm) | 300.0 | 0.5 | 20 | NA | 5/18/00 | 70 | |
| Color | COLOR UNIT | 110.2 | 5 | 1 | NA | 5/17/00 | ND | |
| Conductivity | uMHOS/cm | 120.1 | 10 | 1 | NA | 5/17/00 | 1100 | |
| Cyanide, Total | mg/L (ppm) | 335.2 | 0.05 | 1 | NA | 5/22/00 | ND | |
| Fluoride | mg/L (ppm) | 340.2 | 0.1 | 1 | NA | 5/17/00 | 0.9 | |
| Nitrate as Nitrogen | mg/L (ppm) | 300.0 | 0.2 | 1 | NA | 5/18/00 | 1.6 | |
| Nitrite as Nitrogen | mg/L (ppm) | 354.1 | 0.003 | 1 | NA | 5/18/00 | ND | |
| Odor | T.O.N. | 140.1 | 1 | 1 | NA | 5/17/00 | ND | |
| pH | pH UNITS | 150.1 | -- | 1 | NA | 5/17/00 | 7.6 | |
| Solids, Total Dissolved (TDS) | mg/L (ppm) | 160.1 | 10 | 1 | NA | 5/17-18/00 | 650 | |
| Sulfate | mg/L (ppm) | 300.0 | 1.0 | 20 | NA | 5/18/00 | 250 | |
| Surfactants | mg/L (ppm) | 425.1 | 0.1 | 1 | 5/18/00 | 5/18/00 | ND | |
| Turbidity | NTU | 180.1 | 0.1 | 1 | NA | 5/17/00 | 0.4 | |

Approved By: _____ Date: 5/23/00

# COLUMBIA ANALYTICAL SERVICES, INC.

## Analytical Report

| | | | |
|---|---|---|---|
| Client: | Newhall Land and Farming Company | Service Request: | L2001744 |
| Project: | Newhall Ranch | Date Collected: | 5/17/00 |
| Sample Matrix: | Water | Date Received: | 5/17/00 |

### Inorganic Parameters

Sample Name: E-9
Lab Code: L2001744-002
Test Notes:

Basis: NA

| Analyte | Units | Analysis Method | MRL | Dilution Factor | Date Extracted | Date Analyzed | Result | Result Notes |
|---|---|---|---|---|---|---|---|---|
| Alkalinity as CaCO3, Total | mg/L (ppm) | SM 2320B | 10 | 1 | NA | 5/18/00 | 280 | |
| Chloride | mg/L (ppm) | 300.0 | 0.5 | 10 | NA | 5/18/00 | 40 | |
| Color | COLOR UNIT | 110.2 | 5 | 1 | NA | 5/17/00 | ND | |
| Conductivity | uMHOS/cm | 120.1 | 10 | 1 | NA | 5/17/00 | 1100 | |
| Cyanide, Total | mg/L (ppm) | 335.2 | 0.05 | 1 | NA | 5/22/00 | ND | |
| Fluoride | mg/L (ppm) | 340.2 | 0.1 | 1 | NA | 5/17/00 | 0.7 | |
| Nitrate as Nitrogen | mg/L (ppm) | 300.0 | 0.2 | 1 | NA | 5/18/00 | 2.3 | |
| Nitrite as Nitrogen | mg/L (ppm) | 354.1 | 0.003 | 1 | NA | 5/18/00 | ND | |
| Odor | T.O.N. | 140.1 | 1 | 1 | NA | 5/17/00 | ND | |
| pH | pH UNITS | 150.1 | -- | 1 | NA | 5/17/00 | 7.5 | |
| Solids, Total Dissolved (TDS) | mg/L (ppm) | 160.1 | 10 | 1 | NA | 5/17-18/00 | 680 | |
| Sulfate | mg/L (ppm) | 300.0 | 1.0 | 10 | NA | 5/18/00 | 240 | |
| Surfactants | mg/L (ppm) | 425.1 | 0.1 | 1 | 5/18/00 | 5/18/00 | ND | |
| Turbidity | NTU | 180.1 | 0.1 | 1 | NA | 5/17/00 | 0.6 | |

Approved By: _____ Date: 5/23/00



116225

# COLUMBIA ANALYTICAL SERVICES, INC.

## Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Newhall Land and Farming Company | **Service Request:** | L2001744 |
| **Project:** | Newhall Ranch | **Date Collected:** | 5/17/00 |
| **Sample Matrix:** | Water | **Date Received:** | 5/17/00 |

### Inorganic Parameters

Sample Name: C WELL
Lab Code: L2001744-003
Test Notes:

Basis: NA

| Analyte | Units | Analysis Method | MRL | Dilution Factor | Date Extracted | Date Analyzed | Result | Result Notes |
|---|---|---|---|---|---|---|---|---|
| Alkalinity as CaCO3, Total | mg/L (ppm) | SM 2320B | 10 | 1 | NA | 5/18/00 | 260 | |
| Chloride | mg/L (ppm) | 300.0 | 0.5 | 10 | NA | 5/18/00 | 57 | |
| Color | COLOR UNIT | 110.2 | 5 | 1 | NA | 5/17/00 | ND | |
| Conductivity | uMHOS/cm | 120.1 | 10 | 1 | NA | 5/17/00 | 1200 | |
| Cyanide, Total | mg/L (ppm) | 335.2 | 0.05 | 1 | NA | 5/22/00 | ND | |
| Fluoride | mg/L (ppm) | 340.2 | 0.1 | 1 | NA | 5/17/00 | 0.7 | |
| Nitrate as Nitrogen | mg/L (ppm) | 300.0 | 0.2 | 1 | NA | 5/18/00 | 2.1 | |
| Nitrite as Nitrogen | mg/L (ppm) | 354.1 | 0.003 | 1 | NA | 5/18/00 | ND | |
| Odor | T.O.N. | 140.1 | 1 | 1 | NA | 5/17/00 | ND | |
| pH | pH UNITS | 150.1 | – | 1 | NA | 5/17/00 | 7.5 | |
| Solids, Total Dissolved (TDS) | mg/L (ppm) | 160.1 | 10 | 1 | NA | 5/17-18/00 | 750 | |
| Sulfate | mg/L (ppm) | 300.0 | 1.0 | 10 | NA | 5/18/00 | 290 | |
| Surfactants | mg/L (ppm) | 425.1 | 0.1 | 1 | 5/18/00 | 5/18/00 | ND | |
| Turbidity | NTU | 180.1 | 0.1 | 1 | NA | 5/17/00 | 0.2 | |

Approved By: _____ Date: 5/23/00

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Newhall Land and Farming Company | **Service Request:** | L2001744 |
| **Project:** | Newhall Ranch | **Date Collected:** | 5/17/00 |
| **Sample Matrix:** | Water | **Date Received:** | 5/17/00 |

Inorganic Parameters

| | |
|---|---|
| Sample Name: | B-6 |
| Lab Code: | L2001744-004 |
| Test Notes: | |

Basis: NA

| Analyte | Units | Analysis Method | MRL | Dilution Factor | Date Extracted | Date Analyzed | Result | Result Notes |
|---|---|---|---|---|---|---|---|---|
| Alkalinity as CaCO3, Total | mg/L (ppm) | SM 2320B | 10 | 1 | NA | 5/18/00 | 310 | |
| Chloride | mg/L (ppm) | 300.0 | 0.5 | 10 | NA | 5/18/00 | 83 | |
| Color | COLOR UNIT | 110.2 | 5 | 1 | NA | 5/17/00 | ND | |
| Conductivity | uMHOS/cm | 120.1 | 10 | 1 | NA | 5/17/00 | 1400 | |
| Cyanide, Total | mg/L (ppm) | 335.2 | 0.05 | 1 | NA | 5/22/00 | ND | |
| Fluoride | mg/L (ppm) | 340.2 | 0.1 | 1 | NA | 5/17/00 | 0.8 | |
| Nitrate as Nitrogen | mg/L (ppm) | 300.0 | 0.2 | 1 | NA | 5/18/00 | 1.9 | |
| Nitrite as Nitrogen | mg/L (ppm) | 354.1 | 0.003 | 1 | NA | 5/18/00 | ND | |
| Odor | T.O.N. | 140.1 | 1 | 1 | NA | 5/17/00 | ND | |
| pH | pH UNITS | 150.1 | -- | 1 | NA | 5/17/00 | 7.4 | |
| Solids, Total Dissolved (TDS) | mg/L (ppm) | 160.1 | 10 | 1 | NA | 5/17-18/00 | 940 | |
| Sulfate | mg/L (ppm) | 300.0 | 1.0 | 10 | NA | 5/18/00 | 360 | |
| Surfactants | mg/L (ppm) | 425.1 | 0.1 | 1 | 5/18/00 | 5/18/00 | ND | |
| Turbidity | NTU | 180.1 | 0.1 | 1 | NA | 5/17/00 | 0.3 | |

Approved By: _____ BQS Date: 5/23/00



116227

## COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

**Client:** Newhall Land and Farming Company
**Project:** Newhall Ranch
Sample Matrix: Water

**Service Request:** L2001744
**Date Collected:** 5/17/00
**Date Received:** 5/17/00

Inorganic Parameters

Sample Name: S-11
Lab Code: L2001744-005
Test Notes:

Basis: NA

| Analyte | Units | Analysis Method | MRL | Dilution Factor | Date Extracted | Date Analyzed | Result | Result Notes |
|---|---|---|---|---|---|---|---|---|
| Alkalinity as CaCO3, Total | mg/L (ppm) | SM 2320B | 10 | 1 | NA | 5/18/00 | 260 | |
| Chloride | mg/L (ppm) | 300.0 | 0.5 | 10 | NA | 5/18/00 | 88 | |
| Color | COLOR UNIT | 110.2 | 5 | 1 | NA | 5/17/00 | ND | |
| Conductivity | uMHOS/cm | 120.1 | 10 | 1 | NA | 5/17/00 | 1300 | |
| Cyanide, Total | mg/L (ppm) | 335.2 | 0.05 | 1 | NA | 5/22/00 | ND | |
| Fluoride | mg/L (ppm) | 340.2 | 0.1 | 1 | NA | 5/17/00 | 0.7 | |
| Nitrate as Nitrogen | mg/L (ppm) | 300.0 | 0.2 | 1 | NA | 5/18/00 | 2.3 | |
| Nitrite as Nitrogen | mg/L (ppm) | 354.1 | 0.003 | 1 | NA | 5/18/00 | 0.008 | |
| Odor | T.O.N. | 140.1 | 1 | 1 | NA | 5/17/00 | ND | |
| pH | pH UNITS | 150.1 | -- | 1 | NA | 5/17/00 | 7.6 | |
| Solids, Total Dissolved (TDS) | mg/L (ppm) | 160.1 | 10 | 1 | NA | 5/17-18/00 | 800 | |
| Sulfate | mg/L (ppm) | 300.0 | 1.0 | 10 | NA | 5/18/00 | 290 | |
| Surfactants | mg/L (ppm) | 425.1 | 0.1 | 1 | 5/18/00 | 5/18/00 | ND | |
| Turbidity | NTU | 180.1 | 0.1 | 1 | NA | 5/17/00 | ND | |

Approved By: BQS Date: 5/23/00

01744WET.SAL - Sample (1) 5/23/00



116228

# COLUMBIA ANALYTICAL SERVICES, INC.

## Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Newhall Land and Farming Company | **Service Request:** | L2001744 |
| **Project:** | Newhall Ranch | **Date Collected:** | 5/17/00 |
| **Sample Matrix:** | Water | **Date Received:** | 5/17/00 |

## Inorganic Parameters

| | |
|---|---|
| Sample Name: | S-130 |
| Lab Code: | L2001744-006 |
| Test Notes: | |

Basis: NA

| Analyte | Units | Analysis Method | MRL | Dilution Factor | Date Extracted | Date Analyzed | Result | Result Notes |
|---|---|---|---|---|---|---|---|---|
| Alkalinity as CaCO3, Total | mg/L (ppm) | SM 2320B | 10 | 1 | NA | 5/18/00 | 220 | |
| Chloride | mg/L (ppm) | 300.0 | 0.5 | 10 | NA | 5/18/00 | 26 | |
| Color | COLOR UNIT | 110.2 | 5 | 1 | NA | 5/17/00 | ND | |
| Conductivity | uMHOS/cm | 120.1 | 10 | 1 | NA | 5/17/00 | 1100 | |
| Cyanide, Total | mg/L (ppm) | 335.2 | 0.05 | 1 | NA | 5/22/00 | ND | |
| Fluoride | mg/L (ppm) | 340.2 | 0.1 | 1 | NA | 5/17/00 | 0.4 | |
| Nitrate as Nitrogen | mg/L (ppm) | 300.0 | 0.2 | 1 | NA | 5/18/00 | 2.4 | |
| Nitrite as Nitrogen | mg/L (ppm) | 354.1 | 0.003 | 1 | NA | 5/18/00 | ND | |
| Odor | T.O.N. | 140.1 | 1 | 1 | NA | 5/17/00 | ND | |
| pH | pH UNITS | 150.1 | - | 1 | NA | 5/17/00 | 7.7 | |
| Solids, Total Dissolved (TDS) | mg/L (ppm) | 160.1 | 10 | 1 | NA | 5/17-18/00 | 770 | |
| Sulfate | mg/L (ppm) | 300.0 | 1.0 | 10 | NA | 5/18/00 | 360 | |
| Surfactants | mg/L (ppm) | 425.1 | 0.1 | 1 | 5/18/00 | 5/18/00 | ND | |
| Turbidity | NTU | 180.1 | 0.1 | 1 | NA | 5/17/00 | 0.1 | |

Approved By: BOS Date: 5/23/00

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Laboratory
Report
#66091

Columbia Analytical Services
Ross Fenstermakr, Eydie Schwrtz
6925 Canoga Avenue
Canoga Park , CA 91304

Samples Received
18-may-2000 09:24:00

| Prepared | Analyzed | QC Batch# | Method | Analyte | Result | Units | MRL | Dilution |
|---|---|---|---|---|---|---|---|---|
| WELL E (2005180055) | | | Sampled on 05/17/00 | | | | | |
| | | | | **Gross Alpha and Beta Radiation** | | | | |
| | 05/31/00 | 116953 | ( ML/EPA 900.0 ) | Alpha, Gross | 3.5 | pCi/l | 1.3 | 1 |
| | 05/31/00 | 116953 | ( ML/EPA 900.0 ) | Alpha, Two Sigma Error | 2.7 | pCi/l | 0.0000 | 1 |
| | 05/31/00 | 116953 | ( ML/EPA 900.0 ) | Alpha, Min Detectable Activity | 1.3 | pCi/l | 1.3 | 1 |
| | 05/31/00 | 116953 | ( ML/EPA 900.0 ) | Beta, Gross | 3.3 | pCi/l | 1.7 | 1 |
| | 05/31/00 | 116953 | ( ML/EPA 900.0 ) | Beta, Two Sigma Error | 1.9 | pCi/l | 0.0000 | 1 |
| | 05/31/00 | 116953 | ( ML/EPA 900.0 ) | Beta, Min Detectable Activity | 1.7 | pCi/l | 1.7 | 1 |
| | | | | **Radon 222** | | | | |
| | 05/18/00 | 116912 | ( SM7500RN ) | Radon 222 | 230 | pCi/l | 50 | 1 |
| | 05/18/00 | 116912 | ( SM7500RN ) | Radon 222, Two Sigma Error | 19.7 | pCi/l | 0.0000 | 1 |
| | | | | **Regulated VOCs plus Lists 1&3** | | | | |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,1,1,2-Tetrachloroethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,1,1-Trichloroethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,1,2,2-Tetrachloroethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,1,2-Trichloroethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,1-Dichloroethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,1-Dichloroethylene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,1-Dichloropropane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,2,3-Trichlorobenzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,2,3-Trichloropropane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,2,4-Trichlorobenzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,2,4-Trimethylbenzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,2-Dichloroethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,2-Dichloropropane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,3,5-Trimethylbenzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,3-Dichloropropane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | p-Dichlorobenzene (1,4-DCB) | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 2,2-Dichloropropane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 2-Butanone (MEK) | ND | ug/l | 5.0 | 1 |

116230

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Laboratory
Report
#66091

## Columbia Analytical Services
(continued)

| Prepared | Analyzed | QC Batch# | Method | Analyte | Result | Units | MRL | Dilution |
|---|---|---|---|---|---|---|---|---|
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | o-Chlorotoluene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | p-Chlorotoluene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 4-Methyl-2-Pentanone (MIBK) | ND | ug/l | 5.0 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Benzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Bromobenzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Bromomethane (Methyl Bromide) | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | cis-1,2-Dichloroethylene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Chlorobenzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Carbon Tetrachloride | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | cis-1,3-Dichloropropene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Bromoform | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Chloroform (Trichloromethane) | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Bromochloromethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Chloroethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Chloromethane (Methyl Chloride) | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Chlorodibromomethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Dibromomethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Bromodichloromethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Dichloromethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Di-isopropyl ether | NA | ug/l | 5.0 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Ethyl benzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/ES24.2/624 ) | Dichlorodifluoromethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Fluorotrichloromethane-Freon11 | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Hexachlorobutadiene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Isopropylbenzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | m-Dichlorobenzene (1,3-DCB) | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | m,p-Xylenes | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/8524.2/624 ) | Methyl Tert-butyl ether (MTBE) | ND | ug/l | 3.0 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Naphthalene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | n-Butylbenzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | n-Propylbenzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | o-Xylene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | o-Dichlorobenzene (1,2-DCB) | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Tetrachloroethylene (PCE) | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | p-Isopropyltoluene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | sec-Butylbenzene | ND | ug/l | 0.50 | 1 |

116231

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Laboratory Report #66091

Columbia Analytical Services
(continued)

| Prepared | Analyzed | QC Batch# | Method | Analyte | Result | Units | MRL | Dilution |
|---|---|---|---|---|---|---|---|---|
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Styrene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | trans-1,2-Dichloroethylene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | tert-amyl Methyl Ether | ND | ug/l | 3.0 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | tert-Butyl Ethyl Ether | ND | ug/l | 3.0 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | tert-Butylbenzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Trichloroethylene (TCE) | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Trichlorotrifluoroethane(Freon | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | trans-1,3-Dichloropropene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Toluene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Total TPH | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Total Xylenes | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Vinyl chloride (VC) | ND | ug/l | 0.30 | 1 |
| | | | ( Surrogate ) | 1,2-Dichloroethane-d4 | NA | % Rec | | |
| | | | ( Surrogate ) | 4-Bromofluorobenzene | 71 | % Rec | | |
| | | | ( Surrogate ) | Toluene-d8 | NA | % Rec | | |

**E-9 (2005180057)** **Sampled on 05/17/00**

**Gross Alpha and Beta Radiation**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 05/31/00 | 116953 | ( ML/EPA 900.0 ) | Alpha, Gross | 3.5 | pCi/l | 1.5 | 1 |
| | 05/31/00 | 116953 | ( ML/EPA 900.0 ) | Alpha, Two Sigma Error | 3.3 | pCi/l | 0.0000 | 1 |
| | 05/31/00 | 116953 | ( ML/EPA 900.0 ) | Alpha, Min Detectable Activity | 1.5 | pCi/l | 1.5 | 1 |
| | 05/31/00 | 116953 | ( ML/EPA 900.0 ) | Beta, Gross | 7.8 | pCi/l | 1.1 | 1 |
| | 05/31/00 | 116953 | ( ML/EPA 900.0 ) | Beta, Two Sigma Error | 2.8 | pCi/l | 0.0000 | 1 |
| | 05/31/00 | 116953 | ( ML/EPA 900.0 ) | Beta, Min Detectable Activity | 1.1 | pCi/l | 1.1 | 1 |

**Radon 222**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 05/18/00 | 116912 | ( SM7500RN ) | Radon 222 | 185 | pCi/l | 50 | 1 |
| | 05/18/00 | 116912 | ( SM7500RN ) | Radon 222, Two Sigma Error | 18.6 | pCi/l | 0.0000 | 1 |

**Regulated VOCs plus Lists 1&3**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,1,1,2-Tetrachloroethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,1,1-Trichloroethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,1,2,2-Tetrachloroethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,1,2-Trichloroethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,1-Dichloroethane | ND | ug/l | 0.50 | 1 |

116232

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Laboratory
Report
#56091

Columbia Analytical Services
(continued)

| Prepared | Analyzed | QC Batch# | Method | Analyte | Result | Units | MRL | Dilution |
|---|---|---|---|---|---|---|---|---|
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,1-Dichloroethylene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,1-Dichloropropene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,2,3-Trichlorobenzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,2,3-Trichloropropane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,2,4-Trichlorobenzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,2,4-Trimethylbenzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,2-Dichloroethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,2-Dichloropropane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,3,5-Trimethylbenzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,3-Dichloropropane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | p-Dichlorobenzene (1,4-DCB) | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 2,2-Dichloropropane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 2-Butanone (MEK) | ND | ug/l | 5.0 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | o-Chlorotoluene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | p-Chlorotoluene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 4-Methyl-2-Pentanone (MIBK) | ND | ug/l | 5.0 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Benzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Bromobenzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Bromomethane (Methyl Bromide) | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | cis-1,2-Dichloroethylene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Chlorobenzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Carbon Tetrachloride | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | cis-1,3-Dichloropropene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Bromoform | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Chloroform (Trichloromethane) | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Bromochloromethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Chloroethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Chloromethane(Methyl Chloride) | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Chlorodibromomethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Dibromomethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Bromodichloromethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Dichloromethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Di-isopropyl ether | NA | ug/l | 5.0 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Ethyl benzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/E524.2/624 ) | Dichlorodifluoromethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Fluorotrichloromethane-Freon11 | ND | ug/l | 0.50 | 1 |

116233

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Laboratory
Report
#66091

## Columbia Analytical Services
(continued)

| Prepared | Analyzed | QC Batch# | Method | Analyte | Result | Units | MRL | Dilution |
|---|---|---|---|---|---|---|---|---|
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Hexachlorobutadiene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Isopropylbenzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | m-Dichlorobenzene (1,3-DCB) | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | m,p-Xylenes | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA524.2/624 ) | Methyl Tert-butyl ether (MTBE) | ND | ug/l | 3.0 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Naphthalene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | n-Butylbenzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | n-Propylbenzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | o-Xylene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | o-Dichlorobenzene (1,2-DCB) | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Tetrachloroethylene (PCE) | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | p-Isopropyltoluene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | sec-Butylbenzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Styrene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | trans-1,2-Dichloroethylene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | tert-Amyl Methyl Ether | ND | ug/l | 3.0 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | tert-Butyl Ethyl Ether | ND | ug/l | 3.0 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | tert-Butylbenzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Trichloroethylene (TCE) | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Trichlorotrifluoroethane(Freon | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | trans-1,3-Dichloropropene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Toluene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Total THM | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Total xylenes | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Vinyl chloride (VC) | ND | ug/l | 0.30 | 1 |
| | | | ( Surrogate ) | 1,2-Dichloroethane-d4 | NA | % Rec | | |
| | | | ( Surrogate ) | 4-Bromofluorobenzene | 102 | % Rec | | |
| | | | ( Surrogate ) | Toluene-d8 | NA | % Rec | | |

**C WELL (2005180058)** **Sampled on 05/17/00**

### Gross Alpha and Beta Radiation

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 05/31/00 | 116953 | ( ML/EPA 900.0 ) | Alpha, Gross | 5.2 | pCi/l | 1.0 | 1 |
| | 05/31/00 | 116953 | ( ML/EPA 900.0 ) | Alpha, Two Sigma Error | 2.2 | pCi/l | 0.0000 | 1 |
| | 05/31/00 | 116953 | ( ML/EPA 900.0 ) | Alpha, Min Detectable Activity | 1.0 | pCi/l | 1.0 | 1 |
| | 05/31/00 | 116953 | ( ML/EPA 900.0 ) | Beta, Gross | 3.6 | pCi/l | 2.4 | 1 |

116234

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Laboratory
Report
#66091

Columbia Analytical Services
(continued)

| Prepared | Analyzed | QC Batch# | Method | Analyte | Result | Units | MRL | Dilution |
|---|---|---|---|---|---|---|---|---|
| | 05/31/00 | 116953 | ( ML/EPA 900.0 ) | Beta, Two Sigma Error | 5.0 | pCi/l | 0.0000 | 1 |
| | 05/31/00 | 116953 | ( ML/EPA 900.0 ) | Beta, Min Detectable Activity | 2.4 | pCi/l | 2.4 | 1 |
| | | | **Radon 222** | | | | | |
| | 05/18/00 | 116912 | ( SM7500RN ) | Radon 222 | 235 | pCi/l | 50 | 1 |
| | 05/18/00 | 116912 | ( SM7500RN ) | Radon 222, Two Sigma Error | 20.0 | pCi/l | 0.0000 | 1 |
| | | | **Regulated VOCs plus Lists 1&3** | | | | | |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,1,1,2-Tetrachloroethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,1,1-Trichloroethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,1,2,2-Tetrachloroethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,1,2-Trichloroethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,1-Dichloroethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,1-Dichloroethylene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,1-Dichloropropene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,2,3-Trichlorobenzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,2,3-Trichloropropane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,2,4-Trichlorobenzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,2,4-Trimethylbenzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,2-Dichloroethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,2-Dichloropropane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,3,5-Trimethylbenzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,3-Dichloropropane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | p-Dichlorobenzene (1,4-DCB) | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 2,2-Dichloropropane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 2-Butanone (MEK) | ND | ug/l | 5.0 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | o-Chlorotoluene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | p-Chlorotoluene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 4-Methyl-2-Pentanone (MIBK) | ND | ug/l | 5.0 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Benzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Bromobenzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Bromomethane (Methyl Bromide) | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | cis-1,2-Dichloroethylene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Chlorobenzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Carbon Tetrachloride | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | cis-1,3-Dichloropropene | ND | ug/l | 0.50 | 1 |

116235

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Laboratory
Report
#66091

Columbia Analytical Services
(continued)

| Prepared | Analyzed | QC Batch# | Method | Analyte | Result | Units | MRL | Dilution |
|---|---|---|---|---|---|---|---|---|
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Bromoform | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Chloroform (Trichloromethane) | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Bromochloromethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Chloroethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Chloromethane(Methyl Chloride) | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Chlorodibromomethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Dibromomethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Bromodichloromethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Dichloromethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Di-isopropyl ether | NA | ug/l | 5.0 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Ethyl benzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/E524.2/624 ) | Dichlorodifluoromethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Fluorotrichloromethane-Freon11 | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Hexachlorobutadiene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Isopropylbenzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | m-Dichlorobenzene (1,3-DCB) | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | m,p-Xylenes | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/ES24.2/624 ) | Methyl Tert-butyl ether (MTBE) | ND | ug/l | 3.0 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Naphthalene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | n-Butylbenzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | n-Propylbenzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | o-Xylene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | o-Dichlorobenzene (1,2-DCB) | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Tetrachloroethylene (PCE) | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | p-Isopropyltoluene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | sec-Butylbenzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Styrene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | trans-1,2-Dichloroethylene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | tert-amyl Methyl Ether | ND | ug/l | 3.0 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | tert-Butyl Ethyl Ether | ND | ug/l | 3.0 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | tert-Butylbenzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Trichloroethylene (TCE) | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Trichlorotrifluoroethane(Freon | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | trans-1,3-Dichloropropene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Toluene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Total THM | ND | ug/l | 0.50 | 1 |

116236

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Laboratory Report #66091

Columbia Analytical Services
(continued)

| Prepared | Analyzed | QC Batch# | Method | Analyte | Result | Units | MRL | Dilution |
|---|---|---|---|---|---|---|---|---|
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Total xylenes | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Vinyl chloride (VC) | ND | ug/l | 0.30 | 1 |
| | | | ( Surrogate ) | 1,2-Dichloroethane-d4 | NA | % Rec | | |
| | | | ( Surrogate ) | 4-Bromofluorobenzene | 67 | % Rec | | |
| | | | ( Surrogate ) | Toluene-d8 | NA | % Rec | | |
| B-6 (2005180059) | | | Sampled on 05/17/00 | | | | | |
| | | | **Gross Alpha and Beta Radiation** | | | | | |
| | 05/31/00 | 116953 | ( ML/EPA 900.0 ) | Alpha, Gross | 17.7 | pCi/l | 1.4 | 1 |
| | 05/31/00 | 116953 | ( ML/EPA 900.0 ) | Alpha, Two Sigma Error | 4.0 | pCi/l | 0.0000 | 1 |
| | 05/31/00 | 116953 | ( ML/EPA 900.0 ) | Alpha, Min Detectable Activity | 1.4 | pCi/l | 1.4 | 1 |
| | 05/31/00 | 116953 | ( ML/EPA 900.0 ) | Beta, Gross | <2.3 | pCi/l | 2.3 | 1 |
| | 05/31/00 | 116953 | ( ML/EPA 900.0 ) | Beta, Two Sigma Error | NA | pCi/l | 0.0000 | 1 |
| | 05/31/00 | 116953 | ( ML/EPA 900.0 ) | Beta, Min Detectable Activity | 2.3 | pCi/l | 2.3 | 1 |
| | | | **Radon 222** | | | | | |
| | 05/18/00 | 116912 | ( SM7500RN ) | Radon 222 | 170 | pCi/l | 50 | 1 |
| | 05/18/00 | 116912 | ( SM7500RN ) | Radon 222, Two Sigma Error | 18.5 | pCi/l | 0.0000 | 1 |
| | | | **Regulated VOCs plus Lists 1&3** | | | | | |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,1,1,2-Tetrachloroethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,1,1-Trichloroethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,1,2,2-Tetrachloroethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,1,2-Trichloroethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,1-Dichloroethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,1-Dichloroethylene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,1-Dichloropropene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,2,3-Trichlorobenzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,2,3-Trichloropropane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,2,4-Trichlorobenzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,2,4-Trimethylbenzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,2-Dichloroethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,2-Dichloropropane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,3,5-Trimethylbenzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,3-Dichloropropane | ND | ug/l | 0.50 | 1 |

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Laboratory Report #66091

## Columbia Analytical Services (continued)

| Prepared | Analyzed | QC Batch# | Method | Analyte | Result | Units | MRL | Dilution |
|---|---|---|---|---|---|---|---|---|
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | p-Dichlorobenzene (1,4-DCB) | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 2,2-Dichloropropane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 2-Butanone (MEK) | ND | ug/l | 5.0 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | o-Chlorotoluene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | p-Chlorotoluene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 4-Methyl-2-Pentanone (MIBK) | ND | ug/l | 5.0 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Benzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Bromobenzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Bromomethane (Methyl Bromide) | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | cis-1,2-Dichloroethylene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Chlorobenzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Carbon Tetrachloride | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | cis-1,3-Dichloropropene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Bromoform | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Chloroform (Trichloromethane) | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Bromochloromethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Chloroethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Chloromethane(Methyl Chloride) | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Chlorodibromomethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Dibromomethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Bromodichloromethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Dichloromethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Di-isopropyl ether | NA | ug/l | 5.0 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Ethyl benzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/E524.2/624 ) | Dichlorodifluoromethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Fluorotrichloromethane-Freon11 | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Hexachlorobutadiene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Isopropylbenzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | m-Dichlorobenzene (1,3-DCB) | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | m,p-Xylenes | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/E524.2/624 ) | Methyl Tert-butyl ether (MTBE) | ND | ug/l | 3.0 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Naphthalene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | n-Butylbenzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | n-Propylbenzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | o-Xylene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | o-Dichlorobenzene (1,2-DCB) | ND | ug/l | 0.50 | 1 |

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Laboratory
Report
#66091

Columbia Analytical Services
(continued)

| Prepared | Analyzed | QC Batch# | Method | Analyte | Result | Units | MRL | Dilution |
|---|---|---|---|---|---|---|---|---|
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Tetrachloroethylene (PCE) | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | p-Isopropyltoluene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | sec-Butylbenzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Styrene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | trans-1,2-Dichloroethylene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | tert-amyl Methyl Ether | ND | ug/l | 3.0 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | tert-Butyl Ethyl Ether | ND | ug/l | 3.0 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | tert-Butylbenzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Trichloroethylene (TCE) | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Trichlorotrifluoroethane(Freon | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | trans-1,3-Dichloropropene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Toluene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Total THM | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Total xylenes | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Vinyl chloride (VC) | ND | ug/l | 0.30 | 1 |
| | | | ( Surrogate ) | 1,2-Dichloroethane-d4 | NA | % Rec | | |
| | | | ( Surrogate ) | 4-Bromofluorobenzene | 85 | % Rec | | |
| | | | ( Surrogate ) | Toluene-d8 | NA | % Rec | | |

**B-11 (2005180061)** **Sampled on 05/17/00**

**Gross Alpha and Beta Radiation**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 05/31/00 | 116953 | ( ML/EPA 900.0 ) | Alpha, Gross | 7.0 | pCi/l | 1.1 | 1 |
| | 05/31/00 | 116953 | ( ML/EPA 900.0 ) | Alpha, Two Sigma Error | 2.6 | pCi/l | 0.0000 | 1 |
| | 05/31/00 | 116953 | ( ML/EPA 900.0 ) | Alpha, Min Detectable Activity | 1.1 | pCi/l | 1.1 | 1 |
| | 05/31/00 | 116953 | ( ML/EPA 900.0 ) | Beta, Gross | <2.9 | pCi/l | 2.9 | 1 |
| | 05/31/00 | 116953 | ( ML/EPA 900.0 ) | Beta, Two Sigma Error | NA | pCi/l | 0.0000 | 1 |
| | 05/31/00 | 116953 | ( ML/EPA 900.0 ) | Beta, Min Detectable Activity | 2.9 | pCi/l | 2.9 | 1 |

**Radon 222**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 05/18/00 | 116912 | ( SM7500RN ) | Radon 222 | 380 | pCi/l | 50 | 1 |
| | 05/18/00 | 116912 | ( SM7500RN ) | Radon 222, Two Sigma Error | 23.0 | pCi/l | 0.0000 | 1 |

**Regulated VOCs plus Lists 1&3**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,1,1,2-Tetrachloroethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,1,1-Trichloroethane | ND | ug/l | 0.50 | 1 |

116239

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Laboratory
Report
#66091

Columbia Analytical Services
(continued)

| Prepared | Analyzed | QC Batch# | Method | Analyte | Result | Units | MRL | Dilution |
|---|---|---|---|---|---|---|---|---|
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,1,2,2-Tetrachloroethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,1,2-Trichloroethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,1-Dichloroethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,1-Dichloroethylene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,1-Dichloropropene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,2,3-Trichlorobenzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,2,3-Trichloropropane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,2,4-Trichlorobenzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,2,4-Trimethylbenzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,2-Dichloroethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,2-Dichloropropane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,3,5-Trimethylbenzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 1,3-Dichloropropane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | p-Dichlorobenzene (1,4-DCB) | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 2,2-Dichloropropane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 2-Butanone (MEK) | ND | ug/l | 5.0 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | o-Chlorotoluene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | p-Chlorotoluene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 4-Methyl-2-Pentanone (MIBK) | ND | ug/l | 5.0 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Benzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Bromobenzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Bromomethane (Methyl Bromide) | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | cis-1,2-Dichloroethylene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Chlorobenzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Carbon Tetrachloride | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | cis-1,3-Dichloropropene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Bromoform | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Chloroform (Trichloromethane) | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Bromochloromethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Chloroethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Chloromethane (Methyl Chloride) | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Chlorodibromomethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Dibromomethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Bromodichloromethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Dichloromethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Di-isopropyl ether | NA | ug/l | 5.0 | 1 |

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Laboratory Report #65091

Columbia Analytical Services
(continued)

| Prepared | Analyzed | QC Batch# | Method | Analyte | Result | Units | MRL | Dilution |
|---|---|---|---|---|---|---|---|---|
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Ethyl benzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/8524.2/624 ) | Dichlorodifluoromethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Fluorotrichloromethane-Freon11 | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Hexachlorobutadiene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Isopropylbenzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | m-Dichlorobenzene (1,3-DCB) | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | m,p-Xylenes | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/8524.2/624 ) | Methyl Tert-butyl ether (MTBE) | ND | ug/l | 3.0 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Naphthalene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | n-Butylbenzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | n-Propylbenzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | o-Xylene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | o-Dichlorobenzene (1,2-DCB) | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Tetrachloroethylene (PCE) | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | p-Isopropyltoluene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | sec-Butylbenzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Styrene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | trans-1,2-Dichloroethylene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | tert-amyl Methyl Ether | ND | ug/l | 3.0 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | tert-Butyl Ethyl Ether | ND | ug/l | 3.0 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | tert-Butylbenzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Trichloroethylene (TCE) | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Trichlorotrifluoroethane(Freon | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | trans-1,3-Dichloropropene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Toluene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Total THM | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Total xylenes | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Vinyl chloride (VC) | ND | ug/l | 0.30 | 1 |
| | | | ( Surrogate ) | 1,2-Dichloroethane-d4 | NA | % Rec | | |
| | | | ( Surrogate ) | 4-Bromofluorobenzene | 95 | % Rec | | |
| | | | ( Surrogate ) | Toluene-d8 | NA | % Rec | | |

116241

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Laboratory
Report
#66091

Columbia Analytical Services
(continued)

| Prepared | Analyzed | QC Batch# | Method | Analyte | Result | Units | MRL | Dilution |
|---|---|---|---|---|---|---|---|---|
| S-156 (2005180062) | | | Sampled on 05/17/00 | | | | | |
| | | | | **Gross Alpha and Beta Radiation** | | | | |
| 06/06/00 | 117260 | | ML/EPA 900.0 | Alpha, Gross | 4.3 | pCi/l | 1.3 | 1 |
| 06/06/00 | 117260 | | ML/EPA 900.0 | Alpha, Two Sigma Error | 2.9 | pCi/l | 0.0000 | 1 |
| 06/06/00 | 117260 | | ML/EPA 900.0 | Alpha, Min Detectable Activity | 1.3 | pCi/l | 1.3 | 1 |
| 06/06/00 | 117260 | | ML/EPA 900.0 | Beta, Gross | 7.0 | pCi/l | 1.7 | 1 |
| 06/06/00 | 117260 | | ML/EPA 900.0 | Beta, Two Sigma Error | 4.1 | pCi/l | 0.0000 | 1 |
| 06/06/00 | 117260 | | ML/EPA 900.0 | Beta, Min Detectable Activity | 1.7 | pCi/l | 1.7 | 1 |
| | | | | **Radon 222** | | | | |
| 05/18/00 | 116912 | | SM7500RN | Radon 222 | 138 | pCi/l | 50 | 1 |
| 05/18/00 | 116912 | | SM7500RN | Radon 222, Two Sigma Error | 17.7 | pCi/l | 0.0000 | 1 |
| | | | | **Regulated VOCs plus Lists 1&3** | | | | |
| 05/25/00 | 116936 | | ML/EPA 524.2 | 1,1,1,2-Tetrachloroethane | ND | ug/l | 0.50 | 1 |
| 05/25/00 | 116936 | | ML/EPA 524.2 | 1,1,1-Trichloroethane | ND | ug/l | 0.50 | 1 |
| 05/25/00 | 116936 | | ML/EPA 524.2 | 1,1,2,2-Tetrachloroethane | ND | ug/l | 0.50 | 1 |
| 05/25/00 | 116936 | | ML/EPA 524.2 | 1,1,2-Trichloroethane | ND | ug/l | 0.50 | 1 |
| 05/25/00 | 116936 | | ML/EPA 524.2 | 1,1-Dichloroethane | ND | ug/l | 0.50 | 1 |
| 05/25/00 | 116936 | | ML/EPA 524.2 | 1,1-Dichloroethylene | ND | ug/l | 0.50 | 1 |
| 05/25/00 | 116936 | | ML/EPA 524.2 | 1,1-Dichloropropene | ND | ug/l | 0.50 | 1 |
| 05/25/00 | 116936 | | ML/EPA 524.2 | 1,2,3-Trichlorobenzene | ND | ug/l | 0.50 | 1 |
| 05/25/00 | 116936 | | ML/EPA 524.2 | 1,2,3-Trichloropropane | ND | ug/l | 0.50 | 1 |
| 05/25/00 | 116936 | | ML/EPA 524.2 | 1,2,4-Trichlorobenzene | ND | ug/l | 0.50 | 1 |
| 05/25/00 | 116936 | | ML/EPA 524.2 | 1,2,4-Trimethylbenzene | ND | ug/l | 0.50 | 1 |
| 05/25/00 | 116936 | | ML/EPA 524.2 | 1,2-Dichloroethane | ND | ug/l | 0.50 | 1 |
| 05/25/00 | 116936 | | ML/EPA 524.2 | 1,2-Dichloropropane | ND | ug/l | 0.50 | 1 |
| 05/25/00 | 116936 | | ML/EPA 524.2 | 1,3,5-Trimethylbenzene | ND | ug/l | 0.50 | 1 |
| 05/25/00 | 116936 | | ML/EPA 524.2 | 1,3-Dichloropropane | ND | ug/l | 0.50 | 1 |
| 05/25/00 | 116936 | | ML/EPA 524.2 | p-Dichlorobenzene (1,4-DCB) | ND | ug/l | 0.50 | 1 |
| 05/25/00 | 116936 | | ML/EPA 524.2 | 2,2-Dichloropropane | ND | ug/l | 0.50 | 1 |
| 05/25/00 | 116936 | | ML/EPA 524.2 | 2-Butanone (MEK) | ND | ug/l | 5.0 | 1 |
| 05/25/00 | 116936 | | ML/EPA 524.2 | o-Chlorotoluene | ND | ug/l | 0.50 | 1 |
| 05/25/00 | 116936 | | ML/EPA 524.2 | p-Chlorotoluene | ND | ug/l | 0.50 | 1 |

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Laboratory
Report
#66091

Columbia Analytical Services
(continued)

| Prepared | Analyzed | QC Batch# | Method | Analyte | Result | Units | MRL | Dilution |
|---|---|---|---|---|---|---|---|---|
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | 4-Methyl-2-Pentanone (MIBK) | ND | ug/l | 5.0 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Benzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Bromobenzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Bromomethane (Methyl Bromide) | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | cis-1,2-Dichloroethylene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Chlorobenzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Carbon Tetrachloride | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | cis-1,3-Dichloropropene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Bromoform | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Chloroform (Trichloromethane) | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Bromochloromethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Chloroethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Chloromethane(Methyl Chloride) | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Chlorodibromomethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Dibromomethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Bromodichloromethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Dichloromethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Di-isopropyl ether | NA | ug/l | 5.0 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Ethyl benzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA524.2/624 ) | Dichlorodifluoromethane | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Fluorotrichloromethane-Freon11 | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Hexachlorobutadiene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Isopropylbenzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | m-Dichlorobenzene (1,3-DCB) | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | m,p-Xylenes | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA524.2/624 ) | Methyl Tert-butyl ether (MTBE) | ND | ug/l | 3.0 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Naphthalene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | n-Butylbenzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | n-Propylbenzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | o-Xylene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | o-Dichlorobenzene (1,2-DCB) | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Tetrachloroethylene (PCE) | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | p-Isopropyltoluene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | sec-Butylbenzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Styrene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | trans-1,2-Dichloroethylene | ND | ug/l | 0.50 | 1 |

116243

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Laboratory
Report
#66091

## Columbia Analytical Services
(continued)

| Prepared | Analyzed | QC Batch# | Method | Analyte | Result | Units | MRL | Dilution |
|---|---|---|---|---|---|---|---|---|
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | tert-amyl Methyl Ether | ND | ug/l | 3.0 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | tert-Butyl Ethyl Ether | ND | ug/l | 3.0 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | tert-Butylbenzene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Trichloroethylene (TCE) | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Trichlorotrifluoroethane(Freon | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | trans-1,3-Dichloropropene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Toluene | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ] | Total THM | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ] | Total xylenes | ND | ug/l | 0.50 | 1 |
| | 05/25/00 | 116936 | ( ML/EPA 524.2 ) | Vinyl chloride (VC) | ND | ug/l | 0.30 | 1 |
| | | | ( Surrogate ) | 1,2-Dichloroethane-d4 | NA | % Rec | | |
| | | | ( Surrogate ) | 4-Bromofluorobenzene | 88 | % Rec | | |
| | | | ( Surrogate ) | Toluene-d8 | NA | % Rec | | |

116244

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

| | | | |
|---|---|---|---|
| Client: | Newhall Land and Farming Company | Service Request: | L2100666 |
| Project: | Newhall Ranch | Date Collected: | 3/1/01 |
| Sample Matrix: | Water | Date Received: | 3/1/01 |

Volatile Organic Compounds

| | | | |
|---|---|---|---|
| Sample Name: | E WELL | Units: | ug/L (ppb) |
| Lab Code: | L2100666-001 | Basis: | NA |
| Test Notes: | | | |

| Analyte | Prep Method | Analysis Method | CRDL | Dilution Factor | Date Extracted | Date Analyzed | Result | Result Notes |
|---|---|---|---|---|---|---|---|---|
| Dichlorodifluoromethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Chloromethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Vinyl Chloride | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Bromomethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Chloroethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Trichlorofluoromethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Trichlorotrifluoroethane (CFC 113) | METHOD | 524.2 | 2 | 1 | NA | 3/5/01 | ND | |
| 1,1-Dichloroethene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Acetone | METHOD | 524.2 | 5 | 1 | NA | 3/5/01 | ND | |
| Carbon Disulfide | METHOD | 524.2 | 5 | 1 | NA | 3/5/01 | ND | |
| Methylene Chloride | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Methyl *tert*-Butyl Ether | METHOD | 524.2 | 2 | 1 | NA | 3/5/01 | ND | |
| trans-1,2-Dichloroethene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,1-Dichloroethane (1,1-DCA) | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Vinyl Acetate | METHOD | 524.2 | 5 | 1 | NA | 3/5/01 | ND | |
| Diisopropyl Ether | METHOD | 524.2 | 2 | 1 | NA | 3/5/01 | ND | |
| Ethyl *tert*-Butyl Ether | METHOD | 524.2 | 2 | 1 | NA | 3/5/01 | ND | |
| 2,2-Dichloropropane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 2-Butanone (MEK) | METHOD | 524.2 | 5 | 1 | NA | 3/5/01 | ND | |
| cis-1,2-Dichloroethene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Bromochloromethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Chloroform | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,1,1-Trichloroethane (TCA) | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,1-Dichloropropene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Carbon Tetrachloride | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Benzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,2-Dichloroethane (EDC) | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| *tert*-Amyl Methyl Ether | METHOD | 524.2 | 2 | 1 | NA | 3/5/01 | ND | |
| Trichloroethene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,2-Dichloropropane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Dibromomethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Bromodichloromethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 2-Chloroethyl Vinyl Ether | METHOD | 524.2 | 1 | 1 | NA | 3/5/01 | ND | |
| cis-1,3-Dichloropropene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 4-Methyl-2-pentanone (MIBK) | METHOD | 524.2 | 5 | 1 | NA | 3/5/01 | ND | |
| trans-1,3-Dichloropropene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,1,2-Trichloroethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Toluene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Tetrachloroethene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,3-Dichloropropane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 2-Hexanone | METHOD | 524.2 | 5 | 1 | NA | 3/5/01 | ND | |
| Dibromochloromethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,2-Dibromoethane (EDB) | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Chlorobenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |

Approved By: _____ Date: 3-16-01

116245



00666VOA.KR1 - Sample 3/16/01

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Newhall Land and Farming Company
Project: Newhall Ranch
Sample Matrix: Water

Service Request: L2100666
Date Collected: 3/1/01
Date Received: 3/1/01

Volatile Organic Compounds

Sample Name: E WELL
Lab Code: L2100666-001
Test Notes:

Units: ng/L (ppb)
Basis: NA

| Analyte | Prep Method | Analysis Method | CRDL | Dilution Factor | Date Extracted | Date Analyzed | Result | Result Notes |
|---|---|---|---|---|---|---|---|---|
| 1,1,1,2-Tetrachloroethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Ethylbenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Total Xylenes | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Styrene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Bromoform | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Isopropylbenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Bromobenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,1,2,2-Tetrachloroethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,2,3-Trichloropropane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| n-Propylbenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 2-Chlorotoluene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 4-Chlorotoluene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,3,5-Trimethylbenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| tert-Butylbenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,2,4-Trimethylbenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| sec-Butylbenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,3-Dichlorobenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| p-Isopropyltoluene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,4-Dichlorobenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| n-Butylbenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,2-Dichlorobenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,2-Dibromo-3-chloropropane | METHOD | 524.2 | 1 | 1 | NA | 3/5/01 | ND | |
| 1,2,4-Trichlorobenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Hexachlorobutadiene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Naphthalene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,2,3-Trichlorobenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |

Approved By: _____ Date: 3-16-01

152p/020597p

116246



00666VOA.XR1 - Sample 3/16/01

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

| | | | |
|---|---|---|---|
| Client: | Newhall Land and Farming Company | Service Request: | L2100666 |
| Project: | Newhall Ranch | Date Collected: | 3/1/01 |
| Sample Matrix: | Water | Date Received: | 3/1/01 |

Volatile Organic Compounds

| | | | |
|---|---|---|---|
| Sample Name: | E-9 WELL | Units: | ug/L (ppb) |
| Lab Code: | L2100666-002 | Basis: | NA |
| Test Notes: | | | |

| Analyte | Prep Method | Analysis Method | CRDL | Dilution Factor | Date Extracted | Date Analyzed | Result | Result Notes |
|---|---|---|---|---|---|---|---|---|
| Dichlorodifluoromethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Chloromethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Vinyl Chloride | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Bromomethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Chloroethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Trichlorofluoromethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Trichlorotrifluoroethane (CFC 113) | METHOD | 524.2 | 2 | 1 | NA | 3/5/01 | ND | |
| 1,1-Dichloroethene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Acetone | METHOD | 524.2 | 5 | 1 | NA | 3/5/01 | ND | |
| Carbon Disulfide | METHOD | 524.2 | 5 | 1 | NA | 3/5/01 | ND | |
| Methylene Chloride | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Methyl *tert*-Butyl Ether | METHOD | 524.2 | 2 | 1 | NA | 3/5/01 | ND | |
| trans-1,2-Dichloroethene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,1-Dichloroethane (1,1-DCA) | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Vinyl Acetate | METHOD | 524.2 | 5 | 1 | NA | 3/5/01 | ND | |
| Diisopropyl Ether | METHOD | 524.2 | 2 | 1 | NA | 3/5/01 | ND | |
| Ethyl *tert*-Butyl Ether | METHOD | 524.2 | 2 | 1 | NA | 3/5/01 | ND | |
| 2,2-Dichloropropane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 2-Butanone (MEK) | METHOD | 524.2 | 5 | 1 | NA | 3/5/01 | ND | |
| cis-1,2-Dichloroethene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Bromochloroethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Chloroform | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,1,1-Trichloroethane (TCA) | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,1-Dichloropropene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Carbon Tetrachloride | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Benzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,2-Dichloroethane (EDC) | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| *tert*-Amyl Methyl Ether | METHOD | 524.2 | 2 | 1 | NA | 3/5/01 | ND | |
| Trichloroethene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,2-Dichloropropane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Dibromomethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Bromodichloromethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 2-Chloroethyl Vinyl Ether | METHOD | 524.2 | 1 | 1 | NA | 3/5/01 | ND | |
| cis-1,3-Dichloropropene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 4-Methyl-2-pentanone (MIBK) | METHOD | 524.2 | 5 | 1 | NA | 3/5/01 | ND | |
| trans-1,3-Dichloropropene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,1,2-Trichloroethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Toluene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Tetrachloroethene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,3-Dichloropropane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 2-Hexanone | METHOD | 524.2 | 5 | 1 | NA | 3/5/01 | ND | |
| Dibromochloromethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,2-Dibromoethane (EDB) | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Chlorobenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |

Approved By: _____ Date: 3-16-01

116247

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Newhall Land and Farming Company
Project: Newhall Ranch
Sample Matrix: Water

Service Request: L2100666
Date Collected: 3/1/01
Date Received: 3/1/01

Volatile Organic Compounds

Sample Name: E-9 WELL
Lab Code: L2100666-002
Test Notes:

Units: ng/L (ppb)
Basis: NA

| Analyte | Prep Method | Analysis Method | CRDL | Dilution Factor | Date Extracted | Date Analyzed | Result | Result Notes |
|---|---|---|---|---|---|---|---|---|
| 1,1,1,2-Tetrachloroethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Ethylbenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Total Xylenes | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Styrene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Bromoform | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Isopropylbenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Bromobenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,1,2,2-Tetrachloroethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,2,3-Trichloropropane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| n-Propylbenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 2-Chlorotoluene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 4-Chlorotoluene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,3,5-Trimethylbenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| tert-Butylbenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,2,4-Trimethylbenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| sec-Butylbenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,3-Dichlorobenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| p-Isopropyltoluene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,4-Dichlorobenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| n-Butylbenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,2-Dichlorobenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,2-Dibromo-3-chloropropane | METHOD | 524.2 | 1 | 1 | NA | 3/5/01 | ND | |
| 1,2,4-Trichlorobenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Hexachlorobutadiene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Naphthalene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,2,3-Trichlorobenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |

Approved By: _____ Date: 3-16-01

116248

1S2p/020597p



00666VOA.XRI - Sample (2) 3/16/01

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

| | | | |
|---|---|---|---|
| Client: | Newhall Land and Farming Company | Service Request: | L2100666 |
| Project: | Newhall Ranch | Date Collected: | 3/1/01 |
| Sample Matrix: | Water | Date Received: | 3/1/01 |

Volatile Organic Compounds

| | | | |
|---|---|---|---|
| Sample Name: | C WELL | Units: | ug/L (ppb) |
| Lab Code: | L2100666-003 | Basis: | NA |
| Test Notes: | | | |

| Analyte | Prep Method | Analysis Method | CRDL | Dilution Factor | Date Extracted | Date Analyzed | Result | Result Notes |
|---|---|---|---|---|---|---|---|---|
| Dichlorodifluoromethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Chloromethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Vinyl Chloride | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Bromomethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Chloroethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Trichlorofluoromethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Trichlorotrifluoroethane (CFC 113) | METHOD | 524.2 | 2 | 1 | NA | 3/5/01 | ND | |
| 1,1-Dichloroethene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Acetone | METHOD | 524.2 | 5 | 1 | NA | 3/5/01 | ND | |
| Carbon Disulfide | METHOD | 524.2 | 5 | 1 | NA | 3/5/01 | ND | |
| Methylene Chloride | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Methyl *tert*-Butyl Ether | METHOD | 524.2 | 2 | 1 | NA | 3/5/01 | ND | |
| trans-1,2-Dichloroethene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,1-Dichloroethane (1,1-DCA) | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Vinyl Acetate | METHOD | 524.2 | 5 | 1 | NA | 3/5/01 | ND | |
| Diisopropyl Ether | METHOD | 524.2 | 2 | 1 | NA | 3/5/01 | ND | |
| Ethyl *tert*-Butyl Ether | METHOD | 524.2 | 2 | 1 | NA | 3/5/01 | ND | |
| 2,2-Dichloropropane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 2-Butanone (MEK) | METHOD | 524.2 | 5 | 1 | NA | 3/5/01 | ND | |
| cis-1,2-Dichloroethene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Bromochloromethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Chloroform | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,1,1-Trichloroethane (TCA) | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,1-Dichloropropene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Carbon Tetrachloride | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Benzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,2-Dichloroethane (EDC) | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| *tert*-Amyl Methyl Ether | METHOD | 524.2 | 2 | 1 | NA | 3/5/01 | ND | |
| Trichloroethene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,2-Dichloropropane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Dibromomethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Bromodichloromethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 2-Chloroethyl Vinyl Ether | METHOD | 524.2 | 1 | 1 | NA | 3/5/01 | ND | |
| cis-1,3-Dichloropropene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 4-Methyl-2-pentanone (MIBK) | METHOD | 524.2 | 5 | 1 | NA | 3/5/01 | ND | |
| trans-1,3-Dichloropropene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,1,2-Trichloroethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Toluene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Tetrachloroethene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,3-Dichloropropane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 2-Hexanone | METHOD | 524.2 | 5 | 1 | NA | 3/5/01 | ND | |
| Dibromochloromethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,2-Dibromoethane (EDB) | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Chlorobenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |

Approved By: _____ Date: 3-16-01

116249



0666VOA.KRI - Sample (3) 3/15/01

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

| | | | |
|---|---|---|---|
| Client: | Newhall Land and Farming Company | Service Request: | L2100666 |
| Project: | Newhall Ranch | Date Collected: | 3/1/01 |
| Sample Matrix: | Water | Date Received: | 3/1/01 |

Volatile Organic Compounds

| | | | |
|---|---|---|---|
| Sample Name: | C WELL | Units: | ug/L (ppb) |
| Lab Code: | L2100666-003 | Basis: | NA |
| Test Notes: | | | |

| Analyte | Prep Method | Analysis Method | CRDL | Dilution Factor | Date Extracted | Date Analyzed | Result | Result Notes |
|---|---|---|---|---|---|---|---|---|
| 1,1,1,2-Tetrachloroethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Ethylbenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Total Xylenes | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Styrene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Bromoform | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Isopropylbenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Bromobenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,1,2,2-Tetrachloroethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,2,3-Trichloropropane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| n-Propylbenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 2-Chlorotoluene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 4-Chlorotoluene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,3,5-Trimethylbenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| tert-Butylbenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,2,4-Trimethylbenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| sec-Butylbenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,3-Dichlorobenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| p-Isopropyltoluene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,4-Dichlorobenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| n-Butylbenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,2-Dichlorobenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,2-Dibromo-3-chloropropane | METHOD | 524.2 | 1 | 1 | NA | 3/5/01 | ND | |
| 1,2,4-Trichlorobenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Hexachlorobutadiene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Naphthalene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,2,3-Trichlorobenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |

Approved By: _____ Date: 3-11-01

1S2p/020597p

116250



00666VOA.KR1 - Sample (3) 3/16/01

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

| | | | |
|---|---|---|---|
| Client: | Newhall Land and Farming Company | Service Request: | L2100666 |
| Project: | Newhall Ranch | Date Collected: | 3/1/01 |
| Sample Matrix: | Water | Date Received: | 3/1/01 |

Volatile Organic Compounds

| | | | |
|---|---|---|---|
| Sample Name: | B-6 WELL | Units: | ug/L (ppb) |
| Lab Code: | L2100666-004 | Basis: | NA |
| Test Notes: | | | |

| Analyte | Prep Method | Analysis Method | CRDL | Dilution Factor | Date Extracted | Date Analyzed | Result | Result Notes |
|---|---|---|---|---|---|---|---|---|
| Dichlorodifluoromethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Chloromethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Vinyl Chloride | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Bromomethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Chloroethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Trichlorofluoromethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Trichlorotrifluoroethane (CFC 113) | METHOD | 524.2 | 2 | 1 | NA | 3/5/01 | ND | |
| 1,1-Dichloroethene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Acetone | METHOD | 524.2 | 5 | 1 | NA | 3/5/01 | ND | |
| Carbon Disulfide | METHOD | 524.2 | 5 | 1 | NA | 3/5/01 | ND | |
| Methylene Chloride | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Methyl *tert*-Butyl Ether | METHOD | 524.2 | 2 | 1 | NA | 3/5/01 | ND | |
| trans-1,2-Dichloroethene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,1-Dichloroethane (1,1-DCA) | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Vinyl Acetate | METHOD | 524.2 | 5 | 1 | NA | 3/5/01 | ND | |
| Diisopropyl Ether | METHOD | 524.2 | 2 | 1 | NA | 3/5/01 | ND | |
| Ethyl *tert*-Butyl Ether | METHOD | 524.2 | 2 | 1 | NA | 3/5/01 | ND | |
| 2,2-Dichloropropane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 2-Butanone (MEK) | METHOD | 524.2 | 5 | 1 | NA | 3/5/01 | ND | |
| cis-1,2-Dichloroethene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Bromochloromethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Chloroform | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,1,1-Trichloroethane (TCA) | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,1-Dichloropropene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Carbon Tetrachloride | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Benzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,2-Dichloroethane (EDC) | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| *tert*-Amyl Methyl Ether | METHOD | 524.2 | 2 | 1 | NA | 3/5/01 | ND | |
| Trichloroethene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,2-Dichloropropane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Dibromomethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Bromodichloromethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 2-Chloroethyl Vinyl Ether | METHOD | 524.2 | 1 | 1 | NA | 3/5/01 | ND | |
| cis-1,3-Dichloropropene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 4-Methyl-2-pentanone (MIBK) | METHOD | 524.2 | 5 | 1 | NA | 3/5/01 | ND | |
| trans-1,3-Dichloropropene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,1,2-Trichloroethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Toluene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Tetrachloroethene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,3-Dichloropropane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 2-Hexanone | METHOD | 524.2 | 5 | 1 | NA | 3/5/01 | ND | |
| Dibromochloromethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,2-Dibromoethane (EDB) | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Chlorobenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |

Approved By: _____ Date: 3-16-01

116251

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Newhall Land and Farming Company
Project: Newhall Ranch
Sample Matrix: Water

Service Request: L2100666
Date Collected: 3/1/01
Date Received: 3/1/01

Volatile Organic Compounds

Sample Name: B-6 WELL
Lab Code: L2100666-004
Test Notes:

Units: ug/L (ppb)
Basis: NA

| Analyte | Prep Method | Analysis Method | CRDL | Dilution Factor | Date Extracted | Date Analyzed | Result | Result Notes |
|---|---|---|---|---|---|---|---|---|
| 1,1,1,2-Tetrachloroethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Ethylbenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Total Xylenes | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Styrene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Bromoform | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Isopropylbenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Bromobenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,1,2,2-Tetrachloroethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,2,3-Trichloropropane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| n-Propylbenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 2-Chlorotoluene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 4-Chlorotoluene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,3,5-Trimethylbenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| tert-Butylbenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,2,4-Trimethylbenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| sec-Butylbenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,3-Dichlorobenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| p-Isopropyltoluene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,4-Dichlorobenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| n-Butylbenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,2-Dichlorobenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,2-Dibromo-3-chloropropane | METHOD | 524.2 | 1 | 1 | NA | 3/5/01 | ND | |
| 1,2,4-Trichlorobenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Hexachlorobutadiene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Naphthalene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,2,3-Trichlorobenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |

Approved By: _____ Date: 3-16-01

182p/020597p

116252



00666VOA.XRL - Sample (4) 3/16/01

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

| | | | |
|---|---|---|---|
| Client: | Newhall Land and Farming Company | Service Request: | L2100666 |
| Project: | Newhall Ranch | Date Collected: | 3/1/01 |
| Sample Matrix: | Water | Date Received: | 3/1/01 |

Volatile Organic Compounds

| | | | |
|---|---|---|---|
| Sample Name: | EXON WELL | Units: | ug/L (ppb) |
| Lab Code: | L2100666-005 | Basis: | NA |
| Test Notes: | | | |

| Analyte | Prep Method | Analysis Method | CRDL | Dilution Factor | Date Extracted | Date Analyzed | Result | Result Notes |
|---|---|---|---|---|---|---|---|---|
| Dichlorodifluoromethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Chloromethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Vinyl Chloride | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Bromomethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Chloroethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Trichlorofluoromethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Trichlorotrifluoroethane (CFC 113) | METHOD | 524.2 | 2 | 1 | NA | 3/5/01 | ND | |
| 1,1-Dichloroethene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Acetone | METHOD | 524.2 | 5 | 1 | NA | 3/5/01 | ND | |
| Carbon Disulfide | METHOD | 524.2 | 5 | 1 | NA | 3/5/01 | ND | |
| Methylene Chloride | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Methyl *tert*-Butyl Ether | METHOD | 524.2 | 2 | 1 | NA | 3/5/01 | ND | |
| trans-1,2-Dichloroethene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,1-Dichloroethane (1,1-DCA) | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Vinyl Acetate | METHOD | 524.2 | 5 | 1 | NA | 3/5/01 | ND | |
| Diisopropyl Ether | METHOD | 524.2 | 2 | 1 | NA | 3/5/01 | ND | |
| Ethyl *tert*-Butyl Ether | METHOD | 524.2 | 2 | 1 | NA | 3/5/01 | ND | |
| 2,2-Dichloropropane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 2-Butanone (MEK) | METHOD | 524.2 | 5 | 1 | NA | 3/5/01 | ND | |
| cis-1,2-Dichloroethene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Bromochloromethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Chloroform | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,1,1-Trichloroethane (TCA) | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,1-Dichloropropene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Carbon Tetrachloride | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Benzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,2-Dichloroethane (EDC) | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| *tert*-Amyl Methyl Ether | METHOD | 524.2 | 2 | 1 | NA | 3/5/01 | ND | |
| Trichloroethene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,2-Dichloropropane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Dibromomethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Bromodichloromethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 2-Chloroethyl Vinyl Ether | METHOD | 524.2 | 1 | 1 | NA | 3/5/01 | ND | |
| cis-1,3-Dichloropropene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 4-Methyl-2-pentanone (MIBK) | METHOD | 524.2 | 5 | 1 | NA | 3/5/01 | ND | |
| trans-1,3-Dichloropropene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,1,2-Trichloroethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Toluene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Tetrachloroethene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,3-Dichloropropane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 2-Hexanone | METHOD | 524.2 | 5 | 1 | NA | 3/5/01 | ND | |
| Dibromochloromethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,2-Dibromoethane (EDB) | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Chlorobenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |

Approved By: _____ Date: 3-16-01

116253



00666VOA.KRI - Sample (5) 3/16/01

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Newhall Land and Farming Company
Project: Newhall Ranch
Sample Matrix: Water

Service Request: L2100666
Date Collected: 3/1/01
Date Received: 3/1/01

Volatile Organic Compounds

Sample Name: EXON WELL
Lab Code: L2100666-005
Test Notes:

Units: ug/L (ppb)
Basis: NA

| Analyte | Prep Method | Analysis Method | CRDL | Dilution Factor | Date Extracted | Date Analyzed | Result | Result Notes |
|---|---|---|---|---|---|---|---|---|
| 1,1,1,2-Tetrachloroethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Ethylbenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Total Xylenes | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Styrene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Bromoform | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Isopropylbenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Bromobenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,1,2,2-Tetrachloroethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,2,3-Trichloropropane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| n-Propylbenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 2-Chlorotoluene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 4-Chlorotoluene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,3,5-Trimethylbenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| tert-Butylbenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,2,4-Trimethylbenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| sec-Butylbenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,3-Dichlorobenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| p-Isopropyltoluene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,4-Dichlorobenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| n-Butylbenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,2-Dichlorobenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,2-Dibromo-3-chloropropane | METHOD | 524.2 | 1 | 1 | NA | 3/5/01 | ND | |
| 1,2,4-Trichlorobenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Hexachlorobutadiene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Naphthalene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,2,3-Trichlorobenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |

Approved By: _____ Date: 3-16-01

1S2p/020597p

116254



00666VOA.ICR1 - Sample (5) 3/16/01

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

| | | | |
|---|---|---|---|
| Client: | Newhall Land and Farming Company | Service Request: | L2100666 |
| Project: | Newhall Ranch | Date Collected: | 3/1/01 |
| Sample Matrix: | Water | Date Received: | 3/1/01 |

Volatile Organic Compounds

| | | | |
|---|---|---|---|
| Sample Name: | B-11 WELL | Units: | ug/L (ppb) |
| Lab Code: | L2100666-006 | Basis: | NA |
| Test Notes: | | | |

| Analyte | Prep Method | Analysis Method | CRDL | Dilution Factor | Date Extracted | Date Analyzed | Result | Result Notes |
|---|---|---|---|---|---|---|---|---|
| Dichlorodifluoromethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Chloromethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Vinyl Chloride | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Bromomethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Chloroethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Trichlorofluoromethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Trichlorotrifluoroethane (CFC 113) | METHOD | 524.2 | 2 | 1 | NA | 3/5/01 | ND | |
| 1,1-Dichloroethene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Acetone | METHOD | 524.2 | 5 | 1 | NA | 3/5/01 | ND | |
| Carbon Disulfide | METHOD | 524.2 | 5 | 1 | NA | 3/5/01 | ND | |
| Methylene Chloride | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Methyl *tert*-Butyl Ether | METHOD | 524.2 | 2 | 1 | NA | 3/5/01 | ND | |
| trans-1,2-Dichloroethene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,1-Dichloroethane (1,1-DCA) | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Vinyl Acetate | METHOD | 524.2 | 5 | 1 | NA | 3/5/01 | ND | |
| Diisopropyl Ether | METHOD | 524.2 | 2 | 1 | NA | 3/5/01 | ND | |
| Ethyl *tert*-Butyl Ether | METHOD | 524.2 | 2 | 1 | NA | 3/5/01 | ND | |
| 2,2-Dichloropropane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 2-Butanone (MEK) | METHOD | 524.2 | 5 | 1 | NA | 3/5/01 | ND | |
| cis-1,2-Dichloroethene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Bromochloromethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Chloroform | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,1,1-Trichloroethane (TCA) | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,1-Dichloropropene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Carbon Tetrachloride | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Benzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,2-Dichloroethane (EDC) | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| *tert*-Amyl Methyl Ether | METHOD | 524.2 | 2 | 1 | NA | 3/5/01 | ND | |
| Trichloroethene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,2-Dichloropropane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Dibromomethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Bromodichloromethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 2-Chloroethyl Vinyl Ether | METHOD | 524.2 | 1 | 1 | NA | 3/5/01 | ND | |
| cis-1,3-Dichloropropene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 4-Methyl-2-pentanone (MIBK) | METHOD | 524.2 | 5 | 1 | NA | 3/5/01 | ND | |
| trans-1,3-Dichloropropene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,1,2-Trichloroethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Toluene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Tetrachloroethene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,3-Dichloropropane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 2-Hexanone | METHOD | 524.2 | 5 | 1 | NA | 3/5/01 | ND | |
| Dibromochloromethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,2-Dibromoethane (EDB) | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Chlorobenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |

Approved By: _____ Date: 3-16-01

116255

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Newhall Land and Farming Company
Project: Newhall Ranch
Sample Matrix: Water

Service Request: L2100666
Date Collected: 3/1/01
Date Received: 3/1/01

Volatile Organic Compounds

Sample Name: B-11 WELL
Lab Code: L2100666-006
Test Notes:

Units: ug/L (ppb)
Basis: NA

| Analyte | Prep Method | Analysis Method | CRDL | Dilution Factor | Date Extracted | Date Analyzed | Result | Result Notes |
|---|---|---|---|---|---|---|---|---|
| 1,1,1,2-Tetrachloroethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Ethylbenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Total Xylenes | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Styrene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Bromoform | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Isopropylbenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Bromobenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,1,2,2-Tetrachloroethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,2,3-Trichloropropane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| n-Propylbenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 2-Chlorotoluene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 4-Chlorotoluene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,3,5-Trimethylbenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| tert-Butylbenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,2,4-Trimethylbenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| sec-Butylbenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,3-Dichlorobenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| p-Isopropyltoluene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,4-Dichlorobenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| n-Butylbenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,2-Dichlorobenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,2-Dibromo-3-chloropropane | METHOD | 524.2 | 1 | 1 | NA | 3/5/01 | ND | |
| 1,2,4-Trichlorobenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Hexachlorobutadiene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Naphthalene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,2,3-Trichlorobenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |

Approved By: _____ Date: 3-11-01

116256

1S2p/020597p



00666VOAER1 - Sample (6) 3/16/01

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

| | | | |
|---|---|---|---|
| Client: | Newhall Land and Farming Company | Service Request: | L2100666 |
| Project: | Newhall Ranch | Date Collected: | 3/1/01 |
| Sample Matrix: | Water | Date Received: | 3/1/01 |

Volatile Organic Compounds

| | | | |
|---|---|---|---|
| Sample Name: | B-11 WELL | Units: | ug/L (ppb) |
| Lab Code: | L2100666-006 | Basis: | NA |
| Test Notes: | | | |

| Analyte | Prep Method | Analysis Method | CRDL | Dilution Factor | Date Extracted | Date Analyzed | Result | Result Notes |
|---|---|---|---|---|---|---|---|---|
| 1,1,1,2-Tetrachloroethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Ethylbenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Total Xylenes | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Styrene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Bromoform | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Isopropylbenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Bromobenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,1,2,2-Tetrachloroethane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,2,3-Trichloropropane | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| n-Propylbenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 2-Chlorotoluene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 4-Chlorotoluene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,3,5-Trimethylbenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| tert-Butylbenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,2,4-Trimethylbenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| sec-Butylbenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,3-Dichlorobenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| p-Isopropyltoluene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,4-Dichlorobenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| n-Butylbenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,2-Dichlorobenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,2-Dibromo-3-chloropropane | METHOD | 524.2 | 1 | 1 | NA | 3/5/01 | ND | |
| 1,2,4-Trichlorobenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Hexachlorobutadiene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| Naphthalene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |
| 1,2,3-Trichlorobenzene | METHOD | 524.2 | 0.5 | 1 | NA | 3/5/01 | ND | |

Approved By: _____ Date: 3-11-01

1S2p/020597p

116257



00666VOA.KR1 - Sample (6) 3/16/01

# COLUMBIA ANALYTICAL SERVICES, INC.

## Analytical Report

Client: Newhall Land and Farming Company
Project: Newhall Ranch
Sample Matrix: Water

Service Request: L2100666
Date Collected: 3/1/01
Date Received: 3/1/01

## Inorganic Parameters

Sample Name: E WELL
Lab Code: L2100666-001

Basis: NA

Test Notes:

| Analyte | Units | Analysis Method | MRL | Dilution Factor | Date Extracted | Date Analyzed | Result | Result Notes |
|---|---|---|---|---|---|---|---|---|
| Alkalinity as CaCO3, Total | mg/L (ppm) | SM 2320B | 10 | 1 | NA | 3/5/01 | 190 | |
| Chloride | mg/L (ppm) | 300.0 | 0.5 | 10 | NA | 3/6/01 | 84 | |
| Color | COLOR UNITS | 110.2 | 5 | 1 | NA | 3/1/01 | ND | |
| Conductivity | uMHOS/cm | 120.1 | 10 | 1 | NA | 3/1/01 | 1100 | |
| Cyanide, Total | mg/L (ppm) | 335.2 | 0.05 | 1 | NA | 3/8/01 | ND | |
| Fluoride | mg/L (ppm) | 340.2 | 0.1 | 1 | NA | 3/7/01 | 1.1 | |
| Hardness as CaCO3 | mg/L (ppm) | 130.2 | 5 | 1 | NA | 3/8/01 | 360 | |
| Nitrate as Nitrogen | mg/L (ppm) | 300.0 | 0.2 | 1 | NA | 3/2/01 | 1.6 | |
| Nitrite as Nitrogen | mg/L (ppm) | 354.1 | 0.003 | 1 | NA | 3/2/01 | ND | |
| Odor | T.O.N. | 140.1 | 1.0 | 1 | NA | 3/1/01 | ND | |
| pH | pH UNITS | 150.1 | -- | 1 | NA | 3/1/01 | 7.4 | |
| Solids, Total Dissolved (TDS) | mg/L (ppm) | 160.1 | 10 | 1 | NA | 3/7-8/01 | 730 | |
| Sulfate | mg/L (ppm) | 300.0 | 1.0 | 10 | NA | 3/6/01 | 280 | |
| Surfactants | mg/L (ppm) | 425.1 | 0.1 | 1 | 3/1/01 | 3/1/01 | ND | |
| Turbidity | NTU | 180.1 | 0.1 | 1 | NA | 3/1/01 | 1.6 | |

Approved By: _____ Date: 3-11-01

L540/021397p

116258

# COLUMBIA ANALYTICAL SERVICES, INC.

## Analytical Report

| | | | |
|---|---|---|---|
| Client: | Newhall Land and Farming Company | Service Request: | L2100666 |
| Project: | Newhall Ranch | Date Collected: | 3/1/01 |
| Sample Matrix: | Water | Date Received: | 3/1/01 |

## Inorganic Parameters

Sample Name: E-9 WELL
Lab Code: L2100666-002 Basis: NA
Test Notes:

| Analyte | Units | Analysis Method | MRL | Dilution Factor | Date Extracted | Date Analyzed | Result | Result Notes |
|---|---|---|---|---|---|---|---|---|
| Alkalinity as CaCO3, Total | mg/L (ppm) | SM 2320B | 10 | 1 | NA | 3/5/01 | 270 | |
| Chloride | mg/L (ppm) | 300.0 | 0.5 | 10 | NA | 3/6/01 | 39 | |
| Color | COLOR UNITS | 110.2 | 5 | 1 | NA | 3/1/01 | 15 | |
| Conductivity | uMHOS/cm | 120.1 | 10 | 1 | NA | 3/1/01 | 1000 | |
| Cyanide, Total | mg/L (ppm) | 335.2 | 0.05 | 1 | NA | 3/8/01 | ND | |
| Fluoride | mg/L (ppm) | 340.2 | 0.1 | 1 | NA | 3/7/01 | 0.8 | |
| Hardness as CaCO3 | mg/L (ppm) | 130.2 | 5 | 1 | NA | 3/8/01 | 390 | |
| Nitrate as Nitrogen | mg/L (ppm) | 300.0 | 0.2 | 1 | NA | 3/2/01 | 1.7 | |
| Nitrite as Nitrogen | mg/L (ppm) | 354.1 | 0.003 | 1 | NA | 3/2/01 | ND | |
| Odor | T.O.N. | 140.1 | 1.0 | 1 | NA | 3/1/01 | ND | |
| pH | pH UNITS | 150.1 | -- | 1 | NA | 3/1/01 | 7.5 | |
| Solids, Total Dissolved (TDS) | mg/L (ppm) | 160.1 | 10 | 1 | NA | 3/7-8/01 | 690 | |
| Sulfate | mg/L (ppm) | 300.0 | 1.0 | 10 | NA | 3/6/01 | 220 | |
| Surfactants | mg/L (ppm) | 425.1 | 0.1 | 1 | 3/1/01 | 3/1/01 | ND | |
| Turbidity | NTU | 180.1 | 0.1 | 1 | NA | 3/1/01 | 16 | |

Approved By: _____ Date: 3-16-01

116259

# COLUMBIA ANALYTICAL SERVICES, INC.

## Analytical Report

Client: Newhall Land and Farming Company
Project: Newhall Ranch
Sample Matrix: Water

Service Request: L2100666
Date Collected: 3/1/01
Date Received: 3/1/01

## Inorganic Parameters

Sample Name: C WELL
Lab Code: L2100666-003
Test Notes:

Basis: NA

| Analyte | Units | Analysis Method | MRL | Dilution Factor | Date Extracted | Date Analyzed | Result | Result Notes |
|---|---|---|---|---|---|---|---|---|
| Alkalinity as CaCO3, Total | mg/L (ppm) | SM 2320B | 10 | 1 | NA | 3/5/01 | 250 | |
| Chloride | mg/L (ppm) | 300.0 | 0.5 | 10 | NA | 3/6/01 | 56 | |
| Color | COLOR UNITS | 110.2 | 5 | 1 | NA | 3/1/01 | ND | |
| Conductivity | uMHOS/cm | 120.1 | 10 | 1 | NA | 3/1/01 | 1100 | |
| Cyanide, Total | mg/L (ppm) | 335.2 | 0.05 | 1 | NA | 3/8/01 | ND | |
| Fluoride | mg/L (ppm) | 340.2 | 0.1 | 1 | NA | 3/7/01 | 0.7 | |
| Hardness as CaCO3 | mg/L (ppm) | 130.2 | 5 | 1 | NA | 3/8/01 | 410 | |
| Nitrate as Nitrogen | mg/L (ppm) | 300.0 | 0.2 | 1 | NA | 3/2/01 | 2.1 | |
| Nitrite as Nitrogen | mg/L (ppm) | 354.1 | 0.003 | 1 | NA | 3/2/01 | ND | |
| Odor | T.O.N. | 140.1 | 1.0 | 1 | NA | 3/1/01 | ND | |
| pH | pH UNITS | 150.1 | — | 1 | NA | 3/1/01 | 7.4 | |
| Solids, Total Dissolved (TDS) | mg/L (ppm) | 160.1 | 10 | 1 | NA | 3/7-8/01 | 770 | |
| Sulfate | mg/L (ppm) | 300.0 | 1.0 | 10 | NA | 3/6/01 | 280 | |
| Surfactants | mg/L (ppm) | 425.1 | 0.1 | 1 | 3/1/01 | 3/1/01 | ND | |
| Turbidity | NTU | 180.1 | 0.1 | 1 | NA | 3/1/01 | 0.5 | |

Approved By: _____ Date: 3-16-01

116260

# COLUMBIA ANALYTICAL SERVICES, INC.

## Analytical Report

Client: Newhall Land and Farming Company
Project: Newhall Ranch
Sample Matrix: Water

Service Request: L2100666
Date Collected: 3/1/01
Date Received: 3/1/01

### Inorganic Parameters

Sample Name: B-6 WELL
Lab Code: L2100666-004
Test Notes:

Basis: NA

| Analyte | Units | Analysis Method | MRL | Dilution Factor | Date Extracted | Date Analyzed | Result | Result Notes |
|---|---|---|---|---|---|---|---|---|
| Alkalinity as CaCO3, Total | mg/L (ppm) | SM 2320B | 10 | 1 | NA | 3/5/01 | 280 | |
| Chloride | mg/L (ppm) | 300.0 | 0.5 | 10 | NA | 3/6/01 | 80 | |
| Color | COLOR UNITS | 110.2 | 5 | 1 | NA | 3/1/01 | 5 | |
| Conductivity | uMHOS/cm | 120.1 | 10 | 1 | NA | 3/1/01 | 1400 | |
| Cyanide, Total | mg/L (ppm) | 335.2 | 0.05 | 1 | NA | 3/8/01 | ND | |
| Fluoride | mg/L (ppm) | 340.2 | 0.1 | 1 | NA | 3/7/01 | 0.8 | |
| Hardness as CaCO3 | mg/L (ppm) | 130.2 | 5 | 1 | NA | 3/8/01 | 510 | |
| Nitrate as Nitrogen | mg/L (ppm) | 300.0 | 0.2 | 1 | NA | 3/2/01 | 2.8 | |
| Nitrite as Nitrogen | mg/L (ppm) | 354.1 | 0.003 | 1 | NA | 3/2/01 | ND | |
| Odor | T.O.N. | 140.1 | 1.0 | 1 | NA | 3/1/01 | ND | |
| pH | pH UNITS | 150.1 | -- | 1 | NA | 3/1/01 | 7.6 | |
| Solids, Total Dissolved (TDS) | mg/L (ppm) | 160.1 | 10 | 1 | NA | 3/7-8/01 | 960 | |
| Sulfate | mg/L (ppm) | 300.0 | 1.0 | 10 | NA | 3/6/01 | 360 | |
| Surfactants | mg/L (ppm) | 425.1 | 0.1 | 1 | 3/1/01 | 3/1/01 | ND | |
| Turbidity | NTU | 180.1 | 0.1 | 1 | NA | 3/1/01 | 2.4 | |

Approved By: _____ Date: 3-16-01

116261

# COLUMBIA ANALYTICAL SERVICES, INC.

## Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Newhall Land and Farming Company | **Service Request:** | L2100666 |
| **Project:** | Newhall Ranch | **Date Collected:** | 3/1/01 |
| **Sample Matrix:** | Water | **Date Received:** | 3/1/01 |

## Inorganic Parameters

| | |
|---|---|
| **Sample Name:** | EXON WELL |
| **Lab Code:** | L2100666-005 |
| **Test Notes:** | |

**Basis:** NA

| Analyte | Units | Analysis Method | MRL | Dilution Factor | Date Extracted | Date Analyzed | Result | Result Notes |
|---|---|---|---|---|---|---|---|---|
| Alkalinity as CaCO3, Total | mg/L (ppm) | SM 2320B | 10 | 1 | NA | 3/5/01 | 240 | |
| Chloride | mg/L (ppm) | 300.0 | 0.5 | 10 | NA | 3/6/01 | 35 | |
| Color | COLOR UNITS | 110.2 | 5 | 1 | NA | 3/1/01 | 10 | |
| Conductivity | uMHOS/cm | 120.1 | 10 | 1 | NA | 3/1/01 | 1400 | |
| Cyanide, Total | mg/L (ppm) | 335.2 | 0.05 | 1 | NA | 3/8/01 | ND | |
| Fluoride | mg/L (ppm) | 340.2 | 0.1 | 1 | NA | 3/7/01 | 0.5 | |
| Hardness as CaCO3 | mg/L (ppm) | 130.2 | 5 | 1 | NA | 3/8/01 | 550 | |
| Nitrate as Nitrogen | mg/L (ppm) | 300.0 | 0.2 | 1 | NA | 3/2/01 | 5.2 | |
| Nitrite as Nitrogen | mg/L (ppm) | 354.1 | 0.003 | 1 | NA | 3/2/01 | ND | |
| Odor | T.O.N. | 140.1 | 1.0 | 1 | NA | 3/1/01 | ND | |
| pH | pH UNITS | 150.1 | – | 1 | NA | 3/1/01 | 7.6 | |
| Solids, Total Dissolved (TDS) | mg/L (ppm) | 160.1 | 10 | 1 | NA | 3/7-8/01 | 1000 | |
| Sulfate | mg/L (ppm) | 300.0 | 1.0 | 10 | NA | 3/6/01 | 470 | |
| Surfactants | mg/L (ppm) | 425.1 | 0.1 | 1 | 3/1/01 | 3/1/01 | ND | |
| Turbidity | NTU | 180.1 | 0.1 | 1 | NA | 3/1/01 | 9.1 | |

Approved By: _____ Date: 3-16-01

3640021391p

116262

# COLUMBIA ANALYTICAL SERVICES, INC.

## Analytical Report

| | | | |
|---|---|---|---|
| Client: | Newhall Land and Farming Company | Service Request: | L2100666 |
| Project: | Newhall Ranch | Date Collected: | 3/1/01 |
| Sample Matrix: | Water | Date Received: | 3/1/01 |

## Inorganic Parameters

Sample Name: B-11 WELL
Lab Code: L2100666-006
Test Notes:

Basis: NA

| Analyte | Units | Analysis Method | MRL | Dilution Factor | Date Extracted | Date Analyzed | Result | Result Notes |
|---|---|---|---|---|---|---|---|---|
| Alkalinity as CaCO3, Total | mg/L (ppm) | SM2320B | 10 | 1 | NA | 3/5/01 | 250 | |
| Chloride | mg/L (ppm) | 300.0 | 0.5 | 10 | NA | 3/6/01 | 96 | |
| Color | COLOR UNITS | 110.2 | 5 | 1 | NA | 3/1/01 | ND | |
| Conductivity | uMHOS/cm | 120.1 | 10 | 1 | NA | 3/1/01 | 1300 | |
| Cyanide, Total | mg/L (ppm) | 335.2 | 0.05 | 1 | NA | 3/8/01 | ND | |
| Fluoride | mg/L (ppm) | 340.2 | 0.1 | 1 | NA | 3/7/01 | 0.7 | |
| Hardness as CaCO3 | mg/L (ppm) | 130.2 | 5 | 1 | NA | 3/8/01 | 410 | |
| Nitrate as Nitrogen | mg/L (ppm) | 300.0 | 0.2 | 1 | NA | 3/2/01 | 2.5 | |
| Nitrite as Nitrogen | mg/L (ppm) | 354.1 | 0.003 | 1 | NA | 3/2/01 | 0.004 | |
| Odor | T.O.N. | 140.1 | 1.0 | 1 | NA | 3/1/01 | ND | |
| pH | pH UNITS | 150.1 | -- | 1 | NA | 3/1/01 | 7.5 | |
| Solids, Total Dissolved (TDS) | mg/L (ppm) | 160.1 | 10 | 1 | NA | 3/7-8/01 | 850 | |
| Sulfate | mg/L (ppm) | 300.0 | 1.0 | 10 | NA | 3/6/01 | 290 | |
| Surfactants | mg/L (ppm) | 425.1 | 0.1 | 1 | 3/1/01 | 3/1/01 | ND | |
| Turbidity | NTU | 180.1 | 0.1 | 1 | NA | 3/1/01 | 0.3 | |

Approved By: _____ Date: 3-16-01

116263

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

| | | | |
|---|---|---|---|
| Client: | Newhall Land and Farming Company | Service Request: | L2100666 |
| Project: | Newhall Ranch | Date Collected: | 3/1/01 |
| Sample Matrix: | Water | Date Received: | 3/1/01 |

Metals

| | | | |
|---|---|---|---|
| Sample Name: | B WELL | Units: | mg/L (ppm) |
| Lab Code: | L2100666-001 | Basis: | NA |
| Test Notes: | | | |

| Analyte | Prep Method | Analysis Method | MRL | Dilution Factor | Date Digested | Date Analyzed | Result | Result Notes |
|---|---|---|---|---|---|---|---|---|
| Aluminum, Total | METHOD | 200.7 | 0.2 | 1 | 3/5/01 | 3/5/01 | ND | |
| Arsenic, Total | METHOD | 206.2 | 0.005 | 1 | 3/5/01 | 3/8/01 | ND | |
| Barium, Total | METHOD | 200.7 | 0.02 | 1 | 3/5/01 | 3/5/01 | 0.02 | |
| Boron, Total | METHOD | 200.7 | 0.05 | 1 | 3/5/01 | 3/5/01 | 0.37 | |
| Cadmium, Total | METHOD | 200.7 | 0.005 | 1 | 3/5/01 | 3/5/01 | ND | |
| Calcium, Total | METHOD | 200.7 | 0.2 | 1 | 3/5/01 | 3/5/01 | 96 | |
| Chromium, Total | METHOD | 200.7 | 0.01 | 1 | 3/5/01 | 3/5/01 | ND | |
| Copper, Total | METHOD | 200.7 | 0.01 | 1 | 3/5/01 | 3/5/01 | ND | |
| Iron, Total | METHOD | 200.7 | 0.1 | 1 | 3/5/01 | 3/5/01 | 0.1 | |
| Magnesium, Total | METHOD | 200.7 | 0.2 | 1 | 3/5/01 | 3/5/01 | 31 | |
| Manganese, Total | METHOD | 200.7 | 0.01 | 1 | 3/5/01 | 3/5/01 | ND | |
| Mercury, Total | METHOD | 245.1 | 0.0005 | 1 | 3/5/01 | 3/5/01 | ND | |
| Nickel, Total | METHOD | 200.7 | 0.04 | 1 | 3/5/01 | 3/5/01 | ND | |
| Selenium, Total | METHOD | 270.2 | 0.005 | 1 | 3/5/01 | 3/8/01 | ND | |
| Silver, Total | METHOD | 200.7 | 0.01 | 1 | 3/5/01 | 3/5/01 | ND | |
| Sodium, Total | METHOD | 200.7 | 0.5 | 1 | 3/5/01 | 3/5/01 | 92 | |
| Thallium, Total | METHOD | 200.7 | 0.1 | 1 | 3/5/01 | 3/5/01 | ND | |
| Zinc, Total | METHOD | 200.7 | 0.02 | 1 | 3/5/01 | 3/5/01 | 0.05 | |

Approved By: _____ Date: 3-16-01

116264

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

| | | | |
|---|---|---|---|
| Client: | Newhall Land and Farming Company | Service Request: | L2100666 |
| Project: | Newhall Ranch | Date Collected: | 3/1/01 |
| Sample Matrix: | Water | Date Received: | 3/1/01 |

Metals

| | | | |
|---|---|---|---|
| Sample Name: | E WELL | Units: | mg/L (ppm) |
| Lab Code: | L2100666-001 | Basis: | NA |
| Test Notes: | | | |

| Analyte | Prep Method | Analysis Method | MRL | Dilution Factor | Date Digested | Date Analyzed | Result | Result Notes |
|---|---|---|---|---|---|---|---|---|
| Aluminum, Total | METHOD | 200.7 | 0.2 | 1 | 3/5/01 | 3/5/01 | ND | |
| Arsenic, Total | METHOD | 206.2 | 0.005 | 1 | 3/5/01 | 3/8/01 | ND | |
| Barium, Total | METHOD | 200.7 | 0.02 | 1 | 3/5/01 | 3/5/01 | 0.02 | |
| Boron, Total | METHOD | 200.7 | 0.05 | 1 | 3/5/01 | 3/5/01 | 0.37 | |
| Cadmium, Total | METHOD | 200.7 | 0.005 | 1 | 3/5/01 | 3/5/01 | ND | |
| Calcium, Total | METHOD | 200.7 | 0.2 | 1 | 3/5/01 | 3/5/01 | 96 | |
| Chromium, Total | METHOD | 200.7 | 0.01 | 1 | 3/5/01 | 3/5/01 | ND | |
| Copper, Total | METHOD | 200.7 | 0.01 | 1 | 3/5/01 | 3/5/01 | ND | |
| Iron, Total | METHOD | 200.7 | 0.1 | 1 | 3/5/01 | 3/5/01 | 0.1 | |
| Magnesium, Total | METHOD | 200.7 | 0.2 | 1 | 3/5/01 | 3/5/01 | 31 | |
| Manganese, Total | METHOD | 200.7 | 0.01 | 1 | 3/5/01 | 3/5/01 | ND | |
| Mercury, Total | METHOD | 245.1 | 0.0005 | 1 | 3/5/01 | 3/5/01 | ND | |
| Nickel, Total | METHOD | 200.7 | 0.04 | 1 | 3/5/01 | 3/5/01 | ND | |
| Selenium, Total | METHOD | 270.2 | 0.005 | 1 | 3/5/01 | 3/8/01 | ND | |
| Silver, Total | METHOD | 200.7 | 0.01 | 1 | 3/5/01 | 3/5/01 | ND | |
| Sodium, Total | METHOD | 200.7 | 0.5 | 1 | 3/5/01 | 3/5/01 | 92 | |
| Thallium, Total | METHOD | 200.7 | 0.1 | 1 | 3/5/01 | 3/5/01 | ND | |
| Zinc, Total | METHOD | 200.7 | 0.02 | 1 | 3/5/01 | 3/5/01 | 0.05 | |

Approved By: _____ Date: 3-16-01

116265

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Newhall Land and Farming Company
Project: Newhall Ranch
Sample Matrix: Water

Service Request: L2100666
Date Collected: 3/1/01
Date Received: 3/1/01

Metals

Sample Name: E-9 WELL
Lab Code: L2100666-002
Test Notes:

Units: mg/L (ppm)
Basis: NA

| Analyte | Prep Method | Analysis Method | MRL | Dilution Factor | Date Digested | Date Analyzed | Result | Result Notes |
|---|---|---|---|---|---|---|---|---|
| Aluminum, Total | METHOD | 200.7 | 0.2 | 1 | 3/5/01 | 3/5/01 | ND | |
| Arsenic, Total | METHOD | 206.2 | 0.005 | 1 | 3/5/01 | 3/8/01 | ND | |
| Barium, Total | METHOD | 200.7 | 0.02 | 1 | 3/5/01 | 3/5/01 | 0.03 | |
| Boron, Total | METHOD | 200.7 | 0.05 | 1 | 3/5/01 | 3/5/01 | 0.35 | |
| Cadmium, Total | METHOD | 200.7 | 0.005 | 1 | 3/5/01 | 3/5/01 | ND | |
| Calcium, Total | METHOD | 200.7 | 0.2 | 1 | 3/5/01 | 3/5/01 | 98 | |
| Chromium, Total | METHOD | 200.7 | 0.01 | 1 | 3/5/01 | 3/5/01 | ND | |
| Copper, Total | METHOD | 200.7 | 0.01 | 1 | 3/5/01 | 3/5/01 | ND | |
| Iron, Total | METHOD | 200.7 | 0.1 | 1 | 3/5/01 | 3/5/01 | 3.1 | |
| Magnesium, Total | METHOD | 200.7 | 0.2 | 1 | 3/5/01 | 3/5/01 | 36 | |
| Manganese, Total | METHOD | 200.7 | 0.01 | 1 | 3/5/01 | 3/5/01 | 0.10 | |
| Mercury, Total | METHOD | 245.1 | 0.0005 | 1 | 3/5/01 | 3/5/01 | ND | |
| Nickel, Total | METHOD | 200.7 | 0.04 | 1 | 3/5/01 | 3/5/01 | ND | |
| Selenium, Total | METHOD | 270.2 | 0.005 | 1 | 3/5/01 | 3/8/01 | ND | |
| Silver, Total | METHOD | 200.7 | 0.01 | 1 | 3/5/01 | 3/5/01 | ND | |
| Sodium, Total | METHOD | 200.7 | 0.5 | 1 | 3/5/01 | 3/5/01 | 73 | |
| Thallium, Total | METHOD | 200.7 | 0.1 | 1 | 3/5/01 | 3/5/01 | ND | |
| Zinc, Total | METHOD | 200.7 | 0.02 | 1 | 3/5/01 | 3/5/01 | ND | |

Approved By: _____ Date: 3-16-01

1544/m1399p

116266

Page No.

00666EP.CG1 - Sample (2) 3/16/01

# COLUMBIA ANALYTICAL SERVICES, INC.

## Analytical Report

| | | | |
|---|---|---|---|
| **Client:** | Newhall Land and Farming Company | **Service Request:** | L2100566 |
| **Project:** | Newhall Ranch | **Date Collected:** | 3/1/01 |
| **Sample Matrix:** | Water | **Date Received:** | 3/1/01 |

### Metals

| | | | |
|---|---|---|---|
| **Sample Name:** | C WELL | **Units:** | mg/L (ppm) |
| **Lab Code:** | L2100566-003 | **Basis:** | NA |
| **Test Notes:** | | | |

| Analyte | Prep Method | Analysis Method | MRL | Dilution Factor | Date Digested | Date Analyzed | Result | Result Notes |
|---|---|---|---|---|---|---|---|---|
| Aluminum, Total | METHOD | 200.7 | 0.2 | 1 | 3/5/01 | 3/5/01 | ND | |
| Arsenic, Total | METHOD | 206.2 | 0.005 | 1 | 3/5/01 | 3/8/01 | ND | |
| Barium, Total | METHOD | 200.7 | 0.02 | 1 | 3/5/01 | 3/5/01 | 0.02 | |
| Boron, Total | METHOD | 200.7 | 0.05 | 1 | 3/5/01 | 3/5/01 | 0.37 | |
| Cadmium, Total | METHOD | 200.7 | 0.005 | 1 | 3/5/01 | 3/5/01 | ND | |
| Calcium, Total | METHOD | 200.7 | 0.2 | 1 | 3/5/01 | 3/5/01 | 110 | |
| Chromium, Total | METHOD | 200.7 | 0.01 | 1 | 3/5/01 | 3/5/01 | ND | |
| Copper, Total | METHOD | 200.7 | 0.01 | 1 | 3/5/01 | 3/5/01 | ND | |
| Iron, Total | METHOD | 200.7 | 0.1 | 1 | 3/5/01 | 3/5/01 | 0.1 | |
| Magnesium, Total | METHOD | 200.7 | 0.2 | 1 | 3/5/01 | 3/5/01 | 36 | |
| Manganese, Total | METHOD | 200.7 | 0.01 | 1 | 3/5/01 | 3/5/01 | ND | |
| Mercury, Total | METHOD | 245.1 | 0.0005 | 1 | 3/5/01 | 3/5/01 | ND | |
| Nickel, Total | METHOD | 200.7 | 0.04 | 1 | 3/5/01 | 3/5/01 | ND | |
| Selenium, Total | METHOD | 270.2 | 0.005 | 1 | 3/5/01 | 3/8/01 | ND | |
| Silver, Total | METHOD | 200.7 | 0.01 | 1 | 3/5/01 | 3/5/01 | ND | |
| Sodium, Total | METHOD | 200.7 | 0.5 | 1 | 3/5/01 | 3/5/01 | 90 | |
| Thallium, Total | METHOD | 200.7 | 0.1 | 1 | 3/5/01 | 3/5/01 | ND | |
| Zinc, Total | METHOD | 200.7 | 0.02 | 1 | 3/5/01 | 3/5/01 | ND | |

Approved By: _____ Date: 3-16-01

116267

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

| | | | |
|---|---|---|---|
| Client: | Newhall Land and Farming Company | Service Request: | L2100666 |
| Project: | Newhall Ranch | Date Collected: | 3/1/01 |
| Sample Matrix: | Water | Date Received: | 3/1/01 |

Metals

| | | | |
|---|---|---|---|
| Sample Name: | B-6 WELL | Units: | mg/L (ppm) |
| Lab Code: | L2100666-004 | Basis: | NA |
| Test Notes: | | | |

| Analyte | Prep Method | Analysis Method | MRL | Dilution Factor | Date Digested | Date Analyzed | Result | Result Notes |
|---|---|---|---|---|---|---|---|---|
| Aluminum, Total | METHOD | 200.7 | 0.2 | 1 | 3/5/01 | 3/5/01 | ND | |
| Arsenic, Total | METHOD | 206.2 | 0.005 | 1 | 3/5/01 | 3/8/01 | ND | |
| Barium, Total | METHOD | 200.7 | 0.02 | 1 | 3/5/01 | 3/5/01 | 0.03 | |
| Boron, Total | METHOD | 200.7 | 0.05 | 1 | 3/5/01 | 3/5/01 | 0.46 | |
| Cadmium, Total | METHOD | 200.7 | 0.005 | 1 | 3/5/01 | 3/5/01 | ND | |
| Calcium, Total | METHOD | 200.7 | 0.2 | 1 | 3/5/01 | 3/5/01 | 140 | |
| Chromium, Total | METHOD | 200.7 | 0.01 | 1 | 3/5/01 | 3/5/01 | ND | |
| Copper, Total | METHOD | 200.7 | 0.01 | 1 | 3/5/01 | 3/5/01 | ND | |
| Iron, Total | METHOD | 200.7 | 0.1 | 1 | 3/5/01 | 3/5/01 | 0.1 | |
| Magnesium, Total | METHOD | 200.7 | 0.2 | 1 | 3/5/01 | 3/5/01 | 43 | |
| Manganese, Total | METHOD | 200.7 | 0.01 | 1 | 3/5/01 | 3/5/01 | ND | |
| Mercury, Total | METHOD | 245.1 | 0.0005 | 1 | 3/5/01 | 3/5/01 | ND | |
| Nickel, Total | METHOD | 200.7 | 0.04 | 1 | 3/5/01 | 3/5/01 | ND | |
| Selenium, Total | METHOD | 270.2 | 0.005 | 1 | 3/5/01 | 3/8/01 | 0.006 | |
| Silver, Total | METHOD | 200.7 | 0.01 | 1 | 3/5/01 | 3/5/01 | ND | |
| Sodium, Total | METHOD | 200.7 | 0.5 | 1 | 3/5/01 | 3/5/01 | 120 | |
| Thallium, Total | METHOD | 200.7 | 0.1 | 1 | 3/5/01 | 3/5/01 | ND | |
| Zinc, Total | METHOD | 200.7 | 0.02 | 1 | 3/5/01 | 3/5/01 | ND | |

Approved By: _____ Date: 3-16-01

116268

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

| | | | |
|---|---|---|---|
| Client: | Newhall Land and Farming Company | Service Request: | L2100666 |
| Project: | Newhall Ranch | Date Collected: | 3/1/01 |
| Sample Matrix: | Water | Date Received: | 3/1/01 |

Metals

| | | | |
|---|---|---|---|
| Sample Name: | EXON WELL | Units: | mg/L (ppm) |
| Lab Code: | L2100666-005 | Basis: | NA |
| Test Notes: | | | |

| Analyte | Prep Method | Analysis Method | MRL | Dilution Factor | Date Digested | Date Analyzed | Result | Result Notes |
|---|---|---|---|---|---|---|---|---|
| Aluminum, Total | METHOD | 200.7 | 0.2 | 1 | 3/5/01 | 3/5/01 | ND | |
| Arsenic, Total | METHOD | 206.2 | 0.005 | 1 | 3/5/01 | 3/8/01 | ND | |
| Barium, Total | METHOD | 200.7 | 0.02 | 1 | 3/5/01 | 3/5/01 | ND | |
| Boron, Total | METHOD | 200.7 | 0.05 | 1 | 3/5/01 | 3/5/01 | 0.26 | |
| Cadmium, Total | METHOD | 200.7 | 0.005 | 1 | 3/5/01 | 3/5/01 | ND | |
| Calcium, Total | METHOD | 200.7 | 0.2 | 1 | 3/5/01 | 3/5/01 | 140 | |
| Chromium, Total | METHOD | 200.7 | 0.01 | 1 | 3/5/01 | 3/5/01 | ND | |
| Copper, Total | METHOD | 200.7 | 0.01 | 1 | 3/5/01 | 3/5/01 | 0.01 | |
| Iron, Total | METHOD | 200.7 | 0.1 | 1 | 3/5/01 | 3/5/01 | 0.5 | |
| Magnesium, Total | METHOD | 200.7 | 0.2 | 1 | 3/5/01 | 3/5/01 | 48 | |
| Manganese, Total | METHOD | 200.7 | 0.01 | 1 | 3/5/01 | 3/5/01 | 0.03 | |
| Mercury, Total | METHOD | 245.1 | 0.0005 | 1 | 3/5/01 | 3/5/01 | ND | |
| Nickel, Total | METHOD | 200.7 | 0.04 | 1 | 3/5/01 | 3/5/01 | ND | |
| Selenium, Total | METHOD | 270.2 | 0.005 | 1 | 3/5/01 | 3/8/01 | 0.008 | |
| Silver, Total | METHOD | 200.7 | 0.01 | 1 | 3/5/01 | 3/5/01 | ND | |
| Sodium, Total | METHOD | 200.7 | 0.5 | 1 | 3/5/01 | 3/5/01 | 88 | |
| Thallium, Total | METHOD | 200.7 | 0.1 | 1 | 3/5/01 | 3/5/01 | ND | |
| Zinc, Total | METHOD | 200.7 | 0.02 | 1 | 3/5/01 | 3/5/01 | ND | |

Approved By: _____ Date: 3-11-01

1522021397p

116269

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

| | | | |
|---|---|---|---|
| Client: | Newhall Land and Farming Company | Service Request: | L2100666 |
| Project: | Newhall Ranch | Date Collected: | 3/1/01 |
| Sample Matrix: | Water | Date Received: | 3/1/01 |

Metals

| | | | |
|---|---|---|---|
| Sample Name: | B-11 WELL | Units: | mg/L (ppm) |
| Lab Code: | L2100666-006 | Basis: | NA |
| Test Notes: | | | |

| Analyte | Prep Method | Analysis Method | MRL | Dilution Factor | Date Digested | Date Analyzed | Result | Result Notes |
|---|---|---|---|---|---|---|---|---|
| Aluminum, Total | METHOD | 200.7 | 0.2 | 1 | 3/5/01 | 3/5/01 | ND | |
| Arsenic, Total | METHOD | 206.2 | 0.005 | 1 | 3/5/01 | 3/8/01 | ND | |
| Barium, Total | METHOD | 200.7 | 0.02 | 1 | 3/5/01 | 3/5/01 | ND | |
| Boron, Total | METHOD | 200.7 | 0.05 | 1 | 3/5/01 | 3/5/01 | 0.55 | |
| Cadmium, Total | METHOD | 200.7 | 0.005 | 1 | 3/5/01 | 3/5/01 | ND | |
| Calcium, Total | METHOD | 200.7 | 0.2 | 1 | 3/5/01 | 3/5/01 | 110 | |
| Chromium, Total | METHOD | 200.7 | 0.01 | 1 | 3/5/01 | 3/5/01 | ND | |
| Copper, Total | METHOD | 200.7 | 0.01 | 1 | 3/5/01 | 3/5/01 | ND | |
| Iron, Total | METHOD | 200.7 | 0.1 | 1 | 3/5/01 | 3/5/01 | 0.1 | |
| Magnesium, Total | METHOD | 200.7 | 0.2 | 1 | 3/5/01 | 3/5/01 | 35 | |
| Manganese, Total | METHOD | 200.7 | 0.01 | 1 | 3/5/01 | 3/5/01 | 0.05 | |
| Mercury, Total | METHOD | 245.1 | 0.0005 | 1 | 3/5/01 | 3/5/01 | ND | |
| Nickel, Total | METHOD | 200.7 | 0.04 | 1 | 3/5/01 | 3/5/01 | ND | |
| Selenium, Total | METHOD | 270.2 | 0.005 | 1 | 3/5/01 | 3/8/01 | ND | |
| Silver, Total | METHOD | 200.7 | 0.01 | 1 | 3/5/01 | 3/5/01 | ND | |
| Sodium, Total | METHOD | 200.7 | 0.5 | 1 | 3/5/01 | 3/5/01 | 120 | |
| Thallium, Total | METHOD | 200.7 | 0.1 | 1 | 3/5/01 | 3/5/01 | ND | |
| Zinc, Total | METHOD | 200.7 | 0.02 | 1 | 3/5/01 | 3/5/01 | ND | |

Approved By: _____ Date: 3-16-01

ISAS/021397p

116270

Weck Laboratories, Inc.
Environmental and Analytical Services - Since 1964

Report Date: Tuesday, March 06, 2001
Received Date: Thursday, March 01, 2001
Log By: mq
Log Time: 16:18

Client: Columbia Analytical Services
6925 Canoga Avenue
Canoga Park, CA 91303
Attn.: L. Ross Fenstermaker

Phone: (818) 587-5550
FAX: (818) 587-5555

Project:

P.O. #: L2100088
Turnaround Time: Normal

## CERTIFICATE OF ANALYSIS

Lab#: A101554-001 Sample ID: E Well Matrix: Water
Sampled By: Client Date: 3/1/01 Time: 9:25

| Parameter | Result | Flag | Units | Dilution Factor | RL | Method | Analyzed | Worksheet # |
|---|---|---|---|---|---|---|---|---|
| Chromium, hexavalent (Cr VI) | ND | | ug/L | 1 | 0.50 | EPA 218.6 | 3/1/01 dc | WS22315 |
| *Prep. Direct Inj.* | | | | | | | | |
| Perchlorate | ND | | ug/L | 1 | 4.0 | EPA 314 | 3/2/01 dc | WS22368 |

Lab#: A101554-002 Sample ID: E-9 Well Matrix: Water
Sampled By: Client Date: 3/1/01 Time: 9:40

| Parameter | Result | Flag | Units | Dilution Factor | RL | Method | Analyzed | Worksheet # |
|---|---|---|---|---|---|---|---|---|
| Chromium, hexavalent (Cr VI) | ND | | ug/L | 1 | 0.50 | EPA 218.6 | 3/1/01 dc | WS22315 |
| *Prep. Direct Inj.* | | | | | | | | |
| Perchlorate | ND | | ug/L | 1 | 4.0 | EPA 314 | 3/2/01 dc | WS22368 |

Lab#: A101554-003 Sample ID: C Well Matrix: Water
Sampled By: Client Date: 3/1/01 Time: 10:00

| Parameter | Result | Flag | Units | Dilution Factor | RL | Method | Analyzed | Worksheet # |
|---|---|---|---|---|---|---|---|---|
| Chromium, hexavalent (Cr VI) | ND | | ug/L | 1 | 0.50 | EPA 218.6 | 3/1/01 dc | WS22315 |
| *Prep. Direct Inj.* | | | | | | | | |
| Perchlorate | ND | | ug/L | 1 | 4.0 | EPA 314 | 3/2/01 dc | WS22368 |

Lab#: A101554-004 Sample ID: B-8 Well Matrix: Water
Sampled By: Client Date: 3/1/01 Time: 10:20

| Parameter | Result | Flag | Units | Dilution Factor | RL | Method | Analyzed | Worksheet # |
|---|---|---|---|---|---|---|---|---|
| Chromium, hexavalent (Cr VI) | ND | | ug/L | 1 | 0.50 | EPA 218.6 | 3/1/01 dc | WS22315 |
| *Prep. Direct Inj.* | | | | | | | | |
| Perchlorate | ND | | ug/L | 1 | 4.0 | EPA 314 | 3/2/01 dc | WS22368 |



14859 East Clark Avenue, City of Industry, California 91745-1396 (626) 336-2139 FAX (626) 336-2634
www.weckdabs.com

116271

Client: Columbia Analytical Services
Project Name:

Report Date: Tuesday, March 06, 2001

## CERTIFICATE OF ANALYSIS

Lab#: A101554-005 Sample ID: Exon Well Matrix: Water
Sampled By: Client Date: 3/1/01 Time: 11:00

| Parameter | Result | Flag | Units | Dilution Factor | RL | Method | Analyzed | | Worksheet # |
|---|---|---|---|---|---|---|---|---|---|
| Chromium, hexavalent (Cr VI) | 0.70 | | ug/L | 1 | 0.50 | EPA 218.6 | 3/1/01 | dc | WS22315 |
| *Prep. Direct Inj.* | | | | | | | | | |
| Perchlorate | ND | | ug/L | 1 | 4.0 | EPA 314 | 3/2/01 | dc | WS22368 |

Lab#: A101554-006 Sample ID: B-11 Well Matrix: Water
Sampled By: Client Date: 3/1/01 Time: 11:45

| Parameter | Result | Flag | Units | Dilution Factor | RL | Method | Analyzed | | Worksheet # |
|---|---|---|---|---|---|---|---|---|---|
| Chromium, hexavalent (Cr VI) | ND | | ug/L | 1 | 0.50 | EPA 218.6 | 3/1/01 | dc | WS22315 |
| *Prep. Direct Inj.* | | | | | | | | | |
| Perchlorate | ND | | ug/L | 1 | 4.0 | EPA 314 | 3/2/01 | dc | WS22368 |

Authorized Signature

ELAP # 1132
LACSD # 10143

Flags for Data Qualifiers:
B = Compound detected in the blank. Sample result equal or less than 10 times the concentration in the blank.
J = Estimated value, detected but below the reporting limit.
H = Estimated value, result over the calibration range
R = Result is suspect, LCS recovery greater than the upper control limit.
L = Result is suspect, LCS recovery lower than the control limit.
Q = QC result out of acceptance limits.
T = Trace detection, detected but below the reporting limit.

Notes:
Any remaining sample(s) for testing will be disposed of one month from the final report date unless other arrangements are made in advance.
All results are expressed on wet weight basis unless specified.
RL = Reporting Limit.
ND = Not detected, below the reporting limit.
Sub = Subcontracted analysis, original report enclosed.



14859 East Clark Avenue, City of Industry, California 91745-1396 (626) 336-2139 FAX (626) 336-2634
www.wecklabs.com

116272

# SILLIKER LABORATORIES
## OF SOUTHERN CALIFORNIA

1139 East Dominguez, Suite I
Carson, CA 90746
310-637-7121 Fax 310-637-2953
FOOD SAFETY • QUALITY • NUTRITION


## CERTIFICATE OF ANALYSIS

| | |
|---|---|
| COA No: | SCA-15064716-0 |
| Supersedes: | None |
| COA Date | 3/5/01 |
| Page 1 of 2 | |

TO:
Mr. Ross Fenstermaker
Project Manager
Columbia Analytical Services
6925 Canoga Avenue
Canoga Park, CA 91303

| | |
|---|---|
| Received From: | Canoga Park, CA |
| Received Date: | 3/1/01 |
| P.O.# / ID: | LL100666 |
| Location of Test: (except where noted) | Carson, CA |

## Analytical Results

Desc. 1: Log #: L2100666 Desc. 4: Sample Date:03/01/01 Laboratory ID: 150333454
Desc. 2: E Well Desc. 5: Sample Time:09:25 Condition Rec'd: NORMAL
Desc. 3: Sampler:Not Given Desc. 6: Matrix Drinking Water Temp Rec'd (°C): 6.3

| Analyte | Result | Units | Method Reference | Test Date | Loc. |
|---|---|---|---|---|---|
| Coliforms - 10X10 ml MPN | <1.1 | /100mL | SMEWW, 19th ed. | 3/3/01 | |
| E. coli - 10X10 ml MPN | <1.1 | /100mL | SMEWW, 19th ed. | 3/3/01 | |
| Heterotrophic Plate Count | <1 | /mL | SMEWW 18th ed. | 3/3/01 | |

Desc. 1: Log #: L2100666 Desc. 4: Sample Date:03/01/01 Laboratory ID: 150333467
Desc. 2: E-9 Well Desc. 5: Sample Time:09:40 Condition Rec'd: NORMAL
Desc. 3: Sampler:Not Given Desc. 6: Matrix Drinking Water Temp Rec'd (°C): 6.3

| Analyte | Result | Units | Method Reference | Test Date | Loc. |
|---|---|---|---|---|---|
| Coliforms - 10X10 ml MPN | <1.1 | /100mL | SMEWW, 19th ed. | 3/3/01 | |
| E. coli - 10X10 ml MPN | <1.1 | /100mL | SMEWW, 19th ed. | 3/3/01 | |
| Heterotrophic Plate Count | 6.0 | /mL | SMEWW 18th ed. | 3/3/01 | |

Desc. 1: Log #: L2100666 Desc. 4: Sample Date:03/01/01 Laboratory ID: 150333461
Desc. 2: C-Well Desc. 5: Sample Time:10:00 Condition Rec'd: NORMAL
Desc. 3: Sampler:Not Given Desc. 6: Matrix Drinking Water Temp Rec'd (°C): 6.3

| Analyte | Result | Units | Method Reference | Test Date | Loc. |
|---|---|---|---|---|---|
| Coliforms - 10X10 ml MPN | <1.1 | /100mL | SMEWW, 19th ed. | 3/3/01 | |
| E. coli - 10X10 ml MPN | <1.1 | /100mL | SMEWW, 19th ed. | 3/3/01 | |
| Heterotrophic Plate Count | 16 | /mL | SMEWW 18th ed. | 3/3/01 | |

Desc. 1: Log #: L2100666 Desc. 4: Sample Date:03/01/01 Laboratory ID: 150333463
Desc. 2: B-6 Well Desc. 5: Sample Time:10:20 Condition Rec'd: NORMAL
Desc. 3: Sampler:Not Given Desc. 6: Matrix Drinking Water Temp Rec'd (°C): 6.3

| Analyte | Result | Units | Method Reference | Test Date | Loc. |
|---|---|---|---|---|---|
| Coliforms - 10X10 ml MPN | <1.1 | /100mL | SMEWW, 19th ed. | 3/3/01 | |
| E. coli - 10X10 ml MPN | <1.1 | /100mL | SMEWW, 19th ed. | 3/3/01 | |
| Heterotrophic Plate Count | 29 | /mL | SMEWW 18th ed. | 3/3/01 | |

Desc. 1: Log #: L2100666 Desc. 4: Sample Date:03/01/01 Laboratory ID: 150333465
Desc. 2: Exon Well Desc. 5: Sample Time:11:00 Condition Rec'd: NORMAL
Desc. 3: Sampler:Not Given Desc. 6: Matrix Drinking Water Temp Rec'd (°C): 6.3

| Analyte | Result | Units | Method Reference | Test Date | Loc. |
|---|---|---|---|---|---|
| Coliforms - 10X10 ml MPN | <1.1 | /100mL | SMEWW, 19th ed. | 3/3/01 | |
| E. coli - 10X10 ml MPN | <1.1 | /100mL | SMEWW, 19th ed. | 3/3/01 | |
| Heterotrophic Plate Count | 6.0 | /mL | SMEWW 18th ed. | 3/3/01 | |

The results of these tests relate only to the samples tested. This report shall not be reproduced except in full, without the written approval of the laboratory.

# SILLIKER LABORATORIES
## OF SOUTHERN CALIFORNIA

1139 East Dominguez, Suite I
Carson, CA 90746
310-637-7121 Fax 310-637-2953
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## CERTIFICATE OF ANALYSIS

| | |
|---|---|
| COA No: | SCA-15064718-0 |
| Supersedes: | None |
| COA Date | 3/5/01 |
| Page 2 of 2 | |

TO:
Mr. Ross Fenstermaker
Project Manager
Columbia Analytical Services
6925 Canoga Avenue
Canoga Park, CA 91303

| | |
|---|---|
| Received From: | Canoga Park, CA |
| Received Date: | 3/1/01 |
| P.O.# / ID: | LL100666 |
| Location of Test: (except where noted) | Carson, CA |

## Analytical Results

| | | | | | |
|---|---|---|---|---|---|
| Desc. 1: | Log #: L2100666 | Desc. 4: | Sample Date:03/01/01 | Laboratory ID: | 150333466 |
| Desc. 2: | B-11 Well | Desc. 6: | Sample Time:11:45 | Condition Rec'd: | NORMAL |
| Desc. 3: | Sampler:Not Given | Desc. 5: | Matrix: Drinking Water | Temp Rec'd (°C): | 6.3 |

| Analyte | Result | Units | Method Reference | Test Date | Loc. |
|---|---|---|---|---|---|
| Coliforms - 10X10 ml MPN | <1.1 | /100mL | SMEWW, 19th ed. | 3/3/01 | |
| E. coli - 10X10 ml MPN | <1.1 | /100mL | SMEWW, 19th ed. | 3/3/01 | |
| Heterotrophic Plate Count | 34 | /mL | SMEWW 18th ed. | 3/3/01 | |

COA Comment: This water complies with State of California and the U.S. Public Health Services regulations for potable water as analyzed by Silliker Laboratories.

Vidhya Gangar

Vidhya Gangar, M.S. Laboratory Director

The results of these tests relate only to the samples tested. This report shall not be reproduced except in full, without the written approval of the laboratory.

DAVI LABORATORIES, ENVIRONMENTAL ASSOCIATES
701 "B" Belmont Way • Pinole, CA 94564 • (510) 724-9450 • Fax (510) 724-9174

# ANALYTICAL RESULTS REPORT

Company: Columbia Analytical Services
Address: 6925 Canoga Avenue
Canoga Park, CA 91303

Contact: Mr. L. Ross Fenstermaker
Report Date: March 20, 2001
Purchase Order #: L2100666

TABLE I

| Sample I.D. | Analyses Date/Time | Matrix | EPA Method | Analysis | Results pCi/L | ± | Sigma error |
|---|---|---|---|---|---|---|---|
| E Well | 3/20/01(0925) | Water | 900.0 | Gross Alpha | 6.00 | ± | 1.59 |
| | | | 900.0 | Gross Beta | 1.62 | ± | 0.41 |
| | | | 913.0 | Radon 222 | 303 | ± | 47 |
| | | | 908.1 | Uranium | 5.52 | ± | 1.61 |
| | | | 903.0 | Radium 226 | 0.41 | ± | 0.40 |
| | | | 904.0 | Radium 228 | 0.83 | ± | 1.24 |
| E -9 Well | 3/20/01(0940) | Water | 900.0 | Gross Alpha | 3.24 | ± | 1.20 |
| | | | 900.0 | Gross Beta | 1.82 | ± | 0.52 |
| | | | 913.0 | Radon 222 | 203 | ± | 40 |
| | | | 908.1 | Uranium | 1.79 | ± | 0.39 |
| | | | 903.0 | Radium 226 | 0.32 | ± | 0.19 |
| | | | 904.0 | Radium 228 | 0.00 | ± | 1.00 |
| C Well | 3/20/01(1000) | Water | 900.0 | Gross Alpha | 3.56 | ± | 1.31 |
| | | | 900.0 | Gross Beta | 0.68 | ± | 0.28 |
| | | | 913.0 | Radon 222 | 259 | ± | 44 |
| | | | 908.1 | Uranium | 3.10 | ± | 0.90 |
| | | | 903.0 | Radium 226 | 0.26 | ± | 0.23 |
| | | | 904.0 | Radium 228 | 0.00 | ± | 1.00 |
| B-6 Well | 3/20/01(1020) | Water | 900.0 | Gross Alpha | 8.95 | ± | 2.16 |
| | | | 900.0 | Gross Beta | 0.58 | ± | 0.15 |
| | | | 913.0 | Radon 222 | 182 | ± | 39 |
| | | | 908.1 | Uranium | 7.88 | ± | 2.29 |
| | | | 903.0 | Radium 226 | 0.67 | ± | 0.40 |
| | | | 904.0 | Radium 228 | 1.85 | ± | 0.29 |



116275

| | |
|---|---|
| Company: | Columbia Analytical Services |
| Contact: | Mr. L. Ross Fenstermaker |
| Report Date: | March 20, 2001 |
| Purchase Order #: | L2100666 |

TABLE I

| Sample I.D. | Analyses Date/Time | Matrix | EPA Method | Analysis | Results pCi/L | ± | Sigma error |
|---|---|---|---|---|---|---|---|
| Exon Well | 3/20/01(1100) | Water | 900.0 | Gross Alpha | 6.55 | ± | 1.95 |
| | | | 900.0 | Gross Beta | 0.97 | ± | 0.26 |
| | | | 913.0 | Radon 222 | 127 | ± | 34 |
| | | | 908.1 | Uranium | 4.23 | ± | 1.23 |
| | | | 903.0 | Radium 226 | 0.00 | ± | 1.00 |
| | | | 904.0 | Radium 228 | 0.59 | ± | 0.28 |
| B-11 Well | 3/20/01(1145) | Water | 900.0 | Grossalpha | 7.92 | ± | 1.91 |
| | | | 900.0 | Gross Beta | 2.39 | ± | 0.40 |
| | | | 913.0 | Radon 222 | 274 | ± | 45 |
| | | | 908.1 | Uranium | 5.08 | ± | 1.48 |
| | | | 903.0 | Radium 226 | 0.34 | ± | 0.30 |
| | | | 904.0 | Radium 228 | 0.00 | ± | 1.00 |

TABLE II QA/QC Data

| Analysis. | Spike Activity pCi | Detected Activity pCi | Percent of Agreement % |
|---|---|---|---|
| Gross Alpha | 492.3 pCi | 453.3 pCi | 92.08 |
| Gross Beta | 1193.6 pCi | 1133.1 pCi | 94.93 |
| Radon 222 | 8275.0 pCi | 8010.2 pCi | 96.80 |
| Uranium | 237.5 pCi | 230.5 pCi | 97.05 |
| Radium 226 | 2.9 pCi | 2.7 pCi | 93.10 |
| Radium 228 | 11.9 pCi | 11.3 pCi | 94.95 |

Patricia Davi
Davi Laboratories
QA/QC Manager

amec

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SEP 16 2009
By

September 15, 2009

Project 9967.000.0

Mr. Jose Diaz
Department of Toxic Substances Control
Site Mitigation Branch
9211 Oakdale Avenue
Chatsworth, CA 91311

**Re: Former Whittaker-Bermite Facility, Santa Clarita, CA**
**Summary Report for Month of August 2009**

Dear Mr. Diaz:

This letter constitutes a progress report for the month of August 2009, prepared pursuant to Task 4 and Section 6.3 of the "Imminent and Substantial Endangerment Determination and Order and Remedial Action Order" (the Order) that the Department of Toxic Substances Control (DTSC) issued on November 22, 2002, for the former Whittaker-Bermite facility (site) in Santa Clarita, California.

## SECTION I – SOIL ISSUES

Specific actions taken on behalf of the respondent, actions expected to be undertaken, and planned activities for soil issues are summarized in the following sections:

### OU1 REMEDIATION

#### Activities for This Report Period (1)

All excavation, bio-treatment, backfilling, and slope restoration activities for the OU1 remediation program were completed during previous reporting periods. During this reporting period, CDM worked on the preparation of the closure report documenting the soil remediation operations for OU1.

#### *Anticipated Activities for This Month*

Work on the closure report documenting the soil remediation operations for OU1.

#### *Long-Term Actions*

Complete the closure report documenting the soil remediation operations for OU1 and submit to DTSC for review.

#### Activities for This Report Period (2)

Operated the primary soil vapor extraction (SVE) system at Area 43 and the secondary (hi-vacuum) SVE system at Building 329.

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510 Superior Avenue, Suite 200
Newport Beach, CA
USA 92663-3627
Tel (949) 642-0245
Fax (949) 642-4474
www.amecgeomatrixinc.com

### Anticipated Activities for This Month

Continue operation and optimization of SVE systems at Building 329 and Area 43.

#### *Long-Term Actions*

Continue the SVE operations until volatile organic compound levels are eliminated or reduced to appropriate levels or until asymptotic levels are reached.

## REMEDIAL ACTION PLAN

### Activities for This Report Period

CDM completed the third draft of the Remedial Action Plan (RAP) for OU2 through OU6 soils (Site-Wide Soils RAP), which was submitted to DTSC on August 14, 2009. The DTSC issued preliminary review comments via email on August 24, 2009. DTSC's preliminary review comments were incorporated and the third draft of the RAP was resubmitted to DTSC on August 31, 2009.

#### *Anticipated Activities for This Month*

Allow DTSC review of the Site-Wide Soils RAP. Address DTSC's comments, if any received.

#### *Long-Term Actions*

Work with DTSC to finalize the Site-Wide Soils RAP and present for public review.

## PILOT STUDIES (SVE)

### Activities for This Report Period

CDM had previously prepared a pilot study work plan for SVE. DTSC approved the revised SVE work plan in a letter dated October 22, 2008.

The field pilot programs for Areas 2, 4, 27, 31/45, 53/54/72, Area 14-South, and Hula Bowl Canyon I were completed during prior reporting periods. During this reporting period the field pilot program for Area 14-Central was completed. However, due to the large amount of VOC mass removal achieved for both Area 14-South and 14-Central using the G.E.O. cryogenic/condenser system, the operations in Area 14 were extended for an additional two months while evaluations are completed to determine if further operation of the G.E.O. system with the existing well configuration is warranted prior to scale up of the pilot study operations.

#### *Anticipated Activities for This Month*

Prepare the report documenting the results of the pilot studies, and extended SVE pilot operations in Area 14.

### *Long-Term Actions*

Complete planned pilot study activities and prepare documentation reports for submittal to DTSC. Incorporate the results of the SVE Pilot Study to the Site-Wide RAP and the Remedial Design document.

## PILOT STUDIES (GEDIT)

### Activities for This Report Period

CDM had previously prepared pilot study work plan for in-situ bioremediation of perchlorate impact to deep soils via Gaseous Electron Donor Injection Technology (GEDIT). DTSC provided conditional approval of the GEDIT work plan on November 14, 2008.

The laboratory bench-scale treatability study for the GEDIT pilot study was initiated at CDM's laboratory in Bellevue, Washington, during a previous reporting period. The bench-scale study was continued during this reporting period.

### *Anticipated Activities for This Month*

Continue tracking and monitoring of bench-scale study.

### *Long-Term Actions*

Complete planned pilot study activities and prepare documentation reports for submittal to DTSC. Incorporate the results of the GEDIT Pilot Study to the Site-Wide RAP and the Remedial Design document.

## SOILS INTERIM REMEDIAL MEASURES (IRMS) AND REMOVAL ACTIONS

### Depleted Uranium (DU) Investigation and Clearance Activities

### Activities for this Report Period

Continued to maintain close contact with California Department of Public Health-Radiological Health Branch (CDPH-RHB) regarding the review of the Work Plan and have provided preliminary information to address requests made by CDPH-RHB. Site visit by CDPH-RHB has not been scheduled at this time and is being coordinated by Mr. Jerry Hensley at RHB along with Mr. Jose Diaz at DTSC. Meeting with California Department of Fish and Game representative was completed on August 24th resulting in approval of permit for brush removal as described in our notification. Development of the project Health and Safety Plan (HASP) as well as the Final Status Survey Plan (FSSP) have also been started during this period. Finalization of both plans will be pending information received from CDPH-RHB review of Work Plan.

***Anticipated Activities for this Month***

It is anticipated that a site visit will be scheduled by CDPH-RHB and DTSC as part of the Work Plan review process. This visit will provide supporting information pertinent to the review of the submitted Work Plan. Pending comments from CDPH-RBH, changes may be necessary to the Work Plan. Work on both the HASP and FSSP will be continued during this period. We are awaiting approval from ACOE and RWQCB prior to moving forward with the brush removal. We expect to initiate coordination for brush removal during this period.

***Long Term Actions***

Once approval is confirmed with ACOE and RWQCB the brush removal and UXO clearance survey can be coordinated. Pending necessary changes to the Work Plan, submittal of the FSSP to CDPH-RHB will be required. A specific schedule will be developed for brush removal, UXO clearance, DU removal and Final Status Surveys.

**UXO/OE Investigation and Clearance Activities**

## Activities for This Report Period

EODT completed the following activities during this reporting period.

Work Plan Addendum (WPA) Further Investigation and No Further Action Areas
The EODT Work Plan Addendum (WPA) and associated Conceptual Site Model were submitted for DTSC and stakeholders review on July 23, 2009. The WPA field work will characterize the Further Investigations Areas and confirm the No Further Action status of the areas not affected by Munitions and Explosives of Concerns (MEC) as originally referenced in the 2006 Historical Site Assessment (HSA) Report.

Munitions and Explosives of Concern Clearance Activities at Hula Bowl II and III Associated Drainage Area, and the Depleted Uranium (DU) Impacted Area
The Hula Bowl II and III and DU Work Plan Addenda were approved with comments by DTSC in June 2008. EODT continues to coordinate with the DU-Impacted Area contractor Energy Solutions and AMEC Geomatrix to refine a phased removal plan consisting of an initial surface clearance to be followed by a removal to depth in the footprint of the DU excavation. After the MEC surface clearance is complete and actual site conditions are known, along with DTSC, the subsurface removal action alternatives will be planned and completed. Fish and Game permit application has been submitted and approved for brush clearance in the DU clearance area.

Hula Bowl II and III Drainage
EODT is tracking the landfill drainage so the clearance is completed after the drainage 'dam' is in place (so new items do not enter the drainage).

### Anticipated Activities for This Month

Work Plan Addendum Further Investigation and No Further Action Areas
Anticipate planning for the field work execution and staffing in coordination with DTSC and the stakeholders.

Munitions and Explosives of Concern Clearance Activities at Hula Bowl II and III Associated Drainage Area, and the Depleted Uranium Impacted Area
Track the progress on the Hula Bowl II and III drainage 'dam' to determine the appropriate time for surface removal.

DU area MEC clearance
EODT will continue to track the progress of the review and approval process and refine the schedule for the surface clearance.

## SECTION III – GROUNDWATER AND SURFACE WATER ISSUES

Specific actions taken on behalf of the respondent, action expected to be undertaken and planned activities for groundwater and surface water issues are summarized in the following sections:

### GROUNDWATER (OU7) FEASIBILITY STUDY (FS)

### Activities for This Report Period (1)

The Draft OU-7 FS report has been prepared and is under internal review. To support the OU-7 FS evaluations, step drawdown testing was conducted in selected OU2/OU6 perched zone wells to assess hydraulic properties.

### *Anticipated Activities for This Month*

Continue the OU-7 FS evaluations. The Draft OU-7 FS report is under review and will be submitted to DTSC in October 2009.

Review the step drawdown testing results for selected OU2/OU6 perched zone wells. This information will be used in the OU-7 FS evaluation of groundwater extraction and dewatering options for the perched groundwater zone.

### *Long-Term Actions*

Prepare the Remedial Action Plan for OU-7.

## INTERIM REMEDIAL MEASURES (IRMS) AND PILOT PROGRAMS FOR GROUNDWATER

### SAUGUS AQUIFER EXTRACTION PILOT PROGRAM

#### Activities for This Report Period

The Work Plan, Saugus Aquifer Pilot Remediation Well Network, Operable Unit 7 was submitted to DTSC on September 22, 2008. DTSC provided comments on November 18, 2008 and subsequently provided conditional approval of the Work Plan on December 31, 2008. A request for qualifications and proposals (RFQ/RFP) for implementation of the Saugus Extraction Pilot program was issued during March and a site tour was given to the bidders on March 25th. Responses to RFQ/RFP were received from five firms on the proposal deadline of April 23. Following review of the proposals, presentations and interviews were conducted with the five companies on May 27, 2009. Whittaker team has entered into contract negotiations with the front runner firm for implementation of the Saugus Extraction Pilot program.

#### *Anticipated Activities for This Month*

Whittaker team will continue negotiations with the front runner firm and execute a mutually agreeable contract so that the scope of work outlined in the Work Plan, Saugus Aquifer Pilot Remediation Well Network is implemented. DTSC comments on the Pilot Saugus Groundwater Remediation Work Plan will be incorporated as the Work Plan is implemented.

#### *Long-Term Actions*

Implement the Saugus Aquifer Extraction Pilot Program. Incorporate the results of the pilot work to the groundwater (OU7) RAP and design document.

### NORTHERN ALLUVIUM GROUNDWATER TREATMENT SYSTEM OPERATION

#### Activities for This Report Period (1)

A Pilot Remediation Pumping Program was started in Northern Alluvium Areas 11, 67, and 75, in 2006. An alternate extraction well 75-MW-35 for higher groundwater extraction and six hot spot wells were connected to the new higher capacity groundwater treatment system in 2007. Sustained pumping of the extraction well 75-MW-35 that began in mid-October 2007 continues to date, with the exception of a brief period of shut down for treatment system maintenance. As of August 31, 2009, approximately 23,017,700 gallons of impacted water have been treated and discharged.

The August monthly compliance sample was collected on August 3, 2009. The sampling results indicated that the system was in compliance during May. Media were replaced in the treatment vessels as follows:

- August 6, 2009 – Removed/replaced perchlorate media in lead vessel.

- August 31, 2009 – Removed/replaced nitrate medial in lead vessel.

After replacement, the nitrate and perchlorate treatment vessels were reconfigured to have the old lag vessel as the lead and the new vessel with fresh media as the lag vessel. Because of a cracked valve on the GAC manifold, only the lead GAC vessel is in operation. Siemens is working on a solution to repair the leaky manifold.

The system was operated routinely throughout the month. The low flow wells were shut down during the routine quarterly sampling event (August 5 to August 12, 2009), however, the high flow well remained on during this time. As of August 31, 2009, approximately 23,017,700 gallons of impacted water have been treated and discharged. Approximately 91 percent of the treated volume was from the extraction wells of the Northern Alluvium pumping system; the remaining 9 percent is from IDW water collected during the quarterly sampling events, storm water collected from various areas of the site, and Saugus well development water.

### *Anticipated Activities for This Month*

Continue the pumping, treatment, and discharge system operation and routine weekly and monthly NPDES compliance sampling and media change outs as needed.

Monitoring of the aquifer response to pumping from the alternate extraction well 75-MW-35 and the downgradient site boundary low flow extraction wells will continue.

Repair GAC manifold and put the second GAC treatment vessel back into service.

### *Long-Term Actions*

Continue operating the extraction and treatment system and conduct additional performance monitoring.

## Activities for This Report Period (2)

Potential application of remedial technologies for Northern Alluvium groundwater hot spots, including evaluation of the Area 75 boundary containment established by sustained operation of the low flow pumping wells is being addressed in the OU7 FS.

### *Anticipated Activities for This Month*

Evaluation of potential pilot studies for the Northern Alluvium area of the site will continue. The results presented in the Shaw Technology Demonstration Summary Report for Area 11 will be reviewed for potential applicability to other areas in the Northern Alluvium.

### *Long-Term Actions*

Additional source control measures in Northern Alluvium will be considered and recommended where determined to be necessary.

## GROUNDWATER AND MONITORING

### Activities for This Report Period (1)

Data review and preparation of the report is in progress for the Second Quarter 2009 quarterly groundwater monitoring. Sampling for the Third Quarter 2009 monitoring event was conducted during August.

### *Anticipated Activities for This Month*

Data review and preparation of the report is in progress for the Second Quarter 2009 quarterly groundwater monitoring.

### *Long-Term Actions*

Continue monitoring and reporting of the proposed network of monitoring wells on the updated schedule presented in Technical Memorandum No. 8.

### Activities for This Report Period (2)

RCRA groundwater monitoring of the Area 1 (former Building 317) continues on schedule. Data from the Second Quarter 2009 groundwater monitoring event conducted in May 2009 is being reviewed. Sampling for the Third Quarter 2009 monitoring event was conducted during August.

### *Anticipated Activities for This Month*

Data from the Second Quarter 2009 groundwater monitoring event conducted in May 2009 is being reviewed and report preparation is in progress.

### *Long-Term Actions*

The current RCRA groundwater monitoring program will be modified to include the proposed wells and frequency and DTSC input to the monitoring plan.

## STORM WATER MONITORING

### Activities for This Report Period

Pursuant to the site Storm Water Pollution Prevention Plan, Environ continued coordinating the implementation of short-term surface water run-off mitigation measures. Implementation of the short-term mitigation measures is being coordinated with CDM, particularly in the areas of the site where soil remediation activities have occurred.

### *Anticipated Activities for This Month*

Upgrades to the short-term mitigation measures will continue as necessary. CDM is working on a plan for upgrading the short-term mitigation measures. Surface water run-off sampling will be conducted following significant rainfall events in accordance with the site-wide surface water runoff sampling plan.

### *Long-Term Actions*

Long-term mitigation of the drainages and excavations will be conducted in conjunction with the soil remediation.

## SECTION IV – REQUIREMENTS UNDER THE ORDER THAT WERE NOT COMPLETED

All requirements of the Order were completed. Whittaker has met or exceeded all the substantive requirements of the Order.

## SECTION V – PROBLEMS OR ANTICIPATED PROBLEMS IN COMPLYING WITH THE ORDER

Following DTSC's agreement with Whittaker's proposed modifications to implementation plans in compliance with the Order reflected in the letter dated September 28, 2004, DTSC's letter dated July 11, 2005, included a schedule for submitting a number of documents. All deadlines have been met and documents have been submitted per requested schedule.

## SECTION VI – RESULTS OF SAMPLE ANALYSIS, TESTS, AND OTHER DATA

Whittaker has instructed its contractors to continue to provide DTSC staff with raw data sets for ongoing quarterly groundwater monitoring events and RI/FS work upon receipt from the lab.

Sincerely yours,
AMEC Geomatrix, Inc.

Hassan Amini, PhD, CHG
Project Coordinator

cc: Eric Lardiere, Esq., Whittaker Corp; Joseph Armao, Winston & Strawn, LLP; William Weaver, CDM; Jessica Donovan, ENVIRON; Paul Bergstrom, Knight Piésold; Larry Sievers, EODT; Tim Bricker, Santa Clarita L.L.C.; Megan Trend, Chubb Financial Solutions; Cindy Hunter, MariKay Fish, Julie Diebenow, AIG Insurance; Vitthal Hosangadi, NOREAS; John Carty, Zurich North America; Hal Dash, Cerrell Associates; Jeff Hogan, City of Santa Clarita; Yueh

Chuang, CH2M Hill; Kathy Stryker Anderson, US Army Corps of Engineers; Robert DiPrimio, Valencia Water Company; Lynn Takaichi, and Meredith Durant, Kennedy Jenks; David Bacharowski, RWQCB; James Leserman, Castaic Lake Water Agency; Steve Cole, Newhall County Water District; Mauricio Guardado, Santa Clarita Water; Neil Elsey, Avion Holdings LLC; Alisa Lacey, Stinson Morrison Hecker LLP; Jeff O'Keefe, Department of Public Health.

**AMEC Letter Request for Deadline Extension for OU2-6 RAP Former Whittaker Bermite Facility, Santa Clarita, CA (June 8, 2009)**

June 8, 2009

Project 9967

Mr. Jose Diaz
Department of Toxic Substances Control
Site Mitigation Branch
9211 Oakdale Avenue
Chatsworth, California 91311

**Re: Request for Deadline Extension for OU2-6 RAP**
**Former Whittaker Bermite Facility, Santa Clarita, CA**

Dear Mr. Diaz:

Confirming our discussions of May 22 and June 2, this letter presents Whittaker's formal request to extend the deadline for submitting the Remedial Action Plan (RAP) for Operable Units 2 through 6 of the former Whittaker Bermite site (the site) from May 29, 2009, to August 14, 2009.

As you are aware, the Whittaker team prepared and submitted the second draft of the RAP to the Department of Toxic Substance Control (DTSC) on January 30, 2009. DTSC provided comments on April 10, 2009, and referenced the February 18, 2009, letter from the City of Santa Clarita (City) and raised concern that modifications to the terms and conditions of the Porta Bella Development Plan that was referenced in the City letter would significantly delay cleanup of the site. Based on that concern DTSC requested that the RAP should be revised to remove any reference to the Porta Bella Plan. As requested, the Whittaker team is currently revising the RAP and removing specific references to the Porta Bella Plan. Nonetheless, we wish to maintain the references to the integration of site remediation with potential future development on a conceptual level to allow flexibility for any potential future development.

As we discussed during our telephone conversations on May 22nd and June 2nd, 2009, a technical meeting between the DTSC and Whittaker teams will be highly beneficial to discuss application of the selected remedial measures to specific areas referenced in the RAP. To that end, I will contact you to coordinate that meeting. Following our technical meeting and discussions with DTSC, we will make appropriate changes to the text, figures, tables, and appendixes as necessary.

The April 10, 2009, DTSC letter also provided comments related to the Resource Conservation and Recovery Act (RCRA) unit (OU6). DTSC requested a revised "Closure Plan" for the RCRA unit to incorporate pilot and field studies proposed for that area. DTSC anticipates that the revisions to the Closure Plan will trigger Class 2 or 3 modifications to the RCRA Interim Status Hazardous Waste Facility Permit. As I briefed you during our telephone conversations, we are currently reviewing the available closure options for the RCRA unit (i.e., clean closure vs. closure with waste in place). Based on the review of the DTSC comments and our telephone conversations, we understand that modifications to the Closure Plan can be proposed at this time while the pilot and field studies are underway. However, the determination of "clean" vs. "waste in place" closure will need to be made based on the results of the studies as well as an

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assessment of the risks to human health and environment that may be posed by any residual chemicals beneath the RCRA unit. Although we have already started review of this matter, development of modifications to the Closure Plan will require additional time. Therefore, I respectfully request a revised deadline of September 15 for the proposed modifications.

As you are aware, we are making good progress in implementing the work plan for the soil vapor extraction pilot study that has been approved by the DTSC. We have also started the laboratory scale testing portion of our pilot study work plan for Gaseous Electron Donor Injection Technology potentially applicable to deep soil treatment at the site. Meanwhile, we will continue our focus on expediting on-site groundwater containment through implementation of the pilot scale extraction and treatment operation that was approved by DTSC. To that end, we have finished review of the contractors' proposals and have conducted interviews to select a qualified firm. We will make that selection in the next two weeks. In addition, Energy Solutions results of characterization of the depleted uranium (DU) impact in the Areas 57 and 14 and their work plan for DU removal has been finalized and will be submitted to DTSC and the Radiological Health Branch of the California Department of Public Health shortly. In summary, we are making good progress in all areas of compliance with the DTSC order, as I regularly summarize in my monthly project progress summary reports.

Please call me at (949) 642-0245 if you need any additional information. Thank you for your continuous attention and support.

Sincerely,
AMEC Geomatrix, Inc.

Hassan Amini, Ph.D. C.HG.
Project Coordinator

cc: Eric Lardiere, Whittaker Corp; William Weaver, CDM; Jessica Donovan, ENVIRON; Paul Bergstrom, Knight Piésold; Larry Sievers, EODT; Tim Bricker, Santa Clarita L.L.C.; Megan Trend, Chubb Financial Solutions; Cindy Hunter, MariKay Fish, Julie Diebenow, AIG Insurance; Vitthal Hosangadi, NOREAS; John Carty, Zurich North America; Hal Dash, Cerrell Associates; Jeff Hogan, City of Santa Clarita; Yueh Chuang, CH2M Hill; Kathy Stryker Anderson, US Army Corps of Engineers; Robert DiPrimio, Valencia Water Company; Lynn Takaichi, and Meredith Durant, Kennedy Jenks; David Bacharowski, RWQCB; James Leserman, Castaic Lake Water Agency; Steve Cole, Newhall County Water District; Mauricio Guardado, Santa Clarita Water; Neil Elsey, Avion Holdings LLC; Alisa Lacey, Stinson Morrison Hecker LLP; Jeff O'Keefe, Department of Public Health

# Castaic Lake Water Agency
# Memorandum

ITEM NO. 4.1

October 1, 2009

**To:** CLWA Board of Directors

**From:** Brian J. Folsom BJF
Engineering and Operations Manager

**Subject:** Engineering and Operations Department Report

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## TREATMENT PLANT OPERATIONS AND MAINTENANCE

**Completed Work:**

Deliveries to the purveyors in September totaled 4,663 acre-feet (AF), for an average daily flow rate of 51 million gallons per day (MGD). September 2009 deliveries were 8.7% above September 2008 deliveries. The fiscal-year-to-date (FYTD) deliveries for FY 2009/2010 are 15,036 AF, which is 2.2% above FYTD 2008/2009. Monthly flows for 2006, 2007, 2008 and 2009 are presented in the attached table. *(FY 09/10 Action A1.1. Meet all purveyor water demands and Action B3.9: Meet all applicable water quality regulations.)*

FYTD electrical use for FY 2009/10 at the Agency's major facilities is shown in the attached "Energy Usage at Major Facilities" table and equals 2,990,433 kWh at a total cost of $343,452.77.

Inspection and maintenance activities during September included cleaning wash water return basins, chemical feed pump monthly maintenance, on-line analyzer maintenance and fabrication of clarifier screens at RVWTP.

Distribution system maintenance activities during September included preventive maintenance on air release and vacuum valves and pump outs, and exercising of valves. Grading at Sand Canyon Reservoir was completed.

Inspector Activities

Pressure recorders/data loggers readings and GPS coordinates were gathered at various points throughout the system.

Magic Mountain Pipeline/Recycled Water Pipeline Modification: Performed inspections of Security Paving's construction of the Magic Mountain Pipeline Vault Replacement.

Rio Vista Water Treatment Plant Expansion: Inspected soil borings, located underground facilities and collected GPS coordinates of existing utilities throughout jobsite.

Completed 50 dig alerts.

**Work in Progress:**

Maintenance of air release and vacuum valves and pump-outs throughout the distribution system continues. Ozone injector preventive maintenance is ongoing. At RVWTP, a leak was discovered near the plant water line and the area was excavated to determine the source of the leak. Repair of the leak is nearly complete. Electrical switch gear preventive maintenance and testing at all facilities continues.

**Planned Actions:**

Install ozone generator cooling water closed loop system. Perform repairs on plant water tank at Rio Vista Water Treatment Plant.

**PERCHLORATE CONTAMINATION PROGRAM MANAGEMENT**

*(FY 2009/10 Action A4.1: Complete construction of the Groundwater Production Restoration Project; Action A4.2: Complete construction and startup of the Perchlorate Treatment Project; Action A4.8: Develop replacement wells for capacity lost due to perchlorate contamination.)*

**SUMMARY**

Work continues on multiple tasks to address the groundwater contamination stemming from past manufacturing activities on the Whittaker-Bermite site. The Agency and purveyors are proceeding to restore the production capacity of the groundwater supply wells contaminated by perchlorate, while working on the objectives of containing the downgradient migration of perchlorate and recovering costs incurred in responding to the perchlorate contamination.

**PERCHLORATE CONTAMINATION PROGRAM MANAGEMENT**

The following table provides a status report on the activities and tasks:

| Task Group | Tasks | Consultant | Status |
|---|---|---|---|
| **Settlement Activities** | Project Description | K/J | Complete. |
| | Final Settlement | K/J, Nossaman | Settlement agreement took effect on 7/13/07 with U.S. District Court approval. |
| **DTSC Approval Activities** | Remedial Investigation (RI) | K/J | DTSC approved 8/16/05. |
| | Feasibility Study (FS) | K/J | DTSC approved 8/16/05. |
| | Final Remedial Action Plan | K/J | Public hearing held 9/7/05. DTSC approved 1/20/06. |
| U.S. Army Corps of Engineers Feasibility Phase Study | Conceptual Hydrogeology Technical Memorandum | CH2MHill | Final distributed 1/19/05. Progress report with model construction calibration distributed 10/11/05. |
| DPH Approval Activities (97-005) | Source Water Assessment | B&V, CE | Received comments on revised document from DPH 4/27/06. |
| | Effective Monitoring and Treatment | B&V, CE, CH2MHill | Received comments on revised document from DPH 4/27/06. |
| | Water Quality Investigation | B&V, CE | Received comments on revised document from DPH 4/27/06. |
| | Human Health Risk | B&V | Received comments on revised document from DPH 4/27/06. |
| | Source Protection Plan | B&V | Received comments on revised document from DPH 4/27/06. |

| Task Group | Tasks | Consultant | Status |
|---|---|---|---|
| | Alternatives Evaluation | B&V, CE | Received comments on revised document from DPH 5/10/06. Revised document will be returned to DPH with Engineer's Report. |
| | Engineers Report | B&V | Final submitted to DPH 1/29/09. |
| | CEQA | B&V | Mitigated Negative Declaration certified 9/14/05. |
| | Operations and Maintenance Report | K/J | Staff is reviewing K/J draft report submitted on 8/19/09. |
| | Permit Application | B&V | Will be submitted with documents. |
| | Public Hearing | B&V | Will take place upon approval of all documents. |
| | DPH Evaluation and Permit | B&V | Awaiting response from DPH. |
| Implementation Activities | Easements and Right of Way | K/J | Easement and right-of-way acquisition completed 1/08. |
| | Treatment Project | K/J | Project is 96% complete. |
| | Pipeline Project | K/J | Project is 98% complete. |
| | Well Rehabilitation | SCP/GPC | General Pump completed the rehabilitation work on 2/3/09 and installed the new pumps. |
| | Start-up and Monitoring | K/J | Scheduled fall 2009. |
| | Sentinel Wells | Environ | Wells have been installed. Disposal of investigation derived wastes awaits results of laboratory analyses. |

The monthly Technical Committee Meeting was held on September 9, 2009. The next Technical Committee Meeting is scheduled for October 13, 2009. The next Whittaker-Bermite Multi-Jurisdictional Task Force meeting is scheduled for December 9, 2009. A ribbon cutting event was held at the new Perchlorate Treatment Facility on September 22, 2009.

**FINANCIAL STATUS**

The Settlement Agreement among CLWA, the purveyors, Whittaker-Bermite and insurance carriers is in effect. Reimbursement requests have been submitted and payments have been made for expenses through July 31, 2009.

## CAPITAL IMPROVEMENT PROJECTS

### Sand Canyon Pipeline and Reservoir

**Completed Work:**

Nye and Nelson, Inc. completed construction work on July 31, 2009. The Agency approved the Certificate of Acceptance for the project on August 26, 2009 and recorded the Notice of Completion on September 2, 2009.

**Work In Progress:**

Construction contract is in close-out phase.

**Planned Actions:**

Close out project and process final payment to contractor.

### Rio Vista Water Treatment Plant Expansion

*(FY 2009/10 Action B1.26: Complete construction of the RVWTP Expansion Project.)*

**Completed Work:**

The contractor has installed the foundation rebar for the new washwater return basin and the formwork for a portion of the chlorine building walls. The contractor has also constructed a portion of the ozone injection sample stations and prepared the subgrade for the new clarifier structure.

**Work In Progress:**

The contactor is working on the remaining submittals and Kennedy/Jenks Consultants (K/J) is reviewing the submitted submittals. The contractor is installing the formwork for the chlorine building walls and preparing the clarifier structure area for rebar installation. The contractor is also installing electrical duct banks.

**Planned Actions:**

The contractor will continue to prepare and submit his construction submittals and K/J will continue to review them. Construction activities will continue.

### Modification to MWDSC Foothill Feeder Connection

*(FY 2009/10 Action B1.25: Complete construction of the permanent raw water connection to MWDSC's Foothill Feeder pipeline.)*

**Completed Work:**

The connection agreement has been executed. The 60% design submittal has been completed.

**Work in Progress:**

MWDSC and staff are reviewing the 60% submittal.

**Planned Actions:**

MWDSC and staff will be submitting comments to K/J for action.

**Honby Parallel Phase II**

*(FY 2009/10 Action B1.3: Complete design of the Honby Parallel Pipeline Phase 2; Action B1.24: Complete construction of the Honby Parallel Pipeline Phase 2.)*

**Completed Work:**

The City has approved the pipeline alignment and geotechnical data.

**Work in Progress:**

Permits, license agreements and easements are in the process of being acquired. K/J is revising the plans and specifications to address LADWP comments.

**Planned Actions:**

Complete and submit the traffic control plans to the City for approval. Mail notification letters to businesses along the project route to inform them of the project. Acquire permits, license agreement and easements. Submit the revised plans and specifications to LADWP.

**RVWTP Relocate Entrance Gate and Security Kiosk**

*(FY 2009/10 Action B6.2: Complete design of RVWTP entrance gate and security kiosk relocation.)*

**Completed Work:**

Lee & Ro completed the PDR.

**Work In Progress:**

Staff is in the process of requesting Board approval of the final design services.

**Planned Actions:**

Start final design.

**RVWTP Warehouse and Storage Facilities**

*(FY 2009/10 Action B1.16: Complete design of the RVWTP Maintenance Facility Expansion Project.)*

**Completed Work:**

Lee & Ro completed the preliminary plans.

**Work in Progress:**

Staff is reviewing the preliminary plans.

**Planned Actions:**

Staff will meet with Lee & Ro to discuss staff's comments to the preliminary plans.

**ESFP Chemical Storage and Delivery**

**Completed Work:**

SoCal Pacific Construction completed 99% of the construction contract. Remaining work was evaluated and credits and liquidated damages were issued as deductive contract change orders. Notice of Completion for the project was recorded in the Los Angeles County Recorder's Office on August 20, 2009 and the final payment was released on September 30, 2009.

**ESFP Chemical Storage and Delivery**

*(Continued from previous page...)*

**Work in Progress:**

Construction contract is in closeout phase.

**Planned Actions:**

Agency staff will complete the remaining construction items.

**ESFP Drainage and Paving Improvements**

*(FY 2009/10 Action B1.23: Complete construction of the ESFP Drainage and Paving Improvements Project.)*

a) Planning and Preliminary Design for ESFP Drainage and Paving Improvements.

b) ESFP Ozone Injection Station Canopy, Lighting and Pavement Improvements.

**Completed Work:**

a) Notice to Proceed was issued to Civiltec Engineering, Inc. on November 13, 2008. Civiltec completed topographic survey, subsurface investigations, initial Base Map and submitted the Geotechnical Investigation Report and a draft of a Preliminary Design Report. On September 30, 2009, Civiltec submitted recommended alternatives for discussion.

b) Design drawings have been completed.

**Work in Progress:**

a) Civiltec Engineering, Inc. is finalizing the recommendations for a Preliminary Design Report draft.

b) The specifications are being finalized.

**Planned Actions:**

a) Staff will review the proposed design alternatives.

b) Advertise the project for construction bids.

**ESFP Railing and Platform Modifications**

*(FY 2009/10 Action B2.16: Complete modifications of the ESFP railings and platforms.)*

**Completed Work:**

The topographic survey has been completed. Construction drawings for the railing and platform improvements at washwater basin are being finalized. The design of railing and platform improvements at filter gallery was added to the project scope in April 2009. Hilts Consulting Group, Inc. collected and reviewed record drawings information and conducted field investigations and provided 90% submittals plans and specifications for staff review and comments.

**Work in Progress:**

Hilts Consulting Group is reviewing the comments and modifying the plans and specifications.

## ESFP Railing and Platform Modifications

*(Continued from previous page...)*

**Planned Actions:**

On October 5, 2009, meet with the consultant to field verify proposed design details. Consultant anticipates submitting final plans and specifications for staff review and approval in October 2009.

## Recycled Water Program Phase II

*(FY 2009/10 Action B1.27: Complete design and construct Recycled Water Program Phase II.)*

**Completed Work:**

The draft initial study for Phase 2A has been completed. The draft evaluation for the old Honby Pump Station has been completed. The draft design has been completed for the installation of inspection access structures for the old Honby Pipeline.

**Work in Progress:**

Staff is reviewing the draft initial study for Phase 2A and the draft evaluation of the old Honby Pump Station for Phase 2B. K/J is analyzing potential recycled water facilities near Lost Canyon for Phase 2B. Staff is reviewing the draft design of the inspection access structures for the old Honby Pipeline.

**Planned Actions:**

Complete the draft environmental documentation for Phase 2A. Finalize the evaluation of the old Honby Pump Station.

## Kennedy/Jenks Consultants' General Engineering Services Work Authorization

During September, K/J assisted the Agency staff with various engineering tasks including coordinating with the Los Angeles County Sanitation District regarding the treatment and availability of recycled water at the Saugus Water Reclamation Plant and coordinating with Civiltec Engineering, Inc. on the development of the water system hydraulic model and the system emergency storage study.

## FACILITY CAPACITY FEES

*(Goal C1.: Fairness Doctrine - Apply all costs using the Fairness Doctrine by applying costs to those who benefit from an expenditure and ensuring that existing and future users will pay their fair share.)*

**Completed Work:**

During September, 20 new certificates were issued and $145,894 was collected in facility capacity fees, representing approximately 11.7 acre-feet of water demand. For the fiscal year, 54 new certificates have been issued and $1,129,853 has been collected in developer impact fees representing 100.26 acre-feet of water demand.

Attachments

# CASTAIC LAKE WATER AGENCY

## SWP Water Deliveries to Purveyors (Acre-Feet)

| 2006 | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SCWC | 807 | 775 | 428 | 545 | 1,603 | 2,051 | 2,648 | 2,410 | 2,183 | 1,495 | 1,267 | 936 | 17,146 |
| VWC | 821 | 875 | 622 | 887 | 1,736 | 2,050 | 2,360 | 1,412 | 1,614 | 1,574 | 1,327 | 1,035 | 16,313 |
| NCWD | 490 | 347 | 158 | 245 | 589 | 454 | 828 | 625 | 647 | 464 | 597 | 455 | 5,898 |
| LACo | 68 | 75 | 52 | 55 | 113 | 146 | 178 | 161 | 143 | 112 | 105 | 81 | 1,289 |
| Total | 2,186 | 2,072 | 1,260 | 1,732 | 4,041 | 4,701 | 6,013 | 4,608 | 4,586 | 3,644 | 3,295 | 2,508 | **40,646** |
| Cum. YTD | 2,186 | 4,258 | 5,518 | 7,250 | 11,291 | 15,992 | 22,005 | 26,613 | 31,199 | 34,843 | 38,138 | 40,646 | |
| Cum. FYTD | 26,700 | 28,772 | 30,032 | 31,763 | 35,804 | **40,505** | 6,013 | 10,622 | 15,207 | 18,852 | 22,146 | 24,654 | |
| **2007** | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** | **Jul** | **Aug** | **Sep** | **Oct** | **Nov** | **Dec** | **Total** |
| SCWC | 984 | 684 | 1,217 | 1,423 | 2,023 | 2,370 | 2,732 | 2,773 | 2,229 | 1,906 | 1,403 | 926 | 20,669 |
| VWC | 983 | 640 | 1,212 | 908 | 1,871 | 2,003 | 2,046 | 1,857 | 1,767 | 1,428 | 1,270 | 922 | 16,906 |
| NCWD | 436 | 185 | 397 | 578 | 712 | 586 | 765 | 910 | 630 | 443 | 420 | 418 | 6,478 |
| LACo | 83 | 63 | 92 | 102 | 137 | 151 | 174 | 168 | 138 | 122 | 107 | 69 | 1,406 |
| Total | 2,485 | 1,572 | 2,918 | 3,012 | 4,742 | 5,110 | 5,717 | 5,707 | 4,764 | 3,899 | 3,200 | 2,334 | **45,459** |
| Cum. YTD | 2,485 | 4,056 | 6,974 | 9,986 | 14,729 | 19,838 | 25,555 | 31,262 | 36,026 | 39,925 | 43,125 | 45,459 | |
| Cum. FYTD | 27,139 | 28,711 | 31,629 | 34,641 | 39,383 | **44,493** | 5,717 | 11,424 | 16,188 | 20,087 | 23,286 | 25,621 | |
| **2008** | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** | **Jul** | **Aug** | **Sep** | **Oct** | **Nov** | **Dec** | **Total** |
| SCWC | 764 | 707 | 1,203 | 1,273 | 1,795 | 2,333 | 2,446 | 2,283 | 2,064 | 2,044 | 1,162 | 638 | 18,712 |
| VWC | 815 | 583 | 1,631 | 1,443 | 1,640 | 1,845 | 2,159 | 1,761 | 1,577 | 1,419 | 1,000 | 547 | 16,419 |
| NCWD | 414 | 300 | 270 | 344 | 505 | 640 | 767 | 671 | 505 | 493 | 302 | 217 | 5,427 |
| LACo | 56 | 53 | 92 | 116 | 134 | 158 | 167 | 163 | 144 | 127 | 82 | 62 | 1,353 |
| Total | 2,049 | 1,642 | 3,196 | 3,175 | 4,074 | 4,975 | 5,539 | 4,879 | 4,290 | 4,083 | 2,546 | 1,465 | **41,912** |
| Cum. YTD | 2,049 | 3,692 | 6,887 | 10,062 | 14,136 | 19,111 | 24,650 | 29,529 | 33,819 | 37,901 | 40,447 | 41,912 | |
| Cum. FYTD | 27,670 | 29,312 | 32,508 | 35,683 | 39,757 | **44,732** | 5,539 | 10,418 | 14,708 | 18,790 | 21,336 | 22,801 | |
| **2009** | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** | **Jul** | **Aug** | **Sep** | **Oct** | **Nov** | **Dec** | **Total** |
| SCWC | 910 | 367 | 1,106 | 1,448 | 2,135 | 1,896 | 2,073 | 2,300 | 2,032 | 0 | 0 | 0 | 14,267 |
| VWC | 518 | 364 | 923 | 1,242 | 1,135 | 996 | 2,102 | 2,063 | 2,011 | 0 | 0 | 0 | 11,353 |
| NCWD | 242 | 132 | 210 | 415 | 467 | 427 | 937 | 599 | 477 | 0 | 0 | 0 | 3,904 |
| LACo | 75 | 38 | 73 | 102 | 134 | 121 | 152 | 149 | 143 | 0 | 0 | 0 | 986 |
| Total | 1,744 | 901 | 2,312 | 3,207 | 3,870 | 3,440 | 5,263 | 5,110 | 4,663 | 0 | 0 | 0 | **30,510** |
| Cum. YTD | 1,744 | 2,645 | 4,957 | 8,164 | 12,034 | 15,474 | 20,737 | 25,847 | 30,510 | 30,510 | 30,510 | 30,510 | |
| Cum. FYTD | 24,545 | 25,446 | 27,758 | 30,965 | 34,835 | **38,275** | 5,263 | 10,373 | 15,036 | 15,036 | 15,036 | 15,036 | |

10/1/2009

# CASTAIC LAKE WATER AGENCY

## Recycled Water Deliveries to Purveyors (Acre-Feet)

| 2006 | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SCWC | | | | | | | | | | | | | 0 |
| VWC | 14 | 16 | 6 | 12 | 42 | 66 | 75 | 63 | 67 | 33 | 20 | 12 | 427 |
| NCWD | | | | | | | | | | | | | 0 |
| LACo | | | | | | | | | | | | | 0 |
| Total* | 14 | 16 | 6 | 12 | 42 | 66 | 75 | 63 | 67 | 33 | 20 | 12 | **426** |
| Cum. YTD | 14 | 30 | 36 | 48 | 90 | 156 | 231 | 294 | 361 | 394 | 414 | 426 | |
| Cum. FYTD | 284 | 300 | 306 | 318 | 360 | **426** | 75 | 142 | 209 | 242 | 262 | 274 | |
| **2007** | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** | **Jul** | **Aug** | **Sep** | **Oct** | **Nov** | **Dec** | **Total** |
| SCWC | | | | | | | | | | | | | 0 |
| VWC | 17 | 14 | 43 | 38 | 58 | 63 | 78 | 67 | 55 | 37 | 25 | 7 | 501 |
| NCWD | | | | | | | | | | | | | 0 |
| LACo | | | | | | | | | | | | | 0 |
| Total* | 17 | 14 | 43 | 38 | 58 | 63 | 78 | 67 | 55 | 37 | 25 | 7 | **501** |
| Cum. YTD | 17 | 32 | 74 | 112 | 170 | 233 | 311 | 378 | 433 | 469 | 494 | 501 | |
| Cum. FYTD | 291 | 306 | 348 | 386 | 444 | **507** | 78 | 133 | 187 | 224 | 249 | 256 | |
| **2008** | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** | **Jul** | **Aug** | **Sep** | **Oct** | **Nov** | **Dec** | **Total** |
| SCWC | | | | | | | | | | | | | 0 |
| VWC | 4 | 11 | 39 | 37 | 56 | 34 | 26 | 63 | 44 | 38 | 4 | 1 | 358 |
| NCWD | | | | | | | | | | | | | 0 |
| LACo | | | | | | | | | | | | | 0 |
| Total* | 4 | 11 | 39 | 37 | 56 | 34 | 26 | 63 | 44 | 38 | 4 | 1 | **358** |
| Cum. YTD | 4 | 16 | 54 | 92 | 147 | 182 | 208 | 271 | 315 | 353 | 357 | 358 | |
| Cum. FYTD | 260 | 271 | 310 | 348 | 403 | **438** | 26 | 89 | 133 | 171 | 175 | 176 | |
| **2009** | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** | **Jul** | **Aug** | **Sep** | **Oct** | **Nov** | **Dec** | **Total** |
| SCWC | | | | | | | | | | | | | 0 |
| VWC | 8 | 3 | 24 | 39 | 30 | 46 | 71 | 59 | 17 | 0 | 0 | 0 | 298 |
| NCWD | | | | | | | | | | | | | 0 |
| LACo | | | | | | | | | | | | | 0 |
| Total* | 8 | 3 | 24 | 39 | 30 | 46 | 71 | 59 | 17 | 0 | 0 | 0 | **298** |
| Cum. YTD | 8 | 11 | 35 | 74 | 104 | 150 | 221 | 280 | 298 | 298 | 298 | 298 | |
| Cum. FYTD | 184 | 187 | 211 | 250 | 280 | **326** | 71 | 88 | 105 | 105 | 105 | 105 | |

10/1/2009

**FY 2009/10**
**Energy Usage at Major Facilities**

| Service Date From | Service Date To | Usage kWh Total | Usage kVarh Total | Total $ Amount |
|---|---|---|---|---|
| **Earl Schmidt Intake Pump Station** | | | | |
| 07/01/09 | 07/29/09 | 4,008 | 4,302 | $489.20 |
| 07/29/09 | 08/27/09 | 7,226 | 10,163 | $6,311.53 |
| | | **Total** | | **$6,800.73** |
| **Earl Schmidt Filtration Plant** | | | | |
| 07/01/09 | 07/28/09 | 118,668 | 89,844 | $12,575.44 |
| 07/28/09 | 08/26/09 | 124,925 | 97,018 | $13,573.19 |
| | | **Total** | | **$26,148.63** |
| **Honby Pump Station** | | | | |
| 07/01/09 | 07/22/09 | 0 | | $67.28 |
| 07/22/09 | 08/20/09 | 0 | | $94.80 |
| | | **Total** | | **$162.08** |
| **Recycled Water Meter** | | | | |
| 07/01/09 | 07/10/09 | 10,987 | 4,197 | $1,617.58 |
| 07/10/09 | 08/10/09 | 37,110 | 14,067 | $5,325.10 |
| | | **Total** | | **$6,942.68** |
| **Rio Vista Intake Pump Station** | | | | |
| 07/01/09 | 07/29/09 | 578,750 | 206 | $73,917.27 |
| 06/29/09 | 07/29/09 | | | $10.00 |
| 07/29/09 | 08/27/09 | 632,506 | 142,890 | $80,482.94 |
| | | **Total** | | **$154,410.21** |
| **Rio Vista Water Treatment Plant** | | | | |
| 07/01/09 | 07/29/09 | 183,775 | | $15,847.44 |
| 07/29/09 | 08/27/09 | 190,833 | | $16,335.09 |
| | | **Total** | | **$32,182.53** |
| **Sand Canyon Pump Station** | | | | |
| 07/01/09 | 07/29/09 | 467,599 | 168,661 | $53,803.10 |
| 07/29/09 | 08/27/09 | 574,056 | 202,627 | $63,002.81 |
| | | | | **$116,805.91** |
| | **TOTAL** | **2,930,443** | | **$343,452.77** |

**Castaic Lake Water Agency News Release**
**September 14, 2009**

**NEWS RELEASE**
**DATE: September 14, 2009**
**FOR IMMEDIATE RELEASE**

CONTACT: Dan Masnada (661) 297-1600 ext. 239
Brian Folsom (661) 297-1600 ext. 270

CASTAIC LAKE WATER AGENCY

## CLWA TO CELEBRATE COMPLETION OF PROJECT TO RESTORE GROUNDWATER PRODUCTION CAPACITY IMPACTED BY PERCHLORATE CONTAMINATION

The Castaic Lake Water Agency (CLWA), in partnership with the CLWA Santa Clarita Water Division, Newhall County Water District, Valencia Water Company and the City of Santa Clarita, will be holding an event celebrating completion of a project to restore groundwater production capacity impacted by perchlorate contamination and stop migration of a contaminant plume emanating from the former Whittaker-Bermite site in the center of the Santa Clarita Valley. The event is scheduled for Tuesday, September 22, 2009 at 9:30 a.m. at CLWA Rio Vista Intake Pump Station (RVIPS) located at 26401 Bouquet Canyon Road. The RVIPS is the stucco building to the left of In-N-Out Burger near Lowe's Home Improvement Warehouse.

After years of negotiations and studies, regulatory agencies, property owners and water suppliers agreed on the process to clean up ammonium perchlorate contaminating a portion of the local groundwater basin. The contamination is a result of manufacturing and storing explosives, fireworks and munitions over 50 years at the approximate 996 site.

The project to restore the well production capacity and mitigate the migration of the perchlorate plume began in 2007. Pumping and treatment operations will occur on a continuous basis over a number of decades. The affected groundwater will be pumped from two existing wells through a dedicated underground pipeline to the new perchlorate treatment plant located at CLWA's RVIPS. The project will remove the perchlorate from the pumped groundwater using ion exchange technology. The treated groundwater will then be disinfected and pumped into the CLWA distribution system.

Other activities on the project include continual monitoring of the wells and further characterization of the groundwater contamination to ensure migration of the contaminate plume is fully contained. The entire process will be overseen by State regulatory agencies to ensure public health and safety. The successful completion of the project would not be possible without the mutual cooperation of many parties in addition to the four water agencies and the City, including the U.S. Army Corps of Engineers, California Department of Public Health, California Department of Toxic Substances Control, Los Angeles County Department of Public Works, community groups, Whittaker Corporation, and numerous consultants, contractors, and suppliers.

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Friends of Santa Clara River v. Castaic Lake Water Agency
Cal.App. 5 Dist.,2004.

Court of Appeal, Fifth District, California.
FRIENDS OF the SANTA CLARA RIVER et al.,
Plaintiffs and Appellants,
v.
CASTAIC LAKE WATER AGENCY et al.,
Defendants and Respondents.
**No. F043273.**

Sept. 22, 2004.
Rehearing Denied Oct. 14, 2004.

**Background:** Nonprofit corporations petitioned for writ of mandate against water districts and agencies alleging an urban water management plan was adopted in violation of the Urban Water Management Planning Act (UWMP Act). The Superior Court of Kern County, No. 245365,Richard J. Oberholzer, entered judgment denying the writ. Corporations appealed.

**Holding:** The Court of Appeal, Cornell, J., held that plan's description of the reliability of groundwater was inadequate because of the failure to address timing issues related to perchlorate contamination.

Reversed and remanded.

West Headnotes

**[1] Waters and Water Courses 405 196**

405 Waters and Water Courses
405IX Public Water Supply
405IX(A) Domestic and Municipal Purposes
405k196 k. Purity of Water and Protection Thereof from Pollution or Diversion. Most Cited Cases
The role of an appellate court in reviewing an administrative record for a prejudicial abuse of discretion under the Urban Water Management Planning Act (UWMP Act) is precisely the same as the role of the superior court and, therefore, the lower court's findings of fact and conclusions of law are not binding on the appellate court. West's Ann.Cal.Water Code § 10651.

**[2] Waters and Water Courses 405 196**

405 Waters and Water Courses
405IX Public Water Supply
405IX(A) Domestic and Municipal Purposes
405k196 k. Purity of Water and Protection Thereof from Pollution or Diversion. Most Cited Cases
Under the Urban Water Management Planning Act (UWMP Act), a water plan's description of the reliability of the groundwater supplied from a formation and an aquifer was inadequate because of the failure to address timing issues related to perchlorate contamination; simply stating that a treatment technology was available and that a groundwater treatment plan was being developed, without discussing when the plan would need to be implemented and the amount of time needed for its implementation, left a temporal gap in the description of the reliability of the water source, which rendered the UWMP legally inadequate. West's Ann.Cal.Water Code § 10631(c).
*See 63 Cal.Jur.3d, Water, § 1131.*
****625** Law Offices of Stephan C. Volker, Stephan C. Volker, San Francisco, and Gretchen E. Dent, San Jose, for Plaintiffs and Appellants.
Horvitz & Levy, Encino, William N. Hancock, San Francisco, Jon B. Eisenberg, Encino; McCormick, Kidman & Behrens, Russell G. Behrens and David D. Boyer, Costa Mesa, for Defendants and Respondents Castaic Lake Water Agency and Santa Clarita Water Company.
Gatzke Dillon & Ballance, Mark J. Dillon, Carlsbad, Michael S. Haberkorn and Heather S. Riley for Defendant and Respondent Valencia Water Company.

***3 OPINION**

CORNELL, J.
Friends of the Santa Clara River and the Sierra Club appeal from the denial of their petition for writ of mandate alleging an urban water management plan for parts of the Santa Clarita Valley was adopted in violation of the Urban Water Management Planning

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Act (UWMP Act), ****626**Water Code section 10610 et seq.[FN1] Among the many grounds for reversal asserted is ***4** the failure of the urban water management plan to assess the reliability of the water supply obtained from two layers of an aquifer contaminated with perchlorate.

> FN1. All further statutory references are to the version of the Water Code in effect during 2000 unless otherwise indicated.

Certain aspects of the urban water management plan concerning the effects of perchlorate contamination on the groundwater supply can be summarized as follows. If there is a dry stretch, the districts plan to take more water from the Saugus Formation. If the perchlorate contamination impairs the supply of water taken from the Saugus Formation in dry years, the districts plan to restore full production capacity by treating the contaminated water. While the treatment facilities are being built, the districts have no plan to cover the reduction in water available from the Saugus Formation.

Thus, the plan's description of the perchlorate contamination and the method for addressing that contamination is flawed because it fails to (1) address the time needed to implement the available method for treating the contaminated water and (2) describe the reliability of the groundwater supply during that implementation period. As this gap in the reliability analysis is sufficient for reversal, we do not address the other challenges to the adoption of the plan.[FN2]

> FN2. The failure to address the other challenges should not give rise to any inference as to their merit.

## FACTUAL AND PROCEDURAL SUMMARY

### I. Parties

Friends of the Santa Clara River is a nonprofit corporation organized under the laws of the State of California in 1993. Some of its members reside within the subject service area and are ratepayers. The Sierra Club is a nonprofit corporation formed under the laws of the State of California in 1892. These parties are referred to collectively as plaintiffs.

Castaic Lake Water Agency (CLWA) is a public agency created and governed by the uncodified Castaic Lake Water Agency Law. (Stats.1962, 1st Ex.Sess., ch. 28, § 1, p. 208, reprints at 72A West's Ann. Wat.-Appen. (1999 ed.) § 103-1 et seq., p. 487.) CLWA was formed to provide a supplemental supply of imported water to the water purveyors of the Santa Clarita Valley. Its area of wholesale water service covers approximately 195 square miles. CLWA contracts with California's Department of Water Resources for water from the State Water Project (SWP) and other sources, treats those supplies at its treatment plants, and delivers the treated water to water retailers within its area.

***5** Newhall County Water District (Newhall) is a district formed by election under California's County Water District Law (§ 30000 et seq.). Newhall is a retail water purveyor serving an area of approximately 34 square miles and supplies groundwater pumped from wells supplemented by imported water purchased from CLWA. At the end of 1999, Newhall served approximately 6,758 connections, i.e., accounts.[FN3]

> FN3. On May 20, 2004, Newhall filed a request for withdrawal of its brief that did not explain the reason for the request but acknowledged that if withdrawal was granted, this court, in accordance with California Rules of Court, rule 17(a)(2), would decide the appeal based on the record, the opening brief, the briefs of the other defendants, and oral argument.

Santa Clarita Water Company (SCWC) is a California corporation and retailer of ****627** water. SCWC's service area includes portions of the City of Santa Clarita and unincorporated areas of Los Angeles County in the communities of Saugus, Canyon Country and Newhall. SCWC supplies water from groundwater wells and imported water purchased from CLWA.[FN4]At the end of 1999, SCWC served approximately 21,100 connections.

> FN4. The relationship between CLWA and SCWC was, at one time, more than that of wholesaler and retailer. (See *Klajic v. Castaic Lake Water Agency* (2001) 90 Cal.App.4th 987, 109 Cal.Rptr.2d 454 [writ of mandate sought to compel CLWA to

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divest itself of its ownership of all stock of SCWC].)

Valencia Water Company (VWC) is a California corporation and retailer of water. VWC's service area is approximately 25 square miles and includes portions of the City of Santa Clarita, the community of Valencia, and the unincorporated areas of Castaic and Stevenson Ranch. VWC supplies water from groundwater wells and imported water purchased from CLWA. At the end of 1999, VWC served approximately 20,865 connections.

CLWA, Newhall, SCWC and VWC are referred to collectively as defendants.

Defendants jointly caused the preparation of the 2000 Urban Water Management Plan (UWMP) under the UWMP Act to cover the service area of CLWA.

**II. Sources of Water for the Santa Clarita Valley**

Historically, the Santa Clarita Valley obtained its water supply from an underground water basin, or aquifer, that is about 84 square miles and is divided into an upper and lower level. The shallow level, called the Alluvial Aquifer, underlies the Santa Clara River and its tributaries. Water from this layer is obtained from wells up to 200 feet deep. Beneath the Alluvial Aquifer is a deeper layer of groundwater called the Saugus Formation. Water from the Saugus Formation is pumped from wells extending to approximately 2,000 feet in depth.

***6** Based on historical production, the UWMP estimates (1) the Alluvial Aquifer will supply 30,000 to 40,000 acre-feet per year in normal weather years and 30,000 to 35,000 acre-feet per year in dry years, and (2) the Saugus Formation will supply 7,500 to 15,000 acre-feet per year in normal weather years and 11,000 to 15,000 acre-feet per year in dry years. At the time the UWMP was adopted, groundwater from the aquifer accounted for approximately 54 percent of the water supplied in the CLWA service area.

Since 1980, imported water from the SWP has supplemented local supplies to meet community water requirements. CLWA owns three entitlements to water from the SWP that total 95,200 acre-feet per year.[FN5] In 1966, CLWA entered into a contract with the SWP for 41,500 acre-feet of water per year. In the 1980's, CLWA purchased an entitlement to 12,700 acre-feet per year of SWP water from a Kern County water district. In 1999, CLWA acquired an entitlement to 41,000 acre-feet per year of SWP water from the Kern County Water Agency and its member district, Wheeler Ridge-Maricopa Water Storage District.[FN6]

FN5. This annual contractual entitlement represented about 2.3 percent of the 4.2 million acre-feet per year the SWP was contracted to deliver to 29 contracting agencies. The California Department of Water Resources' contractual obligations to deliver water through the SWP, and the reliability of the delivery, is discussed in greater detail in *Planning & Conservation League v. Department of Water Resources* (2000) 83 Cal.App.4th 892, 908, footnote 5, 100 Cal.Rptr.2d 173.

FN6. The agreement for the acquisition is described in *Friends of the Santa Clara River v. Castaic Lake Water Agency* (2002) 95 Cal.App.4th 1373, 1375, 116 Cal.Rptr.2d 54.

****628 III. Proposal and Adoption of the UWMP**

On Wednesday, November 22, 2000, defendants released a draft of the UWMP to the public for review and comment. CLWA indicated that public comments would be accepted only if received by it by 6:00 p.m., December 7, 2000.

The general manager of the United Water Conservation District sent a comment letter that expressed concerns about (1) the way the UWMP's draft presented existing and future water supplies, (2) reliance on groundwater banking projects that were unavailable to CLWA or years away from operation, and (3) the uncertainty of how the Saugus Formation will react to the higher levels of pumping proposed. In particular, the letter states:

"In the legislation concerning Urban Water Management Plans, agencies are asked to consider existing and future sources of water. This is particularly useful to those using the Plan, since supply shortfalls can be recognized and future

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projects can be identified to supplement the existing sources of water. ***7** Our largest concern is that the draft of the Plan tends to combine existing sources with future potential sources so that it is difficult to establish where you are now and where you need to go. Thus, it is difficult to determine the present state of the supply and the timing of need for specific future projects. An example, which we will explain in more detail below, is the listing of various out-of-area storage projects as part of the year 2000 water supply (e.g., Figure 1-12). This approach implies that these projects are needed now (they are not) and that they could supply water to [CLWA] now (they cannot)."

On December 6, 2000, defendants conducted a joint public hearing concerning the UWMP. On December 20, 2000, the boards of the defendant water agencies held a joint meeting and approved the UWMP. CLWA submitted the UWMP to the California Department of Water Resources, and the submission was completed on February 5, 2001.

**IV. Lawsuit**

On April 23, 2001, plaintiffs filed a verified petition for writ of mandate challenging defendants' approval of the UWMP based on alleged violations of the UWMP Act and the public trust doctrine. The County of Ventura also filed a petition for writ of mandate challenging defendants' approval of the UWMP. The two petitions were consolidated into a single case and transferred to the Kern Superior Court.

Plaintiffs' cause of action based on the public trust doctrine was dismissed without leave to amend as a result of demurrers filed by defendants. Plaintiffs' cause of action based on violations of the UWMP Act was heard on the merits by the superior court on January 21, 2003, and February 4, 2003.

On April 8, 2003, the superior court filed an "Order and Findings: Statement of Decision" in which it denied the petitions for writ of mandate.[FN7] Defendants filed memoranda of costs. Defendants CLWA and SCWC jointly requested costs in the amount of $59,179.04. Defendant VWC claimed $8,416.78 in costs. Plaintiffs filed a motion to tax costs that challenged the recovery of certain costs related to the preparation of the administrative record, [FN8]****629** such as "the cost of copies, including Bates stamping ($49,203.77), offsite duplication ($132.84 and $430.45), binders ($1,175.84, $421.53 and ***8** $177.49), and [VWC's] administrative record charges ($4,191.31)." [FN9] The superior court heard the motion to tax costs on July 1, 2003, and awarded CLWA and SCWC costs in the amount of $55,469.72 and awarded VWC costs in the amount of $6,575.06.

FN7. The County of Ventura did not appeal from the denial of its petition.

FN8. The administrative record of proceedings submitted to the superior court was organized into 37 three-ring binders and contained 17,766 pages.

FN9. The invoice from Whitmont Legal Copying, Inc., to counsel for CLWA and SCWC in the amount of $49,203.77 for copies and Bates labeling appears to cover the production of 16 copies of the administrative record. After subtracting the $1,065.96 charged to generate and apply the Bates labels, the average cost per page for the copies of the administrative record came to approximately 16.93 cents (($49,203.77 $1,065.96) (17,766 pages 16 copies) = $0.16934 per page).

Subsequently, judgment was entered in favor of defendants and plaintiffs appealed.

**DISCUSSION**

In 1983, the Legislature adopted the UWMP Act to promote the active management of urban water demands and efficient water usage in order to protect the people of the state and their water resources. (Stats.1983, ch. 1009, § 1, p. 3556.) To achieve the goal of water conservation and efficient use, urban water suppliers are required to develop water management plans that include long-range planning to ensure adequate water supplies to serve existing customers and future demands for water. (§ 10610.2, subds.(d) & (e).) The plans must consider a 20-year time horizon (§ 10631, subd. (a)) and must be updated "at least once every five years on or before December 31, in years ending in five and zero" (§ 10621, subd. (a)). The UWMP Act requires plans to address specific issues. (§§ 10631, 10632 & 10633.) It also sets forth the procedural steps that urban water

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suppliers must follow when preparing, reviewing, and amending their plans. (§§ 10640-10645; see generally Waterman, *Addressing California's Uncertain Water Future By Coordinating Long-Term Land Use and Water Planning: Is A Water Element in the General Plan the Next Step?*(2004) 31 Ecology L.Q. 117, 162-166 [overview of the UWMP Act].)

**I. Standard of Review**

In a mandate proceeding to review the decision of a public agency to adopt an urban water management plan, the standard of our review is set forth in section 10651, which provides:

"In any action or proceeding to attack, review, set aside, void, or annul a plan, or an action taken pursuant to the plan by an urban water supplier on the grounds of noncompliance with this part, the inquiry shall extend only to whether there was a prejudicial abuse of discretion. Abuse ***9** of discretion is established if the supplier has not proceeded in a manner required by law or if the action by the water supplier is not supported by substantial evidence."

Although no published decision has applied section 10651, the statutory language is similar to Public Resources Code section 21168.5, which applies to some of the mandamus proceedings brought under the California Environmental Quality Act (CEQA), Public Resources Code section 21000 et seq.

[1] The role of an appellate court in reviewing an administrative record for a "prejudicial abuse of discretion" under section 10651 is precisely the same as the role of the superior court and, therefore, the lower court's findings of fact and conclusions of law are not binding on the appellate court. (See ****630***San Joaquin Raptor /Wildlife Rescue Center v. County of Stanislaus* (1994) 27 Cal.App.4th 713, 722, 32 Cal.Rptr.2d 704 [review conducted under Pub. Resources Code, § 21168.5].)

Plaintiffs contend that the defendants "ha[ve] not proceeded in a manner required by law" as that phrase is used in section 10651 and thus have prejudicially abused their discretion in adopting the UWMP. In particular, plaintiffs claim the UWMP does not comply with section 10631 because it (1) erroneously conflates existing sources with planned sources, (2) improperly characterizes supplies that are merely potential as "planned sources of water available to the supplier" (§ 10631, subd. (b)), and (3) fails to evaluate adequately the reliability of existing sources of water, such as groundwater from the aquifers and imported water from the SWP. Plaintiffs also contend that many of the findings of fact made in the UWMP are not supported by substantial evidence.

Defendants argue that all of the deficiencies alleged by plaintiffs are merely claims that the weight of the evidence does not support the conclusions of the agencies. As it is not our function to reweigh the evidence, but to determine if there is substantial evidence to support the findings of the UWMP, the plaintiffs must fail if there is such substantial evidence. Defendants claim that such substantial evidence exists in the record. Defendants also seem to imply that since the UWMP is subject to modification at any time and must be reviewed every five years (§ 10621, subd. (a)), any deficiency is not prejudicial.

**II. Reliability of Groundwater Sources and Perchlorate Contamination**

Plaintiffs have raised a number of issues concerning the discussion in the UWMP regarding the quantity and quality of available groundwater. Some of the issues relate to the perchlorate contamination of the groundwater.

****10 A. Testimony Regarding Perchlorate Contamination***

To support their claims concerning the inadequacy of the UWMP's discussion of perchlorate contamination, plaintiffs cite the following testimony given before the Public Utilities Commission by Steven B. Bachman, a geologist employed by the primary water wholesaler in the County of Ventura who also does consulting work for the County of Ventura.

"There is a significant area of perchlorate contamination to the east of the wells that pump from the Saugus Aquifer. The perchlorate has seeped into the Saugus Aquifer and has flowed westward towards the wells, shutting down 25 percent of the total Saugus Aquifer wells. [¶] ... [¶]

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"The extent of the perchlorate contamination in the Saugus Aquifer is not yet known, largely because there is a lack of wells to monitor west of well VWC No. 157.... Perchlorate that is still in the soils at the contamination site will be 'a long-term source of contamination' that will continue to reach the aquifers as rains and runoff push the contaminants in the soil into the groundwater system.... [¶] ... [¶]

"The concentration of perchlorate in the production wells probably represents the leading edge of a much larger plume of higher concentrations of perchlorate. The total area of the Saugus Aquifer contaminated by the perchlorate has yet to be fully defined. We do know that the contaminant has migrated a minimum of 2 miles through the subsurface and over land to contaminate the vital pumping areas. (Exhibit 23.) Since the groundwater gradients in the contaminated area in the Saugus are towards ****631** the west, the contaminant is likely to continue to migrate further west and northwest. Time of travel from the soil contamination sites to the deep Saugus wells implies that the contaminant has been moving between 1 to 3 feet per day within the Saugus Aquifer. This implies that the perchlorate could impact [VWC's] well No. 201 as early as next year. Further down gradient is [VWC's] well No. 160."

Also, Richard D. McJunkin, a senior hydrogeologist with the California Department of Toxic Substances Control, testified that increased pumping of water from wells near the contamination site will accelerate the flow of the perchlorate contamination.

***B. Contents of UWMP***

Perchlorate contamination is discussed in chapters 1, 2 and 6 of the UWMP. Chapter 1 of the UWMP is titled Introduction and Summary. Section 1.6 of the UWMP describes the water supply, including groundwater taken ***11** from both layers of the underground water basin. Section 1.6A. of the UWMP contains the following summary of the quality of the groundwater:

"Groundwater quality can be compromised by the presence of contaminants. Perchlorate was recently discovered in Saugus Formation groundwater at a site formerly occupied by an industry located in the area. Wells found exceeding the legal limit of this contaminant were shut down, and a groundwater cleanup plan is being developed using proven treatment methods which can restore full production capability."

Chapter 2 of the UWMP is titled "Water Supply Resources." The introductory paragraphs in that chapter contain the following statements about groundwater and perchlorate contamination:

"There is a range of opinion about issues such as the annual yield capability from groundwater basins. Accordingly, the [UWMP] recognizes that active management of resources may be necessary to achieve the projected supply. A number of management activities are thus described in this chapter, such as a water treatment program to remove perchlorates from the Saugus Formation. Many similar programs have been successfully implemented, including the water recharge and water quality management programs of groundwater in Orange County, which in recent years have enhanced the annual yield from this important source of local supply. Although there are water supply and water quality issues to be addressed in relation to groundwater supplies, the availability of active management options to address these issues creates a high probability that the annual yields discussed in this chapter can be sustained."

The "water treatment program to remove perchlorates from the Saugus Formation" is described subsequently in section 2.1A. of the UWMP as follows:

"In addition to [total dissolved solids] concerns, water quality problems have been observed in Southern California recently that could affect groundwater supply availability, in particular, the local discovery of perchlorate. Perchlorate is used in the manufacture of solid rocket propellants, munitions, and fireworks, and can be treated and removed from groundwater. Aerojet has implemented biological treatment in Rancho Cordova, California and is re-injecting the treated water into the ground. The California Department of Health Services has not yet approved biological treatment for a drinking water end use.

****632** "An ion exchange process has also been developed that successfully treats and removes

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perchlorate. This process is called the continuous ion exchange ***12** system. The system has been successfully piloted at Jet Propulsion Laboratory and at a location in Main San Gabriel Basin. The treatment cost for this process is about $300 per acre-foot excluding the cost of brine disposal. Discussions are currently underway with the owners of the property identified as the source of the local contamination on groundwater cleanup. No perchlorate has been detected in Alluvial Aquifer wells to date, although some has been detected in monitoring wells located on the contaminating site."

These two paragraphs and the above quoted statement from the introductory materials are the only mention of perchlorate contamination in chapter 2 of the UWMP and its effect on the reliability or availability of water supplied from the aquifers.

Chapter 4 of the UWMP is titled Reliability Planning and does not mention perchlorate contamination or describe its effect on the reliability of the aquifers as a source of groundwater.

The description in chapters 1 and 2 of the UWMP of perchlorate contamination and its impact on the supply of water from the underground water basin can be summarized as follows: (1) An unspecified number of wells in the Saugus Formation have been shut down because of perchlorate contamination; (2) perchlorate has not been found in supply wells in the Alluvial Aquifer but has been found in monitoring wells on the contaminating site; (3) perchlorate contamination in water can be treated with an ion exchange process at a cost of over $300 per acre-foot; (4) defendants and the owners of the site contaminated with perchlorate are discussing groundwater cleanup; and (5) available options to address the perchlorate issues create a high probability that the annual yields discussed in the UWMP can be sustained.[FN10]

> FN10. Section 6.4 of the UWMP summarizes the earlier discussion of the perchlorate contamination as follows: "The recent detection of perchlorate in the Saugus Formation is an example of prior contamination due to industrial chemical processes. The few wells affected have been shut down, effective treatment technologies have been developed, and a plan is being worked out to remove the contamination from the groundwater."

***C. Matters Not Discussed in the UWMP***

The UWMP mentions "a groundwater cleanup plan ... being developed" (UWMP, § 1.6A.) to address the perchlorate contamination, but it does not mention what stage of development has been reached or how much longer it will take to complete and implement that plan.[FN11] Assuming the length of time ***13** needed to implement the plan is uncertain, the UWMP does not describe the factors that have caused that uncertainty.[FN12]

> FN11. As a result of the failure to describe the timing, the UWMP also does not describe plans to replace contaminated sources with alternative sources of water until the treatment option is implemented. (See § 10631, subd. (c).)

> FN12. For example, implementation of the ion exchange process may be subject to review under CEQA because the disposal of the brine created by that process may have a significant environmental impact and the CEQA review process would increase the amount of time needed to implement the treatment process.

Timing considerations of other aspects of the perchlorate contamination also affect the reliability of the supply of groundwater. For instance, the UWMP does not ****633** state how fast the perchlorate contamination is spreading in either the Saugus Formation or the Alluvial Aquifer, how far it might reach within the 20-year period covered by the UWMP, or how the rate of migration is affected by factors, such as the increased use of Saugus Formation in dry years. To the extent that the answers to these timing issues are uncertain, the UWMP does not discuss how this uncertainty affects the reliability of the supply of groundwater. More specifically, the UWMP does not state how it reached the implicit determination that the quantities of groundwater set forth in the UWMP met the reliability criterion of 90 percent, i.e., there was a 90 percent level of certainty that those amounts would be available.[FN13]

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> FN13. Section 1.7A. of the UWMP states that "The [reliability] criterion set for this [UWMP] is that there must be a water supply sufficient to meet projected demands 90 percent of the time, or in 18 out of the next 20 years."

The lack of information in the UWMP regarding how long it would take to implement the ion exchange process to treat perchlorate contaminated water pumped from the Saugus Formation or the Alluvial Aquifer stands in contrast to figure 1-14 in the UWMP, which sets forth a program implementation schedule for other programs related to water supply, such as (1) drilling new wells in the Saugus Formation (feasibility-six months, design-three months, construction & permitting-nine months), (2) negotiating water transfer agreements (15 months), (3) water recycling, (4) water banking programs, and (5) desalination.

***D. The UWMP Did Not Comply with Section 10631***

Section 10631 specifies some of the mandatory contents of an urban water management plan. Under subdivision (b) of section 10631, a plan shall "[i]dentify and quantify, to the extent practicable, the existing and planned sources of water available to the supplier over ... five-year increments" to 20 years or as far as data is available. Subdivision (c) of section 10631 provides:

"Describe the reliability of the water supply and vulnerability to seasonal or climatic shortage, to the extent practicable, and provide data for each of ***14** the following: [¶] (1) An average water year. [¶] (2) A single dry water year. [¶] (3) Multiple dry water years.

"For any water source that may not be available at a consistent level of use, given specific legal, environmental, water quality, or climatic factors, describe plans to replace that source with alternative sources or water demand management measures, to the extent practicable."

Plaintiffs contend the UWMP fails to comply with section 10631 in that it does not evaluate adequately the reliability of the Saugus Formation and the Alluvial Aquifer as sources of water because the UWMP understates the perchlorate contamination and ignores the migration of that contamination.

When any water source may not be available at a consistent level of use, the UWMP must describe plans to replace that source with alternative sources. (§ 10631, subd. (c).) In this case, the Saugus Formation and Alluvial Aquifer may be sources that are not available at a consistent level because of the environmental and water quality concerns raised by the perchlorate contamination. Furthermore, the implementation of a process to treat water pumped from those sources cannot be implemented instantaneously. If the decision to implement a water treatment process is not made until a dry year has begun or until after the start of multiple ****634** dry years, the reliability of the water supply available during those dry periods could be affected significantly.

[2] Accordingly, we conclude that the UWMP's description of the reliability of the groundwater supplied from the Saugus Formation and Alluvial Aquifer is inadequate under subdivision (c) of section 10631 because of the failure to address timing issues related to the perchlorate contamination.[FN14] Simply stating that a treatment technology is available and that a groundwater treatment plan is being developed without discussing when the plan may need to be implemented and the amount of time needed for its implementation leaves a temporal gap in the description of the reliability of the water source. This gap renders the UWMP legally inadequate.

> FN14. This holding can be restated in the language of section 10610.2, subdivision (d) as follows. Because of the failure to address the timing issues, the UWMP does not show that the defendants have made "every effort to ensure the appropriate level of reliability in [their] water service sufficient to meet the needs of [their] various categories of customers during normal, dry, and multiple dry years." (*Ibid.*)

***15** Without a reliable analysis of the availability of water, the UWMP is fatally flawed. The public and the various governmental entities that rely on the UWMP may be seriously misled by it and, if the wrong set of circumstances occur,[FN15] the consequences to those who relied on the UWMP, as well as those who share a water supply with them,

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could be severe. The ability to modify and review the plan does not overcome the initial failure.

> FN15. Those circumstances could include a prolonged drought, increased reliance on groundwater from the Saugus Formation, accelerated spread of the perchlorate contamination within the formation, and problems or delays in implementing the ion exchange.

The judgment must be reversed as defendants did not proceed in a manner required by law in their preparation of the UWMP, thus prejudicially abusing their discretion. (§ 10651.)

**III. Recoverable Costs**

As the judgment against plaintiffs will be reversed, we need not address the issues raised in connection with their attack on the costs awarded to defendants, such as whether defendants were entitled to recover the expense incurred for *additional* copies of the administrative record (see Cal. Administrative Mandamus (Cont.Ed.Bar 3d ed. 2003) Recoverable Costs, § 10.15, pp. 360-361 (5/04)).

**DISPOSITION**

The judgment is reversed and the matter is remanded to the superior court with directions to grant the petition for a writ of mandate vacating defendants' approval of the 2000 Urban Water Management Plan. Friends of the Santa Clara River and Sierra Club shall recover their costs on appeal from Castaic Lake Water Agency, Santa Clarita Water Company and Valencia Water Company. Newhall County Water District's request to withdraw its respondent's brief is granted.

WE CONCUR: VARTABEDIAN, Acting P.J., and BUCKLEY, J.
Cal.App. 5 Dist.,2004.
Friends of Santa Clara River v. Castaic Lake Water Agency
123 Cal.App.4th 1, 19 Cal.Rptr.3d 625, 34 Envtl. L. Rep. 20,118, 04 Cal. Daily Op. Serv. 9281, 2004 Daily Journal D.A.R. 12,676

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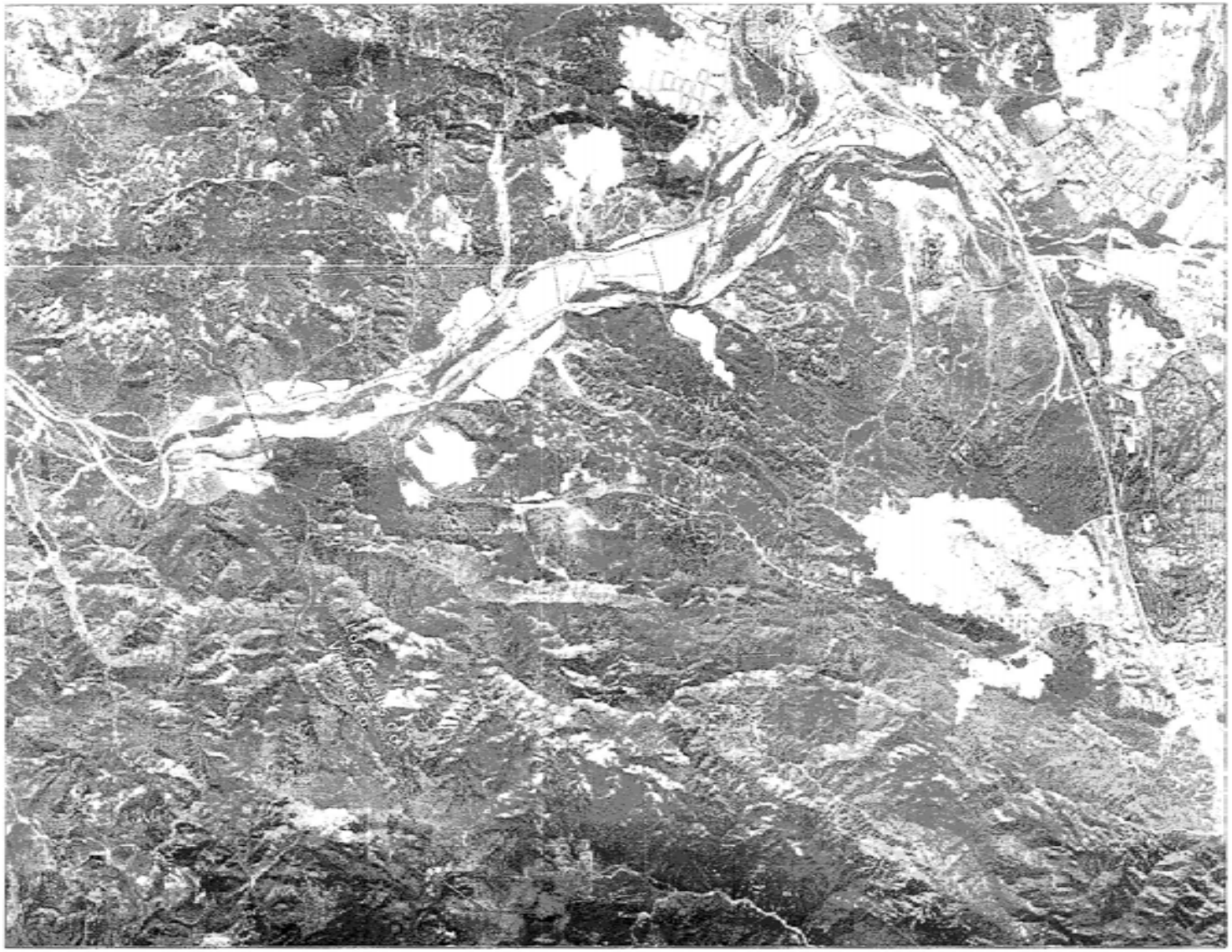


L E G E N D

Newhall Ranch Specific Plan Boundary

Irrigated Agricultural Lands - NRSP

Irrigated Agricultural Lands - outside NRSP

FORMA

Newhall Land Historically Irrigated Agricultural Areas within Los Angeles County

**RETIRED IRRIGATED FARMLAND – LANDMARK VILLAGE**
**Tentative Tract Map No. TR53108**
**County Project No. 00-196**
**2008**

The Newhall Land and Farming Company (Newhall) has submitted an application to Los Angeles County for approval of the Landmark Village Vesting Tentative Tract Map No. 53108, which is the first tentative map within the Newhall Ranch Specific Plan. As part of the approval of the Specific Plan in 2003, the County required the following Specific Plan mitigation measure (Mitigation Measure 4.11-22):

> "4.11-22. Beginning with the filing of the first subdivision map allowing construction on the Specific Plan site and with the filing of each subsequent subdivision map allowing construction, the Specific Plan applicant, or its designee, shall provide documentation to the County of Los Angeles identifying the specific portion(s) of irrigated farmland in the County of Los Angeles proposed to be retired from irrigated production to make agricultural water available to serve the subdivision. As a condition of subdivision approval, the applicant, or its designee, shall provide proof to the County that the agricultural land has been retired prior to issuance of building permits for the subdivision."

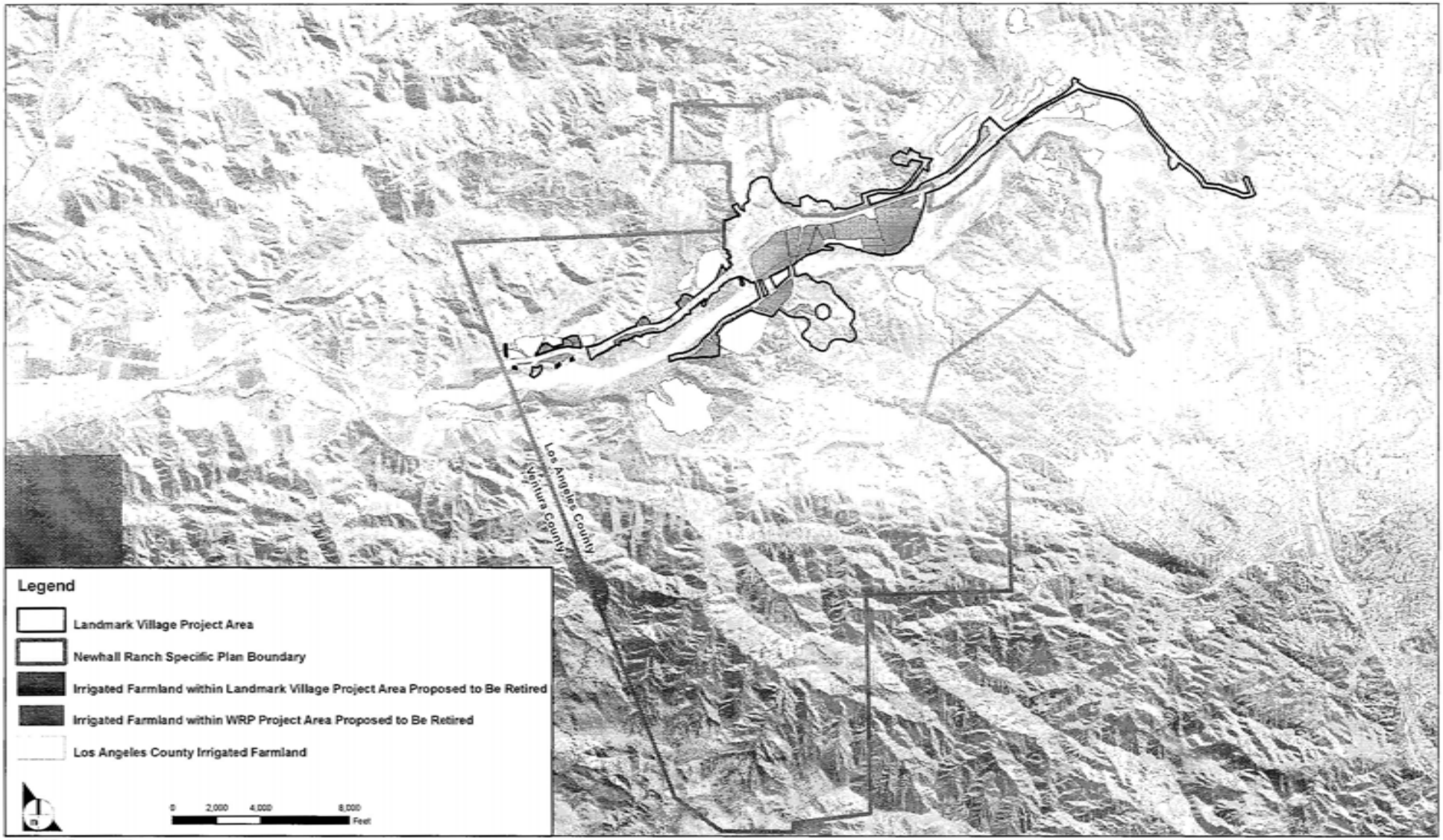
The attached illustration, entitled "Exhibit A - Newhall Ranch Irrigated Farmland Proposed to Be Retired - Landmark Village / WRP," shows irrigated agricultural lands on and near the Specific Plan site, including Landmark Village and the site for the Newhall Water Reclamation Plant (WRP). [1] In association with the Landmark Village project, Newhall proposes to retire irrigated agricultural lands on the Landmark Village site. As shown on Exhibit B entitled, "Landmark Village Irrigated Farmlands to be Retired," this action would allow for the transfer of 2,940 acre-feet per year (afy) of groundwater historically and presently used for irrigation on the Landmark Village site to the Municipal and Industrial (M&I) uses. As also shown on Exhibit B, another 141 afy would be available for M&I uses proposed for the Specific Plan site. As a result of this land conversion, a total of 3,080 afy would be transferred to proposed M&I uses on the

[1] The Newhall Water Reclamation Plant is not part of the Landmark Village project. It is a previously approved project that will serve the Newhall Ranch Specific Plan. It is being addressed in this report because the development of the WRP site will also result in the transfer of agricultural land to WRP uses and, hence, result in the transfer of agricultural water to M&I uses.

Specific Plan site, including the Landmark Village project and the WRP. As shown, the potable water demand for the Landmark Village project is 608 acre-feet per year (afy). The potable water demand for the WRP is 13 afy. After subtracting these demands from the total amount of water that would become available once the agricultural land on the Landmark Village site and WRP site is retired, a total of 6,417 afy will still be available to future subdivision maps on the Specific Plan site.

Prior to the issuance of building permits for the Landmark Village project, Newhall, or its designee, will provide evidence that irrigated agricultural land on the Landmark Village site has been retired to make agricultural water available to serve the subdivision.

Exhibits A and B




SOURCE: Forma 2003

Exhibit A

Newhall Ranch Irrigated Farmland Proposed to Be Retired - Landmark Village / WRP

**EXHIBIT B**
**LANDMARK VILLAGE**
**IRRIGATED FARMLANDS TO BE RETIRED**

(Mitigation Measure 4.11-22)
(all numbers in acre feet)

| Proposed Subdivision | A<br>Starting Agricultural Water Supply Available for Conversion to Potable | B<br>Location of Agricultural Fields to be Retired | Types of Planted Crops Retired | C<br>Retired Fields Water Useage | D<br>Subdivision Potable Water Demand | E<br>Ending Agricultural Water Supply Available for Next Subdivision (A-D) |
|---|---|---|---|---|---|---|
| 1 Landmark Village TTM 53108* | 7038 | See Exhibit A | Alfalfa, sudan/pasture, | 2940 | 608 | 6430 |
| 2 WRP | 6430 | See Exhibit A | Leased vegetables | 141 | 13 | 6417 |
| Total All Projects | | | | 3080 | 621 | |

**RETIRED IRRIGATED FARMLAND – MISSION VILLAGE**
**Tentative Tract Map No. TR61105**
**County Project No. 04-181**
**2008**

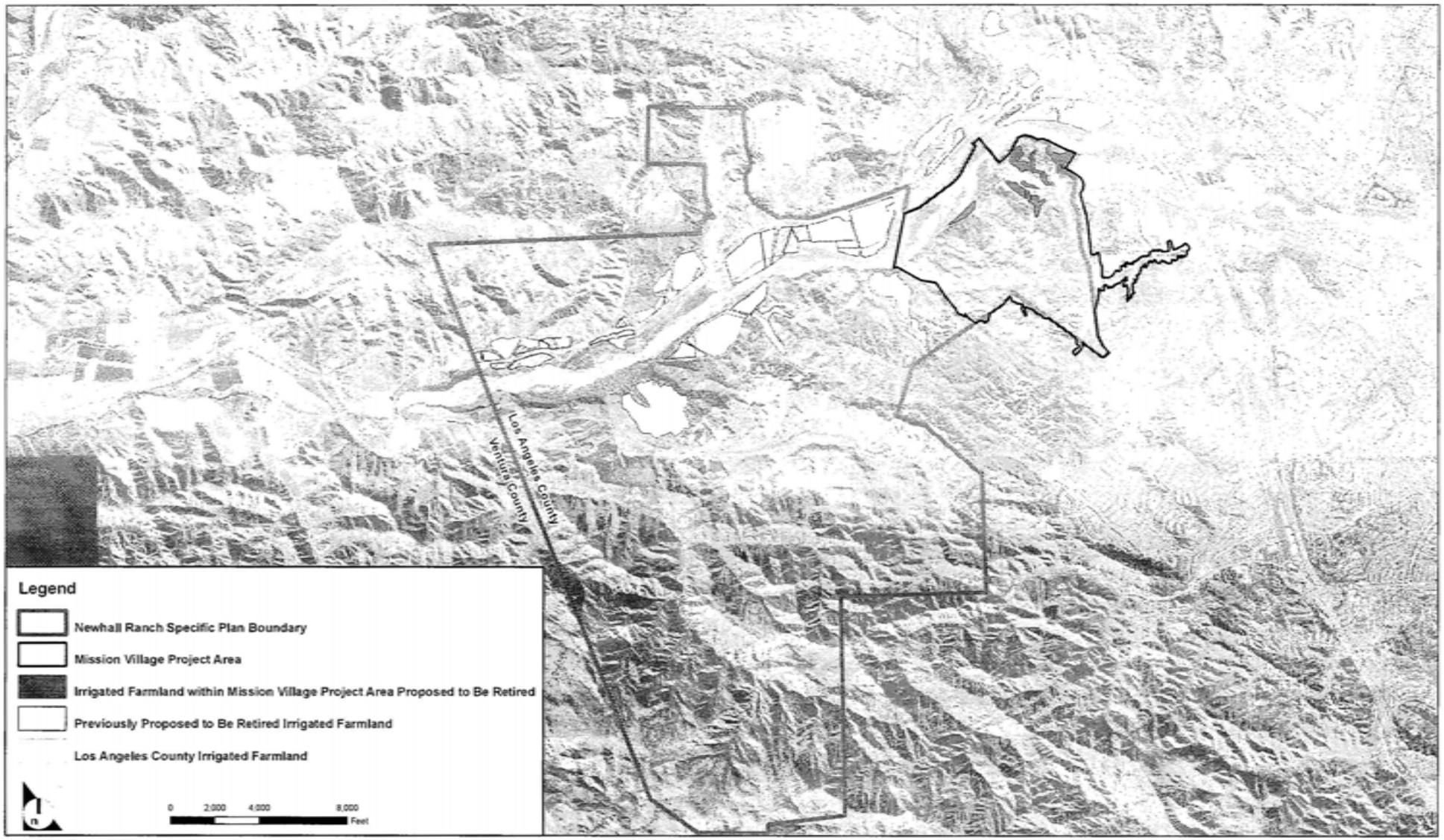
The Newhall Land and Farming Company (Newhall) has submitted an application to Los Angeles County for approval of the Mission Village Vesting Tentative Tract Map No. 61105, which is the second tentative map within the Newhall Ranch Specific Plan. As part of the approval of the Specific Plan in 2003, the County required the following Specific Plan mitigation measure (Mitigation Measure 4.11-22):

> "4.11-22. Beginning with the filing of the first subdivision map allowing construction on the Specific Plan site and with the filing of each subsequent subdivision map allowing construction, the Specific Plan applicant, or its designee, shall provide documentation to the County of Los Angeles identifying the specific portion(s) of irrigated farmland in the County of Los Angeles proposed to be retired from irrigated production to make agricultural water available to serve the subdivision. As a condition of subdivision approval, the applicant, or its designee, shall provide proof to the County that the agricultural land has been retired prior to issuance of building permits for the subdivision."

The attached illustration, entitled "Exhibit A - Newhall Ranch Irrigated Farmland Proposed to Be Retired - Mission Village," shows irrigated agricultural lands on and near the Specific Plan site, including Mission Village. In association with the Mission Village project, Newhall proposes to retire irrigated agricultural lands on the Mission Village site. As shown on Exhibit B entitled, "Mission Village Irrigated Farmlands to be Retired," this action would allow for the transfer of 529 acre-feet per year (afy) of groundwater historically and presently used for irrigation on the Mission Village site to the Municipal and Industrial (M&I) uses for the Specific Plan site. As shown, the potable water demand for the Mission Village project is 1,961 afy. After subtracting this demand from the total amount of water that would become available once the agricultural land on the Mission Village site is retired, a total of 4,456 afy will still be available to future subdivision maps on the Specific Plan site.

Prior to the issuance of building permits for the Mission Village project, Newhall, or its designee, will provide evidence that irrigated agricultural land on the Mission Village site has been retired to make agricultural water available to serve the subdivision.

Exhibits A and B




SOURCE: Forma 2003

Exhibit A

Newhall Ranch Irrigated Farmland Proposed to Be Retired - Mission Village

**EXHIBIT B**
**MISSION VILLAGE**
**IRRIGATED FARMLANDS TO BE RETIRED**

(Mitigation Measure 4.11-22)
(all numbers in acre feet)

| Proposed Subdivision | A<br>Starting Agricultural Water Supply Available for Conversion to Potable | B<br>Location of Agricultural Fields to be Retired | Types of Planted Crops Retired | C<br>Retired Fields Water Useage | D<br>Subdivision Potable Water Demand | E<br>Ending Agricultural Water Supply Available for Next Subdivision (A-D) |
|---|---|---|---|---|---|---|
| 1 Landmark Village TTM 53108* | 7038 | See Exhibit A | Alfalfa, sudan/pasture, | 2940 | 608 | 6430 |
| 2 WRP * | 6430 | See Exhibit A | Leased vegetables | 141 | 13 | 6417 |
| 3 Mission Village | 6417 | See Exhibit A | Leased vegetables | 529 | 1961 | 4456 |
| Total All Projects | | | | 3610 | 2582 | |

* Landmark + WRP Potable Demand is 621 afy

**RETIRED IRRIGATED FARMLAND – HOMESTEAD VILLAGE**
**Tentative Tract Map No. TR060678**
**2008**

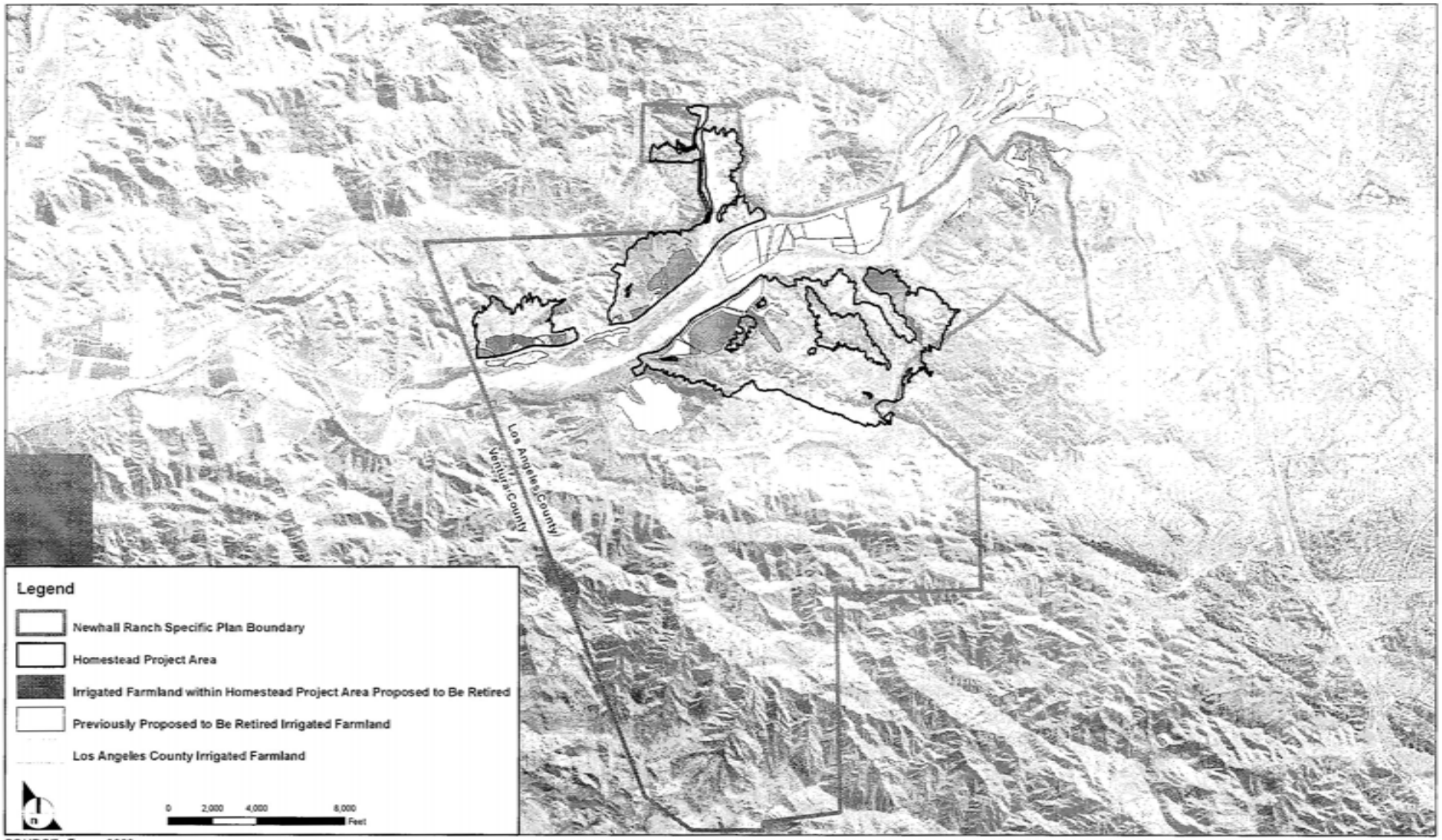
The Newhall Land and Farming Company (Newhall) has submitted an application to Los Angeles County for approval of the Homestead Village Vesting Tentative Tract Map No. 060678, which is the third tentative map within the Newhall Ranch Specific Plan. As part of the approval of the Specific Plan in 2003, the County required the following Specific Plan mitigation measure (Mitigation Measure 4.11-22):

> "4.11-22. Beginning with the filing of the first subdivision map allowing construction on the Specific Plan site and with the filing of each subsequent subdivision map allowing construction, the Specific Plan applicant, or its designee, shall provide documentation to the County of Los Angeles identifying the specific portion(s) of irrigated farmland in the County of Los Angeles proposed to be retired from irrigated production to make agricultural water available to serve the subdivision. As a condition of subdivision approval, the applicant, or its designee, shall provide proof to the County that the agricultural land has been retired prior to issuance of building permits for the subdivision."

The attached illustration, entitled "Exhibit A - Newhall Ranch Irrigated Farmland Proposed to Be Retired - Homestead Village," shows irrigated agricultural lands on and near the Specific Plan site, including Homestead Village. In association with the Homestead Village project, Newhall proposes to retire irrigated agricultural lands on the Homestead Village site. As shown on Exhibit B entitled, "Homestead Village Irrigated Farmlands to be Retired," this action would allow for the transfer of 1,726 acre-feet per year (afy) of groundwater historically and presently used for irrigation on the Homestead Village site to the Municipal and Industrial (M&I) uses for the Specific Plan site. As shown, the potable water demand for the Homestead Village project is 2,462 afy. After subtracting this demand from the total amount of water that would become available once the agricultural land on the Homestead Village site is retired, a total of 1,994 afy will still be available to future subdivision maps on the Specific Plan site.

Prior to the issuance of building permits for the Homestead Village project, Newhall, or its designee, will provide evidence that irrigated agricultural land on the Homestead Village site has been retired to make agricultural water available to serve the subdivision.

Exhibits A and B




SOURCE: Forma 2003

Exhibit A

Newhall Ranch Irrigated Farmland Proposed to Be Retired - Homestead

**EXHIBIT B**
**HOMESTEAD**
**IRRIGATED FARMLANDS TO BE RETIRED**

(Mitigation Measure 4.11-22)
(all numbers in acre feet)

| Proposed Subdivision | A<br>Starting Agricultural Water Supply Available for Conversion to Potable | B<br>Location of Agricultural Fields to be Retired | Types of Planted Crops Retired | C<br>Retired Fields Water Useage | D<br>Subdivision Potable Water Demand | E<br>Ending Agricultural Water Supply Available for Next Subdivision (A-D) |
|---|---|---|---|---|---|---|
| 1 Landmark Village TTM 53108* | 7038 | See Exhibit A | Alfalfa, sudan/pasture, | 2940 | 608 | 6430 |
| 2 WRP * | 6430 | See Exhibit A | Leased vegetables | 141 | 13 | 6417 |
| 3 Mission Village | 6417 | See Exhibit A | Leased vegetables | 529 | 1961 | 4456 |
| 4 Homestead ** | 4456 | See Exhibit A | Leased vegetables | 1726 | 2462 | 1994 |
| Total All Projects | | | | 5336 | 5044 | |

* Landmark + WRP Potable Demand is 621 afy
** Homestead potable demand reflects the 13 afy of WRP which is accounted for separately in line #2 above.

**CLWA, February 24, 2010, Letter from CLWA (Dan Masnada) to County of Los Angeles (Mitch Glaser)**

RECEIVED
MAR 01 2010
By

CASTAIC LAKE WATER AGENCY

February 24, 2010

Mr. Mitch Glaser
Los Angeles County
Department of Regional Planning
320 West Temple Street
Los Angeles, California 90012

Re: Castaic Lake Water Agency Additional Information on Comments on the One Valley One Vision, Draft Environmental Impact Report

Dear Mr. Glaser:

The Castaic Lake Water Agency (CLWA) is the provider of imported water to the Santa Clarita Valley. The CLWA service area covers most of the proposed project area and the determination of water demand and availability for CLWA's service area is addressed in the 2005 Santa Clarita Valley Urban Water Management Plan (UWMP) prepared by CLWA and the local water retailers. As such, CLWA has an interest in Santa Clarita Valley water issues and previously submitted a letter in response to the Draft Environmental Impact Report (DEIR) on the One Valley One Vision (OVOV) plan.

In an October 28, 2009 letter, CLWA commented on the Water Resources section of the DEIR. CLWA stated that it would be revising its comments after the California Department of Water Resources (DWR) updated its 2007 State Water Project SWP Delivery Reliability Report. On January 26, 2010, DWR released its Draft 2009 SWP Delivery Reliability Report.

The 2009 draft report shows reductions in average water deliveries when compared to the 2007 report which, in turn, shows reductions in SWP deliveries from the 2005 report that was used to prepare the 2005 UWMP. The 2007 report shows current SWP annual Table A deliveries averaging 63% of the maximum contract amount of 4,133 thousand acre-feet (taf) per year (CLWA's portion of this total is 95,200 af). The 2009 draft report shows a corresponding value of 60%. The 2007 report projects an annual average of 66% to 69% for the future condition, whereas the updated 2009 draft report uses 60% for all years 2009 through 2029. Conversely, the annual deliveries during drier conditions are projected to be slightly higher than estimated in the 2007 report.

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Attached is a revised estimate of the water supply projections for all of the scenarios in the 2005 UWMP, which incorporate the results of the 2009 draft report. The chart includes additional sources of supply that CLWA has identified since the 2005 UWMP. These include water from Newhall Land sources in Kern County and recycled water that will be generated by the Newhall Ranch Water Reclamation Plant and utilized by the Newhall Ranch development (Newhall Ranch projected demand is included in the 2005 UWMP).

The attached charts represent a reasonable estimate of the available supplies for the CLWA service area. ***The charts show that, for the demand projected in the 2005 UWMP, the supply would be adequate for all scenarios and all years through 2030.*** The 2030 scenarios in the 2005 UWMP used a population projection of 428,209 for the CLWA service area. The DEIR should consider this projected number in its demand analysis in relation to the 460,000 to 485,000 residents reflected in the OVOV Plan buildout population in the DEIR Project Description.

The demand figures in the updated 2005 UWMP charts have not been adjusted to reflect the recent passage of SB 7X-7. This law requires that CLWA and the local retailers demonstrate a per capita water reduction of 10% in 2015 and 20% by 2020. The 2005 UWMP includes a 10% conservation factor through the year 2030. The 2010 UWMP will address a number of projected demand scenarios including one that reflects the impact of the 20%-conservation-by-2020 legislation.

***Additionally, the updated 2005 UWMP charts do not incorporate demands or supplies for the OVOV planning area that are outside of the CLWA service area and which constitute part of the 460,000 to 485,000 population projection cited above. Analysis of these demands and supplies should be performed independent of CLWA's updated 2005 UWMP charts.***

While the 2009 draft report reflects the most current information on SWP reliability, it may be subject to revision as a result of the public review process. Additionally, the Biological Opinions that were the primary reason for the reductions in SWP supply reliability are subject to change due to ongoing legal challenges and new scientific information given to the resource agencies responsible for the Biological Opinions. Such changes that may occur in the future would require that the attached charts be revised and appropriate revisions made in the County's planning and environmental documents.

CLWA appreciates the efforts of the County and the City of Santa Clarita on the OVOV plan update and the DEIR and looks forward to assisting you in providing information for the DEIR. If you have any questions, please contact Jeff Ford, Senior Water Resources Planner, at (661) 513-1281 or by e-mail at jford@clwa.org.

Sincerely,

Dan Masnada
General Manager

Attachments

cc: Paul Brotzman, City of Santa Clarita
Jason Smisko, City of Santa Clarita
Steve Cole, Newhall County Water District
Robert DiPrimio, Valencia Water Company
Mauricio Guardado, Santa Clarita Water Company
Adam Ariki, Los Angeles County Waterworks District #36
Tom Worthington, Impact Sciences, Inc.

| Table 5-1 Summary of Current and Planned Water Supplies and Banking Programs(1) | | | | | | |
|---|---|---|---|---|---|---|
| Water Supply Sources | Supply (af) | | | | | |
| | 2007 | 2010 | 2015 | 2020 | 2025 | 2030 |
| **Existing Supplies (1)** | | | | | | |
| Wholesale (Imported) | 61,800 | 75,787 | 75,787 | 74,407 | 74,407 | 74,407 |
| SWP Table A Supply (2) | 57,120 | 57,120 | 57,120 | 57,120 | 57,120 | 57,120 |
| Buena Vista-Rosedale | 0 | 11,000 | 11,000 | 11,000 | 11,000 | 11,000 |
| Nickel Water - Newhall Land | 0 | 1,607 | 1,607 | 1,607 | 1,607 | 1,607 |
| Flexible Storage Account (CLWA) (3) | 4,680 | 4,680 | 4,680 | 4,680 | 4,680 | 4,680 |
| Flexible Storage Account (Ventura County) (3) (4) | 0 | 1,380 | 1,380 | 0 | 0 | 0 |
| Local Supplies | | | | | | |
| Groundwater | 40,000 | 46,000 | 46,000 | 46,000 | 46,000 | 46,000 |
| Alluvial Aquifer | 35,000 | 35,000 | 35,000 | 35,000 | 35,000 | 35,000 |
| Saugus Formation | 5,000 | 11,000 | 11,000 | 11,000 | 11,000 | 11,000 |
| Recycled Water | 1,700 | 1,700 | 1,700 | 1,700 | 1,700 | 1,700 |
| | | | | | | |
| **Total Existing Supplies** | 103,500 | 123,487 | 123,487 | 122,107 | 122,107 | 122,107 |
| | | | | | | |
| **Existing Banking Programs (3)** | | | | | | |
| Semitropic Water Bank (5) | 50,870 | 50,870 | 0 | 0 | 0 | 0 |
| Rosedale-Rio Bravo (7) | 64,898 | 64,898 | 64,898 | 64,898 | 64,898 | 64,898 |
| Semitropic Water Bank Newhall Land (8) | 0 | 18,828 | 18,828 | 18,828 | 18,828 | 18,828 |
| | | | | | | |
| **Total Existing Banking Programs** | 115,768 | 134,596 | 83,726 | 83,726 | 83,726 | 83,726 |
| | | | | | | |
| **Planned Supplies (1)** | | | | | | |
| Local Supplies | | | | | | |
| Groundwater | 0 | 10,000 | 10,000 | 20,000 | 20,000 | 20,000 |
| Restored wells (Saugus Formation) | 0 | 10,000 | 10,000 | 10,000 | 10,000 | 10,000 |
| New Wells (Saugus Formation) | 0 | 0 | 0 | 10,000 | 10,000 | 10,000 |
| Recycled Water - CLWA (6) | 0 | 0 | 1,600 | 6,300 | 11,000 | 15,700 |
| Recycled Water - Newhall Ranch | 0 | 0 | 1,500 | 2,500 | 3,500 | 5,400 |
| | | | | | | |
| **Total Planned Supplies** | 0 | 10,000 | 13,100 | 28,800 | 34,500 | 41,100 |
| | | | | | | |
| **Planned Banking Programs (3)** | | | | | | |
| Additional Planned Banking | 0 | 0 | 20,000 | 20,000 | 20,000 | 20,000 |
| | | | | | | |
| **Total Planned Banking Programs** | 0 | 0 | 20,000 | 20,000 | 20,000 | 20,000 |

1. The values shown under "Existing Supplies" and "Planned Supplies" are supplies projected to be available in average/normal years. The values shown under "Existing Banking Programs" and "Planned Banking Programs" are total amounts currently in storage.
2. SWP supplies are calculated by multiplying CLWA's Table A Amount of 95,200 af by percentages of average deliveries projected to be available, based on Tables 6-12 and 6-13 of DWR's "State Water Project Delivery Reliability Report 2009". Year 2030 figure is calculated by multiplying by DWR's 2029 percentage of 60%. Figures shown in red represent changes from the 2005 UWMP due to the Draft State Water Project Delivery Reliability Report 2009. Figures shown in blue are additional sources of supply identified since the 2005 UWMP.
3. Supplies shown are total amounts that can be withdrawn, and would typically be used only during dry years. Each water bank has annual limitations on withdrawals that are reflected in Tables 5-3 and 5-4.
4. Initial term of the Ventura County entities' flexible storage account is ten years (from 2008 to 2015).
5. Supplies shown are the total amount currently in storage, and would typically be used only during dry years. Once the current storage amount is withdrawn, this supply would no longer be available and in any event, is not available after 2013.
6. Recycled water supplies based on projections provided in CLWA's 2005 UWMP Chapter 4, Recycled Water.
7. CLWA has 64,898 af of recoverable water as of 12/31/09 in the Rosedale-Rio Bravo Water Banking and Recovery Program.
8. Supplies shown are the total amounts currently in storage. As of December 31, 2009, there is 18,828 af of water stored in the Semitropic Groundwater Storage Bank by The Newhall Land and Farming Company for the Newhall Ranch Specific Plan. The stored water can be extracted from the bank in dry years in amounts up to 4,950 afy. Newhall Ranch is located within the CLWA service area.

| Table 5-2 Projected Average/Normal Year Supplies and Demands | | | | | |
|---|---|---|---|---|---|
| Water Supply Sources | Supply (af) | | | | |
| | 2010 | 2015 | 2020 | 2025 | 2030 |
| **Existing Supplies** | | | | | |
| Wholesale (Imported) | 69,727 | 69,727 | 69,727 | 69,727 | 69,727 |
| SWP Table A Supply (1) | 57,120 | 57,120 | 57,120 | 57,120 | 57,120 |
| Buena Vista-Rosedale | 11,000 | 11,000 | 11,000 | 11,000 | 11,000 |
| Nickel Water - Newhall Land (6) | 1,607 | 1,607 | 1,607 | 1,607 | 1,607 |
| Flexible Storage Account (CLWA) (2) | 0 | 0 | 0 | 0 | 0 |
| Flexible Storage Account (Ventura County) (2) | 0 | 0 | 0 | 0 | 0 |
| Local Supplies | | | | | |
| Groundwater | 46,000 | 46,000 | 46,000 | 46,000 | 46,000 |
| Alluvial Aquifer | 35,000 | 35,000 | 35,000 | 35,000 | 35,000 |
| Saugus Formation | 11,000 | 11,000 | 11,000 | 11,000 | 11,000 |
| Recycled Water | 1,700 | 1,700 | 1,700 | 1,700 | 1,700 |
| **Total Existing Supplies** | 117,427 | 117,427 | 117,427 | 117,427 | 117,427 |
| **Existing Banking Programs** | | | | | |
| Semitropic Water Bank (2) | 0 | 0 | 0 | 0 | 0 |
| Rosedale-Rio Bravo (2) | 0 | 0 | 0 | 0 | 0 |
| Semitropic Water Bank – Newhall Land (2) | 0 | 0 | 0 | 0 | 0 |
| **Total Existing Banking Programs** | 0 | 0 | 0 | 0 | 0 |
| **Planned Supplies** | | | | | |
| Local Supplies | | | | | |
| Groundwater | 0 | 0 | 0 | 0 | 0 |
| Restored wells (Saugus Formation) (2) | 0 | 0 | 0 | 0 | 0 |
| New Wells (Saugus Formation) (2) | 0 | 0 | 0 | 0 | 0 |
| Recycled Water - CLWA (3) | 0 | 1,600 | 6,300 | 11,000 | 15,700 |
| Recycled Water - Newhall Ranch | 0 | 1,500 | 2,500 | 3,500 | 5,400 |
| **Total Planned Supplies** | 0 | 3,100 | 8,800 | 14,500 | 21,100 |
| **Planned Banking Programs** | | | | | |
| Additional Planned Banking (2) | 0 | 0 | 0 | 0 | 0 |
| **Total Planned Banking Programs** | 0 | 0 | 0 | 0 | 0 |
| **Total Existing and Planned Supplies and Banking** | 117,427 | 120,527 | 126,227 | 131,927 | 138,527 |
| **Total Estimated Demand (w/o conservation) (4)** | 100,050 | 109,400 | 117,150 | 128,400 | 138,300 |
| **Conservation (5)** | (8,600) | (9,700) | (10,700) | (11,900) | (12,900) |
| **Total Adjusted Demand** | 91,450 | 99,700 | 106,450 | 116,500 | 125,400 |

1. SWP supplies are calculated by multiplying CLWA's Table A Amount of 95,200 af by 60%.
2. Not needed during average/normal years.
3. Recycled water supplies based on projections provided in CLWA's 2005 UWMP Chapter 4, Recycled Water.
4. Demands are for uses within the existing CLWA service area. Demands for any annexations to the CLWA service area are not included.
5. Assumes 10 percent reduction on urban portion of total demand resulting from conservation best management practices, as discussed in CLWA's 2005 UWMP, Chapter 7.
6. Figures shown in red represent changes from the 2005 UWMP due to the Draft State Water Project Delivery Reliability Report 2009. Figures shown in blue are additional sources of supply identified since the 2005 UWMP.

| Table 5-3 Projected Single-Dry Year Supplies and Demands | | | | | |
|---|---|---|---|---|---|
| Water Supply Sources | Supply (af) | | | | |
| | 2010 | 2015 | 2020 | 2025 | 2030 |
| **Existing Supplies** | | | | | |
| Wholesale (Imported) | 25,331 | 26,283 | 25,855 | 26,807 | 27,759 |
| SWP Table A Supply (1) | 6,664 | 7,616 | 8,568 | 9,520 | 10,472 |
| Buena Vista-Rosedale | 11,000 | 11,000 | 11,000 | 11,000 | 11,000 |
| Nickel Water - Newhall Land | 1,607 | 1,607 | 1,607 | 1,607 | 1,607 |
| Flexible Storage Account (CLWA) | 4,680 | 4,680 | 4,680 | 4,680 | 4,680 |
| Flexible Storage Account (Ventura County)(2) | 1,380 | 1,380 | 0 | 0 | 0 |
| Local Supplies | | | | | |
| Groundwater | 47,500 | 47,500 | 47,500 | 47,500 | 47,500 |
| Alluvial Aquifer | 32,500 | 32,500 | 32,500 | 32,500 | 32,500 |
| Saugus Formation | 15,000 | 15,000 | 15,000 | 15,000 | 15,000 |
| Recycled Water | 1,700 | 1,700 | 1,700 | 1,700 | 1,700 |
| **Total Existing Supplies** | 74,531 | 75,483 | 75,055 | 76,007 | 76,959 |
| **Existing Banking Programs** | | | | | |
| Semitropic Water Bank (3) | 17,000 | 0 | 0 | 0 | 0 |
| Rosedale-Rio Bravo (5) | 20,000 | 20,000 | 20,000 | 20,000 | 20,000 |
| Semitropic Water Bank – Newhall Land (10) | 4,950 | 4,950 | 4,950 | 4,950 | 4,950 |
| **Total Existing Banking Programs** | 41,950 | 24,950 | 24,950 | 24,950 | 24,950 |
| **Planned Supplies** | | | | | |
| Local Supplies | | | | | |
| Groundwater | 10,000 | 10,000 | 20,000 | 20,000 | 20,000 |
| Restored wells (Saugus Formation) | 10,000 | 10,000 | 10,000 | 10,000 | 10,000 |
| New Wells (Saugus Formation) | 0 | 0 | 10,000 | 10,000 | 10,000 |
| Recycled Water - CLWA (4) | 0 | 1,600 | 6,300 | 11,000 | 15,700 |
| Recycled Water - Newhall Ranch | 0 | 1,500 | 2,500 | 3,500 | 5,400 |
| **Total Planned Supplies** | 10,000 | 13,100 | 28,800 | 34,500 | 41,100 |
| **Planned Banking Programs** | | | | | |
| Additional Planned Banking (6) | 0 | 20,000 | 20,000 | 20,000 | 20,000 |
| **Total Planned Banking Programs** | 0 | 20,000 | 20,000 | 20,000 | 20,000 |
| **Total Existing and Planned Supplies and Banking** | 126,481 | 133,533 | 148,805 | 155,457 | 163,009 |
| **Total Estimated Demand (w/o conservation) (7) (8)** | 110,100 | 120,300 | 128,900 | 141,200 | 152,100 |
| **Conservation (9)** | (9,500) | (10,700) | (11,700) | (13,100) | (14,200) |
| **Total Adjusted Demand** | 100,600 | 109,600 | 117,200 | 128,100 | 137,900 |

1. SWP supplies are calculated by multiplying CLWA's Table A Amount of 95,200 af by percentages of single dry year deliveries projected to be available on Tables 6-4 and 6-13 of DWR's "State Water Project Delivery Reliability Report 2009". Year 2030 figure is calculated by multiplying by DWR's 2029 percentage of 11%. Figures shown in red represent changes from the 2005 UWMP due to the Draft State Water Project Delivery Reliability Report 2009. Figures shown in blue are additional sources of supply identified since the 2005 UWMP.
2. Initial term of the Ventura County entities' flexible storage account is ten years (from 2006 to 2015).
3. The total amount of water currently in storage is 50,870 af, available through 2013. Withdrawals of up to this amount are potentially available in a dry year, but given possible competition for withdrawal capacity with other Semitropic banking partners in extremely dry years, it is assumed here that about one third of the total amount stored could be withdrawn.
4. Recycled water supplies based on projections provided in CLWA's 2005 UWMP Chapter 4, Recycled Water.
5. CLWA has 64,898 af of recoverable water as of 12/31/09 in the Rosedale-Rio Bravo Water Banking and Recovery Program.
6. Assumes additional planned banking supplies available by 2014.
7. Assumes increase in total demand of 10 percent during dry years.
8. Demands are for uses within the existing CLWA service area. Demands for any annexations to the CLWA service area are not included.
9. Assumes 10 percent reduction on urban portion of total normal year demand resulting from conservation best management practices ([urban portion of total normal year demand x 1.10] * 0.10), as discussed in CLWA's 2005 UWMP, Chapter 7.
10. Delivery of stored water from the Newhall Land Semitropic Groundwater Bank requires further agreements between CLWA and Newhall Land.

| Table 5-4 Projected Multiple-Dry Year Supplies and Demands(1) | | | | | |
|---|---|---|---|---|---|
| Water Supply Sources | Supply (af) | | | | |
| | 2010 | 2015 | 2020 | 2025 | 2030 |
| **Existing Supplies** | | | | | |
| Wholesale (Imported) | 46,485 | 46,485 | 47,097 | 47,097 | 47,097 |
| SWP Table A Supply (2) | 32,368 | 32,368 | 33,320 | 33,320 | 33,320 |
| Buena Vista-Rosedale | 11,000 | 11,000 | 11,000 | 11,000 | 11,000 |
| Nickel Water - Newhall Land | 1,607 | 1,607 | 1,607 | 1,607 | 1,607 |
| Flexible Storage Account (CLWA) (3) | 1,170 | 1,170 | 1,170 | 1,170 | 1,170 |
| Flexible Storage Account (Ventura County) (3) | 340 | 340 | 0 | 0 | 0 |
| Local Supplies | | | | | |
| Groundwater | 47,500 | 47,500 | 47,500 | 47,500 | 47,500 |
| Alluvial Aquifer | 32,500 | 32,500 | 32,500 | 32,500 | 32,500 |
| Saugus Formation (4) | 15,000 | 15,000 | 15,000 | 15,000 | 15,000 |
| Recycled Water | 1,700 | 1,700 | 1,700 | 1,700 | 1,700 |
| **Total Existing Supplies** | 96,685 | 95,685 | 99,297 | 96,297 | 96,297 |
| **Existing Banking Programs** | | | | | |
| Semitropic Water Bank (3) | 12,700 | 0 | 0 | 0 | 0 |
| Rosedale-Rio Bravo (6) (7) | 5,000 | 15,000 | 15,000 | 15,000 | 15,000 |
| Semitropic Water Bank – Newhall Land (12) | 4,950 | 4,950 | 4,950 | 4,950 | 4,950 |
| **Total Existing Banking Programs** | 22,650 | 19,950 | 19,950 | 19,950 | 19,950 |
| **Planned Supplies** | | | | | |
| Local Supplies | | | | | |
| Groundwater | 6,500 | 6,500 | 6,500 | 6,500 | 6,500 |
| Restored wells (Saugus Formation) (4) | 6,500 | 6,500 | 5,000 | 5,000 | 5,000 |
| New Wells (Saugus Formation) (4) | 0 | 0 | 1,500 | 1,500 | 1,500 |
| Recycled Water (5) | 0 | 1,600 | 6,300 | 11,000 | 15,700 |
| Recycled Water - Newhall Ranch | 0 | 1,500 | 2,500 | 3,500 | 5,400 |
| **Total Planned Supplies** | 6,500 | 9,600 | 15,300 | 21,000 | 27,600 |
| **Planned Banking Programs** | | | | | |
| Additional Planned Banking (7) (8) | 0 | 5,000 | 15,000 | 15,000 | 15,000 |
| **Total Planned Banking Programs** | 0 | 5,000 | 15,000 | 15,000 | 15,000 |
| **Total Existing and Planned Supplies and Banking** | 124,835 | 130,235 | 148,547 | 152,247 | 158,847 |
| **Total Estimated Demand (w/o conservation) (9) (10)** | 110,100 | 120,300 | 128,900 | 141,200 | 152,100 |
| **Conservation (11)** | (9,500) | (10,700) | (11,700) | (13,100) | (14,200) |
| **Total Adjusted Demand** | 100,600 | 109,600 | 117,200 | 128,100 | 137,900 |

1. Supplies shown are annual averages over four consecutive dry years (unless otherwise noted). Figures shown in red represent changes from the 2005 UWMP due to the Draft State Water Project Delivery Reliability Report 2009. Figures shown in blue are additional sources of supply identified since the 2005 UWMP.
2. SWP supplies are calculated by multiplying CLWA's Table A Amount of 95,200 af by percentages of average deliveries projected to be available during the worst case four-year drought of 1931-1934 as provided in Tables 6-4 and 6-13 of DWR's "State Water Project Delivery Reliability Report 2009." Year 2030 figure is calculated by multiplying by DWR's 2029 percentage of 35%.
3. Based on total amount of storage available divided by 4 (4-year dry period). Initial term of the Ventura County entities' flexible storage account is ten years (from 2006 to 2015).
4. Total Saugus pumping is the average annual amount that would be pumped under the groundwater operating plan, as summarized in Table 3-6 of the 2005 UWMP ([11,000+15,000+25,000+35,000]/4).
5. Recycled water supplies based on projections provided in CLWA's 2005 UWMP Chapter 4, Recycled Water.
6. CLWA has 64,898 af of recoverable water as of 12/31/09 in the Rosedale-Rio Bravo Water Banking and Recovery Program.
7. Average dry year period supplies could be up to 20,000 af for each program depending on storage amounts at the beginning of the dry period.
8. Assumes additional planned banking supplies available by 2014.
9. Assumes increase in total demand of 10 percent during dry years.
10. Demands are for uses within the existing CLWA service area. Demands for any annexations to the CLWA service area are not included.
11. Assumes 10 percent reduction on urban portion of total normal year demand resulting from conservation best management practices ([urban portion of total normal year demand x 1.10] * 0.10), as discussed in CLWA's 2005 UWMP, Chapter 7.
12. Delivery of stored water from the Newhall Land Semitropic Groundwater Bank requires further agreements between CLWA and Newhall Land.

**Letter from Alex Herrell, Director, Community Development, to Sam Dea, Supervising Regional Planner, Los Angeles County Department of Regional Planning, dated April 7, 2009**

NEWHALL LAND

A LENNAR/LNR COMPANY

April 7, 2009
Sam Dea
Supervising Regional Planner
Los Angeles County Department of Regional Planning

Dear Mr. Dea

This correspondence and attachments are provided in compliance with the Newhall Ranch Specific Plan Final EIR Mitigation Measure 4.11-15 (below) to provide an annual report indicating the amount of groundwater used in Los Angeles County for irrigation.

4.11-15. Groundwater historically and presently used for crop irrigation on the Newhall Ranch Specific Plan site and elsewhere in Los Angeles County shall be made available by the Newhall Land and Farming Company, or its assignee, to partially meet the potable water demands of the Newhall Ranch Specific Plan. The amount of groundwater pumped for this purpose shall not exceed 7,038 AFY. This is the amount of groundwater pumped historically and presently by the Newhall Land and Farming Company in Los Angeles County to support its agricultural operations. Pumping this amount will not result in a net increase in groundwater use in the Santa Clarita Valley. To monitor groundwater use, the Newhall Land and Farming Company, or its assignee, shall provide the County an annual report indicating the amount of groundwater used in Los Angeles County and the specific land upon which that groundwater was historically used for irrigation. For agricultural land located off the Newhall Ranch Specific Plan site in Los Angeles County, at the time agricultural groundwater is transferred from agricultural uses on that land to Specific Plan uses, The Newhall Land and Farming Company, or its assignee, shall provide a verified statement to the County's Department of Regional Planning that Alluvial aquifer water rights on that land will now be used to meet Specific Plan demand. (emphasis added)

The information provided in the attached chart depicts the amount of irrigation water historically and currently used on Newhall's Los Angeles County farm fields for crop seasons 2001-2008, using the same methodology from the FEIR. Revised Table 2.5-32 from the FEIR is also attached showing the original information for the years 1996 – 2000 that served as the baseline for determining the estimated annual average usage of 7,038 acre feet. A map is also attached showing the specific land in Los Angeles County upon which the groundwater has historically been used.

Newhall's annual water use varies based upon the amount of irrigated acres, the type of irrigated crops and their water demand as determined by California Irrigation Management Information System.

If you have any questions regarding this letter or the attached exhibits please contact me at (661) 255-4449.

Newhall Land

Alex Herrell
Director, Community Development

THE NEWHALL LAND AND FARMING COMPANY
23823 VALENCIA BOULEVARD, VALENCIA, CALIFORNIA 91355-2194 • PHONE 661.255.4000 FAX 661.255.3960 WWW.NEWHALL.COM

# Los Angeles County Agriculture Water Use

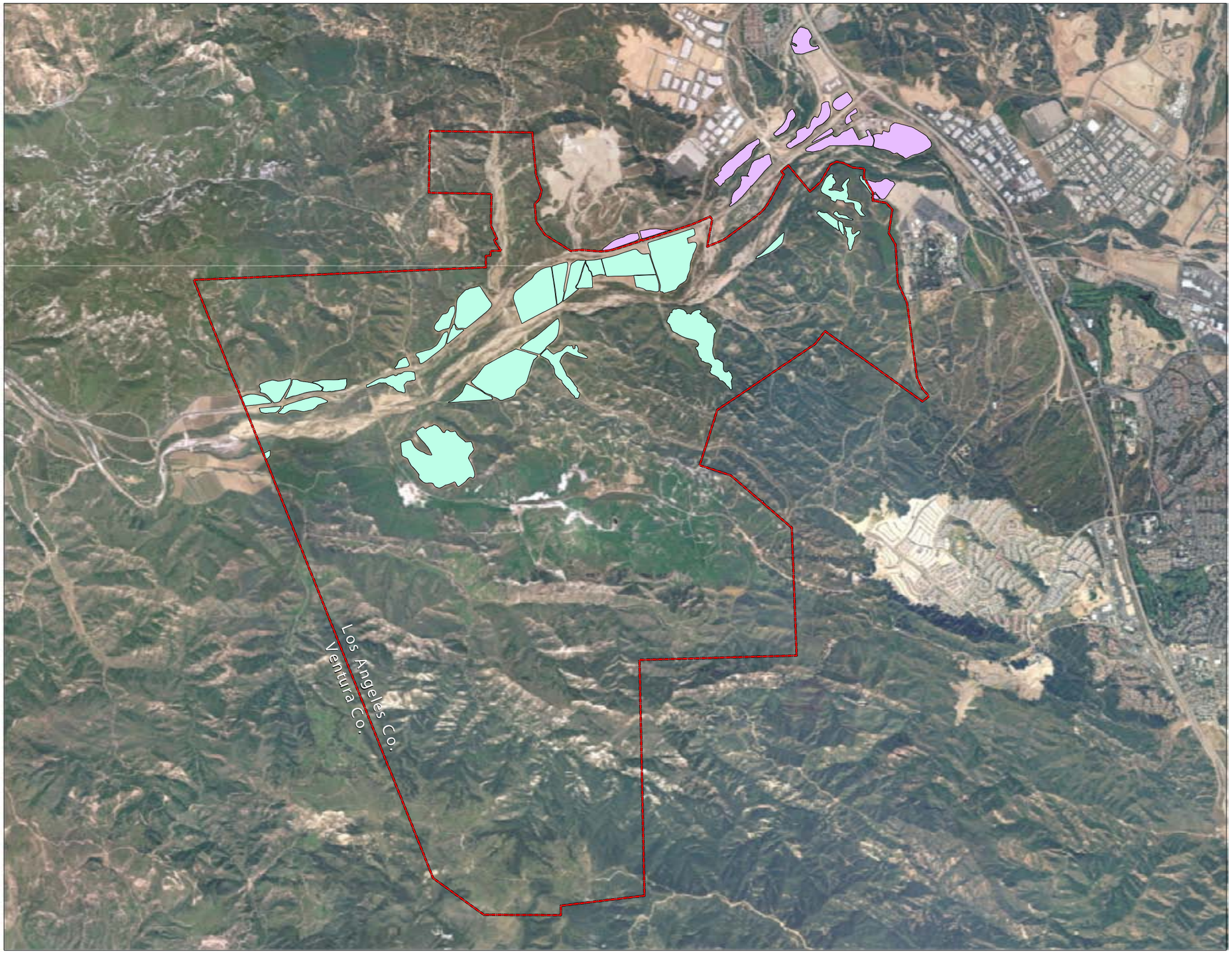
Using Adjusted CIMIS ET Data to Allocate Actual Water Pumped

| Year | Crop Type | Total Irrigated Acres | Adjusted CIMIS Water Use (af/ac) | Adjusted CIMIS Water Use (af/yr) | %of Water use by Crop | Total Pumped Water Based on SCE (af) | Allocation of Total Pumped Water By Crop (af/yr) | Acre Feet/ Year per Acre of Crop | LA Co. Irrigated Crops (acres) | LA Co. Crop Share Of Actual Pumped Water (af/yr) | LA Co. Crop Share Using Adjusted CIMIS (af/yr) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2008 | | | | | | | | | | | |
| | Citrus | 273 | 4.63 | 1264 | 10.31% | 10,633 | 1,096 | 4.01 | | | |
| | Alfalfa | 82 | 7.57 | 621 | 5.06% | | 538 | 6.56 | 82 | 538 | 621 |
| | Irrigated Hay | 28 | 7.57 | 212 | 1.73% | | 184 | 6.56 | | | |
| | Irrigated Pasture | 231 | 8.83 | 2040 | 16.63% | | 1,769 | 7.66 | 231 | 1,769 | 2,040 |
| | Vegetables | 825 | 7.57 | 6245 | 50.93% | | 5,416 | 6.56 | 142 | 932 | 1,075 |
| | Sod | 168 | 7.27 | 1221 | 9.96% | | 1,059 | 6.30 | 168 | 1,059 | 1,221 |
| | Nursery | 199 | 3.31 | 659 | 5.37% | | 571 | 2.87 | | - | |
| | | | | | **100.00%** | | **10,633** | | **623** | **4,298** | **4,957** |
| 2007 | | | | | | | | | | | |
| | Citrus | 278 | 4.45 | 1237 | 8.88% | 11,781 | 1,046 | 3.76 | | | |
| | Alfalfa | 205 | 7.27 | 1490 | 10.70% | | 1,261 | 6.15 | 205 | 1,261 | 1,490 |
| | Irrigated Hay | 28 | 7.27 | 204 | 1.46% | | 172 | 6.15 | | | |
| | Irrigated Pasture | 231 | 8.48 | 1959 | 14.07% | | 1,657 | 7.17 | 231 | 1,657 | 1,959 |
| | Vegetables | 1,037 | 7.27 | 7539 | 54.13% | | 6,377 | 6.15 | 355 | 2,183 | 2,581 |
| | Sod | 119 | 7.27 | 865 | 6.21% | | 732 | 6.15 | 119 | 732 | 865 |
| | Nursery | 199 | 3.18 | 633 | 4.54% | | 535 | 2.69 | | | |
| | | | | | **100.00%** | | **11,781** | | **910** | **5,833** | **6,895** |
| 2006 | | | | | | | | | | | |
| | Citrus | 278 | 4.07 | 1131 | 9.44% | 13,709 | 1,295 | 4.66 | | | |
| | Irrigated Hay | 233 | 6.65 | 1549 | 12.93% | | 1,773 | 7.61 | 205 | 1,560 | 1,363 |
| | Irrigated Pasture | 231 | 7.76 | 1793 | 14.96% | | 2,051 | 8.88 | 231 | 2,051 | 1,793 |
| | Vegetables | 923 | 6.65 | 6138 | 51.23% | | 7,023 | 7.61 | 285 | 2,168 | 1,895 |
| | Sod | 119 | 6.65 | 791 | 6.60% | | 905 | 7.61 | 119 | 905 | 791 |
| | Nursery | 199 | 2.91 | 579 | 4.83% | | 663 | 3.33 | | | - |
| | | | | | **100.00%** | | **13,709** | | **840** | **6,685** | **5,842** |
| 2005 | | | | | | | | | | | |
| | Citrus | 308 | 3.69 | 1137 | 12.61% | 8,800 | 1,110 | 3.60 | | | |
| | Irrigated Hay | 160 | 6.03 | 965 | 10.70% | | 942 | 5.89 | 160 | 942 | 965 |
| | Irrigated Pasture | 174 | 7.03 | 1223 | 13.57% | | 1,194 | 6.86 | 175 | 1,201 | 1,230 |
| | Vegetables | 907 | 6.03 | 5469 | 60.68% | | 5,340 | 5.89 | 278 | 1,637 | 1,676 |
| | Nursery | 83 | 2.64 | 219 | 2.43% | | 214 | 2.58 | | | - |
| | | | | | **100.00%** | | **8,800** | | **613** | **3,780** | **3,871** |
| 2004 | | | | | | | | | | | |
| | Citrus | 340 | 4.92 | 1673 | 10.86% | 12,828 | 1,393 | 4.10 | | | |
| | Irrigated Hay | 160 | 2.95 | 472 | 3.06% | | 393 | 2.46 | 160 | 393 | 472 |
| | Irrigated Pasture | 174 | 11.26 | 1959 | 12.72% | | 1,632 | 9.38 | 174 | 1,632 | 1,959 |
| | Vegetables | 1,392 | 8.04 | 11192 | 72.67% | | 9,322 | 6.70 | 627 | 4,199 | 5,041 |
| | Nursery | 30 | 3.52 | 106 | 0.69% | | 88 | 2.93 | | - | - |
| | | | | | **100.00%** | | **12,828** | | **961** | **6,224** | **7,472** |
| 2003 | | | | | | | | | | | |
| | Citrus(furrow) | 59 | 6.31 | 372 | 2.64% | 12,286 | 325 | 5.51 | | | |
| | Citrus(micro) | 492 | 4.73 | 2327 | 16.53% | | 2,030 | 4.13 | | | |
| | Sudan Grass | 388 | 10.81 | 4194 | 29.79% | | 3,660 | 9.43 | 388 | 3,660 | 4,194 |
| | Vegetables | 931 | 7.72 | 7187 | 51.04% | | 6,271 | 6.74 | 581 | 3,914 | 4,485 |
| | | | | | **100.00%** | | **12,286** | | **969** | **7,573** | **8,680** |
| 2002 | | | | | | | | | | | |
| | Citrus(furrow) | 171 | 6.62 | 1132 | 7.57% | 15,135 | 1,146 | 6.70 | | | |
| | Citrus(micro) | 545 | 4.97 | 2709 | 18.12% | | 2,742 | 5.03 | | | |
| | Sudan Grass | 175 | 11.35 | 1986 | 13.29% | | 2,011 | 11.49 | 175 | 2,011 | 1,986 |
| | Vegetables | 1,125 | 8.11 | 9124 | 61.03% | | 9,236 | 8.21 | 800 | 6,568 | 6,488 |
| | | | | | **100.00%** | | **15,135** | | **975** | **8,579** | **8,474** |
| 2001 | | | | | | | | | | | |
| | Citrus(furrow) | 288 | 5.49 | 1581 | 13.47% | 14,188 | 1,911 | 6.63 | | | |
| | Citrus(micro) | 657 | 4.12 | 2707 | 23.06% | | 3,271 | 4.98 | | | |
| | Sudan Grass | 150 | 9.41 | 1412 | 12.02% | | 1,706 | 11.37 | 150 | 1,706 | 1,412 |
| | Vegetables | 899 | 6.72 | 6041 | 51.46% | | 7,301 | 8.12 | 719 | 5,839 | 4,832 |
| | | | | | **100.00%** | | **14,188** | | **869** | **7,545** | **6,243** |

**Revised Table 2.5-32**
**Los Angeles County Agricultural Water Use**
**Using Adjusted CIMIS ET Data to Allocate Actual Water Pumped**

| Year | Crop Type | Total Irrigated Acres | Adjusted CIMIS Water Use (af/ac) | Adjusted CIMIS Water Use (af/yr) | % of Water Use by Crop | Total Pumped Water Based on SCE (af) | Allocation of Total Pumped Water by Crop (af/yr) | Acre Feet/ Year per Acre of Crop | LA Co. Irrigated Crops (acres) | LA Co. Crop Share of Actual Pumped Water (af/yr) | LA Co. Crop Share Using Adjusted CIMIS (af/yr) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2000 | Citrus (furrow) | 291 | 6.05 | 1,761 | 12.35% | 13,798 | 1,704 | 5.86 | | | |
| | Citrus (micro) | 811 | 4.54 | 3,682 | 25.83% | | 3,565 | 4.40 | | | |
| | Alfalfa (flood) | 55 | 10.37 | 570 | 4.00% | | 552 | 10.04 | 55 | 552 | 570 |
| | Sudan/pasture (flood) | 150 | 10.37 | 1,556 | 10.91% | | 1,506 | 10.04 | 150 | 1,506 | 1,556 |
| | lsd. Vegetables (sprinkler) | 902 | 7.41 | 6,684 | 46.90% | | 6,471 | 7.17 | 722 | 5,180 | 5,350 |
| | | | | | 100.00% | | **13,798** | | **927** | **7,238** | **7,476** |
| 1999 | Citrus (furrow) | 291 | 6.13 | 1,784 | 12.56% | 16,131 | 2,025 | 6.96 | | | |
| | Citrus (micro) | 781 | 4.6 | 3,593 | 25.29% | | 4,079 | 5.22 | | | |
| | Alfalfa (flood) | 55 | 10.51 | 578 | 4.07% | | 656 | 11.93 | 55 | 656 | 578 |
| | Sudan/pasture (flood) | 150 | 10.51 | 1,577 | 11.10% | | 1,790 | 11.93 | 150 | 1,790 | 1,577 |
| | lsd. Vegetables (sprinkler) | 889 | 7.51 | 6,676 | 46.99% | | 7,580 | 8.53 | 709 | 6,046 | 5,325 |
| | | | | | 100.00% | | **16,131** | | **914** | **8,492** | **7,479** |
| 1998 | Citrus (furrow) | 291 | 5.48 | 1,595 | 13.47% | 11,477 | 1,546 | 5.31 | | | |
| | Citrus (micro) | 743 | 4.11 | 3,054 | 25.80% | | 2,961 | 3.99 | | | |
| | Alfalfa (flood) | 115 | 9.4 | 1,081 | 9.13% | | 1,048 | 9.11 | 115 | 1,048 | 1,081 |
| | Sudan/pasture (flood) | 100 | 9.4 | 940 | 7.94% | | 911 | 9.11 | 100 | 911 | 940 |
| | lsd. Vegetables (sprinkler) | 770 | 6.71 | 5,167 | 43.65% | | 5,010 | 6.51 | 590 | 3,839 | 3,959 |
| | | | | | 100.00% | | **11,477** | | **805** | **5,798** | **5,980** |
| 1997 | Citrus (furrow) | 291 | 5.96 | 1,734 | 12.12% | 14,862 | 1,801 | 6.19 | | | |
| | Citrus (micro) | 803 | 4.47 | 3,589 | 25.08% | | 3,727 | 4.64 | | | |
| | Walnuts (micro) | 33 | 4.47 | 148 | 1.03% | | 153 | 4.64 | | | |
| | Alfalfa (flood) | 160 | 10.22 | 1,635 | 11.42% | | 1,698 | 10.61 | 160 | 1,698 | 1,635 |
| | Sudan/pasture (flood) | 103 | 10.22 | 1,053 | 7.35% | | 1,093 | 10.61 | 103 | 1,093 | 1,053 |
| | lsd. Vegetables (sprinkler) | 843 | 7.3 | 6,154 | 43.00% | | 6,390 | 7.58 | 663 | 5,026 | 4,840 |
| | | | | | 100.00% | | **14,862** | | **926** | **7,816** | **7,528** |
| 1996 | Citrus (furrow) | 291 | 5.96 | 1,734 | 12.84% | 13,702 | 1,760 | 6.05 | | | |
| | Citrus (micro) | 801 | 4.47 | 3,580 | 26.51% | | 3,633 | 4.54 | | | |
| | Walnuts (micro) | 33 | 4.47 | 148 | 1.09% | | 150 | | | | |
| | Alfalfa (flood) | 105 | 10.21 | 1,072 | 7.94% | | 1,088 | 10.36 | 105 | 1,088 | 1,072 |
| | Sudan/pasture (flood) | 170 | 10.21 | 1,736 | 12.85% | | 1,761 | 10.36 | 170 | 1,761 | 1,736 |
| | lsd. Vegetables (sprinkler) | 717 | 7.3 | 5,234 | 38.76% | | 5,311 | 7.41 | 537 | 3,978 | 3,920 |
| | | | | | 100.00% | | **13,702** | | **812** | **6,826** | **6,728** |
| **Average** | | | | | | **13,994** | **13,994** | | **877** | **7,234** | **7,038** |

CIMIS = California Irrigation Management Information System. Does not include dryland farming or Christmas tree use.
af = acre-feet; ac = acres; yr = year.




L E G E N D

- Newhall Ranch Specific Plan Boundary
- Irrigated Agricultural Lands - NRSP
- Irrigated Agricultural Lands - outside NRSP

Feet
0 1,000 2,000 4,000
Meters
0 250 500 1,000

FORMA
04-07-2003
agricultural_acres_040703.mxd

Newhall Land Historically Irrigated Agricultural Areas within Los Angeles County

**Semitropic Water Storage District, February 22, 2010, Letter to Newhall Land and Farming**

NEWHALL LAND

April 22, 2010

Sam Dea
Supervising Regional Planner
Los Angeles County Department of Regional Planning
Hall of Records, 13th Floor
320 West Temple Street, Room 1382
Los Angeles, California 90012

Dear Mr. Dea:

This correspondence and the attached communication from Semitropic Water Storage District is Newhall's status report to the County of Los Angeles, Department of Regional Planning, indicating that the amount of water placed in the Semitropic groundwater bank under Newhall's stored water account is 18,828 acre feet as of December 31, 2009. This status report is a requirement of the Newhall Ranch Specific Plan Program EIR, Mitigation Measure SP-4.11-18.

If you should have any questions, please do not hesitate to call me.

Sincerely,

Newhall Land

Alex Herrell
Director, Community Development

Attachment: Semitropic letter, dated February 22, 2010

1101 Central Avenue, P.O. Box Z, Wasco, CA 93280-0877

Telephone: (661) 758-5113 Bakersfield: (661) 327-7144
Facsimile: (661) 758-3219 E-mail: mail@semitropic.com
Website: www.semitropic.com

February 22, 2010

Newhall Land and Farming Company
Attn: Steve Zimmer, General Manager
25121 Springfield Court, Suite 300
Valencia, CA 91355-2103

Mr. Zimmer:

As of December 31, 2009, Newhall Land and Farming Company has 18,828 acre feet of stored water in their account.

Please let me know if I can be of further help.

Sincerely,

Judy Burns

Judy Burns
Accounting Supervisor

**5TH CIVIL NO. F044638**

**IN THE COURT OF APPEAL OF THE STATE OF CALIFORNIA**
**FIFTH APPELLATE DISTRICT**

United Water Conservation District,

Petitioner,

v.

County of Los Angeles, *et al.*,

Respondents.

The Newhall Land and Farming Company, *et al.*,

Real Parties in Interest.

And Related Cases.

COURT OF APPEAL
FIFTH APPELLATE DISTRICT
FILED

APR - 1 2004

KAY FRAUENHOLTZ
CLERK/ADMINISTRATOR
By _____ Deputy

Appeal From The Judgment of The Kern County Superior Court
The Honorable Roger D. Randall, Presiding
(Kern County Superior Court No. 239324-RDR
[Consolidated with Case Nos. 239325, 239326 and 239327-RDR])

# NOTICE OF SETTLEMENT AND DISMISSAL OF APPEAL

Lloyd W. Pellman, County Counsel
Peter J. Gutierrez, Sr. Deputy County Counsel
652 Kenneth Hahn Hall of Administration
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Los Angeles, CA 90012-2713
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Attorneys for Real Parties in Interest/Respondents, The Newhall Land and Farming Company, *et al.*

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3250 Ocean Park Boulevard, Suite 300
Santa Monica, California 90405
Telephone: (310) 314-8040
Fax: (310) 314-8050

Attorneys for Petitioners/Plaintiffs, Sierra Club, Friends of the Santa Clara River, and Santa Clarita Organization for Planning the Environment

**NOTICE OF SETTLEMENT**
**(APPELLATE COURT CASE NO. F044638)**

The parties to this settlement ("the Parties"), as defined below, through their respective counsel, have agreed as follows:

## I. THE PARTIES AND PURPOSE

### A. THE PARTIES/EFFECTIVE DATE

1. The Sierra Club, Friends of the Santa Clara River and Santa Clarita Organization for Planning the Environment ("Appellants") are represented by John T. Buse of the Environmental Defense Center and Jan Chatten-Brown of Chatten-Brown and Associates in the Newhall Ranch litigation and this appeal (*United Water Conservation District v. County of Los Angeles, et al.*, Case No. 239324-RDR [Consolidated with Case Nos. 239325, 239326 and 239327-RDR], 5th Civil No. F044638) ("Newhall Ranch Litigation").

2. The Appellants filed the "Notice Of Appeal From Order Granting Motion To Discharge Peremptory Writ Of Mandate" ("Notice of Appeal") on December 19, 2003 in connection with the Newhall Ranch Litigation. The Judgment appealed from disposed of all claims and causes of action between the Parties.

3. The County of Los Angeles and its Board of Supervisors ("the County") are represented in the Newhall Ranch Litigation by Lloyd W. Pellman, County Counsel, and Peter J. Gutierrez, Senior Deputy County Counsel. The County is not a party to this settlement, because there are no settlement provisions that require any action to be taken by the County to implement the settlement. Nonetheless, the County will benefit by this settlement due to the dismissal of this appeal, as discussed below. In addition, the counsel for the County has reviewed this Notice, and has no objection to the settlement.

4. The Newhall Land and Farming Company, a California limited partnership, Valencia Corporation, the Newhall Ranch Company, Newhall Management Limited Partnership and The Newhall Land and Farming Company, a California

corporation ("Newhall") are represented in the Newhall Ranch Litigation by Mark J. Dillon and Michael S. Haberkorn of Gatzke Dillon & Ballance LLP.

5. The effective date of this settlement will be March 29, 2004 ("Effective Date").

**B. PURPOSE**

1. The purpose of this settlement is to set forth the Parties' agreement, which shall result in the final settlement of the Newhall Ranch Litigation (*United Water Conservation District v. County of Los Angeles, et al.*, Case No. 239324-RDR [Consolidated with Case Nos. 239325, 239326 and 239327-RDR] 5th Civil No. F044638), the effect of which will be a complete dismissal, with prejudice, of the appeal, pursuant to Rule 20 of the California Rules of Court.

2. This settlement is a compromise of disputed claims, and neither this settlement nor any term thereof shall be construed as any type of admission on the part of any party to this settlement.

## II. TERMS OF SETTLEMENT/DISMISSAL

**A. AGRICULTURAL WATER SUPPLY**

1. As stated in the Revised Additional Analysis (Volume VIII; May 2003), the actual amount of groundwater pumped from the basin to irrigate Newhall's agricultural lands is calculated by utilizing Southern California Edison ("SCE") pump test data.

For pumps powered by electricity, SCE pump tests are used to calculate the actual amount of water pumped from the basin. The actual water pumping is calculated by multiplying the total kilowatt-hours (kwh) of energy used per well per year, by the kilowatt-hours per acre foot (kwh/AF), which is derived from the annual pump tests performed by SCE, Hydrologic Services Division. These pump tests are performed by SCE on an annual basis, which is customary in the agricultural industry. Newhall also requests that SCE perform these well pump tests for purposes of monitoring well efficiency and energy costs.

For pumps powered by diesel and natural gas, the actual water pumping is calculated by multiplying the actual running hours from engine hour meters by the acre-

feet pumped per hour. The acre-feet pumped per hour is determined by the gallons per minute that each unit is designed to pump.

The total water pumped from all Newhall agricultural wells, utilizing the SCE and other data, is summarized in Exhibit 1 to the letter report, dated March 7, 2003, from Underhill Engineering, Inc. The Underhill report, which was contained in **Appendix AB** in the Newhall Ranch Final Additional Analysis (Volume IV; March 2003) included Los Angeles County agricultural water use data over a five-year period (1996-2000). In addition, actual results of pump tests from SCE were included as **Appendix AQ** in the Newhall Ranch Final Additional Analysis (Volume VII; May 2003). At page 2.5-136 - 2.5-139, the Revised Additional Analysis (Volume VIII; May 2003) was revised to clarify the above information. In addition, at page 2.5-140, the Revised Additional Analysis included revised **Table 2.5-32**, which depicted Newhall's water use for its agricultural lands in Los Angeles County.

As shown on revised **Table 2.5-32**, using the actual SCE pump test data, a five-year annual average of 7,246 acre-feet of water per year was pumped by Newhall and utilized for irrigation of its crops in Los Angeles County. In addition, the County and Newhall used adjusted data from the California Irrigation Management Information System ("CIMIS"), which is provided by the University of California. The adjusted CIMIS data was used as a "cross check" to corroborate Newhall's allocation of the total amount of water actually pumped, as calculated from the SCE pump test and other data. Using the adjusted CIMIS data to compare to actual pumpage, a total of 7,038 acre-feet of water per year was determined to be the average amount of water used on Newhall's agricultural lands in Los Angeles County from 1996-2000. The revised Additional Analysis used the lower (and more conservative) of the two methods to determine the actual amount of groundwater pumped and delivered to Newhall's agricultural lands in Los Angeles County (*i.e.*, 7,038 AFY).

2. Newhall shall do the following:

**(a) Groundwater Use/Limitations.** Groundwater historically and presently used for crop irrigation on the Newhall Ranch Specific Plan

site and elsewhere in Los Angeles County shall be made available by Newhall, or its assignee, to partially meet the potable water demands of the Newhall Ranch Specific Plan. The amount of groundwater pumped for this purpose shall not exceed 7,038 AFY. Newhall represents that this is the amount of groundwater pumped historically and presently by Newhall in Los Angeles County to support its agricultural operations, and that pumping this amount will not result in a net increase in groundwater use in the Santa Clarita Valley.

(b) **Reporting.** To monitor groundwater use, Newhall, or its assignee, shall provide the County an annual report indicating the amount of groundwater used in Los Angeles County and the specific land upon which that groundwater was historically used for irrigation. After submitting the annual report to the County, Newhall, or its designee, will promptly provide the Appellants with a copy of such report, provided that the Appellants make a written request to Newhall for a copy of such report.

(c) **Verification.** For agricultural land located off the Newhall Ranch Specific Plan site in Los Angeles County, at the time agricultural groundwater is transferred from agricultural uses on that land to Specific Plan uses, Newhall, or its assignee, shall provide a verified statement to the County's Department of Regional Planning and Appellants that Alluvial aquifer water rights on that land will now be used to meet Specific Plan demand.

(d) **On-Going Documentation.** Beginning with the filing of the first subdivision map allowing construction on the Specific Plan site and with the filing of each subsequent subdivision map allowing construction, Newhall, or its designee, shall provide documentation to the County of Los Angeles and Appellants identifying the specific portion(s) of irrigated farmland in the County proposed to be retired from irrigated production to make agricultural water available to serve the subdivision. This documentation shall include the location of the irrigated agricultural fields to be retired and the types of planted crops on such land for the baseline five-year period 1996-2000. As a condition of subdivision approval, Newhall, or its designee, shall provide proof to the County that the agricultural land has been retired prior to issuance of building permits for the subdivision. A copy of the information provided to the County shall also be provided to Appellants.

## B. AGRICULTURAL WATER QUALITY

1. The Newhall Ranch Final Additional Analysis (Volume IV; March 2003) included water quality data from one of Newhall's existing agricultural wells, along with a map depicting its location ("C-Well"). The water quality testing data was considered representative of Newhall's other existing agricultural wells. Additional agricultural water quality data was presented in the *2001 Update Report, Hydrogeologic Conditions in the Alluvial and Saugus Formation Aquifer Systems*, July 2002, prepared by Richard C. Slade & Associates. The *2001 Update Report* was included as **Appendix 2.5(l)** to the Newhall Ranch Revised Draft Additional Analysis (Volume II; November 2002).

In addition, in response to public comments, Newhall provided water quality sampling from six additional Newhall agricultural-supply wells. The data was taken from sampling that occurred in 2000 and 2001. The additional water quality data was included in the Newhall Ranch Additional Administrative Record (AAR 107:116214-276). The data was consistent with the prior sampling data from the C-Well location.

2. Newhall shall do the following:

**(a) ASR Program.** The Saugus Groundwater Banking/ASR program injection water must meet the water quality requirements of the State Regional Water Quality Control Board, Los Angeles Region. The water extracted for use on the Specific Plan site shall meet the Title 22 drinking water standards of the State Department of Health Services.

**(b) Title 22 Standards.** The agricultural groundwater used to meet the needs of the Specific Plan shall meet the drinking water quality standards required under Title 22 prior to use. As part of the CEQA review for the first tract map of Newhall Ranch, Newhall shall provide data showing that the agricultural groundwater will meet the Title 22 standards and describe the treatment measures, if any, necessary to meet these standards.

## C. FEES/COSTS

1. Newhall shall pay Appellants' counsel a lump sum in the total amount of $43,000.00, provided that this notice of settlement and a separate notice of abandonment of this appeal is filed and served with the appropriate courts, which results in the

dismissal of the pending appeal in the Newhall Ranch Litigation, consistent with Rule 20 of the California Rules of Court, within three court days from the Effective Date of this settlement.

2. Newhall's payment to Appellants' counsel shall be made within thirty days of the court's Order dismissing the pending appeal.

3. The County shall not be responsible for the payment of any fees or costs of any kind whatsoever arising from this settlement.

**D. DISMISSAL**

1. Pursuant to California Rules of Court, Rule 20, the Appellants request that this Court (5th Civil No. F044638) enter the Order, below, dismissing the appeal and the entire action with prejudice. Remittitur to be issued forthwith.

**E. OTHER PROVISIONS**

1. The execution of this settlement shall not be construed by any party as an admission of liability or an admission as to the truth or falsity of any claim, allegation, defense or fact, which is the subject of this settlement.

2. This settlement shall have no force or effect unless and until the court issues an order dismissing the pending appeal in the Newhall Ranch Litigation.

3. All Parties to this settlement represent and warrant that they are the owner of the claims which are the subject of this settlement, and that such claims have not been assigned or transferred to any person or entity, whether voluntarily or involuntarily, by operation of law or otherwise. This representation and warranty shall survive execution and performance of this settlement.

4. All Parties further warrant and represent that the individual executing this settlement on behalf of each party has full authority to bind the party to the terms and conditions of the settlement. The governing bodies, boards of directors or officers of the Parties to this settlement have approved the terms set forth in this settlement, to the extent such approval is required by the rules, regulations, articles of incorporation, by-laws and any other governing documents of any party to the settlement.

5. This settlement shall be construed and enforced in accordance with the laws of the State of California. The Kern County Superior Court shall be the appropriate venue for the resolution of any disputes arising from this settlement.

6. Except as provided in this settlement, the Parties shall bear their own attorneys' fees and costs in connection with the entire Newhall Ranch Litigation.

7. This settlement may be executed by facsimile signatures and in multiple counterparts, each of which shall be deemed to constitute an original, and all of which taken together shall constitute one in the same document. This settlement shall be effective on the Effective Date shown above.

Environmental Defense Center

March 30, 2004 By: John Buse
John T. Buse

Chatten-Brown and Associates

March ___, 2004 By:_____
Jan Chatten-Brown

Attorneys for Appellants, Sierra Club, Friends of the Santa Clara River and Santa Clarita Organization for Planning the Environment

Gatzke Dillon & Ballance LLP

March ___, 2004 By:_____
Mark J. Dillon

Attorneys for Real Parties in Interest, The Newhall Land and Farming Company, *et al.*

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Gatzke Dillon & Ballance LLP

March ___, 2004

By:_____
Mark J. Dillon

Attorneys for Real Parties in Interest, The Newhall Land and Farming Company, *et al.*

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Environmental Defense Center

March ___, 2004

By:_____
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Chatten-Brown and Associates

March ___, 2004

By:_____
Jan Chatten-Brown

Attorneys for Appellants, Sierra Club, Friends of the Santa Clara River and Santa Clarita Organization for Planning the Environment

Gatzke Dillon & Ballance LLP

March 30, 2004

By:_____
Mark J. Dillon

Attorneys for Real Parties in Interest, The Newhall Land and Farming Company, *et al.*

**ORDER**

THE COURT:

Pursuant to the above Notice of Settlement, the appeal in this action (5th Civil No. F044638) is dismissed, with prejudice, and without appeal costs to any party. Remittitur to issue forthwith.

_____, 2004

_____
Associate Justice

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**Civil No. F 044638**
**(Superior Court No. 239324-RDR)**

## DECLARATION OF SERVICE BY OVERNIGHT MAIL
## (C.C.P. Sections 1013a and 2015.5)

I am a resident of the County of San Diego; I am over the age of 18 years and not a party to the within entitled action; my business address: 1921 Palomar Oaks Way, Suite 200, Carlsbad, California 92008.

On March 30, 2004, I served the attached documents: **NOTICE OF SETTLEMENT AND DISMISSAL OF APPEAL** by placing a true copy thereof, enclosed in a sealed envelope, addressed as follows:

**SEE ATTACHED SERVICE LIST**

Service of the attached document was accomplished in the following manner: I placed such envelope(s) addressed as shown on the attached service list for collection and delivery by Golden State Overnight with delivery fees paid or provided for in accordance with this office's practice. I am readily familiar with this office's practice for processing correspondence for delivery the following day by Golden State Overnight.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Executed on March 30, 2004, at Carlsbad, California.

Tina Zampa

**ATTACHMENT TO DECLARATION OF SERVICE BY OVERNIGHT MAIL**

**Civil No. F 44638**
**(Superior Court No. 239324 - RDR)**

| | |
|---|---|
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| The Honorable Roger D. Randall<br>Department 6<br>Kern County Superior Court<br>1415 Truxtun Avenue<br>Bakersfield, California 93301-5216 | |

# REVISED
# WATER SUPPLY ASSESSMENT

## Landmark Village
## Vesting Tentative Tract Map No. 53108

**Prepared for:**

**The County of Los Angeles**
**Department of Regional Planning**

**January 2010**

**Prepared by**

**Valencia Water Company**
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# 1.0 INTRODUCTION

This report provides information necessary to update and complete the Water Supply Assessment ("WSA") for Landmark Village, Vesting Tentative Tract Map No. 53108 ("project"). Landmark Village is the first project to be implemented within the approved Newhall Ranch Specific Plan, located in unincorporated Los Angeles County ("County"). A previous draft WSA was prepared by Valencia Water Company for Landmark Village in June 2006. This revised WSA is intended to replace the prior draft WSA in its entirety.

The revised WSA has been prepared pursuant to the requirements of Senate Bill 610 (Costa; Chapter 643, Stats. 2001) ("SB 610"), which requires public water agencies, parties or purveyors that may supply water to certain proposed development projects to prepare a WSA for use by the County in environmental documentation for such projects, pursuant to the California Environmental Quality Act ("CEQA").[1] This revised WSA contains information from the 2005 Urban Water Management Plan ("2005 UWMP"), which was adopted by Castaic Lake Water Agency ("CLWA"), Valencia Water Company ("Valencia") and other water purveyors. It also includes published information provided by the California Department of Water Resources ("DWR") concerning the reliability of water supplies delivered to CLWA from the State Water Project ("SWP").

The project site is located within Valencia's service area and Valencia is the operator of the public water system that will provide water to the proposed project.[2, 3]

A WSA is required for any "project" that is subject to CEQA[4] and proposes, among other things, a residential development of more than 500 dwelling units.[5] Landmark Village is a qualifying project under this definition.[6] This revised WSA will provide information to the County for its consideration in making a determination, based on the entire record, as to whether there is a sufficient water supply available to meet the Landmark Village project's water demand, in addition to Valencia's existing and planned future uses, including agricultural and manufacturing uses.[7] The County requested that Valencia prepare a WSA for Landmark Village, and it is

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1 SB 610 amended section 21151.9 of the California Public Resources Code, and amended sections 10631, 10656, 10910, 19811, 19812, and 19815, repealed section 10913, and added and amended section 10657, of the California Water Code.

2 For purposes of this WSA, Valencia is the “public water system,” as defined by Water Code §10912(c), because it has 3,000 or more service connections and provides piped water to the public for human consumption.

3 Water Code §10910(b).

4 Public Resources Code §21080.

5 Water Code §10912(a)(1). This section also includes other types of development that are defined as a “project” by this section of the code.

6 Water Code §10912(a)(1). This section also includes other types of development that are defined as a “project” by this section of the code.

7 Water Code §10910(c).

updated to reflect the best available information as of the date of this report. Consistent with the approved Newhall Ranch Specific Plan, no potable State Water Project (SWP) supplies will be utilized to serve Landmark Village.

## 1.1 Landmark Village

The applicant is requesting approval of the Landmark Village residential and commercial mixed-use project (County Project No. 00-196) and associated entitlement actions necessary to develop the project site. The project is a component of the approved Newhall Ranch Specific Plan, and will consist of a maximum total of 1,444 residential home sites, 1,033,000 square feet of retail/commercial/mixed uses, an elementary school, community park, fire station, and other associated amenities and infrastructure improvements. Public and private recreational facilities will be provided, and a network of hiking/biking trails will extend both throughout the project site and along the Santa Clara River. Build-out of the proposed project would result in the following land use mix:

- 1,136 multi-family residential;
- 308 single-family residential;
- A maximum of 1,033,000 square feet of mixed use/commercial;
- 9-acre elementary school;
- 16-acre Community Park (includes about 10 acres of active park and approximately six acres of passive park);
- 1.3-acre fire station;
- Public and private recreational facilities;
- Trails; and
- Road and other infrastructure improvements.

At build-out, total water demand for the project is estimated to be approximately 972 acre-feet per year ("afy"), which includes a potable water demand of 608 afy and a recycled or non-potable water demand of 364 afy.

## 1.2 Purpose of WSA

The purpose of this updated WSA is to provide the County with an analysis of whether Valencia's water system has sufficient projected water supplies to meet the demands of the project, in addition to existing and planned future uses in the Santa Clarita Valley.[8] Specifically, this WSA evaluates whether the total projected water supply determined to be available during

[8] Water Code §10910(c).

normal, single dry, and multiple dry water years over the next 25 years, will meet the projected water demand associated with the project, in addition to existing and planned future water uses, including agriculture and manufacturing uses.[9] If the water supply is anticipated to be insufficient, the WSA must describe measures being taken to obtain an adequate supply.[10] The WSA is required to be included in the Environmental Impact Report ("EIR") prepared by the County for the project pursuant to CEQA.[11]

### 1.3 Castaic Lake Water Agency

CLWA is a public water agency that serves an area of 195 square miles in Los Angeles and Ventura counties. CLWA is a water wholesaler that provides about half of the water used by Santa Clarita households and businesses. CLWA operates two potable water treatment plants, storage facilities, and over 17 miles of transmission pipelines. CLWA supplements local groundwater supplies with SWP water and other imported water from Northern and Central California. This water is treated and delivered to the local water retailers in the Santa Clarita Valley. The four retail purveyors served by CLWA are Valencia, Los Angeles County Water District #36, Newhall County Water District ("NCWD") and Santa Clarita Water Division of CLWA ("SCWD").

CLWA also delivers highly treated recycled water from one of the two existing water reclamation plants in the Santa Clarita Valley owned by the Sanitation Districts of Los Angeles County. The recycled water is used to meet a portion of the non-potable water demands (golf courses and landscape irrigation, etc.) in the Santa Clarita Valley.

### 1.4 Valencia Water Company

Valencia is a public water utility regulated by the California Public Utilities Commission ("CPUC"). Valencia's current service area includes a mix of residential and commercial land uses, mostly comprised of single-family homes, apartments, condominiums and a number of local shopping centers and neighborhood commercial developments. Valencia supplies water from groundwater wells, CLWA imported water and recycled water. The City of Santa Clarita and Los Angeles County special landscape irrigation districts are the largest overall water users for irrigation purposes. Magic Mountain Amusement Park is the largest individual commercial water user. The service area includes three golf courses, the Valencia Industrial Center, and the Valencia Commerce Center. All water services are metered, with the exception of fire services.

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[9] Water Code §10910(c)(4).

[10] Water Code §10911(a).

[11] Water Code §10911(b), (c).

## 1.5 2005 Urban Water Management Plan and Recent Events Affecting the SWP System

The California Urban Water Management Planning Act ("UWMP Act") requires most water utilities to update and submit an Urban Water Management Plan ("UWMP") every five years. In 2005, the Valley's UWMP was updated by CLWA, in cooperation with Valencia and the other retail water purveyors. The 2005 UWMP was adopted by CLWA's Board of Directors in November 2005 and by Valencia's Board of Directors in December 2005. The 2005 UWMP is a compilation of information collected from various water resource documents listed in Section 1.6. The 2005 UWMP contains information on water use, water resources, recycled water, water quality, reliability planning, demand management measures, best management practices and water shortage contingency planning.

This revised WSA also includes information prepared by DWR regarding the reliability of imported water supplies delivered from the SWP, although Landmark Village does not rely on these supplies. In December 2007, a federal court imposed interim rules that restrict the operations of both the SWP and the Central Valley Project ("CVP") while a new federal biological opinion for the Delta smelt was prepared by the U.S. Fish and Wildlife Service in 2008. In August 2008, DWR prepared an update to its 2005 Reliability Report, which is issued biennially to indicate how much SWP water is available during varying hydrologic scenarios (i.e., normal and dry years). The DWR 2007 SWP Delivery Reliability Report (August 2008) reduced the average long term reliability of SWP supply from 77% to 66% in order to account for the operational changes required by the federal court to protect the Delta smelt and other constraints on the SWP system.

In addition, on November 14, 2008, the California Fish and Game Commission listed the longfin smelt as a threatened species under the California Endangered Species Act. The Commission also voted to change the state-protected status of the Delta smelt from threatened to endangered. In response, on December 9, 2008, the State Water Contractors and others filed litigation challenging the Commission's decision on the longfin smelt. The litigation is still pending, and the outcome of the litigation cannot be predicted at this time.

On December 15, 2008, the U.S. Fish and Wildlife Service issued the new Biological Opinion for the Delta smelt. The new Biological Opinion continues restrictions on SWP and CVP operations that have been in place under the federal court's interim rules concerning the Delta smelt. However, the Biological Opinion also imposed new requirements for the Bay-Delta that may further erode SWP water delivery reliability under the current, constrained operations. DWR has not yet issued a new SWP delivery reliability report, which is expected to address the ramifications of the new Biological Opinion, and its effects on SWP supplies and deliveries. DWR is expected to issue the next update of the SWP delivery reliability report by the end of 2009. In response to the Biological Opinion, on March 5, 2009, the State Water Contractors and

others filed litigation challenging the new Biological Opinion. The litigation is still pending, and the outcome of the litigation cannot be predicted at this time.

On January 4, 2009, the National Marine Fisheries Services (NMFS) issued a new Biological Opinion based on its review of the proposed long-term coordinated Central Valley Project/State Water Project (CVP/SWP) operations in the Central Valley, California, and its effects on listed fish and designated and proposed critical habitats. Specifically, the 2009 BO concluded that the CVP/SWP operations are likely to jeopardize continued existence of federally-listed Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, Central Valley steelhead, green sturgeon, and Southern Resident killer whales, and the designated critical habitats of the salmon, steelhead, and sturgeon.

The 2009 BO contains new measures causing water supply impacts, in addition to requiring a number of habitat measures and associated studies. According to the NMFS, the 2009 BO's restrictions on CVP/SWP operations will impact an estimated five to seven percent of the available annual water on average moved by the federal and state pumping plants, or about 330,000 acre-feet per year (afy); however, water operations will not be affected by the 2009 BO immediately and will be tied to water year type. The 2009 BO also includes exception procedures for drought and health and safety issues.

In December 2009, DWR prepared an update to its 2007 Reliability Report. The Draft 2009 SWP Delivery Reliability Report (December 2009) further reduced the average long term reliability of SWP supply from 66% to 60% in order to account for the operational changes required due to federal Biological Opinions to protect endangered fish such as Delta smelt and spring-run salmon, climate change and other constraints on the SWP system. Using the lower percentages from the DWR Draft 2009 SWP Delivery Reliability Report (December 2009), and updating information related to other sources of supply in the Santa Clarita Valley, Tables 1, 2, 3, and 4, below, are consistent with the best available information provided by DWR concerning the long term reliability of SWP supply and other sources of supply.[12]

The total projected water demand for this project is estimated to be 972 acre-feet per year and was accounted for in the 2005 UWMP. The timing of the project places it within the timeframe for calculating "planned future uses" within the 25 year water supply projection included in the

[12] The information presented in Tables 1-4 of this WSA is based on the 2005 UWMP, with the additional information provided by the DWR Draft 2009 SWP Delivery Reliability Report, December 2009 (and changes and updated information regarding other sources of supply). The discussion of water supply in this WSA and in environmental documents should be tempered, though, by noting that while the Draft 2009 SWP Delivery Reliability Report (December 2009) represents a reasonable scenario as required by CEQA, recent reductions in supply close the gap between the available supply and demand in the future, thereby making the CLWA service area more susceptible to shortages in certain dry years. Accordingly, the reduction in SWP supply reinforces the need to continue diligent efforts to conserve potable water and increase the use of recycled water, both to meet the goals in the 2005 UWMP and to maximize utilization of potable water supplies. CLWA and the retail water purveyors will continue to work diligently with Los Angeles County and the City of Santa Clarita with water conservation ordinances and the enforcement mechanisms to aggressively implement water conservation in the CLWA service area.

2005 UWMP. This information is incorporated by reference in this WSA. SB 610 requires the WSA to document the water demand for the proposed project, in addition to the public water system's existing and planned future uses, including agricultural and manufacturing uses. (Water Code §10910(c).) Water Code §10910(c)(2) states that if the proposed project was accounted for in the most recently adopted UWMP, the public water system may incorporate the requested information from the UWMP in preparing the WSA. The 2005 UWMP projects an annual growth rate in water demand of approximately 2.2 percent over a 25-year period for the Santa Clarita Valley. The project's associated water demand was included by Valencia in the water demand projections contained in the 2005 UWMP (see Table 2-6 in the 2005 UWMP); and, therefore, is accounted for in the 2005 UWMP.

## 1.6 Documents Relied upon in Preparing this WSA

The following list identifies the documentation that has been relied upon in the preparation of this WSA. The documents are incorporated by reference in this WSA as if fully set forth herein. Copies of the referenced documents are available for review at Valencia Water Company by contacting Robert J. DiPrimio, (661) 295-6501, and can be obtained upon the payment of the costs of reproduction. These documents, which are part of Valencia Water Company's record for the preparation of this WSA, are organized below by subject matter and are presented chronologically (earliest first):

**DWR Documents**

*California Department of Water Resources, Groundwater Basins in California, Bulletin 118-80,* January 1980. (DWR Bulletin 118-80, 1980).

*California Department of Water Resources, The State Water Project Delivery Reliability Report 2002*, May 2003. (DWR Reliability Report, 2003).

*California Department of Water Resources, California's Groundwater, Bulletin 118, Santa Clara River Valley Groundwater Basin, Santa Clara River Valley East Subbasin,* February, 2004.

*California Department of Water Resources, Excerpts from the Working Draft of 2005 State Water Project Delivery Reliability,* May 25, 2005. (DWR Reliability Report Excerpts, 2005)

*California Department of Water Resources, The State Water Project Delivery Reliability Report 2005, Final,* April 2006. (DWR Reliability Report, 2006).

*California Department of Water Resources, The State Water Project Delivery Reliability Report 2007, Draft,* December 2007. (DWR Reliability Report Draft, 2007).

*California Department of Water Resources, The State Water Project Delivery Reliability Report 2007, Final,* August 2008. (DWR Reliability Report, 2007).

*California Department of Water Resources, The State Water Project Delivery Reliability Report 2009, Draft,* December 2009. (DWR Draft Reliability Report Draft, 2009).

**CLWA Documents**

Water Supply Contract Between the State of California Department of Water Resources and CLWA, 1963 (plus amendments, including the "Monterey Amendment," 1995, and Amendment No. 19, 1999, the transfer of 41,000 acre-feet of entitlement from Kern County Water Agency to CLWA).

*2002 Draft Recycled Water Master Plan* prepared for CLWA by Kennedy/Jenks Consultants.

*2002 Semitropic Groundwater Storage Program and Point of Delivery Agreement Among the Department of Water Resources of the State of California, CLWA and Kern County Water Agency.*

*2003 Semitropic Groundwater Storage Program* prepared for CLWA by Kennedy/Jenks Consultants.

*Water Supply Reliability Plan Draft Report* prepared for CLWA by Kennedy/Jenks Consultants, September 2003.

Draft Environmental Impact Report – Supplemental Water Project Transfer of 41,000 acre-feet of State Water Project Table A Amount, prepared for CLWA by Science Applications International Corporation, June 2004 (SCH No. 1998041127).

Final Environmental Impact Report – Supplemental Water Project Transfer of 41,000 acre-feet of State Water Project Table A Amount, prepared for CLWA by Science Applications International Corporation, December 2004 (SCH No. 1998041127).[13]

Draft Environmental Impact Report - Rosedale-Rio Bravo Water Storage District (RRBWSD) Water Banking and Exchange Program, prepared for CLWA by Science Applications International Corporation, August 2005 (SCH No. 2005061157).

Final Environmental Impact Report - Rosedale-Rio Bravo Water Storage District (RRBWSD) Water Banking and Exchange Program, prepared for CLWA by Science Applications International Corporation, October 2005 (SCH No. 2005061157).

Draft Environmental Impact Report - Castaic Lake Water Agency Water Acquisition from the Buena Vista Water Storage District and Rosedale-Rio Bravo Water Storage District Water

[13] CLWA's contract rights to SWP water total 95,200 afy, including a water transfer of 41,000 afy approved in 1999 from Wheeler Ridge-Maricopa Water Storage District, a member unit of the Kern County Water Agency. CLWA's EIR prepared in connection with the 41,000 water transfer was challenged in *Friends of the Santa Clara River v. Castaic Lake Water Agency* (Los Angeles Superior Court, Case Number PC018110). CLWA was not enjoined from using any water that is part of the 41,000 afy transfer. CLWA prepared and circulated a new draft EIR for the transfer. CLWA approved and certified the new EIR for the transfer on December 22, 2004. Two challenges to the new EIR were filed in January 2005 in the Ventura County Superior Court (*Planning and Conservation League v. CLWA* and *California Water Impact Network v. CLWA*). The matters were consolidated and transferred to Los Angeles Superior Court. In April 2007, the Court ruled that the 2004 EIR was properly prepared with one exception: it failed to show the analytical route as to how and why the EIR's three water supply allocation scenarios are relevant and would occur. PCL and CWIN filed Notices of Appeal in July 2007. CLWA and two Kern County Water Agencies filed notices of cross appeals. On December 17, 2009, the California Court of Appeal issued its opinion which upheld the adequacy of CLWA's 2004 EIR and legal right to the transferred water.

Banking and Recovery Program, prepared for CLWA by Science Applications International Corporation, June 2006 (SCH No. 2006021003).

Final Environmental Impact Report - Castaic Lake Water Agency Water Acquisition from the Buena Vista Water Storage District and Rosedale-Rio Bravo Water Storage District Water Banking and Recovery Program, prepared for CLWA by Science Applications International Corporation, October 2006 (SCH No. 2006021003).

*Draft Program Environmental Impact Report - Recycled Water Master Plan*, prepared for CLWA by Bon Terra Consulting, November 2006 (SCH No. 2005041138).

*Final Program Environmental Impact Report - Recycled Water Master Plan*, prepared for CLWA by Bon Terra Consulting, March 2007 (SCH No. 2005041138).

CLWA Letter to City of Santa Clarita and Los Angeles County Department of Regional Planning, June 2007.

CLWA Letter to Los Angeles County Department of Regional Planning, February 2008. (CLWA Letter, February 2008).`

CLWA Data Document/Capital Improvement Program, dated November 12, 2008.

**Groundwater Documents**

*Memorandum of Understanding Between the Santa Clara River Valley Upper Basin Water Purveyors and United Water Conservation District*, August 2001. (MOU, 2001).

*2001 Update Report: Hydrogeologic Conditions in the Alluvial and Saugus Formation Aquifer Systems*, prepared for Santa Clarita Valley Water Purveyors by Richard C. Slade and Associates, LLC, July 2002. (Slade, 2002).

*Groundwater Management Plan - Santa Clara River Valley Groundwater Basin, East Subbasin*, prepared for CLWA by Luhdorff & Scalmanini Consulting Engineers, December 2003.

*Regional Groundwater Flow Model for the Santa Clarita Valley: Model Development and Calibration*, prepared for Upper Basin Water Purveyors (CLWA, CLWA Santa Clarita Water Division, Newhall County Water District and Valencia Water Company) by CH2M HILL, April 2004.

*Analysis of Perchlorate Containment in Groundwater Near the Whittaker-Bermite Property, Santa Clarita, California*, prepared for Upper Basin Water Purveyors in Support of the Department of Health Services 97-005 Permit Application by CH2M HILL, December 2004.

*Analysis of Near-Term Groundwater Capture Areas for Production Wells Located Near the Whittaker-Bermite Property (Santa Clarita, California)*, prepared for Upper Basin Water Purveyors in support of the amended 2000 UWMP by CH2M HILL, December 21, 2004.

*Impact and Response to Perchlorate Contamination, Valencia Water Company Well Q2*, prepared by Luhdorff & Scalmanini Consulting Engineers, April 2005 (Q2 Report).

*Analysis of Groundwater Basin Yield, Upper Santa Clara River Groundwater Basin, East Subbasin, Los Angeles County, California*, prepared in support of the August 2001 Memorandum of Understanding between the Upper Basin Water Purveyors and the United Water Conservation

District, prepared by CH2M HILL in cooperation with Luhdorff & Scalmanini, August 2005. (Basin Yield Study, 2005).

*Analysis of Groundwater Supplies and Groundwater Basin Yield, Upper Santa Clara River Groundwater Basin, East Subbasin, August 2009,* prepared by Luhdorff & Scalmanini and GSI Water Solutions. (Basin Yield Study, 2009).

*Interim Remedial Action Plan,* to facilitate and restore pumping of groundwater from two Saugus Formation production wells impacted by perchlorate, prepared for Castaic Lake Water Agency by Kennedy/Jenks Consultants, and approved by the Department of Toxic Substances Control, December 2005.

Mitigated Negative Declaration - Groundwater Containment, Treatment and Restoration Project, CLWA, August 2005.

Technical Memorandum: *Potential Effects of Climate Change on Groundwater Supplies for the Newhall Ranch Specific Plan, Santa Clarita Valley, California*, prepared by GSI Water Solutions, Inc. (John Porcello), dated March 18, 2008.

**Water Planning Documents**

*2005 Urban Water Management Plan*, prepared for Castaic Lake Water Agency, CLWA Santa Clarita Water Division, Newhall County Water District, Valencia Water Company, Los Angeles County Waterworks District No. 36, prepared by Black & Veatch, Nancy Clemm, Kennedy Jenks Consultants, Jeff Lambert, Luhdorff & Scalmanini, Richard Slade and Associates, November 2005. (2005 UWMP).

*Santa Clarita Valley Water Report 2005,* prepared for CLWA, Los Angeles County Waterworks District No. 36, Santa Clarita Water Division, Newhall County Water District and Valencia Water Company by Luhdorff and Scalmanini, Consulting Engineers, April 2006. (SCVWR, 2006).

*Santa Clarita Valley Water Report 2006*, prepared for CLWA, Los Angeles County Waterworks District No. 36, Santa Clarita Water Division, Newhall County Water District and Valencia Water Company by Luhdorff and Scalmanini, Consulting Engineers, May 2007. (SCVWR, 2007).

*Santa Clarita Valley Water Report 2007*, prepared for CLWA, Los Angeles County Waterworks District No. 36, Santa Clarita Water Division, Newhall County Water District and Valencia Water Company by Luhdorff and Scalmanini, Consulting Engineers, April 2008. (SCVWR, 2008).

*Santa Clarita Valley Water Report 2008,* prepared for CLWA, Los Angeles County Waterworks District No. 36, Santa Clarita Water Division, Newhall County Water District and Valencia Water Company by Luhdorff and Scalmanini, Consulting Engineers, April 2009. (SCVWR, 2009).

**Newhall Ranch Planning Documents**

*Agreement between Newhall Land and Farming Company and Semitropic Water Storage District for a Newhall-Semitropic Water Banking and Exchange Program, 2001.*

*Nickel Water contract and environmental documentation* (*see*, Newhall Ranch Revised Draft Additional Analysis, Volume II, prepared by Impact Sciences, Inc., for Los Angeles County, November 2002, Appendix 2.5(b), (c)).

*Los Angeles County. 2003. Additional CEQA Findings Regarding the Newhall Ranch Final Additional Analysis to the Partially Certified Final EIR for the Newhall Ranch Specific Plan and Water Reclamation Plant.* March 2003. (Los Angeles County 2003).

*Revised Additional Analysis to the Newhall Ranch Specific Plan and Water Reclamation Plant Final Environmental Impact Report, Volume VIII (Final Revised Text, Figures and Tables),* (SCH No. 95011015) prepared by Impact Sciences, Inc. for Los Angeles County Department of Regional Planning, May 2003. (Newhall Ranch, 2003).

*Landmark Village Draft EIR, Vols. I-IX*, including appendices (November 2006)

*Landmark Village Final EIR*, Vols. I-V, including appendices (November 2007)

## 2.0 WATER SUPPLY ASSESSMENT

The preparation of this WSA relies upon information from the 2005 UWMP and numerous water resource and planning documents listed in Section 1.6. Based on this supporting information, Valencia concludes that there is sufficient water supply available to meet the Landmark Village project demand, in addition to Valencia's existing and other planned future uses, including agricultural and manufacturing uses.

Valencia and CLWA have existing water entitlements, rights, and contracts to meet future demand as needed over time, and have committed sufficient capital resources and planned investments in various water programs and facilities to serve all of its existing and planned customers. Valencia also has identified specific water supplies provided by the developer combined with operational strategies and a prudent and flexible management approach that demonstrates water supply reliability for the Landmark Village project.

The project is part of the approved Newhall Ranch Specific Plan. The Specific Plan identified four primary sources of supply: (a) Newhall Ranch agricultural water (from the Alluvial aquifer); (b) recycled water from the Newhall Ranch Water Reclamation Plant ("Newhall WRP") and the existing Valencia WRP; (c) imported water supply referred to as Nickel Water (not a part of the SWP); and (d) Semitropic Groundwater Bank. Additional information about these sources and their use is discussed in the previously certified Newhall Ranch Specific Plan Program EIR (March 9, 1999) and the Newhall Ranch Revised Additional Analysis, Vol. VIII (May 2003).

In 2008, Valencia's service area-wide demands were 32,730 af, and the total municipal demand for both imported, groundwater and non-potable recycled water in CLWA's service area was 75,900 af. Based on information provided by the project's consultant, Valencia has estimated that the project will require approximately 972 afy of water consisting of 608 af of potable water and 364 af of non-potable (recycled) water at build-out.

Provided below is a summary of water supply and demand projections presented in the 2005 UWMP that address the SB610 requirements for this project. The 2005 UWMP contains information about water use (Chapter 2), water resources (Chapter 3), recycled water (Chapter 4), water quality (Chapter 5), reliability planning (Chapter 6), demand management measures (Chapter 7) and shortage contingency planning (Chapter 8).

All four of the primary sources of water identified in the approved Newhall Ranch Specific Plan are included as part of the water supplies reported in the 2005 UWMP. The Newhall Ranch agricultural water is included with the existing Alluvial aquifer supplies resulting in no net increase in groundwater use from build-out of the project. Recycled water from the Newhall Ranch WRP and the Valencia WRP are also included as part of the planned water supplies for the project and included in the 2005 UWMP. The other two Specific Plan supplies (imported

water referred to as Nickel Water and the Semitropic Water Bank-Newhall Land) are available, but are not needed to meet the water demand for the proposed Landmark Village project.

## 2.1 Average/Normal Year, Single Dry Year and Multiple Dry Year Water Assessment

The amount of available water supply is summarized in Table 1 below. Table 1 is not intended to be an operational plan for how supplies would be used in a particular year, but rather identifies the complete range of water supplies available under a range of hydrologic conditions. Diversity of supply allows Valencia and the purveyors the option of drawing on multiple sources of supply in response to changing conditions such as varying climatic conditions (average/normal years, single dry years, multiple dry years), natural disasters and contamination with substances such as perchlorate.

It is the stated goal of Valencia, CLWA and the other retail water purveyors to deliver a reliable and high quality water supply for their customers, even during dry periods. Based on conservative water supply and demand assumptions over the next 25 years in combination with conservation of non-essential demand during certain dry years, the water supply plan described in the 2005 UWMP successfully achieves this goal.

**Table 1**
**Summary of Current and Planned Water Supplies and Banking Programs[1]**

| Water Supply Sources | Supply (af) | | | | |
|---|---|---|---|---|---|
| | **2010** | **2015** | **2020** | **2025** | **2030** |
| Existing Supplies[1] | | | | | |
| Wholesale (Imported) | 75,667 | 75,667 | 74,287 | 74,287 | 74,287 |
| SWP Table A Supply[2] | 57,000 | 57,000 | 57,000 | 57,000 | 57,000 |
| Buena Vista-Rosedale | 11,000 | 11,000 | 11,000 | 11,000 | 11,000 |
| Nickel Water - Newhall Land | 1,607 | 1,607 | 1,607 | 1,607 | 1,607 |
| Flexible Storage Account (CLWA)[3] | 4,680 | 4,680 | 4,680 | 4,680 | 4,680 |
| Flexible Storage Account (Ventura County)[3] [4] | 1,380 | 1,380 | 0 | 0 | 0 |
| Local Supplies | | | | | |
| Groundwater | *46,000* | *46,000* | *46,000* | *46,000* | *46,000* |
| Alluvial Aquifer | 35,000 | 35,000 | 35,000 | 35,000 | 35,000 |
| Saugus Formation | 11,000 | 11,000 | 11,000 | 11,000 | 11,000 |
| Recycled Water | 1,700 | 1,700 | 1,700 | 1,700 | 1,700 |
| **Total Existing Supplies** | **123,367** | **123,367** | **121,987** | **121,987** | **121,987** |
| Existing Banking Programs [3] | | | | | |
| Semitropic Water Bank [5] | 45,920 | 0 | 0 | 0 | 0 |
| Rosedale-Rio Bravo [7] | 64,898 | 64,898 | 64,898 | 64,898 | 64,898 |
| Semitropic Water Bank – Newhall Land [8] | 18,828 | 18,828 | 18,828 | 18,828 | 18,828 |
| **Total Existing Banking Programs** | **129,646** | **83,726** | **83,726** | **83,726** | **83,726** |
| Planned Supplies [1] | | | | | |
| Local Supplies | | | | | |
| Groundwater | 10,000 | 10,000 | 20,000 | 20,000 | 20,000 |
| Restored wells (Saugus Formation) | 10,000 | 10,000 | 10,000 | 10,000 | 10,000 |
| New Wells (Saugus Formation) | 0 | 0 | 10,000 | 10,000 | 10,000 |
| Recycled Water - CLWA[6] | 0 | 1,600 | 6,300 | 11,000 | 15,700 |
| Recycled Water - Newhall Ranch | 0 | 1,500 | 2,500 | 3,500 | 5,400 |
| **Total Planned Supplies** | **10,000** | **13,100** | **28,800** | **34,500** | **41,100** |
| Planned Banking Programs[3] | | | | | |
| Additional Planned Banking | 0 | 20,000 | 20,000 | 20,000 | 20,000 |
| **Total Planned Banking Programs** | **0** | **20,000** | **20,000** | **20,000** | **20,000** |

Notes:

[1] The values shown under "Existing Supplies" and "Planned Supplies" are supplies projected to be available in average/normal years. The values shown under "Existing Banking Programs" are the total amounts currently in storage; the values shown under "Planned Banking Programs" represent the annual maximum withdrawal capacity. In 2008, CLWA also acquired approximately 850 af of non-SWP water supply by entering into a water transfer agreement with Yuba County Water Agency (YCWA); however, Table 1 has not been updated to reflect this additional non-SWP supply.

[2] SWP supplies are calculated by multiplying CLWA's Table A Amount of 95,200 af by percentages of average deliveries projected to be available, based on Tables 6.3 and 6.12 of DWR's "Draft State Water Project Delivery Reliability Report, December 2009" [14]

[3] Supplies shown are total amounts that can be withdrawn, and would typically be used only during dry years.

[14] The Landmark Village Draft EIR (SCH No. 2004021002; November 2006), Section 4.10, Water Service, and the Landmark Village Final EIR, Volume I (November 2007), Topical Responses 4 and 5, provide extensive information concerning the litigation effects on availability of SWP Table A Amount.

[4] Initial term of the Ventura County entities' flexible storage account is ten years (from 2006 to 2015).

[5] Supplies shown are the total amount currently in storage, and would typically be used only during dry years. Once the current storage amount is withdrawn, this supply would no longer be available and in any event, is not available after 2013.

[6] Recycled water supplies based on projections provided in CLWA's 2005 UWMP Chapter 4, Recycled Water.

[7] CLWA has 64,898 af of recoverable water as of 12/31/07 in the Rosedale-Rio Bravo Water Banking and Recovery Program.

[8] Supplies shown are the total amount currently in storage. As of December 31, 2007, there is 18,828 af of water stored in the Semitropic Groundwater Storage Bank by The Newhall Land and Farming Company for the Newhall Ranch Specific Plan. The stored water can be extracted from the bank in dry years in amounts up to 4,950 afy. Newhall Ranch is located within the CLWA service area.

*Source: 2005 UWMP*, DWR Draft 2009 SWP Delivery Reliability Report, SCV Water Report (April 2009)

The subject of perchlorate contamination and its impact on groundwater supplies was extensively discussed in the 2005 UWMP. The source of the contamination is believed to be the Whittaker-Bermite property, located in the center of the Santa Clarita Valley and used as a munitions manufacturing facility for over 50 years. Significant progress has been made toward characterizing the extent of perchlorate contamination, along with implementing necessary measures for on-site and off-site containment and treatment. The reliability analysis provided in the 2005 UWMP takes into account the impact on water supply operations while the planning, design and construction of perchlorate treatment, containment and other restoration activities are implemented. For additional information on this topic, please see Chapters 5 and 6, Appendixes D and E in the 2005 UWMP and the latest annual Santa Clarita Valley Water Report (April 2009).

### 2.1.1 Average/Normal Water Year

Table 2 summarizes the water supplies available to Valencia, CLWA and the other retail water purveyors over the 25 year planning period during an average/normal year. The water supplies are broken down into existing and planned water supply sources, including wholesale (imported) water, local supplies, transfers, and banking programs. Demands are shown with and without the effects of an assumed 10 percent urban demand reduction resulting from conservation.

**TABLE 2**
**PROJECTED AVERAGE/NORMAL YEAR SUPPLIES AND DEMAND**

| Water Supply Sources | Supply (af) | | | | |
|---|---|---|---|---|---|
| | **2010** | **2015** | **2020** | **2025** | **2030** |
| **Existing Supplies** | | | | | |
| Wholesale (Imported) | 69,707 | 69,707 | 69,707 | 69,707 | 69,707 |
| SWP Table A Supply [1] | 57,100 | 57,100 | 57,100 | 57,100 | 57,100 |
| Buena Vista-Rosedale | 11,000 | 11,000 | 11,000 | 11,000 | 11,000 |
| Nickel Water - Newhall Land | 1,607 | 1,607 | 1,607 | 1,607 | 1,607 |
| Flexible Storage Account (CLWA) [2] | 0 | 0 | 0 | 0 | 0 |
| Flexible Storage Account (Ventura County) [2] | 0 | 0 | 0 | 0 | 0 |
| Local Supplies | | | | | |
| Groundwater | 46,000 | 46,000 | 46,000 | 46,000 | 46,000 |
| Alluvial Aquifer | 35,000 | 35,000 | 35,000 | 35,000 | 35,000 |
| Saugus Formation | 11,000 | 11,000 | 11,000 | 11,000 | 11,000 |
| Recycled Water | 1,700 | 1,700 | 1,700 | 1,700 | 1,700 |
| **Total Existing Supplies** | **117,407** | **117,407** | **117,407** | **117,407** | **117,407** |
| **Existing Banking Programs** | | | | | |
| Semitropic Water Bank [2] | 0 | 0 | 0 | 0 | 0 |
| Rosedale-Rio Bravo [2] | 0 | 0 | 0 | 0 | 0 |
| Semitropic Water Bank – Newhall Land [2] | 0 | 0 | 0 | 0 | 0 |
| **Total Existing Banking Programs** | 0 | 0 | 0 | 0 | 0 |
| **Planned Supplies** | | | | | |
| Local Supplies | | | | | |
| Groundwater | 0 | 0 | 0 | 0 | 0 |
| Restored wells (Saugus Formation) [2] | 0 | 0 | 0 | 0 | 0 |
| New Wells (Saugus Formation) [2] | 0 | 0 | 0 | 0 | 0 |
| Recycled Water - CLWA [3] | 0 | 1,600 | 6,300 | 11,000 | 15,700 |
| Recycled Water - Newhall Ranch | 0 | 1,500 | 2,500 | 3,500 | 5,400 |
| **Total Planned Supplies** | 0 | 3,100 | 8,800 | 14,500 | 21,100 |
| **Planned Banking Programs** | | | | | |
| Additional Planned Banking [2] | 0 | 0 | 0 | 0 | 0 |
| **Total Planned Banking Programs** | 0 | 0 | 0 | 0 | 0 |
| **Total Existing and Planned Supplies and Banking** | **117,407** | **120,507** | **126,207** | **131,907** | **138,507** |
| **Total Estimated Demand (w/o conservation)** [4] | 100,050 | 109,400 | 117,150 | 128,400 | 138,300 |
| **Conservation** [5] | (8,600) | (9,700) | (10,700) | (11,900) | (12,900) |
| **Total Adjusted Demand** | 91,450 | 99,700 | 106,450 | 116,500 | 125,400 |

Notes:

1 SWP supplies are calculated by multiplying CLWA's Table A Amount of 95,200 af by percentages of average deliveries projected to be available on Tables 6.3 and 6.12 of DWR's "Draft State Water Project Delivery Reliability Report, 2009."

2 Not needed during average/normal years.

3 Recycled water supplies based on projections provided in CLWA's 2005 UWMP Chapter 4, Recycled Water.

4 Demands are for uses within the existing CLWA service area. Demands for any annexations to the CLWA service area are not included.

5 A 10 percent reduction on urban portion of total normal demand is estimated to result from conservation best management practices, as discussed in CLWA's 2005 UWMP, Chapter 7.

Source: 2005 UWMP, DWR Draft 2009 SWP Delivery Reliability Report, SCV Water Report (April 2009)

### 2.1.2 Single-Dry Year

Table 3 summarizes the existing and planned water supplies available to Valencia, CLWA and the other retail water purveyors over the 25 year planning period should a single-dry event occur, similar to the drought that occurred in California in 1977. Demand during single-dry years was assumed to increase by 10 percent. During prolonged dry periods, experience indicates that a reduction in demand of 10 percent is achievable through the implementation of conservation best management practices.

**Table 3**
**Projected Single-Dry Year Supplies and Demands**

| Water Supply Sources | Supply (af) | | | | |
|---|---|---|---|---|---|
| | **2010** | **2015** | **2020** | **2025** | **2030** |
| **Existing Supplies** | | | | | |
| Wholesale (Imported) | 25,367 | 26,267 | 25,887 | 26,787 | 27,787 |
| SWP Table A Supply [1] | 6,700 | 7,600 | 8,600 | 9,500 | 10,500 |
| Buena Vista-Rosedale | 11,000 | 11,000 | 11,000 | 11,000 | 11,000 |
| Nickel Water - Newhall Land | 1,607 | 1,607 | 1,607 | 1,607 | 1,607 |
| Flexible Storage Account (CLWA) | 4,680 | 4,680 | 4,680 | 4,680 | 4,680 |
| Flexible Storage Account (Ventura County)[2] | 1,380 | 1,380 | 0 | 0 | 0 |
| Local Supplies | | | | | |
| Groundwater | 47,500 | 47,500 | 47,500 | 47,500 | 47,500 |
| Alluvial Aquifer | 32,500 | 32,500 | 32,500 | 32,500 | 32,500 |
| Saugus Formation | 15,000 | 15,000 | 15,000 | 15,000 | 15,000 |
| Recycled Water | 1,700 | 1,700 | 1,700 | 1,700 | 1,700 |
| **Total Existing Supplies** | **74,567** | **75,467** | **75,087** | **75,987** | **76,987** |
| **Existing Banking Programs** | | | | | |
| Semitropic Water Bank [3] | 17,000 | 0 | 0 | 0 | 0 |
| Rosedale-Rio Bravo [5] | 20,000 | 20,000 | 20,000 | 20,000 | 20,000 |
| Semitropic Water Bank – Newhall Land [10] | 4,950 | 4,950 | 4,950 | 4,950 | 4,950 |
| **Total Existing Banking Programs** | **41,950** | **24,950** | **24,950** | **24,950** | **24,950** |
| **Planned Supplies** | | | | | |
| Local Supplies | | | | | |
| Groundwater | 10,000 | 10,000 | 20,000 | 20,000 | 20,000 |
| Restored wells (Saugus Formation) | 10,000 | 10,000 | 10,000 | 10,000 | 10,000 |
| New Wells (Saugus Formation) | 0 | 0 | 10,000 | 10,000 | 10,000 |
| Recycled Water - CLWA [4] | 0 | 1,600 | 6,300 | 11,000 | 15,700 |
| Recycled Water - Newhall Ranch | 0 | 1,500 | 2,500 | 3,500 | 5,400 |
| **Total Planned Supplies** | **10,000** | **13,100** | **28,800** | **34,500** | **41,100** |
| **Planned Banking Programs** | | | | | |
| Additional Planned Banking [6] | 0 | 20,000 | 20,000 | 20,000 | 20,000 |
| **Total Planned Banking Programs** | 0 | 20,000 | 20,000 | 20,000 | 20,000 |
| **Total Existing and Planned Supplies and Banking[11]** | **126,517** | **133,517** | **148,837** | **155,437** | **163,037** |
| **Total Estimated Demand (w/o conservation)** [7] [8] | 110,100 | 120,300 | 128,900 | 141,200 | 152,100 |
| **Conservation** [9] | (9,500) | (10,700) | (11,700) | (13,100) | (14,200) |
| **Total Adjusted Demand** | 100,600 | 109,600 | 117,200 | 128,100 | 137,900 |

Notes:

[1] SWP supplies are calculated by multiplying CLWA's Table A Amount of 95,200 af by percentages of single dry year deliveries projected to be available, based on Tables 6.4 and 6-13 of DWR's "Draft State Water Project Delivery Reliability Report 2009."

[2] Initial term of the Ventura County entities' flexible storage account is ten years (from 2006 to 2015).

[3] The total amount of water currently in storage is 45,920 af, available through 2013. Withdrawals of up to this

amount are potentially available in a dry year, but given possible competition for withdrawal capacity with other Semitropic banking partners in extremely dry years, it is assumed here that about one third of the total amount stored could be withdrawn.

[4] Recycled water supplies based on projections provided in CLWA's 2005 UWMP Chapter 4, Recycled Water.

[5] CLWA has 64,898 af of recoverable water as of 12/31/07 in the Rosedale-Rio Bravo Water Banking and Recovery Program.

[6] Assumes additional planned banking supplies available by 2014.

[7] Assumes increase in total demand of 10 percent during dry years.

[8] Demands are for uses within the existing CLWA service area. Demands for any annexations to the CLWA service area are not included.

[9] A 10 percent reduction on urban portion of total normal year demand is estimated to result from conservation best management practices ([urban portion of total normal year demand x 1.10] * 0.10), as discussed in CLWA's 2005 UWMP, Chapter 7.

[10] Delivery of stored water from the Newhall Land Semitropic Groundwater Bank requires further agreements between CLWA and Newhall.

[11] In 2008, CLWA also acquired approximately 850 af of non-SWP water supply by entering into a water transfer agreement with Yuba County Water Agency (YCWA); however, Table 3 has not been updated to reflect this additional non-SWP supply, which is available during dry year.

Source*:* 2005 UWMP, DWR Draft 2009 SWP Delivery Reliability Report, SCV Water Report (April 2009)

### 2.1.3 Multiple Dry Years

Table 4 summarizes the existing and planned water supplies available to Valencia, CLWA and the other retail water purveyors over the 25 year planning period should a four year multiple dry year event occur, similar to the drought that occurred in California during the years 1931 to 1934. Demand during dry years was assumed to increase by 10 percent. During prolonged dry periods, experience indicates that a reduction in demand of 10 percent is achievable through the implementation of conservation best management practices.

**Table 4**
**Projected Multiple-Dry Year Supplies and Demands[1]**

| Water Supply Sources | Supply (af) | | | | |
|---|---|---|---|---|---|
| | 2010 | 2015 | 2020 | 2025 | 2030 |
| **Existing Supplies** | | | | | |
| Wholesale (Imported) | 47,417 | 47,417 | 47,077 | 47,077 | 47,077 |
| SWP Table A Supply [2] | 33,300 | 33,300 | 33,300 | 33,300 | 33,300 |
| Buena Vista-Rosedale | 11,000 | 11,000 | 11,000 | 11,000 | 11,000 |
| Nickel Water - Newhall Land | 1,607 | 1,607 | 1,607 | 1,607 | 1,607 |
| Flexible Storage Account (CLWA) [3] | 1,170 | 1,170 | 1,170 | 1,170 | 1,170 |
| Flexible Storage Account (Ventura County) [3] | 340 | 340 | 0 | 0 | 0 |
| Local Supplies | | | | | |
| Groundwater | 47,500 | 47,500 | 47,500 | 47,500 | 47,500 |
| Alluvial Aquifer | 32,500 | 32,500 | 32,500 | 32,500 | 32,500 |
| Saugus Formation [4] | 15,000 | 15,000 | 15,000 | 15,000 | 15,000 |
| Recycled Water | 1,700 | 1,700 | 1,700 | 1,700 | 1,700 |
| **Total Existing Supplies** | **96,617** | **96,617** | **96,277** | **96,277** | **96,277** |
| **Existing Banking Programs** | | | | | |
| Semitropic Water Bank | 12,700 | 0 | 0 | 0 | 0 |
| Rosedale-Rio Bravo [6] [7] | 5,000 | 15,000 | 15,000 | 15,000 | 15,000 |
| Semitropic Water Bank – Newhall Land[12] | 4,950 | 4,950 | 4,950 | 4,950 | 4,950 |
| **Total Existing Banking Programs** | **22,650** | **19,950** | **19,950** | **19,950** | **19,950** |
| **Planned Supplies** | | | | | |
| Local Supplies | | | | | |
| Groundwater | 6,500 | 6,500 | 6,500 | 6,500 | 6,500 |
| Restored wells (Saugus Formation) [4] | 6,500 | 6,500 | 5,000 | 5,000 | 5,000 |
| New Wells (Saugus Formation) [4] | 0 | 0 | 1,500 | 1,500 | 1,500 |
| Recycled Water [5] | 0 | 1,600 | 6,300 | 11,000 | 15,700 |
| Recycled Water - Newhall Ranch | 0 | 1,500 | 2,500 | 3,500 | 5,400 |
| **Total Planned Supplies** | **6,500** | **9,600** | **15,300** | **21,000** | **27,600** |
| **Planned Banking Programs** | | | | | |
| Additional Planned Banking [7] [8] | 0 | 5,000 | 15,000 | 15,000 | 15,000 |
| **Total Planned Banking Programs** | **0** | **5,000** | **15,000** | **15,000** | **15,000** |
| **Total Existing and Planned Supplies and Banking[13]** | **125,767** | **131,167** | **146,527** | **152,227** | **158,827** |
| **Total Estimated Demand (w/o conservation)** | 110,100 | 120,300 | 128,900 | 141,200 | 152,100 |
| **Conservation** [11] | (9,500) | (10,700) | (11,700) | (13,100) | (14,200) |
| **Total Adjusted Demand** | 100,600 | 109,600 | 117,200 | 128,100 | 137,900 |

Notes:

1 Supplies shown are annual averages over four consecutive dry years (unless otherwise noted).

2 SWP supplies are calculated by multiplying CLWA's Table A Amount of 95,200 af by percentages of average deliveries projected to be available during the worst case four-year drought of 1931-1934 as provided in Tables 6.13 of DWR's "Draft State Water Project Delivery Reliability Report, 2009."

3 Based on total storage amount available ÷ by 4-yr dry period. Initial term of the Ventura County entities' flexible storage account is 10 years (2006-2015).

4 Total Saugus pumping is the avg. annual amount that would be pumped under the groundwater operating plan summarized in Table 3-6, 2005 UWMP.

5 Recycled water supplies based on projections provided in CLWA's 2005 UWMP, Chapter 4, Recycled Water.

6 CLWA has 64,898 af of recoverable water as of 12/31/07 in the Rosedale-Rio Bravo Water Banking and

Recovery Program.

[7] Average dry year period supplies could be up to 20,000 af for each program depending on storage amounts at the beginning of the dry period.

[8] Assumes additional planned banking supplies available by 2014.

[9] Assumes increase in total demand of 10 percent during dry years.

[10] Demands are for uses within the existing CLWA service area. Demands for any annexations to the CLWA service area are not included.

[11] A 10 percent reduction on urban portion of total normal year demand is estimated to result from conservation best management practices ([urban portion of total normal year demand x 1.10] * 0.10), as discussed in CLWA's 2005 UWMP, Chapter 7.

[12] Delivery of stored water from the Newhall Land Semitropic Groundwater Bank requires further agreements between CLWA and Newhall.

[13] In 2008, CLWA also acquired approximately 850 af of non-SWP water supply by entering into a water transfer agreement with Yuba County Water Agency (YCWA); however, Table 4 has not been updated to reflect this additional non-SWP supply, which is available during dry years.

Source: 2005 UWMP, DWR Draft 2009 SWP Delivery Reliability Report, SCV Water Report (April 2009)

# 3.0 IDENTIFICATION OF EXISTING WATER SUPPLY SOURCES

## 3.1 Annual Existing Water Supply Entitlements, Water Rights, or Water Service Contracts

The first substantive "content" requirement for a WSA is the identification and description of the existing water supply sources in the public water system that will serve the project. Water Code §10910(d) requires that the WSA identify any existing water supply entitlements, water rights, or water service contracts relevant to the identified water supply for the proposed project, and describe the quantities of water received in prior years by the public water system. The identification of existing water supplies must be demonstrated by providing information related to the following:

- Written contracts or other proof of entitlement to an identified water supply;
- Copies of a capital outlay program for financing the delivery of a water supply that has been adopted by the public water system;
- Federal, state, and local permits for construction of necessary infrastructure associated with delivering the water supply; and
- Any necessary regulatory approvals that are required in order to be able to convey or deliver the water supply.

The proposed project has independent rights to several sources of water. They are:

- Newhall Ranch Agricultural Water (from the Alluvial aquifer);
- Recycled Water generated by the Newhall Ranch WRP;
- Imported Nickel Water (not a part of the SWP); and
- Semitropic Groundwater Banking Project.

In addition to the independent sources listed above, the proposed project has identified the Valencia Water Reclamation Plant (Valencia WRP) as an available source of recycled water for the project. Wastewater generated by the proposed project would be pumped to the Valencia WRP for treatment. For additional information regarding these supplies, please see *Newhall Ranch Revised Additional Analysis, Volume VIII*, (May 2003).

The potable and non-potable water supplies identified to serve the Newhall Ranch Specific Plan and the amounts needed to serve the project are presented below:

| Newhall Ranch Specific Plan<br>Summary of Water Supplies and Landmark Village Demand | | | |
|---|---|---|---|
| | | **Supply** | **Landmark Village Demand** |
| | | **(Acre-Feet/Year)** | **(Acre-Feet/Year)** |
| **Potable Water** | | 8,645 | |
| | Newhall Agricultural Water | 7,038 | 608 |
| | Nickel Water | 1,607 | 0 |
| **Non-Potable Water** | | 9,035 | |
| | Newhall Ranch Recycled Water | 5,344 | 0 |
| | Valencia Water Reclamation Plant | 3,691 | 364 |
| **Total Water Supplies** | | 17,680 | 972 |
| **Banking Programs** | | 4,950 | 0 |
| | Semitropic Groundwater Banking Project | 4,950 | 0 |

The 2005 UWMP summarizes the current water supplies available for the project and the Santa Clarita Valley as a whole. Such supplies are derived from five primary sources:

- Groundwater from the Alluvial aquifer;
- Groundwater from the Saugus Formation;
- SWP supplies and other imported sources;
- Dry-year groundwater banking programs; and
- Recycled water.

Within the CLWA service area, these sources of water supply can be characterized as: (1) *local supplies*, consisting of groundwater and recycled water; and (2) *imported supplies*, transported via the SWP consisting of SWP contract amounts, other imported water sources and dry year supplies delivered from groundwater banking programs. As required by SB 610 (Water Code §10910(d)), Chapter 2 of the 2005 UWMP and the SCVWR 2009 summarize the quantities of water used by each of the water purveyors in the Santa Clarita Valley to meet water demands since importation of SWP water began in 1980. Also, Section 1.6, above, contains a list of documents identifying the existing water supply entitlements, water rights, or water service contracts relevant to meet the project's water demand as well as future estimated demands reported in the 2005 UWMP.

Potential future water sources include acquisition of additional imported water supplies, recycled water, desalination, storm water runoff, increased short term pumping from the Saugus Formation during dry years and additional groundwater banking programs. Demand side management programs (conservation) are also considered an important component of water supply resulting from efforts by CLWA, Valencia and the other retailers to reduce long-term water demands.

## 3.2 Groundwater

Water Code §10910(f) requires a WSA to include specific information describing groundwater resources if the water supply for a proposed project includes groundwater. Over the last 25 years, the water purveyors have developed a groundwater operating plan that includes municipal, agricultural and other smaller uses while maintaining the local Basin in a sustainable condition (i.e., no long term depletion of groundwater or interrelated surface water). This has resulted in preparation of the following important studies funded by the purveyors to ensure sustainability of the local groundwater resources:

1. Slade (2002) updates prior reports and includes a detailed review of the hydrologic conditions and description of groundwater resources available to Valencia and other large municipal and agriculture groundwater producers, including SCWD, NCWD, The Newhall Land and Farming Company ("Newhall") and the Wayside Honor Ranch operating within the Santa Clara River Valley East Subbasin, one of several subbasins identified along the Santa Clara River in Los Angeles and Ventura counties by Updated Bulletin 118 of the California Department of Water Resources. The shallow aquifer system is designated the Alluvial aquifer and the deeper aquifer is designated the Saugus Formation. Slade reported that both aquifer systems were in good operating condition and not in an overdraft condition. Also included are hundreds of other small scale water producers that account for less than 1 percent of total production from these aquifer systems (SCVWR 2008).

2. In 2003, CLWA in cooperation with Valencia and the other retail water purveyors completed and adopted a Groundwater Management Plan in accordance with Water Code §10753. Among the elements of the adopted Plan is the preparation of annual groundwater management reports, such as the Santa Clarita Valley Water Report, that provides information about local groundwater conditions, SWP supplies, water conservation and recycled water. The Plan also contemplated preparing other technical reports to address specific aspects of basin management. Recently, technical reports have been prepared on the development and calibration of a numerical groundwater flow model, an analysis of perchlorate containment in groundwater and a groundwater yield study of the Upper Basin.

3. In August 2005, work was completed in support of a Memorandum of Understanding (MOU) entered into by the Valencia, CLWA and the other water purveyors and United Water Conservation District. The MOU is a commitment by the water purveyors to expand on the previous knowledge of groundwater conditions in the Upper Basin and, using a regional groundwater flow model, evaluate the long-term sustainability of the purveyor's groundwater operating plan under a range of existing and potential future hydrologic conditions. The primary conclusion of the modeling analysis is that the groundwater operating plan will not cause detrimental short-term or long-term effects to the groundwater and surface water resources in the Santa Clarita Valley and, therefore, is sustainable (Basin Yield Study, 2005).

4. In August 2009, the Basin Yield Study 2005 was updated by Luhdorff and Scalmanini and GSI Solutions. The study essentially updated previous groundwater modeling work but included important additional analyses. The additional work included analyzing different groundwater operating scenarios and assessing the potential impact from several climate change scenarios. The updated study concluded that continuation of the region's current groundwater operating plan is sustainable; that the groundwater basin has not been and is not projected to be in overdraft; and that the water purveyors' groundwater operating can be relied upon for long term planning purposes (Basin Yield Study, 2009).

The following sub-parts respond to specific requirements of Water Code §10910(f):

### 3.2.1 Water Code §10910(f)(1). Review of relevant information contained in the urban water management plan.

The 2005 UWMP contains relevant information about groundwater resources available for the project in Chapter 3, Water Resources and Appendix C, Groundwater Resources and Yield. This includes a description of the local Alluvial and Saugus Formation aquifer systems, their respective yields as well as historical and projected production consistent with the purveyor's groundwater operating plan.

### 3.2.2 Water Code §10910(f) (2). Description of any groundwater basin or basins from which the proposed project will be supplied, including information concerning adjudication and overdraft.

Slade (2002) provides a detailed description of the Santa Clara River Valley East Sub-basin ("Basin") and the two aquifer systems, the Alluvial aquifer and the Saugus Formation. The Basin is about 22 miles long east to west and 13 miles wide. The Alluvial Aquifer has an estimated storage capacity of about 240,000 acre-feet (af) of water and approximately 1.65 million af of potentially usable groundwater is present from depths of 300 to 2,500 feet in the Saugus Formation (Slade 2002).

In 2003, CLWA with the cooperation of Valencia and the other retail water purveyors completed and adopted a Groundwater Management Plan in accordance with Water Code §10753. The management objectives of the Plan is to ensure the ongoing use of local groundwater by maintaining the Basin in good operating condition (no overdraft), protecting water quality and preventing adverse impacts to surface waters. The groundwater basin has not been adjudicated and has not been identified as overdrafted or projected to be overdrafted by the Department of Water Resources (DWR Bulletin 118, California's Groundwater, 2003, page 98).

The most current analysis and update of operational yield for both aquifers is included in the Basin Yield Study completed by CH2MHill/Scalmanini in 2005, as updated by Luhdorff and Scalmanini and GSI Solutions in 2009. The updated report analyzes the operational yield of both aquifers and other parameters of production capacity. The study concluded neither aquifer

system is in overdraft and the purveyor's groundwater operating plan as described in the Groundwater Management Plan is sustainable (Basin Yield Study, 2009).

### 3.2.3 Water Code §10910(f)(3). Description and analysis of the amount and location of groundwater pumped by the public water system for the past 5 years from any groundwater basin from which the proposed project will be supplied.

During the past 5-year period, Valencia's production averaged 12,288 afy from the Alluvial aquifer and 2,212 afy from the Saugus Formation. See Table 2-1 in the SCVWR 2009 for a summary of the historical groundwater production for the past five years by the retail water purveyors.

Total pumpage from the Alluvial aquifer in 2007 was 41,716 af. Of the total Alluvial pumpage in 2008, 27,919 af was for municipal water supply, and the balance, 13,797 af, was for agriculture and other (minor) miscellaneous uses (SCVWR 2009). Since 1980, when imported water deliveries began from the SWP, total pumpage from the Alluvial aquifer has ranged from a low of about 20,200 afy (in 1983) to slightly more than 43,400 afy (in 1999) (SCVWR 2009).

Total pumpage from the Saugus Formation in 2008 was 6,918 af (SCVWR 2009). Of the total Saugus Formation pumpage in 2008, 5,965 af was for municipal water supply, and the balance 953 af was for agricultural and other (minor) uses (SCVWR 2009). Groundwater pumpage from the Saugus peaked in the early 1990s and then declined steadily. On a long-term average basis since the importation of SWP water, total pumpage from the Saugus Formation has ranged from a low of 3,716 afy (in 1999) to a high of 14,917 afy in (1991) (SCVWR 2009).

### 3.2.4 Water Code §10910(f)(4). Description and analysis of the amount and location of groundwater that is projected to be pumped by the public water system from any basin from which the proposed project will be supplied.

See Table 3-8 in the 2005 UWMP for a summary of the range of groundwater production projected by Valencia and the other the retail water purveyors. To ensure sustainability, the purveyors have committed that the annual use of groundwater pumped collectively in any given year will not exceed the purveyors' operating plan as described in the Basin Yield Study (August 2009) and reported annually in the Santa Clarita Valley Water Report. The project's potable water demand of 608 afy will be supplied from groundwater produced from the Alluvial aquifer located in Los Angeles County.

### 3.2.5 Water Code §10910(f)(5). Analysis of the sufficiency of the groundwater from the basin or basins from which the proposed project will be supplied to meet the projected water demand associated with the proposed project.

As to the Newhall Ranch Specific Plan, the project applicant, Newhall, would meet most of the potable water demands of the Specific Plan by using Newhall's groundwater produced from the

Alluvial aquifer in Los Angeles County, which is presently committed to agriculture. The amount of water available from this source totals approximately 7,038 afy. The project's potable water demand is estimated to be 608 afy. The water presently used to irrigate crops would be used to meet all of the potable water needs of the project resulting in no net increase in groundwater use.

As stated previously, the water purveyors have developed a groundwater operating plan to meet the requirements of municipal, agricultural and other smaller uses while maintaining the local Alluvial Aquifer and Saugus Formation in a sustainable condition (i.e., no long term depletion of groundwater or interrelated surface water). The groundwater operating plan is based on the concept that pumping can vary from year to year to allow increased groundwater use in dry year periods and increased recharge during wet periods and collectively assure that the groundwater Basin is adequately replenished through various wet/dry cycles. A description of the groundwater operating plan is found in the 2005 UWMP and the Basin Yield Study (August 2009). Based on these studies, the groundwater Basin is in good operating condition (not in a condition of overdraft). The purveyor's groundwater operating plan is a reliable long term component of water supply for the Santa Clarita Valley.

As stated in this WSA, an analysis and discussion regarding the discovery and impact of perchlorate contamination on the sufficiency of groundwater supplies is contained in the 2005 UWMP and most recent annual Santa Clarita Valley Water Report. The reliability analysis contained in the 2005 UWMP takes into account the impact of perchlorate on water supply operations while the planning, design and construction of treatment and other restoration activities are implemented.

### 3.2.6 Sustainability of Existing Groundwater Supplies and Projected Supplies

Groundwater supplies were reviewed in the 2005 UWMP and evaluated in the Basin Yield Study (August 2009) to determine whether supply projections were realistic over varying hydrologic conditions. The review made the following critical findings:

(1) Both the Alluvial aquifer and the Saugus Formation are reasonable and sustainable sources at the yields represented in the 2005 UWMP over the next 25 years;

(2) The yields are not overstated and will not deplete or "dry up" the groundwater basin; and

(3) There is no need to reduce the yields for purposes of planning in the context of the 2005 UWMP.

Additionally, the 2005 UWMP and Basin Yield Study (August 2009) concluded that both aquifers are in good operating condition (not in a condition of overdraft) and are not projected to become overdrafted.

## 3.3 Additional Project Water Supplies

### 3.3.1 Nickel Water

Newhall also maintains contractual rights to an additional source of water, referred to as "Nickel Water." The applicant has secured 1,607 afy of potable water under contract with the Nickel Family LLC in Kern County. This water is 100 percent reliable on a year-to-year basis, and not subject to the annual fluctuations that can occur in dry year conditions. The water would be delivered through the Kern County Water Agency and the SWP system. Nickel Water would only be needed on the Specific Plan site in years when all of the Newhall Ranch agricultural water has been used, which is estimated to occur after the 20th year of project construction. Consequently, this source of water would not be needed to serve the proposed project.

### 3.3.2 Semitropic Water Storage District Groundwater Banking Project

The project applicant has entered into an agreement to reserve and purchase water storage capacity of up to 55,000 acre-feet in the Semitropic Water Storage District Groundwater Banking Project. Sources of water that can be stored in this banking project include, but are not limited to, Nickel Water, CLWA SWP entitlement and other CLWA water supplies. As of December 31, 2007, Newhall has stored 18,828 af of water in this banking program that could be extracted when needed in amounts of up to 4,950 afy. This supply provides added reliability for the entire Newhall Ranch Specific Plan especially in dry years and only after the Newhall Ranch agricultural water is fully committed. Consequently, this source is not needed to serve the proposed project.

## 3.4 Recycled Water

Wastewater that has been highly treated and disinfected can be reused for landscape irrigation. In 1993, CLWA completed a *Reclaimed Water System Master Plan* to use recycled water as a reliable water source to meet a portion of the non-potable demand within Santa Clarita Valley. The Master Plan was updated in 2002 and again in 2007, and the amount of recycled water expected to be produced in the future is approximately 17,000 af per year in 2030 (2005 UWMP, CLWA Final Program EIR Recycled Water Master Plan, 2007). CLWA is currently under contract for 1,700 af per year that became available in 2003.

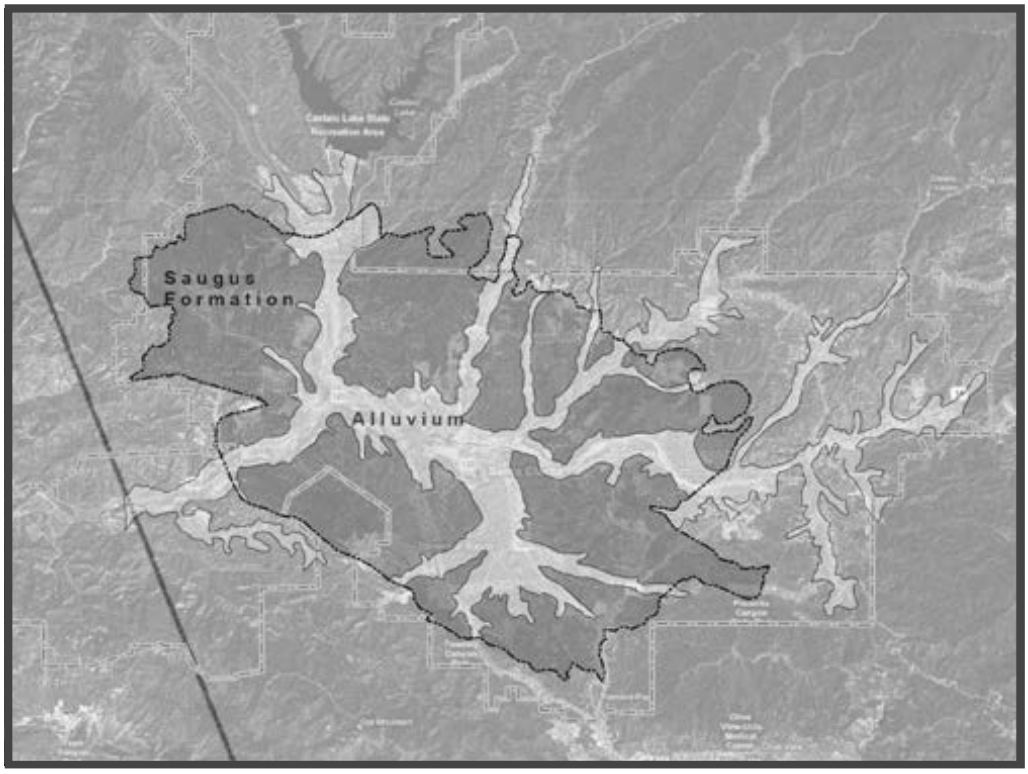
As the Newhall Ranch Specific Plan is developed, including the Landmark Village project, two sources of recycled water would be available to the project from the Newhall WRP and the existing Valencia WRP. Water from the Newhall WRP and Valencia WRP would be used to meet the non-potable demands of the project. Areas on the site that would use recycled water to meet non-potable demands include common areas, slopes, school landscaped areas and parks.

Wastewater generated by the project would be pumped to the Valencia WRP for treatment. Consequently, initial deliveries of recycled water to the project would be supplied from the Valencia WRP.

## 4.0 CONCLUSION

Based on the analysis set forth in this revised WSA and as supported by the documents relied on for its preparation, Valencia Water Company's total projected water supplies will meet the projected water demands associated with the Landmark Village project in combination with existing and other planned uses within the Valencia's service area. This determination is consistent with the best available information, including the 2005 UWMP, DWR's 2009 Delivery Reliability Report, and the most recent annual Santa Clarita Valley Water Report (April 2009).

# 2009
# Santa Clarita Valley
# Water Report




Castaic Lake Water Agency (CLWA)
CLWA Santa Clarita Water Division
Los Angeles County Waterworks District 36
Newhall County Water District
Valencia Water Company
May 2010

LUHDORFF & SCALMANINI
CONSULTING ENGINEERS

# 2009 Santa Clarita Valley Water Report

*prepared for:*

Castaic Lake Water Agency (CLWA)
CLWA Santa Clarita Water Division
Los Angeles County Waterworks District 36
Newhall County Water District
Valencia Water Company

LUHDORFF & SCALMANINI
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# Executive Summary

This annual report, which is the twelfth in a series that began to describe water supply conditions in 1998, provides current information about the water requirements and water supplies of the Santa Clarita Valley. The report was prepared for the imported water wholesaler, Castaic Lake Water Agency (CLWA), and for the four local retail water Purveyors that serve the Valley: CLWA Santa Clarita Water Division, Los Angeles County Waterworks District 36, Newhall County Water District, and Valencia Water Company. These entities and representatives from the City of Santa Clarita and the County of Los Angeles Department of Regional Planning meet as required to coordinate the management of imported water with local groundwater and recycled water to meet water requirements in the Valley.

This report provides information about local groundwater resources, State Water Project (SWP) and other imported water supplies, water conservation, and recycled water. The report reviews the sufficiency and reliability of supplies in the context of existing water demand, with focus on actual conditions in 2009, and it provides a short-term outlook of water supply and demand for 2010.

## ES.1 2009 Water Requirements and Supplies

In 2009, total water requirements in the Santa Clarita Valley were about 86,600 acre-feet (af), of which about 70,000 af (81 percent) were for municipal use and the remainder (16,600 af) was for agricultural and other (miscellaneous) uses, including individual domestic uses. Total demand in 2009 was about 4.5 percent lower than in 2008, less than what was estimated in the 2008 Water Report, and water requirements in 2009 were also lower than the average projection in the 2005 Urban Water Management Plan (UWMP) (but closer to the projection in the 2005 UWMP with conservation). The majority of decreased water demand is attributable to a significant (8%) decrease in municipal water use from 2008. Total water requirements in 2009 were met by a combination of about 47,700 af from local groundwater resources (about 31,100 af for municipal and about 16,600 af for agricultural and other uses), about 38,600 af of SWP and other imported water, and about 300 af of recycled water.

Of the 47,700 af of total groundwater pumping in the Valley in 2009, about 40,000 af were pumped from the Alluvium and about 7,700 af were pumped from the underlying, deeper Saugus Formation. Alluvial pumping represented about a 1,750 af decrease from 2008, and Saugus pumping was slightly higher than in 2008, by about 750 af. Neither pumping volume resulted in any notable overall change in groundwater conditions (water levels, water quality, etc.) in either

aquifer system. Imported water deliveries to the Purveyors decreased by about 3,200 af from the previous year. Water uses and supplies in 2009 are summarized in the following Table ES-1.

**Table ES-1**
**Santa Clarita Valley**
**Summary of 2009 Water Supplies and Uses**
**(acre-feet)**

| | | |
|---|---|---|
| ***Municipal*** | | |
| SWP and other Imported | | 38,546 |
| Groundwater (Total) | | 31,100 |
| *Alluvium* | *24,396* | |
| *Saugus* | *6,704* | |
| Recycled Water | | 328 |
| **Subtotal** | | **69,974** |
| | | |
| ***Agriculture/Miscellaneous*** | | |
| SWP and other Imported | | - |
| Groundwater (Total) | | 16,564 |
| *Alluvium* | *15,590* | |
| *Saugus* | *974* | |
| **Subtotal** | | **16,564** |
| | | |
| ***Total*** | | ***86,538*** |

In accordance with the California Urban Water Management Planning Act, the Valley-wide UWMP was updated in 2005 to extend projected water demands through 2030, and to describe the combination of local groundwater, imported water supplies from the State Water Project and other sources, local recycled water supplies, and other water supplies planned to meet those existing and projected water demands in the Valley. The 2005 UWMP describes the reliability of local groundwater resources and the adequacy of groundwater supplies to meet groundwater demand, including consideration of the impacts of perchlorate contamination on several municipal water supply wells. The 2005 UWMP also describes the plans and ongoing work for integrated control of perchlorate migration and full restoration of perchlorate-impacted groundwater supply.

Notable details about each component of water supply in the Valley, and about the water supply outlook for 2010, include the following.

## ES.2 Alluvial Aquifer

The groundwater operating plan in the 2005 UWMP includes Alluvial pumping in the range of 30,000 to 40,000 acre-feet per year (afy) following average/normal years, and slightly reduced pumping (30,000 to 35,000 afy) following dry years. An updated review of groundwater basin yield, completed in 2009, includes the same basic range of Alluvial pumping in the 2008 groundwater Operating Plan. Pumping from the Alluvium in 2009 was 40,000 af, which is at the upper end of the operating plan range for the Alluvium and had no adverse effects on groundwater levels and storage in the basin. On average, pumping from the Alluvium has been about 32,000 afy since supplemental imported water became available in 1980. That average rate remains near the lower end of the range of operational yield.

On a long-term basis, continuing through 2009, there is no evidence of any historic or recent trend toward permanent water level or storage decline. In general, throughout a large part of the basin, Alluvial groundwater levels have generally remained near historic highs during the last 30 years. Above average precipitation in late 2004 and 2005 resulted in significant water level recovery in the eastern part of the basin, continuing the overall trend of fluctuating groundwater levels within a generally constant range over the last 30 years. These ongoing data indicate that the Alluvium remains in good operating condition and can continue to support pumping in the operating range included in the 2005 UWMP, or slightly higher, without adverse results (e.g., long-term water level decline or degradation of groundwater quality.)

Based on an integration of water quality records from multiple wells completed in the Alluvium, there have been historical fluctuations in groundwater quality, typically associated with variations in precipitation and streamflow. However, like groundwater levels, there has been no long-term trend toward groundwater quality degradation; groundwater produced from the Alluvial aquifer remains a viable municipal and agricultural water supply.

In 2002, as part of ongoing monitoring of wells for perchlorate contamination, perchlorate was detected in one Alluvial well (the SCWD Stadium Well) located near the former Whittaker-Bermite facility. The detected concentration was slightly below the then-applicable Notification Level for perchlorate (6 μg/l, which was subsequently established as the Maximum Contaminant Level for perchlorate in October 2007), and the well has now been replaced to restore that component of municipal water supply that was impacted by perchlorate. In early 2005, perchlorate was detected in a second Alluvial well, VWC's Well Q2. After an interim period of wellhead treatment, that well has now been returned to regular water supply service. All other Alluvial wells operated by the Purveyors continue to be used for municipal water supply service;

those wells near the Whittaker-Bermite property are sampled in accordance with drinking water regulations and perchlorate has not been detected. As detailed in the 2005 UWMP, the ongoing inactivation of one Alluvial well due to perchlorate contamination does not limit the Purveyors' ability to produce groundwater from the Alluvium in accordance with the groundwater operating plan in the 2005 UWMP or the now updated 2008 groundwater Operating Plan.

The ongoing characterization and plan for control and cleanup of perchlorate in the Valley has focused on the Saugus Formation. In addition, however, on-site cleanup and control activities that began in 2006, and continued through 2009, include continuation of soil cleanup on the Whittaker-Bermite site, and continuation of pumping and treatment in the Northern Alluvium on the Whittaker-Bermite site. Expanded pumping and treatment, intended to effect perchlorate containment in the Northern Alluvium, became operational in October 2007. Under the direction of the State Department of Toxic Substances Control (DTSC), Whittaker has submitted a comprehensive site-wide remediation plan for the contaminants of concern in soil and groundwater detected on the site. A Draft Remedial Action Plan for Operable Units 2 through 6, focused on soil remediation, was submitted to DTSC in 2009. Whittaker has also completed a Draft Feasibility Study for Operable Unit 7 to identify and select treatment technologies for both on-site and off-site groundwater. Final approval of soil and groundwater clean-up plans by DTSC is expected by the end of 2010.

### ES.3 Saugus Formation

The groundwater operating plan in the 2005 UWMP includes pumping from the Saugus in the range of 7,500 to 15,000 afy in average/normal years; it also includes planned dry-year pumping from the Saugus of 21,000 to 35,000 afy for one to three consecutive dry years. The 2005 UWMP recognizes the results of basin yield analyses in 2004 and 2005 which found that such short-term pumping can be recharged during subsequent wet/normal years to allow groundwater levels and storage to recover, as it has in historical periods. The 2008 groundwater Operating Plan includes the same broad ranges by Saugus pumping.

Pumping from the Saugus Formation was about 7,700 af in 2009; on average, Saugus pumping has been about 6,800 afy since 1980. Both rates remain near the lower end of the ranges included in the groundwater operating plans and in the UWMP. As a result of long-term relatively low pumping from the Saugus Formation, groundwater levels in that aquifer have remained generally constant to slightly increasing over the last 35 to 40 years; those trends continued in 2009.

In 1997, ammonium perchlorate was discovered in four wells completed in the Saugus Formation in the vicinity of the former Whittaker-Bermite facility located generally toward the east, on the south side of the basin. All four of those impacted wells remain out of active supply service; one of them has been permanently sealed and destroyed. In 2006, a very low level of perchlorate was detected in another Saugus municipal well (NCWD's Well NC-13). That low level detection has been interpreted to not indicate anything new about the migration of perchlorate; however, it has also prompted additional monitoring well installation and a focused study of the Saugus Formation in that area. Results are being integrated with other groundwater remediation efforts and reviewed by the DTSC. All other Saugus wells owned and operated by the Purveyors are available for municipal water supply service. As part of regular operation, those wells are sampled in accordance with drinking water regulations and perchlorate has not been detected. Despite the inactivated Saugus wells, the Purveyors still have sufficient pumping capacity in other wells to meet the planned normal range of Saugus pumping in the 2005 UWMP.

Work toward the ultimate remediation of perchlorate contamination, including the restoration of impacted groundwater supply continued to progress in 2009, with focus on construction of facilities to implement a jointly developed plan to "pump and treat" contaminated water from two of the originally impacted wells to stop migration of the contaminant plume, and to deliver treated water for municipal supply to partially replace impacted well capacity. Environmental review of the project was completed with adoption of a Mitigated Negative Declaration in September 2005. The Final Interim Remedial Action Plan was completed and approved by DTSC in January 2006. Construction of facilities and pipelines necessary to implement the pump and treat program and to also restore inactivated well capacity began in November 2007. Construction was completed in spring 2010, and operational start-up is ongoing as this report is being written.

### ES.4 Imported Water

Historically comprised of only its SWP Table A Amount, CLWA's imported water supplies now consist of a combination of SWP water and water acquired from the Buena Vista Water Storage District in Kern County. CLWA's contractual Table A Amount is 95,200 af of water from the SWP. Under the 2007 Water Acquisition Agreement with the Buena Vista Water Storage District (Buena Vista) and the Rosedale-Rio Bravo Water Storage District (Rosedale-Rio Bravo), Buena Vista's high flow Kern River entitlements (and other acquired waters that may become available) are captured and recharged within the Rosedale-Rio Bravo's service area on an ongoing basis. CLWA will receive 11,000 af of these supplies annually through either exchange

of Buena Vista's and Rosedale-Rio Bravo's SWP supplies or through direct delivery of water to the California Aqueduct via the Cross Valley Canal.

CLWA's final allocation of SWP water for 2009 was 40 percent of its Table A Amount, or 38,080 af. The total available imported water supply in 2009 was 67,050 af, comprised of the 38,080 af of Table A supply, 11,000 af purchased from Buena Vista/Rosedale Rio Bravo, 14,610 af of 2008 carryover delivered in 2009, 1,650 af recovered from the Semitropic Water Banking and Exchange Program, 52 af from the 2009 SWP Turnback Pool and 1,658 af through the Yuba Accord. CLWA deliveries to the Purveyors were 38,546 af. Following disposition of available water supplies in 2009, carryover of 28,303 af from 2008 and 2009 is available for 2010 water supply. No additional banking of imported water occurred in 2009.

CLWA has two groundwater banking agreements with the Semitropic Water Storage District in Kern County. In accordance with those agreements, over a ten-year period (until 2012/13), CLWA could withdraw up to 50,870 af of its Table A water that was stored in 2002 and 2003 to meet future Valley demands when needed. Following the withdrawal of 4,950 af in 2009 (1,650 af utilized in 2009 and 3,300 af planned to be utilized in 2010), that balance is 45,920 af. In addition to the banking in Semitropic, CLWA finalized an agreement with the Rosedale-Rio Bravo Water Storage District in 2005 and can now bank up to 100,000 afy of surplus Table A Amount in that District's Water Banking and Exchange Program. In addition to 20,000 af previously banked in both 2005 and 2006, CLWA banked 8,200 af of water in 2007. In accordance with the provisions of that agreement, CLWA can withdraw up to a total of 42,900 af of that water, at a rate up to 20,000 afy, to meet Valley water demands when needed. Additionally, as part of the Buena Vista Water Acquisition Agreement, CLWA is entitled to 22,000 af of water that was stored in the Rosedale Rio-Bravo Water Banking and Exchange Program in 2005 and 2006 on CLWA's behalf. As of 2010, CLWA maintains a recoverable total of 64,900 af in the Rosedale Rio-Bravo Water Banking and Exchange Program.

Since SWP water deliveries are subject to reduction when dry conditions occur in Northern California, the UWMP includes programs, like the Semitropic and Rosedale-Rio Bravo programs, for enhancing water supply reliability during such occurrences. A capital improvement program funded by CLWA has been established to provide facilities and additional water supplies needed to firm up SWP water supplies during times of drought.

### ES.5 Recycled Water

Recycled water service was initiated in July 2003 in accordance with CLWA's Draft Reclaimed

Water System Master Plan (2002). The amount of recycled water used for irrigation purposes, at a golf course and in roadway median strips, was approximately 328 af in 2009. CLWA completed programmatic CEQA analysis in early 2007 for full implementation of the recycled water system as outlined in the Master Plan. CLWA is preparing the design of the second phase of the Recycled Water Master Plan that will take water from the Saugus Water Reclamation plant and distribute it to identified users to the north, across the Santa Clara River and then to the west and the east, which will include service to Santa Clarita Central Park. Another new phase of the recycled water system is in design to extend the system south from Magic Mountain Parkway. Collectively, these phases will have design capacity to increase recycled water deliveries by about 1,500 afy.

## ES.6 2010 Water Supply Outlook

In 2010, total water demands are expected to be between 82,000-84,000 af, less than actual water use over the last three years, and below the water demand projections in the 2005 UWMP. It is expected that water demands in 2010 will continue to be met with a generally similar mix of water supplies comprised of local groundwater, supplemental SWP and other imported water, and recycled water.

Announced on May 20, 2010, the final allocation of water from the SWP is 45 percent of CLWA's Table A Amount, or 42,840 af. Combined with local groundwater from the two aquifer systems (48,000 af), total Flexible Storage Account (6,060 af), net carryover of SWP Table A allocation from 2008 and 2009 (28,303 af), annual acquisition through the Buena Vista Water/Rosedale Rio-Bravo Water Acquisition Agreement (11,000 af), delivery of water previously recovered but not used from the Semitropic Groundwater Storage Bank (3,300 af), and recycled water (500 af), the total available water supplies for 2010 are 140,000 af. As a result, CLWA and the Purveyors anticipate having more than adequate supplies to meet all water demands in 2010.

In August, 2007, a federal court ruled that certain operational changes were required of the SWP in order to protect the endangered Delta smelt. The court order resulted in the preparation of a new Biological Opinion (BO) requiring DWR to implement mitigation requirements with resultant impacts on SWP water supply reliability. Since then, DWR has prepared two updates to its 2005 Reliability Report, which is issued biennially to assist SWP contractors in assessing the adequacy of the SWP component of their overall supplies under varying hydrologic scenarios, e.g. normal and dry years. The current Draft SWP Delivery Reliability Report 2009 was issued in February, 2010. With the objective of protecting endangered fish such as the Delta

smelt and spring-run salmon, the Draft incorporates restrictions on SWP operations according to the Biological Opinions of the U.S. Fish and Wildlife Service and the National Marine Fishery Service issued on December 15, 2008 and June 4, 2009, respectively. It also considers the impacts on SWP delivery reliability due to climate change, sea level rise, and vulnerability of the Delta's conveyance system and structure due to floods and earthquakes. The current Draft Reliability Report projects long-term reliability of 60 percent during normal year hydrology. CLWA staff has assessed the impact of the current Reliability Report on the CLWA reliability analysis contained in the Agency's 2005 UWMP and concluded that current and anticipated supplies are available to meet anticipated water supply needs.

CLWA, the retail water Purveyors, Los Angeles County and the City of Santa Clarita have formed the Santa Clarita Valley Water Committee. The specific purpose of the committee is to work collaboratively to ensure the progressive implementation of water use efficiency programs and ordinances in the Santa Clarita Valley. In terms of short-term water supply availability, CLWA has determined that, while current operational changes of the SWP are in effect, there are sufficient supplemental water supplies, including SWP water, to augment local groundwater and other water supplies such that overall water supplies will be sufficient to meet projected 2010 water requirements as reflected herein.

In any given year, SWP supplies may be reduced due to dry weather conditions or regulatory factors. During such an occurrence, the remaining water demands are planned to be met by a combination of alternate supplies such as returning water from CLWA's accounts in the Semitropic Groundwater Storage Program and the Rosedale-Rio Bravo Water Banking and Exchange Program, deliveries from CLWA's flexible storage account in Castaic Lake Reservoir, local groundwater pumping, short-term water exchanges, and participation in DWR dry-year water purchase programs in accordance with the 2005 Urban Water Management Plan. Following the recovery of 4,950 af in 2009, the banked excess 2002 and 2003 SWP Table A water in Semitropic represents nearly 46,000 af of recoverable water for drought water supply. In addition, the banked excess SWP Table A water in 2005 and 2006, augmented by banked water acquired through the Buena Vista/Rosedale-Rio Bravo Water Acquisition Agreement in 2005, 2006 and 2007, represent a total of 64,900 af of recoverable water for drought water supply from the Rosedale-Rio Bravo Banking and Exchange Program.

Drought periods may affect available water supplies in any single year and for a duration usually not longer than three consecutive years. It is important to note that hydrologic conditions vary from region to region throughout the state. Dry conditions in Northern California affecting SWP supply may not affect local groundwater and other supplies in Southern California, and the

reverse situation can also occur (as it did in 2002 and 2003). For this reason, CLWA and the Purveyors have emphasized developing a water supply portfolio that is diverse, especially in dry years. Diversity of supply is considered a key element of reliability, giving Valley water Purveyors the ability to draw on multiple sources of supply to ensure reliable service during dry years, as well as during normal and wet years.

# 1. Introduction

## 1.1 Background

For most residents of the Santa Clarita Valley (Valley), domestic water service is provided by four retail water Purveyors: Castaic Lake Water Agency's Santa Clarita Water Division (SCWD), Los Angeles County Waterworks District 36 (LAWWD36), Newhall County Water District (NCWD), and Valencia Water Company (VWC). Together, the Purveyors provide water to nearly 70,000 service connections. As a State Water Contractor, Castaic Lake Water Agency (CLWA) contracts for State Water Project water delivered from Castaic Lake, after which it is treated, filtered, and disinfected at two CLWA treatment plants before distribution to the Purveyors. Staff of these entities meet regularly to coordinate the supply of water in the Valley. Their respective service areas are shown in Figure 1-1.

While municipal water supply has grown to become the largest category of water use in the Valley, there remains an agricultural and other small private water demand that is predominately dependent on local groundwater for its water supply. Accordingly, ongoing agricultural water requirements and the use of local groundwater to meet those requirements are considered in analyses of water requirements and supplies such as reported herein. In addition to municipal and agricultural water uses in the Valley, water supply for a small fraction of Valley residents is provided by individual private water supply wells. The locations, construction details, annual pumping and other information about these private wells are not currently available. In the absence of detailed information about private wells and associated water use, pumping as reported herein necessarily includes an estimate of groundwater pumped from private wells; it is intended that this estimate will be refined in the future as more information about the private wells is obtained.

For more than 20 years, CLWA and the Purveyors have reviewed and reported on the availability of water supplies to meet all water requirements in the Valley. Those reports have also addressed local water resources, most notably groundwater, in the region. Past studies have assessed the condition of local groundwater aquifers, their hydrogeologic characteristics, aquifer storage capacity, operational yield and recharge rate, groundwater quality and contamination, and the ongoing conjunctive use of groundwater and imported water resources.

Other efforts have included developing drought contingency plans, coordinating emergency response procedures and implementing Valley-wide conservation programs. In 1985, the

Purveyors prepared the area's first Urban Water Management Plan (UWMP.) Information in the plan was coordinated among CLWA and the Purveyors to provide accurate, comprehensive and consistent water supply and demand information for long term planning purposes. In accordance with the California Urban Water Management Planning Act, the Valley-wide UWMP was most recently updated in 2005 to extend water demand projections through 2030, and to describe the combination of local groundwater, imported water supplies from the State Water Project, local recycled water supplies, and planned other water supplies to meet the existing and projected water demands in the Valley. The 2005 UWMP also describes the reliability of local groundwater resources and the adequacy of groundwater supplies to meet that component of overall water supply; and it also describes the impacts of perchlorate contamination on several municipal water supply wells, and the plans and ongoing work for integrated control of perchlorate migration and full restoration of perchlorate-impacted groundwater supply.

In 2009, primarily in preparation for the next update of the UWMP in 2010, an updated analysis of groundwater basin yield was completed to guide the ongoing use of groundwater and the associated distribution of pumping to maintain groundwater use at a sustainable rate while also addressing localized issues such as restoration of groundwater contamination which has impacted local groundwater supplies since 1987. The results of the updated groundwater basin analysis are summarized in this Water Report.

## 1.2 Purpose and Scope of the Report

The purpose of this report, which is the twelfth in a series of annual water reports that began to describe water supply conditions in 1998, is to provide current information about water requirements and available water supplies to meet those demands in the Santa Clarita Valley. CLWA and the Purveyors began preparation of this series of reports in response to a request made by the Los Angeles County Board of Supervisors in 1998. Over the last few years, this series of reports has also served as an annual summary of groundwater conditions in the Valley in fulfillment of the commitment in the Santa Clarita Valley Groundwater Management Plan, adopted in 2003, to regularly report on implementation of that Plan.

This report was prepared for Castaic Lake Water Agency, for CLWA's Santa Clarita Water Division, and for Los Angeles County Waterworks District 36, Newhall County Water District, and Valencia Water Company. It continues a format for providing information regarding water uses and the availability of water supplies on an annual basis. It is intended to be a helpful resource for use by water planners and local land use planning agencies. This report is complemented by the more detailed Urban Water Management Plan for the area, which provides

longer-term water supply planning over a 25-year period, and by a number of other technical reports, some of which are specifically referenced herein.

## 1.3 Santa Clarita Valley Water Purveyors

As introduced above, four retail water Purveyors provide water service to most residents of the Santa Clarita Valley. Brief summary descriptions of those four Purveyors are as follows.

**Castaic Lake Water Agency Santa Clarita Water Division** has a service area that includes a portion of the City of Santa Clarita and unincorporated portions of Los Angeles County in the communities of Saugus, Canyon Country, and Newhall. Water is supplied from both groundwater and CLWA turnouts to about 28,700 service connections.

**Los Angeles County Waterworks District 36** has a service area that encompasses approximately 7,635 acres in the Hasley Canyon area and the unincorporated community of Val Verde. LAWWD 36 has nearly 1,400 service connections. The District has traditionally obtained its full water supply from a connection to the CLWA's Castaic Conduit and continued to do so in 2009.

**Newhall County Water District's** service area includes portions of the City of Santa Clarita and unincorporated portions of Los Angeles County in the communities of Newhall, Canyon Country, Valencia, and Castaic. NCWD supplies water from both groundwater and CLWA turnouts to approximately 9,600 service connections.

**Valencia Water Company's** service area serves nearly 30,000 service connections in a portion of the City of Santa Clarita and in the unincorporated communities of Castaic, Newhall, Saugus, Stevenson Ranch, and Valencia. VWC supplies water from both groundwater and CLWA turnouts; VWC also delivers recycled water for a small amount of non-potable use.

## 1.4 The Upper Santa Clara River Hydrologic Area and East Groundwater Subbasin

The Upper Santa Clara River Hydrologic Area (HA), as defined by the California Department of Water Resources (DWR), is located almost entirely in northwestern Los Angeles County. The area encompasses about 654 square miles comprised of flat valley land (about 6 percent of the total area) and hills and mountains (about 94 percent of the total area) that border the valley area. The mountains include the Santa Susana and San Gabriel Mountains to the south, and the Sierra

Pelona and Leibre-Sawmill Mountains to the north. Elevations range from about 800 feet on the valley floor to about 6,500 feet in the San Gabriel Mountains. The headwaters of the Santa Clara River are at an elevation of about 3,200 feet at the divide separating this hydrologic area from the Mojave Desert.

The Santa Clara River and its tributaries flow intermittently from Lang Station westward about 35 miles to Blue Cut, just west of the Los Angeles-Ventura County line, where the River is the outlet from the Upper Santa Clara River Hydrologic Area. The principal tributaries of the River in the Santa Clarita Valley are Castaic Creek, San Francisquito Creek, Bouquet Creek, and the South Fork of the Santa Clara River. In addition to tributary inflow, the Santa Clara River receives treated wastewater discharge from the Saugus and Valencia Water Reclamation Plants, which are operated by the Sanitation Districts of Los Angeles County.

The Santa Clara River Valley East Groundwater Subbasin, beneath the Santa Clarita Valley in the Upper Santa Clara River HA, is the source of essentially all local groundwater used for water supply in the Santa Clarita Valley. Below Blue Cut, the Santa Clara River continues westward through Ventura County to its mouth near Oxnard. Along that route, the River traverses all or parts of six groundwater basins in Ventura County (Piru, Fillmore, Santa Paula, Oxnard Forebay, Oxnard Plain, and Mound) as shown in Figure 1-2.

There are two primary precipitation gages in the Santa Clarita Valley, the Newhall-Soledad 32c gage and the Newhall County Water District gage (Figure 1-3). The National Climatic Data Center (NCDC) and Los Angeles County Department of Public Works (LADPW) have maintained records for the Newhall-Soledad 32c gage since 1931. Newhall County Water District has maintained records for the NCWD gage since 1979. The cumulative records from these two gages correlate very closely, with the NCWD gage recording approximately 25 percent more precipitation than the Newhall-Soledad 32c gage. This is likely due to the location of the NCWD gage, which is at the base of the mountains rimming the southern edge of the Santa Clarita Valley.

The Santa Clarita Valley is characterized as having an arid climate. Historically, intermittent periods of below-average precipitation have typically been followed by periods of above-average precipitation in a cyclical pattern, with each wetter or drier period typically lasting from one to five years. The longer-term precipitation records for the Newhall-Soledad 32c gage are illustrated in Figure 1-3. Long-term average precipitation at that gage is 17.9 inches (1931-2009). Figure 1-3 also shows the cumulative departure from mean annual precipitation. In general, periods of below-average precipitation have been longer and more moderate than

periods of above-average precipitation. Recently, the periods from 1971 to 1976, 1984 to 1991 and 1999 to 2003 have been drier than average; the periods from 1977 to 1983 and 1992 to 1996 have been wetter than average. More recently, wet conditions that began in late 2004, continued into early 2005, ultimately resulting in about 37 inches of measured precipitation, or slightly more than 200 percent of long-term average precipitation, in that year. Those significantly wet conditions contributed to substantial groundwater recharge and decreased water demand that year. Subsequently, total precipitation in 2006 and 2007 was slightly to significantly lower, 14 inches and 6 inches respectively, but water requirements in both years were still close to those projected in the 2005 UWMP, and there were no dramatic changes in groundwater conditions. With the exception of the average annual rainfall total in 2008, the dry conditions that began in 2006 have persisted through 2009. 2009 was a below-average year, with 11.6 inches of precipitation. However, water demand in 2009 was below that projected for average conditions in the 2005 UWMP, and below the short-term projection in the 2008 Water Report. Early year precipitation in 2010 was approximately 13.4 inches through April, or close to long-term average for that part of the year, but water use further decreased from last year for the same period. Combined with other water supply considerations, discussed in Chapter 4, those conditions are expected to result in 2010 water requirements being slightly lower than water use in 2009.

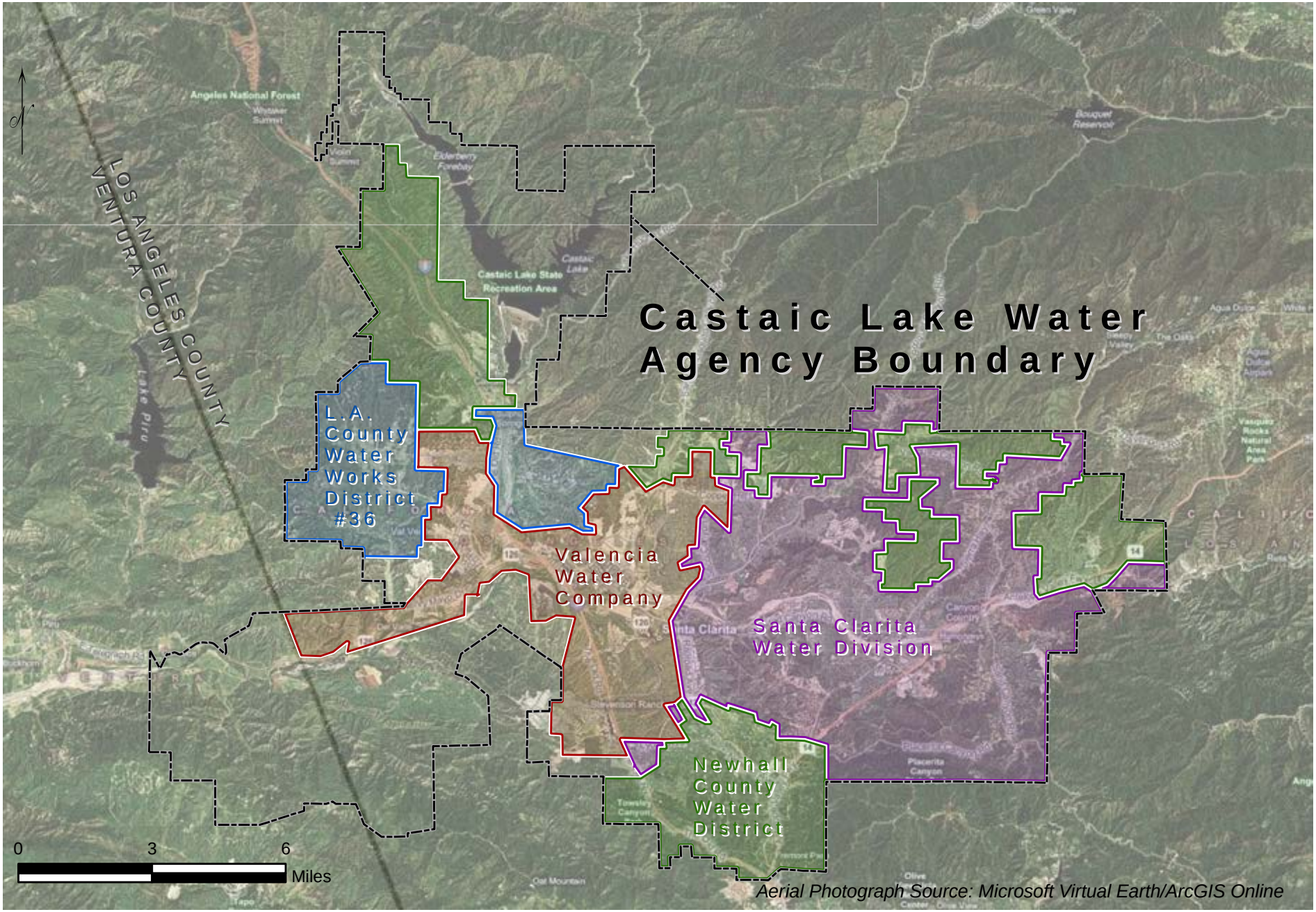


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**Figure 1-1**
**CLWA and Purveyor Service Areas**

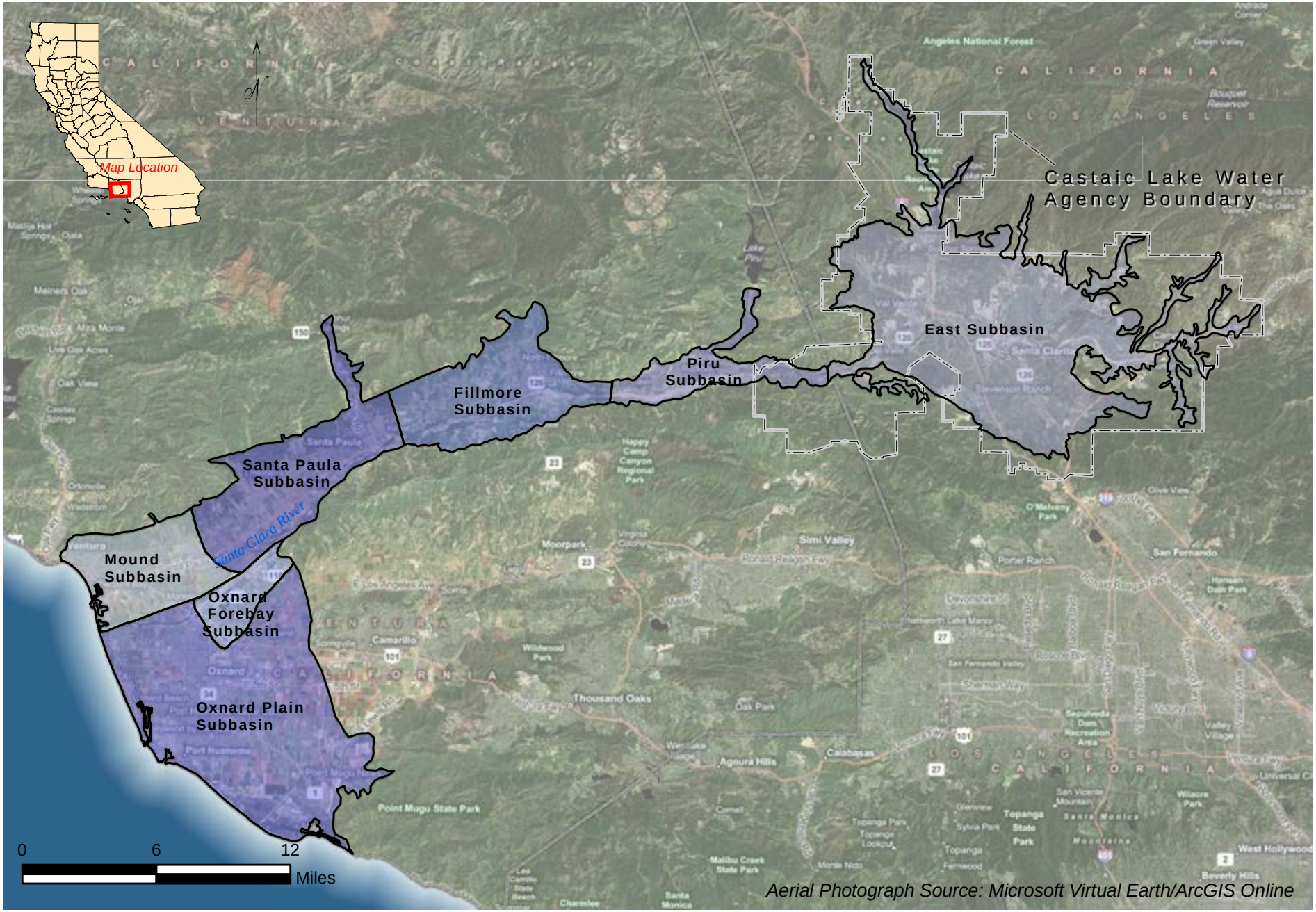


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**Figure 1-2**
**Santa Clara River Groundwater Subbasins**

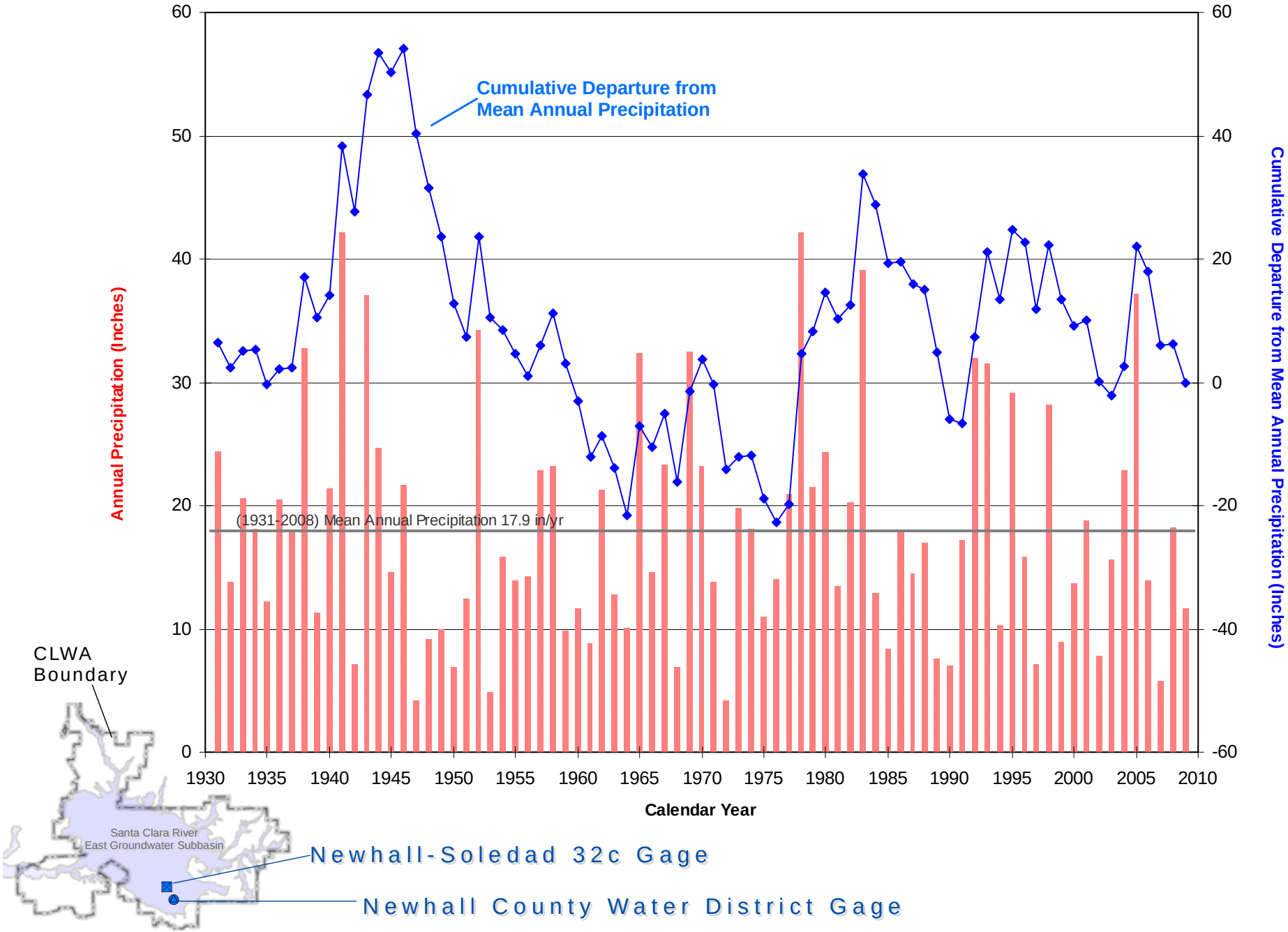


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**Figure 1-3**
**Annual Precipitation and Cumulative Departure from Mean Annual Precipitation at Newhall-Soledad 32c Gage**

# 2. 2009 Water Requirements and Supplies

Total water use in the Santa Clarita Valley was 86,600 af in 2009, a decrease of 4,100 af from the previous year. Of the total water demand, 70,000 af (81 percent) were for municipal use and the remaining 16,600 af (19 percent) were for agricultural and other (miscellaneous) uses, including estimated individual domestic uses. The majority of decreased water demand is attributable to a significant (8%) decrease in municipal water use from 2008. The total water demands were met by a combination of about 47,700 af from local groundwater resources (about 31,100 af for municipal supply and about 16,600 af for agricultural and other uses), about 38,600 af of SWP and other imported water, and about 300 af of recycled water.

Compared to the previous year, total water demand in the Santa Clarita Valley decreased by about 4.5 percent in 2009, and was less than the short-term projected water requirement presented in last year's Water Report. The decrease in water use in 2009 is attributed to ongoing very slow growth in the number of new service connections and continued water conservation awareness as a result of state-wide dry conditions and decreased deliveries of water from the State Water Project. Growth in each Purveyor service area was notably lower than in the preceding two years, with total additions of only about 300 new services connections in 2009, in notable contrast to the growth rate of about 1,000 connections per year over the preceding three years, and in even greater contrast to the predominant growth rate that was three times higher from the late 1990's through 2004. In addition, the Purveyors and the local community continued to be aware of the Governor's Alert in June, 2008 with regard to drought conditions and potential water supply shortages followed by the Governor's Drought Emergency Declaration in February, 2009. The widespread awareness of dry conditions throughout the state and the perceived effects on water supply availability are considered to be prime factors causing total water demand in 2009 to have continued to decline over each of the preceding two years, and to be well below the demand projections in the 2005 UWMP.

The uses of local groundwater, augmented by imported water supplies to meet municipal water requirements since 1980, when the importation of SWP water began, and also slightly augmented by the use of recycled water, are summarized in Table 2-1. Notable with regard to municipal water requirements is that, through 2009, total municipal demand (70,000 af) continues to be below (by about 11,000 af in 2009) the projections in the 2005 UWMP without conservation, and about equal to the projections in the UWMP with conservation.

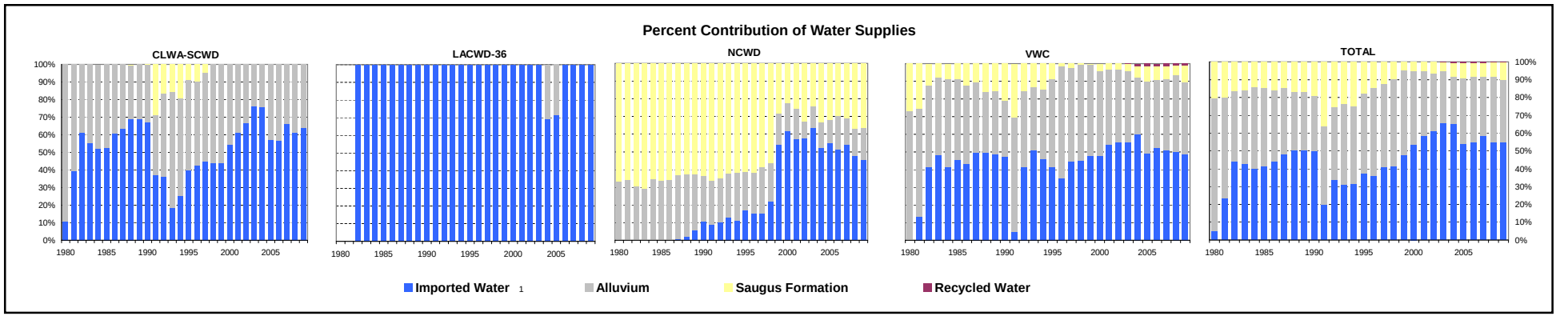
Water supply utilization for all agricultural and other non-municipal uses is summarized in Table 2-2. The category of Small Private Domestic, Irrigation and Golf Course Uses in Table 2-2 includes an estimated 500 af of small private pumping from the Alluvium.

Water supply utilization for all uses in the Santa Clarita Valley, again for the period 1980 to present, is summarized in Table 2-3. The trends in utilization of local groundwater and imported water, complemented by the recent addition of recycled water, are graphically illustrated in Figure 2-1. As can be seen by inspection of Table 2-2 and Figure 2-1, total water use in the Valley was nearly linearly increasing from the early 1980's through 2007, with some weather-related fluctuations in certain years. As discussed above, total water use has declined over the last two years, from a peak slightly above 92,000 af in 2007 to 86,600 af in 2009. Overall, the increase in total water demand since the inception of supplemental SWP importation has been from about 37,000 acre-feet in 1980 to the mid-80,000 acre-feet per year range through 2000-2005, to the short-term peak in the low-90,000 acre-feet per year range in 2006 through 2008.

The decreased demand in 2009 is comparable to the then-increasing demand in 2002. As can also be seen by inspection of Table 2-2 and Figure 2-1, most of the historical increase in water demand has been met with generally increasing importation of SWP water, most recently complemented by other imported water as discussed herein. Since the early 1990's, following a decade of decreased groundwater use during the initial period of SWP importation, total groundwater pumping has fluctuated from year to year, but has remained within a range between about 38,000 and 50,000 acre-feet per year through 2009.

**Table 2-1**
**Water Supply Utilization by Municipal Purveyors**
**(Acre-Feet)**

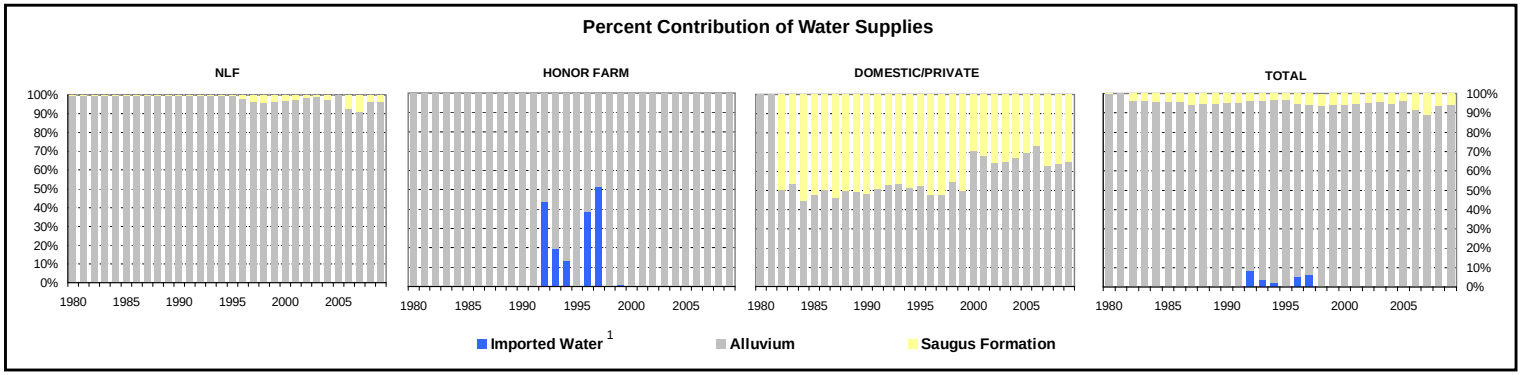
| | CLWA Santa Clarita Water Division | | | | Los Angeles County Waterworks District 36 | | | Newhall County Water District | | | | Valencia Water Company | | | | | All Municipal Purveyors | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | *Imported Water* [1] | *Alluvium* | *Saugus Formation* | **Total** | *Imported Water* [1] | *Alluvium* [2] | **Total** | *Imported Water* [1] | *Alluvium* | *Saugus Formation* | **Total** | *Imported Water* [1] | *Alluvium* | *Saugus Formation* | *Recycled Water* | **Total** | *Imported Water* [1] | *Alluvium* | *Saugus Formation* | *Recycled Water* | **Total** |
| 1980 | 1,125 | 9,460 | 0 | **10,585** | 0 | - | **0** | 0 | 1,170 | 2,363 | **3,533** | 0 | 5,995 | 2,206 | - | **8,201** | 1,125 | 16,625 | 4,569 | - | **22,319** |
| 1981 | 4,602 | 7,109 | 0 | **11,711** | 0 | - | **0** | 0 | 1,350 | 2,621 | **3,971** | 1,214 | 5,597 | 2,329 | - | **9,140** | 5,816 | 14,056 | 4,950 | - | **24,822** |
| 1982 | 6,454 | 4,091 | 0 | **10,545** | 145 | - | **145** | 0 | 1,178 | 2,672 | **3,850** | 3,060 | 3,415 | 897 | - | **7,372** | 9,659 | 8,684 | 3,569 | - | **21,912** |
| 1983 | 5,214 | 4,269 | 0 | **9,483** | 207 | - | **207** | 0 | 1,147 | 2,787 | **3,934** | 3,764 | 3,387 | 611 | - | **7,762** | 9,185 | 8,803 | 3,398 | - | **21,386** |
| 1984 | 6,616 | 6,057 | 0 | **12,673** | 240 | - | **240** | 0 | 1,549 | 2,955 | **4,504** | 4,140 | 4,975 | 854 | - | **9,969** | 10,996 | 12,581 | 3,809 | - | **27,386** |
| 1985 | 6,910 | 6,242 | 0 | **13,152** | 272 | - | **272** | 0 | 1,644 | 3,255 | **4,899** | 4,641 | 4,633 | 885 | - | **10,159** | 11,823 | 12,519 | 4,140 | - | **28,482** |
| 1986 | 8,366 | 5,409 | 0 | **13,775** | 342 | - | **342** | 0 | 1,842 | 3,548 | **5,390** | 5,051 | 5,167 | 1,427 | - | **11,645** | 13,759 | 12,418 | 4,975 | - | **31,152** |
| 1987 | 9,712 | 5,582 | 0 | **15,294** | 361 | - | **361** | 22 | 2,127 | 3,657 | **5,806** | 6,190 | 4,921 | 1,305 | - | **12,416** | 16,285 | 12,630 | 4,962 | - | **33,877** |
| 1988 | 11,430 | 5,079 | 63 | **16,572** | 434 | - | **434** | 142 | 2,283 | 4,041 | **6,466** | 7,027 | 4,835 | 2,300 | - | **14,162** | 19,033 | 12,197 | 6,404 | - | **37,634** |
| 1989 | 12,790 | 5,785 | 0 | **18,575** | 457 | - | **457** | 428 | 2,367 | 4,688 | **7,483** | 7,943 | 5,826 | 2,529 | - | **16,298** | 21,618 | 13,978 | 7,217 | - | **42,813** |
| 1990 | 12,480 | 5,983 | 40 | **18,503** | 513 | - | **513** | 796 | 1,936 | 4,746 | **7,478** | 7,824 | 5,232 | 3,516 | - | **16,572** | 21,613 | 13,151 | 8,302 | - | **43,066** |
| 1991 | 6,158 | 5,593 | 4,781 | **16,532** | 435 | - | **435** | 675 | 1,864 | 4,994 | **7,533** | 700 | 9,951 | 4,642 | - | **15,293** | 7,968 | 17,408 | 14,417 | - | **39,793** |
| 1992 | 6,350 | 8,288 | 2,913 | **17,551** | 421 | - | **421** | 802 | 1,994 | 5,160 | **7,956** | 6,338 | 6,615 | 2,385 | - | **15,338** | 13,911 | 16,897 | 10,458 | - | **41,266** |
| 1993 | 3,429 | 12,016 | 2,901 | **18,346** | 465 | - | **465** | 1,075 | 1,977 | 5,068 | **8,120** | 8,424 | 5,815 | 2,182 | - | **16,421** | 13,393 | 19,808 | 10,151 | - | **43,352** |
| 1994 | 5,052 | 10,996 | 3,863 | **19,911** | 453 | - | **453** | 906 | 2,225 | 5,103 | **8,234** | 7,978 | 6,847 | 2,565 | - | **17,390** | 14,389 | 20,068 | 11,531 | - | **45,988** |
| 1995 | 7,955 | 10,217 | 1,726 | **19,898** | 477 | - | **477** | 1,305 | 1,675 | 4,775 | **7,755** | 7,259 | 8,698 | 1,586 | - | **17,543** | 16,996 | 20,590 | 8,087 | - | **45,673** |
| 1996 | 9,385 | 10,445 | 2,176 | **22,006** | 533 | - | **533** | 1,213 | 1,803 | 4,871 | **7,887** | 6,962 | 12,433 | 326 | - | **19,721** | 18,093 | 24,681 | 7,373 | - | **50,147** |
| 1997 | 10,120 | 11,268 | 1,068 | **22,456** | 785 | - | **785** | 1,324 | 2,309 | 5,168 | **8,801** | 9,919 | 11,696 | 516 | - | **22,131** | 22,148 | 25,273 | 6,752 | - | **54,173** |
| 1998 | 8,893 | 11,426 | 0 | **20,319** | 578 | - | **578** | 1,769 | 1,761 | 4,557 | **8,087** | 9,014 | 10,711 | 149 | - | **19,874** | 20,254 | 23,898 | 4,706 | - | **48,858** |
| 1999 | 10,772 | 13,741 | 0 | **24,513** | 654 | - | **654** | 5,050 | 1,676 | 2,622 | **9,348** | 10,806 | 11,823 | 106 | - | **22,735** | 27,282 | 27,240 | 2,728 | - | **57,250** |
| 2000 | 13,751 | 11,529 | 0 | **25,280** | 800 | - | **800** | 6,024 | 1,508 | 2,186 | **9,718** | 12,004 | 12,179 | 1,007 | - | **25,190** | 32,579 | 25,216 | 3,193 | - | **60,988** |
| 2001 | 15,648 | 9,896 | 0 | **25,544** | 907 | - | **907** | 5,452 | 1,641 | 2,432 | **9,525** | 13,362 | 10,518 | 835 | - | **24,715** | 35,369 | 22,055 | 3,267 | - | **60,691** |
| 2002 | 18,921 | 9,513 | 0 | **28,434** | 1,069 | - | **1,069** | 5,986 | 981 | 3,395 | **10,362** | 15,792 | 11,603 | 965 | - | **28,360** | 41,768 | 22,097 | 4,360 | - | **68,225** |
| 2003 | 20,668 | 6,424 | 0 | **27,092** | 1,175 | - | **1,175** | 6,572 | 1,266 | 2,513 | **10,351** | 16,004 | 11,707 | 1,068 | 50 | **28,829** | 44,419 | 19,397 | 3,581 | 50 | **67,447** |
| 2004 | 22,045 | 7,146 | 0 | **29,191** | 854 | 380 | **1,234** | 5,896 | 1,582 | 3,739 | **11,217** | 18,410 | 9,862 | 1,962 | 420 | **30,654** | 47,205 | 18,970 | 5,701 | 420 | **72,296** |
| 2005 | 16,513 | 12,408 | 0 | **28,921** | 857 | 343 | **1,200** | 5,932 | 1,389 | 3,435 | **10,756** | 14,732 | 12,228 | 2,513 | 418 | **29,891** | 38,034 | 26,368 | 5,948 | 418 | **70,768** |
| 2006 | 17,146 | 13,156 | 0 | **30,302** | 1,289 | - | **1,289** | 5,898 | 2,149 | 3,423 | **11,470** | 16,313 | 11,884 | 2,449 | 419 | **31,065** | 40,646 | 27,189 | 5,872 | 419 | **74,126** |
| 2007 | 20,669 | 10,686 | 0 | **31,355** | 1,406 | - | **1,406** | 6,478 | 1,806 | 3,691 | **11,975** | 16,779 | 13,140 | 2,367 | 470 | **32,756** | 45,332 | 25,632 | 6,058 | 470 | **77,492** |
| 2008 | 18,598 | 11,878 | 0 | **30,476** | 1,354 | - | **1,354** | 5,428 | 1,717 | 4,195 | **11,340** | 16,325 | 14,324 | 1,770 | 311 | **32,730** | 41,705 | 27,919 | 5,965 | 311 | **75,900** |
| 2009 | 17,739 | 10,077 | 0 | **27,816** | 1,243 | - | **1,243** | 4,832 | 1,860 | 3,868 | **10,559** | 14,732 | 12,459 | 2,836 | 328 | **30,355** | 38,546 | 24,396 | 6,704 | 328 | **69,974** |




*1. Reflects State Water Project through 2006; includes imported water from State Water Project and Buena Vista WSD Agreement beginning in 2007.*
*2.Groundwater purchased from LA County Honor Farm.*

**Table 2-2**
**Individual Water Supply Utilization by Agricultural and Other Users**
**(Acre-Feet)**

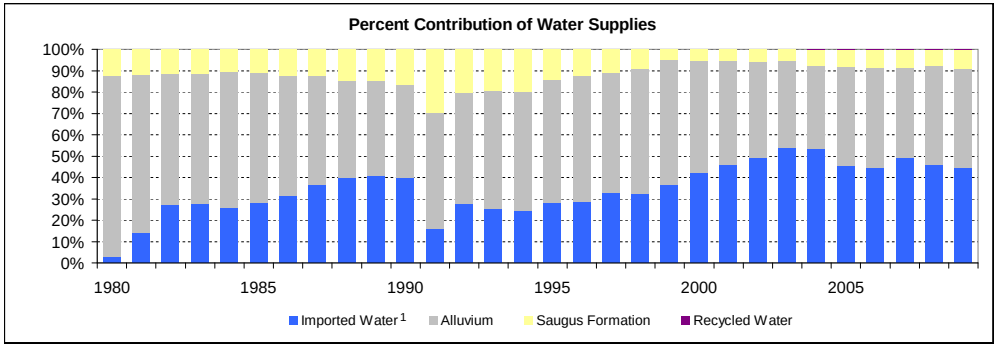
| | Newhall Land and Farming | | | Los Angeles County Honor Farm | | | Small Private Domestic, Irrigation and Golf Courses Uses | | | All Agricultural and Other Users | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | *Alluvium* | *Saugus Formation* | **Total** | *Alluvium* | *Imported Water* [1] | **Total** | *Alluvium* [2] | *Saugus Formation* [3] | **Total** | *Imported Water* [1] | *Alluvium* | *Saugus Formation* | **Total** |
| 1980 | 11,331 | 20 | **11,351** | 3,000 | 0 | **3,000** | 500 | 0 | **500** | 0 | 14,831 | 20 | **14,851** |
| 1981 | 13,237 | 20 | **13,257** | 3,000 | 0 | **3,000** | 500 | 0 | **500** | 0 | 16,737 | 20 | **16,757** |
| 1982 | 9,684 | 20 | **9,704** | 3,000 | 0 | **3,000** | 500 | 501 | **1,001** | 0 | 13,184 | 521 | **13,705** |
| 1983 | 7,983 | 20 | **8,003** | 3,000 | 0 | **3,000** | 500 | 434 | **934** | 0 | 11,483 | 454 | **11,937** |
| 1984 | 11,237 | 20 | **11,257** | 3,000 | 0 | **3,000** | 500 | 620 | **1,120** | 0 | 14,737 | 640 | **15,377** |
| 1985 | 9,328 | 20 | **9,348** | 3,000 | 0 | **3,000** | 500 | 555 | **1,055** | 0 | 12,828 | 575 | **13,403** |
| 1986 | 8,287 | 20 | **8,307** | 3,000 | 0 | **3,000** | 500 | 490 | **990** | 0 | 11,787 | 510 | **12,297** |
| 1987 | 6,512 | 20 | **6,532** | 3,000 | 0 | **3,000** | 500 | 579 | **1,079** | 0 | 10,012 | 599 | **10,611** |
| 1988 | 5,951 | 20 | **5,971** | 3,000 | 0 | **3,000** | 500 | 504 | **1,004** | 0 | 9,451 | 524 | **9,975** |
| 1989 | 6,243 | 20 | **6,263** | 3,000 | 0 | **3,000** | 500 | 522 | **1,022** | 0 | 9,743 | 542 | **10,285** |
| 1990 | 8,225 | 20 | **8,245** | 2,000 | 0 | **2,000** | 500 | 539 | **1,039** | 0 | 10,725 | 559 | **11,284** |
| 1991 | 7,039 | 20 | **7,059** | 2,240 | 0 | **2,240** | 500 | 480 | **980** | 0 | 9,779 | 500 | **10,279** |
| 1992 | 8,938 | 20 | **8,958** | 1,256 | 987 | **2,243** | 500 | 446 | **946** | 987 | 10,694 | 466 | **12,147** |
| 1993 | 8,020 | 20 | **8,040** | 1,798 | 443 | **2,241** | 500 | 439 | **939** | 443 | 10,318 | 459 | **11,220** |
| 1994 | 10,606 | 20 | **10,626** | 1,959 | 311 | **2,270** | 500 | 474 | **974** | 311 | 13,065 | 494 | **13,870** |
| 1995 | 11,174 | 20 | **11,194** | 2,200 | 6 | **2,206** | 500 | 453 | **953** | 6 | 13,874 | 473 | **14,353** |
| 1996 | 12,020 | 266 | **12,286** | 1,237 | 780 | **2,017** | 500 | 547 | **1,047** | 780 | 13,757 | 813 | **15,350** |
| 1997 | 12,826 | 445 | **13,271** | 1,000 | 1,067 | **2,067** | 500 | 548 | **1,048** | 1,067 | 14,326 | 993 | **16,386** |
| 1998 | 10,250 | 426 | **10,676** | 2,000 | 12 | **2,012** | 500 | 423 | **923** | 12 | 12,750 | 849 | **13,611** |
| 1999 | 13,824 | 479 | **14,303** | 1,842 | 20 | **1,862** | 500 | 509 | **1,009** | 20 | 16,166 | 988 | **17,174** |
| 2000 | 11,857 | 374 | **12,231** | 1,644 | 3 | **1,647** | 1,220 | 513 | **1,733** | 3 | 14,721 | 887 | **15,611** |
| 2001 | 12,661 | 300 | **12,961** | 1,604 | 0 | **1,604** | 1,224 | 573 | **1,797** | 0 | 15,489 | 873 | **16,362** |
| 2002 | 13,514 | 211 | **13,725** | 1,602 | 0 | **1,602** | 1,063 | 589 | **1,652** | 0 | 16,179 | 800 | **16,979** |
| 2003 | 10,999 | 122 | **11,121** | 2,273 | 0 | **2,273** | 931 | 504 | **1,435** | 0 | 14,203 | 626 | **14,829** |
| 2004 | 10,991 | 268 | **11,259** | 2,725 | 0 | **2,725** | 1,071 | 535 | **1,606** | 0 | 14,787 | 803 | **15,590** |
| 2005 | 8,648 | 6 | **8,654** | 2,499 | 0 | **2,499** | 1,133 | 499 | **1,632** | 0 | 12,280 | 505 | **12,785** |
| 2006 | 11,477 | 934 | **12,411** | 3,026 | 0 | **3,026** | 1,369 | 506 | **1,875** | 0 | 15,872 | 1,440 | **17,312** |
| 2007 | 9,968 | 971 | **10,939** | 2,085 | 0 | **2,085** | 1,088 | 656 | **1,744** | 0 | 13,141 | 1,627 | **14,768** |
| 2008 | 9,191 | 330 | **9,521** | 3,506 | 0 | **3,506** | 1,100 | 623 | **1,723** | 0 | 13,797 | 953 | **14,750** |
| 2009 | 11,061 | 379 | **11,440** | 3,432 | 0 | **3,432** | 1,097 | 595 | **1,692** | 0 | 15,590 | 974 | **16,564** |




1. *Reflects State Water Project through 2006; includes imported water from State Water Project and Buena Vista WSD Agreement beginning in 2007.*
2. *Robinson Ranch Golf Course irrigation and estimated private pumping.*
3. *Valencia Country Club and Vista Valencia Golf Course irrigation.*

**Table 2-3**
**Total Water Supply Utilization for Municipal, Agricultural and Other Uses**
**(Acre-Feet)**

| Year | *Imported Water*[1] | *Alluvium* | *Saugus Formation* | *Recycled Water* | **Total** |
|---|---|---|---|---|---|
| 1980 | 1,125 | 31,456 | 4,589 | - | **37,170** |
| 1981 | 5,816 | 30,793 | 4,970 | - | **41,579** |
| 1982 | 9,659 | 21,868 | 4,090 | - | **35,617** |
| 1983 | 9,185 | 20,286 | 3,852 | - | **33,323** |
| 1984 | 10,996 | 27,318 | 4,449 | - | **42,763** |
| 1985 | 11,823 | 25,347 | 4,715 | - | **41,885** |
| 1986 | 13,759 | 24,205 | 5,485 | - | **43,449** |
| 1987 | 16,285 | 22,642 | 5,561 | - | **44,488** |
| 1988 | 19,033 | 21,648 | 6,928 | - | **47,609** |
| 1989 | 21,618 | 23,721 | 7,759 | - | **53,098** |
| 1990 | 21,613 | 23,876 | 8,861 | - | **54,350** |
| 1991 | 7,968 | 27,187 | 14,917 | - | **50,072** |
| 1992 | 14,898 | 27,591 | 10,924 | - | **53,413** |
| 1993 | 13,836 | 30,126 | 10,610 | - | **54,572** |
| 1994 | 14,700 | 33,133 | 12,025 | - | **59,858** |
| 1995 | 17,002 | 34,464 | 8,560 | - | **60,026** |
| 1996 | 18,873 | 38,438 | 8,186 | - | **65,497** |
| 1997 | 23,215 | 39,599 | 7,745 | - | **70,559** |
| 1998 | 20,266 | 36,648 | 5,555 | - | **62,469** |
| 1999 | 27,302 | 43,406 | 3,716 | - | **74,424** |
| 2000 | 32,582 | 39,937 | 4,080 | - | **76,599** |
| 2001 | 35,369 | 37,544 | 4,140 | - | **77,053** |
| 2002 | 41,768 | 38,276 | 5,160 | - | **85,204** |
| 2003 | 44,419 | 33,599 | 4,207 | 50 | **82,276** |
| 2004 | 47,205 | 33,757 | 6,503 | 420 | **87,885** |
| 2005 | 38,034 | 38,648 | 6,453 | 418 | **83,553** |
| 2006 | 40,646 | 43,061 | 7,312 | 419 | **91,438** |
| 2007 | 45,332 | 38,773 | 7,685 | 470 | **92,260** |
| 2008 | 41,705 | 41,716 | 6,918 | 311 | **90,650** |
| 2009 | 38,546 | 39,986 | 7,678 | 328 | **86,538** |




*1. Reflects State Water Project through 2006; includes imported water from State Water Project and Buena Vista WSD Agreement beginning in 2007.*

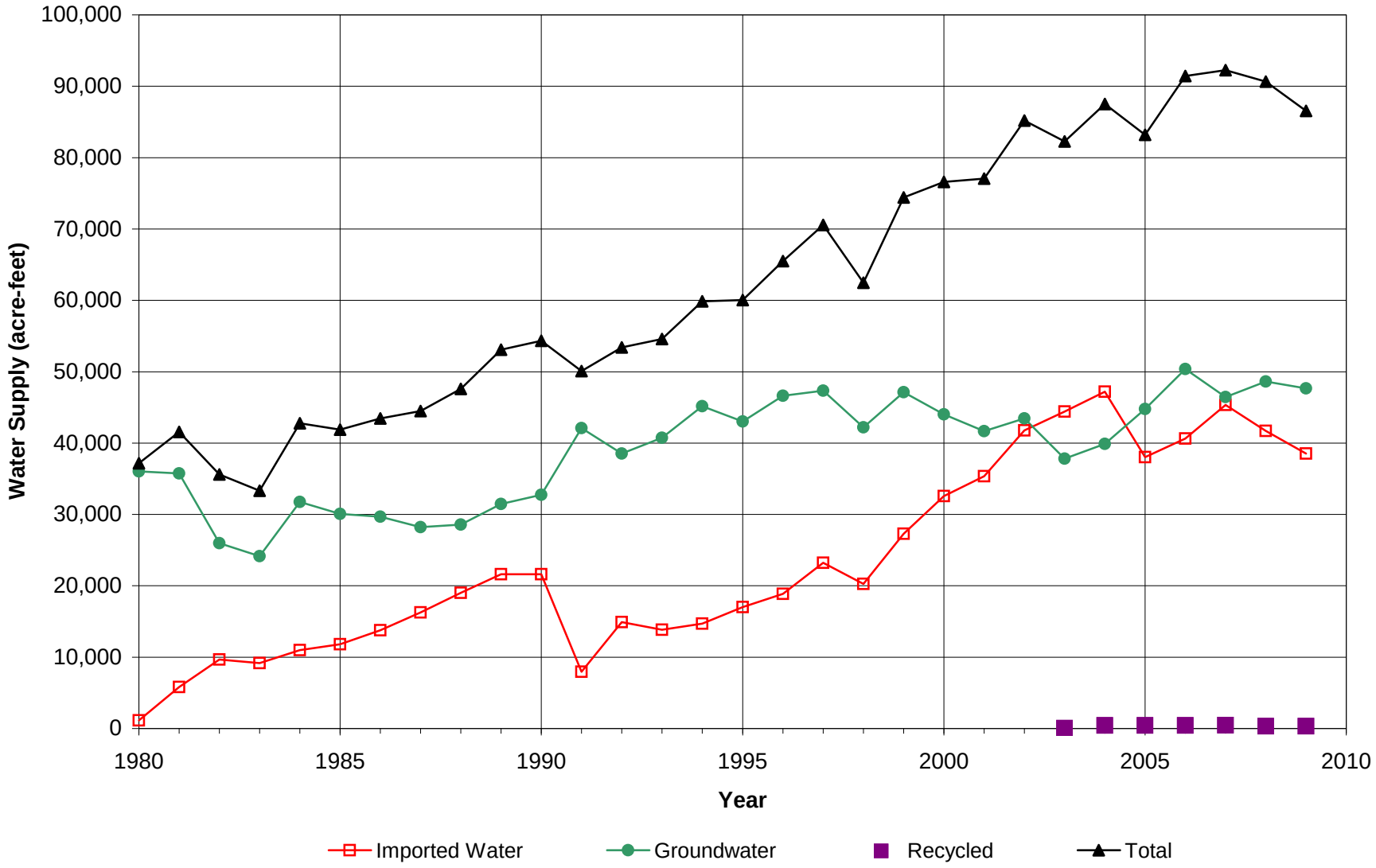



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**Figure 2-1**
**Total Water Supply Utilization**
**Santa Clarita Valley**

# 3. Water Supplies

Prior to 1980, local groundwater extracted from the Alluvium and the Saugus Formation was the sole source of water supply in the Santa Clarita Valley. Since 1980, local groundwater supplies have been supplemented with imported SWP water supplies, augmented in 2007 by acquisition of additional supplemental water from the Buena Vista Water Storage District. Those water supplies have also been slightly augmented by deliveries from CLWA's recycled water program since 2003. This section describes the groundwater resources of the Santa Clarita Valley, SWP and other imported water supplies, and CLWA's recycled water program.

## 3.1 Groundwater Basin Yield

The groundwater basin generally beneath the Santa Clarita Valley, identified in the State Department of Water Resources' Bulletin 118 as the Santa Clara River Valley Groundwater Basin, East Subbasin (Basin No. 4-4.07), is comprised of two aquifer systems. The Alluvium generally underlies the Santa Clara River and its several tributaries, and the Saugus Formation underlies practically the entire Upper Santa Clara River area. The mapped extent of the Santa Clara River Valley East Subbasin in DWR Bulletin 118 and its relationship to the extent of the CLWA service area are illustrated in Figure 3-1. The mapped Subbasin boundary approximately coincides with the outer extent of the Alluvium and Saugus Formation.

A 2001 Update Report on both the Alluvium and Saugus Formation Aquifers (Slade, 2002), which updated analyses and interpretation of hydrogeologic conditions from earlier reports (Slade, 1986 and 1988), included extensive detail on major aspects of the groundwater basin. Notable parts of the Update Report relative to groundwater supply included findings that:

- Analysis of historical groundwater levels and production indicates that there have been no conditions that would be illustrative of groundwater overdraft.

- Utilization of operational yield (as opposed to perennial yield) as a basis for managing groundwater production would be more applicable in this basin to reflect fluctuating utilization of groundwater in conjunction with imported SWP water.

- Operational yield of the Alluvium would typically be 30,000 to 40,000 afy for wet and normal rainfall years, with an expected reduction into the range of 30,000 to 35,000 afy in dry years.

- Operational yield of the Saugus Formation would typically be in the range of 7,500 to 15,000 afy on a long-term basis, with possible short-term increases during dry periods into a range of 15,000 to 25,000 afy, and to 35,000 afy if dry conditions continue.

Following on the 2001 Update Report, the groundwater component of overall water supply in the Valley derives from a groundwater operating plan to meet water requirements (municipal, agricultural and other non-municipal, and small individual domestic) while maintaining the basin in a sustainable condition (i.e., no long-term depletion of groundwater or interrelated surface water). That operating plan also addresses groundwater contamination issues in the basin, all consistent with the Groundwater Management Plan adopted in 2003. The groundwater operating plan is based on the concept that pumping can vary from year to year to generally rely on increased groundwater use in dry periods and increased recharge during locally wet periods, and to collectively assure that the groundwater basin is adequately replenished through various wet/dry cycles.

The groundwater operating plan, summarized in Table 3-1, is as follows:

**Alluvium** – Pumping from the Alluvial Aquifer in a given year is related to local hydrologic conditions in the eastern Santa Clara River watershed. Pumping is expected to typically range between 30,000 and 40,000 afy following normal and above-normal rainfall years. Due to hydrogeologic constraints in the eastern part of the basin, pumping is expected to be typically reduced to between 30,000 and 35,000 afy following multiple locally dry years.

**Saugus Formation** – Pumping from the Saugus Formation in a given year is related to the availability of other water supplies, particularly from the SWP. During average-year conditions within the SWP system, Saugus pumping is expected to typically range between 7,500 and 15,000 afy. Planned dry-year pumping from the Saugus Formation is expected to range between 15,000 and 25,000 afy during a drought year and can increase to between 21,000 and 25,000 afy if SWP deliveries are reduced for two consecutive years, and between 21,000 and 35,000 afy if SWP deliveries are reduced for three consecutive years. Such high pumping is expected to typically be followed by periods of reduced (average-year) pumping, at rates between 7,500 and 15,000 afy, to further enhance the effectiveness of natural recharge processes that would cause groundwater levels and storage volumes to recover after the higher pumping during dry years.

**Table 3-1**
**Groundwater Operating Plan for the Santa Clarita Valley**

| Aquifer | Groundwater Production (af) | | | |
|---|---|---|---|---|
| | **Normal Years** | **Dry Year 1** | **Dry Year 2** | **Dry Year 3** |
| Alluvium | 30,000 to 40,000 | 30,000 to 35,000 | 30,000 to 35,000 | 30,000 to 35,000 |
| Saugus | 7,500 to 15,000 | 15,000 to 25,000 | 21,000 to 25,000 | 21,000 to 35,000 |
| **Total** | **37,500 to 55,000** | **45,000 to 60,000** | **51,000 to 60,000** | **51,000 to 70,000** |

In 2004, as part of analyzing the restoration of perchlorate-impacted groundwater supply in the Valley, a numerical groundwater flow model was developed and calibrated for use in analyzing the response of the groundwater basin to long-term operation at the operational yields noted above, with focus on perchlorate extraction and the control of perchlorate migration in the basin. That groundwater flow model was then utilized in 2005 to specifically analyze the sustainability of groundwater supplies in both the Alluvium and the Saugus Formation through a long-term (78 year) hydrologic period that was selected to examine groundwater basin response to variations in pumping in accordance with the operating plan. Resultant projections of groundwater levels, groundwater storage, and surface water flows showed the basin to respond in a long-term sustainable manner, with no chronic depletion of groundwater levels, storage, or stream flows. The analysis of groundwater sustainability was summarized in a Basin Yield Report (CH2M Hill and LSCE, 2005), which included the following findings:

- The groundwater basin has historically been, and continues to be, in good operating condition and not in overdraft, as indicated by historical data.

- The groundwater plan is sustainable over varying hydrologic conditions, because it is feasible to intermittently exceed a long-term average yield for one or more years without creating long-term adverse impacts to the groundwater system and the Santa Clara River.

- The groundwater operating plan for the Alluvium and the Saugus Formation can be used for long-term water supply planning purposes. In particular, although increased pumping from the Saugus Formation during dry periods can be expected to cause short-term declines in groundwater levels, it is not projected to cause permanent declines in groundwater discharges or streamflow. Saugus groundwater levels can be expected to recover to pre-drought conditions when pumping is reduced in subsequent wet to normal years.

- The strategy around which the groundwater operating plan was designed (maximizing the use of Alluvial Aquifer and imported water during years of normal or above-normal availability of these supplies, while limiting the use of the Saugus Formation during these periods, then temporarily increasing Saugus pumping during years when SWP supplies are significantly reduced because of drought conditions) is viable on a long-term basis.

- Together, the historical observations of basin conditions and the model simulations together support the historical and ongoing confidence that groundwater can continue to be a sustainable source of water supply under the groundwater operating plan.

In 2008, partly in preparation for the next UWMP in 2010, and in part because of recent events that can be expected to impact the future reliability of the supplemental water supply from the State Water Project, the Purveyors initiated an updated analysis to further assess groundwater development potential and possible augmentation of the groundwater operating plan. A further consideration in conducting an updated analysis of the basin was that global climate change could alter local rainfall and associated recharge patterns, thus affecting local groundwater supplies, i.e. the yield of the basin. Finally, the Los Angeles County Flood Control District (LACFCD) is planning a number of small flood control projects in the Santa Clarita Valley; estimated amounts of conservation/groundwater recharge potential were being included for each of the individual projects in the overall LACFCD planning, and the Purveyors had interest in whether that potential could appreciably augment the yield of the basin.

The updated basin yield analysis, completed in August, 2009, concluded the following (LSCE and GSI, 2009).

- The 2008 Operating Plan, with currently envisioned pumping rates and distribution comparable to the Operating Plan described above, will not cause detrimental short- or long-term effects to the groundwater and surface water resources in the Valley and is, therefore, sustainable. Further, local conditions in the Alluvium in the eastern end of the basin can be expected to repeat historical groundwater level declines during dry periods, necessitating a reduction in desired Alluvial aquifer pumping due to decreased well yield and associated actual pumping capacity during those periods. However, those reductions in pumping from the Alluvial aquifer can be made up by an equivalent amount of increased pumping in other parts of the basin without disrupting basin-wide sustainability or local pumping capacity in those other areas. For the Saugus Formation, the modeling analysis indicated that this aquifer can sustain the pumping that is imbedded the 2008 Operating Plan.

- A Potential Operating Plan (Alluvial pumping between 41,500 and 47,500 afy) would result in lower Alluvial groundwater levels, failure of the basin to fully recover (during wet hydrologic cycles) from depressed storage that would occur during dry periods, and generally declining trends in groundwater levels and storage. Long-term lowering of groundwater levels would also occur in the Saugus Formation (pumping between about 16,000 and nearly 40,000 afy) with only partial water level recovery occurring in the Saugus. Thus, the Potential Operating Plan would not be sustainable over a long-term period.

- Several climate change models were examined to estimate the potential impacts on local hydrology in the Santa Clarita Valley. The range of potential climate change impacts extends from a possible wet trend to a possible dry trend over the long term. The trends that range from an approximate continuation of historical average precipitation, to something wetter than that, would appear to result in continued sustainability of the 2008 Operating Plan, again with intermittent constraints on full pumping in the eastern part of the basin. The potential long-term dry trend arising out of climate change would be expected to decrease local recharge to the point that lower and declining groundwater levels would render the 2008 Operating Plan unsustainable. Ultimately it was recognized that a wide range of potential global climate change produces a range of non-unique results with respect to local hydrologic conditions and associated sustainable groundwater supply. Notable in the wide range of possibilities, however, was the output that, over 20 to 25 year planning horizon of the UWMP, the range of relatively wet to relatively dry hydrologic conditions would be expected to produce sustainable groundwater conditions under the 2008 groundwater Operating Plan.

Based on the preceding conclusions, groundwater utilization continues in accordance with the 2008 Operating Plan; and the Potential Operating Plan is not being considered for implementation.

## 3.2 Alluvium – General

The spatial extent of the aquifers used for groundwater supply in the Valley, the Alluvium and the Saugus Formation, are illustrated in Figure 3-1. Geologic descriptions and hydrogeologic details related to both aquifers are included in several technical reports including Slade (1986, 1988 & 2002), CH2M Hill (2005) and LSCE (2005), and in the 2005 Urban Water Management Plan.

Consistent with the 2001 Update Report (Slade), the 2005 Basin Yield Report (CH2M Hill and LSCE), the 2005 UWMP, and the 2009 Updated Basin Yield Report (LSCE and GSI), the management practice of the Purveyors continues to be to rely on groundwater from the Alluvium for part of the overall municipal water supply, whereby total pumping from the Alluvium (by municipal, agricultural, and small private pumpers) is in accordance with the 2008 groundwater Operating Plan, 30,000 to 40,000 afy following wet and normal years, with possible reduction to 30,000 to 35,000 afy following multiple dry years. Such operation will maximize use of the Alluvium because of the aquifer's ability to store and produce good quality water on a sustainable basis, and because the Alluvium is capable of rapid recovery of groundwater storage in wet periods. As with many groundwater basins, it is possible to intermittently exceed a long-term average yield for one or more years without long-term adverse effects. Higher pumping for short periods may temporarily lower groundwater storage and related water levels, as has been the case in the Alluvium several times since the 1930's. However, subsequent decreases in pumping limit the amount of water level decline. Normal to wet-period recharge results in a rapid return of groundwater levels to historic highs. Historical groundwater data collected from the Alluvium over numerous hydrologic cycles continue to provide assurance that groundwater elevations, if locally lowered during dry periods, recover in subsequent average or wet years. Such water level response to rainfall is a significant characteristic of permeable, porous, alluvial aquifer systems that occur within large watersheds. In light of these historical observations, complemented by the long-term sustainability analysis using the numerical groundwater flow model, there is ongoing confidence that groundwater will continue to be a sustainable source of water supply at the rates of pumping described in the Basin Yield Report, as incorporated in the 2005 UWMP, and as described in the Updated Basin Yield Report, as expected to be incorporated in the 2010 UWMP.

Long-term adverse impacts to the Alluvium could occur if the amount of water extracted from the aquifer were to exceed the amount of water that recharges the aquifer over an extended period. However, the quantity and quality of water in the Alluvium and all significant pumping from the Alluvium are routinely monitored, and no long-term adverse impacts have ever been evident. Ultimately, the Purveyors have identified cooperative measures to be taken, if needed, to ensure sustained use of the aquifer. Such measures include but are not limited to the continuation of conjunctive use of SWP and other imported supplemental water with local groundwater, artificial recharge of the aquifer with local runoff or other surface water supplies, financial incentives discouraging extractions above a selected limit, expanded use of other water supplies such as recycled water, and expanded implementation of demand-side management, including conservation.

### 3.2.1 Alluvium – Historical and Current Conditions

Total pumping from the Alluvium in 2009 was about 40,000 af, a decrease of 1,750 af from the preceding year. Total Alluvium pumping was at the upper end of the groundwater Operating Plan range. Of the total Alluvial pumping in 2009, about 24,400 af (61 percent) was for municipal water supply, and the balance, about 15,600 af (39 percent), was for agriculture and other smaller uses, including individual domestic uses. In a longer-term context, there has been a change in municipal/agricultural pumping distribution since SWP deliveries began in 1980, toward a higher fraction for municipal water supply (from about 50 percent to more than 65 percent of Alluvial pumpage), which reflects the general land use changes in the area. Ultimately, on a long-term average basis since the beginning of imported water deliveries from the SWP, total Alluvial pumping has been about 32,000 afy, which is at the lower end of the range of operational yield of the Alluvium. That average has been higher over the last decade, about 38,500 afy, which remains within the range of operational yield of the Alluvium. The overall historic record of Alluvial pumping is illustrated in Figure 3-2.

Groundwater levels in various parts of the basin have historically exhibited different responses to both pumpage and climatic fluctuations. During the last 20 to 30 years, depending on location, Alluvial groundwater levels have remained nearly constant (generally toward the western end of the basin), or have fluctuated from near the ground surface when the basin is full, to as much as 100 feet lower during intermittent dry periods of reduced recharge (generally toward the eastern end of the basin). For illustration of the various groundwater level conditions in the basin, the Alluvial wells have been grouped into areas with similar groundwater level patterns, as shown in Figure 3-3. The groundwater level records have been organized into hydrograph form (groundwater elevation vs. time) as illustrated in Figures 3-4 and 3-5. Also shown on these plots is an annual marker indicating whether the year had a below-average amount of rainfall. The wells shown on these plots are representative of the respective areas, showing the range of values (highest to lowest elevation) through each area, and containing a sufficiently long-term record to illustrate trends over time.

Situated along the eastern upstream end of the Santa Clara River Channel, the ‘Mint Canyon’ area, located at the far eastern end of the groundwater basin, and the nearby ‘Above Saugus WRP’ area generally exhibit similar groundwater level responses (Figure 3-4) to hydrologic and pumping conditions. As shown in Figure 3-6, the Purveyors decreased total Alluvial pumping from the ‘Mint Canyon’ area steadily from 2000 through 2003, and correspondingly increased pumping in the ‘Below Saugus WRP’, and ‘Below Valencia WRP’ areas. In spite of a continued period of below-average precipitation from 1999 to 2003, that progressive decrease in pumping resulted in a cessation of groundwater level decline in the ‘Mint Canyon Area’. Subsequent wet

conditions in late 2004, continuing into 2005, resulted in full recovery of groundwater storage. With such high groundwater levels, pumping in the 'Mint Canyon' area was increased in 2005 and 2006, with no significant change in groundwater levels in 2005 and a slight decrease in 2006. Over the last four years, precipitation has been average to below-average. Accordingly, water levels have shown some decline, but this decline has been slowed by the reduction in pumpage in this easternmost part of the basin. Water levels remain within the historic range of levels over similar wet/dry periods. Just below the 'Mint Canyon' area, the 'Above Saugus WRP' has shown a similar decline, despite the steady rate of pumping over the last four years. Here the water levels also remain within the range of historical levels, as expected following a multi-year period without a significant wet year. These parts of the Valley have historically experienced a number of alternating wet and dry hydrologic conditions (Figure 3-4) during which groundwater level declines have been followed by returns to high or mid-range historic levels. This trend has continued over the last four years where below-average hydrologic conditions in 2009 followed three average to below-average years, and groundwater levels remain within mid-range levels.

In the 'Bouquet Canyon' area, pumping has remained relatively constant for the last ten years, and water levels have fluctuated with consecutive wet or dry years. During and since the most recent wet conditions of 2004 and 2005, water levels returned to within historic mid-range levels. During 2009, groundwater level trends either leveled off or showed some increase with the onset of precipitation at the end of the year. This groundwater level response to wet/dry years and pumping is typical for this area of the basin and, for 2009, levels have remained within the range of historical levels. When water levels are low, well yields and pumping capacities in this and other eastern areas can be impacted. The affected Purveyors typically respond by increasing use of Saugus Formation and imported (SWP) supplies, as shown in Table 2-3. The Purveyors also shift a fraction of the Alluvial pumping that would normally be supplied by the eastern areas to areas further west, where well yields and pumping capacities remain fairly constant because of smaller groundwater level fluctuations.

In the western parts and lower elevations of the Alluvium, groundwater levels respond to pumping and precipitation in a similar manner, but to an attenuated or limited extent compared to those situated in the eastern, higher elevation areas. As shown in the western group of hydrographs in Figure 3-5, groundwater level fluctuations become more subtle moving westward and lower in the Valley. The 'Below Saugus WRP' area, along the Santa Clara River immediately downstream of the Saugus Water Reclamation Plant, and the 'San Francisquito Canyon' area generally exhibit similar groundwater level trends. In this middle part of the basin, historical groundwater levels were lower in the 1950's and 60's than current levels. Groundwater levels in this area notably recovered as pumping declined through the 1960's and 1970's. They

have subsequently sustained generally high levels for much of the last 30 years, with three dry-period exceptions: mid-1970's, late 1980's to early 1990's, and the late 1990's to early 2000's. Recoveries to previous high groundwater levels followed both of the short dry-period declines in the 1970's and 1990's. More recently, groundwater levels recovered significantly in both areas, to historic highs, following a wetter-than-average year in 2004 and significantly wet 2005. Since 2005, pumping has been increasing in the 'Below Saugus WRP' area, while 'San Francisquito Canyon' area pumping approximately doubled in 2005, and has since gradually declined and leveled off over the last three years. Despite the current multi-year period of average to below-average precipitation, groundwater levels in these two areas remain in mid-range to high historical range.

The 'Castaic Valley' area is located along Castaic Creek below Castaic Lake. Below that and along the Santa Clara River, downstream of the Valencia Water Reclamation Plant, is the 'Below Valencia WRP' area, where discharges of treated effluent from the Valencia WRP to the Santa Clara River contribute to groundwater recharge. In the 'Castaic Valley' area, groundwater levels continue to remain fairly constant, with slight responses to climatic and other fluctuations, since the 1950's (Figure 3-5). Small changes in groundwater levels over the last four years are consistent with other short-term historical fluctuations. The long-term, generally constant trend remained through 2009. The 'Below Valencia WRP' area groundwater levels exhibit slight, if any, response to climatic fluctuations, and have remained fairly constant since the 1950's despite a notable increase in pumping through the 1990s that has since remained relatively steady over the last seven years, through 2009 (Figure 3-5 and 3-6).

In summary, depending on the period of available data, all the history of groundwater levels in the Alluvium shows the same general picture: recent (last 30 years) groundwater levels have exhibited historic highs; in some locations, there are intermittent dry-period declines (resulting from use of some groundwater from storage) followed by wet-period recoveries (and associated refilling of storage space). On a long-term basis, whether over the last 29 years since importation of supplemental SWP water, or over the last 40 to 50 years (since the 1950's - 60's), the Alluvium shows no chronic trend toward decreasing water levels and storage, and thus shows no symptoms of water level-related overdraft. Consequently, pumping from the Alluvium has been and continues to be sustainable, well within the operational yield of that aquifer on a long-term average basis, and also within the operating yield in almost every individual year.

## 3.3 Saugus Formation – General

Saugus wells operated by the Purveyors are located in the southern portion of the basin, south of the Santa Clara River (Figure 3-7). Consistent with the 2001 Update Report (Slade), the 2005

Basin Yield Report (CH2M Hill and LSCE), and the 2009 Basin Yield Update Report (LSCE and GSI), the Purveyors have utilized the Saugus in accordance with the original (and the 2008) groundwater Operating Plan, in the range of 7,500 to 15,000 afy in average/normal years, with planned dry-year pumping of 15,000 to 35,000 afy for one to three consecutive dry years, when shortages to CLWA's SWP water supplies could occur. Such high pumping would be followed by periods of lower pumping (7,500 to 15,000 afy in average/normal years as noted above) in order to allow recharge to recover water levels and storage in the Saugus. Maintaining the substantial volume of water in the Saugus Formation is an important strategy to help maintain water supplies in the Santa Clarita Valley during drought periods.

### 3.3.1 Saugus Formation – Historical and Current Conditions

Total pumping from the Saugus in 2009 was about 7,700 af, or about 750 af more than in the preceding year. Of the total Saugus pumping in 2009, most (about 6,700 af) was for municipal water supply, and the balance (1,000 af) was for agricultural and other irrigation uses. Historically, groundwater pumping from the Saugus peaked in the early 1990's and then steadily declined through the remainder of that decade. Since then, Saugus pumping had been in the range of about 4,000 to 6,500 afy, with the increase to almost 7,700 af in 2007 and again in 2009. Over the last five years, the municipal use of Saugus water has been relatively unchanged; almost all of the relatively small fluctuations from year to year have been related to non-municipal usage. On a long-term average basis since the importation of SWP water, total pumping from the Saugus Formation has ranged between a low of about 3,700 afy (in 1999) and a high of nearly 15,000 afy (in 1991); average pumping from 1980 to present has been about 6,800 afy. These pumping rates remain well within, and generally at the lower end of the range of Operating Yield of the Saugus Formation. The overall historic record of Saugus pumping is illustrated in Figure 3-8.

Unlike the Alluvium, which has an abundance of wells with extensive water level records, the water level data for the Saugus Formation are limited by both the distribution of the wells in that Formation and the periods of water level records. The wells that do have water level records extending back to the mid-1960's indicate that groundwater levels in the Saugus Formation were highest in the mid-1980's and are currently higher than they were in the mid-1960's (Figure 3-9). Based on these data, there is no evidence of any historic or recent trend toward permanent water level or storage decline. There continue to be seasonal fluctuations in groundwater levels but the prevalent longer-term trend is one of general stability.

Consistent with the 2001 Update Report (Slade), the 2005 Basin Yield Report (CH2M Hill and LSCE), the 2005 UWMP, and the 2008 Updated Basin Yield Report (LSCE and GSI, 2009), the

Purveyors continue to maintain groundwater storage and associated water levels in the Saugus Formation so that supply is available during drought periods, when Alluvial pumping might be reduced and/or SWP or other supplemental supplies also decreased. The period of increased pumping during the early 1990's is a good example of this management strategy. Most notably, in 1991, when SWP deliveries were substantially reduced, increased pumping from the Saugus made up almost half of the decrease in SWP deliveries. The increased Saugus pumping over several consecutive dry years (1991-1994) resulted in short-term declining groundwater levels, reflecting the use of water from storage. However, groundwater levels subsequently recovered when pumping declined, reflecting recovery of groundwater storage in the Saugus Formation.

## 3.4 Imported Water

CLWA obtains the majority of its water supplies from the State Water Project (SWP), which is owned and operated by the California Department of Water Resources (DWR). CLWA is one of 29 contractors holding long-term SWP contracts with DWR. SWP water originates as rainfall and snowmelt in northern and central California. Runoff is stored in Lake Oroville, which is the project's largest storage facility. The water is then released from Lake Oroville down the Feather River to the Sacramento River and through the Sacramento-San Joaquin Delta. Water is diverted from the Delta into the Clifton Court Forebay, and then pumped into the 444-mile long California Aqueduct. SWP water is temporarily stored in San Luis Reservoir, which is jointly operated by DWR and the U.S. Bureau of Reclamation. Prior to delivery to CLWA, SWP supplies are stored in Castaic Lake, a terminal reservoir located at the end of the West Branch of the California Aqueduct.

CLWA's service area covers approximately 195 square miles (124,800 acres), including the City of Santa Clarita and surrounding unincorporated communities. SWP water from Castaic Lake is treated, filtered and disinfected at CLWA's Earl Schmidt Filtration Plant and Rio Vista Water Treatment Plant, which have a combined treatment capacity of 86 million gallons per day. Treated water is delivered from the treatment plants by gravity flow to each of the four Purveyors through a distribution network of pipelines and turnouts. At present, CLWA delivers water to the four Purveyors through 25 potable turnouts as schematically illustrated in Figure 3-10.

In 2009, CLWA fulfilled the following major accomplishments in order to enhance, preserve, and strengthen the quality and reliability of existing and future supplies:

- continued participation in a long-term water banking programs with Rosedale-Rio Bravo Water Storage District and the Semitropic Water Storage District. Water was not

withdrawn from the Rosedale-Rio Bravo Water Storage District, but 1,650 acre-feet was withdrawn from the Semitropic Water Storage District,

- continued implementation of the AB 3030 Groundwater Management Plan,
- continued implementation of the water conservation Best Management Practices,
- reconvened the Santa Clarita Valley Drought Committee, which has now changed its name to the Santa Clarita Valley Water Committee
- continued construction of treatment and distribution facilities for restoration of municipal well capacity impacted by perchlorate contamination,
- continued cooperative effort with the U.S. Army Corps of Engineers for characterization studies of the former Whittaker-Bermite site and in a task force effort with the City of Santa Clarita, local legislators, and state agencies to effect the cleanup and remediation of all aspects of the former Whittaker-Bermite site, including perchlorate contamination of local groundwater,
- began construction of the expansion of the Rio Vista Water Treatment Plant from 30 mgd to 60 mgd, and
- continued recycled water service.

### 3.4.1 State Water Project Table A Supplies

Each SWP contractor has a specified water supply amount shown in Table A of its contract that currently totals approximately 4.1 million af. The term of the CLWA contract is through 2038 and is renewable after that year. Although the SWP has not been fully completed, the SWP can deliver all 4.1 million af of Table A Amounts during certain wet years.

CLWA has a contractual Table A Amount of 95,200 af per year of water from SWP.[1] On October 30, 2008, the initial allocation for 2009 was announced as 15 percent. The allocation

[1] Of CLWA's 95,200 af annual Table A Amount, 41,000 afy was permanently transferred to CLWA in 1999 by Wheeler Ridge-Maricopa Water Storage District, a member unit of the Kern County Water Agency. CLWA's EIR prepared in connection with the 41,000 afy water transfer was challenged in Friends of the Santa Clara River v. Castaic Lake Water Agency (Los Angeles County Superior Court) ("Friends"). On appeal, the Court of Appeal held that since the 41,000 afy EIR tiered off the Monterey Agreement EIR that was later decertified, CLWA would also have to decertify its EIR as well and prepare a revised EIR. CLWA was not prevented from using any water that is part of the 41,000 afy transfer. Under the jurisdiction of the Los Angeles County Superior Court, CLWA prepared and circulated a revised Draft EIR for the transfer. CLWA approved the revised EIR in late 2004 ("2004 EIR") and lodged the EIR with the Los Angeles Superior Court. Thereafter, the case was dismissed with prejudice (i.e., permanently).

In January 2005, two new challenges to CLWA's 2004 EIR were filed in the Ventura County Superior Court by the Planning and Conservation League ("PCL") and by the California Water Impact Network ("CWIN"); these cases were consolidated and transferred to Los Angeles County Superior Court, Planning and Conservation League v. Castaic Lake Water Agency (Los Angeles County Superior Court,) ("PCL Action"). In May 2007, a final Statement of Decision was filed by the trial court in the PCL Action. It included a determination that the transfer is valid and cannot be terminated or unwound. The trial court did find one defect in the 2004 EIR, requiring Judgment to be entered against CLWA. The defect, however, did not relate to the environmental conclusions reached in the 2004 EIR. Notices of Appeal were filed by PCL and CWIN and the Agency, Kern County Water Agency, and Wheeler Ridge-Maricopa Water Storage District filed notices of cross-appeals. On December 17, 2009, the Court of Appeal issued a published opinion in which it reversed the trial court's Judgment, and found that the 41,000 afy EIR fully complied with CEQA, and remanded the matter to the trial court with directions to issue a new judgment denying PCL's and CWIN's challenges in their entirety. A petition for rehearing was filed by PCL and CWIN on January 4, 2010 but was denied on January 14, 2010. On January 26, 2010, PCL and CWIN filed a petition for review with the California Supreme Court, but the Court denied the petition on March 10, 2010.

was increased to 20 percent on March 18, 2009, and further increased to 30 percent on April 16, 2009; and then to 40 percent on May 20, 2009. The allocation was not subsequently changed. CLWA's final allocation of Table A Amount for 2009 was thus 40 percent, or 38,080 af.

In addition to its Table A Amount, CLWA has access to 4,684 af of "flexible storage" in Castaic Lake. In 2005, CLWA negotiated an agreement with the Ventura County SWP contractors to allow CLWA to utilize their flexible storage account of 1,376 af. In combination, this provides total flexible storage of 6,060 af, which is maintained in Castaic Lake for use in a future dry period or an emergency. This amount was available in 2009, but was not utilized due to other available supplies.

Also in 2005, CLWA completed an agreement to participate in a long-term water banking program with Rosedale-Rio Bravo Water Storage District in Kern County. CLWA delivered 20,000 af of its excess Table A water into storage in both 2005 and 2006. CLWA delivered another 8,200 af into that storage account in 2007 but did not contribute to or withdraw SWP water from the bank in 2008 or 2009. This long-term program will allow the storage up to 100,000 af at any one time, and will provide significant dry year reliability for the Santa Clarita Valley.

The other banking component of CLWA's imported water supply reliability program is comprised of two 10-year agreements with Semitropic Water Storage District whereby CLWA banked surplus Table A water supply in 2002 and 2003. Notable in 2009 was the first recovery of water from the 2002 account; of 4,950 af withdrawn in 2009, 1,650 af were delivered for water supply in the Valley, and the 3,300 af balance is intended to be delivered in 2010.

As delineated in Table 3-2, with the 40 percent Table A allocation and other imported water supplies, including 14,610 af of carryover from 2008, CLWA had total available supply of 67,050 af in 2009, most of which was delivered to the Purveyors (38,546 af), leaving 28,303 af of Table A Amount available for carryover to 2010.

### 3.4.2 Other Imported Water Supplies

In early 2007, CLWA finalized a Water Acquisition Agreement with the Buena Vista Water Storage District (Buena Vista) and the Rosedale-Rio Bravo Water Storage District (Rosedale-Rio Bravo) in Kern County. Under this Program, Buena Vista's high flow Kern River entitlements (and other acquired waters that may become available) are captured and recharged within

**Table 3-2**
**2009 CLWA Imported Water Supply and Disposition**
**(acre-feet)**

| | | |
|---|---|---|
| ***Supply*** | | |
| Net 2008 SWP Carryover to 2009 [1] | | 14,610 |
| Buena Vista/Rosedale Rio-Bravo | | 11,000 |
| Yuba County Accord Water | | 1,658 |
| 2009 SWP Turnback Pool Water | | 52 |
| Semitropic Water Banking and Exchange Program | | 1,650 |
| 2009 Final SWP Table A Allocation [2] | | 38,080 |
| **Total 2009 Imported Water Supply** | | **67,050** |
| | | |
| ***Disposition*** | | |
| Purveyor Deliveries (Total) | | 38,546 |
| *CLWA SCWD* | *17,739* | |
| *Valencia Water Company* | *14,732* | |
| *Newhall County Water District* | *4,832* | |
| *Los Angeles County WWD 36* | *1,243* | |
| CLWA/DWR/Purveyor Metering[3] | | 201 |
| Rosedale – Rio Bravo Water Banking and Exchange Program | | 0 |
| 2009 Table A Carryover to 2010[4] | | 28,303 |
| **Total 2009 Imported Water Disposition** | | **67,050** |

1. Total 2009 carryover; amount used by CLWA, based on final DWR delivery accounting was 10,107 af.

2. Final 2009 allocation was 40% of contractual Table A amount of 95,200 acre-feet, which progressed as follows:

| | |
|---|---|
| Initial allocation, October 30, 2008 | 15% |
| Allocation increase, March 18, 2009 | 20% |
| Allocation increase, April 16, 2009 | 30% |
| Final allocation, May 20, 2009 | 40% |

3. Reflects meter reading differences.

4. Total 2009 Table A carryover to 2010.

Rosedale-Rio Bravo's service area on an ongoing basis.[2] CLWA receives 11,000 af of these supplies annually through either exchange of Buena Vista's and Rosedale-Rio Bravo's SWP supplies or through direct delivery of water to the California Aqueduct via the Cross Valley Canal.

In 2008, CLWA entered into the Yuba Accord Agreement, which allows for the purchase of water from the Yuba County Water Agency through the Department of Water Resources to 21 State Water Project contractors (including CLWA) and the San Luis and Delta-Mendota Water Authority. CLWA may purchase up to approximately 1,000 af per year and in 2009 received 1,658 af as part of the Agreement.

### 3.4.3 Imported Water Supply Reliability

The Department of Water Resources issued its Draft State Water Project Delivery Reliability Report 2009 in February 2010. The report is updated with new information and calculations of delivery reliability every two years and is intended to assist SWP contractors in assessing the adequacy of the SWP component of their overall supplies. The current Draft Reliability Report, with the objective of protecting endangered fish such as the Delta smelt and spring-run salmon, incorporates restrictions on SWP operations according to the Biological Opinions of the U.S. Fish and Wildlife Service and the National Marine Fishery Service issued on December 15, 2008 and June 4, 2009, respectively. It also considers the impacts on SWP delivery reliability due to climate change, sea level rise, and vulnerability of the Delta's conveyance system and structure due to floods and earthquakes. The current Draft Reliability Report projects long-term reliability of 60 percent during normal year hydrology. In 2010, CLWA staff assessed the impact of the current Reliability Report on the CLWA reliability analysis contained in the Agency's 2005 UWMP. It concluded that current and anticipated supplies are available to meet anticipated water supply needs.

Groundwater banking and conjunctive use offer significant opportunities to improve water supply reliability for CLWA. Groundwater banking is the process of storing available supplies of water in groundwater basins during wet years or when supplemental water is otherwise available. During dry periods, or when imported water supply availability is reduced, banked water can be recovered from groundwater storage to replace, or firm up, the imported water supply deliveries.

[2] A CEQA action was filed by California Water Impact Network (CWIN) in November 2006 challenging the adequacy of CLWA's EIR on the acquisition of 11,000 af from the Buena Vista Water Storage District and Rosedale-Rio Bravo Water Storage District. In November 2007, a Los Angeles Superior Court ruled in favor of CLWA on all points. In January 2008, CWIN filed a notice of appeal. The case was argued before the appellate court March 2, 2009. On April 20, 2009, the Court of Appeal issued an opinion affirming the Superior Court's judgement.

As described herein, CLWA has entered into two groundwater banking programs and now has, in aggregate, more than 110,000 af of recoverable water in banked groundwater storage outside the local groundwater basin. The first component of CLWA's overall groundwater banking program is the result of two 10-year agreements between CLWA and Semitropic Water Storage District whereby, over the terms of the two agreements, CLWA can withdraw up to 45,920 af of SWP Table A water that it stored in Semitropic to meet Valley demands when needed in dry years (45,920 af is the net recoverable balance after originally banking 24,000 af in 2002 and 32,522 af in 2003, and withdrawing 4,950 af in 2009). The second component of the program, the long-term Rosedale-Rio Bravo Water Banking and Exchange Program in Kern County, has a recoverable total of 64,900 acre-feet in storage (i.e., 75,200 af originally banked less contractual losses).

Conjunctive use is the purposeful integrated use of surface water and groundwater supplies to maximize water supply from the two sources. CLWA and the Purveyors have been conjunctively utilizing local groundwater and imported surface water since the initial importation of SWP water in 1980. The groundwater banking programs described above allow CLWA to firm up the imported water component of conjunctive use in the Valley by storing surplus SWP and other water, in wet years, in groundwater basins outside the Valley. This allows recovery and importation of that water as needed in dry years to maintain a greater overall amount of imported surface water to be used conjunctively with local groundwater, further supporting the sustainable use of local groundwater at the rates in the groundwater operating plan.

## 3.5 Water Quality – General

Water delivered by the Purveyors consistently meets drinking water standards set by the Environmental Protection Agency (EPA) and the California Department of Public Health (DPH). An annual Water Quality Report is provided to all Santa Clarita Valley residents who receive water from one of the four water retailers. There is detailed information in that report about the results of quality testing of the groundwater and treated SWP water supplied to the residents of the Santa Clarita Valley during 2008. Several constituents of particular local interest are discussed in more detail below.

### Total Trihalomethanes

In 2002, the United States Environmental Protection Agency implemented the new Disinfectants and Disinfection Byproducts Rule. In part, this rule established a new MCL of 80 µg/l (based on an annual running average) for Total Trihalomethanes (TTHM). TTHMs are byproducts created when chlorine is used as a means for disinfection. CLWA and the Purveyors implemented an alternative method of disinfection, chloramination, in 2005 to maintain compliance with the new

rule and future regulations relating to disinfection byproducts. TTHM concentrations have remained significantly below the MCL since implementation of alternative disinfection.

**Perchlorate**

Perchlorate has been a water quality concern in the Valley since 1997 when it was originally detected in four wells operated by the Purveyors in the eastern part of the Saugus Formation, near the former Whittaker-Bermite facility. In late 2002, perchlorate was detected in a fifth municipal well, in this case an Alluvial well (SCWD's Stadium Well) also located near the former Whittaker-Bermite site. In early 2005, perchlorate was detected in a second Alluvial well (VWC's Well Q2) near the former Whittaker-Bermite site. In 2006, a very low concentration of perchlorate was detected in another Saugus well (NCWD's Well NC-13), near one of the originally impacted wells. However, that detection has been interpreted to not be an indication of continued perchlorate migration in a westerly direction. Subsequent monitoring well installation has been completed and a focused study of the Saugus Formation has ultimately been incorporated into the overall groundwater remediation and removal actions submitted by Whittaker-Bermite and reviewed by the State Department of Toxic Substances Control (DTSC) as discussed below.

Wells with perchlorate concentrations exceeding the then-applicable Action Level (18 µg/l) or, more recently, the then-applicable Notification Level (6 µg/l)[3] were removed from active water supply service. One of the Alluvial wells (VWC's Well Q2) was returned to active water supply service, with treatment, in late 2005 as discussed below. The other impacted wells remain out of service; two wells (VWC's Well 157 and SCWD's Stadium Well) have been sealed and replaced by new wells, and two wells (SCWD's Saugus 1 & 2 Wells) are being returned to service as described below. The 2005 UWMP specifically addressed the adequacy of groundwater supply in light of the inactivation of the impacted Alluvial and Saugus wells; and it addressed the plan and schedule for restoration of perchlorate-impacted wells, including the protection of existing non-impacted wells. As summarized in the 2005 UWMP, the inactivation of the impacted wells does not constrain the ability to meet the groundwater component of total water supply in the Valley.

In 2000, CLWA and the impacted Purveyors filed a lawsuit against Whittaker Corporation (the former owner of the contaminated property) and Santa Clarita LLC and Remediation Financial, Inc. (the owners of record at that time). The lawsuit sought to have defendants pay all necessary costs of response, removal of the contaminant, remedial actions, and any liabilities or damages associated with the contamination. An Interim Settlement and Funding Agreement was reached

[3] The Maximum Contaminant Level (MCL) for perchlorate was set at 6 µg/l by the State Department of Public Health in October 2007.

in 2003. Although that Agreement expired in January 2005, the parties, under DTSC oversight, jointly developed a plan to "pump and treat" contaminated water from two of the Purveyors' impacted wells to stop migration of the contaminant plume and to partially restore the municipal well capacity that has been impacted by perchlorate. The parties also continued negotiations intended to achieve a long term settlement to the litigation through 2006, and a final settlement was completed and executed in April 2007.

Since 2007, the impacted Purveyors (SCWD, NCWD, and VWC) and CLWA continued working toward implementation of a jointly developed plan that will combine pumping from two of the impacted wells and a water treatment process to restore the impacted pumping capacity and control the migration of contamination in the aquifer. The development and implementation of a cleanup plan for the Whittaker-Bermite site and the impacted groundwater is being coordinated among CLWA, the impacted Purveyors, the State DTSC, and U.S. Army Corps of Engineers. DTSC is the lead agency responsible for regulatory oversight of the Whittaker-Bermite site.

In February 2003, DTSC and the impacted Purveyors entered into a voluntary cleanup agreement entitled *Environmental Oversight Agreement*. Under the Agreement, DTSC is providing review and oversight of the response activities being undertaken by the Purveyors related to the detection of perchlorate in the impacted wells. Under the Agreement's Scope of Work, the impacted Purveyors prepared a Work Plan for sampling the production wells, a report on the results and findings of the production well sampling, a draft Human Health Risk Assessment, a draft Remedial Action Workplan, an evaluation of treatment technologies and an analysis showing the integrated effectiveness of a project to restore impacted pumping capacity, extract perchlorate-impacted groundwater from two Saugus wells for treatment, and control the migration of perchlorate in the Saugus Formation. Environmental review of that project was completed in 2005 with adoption of a mitigated Negative Declaration. The Final Interim Remedial Action Plan for containment and extraction of perchlorate was completed and approved by DTSC in January 2006. Design of the treatment facilities and related pipelines is complete. Construction of those facilities and pipelines to implement the pump and treat program and to also restore inactivated municipal well capacity began in November 2007 and was completed, and in operational startup, as this report was being drafted (May, 2010).

Under the direction of DTSC, Whittaker has submitted a comprehensive site-wide remediation plan for the contaminants of concern in soil and groundwater detected on the property. A Draft Remedial Action Plan for Operable Units 2 through 6 that is focused on soil remediation was submitted to DTSC in 2009. The plan contains a number of recommended technologies to remove contaminants from the soil, in addition to a proposed clean-up schedule for the site. Whittaker has also completed a Draft Operable Unit 7 Feasibility Study to identify and select

treatment technologies for both on-site and off-site groundwater. Final approval by DTSC of soil and groundwater clean-up plans is expected by the end of 2010.

As noted above, perchlorate was detected in a second Alluvial well, VWC's Well Q2, in early 2005. In response, Valencia removed the well from active service, and commissioned the preparation of an analysis and report assessing the impact of, and response to, the perchlorate contamination of that well. Valencia's response for Well Q2 was to obtain permitting for installation of wellhead treatment, followed by installation of treatment facilities and returning the well to water supply service in October 2005. After nearly two years of operation with wellhead treatment, including regular monitoring specified by the State Department of Public Health (DPH), all of which resulted in no detection of perchlorate in Well Q2, Valencia requested that DPH allow treatment to be discontinued. DPH approved that request in August 2007, and treatment was subsequently discontinued. DPH-specified monitoring for perchlorate continues at Well Q2; there has been no detection of perchlorate since discontinuation of wellhead treatment.

On the Whittaker-Bermite site, soil remediation activities in operating unit subareas started in 2005. Groundwater "pump and treat" operations in the Northern Alluvium, which also started in 2005, continued through 2009. Expanded pumping, intended to effect perchlorate containment as well as to treat 'hot spots' in the Northern Alluvium, became operational in October 2007. Also on the Whittaker-Bermite site, remediation work in the Saugus Formation is underway. Additional objectives of this project include the reduction of further transport of contaminants to regional groundwater and reduction of the size of the contaminant mass in deep/perched zones.

**Hardness**

In 2008, the Valencia Water Company began a demonstration project delivering pre-softened groundwater from one of its wells to approximately 420 residents located in the Copperhill Community of Valencia. Hard water is the primary complaint from Valencia customers and it is estimated that more than 50 percent have installed individual water softening units at their homes. In addition to having high operating costs, many of these units are designed to discharge a brine (salt) solution to the sanitary sewer system that is eventually discharged to the Santa Clara River, or is part of the recycled water supply. The environmental impact of such discharges was the subject of a major Chloride Total Maximum Daily Load investigation which concluded with a commitment by the Purveyors to achieve surface water quality goals for in-stream discharge from the basin. Valencia's project is aimed at improving the quality of water for its customers to eliminate the need for home softening devices and to achieve the environmental benefits of reduced chloride discharge to the river.

The demonstration project utilizes softening technology that removes calcium and produces small calcium carbonate pellets which can be reused in a variety of industries. The demonstration project has now been operated for over a year and provides the water company with customer feedback and technical/financial information to assess potential future expansion of treatment to other well sites.

### 3.5.1 Groundwater Quality – Alluvium

Groundwater quality is, of course, a key factor in assessing the Alluvial aquifer as a municipal and agricultural water supply. Groundwater quality details and long-term conditions, examined by integration of individual records from several wells completed in the same aquifer materials and in close proximity to each other, have been discussed in previous annual Water Reports and in the 2005 UWMP. There were some changes in groundwater quality in 2009 that reflect fluctuations, trends, or other groundwater quality conditions as illustrated in Figures 3-11 and 3-12. These graphs show historical specific conductance values for representative wells in the Valley with the California Department of Public Health Secondary Maximum Levels included for reference. Most of the trends show a significant lowering of the specific conductance values by half following the wet years of 2004-2005. Since then, those trends have returned to 2004 levels but do not exceed historical levels. In summary, those conditions include: no long-term overall trend and, most notably, no long-term decline in Alluvial groundwater quality; a general groundwater quality "gradient" from east to west, with lowest dissolved mineral content to the east, increasing in a westerly direction; and periodic fluctuations in some parts of the basin, where groundwater quality has inversely varied with precipitation and stream flow. Those variations are typically characterized by increased mineral concentrations through dry periods of lower stream flow and lower groundwater recharge, such as is currently occurring, followed by lower mineral concentrations through wetter periods of higher stream flow and higher groundwater recharge.

The presence of long-term consistent water quality patterns, although intermittently affected by wet and dry cycles, supports the conclusion that the Alluvial aquifer remains a viable ongoing water supply source in terms of groundwater quality.

### 3.5.2 Groundwater Quality – Saugus Formation

As discussed above for the Alluvium, groundwater quality is a key factor in also assessing the Saugus Formation as a municipal and agricultural water supply. As with groundwater level data, long-term Saugus groundwater quality data are not sufficiently extensive to permit any sort of basin-wide analysis or assessment of pumping-related impacts on quality. However, integration

of individual records from several wells has been used to examine general water quality trends. Based on those records, water quality in the Saugus Formation has not historically exhibited the precipitation-related fluctuations seen in the Alluvium. Based on available data over the last 50 years, groundwater quality in the Saugus has exhibited a slight overall increase in dissolved mineral content as illustrated in Figure 3-13. More recently, several wells within the Saugus Formation have exhibited an additional increase in dissolved mineral content, similar to short-term changes in the Alluvium, possibly as a result of recharge to the Saugus Formation from the Alluvium. Since 2005, however, these levels have been steadily dropping or remaining constant. Dissolved mineral concentrations in the Saugus Formation remain below the Secondary (aesthetic) Upper Maximum Contaminant Level. Groundwater quality within the Saugus will continue to be monitored to ensure that degradation to the long-term viability of the Saugus as a component of overall water supply does not occur.

### 3.5.3 Imported Water Quality

CLWA operates two water treatment plants, the Earl Schmidt Filtration Plant located near Castaic Lake and the Rio Vista Water Treatment Plant located in Saugus. CLWA produces water that meets drinking water standards set by the U.S. EPA and DPH. SWP water has different aesthetic characteristics than groundwater with lower dissolved mineral concentrations (total dissolved solids) of approximately 250 to 360 mg/l, and lower hardness (as calcium carbonate) of about 105 to 135 mg/l.

Historically, the State Water Project (SWP) delivered only surface water from the Sacramento-San Joaquin River Delta. However, CLWA and other SWP users, in anticipation of drought, many years ago began “water banking” programs where SWP water could be stored or exchanged during wet years and withdrawn in dry years. The last three years have seen severe state-wide drought. As a result, water has been withdrawn from the water banking programs and pumped into the SWP system. During the period of 2008 through 2010, a greater portion of water in the SWP has been this “pumped-in” water. The “pumped-in” water has met all water quality standards established by DWR under its anti-degradation policy for the SWP.

## 3.6 Recycled Water

Recycled water is available from two water reclamation plants operated by the Sanitation Districts of Los Angeles County. In 1993, CLWA prepared a draft Reclaimed Water System Master Plan that outlined a multi-phase program to deliver recycled water in the Valley. CLWA previously completed environmental review on the construction of Phase I of the project, which will ultimately deliver 1,700 afy of recycled water. Deliveries of recycled water began in 2003

for irrigation water supply at a golf course and in roadway median strips. In 2009, recycled water deliveries were 328 af, generally consistent with recycled water deliveries that have ranged between 311 and 470 afy over the past six years.

Surveys conducted by CLWA indicate an interest for recycled water by existing water users as well as by future development as recycled water becomes available. In 2002, CLWA produced an updated Draft Recycled Water Master Plan. Overall, the program is expected to ultimately recycle up to 17,400 af of treated (tertiary) wastewater suitable for reuse on golf courses, landscaping and other non-potable uses, as set forth in the UWMP.

In 2007, CLWA completed California Environmental Quality Act (CEQA) analysis of the Recycled Water Master Plan (2002). This analysis consisted of a Program Environmental Impact Report (PEIR) covering the various options for a recycled water system as outlined in the Master Plan. The PEIR was certified by the CLWA Board in March 2007.

CLWA is preparing the design of the second phase of the Recycled Water Master Plan that will take water from the Saugus Water Reclamation plant and distribute it to identified users to the north, across the Santa Clara River and then to the west and the east, which will include service to Santa Clarita Central Park. There is also a new phase of the of the recycled water system in design that would extend the existing system southward from the intersection of Magic Mountain Parkway and the Old Road to the intersection of Orchard Village Road and Lyons Avenue, serving large irrigation customers along its proposed alignment. Collectively, these phases will have design capacity to increase recycled water deliveries by about 1,500 afy.

## 3.7 Santa Clara River

The Memorandum of Understanding (MOU) between the Santa Clarita Valley Purveyors and the United Water Conservation District, which manages surface and groundwater resources in seven groundwater basins in the Lower Santa Clara River Valley Area, was a significant accomplishment when it was prepared and executed in 2001. The MOU initiated a collaborative and integrated approach to data collection; database management; groundwater flow modeling; assessment of groundwater basin conditions, including determination of basin yield amounts; and preparation and presentation of reports, including continued annual reports such as this one for current planning and consideration of development proposals, and also including more technically detailed reports on geologic and hydrologic aspects of the overall stream-aquifer system. Meetings of the MOU participants have continued, and integration of the Upper (Santa Clarita Valley) and Lower (United WCD) Santa Clara River databases has been accomplished. As discussed above, a numerical groundwater flow model of the entire Santa Clarita groundwater

basin was developed and calibrated in 2002-2004. Subsequent to its initial use in 2004 for assessing the effectiveness of various operating scenarios to restore pumping capacity impacted by perchlorate contamination (by pumping and treating groundwater for water supply while simultaneously controlling the migration of contaminated groundwater), the model was used in 2005 for evaluation of basin yield under varying management actions and hydrologic conditions. The results completed the determination of sustainable operating yield values for both the Alluvium and the Saugus Formation, which were incorporated in the 2005 UWMP. The updated analysis of basin yield, completed in 2009, indicates that the 2008 Operating Plan will maintain river flows at higher levels than occurred prior to urbanization of the Valley.

On occasion, issues have been raised about whether use and management of groundwater in the Santa Clarita Valley have adversely impacted surface water flows into Ventura County. Part of the groundwater modeling work has addressed the surface water flow question as well as groundwater levels and storage. While the sustainability of groundwater has logically derived primarily from projected long-term stability of groundwater levels and storage, it has also derived in part from modeled simulations of surface water flows and the lack of streamflow depletion by groundwater pumping. In addition, the long-term history of groundwater levels in the western and central part of the basin, as illustrated in Figures 3-4 and 3-5, supports the modeled analysis and suggests that groundwater has not been lowered in such a way as to induce infiltration from the river and thus impact surface water flows.

Historical annual stream discharge in the Santa Clara River, into and out of the Santa Clarita Valley, is shown on Figure 3-14. The upstream gage at Lang Station was reinstated in 2002 and shows a wide range of average annual inflow over the last seven years. The downstream gage was moved in 1996 to its present location near Piru, about two miles downriver from the former County Line Gage. The combined record (1953-2009) of these two downstream gages indicates an annual stream discharge of about 47,000 afy. These data gaged near the County line show notably higher flows from the Santa Clarita Valley into the uppermost downstream basin, the Piru Basin, over the last 30 to 35 years.

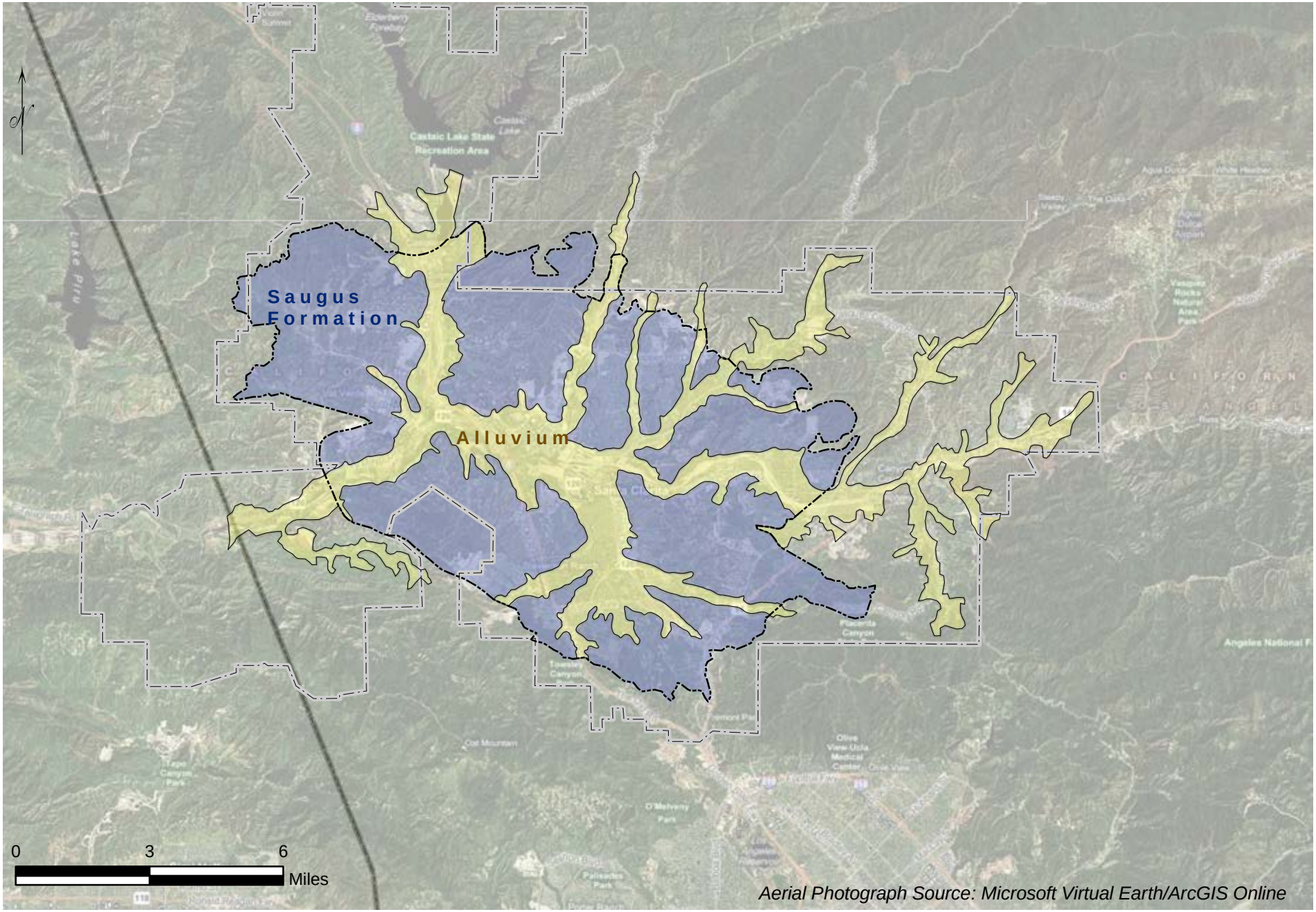


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**Figure 3-1**
**Alluvium and Saugus Formation**
**Santa Clara River Valley, East Groundwater Subbasin**

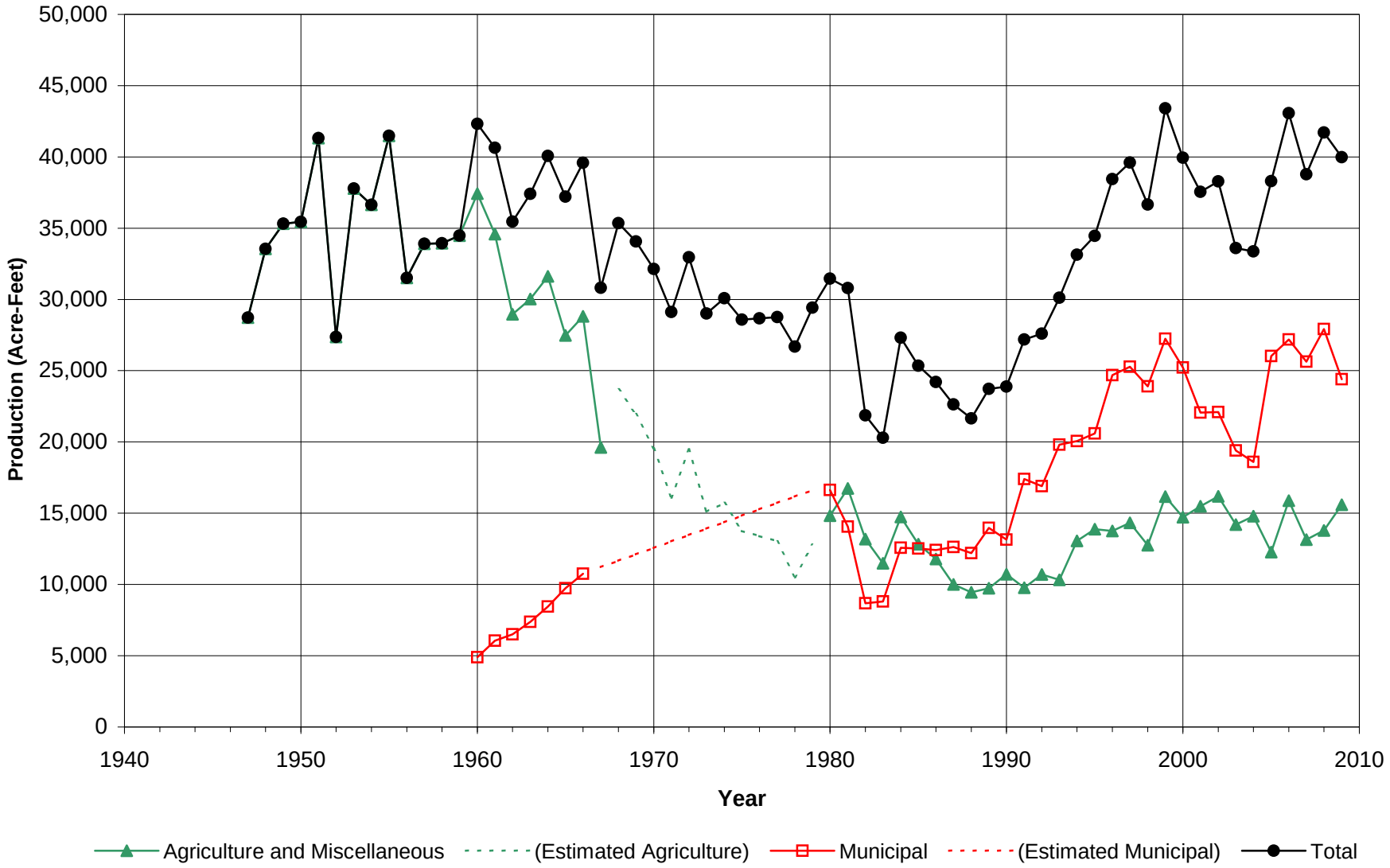


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**Figure 3-2**
**Groundwater Production - Alluvium**
**Santa Clara River Valley, East Groundwater Subbasin**

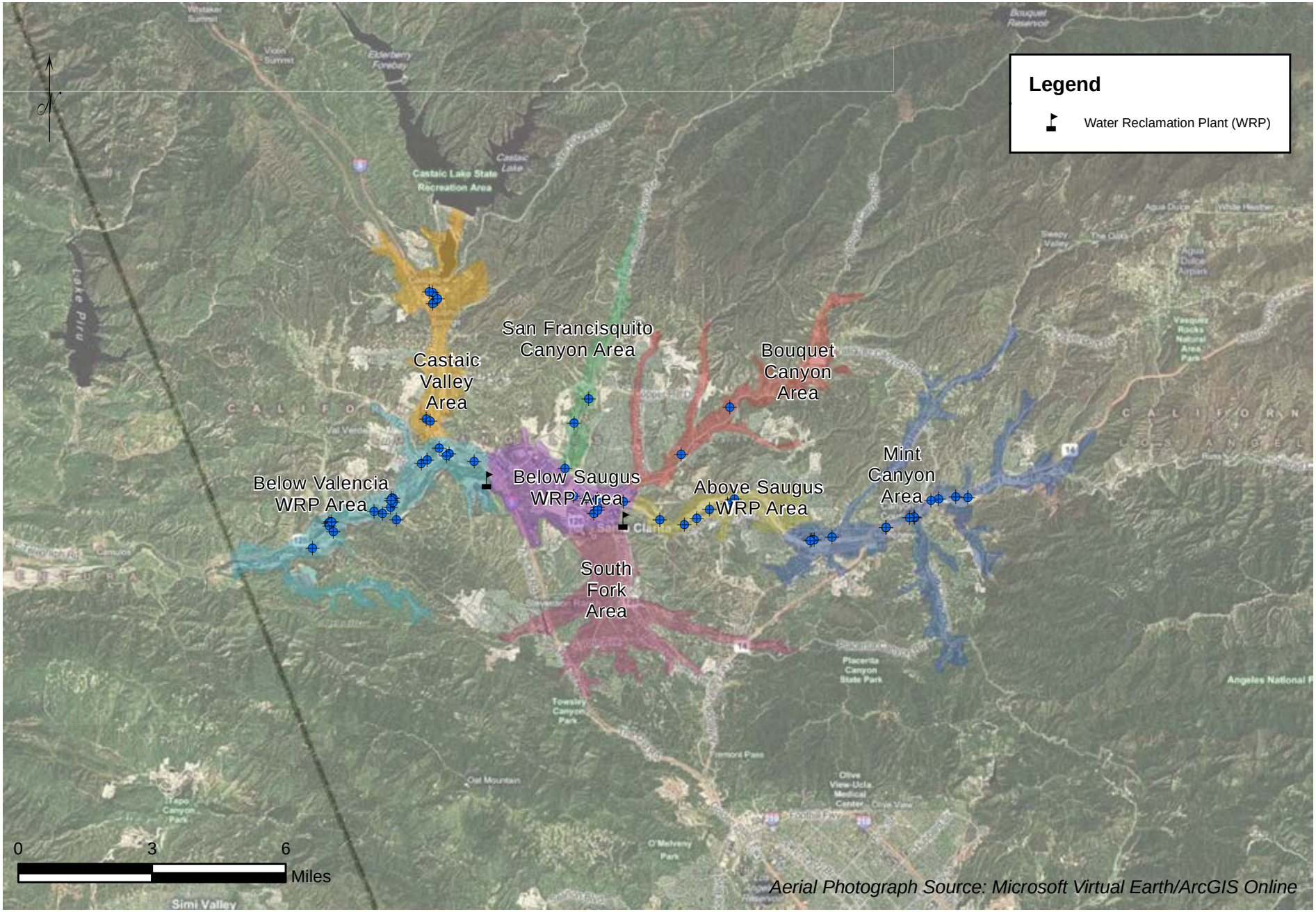


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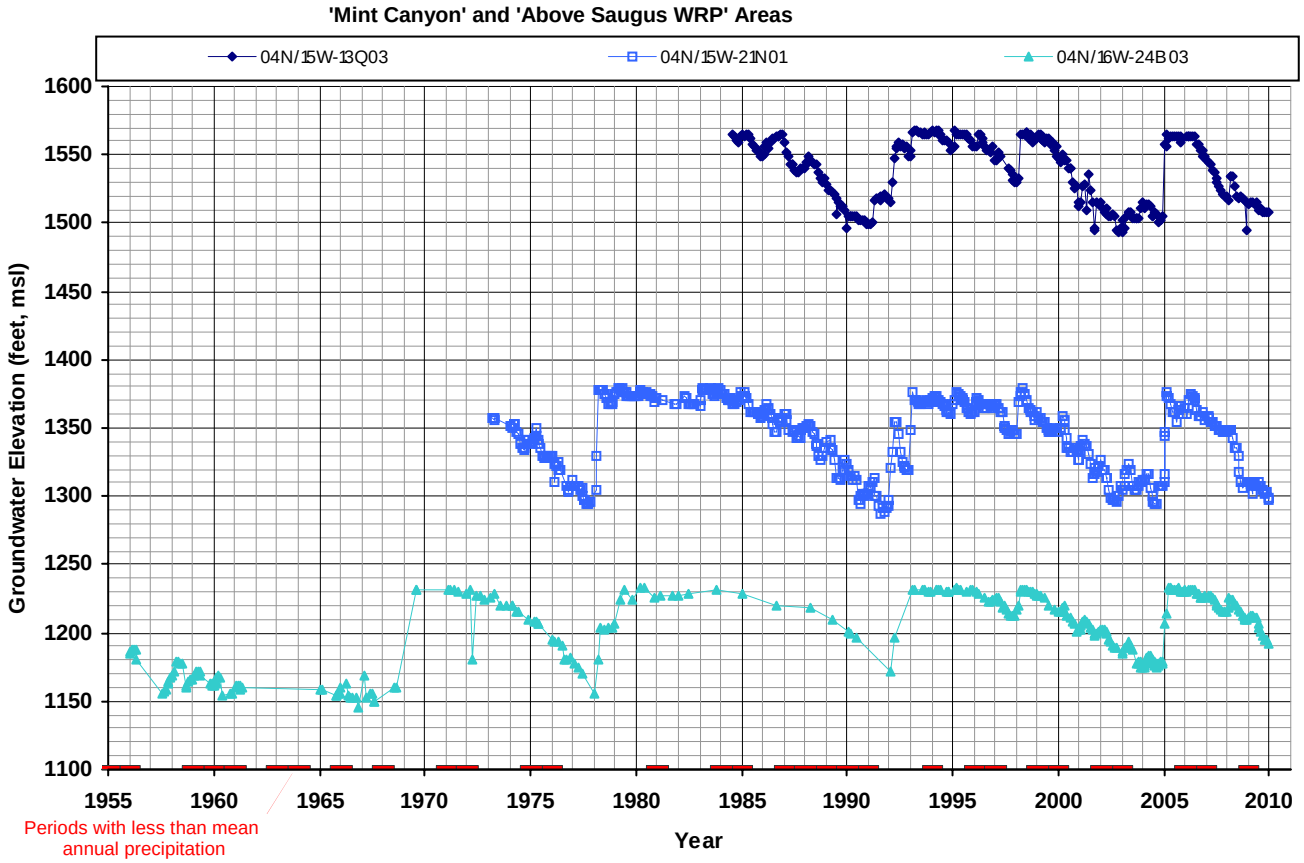
**Figure 3-3**
**Alluvial Well Locations By Area**
**Santa Clara River Valley, East Groundwater Subbasin**



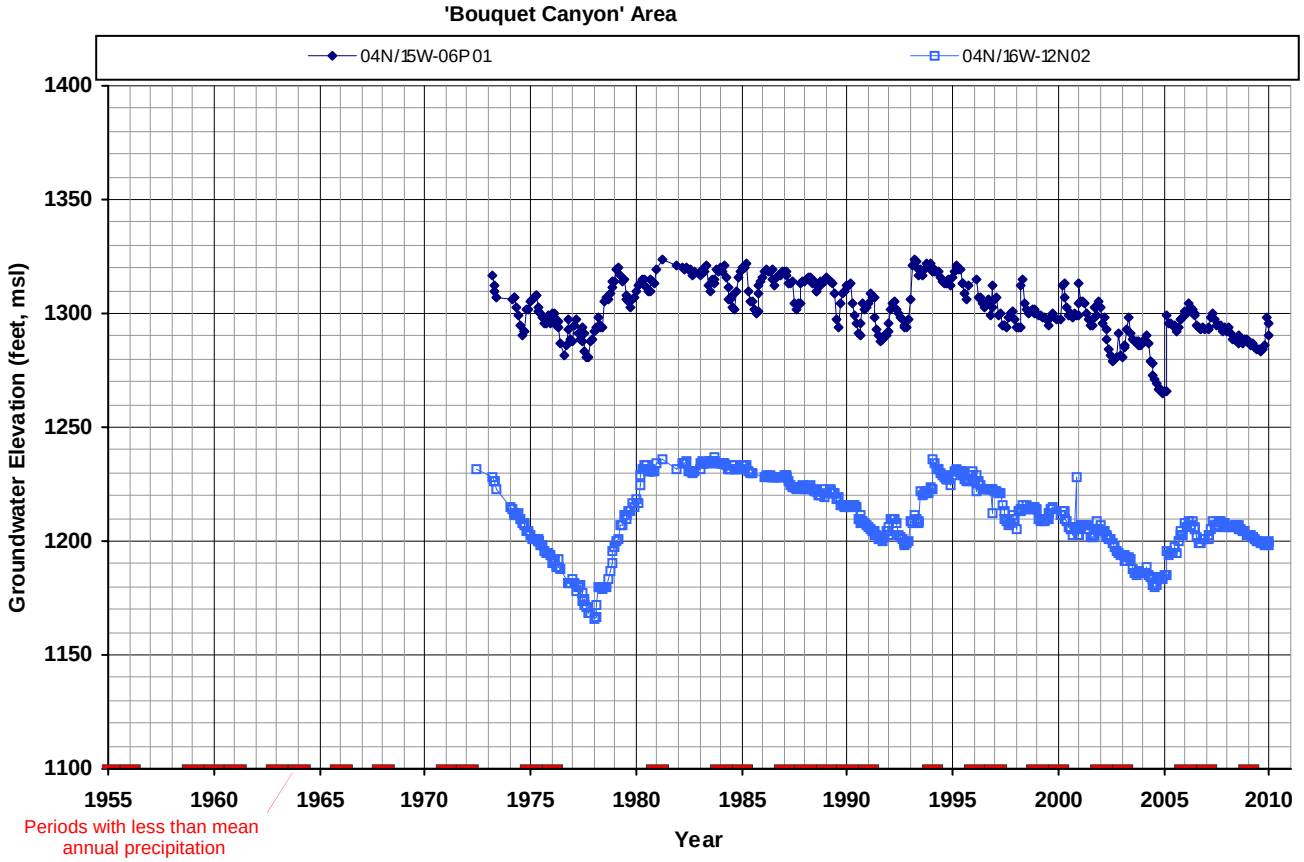




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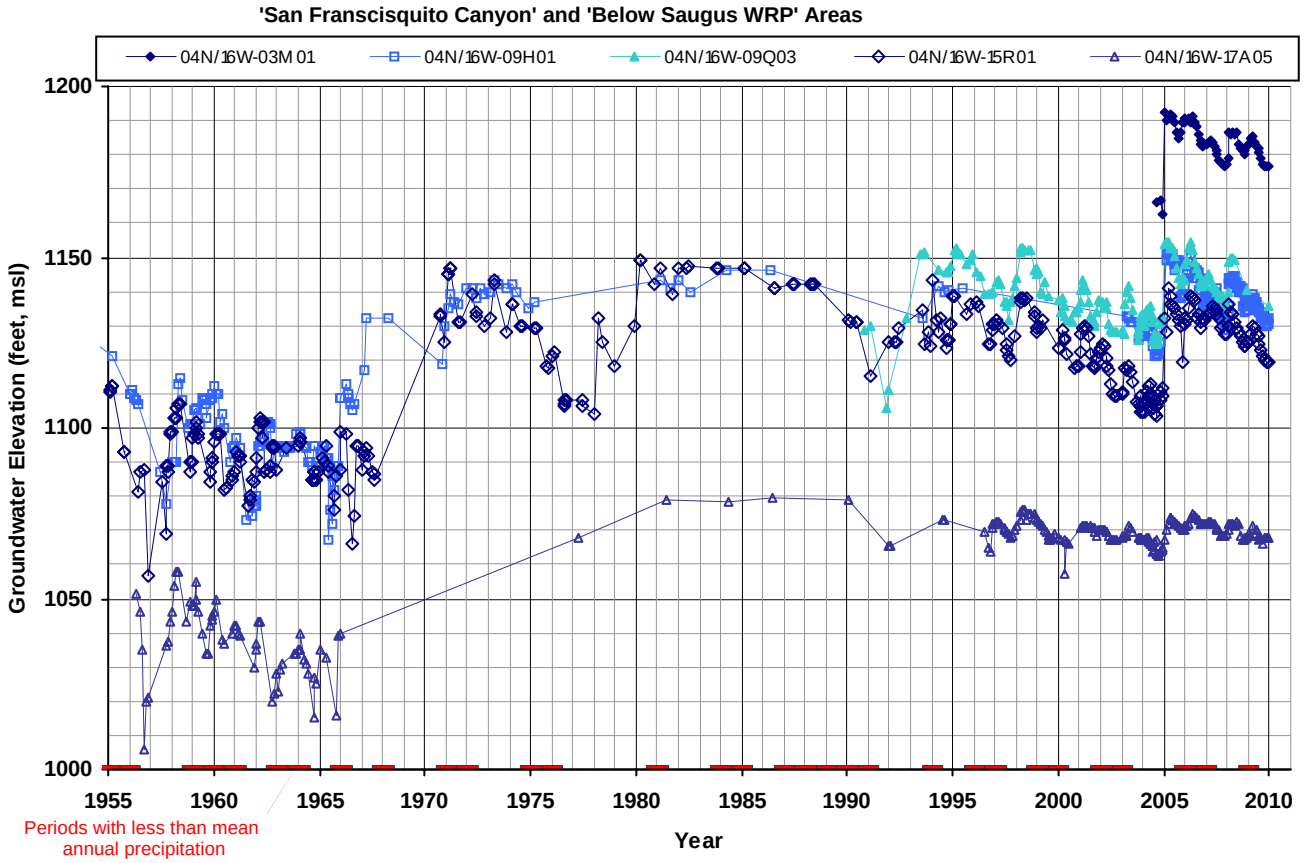
**Figure 3-4**
**Groundwater Elevations in Eastern Santa Clarita Valley Alluvial Wells**



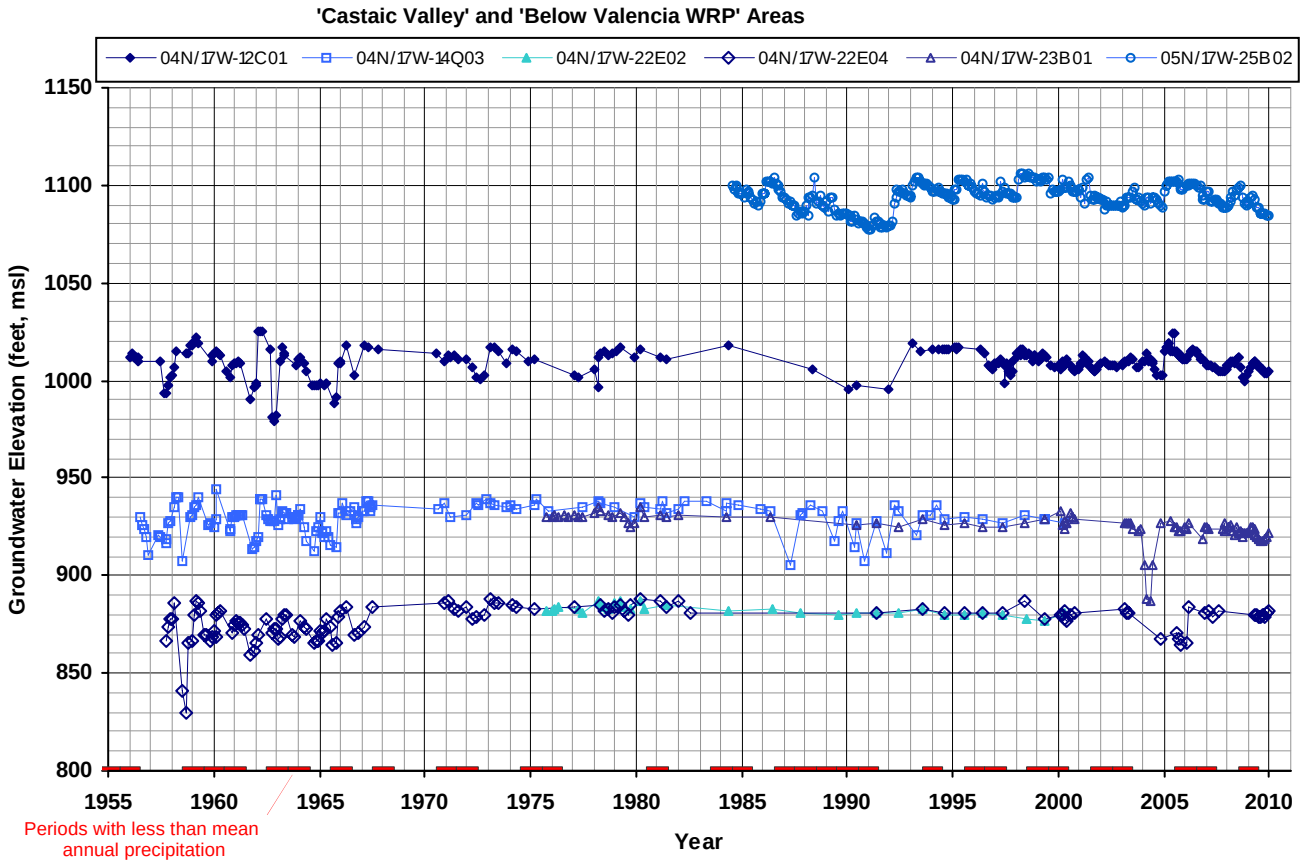




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**Figure 3-5**
**Groundwater Elevations in Western Santa Clarita Valley Alluvial Wells**

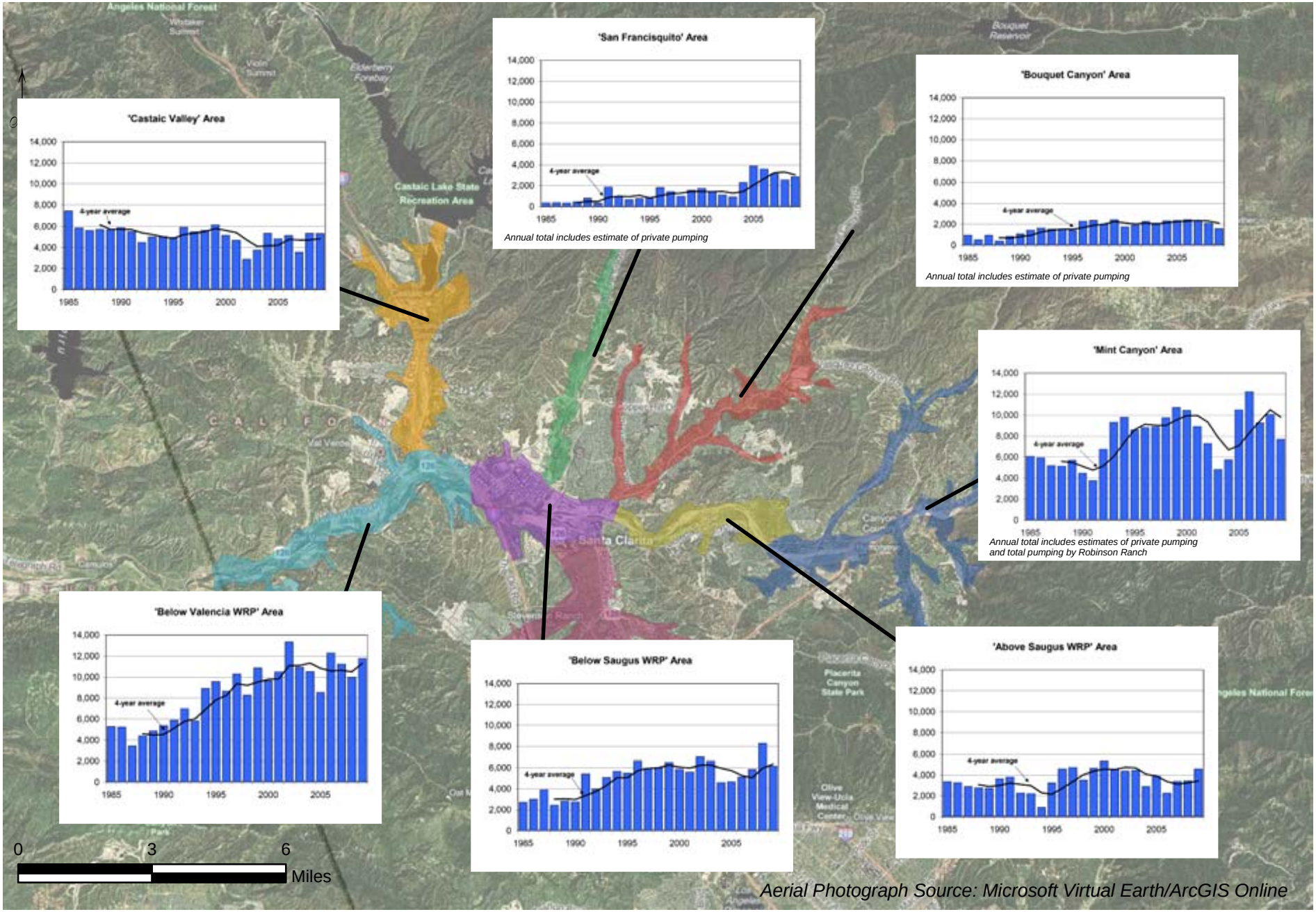


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**Figure 3-6**
**Annual Groundwater Production from Alluvium by Area (Acre-feet)**
**Santa Clara River Valley, East Groundwater Subbasin**

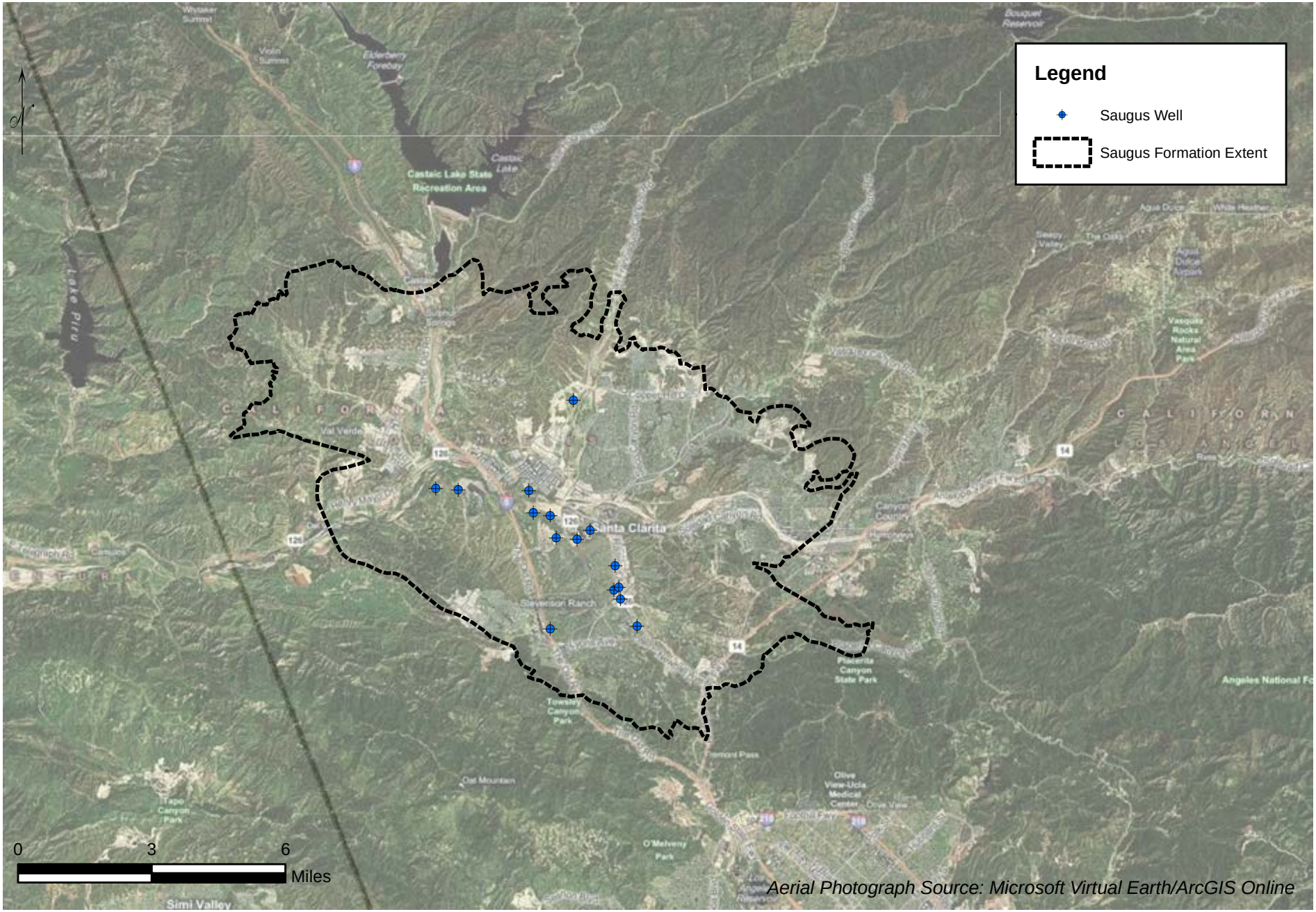


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**Figure 3-7**
**Saugus Well Locations**
**Santa Clara River Valley, East Groundwater Subbasin**

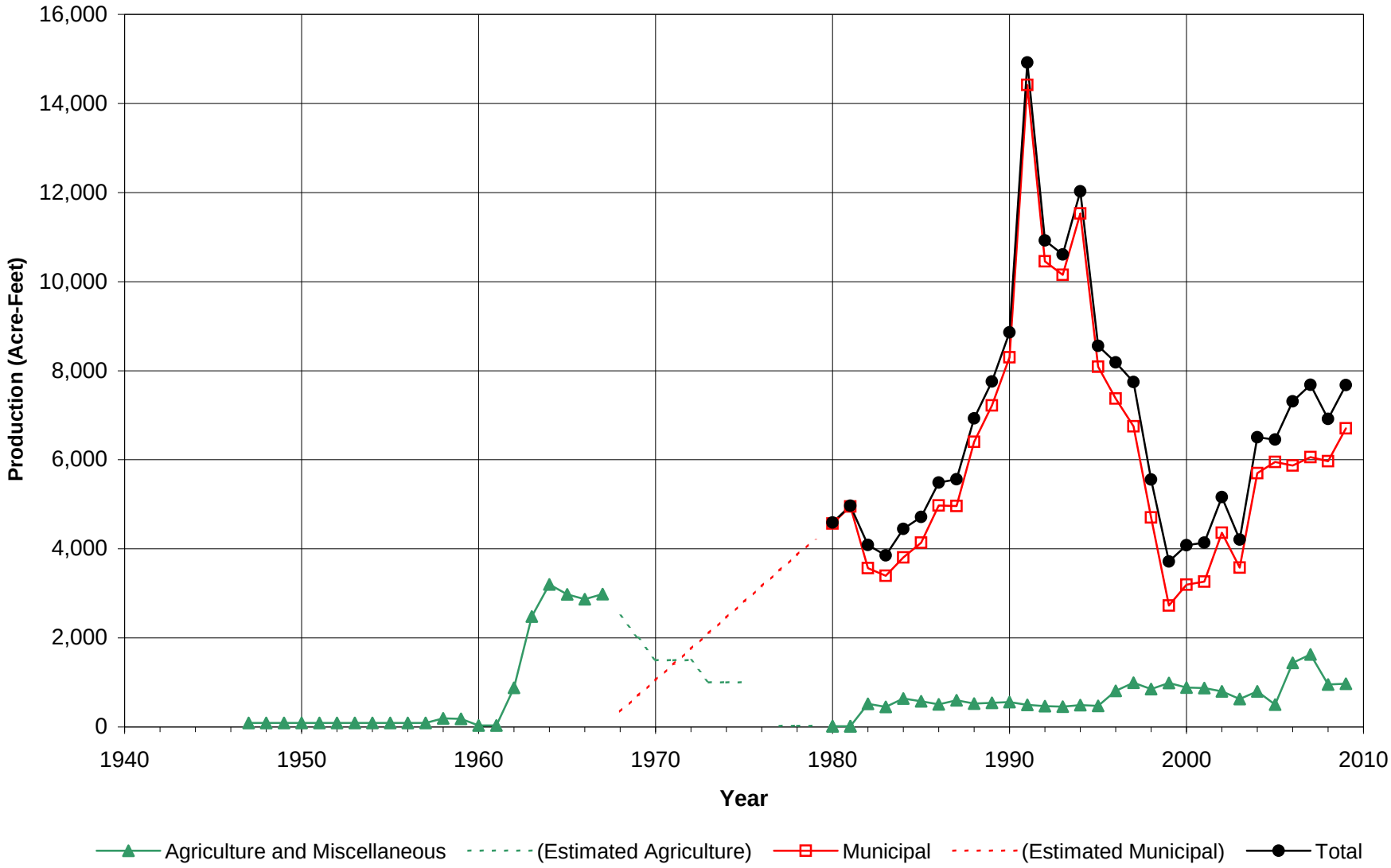


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**Figure 3-8**
**Groundwater Production - Saugus Formation**
**Santa Clara River Valley, East Groundwater Subbasin**

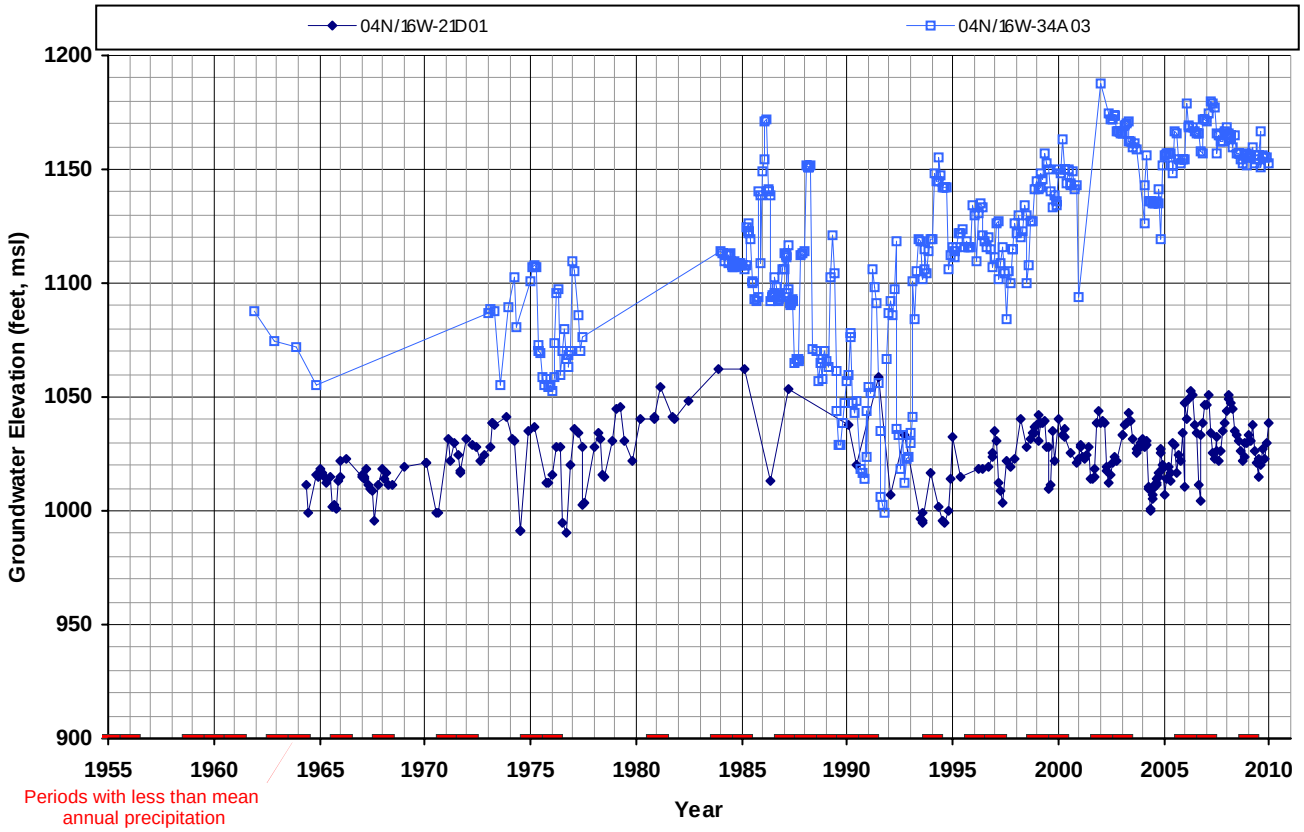


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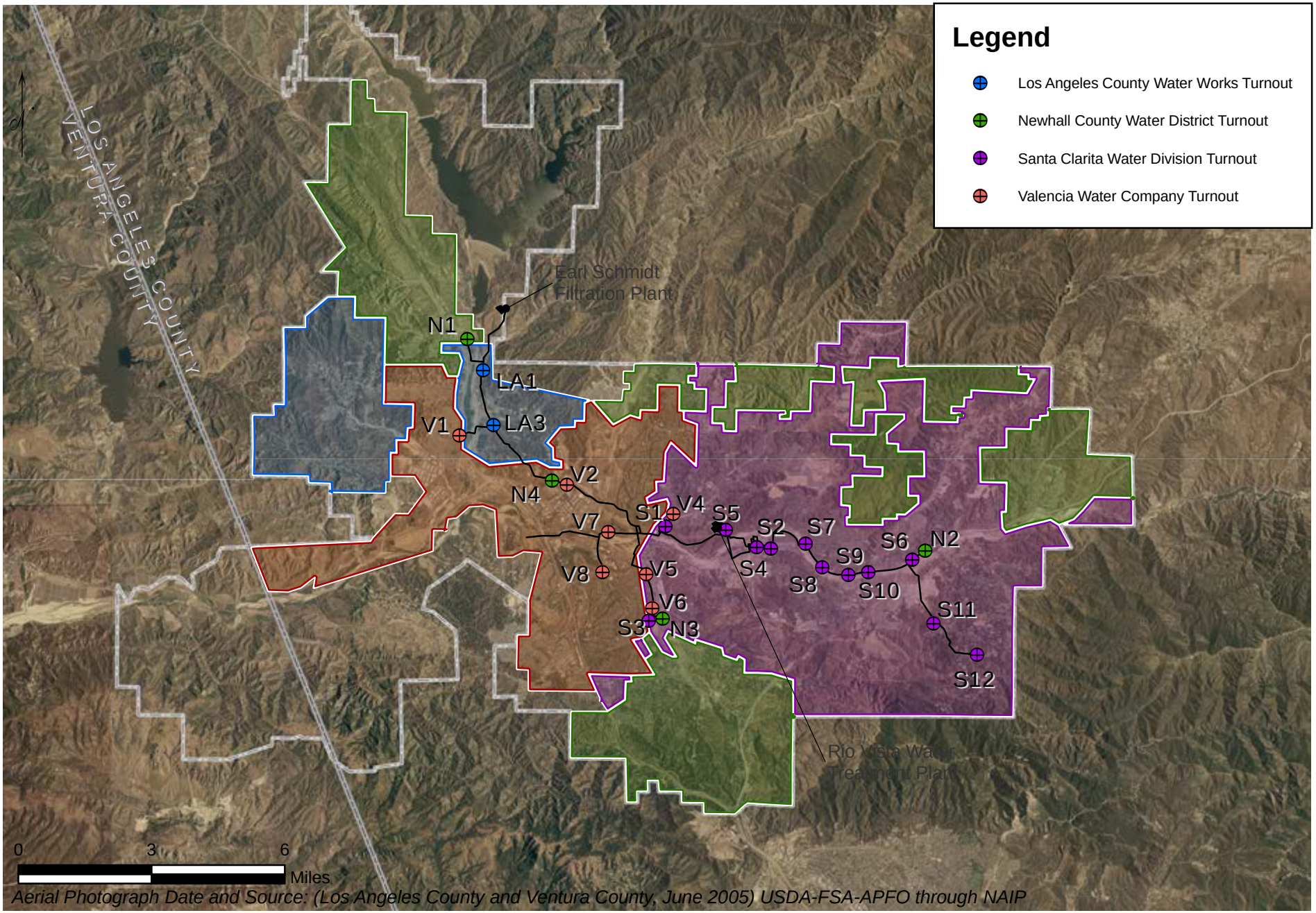
**Figure 3-9**
**Groundwater Elevations in Saugus Wells**




*Aerial Photograph Date and Source: (Los Angeles County and Ventura County, June 2005) USDA-FSA-APFO through NAIP*

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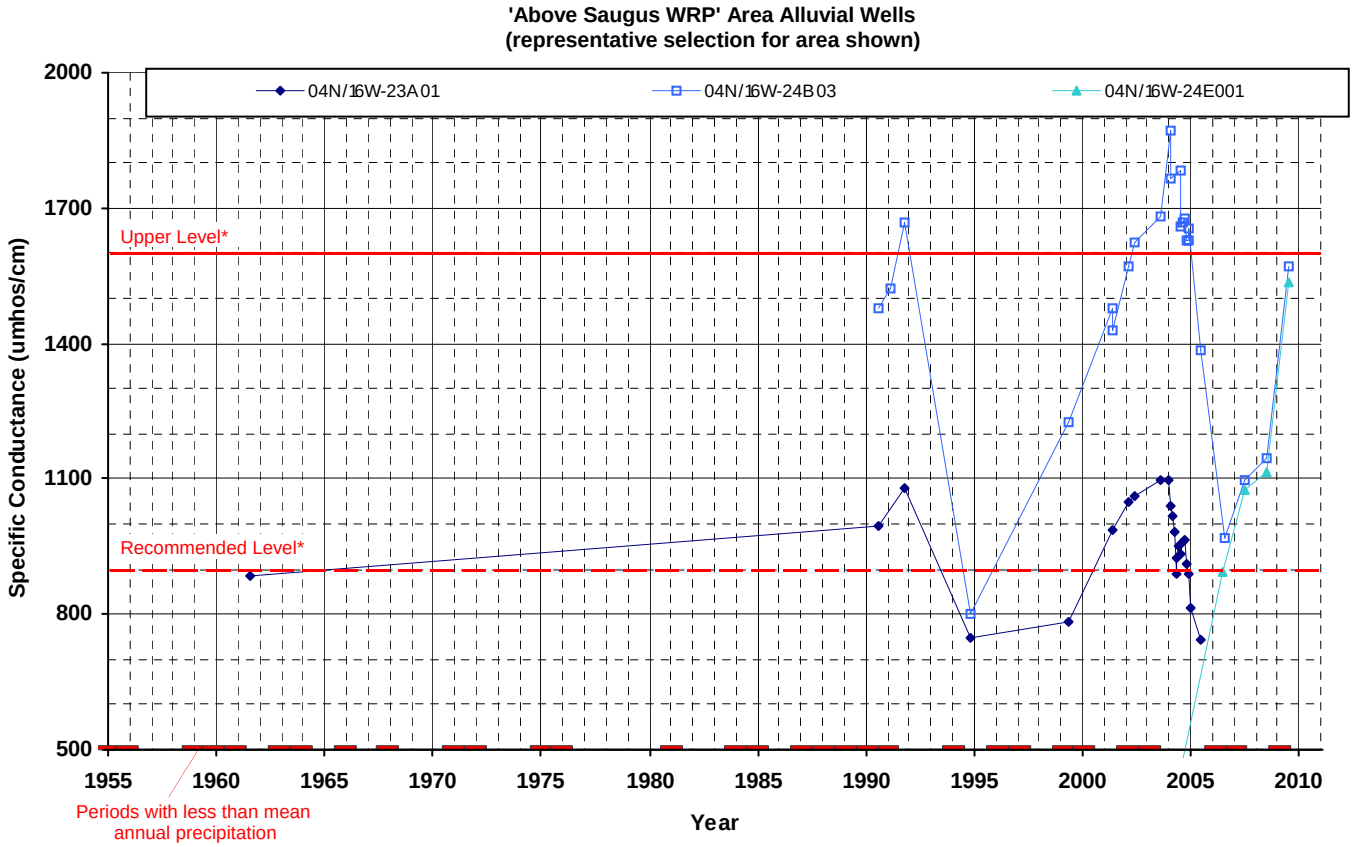
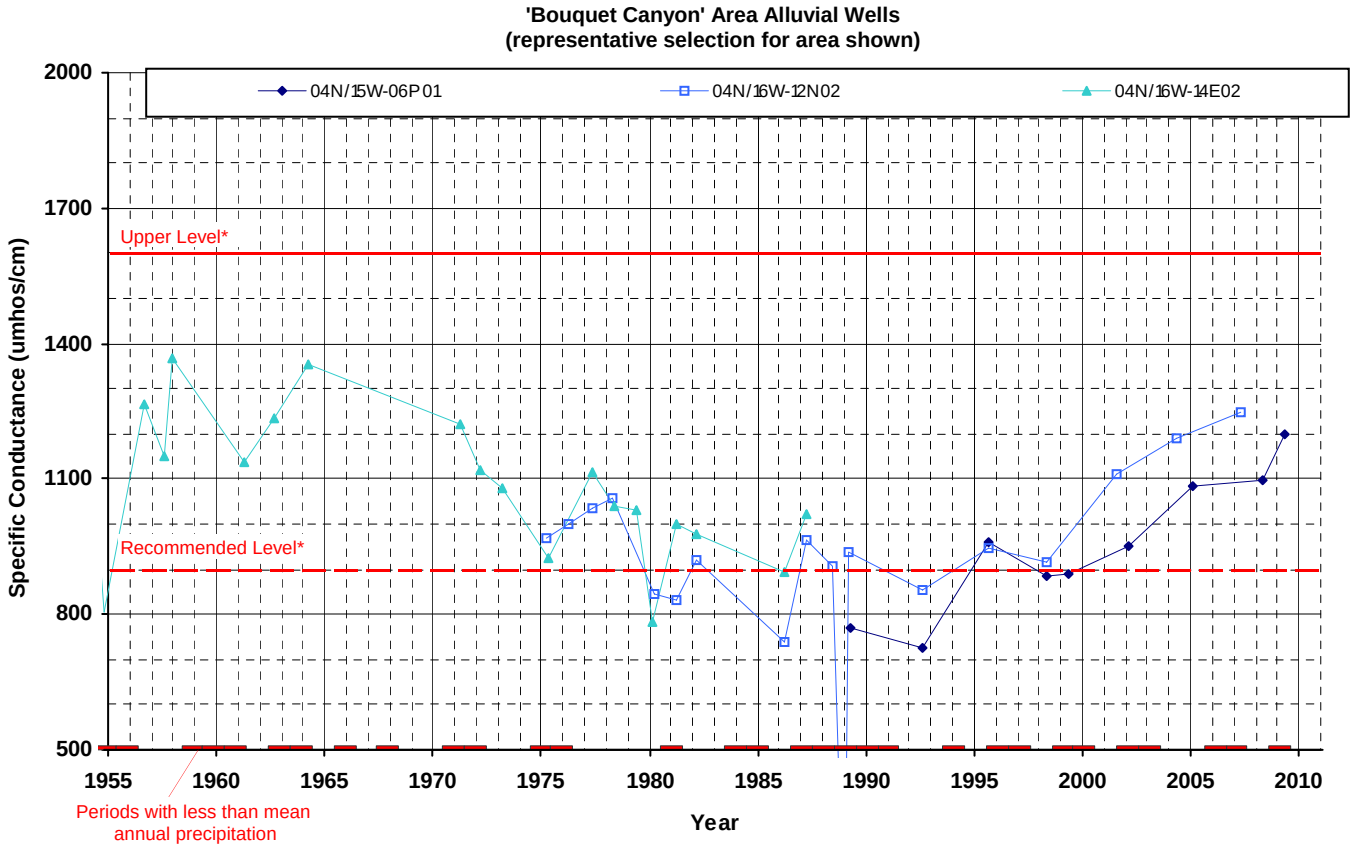
**Figure 3-10**
**Treated Water Distribution System**
**Castaic Lake Water Agency**




*California Department of Public Health Secondary Maximum Contaminant Level

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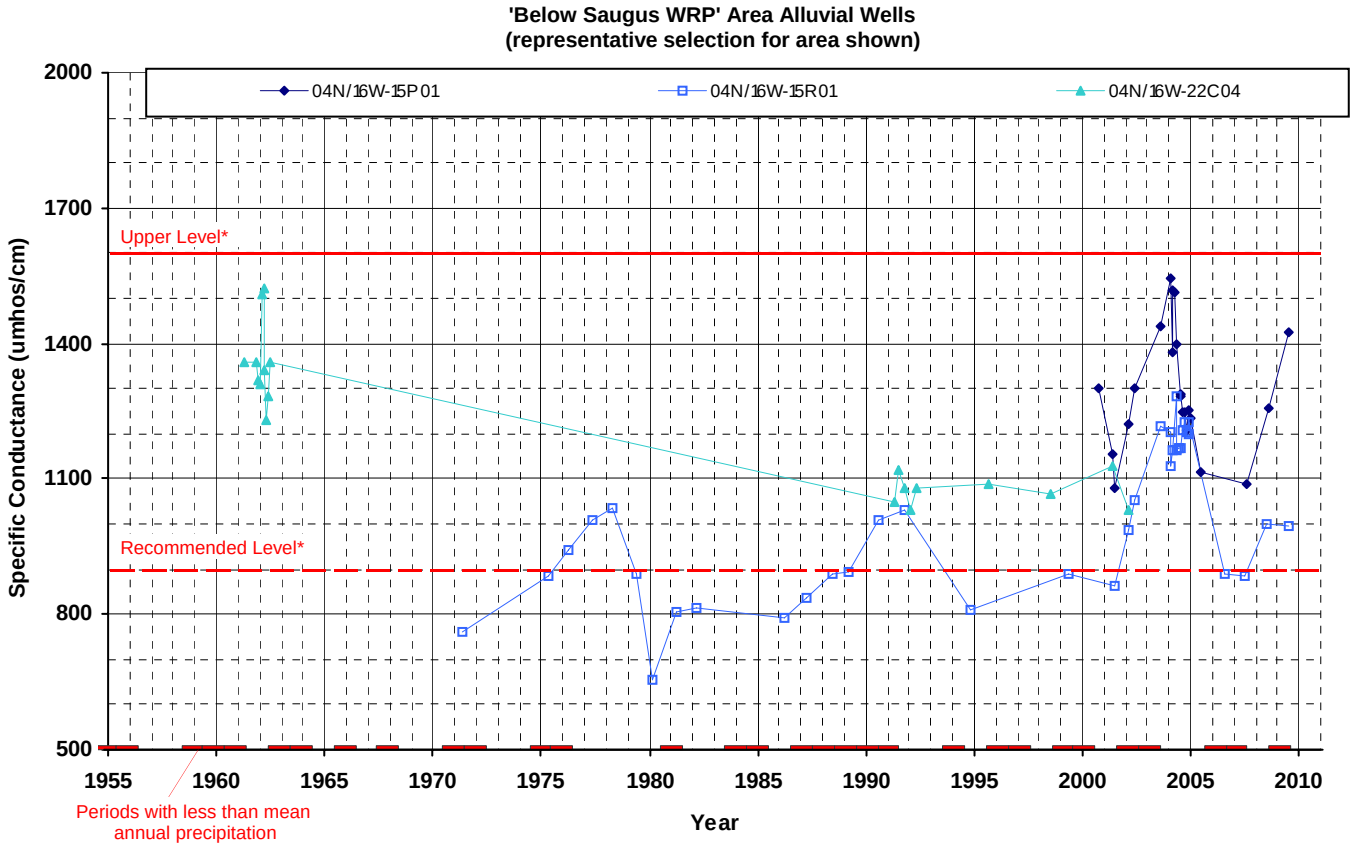
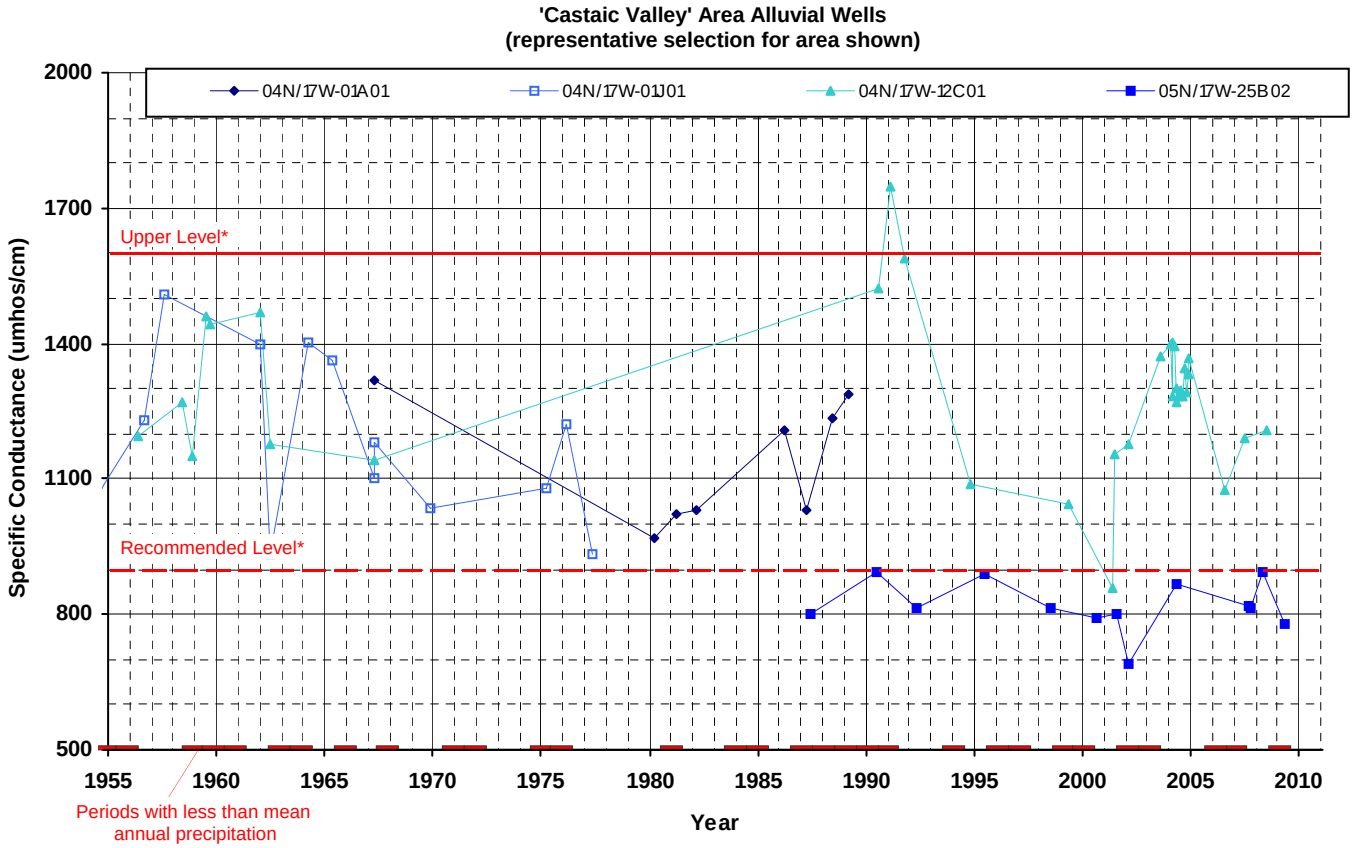
**Figure 3-11**
**Groundwater Quality in Eastern Santa Clarita Valley Alluvial Wells**




*California Department of Public Health Secondary Maximum Contaminant Level

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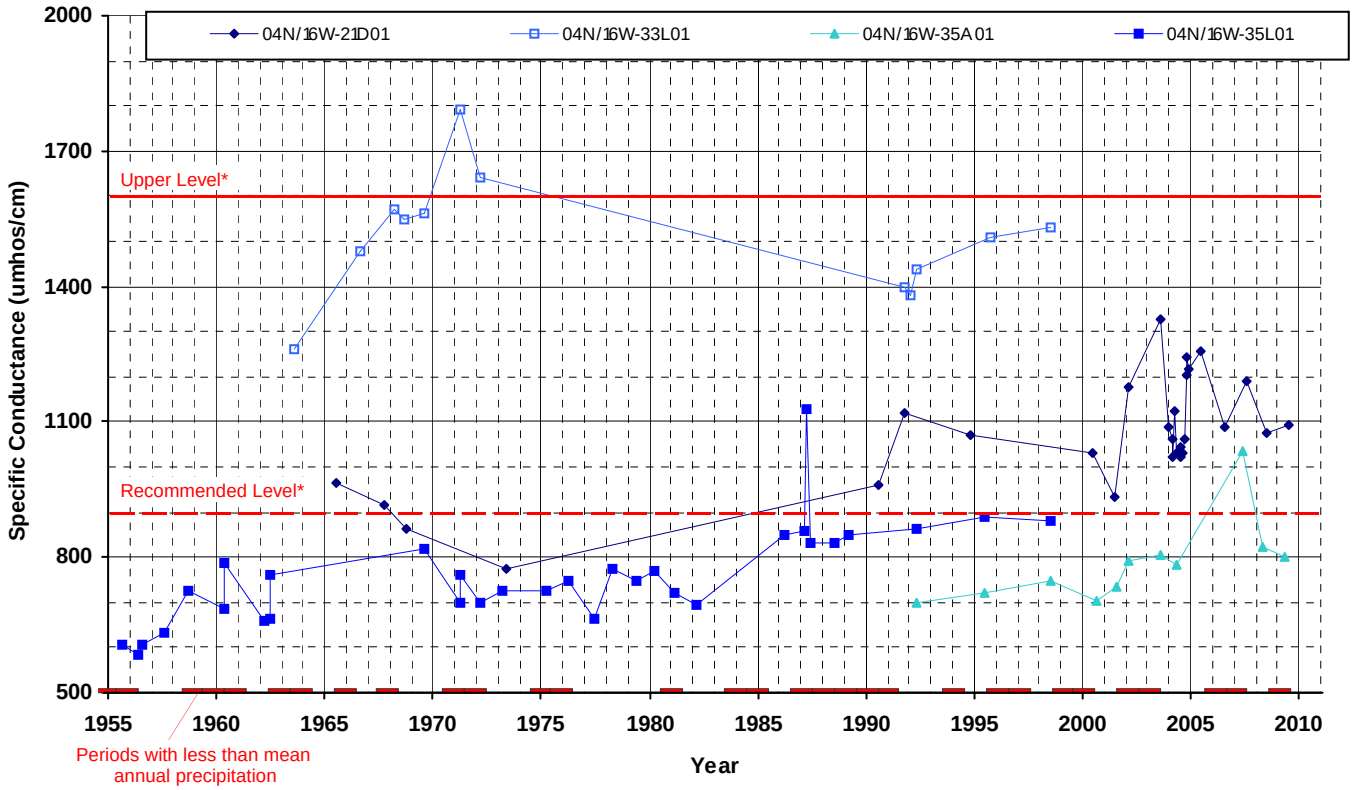
**Figure 3-12**
**Groundwater Quality in Western Santa Clarita Valley Alluvial Wells**




*California Department of Public Health Secondary Maximum Contaminant Level

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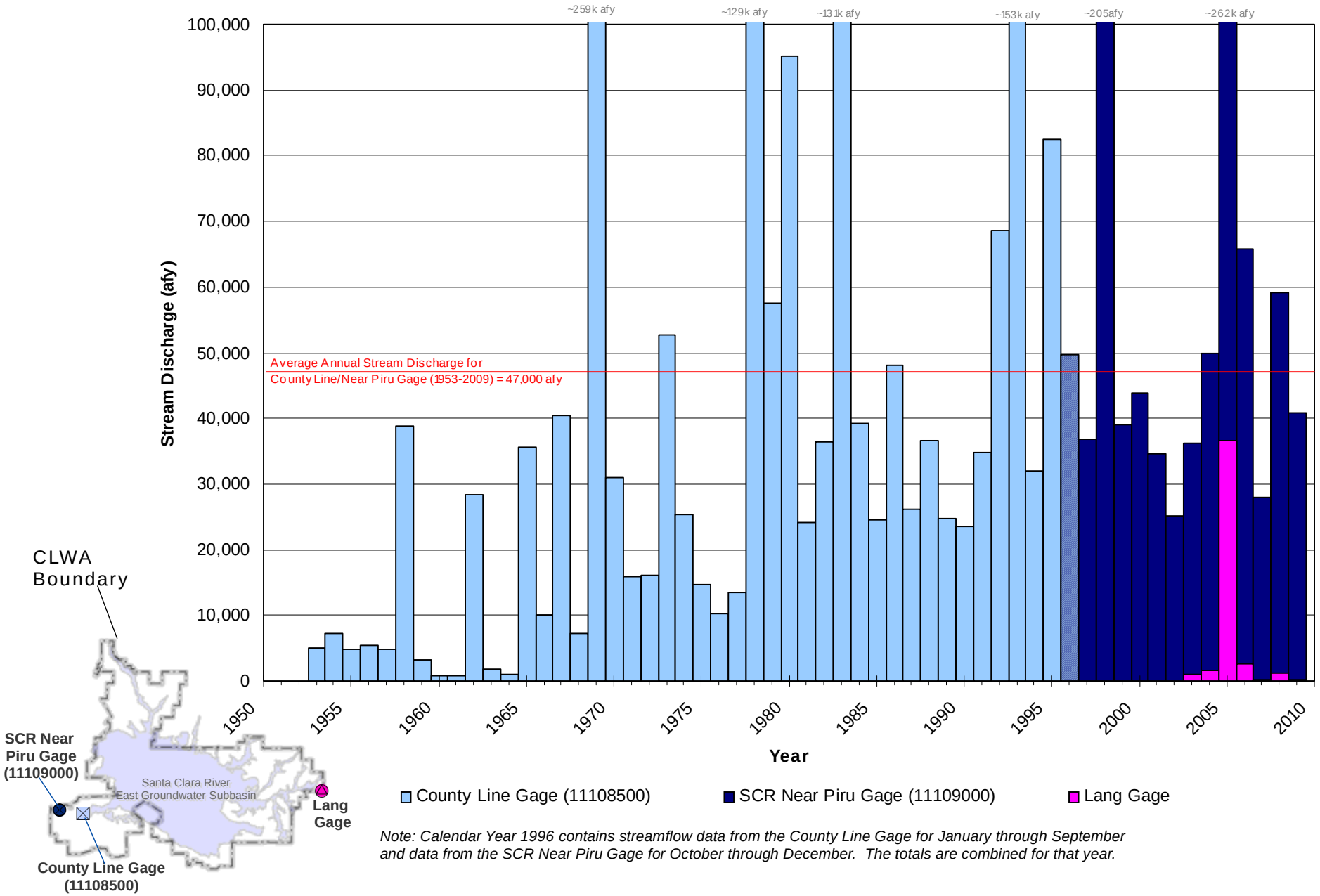
**Figure 3-13**
**Groundwater Quality in Saugus Wells**




*Note: Calendar Year 1996 contains streamflow data from the County Line Gage for January through September and data from the SCR Near Piru Gage for October through December. The totals are combined for that year.*

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**Figure 3-14**
**Annual Stream Discharge**
**Santa Clara River**

# 4. Summary of 2009 Water Supply and 2010 Outlook

As discussed in the preceding chapters, total water demands in the Santa Clarita Valley were 86,600 af in 2009. This represented a decrease of 4,100 af, or about 4.5 percent, from total demand in 2008 and continues a declining trend in total water demand over the last two years. Of the total demand in 2009, nearly 70,000 af were for municipal water supply, and the balance (16,600 af) was for agricultural and other uses, including estimated individual domestic uses. As detailed in Chapter 2, the total demand in 2009 was met by a combination of local groundwater, SWP and other imported water, and a small amount of recycled water.

The water demand in 2009 was notably lower than the average projection in the 2005 UWMP, (97,900 af), and also lower than the short-term projected demand that was estimated in the 2008 Water Report (91,000 af). For illustration, historical water use from 1980 through 2008 is plotted in Figure 4-1; also shown with that historical record are the projected total water demands in the 2005 UWMP through 2030. As discussed in the 2005 UWMP, year-to-year fluctuations in historical water demand have ranged from about ten percent below to about nine percent above the average or "normal" projection that would describe the long-term historical trend in the Valley's total water demand. The primary factor causing the year-to-year fluctuations is weather. In the short term, wetter years have typically resulted in decreased water demand, and drier years have typically resulted in higher water demand. Extended drier periods, however, have resulted in decreases in demand due to conservation and water shortage awareness. The decline in water demand toward the end of the 1987-92 drought is a good example of such reduced demand. A good recent example of wet-year effects on water demand was 2005, where extremely wet conditions resulted in total water requirements about six percent below the average projection in the 2005 UWMP.

Adding to the types of demand fluctuations described in the 2005 UWMP are the recently-observed effects of broad economic conditions on growth. As reflected by the numbers of service connections in each Purveyor service area, growth in 2009 further slowed, with addition of a total of only about 300 new service connections, in contrast to about 1,000 new connections in each of the preceding two years, and in notable contrast to the predominant growth rate nearly three times higher from the late 1990's through 2004. In addition, the Purveyors were informed by, and have conveyed to the local community, the Governor's Alert in June, 2008 regarding drought conditions and potential water supply shortages, and the Governor's subsequent Drought Emergency Declaration in February, 2009. The widespread awareness of dry conditions throughout the state, aggressive conservation messaging, and the decrease in local growth are

prime factors causing total water demand in 2009 to be notably less than each of the preceding two years, and well below the earlier estimated demand in the 2005 UWMP.

The preceding factors are expected to have a continuing effect in 2010, resulting in estimated total water demand that is again lower than last year. Total municipal water requirements in the first quarter of 2010 were about 16 percent lower than in 2009; that trend continued through April, at the end of which total municipal water requirements were about 19 percent lower than through the first four months of 2009. If municipal demand through the balance of the year tracks average or below average use over the same period through the last two years, and with agricultural and other water requirements comparable to previous years, total water demand in 2010 will be around 82,000 to 84,000 af. That range continues to be substantially below the 100,000 af demand projected for 2010 in the 2005 UWMP.

It is expected that both municipal and agricultural water demands in 2010 will continue to be met with a mix of water supplies as in previous years, notably local groundwater and imported SWP and other supplemental water, complemented by recycled water that will continue to supply a small fraction of total water demand.

On May 20, 2010, the final allocation of water from the SWP in 2010 was announced to be 45 percent; for CLWA, that equates to 42,840 af of its total Table A Amount, of 95,200 af. Combined with local groundwater from the two aquifer systems (48,000 af), total Flexible Storage Account water (6,060 af), net carryover SWP water from 2008 and 2009 (28,303 af), annual acquisition from Buena Vista Water/Rosedale-Rio Bravo Water Storage Districts (11,000 af), unused water previously withdrawn from the Semitropic Groundwater Storage Bank (3,300 af), and recycled water (500 af), the total available water supplies for 2010 are about 140,000 af. Consequently, CLWA and the Purveyors anticipate having more than adequate supplies to meet all water demands in 2010. Projected 2010 water supplies and demand are summarized in Table 4-1.

In August, 2007, a federal court ruled that certain operational changes were required of the SWP in order to protect the endangered Delta smelt. The court order resulted in the preparation of a new Biological Opinion (BO) requiring DWR to implement mitigation requirements with resultant impacts on SWP water supply reliability. Since then, DWR has prepared two updates to its 2005 Reliability Report, which is issued biennially to assist SWP contractors in assessing the adequacy of the SWP component of their overall supplies under varying hydrologic scenarios, e.g. normal and dry years. The current Draft SWP Delivery Reliability Report 2009 was issued in February, 2010. With the objective of protecting endangered fish such as the Delta

**Table 4-1**
**2010 Water Supply and Demand**
**(acre-feet)**

| | | |
|---|---|---|
| **Projected 2010 Demand [1]** | | **82,000-84,000** |
| ***Available 2010 Water Supplies*** | | |
| Local Groundwater | | 48,000 |
| *Alluvium [2]* | *39,000* | |
| *Saugus Formation [3]* | *9,000* | |
| Imported Water | | 91,503 |
| *Table A Amount [4]* | *42,840* | |
| *Net Carryover from 2009 [5]* | *28,303* | |
| *Buena Vista/Rosedale-Rio Bravo[6]* | *11,000* | |
| *Flexible Storage Account (CLWA) [7]* | *4,684* | |
| *Flexible Storage Account (Ventura County) [7]* | *1,376* | |
| *Yuba Accord[8]* | *0* | |
| Recovery of Banked Water | | |
| *Unused Semitropic 2002 Account withdrawal in 2009* | *3,300* | |
| Recycled Water | | 500 |
| **Total Available 2010 Supplies** | | **140,003** |
| ***Additional Dry Year Supplies*** [9] | | |
| Semitropic Groundwater Storage Bank | | 45,920 |
| *2002 Account[10]* | *16,650* | |
| *2003 Account[10]* | *29,270* | |
| Rosedale-Rio Bravo Water Banking and Exchange Program | | 64,898 |
| *2005 and 2006 Buena Vista/Rosedale-Rio Bravo Water Acquisition Agreement[11]* | *22,000* | |
| *2005 Banking of Table A[12]* | *17,800* | |
| *2006 Banking of Table A[12]* | *17,800* | |
| *2007 Rosedale Rio-Bravo Banking[12]* | *7,298* | |
| **Total Additional Dry Year Supplies** | | **110,818** |

1. Decreased from 2005 UWMP projections to reflect recent early 2010 actual water use, recent three-year trend, and economy-driven decrease in growth.

2. The Alluvium represents 30,000 – 40,000 afy of available supply under local wet-normal conditions, and 30,000 – 35,000 afy under local dry conditions. Available supply in 2010 is shown to be upper-range for average/wet conditions based on actual Alluvium conditions.

3. The Saugus Formation represents 7,500 – 15,000 afy of available water supply under non-drought conditions, and up to 35,000 afy under increasingly dry conditions. Available supply in 2010 is shown to be below mid-range for average/wet conditions, but above recent Saugus pumping in anticipation of perchlorate containment and cleanup pumping in the second half of 2010.

4. CLWA's SWP Table A amount is 95,200 af. The initial 2010 allocation was 15 percent (14,820 af). On March 17, 2010, the allocation was increased to 20 percent (19,040 af). On April 15, 2010 the allocation

was increased to 30 percent (28,560 af). On May 4, 2010 the allocation was increased to 40 percent (38,080 af). On May 20, 2010 the final allocation was increased to 45 percent (42,840 af).

5. Net amount available to CLWA in 2010; total carryover was 28,303 af.

6. 2010 annual supply from Buena Vista / Rosedale-Rio Bravo Water Acquisition Agreement.

7. CLWA can directly utilize up to 4,684 af of storage capacity in Castaic Lake. By agreement in 2005, CLWA can also utilize 1,376 af of Ventura County SWP contractors' flexible storage capacity in Castaic Lake.

8. Up to 850 af of non-SWP water supply is available to CLWA in critically dry years as a result of agreements among DWR, Yuba County Water Agency, and the U.S. Bureau of Reclamation regarding settlement of water rights issues on the Lower Yuba River (Yuba Accord). CLWA opted to not take any Yuba water in 2010.

9. Does not include other reliability measures available to CLWA and the retail water Purveyors. These measures include short-term exchanges, participation in DWR's dry-year water purchase programs, local dry-year supply programs and other future groundwater storage programs.

10. Net recoverable water after banking 24,000 af and 32,522 af in 2002 and 2003, respectively and recovering 4,950 af in 2009.

11. Water stored in Rosedale-Rio Bravo Water Banking and Exchange Program pursuant to the Buena Vista/Rosedale-Rio Bravo Water Acquisition Agreement.

12. Net recoverable water after banking 20,000 af in both 2005 and 2006, and banking 8,200 af in 2007.

smelt and spring-run salmon, the Draft incorporates restrictions on SWP operations according to the Biological Opinions of the U.S. Fish and Wildlife Service and the National Marine Fishery Service issued on December 15, 2008 and June 4, 2009, respectively. It also considers the impacts on SWP delivery reliability due to climate change, sea level rise, and vulnerability of the Delta's conveyance system and structure due to floods and earthquakes. The current Draft Reliability Report projects long-term reliability of 60 percent during normal year hydrology. CLWA staff has assessed the impact of the current Reliability Report on the CLWA reliability analysis contained in the Agency's 2005 UWMP and concluded that current and anticipated supplies are available to meet anticipated water supply needs. However, the preceding discussion of SWP supply should be considered by noting that, while the SWP Reliability Report represents a reasonable scenario with respect to long term reliability, recent reductions in supply reduce the difference between available supply and demand in the future, thereby making the CLWA service area more subject to shortages in certain dry years. Accordingly, the reduction in SWP supply reinforces the need to continue diligent efforts to conserve potable water and increase the use of recycled water, both to meet the goals in the 2005 UWMP and to maximize utilization of potable water supplies.

As discussed in Chapter 5, CLWA and the retail water purveyors have worked with Los Angeles County and the City of Santa Clarita in preparing a water conservation ordinance and the enforcement mechanisms to aggressively implement water conservation in the CLWA service area. In terms of short-term water supply availability, however, CLWA and the Purveyors have determined that, while current operational changes of the SWP are in effect, there are sufficient supplemental water supplies, including SWP water, to augment local groundwater and other water supplies such that overall water supplies will be sufficient to meet projected water requirements, as reflected herein, without the need for mandatory rationing though the summer of 2010. CLWA, the retail water Purveyors, Los Angeles County and the City of Santa Clarita have formed the Santa Clarita Valley Water Committee. The specific purpose of the committee is to work collaboratively to ensure the progressive implementation of water use efficiency programs and ordinances in the Santa Clarita Valley.

In addition to the regular and previously banked water supplies described above to meet projected demand in 2010, a residual of nearly 46,000 af of recoverable water remains stored in the Semitropic Groundwater Storage Bank in Kern County. Nearly 64,900 af of recoverable water are also stored in the long-term Rosedale-Rio Bravo Water Banking and Exchange Program, also in Kern County. After recovery of 4,950 af of banked water in 2009, 1,650 af of which were used in 2009 and 3,300 af of which are intended to be used in 2010, remaining recoverable water in all the Kern County storage banks slightly exceeds 110,000 af. That

component of overall water supply is separately reflected in Table 4-1 because it is intended for future dry-year supply and will not be used for 2010 water supply.

CLWA and the Purveyors have implemented a number of projects that are part of an overall program to provide facilities needed to firm up imported water supplies during times of drought. These involve water conservation, surface and groundwater storage, water transfers and exchanges, water recycling, additional short-term pumping from the Saugus Formation, and increasing CLWA's imported supply. This overall strategy is designed to meet increasing water demands while assuring a reasonable degree of supply reliability.

Part of the overall water supply strategy is to provide a blend of groundwater and imported water to area residents to ensure consistent quality and reliability of service. The actual blend of imported water and groundwater in any given year and location in the Valley is an operational decision and varies over time due to source availability and operational capacity of Purveyor and CLWA facilities. The goal is to conjunctively use the available water resources so that the overall reliability of water supply is maximized while utilizing local groundwater at a sustainable rate.

For long-term planning purposes, water supplies and facilities are added on an incremental basis and ahead of need. It would be economically unsound to immediately, or in the short term, acquire all the facilities and water supplies needed for the next twenty to thirty years. This would unfairly burden existing customers with costs that should be borne by future customers. There are numerous ongoing efforts to produce an adequate and reliable supply of good quality water for Valley residents. Water consumers expect that their needs will continue to be met with a high degree of reliability and quality of service. To that end, CLWA's and the Purveyors' stated reliability goal is to deliver a reliable and high quality water supply for their customers, even during dry periods. Based on conservative water supply and demand assumptions contained in the 2005 UWMP for a planning horizon over the next 25 years, in combination with conservation of non-essential demand during certain dry years, CLWA and the Purveyors believe implementing their water plan will successfully achieve this goal.

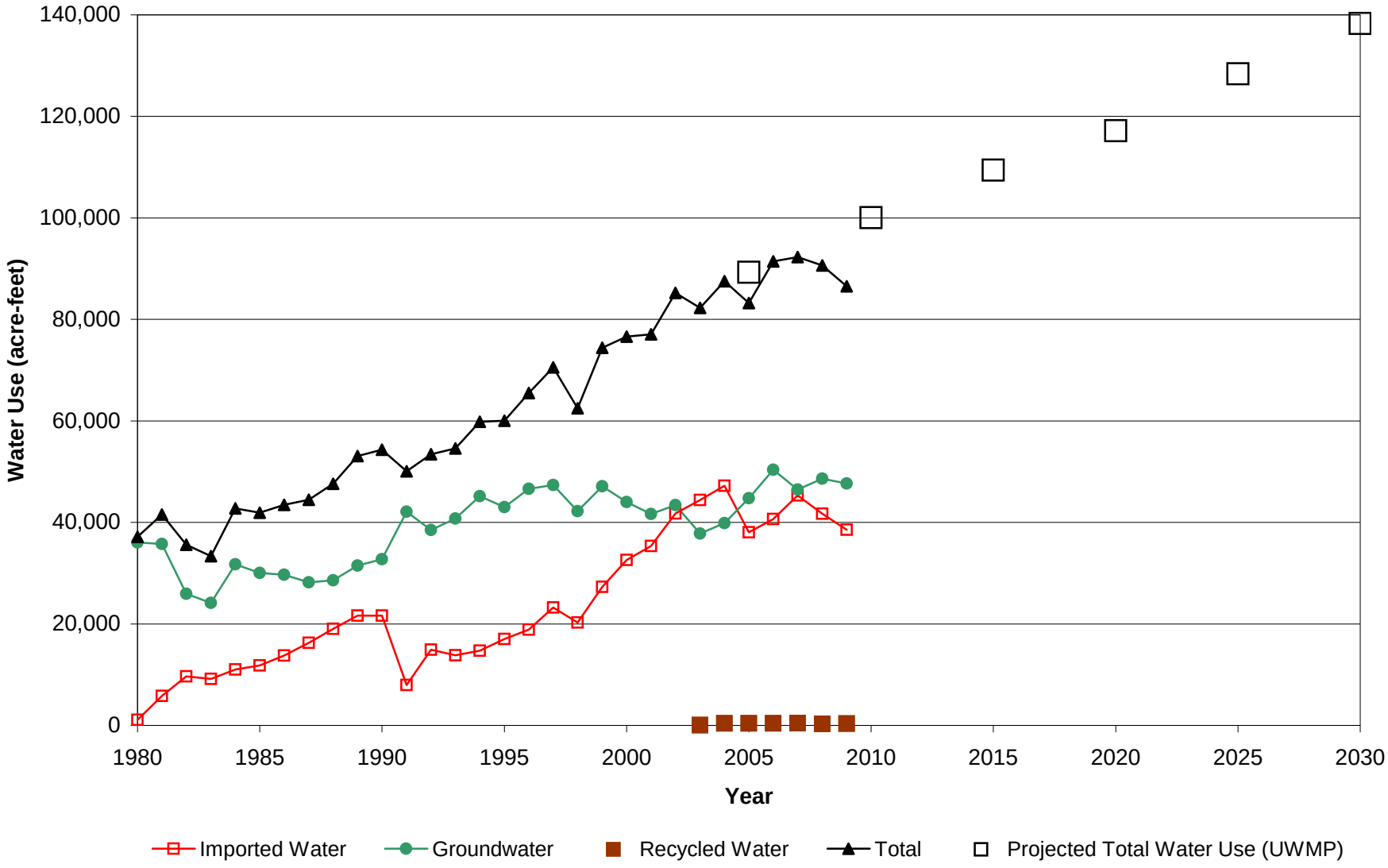


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**Figure 4-1**
**Historical and Projected Water Use**
**Santa Clarita Valley**

# 5. Water Conservation

The California Urban Water Conservation Council (CUWCC) was formed in 1991 through the Memorandum of Understanding (MOU) Regarding Urban Water Conservation in California. The urban water conservation Best Management Practices (BMPs) included in the MOU are intended to reduce California's long-term urban water demands. While the BMPs are currently implemented by the MOU signatories on a voluntary basis, they are specified as part of the Demand Management Measures section of the Urban Water Management Planning Act. Water conservation can achieve a number of goals, such as:

- meeting legal mandates
- reducing average annual potable water demands
- reducing sewer flows
- reducing demands during peak seasons
- meeting drought restrictions
- reducing carbon footprint, waste water flows and urban runoff.

CLWA signed the urban MOU in 2001 on behalf of its wholesale service area, and pledged to implement several BMPs at a wholesale support level (listed below). NCWD signed the MOU in 2002 and VWC signed the MOU in 2006, both on behalf of their respective retail service areas. As separate MOU signatories and in their respective roles as retailers, NCWD and VWC are committed to implementing all BMPs that are feasible and applicable in their service areas. Efforts are made to coordinate with CLWA and the other Purveyors wherever possible to maximize efficiency and ensure the cost effectiveness of NCWD's and VWC's conservation program.

In coordination with the Purveyors, CLWA has been implementing the following BMPs (which pertain to wholesalers) for several years (some prior to signing the MOU in 2001):

| | |
|---|---|
| BMP 3 | System Water Audits, Leak Detection and Repair |
| BMP 7 | Public Information Programs |
| BMP 8 | School Education Programs |
| BMP 10 | Wholesale Agency Programs |
| BMP 12 | Water Conservation Coordinator |

CLWA and the Purveyors have been implementing these BMPs valley-wide. Since 2001,

CLWA has also instituted implementation of BMP 2 (Residential Plumbing Retrofits) and BMP 14 (Residential Ultra Low Flush Toilet (ULFT) and High Efficiency Toilet (HET) Replacement Programs) on behalf of the Purveyors.

In addition to these efforts, in September 2006 CLWA installed a weather station at its headquarters adjacent to the Rio Vista Water Treatment Plant. This station became part a network of over 120 automated weather stations in the state of California that make up the California Irrigation Management Information System (CIMIS). The Department of Water Resources (DWR) manages the system which has a primary purpose of making available to the public, free of charge, information useful in estimating crop water use for irrigation scheduling.

NCWD, SCWD and VWC have initiated implementation of the remaining BMPs that are specific to retail water suppliers:

| | |
|---|---|
| BMP 1 | Water survey programs for single-family residential and multi-family residential customers |
| BMP 2 | Residential plumbing retrofits (including Weather Based Irrigation Controllers) |
| BMP 3 | System water audits, leak detection and repair |
| BMP 4 | Metering with commodity rates for all new connections and retrofit of existing connections |
| BMP 5 | Large landscape conservation programs and incentives |
| BMP 6 | High-efficiency clothes washing machine financial incentive programs |
| BMP 7 | Public Information Programs |
| BMP 8 | School Education Programs |
| BMP 9 | Conservation programs for commercial, industrial, and institutional (CII) accounts |
| BMP 11 | Conservation pricing |
| BMP 12 | Conservation coordinator |
| BMP 13 | Water waste prohibition |
| BMP 14 | Residential High Efficiency Toilet (HET) Replacement Program |

Reports to the CUWCC on BMP implementation by CLWA and the Purveyors were included in the 2005 UWMP and have been reported annually to the CUWCC since 2007.

Additional savings are occurring Valley-wide due to state interior plumbing code requirements that have been in effect since 1992, as well as due to changes in lot size and reduction in exterior square footage of new housing and commercial developments. The City of Santa Clarita and

County of Los Angeles have also taken a more active conservation role and have begun implementing water efficient devices and practices on the properties they own and manage. All of these efforts have begun to impact overall demand in the Valley, as can be seen in the significant decline in total water demand over the last two years and extending into early 2010. The Valley's water suppliers continue to monitor water demand trends through time to assess those factors that are accounting for the reduction, and to attempt to quantify them.

Most recently with regard to water conservation, CLWA and the retail water Purveyors entered into an MOU in 2007 to prepare a Santa Clarita Valley Water Use Efficiency Strategic Plan (the Plan). The purpose of the plan is to prepare a comprehensive long-term conservation plan for the Santa Clarita Valley by adopting objectives, policies and programs designed to promote proven and cost effective conservation practices. The Plan provides a detailed study of existing residential and commercial water use and recommends programs designed to reduce the overall Valley-Wide water demand by 10 percent by 2030. The programs are designed to provide Valley residents with the tools and education to use water more efficiently. The six programs identified in the Plan are:

- High Efficiency Toilet Rebate Program
- CII Audits & Customized Incentive Program
- Large Landscape Audits & Customized Incentive Program
- Landscape Contractor Certification and Weather Based Irrigation Controller Program
- High Efficiency Washer Rebate Program
- Public Information and Education Programs

In addition to the six programs designed for existing customers, the Plan also identifies three other key factors that will help reduce the valley's overall water demand; passive conservation, inflation, and new more water-efficient building ordinances.

Finally, the Plan includes an Appendix with more aggressive water use efficiency measures designed to meet a potential 20 percent reduction in water use by 2020. This includes funding more active conservation programs, retrofit on resale legislation, water rate reform, water budget based rates, and a more aggressive recycled water program.

Implementation of the majority of the programs identified in the Plan are beginning in 2010 through funding by CLWA on behalf of all the Purveyors.

In addition to this effort, the water Purveyors are working with City and County agencies to develop a landscape irrigation ordinance for the Santa Clarita Valley. This ordinance will focus primarily on new construction aimed at reducing overall water demands by requiring efficient landscape design and delivery systems. Implementation of the ordinance is expected in 2010, depending on review and adoption by the City and County.

Finally, in 2008, Governor Schwarzenegger issued a proclamation for all Californians to reduce their per capita water consumption by 20 percent by the year 2020. In November 2009, the Governor and California's legislature reached an historic agreement over ensuring long term water supply reliability for California, as well as restoring and protecting the Sacramento-San Joaquin Delta and other ecologically sensitive areas. The agreement is comprised of four policy bills and an $11.4 billion bond measure. One of the policy bills (SB 7X7) identifies reporting criteria and guidelines for water utilities to track and measure progress toward achieving the 20 percent per capita demand reduction goal. Water utilities are required to implement strategies and report progress in their Urban Water Management Plans. In 2010, DWR is expected to provide guidance and criteria for implementing the provisions of this new law; that guidance is expected to provide clarification regarding individual (per-capita) and broader (Valley-wide) conservation goals, which will be utilized in the preparation of the 2010 update of the UWMP for the Santa Clarita Valley.

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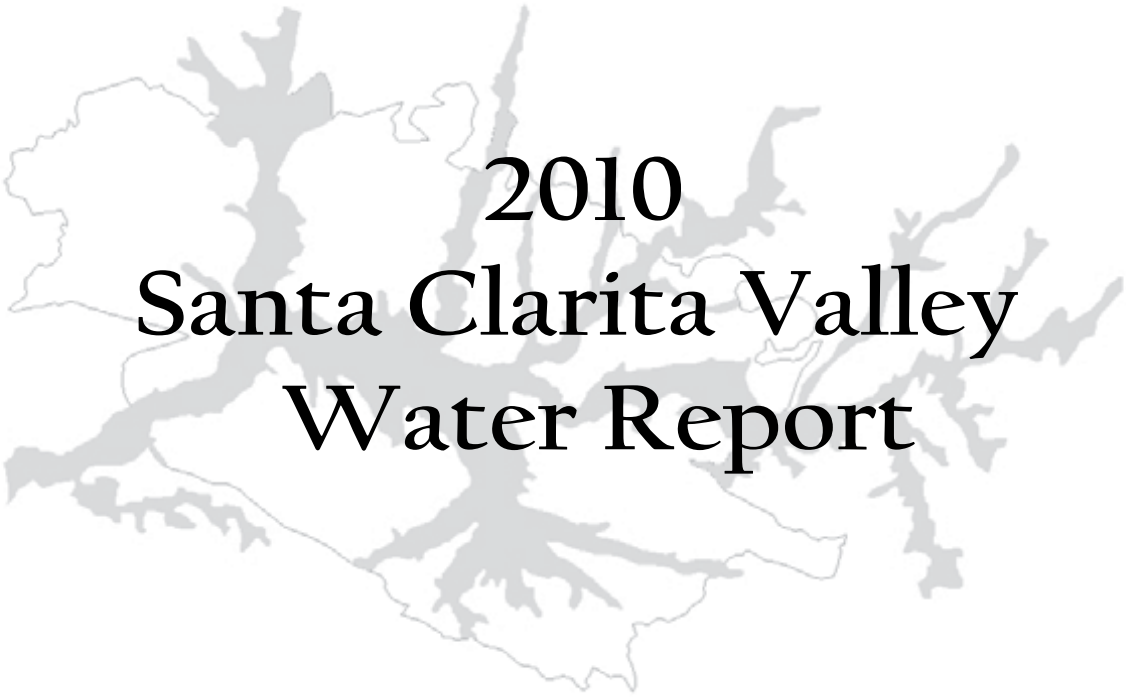
# 2010
# Santa Clarita Valley
# Water Report



Castaic Lake Water Agency (CLWA)
CLWA Santa Clarita Water Division
Los Angeles County Waterworks District 36
Newhall County Water District
Valencia Water Company

June 2011

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CONSULTING ENGINEERS

# 2010 Santa Clarita Valley Water Report

*prepared for:*

Castaic Lake Water Agency (CLWA)
CLWA Santa Clarita Water Division
Los Angeles County Waterworks District 36
Newhall County Water District
Valencia Water Company

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CONSULTING ENGINEERS

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# Executive Summary

This annual report, which is the thirteenth in a series that began to describe water supply conditions in 1998, provides current information about the water requirements and water supplies of the Santa Clarita Valley. The report was prepared for the imported water wholesaler, Castaic Lake Water Agency (CLWA), and for the four local retail water Purveyors that serve the Valley: CLWA Santa Clarita Water Division, Los Angeles County Waterworks District 36, Newhall County Water District, and Valencia Water Company. These entities and representatives from the City of Santa Clarita and the County of Los Angeles Department of Regional Planning meet as required as the Santa Clarita Valley Water Committee to coordinate the management of imported water with local groundwater and recycled water to meet water requirements in the Valley.

This report provides information about local groundwater resources, State Water Project (SWP) and other imported water supplies, water conservation, and recycled water. The report reviews the sufficiency and reliability of supplies in the context of existing water demand, with focus on actual conditions in 2010, and it provides a short-term outlook of water supply and demand for 2011.

## ES.1 2010 Water Requirements and Supplies

In 2010, total water requirements in the Santa Clarita Valley were about 80,200 acre-feet (af), of which about 64,100 af (80 percent) were for municipal use and the remainder (16,100 af) was for agricultural and other (miscellaneous) uses, including individual domestic uses. Total demand in 2010 was about 7.4 percent lower than in 2009, less than what was estimated in the 2009 Water Report, and water requirements in 2010 were also lower than the average projection in the 2005 Urban Water Management Plan (UWMP) (but closer to the projection in the 2005 UWMP with conservation). The majority of decreased water demand is attributable to a significant (8%) decrease in municipal water use from 2009. Total water requirements in 2010 were met by a combination of about 49,300 af from local groundwater resources (about 33,200 af for municipal and about 16,100 af for agricultural and other uses), about 30,600 af of SWP and other imported water, and about 300 af of recycled water.

Of the 49,300 af of total groundwater pumping in the Valley in 2010, about 41,200 af were pumped from the Alluvium and about 8,100 af were pumped from the underlying, deeper Saugus Formation. Alluvial pumping represented about a 1,200 af increase from 2009, and Saugus pumping was slightly higher than in 2009, by about 400 af. Neither pumping volume resulted in

any notable overall change in groundwater conditions (water levels, water quality, etc.) in either aquifer system. Imported water deliveries to the Purveyors decreased by about 8,000 af from the previous year. Water uses and supplies in 2010 are summarized in the following Table ES-1.

**Table ES-1**
**Santa Clarita Valley**
**Summary of 2010 Water Supplies and Uses**
**(acre-feet)**

| | | |
|---|---|---|
| ***Municipal*** | | |
| SWP and other Imported | | 30,578 |
| Groundwater (Total) | | 33,152 |
| *Alluvium* | *25,984* | |
| *Saugus* | *7,168* | |
| Recycled Water | | 336 |
| **Subtotal** | | **64,066** |
| ***Agriculture/Miscellaneous*** | | |
| SWP and other Imported | | - |
| Groundwater (Total) | | 16,099 |
| *Alluvium* | *15,175* | |
| *Saugus* | *924* | |
| **Subtotal** | | **16,099** |
| ***Total*** | | ***80,165*** |

In accordance with the California Urban Water Management Planning Act, the Valley-wide UWMP was updated and recently adopted to extend projected water demands through 2050, and to describe the combination of local groundwater, imported water supplies from the State Water Project and other sources, local recycled water supplies, and other water supplies planned to meet those projected water demands in the Valley. The 2010 UWMP describes the reliability of local groundwater resources and the adequacy of groundwater supplies to meet groundwater demand. The 2010 UWMP also describes the recently completed work for integrated control of perchlorate migration and restoration of perchlorate-impacted groundwater supply.

Notable details about each component of water supply in the Valley, and about the water supply outlook for 2011, include the following.

## ES.2 Alluvial Aquifer

Based on an updated evaluation of groundwater basin yield, completed in 2009, the groundwater operating plan in the 2010 UWMP includes Alluvial pumping in the range of 30,000 to 40,000 acre-feet per year (afy) following average/normal years, and slightly reduced pumping (30,000 to 35,000 afy) following dry years. Pumping from the Alluvium in 2010 was 41,200 af, which is slightly above the upper end of the operating plan range for the Alluvium but had no adverse effects on groundwater levels and storage in the basin. On average, pumping from the Alluvium has been about 32,600 afy since supplemental imported water became available in 1980. That average rate remains near the lower end of the range of operational yield.

On a long-term basis, continuing through 2010, there is no evidence of any historic or recent trend toward permanent water level or storage decline. In general, throughout a large part of the basin, Alluvial groundwater levels have generally remained near historic highs during the last 30 years. Above-average precipitation in late 2004 and 2005 resulted in significant water level recovery in the eastern part of the basin, and through the recent multi-year dry period (2006-2009), water level declines have leveled off and remained within their historic range, continuing the overall trend of fluctuating groundwater levels within a generally constant range over the last 30 years. These ongoing data indicate that the Alluvium remains in good operating condition and can continue to support pumping in the operating range included in the 2010 UWMP, or slightly higher, without adverse results (e.g., long-term water level decline or degradation of groundwater quality.)

Based on an integration of water quality records from multiple wells completed in the Alluvium, there have been historical fluctuations in groundwater quality, typically associated with variations in precipitation and streamflow. However, like groundwater levels, there has been no long-term trend toward groundwater quality degradation; groundwater produced from the Alluvial aquifer remains a viable municipal and agricultural water supply.

In 2002, as part of ongoing monitoring of wells for perchlorate contamination, perchlorate was detected in one Alluvial well (the SCWD Stadium Well) located near the former Whittaker-Bermite facility. The detected concentration was slightly below the then-applicable Notification Level for perchlorate (6 µg/l, which was subsequently established as the Maximum Contaminant Level for perchlorate in October 2007), and the well has now been replaced to restore that component of municipal water supply that was impacted by perchlorate. In early 2005, perchlorate was detected in a second Alluvial well, VWC's Well Q2. After an interim period of wellhead treatment, that well has now been returned to regular water supply service. All other

Alluvial wells operated by the Purveyors continue to be used for municipal water supply service; those wells near the Whittaker-Bermite property are sampled in accordance with drinking water regulations and perchlorate has not been detected. The 2005 UWMP specifically addressed the adequacy of groundwater supply in light of the inactivation of the impacted Alluvial wells; and it addressed the plan and schedule for restoration of perchlorate-impacted wells, including the protection of existing non-impacted wells. As summarized in the 2010 UWMP, the replacement and reactivation of the formerly impacted wells now adds to the overall ability to meet the groundwater component of total water supply in the Valley.

The ongoing characterization and plan for control and cleanup of perchlorate in the Valley has focused on the Saugus Formation. In addition, however, on-site cleanup and control activities that began in 2006, and continued through 2010, include continuation of soil cleanup on the Whittaker-Bermite site, and continuation of pumping and treatment in the Northern Alluvium on the Whittaker-Bermite site. Expanded pumping and treatment, intended to effect perchlorate containment in the Northern Alluvium, became operational in October 2007. Under the direction of the State Department of Toxic Substances Control (DTSC), Whittaker has submitted a comprehensive site-wide remediation plan for the contaminants of concern in soil and groundwater detected on the site. A Draft Remedial Action Plan for Operable Units 2 through 6, focused on soil remediation, was submitted to DTSC in 2009. In January, 2011, Whittaker also completed a Draft Feasibility Study for Operable Unit 7 to identify and select treatment technologies for both on-site and off-site groundwater. DTSC approved the Remedial Action Plan for contaminated soils in Operable Units 2 through 6 on December 6, 2010 and Preparation of the Remedial Design documents is underway. Field implementation of the soil remediation is expected to begin in fall 2011.

## ES.3 Saugus Formation

The groundwater operating plan in the 2010 UWMP includes pumping from the Saugus in the range of 7,500 to 15,000 afy in average/normal years; it also includes planned dry-year pumping from the Saugus of 21,000 to 35,000 afy for one to three consecutive dry years. As with the operation plan for the Alluvium, the ranges of Saugus pumping are based on the updated evaluation of groundwater basin yield, completed in 2009, which found those ranges of pumping to be sustainable on a long-term basis.

Pumping from the Saugus Formation was about 8,100 af in 2010; on average, Saugus pumping has been slightly more than 6,800 afy since 1980. Both rates remain near the lower end of the ranges included in the groundwater operating plans and in the UWMP. As a result of long-term

relatively low pumping from the Saugus Formation, groundwater levels in that aquifer have remained generally constant to slightly increasing over the last 40 to 45 years; those trends continued in 2010.

In 1997, ammonium perchlorate was discovered in four wells (Saugus 1, Saugus 2, V157, and NC-11) completed in the Saugus Formation in the vicinity of the former Whittaker-Bermite facility located generally toward the east, on the south side of the basin. In 2006, a very low level of perchlorate was detected in another Saugus municipal well (NC-13). And in 2010, it was detected further downgradient in a sixth Saugus well (V201). To date, one of the impacted wells has been destroyed and replaced, three have remained in or been returned to service with treatment as required, one remains out of service with its capacity replaced by an alternate source, and the most recently impacted well remains out of service with plans in development for restoration or replacement. As part of regular operation, those wells that remain in service are sampled in accordance with drinking water regulations. At these wells, perchlorate has either not been detected or wellhead treatment is in place for the removal of perchlorate. All other Saugus wells owned and operated by the Purveyors remain available for municipal water supply service.

Work toward the ultimate remediation of perchlorate contamination, including the restoration of impacted groundwater supply continued to progress in 2010, with focus on construction of facilities to implement a jointly developed plan to "pump and treat" contaminated water from two of the originally impacted wells to stop migration of the contaminant plume, and to deliver treated water for municipal supply to partially replace impacted well capacity. Environmental review of the project was completed with adoption of a Mitigated Negative Declaration in September 2005. The Final Interim Remedial Action Plan was completed and approved by DTSC in January 2006. Construction of facilities and pipelines necessary to implement the pump and treat program and to also restore inactivated well capacity began in November 2007. Construction was completed in May, 2010, DPH issued an amendment to CLWA's Operating Permit in December, 2010, and two of the originally impacted Saugus wells (Saugus 1 and 2) were placed back in service in January, 2011. Through this reactivation, Castaic Lake Water Agency's Saugus Perchlorate Treatment Facility (SPTF) is now online and numerous monitoring tests are performed each week in order to ensure the safety of the water leaving the plant. The Purveyors continue to have sufficient pumping capacity to meet the planned normal range of Saugus pumping as described in the 2010 UWMP.

## ES.4 Imported Water

Historically comprised of only its SWP Table A Amount, CLWA's imported water supplies now consist of a combination of SWP water and water acquired from the Buena Vista Water Storage District in Kern County. CLWA's contractual Table A Amount is 95,200 af of water from the SWP. Under the 2007 Water Acquisition Agreement with the Buena Vista Water Storage District (Buena Vista) and the Rosedale-Rio Bravo Water Storage District (Rosedale-Rio Bravo), Buena Vista's high flow Kern River entitlements (and other acquired waters that may become available) are captured and recharged within the Rosedale-Rio Bravo's service area on an ongoing basis. CLWA will receive 11,000 af of these supplies annually through either exchange of Buena Vista's and Rosedale-Rio Bravo's SWP supplies or through direct delivery of water to the California Aqueduct via the Cross Valley Canal.

CLWA's final allocation of SWP water for 2010 was 50 percent of its Table A Amount, or 47,600 af. The total available imported water supply in 2010 was 90,498 af, comprised of the 47,600 af of Table A supply, 11,000 af purchased from Buena Vista/Rosedale Rio Bravo, 28,303 af of 2008 and 2009 carryover delivered in 2010, 3,300 af delivered from the Semitropic Water Banking and Exchange Program, and 295 af from the 2010 SWP Turnback Pool. CLWA deliveries to the Purveyors were 30,578 af. Following disposition of available water supplies in 2010, carryover of 3,712 af from 2010 is available for 2011 water supply. Water banking in 2010 included 32,256 af of water delivered to the Rosedale-Rio Bravo Water Banking and Exchange Program.

CLWA has two groundwater banking agreements with the Semitropic Water Storage District in Kern County. In accordance with those amended agreements, over a twenty-year period (until 2022/2023), CLWA could withdraw up to 50,870 af of its Table A water that was stored in 2002 and 2003 to meet future Valley demands when needed. Following the withdrawal of 4,950 af in 2009 (1,650 af utilized in 2009 and 3,300 af utilized in 2010), that balance is 45,920 af. In addition to the banking in Semitropic, CLWA finalized an agreement with the Rosedale-Rio Bravo Water Storage District in 2005 and can now bank up to 100,000 afy of surplus Table A Amount in that District's Water Banking and Exchange Program. In addition to 20,000 af previously banked in both 2005 and 2006, CLWA banked 8,200 af of water in 2007, and 32,256 af of water in 2010. In accordance with the provisions of that agreement, CLWA can withdraw up to a total of 72,513 af of that water, at a rate up to 20,000 afy, to meet Valley water demands when needed. Additionally, as part of the Buena Vista Water Acquisition Agreement, CLWA is entitled to 22,000 af of water that was stored in the Rosedale Rio-Bravo Water Banking and Exchange Program in 2005 and 2006 on CLWA's behalf. As of 2011, CLWA maintains a

recoverable total of 94,500 af in the Rosedale Rio-Bravo Water Banking and Exchange Program.

Since SWP water deliveries are subject to reduction when dry conditions occur in Northern California, the 2010 UWMP includes programs, like the Semitropic and Rosedale-Rio Bravo programs, for enhancing water supply reliability during such occurrences. A capital improvement program funded by CLWA has been established to provide facilities and additional water supplies needed to firm up SWP water supplies during times of drought.

## ES.5 Recycled Water

Recycled water service was initiated in July 2003 in accordance with CLWA's Draft Reclaimed Water System Master Plan (2002). The amount of recycled water used for irrigation purposes, at a golf course and in roadway median strips, was approximately 336 af in 2010. CLWA and the Purveyors completed programmatic CEQA analysis in early 2007 for full implementation of the recycled water system as outlined in the Master Plan. CLWA and the Purveyors are preparing the design of the second phase of the Recycled Water Master Plan (Phase IIA) that will take water from the Saugus Water Reclamation plant and distribute it to identified users to the north, across the Santa Clara River and then to the west and the east, which will include service to Santa Clarita Central Park. Another new phase of the recycled water system (Phase IIC) is in design to extend the system southward from the intersection of Valencia Boulevard and the Old Road, south along Rockwell Canyon Road to the intersection of Orchard Village Road and Lyons Avenue, serving large irrigation customers along its proposed alignment. Collectively, these phases will have design capacity to increase recycled water deliveries by about 1,500 afy.

## ES.6 2011 Water Supply Outlook

In 2011, total water demands are expected to be about 82,000 af, slightly more than actual water use last year, and consistent with the water demand projections in the 2010 UWMP. It is expected that water demands in 2011 will continue to be met with a generally similar mix of water supplies comprised of local groundwater, supplemental SWP and other imported water, and recycled water.

Announced on April 20, 2011, the latest allocation of water from the SWP in 2011 is 80 percent of CLWA's Table A Amount, or 76,160 af. Combined with local groundwater from the two aquifer systems (50,000 af), total Flexible Storage Account (6,060 af), net carryover of SWP Table A allocation from 2010 used in 2011 (3,712 af), annual acquisition through the Buena Vista Water/Rosedale Rio-Bravo Water Acquisition Agreement (11,000 af), and recycled water

(500 af), the total available water supplies for 2011 are nearly 150,000 af. As a result, CLWA and the Purveyors anticipate having more than adequate supplies to meet all water demands in 2011.

In August, 2007, a federal court ruled that certain operational changes were required of the SWP in order to protect the endangered Delta smelt. The court order resulted in the preparation of a new Biological Opinion (BO) requiring DWR to implement mitigation requirements with resultant impacts on SWP water supply reliability. The current SWP Delivery Reliability Report 2009, finalized in August, 2010, incorporates restrictions on SWP operations according to the Biological Opinions of the U.S. Fish and Wildlife Service and the National Marine Fishery Service issued on December 15, 2008 and June 4, 2009, respectively. However, in December 2010, a federal judge overruled most of the 2008 federal biological opinion and invalidated several of the criteria that reduced SWP's water supply. The effects of this reversal are still not completely known, but will probably result in some relief from SWP pumping restrictions in the long term. The current SWP Delivery Reliability Report 2009 also considers the impacts on SWP delivery reliability due to climate change, sea level rise, and vulnerability of the Delta's conveyance system and structure due to floods and earthquakes. With these factors, the Reliability Report projects long-term reliability of 60 percent during normal year hydrology. CLWA staff has assessed the impact of the current Reliability Report on the CLWA reliability analysis contained in the Agency's 2005 UWMP and concluded in the 2010 UWMP that current and anticipated supplies are available to meet anticipated water supply needs through the year 2050.

CLWA, the retail water Purveyors, Los Angeles County and the City of Santa Clarita have formed the Santa Clarita Valley Water Committee. The specific purpose of the Committee is to work collaboratively to ensure the progressive implementation of water use efficiency programs and manage the conjunctive use of the water supplies in the Santa Clarita Valley. In terms of short-term water supply availability, the Committee has determined that, while current operational changes of the SWP are in effect, there are sufficient supplemental water supplies, including SWP water, to augment local groundwater and other water supplies such that overall water supplies will be sufficient to meet projected 2011 water requirements as reflected herein.

In any given year, SWP supplies may be reduced due to dry weather conditions or regulatory factors. During such an occurrence, the remaining water demands are planned to be met by a combination of alternate supplies such as returning water from CLWA's accounts in the Semitropic Groundwater Storage Program and the Rosedale-Rio Bravo Water Banking and Exchange Program, deliveries from CLWA's flexible storage account in Castaic Lake Reservoir,

local groundwater pumping, short-term water exchanges, and participation in DWR dry-year water purchase programs. Following the recovery of 4,950 af (with delivery of 1,650 af in 2009 and delivery of 3,300 in 2010), the banked excess 2002 and 2003 SWP Table A water in Semitropic represents nearly 46,000 af of recoverable water for drought water supply. In addition, the banked excess SWP Table A water in 2005 and 2006, augmented by banked water acquired through the Buena Vista/Rosedale-Rio Bravo Water Acquisition Agreement in 2005, 2006, 2007 and 2010, represent a total of more than 94,500 af of recoverable water for drought water supply from the Rosedale-Rio Bravo Banking and Exchange Program.

Drought periods may affect available water supplies in any single year and for a duration usually not longer than three consecutive years. It is important to note that hydrologic conditions vary from region to region throughout the state. Dry conditions in Northern California affecting SWP supply may not affect local groundwater and other supplies in Southern California, and the reverse situation can also occur (as it did in 2002 and 2003). For this reason, CLWA and the Purveyors have emphasized developing a water supply portfolio that is diverse, especially in dry years. Diversity of supply is considered a key element of reliability, giving Valley water Purveyors the ability to draw on multiple sources of supply to ensure reliable service during dry years, as well as during normal and wet years.

# 1. Introduction

## 1.1 Background

For most residents of the Santa Clarita Valley (Valley), domestic water service is provided by four retail water Purveyors: Castaic Lake Water Agency's Santa Clarita Water Division (SCWD), Los Angeles County Waterworks District 36 (LAWWD36), Newhall County Water District (NCWD), and Valencia Water Company (VWC). Together, the Purveyors provide water to about 70,000 service connections. As a State Water Contractor, Castaic Lake Water Agency (CLWA) contracts for State Water Project water delivered from Castaic Lake, after which it is treated, filtered, and disinfected at two CLWA treatment plants before distribution to the Purveyors. Staff of these entities meet regularly to coordinate the supply of water in the Valley. Their respective service areas are shown in Figure 1-1.

While municipal water supply has grown to become the largest category of water use in the Valley, there remains an agricultural and other small private water demand that is dependent on local groundwater for its water supply. Accordingly, ongoing agricultural water requirements and the use of local groundwater to meet those requirements are considered in analyses of water requirements and supplies as reported herein. Also, in addition to municipal and agricultural water uses in the Valley, water supply for a small fraction of Valley residents is provided by individual private water supply wells. The locations, construction details, annual pumping and other information about these private wells are not currently available. In the absence of detailed information about private wells and associated water use, pumping as reported herein necessarily includes an estimate of groundwater pumped from private wells; it is intended that this estimate will be refined in the future as more information about the private wells is obtained.

For more than 25 years, CLWA and the Purveyors have reviewed and reported on the availability of water supplies to meet all water requirements in the Valley. Those reports have also addressed local water resources, most notably groundwater, in the region. Past studies have assessed the condition of local groundwater aquifers, their hydrogeologic characteristics, aquifer storage capacity, operational yield and recharge rate, groundwater quality and contamination, and the ongoing conjunctive use of groundwater and imported water resources.

Other efforts have included developing drought contingency plans, coordinating emergency response procedures and implementing Valley-wide conservation programs. In 1985, the Purveyors prepared the area's first Urban Water Management Plan (UWMP.) Information in the

plan was coordinated among CLWA and the Purveyors to provide accurate, comprehensive and consistent water supply and demand information for long term planning purposes. In accordance with the California Urban Water Management Planning Act, the Valley-wide UWMP has been updated to extend water demand projections through 2050, and to describe the combination of local groundwater, imported water supplies from the State Water Project, local recycled water supplies, and planned other water supplies to meet the existing and projected water demands in the Valley. The 2010 UWMP describes the reliability of local groundwater resources and the adequacy of groundwater supplies to meet that component of overall water supply; and it also describes the mitigation of perchlorate contamination which had impacted several municipal water supply wells, and the implementation of integrated control of perchlorate migration and full restoration of perchlorate-impacted groundwater supply.

In 2009, primarily in preparation for the update of the UWMP in 2010, an updated analysis of groundwater basin yield was completed to guide the ongoing use of groundwater and the associated distribution of pumping to maintain groundwater use at a sustainable rate while also addressing localized issues such as restoration of groundwater contamination which has impacted local groundwater supplies since 1987. The results of the updated groundwater basin analysis are summarized in this Water Report.

## 1.2 Purpose and Scope of the Report

The purpose of this report, which is the thirteenth in a series of annual water reports that began to describe water supply conditions in 1998, is to provide current information about water requirements and available water supplies to meet those demands in the Santa Clarita Valley. CLWA and the Purveyors began preparation of this series of reports in response to a request made by the Los Angeles County Board of Supervisors in 1998. Over the last few years, this series of reports has also served as an annual summary of groundwater conditions in the Valley in fulfillment of the commitment in the Santa Clarita Valley Groundwater Management Plan, adopted in 2003, to regularly report on implementation of that Plan.

This report was prepared for Castaic Lake Water Agency, for CLWA's Santa Clarita Water Division, and for Los Angeles County Waterworks District 36, Newhall County Water District, and Valencia Water Company. It continues a format for providing information regarding water uses and the availability of water supplies on an annual basis. It is intended to be a helpful resource for use by water planners and local land use planning agencies. This report is complemented by the more detailed Urban Water Management Plan for the area, which provides

longer-term water supply planning over a 40-year period, and by a number of other technical reports, some of which are specifically referenced herein.

## 1.3 Santa Clarita Valley Water Purveyors

As introduced above, four retail water Purveyors provide water service to most residents of the Santa Clarita Valley. Brief summary descriptions of those four Purveyors are as follows.

**Castaic Lake Water Agency Santa Clarita Water Division** has a service area that includes a portion of the City of Santa Clarita and unincorporated portions of Los Angeles County in the communities of Saugus, Canyon Country, and Newhall. Water is supplied from both groundwater and CLWA turnouts to about 28,900 service connections.

**Los Angeles County Waterworks District 36** has a service area that encompasses approximately 7,635 acres in the Hasley Canyon area and the unincorporated community of Val Verde. LAWWD 36 has nearly 1,400 service connections. The District has traditionally obtained its full water supply from a connection to the CLWA's Castaic Conduit and continued to do so in 2010.

**Newhall County Water District's** service area includes portions of the City of Santa Clarita and unincorporated portions of Los Angeles County in the communities of Newhall, Canyon Country, Valencia, and Castaic. NCWD supplies water from both groundwater and CLWA turnouts to more than 9,600 service connections.

**Valencia Water Company's** service area serves nearly 30,100 service connections in a portion of the City of Santa Clarita and in the unincorporated communities of Castaic, Newhall, Saugus, Stevenson Ranch, and Valencia. VWC supplies water from both groundwater and CLWA turnouts; VWC also delivers recycled water for a small amount of non-potable use.

## 1.4 The Upper Santa Clara River Hydrologic Area and East Groundwater Subbasin

The Upper Santa Clara River Hydrologic Area (HA), as defined by the California Department of Water Resources (DWR), is located almost entirely in northwestern Los Angeles County. The area encompasses about 654 square miles comprised of flat valley land (about 6 percent of the total area) and hills and mountains (about 94 percent of the total area) that border the valley area. The mountains include the Santa Susana and San Gabriel Mountains to the south, and the Sierra

Pelona and Leibre-Sawmill Mountains to the north. Elevations range from about 800 feet on the valley floor to about 6,500 feet in the San Gabriel Mountains. The headwaters of the Santa Clara River are at an elevation of about 3,200 feet at the divide separating this hydrologic area from the Mojave Desert.

The Santa Clara River and its tributaries flow intermittently from Lang Station westward about 35 miles to Blue Cut, just west of the Los Angeles-Ventura County line, where the River is the outlet from the Upper Santa Clara River Hydrologic Area. The principal tributaries of the River in the Santa Clarita Valley are Castaic Creek, San Francisquito Creek, Bouquet Creek, and the South Fork of the Santa Clara River. In addition to tributary inflow, the Santa Clara River receives treated wastewater discharge from the Saugus and Valencia Water Reclamation Plants, which are operated by the Santa Clarita Valley Sanitation District.

The Santa Clara River Valley East Groundwater Subbasin, beneath the Santa Clarita Valley in the Upper Santa Clara River HA, is the source of essentially all local groundwater used for water supply in the Santa Clarita Valley. Below Blue Cut, the Santa Clara River continues westward through Ventura County to its mouth near Oxnard. Along that route, the River traverses all or parts of six groundwater basins in Ventura County (Piru, Fillmore, Santa Paula, Oxnard Forebay, Oxnard Plain, and Mound) as shown in Figure 1-2.

There are two primary precipitation gages in the Santa Clarita Valley, the Newhall-Soledad 32c gage and the Newhall County Water District gage (Figure 1-3). The National Climatic Data Center (NCDC) and Los Angeles County Department of Public Works (LADPW) have maintained records for the Newhall-Soledad 32c gage since 1931. Newhall County Water District has maintained records for the NCWD gage since 1979. The cumulative records from these two gages correlate very closely, with the NCWD gage historically recording approximately 25 percent more precipitation than the Newhall-Soledad 32c gage. Recently, since 2006, this relationship has been slightly different, with the NCWD gage recording approximately 40% more precipitation than the Newhall-Soledad 32c gage. The cause of this change may be due to different equipment or practices at one of the gages, and will be investigated further, but the overall offset is likely due to the location of the NCWD gage, which is at the base of the mountains rimming the southern edge of the Santa Clarita Valley.

A third gage was established in December, 2006 near the Rio Vista Treatment Plant near the main Santa Clara River channel and on the north side of the Valley (inset map on Figure 1-3). This gage is managed through the CIMIS program by the Department of Water Resources, under the name #204 Santa Clarita. These data correlate well with the nearby precipitation gages in the

Valley over the period of 2008 into 2010, and they are intended to be incorporated in future monitoring and reporting on the Valley. Comparison of overlapping records indicate that this station records about 30% less precipitation than is measured at Newhall-Soledad, and about half of what is measured at the NCWD gage.

The Santa Clarita Valley is characterized as having an arid climate. Historically, intermittent periods of below-average precipitation have typically been followed by periods of above-average precipitation in a cyclical pattern, with each wetter or drier period typically lasting from one to five years. The longer-term precipitation records for the Newhall-Soledad 32c gage are illustrated in Figure 1-3. Long-term average precipitation at that gage is 17.8 inches (1931-2010). Figure 1-3 also shows the cumulative departure from mean annual precipitation. In general, periods of below-average precipitation have been longer and more moderate than periods of above-average precipitation. Recently, the periods from 1971 to 1976, 1984 to 1991 and 1999 to 2003 have been drier than average; the periods from 1977 to 1983, 1992 to 1996, and 2004 to 2005 have been wetter than average. More recently, with the exception of the average annual rainfall total in 2008, the dry conditions that began in 2006, persisted through 2009. 2010 was an above average year (125% of normal) with 24.3 inches of precipitation. It is notable, that almost half of that amount came in the last quarter of the year, with 8.6 inches in December. Despite the overall drier-than-average conditions, water demand in 2007 through 2010 was below that projected in the 2005 UWMP, and actual demand in 2010 was below the short-term projection in the 2009 Water Report. Early year precipitation in 2011 was approximately 11.6 inches through March, or close to long-term average for that part of the year, but water use was slightly higher than last year for the same period. Combined with other water supply considerations, discussed in Chapter 4, those conditions are expected to result in 2011 water requirements being slightly higher than water use in 2010.

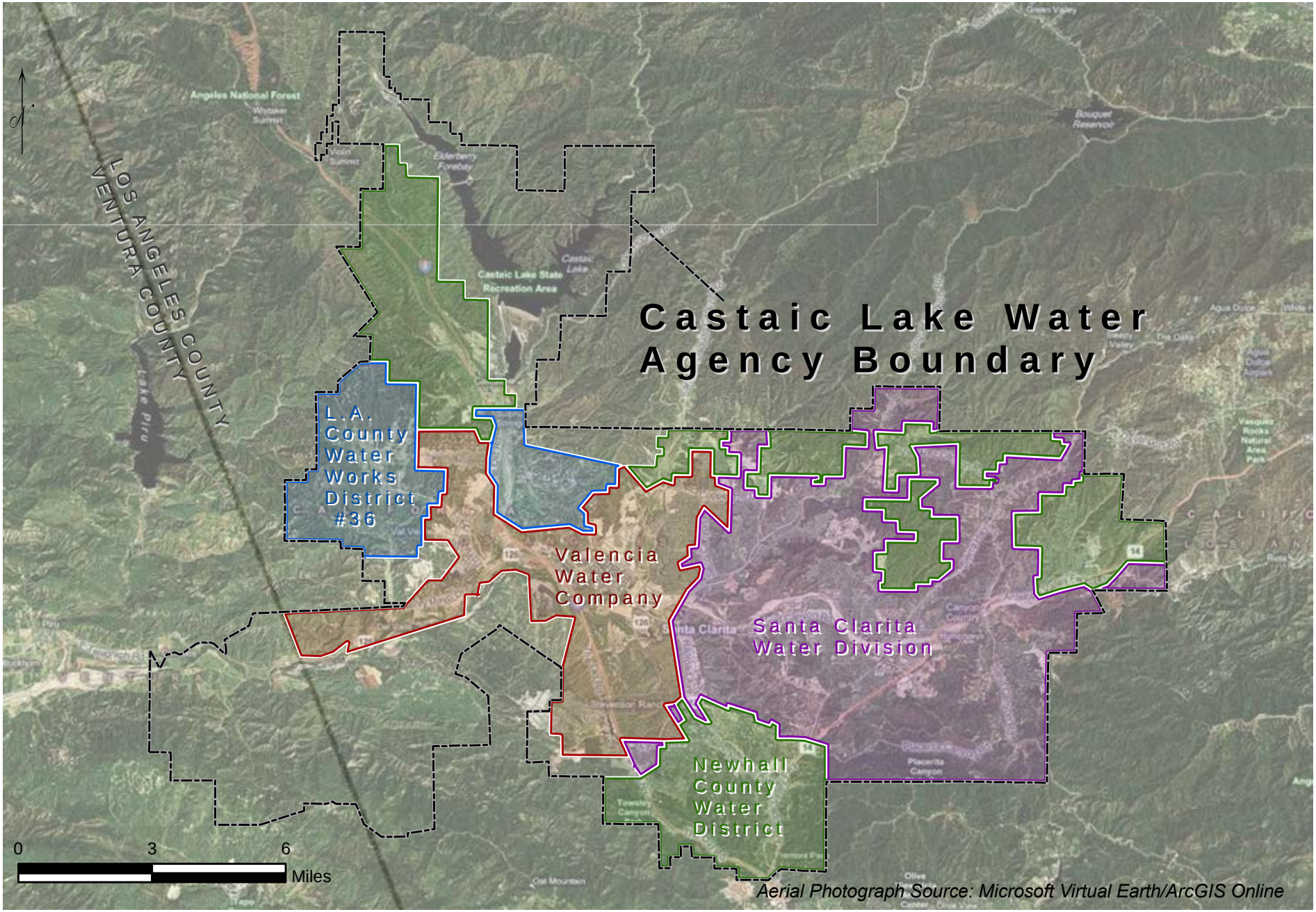


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**Figure 1-1**
**CLWA and Purveyor Service Areas**

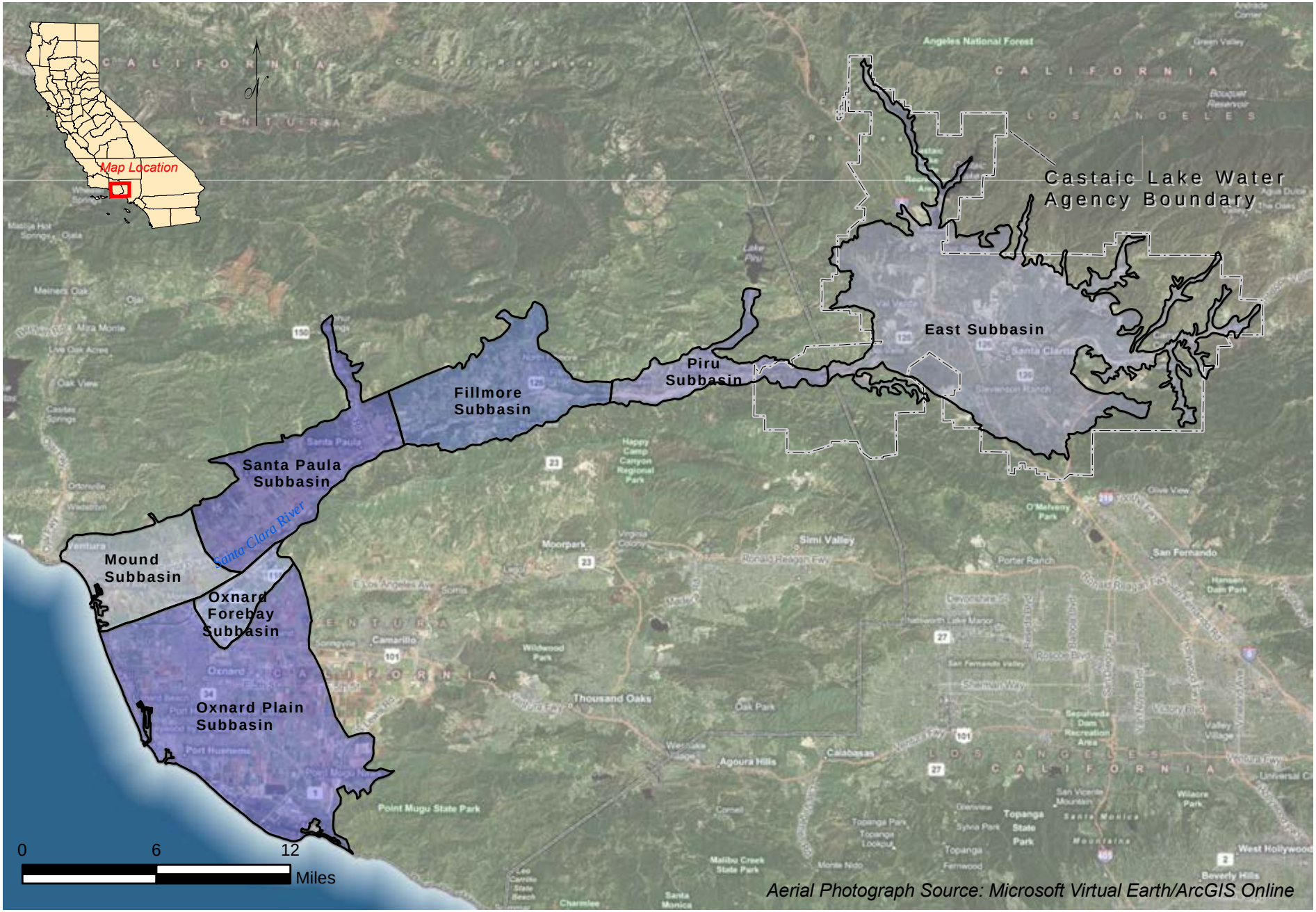


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**Figure 1-2**
**Santa Clara River Groundwater Subbasins**

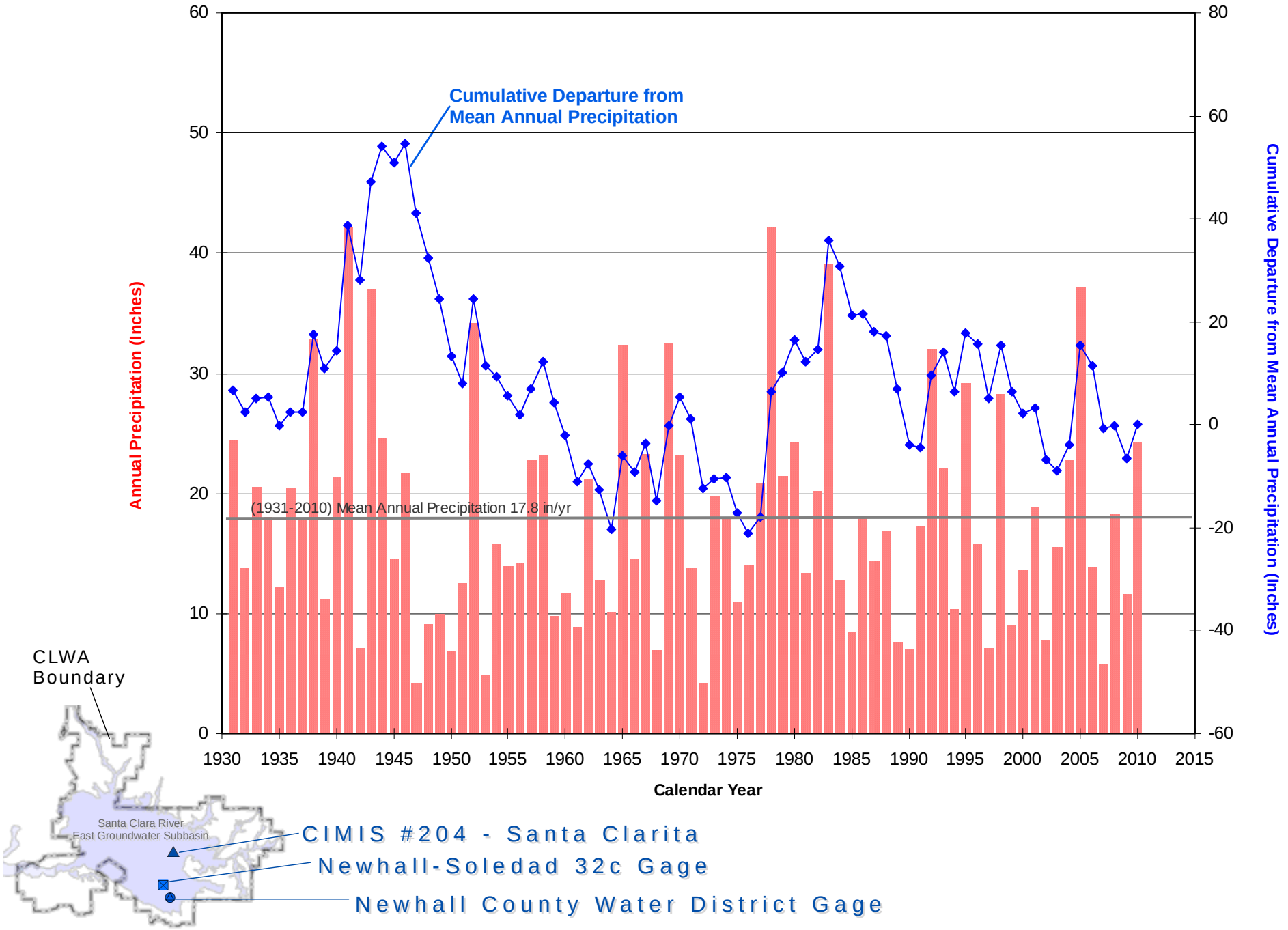


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**Figure 1-3**
**Annual Precipitation and Cumulative Departure from Mean Annual Precipitation at Newhall-Soledad 32c Gage**

# 2. 2010 Water Requirements and Supplies

Total water use in the Santa Clarita Valley was 80,200 af in 2010, a decrease of 6,400 af from the previous year. Of the total water demand, 64,100 af (80 percent) were for municipal use and the remaining 16,100 af (20 percent) were for agricultural and other (miscellaneous) uses, including estimated individual domestic uses. The majority of decreased water demand is attributable to a significant (8%) decrease in municipal water use from 2009. The total water demands were met by a combination of about 49,300 af from local groundwater resources (about 33,200 af for municipal supply and about 16,100 af for agricultural and other uses), about 30,600 af of SWP and other imported water, and about 300 af of recycled water.

Compared to the previous year, total water demand in the Santa Clarita Valley decreased by about 7.4 percent in 2010, and was less than the short-term projected water requirement estimated in last year's Water Report. The decrease in water use in 2010 is attributed to ongoing very slow growth in the number of new service connections and continued water conservation awareness as a result of state-wide dry conditions. Growth over the last two years in each Purveyor service area was notably lower than in the preceding four-year period, with total additions of only about 400 new services connections in 2010, in notable contrast to the growth rate of about 1,000 connections per year between 2005 to 2008, and in even greater contrast to the predominant growth rate that was three times higher from the late 1990's through 2004. In addition, the Purveyors and the local community continued to be aware of the Governor's Alert in June, 2008 with regard to drought conditions and potential water supply shortages followed by the Governor's Drought Emergency Declaration in February, 2009. The widespread awareness of dry conditions throughout the state and the perceived effects on water supply availability are considered to be prime factors causing total water demand in 2010 to have continued to decline over each of the preceding three years, and to be well below the demand projections in the 2005 UWMP.

The uses of local groundwater, augmented by imported water supplies to meet municipal water requirements since 1980, when the importation of SWP water began, and also slightly augmented by the use of recycled water, are summarized in Table 2-1. Notable with regard to municipal water requirements is that, through 2010, total municipal demand (64,100 af) continues to be below (by about 20,000 af in 2010) the projections in the 2005 UWMP without conservation, and about equal to the projections in the UWMP with conservation.

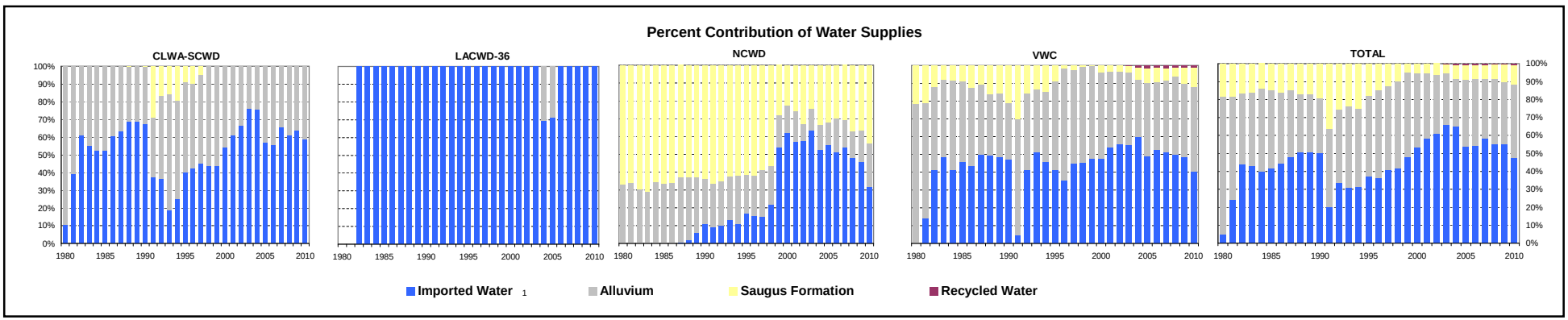
Water supply utilization for all agricultural and other non-municipal uses is summarized in Table 2-2. The category of Small Private Domestic, Irrigation and Golf Course Uses in Table 2-2 includes an estimated 500 af of small individual private pumping from the Alluvium.

Water supply utilization for all uses in the Santa Clarita Valley, again for the period 1980 to present, is summarized in Table 2-3. The trends in utilization of local groundwater and imported water, complemented by the recent addition of recycled water, are graphically illustrated in Figure 2-1. As can be seen by inspection of Table 2-2 and Figure 2-1, total water use in the Valley was nearly linearly increasing from the early 1980's through 2007, with some weather-related fluctuations in certain years. As discussed above, total water use has progressively declined over the last three years, from a peak slightly above 92,000 af in 2007 to 80,200 af in 2010. The decreased demand in 2010 is the lowest in nearly a decade (since 2001). Overall, the increase in total water demand since the inception of supplemental SWP importation has been from about 37,000 acre-feet in 1980 to the mid-80,000 acre-feet per year range through 2000-2005, to the short-term peak in the low-90,000 acre-feet per year range in 2006 through 2008, and back to the mid to low-80,000 af per year range over the last couple of years.

As can also be seen by inspection of Table 2-2 and Figure 2-1, most of the historical increase in water demand has been met with generally increasing importation of SWP water, most recently complemented by other imported water as discussed herein. The recent decrease in water demand has been met with a generally consistent amount of local groundwater and a decreased use of imported water. Since the early 1990's, following a decade of generally decreased groundwater use during the initial period of SWP importation, total groundwater pumping has fluctuated from year to year, but has remained within a range between about 38,000 and 50,000 acre-feet per year through 2010.

**Table 2-1**
**Water Supply Utilization by Municipal Purveyors**
**(Acre-Feet)**

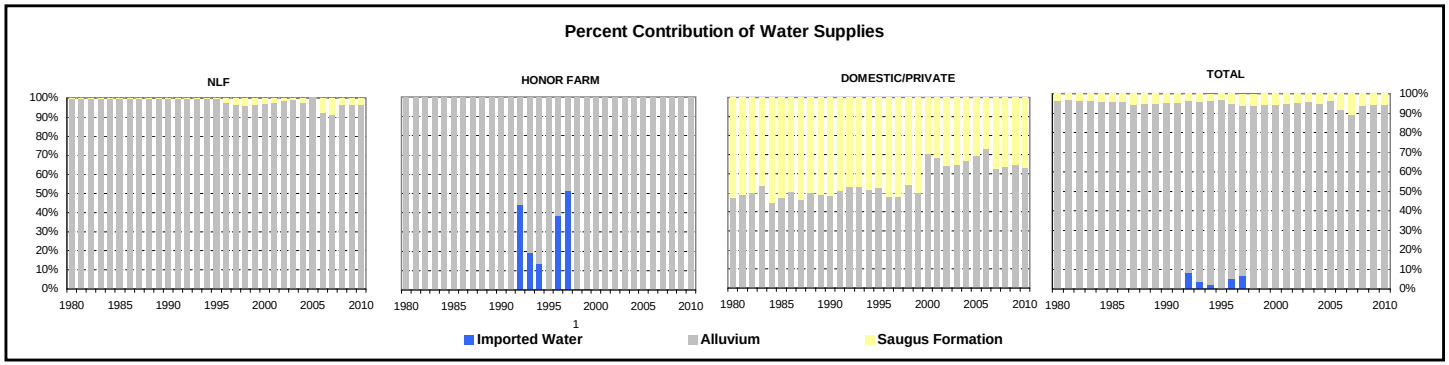
| | CLWA Santa Clarita Water Division | | | | Los Angeles County Waterworks District 36 | | | Newhall County Water District | | | | Valencia Water Company | | | | | All Municipal Purveyors | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | *Imported Water* [1] | *Alluvium* | *Saugus Formation* | **Total** | *Imported Water* [1] | *Alluvium* [2] | **Total** | *Imported Water* [1] | *Alluvium* | *Saugus Formation* | **Total** | *Imported Water* [1] | *Alluvium* | *Saugus Formation* | *Recycled Water* | **Total** | *Imported Water* [1] | *Alluvium* | *Saugus Formation* | *Recycled Water* | **Total** |
| 1980 | 1,126 | 9,467 | 0 | **10,593** | 0 | - | **0** | 0 | 1,170 | 2,363 | **3,533** | 0 | 5,995 | 1,644 | - | **7,639** | 1,126 | 16,632 | 4,007 | - | **21,765** |
| 1981 | 4,603 | 7,106 | 0 | **11,709** | 0 | - | **0** | 0 | 1,350 | 2,621 | **3,971** | 1,214 | 5,597 | 1,808 | - | **8,619** | 5,817 | 14,053 | 4,429 | - | **24,299** |
| 1982 | 6,454 | 4,091 | 0 | **10,545** | 145 | - | **145** | 0 | 1,178 | 2,672 | **3,850** | 3,060 | 3,415 | 897 | - | **7,372** | 9,659 | 8,684 | 3,569 | - | **21,912** |
| 1983 | 5,214 | 4,269 | 0 | **9,483** | 207 | - | **207** | 0 | 1,147 | 2,787 | **3,934** | 3,764 | 3,387 | 611 | - | **7,762** | 9,185 | 8,803 | 3,398 | - | **21,386** |
| 1984 | 6,616 | 6,057 | 0 | **12,673** | 240 | - | **240** | 0 | 1,549 | 2,955 | **4,504** | 4,140 | 4,975 | 854 | - | **9,969** | 10,996 | 12,581 | 3,809 | - | **27,386** |
| 1985 | 6,910 | 6,242 | 0 | **13,152** | 272 | - | **272** | 0 | 1,644 | 3,255 | **4,899** | 4,641 | 4,633 | 885 | - | **10,159** | 11,823 | 12,519 | 4,140 | - | **28,482** |
| 1986 | 8,366 | 5,409 | 0 | **13,775** | 342 | - | **342** | 0 | 1,842 | 3,548 | **5,390** | 5,051 | 5,167 | 1,427 | - | **11,645** | 13,759 | 12,418 | 4,975 | - | **31,152** |
| 1987 | 9,712 | 5,582 | 0 | **15,294** | 361 | - | **361** | 22 | 2,127 | 3,657 | **5,806** | 6,190 | 4,921 | 1,305 | - | **12,416** | 16,285 | 12,630 | 4,962 | - | **33,877** |
| 1988 | 11,430 | 5,079 | 63 | **16,572** | 434 | - | **434** | 142 | 2,283 | 4,041 | **6,466** | 7,027 | 4,835 | 2,300 | - | **14,162** | 19,033 | 12,197 | 6,404 | - | **37,634** |
| 1989 | 12,790 | 5,785 | 0 | **18,575** | 457 | - | **457** | 428 | 2,367 | 4,688 | **7,483** | 7,943 | 5,826 | 2,529 | - | **16,298** | 21,618 | 13,978 | 7,217 | - | **42,813** |
| 1990 | 12,480 | 5,983 | 40 | **18,503** | 513 | - | **513** | 796 | 1,936 | 4,746 | **7,478** | 7,824 | 5,232 | 3,516 | - | **16,572** | 21,613 | 13,151 | 8,302 | - | **43,066** |
| 1991 | 6,158 | 5,593 | 4,781 | **16,532** | 435 | - | **435** | 675 | 1,864 | 4,994 | **7,533** | 700 | 9,951 | 4,642 | - | **15,293** | 7,968 | 17,408 | 14,417 | - | **39,793** |
| 1992 | 6,350 | 8,288 | 2,913 | **17,551** | 421 | - | **421** | 802 | 1,994 | 5,160 | **7,956** | 6,338 | 6,615 | 2,385 | - | **15,338** | 13,911 | 16,897 | 10,458 | - | **41,266** |
| 1993 | 3,429 | 12,016 | 2,901 | **18,346** | 465 | - | **465** | 1,075 | 1,977 | 5,068 | **8,120** | 8,424 | 5,815 | 2,182 | - | **16,421** | 13,393 | 19,808 | 10,151 | - | **43,352** |
| 1994 | 5,052 | 10,996 | 3,863 | **19,911** | 453 | - | **453** | 906 | 2,225 | 5,103 | **8,234** | 7,978 | 6,847 | 2,565 | - | **17,390** | 14,389 | 20,068 | 11,531 | - | **45,988** |
| 1995 | 7,955 | 10,217 | 1,726 | **19,898** | 477 | - | **477** | 1,305 | 1,675 | 4,775 | **7,755** | 7,259 | 8,698 | 1,586 | - | **17,543** | 16,996 | 20,590 | 8,087 | - | **45,673** |
| 1996 | 9,385 | 10,445 | 2,176 | **22,006** | 533 | - | **533** | 1,213 | 1,803 | 4,871 | **7,887** | 6,962 | 12,433 | 326 | - | **19,721** | 18,093 | 24,681 | 7,373 | - | **50,147** |
| 1997 | 10,120 | 11,268 | 1,068 | **22,456** | 785 | - | **785** | 1,324 | 2,309 | 5,168 | **8,801** | 9,919 | 11,696 | 516 | - | **22,131** | 22,148 | 25,273 | 6,752 | - | **54,173** |
| 1998 | 8,893 | 11,426 | 0 | **20,319** | 578 | - | **578** | 1,769 | 1,761 | 4,557 | **8,087** | 9,014 | 10,711 | 149 | - | **19,874** | 20,254 | 23,898 | 4,706 | - | **48,858** |
| 1999 | 10,772 | 13,741 | 0 | **24,513** | 654 | - | **654** | 5,050 | 1,676 | 2,622 | **9,348** | 10,806 | 11,823 | 106 | - | **22,735** | 27,282 | 27,240 | 2,728 | - | **57,250** |
| 2000 | 13,751 | 11,529 | 0 | **25,280** | 800 | - | **800** | 6,024 | 1,508 | 2,186 | **9,718** | 12,004 | 12,179 | 1,007 | - | **25,190** | 32,579 | 25,216 | 3,193 | - | **60,988** |
| 2001 | 15,648 | 9,941 | 0 | **25,589** | 907 | - | **907** | 5,452 | 1,641 | 2,432 | **9,525** | 13,362 | 10,518 | 835 | - | **24,715** | 35,369 | 22,100 | 3,267 | - | **60,736** |
| 2002 | 18,916 | 9,513 | 0 | **28,429** | 1,069 | - | **1,069** | 5,986 | 981 | 3,395 | **10,362** | 15,792 | 11,603 | 965 | - | **28,360** | 41,763 | 22,097 | 4,360 | - | **68,220** |
| 2003 | 20,665 | 6,424 | 0 | **27,089** | 1,175 | - | **1,175** | 6,572 | 1,266 | 2,513 | **10,351** | 16,004 | 11,707 | 1,068 | 50 | **28,829** | 44,416 | 19,397 | 3,581 | 50 | **67,444** |
| 2004 | 22,045 | 7,146 | 0 | **29,191** | 854 | 380 | **1,234** | 5,896 | 1,582 | 3,739 | **11,217** | 18,410 | 9,862 | 1,962 | 420 | **30,654** | 47,205 | 18,970 | 5,701 | 420 | **72,296** |
| 2005 | 16,476 | 12,408 | 0 | **28,884** | 857 | 343 | **1,200** | 5,932 | 1,389 | 3,435 | **10,756** | 14,732 | 12,228 | 2,513 | 418 | **29,891** | 37,997 | 26,368 | 5,948 | 418 | **70,731** |
| 2006 | 16,548 | 13,156 | 0 | **29,704** | 1,289 | - | **1,289** | 5,898 | 2,149 | 3,423 | **11,470** | 16,313 | 11,884 | 2,449 | 419 | **31,065** | 40,048 | 27,189 | 5,872 | 419 | **73,528** |
| 2007 | 20,488 | 10,686 | 0 | **31,174** | 1,406 | - | **1,406** | 6,478 | 1,806 | 3,691 | **11,975** | 16,779 | 13,140 | 2,367 | 470 | **32,756** | 45,151 | 25,632 | 6,058 | 470 | **77,311** |
| 2008 | 18,598 | 11,878 | 0 | **30,476** | 1,354 | - | **1,354** | 5,428 | 1,717 | 4,195 | **11,340** | 16,325 | 14,324 | 1,770 | 311 | **32,730** | 41,705 | 27,919 | 5,965 | 311 | **75,900** |
| 2009 | 17,739 | 10,077 | 0 | **27,816** | 1,243 | - | **1,243** | 4,832 | 1,860 | 3,868 | **10,559** | 14,732 | 12,459 | 2,836 | 328 | **30,355** | 38,546 | 24,396 | 6,704 | 328 | **69,974** |
| 2010 | 15,188 | 10,607 | 0 | **25,795** | 1,141 | - | **1,141** | 3,035 | 2,323 | 4,173 | **9,531** | 11,214 | 13,054 | 2,995 | 336 | **27,599** | 30,578 | 25,984 | 7,168 | 336 | **64,066** |




*1. Reflects State Water Project through 2006; includes imported water from State Water Project and Buena Vista WSD Agreement beginning in 2007.*
*2.Groundwater purchased from LA County Honor Farm.*
*Note: Water use for SCWD was adjusted in the 2010 Water Report for 1980, 1981, 2001, 2002, 2003, 2005, 2006, and 2007 to reflect the correct amount; the annual totals were changed in Tables 2-1 and 2-3 by +8 af, -2 af, +45 af, -5 af, -3 af, -37 af, -598 af, and -181 af, respectively.*
*The Saugus Formation use was adjusted in the 2010 Water Report for 1980 and 1981 to shift 562 af and 521 af, respectively, from VWC municipal use shown in Table 2-1 to irrigation and golf course use shown in Table 2-2; the annual totals in Table 2-3 do not change.*

## Table 2-2
## Individual Water Supply Utilization by Agricultural and Other Users
## (Acre-Feet)

| | Newhall Land and Farming | | | Los Angeles County Honor Farm | | | Small Private Domestic, Irrigation and Golf Courses Uses | | | All Agricultural and Other Users | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | *Alluvium* | *Saugus Formation* | **Total** | *Alluvium* | *Imported Water* [1] | **Total** | *Alluvium* [2] | *Saugus Formation* [3] | **Total** | *Imported Water* [1] | *Alluvium* | *Saugus Formation* | **Total** |
| 1980 | 11,331 | 20 | **11,351** | 3,000 | 0 | **3,000** | 500 | 562 | **1,062** | 0 | 14,831 | 582 | **15,413** |
| 1981 | 13,237 | 20 | **13,257** | 3,000 | 0 | **3,000** | 500 | 521 | **1,021** | 0 | 16,737 | 541 | **17,278** |
| 1982 | 9,684 | 20 | **9,704** | 3,000 | 0 | **3,000** | 500 | 501 | **1,001** | 0 | 13,184 | 521 | **13,705** |
| 1983 | 7,983 | 20 | **8,003** | 3,000 | 0 | **3,000** | 500 | 434 | **934** | 0 | 11,483 | 454 | **11,937** |
| 1984 | 11,237 | 20 | **11,257** | 3,000 | 0 | **3,000** | 500 | 620 | **1,120** | 0 | 14,737 | 640 | **15,377** |
| 1985 | 9,328 | 20 | **9,348** | 3,000 | 0 | **3,000** | 500 | 555 | **1,055** | 0 | 12,828 | 575 | **13,403** |
| 1986 | 8,287 | 20 | **8,307** | 3,000 | 0 | **3,000** | 500 | 490 | **990** | 0 | 11,787 | 510 | **12,297** |
| 1987 | 6,512 | 20 | **6,532** | 3,000 | 0 | **3,000** | 500 | 579 | **1,079** | 0 | 10,012 | 599 | **10,611** |
| 1988 | 5,951 | 20 | **5,971** | 3,000 | 0 | **3,000** | 500 | 504 | **1,004** | 0 | 9,451 | 524 | **9,975** |
| 1989 | 6,243 | 20 | **6,263** | 3,000 | 0 | **3,000** | 500 | 522 | **1,022** | 0 | 9,743 | 542 | **10,285** |
| 1990 | 8,225 | 20 | **8,245** | 2,000 | 0 | **2,000** | 500 | 539 | **1,039** | 0 | 10,725 | 559 | **11,284** |
| 1991 | 7,039 | 20 | **7,059** | 2,240 | 0 | **2,240** | 500 | 480 | **980** | 0 | 9,779 | 500 | **10,279** |
| 1992 | 8,938 | 20 | **8,958** | 1,256 | 987 | **2,243** | 500 | 446 | **946** | 987 | 10,694 | 466 | **12,147** |
| 1993 | 8,020 | 20 | **8,040** | 1,798 | 443 | **2,241** | 500 | 439 | **939** | 443 | 10,318 | 459 | **11,220** |
| 1994 | 10,606 | 20 | **10,626** | 1,959 | 311 | **2,270** | 500 | 474 | **974** | 311 | 13,065 | 494 | **13,870** |
| 1995 | 11,174 | 20 | **11,194** | 2,200 | 6 | **2,206** | 500 | 453 | **953** | 6 | 13,874 | 473 | **14,353** |
| 1996 | 12,020 | 266 | **12,286** | 1,237 | 780 | **2,017** | 500 | 547 | **1,047** | 780 | 13,757 | 813 | **15,350** |
| 1997 | 12,826 | 445 | **13,271** | 1,000 | 1,067 | **2,067** | 500 | 548 | **1,048** | 1,067 | 14,326 | 993 | **16,386** |
| 1998 | 10,250 | 426 | **10,676** | 2,000 | 12 | **2,012** | 500 | 423 | **923** | 12 | 12,750 | 849 | **13,611** |
| 1999 | 13,824 | 479 | **14,303** | 1,842 | 20 | **1,862** | 500 | 509 | **1,009** | 20 | 16,166 | 988 | **17,174** |
| 2000 | 11,857 | 374 | **12,231** | 1,644 | 3 | **1,647** | 1,220 | 513 | **1,733** | 3 | 14,721 | 887 | **15,611** |
| 2001 | 12,661 | 300 | **12,961** | 1,604 | 0 | **1,604** | 1,224 | 573 | **1,797** | 0 | 15,489 | 873 | **16,362** |
| 2002 | 13,514 | 211 | **13,725** | 1,602 | 0 | **1,602** | 1,063 | 589 | **1,652** | 0 | 16,179 | 800 | **16,979** |
| 2003 | 10,999 | 122 | **11,121** | 2,273 | 0 | **2,273** | 931 | 504 | **1,435** | 0 | 14,203 | 626 | **14,829** |
| 2004 | 10,991 | 268 | **11,259** | 2,725 | 0 | **2,725** | 1,071 | 535 | **1,606** | 0 | 14,787 | 803 | **15,590** |
| 2005 | 8,648 | 6 | **8,654** | 2,499 | 0 | **2,499** | 1,133 | 499 | **1,632** | 0 | 12,280 | 505 | **12,785** |
| 2006 | 11,477 | 934 | **12,411** | 3,026 | 0 | **3,026** | 1,369 | 506 | **1,875** | 0 | 15,872 | 1,440 | **17,312** |
| 2007 | 9,968 | 971 | **10,939** | 2,085 | 0 | **2,085** | 1,088 | 656 | **1,744** | 0 | 13,141 | 1,627 | **14,768** |
| 2008 | 9,191 | 330 | **9,521** | 3,506 | 0 | **3,506** | 1,100 | 623 | **1,723** | 0 | 13,797 | 953 | **14,750** |
| 2009 | 11,061 | 379 | **11,440** | 3,432 | 0 | **3,432** | 1,097 | 595 | **1,692** | 0 | 15,590 | 974 | **16,564** |
| 2010 | 10,772 | 366 | **11,138** | 3,446 | 0 | **3,446** | 957 | 558 | **1,515** | 0 | 15,175 | 924 | **16,099** |

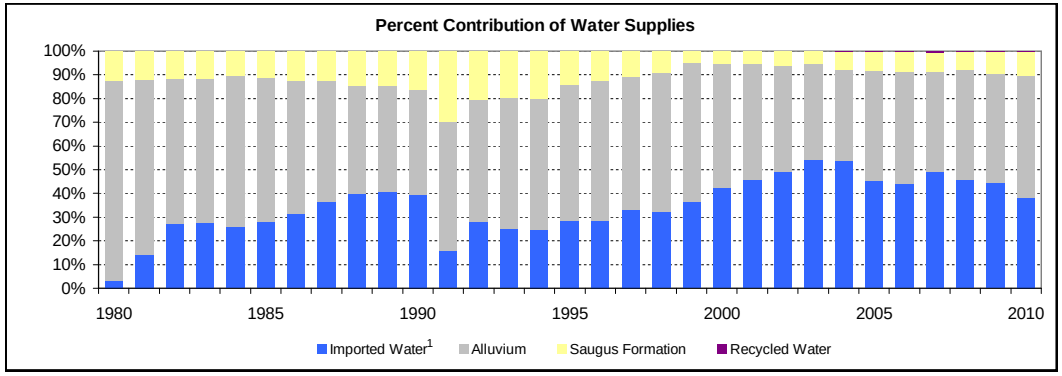



1. *Reflects State Water Project through 2006; includes imported water from State Water Project and Buena Vista WSD Agreement beginning in 2007.*
2. *Robinson Ranch Golf Course irrigation and estimated private pumping.*
3. *Valencia Country Club and Vista Valencia Golf Course irrigation.*

*Note: The Saugus Formation use was adjusted in the 2010 Water Report for 1980 and 1981 to shift 562 af and 521 af, respectively, from VWC municipal use shown in Table 2-1 to irrigation and golf course use shown in Table 2-2; the annual totals in Table 2-3 do not change.*

**Table 2-3**
**Total Water Supply Utilization for Municipal, Agricultural and Other Uses**
**(Acre-Feet)**

| Year | *Imported Water* [1] | *Alluvium* | *Saugus Formation* | *Recycled Water* | **Total** |
|---|---|---|---|---|---|
| 1980 | 1,126 | 31,463 | 4,589 | - | **37,178** |
| 1981 | 5,817 | 30,790 | 4,970 | - | **41,577** |
| 1982 | 9,659 | 21,868 | 4,090 | - | **35,617** |
| 1983 | 9,185 | 20,286 | 3,852 | - | **33,323** |
| 1984 | 10,996 | 27,318 | 4,449 | - | **42,763** |
| 1985 | 11,823 | 25,347 | 4,715 | - | **41,885** |
| 1986 | 13,759 | 24,205 | 5,485 | - | **43,449** |
| 1987 | 16,285 | 22,642 | 5,561 | - | **44,488** |
| 1988 | 19,033 | 21,648 | 6,928 | - | **47,609** |
| 1989 | 21,618 | 23,721 | 7,759 | - | **53,098** |
| 1990 | 21,613 | 23,876 | 8,861 | - | **54,350** |
| 1991 | 7,968 | 27,187 | 14,917 | - | **50,072** |
| 1992 | 14,898 | 27,591 | 10,924 | - | **53,413** |
| 1993 | 13,836 | 30,126 | 10,610 | - | **54,572** |
| 1994 | 14,700 | 33,133 | 12,025 | - | **59,858** |
| 1995 | 17,002 | 34,464 | 8,560 | - | **60,026** |
| 1996 | 18,873 | 38,438 | 8,186 | - | **65,497** |
| 1997 | 23,215 | 39,599 | 7,745 | - | **70,559** |
| 1998 | 20,266 | 36,648 | 5,555 | - | **62,469** |
| 1999 | 27,302 | 43,406 | 3,716 | - | **74,424** |
| 2000 | 32,582 | 39,937 | 4,080 | - | **76,599** |
| 2001 | 35,369 | 37,589 | 4,140 | - | **77,098** |
| 2002 | 41,763 | 38,276 | 5,160 | - | **85,199** |
| 2003 | 44,416 | 33,599 | 4,207 | 50 | **82,273** |
| 2004 | 47,205 | 33,757 | 6,503 | 420 | **87,885** |
| 2005 | 37,997 | 38,648 | 6,453 | 418 | **83,516** |
| 2006 | 40,048 | 43,061 | 7,312 | 419 | **90,840** |
| 2007 | 45,151 | 38,773 | 7,685 | 470 | **92,079** |
| 2008 | 41,705 | 41,716 | 6,918 | 311 | **90,650** |
| 2009 | 38,546 | 39,986 | 7,678 | 328 | **86,538** |
| 2010 | 30,578 | 41,159 | 8,092 | 336 | **80,165** |




*1. Reflects State Water Project through 2006; includes imported water from State Water Project and Buena Vista WSD Agreement beginning in 2007.*

*Note: Water use for SCWD was adjusted in the 2010 Water Report for 1980, 1981, 2001, 2002, 2003, 2005, 2006, and 2007 to reflect the correct amount; the annual totals were changed in Tables 2-1 and 2-3 by +8 af, -2 af, +45 af, -5 af, -3 af, -37 af, -598 af, and -181 af, respectively.*

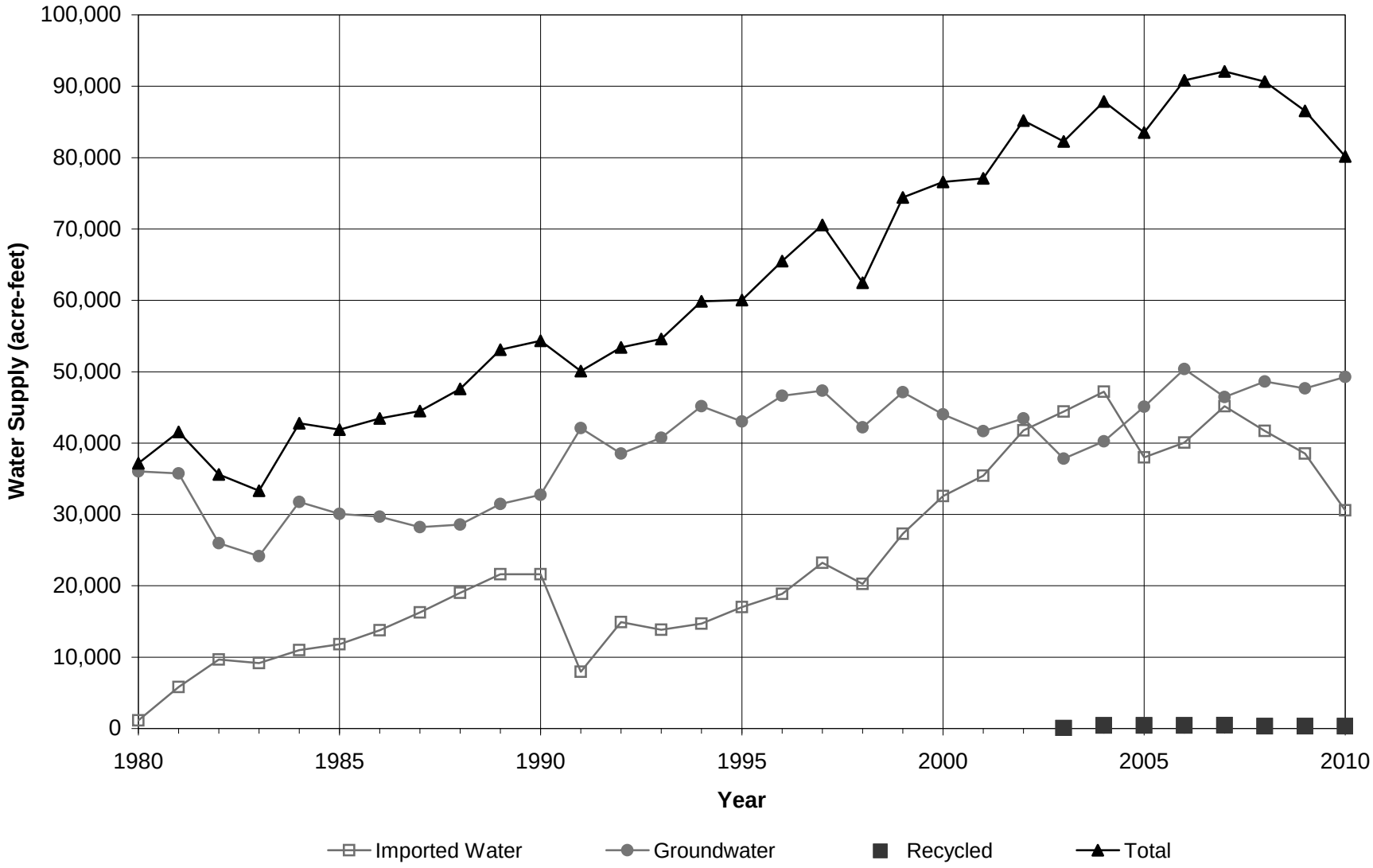



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**Figure 2-1**
**Total Water Supply Utilization**
**Santa Clarita Valley**

# 3. Water Supplies

Prior to 1980, local groundwater extracted from the Alluvium and the Saugus Formation was the sole source of water supply in the Santa Clarita Valley. Since 1980, local groundwater supplies have been supplemented with imported SWP water supplies, augmented in 2007 by acquisition of additional supplemental water from the Buena Vista Water Storage District. Those water supplies have also been slightly augmented by deliveries from CLWA's recycled water program since 2003. This section describes the groundwater resources of the Santa Clarita Valley, SWP and other imported water supplies, and the recycled water program in the Valley.

## 3.1 Groundwater Basin Yield

The groundwater basin generally beneath the Santa Clarita Valley, identified in the State Department of Water Resources' Bulletin 118 as the Santa Clara River Valley Groundwater Basin, East Subbasin (Basin No. 4-4.07), is comprised of two aquifer systems. The Alluvium generally underlies the Santa Clara River and its several tributaries, and the Saugus Formation underlies practically the entire Upper Santa Clara River area. The mapped extent of the Santa Clara River Valley East Subbasin in DWR Bulletin 118 and its relationship to the extent of the CLWA service area are illustrated in Figure 3-1. The mapped Subbasin boundary approximately coincides with the outer extent of the Alluvium and Saugus Formation.

A 2001 Update Report on both the Alluvium and Saugus Formation Aquifers (Slade, 2002), which updated analyses and interpretation of hydrogeologic conditions from earlier reports (Slade, 1986 and 1988), included extensive detail on major aspects of the groundwater basin. Notable parts of the Update Report relative to groundwater supply included findings that:

- Analysis of historical groundwater levels and production indicates that there have been no conditions that would be illustrative of groundwater overdraft.

- Utilization of operational yield (as opposed to perennial yield) as a basis for managing groundwater production would be more applicable in this basin to reflect fluctuating utilization of groundwater in conjunction with imported SWP water.

- Operational yield of the Alluvium would typically be 30,000 to 40,000 afy for wet and normal rainfall years, with an expected reduction into the range of 30,000 to 35,000 afy in dry years.

- Operational yield of the Saugus Formation would typically be in the range of 7,500 to 15,000 afy on a long-term basis, with possible short-term increases during dry periods into a range of 15,000 to 25,000 afy, and to 35,000 afy if dry conditions continue.

Following on the 2001 Update Report (Slade, 2002), the groundwater component of overall water supply in the Valley derives from a groundwater operating plan to meet water requirements (municipal, agricultural and other non-municipal, and small individual domestic) while maintaining the basin in a sustainable condition (i.e., no long-term depletion of groundwater or interrelated surface water). That operating plan also addresses groundwater contamination issues in the basin, all consistent with the Groundwater Management Plan adopted in 2003. The groundwater operating plan is based on the concept that pumping can vary from year to year to generally rely on increased groundwater use in dry periods and increased recharge during locally wet periods, and to collectively assure that the groundwater basin is adequately replenished through various wet/dry cycles.

The groundwater operating plan, summarized in Table 3-1, is as follows:

**Alluvium** – Pumping from the Alluvial Aquifer in a given year is related to local hydrologic conditions in the eastern Santa Clara River watershed. Pumping is expected to typically range between 30,000 and 40,000 afy following normal and above-normal rainfall years. Due to hydrogeologic constraints in the eastern part of the basin, pumping is expected to be typically reduced to between 30,000 and 35,000 afy following multiple locally dry years.

**Saugus Formation** – Pumping from the Saugus Formation in a given year is related to the availability of other water supplies, particularly from the SWP. During average-year conditions within the SWP system, Saugus pumping is expected to typically range between 7,500 and 15,000 afy. Planned dry-year pumping from the Saugus Formation is expected to range between 15,000 and 25,000 afy during a drought year and can increase to between 21,000 and 25,000 afy if SWP deliveries are reduced for two consecutive years, and between 21,000 and 35,000 afy if SWP deliveries are reduced for three consecutive years. Such high pumping is expected to typically be followed by periods of reduced (average-year) pumping, at rates between 7,500 and 15,000 afy, to enhance the effectiveness of natural recharge processes that would cause groundwater levels and storage volumes to recover after the higher pumping during dry years.

**Table 3-1**
**Groundwater Operating Plan for the Santa Clarita Valley**

| Aquifer | Groundwater Production (af) | | | |
|---|---|---|---|---|
| | **Normal Years** | **Dry Year 1** | **Dry Year 2** | **Dry Year 3** |
| Alluvium | 30,000 to 40,000 | 30,000 to 35,000 | 30,000 to 35,000 | 30,000 to 35,000 |
| Saugus | 7,500 to 15,000 | 15,000 to 25,000 | 21,000 to 25,000 | 21,000 to 35,000 |
| **Total** | **37,500 to 55,000** | **45,000 to 60,000** | **51,000 to 60,000** | **51,000 to 70,000** |

In 2004, as part of analyzing the restoration of perchlorate-impacted groundwater supply in the Valley, a numerical groundwater flow model was developed and calibrated for use in analyzing the response of the groundwater basin to long-term operation at the operational yields noted above, with focus on perchlorate extraction and the control of perchlorate migration in the basin. That groundwater flow model was then utilized in 2005 to specifically analyze the sustainability of groundwater supplies in both the Alluvium and the Saugus Formation through a long-term (78 year) hydrologic period that was selected to examine groundwater basin response to variations in pumping in accordance with the operating plan. Resultant projections of groundwater levels, groundwater storage, and surface water flows showed the basin to respond in a long-term sustainable manner, with no chronic depletion of groundwater levels, storage, or stream flows. The analysis of groundwater sustainability was summarized in a Basin Yield Report (CH2M Hill and LSCE, 2005), which included the following findings:

- The groundwater basin has historically been, and continues to be, in good operating condition and not in overdraft, as indicated by historical data.

- The groundwater plan is sustainable over varying hydrologic conditions, because it is feasible to intermittently exceed a long-term average yield for one or more years without creating long-term adverse impacts to the groundwater system and the Santa Clara River.

- The groundwater operating plan for the Alluvium and the Saugus Formation can be used for long-term water supply planning purposes. In particular, although increased pumping from the Saugus Formation during dry periods can be expected to cause short-term declines in groundwater levels, it is not projected to cause permanent declines in groundwater discharges or streamflow. Saugus groundwater levels can be expected to recover to pre-drought conditions when pumping is reduced in subsequent wet to normal years.

- The strategy around which the groundwater operating plan was designed (maximizing the use of Alluvial Aquifer and imported water during years of normal or above-normal availability of these supplies, while limiting the use of the Saugus Formation during these periods, then temporarily increasing Saugus pumping during years when SWP supplies are significantly reduced because of drought conditions) is viable on a long-term basis.

- Together, the historical observations of basin conditions and the model simulations together support the historical and ongoing confidence that groundwater can continue to be a sustainable source of water supply under the groundwater operating plan.

In 2008, partly in preparation for the 2010 Urban Water Management Plan, and in part because of recent events that can be expected to impact the future reliability of the supplemental water supply from the State Water Project, the Purveyors initiated an updated analysis to further assess groundwater development potential and possible augmentation of the groundwater operating plan. A further consideration in conducting an updated analysis of the basin was that global climate change could alter local rainfall and associated recharge patterns, thus affecting local groundwater supplies, i.e. the yield of the basin. Finally, the Los Angeles County Flood Control District (LACFCD) was planning a number of small flood control projects in the Santa Clarita Valley; estimated amounts of conservation/groundwater recharge potential were being included for each of the individual projects in the overall LACFCD planning, and the Purveyors had interest in whether that potential could appreciably augment the yield of the basin.

The updated basin yield analysis, completed in August, 2009, concluded the following (LSCE and GSI, 2009):

- The 2008 Operating Plan, with currently envisioned pumping rates and distribution comparable to the Operating Plan described above, will not cause detrimental short- or long-term effects to the groundwater and surface water resources in the Valley and is, therefore, sustainable. Further, local conditions in the Alluvium in the eastern end of the basin can be expected to repeat historical groundwater level declines during dry periods, necessitating a reduction in desired Alluvial aquifer pumping due to decreased well yield and associated actual pumping capacity during those periods. However, those reductions in pumping from the Alluvial aquifer can be made up by an equivalent amount of increased pumping in other parts of the basin without disrupting basin-wide sustainability or local pumping capacity in those other areas. For the Saugus Formation, the modeling analysis indicated that it can sustain the pumping that is embedded the 2008 Operating Plan.

- A Potential Operating Plan (Alluvial pumping between 41,500 and 47,500 afy) would result in lower Alluvial groundwater levels, failure of the basin to fully recover (during wet hydrologic cycles) from depressed storage that would occur during dry periods, and generally declining trends in groundwater levels and storage. Long-term lowering of groundwater levels would also occur in the Saugus Formation (pumping between about 16,000 and nearly 40,000 afy) with only partial water level recovery occurring in the Saugus. Thus, the Potential Operating Plan would not be sustainable over a long-term period.

- Several climate change models were examined to estimate the potential impacts on local hydrology in the Santa Clarita Valley. The range of potential climate change impacts extends from a possible wet trend to a possible dry trend over the long term. The trends that range from an approximate continuation of historical average precipitation, to something wetter than that, would appear to result in continued sustainability of the 2008 Operating Plan, again with intermittent constraints on full pumping in the eastern part of the basin. The potential long-term dry trend arising out of climate change would be expected to decrease local recharge to the point that lower and declining groundwater levels would render the 2008 Operating Plan unsustainable. Ultimately it was recognized that a wide range of potential global climate change produces a range of non-unique results with respect to local hydrologic conditions and associated sustainable groundwater supply. Notable in the wide range of possibilities, however, was the output that, over a 20 to 25 year planning horizon of the 2005 UWMP, the range of relatively wet to relatively dry hydrologic conditions would be expected to produce sustainable groundwater conditions under the 2008 Groundwater Operating Plan.

Based on the preceding conclusions, groundwater utilization continues in accordance with the 2008 Operating Plan; and the Potential Operating Plan is not being considered for implementation.

## 3.2 Alluvium – General

The spatial extent of the aquifers used for groundwater supply in the Valley, the Alluvium and the Saugus Formation, are illustrated in Figure 3-1. Geologic descriptions and hydrogeologic details related to both aquifers are included in several technical reports including Slade (1986, 1988 & 2002), CH2M Hill (2005) and LSCE (2005), the 2005 UWMP and the 2010 UWMP.

Consistent with the 2001 Update Report (Slade), the 2005 Basin Yield Report (CH2M Hill and LSCE), the 2005 UWMP, the 2009 Updated Basin Yield Report (LSCE and GSI), and the 2010

UWMP, the management practice of the Purveyors continues to be to rely on groundwater from the Alluvium for part of the overall municipal water supply, whereby total pumping from the Alluvium (by municipal, agricultural, and small private pumpers) is in accordance with the 2008 groundwater Operating Plan, 30,000 to 40,000 afy following wet and normal years, with possible reduction to 30,000 to 35,000 afy following multiple dry years. Such operation will maximize use of the Alluvium because of the aquifer's ability to store and produce good quality water on a sustainable basis, and because the Alluvium is capable of rapid recovery of groundwater storage in wet periods. As with many groundwater basins, it is possible to intermittently exceed a long-term average yield for one or more years without long-term adverse effects. Higher pumping for short periods may temporarily lower groundwater storage and related water levels, as has been the case in the Alluvium several times since the 1930's. However, subsequent decreases in pumping limit the amount of water level decline. Normal to wet-period recharge results in a rapid return of groundwater levels to historic highs. Historical groundwater data collected from the Alluvium over numerous hydrologic cycles continue to provide assurance that groundwater elevations, if locally lowered during dry periods, recover in subsequent average or wet years. Such water level response to rainfall is a significant characteristic of permeable, porous, alluvial aquifer systems that occur within large watersheds. In light of these historical observations, complemented by the long-term sustainability analysis using the numerical groundwater flow model, there is ongoing confidence that groundwater will continue to be a sustainable source of water supply at the rates of pumping described in the Basin Yield Report, as incorporated in the 2005 UWMP, and as described in the 2009 Updated Basin Yield Report, and incorporated in the 2010 UWMP.

Long-term adverse impacts to the Alluvium could occur if the amount of water extracted from the aquifer were to exceed the amount of water that recharges the aquifer over an extended period. However, the quantity and quality of water in the Alluvium and all significant pumping from the Alluvium are routinely monitored, and no long-term adverse impacts have ever been evident. Ultimately, the Purveyors have identified cooperative measures to be taken, if needed, to ensure sustained use of the aquifer. Such measures include but are not limited to the continuation of conjunctive use of SWP and other imported supplemental water with local groundwater, artificial recharge of the aquifer with local runoff or other surface water supplies, financial incentives discouraging extractions above a selected limit, expanded use of other water supplies such as recycled water, and expanded implementation of demand-side management, including conservation.

### 3.2.1 Alluvium – Historical and Current Conditions

Total pumping from the Alluvium in 2010 was about 41,200 af, an increase of 1,200 af from the preceding year. Total Alluvium pumping was slightly above the upper end of the groundwater Operating Plan range. However, as discussed in the balance of this section, groundwater level response to that amount of pumping has remained consistent with historically observed conditions, with no negative changes that might indicate pumping in excess of a sustainable amount; overall, the combination of 2010 pumping and groundwater level response suggest that the Operating Plan range does not reflect absolute groundwater pumping limits. Of the total Alluvial pumping in 2010, about 26,000 af (63 percent) was for municipal water supply, and the balance, about 15,200 af (37 percent), was for agriculture and other smaller uses, including individual domestic uses. In a longer-term context, there has been a change in municipal/agricultural pumping distribution since SWP deliveries began in 1980, toward a higher fraction for municipal water supply (from about 50 percent to more than 65 percent of Alluvial pumpage), which reflects the general land use changes in the area. Ultimately, on a long-term average basis since the beginning of imported water deliveries from the SWP, total Alluvial pumping has been about 32,600 afy, which is at the lower end of the range of operational yield of the Alluvium. That average has been higher over the last decade, about 38,700 afy, which remains within the range of operational yield of the Alluvium. The overall historic record of Alluvial pumping is illustrated in Figure 3-2.

Groundwater levels in various parts of the basin have historically exhibited different responses to both pumpage and climatic fluctuations. During the last 20 to 30 years, depending on location, Alluvial groundwater levels have remained nearly constant (generally toward the western end of the basin), or have fluctuated from near the ground surface when the basin is full, to as much as 100 feet lower during intermittent dry periods of reduced recharge (generally toward the eastern end of the basin). For illustration of the various groundwater level conditions in the basin, the Alluvial wells have been grouped into areas with similar groundwater level patterns, as shown in Figure 3-3. The groundwater level records have been organized into hydrograph form (groundwater elevation vs. time) as illustrated in Figures 3-4 and 3-5. Also shown on these plots is an annual marker indicating whether the year had a below-average amount of rainfall. The wells shown on these plots are representative of the respective areas, showing the range of values (highest to lowest elevation) through each area, and containing a sufficiently long-term record to illustrate trends over time.

Situated along the upstream end of the Santa Clara River Channel, the ‘Mint Canyon’ area, located at the far eastern end of the groundwater basin, and the nearby ‘Above Saugus WRP’ area generally exhibit similar groundwater level responses (Figure 3-4) to hydrologic and

pumping conditions. These parts of the Valley have historically experienced a number of alternating wet and dry hydrologic conditions during which groundwater level declines have been followed by returns to high or mid-range historic levels. When water levels are low, well yields and pumping capacities in this and other eastern areas can be impacted. The affected Purveyors typically respond by increasing use of Saugus Formation and imported (SWP) supplies, as shown in Table 2-3. The Purveyors also shift a fraction of the Alluvial pumping that would normally be supplied by the eastern areas to areas further west, where well yields and pumping capacities remain fairly constant because of smaller groundwater level fluctuations. Recent wet and dry periods illustrate the groundwater level response to managed Alluvial pumping. The five-year period of 1999-2003 saw water level declines on the order of 50 to 60 feet; pumping was gradually reduced by 50 percent over that period and water levels stopped declining. Subsequent wet conditions in late 2004, continuing into 2005, resulted in full recovery of groundwater storage. With such high groundwater levels, higher pumping was resumed in the 'Mint Canyon' area in 2005 and 2006 and has again been gradually decreased through the recent dry period. As shown in Figure 3-6, the Purveyors decreased total Alluvial pumping from the 'Mint Canyon' area from 12,000 afy in 2006 to 7,000 afy in 2010, and correspondingly increased pumping in the western areas of the Valley over the drier-than-average period. Continuing through 2010, the decrease in pumping in the 'Mint Canyon' area has corresponded with a cessation of groundwater level decline; water levels remain within the historic range of levels over similar wet/dry periods.

Just below the 'Mint Canyon' area, the 'Above Saugus WRP' area has shown similar water level trends. While the pumping trends are similar to the 'Mint Canyon' area, pumping here has been less by about half. The long-term average of pumping as shown in Figure 3-6 is about 3,500 afy, and the pumping response to hydrologic cycles follows the upstream area by a couple of years. Here the water levels also remain within the range of historical levels, as expected with managed pumping rates and a single wet year in 2010, following a multi-year dry period.

In the 'Bouquet Canyon' area, pumping has remained relatively constant for the last ten years at about 1,700 afy, and water levels have fluctuated with consecutive wet or dry years. During and since the most recent wet conditions of 2004 and 2005, water levels returned to within historic mid-range levels. This groundwater level response to wet/dry years and pumping is typical for this area of the basin and, in 2010, levels remained within their historic range.

In the western parts and lower elevations of the Alluvium, groundwater levels respond to pumping and precipitation in a similar manner, but to an attenuated or limited extent compared to those situated in the eastern, higher elevation areas. As shown in the western group of hydrographs in Figure 3-5, groundwater level fluctuations become more subtle moving westward

and lower in the Valley. The 'Below Saugus WRP' area, along the Santa Clara River immediately downstream of the Saugus Water Reclamation Plant, and the 'San Francisquito Canyon' area generally exhibit similar groundwater level trends. In this middle part of the basin, historical groundwater levels were lower in the 1950's and 60's than current levels. Groundwater levels in this area notably recovered as pumping declined through the 1960's and 1970's. They have subsequently sustained generally high levels for much of the last 30 years, with three dry-period exceptions: mid-1970's, late 1980's to early 1990's, and the late 1990's to early 2000's. Recoveries to previous high groundwater levels followed both of the short dry-period declines in the 1970's and 1990's. More recently, groundwater levels recovered significantly in both areas, to historic highs, following a wetter-than-average year in 2004 and significantly wet 2005. With the exception of a couple of years, pumping has been generally constant at about 6,000 afy since the mid 1990's in the 'Below Saugus WRP' area. In the 'San Francisquito Canyon' area, annual pumping has approximately doubled since 2005, compared to the long-term average of 1,500 afy. In 2010, the single wet year after a multi-year period of below-average precipitation, groundwater levels in these two areas remain in mid-range to high historical range.

The 'Castaic Valley' area is located along Castaic Creek below Castaic Lake. Below that and along the Santa Clara River, downstream of the Valencia Water Reclamation Plant, is the 'Below Valencia WRP' area, where discharges of treated effluent from the Valencia WRP to the Santa Clara River contribute to groundwater recharge. In the 'Castaic Valley' area, groundwater levels continue to remain fairly constant, with slight responses to climatic and other fluctuations, since the 1950's (Figure 3-5). In the 'Castaic Valley' area, pumping has remained relatively constant over the last 25 years at about 5,200 afy, with a recent slight downward trend. Small changes in groundwater levels over the last five years are consistent with other short-term historical fluctuations around the Valley, but in the long-term, a generally constant trend remained through 2010. In the 'Below Valencia WRP' area, pumping notably increased through the 1990's but has since remained relatively stable over the last seven years, at about 12,000 afy (Figure 3-6). Despite the higher pumping rate, groundwater levels in this area exhibit slight, if any, response to either pumping or climatic fluctuations, and have remained fairly constant since the 1950's through 2010 (Figure 3-5).

In summary, depending on the period of available data, all the history of groundwater levels in the Alluvium shows the same general picture: recent (last 30 years) groundwater levels have exhibited historic highs; in some locations, there are intermittent dry-period declines (resulting from use of some groundwater from storage) followed by wet-period recoveries (and associated refilling of storage space). On a long-term basis, whether over the last 30 years since importation of supplemental SWP water, or over the last 40 to 50 years (since the 1950's - 60's), the Alluvium shows no chronic trend toward decreasing water levels and storage, and thus shows

no symptoms of water level-related overdraft. Consequently, pumping from the Alluvium has been and continues to be sustainable, well within the operational yield of that aquifer on a long-term average basis, and also within the operating yield in almost every individual year.

## 3.3 Saugus Formation – General

Saugus wells operated by the Purveyors are located in the southern portion of the basin, south of the Santa Clara River (Figure 3-7). Consistent with the 2001 Update Report (Slade), the 2005 Basin Yield Report (CH2M Hill and LSCE), and the 2009 Updated Basin Yield Report (LSCE and GSI), the Purveyors have utilized the Saugus in accordance with the original (and the 2008) groundwater Operating Plan, in the range of 7,500 to 15,000 afy in average/normal years, with planned dry-year pumping of 15,000 to 35,000 afy for one to three consecutive dry years, when shortages to CLWA's SWP water supplies could occur. Such high pumping would be followed by periods of lower pumping (7,500 to 15,000 afy in average/normal years as noted above) in order to allow recharge to recover water levels and storage in the Saugus. Maintaining the substantial volume of water in the Saugus Formation remains an important strategy to help maintain water supplies in the Santa Clarita Valley during drought periods.

### 3.3.1 Saugus Formation – Historical and Current Conditions

Total pumping from the Saugus in 2010 was about 8,100 af, or about 400 af more than in the preceding year. Of the total Saugus pumping in 2010, most (about 7,200 af) was for municipal water supply, and the balance (900 af) was for agricultural and other irrigation uses. Historically, groundwater pumping from the Saugus peaked in the early 1990's and then steadily declined through the remainder of that decade. Since then, Saugus pumping has been in the range of about 4,000 to 8,000 afy, with the recent 5-year average at about 7,500 af per year. Most of the increase has been over the last two years, as the municipal use of Saugus water over the previous five-year period (2004-2008) had been relatively constant. On a long-term basis since the importation of SWP water, total pumping from the Saugus Formation has ranged between a low of about 3,700 afy (in 1999) and a high of nearly 15,000 afy (in 1991); average pumping from 1980 to present has been slightly more than 6,800 afy. These pumping rates remain well within, and generally at the lower end of the range of Operating Yield of the Saugus Formation. The overall historic record of Saugus pumping is illustrated in Figure 3-8.

Unlike the Alluvium, which has an abundance of wells with extensive water level records, the water level data for the Saugus Formation are limited by both the distribution of the wells in that Formation and the periods of water level records. The wells that do have water level records extending back to the mid-1960's indicate that groundwater levels in the Saugus Formation were

highest in the mid-1980's and are currently higher than they were in the mid-1960's (Figure 3-9). Based on these data, there is no evidence of any historic or recent trend toward permanent water level or storage decline. There continue to be seasonal fluctuations in groundwater levels but the prevalent longer-term trend is one of general stability.

Consistent with the 2001 Update Report (Slade), the 2005 Basin Yield Report (CH2M Hill and LSCE), the 2005 UWMP, the 2009 Updated Basin Yield Report (LSCE and GSI, 2009), and the 2010 UWMP, the Purveyors continue to maintain groundwater storage and associated water levels in the Saugus Formation so that supply is available during drought periods, when Alluvial pumping might be reduced and/or SWP or other supplemental supplies also decreased. The period of increased pumping during the early 1990's is a good example of this management strategy. Most notably, in 1991, when SWP deliveries were substantially reduced, increased pumping from the Saugus made up almost half of the decrease in SWP deliveries. The increased Saugus pumping over several consecutive dry years (1991-1994) resulted in short-term declining groundwater levels, reflecting the use of water from storage. However, groundwater levels subsequently recovered when pumping declined, reflecting recovery of groundwater storage in the Saugus Formation.

## 3.4 Imported Water

CLWA obtains the majority of its water supplies from the State Water Project (SWP), which is owned and operated by the California Department of Water Resources (DWR). CLWA is one of 29 contractors holding long-term SWP contracts with DWR. SWP water originates as rainfall and snowmelt in northern and central California. Runoff is stored in Lake Oroville, which is the project's largest storage facility. The water is then released from Lake Oroville down the Feather River to the Sacramento River and through the Sacramento-San Joaquin Delta. Water is diverted from the Delta into the Clifton Court Forebay, and then pumped into the 444-mile long California Aqueduct. SWP water is temporarily stored in San Luis Reservoir, which is jointly operated by DWR and the U.S. Bureau of Reclamation. Prior to delivery to CLWA, SWP supplies are stored in Castaic Lake, a terminal reservoir located at the end of the West Branch of the California Aqueduct.

CLWA's service area covers approximately 195 square miles (124,800 acres), including the City of Santa Clarita and surrounding unincorporated communities. SWP water from Castaic Lake is treated, filtered and disinfected at CLWA's Earl Schmidt Filtration Plant and Rio Vista Water Treatment Plant, which have a combined treatment capacity of 86 million gallons per day. Treated water is delivered from the treatment plants by gravity flow to each of the four Purveyors through a distribution network of pipelines and turnouts. At present, CLWA delivers

water to the four Purveyors through 26 potable turnouts as schematically illustrated in Figure 3-10.

In 2010, CLWA fulfilled the following major accomplishments in order to enhance, preserve, and strengthen the quality and reliability of existing and future supplies:

- coordinated preparation of the 2010 Urban Water Management Plan
- continued participation in a long-term water banking programs with Rosedale-Rio Bravo Water Storage District and the Semitropic Water Storage District. 32,256 af of water were delivered to the Rosedale-Rio Bravo Water Storage District, and 3,300 acre-feet were delivered to the purveyors after withdrawal from the Semitropic Water Storage District,
- continued implementation of the AB 3030 Groundwater Management Plan,
- continued implementation of the water conservation Best Management Practices, including measures in the Santa Clarita Valley Water Use Efficiency Plan
- continued participation in the Santa Clarita Valley Water Committee
- completed construction, and placed into operation, treatment and distribution facilities for restoration of a portion of municipal well capacity impacted by perchlorate contamination,
- continued cooperative effort with the U.S. Army Corps of Engineers for characterization studies of the former Whittaker-Bermite site and in a task force effort with the City of Santa Clarita, local legislators, and state agencies to effect the cleanup and remediation of all aspects of the former Whittaker-Bermite site, including perchlorate contamination of local groundwater,
- continued construction of the expansion of the Rio Vista Water Treatment Plant from 30 mgd to 60 mgd, and
- continued recycled water service.

### 3.4.1 State Water Project Table A Supplies

Each SWP contractor has a specified water supply amount shown in Table A of its contract that currently totals approximately 4.1 million af. The term of the CLWA contract is through 2038 and is renewable after that year. Although the SWP has not been fully completed, the SWP can deliver nearly all 4.1 million af of Table A Amounts during certain wet years.

CLWA has a contractual Table A Amount of 95,200 af per year of water from SWP.[1] On November 30, 2009, the initial allocation for 2010 was announced as 5 percent. The allocation was increased to 20 percent on March 30, 2010, to 30 percent on April 22, 2010, to 40 percent on May 3, 2010, to 45 percent on May 20, 2010, and finally to 50 percent on June 22, 2010. The allocation was not subsequently changed. CLWA's final allocation of Table A Amount for 2010 was thus 50 percent, or 47,600 af.

In addition to its Table A Amount, CLWA has access to 4,684 af of "flexible storage" in Castaic Lake. In 2005, CLWA negotiated an agreement with the Ventura County SWP contractors to allow CLWA to utilize their flexible storage account of 1,376 af. In combination, this provides total flexible storage of 6,060 af, which is maintained in Castaic Lake for use in a future dry period or an emergency. This amount was available in 2010, but was not utilized due to other available supplies.

Also in 2005, CLWA completed an agreement to participate in a long-term water banking program with Rosedale-Rio Bravo Water Storage District in Kern County. CLWA delivered 20,000 af of its excess Table A water into storage in both 2005 and 2006. CLWA delivered another 8,200 af into that storage account in 2007 and contributed 32,256 af of SWP and Buena Vista-Rosedale Rio Bravo water to the bank in 2010. This long-term program will allow the storage up to 100,000 af at any one time, and will provide significant dry year reliability for the Santa Clarita Valley.

The other banking component of CLWA's imported water supply reliability program is comprised of two agreements with Semitropic Water Storage District whereby CLWA banked surplus Table A water supply in 2002 and 2003. Notable in 2009 was the first recovery of water

[1] Of CLWA's 95,200 af annual Table A Amount, 41,000 afy was permanently transferred to CLWA in 1999 by Wheeler Ridge-Maricopa Water Storage District, a member unit of the Kern County Water Agency. CLWA's EIR prepared in connection with the 41,000 afy water transfer was challenged in Friends of the Santa Clara River v. Castaic Lake Water Agency (Los Angeles County Superior Court) ("Friends"). On appeal, the Court of Appeal held that since the 41,000 afy EIR tiered off the Monterey Agreement EIR that was later decertified, CLWA would also have to decertify its EIR as well and prepare a revised EIR. CLWA was not prevented from using any water that is part of the 41,000 afy transfer. Under the jurisdiction of the Los Angeles County Superior Court, CLWA prepared and circulated a revised Draft EIR for the transfer. CLWA approved the revised EIR in late 2004 ("2004 EIR") and lodged the EIR with the Los Angeles Superior Court. Thereafter, the case was dismissed with prejudice (i.e., permanently).

In January 2005, two new challenges to CLWA's 2004 EIR were filed in the Ventura County Superior Court by the Planning and Conservation League ("PCL") and by the California Water Impact Network ("CWIN"); these cases were consolidated and transferred to Los Angeles County Superior Court, Planning and Conservation League v. Castaic Lake Water Agency (Los Angeles County Superior Court,) ("PCL Action"). In May 2007, a final Statement of Decision was filed by the trial court in the PCL Action. It included a determination that the transfer is valid and cannot be terminated or unwound. The trial court did find one defect in the 2004 EIR, requiring Judgment to be entered against CLWA. The defect, however, did not relate to the environmental conclusions reached in the 2004 EIR. Notices of Appeal were filed by PCL and CWIN and the Agency, Kern County Water Agency, and Wheeler Ridge-Maricopa Water Storage District filed notices of cross-appeals. On December 17, 2009, the Court of Appeal issued a published opinion in which it reversed the trial court's Judgment, and found that the 41,000 afy EIR fully complied with CEQA, and remanded the matter to the trial court with directions to issue a new judgment denying PCL's and CWIN's challenges in their entirety. A petition for rehearing was filed by PCL and CWIN on January 4, 2010 but was denied on January 14, 2010. On January 26, 2010, PCL and CWIN filed a petition for review with the California Supreme Court, but the Court denied the petition on March 10, 2010.

from the 2002 account; of 4,950 af withdrawn in 2009, 1,650 af was delivered for water supply in the Valley in 2009, and the 3,300 af balance was delivered in 2010.

As delineated in Table 3-2, with the 50 percent Table A allocation and other imported water supplies, including 28,303 af of carryover from 2008 and 2009, CLWA had total available supply of 90,498 af in 2010, the largest part of which was delivered to the Rosedale-Rio Bravo Water Banking Program (32,256 af) and to the Purveyors (30,578 af), leaving 26,186 af of Table A Amount available for carryover to 2011. As summarized in Chapter 4, CLWA was able to use 3,712 af of the total available 2010 carryover before the SWP system reservoirs went into a 'spill' mode due to wet hydrologic conditions.

### 3.4.2 Other Imported Water Supplies

In early 2007, CLWA finalized a Water Acquisition Agreement with the Buena Vista Water Storage District (Buena Vista) and the Rosedale-Rio Bravo Water Storage District (Rosedale-Rio Bravo) in Kern County. Under this Program, Buena Vista's high flow Kern River entitlements (and other acquired waters that may become available) are captured and recharged within Rosedale-Rio Bravo's service area on an ongoing basis. CLWA receives 11,000 af of these supplies annually through either exchange of Buena Vista's and Rosedale-Rio Bravo's SWP supplies or through direct delivery of water to the California Aqueduct via the Cross Valley Canal.

In 2008, CLWA entered into the Yuba Accord Agreement, which allows for the purchase of water from the Yuba County Water Agency through the Department of Water Resources to 21 State Water Project contractors (including CLWA) and the San Luis and Delta-Mendota Water Authority. Up to 850 of non-SWP supply is available to CLWA in critically dry years. Under certain hydrologic conditions, additional water may be available to CLWA from this program. CLWA chose not to purchase any water from this source in 2010.

### 3.4.3 Imported Water Supply Reliability

The current SWP Delivery Reliability Report 2009, issued in August, 2010, incorporates restrictions on SWP operations according to the Biological Opinions of the U.S. Fish and Wildlife Service and the National Marine Fishery Service issued on December 15, 2008 and June 4, 2009, respectively. However, in December 2010, a federal judge overruled most of the 2008 federal biological opinion and invalidated several of the criteria that reduced SWP's water supply. The effects of this reversal are still not completely known, but will probably result in some relief from SWP pumping restrictions in the long term. The current SWP Delivery

**Table 3-2**
**2010 CLWA Imported Water Supply and Disposition**
**(acre-feet)**

| | | |
|---|---|---|
| ***Supply*** | | |
| Net 2008 and 2009 SWP Carryover to 2010 [1] | | 28,303 |
| Buena Vista/Rosedale Rio-Bravo | | 11,000 |
| Yuba County Accord Water | | 0 |
| 2010 SWP Turnback Pool Water | | 295 |
| Semitropic Water Banking and Exchange Program | | 3,300 |
| 2010 Final SWP Table A Allocation [2] | | 47,600 |
| **Total 2010 Imported Water Supply** | | **90,498** |
| | | |
| ***Disposition*** | | |
| Purveyor Deliveries (Total) | | 30,578 |
| *CLWA SCWD* | *15,188* | |
| *Valencia Water Company* | *11,214* | |
| *Newhall County Water District* | *3,035* | |
| *Los Angeles County WWD 36* | *1,141* | |
| Deliveries to Devil's Den | | 768 |
| CLWA/DWR/Purveyor Metering[3] | | 710 |
| Rosedale – Rio Bravo Water Banking and Exchange Program | | 32,256 |
| 2010 Table A Carryover to 2011[4] | | 26,186 |
| **Total 2010 Imported Water Disposition** | | **90,498** |

1. Total 2008 and 2009 carryover to 2010; amount used by CLWA, based on final DWR delivery accounting was 28,303 af.

2. Final 2010 allocation was 50% of contractual Table A amount of 95,200 acre-feet, which progressed as follows:

| | |
|---|---|
| Initial allocation, November 30, 2009 | 5% |
| Allocation increase, February 23, 2010 | 15% |
| Allocation increase, March 30, 2010 | 20% |
| Allocation increase, April 22, 2010 | 30% |
| Allocation increase, May 3, 2010 | 40% |
| Allocation increase, May 20, 2010 | 45% |
| Final allocation, June 22, 2010 | 50% |

3. Reflects meter reading differences.

4. Total 2010 Table A carryover to 2011.

Reliability Report 2009 also considers the impacts on SWP delivery reliability due to climate change, sea level rise, and vulnerability of the Delta's conveyance system and structure due to floods and earthquakes. With these factors, the Reliability Report projects long-term reliability of 60 percent during normal year hydrology. CLWA staff has assessed the impact of the current Reliability Report on the CLWA water supply and concluded in the 2010 UWMP that current and anticipated supplies are available to meet anticipated water supply needs through the year 2050.

Groundwater banking and conjunctive use offer significant opportunities to improve water supply reliability for CLWA. Groundwater banking is the process of storing available supplies of water in groundwater basins during wet years or when supplemental water is otherwise available. During dry periods, or when imported water supply availability is reduced, banked water can be recovered from groundwater storage to replace, or firm up, the imported water supply deliveries.

As described herein, CLWA has entered into two groundwater banking programs and now has, in aggregate, more than 140,000 af of recoverable water in banked groundwater storage outside the local groundwater basin. The first component of CLWA's overall groundwater banking program is the result of two 10-year agreements between CLWA and Semitropic Water Storage District whereby, over the terms of the two agreements, CLWA can withdraw up to 45,920 af of SWP Table A water that it stored in Semitropic to meet Valley demands when needed in dry years (45,920 af is the net recoverable balance after originally banking 24,000 af in 2002 and 32,522 af in 2003, and withdrawing 4,950 af in 2009 for delivery in 2009 and 2010). In April, 2011, Semitropic and CLWA extended the original agreements by 10 years to 2022/2023. The second component of the program, the long-term Rosedale-Rio Bravo Water Banking and Exchange Program in Kern County, has a recoverable total of 94,513 acre-feet in storage (including 32,256 af delivered in 2010, less contractual losses).

Conjunctive use is the purposeful integrated use of surface water and groundwater supplies to maximize water supply from the two sources. CLWA and the Purveyors have been conjunctively utilizing local groundwater and imported surface water since the initial importation of SWP water in 1980. The groundwater banking programs described above allow CLWA to firm up the imported water component of conjunctive use in the Valley by storing surplus SWP and other water, in wet years, in groundwater basins outside the Valley. This allows recovery and importation of that water as needed in dry years to maintain a greater overall amount of imported surface water to be used conjunctively with local groundwater, further supporting the sustainable use of local groundwater at the rates in the groundwater operating plan.

## 3.5 Water Quality – General

Water delivered by the Purveyors consistently meets drinking water standards set by the Environmental Protection Agency (EPA) and the California Department of Public Health (DPH). An annual Water Quality Report is provided to all Santa Clarita Valley residents who receive water from one of the four water retailers. There is detailed information in that report about the results of quality testing of the groundwater and treated SWP water supplied to the residents of the Santa Clarita Valley during 2010. Several constituents of particular local interest are discussed in more detail below.

**Total Trihalomethanes**

In 2002, the United States Environmental Protection Agency implemented the new Disinfectants and Disinfection Byproducts Rule. In part, this rule established a new Maximum Contaminant Level (MCL) of 80 µg/l (based on an annual running average) for Total Trihalomethanes (TTHM). TTHMs are byproducts created when chlorine is used as a means for disinfection. CLWA and the Purveyors implemented an alternative method of disinfection, chloramination, in 2005 to maintain compliance with the new rule and future regulations relating to disinfection byproducts. TTHM concentrations have remained significantly below the MCL since implementation of alternative disinfection.

**Perchlorate**

Perchlorate has been a water quality concern in the Valley since 1997 when it was originally detected in four wells operated by the Purveyors in the eastern part of the Saugus Formation, near the former Whittaker-Bermite facility. In late 2002, perchlorate was detected in a fifth municipal well, in this case an Alluvial well (SCWD's Stadium Well) also located near the former Whittaker-Bermite site. In early 2005, perchlorate was detected in a second Alluvial well (VWC's Well Q2) near the former Whittaker-Bermite site. In 2006, a very low concentration of perchlorate was detected to be present below the Detection for Reporting Limit (<4.0 µg/l) in another Saugus well (NCWD's Well NC-13), near one of the originally impacted wells. Most recently, in August 2010, perchlorate was detected further downgradient in an eighth well, Valencia's Saugus Well 201. While the initial detection was below the MCL, the well was immediately taken out of active supply service. VWC is currently pursuing restoration alternatives. Other monitoring has been completed and a focused study of the Saugus Formation has ultimately been incorporated into the overall groundwater remediation and removal actions submitted by Whittaker-Bermite and reviewed by the State Department of Toxic Substances Control (DTSC) as discussed below.

Perchlorate is a regulated chemical in drinking water. In October, 2007, DPH established a MCL for perchlorate of 6 µg/l. Prior to that, wells with perchlorate concentrations exceeding the then-applicable Action Level (18 µg/l) or, subsequently, the then-applicable Notification Level (6 µg/l) were removed from active water supply service. One of the Alluvial wells (VWC's Well Q2) was returned to active water supply service, with treatment, in late 2005 as discussed below. Saugus Well NC-13 has remained in service with regular sampling per DPH requirements and no subsequent detections of perchlorate. NC-11 has remained out of service with its capacity replaced by other sources through a SWP turnout. Two wells (VWC's Well 157 and SCWD's Stadium Well) have been sealed and replaced by new wells, and two wells (SCWD's Saugus 1 & 2 Wells) have recently been returned to service as described below. The 2005 UWMP specifically addressed the adequacy of groundwater supply in light of the inactivation of the impacted Alluvial and Saugus wells; and it addressed the plan and schedule for restoration of perchlorate-impacted wells, including the protection of existing non-impacted wells. As now summarized in the 2010 UWMP, the replacement and reactivation of the impacted wells, augmented by planned and funded replacement wells, adds to the overall ability to meet the groundwater component of total water supply in the Valley. As noted above, Well V201 was taken out of service in August, 2010. Initial plans for restoration are expected to involve some combination of methodologies already employed at other previously impacted wells, installation of wellhead treatment and/or well replacement.

In 2000, CLWA and the impacted Purveyors filed a lawsuit against Whittaker Corporation (the former owner of the contaminated property) and Santa Clarita LLC and Remediation Financial, Inc. (the owners of record at that time). The lawsuit sought to have defendants pay all necessary costs of response, removal of the contaminant, remedial actions, and any liabilities or damages associated with the contamination. An Interim Settlement and Funding Agreement was reached in 2003. Although that Agreement expired in January 2005, the parties, under DTSC oversight, jointly developed a plan to "pump and treat" contaminated water from two of the Purveyors' impacted wells to stop migration of the contaminant plume and to partially restore the municipal well capacity that has been impacted by perchlorate. The parties also continued negotiations intended to achieve a long term settlement to the litigation through 2006, and a final settlement was completed and executed in April 2007.

Since 2007, the impacted Purveyors (SCWD, NCWD, and VWC) and CLWA continued working toward implementation of a jointly developed plan that would combine pumping from two of the impacted wells and a water treatment process to restore the impacted pumping capacity and control the migration of contamination in the aquifer. The development and implementation of a cleanup plan for the Whittaker-Bermite site and the impacted groundwater is being coordinated

among CLWA, the impacted Purveyors, the State DTSC, and U.S. Army Corps of Engineers. DTSC is the lead agency responsible for regulatory oversight of the Whittaker-Bermite site.

In February 2003, DTSC and the impacted Purveyors entered into a voluntary cleanup agreement entitled *Environmental Oversight Agreement*. Under the Agreement, DTSC is providing review and oversight of the response activities being undertaken by the Purveyors related to the detection of perchlorate in the impacted wells. Under the Agreement's Scope of Work, the impacted Purveyors prepared a Work Plan for sampling the production wells, a report on the results and findings of the production well sampling, a draft Human Health Risk Assessment, a draft Remedial Action Workplan, an evaluation of treatment technologies and an analysis showing the integrated effectiveness of a project to restore impacted pumping capacity, extract perchlorate-impacted groundwater from two Saugus wells for treatment, and control the migration of perchlorate in the Saugus Formation. Environmental review of that project was completed in 2005 with adoption of a mitigated Negative Declaration. The Final Interim Remedial Action Plan for containment and extraction of perchlorate was completed and approved by DTSC in January, 2006. Design of the treatment facilities and related pipelines is complete. Construction of those facilities and pipelines to implement the pump and treat program and to also restore inactivated municipal well capacity began in November, 2007 and was completed May, 2010. Water from Saugus 1 and Saugus 2 was initially treated and discharged into the Santa Clara River. DPH issued an amendment to CLWA's Operating Permit in December, 2010, and the wells were placed back in service on January 25, 2011.

Under the direction of DTSC, Whittaker has submitted a comprehensive site-wide remediation plan for the contaminants of concern in soil and groundwater detected on the property. A Draft Remedial Action Plan for Operable Units 2 through 6 that is focused on soil remediation was submitted to DTSC in 2009. The plan contains a number of recommended technologies to remove contaminants from the soil, in addition to a proposed clean-up schedule for the site. Whittaker has also completed a Draft Operable Unit 7 Feasibility Study to identify and select treatment technologies for both on-site and off-site groundwater. The work plan for Pilot Remediation of Saugus Aquifer Containment and Remediation was approved by DTSC on December 31, 2008 and the plan is currently being implemented. DTSC approved the Remedial Action Plan for contaminated soils in Operable Units 2 through 6 on December 6, 2010 and Preparation of the Remedial Design documents is underway. Field implementation of the soil remediation is expected to begin in fall 2011.

As noted above, perchlorate was detected in a second Alluvial well, VWC's Well Q2, in early 2005. In response, Valencia removed the well from active service, and commissioned the preparation of an analysis and report assessing the impact of, and response to, the perchlorate

contamination of that well. Valencia's response for Well Q2 was to obtain permitting for installation of wellhead treatment, followed by installation of treatment facilities and returning the well to water supply service in October 2005. After nearly two years of operation with wellhead treatment, including regular monitoring specified by DPH, all of which resulted in no detection of perchlorate in Well Q2, Valencia requested that DPH allow treatment to be discontinued. DPH approved that request in August 2007, and treatment was subsequently discontinued. DPH-specified monitoring for perchlorate continues at Well Q2; there has been no detection of perchlorate at this well since discontinuation of wellhead treatment.

On January 25, 2011, Castaic Lake Water Agency's Saugus Perchlorate Treatment Facility (SPTF) came on line. Numerous monitoring tests are performed each week in order to ensure the safety of the water leaving the plant. Samples are collected weekly at the Saugus 1 and Saugus 2 wells, influent water point, effluent water point and lead and lag vessels as well as several other distribution locations. The samples are analyzed for many pollutants, including chlorate, perchlorate, chloride, nitrate, nitrite and sulfate. In addition samples are analyzed for microbiological growth, radiological and volatile organic compounds. Castaic Lake Water Agency is also conducting initial monitoring to complete California DPH permit requirements.

On the Whittaker-Bermite site, soil remediation activities in operating unit subareas started in 2005. Groundwater "pump and treat" operations in the Northern Alluvium, which also started in 2005, continued through 2010. Expanded pumping, intended to effect perchlorate containment as well as to treat 'hot spots' in the Northern Alluvium, became operational in October, 2007. Also on the Whittaker-Bermite site, remediation work in the Saugus Formation is underway. Additional objectives of this project include the reduction of further transport of contaminants to regional groundwater and reduction of the size of the contaminant mass in deep/perched zones.

**Hardness**

In 2008, the Valencia Water Company began a demonstration project delivering pre-softened groundwater from one of its wells to approximately 420 residents located in the Copperhill Community of Valencia. Hard water is the primary complaint from Valencia customers and it is estimated that more than 50 percent have installed individual water softening units at their homes. In addition to having high operating costs, many of these units are designed to discharge a brine (salt) solution to the sanitary sewer system that is eventually discharged to the Santa Clara River, or is part of the recycled water supply. The environmental impact of such discharges was the subject of a major Chloride Total Maximum Daily Load investigation which concluded with a commitment by the Purveyors to achieve surface water quality goals for in-stream discharge from the basin. Valencia's project is aimed at improving the quality of water

for its customers to eliminate the need for home softening devices and to achieve the environmental benefits of reduced chloride discharge to the river.

The demonstration project utilizes softening technology that removes calcium and produces small calcium carbonate pellets which can be reused in a variety of industries. The demonstration project has now been operated for over two years and provides the water company with customer feedback and technical/financial information to assess potential future expansion of treatment to other well sites.

### 3.5.1 Groundwater Quality – Alluvium

Groundwater quality is, of course, a key factor in assessing the Alluvial aquifer as a municipal and agricultural water supply. Groundwater quality details and long-term conditions, examined by integration of individual records from several wells completed in the same aquifer materials and in close proximity to each other, have been discussed in previous annual Water Reports and in the 2010 UWMP. There were some changes in groundwater quality in 2010 that reflect fluctuations, trends, or other groundwater quality conditions as illustrated in Figures 3-11 and 3-12. These graphs show historical specific conductance values for representative wells in the Valley ('Above Saugus WRP', 'Below Saugus WRP', 'Bouquet Canyon', and 'Castaic Valley' areas) with the California Department of Public Health Secondary Maximum Levels included for reference. By 2007-2008, some of the trends show a significant lowering of the specific conductance values by half following the wet years of 2004-2005. Since 2007-2008, most of those trends have returned to about 2004 levels. In summary, water quality in the Alluvium exhibits: no long-term overall trends and, most notably, no decline in Alluvial groundwater quality that exceeds historical conditions; and periodic fluctuations in some parts of the basin, where groundwater quality has inversely varied with precipitation and stream flow. Those variations are typically characterized by increased mineral concentrations through dry periods of lower stream flow and lower groundwater recharge, such as is currently occurring, followed by lower mineral concentrations through wetter periods of higher stream flow and higher groundwater recharge.

The presence of long-term consistent water quality patterns, although intermittently affected by wet and dry cycles, supports the conclusion that the Alluvial aquifer remains a viable ongoing water supply source in terms of groundwater quality.

### 3.5.2 Groundwater Quality – Saugus Formation

As discussed above for the Alluvium, groundwater quality is a key factor in also assessing the Saugus Formation as a municipal and agricultural water supply. As with groundwater level data, long-term Saugus groundwater quality data are not sufficiently extensive to permit any sort of basin-wide analysis or assessment of pumping-related impacts on quality. However, integration of individual records from several wells has been used to examine general water quality trends. Based on those records, water quality in the Saugus Formation has not historically exhibited the precipitation-related fluctuations seen in the Alluvium. Based on available data over the last 50 years, groundwater quality in the Saugus has exhibited a slight overall increase in dissolved mineral content as illustrated in Figure 3-13. More recently, several wells within the Saugus Formation have exhibited an additional increase in dissolved mineral content, similar to short-term changes in the Alluvium, possibly as a result of recharge to the Saugus Formation from the Alluvium. Since 2005, however, these levels have been steadily dropping or remaining constant. Dissolved mineral concentrations in the Saugus Formation remain below the Secondary (aesthetic) Upper Maximum Contaminant Level. Groundwater quality within the Saugus will continue to be monitored to ensure that degradation to the long-term viability of the Saugus as a component of overall water supply does not occur.

### 3.5.3 Imported Water Quality

CLWA operates two surface water treatment plants, the Earl Schmidt Filtration Plant located near Castaic Lake and the Rio Vista Water Treatment Plant located in Saugus. CLWA produces water that meets drinking water standards set by the U.S. EPA and DPH. SWP water has different aesthetic characteristics than groundwater with lower dissolved mineral concentrations (total dissolved solids) of approximately 250 to 360 mg/l, and lower hardness (as calcium carbonate) of about 105 to 135 mg/l.

Historically, the State Water Project (SWP) delivered only surface water from the Sacramento-San Joaquin River Delta. However, CLWA and other SWP users, in anticipation of drought, many years ago began “water banking” programs where SWP water could be stored or exchanged during wet years and withdrawn in dry years. The last four years have seen state-wide drought. As a result, water has been withdrawn from the water banking programs and pumped into the SWP system. During the period of 2008 through 2010, a greater portion of water in the SWP has been this “pumped-in” water. The “pumped-in” water has met all water quality standards established by DWR under its anti-degradation policy for the SWP.

## 3.6 Recycled Water

Recycled water is available from two water reclamation plants operated by the Santa Clarita Valley Sanitation District. In 1993, CLWA prepared a draft Reclaimed Water System Master Plan that outlined a multi-phase program to deliver recycled water in the Valley. CLWA previously completed environmental review on the construction of Phase I of the project, which will ultimately deliver 1,700 afy of recycled water. Deliveries of recycled water began in 2003 for irrigation water supply at a golf course and in roadway median strips. In 2010, recycled water deliveries were 336 af, generally consistent with recycled water deliveries that have ranged between about 300 and nearly 500 afy over the past eight years.

Surveys conducted by CLWA indicate an interest for recycled water by existing water users as well as by future development as recycled water becomes available. In 2002, CLWA produced an updated Draft Recycled Water Master Plan. Overall, the program is expected to ultimately recycle up to 17,400 af of treated (tertiary) wastewater suitable for reuse on golf courses, landscaping and other non-potable uses, as set forth in the UWMP. This is in addition to an expected recycled water use of approximately 5,400 af per year in the Newhall Ranch Specific Plan development.

In 2007, CLWA and the Purveyors completed California Environmental Quality Act (CEQA) analysis of the Recycled Water Master Plan (2002). This analysis consisted of a Program Environmental Impact Report (PEIR) covering the various options for a recycled water system as outlined in the Master Plan. The PEIR was certified by the CLWA Board in March 2007.

CLWA and the Purveyors are preparing the design of the second phase of the Recycled Water Master Plan (Phase IIA) that will take water from the Saugus Water Reclamation plant and distribute it to identified users to the north, across the Santa Clara River and then to the west and the east, which will include service to Santa Clarita Central Park. The environmental documentation for this phase is nearly complete. There is also a new phase of the of the recycled water system (Phase IIC) in design that would extend the existing system southward from the intersection of Valencia Boulevard and the Old Road, south along Rockwell Canyon Road to the intersection of Orchard Village Road and Lyons Avenue, serving large irrigation customers along its proposed alignment. Collectively, these phases will have design capacity to increase recycled water deliveries by about 1,500 afy.

## 3.7 Santa Clara River

The Memorandum of Understanding (MOU) between the Santa Clarita Valley Purveyors and the United Water Conservation District, which manages surface and groundwater resources in seven groundwater basins in the Lower Santa Clara River Valley Area, was a significant accomplishment when it was prepared and executed in 2001. The MOU initiated a collaborative and integrated approach to data collection; database management; groundwater flow modeling; assessment of groundwater basin conditions, including determination of basin yield amounts; and preparation and presentation of reports, including continued annual reports such as this one for current planning and consideration of development proposals, and also including more technically detailed reports on geologic and hydrologic aspects of the overall stream-aquifer system. Meetings of the MOU participants have continued, and coordination of the Upper (Santa Clarita Valley) and Lower (United WCD) Santa Clara River databases has been accomplished. As discussed above, a numerical groundwater flow model of the entire Santa Clarita groundwater basin was developed and calibrated in 2002-2004. Subsequent to its initial use in 2004 for assessing the effectiveness of various operating scenarios to restore pumping capacity impacted by perchlorate contamination (by pumping and treating groundwater for water supply while simultaneously controlling the migration of contaminated groundwater), the model was used in 2005 for evaluation of basin yield under varying management actions and hydrologic conditions. The results completed the determination of sustainable operating yield values for both the Alluvium and the Saugus Formation, which were incorporated in the 2005 UWMP. The updated analysis of basin yield, completed in 2009, indicates that the 2008 Operating Plan will maintain river flows at higher levels than occurred prior to urbanization of the Valley; the resultant operating yield values for both the Alluvium and the Saugus Formation are now incorporated in the 2010 UWMP.

On occasion, issues have been raised about whether use and management of groundwater in the Santa Clarita Valley have adversely impacted surface water flows into Ventura County. Part of the groundwater modeling work has addressed the surface water flow question as well as groundwater levels and storage. While the sustainability of groundwater has logically derived primarily from projected long-term stability of groundwater levels and storage, it has also derived in part from modeled simulations of surface water flows and the lack of streamflow depletion by groundwater pumping. In addition, the long-term history of groundwater levels in the western and central part of the basin, as illustrated in Figures 3-4 and 3-5, supports the modeled analysis and suggests that groundwater has not been lowered in such a way as to induce infiltration from the river and thus impact surface water flows.

Historical annual stream discharge in the Santa Clara River, into and out of the Santa Clarita Valley, is shown on Figure 3-14. The upstream gage at Lang Station was reinstated in 2002 and shows a wide range of average annual inflow over the last seven years. The downstream gage was moved in 1996 to its present location near Piru, about two miles downriver from the former County Line Gage. The combined record (1953-2010) of these two downstream gages indicates an annual stream discharge of about 47,000 afy. These data gaged near the County line show notably higher flows from the Santa Clarita Valley into the uppermost downstream basin, the Piru Basin, over the last 35 to 40 years.

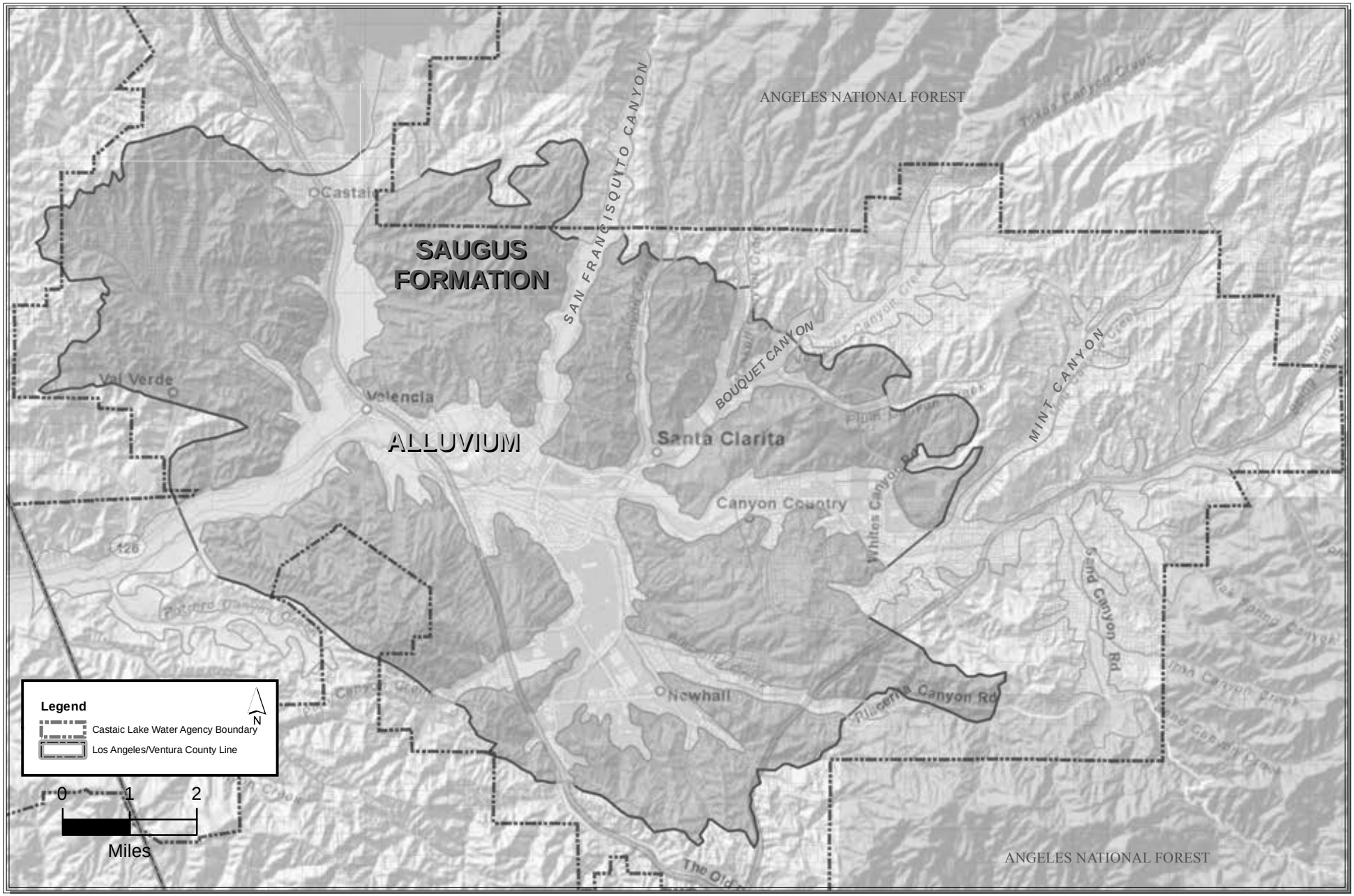


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**Figure 3-1**
**Santa Clara River Valley, East Groundwater Subbasin**

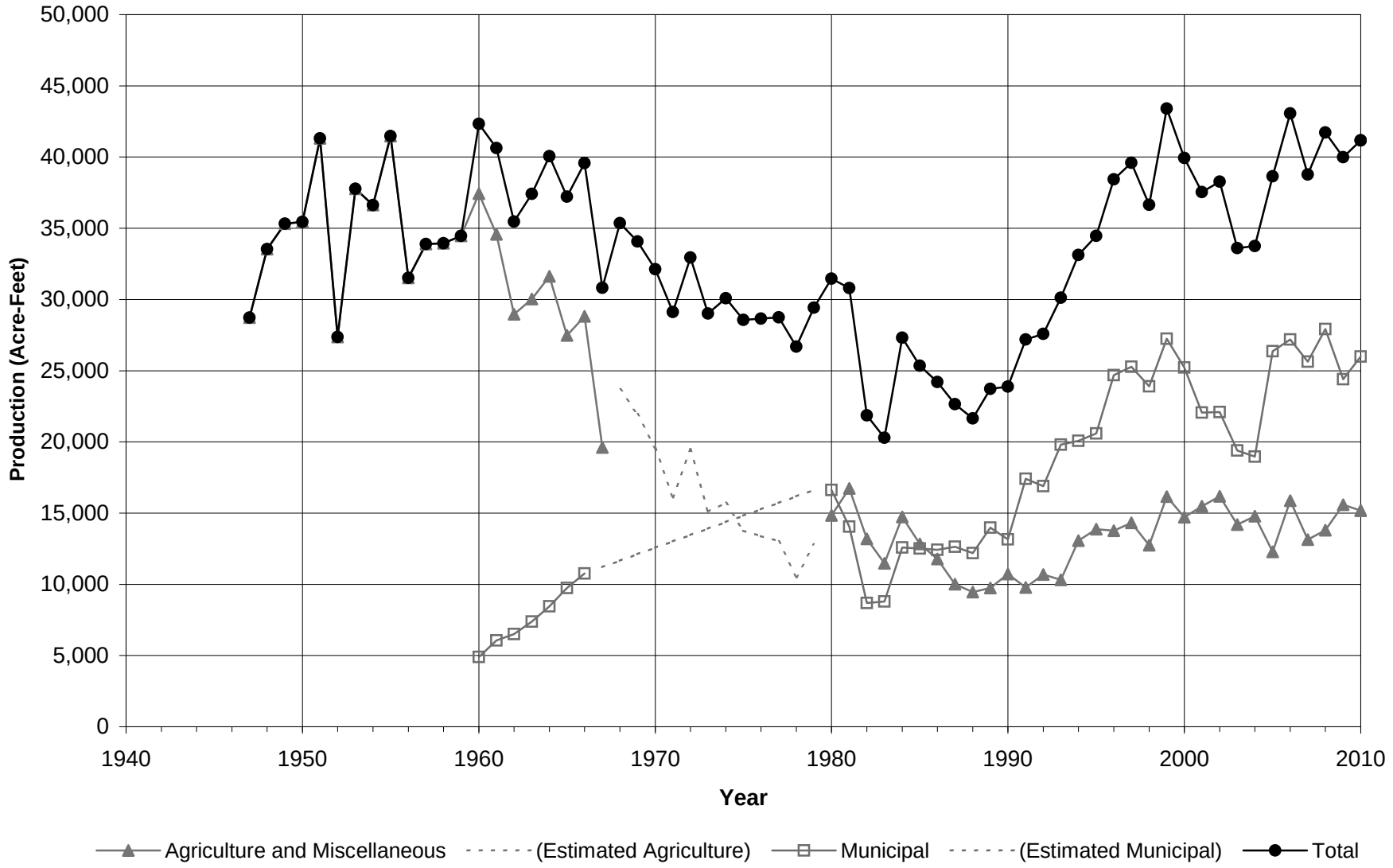


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**Figure 3-2**
**Groundwater Production - Alluvium**
**Santa Clara River Valley, East Groundwater Subbasin**

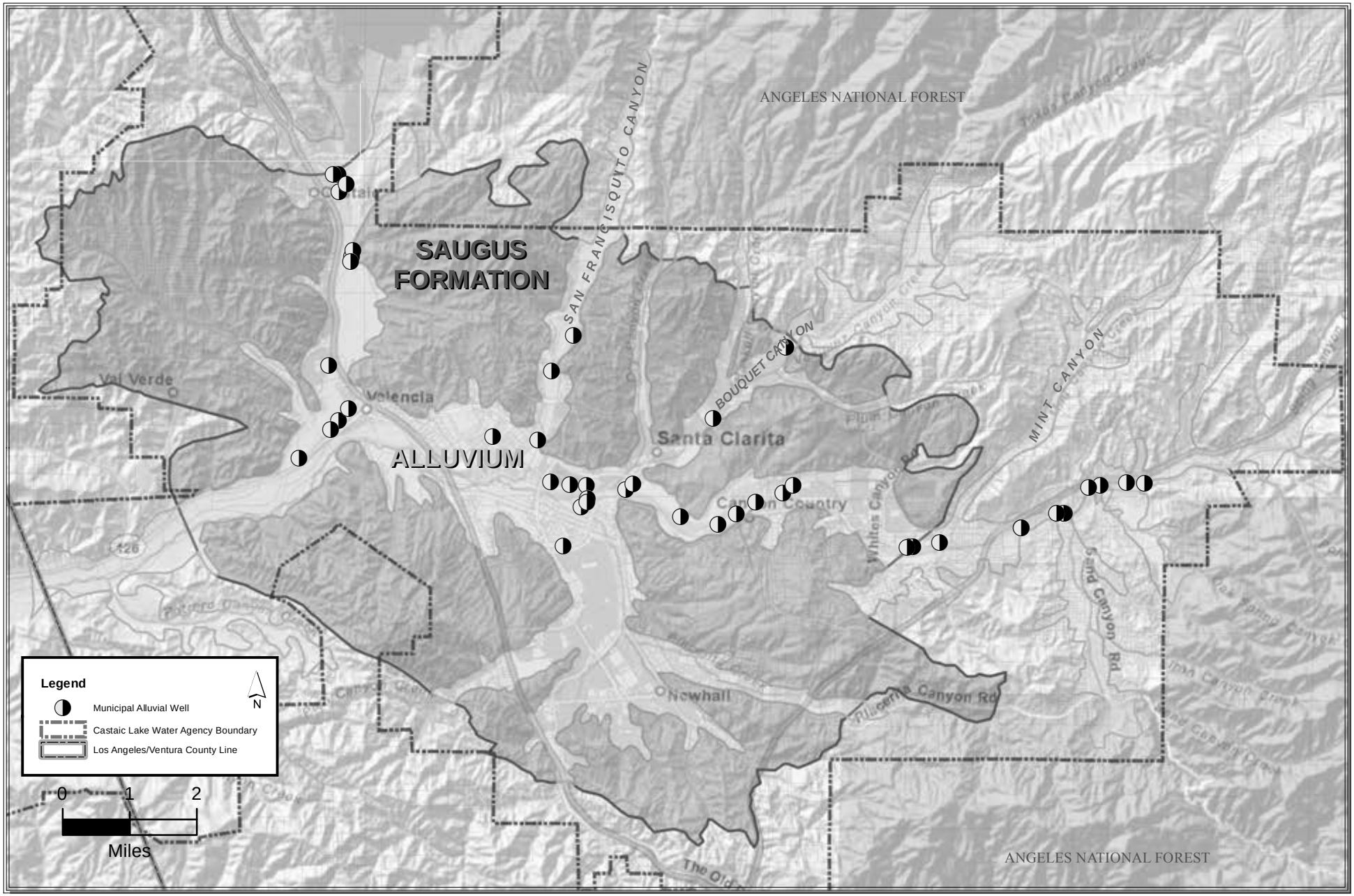


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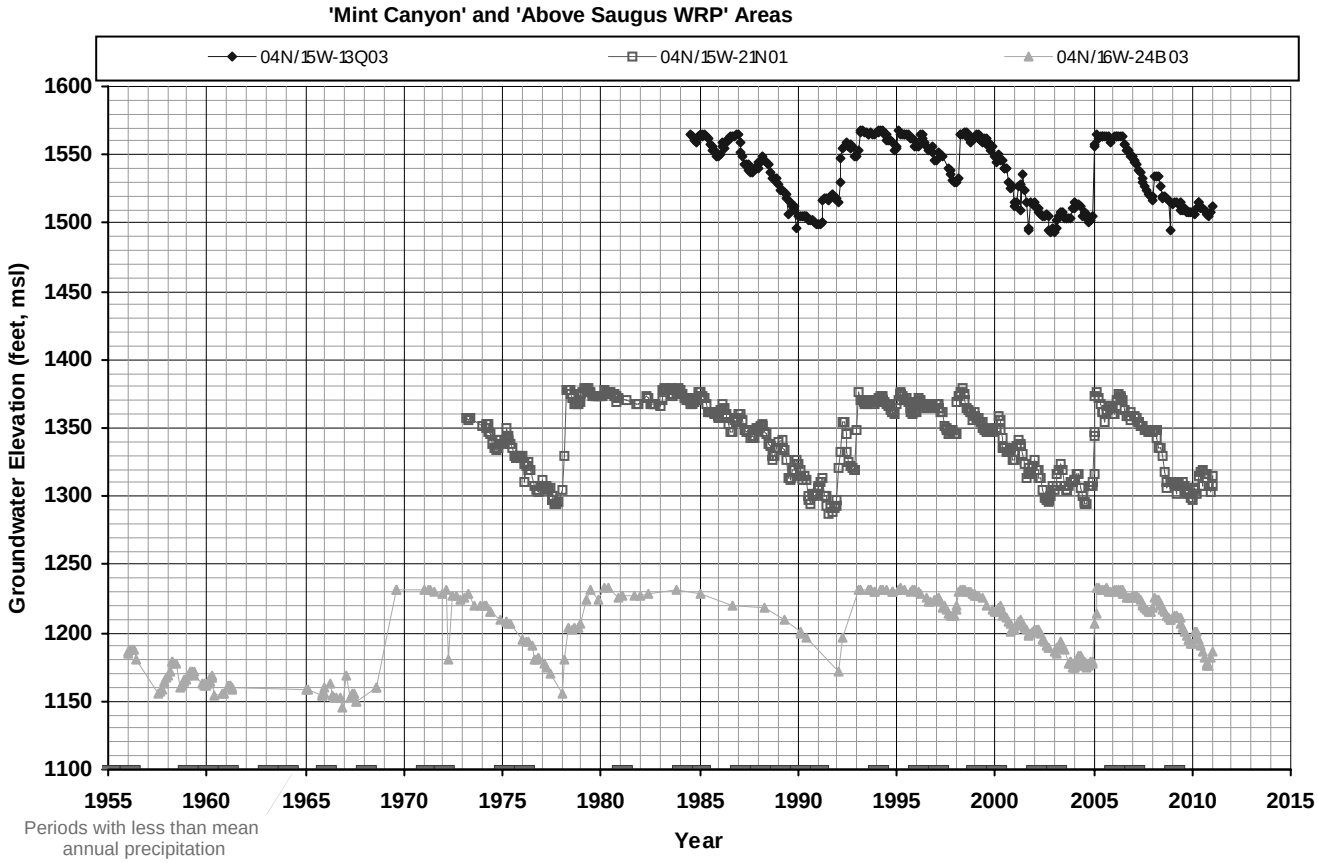
**Figure 3-3**
**Municipal Alluvial Well Locations**
**Santa Clara River Valley, East Groundwater Subbasin**



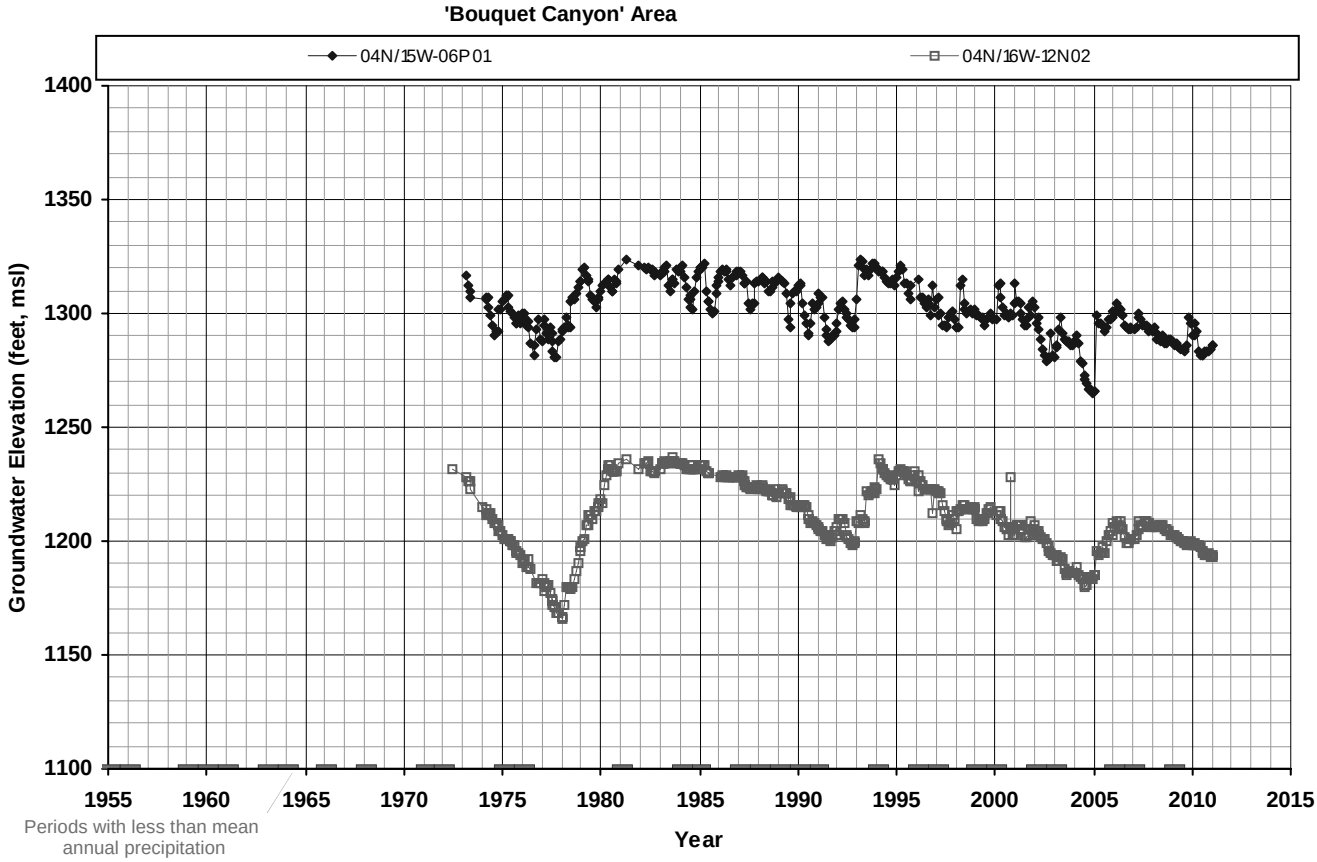




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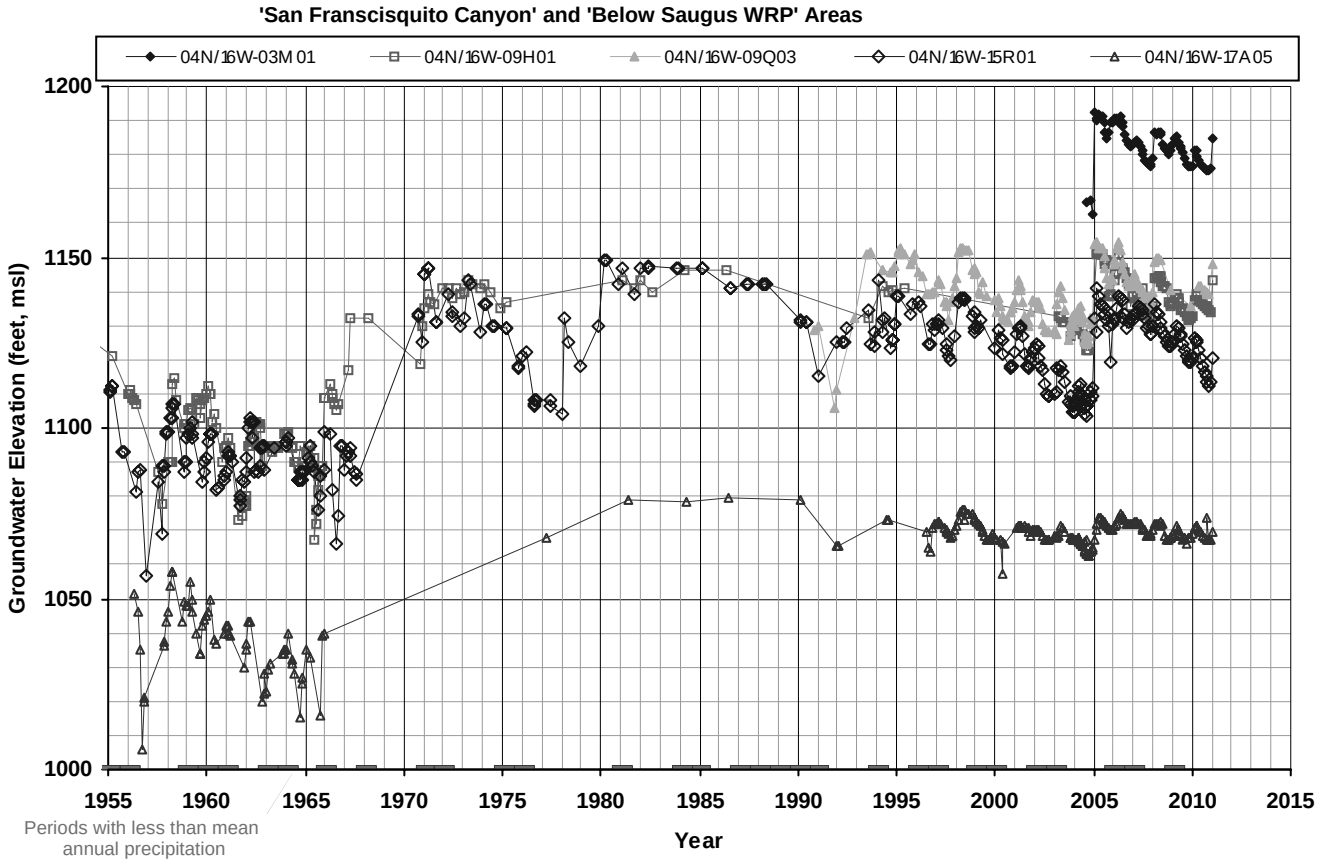
**Figure 3-4**
**Groundwater Elevations in Eastern Santa Clarita Valley Alluvial Wells**



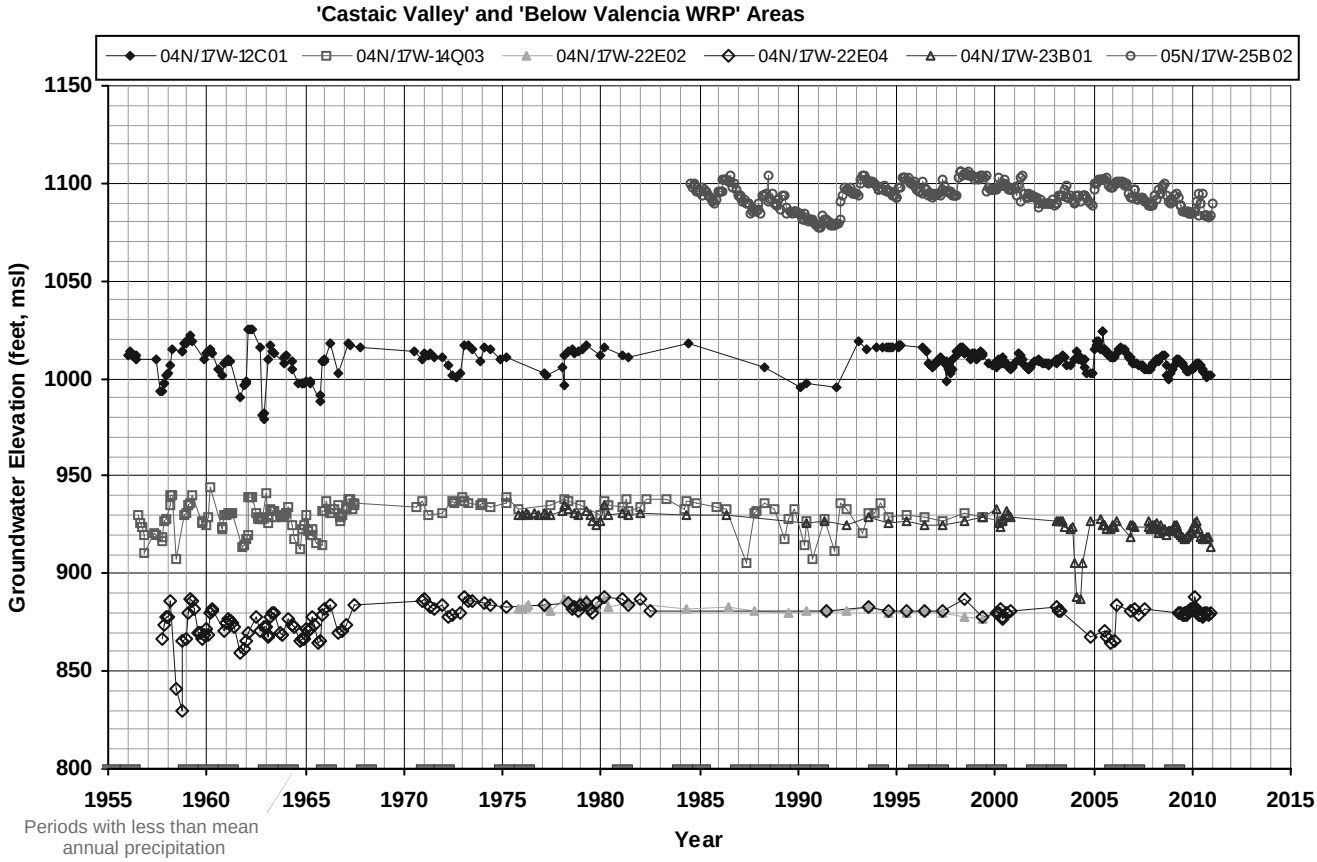




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**Figure 3-5**
**Groundwater Elevations in Western Santa Clarita Valley Alluvial Wells**

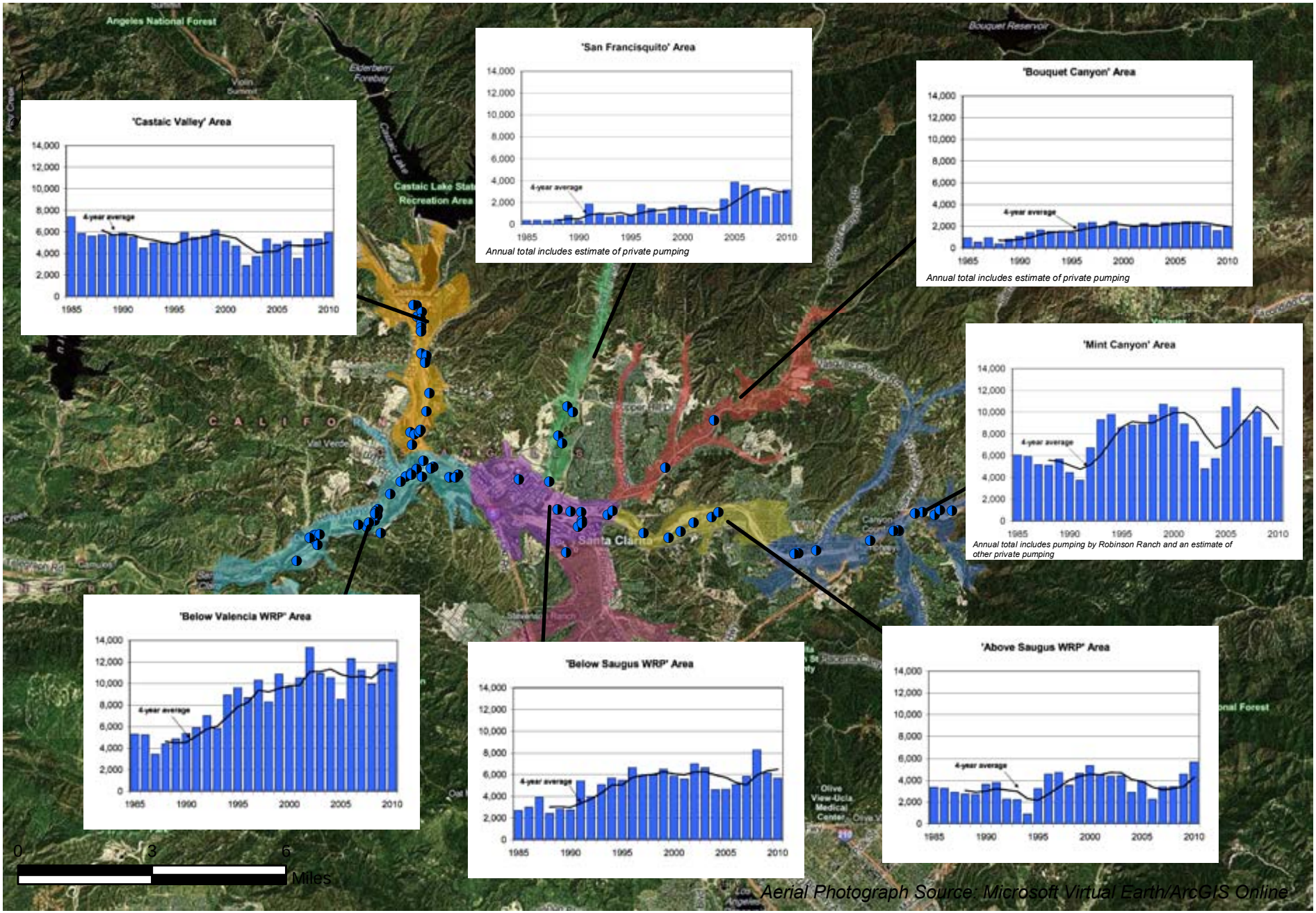


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**Figure 3-6**
**Annual Groundwater Production from Alluvium by Area (Acre-feet)**
**Santa Clara River Valley, East Groundwater Subbasin**

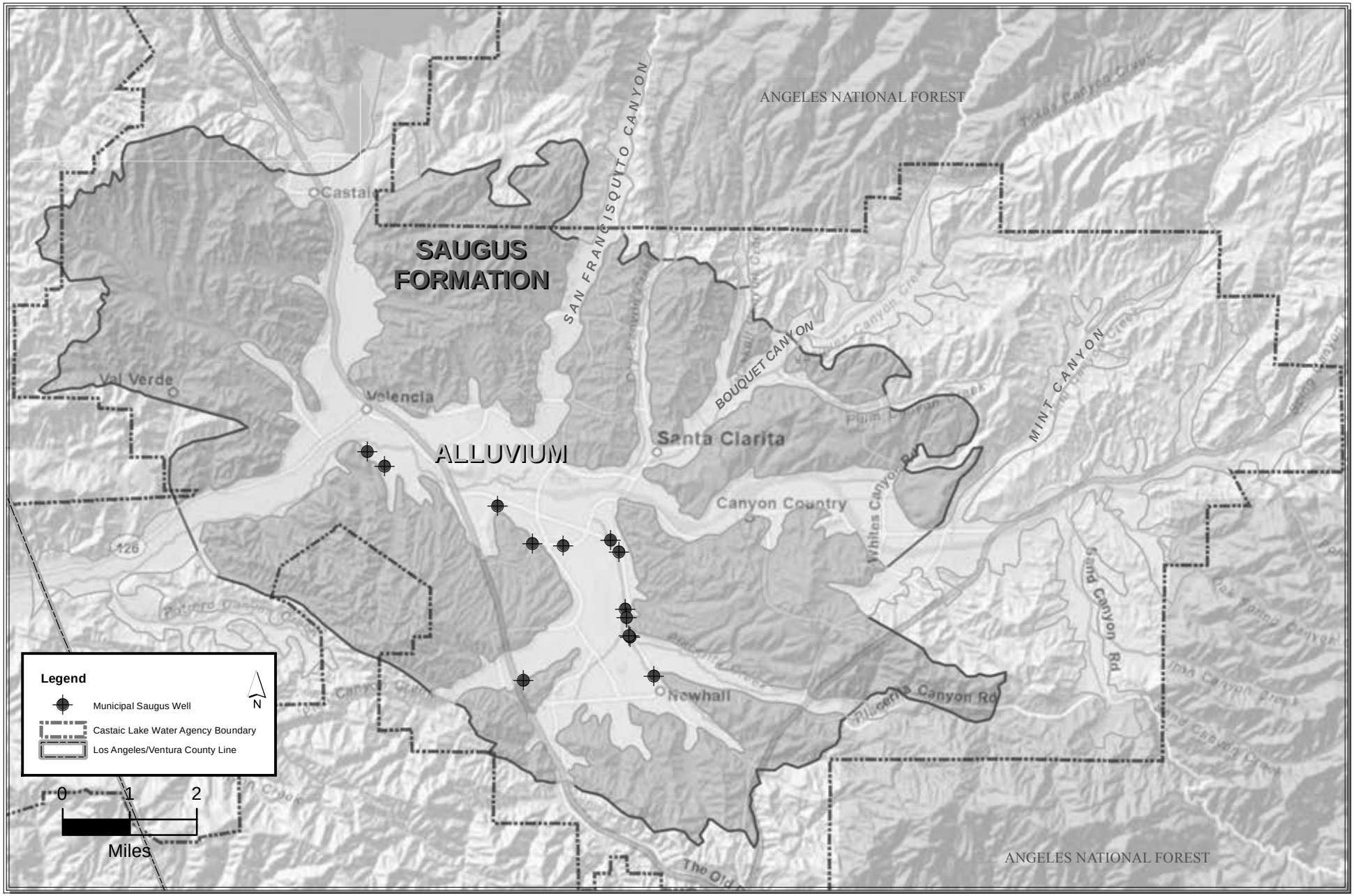


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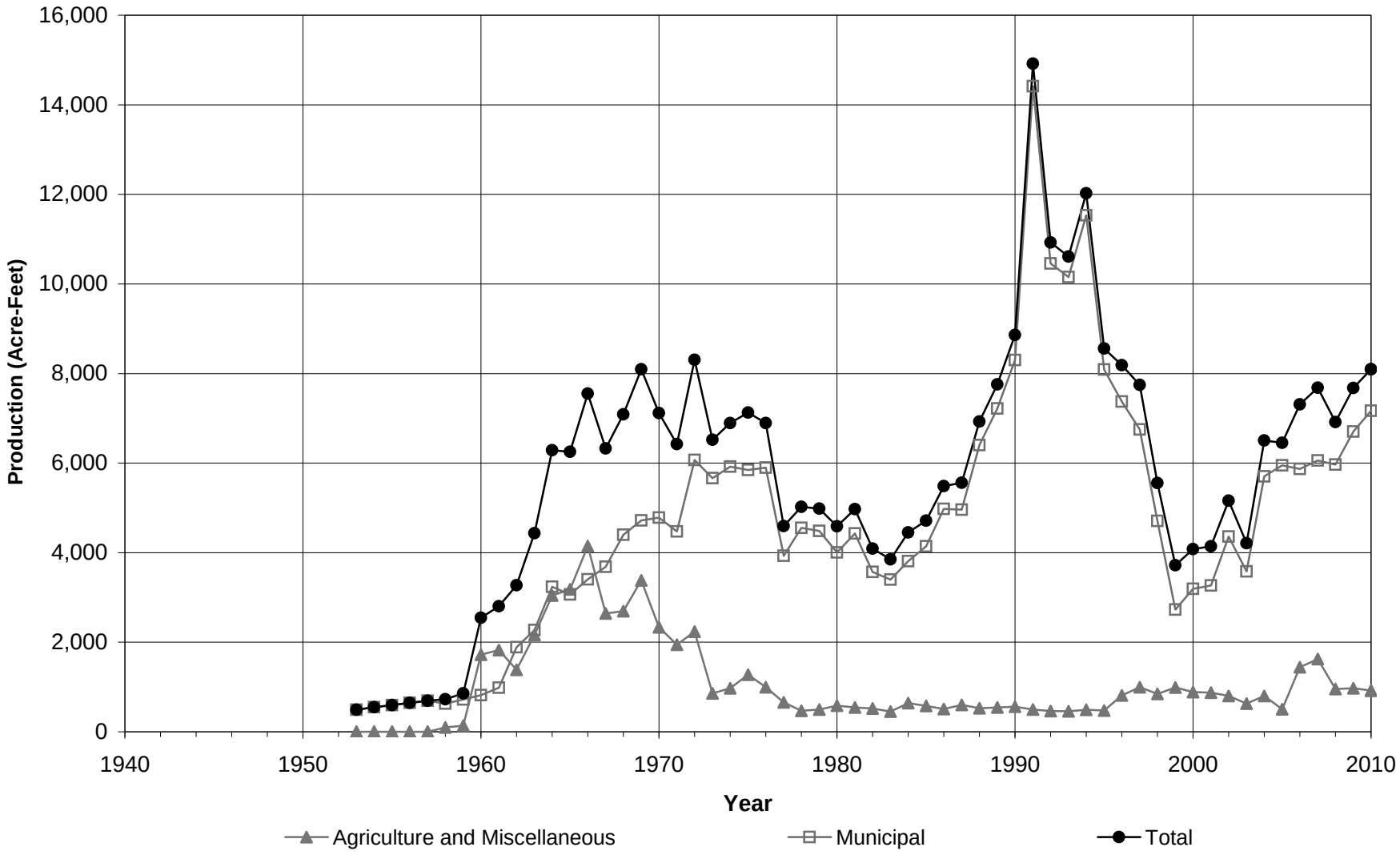
**Figure 3-7**
**Saugus Well Locations**
**Santa Clara River Valley, East Groundwater Subbasin**




*Note: Historical pumping for 1953-1979 was adjusted for the 2010 Water Report to incorporate the amounts reported by Slade (1988) and as verified with the water purveyors.*

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**Figure 3-8**
**Groundwater Production - Saugus Formation**
**Santa Clara River Valley, East Groundwater Subbasin**

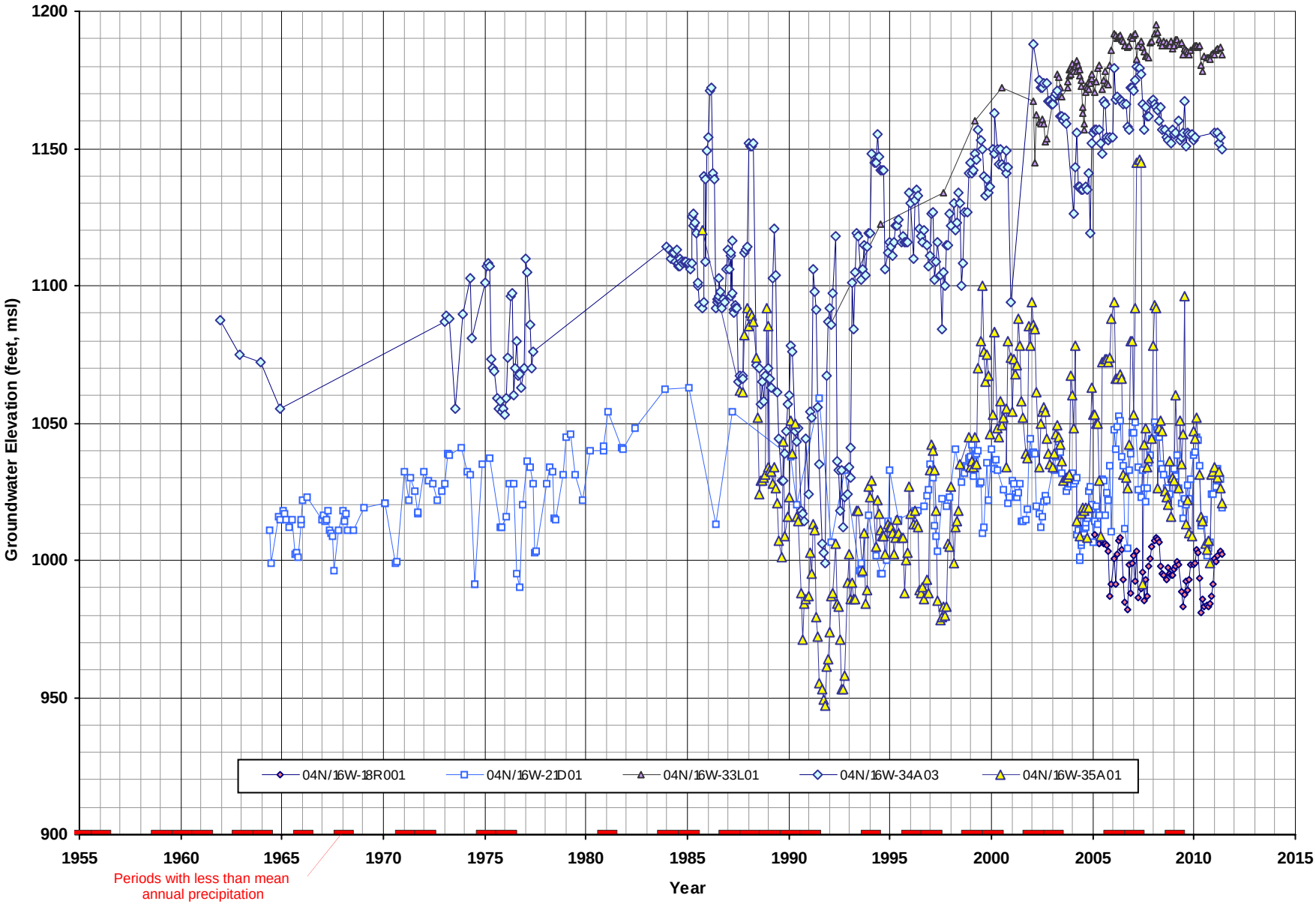


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**Figure 3-9**
**Groundwater Elevations in Saugus Wells**

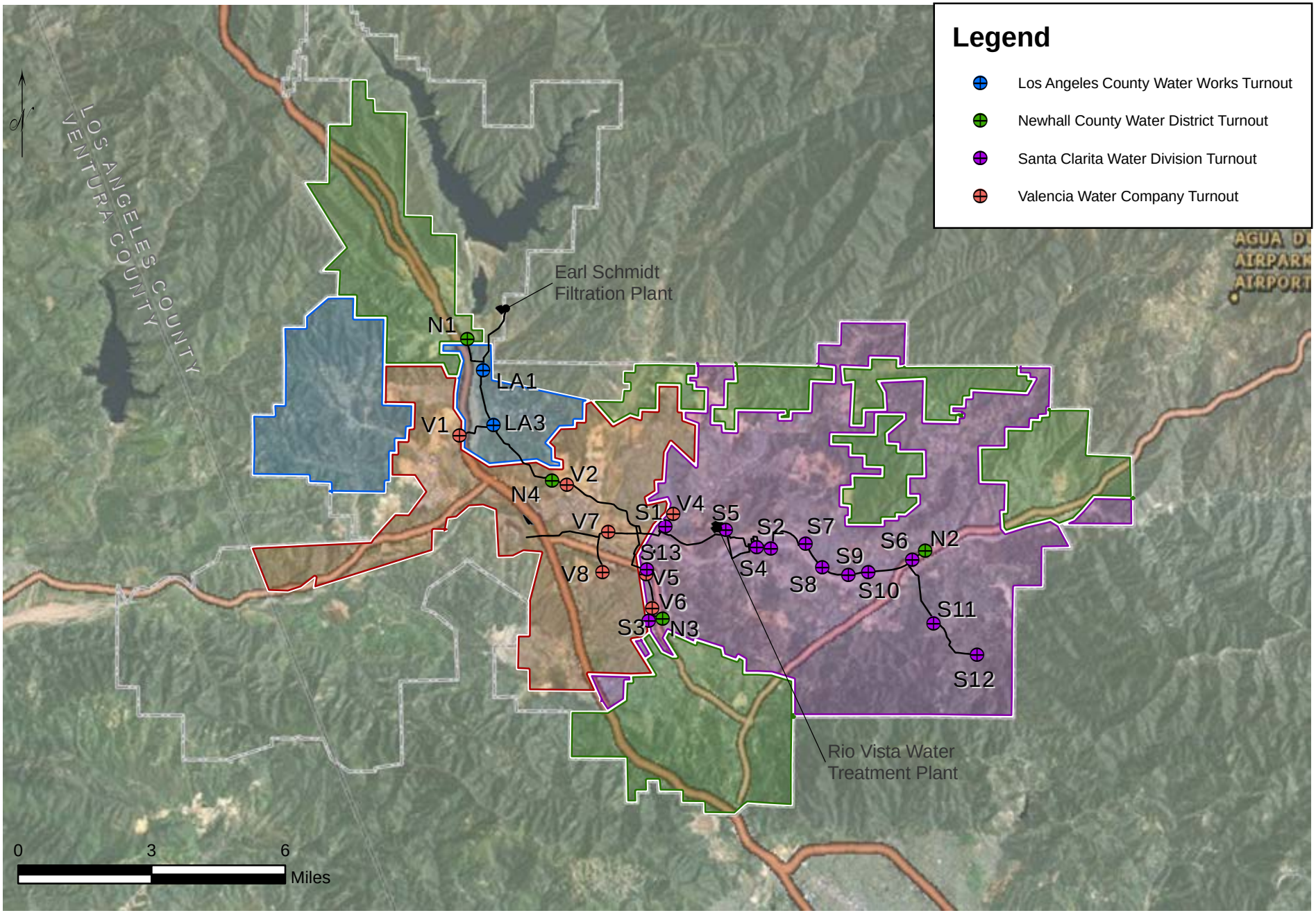


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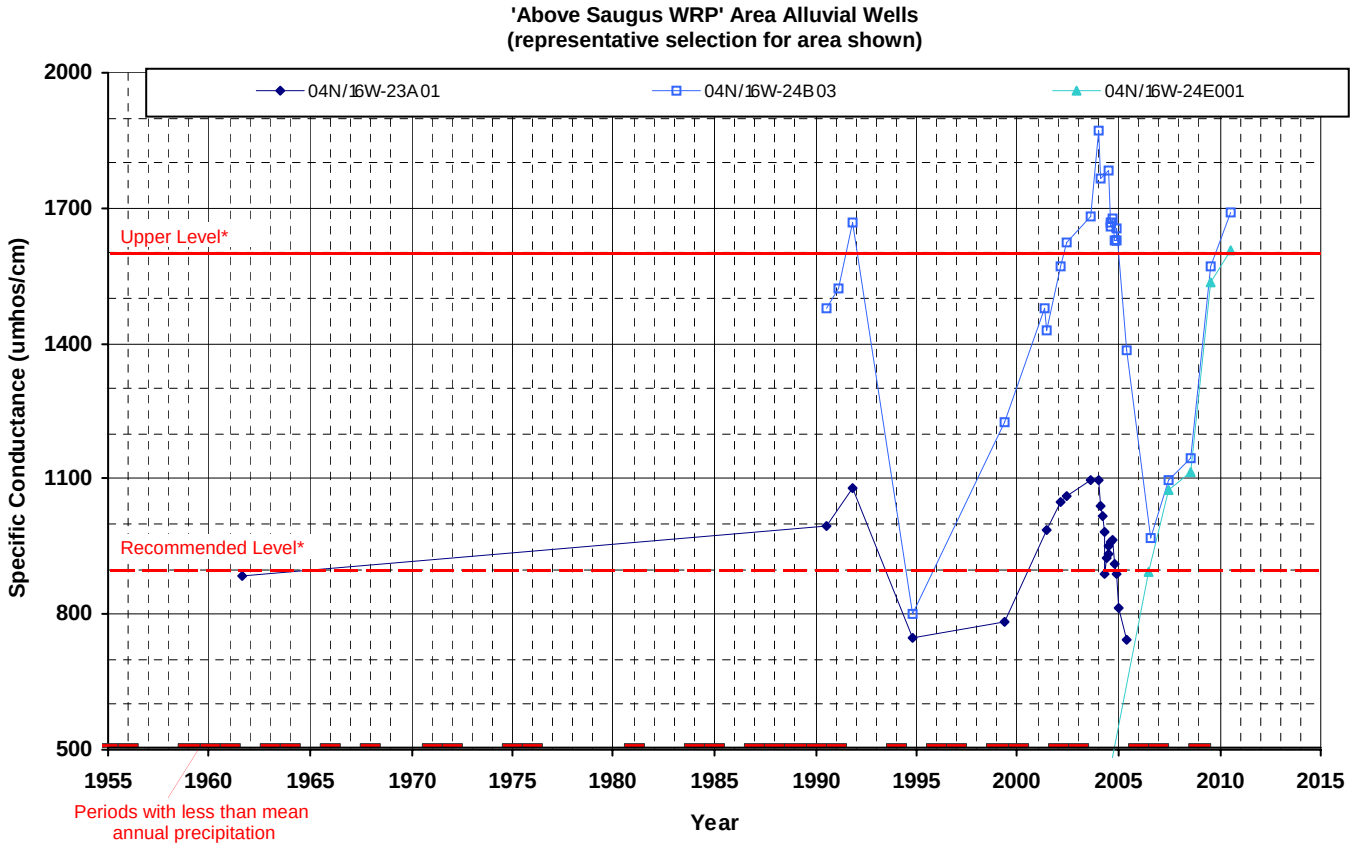
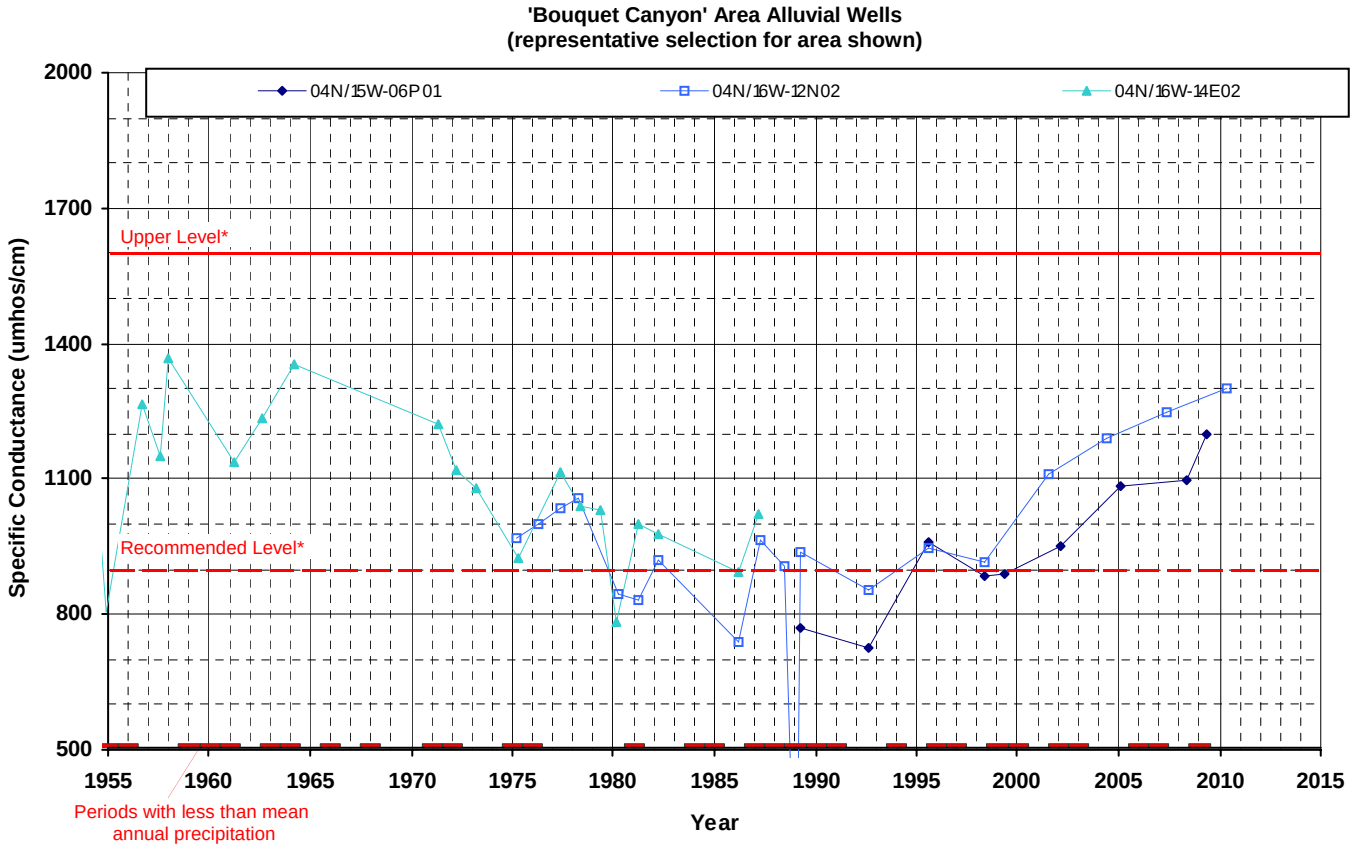
**Figure 3-10**
**Treated Water Distribution System**
**Castaic Lake Water Agency**




*California Department of Public Health Secondary Maximum Contaminant Level

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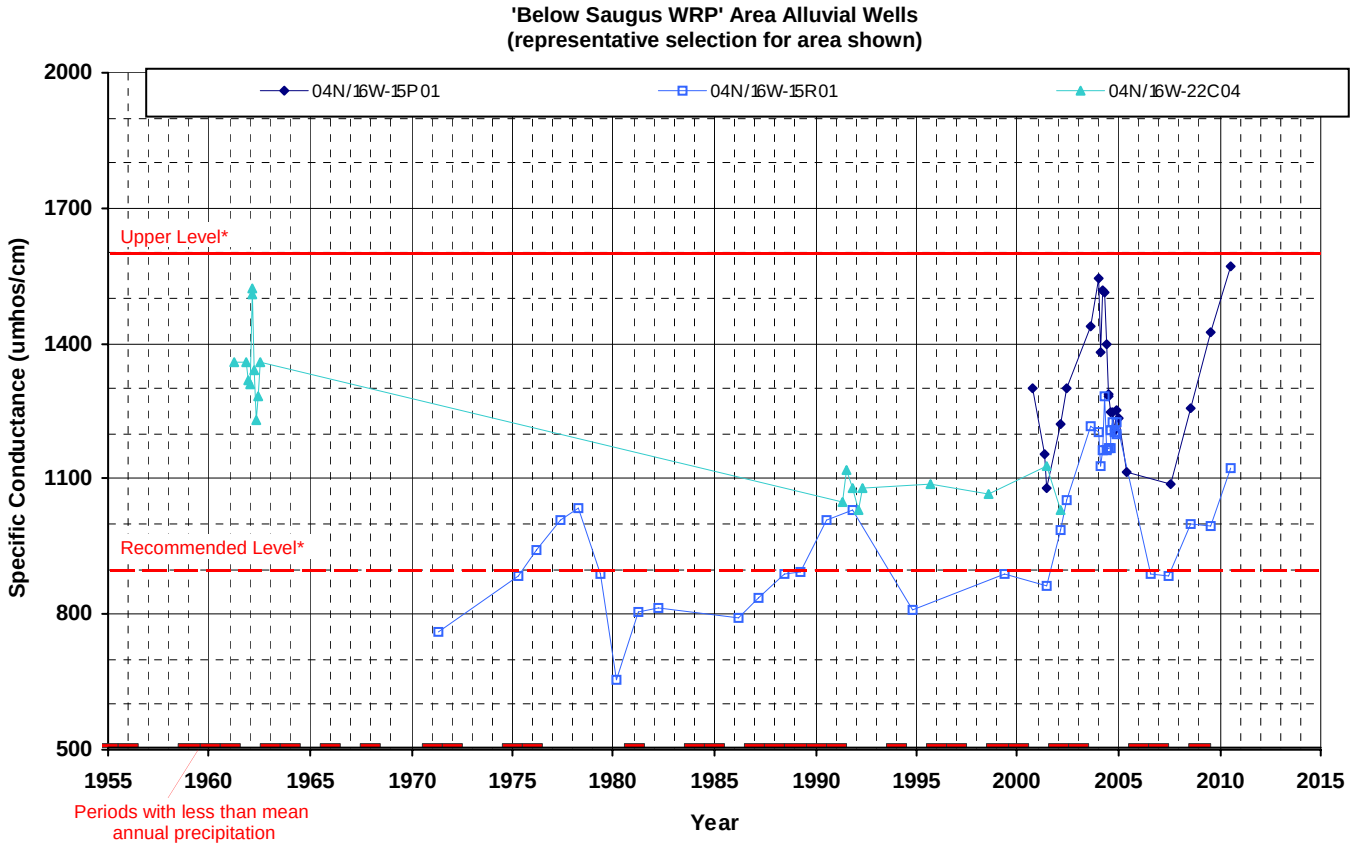
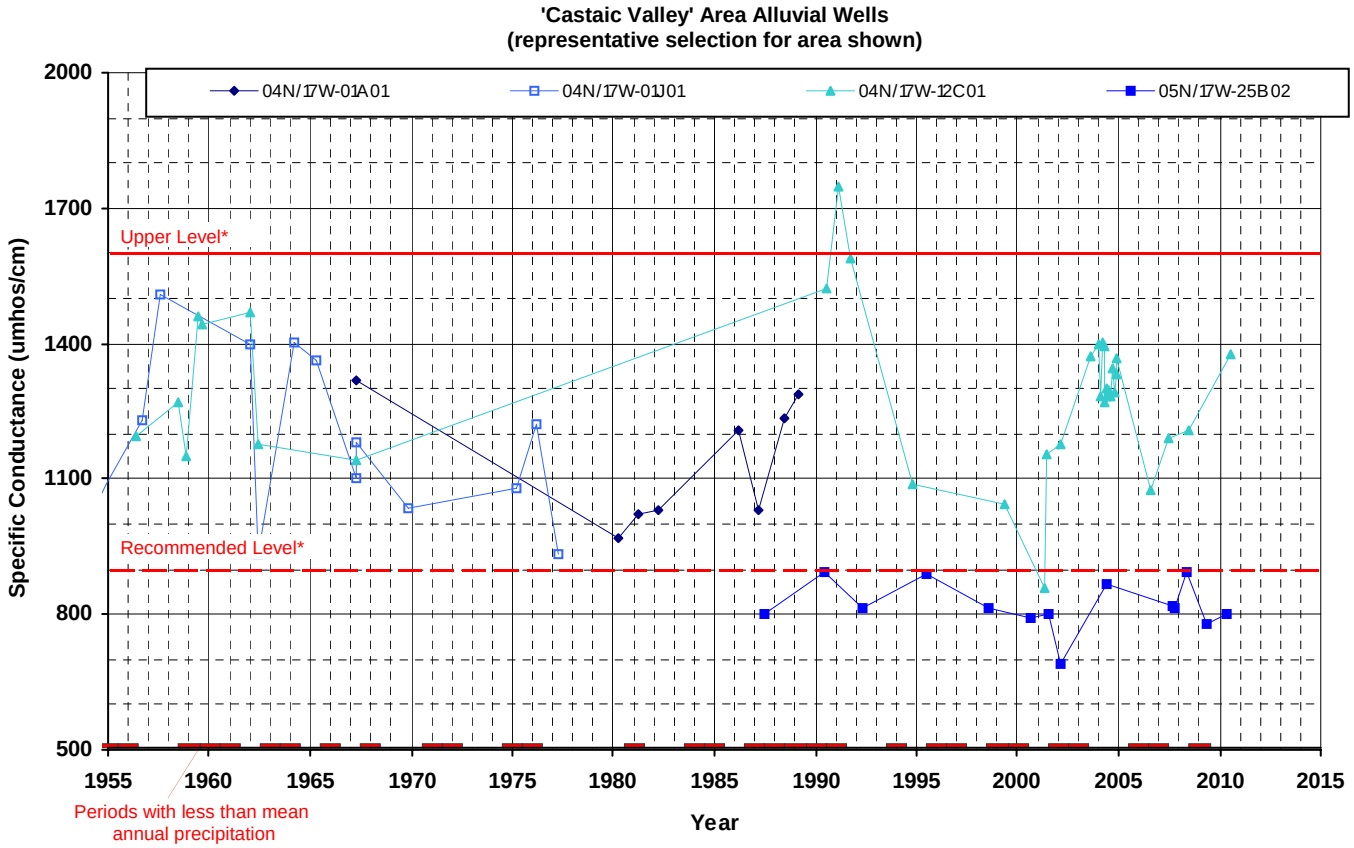
**Figure 3-11**
**Groundwater Quality in Eastern Santa Clarita Valley Alluvial Wells**




*California Department of Public Health Secondary Maximum Contaminant Level

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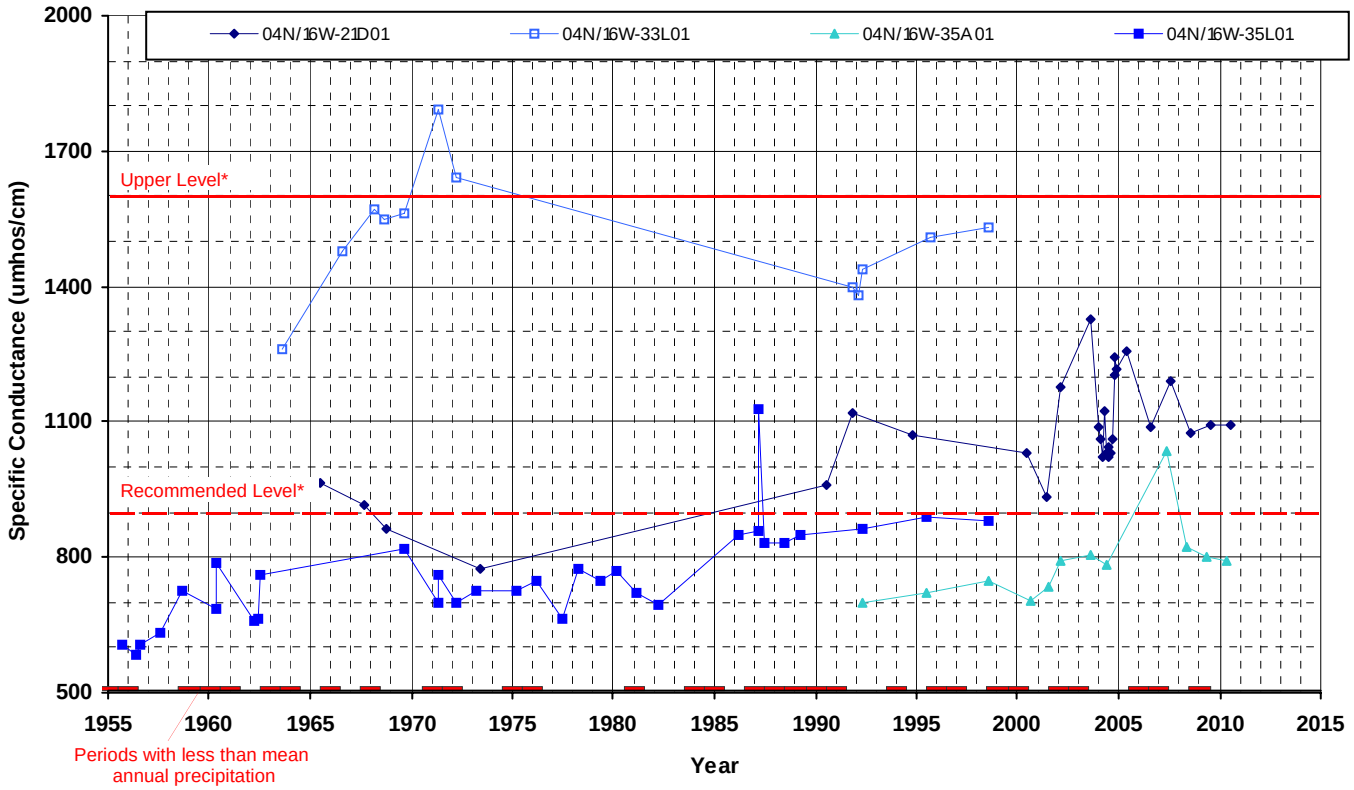
**Figure 3-12**
**Groundwater Quality in Western Santa Clarita Valley Alluvial Wells**




*California Department of Public Health Secondary Maximum Contaminant Level

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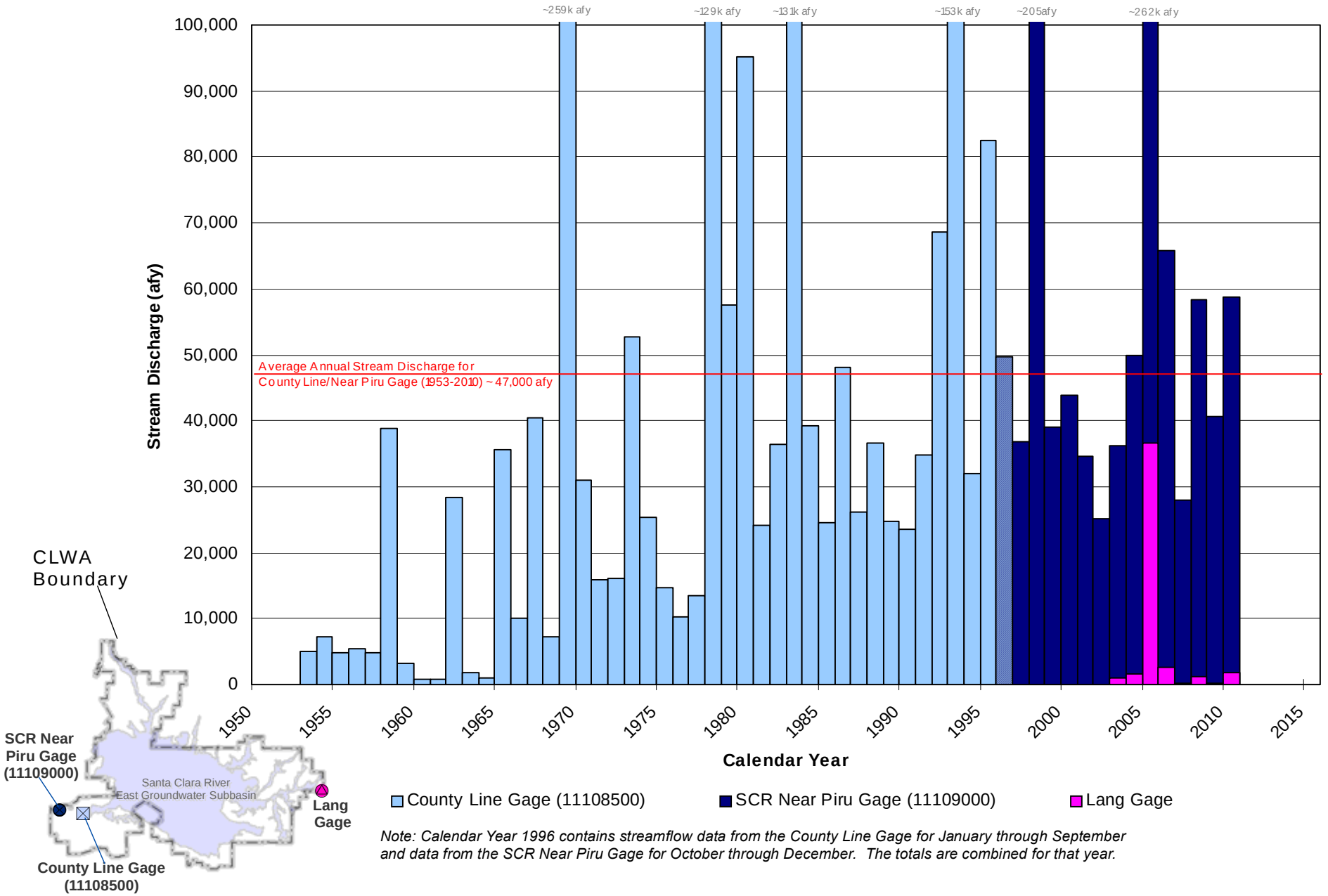
**Figure 3-13**
**Groundwater Quality in Saugus Wells**




*Note: Calendar Year 1996 contains streamflow data from the County Line Gage for January through September and data from the SCR Near Piru Gage for October through December. The totals are combined for that year.*

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**Figure 3-14**
**Annual Stream Discharge**
**Santa Clara River**

# 4. Summary of 2010 Water Supply and 2011 Outlook

As discussed in the preceding chapters, total water demands in the Santa Clarita Valley were 80,200 af in 2010. This represented a decrease of 6,400 af, or about 7.4 percent, from total demand in 2009 and continues a declining trend in total water demand over the last three years. Of the total demand in 2010, nearly 64,100 af were for municipal water supply, and the balance (16,100 af) was for agricultural and other uses, including estimated individual domestic uses. As detailed in Chapter 2, the total demand in 2010 was met by a combination of local groundwater, SWP and other imported water, and a small amount of recycled water.

The water demand in 2010 was notably lower than the average projection in the 2005 UWMP, (100,050 af), and also lower than the short-term projected demand that was estimated in the 2009 Water Report (82,000-84,000 af). For illustration, historical water use from 1980 through 2010 is plotted in Figure 4-1; also shown with that historical record are the currently projected municipal and agricultural water demands in the 2010 UWMP through 2050. The primary factor causing year-to-year fluctuations in water demands has been weather. In the short term, wetter years have typically resulted in decreased water demand, and drier years have typically resulted in higher water demand. Extended drier periods, however, have resulted in decreases in demand due to conservation and water shortage awareness. The decline in water demand toward the end of the 1987-92 drought is a good example of such reduced demand. Similarly, over the recent multi-year dry period (2006-2009), total water demands progressively declined from historical high in 2007 to the lowest in nearly a decade in 2010.

Adding to these types of demand fluctuations are the recently-observed effects of broad economic conditions. As reflected by the numbers of service connections in each Purveyor service area, growth in 2010 remained low, with addition of a total of only about 400 new service connections, in contrast to about 1,000 new connections each year between 2005 and 2008, and in notable contrast to the predominant growth rate nearly three times higher from the late 1990's through 2004. In addition, the Purveyors were informed by, and have conveyed to the local community, the Governor's Alert in June, 2008 regarding drought conditions and potential water supply shortages, and the Governor's subsequent Drought Emergency Declaration in February, 2009. The widespread awareness of dry conditions throughout the state, aggressive conservation messaging, and the decrease in local growth are prime factors causing total water demand in 2010 to be notably less than each of the preceding four years, and lower than all years since 2001.

The preceding factors are expected to have some continuing effect in 2011, resulting in estimated total water demand that will not continue to decline, but is expected to be only slightly higher than last year. Total municipal water requirements in the first quarter of 2011 were about 10 percent higher than the same period in 2010. Recognizing those early-year conditions, and consistent with the most recent demand projections in the 2010 UWMP, total water demand in 2011 is estimated to be about 82,000 af.

It is expected that both municipal and agricultural water demands in 2011 will continue to be met with a mix of water supplies as in previous years, notably local groundwater and imported SWP and other supplemental water, complemented by recycled water that will continue to supply a small fraction of total water demand.

On April 20, 2011, the allocation of water from the SWP in 2011 was announced to be 80 percent; for CLWA, that equates to 76,160 af of its total Table A Amount of 95,200 af. Combined with local groundwater from the two aquifer systems (50,000 af), total Flexible Storage Account water (6,060 af), net carryover SWP water from 2010 (3,712 af), annual acquisition from Buena Vista Water/Rosedale-Rio Bravo Water Storage Districts (11,000 af), and recycled water (500 af), the total available water supplies for 2011 are almost 150,000 af. Consequently, CLWA and the Purveyors anticipate having more than adequate supplies to meet all water demands in 2011. Projected 2011 water supplies and demand are summarized in Table 4-1.

In August, 2007, a federal court ruled that certain operational changes were required of the SWP in order to protect the endangered Delta smelt. With the objective of protecting endangered fish such as the Delta smelt and spring-run salmon, the court order resulted in the preparation of a new Biological Opinion (BO) requiring DWR to implement mitigation requirements with resultant impacts on SWP water supply reliability. The current SWP Delivery Reliability Report 2009, issued in August, 2010, incorporates restrictions on SWP operations according to the Biological Opinions of the U.S. Fish and Wildlife Service and the National Marine Fishery Service issued on December 15, 2008 and June 4, 2009, respectively. However, in December 2010, a federal judge overruled most of the 2008 federal biological opinion and invalidated several of the criteria that reduced SWP's water supply. The effects of this reversal are still not completely known, but will probably result in some relief from SWP pumping restrictions in the long term. The current SWP Delivery Reliability Report 2009 also considers the impacts on SWP delivery reliability due to climate change, sea level rise, and vulnerability of the Delta's conveyance system and structure due to floods and earthquakes. With these factors, the Reliability Report projects long-term reliability of 60 percent during normal year hydrology.

**Table 4-1**
**2011 Water Supply and Demand**
**(acre-feet)**

| | | |
|---|---|---|
| **Projected 2011 Demand [1]** | | **82,000** |
| ***Available 2011 Water Supplies*** | | |
| Local Groundwater | | 50,000 |
| *Alluvium [2]* | *38,500* | |
| *Saugus Formation [3]* | *11,500* | |
| Imported Water | | 96,932 |
| *Table A Amount [4]* | *76,160* | |
| *Net Carryover from 2010 [5]* | *3,712* | |
| *Buena Vista/Rosedale-Rio Bravo [6]* | *11,000* | |
| *Flexible Storage Account (CLWA) [7]* | *4,684* | |
| *Flexible Storage Account (Ventura County) [7]* | *1,376* | |
| *Yuba Accord [8]* | *0* | |
| Recycled Water | | 500 |
| **Total Available 2011 Supplies** | | **147,432** |
| ***Additional Dry Year Supplies [9]*** | | |
| Semitropic Groundwater Storage Bank | | 45,920 |
| *2002 Account [10]* | *16,650* | |
| *2003 Account [10]* | *29,270* | |
| Rosedale-Rio Bravo Water Banking and Exchange Program | | 94,513 |
| *2005 and 2006 Buena Vista/Rosedale-Rio Bravo Water Acquisition Agreement [11]* | *22,000* | |
| *2005 Banking of Table A [12]* | *17,800* | |
| *2006 Banking of Table A [12]* | *17,800* | |
| *2007 Rosedale Rio-Bravo Banking [12]* | *7,298* | |
| *2010 Rosedale Rio-Bravo Banking [13]* | *29,615* | |
| **Total Additional Dry Year Supplies** | | **140,433** |

1. Linear interpolation from actual 2010 demand to projected 2015 demand in draft 2010 UWMP.

2. The Alluvium represents 30,000 – 40,000 afy of available supply under local wet-normal conditions, and 30,000 – 35,000 afy under local dry conditions. Available supply in 2011 is shown to be normal year sustainable production in Updated Basin Yield Analysis, August 2009.

3. The Saugus Formation represents 7,500 – 15,000 afy of available water supply under non-drought conditions, and up to 35,000 afy under increasingly dry conditions. Available supply in 2011 is shown to be normal year sustainable production in Updated Basin Yield Analysis, August 2009.

4. CLWA's SWP Table A amount is 95,200 af. The initial 2011 allocation was 25 percent (23,800 af). On December 16, 2010 the allocation was increased to 50 percent (47,600 af), On January 20, 2011 the allocation was increased to 60 percent (57,120 af). On March 15, 2011 the allocation was increased to 70 percent (66,640 af). On April 20, 2011 the allocation was increased to 80 percent (76,160 af).

5. Of the 26,186 af of total available 2010 carryover, all but 3,712 af was returned to the SWP as the system reservoirs went in a 'spill' mode due to a hydrological wet year in 2010/2011 and the carryover water in storage needed to be reassigned.

6. 2011 annual supply from Buena Vista / Rosedale-Rio Bravo Water Acquisition Agreement.

7. CLWA can directly utilize up to 4,684 af of storage capacity in Castaic Lake. By agreement in 2005, CLWA can also utilize 1,376 af of Ventura County SWP contractors' flexible storage capacity in Castaic Lake.

8. Up to 850 af of non-SWP water supply is available to CLWA in critically dry years as a result of agreements among DWR, Yuba County Water Agency, and the U.S. Bureau of Reclamation regarding settlement of water rights issues on the Lower Yuba River (Yuba Accord). CLWA opted to not take any Yuba water in 2011.

9. Does not include other reliability measures available to CLWA and the retail water Purveyors. These measures include short-term exchanges, participation in DWR's dry-year water purchase programs, local dry-year supply programs and other future groundwater storage programs.

10. Net recoverable water after banking 24,000 af and 32,522 af in 2002 and 2003, respectively and recovering 4,950 af in 2009.

11. Water stored in Rosedale-Rio Bravo Water Banking and Exchange Program pursuant to the Buena Vista/Rosedale-Rio Bravo Water Acquisition Agreement.

12. Net recoverable water after banking 20,000 af in both 2005 and 2006, and banking 8,200 af in 2007.

13. Net recoverable water after banking 32,256 af in 2010.

CLWA staff has assessed the impact of the current Reliability Report on the CLWA reliability analysis contained in the Agency's 2005 UWMP and concluded in the 2010 UWMP that current and anticipated supplies are available to meet anticipated water supply needs through the year 2050. The preceding discussion of SWP supply should be considered by noting that, while the SWP Reliability Report represents a reasonable scenario with respect to long term reliability, recent reductions in supply reduce the difference between available supply and demand in the future, thereby making the CLWA service area more subject to shortages in certain dry years. Accordingly, the reduction in SWP supply reinforces the need to continue diligent efforts to conserve potable water and increase the use of recycled water to maximize utilization of potable water supplies.

As discussed in Chapter 5, CLWA and the retail water purveyors have worked with Los Angeles County and the City of Santa Clarita to aggressively implement water conservation in the CLWA service area. In terms of short-term water supply availability, however, CLWA and the Purveyors have determined that, while current operational changes of the SWP are in effect, there are sufficient supplemental water supplies, including SWP water, to augment local groundwater and other water supplies such that overall water supplies will be sufficient to meet projected water requirements. CLWA, the retail water Purveyors, Los Angeles County and the City of Santa Clarita have formed the Santa Clarita Valley Water Committee (formerly convened as the Santa Clarita Drought Committee). The specific purpose of the committee is to work collaboratively to manage the conjunctive use of the Valley's water supplies and ensure the progressive implementation of water use efficiency programs in the Santa Clarita Valley.

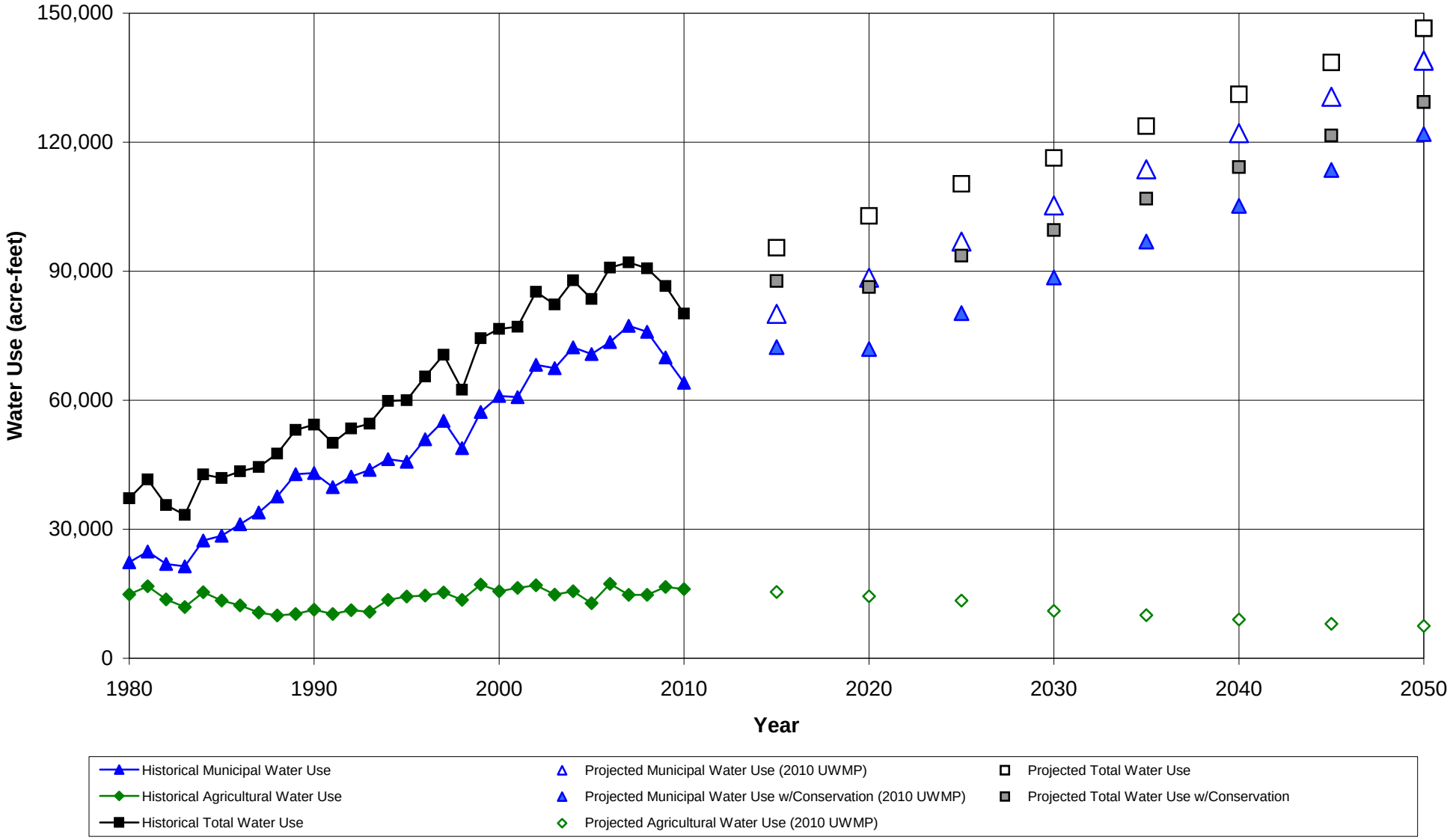
In addition to the regular and previously banked water supplies described above to meet projected demand in 2011, a residual of nearly 46,000 af of recoverable water remains stored in the Semitropic Groundwater Storage Bank in Kern County. Nearly 95,000 af of recoverable water are also stored in the long-term Rosedale-Rio Bravo Water Banking and Exchange Program, also in Kern County. After recovery of 4,950 af of banked water from Semitropic in 2009, 1,650 af of which were used in 2009 and 3,300 af of which were used in 2010, remaining recoverable water in all the Kern County storage banks is slightly more than 140,000 af. That component of overall water supply is separately reflected in Table 4-1 because it is intended for future dry-year supply and will not be used for 2011 water supply.

CLWA and the Purveyors have implemented a number of projects that are part of an overall program to provide facilities needed to firm up imported water supplies during times of drought. These involve water conservation, surface and groundwater storage, water transfers and exchanges, water recycling, additional short-term pumping from the Saugus Formation, and

increasing CLWA's imported supply. This overall strategy is designed to meet increasing water demands while assuring a reasonable degree of supply reliability.

Part of the overall water supply strategy is to provide a blend of groundwater and imported water to area residents to ensure consistent quality and reliability of service. The actual blend of imported water and groundwater in any given year and location in the Valley is an operational decision and varies over time due to source availability and operational capacity of Purveyor and CLWA facilities. The goal is to conjunctively use the available water resources so that the overall reliability of water supply is maximized while utilizing local groundwater at a sustainable rate.

For long-term planning purposes, water supplies and facilities are added on an incremental basis and ahead of need. It would be economically unsound to immediately, or in the short term, acquire all the facilities and water supplies needed for the next twenty to thirty years. This would unfairly burden existing customers with costs that should be borne by future customers. There are numerous ongoing efforts to produce an adequate and reliable supply of good quality water for Valley residents. Water consumers expect that their needs will continue to be met with a high degree of reliability and quality of service. To that end, CLWA's and the Purveyors' stated reliability goal is to deliver a reliable and high quality water supply for their customers, even during dry periods. Based on conservative water supply and demand assumptions contained in the 2010 UWMP for a planning horizon over the next 40 years, in combination with conservation of non-essential demand during certain dry years, CLWA and the Purveyors believe implementing their water plan will successfully achieve this goal.




LUHDORFF & SCALMANINI CONSULTING ENGINEERS

**Figure 4-1**
**Historical and Projected Water Use**
**Santa Clarita Valley**

# 5. Water Conservation

The California Urban Water Conservation Council (CUWCC) was formed in 1991 through the Memorandum of Understanding (MOU) Regarding Urban Water Conservation in California. The urban water conservation Best Management Practices (BMPs) included in the MOU are intended to reduce California's long-term urban water demands. While the BMPs are currently implemented by the MOU signatories on a voluntary basis, they are specified as part of the Demand Management Measures section of the Urban Water Management Planning Act. Water conservation can achieve a number of goals, such as:

- meeting legal mandates
- reducing average annual potable water demands
- reducing sewer flows
- reducing demands during peak seasons
- meeting drought restrictions
- reducing carbon footprint, waste water flows and urban runoff.

CLWA signed the urban MOU in 2001 on behalf of its wholesale service area, and pledged to implement several BMPs at a wholesale support level (listed below). NCWD signed the MOU in 2002 and VWC signed the MOU in 2006, both on behalf of their respective retail service areas. As separate MOU signatories and in their respective roles as retailers, NCWD and VWC are committed to implementing all BMPs that are feasible and applicable in their service areas. Efforts are made to coordinate with CLWA and the other Purveyors wherever possible to maximize efficiency and ensure the cost effectiveness of NCWD's and VWC's conservation program.

In coordination with the Purveyors, CLWA has been implementing the following BMPs (which pertain to wholesalers) for several years (some prior to signing the MOU in 2001) on a Valley-wide scale:

**Foundational BMPs:**
BMP 1 Utility Operation Programs
BMP 2 Education Programs

**Programmatic BMPs:**
BMP 3 Residential
BMP 4 Commercial, Industrial and Institutional
BMP 5 Landscape

In addition to these efforts, as discussed in Chapter 1, CLWA installed a weather station at its headquarters adjacent to the Rio Vista Water Treatment Plant in 2006 to augment precipitation records and provide a local reference for irrigation water management. This station became part a network of over 120 automated weather stations in the state of California that make up the California Irrigation Management Information System (CIMIS). The Department of Water Resources (DWR) manages the system which has a primary purpose of making available to the public, free of charge, information useful in estimating crop water use for irrigation scheduling.

Additional savings are occurring Valley-wide due to state interior plumbing code requirements that have been in effect since 1992, as well as due to changes in lot size and reduction in exterior square footage of new housing and commercial developments. The City of Santa Clarita and County of Los Angeles have also taken a more active conservation role and have begun implementing water efficient devices and practices on the properties they own and manage. All of these efforts have begun to impact overall demand in the Valley, as can be seen in the significant decline in total water demand over the last three years. The Valley's water suppliers continue to monitor water demand trends through time to assess those factors that are accounting for the reduction, and to attempt to quantify them.

More recently with regard to water conservation, CLWA and the retail water Purveyors entered into an MOU in 2007 to prepare a Santa Clarita Valley Water Use Efficiency Strategic Plan (the Plan). The purpose of the plan is to prepare a comprehensive long-term conservation plan for the Santa Clarita Valley by adopting objectives, policies and programs designed to promote proven and cost effective conservation practices. The Plan provides a detailed study of existing residential and commercial water use and recommends programs designed to reduce the overall Valley-Wide water demand by 10 percent by 2030. The programs are designed to provide Valley residents with the tools and education to use water more efficiently. The six programs identified in the Plan are:

- High Efficiency Toilet Rebate Program
- CII Audits & Customized Incentive Program
- Large Landscape Audits & Customized Incentive Program
- Landscape Contractor Certification and Weather Based Irrigation Controller Program
- High Efficiency Washer Rebate Program
- Public Information and Education Programs

In addition to the six programs designed for existing customers, the Plan also identifies three other key factors that will help reduce the valley's overall water demand: passive conservation, inflation, and new more water-efficient building ordinances.

Finally, the Plan includes an Appendix with more aggressive water use efficiency measures designed to meet a potential 20 percent reduction in water use. This includes funding more active conservation programs, retrofit on resale legislation, water rate reform, water budget based rates, and a more aggressive recycled water program. Implementation of the majority of the programs identified in the Plan began in 2010 through funding by CLWA on behalf of all the Purveyors.

In addition to this effort, the water Purveyors worked with City and County agencies to implement the new State Model Efficient Landscape ordinance for the Santa Clarita Valley. This ordinance focused primarily on new construction aimed at reducing overall water demands by requiring efficient landscape design and delivery systems. Implementation of the ordinances occurred in 2010.

Finally, in 2008, Governor Schwarzenegger issued a proclamation for all Californians to reduce their per capita water consumption by 20 percent by the year 2020. In November 2009, the Governor and California's legislature reached an historic agreement ensuring long-term water supply reliability for California, as well as restoring and protecting the Sacramento-San Joaquin Delta and other ecologically sensitive areas. The agreement is comprised of four policy bills and an $11.4 billion bond measure. One of the policy bills (SBx7-7) identifies reporting criteria and guidelines for water utilities to track and measure progress toward achieving the 20 percent per capita demand reduction goal. Water utilities are required to implement strategies and report progress in their Urban Water Management Plans. In 2010, DWR provided guidance and criteria for implementing the provisions of this new law; that guidance provided clarification regarding individual (per-capita) and broader (Valley-wide) conservation goals, which was utilized in the preparation of the 2010 update of the UWMP for the Santa Clarita Valley.

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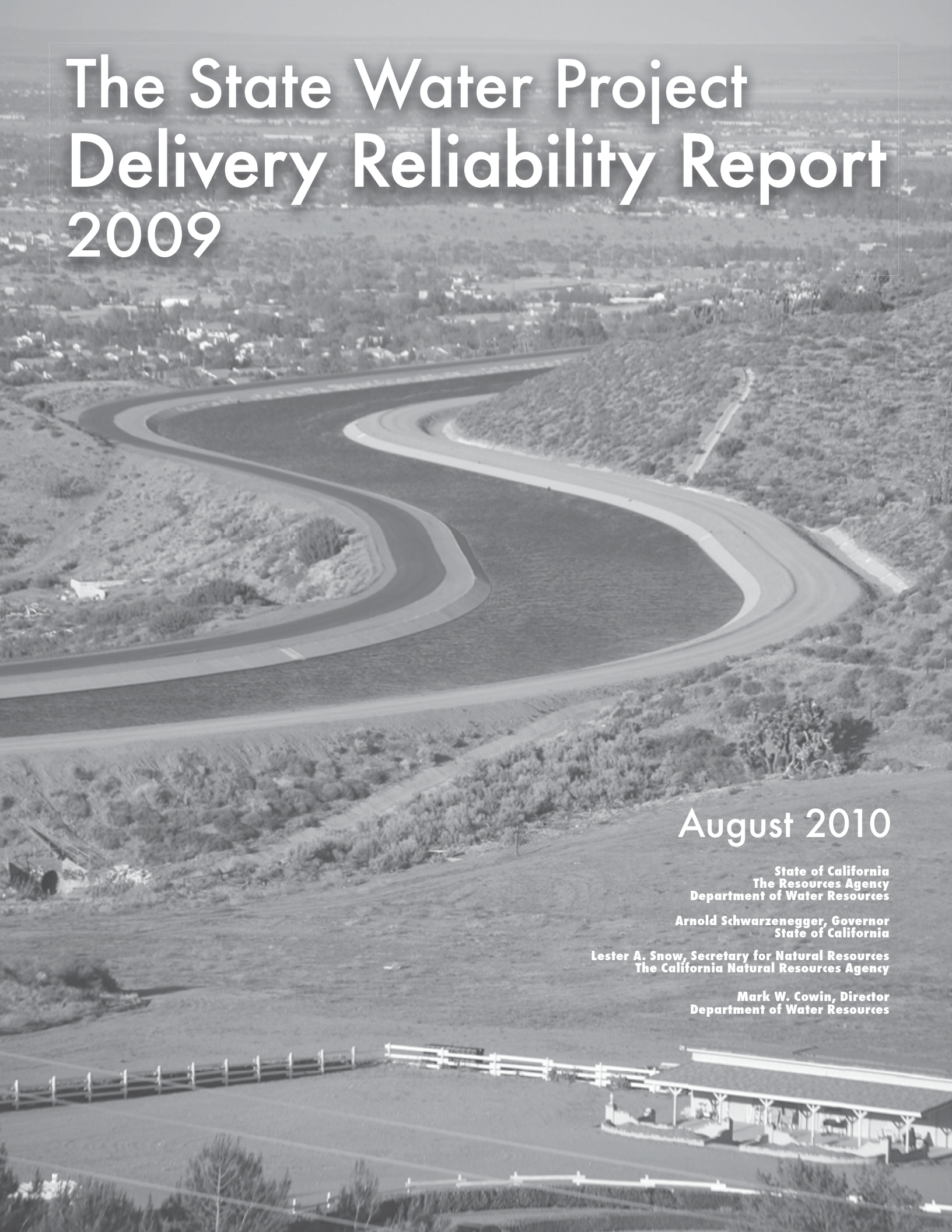

August 2010


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# Foreword

The *2009 State Water Project Delivery Reliability Report (2009 Report)* is a bi-annual report on the current and future for State Water Project (SWP) water supply conditions, if no significant improvements are made to convey water past the Sacramento-San Joaquin Delta (Delta) or to store the more-variable run-off that is expected with climate change.

The report shows a continuing erosion of the ability of the SWP to deliver water. For current conditions, the dominant factor for these reductions is the restrictive operational requirements contained in the federal biological opinions. For future conditions, it is these requirements and the forecasted effects of climate change.

Deliveries estimated for the *2009 Report* are reduced by the operational restrictions of the biological opinions issued by the U.S. Fish and Wildlife Service in December 2008 and the National Marine Fisheries Service in June 2009 governing the SWP and Central Valley Project operations. The *2007 Report* incorporates the interim, and less restrictive, operation rules established by federal Judge Wanger in 2007. The *2005 Report* is based upon much less restrictive operational rules contained in the biological opinions issued in 2005.

To illustrate the effect, the median value estimated for the primary component of SWP Table A annual deliveries for Current Conditions in the *2005 Report* is 3,170 thousand acre feet (taf). In the *2007 Report* it is 2,980 taf, and in the *2009 Report*, it is 2,680 taf. This is an overall reduction of almost 500 taf.

The studies used in this series of reports to estimate future deliveries now also include the potential effects of climate change. The studies for the *2005 Report* did not include any of these potential effects. For the *2007 Report*, the changes in run-off patterns and amounts were incorporated into the analyses. For the 2009 studies, the changes in run-off patterns and amounts are included along with a potential rise in sea level. Sea level rise has the potential to require more water to be released to repel salinity from entering the Delta in order to meet the water quality objectives established for the Delta.

The effect of the operational restrictions in addition to the incorporation of potential climate changes impacts amounts to an estimated reduction of 970 taf when the median value for annual SWP deliveries for Future Conditions in the *2005 Report* (3,570 taf) is compared to the updated value in the *2009 Report* (2,600 taf).

The *2009 Report* compares the updated values to those contained in the *2007 Report* and provides greater detail on the analytical method used to calculate the estimates. The results of the studies are designed to assist water planners and managers in updating their water management and infrastructure development plans. These results emphasize the need for local agencies to develop a resilient and robust water supply, and a distribution and management system to maximize the efficient use of our variable supply. They also illustrate the urgent need to improve the method of conveying water past the Delta in a more sustainable manner that meets the dual goals of increasing water supply reliability and improving the conditions for endangered and threatened fish species.

Lester A. Snow
Director
California Department of Water Resources
December 2009

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# Introduction 1

The State Water Project (SWP) is primarily a water storage and delivery system intended to help close the gap in California between when and where precipitation primarily falls and when and where most water demands occur. Water from the SWP is a critical component of water supply for the 29 state water contractors, who may also receive water from other sources. While each of the water supply contracts defines the maximum amount of water to be delivered annually, the amount of water actually delivered may be less due to such factors as variable precipitation and runoff, physical and institutional limits on storage and conveyance, and contractors' variable water demands. For communities receiving SWP water, the reliability of SWP water deliveries is a key factor for local planners and government officials estimating their own water supply reliability.

The *2009 State Water Project Delivery Reliability Report (2009 Report)* updates the information contained in the *2007 Report* by estimating the amounts of water deliveries for Current Conditions and conditions twenty years in the future. These estimates incorporate restrictions on SWP and Central Valley Project (CVP) operations in accordance with the biological opinions of the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) issued on Dec. 15, 2008 and June 4, 2009, respectively. The estimates for Future Conditions also incorporate potential changes in hydrology due to climate change projections recommended by the Climate Action Team and sea level rise.

This report briefly describes the SWP and the Sacramento-San Joaquin Delta (Delta), the hub of water deliveries in California. It discusses the general topic of water delivery reliability and how Department of Water Resources (DWR) calculates delivery reliability for the SWP. It then summarizes key planning activities that may affect future SWP delivery reliability. Three areas of significant uncertainty for SWP delivery reliability are discussed. They are climate change and sea level rise, the vulnerability of Delta levees to failure, and operation restrictions imposed by the USFWS and NMFS in response to decreasing populations of endangered fish species. Next, the general approach taken to simulate SWP operations using CALSIM II is discussed.

This report presents the results of CALSIM II studies and compares them to previous estimates. Finally, this report provides guidance on how to apply the delivery estimates to water management plans. Presented in appendices are detailed CALSIM II simulation assumptions and results and recent SWP deliveries.

This report does not include analyses of how specific water agencies should integrate SWP water supply into their water supply equation. This topic requires extensive information about local facilities, local water resources, and local water use, which is beyond the scope of this report. Moreover, such an analysis would require decisions about water supply and use that traditionally have been made locally. DWR believes that local officials should continue to fill this role.

# Background

## Purpose

This report is intended to help local agencies, cities, and counties that use SWP water to develop adequate and affordable water supplies for their communities now and in the future. A water management plan, such as the Urban Water Management Plans required by Water Code Sections 10610-10656, is usually prepared by these entities to help them responsibly manage and develop their water supplies. The information in this report can be used by local agencies in preparing or amending their water management plans and identifying the new facilities or programs that may be necessary to meet future water demands. Local agencies and governments will also find in this report useful information for conducting analyses mandated by laws requiring water retailers to demonstrate whether their water supplies are sufficient for certain proposed subdivisions and development projects subject to the California Environmental Quality Act.

November 2009 legislative changes (Senate Bill X7.7, Steinberg) has amended and repealed some sections of the Water Code and may affect the reporting requirements under the Urban Water Management Planning Act and other government codes. DWR has a program to assist urban water suppliers in meeting the requirements of the Act. Program staff assists urban water suppliers with preparing comprehensive and useful water management plans, implementing water conservation programs, and understanding the requirements of the Act. The next cycle of Plans (2010) is due July 1, 2011. It is expected that the *2010 Urban Water Management Plan Guidebook* will be available in late 2010. Information on Urban Water Management Plans is posted at **www.water.ca.gov/urbanwatermanagement**. Any changes in the Urban Water Management Planning Act between now and 2011 will also be posted at this site.

## Reporting Requirements

As a result of a court-approved settlement agreement executed by the Planning and Conservation League, DWR, state water contractors and other entities in the wake of the 3rd Circuit Court of Appeals ruling in the "Monterey Amendments" case in 2000, DWR has a legal duty to prepare SWP delivery reliability reports every two years. In that agreement, DWR committed to the following:

> *Commencing in 2003, and every two years thereafter, the Department of Water Resources (DWR) shall prepare and deliver to all State Water Project (SWP) contractors, all city and county planning departments, and all regional and metropolitan planning departments within the project service area a report which accurately sets forth, under a range of hydrologic conditions, the then existing overall delivery capability of the project facilities and the allocation of that capacity to each contractor. The range of hydrologic conditions shall include the historic extended dry cycle and long-term average. The biennial report shall also disclose, for each of the ten years immediately preceding the report, the total amount of project water delivered and the amount of project water delivered to each contractor. The information presented in each report shall be presented in a manner readily understandable by the public. (Settlement Agreement Attachment B)*

## Previous Reports

The *2009 Report* is the fourth report of this type. The previous reports in 2003, 2005, and 2007 defined and calculated delivery reliability in the same manner as this report, with output from DWR's CALSIM II model. This report differs from those earlier reports because it includes revised estimates of reductions to SWP delivery reliability due to future climate changes and sea level rise and also due to restricted operations to comply with USFWS and NMFS biological opinions. This report also discusses the risk of conveyance disruption due to Delta levee failure.

# Context

## The State Water Project

The SWP is a water storage and delivery system of reservoirs, aqueducts, power plants, and pumping plants that extends for more than 600 miles. Its main purpose is to divert and store surplus water during wet periods and distribute it to areas in Northern California, the San Francisco Bay area, the San Joaquin Valley, the Central Coast, and Southern California. It is also used for recreation and to control floods, generate power, protect fish and wildlife, and manage water quality in the Delta.

The keystone of the SWP is Lake Oroville, which conserves water from the Feather River watershed. It is the SWP's largest storage facility with a capacity of about 3.5 million acre feet (maf). Releases from Lake Oroville flow down the Feather River into the Sacramento River, which drains the northern portion of California's Central Valley. The Sacramento River flows into the Delta, comprised of 738,000 acres of land interlaced with channels that receive runoff from about 40% of the state's land area. The SWP and the CVP rely on Delta channels as a conduit to move water from the Sacramento River inflow to the points of diversion in the south Delta. Thus, the Delta is actually part of the SWP conveyance system, making the Delta a key component in SWP deliveries. The significance of the Delta to SWP deliveries is described in more detail below.

From the northern Delta, Barker Slough Pumping Plant diverts water for delivery to Napa and Solano counties through the North Bay Aqueduct. Near Byron in the southern Delta, the SWP diverts water into Clifton Court Forebay for delivery south of the Delta. Banks pumping plant lifts water from Clifton Court Forebay into the California Aqueduct, which channels the water to Bethany Reservoir. The water delivered to Bethany Reservoir from Banks Pumping Plant is either delivered into the South Bay Aqueduct for use in the San Francisco Bay Area or continues down the California Aqueduct to O'Neil Forebay, Gianelli Pumping-Generating Plant, and San Luis Reservoir.

San Luis Reservoir is jointly operated by DWR and Reclamation and has a storage capacity of more than 2 maf. DWR's share of gross storage in the reservoir is about 1.062 maf. Generally, water is pumped into San Luis Reservoir during late fall through early spring, and is temporarily stored for release back to the California Aqueduct to meet summertime peaking demands for SWP and CVP contractors.

SWP water not stored in San Luis Reservoir and water eventually released from San Luis continues to flow south through the San Luis Canal, a portion of the California Aqueduct jointly owned by DWR and Reclamation. As water flows through the San Joaquin Valley, deliveries of CVP water are made through numerous turnouts to farmlands in the service areas of the CVP. Near Kettleman City, the Coastal Branch Aqueduct splits from the California Aqueduct for water delivery to agricultural areas to the west and municipal and industrial water users in San Luis Obispo and Santa Barbara counties.

The remaining water conveyed by the California Aqueduct travels farther in the San Joaquin Valley to agriculture users such as Kern County Water Agency before reaching Edmonston Pumping Plant, which raises the water high enough to travel across the Tehachapi Mountains into Antelope Valley. In Antelope Valley, the Aqueduct divides into the East and West Branches. The East Branch carries water into Silverwood Lake and Lake Perris. Water in the West Branch flows to Quail Lake, Pyramid Lake, and Castaic Lake.

Twenty-nine state water contractors have signed long-term water supply contracts with DWR for 4,173 maf per year. Signed in the 1960s, all contracts are in effect to at least 2035 and are essentially uniform. Each contract contains a schedule of the maximum amount of water the contractor can receive annually. This schedule is contained in SWP Table A. The annual amount was designed to increase each year, with most contractors reaching

their maximum amount in 1990. In most cases, SWP water is an important component of local water supplies. Five contractors use SWP water primarily for agricultural purposes and the remaining 24 contractors use SWP water primarily for municipal purposes. All available water is allocated annually in proportion to each contractor's annual SWP Table A amount. Appendix C contains additional information about SWP Table A.

## The Sacramento-San Joaquin Delta

The Sacramento-San Joaquin Delta is a network of natural and artificial channels and reclaimed islands at the confluence of the Sacramento and San Joaquin rivers. The Delta forms the eastern portion of the San Francisco estuary, receiving runoff from more than 40% of the state's land area. It is a low-lying region where over the years sediment from the Sacramento, San Joaquin, Mokelumne, Cosumnes, and Calaveras rivers mingled with organic matter deposited by marsh plants. Covering 738,000 acres interlaced with hundreds of miles of waterways, much of the land is below sea level and relies on more than 1,100 miles of rather fragile levees for protection against flooding.

Because the SWP and the CVP use Delta channels to convey water to the southern Delta for diversion, the Delta is the focal point for water distribution throughout the state. In fact, the Delta is one of the few estuaries in the world that is used as a major source of drinking water supply: about one-quarter of California's drinking water comes from the Delta; and two-thirds of Californians get some portion of their drinking water from the Delta. The Delta also provides a unique estuarine habitat for many resident and migratory fish and birds, some of which are listed as threatened or endangered. Most of the native fish either migrate through the Delta or move into it for spawning. Resident native fish are mainly present in areas strongly influenced by inflow from the Sacramento River.

The CVP pumps at Jones Pumping Plant have a capacity of 4,600 cubic feet per second (cfs) and divert water directly from Old River. The CVP has contracts to divert 3.3 maf annually from the Delta for primarily agricultural use south of the Delta. The SWP pumps at Banks Pumping Plant have a combined pumping capacity of 10,300 cfs; however, diversions into the buffering Clifton Court Forebay are restricted to 13,870 acre-feet (af) daily and 13,250 af per day over a three-day average. A rate of 13,250 af per day equates to an average pumping of 6,680 cfs.

CVP and SWP reservoir releases and Delta exports follow the Coordinated Operating Agreement, which sets guidelines for the sharing of supply and responsibility for meeting water quality standards in the Delta. Most of the water exported by the SWP depends on water rights derived from Lake Oroville storage; however, the SWP can also divert water considered in excess in the Delta. These excess conditions in the Delta usually result when there is sufficient inflow to meet all beneficial needs and the SWP is not required to make supporting releases from Lake Oroville. Diversions during excess Delta conditions are still governed by various determinations and rules.

In addition to the state and federal projects' diversions, irrigation water for use in the Delta is taken from channels and sloughs through approximately 1,800 diversions which can total more than 5,000 cfs in July and August.

Delta water quality is primarily governed by the 1995 *Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta*. This plan established beneficial uses, associated water quality objectives, and an implementation program. The State Water Resources Control Board's Water Rights Decision 1641 (D-1641) assigned primary responsibility for meeting many of the Delta water quality objectives to the SWP and CVP. Key factors in determining water quality in the western Delta are the quality of important Delta inflows and the intrusion of ocean-derived salts associated with daily tides. The extent of this intrusion is primarily determined by the magnitude of Delta inflows, export pumping rates, and operation of the Delta Cross Channel.

Delta inflows are normally regulated by upstream reservoir operations.

The water flowing in Delta channels is constrained by an extensive levee system that protects Delta islands from flooding. This protection is critical because land subsidence in the Delta, primarily due to the consuming oxidation of aerated peat soils, has placed most of the land in the Delta below sea level. In fact, the elevation of Delta islands can be more than 20 feet below sea level. The resulting difference between the elevations of Delta lands and the water surface in adjacent channels makes Delta levees vulnerable to failure. Land subsidence in the Delta is expected to continue, which will increase the vulnerability of levees to failure and subsequent island flooding.

# Water Delivery Reliability

# 2

As mentioned in the Introduction, estimates of SWP delivery reliability are intended to help local SWP water users assess their water supply reliability, a key measure of a system's ability to match water supplies with demand. Just how water delivery reliability is assessed is critical to whether it is a meaningful guide for such an analysis. This chapter presents DWR's method for calculating SWP delivery reliability, the factors affecting SWP delivery reliability, and the limitations to estimating future water delivery reliability.

## Calculating SWP Delivery Reliability

For this report, "water delivery reliability" is defined as the annual amount of water that can be expected to be delivered with a certain frequency. SWP delivery reliability is calculated using computer simulations based on 82 years of historical data. The annual amounts of SWP water deliveries are ranked from smallest to largest and a probability is calculated for each amount. These results are often displayed as a graph, commonly referred to as an exceedence plot. They can also be presented in a table.

## Factors Affecting Water Delivery Reliability

The amount of the SWP water supply delivered to the state water contractors in a given year depends on the demand for the supply, amount of rainfall, snowpack, runoff, water in storage, pumping capacity from the Delta, and legal constraints on SWP operation. Expressed in more general terms, water delivery reliability depends on three general factors: the availability of water at the source, the ability to convey water from the source to the desired point of delivery, and the magnitude of demand for the water.

### Availability of Source Water

The availability of water at the source depends on the amount of rain and snow and water use in the source areas. For the SWP, the size of the April 1 snowpack in the Feather River watershed and the storage in Lake Oroville are key components of the annual estimation of the SWP's delivery capabilities from April through September.

**Factors of Uncertainty** The inherent yearly variable location, timing, amount, and form of precipitation in California introduce some uncertainty to the availability of future SWP source water and hence future SWP deliveries. Simulating an 82-year sequence based on historical weather patterns restricts the analytical approach to no more extreme droughts or severe storms than have historically occurred. However, the 82-year sequence of weather patterns does produce a wide range of hydrologic events with which to evaluate the ability of the SWP to deliver water.

Climate change is another factor in source-water uncertainty. Current literature suggests that global warming is likely to significantly affect the hydrologic cycle, changing California's precipitation pattern and amount from that shown by the historical record. In

fact, there is evidence that some changes have already occurred, such as Sierra snowmelt starting earlier, more runoff shifting from the spring to the winter, and an increase in winter flooding frequency. These changes would place more stress on the reliability of existing flood management and water supply systems, such as the SWP.

**Treating Availability of Source Water Issues in CALSIM II Studies** The SWP operation analyses in this report are based on operation simulations under an extended record of historical precipitation and adjusted historical runoff. The 82-year record of 1922-2003 runoff patterns in the studies simulating 2009 and 2029 scenarios have been adjusted as needed to reflect the current and future levels of development in the source areas by analyzing land use patterns and projecting future land and water use. These series of data are then used to forecast the amount of water available to the SWP under Current and Future Conditions.

Climate change is expected to modify rainfall and runoff, which in turn will effect SWP operations. In the 2009 DWR Report, *Using Future Climate Projections to Support Water Resources Decision Making in California*, possible climate change effects to SWP and CVP operations were assessed using 12 future climate projections at mid-century and end-of-century (Chung et al., 2009). The range of results for the 12 projections is detailed throughout that report. Uncertainties in the results increase as the projections move further into the future. These studies assumed that no changes were made to the existing SWP and CVP infrastructure in the future. Future system operations used D-1641 regulations (SWRCB, 1995). Operations guidelines that are subject to change, such as restrictions on Delta exports contained in Endangered Species Act biological opinions, were not included in these studies due to the high uncertainty of how such restrictions may be applied 50 or 100 years from now.

In the 2009 climate change assessment, a three-step streamflow adjustment method was used to estimate inflows to major SWP and CVP reservoirs. An 82-year sequence of reservoir inflows that reflects a wide range of hydrologic variability was determined for each of the 12 future climate projections for both the mid-century and end-of-century analysis periods. Because some water allocation and water quality regulations are based on water year type designations (for example, wet or dry years), these designations were modified as necessary to reflect the future climate projections. Agricultural crop and urban outdoor water demands were adjusted to reflect changes in precipitation. Although there is a wide range of uncertainty in sea level rise projections, for simplicity's sake, sea level rise estimates of 1 foot for the mid-century and 2 feet for the end of the century were chosen for these impact studies. The reliability of the SWP and CVP water supply systems is expected to be reduced for the range of future climate projections studied.

In addition to the mid-century and end-of-the-century analysis described above, for this report DWR has estimated potential deliveries for 2029 using one future climate projection which is representative of median effects on the SWP and CVP system based on results from all 12 projections. The 2029 delivery estimates are based on the assumption that the two projects will be operated to meet the requirements of the recently issued Biological Opinions from the USFWS and the NMFS.[1] Estimates do not assume any changes in the way water is conveyed across the Delta. These assumptions are not a prediction of the future but an assessment of the future if these factors do not change. In addition, these estimates must be viewed with caution given the uncertainty of the effects of climate change in the future and the simplifying assumptions required for the analyses.

[1]USFWS Delta Smelt Biological Opinion December 15, 2008. NMFS Biological and Conference Opinion on the Long-Term Operations of the CVP and SWP June 4, 2009.

## Ability to Convey Source Water to the Desired Point of Delivery

The ability to convey source water to the desired point of delivery refers to the availability of facilities to capture and convey water and any institutional limitations placed upon the facilities. Uncertainty in SWP deliveries may be, in part, due to uncertainty in the ability to convey water. For the SWP, this uncertainty centers on the Delta.

**Factors of Uncertainty** In general, SWP operations are closely regulated by Delta water quality standards established by the State Water Resources Control Board (SWRCB) in D-1641. In addition SWP and CVP operations are further constrained by requirements in the USFWS and NMFS biological opinions. The requirements in both biological opinions are based on physical and biological phenomena that do not lend themselves to simulations using a monthly time step. Much scientific and modeling judgment has been employed to represent the implementation of the biological opinions. The modeled representation of the requirements is the best possible, given the current scientific understanding of environmental factors enumerated in the biological opinions and the limited historical data for some of these factors. Turbidity, water temperature, and the presence of fish are examples of environmental factors that must be approximated in the model.

Another potential uncertainty for SWP water conveyance through the Delta is the risk of interruptions in SWP diversions from the Delta due to levee failures. SWP source water enters the Delta through the Sacramento River and is conveyed to Banks Pumping Plant via Delta channels lined with fragile levees. If a levee fails, depending on the location and the size of the adjacent island, the flow of water from nearby channels onto the affected island can draw saline water from Suisun and San Pablo bays into the central Delta. In such an incident, SWP pumping at Banks Pumping Plant may have to be curtailed or stopped for a period to prevent drawing saline water into the south Delta. Additional releases from Lake Oroville may also be necessary to flush the Delta of the saline water. As discussed in Chapter 4, the likelihood of levee failures in the future is expected to increase.

**Treating SWP Conveyance Issues in CALSIM II Simulations** The 2009 base study in this report assumes current facilities and institutional limitations, which include D-1641, export curtailments for the Vernalis Adaptive Management Plan, as well as the operational restrictions contained in the USFWS and NMFS biological opinions. Chapter 6 has a more detailed description of these assumptions. For comparison, the 2029 studies in this report assume the same institutional limitations as the 2009 simulations regarding requirements for Delta water quality flows and fish protection will be in place in 20 years; no facility improvements, expansions, or additions will be made to the SWP; and conveying water through the Sacramento-San Joaquin Delta will not be significantly interrupted by levee failures. These assumptions are not a prediction of the future but an assessment of the future if these conditions do not change. As discussed in Chapter 3, there are several efforts focused on improving the Delta ecosystem and water supply reliability in the near and long term. The 2029 studies also incorporate assumptions about climate change and sea level rise.

Also not included in this report are CALSIM II studies that reflect risk of levee failures. The effect on SWP deliveries due to a single or multiple levee failure is highly dependent on where the levees fail and the Delta conditions at the time. As the *Delta Risk Management Strategy (DRMS), Phase 1: Risk Analysis* (DWR, 2008) indicates, the effect on SWP deliveries can range from relatively minor to catastrophic with extensive levee failures, depending on whether an earthquake occurs under dry or wet Delta conditions. However, the same report points out that if multiple Delta islands are left flooded with openings to adjacent channels, after a large-scale levee failure, the volume of water that would move in and out of the Delta over a tidal cycle could actually increase, resulting in higher salinities in the west

Delta. If Delta water quality standards remain unchanged, releases from Lake Oroville would then most likely need to increase above current levels to enable the same level of SWP pumping. The Delta Risk Management Strategy report also indicates that multiple levee failures and Delta island flooding due to flood flows may not significantly affect SWP deliveries due to the fresh water Delta-wide conditions that would exist at the time of flood flows. Chapter 4 addresses in more detail Delta levee vulnerability to failure.

## Demand for System Water

Water demand in the delivery service area is affected by such factors as the magnitude and types of water demands, the extent of water conservation measures, local weather patterns, and water costs. Supply from a water system may be sufficiently reliable at a low level of demand but become less reliable as the demand increases. In other cases, the reliability of a water supply system to meet a higher demand may be maintained at its past level because new facilities have been added or the operation of the system has been changed. In general, the higher and the more time-concentrated the water demands, the more need for storage and conveyance capacity to achieve the same delivery reliability. For example, if the demand occurs only three months in the summer, a water system with a sufficient annual supply but insufficient water storage may not be able to reliably meet the demand. If, however, the same total amount of demand is distributed over the year, the same system could more easily meet the demand because the need for water storage is reduced.

Demand levels for the SWP water users in this report are derived from historical data and information from the SWP contractors. Annual demand on the SWP is nearing the maximum contract amount (referred to as the "Maximum SWP Table A amount"). Each SWP contract contains a SWP Table A, which states the maximum annual delivery amount from the SWP over the period of the contract. These annual amounts usually increase over time. Most contractors' SWP Table A amounts reached a maximum in 1990. The total of all contractors' maximum SWP Table A amounts is 4,173 maf per year. SWP Table A is used to define each contractor's portion of the available water supply that DWR will allocate and deliver to that contractor. The SWP Table A amounts in any particular contract are not guarantees of annual delivery amounts but are used to allocate individual contractors' portion of the total delivery amount available. Estimates of each contractor's amount of water delivered are determined by the factors described in this report. See Appendix C for additional explanation and listing of the maximum SWP Table A amounts.

Of the 29 SWP contractors, Yuba City, Butte County, and the Plumas County Flood Control and Water Conservation District are north of the Delta. Their total maximum SWP Table A amounts is 0.040 maf per year. The total maximum SWP Table A amounts for the remaining 26 contractors, who all receive their supply from the Delta, is 4.133 maf per year. This report focuses on SWP deliveries from the Delta because the amount of water pumped from the Delta by the SWP is the most significant component of the total amount of SWP deliveries. The results presented in this report in terms of estimated delivered water supplies as a percent of SWP Table A deliveries apply to contractors north of the Delta in the same manner as those contractors receiving supply from the Delta.

SWP contractors may also receive water under SWP Article 21 of their contract. It is available only if it does not interfere with SWP operations or Table A allocations, excess water is available in the Delta, and it will not be stored in the SWP system. Because an SWP contractor must have an immediate use for SWP Article 21 supply or a place to store it outside of the SWP, not all SWP contractors can take advantage of this additional supply. For those SWP contractors who are able to store their wet weather supplies, SWP Article 21 supply can be stored by being put directly into a reservoir or by offsetting other water that would have been

withdrawn from storage, such as local groundwater. In the absence of storage, SWP Article 21 water is not likely to contribute significantly to local water supply reliability. Incorporating supplies received under SWP Article 21 into the assessment of water supply reliability is a local decision based on specific local circumstances, facts, and level of water supply reliability required. This report presents information on SWP Article 21 water separately so local agencies can determine whether it is appropriate to incorporate this supply into their analyses.

**Factors of Uncertainty** Estimating future demand for SWP water requires assumptions be made about population growth, water conservation, recycling efforts, other sources of supply available to the SWP contractors, and climate change. The estimates also depend on the cost to the SWP contractor for each of the components of their integrated water management plan. These factors are considered by the SWP contractors in the estimates of their current and future demands.

**Treating Water Demand Issues in CALSIM II Simulations** SWP Table A and SWP Article 21 demands in the 2009 study have increased from those in the Study 2007 from the *2007 Report*. SWP Table A and SWP Article 21 demands in the 2029 study have also increased from those in the Study 2027 from the *2007 Report*. Specific values used in the CALSIM II studies are contained in Appendix A.

# Limitations to Estimating Future Water Delivery Reliability

## Studies Must Rely on Assumptions

Actual, historical water deliveries cannot always be used with a significant degree of certainty to predict future water deliveries. As discussed earlier, there are continual, significant changes over time in the determinants of water delivery for a specific water supply system. These changes include water storage and delivery facilities, water use in the source areas, water demand in the receiving areas, and the regulatory constraints on the operation of facilities for the delivery of water. Given the highly significant changes that have occurred for the SWP over the past 40 years, past deliveries are not a good predictor of SWP current deliveries, much less of future deliveries.

For example, the demand 30 years ago for water from the SWP was lower than it is now or expected to be in the future. Lower demand for SWP water resulted in less water transported through the SWP during normal and wet times than could have been—or would have been if the demand for water had been higher. Less water was delivered then because less water was needed; the amount of source water and conveyance capabilities weren't limiting factors for deliveries. Conversely, the recently issued biological opinions' restrictions on SWP exports from the Delta are estimated to reduce annual deliveries from what has been delivered in the recent past. Analyses estimating future SWP deliveries must include assumptions about Future Conditions. Some assumptions are very important to the analyses and are key to understanding the resulting estimates of annual water deliveries. A discussion of the important assumptions for the studies in this report follows.

## Studies Assume Repeating Historical Weather Patterns

One of the most significant assumptions for water planning in general is how wet, dry and variable the weather will be. Until recently, assuming the future weather pattern would be similar to the past was sufficient for many planning purposes. Given the evolving information on the potential effects of global climate change in the future, this approach is no longer adequate. Incorporating climate change into future projections is difficult because of the many ways the patterns of rain, snow and temperature could shift. A way to measure some of the uncertainty is to analyze many potential climate change scenarios in order to capture the range of

water supply effects.

This report contains estimates of future SWP deliveries under one selected median-impacts climate change projection. The historical record of precipitation information for the Central Valley for the period 1922 through 2003 is modified to reflect the future climate projection. The amount and timing of rainfall and runoff is adjusted but the sequence of dry years or wet years is the same for all scenarios. Evaluating how water management systems will respond under severely dry periods is limited to assuming the worst droughts in the period of historical record. The worst multiyear drought on record is 1928 through 1934, although the brief drought from 1976 through 1977 was more acutely dry.

## Other Important Assumptions

To identify the assumptions with the most effect on the estimates of SWP deliveries, DWR conducted a sensitivity analysis for assumptions in CALSIM II model studies. In a sensitivity analysis, an assumption such as the amount of water used in the watershed above Lake Oroville is varied over several studies and the results for SWP deliveries are compared. This is done to assess how each assumption affects study results. The *2005 State Water Project Delivery Reliability Report* presents and discusses the results of DWR's study. The parameters having the largest net effect on SWP Delta deliveries are SWP Table A demands and Banks Pumping Plant limits. The most elastic parameters (i.e., parameters causing the most percent change in SWP deliveries per percent change in value) are SWP Table A demands and Lake Oroville inflow. The estimates for the future inflow to Lake Oroville depend on what is assumed for climate change. Legal limitations are one of the factors defining the rules for operating Banks Pumping Plant. Therefore, the assumptions for climate change and the restrictions of the USFWS' and NMFS' biological opinions directly affecting Banks Pumping Plant operations will significantly affect SWP delivery estimates.

# Status of Planning Activities That May Affect SWP Delivery Reliability

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As discussed earlier, the Delta is an essential part of the conveyance system for the SWP. SWP pumping at Banks Pumping Plant is regulated to protect the many uses of the Delta. However, today's uses in the Delta are not sustainable over the long term under current management practices and regulatory requirements. A comprehensive plan to meet the Delta's and California's water challenges was approved by Governor Schwarzenegger in November 2009. That plan and the key planning efforts involving the Delta are discussed below.

## 2009 Comprehensive Water Package

In November 2009, four legislative bills and the supporting bond bill, creating a comprehensive water package designed to meet California's water challenges, were approved by Governor Schwarzenegger. The legislation establishes the governmental framework to achieve the co-equal goals of providing a more reliable water supply to California and restoring and enhancing the Delta ecosystem. The package includes requirements to improve the management of our water resources by monitoring groundwater basins, developing agricultural water management plans, reducing statewide per capita water consumption 20 percent by 2020, and reporting water diversions and uses in the Delta. It also appropriates $250 million for grants and expenditures for projects to reduce dependence on the Delta.

The Safe, Clean, and Reliable Drinking Water Supply Act of 2010 will come before the California voters in November 2010. If enacted, it would provide funding for California's aging water infrastructure and for projects and programs to improve the ecosystem and water supply reliability for California. The bond bill includes $2.25 billion for actions improving Delta sustainability. These investments will help to reduce seismic risk to Delta water supplies, protect drinking water quality, and reduce conflict between water management and environmental protection.

## Delta Vision

In September 28, 2006, Governor Schwarzenegger signed an executive order to establish an independent Blue Ribbon Task Force to develop a durable vision for sustainable management of the Sacramento-San Joaquin Bay Delta. The Delta Vision process concluded at the end of 2008 with a suite of strategic recommendations for long-term, sustainable management of the Delta. Their recommendations were based upon seven broad goals. These goals helped to guide the development of the 2009 Comprehensive Water Package and are:

- Legally acknowledge the equal goals of restoring the Delta ecosystem and creating a more reliable water supply for California.
- Recognize and enhance the unique cultural, recreational, and agricultural values of the California Delta.

- Restore the Delta ecosystem as the heart of a healthy estuary.
- Promote statewide water conservation, efficiency, and sustainable use.
- Build facilities to improve the existing water conveyance system and expand statewide storage, and operate both to achieve the equal goals.
- Reduce risks to people, property, and state interests in the Delta by effective emergency preparedness, appropriate land used, and strategic levee investments.
- Establish a new governance structure with the authority, responsibility, accountability, science support, and secure funding to achieve these goals.

## Delta Risk Management Strategy

The Delta Risk Management Strategy was initiated as a component of the 2000 CALFED Record of Decision. In 2005, the Legislature passed and the governor signed AB 1200, which requires DWR to evaluate the potential effects on water supply derived from the Delta based on 50-, 100-, and 200-year projections for possible effects on the Delta due to subsidence, earthquakes, floods, climate change, and combinations of these. The assessment of risks and the associated consequences to the State are contained in the *Delta Risk Management Strategy (DRMS), Phase 1: Risk Analysis* (DWR, 2008) report, completed in February 2009.

In Phase 2 of the Delta Risk Management Strategy, DWR and DFG must determine the principal options for reducing the risks to, among other things, prevent the disruption of water supplies derived from the Delta, improve the water quality of drinking water supplies from the Delta, and maintain Delta water quality for Delta users. DFG is to evaluate and comparatively rate each option for its ability to restore salmon and other fisheries that use the Delta. The study is to be completed by Summer 2010.

The Delta Risk Management Strategy is a major source of scientific and technical information on the Delta and Suisun Marsh levees for other major studies and initiatives.

## CALFED Ecosystem Restoration Program Conservation Strategy

The Ecosystem Restoration Program Conservation Strategy has been developed by the California Department of Fish and Game (DFG) in collaboration with the NMFS and USFWS, the three implementing agencies for the program. It provides the foundation for regional implementation of the Ecosystem Restoration Program guided by a science based adaptive management approach designed to improve aquatic and terrestrial habitats and improve ecological functions in the Bay-Delta to support sustainable populations of fish and wildlife species. It represents a "single blueprint" for conservation and recovery of species and will integrate the NMFS recovery plan for Central Valley salmonids and the USFWS Delta Native Fishes Recovery Plan, once these plans are completed. While the Ecosystem Restoration Program Conservation Strategy currently focuses on the Delta and Suisun Marsh it will be expanded to include the tributaries to the Delta.

The Ecosystem Restoration Program Conservation Strategy represents the perspectives of the three fish and wildlife agencies on what is needed at a programmatic level to achieve biological conservation and management goals in the Delta. It serves to guide more detailed planning efforts such as the Bay Delta Conservation Plan. The Bay Delta Conservation Plan is currently evaluating specific detailed actions which would implement at least in part those described more generally in the Ecosystem Restoration Program Conservation Strategy. In particular, Bay Delta Conservation Plan will be addressing the issues of conveyance and flows as a component of ecosystem restoration.

## Bay Delta Conservation Plan

The Bay Delta Conservation Plan is being developed to promote the recovery of endangered, threatened and sensitive fish and wildlife species and their habitats in the Delta in a way that will also protect and restore water supplies.

The Bay Delta Conservation Plan is:

- Identifying conservation strategies to improve the overall ecological health of the Delta.
- Identifying ecologically friendly ways to move fresh water through and/or around the Delta.
- Addressing toxic pollutants, invasive species, and impairments to water quality.
- Establishing a framework and funding to implement the Plan over time.

The Bay Delta Conservation Plan is being developed in compliance with the Federal Endangered Species Act and the California Natural Communities Conservation Planning Act. When completed, the Bay Delta Conservation Plan would provide the basis for the issuance of endangered species permits for the operation of the state and federal water projects. The plan would be implemented over the next 50 years. The heart of the Bay Delta Conservation Plan is a long-term conservation strategy that sets guidelines for the actions needed for a healthy Delta.

State and federal agencies are developing a joint Environmental Impact Report/Statement under the Delta Habitat Conservation and Conveyance Program. The Environmental Impact Report/Statement will determine the potential environmental impacts of the proposed Bay Delta Conservation Plan. The draft Environmental Impact Report/Statement is expected to be ready for public review and comment by mid-2012 and the Bay Delta Conservation Plan Habitat Conservation Plan is scheduled to be delivered early in 2011.

## Delta Habitat Conservation and Conveyance Program

The Delta Habitat Conservation and Conveyance Program is a partnership between DWR and the U.S. Bureau of Reclamation (Reclamation) to evaluate the ecosystem restoration and water conveyance alternative identified by the Bay Delta Conservation Plan along with other conveyance alternatives. The evaluation culminates in the completion of a joint Environmental Impact Report/Statement. The State and federal lead agencies for the Environmental Impact Report/Statement are DWR, Reclamation, the USWS, and the NMFS. Development of the Environmental Impact Report/Statement is being done in cooperation with the DFG, the U.S. Environmental Protection Agency, and the U.S. Army Corps of Engineers. The draft Delta Habitat Conservation and Conveyance Program Environmental Impact Report/Statement is scheduled to be completed mid-2012.

## 2-Gates Fish Protection Demonstration Project

The 2-Gates Fish Protection Demonstration Project is proposed to be installed for 5 years to test its ability to control flows and thereby protect delta smelt and other sensitive aquatic species through reduced entrainment at the SWP and CVP Delta pumping facilities. The 2-Gates Fish Protection Demonstration Project would install and operate removable gate structures in two key locations in the central Delta; in Old River between Bacon Island and Holland Tract, and in Connection Slough between Mandeville Island and Bacon Island. The structures would be opened and closed in conjunction and coordination with operation criteria established by state and federal water quality and environmental regulators. An extensive water quality and fish monitoring program is proposed, using existing and new monitoring actions, to support the validation of the project.

The structures would be temporary and removed after a five-year evaluation period. These facilities include sheet pile dikes extending from each channel bank to the gates, a pile-supported boat ramp to reduce effects to recreational boating and limited dredging and ground disturbance to minimize other biological effects. Barge-mounted gates will be fabricated off-site, floated to the site, and installed by ballasting each gate in place adjacent to the sheet pile dikes.

The project lead is the Reclamation. Public review of the draft environmental assessment and a finding of no significant impacts closed on November 30, 2009. A final environmental assessment and a finding of no significant impacts may follow.

# Areas of Significant Uncertainty for SWP Delivery Reliability

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There are three significant factors contributing to uncertainty in the delivery reliability of the SWP: possible effects from climate change and sea level rise, the vulnerability of Delta levees to failure, and greater operation restrictions imposed by the USFWS and NMFS in response to decreasing populations of endangered fish species. Each of these uncertainties is discussed below.

## Climate Change and Sea Level Rise

Climate change is identified in the *California Water Plan Update 2009* as one of the key considerations in planning for the state's water management. California's reservoirs and water delivery systems were developed based on historical hydrology and, under climate change, the past may no longer be a good guide for the future. In fact, changes have already been observed in California's climate over the past 100 years (DWR, 2009). Air temperatures have risen about 1 degree Fahrenheit with the greatest changes occurring at night and at higher elevations. Early spring snowpack in the Sierra Nevada, a key natural reservoir for California's water supply, has decreased about 10% resulting in a loss of about 1.5 maf of water storage. Sea levels along the California coast have risen by about 7 inches.

The climate is expected to continue changing in the future (DWR, 2009). Mean temperatures are predicted to increase by 1.5 degrees to 5.0 degrees Fahrenheit by mid-century and 3.5 degrees to 11 degrees by the end of the century. These rising air temperatures are expected to continue to reduce snowpack, especially in low elevation watersheds where more precipitation may fall as rain rather than snow (Chung et al., 2009). Reduced snow pack is expected to lead to higher winter runoff and lower spring runoff. This could increase flooding during the winter and reduce river flows in the spring and summer, which may require water managers to evaluate the tradeoffs between flood protection and water supply. Future sea level rise estimates range from 4 to 16 inches by mid-century and 7 to 55 inches by the end of the century (DWR, 2009). Higher sea levels could threaten the existing levee system in the Delta. Salinity intrusion into the Delta could also require increased releases of freshwater from upstream reservoirs to maintain compliance with water quality standards.

For the SWP, these climate changes have the potential to simultaneously affect the availability of source water, the ability to convey water, and users' demands for water. This may exacerbate the existing mismatch in California between where and when precipitation occurs and where and when people use water.

**Previous Assessment of Climate Change Impacts on SWP Delivery Reliability** To better understand how the future reliability of the SWP and CVP may be affected by climate change, DWR examined possible effects for 12 future climate scenarios in a report titled *Using Future Climate Projections to Support Water Resources Decision Making in California* (Chung et al., 2009). The 12 scenarios represent projections from six Global Climate Models for a higher and a lower future

greenhouse gas emissions scenario. The studies also took into account Delta salinity intrusion due to sea level rise and resulting changes in reservoir operations to maintain Delta water quality. Shifts in both water supply and water demands were considered. Several factors related to water supply reliability were examined: annual Delta exports, reservoir carryover storage, Sacramento Valley groundwater pumping, and additional water supplies needed to reduce the frequency and extent of system vulnerability to operational interruption. For the range of future climate projections studied, the reliability of the SWP and CVP water supply systems is expected to be reduced. Although the analysis examined both mid-century and end-of-the-century effects, only mid-century effects are discussed in this report.

One indicator of the amount of water that the SWP can supply south of the Delta is annual Delta exports, which is the total amount of water transferred (exported) south of the Delta through the SWP's Banks Pumping Plant and the CVP's Jones Pumping Plant over the course of one year. At mid-century, median Delta exports are reduced by 7% for the lower greenhouse gas emissions scenario and by 10% for the higher emissions scenario. It is important to note that the full range of mid-century changes in Delta exports for the 12 future climate scenarios spans an increase of 2% to a decrease of 19%. These decreases in annual Delta exports would reduce water deliveries south of the Delta.

An important factor in California's water supply reliability is the amount of water stored in reservoirs from one year to the next. This stored water is like a water supply savings account that allows water managers flexibility during tough times. This water supply savings account is called reservoir carryover storage, and it is the amount of water remaining in a reservoir at the end of September that is available (carries over) for use the next water year. At mid-century, median reservoir carryover storage is reduced by 15% for the lower greenhouse gas emissions scenario and by 19% for the higher emissions scenario. These reductions in reservoir carryover storage would reduce the systems' flexibility during water shortages.

In the Sacramento Valley, reduced surface water supplies are assumed to be augmented by increased groundwater pumping. For agricultural and urban areas where there is access to both surface water and groundwater, surface water diversions are assumed to be used first up to the maximum amount allowed by current contracts. Any unmet demand is then supplied by groundwater pumping. For areas where there is no surface water access, all demands are met by groundwater pumping. At mid-century the median Sacramento Valley groundwater pumping increases by 5% for the lower greenhouse gas emissions scenario and by 9% for the higher emissions scenario.

Under climate change and in some years, water levels in the main supply reservoirs (Shasta, Oroville, Folsom, and Trinity) could fall below the lowest release outlets making the system vulnerable to operational interruption. By mid-century, it is expected that a water shortage worse than the one during the 1977 drought could occur in 1 out of every 6-8 years. In those years, it is estimated that an additional 575-850 taf of water would be needed to meet current regulatory requirements and to maintain minimum system operations. This water could be obtained through additional water supplies, reductions in water demands, or a combination of the two. For current conditions, the report concludes the system is not considered vulnerable to this type of operational interruption.

**Selection of Climate Change Scenario for Updated Reliability Assessment** For the purposes of this report, the 2029 delivery estimates are based upon a single median-impact future climate projection. To identify this projection, a separate analysis was conducted of the 12 mid-century climate projections contained in *Using Future Climate Projections to Support Water Resources Decision Making in California* (Chung et al., 2009), and their resulting water supply effects to determine which one most closely represented the "central" or "median" projection. The metrics used for comparison consist-

ed of projected climate and hydrology variables, and their effects on CVP/SWP system exports; namely, temperature, precipitation, total inflow to major reservoirs, shifts in timing of run-off, and Delta exports. Using these metrics, the future climate projection from the MPI-ECHAM5 global climate model run for the higher greenhouse gas emissions scenario was selected to be representative of median SWP-CVP effects, and thus is used for the analyses presented in this report.

## Vulnerability of Delta Levees to Failure

Delta levees provide constant protection from flooding because most lands in the Delta are below sea level. Most Delta levees, however, do not meet modern engineering standards and are highly susceptible to failure. Levees are subject to failure at times of high flood flows, but also at any time of the year due to seepage or the piping of water through the levee, slippage or sloughing of levee material, or sudden failure due to an earthquake. According to the URS Corp./Jack R. Benjamin & Associates report, *Delta Risk Management Strategy (DRMS), Phase 1: Risk Analysis* (DWR, 2008), the risk of levee failure in the Delta is significant, as shown by the fact that most islands in the Delta have flooded at least once over the past 100 years, with many flooding at least twice. Since 1900, there have been 158 levee failures.

A breach of one or more levees and island flooding may affect Delta water quality and water operations. Depending on the hydrology and the size and locations of the breaches and flooded islands, a significant amount of saline water may be drawn into the interior Delta from Suisun and San Pablo bays. At the time of island flooding, exports may be drastically reduced or ceased to evaluate the salinity distribution in the Delta and to avoid drawing higher saline water toward the pumps. The introduced salinity then could become dispersed and degrade Delta water quality for a prolonged period because of complex relationships between Delta inflows, tidal mixing, and the time taken to repair the breaches.

A large earthquake in the Delta causing significant levee failures and island flooding could lead to multiyear disruptions in water supply, significant water quality degradation, as well as permanent flooding of several islands. Such permanent multi-island flooding would probably lead to increased salt water intrusion into the Delta during seasonal low inflows. Maintaining Delta water quality when several islands are flooded and breaches are open would require additional Delta inflow because the volume of water coming into the Delta on the flood tide would increase, requiring more fresh water from the rivers to prevent the saline water from extending into the Delta. When SWP and CVP pumping are restarted, Delta inflow would need to increase again beyond the pumping amount in order to prevent water quality degradation in the Delta. This chain of events would significantly affect water supply reliability by limiting pumping and requiring additional reservoir releases to generate the needed higher Delta inflows. A worst case scenario for water supply effects would be a moderate or large earthquake causing extensive levee failure in the late summer or fall of a dry year.

The levee break on Middle River and subsequent flooding of Upper Jones Tract in 2004 is a small-scale example of this phenomenon. Following the break, Delta pumping was curtailed for several days to prevent seawater intrusion. Water shipments down the California Aqueduct were continued through unscheduled releases from San Luis Reservoir. Also, Shasta and Oroville reservoir releases were increased to provide for salinity control in the Delta.

A growing concern about the long-term viability of the Delta's levee system led to the initiation of the Delta Risk Management Strategy.

**Delta Risk Management Strategy** The Delta Risk Management Strategy is being developed in two phases. Phase 1 is the analysis of the risk of levee failures and the associated potential economic, environmental, and public health and safety effects.

The final Phase 1 Report was completed in February 2009. Phase 2, expected to be completed by Summer 2010, is to develop and evaluate strategies to reduce risks from levee failures. The risk analysis includes the likely occurrence of earthquakes of varying magnitudes in the region, future rates of subsidence given continued farming practices, the likely magnitude and frequency of storms, and the potential effects associated with global climate change (sea level rise, climate change, temperature change). Estimated risks to the Delta were made for 50-, 100-, and 200-year projections since risk can be expected to increase with time.

The Delta Risk Management Strategy looks at several hazards to levees: seismic events that cause levee failures, flood flows that can overtop levees or cause levee failure by increased pressure and seepage, undetected problems during non-flood flow periods, and erosion due to high wind waves. The level of risk of failure of Delta levees was determined by considering: the frequency of different magnitudes of hazards that can challenge the integrity of Delta levees, how vulnerable different levee reaches are to hazards, how hazards and levee vulnerabilities combine to produce levee failure, and the economic and ecosystem effects due to levee failure. The analysis assumes that existing regulatory and management practices will continue.

**Potential Interruption/Disruption of SWP Deliveries Due to Earthquakes** A strong earthquake affecting the Delta could cause simultaneous levee failures on several islands, with these islands flooding simultaneously. Preliminary analysis indicates that some water may not be treatable by municipal agencies for many months due to high organic carbon concentrations. This would extend the period that Delta water supply would be unavailable for urban users.

Key findings of the Phase 1 report on possible effects on SWP deliveries due to earthquakes are:

- A moderate to large earthquake capable of causing multiple levee failures could happen in the next 25 years.
- There is about a 40% chance of 27 or more islands simultaneously failing during a major earthquake.
- Extensive levee failure would most likely occur in the west and central Delta.
- Levee repairs could take more than 2.5 years and exports from the Delta could be disrupted for about a year with a loss of up to 8 maf of water.
- By 2050, the risk of island flooding from seismic events is expected to increase by 35% over 2007 conditions, if a seismic event has not occurred.

**Potential Interruption/Disruption of SWP Deliveries Due to Floods** During an average year, about 85% of the total Delta inflow comes from the Sacramento River and 10% comes from the San Joaquin River. The remaining Delta inflow primarily comes from three eastside tributaries. Inflow from the Sacramento and San Joaquin rivers depends on reservoir releases, precipitation, and snowmelt. Over the long-term, many different combinations of high flood flows in the Sacramento and San Joaquin rivers are possible because of the large geographical extent of the two rivers' watersheds and the variability in storm paths. The Phase 1 analysis considers the magnitude and frequency of flooding in different parts of the Delta from different sources to evaluate the probability of these high flows. This approach allows the inclusion in the risk analysis of floods that, while possible, are larger than any in the historic record. If the analysis solely relied upon the historical data, the analysts believe the risk would be underestimated.

Potential disruption of Delta exports due to floods and levee failures would depend on the number of flooded islands, the timing and size of the flood flows, and the water quality in the Delta and Suisun Bay at the time of the flood. However, during such high flows, there would normally be little or no effect on the water quality of the exports due to levee failures and Delta Risk Management Strategy assumes no significant effect on Delta exports.

Key findings of the Phase 1 report on possible effects to SWP deliveries due to flood flows by the year 2050 are:

- Delta flood hazard would increase from a sea level rise and more frequent high flows.
- The frequency of island flooding would increase from 2007 conditions.
- The frequency of floods is expected to increase by 35%.
- Levees are expected to become more vulnerable to flooding due to increased seepage and stability problems associated with more subsidence and sea level rise.

The combined effects of increased levee vulnerability and flood flows indicate an expected 80% increase in island flooding from flood flows.

**Potential Interruption/Disruption of SWP Deliveries Due to "Sunny Day" Event** A "sunny day" levee failure is a failure that occurs during non-flood times and is not caused by an earthquake. Possible causes of levee failure include wave action, animal activity, and seepage. The Delta Risk Management Strategy reports that, on average, there will be about 10 sunny-day breaches with 100 years of exposure in the Delta. These types of levee failures are not expected to involve the simultaneous multi-levee events as could happen with high flood flows or a large earthquake.

**Combined Potential Interruption/Disruption of SWP Deliveries** The Delta Risk Management Strategy evaluated combined risk of levee failure due to earthquakes, floods, and "sunny day events" as well as how risks may change in the future. Key findings by the Delta Risk Management Strategy are:

- Levee hazards are expected to increase due to pressure from sea level rise and more frequent flood flows.
- The overall likelihood of a major Delta event causing extensive levee failure is increasing, as is the magnitude of the consequences from a given event.
- There is a possible range of sea level rise of 0.7 to 4.6 feet over the next 100 years, depending on the assumed future greenhouse gas emissions and the forecast model used. Current estimates by the Intergovernmental Panel on Climate Change indicate that sea level will rise from 0.6 to 1.9 feet over the next 100 years. The CALFED Independent Science Board has recommended that planning that incorporates sea level rise should use the full range of variability of 20-55 inches.

**Delta Flood Emergency Preparedness and Response Plan** As part of its efforts to reduce effects to the SWP should a levee failure occur, DWR has initiated the development of the DWR Delta Flood Emergency Preparedness and Response Plan. DWR has emergency response procedures for a Delta levee failure in place but the DWR Delta Flood Emergency Preparedness and Response Plan will enhance the state's ability to prepare for, respond to, and recover from a catastrophic Delta levee failure. This new scalable plan will provide DWR with updated techniques and procedures should a catastrophic Delta levee failure occur. This plan will be DWR's roadmap for coordinating the protection of life and property with our local, state, and federal partners in a levee disaster while protecting the state's water system.

DWR has completed the first of two phases of engineering design work intended to enhance the state's ability to respond to large-scale levee failures or floods in the Delta. In the first phase, DWR conducted a discovery process to analyze previously developed plans and procedures and to identify current DWR capabilities for response to emergencies and disasters in the Delta. In the second phase, DWR will further engage its response partners in local, state, and federal government, and in the private sector to develop a more detailed DWR Delta Flood Emergency Preparedness and Response Plan. This response plan will be consistent with and in compliance with California's Standardized Emergency Management System and with the National Incident Management System[2]. The main goal of this

plan is to reduce the recovery time from a catastrophic levee failure of Delta water users. This will be achieved through the development of new response tools, enhanced response methods, and clarifying response roles in the Delta.

## National Marine Fisheries Service and Fish and Wildlife Service Biological Opinions

Over the past 5 years and in response to declining fish populations, the rules defined by the federal biological opinions issued under the Endangered Species Act for the operation of the SWP and CVP in the Delta have become more and more restrictive. In December 2008, the USFWS issued a new biological opinion for delta smelt. In June 2009, the NMFS issued a new biological opinion covering winter-run and spring-run Chinook salmon, steelhead, green sturgeon, and killer whales. The biological opinions imposed additional operational requirements that restrict the amount of water supply that can be exported from the Delta. Below are some highlights of each biological opinion.

**USFWS biological opinion** The USFWS biological opinion includes additional requirements in all but two months of the year. From December to June, an adaptively managed flow restriction is in place for the average Old River and Middle River flow. The flow restriction can begin as early as December 1 based on USFWS' determination. However, the restriction is more likely to start after December 20 and is based on turbidity and salvage triggers. The restriction has three phases that are intended to protect delta smelt at various life stages. The actual Old River and Middle River flow target is dependent on delta smelt survey information. The USFWS determines the required target flow. Managing Old River and Middle River flow is accomplished primarily by reducing the CVP and SWP exports. Because determining an Old River and Middle River restriction is based on fish location and decisions by USFWS staff, predicting an Old River and Middle River restriction and corresponding export pumping with any great certainty poses a challenge.

The USFWS biological opinion also imposes an additional salinity requirement in the Delta for September and October in wet and above-normal water years. In these years, fresher water must be maintained at locations further west than during the other types of water years. In November during years when this requirement is in place, inflow into the SWP and CVP reservoirs will be passed downstream to augment the outflow until the prior-month's required location for the fresher water is reached.

**NMFS biological opinion** The requirements contained in the NMFS' biological opinion also added an Old River and Middle River requirement. However, we expect that the USFWS Old River and Middle River requirements will satisfy or be sufficiently protective of the listed species under the NMFS biological opinion.

The NMFS' biological opinion also expands the duration of a Springtime operation which combines a significant reduction in Delta exports with a pulse flow on the San Joaquin River from one month to two months. The requirement would likely result in total exports being limited to 1,500 cfs except in extremely wet cases during April and May.

Under the biological opinion, the Delta Cross Channel gates are closed more frequently from October through December 14, and completely closed between December 15 and January 31. Previously, as defined by Water Right Decision 1641, the Delta Cross Channel was closed up to 45 days between November 1 and January 31. This operation can require additional export reductions in order to meet the water quality objectives contained in the water right permits for the SWP and CVP.

There are a number of additional actions under the biological opinion that require temperature, flow

[2] California's Standardized Emergency Management System is an emergency management system required by California Government Code Section 8607(a) for managing incidents involving multiple jurisdictions and agencies. The National Incident Management System is a nationwide, federal emergency management approach, for managing incidents with all levels of government, private-sector, and nongovernmental organizations working together. For more information, please visit: www.oes.ca.gov.

and storage requirements on the CVP system. These additional actions or requirements could have an effect on real-time SWP operations.

# General Approach for Assessing SWP Delivery Reliability

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CALSIM II, a computer model jointly developed by DWR and Reclamation, simulates much of the water resource infrastructure in the Central Valley and Delta region of California. CALSIM II models all areas that contribute flow to the Delta. The geographical coverage includes the Sacramento River Valley, the San Joaquin River Valley, the Delta, the Upper Trinity River, and the CVP and SWP service areas. CALSIM II simulates operation of the CVP-SWP system using a monthly time step. The model assumes that facilities, land use, water supply contracts, and regulatory requirements are constant over this period.

## General Solution Techniques and Incorporating Operational Constraints

CALSIM II routes water through a CVP-SWP system network representation. The network includes more than 300 nodes and more than 900 arcs, representing 24 surface reservoirs and the interconnected flow system. CALSIM II uses logic for determining deliveries to north-of-Delta and south-of-Delta CVP and SWP contractors. The delivery logic uses runoff forecast information that incorporates uncertainty and standardized rules that relate forecasted supplies to estimate the water available for delivery and reservoir carryover storage. The assumed delivery levels are updated monthly within the model for the periods January 1 through May 1 for the SWP and March 1 through May 1 for the CVP to correspond to the updated runoff forecasts. The south-of-Delta SWP and CVP deliveries are based on water supply parameters and operational constraints.

## Hydrology

A range of hydrologic conditions based on the historical flow record is used to represent the possible range of water supply conditions. The hydrology used by CALSIM II was developed jointly by DWR and Reclamation by adjusting the historical flow record to account for the influence of land-use changes and upstream flow regulation. Sacramento Valley and tributary basin hydrologies are developed by adjusting the historical sequence of monthly stream flows to represent a sequence of flows at a current or future level of development. Adjustments to historical water supplies are determined by imposing the current or future level land use on historical meteorological and hydrologic conditions. San Joaquin River basin hydrology is developed in a different manner and uses fixed annual demands and a regression analysis to develop flow accretions and depletions. The resulting hydrology represents the water supply available from Central Valley streams to the CVP and SWP at a current or future level of development. Groundwater is modeled as a series of interconnected basins. Groundwater pumping, recharge from irrigation, stream-aquifer interaction and interbasin flow are calculated dynamically by the model.

The hydrology for the 2029 level of development

that was used in the studies in this report has been modified to incorporate effects of climate change for a selected median-impact future climate projection. The effects of climate change on inflows to major SWP and CVP reservoirs was estimated using the method from *Using Future Climate Projections to Support Water Resources Decision Making in California* (Chung et al., 2009). This method adjusts the base hydrologic sequence to reflect projected changes in the timing and volume of inflow. For each month of the year, streamflows based on the future climate projection were compared to historical streamflows to estimate how much higher or lower future streamflows may be than historical flows. The monthly values for the reservoir inflows were then adjusted to represent the monthly trends for the future climate projection. Further adjustments are made to the hydrology to represent projected changes in annual runoff volume.

# Demands

### North of Delta

For both the 2009 and 2029 scenarios agricultural and outdoor urban land use based demands are calculated from an assumed cropping pattern and a soil-moisture budget. For the 2009 level study the land use based demands have been estimated using fixed 2009 land use and historical hydrology. For the 2029 level study the land use based demands have been estimated using fixed 2029 land use but the hydrology in the Sacramento Valley has been modified to incorporate effects of climate change under a selected representative climate change projection. This modification procedure is similar to what was used to modify inflows to major SWP and CVP reservoirs as discussed in *Using Future Climate Projections to Support Water Resources Decision Making in California* (Chung et al., 2009). Both land use based demands and estimated contract amounts serve as upper bounds on deliveries.

### South of Delta

South of Delta demands, unlike North of Delta demands, are contract based. SWP Table A and SWP Article 21 demands for the 2009 scenario are preprocessed independent of CALSIM II and vary annually according to hydrologic conditions. SWP Table A demands for the 2029 scenario are assumed to be at maximum entitlement annually. SWP Article 21 demands in the 2029 scenario, however, vary annually according to hydrologic conditions.

# Meeting Delta Water Quality Standards

CALSIM II uses DWR's Artificial Neural Network model to simulate the flow-salinity relationships for the Delta. The Artificial Neural Network model correlates salinity at key locations in the Delta with Delta inflows, Delta exports, and Delta Cross Channel operations. The model estimates salinity at four locations for modeling Delta water quality standards. These locations are Old River at Rock Slough, San Joaquin River at Jersey Point, Sacramento River at Emmaton, and Sacramento River at Collinsville.

# CALSIM II Priorities in Water Deliveries

CALSIM II allocates water according to four priorities, in order of priority:

1. Prior-right water users, minimum in-stream flow requirements, and water quality requirements.
2. SWP Table A contractors and CVP contractors.
3. Reservoir storage for the next year (carryover).
4. SWP Article 21 deliveries.

While CVP and SWP contractor deliveries take precedence over next year's reservoir storage, a balance between the two is struck in the allocation decision to ensure that enough water is left in storage at the end of the year in case of impending drought.

## SWP Table A and SWP Article 21 Deliveries

The CALSIM II simulations in this report estimate SWP delivery amounts for SWP Table A and Article 21. As mentioned in Chapter 2, SWP Table A is the contractual method for allocating available supply and the total of all maximum SWP Table A amounts for deliveries from the Delta is 4.133 maf per year. SWP Article 21 refers to a provision in the contract for delivering water that is available in addition to SWP Table A amounts. SWP Article 21 contracts allow contractors to receive additional water deliveries only under specific conditions. These conditions are:

1. The water is available only when it does not interfere with SWP Table A allocations and SWP operations.
2. The water is available only when excess water is available in the Delta.
3. The water is available only when conveyance capacity is not being used for SWP purposes or scheduled SWP deliveries.
4. The water cannot be stored in the SWP system. In other words, the contractors must be able to use the SWP Article 21 water directly or be able to store it in their own system.

## CALSIM II Performance

Some of the comments to the draft *2003 State Water Project Delivery Reliability Report* expressed concern about the accuracy of CALSIM II and the credibility of conclusions about SWP delivery reliability that are based on CALSIM II simulations. To respond to these concerns, DWR conducted several CALSIM II studies. In one study, results from a CALSIM II simulation using historical input from 1975 to 1998 were compared to historical operations. This study is documented in the report *CALSIM II Simulation of Historical SWP-CVP Operations, Technical Memorandum Report, November 2003* and was provided in Appendix E of the *2005 State Water Project Delivery Reliability Report*. In a second study, a sensitivity analysis was performed to quantify the effects of various inputs on CALSIM II results. Two performance measures were used, a Sensitivity Index and Elasticity Index, to quantify the sensitivity of 12 model output responses to 12 different model input parameters. This sensitivity study was also provided in Appendix E of the *2005 State Water Project Delivery Reliability Report.*

In a follow-up study, DWR staff conducted a more detailed analysis of the sensitivity results, focusing on the delivery reliability of the SWP system. The results of this analysis are documented in an internal memorandum report, *Supplemental Technical Memorandum to CalSim-II Model Sensitivity Analysis Study, October 2005*, dated April 30, 2007. The purpose of this analysis was to assist SWP contractors and other interested parties in evaluating the effect of model input parameters on SWP Delta deliveries, SWP north-of-Delta deliveries, and SWP deliveries under SWP Article 21, with respect to a selected subset of input parameters.

## Recent Improvements to CALSIM II Simulations

The CALSIM II model is modified in response to new in water system operational requirements, updated information, or improvements in computational methods. Changes to the model are discussed in Appendix A. Enhancements to CALSIM II of note are:

- **Greater resolution in the representation of the Delta channel configuration and of the distribution of Net Delta Island Consumptive Use (Net DICU).** The representation of the Delta Channels was reconfigured to mimic the flow dynamics in the interior Delta, specifically to capture the flow effects in the Old and Middle Rivers. Channel configurations and flow regressions were taken from the paper *A Model to Estimate Combined Old & Middle River Flows* (Paul Hutton, Ph.D., P.E., Metropolitan Water District of Southern California, April 2008).

- **Article 56 Extended Carryover deliveries.** Article 56 Extended Carryover deliveries is a category of water delivery available to SWP Table A contractors that was not represented in the previous model used in the *2007 Report*. Modeling this category of water delivery gives a more realistic representation of real world export patterns throughout the delivery contract year.

- **Three-pattern deliveries.** The practice of the SWP delivering water based on three delivery patterns submitted by the SWP contractors for 30%, 50%, and 100% allocations is now modeled. Modeling the three delivery patterns based on the level of allocation gives a more realistic representation of real world export patterns throughout the delivery contract year.

- **Improved modeling of flow-salinity relationships in the Delta.** The previous Artificial Neural Network used to estimate flow-salinity relationships has been replaced with a newer more accurate version. The new Artificial Neural Network and its accompanying implementation to the CALSIM II model produces salinities that match more closely the Delta Simulation Model 2 salinities.

- **X2 positions and flow requirements estimated using an Artificial Neural Network.** The X2 positions and flow requirements were previously estimated using the Kimmerer-Monismith Equation. The new Artificial Neural Network used to estimate X2 position more closely matches the Delta Simulation Model 2 model X2 position.

- **Sea Level Rise.** The phenomenon of sea level rise and its effect on Delta salinities is now modeled. Artificial Neural Networks were developed to estimate flow-salinity relationships in the Delta with an assumed increment of sea level rise for a mid-century condition.

- **SWP South of the Delta Allocations.** The SWP South of the Delta Allocation logic has been modified so that adjustments to the Water Supply Index-Delivery Index based allocations are made to account for the export restrictions imposed by the new Biological Opinions. The Biological Opinions dictate that San Joaquin River flows are now the determining factor for export capacity from the Delta. This new logic forecasts export capacity based on San Joaquin River wetness and then develops allocations from them.

# 6 Assessment of Present and Future SWP Delivery Reliability

These updated estimates of the current and future delivery reliability of the SWP reflect the changes in project operation due to the requirements contained in the USFWS' biological opinion issued in December 2008 and the NMFS' biological opinion issued in June 2009. These opinions are discussed in more detail in Chapter 4. The estimates for the future delivery amounts also incorporate assumptions regarding rainfall, runoff, and water supply demand based upon changed climatic conditions.

The updated estimates are presented alongside results from the *2007 Report* to help identify and explain impacts to delivery reliability due to the biological opinions' requirements and future climate change with sea level rise. At the end of the chapter, a comparison of the estimated SWP deliveries under Current Conditions to those under Future Conditions is presented. This chapter contains tables summarizing the updated estimated delivery amounts of the studies for the entire study period (1922-2003), dry years, and wet years and presents information on the estimated probability of annual SWP Table A delivery amounts currently and 20 years in the future. The annual values for SWP deliveries estimated by all the CALSIM II simulations are listed in tables in Appendix B. These tables also show the annual SWP Table A demands assumed for each study.

The results indicate potentially significant differences between the updated studies and studies done for the *2007 Report* under both Current and Future Conditions for estimated deliveries during some periods. In general, updated estimates of both current and future SWP Table A deliveries are less than the deliveries presented in the *2007 Report*, during near-normal to wet years. The updated studies generally show slightly lower SWP Table A deliveries under Future Conditions when compared to Current Conditions. There are, however, some larger decreases in deliveries in the future during multiple dry-year periods. This is primarily due to the effects of the assumed climate change scenario that includes sea level rise. In comparison, the *2007 Report* showed frequent increases in future deliveries.

## Assessment of SWP Delivery Reliability under Current Conditions

Current Conditions refer to those conditions in effect in 2009. They are described below. Corresponding results from the *2007 Report* are presented throughout this section for comparison. Appendix A presents a detailed discussion of the study assumptions for this report.

### Availability of Source Water

The 2005 level of development (level of water use in the source areas) is assumed to be representative of 2009. The hydrologic sequence of simulated years is based upon historical precipitation and runoff patterns and is from water years 1922 through 2003.

## Demand for Delta Water

The SWP contractors' SWP Table A demands for deliveries from the Delta assumed for 2009 are shown in **Table 6.1**. A range in SWP Table A demands is shown because the demand is assumed to vary each year with the weather. The assumed demands for 2009 are higher than the ones used in the corresponding Study 2007 in the *2007 Report*. Differences between the values in updated studies and the Study 2007 are due to increased SWP Table A water demand for municipal uses.

The potential demands for SWP Article 21 water are assumed for study purposes to be very high and are more than double the amounts assumed in the *2007 Report* as shown in **Table 6.2**. The SWP Article 21 demands are increased in the 2009 updated studies to match the amounts assumed in the studies conducted for the biological opinions. Assuming very large SWP Article 21 demands in the studies for the biological opinions was done to capture the upper bound of the potential impact of SWP Article 21 exports upon the Delta ecosystem. This assumption reflects a condition in which SWP contractors are able to use essentially any available SWP Article 21 water when conveyance capacity for SWP Article 21 water exists in the SWP delivery system.

## Ability to Convey Source Water to the Desired Point of Delivery

The CALSIM II simulation assumes that current Delta water quality regulations, contained in the D-1641, are in place for the Current Condition study. The simulation also incorporates the requirements of the USFWS' and NMFS' biological opinions. Additional information on the characterization of the biological opinions in the model is found in Appendix A. The amount of exports allowed while achieving the Old River and Middle River flow targets are assumed to be shared equally between the CVP and the SWP. Combined CVP and SWP exports also are assumed constrained according to the NMFS biological opinion Action 4.2.1 during April 1 to May 31. The specific rules for this restriction are included in Appendix A.

The simulation of Current Conditions in the *2007 Report* assumes the same D-1641 requirements for Delta water quality, but instead assumes an April 15 to May 15 export restriction and Old River and Middle River flow targets from the interim operating rules ordered by the federal court.

## Annual Estimates of SWP Deliveries

The CALSIM II estimates for the SWP Table A and SWP Article 21 annual deliveries for the

**Table 6.1** SWP Table A demands from the Delta under Current Conditions

| Study of Current Conditions | Average Demand | | Maximum Demand | | Minimum Demand | |
|---|---|---|---|---|---|---|
| | taf /year | % of maximum SWP Table A[1] | taf /year | % of maximum SWP Table A[1] | taf /year | % of maximum SWP Table A[1] |
| *2007 Report*, Study 2007 | 3308 | 80% | 3864 | 94% | 2323 | 56% |
| Study 2009 | 3711 | 90% | 4115 | 100% | 3007 | 73% |

[1]/ 4,133 taf /year.

**Table 6.2** SWP Article 21 demands from the Delta under Current Conditions

| Study of Current Conditions | Maximum SWP Article 21 demand (taf/month)[1] | |
|---|---|---|
| | December - March | April - November |
| *2007 Report*, Study 2007 | 184 | 84 |
| Study 2009 | 414 | 214 |

[1]/ The CALSIM II simulations deliver up to these demands in any month in which appropriate conditions exist. However, the actual capability of SWP water contractors to take this amount of SWP Article 21 is not the sum of these maximum monthly values.

Current Condition are presented in Appendix B. These values are analyzed in the following sections.

## SWP Table A Deliveries under Different Hydrologic Scenarios

Table 6.3 contains the average, maximum, and minimum estimates of SWP Table A deliveries from the Delta under Current Conditions from the *2007 Report* and under 2009 assumptions that include the biological opinions' requirements. The estimated probabilities for a given amount of annual SWP delivery under Current Conditions are presented in Figure 6.1.

Table 6.3 shows that under updated Current Conditions, average SWP annual delivery amounts may decrease 3% of maximum SWP Table A when compared to the earlier estimate, from 63% to 60%. This decrease is about 110 taf and is primarily due to the required actions in the biological opinions reducing the amount of Delta water available for export by the SWP in comparison to the effect of the Old River and Middle River flow targets in the Study 2007. The maximum delivery of 90% for the Study 2007 is reduced by 370 taf to 81% for the updated study. The estimate of minimum SWP Table A delivery actually increases slightly.

Table 6.4 includes estimates of SWP Table A deliveries for Current Conditions under an assumed repetition of historical drought periods. The years are identified as dry by the Eight River Index, a good indicator of the relative amount of water supply available to the SWP. The Eight River Index is the sum of the unimpaired runoff from the four rivers in the Sacramento Basin used to define water conditions in the basin plus the four rivers in the San Joaquin Basin, which correspondingly define water conditions in that basin. The eight rivers are the Sacramento, Feather, Yuba, American, Stanislaus, Tuolumne, Merced, and San Joaquin. Table 6.4 also includes the average deliveries for comparison purposes.

Table 6.4 shows that estimates of updated SWP deliveries under Current Conditions during dry periods are about the same as earlier estimates. The four-year drought of 1931-1934 is estimated to provide 34% of maximum SWP Table A; a reduction of 41 taf/year when compared to the 2007 estimate. The two-year drought of 1976-1977 is an exception with SWP deliveries estimated to increase 2% of maximum SWP Table A, from 34% to 36%. This increase in delivery in 1976-1977 is due to the use of Article 56 carryover storage in the 2009 studies for this report. In the Current Condition study, 470 taf

**Table 6.3** SWP Table A delivery from the Delta under Current Conditions

| Study of Current Conditions | Average Delivery | | Maximum Delivery | | Minimum Delivery | |
|---|---|---|---|---|---|---|
| | taf / year | % of maximum SWP Table A[1] | taf / year | % of maximum SWP Table A[1] | taf / year | % of maximum SWP Table A[1] |
| *2007 Report*, Study 2007[2] | 2595 | 63% | 3711 | 90% | 243 | 6% |
| Study 2009 | 2483 | 60% | 3338 | 81% | 301 | 7% |

[1]/ 4,133 taf /year
[2]/ Values reflect averaging annual deliveries from the two scenarios of Old and Middle River flow targets.

**Table 6.4** Average and dry period SWP Table A deliveries from the Delta under Current Conditions

| Study of Current Conditions | SWP Table A delivery from the Delta (in percent of maximum SWP Table A[1]) | | | | | |
|---|---|---|---|---|---|---|
| | Long-term Average | Single dry year 1977 | 2-year drought 1976-1977 | 4-year drought 1931-1934 | 6-year drought 1987-1992 | 6-year drought 1929-1934 |
| *2007 Report*, Study 2007[2] | 63% | 6% | 34% | 35% | 35% | 34% |
| Study 2009 | 60% | 7% | 36% | 34% | 35% | 34% |

[1]/ 4,133 taf /year
[2]/ Values reflect averaging annual deliveries from the two scenarios of Old and Middle River flow targets.

of water allocated in 1975 is carried over and used in January through March of 1976. Article 56 carryover storage was not modeled for *2007 Report* studies.

Table 6.5 summarizes SWP Table A deliveries under an assumed repetition of historical wet periods under Current Conditions. As with drought years, the Eight River Index is used to identify wet years. Table 6.5 shows that estimates of SWP deliveries under updated Current Conditions may either increase or decrease from earlier estimates during wet years. Decreases in SWP deliveries for these wet periods generally range from 0 to 5% of maximum SWP Table A (0 to 206 taf/year). These decreases are due to the requirements of the biological opinions. The increases in delivery in 1983 and 1982-1983 are due to an assumed increase in demand compared to the *2007 Report*.

## SWP Article 21 Deliveries under Different Hydrologic Scenarios

SWP water delivery is a combination of both SWP Table A deliveries and the use of SWP Article 21 by some contractors to store water locally at times when extra water and capacity is available beyond that needed by normal SWP operations. Table 6.6 contains the average, maximum, and minimum SWP Article 21 deliveries over the 1922-2003 period for the earlier study and the updated simulation. Comparing the estimates of SWP Article 21 deliveries, the updated estimates show higher delivery amounts for the maximum delivery over the simulation period. The estimated maximum SWP Article 21 delivery is increased by 260 taf. This increase is due to the higher SWP Article 21 demands assumed for the 2009 studies. The minimum SWP Article 21 delivery for the updated study is 2 taf/yr compared to 0 taf/yr for the *2007 Report*. This higher minimum delivery is due to a revised assumption in the updated studies that allows the diversion of SWP Article 21 water to the North Bay Aqueduct whenever such water is available in the Delta. In the *2007 Report*, SWP Article 21 deliveries to North Bay Aqueduct were assumed to be dependent on the availability of Banks pumping capacity to serve all SWP Article 21 demands. The estimated average SWP Article 21 deliveries are the same under the updated Current Conditions compared to the *2007 Report*.

Because SWP Article 21 exports happen sporadically, it is best to evaluate the effects by looking at specific years. Table 6.7 shows the updated and earlier estimates of SWP Article 21 deliveries by year during dry periods. Under the updated Current Conditions, SWP Article 21 deliveries are estimated to be significantly increased during the years 1932 and 1933. These increases are primarily the result of the assumed higher SWP Article 21 demand. Table 6.7 illustrates that opportunities for delivering SWP Article 21 water exist even during drought periods,

**Table 6.5** Average and wet years SWP Table A delivery from the Delta under Current Conditions

| Study of Current Conditions | Percent of maximum (4,133 taf /year) SWP Table A delivery from the Delta | | | | | |
|---|---|---|---|---|---|---|
| | Long-term Average | Single wet year 1983 | 2-year wet 1982-1983 | 4-year wet 1980-1983 | 6-year wet 1978-1983 | 10-year wet 1978-1987 |
| *2007 Report*, Study 2007[1] | 63% | 60% | 66% | 68% | 73% | 71% |
| Study 2009 | 60% | 68% | 71% | 68% | 68% | 67% |

[1]/ Values reflect averaging annual deliveries from the two scenarios of Old and Middle River flow targets.

**Table 6.6** Annual SWP Article 21 delivery from the Delta under Current Conditions

| Study of Current Conditions | Average delivery (taf) | Maximum delivery (taf) | Minimum delivery (taf) |
|---|---|---|---|
| *2007 Report*, Study 2007[1] | 85 | 590 | 0 |
| Study 2009 | 85 | 850 | 2 |

[1]/ Values reflect averaging annual deliveries from the two scenarios of Old and Middle River flow targets.

Table 6.8 shows the updated and earlier estimates of SWP Article 21 deliveries by year during the 1978-1987 wet period. Under Current Conditions, updated estimated SWP Article 21 delivery can increase up to 450 taf in an individual year, compared to earlier estimates. Once again, the increases in SWP Article 21 are due to the high level of assumed demand. In two years, 1978 and 1982, the estimated Article 21 deliveries decrease when compared to earlier estimates.

## SWP Table A Delivery Probability

The probability that a given level of SWP Table A amount will be delivered from the Delta is shown for Current Conditions in Figure 6.1. Results from the *2007 Report* and updated estimates for 2009 are shown. Probability values for Current Conditions are presented in Appendix B. To use Figure 6.1, one would first locate the value for the specific percent exceedence along the horizontal axis (x-axis) of the graph, move vertically upward to the curve, then horizontally to the vertical axis (y-axis) and read the annual delivery. For example, for a 50% exceedence, the corresponding annual SWP Delta deliveries would be about 2,980 taf (72% of maximum SWP Table A) from previous estimates and 2,675 taf (65% of maximum SWP Table A) for the updated estimates. The numerical data for this figure is included in Appendix B and should be referenced for specific values corresponding to specific exceedences.

Figure 6.1 shows that under Current Conditions, for probabilities of exceedence less than 55%, updated annual SWP Table A deliveries can be 300 to 400 taf less than the earlier estimates. Annual SWP Table A deliveries associated with exceedences greater than 70% are generally more than the Study 2007 by about 200 taf. Table 6.9 contains the values for SWP Delta deliveries corresponding to 25%, 50%, and 75% exceedence. The information in Table 6.9 can be stated as follows:

**Table 6.7** Average and dry year SWP Article 21 delivery under Current Conditions (taf/year)

| Year | *2007 Report*, Study 2007[1] | Study 2009 |
|---|---|---|
| 1929 | 0 | 10 |
| 1930 | 0 | 10 |
| 1931 | 0 | 8 |
| 1932 | 0 | 160 |
| 1933 | 40 | 390 |
| 1934 | 0 | 8 |
| 1976 | 5 | 9 |
| 1977 | 0 | 2 |
| 1987 | 0 | 9 |
| 1988 | 0 | 10 |
| 1989 | 0 | 10 |
| 1990 | 0 | 10 |
| 1991 | 0 | 12 |
| 1992 | 0 | 10 |
| Long-term average | 85 | 85 |

[1]/ Values reflect averaging annual deliveries from the two scenarios of Old and Middle River flow targets.

**Table 6.8** Average and wet year SWP Article 21 delivery under Current Conditions (taf/year)

| Year | *2007 Report*, Study 2007[1] | Study 2009 |
|---|---|---|
| 1978 | 100 | 2 |
| 1979 | 0 | 120 |
| 1980 | 190 | 190 |
| 1981 | 0 | 8 |
| 1982 | 490 | 460 |
| 1983 | 400 | 850 |
| 1984 | 460 | 510 |
| 1985 | 0 | 2 |
| 1986 | 30 | 140 |
| 1987 | 0 | 9 |
| 1978-87 Average | 170 | 230 |
| Long-term Average | 85 | 85 |

[1]/ Values reflect averaging annual deliveries from the two scenarios of Old and Middle River flow targets.

For any given year,

- 25% chance of SWP deliveries at or above 2,920 taf.
- 50% chance of SWP deliveries above or below 2,675 taf.
- 75% chance of SWP deliveries above 2,397 taf (or 25% chance that deliveries will be below 2,397 taf).

# Assessment of SWP Delivery Reliability under Future Conditions

Future Conditions refer to conditions that are assumed in effect in the year 2029. These conditions as described below include effects of climate change and the same requirements of the biological opinions assumed under Current Conditions. Results from the CALSIM II simulations for the *2007 Report* under 2027 future scenario (Study 2027) are presented throughout this section for comparison purposes. A detailed list of the study assumptions for this report is presented in Appendix A.

## Availability of Source Water

DWR's 2009 report, *Using Future Climate Projections to Support Water Resources Decision Making in California* (Chung et al., 2009) evaluates possible future effects on California water supply through CALSIM II simulations with hydrologic sequences which reflect different scenarios of climate change. The 82-year hydrologic sequence used to develop the delivery estimations for the 2029 study discussed below is based upon the methods used in *Using Future Climate Projections to Support Water Resources Decision Making in California*. The method for developing the hydro-

**Figure 6.1** SWP Table A delivery probability under Current Conditions

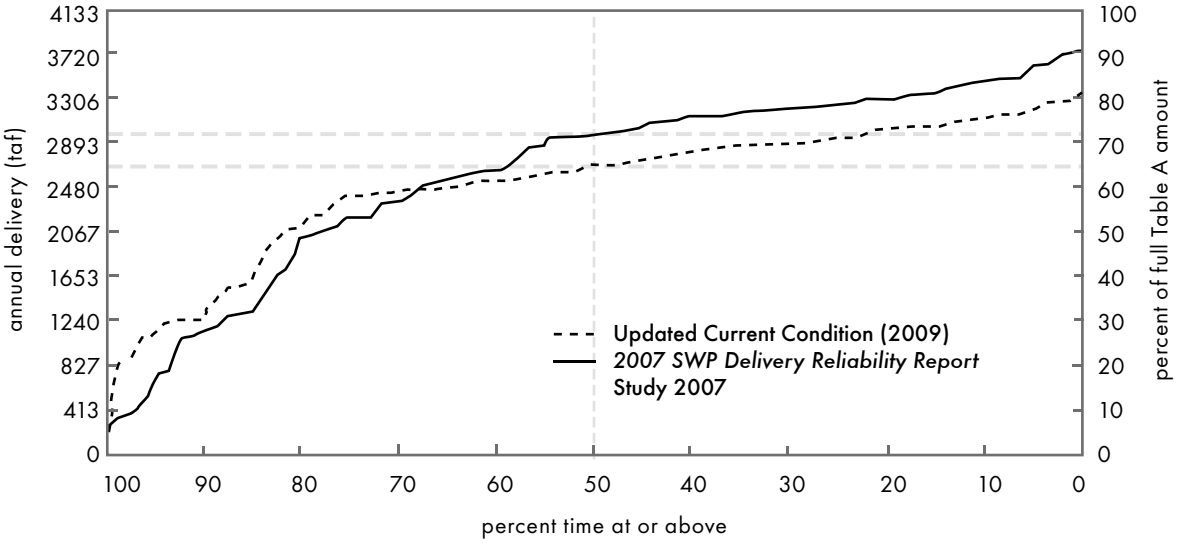



**Table 6.9** Highlighted SWP Table A delivery percent exceedence values under Current Conditions

| Exceedence | Annual SWP Table A Delivery (taf) | | Change in delivery compared to *2007 Report* (taf) |
|---|---|---|---|
| | *2007 Report,* Study 2007 [1] | Study 2009 | |
| 25% | 3218 | 2920 | - 298 |
| 50% | 2976 | 2675 | - 301 |
| 75% | 2168 | 2397 | + 229 |

[1]/ Values reflect averaging annual deliveries from the two scenarios of Old and Middle River flow targets.

logic sequence for 2029 is described in Appendix B.

It was pointed out earlier in Chapter 4 of this report that the studies in *Using Future Climate Projections to Support Water Resources Decision Making in California* of potential climate changes by mid-century indicate a potential for operational interruptions due to one or more reservoirs reaching minimum levels of storage. The study for 2029 conditions indicates a slight increase in system vulnerability when compared with the 2009 study but it does not approach the levels forecasted in *Using Future Climate Projections to Support Water Resources Decision Making in California*. For the 2029 study, it is assumed that actions such as a program to acquire water to meet Delta water quality objectives would be implemented to maintain system operation.

## Demand for Delta Water

The SWP contractors' SWP Table A demands for deliveries from the Delta assumed for 2029 and for Study 2027 are shown in Table 6.10. The maximum annual SWP Table A demand of 4,133 taf is assumed in all 82 years of the simulation. There is no variation in demand due to different annual hydrologic conditions. The assumed demands for 2029 are the same as the demands presently developed for the Bay Delta Conservation Plan.

The assumed SWP Article 21 demands, shown in Table 6.11, are higher than the demands assumed for Study 2027 and are at the same level as the SWP Article 21 demands assumed for the 2009 study. This assumption reflects a condition in which SWP contractors are able to use essentially any available SWP Article 21 water when conveyance capacity for SWP Article 21 water exists in the SWP delivery system.

## Ability to Convey Source Water to the Desired Point of Delivery

One of the most significant assumptions regarding SWP conveyance is that the rules and facilities related to Delta conveyance will remain at the status quo. That is, no new facilities are assumed to be in place to convey water through or around the Delta. As noted in Chapter 3, there are several processes under way to identify modifications to the existing method of conveying water through the Delta to reduce the conflict between fishery concerns and water supply reliability. However, these programs are not at a stage where such changes can be used in this report. The CALSIM II simulations for 2029 scenarios assume the current Delta water quality regulations, contained in D-1641, are in place as well as the requirements of the USFWS and NMFS biological opinions. The exports resulting from meeting Old River and Middle River flow targets related to delta

**Table 6.10** SWP Table A demands from the Delta under Future Conditions

| Study of Future Conditions | Average Demand | | Maximum Demand | | Minimum Demand | |
|---|---|---|---|---|---|---|
| | taf / year | % of maximum SWP Table A[1] | taf / year | % of maximum SWP Table A[1] | taf / year | % of maximum SWP Table A[1] |
| *2007 Report*, Study 2027 | 4111 | 99% | 4133 | 100% | 3935 | 95% |
| Study 2029 | 4133 | 100% | 4133 | 100% | 4133 | 100% |

[1]/ 4,133 taf /year.

**Table 6.11** SWP Article 21 demands from the Delta under Future Conditions

| Study of Future Conditions | Maximum SWP Article 21 demand (taf/month) [1] | |
|---|---|---|
| | December - March | April - November |
| *2007 Report*, Study 2027 | 184 | 84 |
| Study 2029 | 414 | 214 |

[1]/ The CALSIM II simulations deliver up to these demands in any month in which appropriate conditions exist. However, the actual capability of SWP water contractors to take this amount of SWP Article 21 is not the sum of these maximum monthly values.

smelt are again assumed shared equally between the CVP and the SWP.

The simulations of Future Conditions in the *2007 Report* (Study 2027) also assumed D-1641 Delta water quality requirements but it assumed that flow restrictions for Old River and Middle River ordered by the federal court in December 2007 were in place.

To simulate the assumed 2029 conditions, two CALSIM II simulations are needed: a scenario with climate change and a scenario assuming no climate change. SWP deliveries derived from these two simulations were modified as explained below before being used to describe Future Conditions.

## Presentation of CALSIM II Results

For the purpose of describing SWP deliveries under Future Conditions in this chapter, the annual deliveries with climate change simulated by CALSIM II have been adjusted to better estimate deliveries reflecting 2029 conditions. The climate change scenario for Future Conditions assumes projections of climate and hydrology for the year 2050. Currently, 2029 climate change projections are not available. In order to estimate SWP deliveries 20 years in the future with potential changes in climate, annual SWP deliveries were interpolated between deliveries from the CALSIM II simulation with the climate change scenario and deliveries from the CALSIM II simulation which assumes no climate change. Both CALSIM II simulations for future conditions assume a 2029 SWP demand level.

The following tables and graph contain the interpolated values from these two simulations. The annual SWP Table A and SWP Article 21 deliveries for the two simulations upon which the information in this section is based are presented in Appendix B.

## SWP Table A Deliveries under the Future Hydrologic Scenario

Table 6.12 contains the average, maximum, and minimum estimates of SWP Table A deliveries from the Delta under Future Conditions of Study 2027 from the *2007 Report* and under the updated 2029 assumptions. The estimated probabilities for a given amount of annual SWP delivery under Future Conditions and those for the 2027 conditions are presented in Figure 6.4.

Table 6.12 shows that under the updated Future Conditions, average SWP delivery amounts may decrease from 6 to 9% of maximum SWP Table A (240 taf /yr to 360 taf/yr) when compared to the earlier estimates. This decrease in deliveries is primarily due to the effect of the biological opinions' requirements in reducing the amount of Delta water available for export by the SWP in comparison to the effect of the Old River and Middle River flow targets assumed for the Study 2027. Differences in the assumed hydrologic changes associated with climate change could also affect deliveries. The estimate of minimum annual SWP Table A delivery for the updated study is shown to increase from 4 to 5% of maximum SWP Table A amounts (165 taf/yr to 200 taf/yr). Minimum annual deliveries are associated with the conditions simulated for year 1977, the driest year on record.

Table 6.13 includes estimates of SWP Table A deliveries for a single-year and multiyear droughts. It

**Table 6.12** SWP Table A delivery from the Delta under Future Conditions

| Study of Future Conditions | Average Delivery | | Maximum Delivery | | Minimum Delivery | |
|---|---|---|---|---|---|---|
| | taf / year | % of maximum SWP Table A[1] | taf / year | % of maximum SWP Table A[1] | taf / year | % of maximum SWP Table A[1] |
| *2007 Report*, Study 2027 [2] | 2724–2850 | 66–69% | 4133 | 100% | 255–293 | 6–7% |
| Study 2029 | 2487 | 60% | 3999 | 97% | 458 | 11% |

[1]/ 4,133 taf /year
[2]/ Range in values reflects four modified scenarios of climate change: annual SWP Table A deliveries were first interpolated between full 2050 level and no climate change scenarios, then averaged over the two scenarios of Old and Middle River flow targets.

also includes the average of the SWP Table A deliveries for comparison purposes. Estimates of updated SWP deliveries under Future Conditions during dry periods are about the same as the *2007 Report* for four-year and six-year droughts. The six-year drought of 1987-1992 is estimated to provide 32% of maximum SWP Table A, a reduction of 1% to 3% when compared to the 2007 estimate. Updated SWP deliveries in the 1976-1977 drought increase by 11% to 12% of maximum SWP Table A (about 450 taf/yr) compared to the earlier studies. About 180 taf of this increase is due to water allocated in 1975 and delivered in 1976 under the Article 56 carryover program.

Table 6.14 summarizes SWP Table A deliveries under an assumed repetition of historical wet periods under Future Conditions. As with drought years, the Eight River Index is used to identify wet years. SWP deliveries increase in 1983 compared to earlier studies by 3% of maximum SWP Table A due to an assumed increase in demand. Reductions in delivery amounts are significant for the two-, four-, six-, and 10-year wet periods. The highest reduction occurs in the 1978-1987 period and ranges from 8% to 11% of maximum SWP Table A. This is a reduction of 330 taf/yr to 450 taf/yr.

## SWP Article 21 Deliveries under Different Hydrologic Scenarios

Table 6.15 contains the average, maximum, and minimum SWP Article 21 delivery estimates over the 1922-2003 period for the updated simulations of Future Conditions. Comparing the estimates of SWP Article 21 deliveries, the updated estimates show more delivery amounts on average and for the maximum annual delivery over the simulation period. Estimated average SWP Article 21 delivery under the updated Future Conditions is 30 taf/yr more than the corresponding estimate in the *2007 Report*. Estimated maximum annual SWP Article 21 delivery is increased about 120 taf. These increases are due to the assumed higher SWP Article 21 demands in the 2029 studies. The minimum SWP Article 21 delivery for the updated study is 1 taf/yr compared to 0 taf/yr for the *2007 Report*. This higher minimum delivery is due to a revised assumption in the updated studies that allows the diversion of SWP Article 21 water to the North Bay Aqueduct whenever such water is available in the Delta. In the *2007*

**Table 6.13** Average and dry period SWP Table A deliveries from the Delta under Future Conditions

| Study of Future Conditions | Percent of maximum (4,133 taf /year) SWP Table A delivery from the Delta | | | | | |
|---|---|---|---|---|---|---|
| | Long-term Average | Single dry year 1977 | 2-year drought 1976-1977 | 4-year drought 1931-1934 | 6-year drought 1987-1992 | 6-year drought 1929-1934 |
| *2007 Report*, Study 2027[1] | 66–69% | 6–7% | 26–27% | 32–37% | 33–35% | 33–36% |
| Study 2029 | 60% | 11% | 38% | 35% | 32% | 36% |

[1]/ Range in values reflects four modified scenarios of climate change: annual SWP Table A deliveries were first interpolated between full 2050 level and no climate change scenarios, then averaged over the two scenarios of Old and Middle River flow targets.

**Table 6.14** Average and wet period SWP Table A deliveries from the Delta under Future Conditions

| Study of Future Conditions | Percent of maximum (4,133 taf /year) SWP Table A delivery from the Delta | | | | | |
|---|---|---|---|---|---|---|
| | Long-term Average | Single wet year 1983 | 2-year wet 1982-1983 | 4-year wet 1980-1983 | 6-year wet 1978-1983 | 10-year wet 1978-1987 |
| *2007 Report*, Study 2027[1] | 66–69% | 94% | 97% | 86–87% | 84–87% | 80–83% |
| Study 2029 | 60% | 97% | 93% | 82% | 79% | 72% |

[1]/ Range in values reflects four modified scenarios of climate change: annual SWP Table A deliveries were first interpolated between full 2050 level and no climate change scenarios, then averaged over the two scenarios of Old and Middle River flow targets.

*Report*, SWP Article 21 deliveries to North Bay Aqueduct were assumed to be dependent on the available Harvey O. Banks pumping capacity to serve all SWP Article 21 demands.

Table 6.16 contains the estimates for SWP Article 21 deliveries during historical dry periods. The SWP Article 21 deliveries for the updated 2029 study have a dry period maximum of 370 taf/yr compared to 90 taf/yr for the 2027 studies. Table 6.16 illustrates that opportunities for delivering SWP Article 21 water exist even during drought periods.

Table 6.17 shows updated and earlier estimates of SWP Article 21 deliveries by year during the 1978-1987 wet period. The availability of SWP Article 21 deliveries is also increased for this wet period. The average SWP Article 21 delivery for the 1978-1987 period under Future Conditions is 140 taf/yr, compared to a range of 90 taf/yr to 100 taf/yr for the 2027 studies.

## SWP Table A Delivery Probability

The probability that a given level of SWP Table A amount will be delivered from the Delta is shown for Future Conditions in Figure 6.4. Results of the 2027 studies from the *2007 Report* and the updated 2029 study are shown. Probabilities for 2027 conditions are shown as a set of dotted lines representing the four climate change scenarios analyzed in the *2007 Report*.

Figure 6.2 shows that under Future Conditions, for probabilities of exceedence under 60%, updated annual SWP Table A deliveries can be significantly less than the earlier estimates. For example, a delivery estimate which has a 40% chance of being larger is reduced to about 2,700 taf/yr (65% of maximum SWP Table A) in the updated study from the earlier estimates of about 3,260 taf to 3,450 taf annually (79-83% of maximum SWP Table A). Figure 6.2 is based on information for the updated Future Condi-

**Figure 6.2** Delta SWP Table A delivery probability under Future Conditions

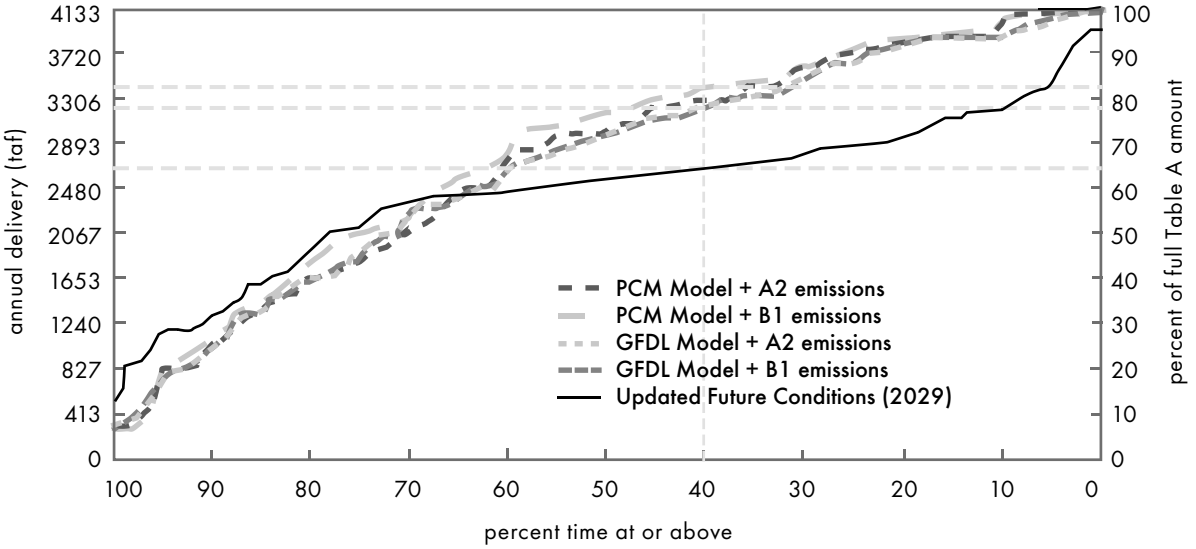



**Table 6.15** Annual SWP Article 21 delivery from the Delta under Future Conditions

| Study of Future Conditions | Average delivery (taf) | Maximum delivery (taf) | Minimum delivery (taf) |
|---|---|---|---|
| *2007 Report*, Study 2027[1] | 30 | 410–420 | 0 |
| Study 2029 | 60 | 540 | 1 |

[1]/ Range in values reflects four modified scenarios of climate change: annual SWP Table A deliveries were first interpolated between full 2050 level and no climate change scenarios, then averaged over the two scenarios of Old and Middle River flow targets.

**Table 6.16** Average and dry year SWP Article 21 delivery under Future Conditions (taf/year)

| Year | *2007 Report*, Study 2027[1] | Study 2029 |
|---|---|---|
| 1929 | 0 | 160 |
| 1930 | 0 | 10 |
| 1931 | 0 | 8 |
| 1932 | 0–40 | 370 |
| 1933 | 20–90 | 230 |
| 1934 | 0–10 | 70 |
| 1976 | 0 | 12 |
| 1977 | 0–10 | 3 |
| 1987 | 0 | 60 |
| 1988 | 0 | 60 |
| 1989 | 0 | 6 |
| 1990 | 0 | 11 |
| 1991 | 0 | 13 |
| 1992 | 0 | 9 |
| Long-term Average | 30 | 60 |

[1]/ Range in values reflects four modified scenarios of climate change: annual SWP Table A deliveries were first interpolated between full 2050 level and no climate change scenarios, then averaged over the two scenarios of Old and Middle River flow targets.

**Table 6.17** Average and wet year SWP Article 21 delivery under Future Conditions (taf/year)

| Year | *2007 Report*, Study 2027 [1] | Study 2029 |
|---|---|---|
| 1978 | 40–150 | 70 |
| 1979 | 0 | 11 |
| 1980 | 90–130 | 30 |
| 1981 | 0 | 14 |
| 1982 | 0 | 100 |
| 1983 | 270–290 | 510 |
| 1984 | 410– 420 | 540 |
| 1985 | 0 | 9 |
| 1986 | 0–10 | 50 |
| 1987 | 0 | 60 |
| 1978-87 Average | 90–100 | 140 |
| Long-term Average | 30 | 60 |

[1]/ Range in values reflects four modified scenarios of climate change: annual SWP Table A deliveries were first interpolated between full 2050 level and no climate change scenarios, then averaged over the two scenarios of Old and Middle River flow targets.

tion contained in **Tables B.4** and **B.5** in Appendix B.

**Table 6.18** presents the SWP Table A annual deliveries associated with 25%, 50%, and 75% exceedence illustrated in **Figure 6.2** and contained in **Table B.5**. The information in **Table 6.18** can be stated as follows:

For any given year,

- 25% chance of SWP deliveries at or above 2,915 taf.
- 50% chance of SWP deliveries above or below 2,596 taf.
- 75% chance of SWP deliveries above 2,137 taf (or 25% chance that deliveries will be below 2,137 taf).

## Comparing Current and Future SWP Delivery Reliability

The results presented earlier in this chapter compare updated delivery projections for both the current and future scenarios with those contained in the *2007 Report.* The comparisons show that deliveries are estimated to be less than projected in the *2007 Report* due to implementing the requirements of the recent biological opinions and, for the future projection, a change in the assumed climate change scenario. This section presents the same CALSIM II simulation-based results as a comparison of current reliability, projected for 2009, to the future reliability, projected for 2029. Comparisons to the results of the *2007 Report* are also included.

## SWP Table A Deliveries under Different Hydrologic Scenarios

**Tables 6.19, 6.20,** and **6.21** summarize the estimated SWP Table A deliveries from the Delta under Current and Future Conditions from the *2007 Report* and as derived from the updated CALSIM II simulations for this report. A significant observation involves the change over the twenty-year period of the average amount of projected SWP Table A deliveries. In the *2007 Report*, average future SWP deliveries are projected to increase 3 to 6 percent of maximum SWP Table A whereas, under the updated estimate, the average delivery does not change. The updated average annual delivery is estimated to remain at 60% of maximum SWP Table A in the future.

In both the *2007 Report* and this updated report, the changes between current and future deliveries fluctuate within 4 percentage points during dry periods greater than 2 years (**Table 6.20**), and increase during wet periods (**Table 6.21**). The increases during the wet periods for both sets of studies become less as the wet periods lengthen. For the *2007 Report*, these increases range from 34% of maximum SWP Table A for a single year to 9% for the 10-year period. For the updated study, the increases range from 29% for the single year to 5% for the 10-year period. The amounts of the increases for the updated estimates are consistently less than those for the *2007 Report*. This is primarily due to the SWP demands assumed for the updated study for current conditions and the climate change scenario assumed for the updated future condition that now includes sea level rise. The assumed demands are very similar between the current and future updated studies whereas the assumed demand for the Study 2027 is significantly higher than the assumed demand in the Study 2007.

**Table 6.18** Highlighted SWP Table A delivery percent exceedence values under Future Conditions

| Exceedence | *2007 Report,* Study 2027[1] | Study 2029[2] | Delivery changes in updated studies compared to *2007 Report* (taf) |
|---|---|---|---|
| 25% | 3687–3815 | 2915 | - 772 to - 900 |
| 50% | 2967–3205 | 2596 | - 371 to - 609 |
| 75% | 1860–2077 | 2137 | + 60 to + 277 |

[1]/ Range in value reflects four modified scenarios of climate change.
[2]/ Annual SWP Table A deliveries were interpolated between year 2050 with climate change and no climate change scenarios.

**Table 6.19** SWP Table A delivery from the Delta under Current and Future Conditions

| | Average Delivery | | Maximum Delivery | | Minimum Delivery | |
|---|---|---|---|---|---|---|
| | taf /year | % of maximum SWP Table A[1] | taf /year | % of maximum SWP Table A[1] | taf /year | % of maximum SWP Table A[1] |
| *2007 Report*<br>Current (2007)<br>Future (2027) [2] | 2595<br>2724–2850 | 63%<br>66–69% | 3711<br>4133 | 90%<br>100% | 243<br>255–293 | 6%<br>6–7% |
| Updated Studies<br>Current (2009)<br>Future (2029) | 2483<br>2487 | 60%<br>60% | 3338<br>3999 | 81%<br>97% | 301<br>458 | 7%<br>11% |

[1]/ 4,133 taf /year
[2]/ Range in values reflects four modified scenarios of climate change: annual SWP Table A deliveries were first interpolated between full 2050 level and no climate change scenarios, then averaged over the two scenarios of Old and Middle River flow targets.

**Table 6.20** Average and dry period SWP Table A deliveries from the Delta under Current and Future Conditions

| | Percent of maximum (4,133 taf /year) SWP Table A delivery from the Delta | | | | | |
|---|---|---|---|---|---|---|
| | Long-term Average | Single dry year 1977 | 2-year drought 1976-1977 | 4-year drought 1931-1934 | 6-year drought 1987-1992 | 6-year drought 1929-1934 |
| *2007 Report*<br>Current (2007)<br>Future (2027) [1] | 63%<br>66–69% | 6%<br>6–7% | 34%<br>26–27% | 35%<br>32–37% | 35%<br>33–35% | 34%<br>33–36% |
| Updated studies<br>Current (2009)<br>Future (2029) | 60%<br>60% | 7%<br>11% | 36%<br>38% | 34%<br>35% | 35%<br>32% | 34%<br>36% |

[1]/ Range in values reflects four modified scenarios of climate change: annual SWP Table A deliveries were first interpolated between full 2050 level and no climate change scenarios, then averaged over the two scenarios of Old and Middle River flow targets.

**Table 6.21** Average and wet period SWP Table A deliveries from the Delta under Current and Future Conditions

| | Percent of maximum (4,133 taf /year) SWP Table A delivery from the Delta | | | | | |
|---|---|---|---|---|---|---|
| | Long-term Average | Single wet year 1983 | 2-year wet 1982-1983 | 4-year wet 1980-1983 | 6-year wet 1978-1983 | 10-year wet 1978-1987 |
| *2007 Report*<br>Current (2007)<br>Future (2027) [1] | 63%<br>66–69% | 60%<br>94% | 66%<br>97% | 68%<br>86–87% | 73%<br>84–87% | 71%<br>80–83% |
| Update studies<br>Current (2009)<br>Future (2029) | 60%<br>60% | 68%<br>97% | 71%<br>93% | 68%<br>82% | 68%<br>79% | 67%<br>72% |

[1]/ Range in values reflects four modified scenarios of climate change: annual SWP Table A deliveries were first interpolated between full 2050 level and no climate change scenarios, then averaged over the two scenarios of Old and Middle River flow targets.

The projections for the single-year and 2-year drought periods are very sensitive to the assumed conditions immediately preceding the drought and the operational rules for the SWP. Two key factors are the reservoir storages assumed at the beginning of the period and the amount of water allocated under SWP Table A for the previous year being carried over into the subsequent year. Under a 2-year drought condition (1976-1977), the *2007 Report* estimates the future SWP Table A deliveries as being lower than the projected current deliveries by as much as 8% of maximum SWP Table A (**Table 6.20**).

The updated estimates indicate that future SWP Table A deliveries under the 2-year drought period could be slightly higher than under Current Conditions (**Table 6.20**). The updated future SWP Table A deliveries for a single dry year are estimated to be higher than the 2009 study by 4% of maximum SWP Table A.

## SWP Article 21 Deliveries under Different Hydrologic Scenarios

**Tables 6.22**, **6.23**, and **6.24** contain summaries and highlights of estimated SWP Article 21 deliveries from the Delta under Current and Future Conditions from the *2007 Report* and as derived from updated CALSIM II simulations for this report. The studies for the *2007 Report* and this updated report conclude lower amounts of deliveries will be made in the future under SWP Article 21. Updated estimates of future SWP Article 21 deliveries may increase over updated current values for specific years; however, the long-term average future SWP Article 21 delivery is reduced to about two-thirds of the estimate for the Current Conditions. Because the updated studies include the assumption that the SWP water contractors have a much greater ability receive water under SWP Article 21, the updated studies show greater annual variation in the amount of SWP Article 21 deliveries when compared to the *2007 Report*.

## SWP Table A Delivery Probability

The current and future probability that a given level of SWP Table A amount will be delivered from the Delta is shown in **Figure 6.3** from the *2007 Report* and in **Figure 6.4** for updated studies for this report. In the *2007 Report*, future SWP Table A deliveries exceeded current deliveries at exceedence levels less than 60%. Under the updated simulations for this report, future SWP Table A deliveries exceed current estimated deliveries at exceedence levels less than 15%. Above this exceedence, future deliveries are generally smaller than current deliveries; with the most significant reduction being exceedence levels of 70% and 80%. The SWP demands are very similar for the current and future scenarios in the updated studies. Therefore, the differences in SWP Table A delivery amounts for the updated studies are primarily due to the climate change scenario that is assumed.

**Table 6.25** presents SWP Table A delivery values which correspond to 25%, 50%, and 75% exceedence for Current and Future Conditions. Previously in the *2007 Report*, future annual SWP deliveries were estimated to be larger than the estimated current deliveries by approximately 500 taf to 600 taf for 25% exceedence and 0 taf to 200 taf for 50% exceedence. At 75% exceedence, future Study 2027 deliveries were estimated to be less than current Study 2007 deliveries by about 100 taf to 300 taf. For the updated studies, future SWP Table A deliveries associated with the 25%, 50%, and 75% exceedence levels are about the same or lower than for the deliveries at the current level (2009). The most significant reduction in updated future deliveries occurs at the 75% exceedence level where future deliveries are about 260 taf less than under Current Conditions. As previously mentioned, this difference is primarily due to the climate change scenario included under Future Conditions.

**Table 6.22** Annual SWP Article 21 delivery from the Delta under Current and Future Conditions

| | Average delivery (taf) | Maximum delivery (taf) | Minimum delivery (taf) |
|---|---|---|---|
| *2007 Report* | | | |
| Current (2007) | 85 | 590 | 0 |
| Future (2027) [1] | 30 | 410–420 | 0 |
| Updated studies | | | |
| Current (2009) | 85 | 850 | 2 |
| Future (2029) | 60 | 540 | 1 |

[1]/ Range in values reflects four modified scenarios of climate change: annual SWP Table A deliveries were first interpolated between full 2050 level and no climate change scenarios, then averaged over the two scenarios of Old and Middle River flow targets.

**Table 6.23** Average and dry year SWP Article 21 delivery under Current and Future Conditions (taf/year)

| Year | *2007 Report* | | Updated Studies | |
|---|---|---|---|---|
| | Current (2007) | Future (2027)[1] | Current (2009) | Future (2029) |
| 1929 | 0 | 0 | 10 | 160 |
| 1930 | 0 | 0 | 10 | 10 |
| 1931 | 0 | 0 | 8 | 8 |
| 1932 | 0 | 0–40 | 160 | 370 |
| 1933 | 40 | 20–90 | 390 | 230 |
| 1934 | 0 | 0–10 | 8 | 70 |
| 1976 | 5 | 0 | 9 | 12 |
| 1977 | 0 | 0–10 | 2 | 3 |
| 1987 | 0 | 0 | 9 | 60 |
| 1988 | 0 | 0 | 10 | 60 |
| 1989 | 0 | 0 | 10 | 6 |
| 1990 | 0 | 0 | 10 | 11 |
| 1991 | 0 | 0 | 12 | 13 |
| 1992 | 0 | 0 | 10 | 9 |
| Long-term Average | 85 | 30 | 85 | 60 |

[1]/ Range in values reflects four modified scenarios of climate change: annual SWP Table A deliveries were first interpolated between full 2050 level and no climate change scenarios, then averaged over the two scenarios of Old and Middle River flow targets.

**Table 6.24** Average and wet year SWP Article 21 delivery under Current and Future Conditions (taf/year)

| Year | *2007 Report* | | Updated Studies | |
|---|---|---|---|---|
| | Current (2007) | Future (2027) [1] | Current (2009) | Future (2029) |
| 1978 | 100 | 40–150 | 2 | 70 |
| 1979 | 0 | 0 | 120 | 11 |
| 1980 | 190 | 90 - 130 | 190 | 30 |
| 1981 | 0 | 0 | 8 | 14 |
| 1982 | 490 | 0 | 460 | 100 |
| 1983 | 400 | 270–290 | 850 | 510 |
| 1984 | 460 | 410–420 | 510 | 540 |
| 1985 | 0 | 0 | 2 | 9 |
| 1986 | 30 | 0–10 | 140 | 50 |
| 1987 | 0 | 0 | 9 | 60 |
| 1978-87 Average | 170 | 90–100 | 230 | 140 |
| Long-term Average | 85 | 30 | 85 | 60 |

[1]/ Range in values reflects four modified scenarios of climate change: annual SWP Table A deliveries were first interpolated between full 2050 level and no climate change scenarios, then averaged over the two scenarios of Old and Middle River flow targets.

**Table 6.25** Highlighted SWP Table A delivery percent exceedence values under Current and Future Conditions

| Exceedence | Annual SWP Table A Delivery (taf) | | | |
|---|---|---|---|---|
| | *2007 Report* | | Updated Studies | |
| | Current (2007) | Future (2027) [1] | Current (2009) | Future (2029) |
| 25% | 3218 | 3687–3815 | 2920 | 2915 |
| 50% | 2976 | 2967–3205 | 2675 | 2596 |
| 75% | 2168 | 1860–2077 | 2397 | 2137 |

[1] Range in values reflects four modified scenarios of climate change: annual SWP Table A deliveries were first interpolated between full 2050 level and no climate change scenarios, then averaged over the two scenarios of Old and Middle River flow targets.

**Figure 6.3** Current and future SWP Table A delivery probability from the 2007 SWP Delivery Reliability Report

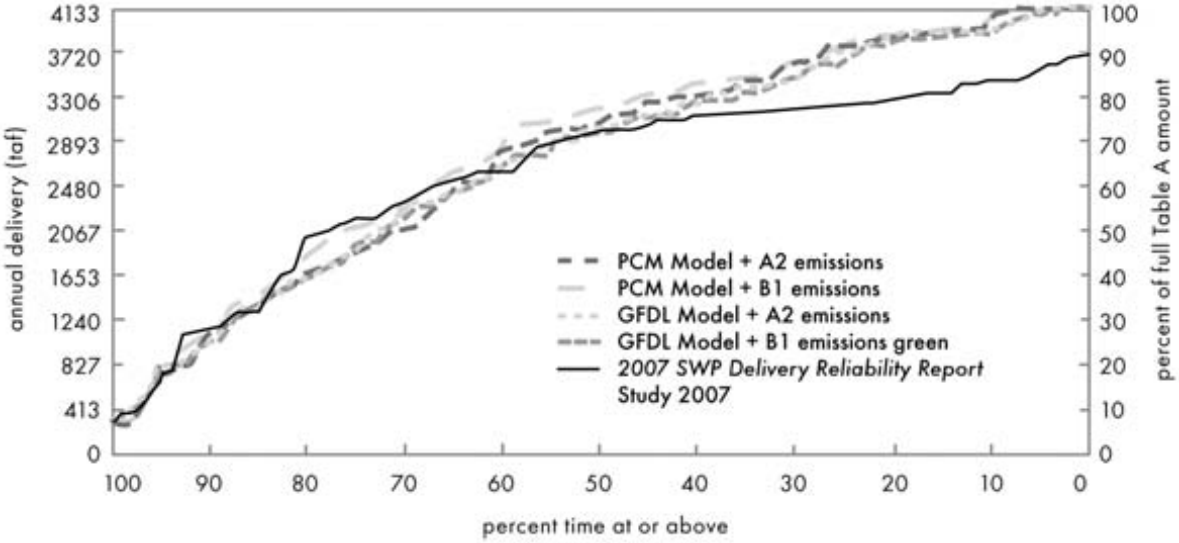
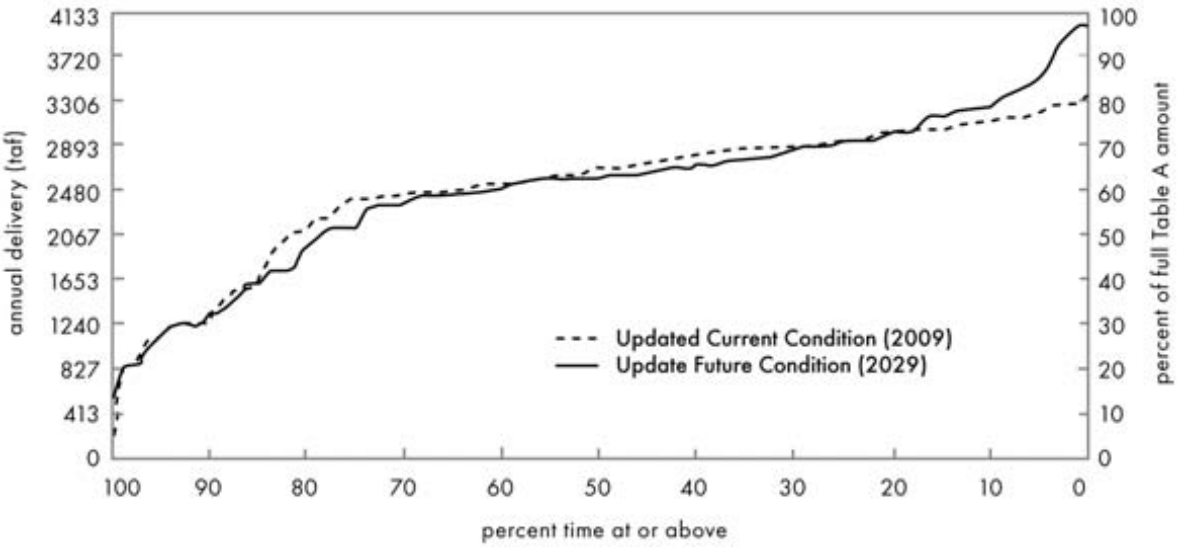



**Figure 6.4** Updated current and future SWP Table A delivery probability



# 7 Interpreting and Applying the Results for Local Planning Use

Chapter 6 presents estimates for current-level deliveries and for deliveries 20 years in the future. Chapter 6 and Appendix B explain how these estimates are developed. This chapter provides guidance on how to apply the delivery estimates to water management plans.

All results in this report are presented as percentages of the maximum SWP Table A amount for SWP deliveries from the Delta of 4,133 taf/yr. In previous delivery reliability reports, all the percentage values of maximum SWP Table A presented in the report were directly applicable to individual contractors. In this report however, the CALSIM II simulations model the practice of certain contractors to carry over water supply from the year in which it was allocated and have it delivered in the following year, as allowed by Article 56 of their contract. See Appendix D for a discussion of Article 56 carryover storage.

The long-term average percentage values of SWP Table A deliveries in this report continue to be directly applicable to all water contractors but values for individual years or averages over shorter periods of time, such as a dry-year period or a wet-year period, should be applied with caution as they may be affected by the amount of water assumed to be held over from one year and delivered in the next under Article 56. For values other than the long-term averages, we recommend individual contractors contact the Department of Water Resources' Bay-Delta Office at (916) 653-1099 to obtain the values specific to their water agency or download the information directly from the SWP Delivery Reliability website at **http://baydeltaoffice.water.ca.gov/swpreliability/index.cfm**. The Bay-Delta Office should also be contacted with other questions regarding the use of the information contained in this report.

The following example illustrates how to incorporate the long-term average values into a local water management plan. It is developed for a hypothetical SWP contractor with a maximum SWP Table A amount of 100,000 af per year.

**Table 7.1** Average SWP Table A delivery from the Delta in five-year intervals for Studies 2009 and 2029

| Year | Average percent of maximum (4,133 taf /year) SWP Table A delivery from the Delta |
|---|---|
| 2009 | 60% |
| 2014 | 60% |
| 2019 | 60% |
| 2024 | 60% |
| 2029 | 60% |

## Example

This example uses data directly from Table 6.20 for updated current and future estimates of SWP Table A deliveries for the long-term average. Table 7.1 shows the long-term current and future averages of Delta SWP Table A deliveries interpolated for 5-year periods. Since the long-term average SWP Table A value is 60% of maximum SWP Table A for both the current and future estimates, the interpolated value for each 5-year period is also 60%. Although the values shown in Tables 7.1 and 7.2 are for the period 2009 – 2029, they are the best estimates available for use in

developing water management plans for the period 2010-2030.

## How to Calculate Supplies

In order to estimate delivery amounts for each 5-year increment from 2009 to 2029, multiply the contractor's maximum SWP Table A amount for a particular year by the corresponding delivery percentages for that year from Table 7.1. The maximum SWP Table A amounts of each contractor are listed in Appendix C. SWP Table A amounts can be amended and a contractor's SWP Table A amount over the next 20 years may be less than its maximum over some or all of this period. In this case, the contractor should use the amended SWP Table A amounts for the corresponding years during this period.

Table 7.2 shows the SWP Table A deliveries projected to be available to a hypothetical contractor with a maximum SWP Table A amount of 100,000 af during average hydrologic conditions. Although the estimates for the SWP delivery amount is constant over the 20-year period, estimates for the long-term average delivery for the other sources of supply could change over the twenty-year period and, therefore, produce different estimates for the total water supply available to an individual contractor for each 5-year period.

Data for other year types can also be presented this way. As mentioned previously, SWP contractors should contact the Bay Delta Office for their specific percentages to be used in estimating deliveries for a specific year or for wet or dry-year periods.

**Table 7.2** Average annual SWP deliveries assuming a maximum SWP Table A amount of 100,000 acre-feet

| **Water Supply Source** | 2009 | 2014 | 2019 | 2024 | 2029 |
|---|---|---|---|---|---|
| SWP Table A | 60,000 | 60,000 | 60,000 | 60,000 | 60,000 |
| SWP Article 21[1] | | | | | |
| Groundwater | | | | | |
| Local Surface Water | | | | | |
| Transfers | | | | | |
| Exchanges | | | | | |
| Reclaimed Water | | | | | |
| Other (identify) | | | | | |
| **Total** | | | | | |

[1]/ Annual Article 21 amounts vary significantly from year to year. Without the ability to store Article 21 supply, it is not likely to contribute to local supply. See discussion of Article 21 supply in Chapter 5.

# Appendix A. CALSIM II Modeling Assumptions

The SWP operation simulations in this report use the CALSIM II model developed for the 2009 DWR-Reclamation CALSIM II Benchmark Studies of the State Water Project that was then modified specifically for these studies. The CALSIM II Benchmark Studies of the State Water Project model was developed from the 2008 Operations Criteria and Plan model and the 2008 Common Assumptions model. Additional information on these models is available at **http://baydeltaoffice.water.ca.gov/swpreliability/index.cfm**. The main difference between the 2009 CALSIM II Benchmark Studies of the State Water Project and the 2008 Operations Criteria and Plan and the 2008 Common Assumptions models is the representation of the 2008 USFW biological opinion for Proposed Coordinated Operation of the CVP and the SWP and the 2009 NMFS biological opinion on the Long Term Operations of the CVP and the SWP.

The 2008 Operations Criteria and Plan model version was also modified to include the following changes:

1. Replacement of the previous Artificial Neural Network with a more accurate version. Implementation of the new Artificial Neural Network in the CALSIM II model produces salinities that more closely match those of Delta Simulation Model 2.

2. More detailed representation of Delta channel configuration. This was done to capture the flow effects in Old and Middle Rivers.

3. Modeling of Article 56 extended carryover deliveries that are available to SWP Table A contractors.

4. Use of three delivery patterns (based on 30%, 50% and 100% allocations) which provides a more accurate representation of SWP deliveries.

5. Estimation of X2 position and flow requirements using an Artificial Neural Network. X2 positions are now more similar to those calculated in Delta Simulation Model 2.

6. The phenomenon of sea level rise and its effect on Delta salinities is now modeled. Artificial Neural Networks were developed to estimate flow-salinity relationships in the Delta with an assumed increment of sea level rise for a mid-century condition.

7. Modified SWP South of the Delta allocation logic to account for export restrictions that are established by the new biological opinions.

All studies assume current SWP Delta diversion limits (often referred to as "Banks Pumping Plant capacity"), existing conveyance capacity of the upper Delta-Mendota Canal/California Aqueduct system, and current SWP/CVP operations agreements. Table A.1 is a complete list of the study assumptions. Tables A.2 and A.3 provide the assumptions for American River demands.

**Table A.1** *2009 Report* CALSIM II modeling assumptions

| | Period of Simulation: 82 years (1922-2003) | |
|---|---|---|
| | Study 2009 | Study 2029 |
| **HYDROLOGY** | | |
| **Level of Development (Land Use)** | 2005 Level, *DWR Bulletin 160-98*[1] | 2020 Level, *DWR Bulletin 160-98*[2] |
| Sacramento River Region (excluding American River) Demands | | |
| CVP | Land Use based, limited by Full Contract | Land Use based, full build-out of contract amounts |
| SWP (FRSA) | Land Use based, limited by Full Contract | |
| Non-Project | Land Use based | |
| Davis-Woodland | None | Proposal 2B from EIR/S |
| Antioch | Pre-1914 water right | |
| CVP Refuges | Recent Historical Level 2 water needs | Firm Level 2 water needs |
| American River Basin Demands | | |
| Water rights | 2005 Level[3] | 2020 Level[4] |
| CVP | 2005 Level, including Freeport Regional Water Project | 2020 Level, full contracts including Freeport Regional Water Project and Sacramento River Water Reliability Project |
| San Joaquin River Basin Demands | | |
| Friant Unit | Limited by contract amounts, based on current allocation policy | |
| Lower Basin | Land-use based, based on district level operations and constraints | |
| Stanislaus River Basin [5] | Land-use based, based on New Melones Interim Operations Plan and NMFS biological opinion (June 2009), Actions 3.1.2 and 3.1.3 [11] | |
| South of Delta Demands | | |
| CVP | Full Contract | |
| Contra Costa Water District | 140 taf/yr [6] | 195 taf/yr [6] |
| SWP (with North Bay Aqueduct) | 3.0-4.1 maf/yr | 4.1 maf/yr |
| SWP Article 21 Demand | Metropolitan Water District of Southern California up to 200 taf/month (Dec-Mar), KCWA demand up to 180 taf/month and others up to 34 taf/month | |
| **FACILITIES** | | |
| Red Bluff Diversion Dam | Diversion dam with gates out (except Jun 15–Aug 31), NMFS biological opinion (Jun 2009), Action I.3.2; assume interim facilities in place | Diversion dam with gates out all year, NMFS biological opinion (Jun 2009), Action I.3.1; assume permanent facilities in place |
| Freeport Regional Water Project | Included [7] | |
| Banks Pumping Capacity | Physical capacity is 10,300 cfs, 6,680 cfs permitted capacity up to 8,500 cfs (Dec 15th–Mar 15th) depending on Vernalis flow conditions [8]; additional capacity of 500 cfs (up to 7,180 cfs) allowed for Jul–Sep for reducing impact of NMFS biological opinion on SWP (Jun 2009), Action 4.2.1[11] | |
| Jones (Tracy) Pumping Capacity | Permit capacity is 4,600 cfs, exports limited to 4,200 cfs plus diversions upstream of Delta-Mendota Canal constriction | Exports up to 4,600 cfs permit capacity in all months (allowed for by the Delta-Mendota Canal/California Aqueduct Intertie) |
| **REGULATORY STANDARDS** | | |
| Trinity River | | |
| Minimum Flow below Lewiston Dam | Trinity EIS Preferred Alternative (369-815 taf/yr) | |
| Trinity Reservoir End-of-September Minimum Storage | Trinity EIS Preferred Alternative (600 taf as able) | |

| REGULATORY STANDARDS | | |
|---|---|---|
| Clear Creek | | |
| Minimum Flow below Whiskeytown Dam | Downstream water rights, 1963 Reclamation Proposal to USFWS and NPS, predetermined Central Valley Project Improvement Act 3406(b)(2) flows and NMFS biological opinion (June 2009) Action I.1.1[11] | |
| Upper Sacramento River | | |
| Shasta Lake End-of-September Minimum Storage | NMFS 2004 Winter-run biological opinion (1900 taf), predetermined Central Valley Project Improvement Act 3406(b)(2) flows, and NMFS biological opinion (Jun 2009) Action I.2.1 [11] | |
| Minimum Flow below Keswick Dam | Flows for SWRCB Water Rights Order 90-5 and 1993 Winter-run biological opinion temperature control, predetermined Central Valley Project Improvement Act 3406(b)(2) flows, and NMFS biological opinion (Jun 2009), Action I.2.2 [11] | |
| Feather River | | |
| Minimum Flow below Thermalito Diversion Dam | 2006 Settlement Agreement (700 / 800 cfs) | |
| Minimum Flow below Thermalito Afterbay outlet | 1983 DWR, DFG Agreement (750–1700 cfs) | |
| Yuba River | | |
| Minimum flow below Daguerre Point Dam | D-1644 Operations (Lower Yuba River Accord) [9] | |
| American River | | |
| Minimum Flow below Nimbus Dam | American River Flow Management as required by NMFS biological opinion (Jun 2009), Action 2.1 [11] | American River Flow Management [10] as required by anticipated SWRCB order |
| Minimum Flow at H Street Bridge | SWRCB D-893 | |
| Lower Sacramento River | | |
| Minimum Flow near Rio Vista | SWRCB D-1641 | |
| Mokelumne River | | |
| Minimum Flow below Camanche Dam | Federal Energy Regulatory Commission 2916-029, 1996 (Joint Settlement Agreement) (100 – 325 cfs) | |
| Minimum Flow below Woodbridge Diversion Dam | Federal Energy Regulatory Commission 2916-029, 1996 (Joint Settlement Agreement) (25 – 300 cfs) | |
| Stanislaus River | | |
| Minimum Flow below Goodwin Dam | 1987 Reclamation, DFG agreement, and flows required for NMFS biological opinion (Jun 2009) Actions III.1.2 and III.1.3 [11] | |
| Minimum Dissolved Oxygen | SWRCB D-1422 | |
| Merced River | | |
| Minimum Flow below Crocker-Huffman Diversion Dam | Davis-Grunsky (180 – 220 cfs, Nov – Mar), and Cowell Agreement | |
| Minimum Flow at Shaffer Bridge | Federal Energy Regulatory Commission 2179 (25 – 100 cfs) | |
| Tuolumne River | | |
| Minimum Flow at Lagrange Bridge | Federal Energy Regulatory Commission 2299-024, 1995 (Settlement Agreement) (94–301 taf/yr) | |
| San Joaquin River | | |
| Maximum Salinity near Vernalis | SWRCB D-1641 | |
| Minimum Flow near Vernalis | SWRCB D-1641, NMFS biological opinion (Jun 2009), Action 4.2.1 [11] | |
| Sacramento River-San Joaquin River Delta | | |
| Delta Outflow Index (Flow and Salinity) | SWRCB D-1641, USFWS biological opinion (Dec 2008), Action 4 [11] | |
| Delta Cross Channel Gate Operation | SWRCB D-1641, NMFS biological opinion (Jun 2009) Action 4.1.2 [11] | |
| Delta Exports | SWRCB D-1641, NMFS biological opinion (Jun 2009) Action 4.2.1 [11] | |
| Combined Flow in Old and Middle River | USFWS biological opinion (Dec 2008), Actions 1–3 and NMFS biological opinion (Jun 2009), Action 4.2.3 [11] | |

| OPERATIONS CRITERIA | |
|---|---|
| **Subsystem** | |
| Upper Sacramento River | |
| Flow Objective for Navigation (Wilkins Slough) | NMFS biological opinion (Jun 2009) Action I.4 [11]; 3,250 – 5,000 cfs based on CVP water supply condition |
| American River | |
| Folsom Dam Flood Control | Variable 400/670 (without outlet modifications) |
| Feather River | |
| Flow at Mouth | Maintain the DFG/DWR flow target above Verona or 2800 cfs for Apr– Sep dependent on Oroville inflow and FRSA allocation |
| Stanislaus River | |
| Flow below Goodwin Dam | NMFS biological opinion (Jun 2009) Actions III.1.2 and III.1.3 [11] |
| **System-wide** | |
| CVP Water Allocation | |
| CVP Settlement and Exchange | 100% (75% in Shasta Critical years) |
| CVP Refuges | 100% (75% in Shasta Critical years) |
| CVP Agriculture | 100% - 0% based on supply; additionally limited due to D-1641, USFWS biological opinion (Dec 2008) and NMFS biological opinion (Jun 2009) export restrictions [11] |
| CVP Municipal & Industrial | 100% - 50% based on supply; additionally limited due to D-1641, USFWS biological opinion (Dec 2008) and NMFS biological opinion (Jun 2009) export restrictions [11] |
| SWP Water Allocation | |
| North of Delta (FRSA) | Contract specific |
| South of Delta | Based on supply, Monterey Agreement; allocations limited due to D-1641, USFWS biological opinion (Dec2008) and NMFS biological opinion (Jun 2009) export restrictions [11] |
| CVP/SWP Coordinated Operations | |
| Sharing of Responsibility for In-Basin-Use | 1986 Coordinated Operations Agreement |
| Sharing of Surplus Flows | 1986 Coordinated Operations Agreement |
| Sharing of Restricted Export Capacity | Equal sharing of export capacity under SWRCB D-1641, USFWS biological opinion (Dec 2008) and NMFS biological opinion (Jun 2009) export restrictions [11] |
| Transfers | |
| Lower Yuba River Accord [12] | Yuba River acquisitions for reducing impact of NMFS biological opinion export restrictions [11] on SWP |
| Dry Year Program | None |
| Phase 8 | None |
| Metropolitan Water District of Southern California/CVP Settlement Contractors | None |
| CVP/SWP Integration | |
| Dedicated Conveyance at Banks | None |
| NOD Accounting Adjustments | None |

[1]The Sacramento Valley hydrology used in the Existing Conditions CALSIM II model reflects nominal 2005 land-use assumptions. The nominal 2005 land-use was determined by interpolation between the 1995 and projected 2020 land-use assumptions associated with Bulletin 160-98. The San Joaquin Valley hydrology reflects 2005 land-use assumptions developed by Reclamation. Existing-level projected land-use assumptions are being coordinated with the California Water Plan Update for future models.
[2] The Sacramento Valley hydrology used in the Future Conditions CALSIM II model reflects 2020 land-use assumptions associated with Bulletin 160-98. The San Joaquin Valley hydrology reflects draft 2030 land-use assumptions developed by Reclamation. Development of future-level projected land-use assumptions are being coordinated with the California Water Plan Update for future models.
[3] Presented in Table A.2.
[4] Presented in Table A.3.
[5] The CALSIM II model representation for the Stanislaus River does not necessarily represent Reclamation's current or future operational policies. A suitable plan for supporting flows has not been developed for NMFS biological opinion (Jun 2009), Action 3.1.3.
[6] The actual amount diverted is operated in conjunction with supplies from the Los Vaqueros project. The existing Los Vaqueros storage capacity is 100 taf. Associated water rights for Delta excess flows are included.
[7] Mokelumne River flows are modified to reflect modified operations associated with East Bay Municipal Utility District supplies from the Freeport Regional Water Project.
[8] Current US Army Corps of Engineers permit for Harvey O. Banks Pumping Plant allows for an average diversion rate of 6,680 cfs in all months. Diversion rate can increase up to 1/3 of the rate of San Joaquin River flow at Vernalis during Dec 15th–Mar 15th up to a maximum diversion of 8,500 cfs, if Vernalis flow exceeds 1,000 cfs.
[9] D-1644 and the Lower Yuba River Accord are assumed to be implemented for Existing and Future Conditions. The Yuba River is not dynamically modeled in CALSIM II. Yuba River hydrology and availability of water acquisitions under the Lower Yuba River Accord are based on modeling performed and provided by the Lower Yuba River Accord EIS/EIR study team.
[10] Under Existing Conditions, the flow components of the proposed American River Flow Management are as required by the NMFS biological opinion (June 4, 2009). Under Future Conditions, the American River Flow Management is treated as a SWRCB permit term.
[11] In cooperation with USBR, NMFS, USFWS, and DGF, the DWR has developed assumptions for implementation of the USFWS biological opinion (December 15, 2008) and NMFS biological opinion (June 4, 2009) in CALSIM II. The USFWS biological opinion and NMFS biological opinion assumptions are included as separate appendices.
[12] Acquisitions of Component 1 water under the Lower Yuba River Accord, and use of 500 cfs dedicated capacity at Banks Pumping Plant during Jul–Sep, are assumed to be used to reduce as much of the effect of the April–May Delta export actions on SWP contractors as possible.

**Table A.2** 2009 Study American River demand assumptions

| CVP Contractor | ALLOCATION TYPE (taf/yr) | | | | DIVERSION LIMITS (taf/yr) if Folsom Unimpaired Inflow = Total taf (Mar to Nov) | | | Notes |
|---|---|---|---|---|---|---|---|---|
| | CVP AG | CVP M&I | Settlement / Exchange | Water Rights / Non-CVP | > 1600 | > 950 | < 400 | |
| Auburn Dam Site | | | | | | | | |
| Placer County Water Agency | – | – | – | 35.5 | 35.5 | 35.5 | 35.5 | |
| **Total** | 0 | 0 | 0 | 35.5 | 35.5 | 35.5 | 35.5 | |
| Folsom Reservoir | | | | | | | | |
| Sacramento Suburban | – | – | – | 17 | 17 | – | – | |
| City of Folsom (Public Law 101-514) | – | 7 | – | 27 | 34 | 34 | 34 | 1 |
| Folsom Prison | – | – | – | 2 | 2 | 2 | 2 | |
| San Juan Water District (Placer County) | – | – | – | 17 | 17 | 17 | 17 | |
| San Juan Water District (Sac County, Public Law 101-514) | – | 24.2 | – | 33 | 44.2 | 44.2 | 44.2 | 1 |
| El Dorado Irrigation District | – | 7.55 | – | – | 7.55 | 7.55 | 7.55 | 1 |
| El Dorado County (Public Law 101-514) | – | 15 | – | – | 4 | 4 | 4 | 1 |
| City of Roseville | – | 32 | – | 5 | 37 | 37 | 37 | 1 |
| Placer County Water Agency | – | – | – | – | – | – | – | |
| **Total** | 0 | 85.75 | 0 | 101 | 162.8 | 145.8 | 145.8 | |
| Folsom South Canal | | | | | | | | |
| So. Cal WC/ Arden Cordova WC | – | – | – | 5 | 5 | 5 | 5 | |
| California Parks and Recreation | – | 5 | – | – | 1 | 1 | 1 | 1 |
| SMUD (export) | – | 30 | – | 15 | 20 | 20 | 20 | 1 |
| Canal Losses | – | – | – | 1 | 1 | 1 | 1 | |
| **Total** | 0 | 35 | 0 | 21 | 27 | 27 | 27 | |
| Lower American River | | | | | | | | |
| City of Sacramento | – | – | – | 58 | 58 | 58 | 50 | |
| Arcade Water District | – | – | – | – | – | – | – | |
| Carmichael Water District | – | – | – | 12 | 12 | 12 | 12 | |
| **Total** | 0 | 0 | 0 | 70 | 70 | 70 | 62 | |
| Lower Sacramento River | | | | | | | | |
| City of Sacramento | – | – | – | 62.3 | 62.3 | 62.3 | 70.3 | |
| Sacramento County Water Agency (SMUD transfer) | – | 10 | – | – | 10 | 10 | 10 | |
| | – | 20 | – | – | 20 | 20 | 20 | |
| Sacramento County Water Agency (assumed Appropriated Water) | – | – | – | 31.3 | 0 | – | – | 2 |
| Sacramento County Water Agency (Public Law 101-514) | – | 15 | – | – | 15 | 15 | 15 | |
| EBMUD (export) | – | 133 | – | – | – | – | – | 3 |
| **Total** | 0 | 178 | 0 | 93.6 | 107.3 | 107.3 | 115.3 | |
| **Total from the American River** | 0 | 298.75 | 0 | 321.10 | | | | |

[1] When the CVP Contract quantity exceeds the quantity of the Diversion Limit minus the Water Right (if any), the diversion modeled is the quantity allocated to the CVP Contract (based on the CVP contract quantity shown times the CVP M&I allocation percentage) plus the Water Right (if any), but with the sum limited to the quantity of the Diversion Limit.

[2] Sacramento County Water Agency targets 68 taf of surface water supplies annually. The portion unmet by CVP contract water is assumed to come from two sources:

- Delta "excess" water averages 16.5 taf annually, but varies according to availability. Sacramento County Water Agency is assumed to divert excess flow when it is available, and when there is available pumping capacity.
- "Other" water, derived from transfers and/or other appropriated water, averaging 14.8 taf annually but varying according remaining unmet demand.

[3] East Bay Municipal Utility District CVP diversions are governed by the Amendatory Contract, stipulating:

- 133 taf maximum diversion in any given year.
- 165 taf maximum diversion amount over any 3 year period.
- Diversions allowed only when EBMUD total storage drops below 500 taf.
- 155 cfs maximum diversion rate.

**Table A.3** 2029 Study American River Demand Assumptions

| CVP Contractor | ALLOCATION TYPE (taf/yr) | | | | DIVERSION LIMITS (taf/yr) if Folsom Unimpaired Inflow = Total taf (Mar to Nov) | | | Notes |
|---|---|---|---|---|---|---|---|---|
| | CVP AG | CVP M&I | Settlement / Exchange | Water Rights / Non-CVP | > 1600 | > 950 | < 400 | |
| Auburn Dam Site | | | | | | | | |
| Placer County Water Agency | – | – | – | 35.5 | 35.5 | 35.5 | 35.5 | |
| **Total** | 0 | 0 | 0 | 35.5 | 35.5 | 35.5 | 35.5 | |
| Folsom Reservoir | | | | | | | | |
| Sacramento Suburban | – | – | – | – | – | – | – | |
| City of Folsom (Public Law 101-514) | – | 7 | – | 27 | 34 | 34 | 34 | 1 |
| Folsom Prison | – | – | – | 5 | 5 | 5 | 5 | |
| San Juan Water District (Placer County) | – | – | – | 24 | 24 | 24 | 24 | |
| San Juan Water District (Sac County, Public Law 101-514) | – | 24.2 | – | 33 | 57.2 | 57.2 | 57.2 | 1 |
| El Dorado Irrigation District | – | 7.55 | – | 17 | 24.55 | 24.55 | 24.55 | 1 |
| El Dorado County (Public Law 101-514) | – | 15 | – | – | 15 | 15 | 15 | 1 |
| City of Roseville | – | 32 | – | – | 32 | 32 | 32 | 1 |
| Placer County Water Agency | – | 35 | – | – | 35 | 35 | 35 | |
| **Total** | 0 | 120.8 | 0 | 106 | 226.8 | 226.8 | 226.8 | |
| Folsom South Canal | | | | | | | | |
| So. Cal WC/ Arden Cordova WC | – | – | – | 5 | 5 | 5 | 5 | |
| California Parks and Recreation | – | 5 | – | – | 5 | 5 | 5 | 1 |
| SMUD (export) | – | 30 | – | 15 | 45 | 45 | 45 | 1 |
| Canal Losses | – | – | – | 1 | 1 | 1 | 1 | |
| **Total** | 0 | 35 | 0 | 21 | 56 | 56 | 56 | |
| Lower American River | | | | | | | | |
| City of Sacramento | – | – | – | 96.3 | 96.3 | 96.3 | 50 | |
| Arcade Water District | – | – | – | – | – | – | – | |
| Carmichael Water District | – | – | – | 12 | 12 | 12 | 12 | |
| **Total** | 0 | 0 | 0 | 108.3 | 108.3 | 108.3 | 62 | |
| Lower Sacramento River | | | | | | | | |
| City of Sacramento | – | – | – | 51.9 | 51.9 | 51.9 | 98.2 | |
| Sacramento County Water Agency (SMUD transfer) | – | 10 | – | – | 10 | 10 | 10 | |
| | – | 20 | – | – | 20 | 20 | 20 | |
| Sacramento County Water Agency (assumed Appropriated Water) | – | – | – | 31.2 | – | – | – | 2 |
| Sacramento County Water Agency (Public Law 101-514) | – | 15 | – | – | 15 | 15 | 15 | |
| EBMUD (export) | – | 133 | – | – | – | – | – | 3 |
| **Total** | 0 | 178 | 0 | 83.1 | 96.9 | 96.9 | 143.2 | |
| **Total from the American River** | 0 | 333.75 | 0 | 353.9 | | | | |

[1] When the CVP Contract quantity exceeds the quantity of the Diversion Limit minus the Water Right (if any), the diversion modeled is the quantity allocated to the CVP Contract (based on the CVP contract quantity shown times the CVP M&I allocation percentage) plus the Water Right (if any), but with the sum limited to the quantity of the Diversion Limit.

[2] Sacramento County Water Agency targets 68 taf of surface water supplies annually. The portion unmet by CVP contract water is assumed to come from two sources:

- Delta "excess" water averages 16.5 taf annually, but varies according to availability. Sacramento County Water Agency is assumed to divert excess flow when it is available, and when there is available pumping capacity.
- "Other" water, derived from transfers and/or other appropriated water, averaging 14.8 taf annually but varying according remaining unmet demand.

[3] East Bay Municipal Utility District CVP diversions are governed by the Amendatory Contract, stipulating:

- 133 taf maximum diversion in any given year.
- 165 taf maximum diversion amount over any 3 year period.
- Diversions allowed only when EBMUD total storage drops below 500 taf.
- 155 cfs maximum diversion rate.

# Appendix A-1. Incorporation of U.S. Fish and Wildlife Service Biological Opinions into CALSIM II

The Reasonable and Prudent Action (RPA) in the USFW biological opinions consists of required actions based on physical and biological phenomena that do not lend themselves readily to simulations using a monthly time step. Much scientific and modeling judgment has been employed to represent the implementation of the RPA actions. The interagency staff has developed modifications to the CALSIM II model to represent the RPA actions as best as possible, given the scientific understanding of

| **RPA Component 1** | | | |
|---|---|---|---|
| **Action 1** | Limit Exports so<br>⊗ 14-day average Old River and Middle River flows are greater than or equal to –2,000 cfs<br>⊗ 5-day running average is greater than 25% | | |
| Period | 14 days | | |
| Trigger 1 | December 1-20<br>low entrainment risk | *and* | USFWS discretion<br>turbidity, flows, Fall Midwater Trawl, salvage |
| Trigger 2 | After December 20<br>high entrainment risk | *and* | Turbidity<br>3-day average is greater than or equal to 12 NTU at Prisoner's Pt., Holland Cut AND Victoria Canal |
| | | *or* | Salvage<br>Daily salvage index value is greater than or equal to 0.5<br>*Daily delta smelt salvage greater than half of the prior year Fall Midwater Trawl index value.* |
| Off-ramp | Temperature<br>Mossdale, Antioch AND Rio Vista stations' daily mean water temperature is greater than or equal to 12° C | *or* | Biological<br>Onset of spawning<br>*Presence of spent females in Spring Kodiak Trawl, Banks OR Jones Pumping Plants.* |

**Proposed CALSIM implementation**

*Using a turbidity trigger, based on a flow surrogate of Sacramento River Index less than 20,000 cfs*

⊗ Set Old River and Middle River target at –2,000 cfs.

⊗ If turbidity trigger first occurs:

- December ➲ assume Action 1 starts December 21
  *background Old River and Middle River target of –8,000 cfs Dec 1-20*
- January ➲ assume Action 1 starts January 1
- February ➲ assume Action 1 starts February 1
- March ➲ assume Action 1 starts March 1

⊗ Action 1, once triggered, continues for 14 days.

⊗ When converting to weighted month, use surrogate temperature trigger for off-ramping.

⊗ For CALSIM II 5-day running averages, use Paul Hutton's method (*Water Supply Impact Analysis of December 2008 Delta Smelt Biological Opinion,* Feb 2009) to accurately compare to 14-day averages.

environmental factors enumerated in the biological opinion (e.g., turbidity, water temperature, and the presence of fish) and the limited historical data for some of these factors. It is further noted that there are on-going discussions on the interpretation of some of RPA actions which have potential to change modeling assumptions, and the resulting project operations.

Given the relatively generalized representation of the RPA actions assumed for CALSIM II modeling, much caution is required when interpreting outputs from the model.

<table>
<tr><th colspan="4">RPA Component 1</th></tr>
<tr><td>Action 2</td><td colspan="3">Limit Exports so<br>⊗ Old River and Middle River flows are greater than or equal to –1,200 to –5,000 cfs<br>⊗ they are determined weekly by the Smelt Working Group</td></tr>
<tr><td>Trigger</td><td>Action 1</td><td>or</td><td>If Action 1 not implemented, Smelt Working Group will determine start date</td></tr>
<tr><td>Suspension</td><td>Flow<br>3 day average<br>Sacramento River at Rio Vista<br>greater than or equal to 90,000 cfs</td><td>and</td><td>Flow<br>3 day average<br>San Joaquin River at Vernalis<br>greater than or equal to 10,000 cfs</td></tr>
<tr><td>Off-ramp</td><td>Temperature<br>Mossdale, Antioch AND Rio Vista<br>stations' daily average water temperature<br>is greater than or equal to 12° C</td><td>or</td><td>Biological<br>Onset of spawning<br>Presence of spent females in Spring Kodiak Trawl, Banks OR Jones Pumping Plants.</td></tr>
<tr><td colspan="4">Proposed CALSIM implementation<br>⊗ Action 2 is always triggered by the end of Action 1<br>⊗ Assume Old River and Middle River criteria based on the previous month's X2.
<table>
<tr><th>Sacramento Valley 40-30-30 Index Water Year Type</th><th>When X2 is East of Roe (cfs)</th><th>When X2 is West of Roe (cfs)</th><th>No Action 1 (cfs)</th></tr>
<tr><td>Wet</td><td>–3,500</td><td>–5,000</td><td>–99,999</td></tr>
<tr><td>Above Normal</td><td>–3,500</td><td>–5,000</td><td>–99,999</td></tr>
<tr><td>Below Normal</td><td>–3,500</td><td>–5,000</td><td>–99,999</td></tr>
<tr><td>Dry</td><td>–3,500</td><td>–5,000</td><td>–99,999</td></tr>
<tr><td>Critical</td><td>–3,500</td><td>–5,000</td><td>–99,999</td></tr>
</table>
⊗ When converting to weighted month, use surrogate temperature trigger for off-ramping.<br>⊗ When using surrogate conditions for suspension (less than 50% frequency of 3-day average), use Paul Hutton's method (Water Supply Impact Analysis of December 2008 Delta Smelt Biological Opinion, Feb 2009) for determining frequency of high flows.<br>⊗ For CALSIM II 5-day running averages, use Paul Hutton's method (Water Supply Impact Analysis of December 2008 Delta Smelt Biological Opinion, Feb 2009) to accurately compare to 14-day averages.</td></tr>
</table>

| **RPA Component 1** | | | |
|---|---|---|---|
| **Action 3** | Limit Exports so<br>⊗ 14-day average Old River and Middle River flows are greater than or equal to –1,200 to –5,000 cfs<br>⊗ 5-day running average is greater than 25% | | |
| Trigger | Temperature<br>Mossdale, Antioch AND Rio Vista stations' daily average water temperature is greater than or equal to 12° C | or | Biological<br>Onset of spawning<br>*Presence of spent females in Spring Kodiak Trawl, Banks OR Jones Pumping Plants.* |
| Off-ramp | End of period<br>June 30 | or | Temperature<br>Clifton Court Forebay daily average water temperature of 25° C for 3 consecutive days |

**Proposed CALSIM implementation**

⊗ When converting to weighted month, use surrogate temperature trigger and specific dates for initiating (no later than April 1).

⊗ Assume Old River and Middle River criteria based on the previous month's X2. (Use April X2 for June.)

| Sacramento Valley 40-30-30 Index Water Year Type | When X2 is East of Chipps (cfs) | When X2 is between Chipps & Roe (cfs) | When X2 is West of Roe (cfs) |
|---|---|---|---|
| Wet | –1,250 | –3,500 | –5,000 |
| Above Normal | –1,250 | –3,500 | –5,000 |
| Below Normal | –1,250 | –3,500 | –5,000 |
| Dry | –1,250 | –3,500 | –5,000 |
| Critical | –1,250 | –3,500 | –5,000 |

⊗ Assume more constraining Old River and Middle River or Vernalis Adaptive Management Plan for the period of April 15–May 15.

⊗ For CALSIM II 5-day running averages, use Paul Hutton's method (*Water Supply Impact Analysis of December 2008 Delta Smelt Biological Opinion,* Feb 2009) to accurately compare to 14-day averages.

| **RPA Component 1** | | | |
|---|---|---|---|
| **Action 4** | Manage X2 position in the Fall through<br>⊗ increasing Delta outflow when the preceding year was wetter than normal | | |
| Period | Average monthly position | | |
| Trigger 1 | September, October, OR November | *and* | Wet or Above Normal preceding water year<br>Sacramento Valley 40-30-30 Index Water Year Type |
| Off-ramp | In November, manage the X2 position by limiting monthly release volumes to the natural monthly inflow into the reservoirs | | |

**Proposed CALSIM implementation**

⊗ In fall months following Wet or Above Normal years, implement the following action.
*74 km in Wet years, 81 km in Above Normal years*

September ➲ Meet monthly average X2 requirement

October ➲ Meet monthly average X2 requirement

November ➲ Increase reservoir releases up to natural inflow as needed to meet monthly average X2 requirement

# Appendix A-2. Incorporation of National Marine Fisheries Service Biological Opinion into CALSIM II

The RPA in the NMFS biological opinion consists of required actions based on physical and biological phenomena that do not lend themselves readily to simulations using a monthly time step. Much scientific and modeling judgment has been employed to represent the implementation of the RPA actions. The interagency staff has developed modifications to CALSIM II model to represent the RPA actions as best as possible at this time, given the scientific understanding of environmental factors enumerated in the biological opinion (e.g., turbidity, water temperature, and the presence of fish) and the limited historical data for some of these factors. It is further noted that there are on-going discussions on the interpretation of some of RPA actions which have potential to change modeling assumptions, and the resulting project operations.

Given the relatively generalized representation of the RPA actions assumed for CALSIM II modeling, much caution is required when interpreting outputs from the model.

## Action Suite 1.1 Clear Creek

### Action 1.1.1 Spring Attraction Flows

Reclamation must annually conduct at least two pulse flows in Clear Creek in May and June of at least 600 cfs for at least three days for each pulse, to attract adult spring-run holding in the Sacramento River main stem.

### Action 1.1.1 Assumptions for CALSIM II Modeling Purposes

Model is modified to meet 600 cfs for 3 days twice in May. In the CALSIM II analysis, flows sufficient to increase flow up to 600 cfs for a total of 6 days are added to the flows that would have otherwise occurred in Clear Creek.

### Action 1.1.5. Thermal Stress Reduction

Reclamation must manage Whiskeytown releases to meet a daily water temperature of: 1) 60°F at the Igo gage from June 1 through September 15; and 2) 56°F at the Igo gage from September 15 to October 31.

### Action 1.1.5 Assumptions for CALSIM II Modeling Purposes

It is assumed that temperature operations can perform reasonably well with flows included in model.

## Action Suite 1.2 Shasta Operations

### Action 1.2.1 Performance Measures

To ensure a sufficient cold water pool to provide suitable temperatures, long-term performance measures for temperature compliance points and EOS carryover storage at Shasta Reservoir must be

attained. Performance measures for minimum EOS carryover storage at Shasta Reservoir are as follows for:

- 87% of years: 2.2 maf
- 82% of years: 2.2 maf
- 82% of years: 3.8 maf end-of-April in following year to meet Balls Ferry compliance point
- 40% of years: 3.2 maf to meet Jelly's Ferry compliance point in following year

Performance measures (measured as a 10-year running average) for temperature compliance points during summer season are:

- Clear Creek: 95%
- Balls Ferry: 85%
- Jelly's Ferry: 40%
- Bend Bridge: 15%

### Action 1.2.1 Assumptions for CALSIM II Modeling Purposes

Performance measures will be met using an iterative approach where full models will be run, model results will be post-processed to assess performance, and then model will be re-run with adjustments to operations until performance measures are met.

Operations adjustments may include changes in rules for delivery allocation, Delta export operations, storage balancing between the CVP north-of-Delta reservoirs, and/or triggering of other USFWS and NMFS biological opinion actions. Currently there are no reiterations of runs being performed to ensure that performance measures are being met.

### Action 1.2.2 November through February Keswick Release Schedule (Fall Actions)

1. Depending on EOS carryover storage and hydrology, Reclamation must develop and implement a Keswick release schedule.
2. Reclamation must reduce deliveries and exports as needed to achieve performance measures.

### Action 1.2.2 Assumptions for CALSIM II Modeling Purposes

Keswick flows based on operation of Central Valley Project Improvement Act 3406(b)(2) releases in 2008 Operations Criteria and Plan Study 7.1 (for Existing) and Study 8 (for Future) are used in CALSIM II. These flows will be reviewed for appropriateness under this action. A post-process based evaluation similar to what has been explained in Action 1.2.1 will be conducted. Currently there are no reiterations of runs being performed to ensure that performance measures are being met.

### Action 1.2.3 February Forecast; March – May 14 Keswick Release Schedule (Spring Actions)

1. Reclamation must make its February 15 forecast of deliverable water based on an estimate of precipitation and runoff within the Sacramento River basin at least as conservative as the 90% probability of exceedance. Subsequent updates of water delivery commitments must be based on monthly forecasts at least as conservative as the 90% probability of exceedance.
2. Reclamation must make releases to maintain a temperature compliance point not in excess of 56 degrees between Balls Ferry and Bend Bridge from April 15 through May 15.

### Action 1.2.3 Assumptions for CALSIM II Modeling Purposes

It is assumed that temperature operations can perform reasonably well with flows included in model.

### Action 1.2.4
### May 15 through October Keswick Release Schedule (Summer Action)

Reclamation must manage operations to achieve daily average water temperatures in the Sacramento River between Keswick Dam and Bend Bridge as follows:

1. Not in excess of 56°F at compliance locations between Balls Ferry and Bend Bridge from May 15 through September 30 for protection of winter-run, and not in excess of 56°F at the same compliance locations between Balls Ferry and Bend Bridge from October 1 through October 31 for protection of mainstem spring run, whenever possible.

2. Reclamation must operate to a final Temperature Management Plan starting May 15 and ending October 31.

### Action 1.2.4
### Assumptions for CALSIM II Modeling Purposes

It is assumed that temperature operations can perform reasonably well with flows included in model. If time permits, a temperature modeling and post-process based approach will be followed to verify temperatures are met at the compliance points. In the long-term approach, for a complete interpretation of the action, development of temperature model runs are needed to develop flow schedules if needed for implementation into CALSIM II.

## Action Suite 1.3
## Red Bluff Diversion Dam Operations

### Action 1.3.1
### Operations after May 14, 2012 Operate Red Bluff Diversion Dam with Gates Out

No later than May 15, 2012, Reclamation must operate Red Bluff Diversion Dam with gates out all year to allow unimpeded passage for listed anadromous fish.

### Action 1.3.1
### Assumptions for CALSIM II Modeling Purposes

Adequate permanent facilities for diversion are assumed; therefore no constraint on diversion schedules is included in the future condition modeling.

### Action 1.3.2
### Interim Operations

Until May 14, 2012, Reclamation must operate Red Bluff Diversion Dam according to the following schedule:

- Sep 1–Jun 14: Gates open. No emergency closures of gates are allowed.
- Jun 15–Aug 31: Gates may be closed at Reclamation's discretion, if necessary to deliver water to TCCA.

### Action 1.3.2
### Assumptions for CALSIM II Modeling Purposes

Adequate interim/temporary facilities for diversion are assumed; therefore no constraint on diversion schedules is included in the Existing condition modeling.

### Action 1.4
### Wilkins Slough Operations

The Sacramento River Temperature Task Group must make recommendations for Wilkins Slough minimum flows for anadromous fish in critically dry years, in lieu of the current 5,000 cfs navigation criterion to NMFS by December 1, 2009. In critically dry years, the Sacramento River Temperature Task Group will make a recommendation.

### Action 1.4
### Assumptions for CALSIM II Modeling Purposes

Current rules for relaxation of NCP in CALSIM II (based on 2008 Operations Criteria and Plan biological assessment models) will be used. In

CALSIM II, NCP flows are relaxed depending on allocations for agricultural contractors. Table A-2.1 is used to determine the relaxation.

**Table A-2.1** NCP Flow Schedule with Relaxation

| CVP AG Allocation (%) | NCP Flow (cfs) |
|---|---|
| <10 | 3250 |
| 10-25 | 3500 |
| 25-40 | 4000 |
| 40-65 | 4500 |
| >65 | 5000 |

## Action 2.1
## Lower American River Flow Management

Implement the flow schedule specified in the Water Forum's Flow Management Standard, which is summarized in Appendix 2-D of the NMFS biological opinion.

## Action 2.1
## Assumptions for CALSIM II Modeling Purposes

The American Falls Resource Management Plan Minimum Release Requirements range from 800 to 2,000 cfs based on a sequence of seasonal indices and adjustments as in 2008 Operations Criteria and Plan biological assessment models. The minimum Nimbus Dam release requirement is determined by applying the appropriate water availability index (Index Flow). Three water availability indices (i.e., Four Reservoir Index, Sacramento River Index, and the Impaired Folsom Inflow Index) are applied during different times of the year, which provides adaptive flexibility in response to changing hydrological and operational conditions.

During some months, Prescriptive Adjustments may be applied to the Index Flow, resulting in the Minimum Release Requirements . If there is no Prescriptive Adjustment, the Minimum Release Requirements is equal to the Index Flow.

Discretionary Adjustments for water conservation or fish protection may be applied during the period extending from June through October. If Discretionary Adjustments are applied, then the resultant flows are referred to as the Adjusted Minimum Release Requirement.

The Minimum Release Requirements and Adjusted Minimum Release Requirements may be suspended in the event of extremely dry conditions, represented by "conference years" or "off-ramp criteria." Conference years are defined when the projected March through November unimpaired inflow into Folsom Reservoir is less than 400,000 af. Off-ramp criteria are triggered if forecasted Folsom Reservoir storage at any time during the next twelve months is less than 200,000 af.

## Action 2.2
## Lower American River Temperature Management

Reclamation must develop a temperature management plan that contains:

1. forecasts of hydrology and storage;
2. a modeling run or runs, using these forecasts, demonstrating that the temperature compliance point can be attained (see Coldwater Management Pool Model approach in Appendix 2-D);
3. a plan of operation based on this modeling run that demonstrates that all other non-discretionary requirements are met; and
4. allocations for discretionary deliveries that conform to the plan of operation.

## Action 2.2
## Assumptions for CALSIM II Modeling Purposes

It is assumed that temperature operations can perform reasonably well with flows included in model. The flows in the model reflect the American Falls Resource Management Plan implemented under Action 2.1

# Action Suite 3.1 Stanislaus River / Eastside Division Actions

## Action 3.1.2 Provide Cold Water Releases to Maintain Suitable Steelhead Temperatures

Reclamation must manage the cold water supply within New Melones Reservoir and make cold water releases from New Melones Reservoir to provide suitable temperatures for Central Valley steelhead rearing, spawning, egg incubation smoltification, and adult migration in the Stanislaus River downstream of Goodwin Dam.

## Action 3.1.2 Assumptions for CALSIM II Modeling Purposes

It is assumed that temperature operations can perform reasonably well with flow operations resulting from the minimum flow requirements described in Action 3.1.3.

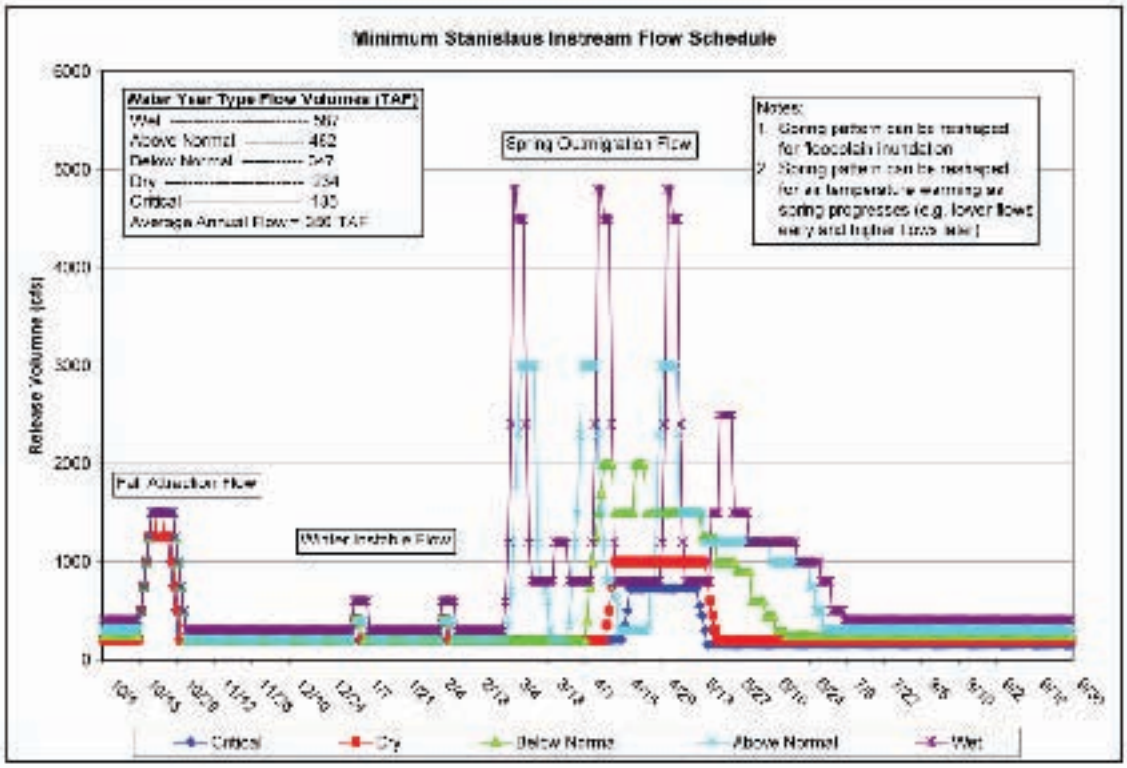
## Action 3.1.3 Operate the East Side Division Dams to Meet the Minimum Flows, as Measured at Goodwin Dam

Reclamation must operate releases from the East Side Division reservoirs to achieve a minimum flow schedule as prescribed in NMFS biological opinion Appendix 2-E (Figure A-2.2). When operating at higher flows than specified, Reclamation must implement ramping rates for flow changes that will avoid stranding and other adverse effects on Central Valley steelhead.

## Action 3.1.3 Assumptions for CALSIM II Modeling Purposes

Minimum flows based on Appendix 2-E flows are assumed consistent to what was modeled by

**Figure A-2.2** Minimum Stanislaus instream flow schedule as prescribed in Appendix 2-E of the NMFS biological opinion (June 2009)



NMFS (5/14/09 and 5/15/09 CALSIM II models provided by NMFS; relevant logic merged into baselines models). The NMFS model assumes an allocation scheme for New Melones releases similar to what is included in the Interim Operations Plan.

Annual allocation in New Melones is modeled to ensure availability of required instream flows (Table A-2.3) based on a water supply forecast that is comprised of end-of-February New Melones storage (taf) plus forecasted inflow to New Melones from March 1 to September 30 (taf). The "forecasted inflow" is calculated using perfect foresight in the model. Allocated volume of water is released according to water year type following the monthly flow schedule illustrated in Figure 11-1 from Appendix 2-E of the NMFS biological opinion.

**Table A-2.3** New Melones Allocations to Meet Minimum Instream Flow Requirements

| New Melones index (taf) | Annual allocation required for instream flows (taf) |
|---|---|
| <1000 | 0-98.9 |
| 1,000 - 1,399 | 98.9 |
| 1,400 - 1,724 | 185.3 |
| 1,725 – 2,177 | 234.1 |
| 2,178 - 2,386 | 346.7 |
| 2,387 – 2,761 | 461.7 |
| 2,762 – 6,000 | 586.9 |

# Action Suite 4.1 Delta Cross Channel Gate Operation, and Engineering Studies of Methods to Reduce Loss of Salmonids in Georgiana Slough and Interior Delta

## Action 4.1.2 Delta Cross Channel Gate Operation

During the period between November 1 and June 15, Delta Cross Channel gate operations will be modified from the proposed action to reduce loss of emigrating salmonids and green sturgeon. From December 1 to January 31, the gates will remain closed, except as operations are allowed using the implementation procedures/modified Salmon Decision Tree.

- Timing ➲ Nov 1–Jun 15
- Triggers ➲ Action triggers and description of action as defined in NMFS biological opinion are presented in Table A-2.4.

## Action 4.1.2 Assumptions for CALSIM II Modeling Purposes

The Delta Cross Channel gate operations for October 1 through January 31 were layered on top of the D-1641 gate operations already included in

**Table A-2.5** Delta Cross Channel Gate Operation Triggers and Actions as Modeled in CALSIM II

| Date | Modeled Action Triggers | Modeled Action Responses |
|---|---|---|
| Oct 1-Dec 14 | ⊗ Sacramento River daily flow at Wilkins Slough exceeding 7,500 cfs<br>⊗ Flow assumed to flush salmon into the Delta | Each month, the Delta Cross Channel gates are closed for number of days estimated to exceed the threshold value. |
| | ⊗ Water quality conditions at Rock Slough subject to D-1641 standards | Each month, the Delta Cross Channel gates are not closed if it results in violation of the D-1641 standard for Rock Slough. If Delta Cross Channel gates are not closed due to water quality conditions, exports during the days in question are restricted to 2,000 cfs. |
| Dec 15–Jan 31 | ⊗ Dec 15-Jan 31 | Delta Cross Channel gates closed |

**Table A-2.4** NMFS biological opinion Delta Cross Channel Gate Operation Triggers and Actions

| Date | Action Triggers | | | Action Responses |
|---|---|---|---|---|
| Oct 1–Nov 30 | Water quality criteria per D-1641 are met | *and* | either the Knights Landing Catch Index or the Sacramento Catch Index are greater than 3 fish per day but less than or equal to 5 fish per day. | Within 24 hours of trigger, Delta Cross Channel gates are closed. Gates will remain closed for 3 days. |
| | Water quality criteria per D-1641 are met | *and* | either the Knights Landing Catch Index or Sacramento Catch Index is greater than 5 fish per day | Within 24 hours, close the Delta Cross Channel gates and keep closed until the catch index is less than 3 fish per day at both the Knights Landing and Sacramento monitoring sites. |
| | The Knights Landing Catch Index or Sacramento Catch Index triggers are met | *but* | water quality criteria are not met per D-1641 criteria. | Delta Operations for Salmonids and Sturgeon reviews monitoring data and makes recommendation to NMFS and WOMT per procedures in Action 4.5. |
| Dec 1–Dec 14 | Water quality criteria are met per D-1641. | | | Delta Cross Channel gates are closed. If Chinook salmon migration experiments are conducted during this time period (e.g., Delta Action 8 or similar studies), the Delta Cross Channel gates may be opened according to the experimental design, with NMFS' prior approval of the study. |
| | Water quality criteria are not met | *but* | both the Knights Landing Catch Index and Sacramento Catch Index are less than 3 fish per day. | Delta Cross Channel gates may be opened until the water quality criteria are met. Once water quality criteria are met, the Delta Cross Channel gates will be closed within 24 hours of compliance. |
| | Water quality criteria are not met | *but* | either of the Knights Landing Catch Index or Sacramento Catch Index is greater than 3 fish per day. | Delta Operations for Salmonids and Sturgeon reviews monitoring data and makes recommendation to NMFS and WOMT per procedures in Action 4.5 |
| Dec 15–Jan 31 | Dec 15-Jan 31 | | | Delta Cross Channel gates closed. |
| | NMFS-approved experiments are being conducted. | | | Agency sponsoring the experiment may request gate opening for up to five days. NMFS will determine whether opening is consistent with ESA obligations. |
| | One-time event Dec 15–Jan 5, when necessary to maintain Delta water quality in response to the astronomical high tide, coupled with low inflow conditions. | | | Upon concurrence of NMFS, Delta Cross Channel Gates may be opened one hour after sunrise to one hour before sunset, for up to 3 days, then return to full closure. Reclamation and DWR will also reduce Delta exports down to a health and safety level during the period of this action. |
| Feb 1–May 15 | D-1641 mandatory gate closure. | | | Gates closed, per WQCP criteria |
| May 16–Jun 15 | D-1641 gate operations criteria. | | | Delta Cross Channel gates may be closed for up to 14 days during this period, per 2006 WQCP, if NMFS determines it is necessary. |

the CALSIM II model. The general assumptions regarding the NMFS Delta Cross Channel operations are summarized in Table A-2.5.

- **Timing** ➲ Oct 1–Jan 31
- **Trigger** ➲ It is assumed that during Oct 1–Dec 14, the Delta Cross Channel will be closed if Sacramento River daily flow at Wilkins Slough exceeds 7,500 cfs. It is assumed that during Dec 15–Jan 31 that the Delta Cross Channel gates are closed under all flow conditions.
- **Water Quality** ➲ It is assumed that during Oct 1–Dec 14 the Delta Cross Channel gates may remain open if water quality is a concern. Using the CALSIM II-ANN flow-salinity model for Rock Slough, current month's chloride level at Rock Slough is estimated assuming Delta Cross Channel closure per NMFS biological opinion. The estimated chloride level is compared against the Rock Slough chloride standard (monthly average). If estimated chloride level exceeds the standard, the gate closure is modeled per D1641 schedule (for the entire month). It is assumed that during December 15 through January 31 that the Delta Cross Channel gates are closed under all water quality conditions.
- **Export Restriction** ➲ During Oct 1–Dec 14 period, if the flow trigger condition is such that additional days of Delta Cross Channel gates closed is called for, however water quality conditions are a concern and the Delta Cross Channel gates remain open, then Delta exports are limited to 2,000 cfs for each day in question. A monthly Delta export restriction is calculated based on the trigger and water quality conditions described above.

# Action Suite 4.2 Delta Flow Management

## Action 4.2.1
## San Joaquin River Inflow to Export Ratio

The Phase 1 – Interim Operations in 2010-2011 are assumed. From Apr 1–May 31, Interim flow operations:

1. Reclamation must continue to implement the Goodwin flow schedule for the Stanislaus River prescribed in Action 3.1.3 and Appendix 2-E of the NMFS biological opinion and increases in releases at Goodwin Reservoir, if necessary, in order to meet the flows required at Vernalis (as provided in table 1 of NMFS biological opinion page 642); and

2. Combined CVP and SWP exports must be restricted to 1,500 cfs for Vernalis flows from 0–6,000 cfs, 4:1 (Vernalis flow:export ratio) for Vernalis flows 6,000 cfs – 21,750 cfs, and unrestricted for Vernalis flows above 21,750 cfs.

## Action 4.2.1
## Assumptions for CALSIM II Modeling Purposes

Flows at Vernalis are assumed consistent to what was modeled by NMFS (5/15/09 CALSIM II models provided by NMFS; relevant logic merged into baselines models). In addition, Delta exports are restricted as stated above.

Minimum flow schedule for Vernalis (Apr 1–May 31) is modeled in NMFS CALSIM II model as illustrated in Table A-2.6.

In addition to prescribed minimum flow

**Table A-2.6** Minimum Flow Required at Vernalis During April and May

| New Melones index (taf) | Minimum Flow Required at Vernalis (cfs) |
|---|---|
| <1000 | No new requirements |
| 1000 - 1,399 | 1,500 |
| 1,400 - 1,999 | 3,000 |
| 2,000 - 2,499 | 4,500 |
| >2,500 | 6,000 |

requirement at Vernalis, exports are also restricted as illustrated in Table A-2.7.

**Table A-2.7** Maximum Combined CVP and SWP Export during April and May

| Flows at Vernalis (cfs) | Combined CVP and SWP Export |
|---|---|
| 0 - 6,000 | 1,500 cfs |
| 6,000 – 21,750 | 4:1<br>Vernalis flow export ratio |
| >21,750 | Unrestricted until flood recedes below 21,570 cfs |

## Action 4.2.3 Old and Middle River Flow Management

From Jan 1–Jun 15, reduce exports as necessary, to limit negative flows to -2,500 to -5,000 cfs in Old and Middle Rivers, depending on the presence of salmonids. The reverse flow will be managed within this range to reduce flows toward the pumps during periods of increased salmonid presence. Refer to NMFS biological opinion document for the negative flow objective decision tree.

## Action 4.2.3 Assumptions for CALSIM II Modeling Purposes

Old and Middle River flows required in this biological opinion are assumed to be covered by Old River and Middle River flow requirements developed for Actions 1 through 3 of the USFWS biological opinion actions in Appendix A-2.

# Appendix B. Results of Report CALSIM II Studies

The model studies selected for this report are intended to estimate current SWP delivery reliability and future SWP delivery reliability in the year 2029. Estimating current SWP delivery reliability assumes that SWP and CVP operations incorporate the RPA actions defined in two biological opinions on the proposed long-term operations of the CVP and SWP. The biological opinions are the USFWS biological opinion released on December 15, 2008, and the NMFS biological opinion and conference opinion released on June 4, 2009. The USFWS' biological opinion has RPA actions to protect threatened Delta smelt. The NMFS biological opinion and conference opinion have RPA actions to protect the following federally listed species:

- Sacramento River winter-run Chinook salmon *Endangered*
- Central Valley spring-run Chinook salmon *Threatened*
- Central Valley steelhead *Threatened*
- Southern Distinct Population Segment of North American green sturgeon *Threatened*
- Southern Resident killer whale

The RPA actions from the two biological opinions are summarized below. Details regarding how the RPA actions are incorporated into CALSIM II are found in Appendices A-2 and A-3.

1. Restrict upstream flow in Old River and Middle River.
2. Implement fall X2 requirements.
3. Provide spring attraction flows in Clear Creek.
4. Implement water temperature requirements for Whiskeytown Lake releases.
5. Implement end-of-September carryover storage criteria for Shasta Lake.
6. Implement November through February Keswick Dam release schedule.
7. Base Reclamation's February 15 forecast for Sacramento River basin runoff on 90% probability of exceedence.
8. Implement water temperature criteria between Balls Ferry and Bend Bridge from April 15 through October 31.
9. Operate Red Bluff Diversion Dam with gates out of the water.
10. Implement Wilkins Slough minimum flow criteria in critically dry years.
11. Implement Nimbus Dam minimum release requirements.
12. Provide cold water releases to maintain suitable water temperatures for steelhead downstream of Goodwin Dam.
13. Implement minimum flow schedule at Goodwin Dam.
14. Modify Delta Cross Channel gate operations.
15. Implement San Joaquin River inflow to export ratio.

Estimating future SWP delivery reliability in 2029 assumes an altered hydrology due to climate change, sea-level rise, no new facilities or improvements to existing facilities, an increased SWP water demand, and existing institutional requirements, including the RPA actions.

As listed in Table B.1, a total of three CALSIM II simulations were used in this report: one for estimating current (2009) SWP delivery reliability and two for estimating future (2029) SWP delivery reliability.

**Table B.1** Summary of CALSIM II simulations used to update SWP delivery estimates

| Time Frame | Climate Change Model | Greenhouse Gas Emissions Scenario |
|---|---|---|
| Current | None | None |
| Future | None | None |
| Future | MPI-ECHAM5[1] | A2[2] |

[1] MPI-ECHAM5 refers to the most recent version of ECHAM which is the Global Climate Model developed by the Max Planck Institute for Meteorology.
[2] A2 emissions scenario assumes high growth in population, regional based economic growth, and slow technological changes, which results in significantly higher greenhouse gas emissions.

Two CALSIM II simulations were needed to estimate future (2029) reliability due to the need to adjust CALSIM II results to account for the climate change scenario assuming a 2050 level of emissions. The two CALSIM II simulations were used to generate one sequence of future (2029) SWP deliveries which is used to describe future SWP delivery reliability in Chapter 6 of this report. This process consisted of interpolating between sequences to estimate SWP deliveries under climate change affects for 2029 instead of 2050. The A2 greenhouse gas emissions scenario assumes a 2050 level of emissions. Scenarios for 2029 were not available at the time of composing this report. A key assumption in estimating 2029 SWP delivery reliability for this report is that SWP deliveries for a CALSIM II simulation which assumes 2029 SWP demands and 2029 climate change, would fall somewhere between CALSIM II simulations which assume 2029 SWP demands and no climate change and 2029 SWP demands and climate change corresponding to 2050 emissions. Just where these SWP deliveries would fall is estimated in this report by interpolating between each sequence from a scenario which assumes 2050 emissions and a scenario which assumes no climate change. The interpolation is as follows:

**Future (2029) annual SWP delivery = NCC + (20/41) (CC – NCC)**

Where

NCC = annual SWP delivery for future, no climate change scenario

CC = annual SWP delivery for future, with climate change scenario which assumes 2050 emission levels

*The ratio of 20/41 corresponds to the ratio of calendar years: (2029-2009)/(2050-2009).*

The key study assumptions are described in detail in Chapter 6 and Appendix A.

# Study Results

The annual SWP Table A delivery amounts estimated by the three CALSIM II simulations are contained in Table B.3 through Table B.7. The tables show the demand level, the amount of delivery from the Delta, and percent of maximum total SWP Table A amounts for the SWP contractors receiving water from the Delta. Of the 29 SWP contractors, 26 receive their deliveries from the Delta. The total maximum SWP Table A amount for all SWP contractors is 4,173 taf/year. Of this amount, 4,133 taf/yr is the maximum Delta SWP Table A amount. Also presented are the results of interpolating SWP delivery sequences which provide the information used in Chapter 6 in assessing future SWP delivery reliability. Current and future SWP deliveries are presented both in time sequence and by ranking to correspond to the data presented in the summary/highlight tables and used to generate the probability curves in Chapter 6.

These values must be interpreted within the context of the assumptions upon which they are calculated. For example, for the year 1958 in the 2029

study the annual delivery is calculated to be 3,503 taf or 85% of maximum Delta SWP Table A (see **Table B.4**). This result should be stated as follows:

The SWP would deliver approximately 3,503 taf, or 85% of maximum Delta SWP Table A, given:

- Rainfall that was similar to what it was in 1958 but modified to reflect climate change effects.
- The level of water use in the source area is increased to the level it would be in 2029.
- SWP facilities and operation requirements are the same as they are today with the RPA actions in effect.
- SWP contractor demands are at their maximum Delta SWP Table A level.

Actually, the conditional statement associated with the result for any particular year is even more complicated than this because the result is also dependent upon the rainfall that has occurred in previous years. For example, if the previous year (1957) was wet, runoff for 1958 for the same amount of rainfall would be greater than if 1957 were dry. In addition, reservoir storage for the beginning of 1958 varies depending upon the weather conditions in 1957. Thus, each year's simulation is dependent on the previous year's simulation and, hence, any year in the entire historical sequence is linked to all previous years.

**Table B.2** summarizes the delivery estimates for the SWP for important dry sequences computed in the studies for Current and Future conditions. The percentages of maximum SWP Table A amounts are based on current deliveries and interpolating future annual SWP Table A deliveries as previously discussed. This information can be helpful in analyzing the delivery reliability of a specific water system that receives a portion of its water supply from the SWP. The series of data contained in **Tables B.3** through **B.5** are also helpful in analyzing longer periods of time that contain not only dry periods but wetter periods which can replenish water supplies.

**Table B.6** presents the annual SWP Article 21 deliveries under Current Conditions and **Table B.7** presents the annual SWP Article 21 deliveries under Future Conditions.

Probability distribution curves derived from the CALSIM II simulations used in this report are presented in **Figures B.1** and **B.2** to visually show the estimated percentage of years a given annual delivery is equaled or exceeded. In this report, this value represents the probability of receiving at least a given level of delivery in any particular year. As a reference, probability distribution curves for the 2007 and 2027 studies from the *2007 Report* are presented along with the curves from the 2009 and 2029 studies in this report. SWP Table A delivery values for 25%, 50%, and 75% exceedences are shown for all scenarios in **Table B.8**.

Finally, the SWP Table A delivery amounts under current conditions as calculated in the *2007 Report* and the 2009 updated report are presented in **Table B.9** to show the estimated impact on SWP Table A deliveries due to the RPA actions.

**Table B.2** Average and dry year SWP Table A delivery from the Delta

| | SWP Table A delivery from the Delta (in percent of maximum SWP Table A[1]) | | | | | |
|---|---|---|---|---|---|---|
| | Long-term Average | Single dry year 1977 | 2-year drought 1976-1977 | 4-year drought 1931-1934 | 6-year drought 1987-1992 | 6-year drought 1929-1934 |
| Updated Studies (2009) | 60% | 7% | 36% | 34% | 35% | 34% |
| Updated Studies (2029) | 60% | 11% | 38% | 35% | 32% | 36% |

[1]/ 4,133 taf /year

**Table B.3** SWP Table A deliveries under Current Conditions
Derived values for estimating probability curve

| Year | SWP Table A demands (taf) | SWP Table A deliveries for 2009 studies | | Probability Curve[1] | | | |
|---|---|---|---|---|---|---|---|
| | | annual volume (taf) | percent of max SWP Table A[2] | Year | SWP Table A Delivery (taf) | Exceedence Frequency | percent of max SWP Table A[2] |
| 1922 | 3,407 | 2,451 | 59% | 1998 | 3,338 | 0% | 81% |
| 1923 | 3,717 | 2,849 | 69% | 1974 | 3,267 | 1% | 79% |
| 1924 | 3,961 | 841 | 20% | 1938 | 3,262 | 2% | 79% |
| 1925 | 3,940 | 1,845 | 45% | 1996 | 3,247 | 4% | 79% |
| 1926 | 3,777 | 2,080 | 50% | 1997 | 3,191 | 5% | 77% |
| 1927 | 3,543 | 2,680 | 65% | 1943 | 3,174 | 6% | 77% |
| 1928 | 3,897 | 2,836 | 69% | 1942 | 3,142 | 7% | 76% |
| 1929 | 3,952 | 1,210 | 29% | 1999 | 3,140 | 9% | 76% |
| 1930 | 3,922 | 1,571 | 38% | 1958 | 3,090 | 10% | 75% |
| 1931 | 3,971 | 1,255 | 30% | 1970 | 3,082 | 11% | 75% |
| 1932 | 3,673 | 1,543 | 37% | 1984 | 3,070 | 12% | 74% |
| 1933 | 3,938 | 1,569 | 38% | 1982 | 3,054 | 14% | 74% |
| 1934 | 3,981 | 1,239 | 30% | 1975 | 3,023 | 15% | 73% |
| 1935 | 3,697 | 2,412 | 58% | 1986 | 3,023 | 16% | 73% |
| 1936 | 3,769 | 2,749 | 67% | 1939 | 3,021 | 17% | 73% |
| 1937 | 3,451 | 2,995 | 72% | 1953 | 3,013 | 19% | 73% |
| 1938 | 3,418 | 3,262 | 79% | 1979 | 2,996 | 20% | 72% |
| 1939 | 3,673 | 3,021 | 73% | 1956 | 2,995 | 21% | 72% |
| 1940 | 3,713 | 2,524 | 61% | 1937 | 2,954 | 22% | 71% |
| 1941 | 3,013 | 2,608 | 63% | 1952 | 2,927 | 23% | 71% |
| 1942 | 3,583 | 3,140 | 76% | 1995 | 2,924 | 25% | 71% |
| 1943 | 3,632 | 3,174 | 77% | 1980 | 2,907 | 26% | 70% |
| 1944 | 3,563 | 2,396 | 58% | 1968 | 2,894 | 27% | 70% |
| 1945 | 3,612 | 2,612 | 63% | 1985 | 2,875 | 28% | 70% |
| 1946 | 3,710 | 2,875 | 70% | 1946 | 2,869 | 30% | 69% |
| 1947 | 3,954 | 2,780 | 67% | 1965 | 2,867 | 31% | 69% |
| 1948 | 3,959 | 2,427 | 59% | 2000 | 2,858 | 32% | 69% |
| 1949 | 3,864 | 2,444 | 59% | 1923 | 2,855 | 33% | 69% |
| 1950 | 3,812 | 2,222 | 54% | 1947 | 2,854 | 35% | 69% |
| 1951 | 3,779 | 2,671 | 65% | 1928 | 2,849 | 36% | 69% |
| 1952 | 3,078 | 2,924 | 71% | 1983 | 2,836 | 37% | 69% |
| 1953 | 3,790 | 3,013 | 73% | 1969 | 2,811 | 38% | 68% |
| 1954 | 3,833 | 2,535 | 61% | 1936 | 2,811 | 40% | 68% |
| 1955 | 3,761 | 2,095 | 51% | 1993 | 2,780 | 41% | 67% |
| 1956 | 3,639 | 2,954 | 71% | 1967 | 2,768 | 42% | 67% |
| 1957 | 3,759 | 2,475 | 60% | 1966 | 2,749 | 43% | 67% |
| 1958 | 3,481 | 3,090 | 75% | 1959 | 2,731 | 44% | 66% |
| 1959 | 4,055 | 2,544 | 62% | 1971 | 2,724 | 46% | 66% |
| 1960 | 4,115 | 2,211 | 54% | 1927 | 2,712 | 47% | 66% |
| 1961 | 4,115 | 2,461 | 60% | 1951 | 2,692 | 48% | 65% |
| 1962 | 3,689 | 2,494 | 60% | 1976 | 2,680 | 49% | 65% |
| 1963 | 3,634 | 2,569 | 62% | 2003 | 2,671 | 51% | 65% |
| 1964 | 3,907 | 2,858 | 69% | 1945 | 2,612 | 52% | 63% |
| 1965 | 3,586 | 2,731 | 66% | 1941 | 2,608 | 53% | 63% |

| Year | SWP Table A demands (taf) | SWP Table A deliveries for 2009 studies | | Probability Curve[1] | | | |
|---|---|---|---|---|---|---|---|
| | | annual volume (taf) | percent of max SWP Table A[2] | Year | SWP Table A Delivery (taf) | Exceedence Frequency | percent of max SWP Table A[2] |
| 1966 | 3,722 | 2,867 | 69% | 1978 | 2,606 | 54% | 63% |
| 1967 | 3,439 | 2,768 | 67% | 1964 | 2,576 | 56% | 62% |
| 1968 | 3,792 | 2,907 | 70% | 2002 | 2,569 | 57% | 62% |
| 1969 | 3,157 | 2,854 | 69% | 1981 | 2,544 | 58% | 62% |
| 1970 | 3,714 | 3,082 | 75% | 1954 | 2,535 | 59% | 61% |
| 1971 | 3,837 | 2,712 | 66% | 1940 | 2,532 | 60% | 61% |
| 1972 | 4,012 | 2,409 | 58% | 1973 | 2,524 | 62% | 61% |
| 1973 | 3,611 | 2,477 | 60% | 1957 | 2,494 | 63% | 60% |
| 1974 | 3,649 | 3,247 | 79% | 1961 | 2,477 | 64% | 60% |
| 1975 | 3,720 | 3,023 | 73% | 1963 | 2,475 | 65% | 60% |
| 1976 | 4,014 | 2,692 | 65% | 1962 | 2,461 | 67% | 60% |
| 1977 | 3,948 | 301 | 7% | 1922 | 2,451 | 68% | 59% |
| 1978 | 3,126 | 2,606 | 63% | 1949 | 2,444 | 69% | 59% |
| 1979 | 3,527 | 3,023 | 73% | 1972 | 2,427 | 70% | 59% |
| 1980 | 3,197 | 2,869 | 69% | 1935 | 2,412 | 72% | 58% |
| 1981 | 3,834 | 2,532 | 61% | 1944 | 2,409 | 73% | 58% |
| 1982 | 3,451 | 3,054 | 74% | 1989 | 2,399 | 74% | 58% |
| 1983 | 3,007 | 2,811 | 68% | 1994 | 2,396 | 75% | 58% |
| 1984 | 3,692 | 3,070 | 74% | 1948 | 2,310 | 77% | 56% |
| 1985 | 3,753 | 2,894 | 70% | 1950 | 2,222 | 78% | 54% |
| 1986 | 3,345 | 2,996 | 72% | 1960 | 2,211 | 79% | 54% |
| 1987 | 3,904 | 1,957 | 47% | 1926 | 2,095 | 80% | 51% |
| 1988 | 4,026 | 902 | 22% | 1955 | 2,080 | 81% | 50% |
| 1989 | 4,097 | 2,399 | 58% | 1987 | 1,957 | 83% | 47% |
| 1990 | 3,961 | 1,241 | 30% | 1925 | 1,845 | 84% | 45% |
| 1991 | 3,957 | 1,102 | 27% | 1933 | 1,571 | 85% | 38% |
| 1992 | 3,880 | 1,061 | 26% | 1932 | 1,569 | 86% | 38% |
| 1993 | 3,559 | 2,724 | 66% | 1930 | 1,543 | 88% | 37% |
| 1994 | 3,739 | 2,310 | 56% | 2001 | 1,409 | 89% | 34% |
| 1995 | 3,451 | 2,927 | 71% | 1931 | 1,255 | 90% | 30% |
| 1996 | 3,692 | 3,267 | 79% | 1929 | 1,241 | 91% | 30% |
| 1997 | 3,559 | 3,191 | 77% | 1992 | 1,239 | 93% | 30% |
| 1998 | 3,451 | 3,338 | 81% | 1990 | 1,210 | 94% | 29% |
| 1999 | 3,692 | 3,142 | 76% | 1934 | 1,102 | 95% | 27% |
| 2000 | 3,720 | 2,855 | 69% | 1991 | 1,061 | 96% | 26% |
| 2001 | 3,961 | 1,409 | 34% | 1988 | 902 | 98% | 22% |
| 2002 | 4,097 | 2,576 | 62% | 1924 | 841 | 99% | 20% |
| 2003 | 3,720 | 2,811 | 68% | 1977 | 301 | 100% | 7% |
| **Avg** | **3,711** | **2,483** | **60%** | | **2,483** | | **60%** |
| **Min** | **3,007** | **301** | **7%** | | **301** | | **7%** |
| **Max** | **4,115** | **3,338** | **81%** | | **3,338** | | **81%** |

[1]/ Percent of time at or about given value [2]/ 4,133 taf/year

**Table B.4** SWP Table A deliveries from the Delta under Future Conditions
MPI-ECHAM5 Model with A2 Emissions

| Year | SWP Table A demands (taf) | No Climate Change | | MPI-ECHAM5 model with A2 Emissions | | Estimated Delivery Interpolated to 2029[2] | |
|---|---|---|---|---|---|---|---|
| | | SWP Table A Delivery (taf) | percent of max SWP Table A[2] | SWP Table A Delivery (taf) | percent of max SWP Table A[2] | SWP Table A Delivery (taf) | percent of max SWP Table A[2] |
| 1922 | 4,133 | 2,633 | 64% | 2,488 | 60% | 2,562 | 62% |
| 1923 | 4,133 | 2,692 | 65% | 2,469 | 60% | 2,583 | 63% |
| 1924 | 4,133 | 1,017 | 25% | 701 | 17% | 863 | 21% |
| 1925 | 4,133 | 1,822 | 44% | 1,606 | 39% | 1,717 | 42% |
| 1926 | 4,133 | 2,384 | 58% | 1,860 | 45% | 2,128 | 51% |
| 1927 | 4,133 | 2,695 | 65% | 2,866 | 69% | 2,779 | 67% |
| 1928 | 4,133 | 2,783 | 67% | 2,736 | 66% | 2,760 | 67% |
| 1929 | 4,133 | 1,243 | 30% | 1,663 | 40% | 1,448 | 35% |
| 1930 | 4,133 | 1,754 | 42% | 1,663 | 40% | 1,710 | 41% |
| 1931 | 4,133 | 1,257 | 30% | 1,174 | 28% | 1,217 | 29% |
| 1932 | 4,133 | 1,605 | 39% | 1,579 | 38% | 1,592 | 39% |
| 1933 | 4,133 | 1,599 | 39% | 1,600 | 39% | 1,599 | 39% |
| 1934 | 4,133 | 1,138 | 28% | 1,500 | 36% | 1,315 | 32% |
| 1935 | 4,133 | 2,711 | 66% | 2,508 | 61% | 2,612 | 63% |
| 1936 | 4,133 | 2,893 | 70% | 2,531 | 61% | 2,716 | 66% |
| 1937 | 4,133 | 3,533 | 85% | 2,905 | 70% | 3,226 | 78% |
| 1938 | 4,133 | 4,088 | 99% | 3,906 | 94% | 3,999 | 97% |
| 1939 | 4,133 | 2,409 | 58% | 1,587 | 38% | 2,008 | 49% |
| 1940 | 4,133 | 2,577 | 62% | 2,525 | 61% | 2,551 | 62% |
| 1941 | 4,133 | 3,162 | 77% | 2,746 | 66% | 2,959 | 72% |
| 1942 | 4,133 | 2,791 | 68% | 2,725 | 66% | 2,759 | 67% |
| 1943 | 4,133 | 3,079 | 74% | 2,770 | 67% | 2,928 | 71% |
| 1944 | 4,133 | 2,559 | 62% | 1,952 | 47% | 2,263 | 55% |
| 1945 | 4,133 | 2,882 | 70% | 2,882 | 70% | 2,882 | 70% |
| 1946 | 4,133 | 2,755 | 67% | 2,458 | 59% | 2,610 | 63% |
| 1947 | 4,133 | 2,631 | 64% | 2,033 | 49% | 2,339 | 57% |
| 1948 | 4,133 | 2,359 | 57% | 2,509 | 61% | 2,432 | 59% |
| 1949 | 4,133 | 2,454 | 59% | 2,208 | 53% | 2,334 | 56% |
| 1950 | 4,133 | 2,312 | 56% | 2,537 | 61% | 2,422 | 59% |
| 1951 | 4,133 | 2,964 | 72% | 2,791 | 68% | 2,880 | 70% |
| 1952 | 4,133 | 3,724 | 90% | 2,982 | 72% | 3,362 | 81% |
| 1953 | 4,133 | 2,408 | 58% | 2,726 | 66% | 2,563 | 62% |
| 1954 | 4,133 | 2,368 | 57% | 2,491 | 60% | 2,428 | 59% |
| 1955 | 4,133 | 2,106 | 51% | 1,421 | 34% | 1,772 | 43% |
| 1956 | 4,133 | 3,347 | 81% | 2,965 | 72% | 3,161 | 76% |
| 1957 | 4,133 | 2,484 | 60% | 2,383 | 58% | 2,435 | 59% |
| 1958 | 4,133 | 3,656 | 88% | 3,343 | 81% | 3,503 | 85% |
| 1959 | 4,133 | 2,089 | 51% | 2,153 | 52% | 2,120 | 51% |
| 1960 | 4,133 | 2,170 | 53% | 1,694 | 41% | 1,938 | 47% |
| 1961 | 4,133 | 2,556 | 62% | 1,668 | 40% | 2,123 | 51% |
| 1962 | 4,133 | 2,525 | 61% | 2,849 | 69% | 2,683 | 65% |
| 1963 | 4,133 | 2,435 | 59% | 2,532 | 61% | 2,483 | 60% |
| 1964 | 4,133 | 2,526 | 61% | 2,618 | 63% | 2,571 | 62% |
| 1965 | 4,133 | 2,707 | 65% | 2,732 | 66% | 2,719 | 66% |

| Year | SWP Table A demands (taf) | No Climate Change | | MPI-ECHAM5 model with A2 Emissions | | Estimated Delivery Interpolated to 2029[2] | |
|---|---|---|---|---|---|---|---|
| | | SWP Table A Delivery (taf) | percent of max SWP Table A[2] | SWP Table A Delivery (taf) | percent of max SWP Table A[2] | SWP Table A Delivery (taf) | percent of max SWP Table A[2] |
| 1966 | 4,133 | 2,765 | 67% | 2,502 | 61% | 2,637 | 64% |
| 1967 | 4,133 | 3,731 | 90% | 2,660 | 64% | 3,208 | 78% |
| 1968 | 4,133 | 2,234 | 54% | 2,705 | 65% | 2,464 | 60% |
| 1969 | 4,133 | 3,862 | 93% | 3,919 | 95% | 3,890 | 94% |
| 1970 | 4,133 | 3,130 | 76% | 2,701 | 65% | 2,920 | 71% |
| 1971 | 4,133 | 2,707 | 65% | 2,336 | 57% | 2,526 | 61% |
| 1972 | 4,133 | 2,349 | 57% | 2,433 | 59% | 2,390 | 58% |
| 1973 | 4,133 | 2,691 | 65% | 2,530 | 61% | 2,612 | 63% |
| 1974 | 4,133 | 3,354 | 81% | 2,654 | 64% | 3,012 | 73% |
| 1975 | 4,133 | 2,885 | 70% | 2,811 | 68% | 2,849 | 69% |
| 1976 | 4,133 | 2,560 | 62% | 2,812 | 68% | 2,683 | 65% |
| 1977 | 4,133 | 226 | 5% | 701 | 17% | 458 | 11% |
| 1978 | 4,133 | 2,962 | 72% | 3,039 | 74% | 3,000 | 73% |
| 1979 | 4,133 | 2,976 | 72% | 2,815 | 68% | 2,897 | 70% |
| 1980 | 4,133 | 3,516 | 85% | 3,143 | 76% | 3,334 | 81% |
| 1981 | 4,133 | 2,472 | 60% | 2,701 | 65% | 2,583 | 63% |
| 1982 | 4,133 | 3,861 | 93% | 3,525 | 85% | 3,697 | 89% |
| 1983 | 4,133 | 3,950 | 96% | 4,031 | 98% | 3,990 | 97% |
| 1984 | 4,133 | 3,071 | 74% | 3,065 | 74% | 3,068 | 74% |
| 1985 | 4,133 | 2,884 | 70% | 2,731 | 66% | 2,810 | 68% |
| 1986 | 4,133 | 3,514 | 85% | 2,762 | 67% | 3,147 | 76% |
| 1987 | 4,133 | 1,302 | 32% | 1,139 | 28% | 1,223 | 30% |
| 1988 | 4,133 | 927 | 22% | 1,537 | 37% | 1,224 | 30% |
| 1989 | 4,133 | 2,665 | 64% | 2,028 | 49% | 2,355 | 57% |
| 1990 | 4,133 | 806 | 19% | 986 | 24% | 894 | 22% |
| 1991 | 4,133 | 986 | 24% | 1,344 | 33% | 1,161 | 28% |
| 1992 | 4,133 | 1,192 | 29% | 787 | 19% | 994 | 24% |
| 1993 | 4,133 | 2,806 | 68% | 2,424 | 59% | 2,619 | 63% |
| 1994 | 4,133 | 2,356 | 57% | 2,536 | 61% | 2,444 | 59% |
| 1995 | 4,133 | 3,304 | 80% | 3,124 | 76% | 3,216 | 78% |
| 1996 | 4,133 | 2,890 | 70% | 2,617 | 63% | 2,757 | 67% |
| 1997 | 4,133 | 3,503 | 85% | 2,939 | 71% | 3,228 | 78% |
| 1998 | 4,133 | 3,271 | 79% | 3,549 | 86% | 3,407 | 82% |
| 1999 | 4,133 | 3,046 | 74% | 2,824 | 68% | 2,938 | 71% |
| 2000 | 4,133 | 2,767 | 67% | 2,715 | 66% | 2,742 | 66% |
| 2001 | 4,133 | 1,491 | 36% | 1,199 | 29% | 1,348 | 33% |
| 2002 | 4,133 | 2,827 | 68% | 2,475 | 60% | 2,656 | 64% |
| 2003 | 4,133 | 2,583 | 63% | 2,424 | 59% | 2,506 | 61% |
| **Avg** | **4,133** | **2,565** | **62%** | **2,406** | **58%** | **2,487** | **60%** |
| **Min** | **4,133** | **226** | **5%** | **701** | **17%** | **458** | **11%** |
| **Max** | **4,133** | **4,088** | **99%** | **4,031** | **98%** | **3,999** | **97%** |

[1]/ As described in Appendix B [2]/ 4,133 taf/year

**Table B.5** SWP Table A deliveries from the Delta under Future Conditions
Derived values for estimating probability curve

| Ranking of calculated SWP Table A deliveries for probability curve | | | | | | | |
|---|---|---|---|---|---|---|---|
| Exceedence Frequency | Year | SWP Table A delivery (taf) | percent of max SWP Table A[1] | Exceedence Frequency | Year | SWP Table A Delivery (taf) | percent of max SWP Table A[1] |
| 0% | 1983 | 3,999 | 97% | 53% | 1922 | 2,571 | 62% |
| 1% | 1938 | 3,990 | 97% | 54% | 1964 | 2,563 | 62% |
| 2% | 1969 | 3,890 | 94% | 56% | 1940 | 2,562 | 62% |
| 4% | 1982 | 3,697 | 89% | 57% | 1953 | 2,551 | 62% |
| 5% | 1998 | 3,503 | 85% | 58% | 1971 | 2,526 | 61% |
| 6% | 1958 | 3,407 | 82% | 59% | 1993 | 2,506 | 61% |
| 7% | 1980 | 3,362 | 81% | 60% | 1963 | 2,483 | 60% |
| 9% | 1952 | 3,334 | 81% | 62% | 1948 | 2,464 | 60% |
| 10% | 1995 | 3,228 | 78% | 63% | 1957 | 2,444 | 59% |
| 11% | 1997 | 3,226 | 78% | 64% | 1954 | 2,435 | 59% |
| 12% | 1937 | 3,216 | 78% | 65% | 2003 | 2,432 | 59% |
| 14% | 1956 | 3,208 | 78% | 67% | 1968 | 2,428 | 59% |
| 15% | 1967 | 3,161 | 76% | 68% | 1972 | 2,422 | 59% |
| 16% | 1986 | 3,147 | 76% | 69% | 1994 | 2,390 | 58% |
| 17% | 1984 | 3,068 | 74% | 70% | 1947 | 2,355 | 57% |
| 19% | 1974 | 3,012 | 73% | 72% | 1950 | 2,339 | 57% |
| 20% | 1941 | 3,000 | 73% | 73% | 1944 | 2,334 | 56% |
| 21% | 1951 | 2,959 | 72% | 74% | 1949 | 2,263 | 55% |
| 22% | 1978 | 2,938 | 71% | 75% | 1961 | 2,128 | 51% |
| 23% | 1970 | 2,928 | 71% | 77% | 1959 | 2,123 | 51% |
| 25% | 1943 | 2,920 | 71% | 78% | 1939 | 2,120 | 51% |
| 26% | 1999 | 2,897 | 70% | 79% | 1926 | 2,008 | 49% |
| 27% | 1945 | 2,882 | 70% | 80% | 1960 | 1,938 | 47% |
| 28% | 1979 | 2,880 | 70% | 81% | 1925 | 1,772 | 43% |
| 30% | 1975 | 2,849 | 69% | 83% | 1955 | 1,717 | 42% |
| 31% | 1985 | 2,810 | 68% | 84% | 1930 | 1,710 | 41% |
| 32% | 1927 | 2,779 | 67% | 85% | 1933 | 1,599 | 39% |
| 33% | 1942 | 2,760 | 67% | 86% | 1932 | 1,592 | 39% |
| 35% | 1928 | 2,759 | 67% | 88% | 1929 | 1,448 | 35% |
| 36% | 1996 | 2,757 | 67% | 89% | 2001 | 1,348 | 33% |
| 37% | 1965 | 2,742 | 66% | 90% | 1934 | 1,315 | 32% |
| 38% | 2000 | 2,719 | 66% | 91% | 1988 | 1,224 | 30% |
| 40% | 1976 | 2,716 | 66% | 93% | 1931 | 1,223 | 30% |
| 41% | 2002 | 2,683 | 65% | 94% | 1987 | 1,217 | 29% |
| 42% | 1962 | 2,683 | 65% | 95% | 1992 | 1,161 | 28% |
| 43% | 1935 | 2,656 | 64% | 96% | 1991 | 994 | 24% |
| 44% | 1946 | 2,637 | 64% | 98% | 1924 | 894 | 22% |
| 46% | 1973 | 2,619 | 63% | 99% | 1990 | 863 | 21% |
| 47% | 1936 | 2,612 | 63% | 100% | 1977 | 458 | 11% |
| 48% | 1981 | 2,612 | 63% | | **Avg** | **2,487** | **60%** |
| 49% | 1923 | 2,610 | 63% | | **Min** | **458** | **11%** |
| 51% | 1966 | 2,583 | 63% | | **Max** | **3,999** | **97%** |
| 52% | 1989 | 2,583 | 63% | | | | |

[1]/ 4,133 taf/year

**Table B.6** SWP Article 21 deliveries under Current Conditions

| Year | Article 21 Demand (taf) | Article 21 Delivery (taf) |
|---|---|---|
| 1922 | 3,368 | 16 |
| 1923 | 3,368 | 12 |
| 1924 | 3,368 | 56 |
| 1925 | 3,368 | 436 |
| 1926 | 3,368 | 7 |
| 1927 | 3,368 | 67 |
| 1928 | 3,368 | 8 |
| 1929 | 3,368 | 10 |
| 1930 | 3,368 | 10 |
| 1931 | 3,368 | 8 |
| 1932 | 3,368 | 156 |
| 1933 | 3,368 | 393 |
| 1934 | 3,368 | 8 |
| 1935 | 3,368 | 14 |
| 1936 | 3,368 | 12 |
| 1937 | 3,368 | 184 |
| 1938 | 3,368 | 443 |
| 1939 | 3,368 | 2 |
| 1940 | 2,726 | 14 |
| 1941 | 1,442 | 2 |
| 1942 | 3,368 | 6 |
| 1943 | 3,368 | 10 |
| 1944 | 3,368 | 7 |
| 1945 | 3,368 | 288 |
| 1946 | 3,368 | 14 |
| 1947 | 3,368 | 8 |
| 1948 | 3,368 | 12 |
| 1949 | 3,368 | 12 |
| 1950 | 3,368 | 17 |
| 1951 | 2,726 | 485 |
| 1952 | 1,442 | 50 |
| 1953 | 3,368 | 8 |
| 1954 | 3,368 | 14 |
| 1955 | 3,368 | 14 |
| 1956 | 3,368 | 704 |
| 1957 | 3,368 | 12 |
| 1958 | 3,368 | 18 |
| 1959 | 3,368 | 4 |
| 1960 | 3,368 | 12 |
| 1961 | 3,368 | 10 |
| 1962 | 3,368 | 10 |
| 1963 | 3,368 | 18 |
| 1964 | 3,368 | 10 |
| 1965 | 3,368 | 16 |
| 1966 | 3,368 | 11 |
| 1967 | 3,368 | 18 |
| 1968 | 2,726 | 8 |
| 1969 | 1,442 | 191 |
| 1970 | 3,368 | 238 |
| 1971 | 3,368 | 9 |
| 1972 | 3,368 | 20 |
| 1973 | 3,368 | 16 |
| 1974 | 3,368 | 12 |
| 1975 | 3,368 | 11 |
| 1976 | 3,368 | 9 |
| 1977 | 2,726 | 2 |
| 1978 | 1,442 | 2 |
| 1979 | 2,726 | 124 |
| 1980 | 1,442 | 189 |
| 1981 | 3,368 | 9 |
| 1982 | 2,726 | 463 |
| 1983 | 1,442 | 853 |
| 1984 | 3,368 | 507 |
| 1985 | 2,726 | 2 |
| 1986 | 1,442 | 140 |
| 1987 | 3,368 | 9 |
| 1988 | 3,368 | 10 |
| 1989 | 3,368 | 10 |
| 1990 | 3,368 | 10 |
| 1991 | 3,368 | 12 |
| 1992 | 3,368 | 10 |
| 1993 | 3,368 | 14 |
| 1994 | 2,726 | 6 |
| 1995 | 1,442 | 2 |
| 1996 | 3,368 | 6 |
| 1997 | 2,726 | 47 |
| 1998 | 1,442 | 201 |
| 1999 | 3,368 | 123 |
| 2000 | 3,368 | 8 |
| 2001 | 3,368 | 14 |
| 2002 | 3,368 | 25 |
| 2003 | 3,368 | 16 |
| **Avg** | **3,086** | **85** |
| **Min** | **1,442** | **2** |
| **Max** | **3,368** | **853** |

**Table B.7** SWP Article 21 deliveries under Future Conditions
MPI-ECHAM5 Model with A2 Emissions

| Year | Article 21 Demand (taf) | Article 21 Delivery (taf) | | |
|---|---|---|---|---|
| | | no climate change | MPI-ECHAM5 A2 Emissions | interpolated to 2029[1] |
| 1922 | 3,368 | 16 | 16 | 16 |
| 1923 | 3,368 | 15 | 16 | 15 |
| 1924 | 3,368 | 22 | 72 | 46 |
| 1925 | 3,368 | 449 | 431 | 440 |
| 1926 | 3,368 | 15 | 8 | 11 |
| 1927 | 3,368 | 14 | 14 | 14 |
| 1928 | 3,368 | 12 | 10 | 11 |
| 1929 | 3,368 | 10 | 324 | 163 |
| 1930 | 3,368 | 10 | 10 | 10 |
| 1931 | 3,368 | 8 | 8 | 8 |
| 1932 | 3,368 | 401 | 336 | 369 |
| 1933 | 3,368 | 431 | 21 | 231 |
| 1934 | 3,368 | 10 | 129 | 68 |
| 1935 | 3,368 | 10 | 10 | 10 |
| 1936 | 3,368 | 12 | 17 | 15 |
| 1937 | 3,368 | 98 | 114 | 106 |
| 1938 | 3,368 | 9 | 13 | 11 |
| 1939 | 3,368 | 8 | 8 | 8 |
| 1940 | 2,726 | 14 | 12 | 13 |
| 1941 | 1,442 | 2 | 2 | 2 |
| 1942 | 3,368 | 14 | 18 | 16 |
| 1943 | 3,368 | 12 | 16 | 14 |
| 1944 | 3,368 | 10 | 12 | 11 |
| 1945 | 3,368 | 265 | 240 | 253 |
| 1946 | 3,368 | 18 | 18 | 18 |
| 1947 | 3,368 | 10 | 10 | 10 |
| 1948 | 3,368 | 10 | 8 | 9 |
| 1949 | 3,368 | 10 | 17 | 13 |
| 1950 | 3,368 | 18 | 19 | 19 |
| 1951 | 2,726 | 364 | 24 | 198 |
| 1952 | 1,442 | 1 | 2 | 1 |
| 1953 | 3,368 | 16 | 17 | 17 |
| 1954 | 3,368 | 14 | 12 | 13 |
| 1955 | 3,368 | 13 | 12 | 13 |
| 1956 | 3,368 | 383 | 601 | 490 |
| 1957 | 3,368 | 17 | 19 | 18 |
| 1958 | 3,368 | 9 | 32 | 20 |
| 1959 | 3,368 | 10 | 12 | 11 |
| 1960 | 3,368 | 10 | 12 | 11 |
| 1961 | 3,368 | 8 | 9 | 8 |
| 1962 | 3,368 | 8 | 8 | 8 |
| 1963 | 3,368 | 19 | 15 | 17 |
| 1964 | 3,368 | 16 | 12 | 14 |
| 1965 | 3,368 | 15 | 14 | 14 |
| 1966 | 3,368 | 16 | 15 | 15 |
| 1967 | 3,368 | 12 | 18 | 15 |
| 1968 | 2,726 | 13 | 11 | 13 |
| 1969 | 1,442 | 38 | 34 | 36 |
| 1970 | 3,368 | 102 | 16 | 60 |
| 1971 | 3,368 | 14 | 18 | 16 |
| 1972 | 3,368 | 20 | 18 | 19 |
| 1973 | 3,368 | 16 | 22 | 19 |
| 1974 | 3,368 | 15 | 14 | 15 |
| 1975 | 3,368 | 13 | 18 | 16 |
| 1976 | 3,368 | 12 | 12 | 12 |
| 1977 | 2,726 | 2 | 4 | 3 |
| 1978 | 1,442 | 2 | 135 | 67 |
| 1979 | 2,726 | 12 | 10 | 11 |
| 1980 | 1,442 | 32 | 35 | 34 |
| 1981 | 3,368 | 15 | 12 | 14 |
| 1982 | 2,726 | 187 | 13 | 102 |
| 1983 | 1,442 | 549 | 468 | 509 |
| 1984 | 3,368 | 547 | 530 | 539 |
| 1985 | 2,726 | 8 | 10 | 9 |
| 1986 | 1,442 | 94 | 2 | 49 |
| 1987 | 3,368 | 12 | 107 | 58 |
| 1988 | 3,368 | 10 | 125 | 66 |
| 1989 | 3,368 | 6 | 6 | 6 |
| 1990 | 3,368 | 11 | 12 | 11 |
| 1991 | 3,368 | 12 | 14 | 13 |
| 1992 | 3,368 | 10 | 8 | 9 |
| 1993 | 3,368 | 12 | 19 | 16 |
| 1994 | 2,726 | 10 | 8 | 9 |
| 1995 | 1,442 | 1 | 2 | 2 |
| 1996 | 3,368 | 14 | 16 | 15 |
| 1997 | 2,726 | 79 | 156 | 117 |
| 1998 | 1,442 | 24 | 2 | 13 |
| 1999 | 3,368 | 250 | 14 | 135 |
| 2000 | 3,368 | 14 | 12 | 13 |
| 2001 | 3,368 | 14 | 14 | 14 |
| 2002 | 3,368 | 12 | 43 | 27 |
| 2003 | 3,368 | 16 | 12 | 14 |
| **Avg** | **3,086** | **62** | **58** | **60** |
| **Min** | **1,442** | **1** | **2** | **1** |
| **Max** | **3,368** | **549** | **601** | **539** |

[1]/ As described in Appendix B

**Table B.8** Highlighted SWP Table A delivery percent exceedence values under Current and Future Conditions

| Exceedence | Annual SWP Table A Delivery (taf) | | | | | | |
|---|---|---|---|---|---|---|---|
| | *2007 Report* | | | | | Updated Studies | |
| | Current (2007) | Future (2027)[1] | | | | Current (2009) | Future (2029)[2] |
| | | GFDL + A2 | GFDL + B1 | PCM + A2 | PCM + B1 | | |
| 25% | 3218 | 3703 | 3686 | 3782 | 3813 | 2920 | 2915 |
| 50% | 2976 | 3017 | 2967 | 3084 | 3205 | 2675 | 2596 |
| 75% | 2168 | 1883 | 1966 | 1860 | 2077 | 2397 | 2137 |

[1]/ Based upon SWP Table A deliveries that have been interpolated between the "no climate change" scenario and the climate change scenarios determined by climate change model (GFDL or PCM) and greenhouse gas emissions scenario (A2 or B1). SWP Table A deliveries for two scenarios of Old and Middle River flow targets were then averaged.
[2]/ Based upon SWP Table A deliveries that have been interpolated between the "no climate change" scenario and the climate change scenario determined by climate change model MPI-ECHAM5 and greenhouse gas emissions scenario A2.

**Figure B.1** SWP Table A delivery probability under Current Conditions

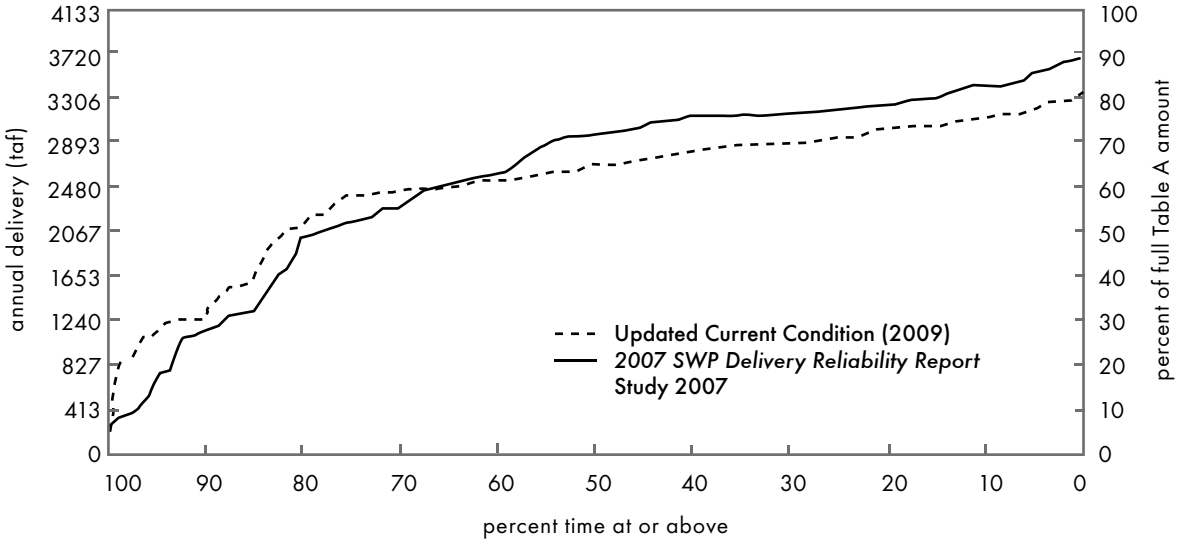



**Figure B.2** SWP Table A delivery probability under Future Conditions

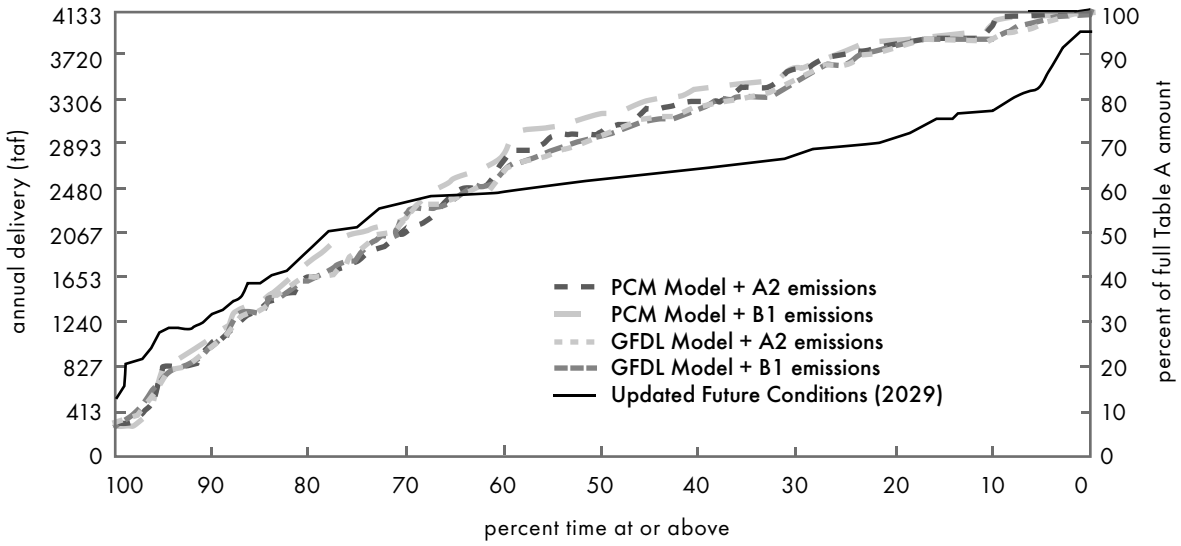


**Table B.9** Comparing SWP Table A deliveries under Current Conditions from updated studies to deliveries from *2007 Report*

| Year | SWP Table A Deliveries (taf) | | |
|---|---|---|---|
| | **Study 2007,** *2007 Report* | **Updated Study 2009** | **Change in Deliveries** |
| 1922 | 3,674 | 2,451 | -1,223 |
| 1923 | 3,159 | 2,849 | -310 |
| 1924 | 400 | 841 | 441 |
| 1925 | 1,644 | 1,845 | 202 |
| 1926 | 2,186 | 2,080 | -107 |
| 1927 | 3,699 | 2,680 | -1,019 |
| 1928 | 2,059 | 2,836 | 777 |
| 1929 | 753 | 1,210 | 457 |
| 1930 | 2,028 | 1,571 | -457 |
| 1931 | 1,105 | 1,255 | 150 |
| 1932 | 1,305 | 1,543 | 238 |
| 1933 | 1,981 | 1,569 | -412 |
| 1934 | 1,315 | 1,239 | -75 |
| 1935 | 3,334 | 2,412 | -923 |
| 1936 | 3,124 | 2,749 | -374 |
| 1937 | 3,219 | 2,995 | -223 |
| 1938 | 3,394 | 3,262 | -133 |
| 1939 | 3,256 | 3,021 | -235 |
| 1940 | 3,165 | 2,524 | -641 |
| 1941 | 2,526 | 2,608 | 82 |
| 1942 | 3,167 | 3,140 | -27 |
| 1943 | 3,154 | 3,174 | 20 |
| 1944 | 2,930 | 2,396 | -533 |
| 1945 | 3,085 | 2,612 | -472 |
| 1946 | 3,199 | 2,875 | -324 |
| 1947 | 2,314 | 2,780 | 466 |
| 1948 | 2,609 | 2,427 | -182 |
| 1949 | 1,271 | 2,444 | 1,173 |
| 1950 | 2,462 | 2,222 | -240 |
| 1951 | 3,497 | 2,671 | -827 |
| 1952 | 2,585 | 2,924 | 339 |
| 1953 | 3,323 | 3,013 | -310 |
| 1954 | 3,201 | 2,535 | -667 |
| 1955 | 1,137 | 2,095 | 958 |
| 1956 | 3,581 | 2,954 | -627 |
| 1957 | 2,545 | 2,475 | -70 |
| 1958 | 3,030 | 3,090 | 60 |
| 1959 | 3,465 | 2,544 | -921 |
| 1960 | 1,460 | 2,211 | 751 |
| 1961 | 2,357 | 2,461 | 104 |
| 1962 | 2,962 | 2,494 | -467 |

| Year | SWP Table A Deliveries (taf) | | |
|---|---|---|---|
| | **Study 2007,** *2007 Report* | **Updated Study 2009** | **Change in Deliveries** |
| 1963 | 3,406 | 2,569 | -837 |
| 1964 | 2,211 | 2,858 | 648 |
| 1965 | 2,861 | 2,731 | -130 |
| 1966 | 3,265 | 2,867 | -399 |
| 1967 | 2,990 | 2,768 | -222 |
| 1968 | 3,297 | 2,907 | -390 |
| 1969 | 2,626 | 2,854 | 228 |
| 1970 | 3,257 | 3,082 | -176 |
| 1971 | 3,317 | 2,712 | -604 |
| 1972 | 1,707 | 2,409 | 701 |
| 1973 | 3,085 | 2,477 | -608 |
| 1974 | 3,184 | 3,247 | 63 |
| 1975 | 3,218 | 3,023 | -195 |
| 1976 | 2,604 | 2,692 | 88 |
| 1977 | 243 | 301 | 58 |
| 1978 | 3,599 | 2,606 | -993 |
| 1979 | 3,128 | 3,023 | -106 |
| 1980 | 2,710 | 2,869 | 159 |
| 1981 | 3,128 | 2,532 | -596 |
| 1982 | 2,940 | 3,054 | 114 |
| 1983 | 2,497 | 2,811 | 314 |
| 1984 | 3,227 | 3,070 | -157 |
| 1985 | 3,198 | 2,894 | -304 |
| 1986 | 2,294 | 2,996 | 701 |
| 1987 | 2,825 | 1,957 | -868 |
| 1988 | 477 | 902 | 426 |
| 1989 | 3,130 | 2,399 | -732 |
| 1990 | 360 | 1,241 | 882 |
| 1991 | 729 | 1,102 | 373 |
| 1992 | 1,087 | 1,061 | -26 |
| 1993 | 3,711 | 2,724 | -987 |
| 1994 | 2,105 | 2,310 | 206 |
| 1995 | 2,993 | 2,927 | -66 |
| 1996 | 3,440 | 3,267 | -172 |
| 1997 | 3,101 | 3,191 | 90 |
| 1998 | 3,008 | 3,338 | 330 |
| 1999 | 3,439 | 3,142 | -297 |
| 2000 | 3,451 | 2,855 | -596 |
| 2001 | 1,164 | 1,409 | 245 |
| 2002 | 2,162 | 2,576 | 414 |
| 2003 | 2,943 | 2,811 | -133 |

# Appendix C. State Water Project Table A Amounts

The contracts between the DWR and the 29 SWP water contractors define the terms and conditions governing the water delivery and cost repayment for the SWP. SWP Table A is an exhibit to these contracts. Comprehension of Table A is important in understanding the information in this report. To understand the table, it is necessary to understand how the contracts work.

All water-supply related costs of the SWP are paid by the contractors, and SWP Table A serves as a basis for allocating some of the costs among the contractors. In addition, SWP Table A plays a key role in the annual allocation of available supply among contractors. When the SWP was being planned, the amount of water projected to be available for delivery to the contractors was 4,173 taf per year. This was referred to as the maximum project yield, and it was recognized that in some years the project would be unable to deliver that amount and in other years project supply could exceed that amount. This amount was used as the basis for apportioning available supply to each contractor and as a factor in calculating each contractor's share of the project's costs. This apportionment is accomplished by SWP Table A in each contract. SWP Table A lists by year and acre-feet the portion of the 4,173 taf deliverable to each contractor. Other contract provisions permit changes to an individual contractor's SWP Table A under special circumstances. The total of the maximums in all the contracts now equals 4,173 taf.

A copy of the consolidated SWP Table A from all the contracts follows this explanation. The amounts listed in SWP Table A cannot be viewed as an indication of the SWP water delivery reliability, nor should these amounts be used to support an expectation that a certain amount of water will be delivered to a contractor in any particular time span. SWP Table A is simply a tool for apportioning available supply and cost obligations under the contract. In this report, reference to "SWP Table A amounts" means the amounts listed in SWP Table A. Contractors also receive other classifications of water from the project, as distinguished from SWP Table A (for example, Article 21 water, and turnback pool water). These other contract provisions are discussed in Appendix D.

**Table C.1** Maximum annual SWP Table A amounts (acre-feet)

| Contractor | Maximum SWP Table A |
|---|---|
| North Bay | |
| Napa County FC&WCD | 29,025 |
| Solano County WA | 47,756 |
| **Subtotal** | **76,781** |
| South Bay | |
| Alameda County FC&WCD, Zone 7 | 80,619 |
| Alameda County WD | 42,000 |
| Santa Clara Valley WD | 100,000 |
| **Subtotal** | **222,619** |
| San Joaquin Valley | |
| Oak Flat WD | 5,700 |
| Kings County | 9,305 |
| Dudley Ridge WD | 57,343 |
| Empire West Side ID | 3,000 |
| Kern County WA | 998,730 |
| Tulare Lake Basin WSD | 95,922 |
| **Subtotal** | **1,170,000** |
| Central Coastal | |
| San Luis Obispo County FC&WCD | 25,000 |
| Santa Barbara County FC&WCD | 45,486 |
| **Subtotal** | **70,486** |
| Southern California | |
| Antelope Valley-East Kern WA | 141,400 |
| Castaic Lake WA | 95,200 |
| Coachella Valley WD | 121,100 |
| Crestline-Lake Arrowhead WA | 5,800 |
| Desert WA | 50,000 |
| Littlerock Creek ID | 2,300 |
| Mojave WA | 75,800 |
| Metropolitan WDSC | 1,911,500 |
| Palmdale WD | 21,300 |
| San Bernardino Valley MWD | 102,600 |
| San Gabriel Valley MWD | 28,800 |
| San Gorgonio Pass WA | 17,300 |
| Ventura County FCD | 20,000 |
| **Subtotal** | **2,593,100** |
| **Delta Delivery Total** | **4,132,986** |
| Feather River | |
| Butte County | 27,500 |
| Plumas County FC&WCD | 2,700 |
| Yuba City | 9,600 |
| **Subtotal** | **39,800** |
| **Total** | **4,172,786** |

# Appendix D. Recent State Water Project Deliveries

## SWP Contract Water Types

The SWP contracts define several classifications of water available for delivery to contractors under specific circumstances. All classifications are considered "project" water. Many contractors make frequent use of these additional water types to increase or decrease the amount available to them under SWP Table A.

### SWP Table A Water

Each contract's SWP Table A is the amount in acre-feet that is used to determine the portion of available supply to be delivered to that contractor. SWP Table A water is water delivered according to this apportionment methodology and is given first priority for delivery.

### SWP Article 21 Water

SWP Article 21 of the contracts permits delivery of water excess to delivery of SWP Table A and some other water types to those contractors requesting it. It is available under specific conditions discussed in Chapter 5. SWP Article 21 water is apportioned to those contractors requesting it in the same proportion as their SWP Table A.

### Turnback Pool Water

Contractors may choose to offer their allocated SWP Table A water excess to their needs to other contractors through two pools in February and March. Contributing contractors receive a reduction in charges, and taking contractors pay extra.

### Carryover Water

Pursuant to the long-term water supply contracts, contractors have the opportunity to carry over a portion of their allocated water approved for delivery in the current year for delivery during the next year. Contractors can carry over water under Article 56C with advanced notice when they submit their initial request for SWP Table A water, or within the last three months of the delivery year, under Article 12E for various reasons, including local wet conditions and exchange and transfer arrangements. The carryover program was designed to encourage the most effective and beneficial use of water and to avoid obligating the contractors to use or lose the water by December 31 of each year. The water supply contracts state the criteria of carrying over SWP Table A water from one year to the next. Normally, carryover water is water that has been exported during the year, has not been delivered to the contractor during that year, and has remained stored in the SWP share of San Luis Reservoir to be delivered during the following year. Storage for carryover water no longer becomes available to the contractors if it interferes with storage of SWP water for project needs.

## Updated Historical Deliveries

Table D.1 through D.10 list annual historical deliveries by various water classifications for each contractor for 1999 through 2008. Similar delivery tables for years 1997 through 2006 are included in *Report 2007*.

**Table D.1** Historical SWP Deliveries: 1999

| Sacramento River Index<br>Year Type | 1<br>Wet | | | | |
|---|---|---|---|---|---|
| | SWP Table A | SWP Article 21 | Turnback | Carryover | Total |
| Butte County | 286 | 0 | 0 | 0 | 286 |
| Plumas County FC&WCD | | | | | |
| Yuba City | 1,096 | 0 | 0 | 0 | 1,096 |
| Napa County FC&WCD | 4,550 | 754 | 0 | 0 | 5,304 |
| Solano County WA | 37,753 | 0 | 0 | 0 | 37,753 |
| Alameda County FC&WCD, Zone 7 | 46,000 | 2,910 | 0 | 0 | 48,910 |
| Alameda County WD | 34,871 | 2,781 | 0 | 0 | 37,652 |
| Santa Clara Valley WD | 67,465 | 15,480 | 0 | 0 | 82,945 |
| Oak Flat WD | 4,871 | 0 | 0 | 0 | 4,871 |
| Kings County | 4,000 | 0 | 0 | 0 | 4,000 |
| Dudley Ridge WD | 51,870 | 4,990 | 6,566 | 0 | 63,426 |
| Empire West Side ID | 3,000 | 176 | 0 | 0 | 3,176 |
| Kern County WA | 1,077,755 | 58,241 | 42,154 | 0 | 1,178,150 |
| Little Rock Creek ID | 342 | 0 | 0 | 0 | 342 |
| Tulare Lake Basin WSD | 118,500 | 49,898 | 121,337 | 0 | 289,735 |
| San Luis Obispo County FC&WCD | 3,743 | 0 | 0 | 0 | 3,743 |
| Santa Barbara County FC&WCD | 20,137 | 0 | 0 | 0 | 20,137 |
| Antelope Valley-East Kern WA | 69,073 | 0 | 0 | 0 | 69,073 |
| Castaic Lake WA (+Rch 31A, 5 & 7) | 32,899 | 0 | 0 | 0 | 32,899 |
| Coachella Valley WD | 23,100 | 0 | 27,380 | 0 | 50,480 |
| Crestline-Lake Arrowhead WA | 1,132 | 0 | 0 | 0 | 1,132 |
| Desert WA | 38,100 | 0 | 20,000 | 0 | 58,100 |
| Mojave WA | 5,144 | 0 | 0 | 0 | 5,144 |
| Metropolitan WDSC | 829,777 | 22,840 | 0 | 0 | 852,617 |
| Palmdale WD | 13,278 | 0 | 0 | 0 | 13,278 |
| San Bernardino Valley MWD | 12,874 | 0 | 0 | 0 | 12,874 |
| San Gabriel Valley MWD | 18,000 | 0 | 0 | 0 | 18,000 |
| San Gorgonio Pass WA | | | | | |
| Ventura County FCD | 1,850 | 0 | 0 | 0 | 1,850 |
| **Totals** | 2,521,466 | 158,070 | 217,437 | 0 | 2,896,973 |
| **Total South of Delta** | 2,520,084 | 158,070 | 217,437 | 0 | 2,895,591 |

**Table D.2** Historical SWP Deliveries: 2000

| Sacramento River Index<br>Year Type | 2<br>Above Normal | | | | |
|---|---|---|---|---|---|
| | SWP Table A | SWP Article 21 | Turnback | Carryover | Total |
| Butte County | 586 | 0 | 0 | 0 | 586 |
| Plumas County FC&WCD | | | | | |
| Yuba City | 901 | 0 | 0 | 0 | 901 |
| Napa County FC&WCD | 3,136 | 297 | 0 | 1,525 | 4,958 |
| Solano County WA | 32,882 | 1,040 | 0 | 1,417 | 35,339 |
| Alameda County FC&WCD, Zone 7 | 53,877 | 3,740 | 0 | 0 | 57,617 |
| Alameda County WD | 33,598 | 2,380 | 0 | 0 | 35,978 |
| Santa Clara Valley WD | 70,433 | 18,381 | 0 | 13,174 | 101,988 |
| Oak Flat WD | 4,494 | 0 | 0 | 14 | 4,508 |
| Kings County | 3,600 | 0 | 0 | 0 | 3,600 |
| Dudley Ridge WD | 38,673 | 7,454 | 12,193 | 2,884 | 61,204 |
| Empire West Side ID | 1,271 | 528 | 0 | 0 | 1,799 |
| Kern County WA | 825,856 | 78,908 | 233,202 | 13,193 | 1,151,159 |
| Little Rock Creek ID | | | | | |
| Tulare Lake Basin WSD | 98,595 | 56,818 | 27,073 | 15,827 | 198,313 |
| San Luis Obispo County FC&WCD | 3,962 | 0 | 0 | 0 | 3,962 |
| Santa Barbara County FC&WCD | 22,741 | 0 | 0 | 0 | 22,741 |
| Antelope Valley-East Kern WA | 83,577 | 0 | 0 | 0 | 83,577 |
| Castaic Lake WA (+Rch 31A, 5 & 7) | 40,680 | 0 | 0 | 0 | 40,680 |
| Coachella Valley WD | 20,790 | 17,820 | 3,713 | 0 | 42,323 |
| Crestline-Lake Arrowhead WA | 1,194 | 0 | 0 | 0 | 1,194 |
| Desert WA | 34,290 | 17,820 | 6,124 | 0 | 58,234 |
| Mojave WA | 9,135 | 0 | 0 | 0 | 9,135 |
| Metropolitan WDSC | 1,273,729 | 103,124 | 0 | 169,529 | 1,546,382 |
| Palmdale WD | 8,221 | 0 | 0 | 839 | 9,060 |
| San Bernardino Valley MWD | 18,399 | 0 | 0 | 0 | 18,399 |
| San Gabriel Valley MWD | 14,000 | 475 | 0 | 0 | 14,475 |
| San Gorgonio Pass WA | | | | | |
| Ventura County FCD | 4,050 | 0 | 0 | 0 | 4,050 |
| **Totals** | 2,702,670 | 308,785 | 282,305 | 218,402 | 3,512,162 |
| **Total South of Delta** | 2,701,183 | 308,785 | 282,305 | 218,402 | 3,510,675 |

**Table D.3** Historical SWP Deliveries: 2001

| Sacramento River Index<br>Year Type | 4<br>Dry | | | | |
|---|---|---|---|---|---|
| | SWP Table A | SWP Article 21 | Turnback | Carryover | Total |
| Butte County | 513 | 0 | 0 | 0 | 513 |
| Plumas County FC&WCD | | | | | |
| Yuba City | 1,065 | 0 | 0 | 0 | 1,065 |
| Napa County FC&WCD | 4,293 | 996 | 82 | 1,723 | 7,094 |
| Solano County WA | 17,756 | 2,304 | 0 | 1,021 | 21,081 |
| Alameda County FC&WCD, Zone 7 | 22,307 | 0 | 308 | 5,990 | 28,605 |
| Alameda County WD | 13,695 | 10 | 107 | 4,192 | 18,004 |
| Santa Clara Valley WD | 35,689 | 0 | 0 | 12,233 | 47,922 |
| Oak Flat WD | 2,089 | 0 | 22 | 101 | 2,212 |
| Kings County | 1,560 | 0 | 0 | 0 | 1,560 |
| Dudley Ridge WD | 18,467 | 933 | 347 | 6,815 | 26,562 |
| Empire West Side ID | 0 | 253 | 0 | 1,107 | 1,360 |
| Kern County WA | 363,204 | 23,233 | 6,502 | 92,052 | 484,991 |
| Little Rock Creek ID | | | | | |
| Tulare Lake Basin WSD | 40,830 | 8,755 | 769 | 7,889 | 58,243 |
| San Luis Obispo County FC&WCD | 4,184 | 0 | 99 | 0 | 4,283 |
| Santa Barbara County FC&WCD | 14,285 | 396 | 296 | 0 | 14,977 |
| Antelope Valley-East Kern WA | 45,071 | 0 | 899 | 0 | 45,970 |
| Castaic Lake WA (+Rch 31A, 5 & 7) | 30,471 | 850 | 618 | 0 | 31,939 |
| Coachella Valley WD | 9,009 | 0 | 91 | 0 | 9,100 |
| Crestline-Lake Arrowhead WA | 1,057 | 0 | 0 | 0 | 1,057 |
| Desert WA | 14,859 | 0 | 151 | 0 | 15,010 |
| Mojave WA | 4,433 | 0 | 0 | 0 | 4,433 |
| Metropolitan WDSC | 686,545 | 10,415 | 7,949 | 200,000 | 904,909 |
| Palmdale WD | 8,170 | 0 | 0 | 2,257 | 10,427 |
| San Bernardino Valley MWD | 26,488 | 0 | 0 | 0 | 26,488 |
| San Gabriel Valley MWD | 6,534 | 0 | 0 | 0 | 6,534 |
| San Gorgonio Pass WA | | | | | |
| Ventura County FCD | 1,850 | 0 | 0 | 0 | 1,850 |
| **Totals** | 1,374,424 | 48,145 | 18,240 | 335,380 | 1,776,189 |
| **Total South of Delta** | 1,372,846 | 48,145 | 18,240 | 335,380 | 1,774,611 |

**Table D.4** Historical SWP Deliveries: 2002

| Sacramento River Index<br>Year Type | 4<br>Dry | | | | |
|---|---|---|---|---|---|
| | SWP Table A | SWP Article 21 | Turnback | Carryover | Total |
| Butte County | 419 | 0 | 0 | 0 | 419 |
| Plumas County FC&WCD | | | | | |
| Yuba City | 1,181 | 0 | 0 | 0 | 1,181 |
| Napa County FC&WCD | 2,022 | 827 | 283 | 3,743 | 6,875 |
| Solano County WA | 28,223 | 2,242 | 0 | 0 | 30,465 |
| Alameda County FC&WCD, Zone 7 | 40,707 | 1,484 | 556 | 8,113 | 50,860 |
| Alameda County WD | 24,250 | 83 | 862 | 2,331 | 27,526 |
| Santa Clara Valley WD | 55,896 | 202 | 2,053 | 3,311 | 61,462 |
| Oak Flat WD | 3,841 | 50 | 76 | 134 | 4,101 |
| Kings County | 2,800 | 0 | 54 | 0 | 2,854 |
| Dudley Ridge WD | 38,688 | 1,861 | 1,177 | 1,994 | 43,720 |
| Empire West Side ID | 1,278 | 26 | 0 | 101 | 1,405 |
| Kern County WA | 670,884 | 21,951 | 20,543 | 15,680 | 729,058 |
| Little Rock Creek ID | | | | | |
| Tulare Lake Basin WSD | 73,785 | 3,749 | 2,289 | 5,385 | 85,208 |
| San Luis Obispo County FC&WCD | 4,355 | | 0 | 0 | 4,355 |
| Santa Barbara County FC&WCD | 24,166 | 436 | 324 | 3,455 | 28,381 |
| Antelope Valley-East Kern WA | 53,907 | | 1,008 | 3,256 | 58,171 |
| Castaic Lake WA (+Rch 31A, 5 & 7) | 61,880 | 280 | | 6,657 | 68,817 |
| Coachella Valley WD | 16,170 | 111 | 474 | 0 | 16,755 |
| Crestline-Lake Arrowhead WA | 2,189 | 0 | 0 | 0 | 2,189 |
| Desert WA | 26,670 | 189 | 781 | 0 | 27,640 |
| Mojave WA | 4,346 | 0 | 0 | 0 | 4,346 |
| Metropolitan WDSC | 1,273,205 | 9,624 | 14,335 | 97,940 | 1,395,104 |
| Palmdale WD | 8,359 | 0 | 437 | 0 | 8,796 |
| San Bernardino Valley MWD | 68,268 | 0 | 0 | 3,801 | 72,069 |
| San Gabriel Valley MWD | 18,353 | 0 | 0 | 4,698 | 23,051 |
| San Gorgonio Pass WA | | | | | |
| Ventura County FCD | 4,998 | 0 | 0 | 0 | 4,998 |
| **Totals** | 2,510,840 | 43,115 | 45,252 | 160,599 | 2,759,806 |
| **Total South of Delta** | 2,509,240 | 43,115 | 45,252 | 160,599 | 2,758,206 |

**Table D.5** Historical SWP Deliveries: 2003

| Sacramento River Index<br>Year Type | 2<br>Above Normal | | | | |
|---|---|---|---|---|---|
| | SWP Table A | SWP Article 21 | Turnback | Carryover | Total |
| Butte County | 551 | 0 | 0 | 0 | 551 |
| Plumas County FC&WCD | | | | | |
| Yuba City | 1,324 | 0 | 0 | 0 | 1,324 |
| Napa County FC&WCD | 6,026 | 376 | 180 | 1,055 | 7,637 |
| Solano County WA | 25,135 | 2,280 | 0 | 1,918 | 29,333 |
| Alameda County FC&WCD, Zone 7 | 30,695 | 0 | 656 | 13,099 | 44,450 |
| Alameda County WD | 31,086 | 0 | 354 | 5,150 | 36,590 |
| Santa Clara Valley WD | 90,620 | 936 | 841 | 14,104 | 106,501 |
| Oak Flat WD | 4,059 | 19 | 48 | 140 | 4,266 |
| Kings County | 3,600 | 58 | 34 | 0 | 3,692 |
| Dudley Ridge WD | 49,723 | 1,928 | 482 | 1,452 | 53,585 |
| Empire West Side ID | 1,074 | 175 | 0 | 187 | 1,436 |
| Kern County WA | 841,697 | 27,891 | 8,419 | 22,380 | 900,387 |
| Little Rock Creek ID | | | | | |
| Tulare Lake Basin WSD | 94,376 | 6,243 | 938 | 4,284 | 105,841 |
| San Luis Obispo County FC&WCD | 4,417 | 36 | 0 | 0 | 4,453 |
| Santa Barbara County FC&WCD | 24,312 | 339 | 43 | 2,274 | 26,968 |
| Antelope Valley-East Kern WA | 52,730 | 0 | 250 | 7,049 | 60,029 |
| Castaic Lake WA (+Rch 31A, 5 & 7) | 49,895 | 991 | 90 | 4,760 | 55,736 |
| Coachella Valley WD | 14,045 | 204 | 194 | 0 | 14,443 |
| Crestline-Lake Arrowhead WA | 1,563 | 0 | 0 | 0 | 1,563 |
| Desert WA | 23,168 | 330 | 321 | 0 | 23,819 |
| Mojave WA | 10,907 | 0 | 0 | 3,528 | 14,435 |
| Metropolitan WDSC | 1,550,356 | 17,622 | 16,920 | 134,845 | 1,719,743 |
| Palmdale WD | 9,701 | 0 | 0 | 1,846 | 11,547 |
| San Bernardino Valley MWD | 25,371 | 200 | 0 | 1,844 | 27,415 |
| San Gabriel Valley MWD | 13,034 | 200 | 0 | 0 | 13,234 |
| San Gorgonio Pass WA | 116 | 0 | 0 | 0 | 116 |
| Ventura County FCD | 5,000 | 0 | 0 | 0 | 5,000 |
| **Totals** | 2,964,581 | 59,828 | 29,770 | 219,915 | 3,274,094 |
| **Total South of Delta** | 2,962,706 | 59,828 | 29,770 | 219,915 | 3,272,219 |

**Table D.6** Historical SWP Deliveries: 2004

| Sacramento River Index<br>Year Type | 3<br>Below Normal | | | | |
|---|---|---|---|---|---|
| | SWP Table A | SWP Article 21 | Turnback | Carryover | Total |
| Butte County | 1,440 | 0 | 0 | 0 | 1,440 |
| Plumas County FC&WCD | | | | | |
| Yuba City | 1,434 | 0 | 0 | 0 | 1,434 |
| Napa County FC&WCD | 5,030 | 1,450 | 52 | 1,602 | 8,134 |
| Solano County WA | 17,991 | 7,787 | 0 | 47 | 25,825 |
| Alameda County FC&WCD, Zone 7 | 39,898 | 0 | 0 | 11,466 | 51,364 |
| Alameda County WD | 20,956 | 0 | 214 | 6,714 | 27,884 |
| Santa Clara Valley WD | 52,867 | 2,983 | 508 | 0 | 56,358 |
| Oak Flat WD | 4,324 | 0 | 29 | 276 | 4,629 |
| Kings County | 5,850 | 3,157 | 46 | 0 | 9,053 |
| Dudley Ridge WD | 36,377 | 7,393 | 291 | 2,185 | 46,246 |
| Empire West Side ID | 1,310 | 626 | 0 | 1,626 | 3,562 |
| Kern County WA | 640,190 | 86,513 | 5,075 | 40,120 | 771,898 |
| Little Rock Creek ID | | | | | |
| Tulare Lake Basin WSD | 58,575 | 15,299 | 489 | 5,638 | 80,001 |
| San Luis Obispo County FC&WCD | 4,096 | 69 | 0 | 0 | 4,165 |
| Santa Barbara County FC&WCD | 29,566 | 0 | 122 | 0 | 29,688 |
| Antelope Valley-East Kern WA | 50,532 | 0 | 0 | 9,199 | 59,731 |
| Castaic Lake WA (+Rch 31A, 5 & 7) | 46,358 | 1,618 | 0 | 35,785 | 83,761 |
| Coachella Valley WD | 8,631 | 0 | 89 | 6,745 | 15,465 |
| Crestline-Lake Arrowhead WA | 2,006 | 0 | 0 | 0 | 2,006 |
| Desert WA | 9,966 | 0 | 102 | 11,122 | 21,190 |
| Mojave WA | 11,176 | 0 | 0 | 0 | 11,176 |
| Metropolitan WDSC | 1,195,807 | 91,601 | 10,223 | 215,000 | 1,512,631 |
| Palmdale WD | 10,549 | 0 | 0 | 1,613 | 12,162 |
| San Bernardino Valley MWD | 35,522 | 0 | 0 | 20,631 | 56,153 |
| San Gabriel Valley MWD | 15,600 | 0 | 0 | 0 | 15,600 |
| San Gorgonio Pass WA | 841 | 0 | 0 | 0 | 841 |
| Ventura County FCD | 5,250 | 0 | 0 | 0 | 5,250 |
| **Totals** | 2,312,142 | 218,496 | 17,240 | 369,769 | 2,917,647 |
| **Total South of Delta** | 2,309,268 | 218,496 | 17,240 | 369,769 | 2,914,773 |

**Table D.7** Historical SWP Deliveries: 2005

| Sacramento River Index<br>Year Type | 2<br>Above Normal | | | | |
|---|---|---|---|---|---|
| | SWP Table A | SWP Article 21 | Turnback | Carryover | Total |
| Butte County | 527 | 0 | 0 | 0 | 527 |
| Plumas County FC&WCD | | | | | |
| Yuba City | 1,894 | 0 | 0 | 0 | 1,894 |
| Napa County FC&WCD | 5,322 | 606 | 0 | 1,741 | 7,669 |
| Solano County WA | 24,515 | 10,421 | 0 | 83 | 35,019 |
| Alameda County FC&WCD, Zone 7 | 38,388 | 0 | 275 | 7,849 | 46,512 |
| Alameda County WD | 36,469 | 846 | 943 | 6,341 | 44,599 |
| Santa Clara Valley WD | 89,476 | 6,298 | 342 | 11,899 | 108,015 |
| Oak Flat WD | 4,067 | 0 | 127 | 0 | 4,194 |
| Kings County | 8,100 | 11,504 | 202 | 0 | 19,806 |
| Dudley Ridge WD | 51,609 | 28,197 | 1,286 | 821 | 81,913 |
| Empire West Side ID | 1,448 | 1,799 | 0 | 587 | 3,834 |
| Kern County WA | 893,439 | 453,078 | 22,397 | 9,851 | 1,378,765 |
| Little Rock Creek ID | | | | | |
| Tulare Lake Basin WSD | 86,604 | 47,267 | 2,158 | 3,973 | 140,002 |
| San Luis Obispo County FC&WCD | 4,006 | 245 | 0 | 0 | 4,251 |
| Santa Barbara County FC&WCD | 22,981 | 0 | 155 | 0 | 23,136 |
| Antelope Valley-East Kern WA | 57,205 | 0 | 0 | 2,626 | 59,831 |
| Castaic Lake WA (+Rch 31A, 5 & 7) | 54,303 | 2,451 | 0 | 2,702 | 59,456 |
| Coachella Valley WD | 26,984 | 0 | 2,716 | 12,819 | 42,519 |
| Crestline-Lake Arrowhead WA | 807 | 0 | 0 | 0 | 807 |
| Desert WA | 33,168 | 0 | 1,122 | 14,799 | 49,089 |
| Mojave WA | 10,360 | 0 | 0 | 1,201 | 11,561 |
| Metropolitan WDSC | 1,247,183 | 168,300 | 6,530 | 106,032 | 1,528,045 |
| Palmdale WD | 10,174 | 0 | 0 | 1,538 | 11,712 |
| San Bernardino Valley MWD | 31,211 | 56 | 0 | 283 | 31,550 |
| San Gabriel Valley MWD | 10,500 | 0 | 0 | 0 | 10,500 |
| San Gorgonio Pass WA | 655 | 15 | 22 | 0 | 692 |
| Ventura County FCD | 1,665 | 0 | 0 | 0 | 1,665 |
| **Totals** | 2,753,060 | 731,083 | 38,275 | 185,145 | 3,707,563 |
| **Total South of Delta** | 2,750,639 | 731,083 | 38,275 | 185,145 | 3,705,142 |

**Table D.8** Historical SWP Deliveries: 2006

| Sacramento River Index<br>Year Type | 1<br>Wet | | | | |
|---|---|---|---|---|---|
| | SWP Table A | SWP Article 21 | Turnback | Carryover | Total |
| Butte County | 468 | 0 | 0 | 0 | 468 |
| Plumas County FC&WCD | | | | | |
| Yuba City | 4,148 | 1,194 | 0 | 0 | 5,342 |
| Napa County FC&WCD | 7,312 | 300 | 0 | 172 | 7,784 |
| Solano County WA | 12,070 | 18,195 | 0 | 390 | 30,655 |
| Alameda County FC&WCD, Zone 7 | 50,785 | 0 | 491 | 2,252 | 53,528 |
| Alameda County WD | 0 | 2,375 | 39,373 | 1,331 | 43,079 |
| Santa Clara Valley WD | 47,344 | 26,769 | 0 | 524 | 74,637 |
| Oak Flat WD | 4,118 | 0 | 107 | 17 | 4,242 |
| Kings County | 8,991 | 366 | 173 | 0 | 9,530 |
| Dudley Ridge WD | 55,343 | 18,515 | 1,068 | 0 | 74,926 |
| Empire West Side ID | 1,500 | 1,124 | 0 | 658 | 3,282 |
| Kern County WA | 961,882 | 256,634 | 18,610 | 5,418 | 1,242,544 |
| Little Rock Creek ID | | | | | |
| Tulare Lake Basin WSD | 48,361 | 59,424 | 1,787 | 0 | 109,572 |
| San Luis Obispo County FC&WCD | 3,382 | 827 | 0 | 0 | 4,209 |
| Santa Barbara County FC&WCD | 19,255 | 4,020 | 0 | 0 | 23,275 |
| Antelope Valley-East Kern WA | 76,623 | 0 | 0 | 3,761 | 80,384 |
| Castaic Lake WA (+Rch 31A, 5 & 7) | 56,758 | 2,089 | 0 | 3,905 | 62,752 |
| Coachella Valley WD | 121,100 | 0 | 0 | 0 | 121,100 |
| Crestline-Lake Arrowhead WA | 257 | 0 | 0 | 0 | 257 |
| Desert WA | 50,000 | 0 | 0 | 0 | 50,000 |
| Mojave WA | 32,496 | 238,478 | 11,638 | 1,518 | 34,014 |
| Metropolitan WDSC | 1,103,538 | 238,478 | 11,638 | 136,424 | 1,490,078 |
| Palmdale WD | 10,374 | 1,653 | 130 | 335 | 12,492 |
| San Bernardino Valley MWD | 31,902 | 0 | 0 | 3,427 | 35,329 |
| San Gabriel Valley MWD | 13,524 | 0 | 0 | 0 | 13,524 |
| San Gorgonio Pass WA | 4,262 | 0 | 0 | 0 | 4,262 |
| Ventura County FCD | 1,850 | 0 | 0 | 0 | 1,850 |
| **Totals** | 2,727,643 | 631,963 | 73,377 | 160,132 | 3,593,115 |
| **Total South of Delta** | 2,723,027 | 630,769 | 73,377 | 160,132 | 3,587,305 |

**Table D.9** Historical SWP Deliveries: 2007

| Sacramento River Index<br>Year Type | 4<br>Dry | | | | |
|---|---|---|---|---|---|
| | SWP Table A | SWP Article 21 | Turnback | Carryover | Total |
| Butte County | 956 | 0 | 0 | 0 | 956 |
| Plumas County FC&WCD | | | | | |
| Yuba City | 2,327 | 0 | 0 | 0 | 2,327 |
| Napa County FC&WCD | 6,362 | 3,597 | 0 | 998 | 10,957 |
| Solano County WA | 14,892 | 8,217 | 0 | 1,822 | 24,931 |
| Alameda County FC&WCD, Zone 7 | 32,972 | 912 | 378 | 2,895 | 37,157 |
| Alameda County WD | 16,541 | 550 | 197 | 2,103 | 19,391 |
| Santa Clara Valley WD | 38,812 | 4,840 | 469 | 8,161 | 52,282 |
| Oak Flat WD | 3,430 | 41 | 27 | 69 | 3,567 |
| Kings County | 4,924 | 474 | 43 | 0 | 5,441 |
| Dudley Ridge WD | 28,457 | 8,953 | 269 | 2,000 | 39,679 |
| Empire West Side ID | 397 | 1,172 | 0 | 515 | 2,084 |
| Kern County WA | 592,423 | 99,861 | 4,683 | 19,645 | 716,612 |
| Little Rock Creek ID | 1,380 | 0 | 0 | 0 | 1,380 |
| Tulare Lake Basin WSD | 57,272 | 12,902 | 450 | 16,459 | 87,083 |
| San Luis Obispo County FC&WCD | 3,752 | 24 | 0 | 0 | 3,776 |
| Santa Barbara County FC&WCD | 24,760 | 1,070 | 0 | 1,390 | 27,220 |
| Antelope Valley-East Kern WA | 74,459 | 0 | 0 | 4,364 | 78,823 |
| Castaic Lake WA (+Rch 31A, 5 & 7) | 44,974 | 0 | 0 | 4,216 | 49,190 |
| Coachella Valley WD | 72,660 | 0 | 568 | 0 | 73,228 |
| Crestline-Lake Arrowhead WA | 1,768 | 0 | 0 | 0 | 1,768 |
| Desert WA | 30,000 | 0 | 234 | 0 | 30,234 |
| Mojave WA | 45,372 | 0 | 0 | 737 | 46,109 |
| Metropolitan WDSC | 1,146,900 | 166,517 | 8,962 | 28,098 | 1,350,477 |
| Palmdale WD | 12,780 | 843 | 100 | 985 | 14,708 |
| San Bernardino Valley MWD | 57,116 | 0 | 0 | 0 | 57,116 |
| San Gabriel Valley MWD | 10,000 | 0 | 0 | 0 | 10,000 |
| San Gorgonio Pass WA | 4,009 | 0 | 0 | 0 | 4,009 |
| Ventura County FCD | 3,000 | 0 | 0 | 0 | 3,000 |
| **Totals** | 2,332,695 | 309,973 | 16,380 | 94,457 | 2,753,505 |
| **Total South of Delta** | 2,329,412 | 309,973 | 16,380 | 94,457 | 2,750,222 |

**Table D.10** Historical SWP Deliveries: 2008

| Sacramento River Index<br>Year Type | 5<br>Critical | | | | |
|---|---|---|---|---|---|
| | SWP Table A | SWP Article 21 | Turnback | Carryover | Total |
| Butte County | 9,436 | 0 | 0 | 0 | 9,436 |
| Plumas County FC&WCD | 243 | 0 | 0 | 0 | 243 |
| Yuba City | 1,923 | 0 | 0 | 0 | 1,923 |
| Napa County FC&WCD | 3,636 | 1,219 | 21 | 7,363 | 12,239 |
| Solano County WA | 10,436 | 1,510 | 0 | 12,389 | 24,335 |
| Alameda County FC&WCD, Zone 7 | 13,633 | 0 | 0 | 15,400 | 29,033 |
| Alameda County WD | 4,206 | 0 | 37 | 8,659 | 12,902 |
| Santa Clara Valley WD | 11,133 | 0 | 88 | 21,188 | 32,409 |
| Oak Flat WD | 1,929 | 0 | 5 | 0 | 1,934 |
| Kings County | 3,187 | 0 | 8 | 0 | 3,195 |
| Dudley Ridge WD | 12,260 | 0 | 51 | 5,949 | 18,260 |
| Empire West Side ID | 0 | 0 | 0 | 915 | 915 |
| Kern County WA | 271,636 | 0 | 883 | 6,815 | 279,334 |
| Little Rock Creek ID | 805 | 0 | 0 | 0 | 805 |
| Tulare Lake Basin WSD | 32,302 | 0 | 85 | 281 | 32,668 |
| San Luis Obispo County FC&WCD | 8,512 | 0 | 0 | 0 | 8,512 |
| Santa Barbara County FC&WCD | 11,311 | 0 | 40 | 2,532 | 13,883 |
| Antelope Valley-East Kern WA | 31,082 | 0 | 125 | 10,381 | 41,588 |
| Castaic Lake WA (+Rch 31A, 5 & 7) | 18,710 | 0 | 0 | 12,146 | 30,856 |
| Coachella Valley WD | 42,385 | 0 | 107 | 0 | 42,492 |
| Crestline-Lake Arrowhead WA | 1,159 | 0 | 0 | 689 | 1,848 |
| Desert WA | 17,500 | 0 | 44 | 0 | 17,544 |
| Mojave WA | 26,288 | 0 | 0 | 108 | 26,396 |
| Metropolitan WDSC | 654,304 | 0 | 1,689 | 0 | 655,993 |
| Palmdale WD | 4,226 | 0 | 19 | 0 | 4,245 |
| San Bernardino Valley MWD | 30,562 | 0 | 0 | 4,444 | 35,006 |
| San Gabriel Valley MWD | 10,080 | 0 | 0 | 0 | 10,080 |
| San Gorgonio Pass WA | 5,419 | 0 | 0 | 300 | 5,719 |
| Ventura County FCD | 3,798 | 0 | 0 | 0 | 3,798 |
| **Totals** | 1,242,101 | 2,729 | 3,202 | 109,559 | 1,357,591 |
| **Total South of Delta** | 1,230,499 | 2,729 | 3,202 | 109,559 | 1,345,989 |

# Appendix E. Comment Letter and the Department's Response on the Draft Report

THE METROPOLITAN WATER DISTRICT
OF SOUTHERN CALIFORNIA

*Office of the General Manager*

March 4, 2010

Ms. Cynthia Pierson
California Department of Water Resources
SWP Delivery Reliability Report Attn: Cynthia Pierson
P.O. Box 942836
Sacramento, CA 94236-0001

Dear Ms. Pierson:

State Water Project Delivery Reliability Report 2009 December 2009 Draft

The Metropolitan Water District of Southern California (Metropolitan) has reviewed the Department's December 2009 draft of the State Water Project (SWP) Delivery Report. The report updates estimates of current (2009) and future (2029) SWP delivery reliability and incorporates the operational restrictions of the biological opinions issued by the U.S. Fish and Wildlife Service (USFWS) in December 2008 and the National Marine Fisheries Service (NMFS) in June 2009 governing the SWP and Central Valley Project operations.

The updated estimates of both current and future SWP Table A deliveries are less than the deliveries presented in the 2007 report during near-normal to wet years. The decreases in deliveries are primarily driven by the effects of the fish restrictions and the incorporation of potential climatic changes. As mentioned in the Draft 2009 report, uncertainty surrounds both of these drivers and "much scientific and modeling judgment has been employed to represent the implementation of the BOs" and impacts of climate change. Metropolitan acknowledges that the Department has made efforts to best represent these factors in their analysis given the current scientific understanding.

Given the uncertainty surrounding the potential effects of climate change, sea level rise and the limited historical data regarding operational compliance with the new biological opinions, Metropolitan is requesting that the Department make available a range of estimated deliveries for both Table A and Article 21 deliveries. This range would be based on the upper and lower limits with respect to the fish restrictions with and without potential climate impacts. The approach would be similar to what was done for the 2007 Report that presented "more restrictive" and "least restrictive" operating levels to capture the 2007 federal court ruling impacts on Delta exports. The attached table illustrates our request. Metropolitan appreciates the opportunity to provide comments and believes augmenting the 2009 Report with a range of possible deliveries would assist our integration of the SWP water supply reliability into our planning and water management decision making process.

Very truly yours,

Devendra N. Upadhyay
Manager, Water Resource Management

Enclosure

DJP:jc

SWP Delivery Reliability Report 2009 Comments  Summary of requested information

We are requesting an upper and lower range for the six delivery estimates already provided in Tables B.3, B.4, B.6, and B.7. This will result in 12 additional delivery estimates as shown below:

| Study - Delivery Climate Scenario | PROVIDED | REQUESTED | |
|---|---|---|---|
| | No Range | Least Restrictive | Most Restrictive |
| 2009 - Table A Without Climate Change | 1 (Table B.3) | 1 | 1 |
| 2009 Article 21 Without Climate Change | 1 (Table B.6) | 1 | 1 |
| 2029 Table A Without Climate Change | 1 (Table B.4) | 1 | 1 |
| 2029 - Article 21 Without Climate Change | 1 (Table B.7) | 1 | 1 |
| 2029 - Table A With Climate Change | 1 (Table B.4) | 1 | 1 |
| 2029 – Article 21 With Climate Change | 1 (Table B.7) | 1 | 1 |
| # of Model Runs | 6 | 12 | |

STATE OF CALIFORNIA – CALIFORNIA NATURAL RESOURCES AGENCY ARNOLD SCHWARZENEGGER, Governor

**DEPARTMENT OF WATER RESOURCES**
1416 NINTH STREET, P.O. BOX 942836
SACRAMENTO, CA 94236-0001
(916) 653-5791

July 14, 2010

Devendra N. Upadhyay
Manager, Water Resources Management
The Metropolitan Water District of Southern California
PO Box 54153
Los Angeles, California 90054-0153

Dear Mr. Upadhyay:

This letter responds to your letter dated March 4, 2010 providing comments of the Metropolitan Water District of Southern California on the draft of the 2009 State Water Project Delivery Reliability Report (Draft 2009 Report).

In your letter, you acknowledge that the Department of Water Resources (Department) has made efforts to best represent the effects of the requirements of the federal biological opinions and potential climatic changes. Due to the uncertainty surrounding the potential effects of climate change, sea level rise and the application of the operational requirements of the biological opinions, you have requested the Department make available a range of estimated Table A and Article 21 deliveries. The range of deliveries you suggest would be based on the upper and lower limits of the operational restrictions in the biological opinions, both with and without potential climate change.

We have conducted the six additional CalSim II studies specified in your request. These studies use the conditions contained in Table 1 (attached). The assumptions for the Least Restrictive Old and Middle Rivers (OMR) criteria include target flows of -8,000 cfs for December 1-17 and -5,000 cfs for December 18-31. The criteria are set at -5,000 cfs for the January through June period. The assumptions for the Most Restrictive OMR criteria include target flows of -2,000 cfs for December 1-17 and -1,250 cfs for December 18-31. The flow requirement is set at -1,250 cfs for January through June. Both the Least Restrictive OMR and the Most Restrictive OMR criteria include the minimum Delta export requirement of 1,500 cfs in April and May.

Also attached are tables and exceedence curves of the model simulation results. Tables 2 through 7 present the estimated State Water Project (SWP) Table A deliveries along with the sorted delivery values used to develop exceedence curves. Tables 2 and 3 present the estimated Table A deliveries for 2009 conditions for the Least Restrictive and Most Restrictive OMR flow criteria, respectively. Tables 4 and 5 present the estimated Table A deliveries for 2029 conditions for the Least Restrictive and Most Restrictive OMR flow criteria without climate change. Tables 6 and 7 present the

estimated Table A deliveries for the Least Restrictive and Most Restrictive OMR flow criteria under assumed climate change interpolated to 2029 conditions. Tables 8 through 10 present the corresponding estimated SWP Article 21 deliveries.

Figures 1 through 3 compare the SWP Table A delivery values estimated for the Draft 2009 Report with the estimates using the Least Restrictive OMR flow criteria, and the Most Restrictive OMR flow criteria. These comparisons are made under current conditions, future conditions without climate change, and future conditions with deliveries interpolated to the assumed 2029 climate change condition.

In each of the figures, the estimates associated with the Draft 2009 Report track very closely to the estimates for the Least Restrictive OMR flow criteria. The studies done for the Draft 2009 Report incorporate a dynamic OMR requirement. The rules used to simulate the implementation of the OMR actions were defined in close coordination with the fish biologists associated with the biological opinions. The OMR requirements are first triggered with a flow surrogate for turbidity and the OMR flow target level is set based upon an estimate of Delta salinity. Typically, during wetter conditions OMR is allowed to be less restrictive (down to -5000 cfs) and during drier conditions OMR is more restrictive (up to -1250 cfs).

The new Least Restrictive OMR simulation assumes a constant restriction (-5000 cfs) throughout the time period defined in the biological opinion. However, in dry periods the simulated exports are not being restricted by this OMR requirement, but rather are restricted by the lack of water in the system. The coincidental consequence is that the resulting OMR flows often emulate those found in the Draft 2009 Report simulation.

So, although the approaches of the simulations for the Draft 2009 Report and the Least Restrictive scenario are quite different, the resulting exports and the associated SWP deliveries of the two simulations are very similar.

It is worthwhile to note that the studies used for the Draft 2009 Report utilize an earlier version of the assumptions for the studies for the Bay-Delta Conservation Plan (BDCP). Since then, the relevant BDCP studies have evolved with several refinements and adjustments in the interpretation of the biological opinions and in other study assumptions. The assumptions used in the current BDCP studies are very similar to those for the Draft 2009 DRR Report and produce very similar estimates for SWP deliveries.

The final 2009 Report will be issued soon and will include an appendix containing the comment letters on the draft report and the Department's responses. Thank you for your comments. If you wish to discuss this report further, please contact me at (916) 653-1099 or kkelly@water.ca.gov. To discuss the details of these studies, please contact Sushil Arora, Chief of the Central Valley Water Resources System Modeling Section, at (916) 653-6921.

Sincerely,

Katherine F. Kelly, Chief
Bay-Delta Office

Attachment

Table 1. CalSim II additional study assumptions

| Operating Criteria | Conditions |
|---|---|
| Least Restrictive OMR criteria | Current Conditions |
| | Future Conditions without Climate Change |
| | Future Conditions with deliveries interpolated to the assumed 2029 Climate Change conditions |
| Most Restrictive OMR criteria | Current Conditions |
| | Future Conditions without Climate Change |
| | Future Conditions with deliveries interpolated to the assumed 2029 Climate Change conditions |

Table 2. SWP Table A Deliveries under current (2009) conditions and Least Restrictive OMR criteria

| 2009 Least Restrictive OMR | | | | | | |
|---|---|---|---|---|---|---|
| Year | SWP Table A Delivery | | Probability Curve | | | |
| | (TAF) | Percent of Maximum Table A | Year | SWP Table A Delivery (TAF) | Exceedence Frequency | Percent of Maximum Table A |
| 1922 | 2,410 | 58% | 1996 | 3,350 | 0% | 81% |
| 1923 | 2,845 | 69% | 1943 | 3,317 | 1% | 80% |
| 1924 | 1,086 | 26% | 1974 | 3,262 | 2% | 79% |
| 1925 | 1,899 | 46% | 1998 | 3,237 | 4% | 78% |
| 1926 | 2,311 | 56% | 1938 | 3,236 | 5% | 78% |
| 1927 | 2,612 | 63% | 1942 | 3,236 | 6% | 78% |
| 1928 | 2,814 | 68% | 1997 | 3,195 | 7% | 77% |
| 1929 | 1,095 | 26% | 1999 | 3,140 | 9% | 76% |
| 1930 | 1,800 | 44% | 1937 | 3,103 | 10% | 75% |
| 1931 | 1,303 | 32% | 1958 | 3,095 | 11% | 75% |
| 1932 | 1,489 | 36% | 1970 | 3,082 | 12% | 75% |
| 1933 | 1,572 | 38% | 1984 | 3,070 | 14% | 74% |
| 1934 | 995 | 24% | 1982 | 3,065 | 15% | 74% |
| 1935 | 2,456 | 59% | 1939 | 3,042 | 16% | 74% |
| 1936 | 2,851 | 69% | 1946 | 3,034 | 17% | 73% |
| 1937 | 3,103 | 75% | 1953 | 3,032 | 19% | 73% |
| 1938 | 3,236 | 78% | 1979 | 3,027 | 20% | 73% |
| 1939 | 3,042 | 74% | 1995 | 2,961 | 21% | 72% |
| 1940 | 2,636 | 64% | 1956 | 2,948 | 22% | 71% |
| 1941 | 2,649 | 64% | 1952 | 2,946 | 23% | 71% |
| 1942 | 3,236 | 78% | 1968 | 2,920 | 25% | 71% |
| 1943 | 3,317 | 80% | 1975 | 2,892 | 26% | 70% |
| 1944 | 2,624 | 63% | 1980 | 2,883 | 27% | 70% |
| 1945 | 2,630 | 64% | 1986 | 2,878 | 28% | 70% |
| 1946 | 3,034 | 73% | 1947 | 2,875 | 30% | 70% |
| 1947 | 2,875 | 70% | 1985 | 2,875 | 31% | 70% |
| 1948 | 2,645 | 64% | 2003 | 2,860 | 32% | 69% |
| 1949 | 2,457 | 59% | 1936 | 2,851 | 33% | 69% |
| 1950 | 2,539 | 61% | 1923 | 2,845 | 35% | 69% |
| 1951 | 2,696 | 65% | 1969 | 2,826 | 36% | 68% |
| 1952 | 2,946 | 71% | 1965 | 2,817 | 37% | 68% |
| 1953 | 3,032 | 73% | 1928 | 2,814 | 38% | 68% |
| 1954 | 2,555 | 62% | 1983 | 2,811 | 40% | 68% |
| 1955 | 1,780 | 43% | 1966 | 2,809 | 41% | 68% |
| 1956 | 2,948 | 71% | 1964 | 2,803 | 42% | 68% |
| 1957 | 2,495 | 60% | 1967 | 2,766 | 43% | 67% |
| 1958 | 3,095 | 75% | 2000 | 2,757 | 44% | 67% |
| 1959 | 2,569 | 62% | 1993 | 2,725 | 46% | 66% |
| 1960 | 2,438 | 59% | 1971 | 2,718 | 47% | 66% |
| 1961 | 2,397 | 58% | 1951 | 2,696 | 48% | 65% |
| 1962 | 2,440 | 59% | 1941 | 2,649 | 49% | 64% |
| 1963 | 2,601 | 63% | 1948 | 2,645 | 51% | 64% |
| 1964 | 2,803 | 68% | 1940 | 2,636 | 52% | 64% |
| 1965 | 2,817 | 68% | 1945 | 2,630 | 53% | 64% |

Table 2. (cont.) SWP Table A Deliveries under current (2009) conditions and Least Restrictive OMR criteria

| 2009 Least Restrictive OMR | | | | | | |
|---|---|---|---|---|---|---|
| Year | SWP Table A Delivery | | Probability Curve | | | |
| | (TAF) | Percent of Maximum Table A | Year | SWP Table A Delivery (TAF) | Exceedence Frequency | Percent of Maximum Table A |
| 1966 | 2,809 | 68% | 1944 | 2,624 | 54% | 63% |
| 1967 | 2,766 | 67% | 1978 | 2,619 | 56% | 63% |
| 1968 | 2,920 | 71% | 1927 | 2,612 | 57% | 63% |
| 1969 | 2,826 | 68% | 1989 | 2,611 | 58% | 63% |
| 1970 | 3,082 | 75% | 1963 | 2,601 | 59% | 63% |
| 1971 | 2,718 | 66% | 2002 | 2,588 | 60% | 63% |
| 1972 | 2,418 | 59% | 1959 | 2,569 | 62% | 62% |
| 1973 | 2,557 | 62% | 1973 | 2,557 | 63% | 62% |
| 1974 | 3,262 | 79% | 1954 | 2,555 | 64% | 62% |
| 1975 | 2,892 | 70% | 1950 | 2,539 | 65% | 61% |
| 1976 | 2,480 | 60% | 1957 | 2,495 | 67% | 60% |
| 1977 | 299 | 7% | 1976 | 2,480 | 68% | 60% |
| 1978 | 2,619 | 63% | 1949 | 2,457 | 69% | 59% |
| 1979 | 3,027 | 73% | 1935 | 2,456 | 70% | 59% |
| 1980 | 2,883 | 70% | 1962 | 2,440 | 72% | 59% |
| 1981 | 2,426 | 59% | 1960 | 2,438 | 73% | 59% |
| 1982 | 3,065 | 74% | 1981 | 2,426 | 74% | 59% |
| 1983 | 2,811 | 68% | 1972 | 2,418 | 75% | 59% |
| 1984 | 3,070 | 74% | 1922 | 2,410 | 77% | 58% |
| 1985 | 2,875 | 70% | 1961 | 2,397 | 78% | 58% |
| 1986 | 2,878 | 70% | 1926 | 2,311 | 79% | 56% |
| 1987 | 1,983 | 48% | 1994 | 2,250 | 80% | 54% |
| 1988 | 878 | 21% | 1987 | 1,983 | 81% | 48% |
| 1989 | 2,611 | 63% | 1925 | 1,899 | 83% | 46% |
| 1990 | 934 | 23% | 1930 | 1,800 | 84% | 44% |
| 1991 | 1,313 | 32% | 1955 | 1,780 | 85% | 43% |
| 1992 | 1,198 | 29% | 2001 | 1,624 | 86% | 39% |
| 1993 | 2,725 | 66% | 1933 | 1,572 | 88% | 38% |
| 1994 | 2,250 | 54% | 1932 | 1,489 | 89% | 36% |
| 1995 | 2,961 | 72% | 1991 | 1,313 | 90% | 32% |
| 1996 | 3,350 | 81% | 1931 | 1,303 | 91% | 32% |
| 1997 | 3,195 | 77% | 1992 | 1,198 | 93% | 29% |
| 1998 | 3,237 | 78% | 1929 | 1,095 | 94% | 26% |
| 1999 | 3,140 | 76% | 1924 | 1,086 | 95% | 26% |
| 2000 | 2,757 | 67% | 1934 | 995 | 96% | 24% |
| 2001 | 1,624 | 39% | 1990 | 934 | 98% | 23% |
| 2002 | 2,588 | 63% | 1988 | 878 | 99% | 21% |
| 2003 | 2,860 | 69% | 1977 | 299 | 100% | 7% |
| Avg | 2,506 | 61% | Avg | 2,506 | | 61% |
| Min | 299 | 7% | Min | 299 | | 7% |
| Max | 3,350 | 81% | Max | 3,350 | | 81% |

Table 3. SWP Table A Deliveries under current (2009) conditions and Most Restrictive OMR criteria

| 2009 Most Restrictive OMR | | | | | | |
|---|---|---|---|---|---|---|
| Year | SWP Table A Delivery | | Probability Curve | | | |
| | (TAF) | Percent of Maximum Table A | Year | SWP Table A Delivery (TAF) | Exceedence Frequency | Percent of Maximum Table A |
| 1922 | 2,186 | 53% | 1938 | 3,102 | 0% | 75% |
| 1923 | 1,837 | 44% | 1970 | 3,028 | 1% | 73% |
| 1924 | 741 | 18% | 1984 | 2,947 | 2% | 71% |
| 1925 | 1,952 | 47% | 1956 | 2,935 | 4% | 71% |
| 1926 | 1,785 | 43% | 1982 | 2,905 | 5% | 70% |
| 1927 | 2,433 | 59% | 1958 | 2,901 | 6% | 70% |
| 1928 | 1,809 | 44% | 1997 | 2,861 | 7% | 69% |
| 1929 | 404 | 10% | 1983 | 2,781 | 9% | 67% |
| 1930 | 1,680 | 41% | 1969 | 2,777 | 10% | 67% |
| 1931 | 1,015 | 25% | 1980 | 2,752 | 11% | 67% |
| 1932 | 1,102 | 27% | 1998 | 2,727 | 12% | 66% |
| 1933 | 1,579 | 38% | 1999 | 2,712 | 14% | 66% |
| 1934 | 364 | 9% | 1952 | 2,709 | 15% | 66% |
| 1935 | 2,396 | 58% | 1995 | 2,706 | 16% | 65% |
| 1936 | 1,982 | 48% | 1986 | 2,676 | 17% | 65% |
| 1937 | 2,448 | 59% | 1996 | 2,526 | 19% | 61% |
| 1938 | 3,102 | 75% | 1974 | 2,461 | 20% | 60% |
| 1939 | 2,204 | 53% | 1937 | 2,448 | 21% | 59% |
| 1940 | 2,012 | 49% | 1951 | 2,444 | 22% | 59% |
| 1941 | 2,292 | 55% | 1967 | 2,438 | 23% | 59% |
| 1942 | 2,398 | 58% | 1927 | 2,433 | 25% | 59% |
| 1943 | 2,425 | 59% | 1943 | 2,425 | 26% | 59% |
| 1944 | 1,731 | 42% | 1985 | 2,405 | 27% | 58% |
| 1945 | 2,386 | 58% | 1989 | 2,399 | 28% | 58% |
| 1946 | 2,185 | 53% | 1942 | 2,398 | 30% | 58% |
| 1947 | 1,967 | 48% | 1935 | 2,396 | 31% | 58% |
| 1948 | 2,017 | 49% | 1945 | 2,386 | 32% | 58% |
| 1949 | 1,780 | 43% | 1965 | 2,385 | 33% | 58% |
| 1950 | 1,839 | 44% | 1973 | 2,356 | 35% | 57% |
| 1951 | 2,444 | 59% | 1978 | 2,328 | 36% | 56% |
| 1952 | 2,709 | 66% | 1993 | 2,320 | 37% | 56% |
| 1953 | 2,040 | 49% | 1975 | 2,318 | 38% | 56% |
| 1954 | 1,790 | 43% | 1979 | 2,310 | 40% | 56% |
| 1955 | 1,347 | 33% | 1941 | 2,292 | 41% | 55% |
| 1956 | 2,935 | 71% | 2002 | 2,271 | 42% | 55% |
| 1957 | 1,828 | 44% | 1939 | 2,204 | 43% | 53% |
| 1958 | 2,901 | 70% | 1963 | 2,198 | 44% | 53% |
| 1959 | 1,675 | 41% | 1922 | 2,186 | 46% | 53% |
| 1960 | 1,663 | 40% | 1946 | 2,185 | 47% | 53% |
| 1961 | 1,907 | 46% | 1964 | 2,131 | 48% | 52% |
| 1962 | 1,928 | 47% | 2003 | 2,075 | 49% | 50% |
| 1963 | 2,198 | 53% | 1953 | 2,040 | 51% | 49% |
| 1964 | 2,131 | 52% | 2000 | 2,027 | 52% | 49% |
| 1965 | 2,385 | 58% | 1948 | 2,017 | 53% | 49% |

Table 3. (cont.) SWP Table A Deliveries under current (2009) conditions and Most Restrictive OMR criteria

| 2009 Most Restrictive OMR | | | | | | |
|---|---|---|---|---|---|---|
| Year | SWP Table A Delivery | | Probability Curve | | | |
| | (TAF) | Percent of Maximum Table A | Year | SWP Table A Delivery (TAF) | Exceedence Frequency | Percent of Maximum Table A |
| 1966 | 1,774 | 43% | 1940 | 2,012 | 54% | 49% |
| 1967 | 2,438 | 59% | 1936 | 1,982 | 56% | 48% |
| 1968 | 1,959 | 47% | 1971 | 1,976 | 57% | 48% |
| 1969 | 2,777 | 67% | 1947 | 1,967 | 58% | 48% |
| 1970 | 3,028 | 73% | 1981 | 1,962 | 59% | 47% |
| 1971 | 1,976 | 48% | 1968 | 1,959 | 60% | 47% |
| 1972 | 1,688 | 41% | 1925 | 1,952 | 62% | 47% |
| 1973 | 2,356 | 57% | 1962 | 1,928 | 63% | 47% |
| 1974 | 2,461 | 60% | 1961 | 1,907 | 64% | 46% |
| 1975 | 2,318 | 56% | 1950 | 1,839 | 65% | 44% |
| 1976 | 1,598 | 39% | 1923 | 1,837 | 67% | 44% |
| 1977 | 268 | 6% | 1957 | 1,828 | 68% | 44% |
| 1978 | 2,328 | 56% | 1928 | 1,809 | 69% | 44% |
| 1979 | 2,310 | 56% | 1954 | 1,790 | 70% | 43% |
| 1980 | 2,752 | 67% | 1926 | 1,785 | 72% | 43% |
| 1981 | 1,962 | 47% | 1949 | 1,780 | 73% | 43% |
| 1982 | 2,905 | 70% | 1966 | 1,774 | 74% | 43% |
| 1983 | 2,781 | 67% | 1944 | 1,731 | 75% | 42% |
| 1984 | 2,947 | 71% | 1972 | 1,688 | 77% | 41% |
| 1985 | 2,405 | 58% | 1930 | 1,680 | 78% | 41% |
| 1986 | 2,676 | 65% | 1959 | 1,675 | 79% | 41% |
| 1987 | 1,073 | 26% | 1960 | 1,663 | 80% | 40% |
| 1988 | 687 | 17% | 1976 | 1,598 | 81% | 39% |
| 1989 | 2,399 | 58% | 1933 | 1,579 | 83% | 38% |
| 1990 | 828 | 20% | 1994 | 1,543 | 84% | 37% |
| 1991 | 1,029 | 25% | 1955 | 1,347 | 85% | 33% |
| 1992 | 863 | 21% | 2001 | 1,106 | 86% | 27% |
| 1993 | 2,320 | 56% | 1932 | 1,102 | 88% | 27% |
| 1994 | 1,543 | 37% | 1987 | 1,073 | 89% | 26% |
| 1995 | 2,706 | 65% | 1991 | 1,029 | 90% | 25% |
| 1996 | 2,526 | 61% | 1931 | 1,015 | 91% | 25% |
| 1997 | 2,861 | 69% | 1992 | 863 | 93% | 21% |
| 1998 | 2,727 | 66% | 1990 | 828 | 94% | 20% |
| 1999 | 2,712 | 66% | 1924 | 741 | 95% | 18% |
| 2000 | 2,027 | 49% | 1988 | 687 | 96% | 17% |
| 2001 | 1,106 | 27% | 1929 | 404 | 98% | 10% |
| 2002 | 2,271 | 55% | 1934 | 364 | 99% | 9% |
| 2003 | 2,075 | 50% | 1977 | 268 | 100% | 6% |
| Avg | 2,017 | 49% | Avg | 2,017 | | 49% |
| Min | 268 | 6% | Min | 268 | | 6% |
| Max | 3,102 | 75% | Max | 3,102 | | 75% |

Table 4. SWP Table A Deliveries under 2029 conditions and Least Restrictive OMR criteria without climate change

| 2029 Least Restrictive OMR without Climate Change | | | | | | |
|---|---|---|---|---|---|---|
| Year | SWP Table A Delivery | | Probability Curve | | | |
| | (TAF) | Percent of Maximum Table A | Year | SWP Table A Delivery (TAF) | Exceedence Frequency | Percent of Maximum Table A |
| 1922 | 2,622 | 63% | 1938 | 4,040 | 0% | 98% |
| 1923 | 2,678 | 65% | 1983 | 3,950 | 1% | 96% |
| 1924 | 1,105 | 27% | 1969 | 3,862 | 2% | 93% |
| 1925 | 1,765 | 43% | 1982 | 3,861 | 4% | 93% |
| 1926 | 2,299 | 56% | 1952 | 3,818 | 5% | 92% |
| 1927 | 2,916 | 71% | 1958 | 3,722 | 6% | 90% |
| 1928 | 2,755 | 67% | 1967 | 3,707 | 7% | 90% |
| 1929 | 1,013 | 25% | 1980 | 3,549 | 9% | 86% |
| 1930 | 1,876 | 45% | 1937 | 3,528 | 10% | 85% |
| 1931 | 1,416 | 34% | 1997 | 3,504 | 11% | 85% |
| 1932 | 1,603 | 39% | 1986 | 3,403 | 12% | 82% |
| 1933 | 1,600 | 39% | 1974 | 3,384 | 14% | 82% |
| 1934 | 1,205 | 29% | 1956 | 3,349 | 15% | 81% |
| 1935 | 2,884 | 70% | 1995 | 3,348 | 16% | 81% |
| 1936 | 2,882 | 70% | 1943 | 3,260 | 17% | 79% |
| 1937 | 3,528 | 85% | 1941 | 3,253 | 19% | 79% |
| 1938 | 4,040 | 98% | 1998 | 3,176 | 20% | 77% |
| 1939 | 2,407 | 58% | 1970 | 3,128 | 21% | 76% |
| 1940 | 2,628 | 64% | 1951 | 3,088 | 22% | 75% |
| 1941 | 3,253 | 79% | 1978 | 3,079 | 23% | 75% |
| 1942 | 2,836 | 69% | 1984 | 3,071 | 25% | 74% |
| 1943 | 3,260 | 79% | 1999 | 3,045 | 26% | 74% |
| 1944 | 2,613 | 63% | 1946 | 2,958 | 27% | 72% |
| 1945 | 2,882 | 70% | 1979 | 2,943 | 28% | 71% |
| 1946 | 2,958 | 72% | 1947 | 2,918 | 30% | 71% |
| 1947 | 2,918 | 71% | 1927 | 2,916 | 31% | 71% |
| 1948 | 2,614 | 63% | 1993 | 2,903 | 32% | 70% |
| 1949 | 2,120 | 51% | 1996 | 2,901 | 33% | 70% |
| 1950 | 2,743 | 66% | 1965 | 2,895 | 35% | 70% |
| 1951 | 3,088 | 75% | 1935 | 2,884 | 36% | 70% |
| 1952 | 3,818 | 92% | 1936 | 2,882 | 37% | 70% |
| 1953 | 2,271 | 55% | 1945 | 2,882 | 38% | 70% |
| 1954 | 2,475 | 60% | 2002 | 2,881 | 40% | 70% |
| 1955 | 1,785 | 43% | 1989 | 2,876 | 41% | 70% |
| 1956 | 3,349 | 81% | 1942 | 2,836 | 42% | 69% |
| 1957 | 2,518 | 61% | 1975 | 2,822 | 43% | 68% |
| 1958 | 3,722 | 90% | 2000 | 2,790 | 44% | 68% |
| 1959 | 2,173 | 53% | 1928 | 2,755 | 46% | 67% |
| 1960 | 2,369 | 57% | 1973 | 2,754 | 47% | 67% |
| 1961 | 2,299 | 56% | 1985 | 2,754 | 48% | 67% |
| 1962 | 2,508 | 61% | 1950 | 2,743 | 49% | 66% |
| 1963 | 2,567 | 62% | 1971 | 2,707 | 51% | 66% |
| 1964 | 2,551 | 62% | 1966 | 2,707 | 52% | 65% |
| 1965 | 2,895 | 70% | 1923 | 2,678 | 53% | 65% |

Table 4. (cont.) SWP Table A Deliveries under 2029 conditions and Least Restrictive OMR criteria without climate change

| 2029 Least Restrictive OMR without Climate Change | | | | | | |
|---|---|---|---|---|---|---|
| Year | SWP Table A Delivery | | Probability Curve | | | |
| | (TAF) | Percent of Maximum Table A | Year | SWP Table A Delivery (TAF) | Exceedence Frequency | Percent of Maximum Table A |
| 1966 | 2,707 | 65% | 2003 | 2,670 | 54% | 65% |
| 1967 | 3,707 | 90% | 1940 | 2,628 | 56% | 64% |
| 1968 | 2,165 | 52% | 1922 | 2,622 | 57% | 63% |
| 1969 | 3,862 | 93% | 1948 | 2,614 | 58% | 63% |
| 1970 | 3,128 | 76% | 1944 | 2,613 | 59% | 63% |
| 1971 | 2,707 | 66% | 1963 | 2,567 | 60% | 62% |
| 1972 | 2,435 | 59% | 1964 | 2,551 | 62% | 62% |
| 1973 | 2,754 | 67% | 1957 | 2,518 | 63% | 61% |
| 1974 | 3,384 | 82% | 1962 | 2,508 | 64% | 61% |
| 1975 | 2,822 | 68% | 1954 | 2,475 | 65% | 60% |
| 1976 | 2,469 | 60% | 1976 | 2,469 | 67% | 60% |
| 1977 | 231 | 6% | 1981 | 2,458 | 68% | 59% |
| 1978 | 3,079 | 75% | 1972 | 2,435 | 69% | 59% |
| 1979 | 2,943 | 71% | 1939 | 2,407 | 70% | 58% |
| 1980 | 3,549 | 86% | 1960 | 2,369 | 72% | 57% |
| 1981 | 2,458 | 59% | 1926 | 2,299 | 73% | 56% |
| 1982 | 3,861 | 93% | 1961 | 2,299 | 74% | 56% |
| 1983 | 3,950 | 96% | 1953 | 2,271 | 75% | 55% |
| 1984 | 3,071 | 74% | 1994 | 2,250 | 77% | 54% |
| 1985 | 2,754 | 67% | 1959 | 2,173 | 78% | 53% |
| 1986 | 3,403 | 82% | 1968 | 2,165 | 79% | 52% |
| 1987 | 1,435 | 35% | 1949 | 2,120 | 80% | 51% |
| 1988 | 1,022 | 25% | 1930 | 1,876 | 81% | 45% |
| 1989 | 2,876 | 70% | 1955 | 1,785 | 83% | 43% |
| 1990 | 805 | 19% | 1925 | 1,765 | 84% | 43% |
| 1991 | 1,158 | 28% | 1932 | 1,603 | 85% | 39% |
| 1992 | 1,239 | 30% | 1933 | 1,600 | 86% | 39% |
| 1993 | 2,903 | 70% | 2001 | 1,562 | 88% | 38% |
| 1994 | 2,250 | 54% | 1987 | 1,435 | 89% | 35% |
| 1995 | 3,348 | 81% | 1931 | 1,416 | 90% | 34% |
| 1996 | 2,901 | 70% | 1992 | 1,239 | 91% | 30% |
| 1997 | 3,504 | 85% | 1934 | 1,205 | 93% | 29% |
| 1998 | 3,176 | 77% | 1991 | 1,158 | 94% | 28% |
| 1999 | 3,045 | 74% | 1924 | 1,105 | 95% | 27% |
| 2000 | 2,790 | 68% | 1988 | 1,022 | 96% | 25% |
| 2001 | 1,562 | 38% | 1929 | 1,013 | 98% | 25% |
| 2002 | 2,881 | 70% | 1990 | 805 | 99% | 19% |
| 2003 | 2,670 | 65% | 1977 | 231 | 100% | 6% |
| Avg | 2,595 | 63% | Avg | 2,595 | | 63% |
| Min | 231 | 6% | Min | 231 | | 6% |
| Max | 4,040 | 98% | Max | 4,040 | | 98% |

Table 5. SWP Table A Deliveries under 2029 conditions and Most Restrictive OMR criteria without climate change

| 2029 Most Restrictive OMR without Climate Change | | | | | | |
|---|---|---|---|---|---|---|
| Year | SWP Table A Delivery | | Probability Curve | | | |
| | (TAF) | Percent of Maximum Table A | Year | SWP Table A Delivery (TAF) | Exceedence Frequency | Percent of Maximum Table A |
| 1922 | 2,269 | 55% | 1983 | 3,958 | 0% | 96% |
| 1923 | 1,855 | 45% | 1969 | 3,860 | 1% | 93% |
| 1924 | 789 | 19% | 1938 | 3,515 | 2% | 85% |
| 1925 | 1,894 | 46% | 1956 | 3,321 | 4% | 80% |
| 1926 | 1,804 | 44% | 1982 | 3,315 | 5% | 80% |
| 1927 | 2,479 | 60% | 1980 | 3,068 | 6% | 74% |
| 1928 | 1,942 | 47% | 1997 | 3,019 | 7% | 73% |
| 1929 | 267 | 6% | 1952 | 3,019 | 9% | 73% |
| 1930 | 1,682 | 41% | 1984 | 3,016 | 10% | 73% |
| 1931 | 1,036 | 25% | 1967 | 2,882 | 11% | 70% |
| 1932 | 1,137 | 28% | 1958 | 2,881 | 12% | 70% |
| 1933 | 1,504 | 36% | 1995 | 2,827 | 14% | 68% |
| 1934 | 420 | 10% | 1986 | 2,740 | 15% | 66% |
| 1935 | 2,548 | 62% | 1999 | 2,677 | 16% | 65% |
| 1936 | 1,954 | 47% | 1998 | 2,662 | 17% | 64% |
| 1937 | 2,603 | 63% | 1978 | 2,607 | 19% | 63% |
| 1938 | 3,515 | 85% | 1937 | 2,603 | 20% | 63% |
| 1939 | 1,651 | 40% | 1935 | 2,548 | 21% | 62% |
| 1940 | 1,977 | 48% | 1974 | 2,537 | 22% | 61% |
| 1941 | 2,519 | 61% | 1943 | 2,525 | 23% | 61% |
| 1942 | 2,200 | 53% | 1941 | 2,519 | 25% | 61% |
| 1943 | 2,525 | 61% | 1945 | 2,512 | 26% | 61% |
| 1944 | 1,622 | 39% | 1927 | 2,479 | 27% | 60% |
| 1945 | 2,512 | 61% | 1970 | 2,465 | 28% | 60% |
| 1946 | 2,155 | 52% | 1989 | 2,397 | 30% | 58% |
| 1947 | 2,097 | 51% | 1951 | 2,392 | 31% | 58% |
| 1948 | 1,920 | 46% | 1985 | 2,355 | 32% | 57% |
| 1949 | 1,859 | 45% | 1973 | 2,345 | 33% | 57% |
| 1950 | 1,825 | 44% | 1996 | 2,335 | 35% | 56% |
| 1951 | 2,392 | 58% | 2002 | 2,329 | 36% | 56% |
| 1952 | 3,019 | 73% | 1975 | 2,305 | 37% | 56% |
| 1953 | 1,723 | 42% | 1922 | 2,269 | 38% | 55% |
| 1954 | 1,774 | 43% | 1993 | 2,246 | 40% | 54% |
| 1955 | 1,345 | 33% | 1965 | 2,239 | 41% | 54% |
| 1956 | 3,321 | 80% | 1979 | 2,209 | 42% | 53% |
| 1957 | 1,779 | 43% | 1942 | 2,200 | 43% | 53% |
| 1958 | 2,881 | 70% | 1946 | 2,155 | 44% | 52% |
| 1959 | 1,687 | 41% | 2000 | 2,149 | 46% | 52% |
| 1960 | 1,720 | 42% | 1971 | 2,135 | 47% | 52% |
| 1961 | 1,771 | 43% | 1963 | 2,100 | 48% | 51% |
| 1962 | 2,035 | 49% | 1947 | 2,097 | 49% | 51% |
| 1963 | 2,100 | 51% | 2003 | 2,074 | 51% | 50% |
| 1964 | 2,060 | 50% | 1964 | 2,060 | 52% | 50% |
| 1965 | 2,239 | 54% | 1962 | 2,035 | 53% | 49% |

Table 5. (cont.) SWP Table A Deliveries under 2029 conditions and Most Restrictive OMR criteria without climate change

| 2029 Most Restrictive OMR without Climate Change | | | | | | |
|---|---|---|---|---|---|---|
| Year | SWP Table A Delivery | | Probability Curve | | | |
| | (TAF) | Percent of Maximum Table A | Year | SWP Table A Delivery (TAF) | Exceedence Frequency | Percent of Maximum Table A |
| 1966 | 1,868 | 45% | 1981 | 2,028 | 54% | 49% |
| 1967 | 2,882 | 70% | 1940 | 1,977 | 56% | 48% |
| 1968 | 1,566 | 38% | 1936 | 1,954 | 57% | 47% |
| 1969 | 3,860 | 93% | 1928 | 1,942 | 58% | 47% |
| 1970 | 2,465 | 60% | 1948 | 1,920 | 59% | 46% |
| 1971 | 2,135 | 52% | 1925 | 1,894 | 60% | 46% |
| 1972 | 1,649 | 40% | 1966 | 1,868 | 62% | 45% |
| 1973 | 2,345 | 57% | 1949 | 1,859 | 63% | 45% |
| 1974 | 2,537 | 61% | 1923 | 1,855 | 64% | 45% |
| 1975 | 2,305 | 56% | 1950 | 1,825 | 65% | 44% |
| 1976 | 1,596 | 39% | 1926 | 1,804 | 67% | 44% |
| 1977 | 189 | 5% | 1957 | 1,779 | 68% | 43% |
| 1978 | 2,607 | 63% | 1954 | 1,774 | 69% | 43% |
| 1979 | 2,209 | 53% | 1961 | 1,771 | 70% | 43% |
| 1980 | 3,068 | 74% | 1953 | 1,723 | 72% | 42% |
| 1981 | 2,028 | 49% | 1960 | 1,720 | 73% | 42% |
| 1982 | 3,315 | 80% | 1959 | 1,687 | 74% | 41% |
| 1983 | 3,958 | 96% | 1930 | 1,682 | 75% | 41% |
| 1984 | 3,016 | 73% | 1939 | 1,651 | 77% | 40% |
| 1985 | 2,355 | 57% | 1972 | 1,649 | 78% | 40% |
| 1986 | 2,740 | 66% | 1944 | 1,622 | 79% | 39% |
| 1987 | 1,020 | 25% | 1976 | 1,596 | 80% | 39% |
| 1988 | 712 | 17% | 1994 | 1,569 | 81% | 38% |
| 1989 | 2,397 | 58% | 1968 | 1,566 | 83% | 38% |
| 1990 | 813 | 20% | 1933 | 1,504 | 84% | 36% |
| 1991 | 1,066 | 26% | 1955 | 1,345 | 85% | 33% |
| 1992 | 878 | 21% | 1932 | 1,137 | 86% | 28% |
| 1993 | 2,246 | 54% | 1991 | 1,066 | 88% | 26% |
| 1994 | 1,569 | 38% | 2001 | 1,049 | 89% | 25% |
| 1995 | 2,827 | 68% | 1931 | 1,036 | 90% | 25% |
| 1996 | 2,335 | 56% | 1987 | 1,020 | 91% | 25% |
| 1997 | 3,019 | 73% | 1992 | 878 | 93% | 21% |
| 1998 | 2,662 | 64% | 1990 | 813 | 94% | 20% |
| 1999 | 2,677 | 65% | 1924 | 789 | 95% | 19% |
| 2000 | 2,149 | 52% | 1988 | 712 | 96% | 17% |
| 2001 | 1,049 | 25% | 1934 | 420 | 98% | 10% |
| 2002 | 2,329 | 56% | 1929 | 267 | 99% | 6% |
| 2003 | 2,074 | 50% | 1977 | 189 | 100% | 5% |
| Avg | 2,060 | 50% | Avg | 2,060 | | 50% |
| Min | 189 | 5% | Min | 189 | | 5% |
| Max | 3,958 | 96% | Max | 3,958 | | 96% |

Table 6. SWP Table A Deliveries for the Least Restrictive OMR criteria with climate change interpolated to 2029 conditions

| 2029 Least Restrictive OMR Estimated Delivery Interpolated to 2029 | | | | | | |
|---|---|---|---|---|---|---|
| Year | SWP Table A Delivery | | Probability Curve | | | |
| | (TAF) | Percent of Maximum Table A | Year | SWP Table A Delivery (TAF) | Exceedence Frequency | Percent of Maximum Table A |
| 1922 | 2,534 | 61% | 1983 | 3,988 | 0% | 96% |
| 1923 | 2,550 | 62% | 1938 | 3,969 | 1% | 96% |
| 1924 | 983 | 24% | 1969 | 3,874 | 2% | 94% |
| 1925 | 1,705 | 41% | 1982 | 3,720 | 4% | 90% |
| 1926 | 2,047 | 50% | 1958 | 3,559 | 5% | 86% |
| 1927 | 2,897 | 70% | 1952 | 3,420 | 6% | 83% |
| 1928 | 2,739 | 66% | 1980 | 3,384 | 7% | 82% |
| 1929 | 1,325 | 32% | 1998 | 3,289 | 9% | 80% |
| 1930 | 1,863 | 45% | 1997 | 3,259 | 10% | 79% |
| 1931 | 1,308 | 32% | 1937 | 3,247 | 11% | 79% |
| 1932 | 1,591 | 38% | 1967 | 3,198 | 12% | 77% |
| 1933 | 1,600 | 39% | 1995 | 3,184 | 14% | 77% |
| 1934 | 1,371 | 33% | 1956 | 3,162 | 15% | 76% |
| 1935 | 2,734 | 66% | 1986 | 3,119 | 16% | 75% |
| 1936 | 2,769 | 67% | 1943 | 3,093 | 17% | 75% |
| 1937 | 3,247 | 79% | 1974 | 3,082 | 19% | 75% |
| 1938 | 3,969 | 96% | 1984 | 3,068 | 20% | 74% |
| 1939 | 2,090 | 51% | 1941 | 3,061 | 21% | 74% |
| 1940 | 2,607 | 63% | 1979 | 3,011 | 22% | 73% |
| 1941 | 3,061 | 74% | 1951 | 2,996 | 23% | 73% |
| 1942 | 2,815 | 68% | 1978 | 2,978 | 25% | 72% |
| 1943 | 3,093 | 75% | 1999 | 2,951 | 26% | 71% |
| 1944 | 2,383 | 58% | 1970 | 2,909 | 27% | 70% |
| 1945 | 2,882 | 70% | 1927 | 2,897 | 28% | 70% |
| 1946 | 2,843 | 69% | 1945 | 2,882 | 30% | 70% |
| 1947 | 2,531 | 61% | 1946 | 2,843 | 31% | 69% |
| 1948 | 2,554 | 62% | 1965 | 2,821 | 32% | 68% |
| 1949 | 2,167 | 52% | 1942 | 2,815 | 33% | 68% |
| 1950 | 2,691 | 65% | 1975 | 2,804 | 35% | 68% |
| 1951 | 2,996 | 73% | 1996 | 2,800 | 36% | 68% |
| 1952 | 3,420 | 83% | 2000 | 2,771 | 37% | 67% |
| 1953 | 2,472 | 60% | 1936 | 2,769 | 38% | 67% |
| 1954 | 2,457 | 59% | 1928 | 2,739 | 40% | 66% |
| 1955 | 1,532 | 37% | 1935 | 2,734 | 41% | 66% |
| 1956 | 3,162 | 76% | 1985 | 2,726 | 42% | 66% |
| 1957 | 2,537 | 61% | 1993 | 2,716 | 43% | 66% |
| 1958 | 3,559 | 86% | 1950 | 2,691 | 44% | 65% |
| 1959 | 2,164 | 52% | 2002 | 2,687 | 46% | 65% |
| 1960 | 2,198 | 53% | 1973 | 2,684 | 47% | 65% |
| 1961 | 1,996 | 48% | 1962 | 2,672 | 48% | 65% |
| 1962 | 2,672 | 65% | 1966 | 2,622 | 49% | 63% |
| 1963 | 2,612 | 63% | 1976 | 2,620 | 51% | 63% |
| 1964 | 2,557 | 62% | 1963 | 2,612 | 52% | 63% |
| 1965 | 2,821 | 68% | 1940 | 2,607 | 53% | 63% |

Table 6. (cont.) SWP Table A Deliveries for the Least Restrictive OMR criteria with climate change interpolated to 2029 conditions

| 2029 Least Restrictive OMR Estimated Delivery Interpolated to 2029 | | | | | | |
|---|---|---|---|---|---|---|
| Year | SWP Table A Delivery | | Probability Curve | | | |
| | (TAF) | Percent of Maximum Table A | Year | SWP Table A Delivery (TAF) | Exceedence Frequency | Percent of Maximum Table A |
| 1966 | 2,622 | 63% | 1971 | 2,584 | 54% | 63% |
| 1967 | 3,198 | 77% | 2003 | 2,572 | 56% | 62% |
| 1968 | 2,410 | 58% | 1964 | 2,557 | 57% | 62% |
| 1969 | 3,874 | 94% | 1989 | 2,554 | 58% | 62% |
| 1970 | 2,909 | 70% | 1948 | 2,554 | 59% | 62% |
| 1971 | 2,584 | 63% | 1923 | 2,550 | 60% | 62% |
| 1972 | 2,435 | 59% | 1957 | 2,537 | 62% | 61% |
| 1973 | 2,684 | 65% | 1922 | 2,534 | 63% | 61% |
| 1974 | 3,082 | 75% | 1947 | 2,531 | 64% | 61% |
| 1975 | 2,804 | 68% | 1981 | 2,480 | 65% | 60% |
| 1976 | 2,620 | 63% | 1953 | 2,472 | 67% | 60% |
| 1977 | 469 | 11% | 1954 | 2,457 | 68% | 59% |
| 1978 | 2,978 | 72% | 1972 | 2,435 | 69% | 59% |
| 1979 | 3,011 | 73% | 1968 | 2,410 | 70% | 58% |
| 1980 | 3,384 | 82% | 1944 | 2,383 | 72% | 58% |
| 1981 | 2,480 | 60% | 1994 | 2,247 | 73% | 54% |
| 1982 | 3,720 | 90% | 1960 | 2,198 | 74% | 53% |
| 1983 | 3,988 | 96% | 1949 | 2,167 | 75% | 52% |
| 1984 | 3,068 | 74% | 1959 | 2,164 | 77% | 52% |
| 1985 | 2,726 | 66% | 1939 | 2,090 | 78% | 51% |
| 1986 | 3,119 | 75% | 1926 | 2,047 | 79% | 50% |
| 1987 | 1,351 | 33% | 1961 | 1,996 | 80% | 48% |
| 1988 | 1,279 | 31% | 1930 | 1,863 | 81% | 45% |
| 1989 | 2,554 | 62% | 1925 | 1,705 | 83% | 41% |
| 1990 | 887 | 21% | 1933 | 1,600 | 84% | 39% |
| 1991 | 1,373 | 33% | 1932 | 1,591 | 85% | 38% |
| 1992 | 1,072 | 26% | 1955 | 1,532 | 86% | 37% |
| 1993 | 2,716 | 66% | 2001 | 1,401 | 88% | 34% |
| 1994 | 2,247 | 54% | 1991 | 1,373 | 89% | 33% |
| 1995 | 3,184 | 77% | 1934 | 1,371 | 90% | 33% |
| 1996 | 2,800 | 68% | 1987 | 1,351 | 91% | 33% |
| 1997 | 3,259 | 79% | 1929 | 1,325 | 93% | 32% |
| 1998 | 3,289 | 80% | 1931 | 1,308 | 94% | 32% |
| 1999 | 2,951 | 71% | 1988 | 1,279 | 95% | 31% |
| 2000 | 2,771 | 67% | 1992 | 1,072 | 96% | 26% |
| 2001 | 1,401 | 34% | 1924 | 983 | 98% | 24% |
| 2002 | 2,687 | 65% | 1990 | 887 | 99% | 21% |
| 2003 | 2,572 | 62% | 1977 | 469 | 100% | 11% |
| Avg | 2,520 | 61% | Avg | 2,520 | | 61% |
| Min | 469 | 11% | Min | 469 | | 11% |
| Max | 3,988 | 96% | Max | 3,988 | | 96% |

Table 7. SWP Table A Deliveries for the Most Restrictive OMR criteria with climate change interpolated to 2029 conditions

| 2029 Most Restrictive OMR Estimated Delivery Interpolated to 2029 | | | | | | |
|---|---|---|---|---|---|---|
| Year | SWP Table A Delivery | | Probability Curve | | | |
| | (TAF) | Percent of Maximum Table A | Year | SWP Table A Delivery (TAF) | Exceedence Frequency | Percent of Maximum Table A |
| 1922 | 2,055 | 50% | 1983 | 3,992 | 0% | 97% |
| 1923 | 1,936 | 47% | 1969 | 3,752 | 1% | 91% |
| 1924 | 758 | 18% | 1938 | 3,249 | 2% | 79% |
| 1925 | 1,586 | 38% | 1982 | 3,204 | 4% | 78% |
| 1926 | 1,768 | 43% | 1956 | 3,120 | 5% | 76% |
| 1927 | 2,480 | 60% | 1984 | 2,963 | 6% | 72% |
| 1928 | 1,838 | 44% | 1980 | 2,864 | 7% | 69% |
| 1929 | 611 | 15% | 1997 | 2,842 | 9% | 69% |
| 1930 | 1,636 | 40% | 1958 | 2,738 | 10% | 66% |
| 1931 | 996 | 24% | 1998 | 2,717 | 11% | 66% |
| 1932 | 1,226 | 30% | 1952 | 2,706 | 12% | 65% |
| 1933 | 1,398 | 34% | 1967 | 2,624 | 14% | 63% |
| 1934 | 718 | 17% | 1995 | 2,587 | 15% | 63% |
| 1935 | 2,421 | 59% | 1978 | 2,568 | 16% | 62% |
| 1936 | 1,900 | 46% | 1999 | 2,522 | 17% | 61% |
| 1937 | 2,425 | 59% | 1945 | 2,507 | 19% | 61% |
| 1938 | 3,249 | 79% | 1986 | 2,489 | 20% | 60% |
| 1939 | 1,532 | 37% | 1927 | 2,480 | 21% | 60% |
| 1940 | 2,008 | 49% | 1937 | 2,425 | 22% | 59% |
| 1941 | 2,331 | 56% | 1935 | 2,421 | 23% | 59% |
| 1942 | 2,092 | 51% | 1943 | 2,386 | 25% | 58% |
| 1943 | 2,386 | 58% | 1974 | 2,341 | 26% | 57% |
| 1944 | 1,507 | 36% | 1941 | 2,331 | 27% | 56% |
| 1945 | 2,507 | 61% | 1951 | 2,323 | 28% | 56% |
| 1946 | 2,064 | 50% | 1985 | 2,322 | 30% | 56% |
| 1947 | 1,958 | 47% | 1973 | 2,322 | 31% | 56% |
| 1948 | 2,070 | 50% | 1970 | 2,233 | 32% | 54% |
| 1949 | 1,628 | 39% | 1996 | 2,208 | 33% | 53% |
| 1950 | 1,898 | 46% | 1965 | 2,206 | 35% | 53% |
| 1951 | 2,323 | 56% | 1962 | 2,205 | 36% | 53% |
| 1952 | 2,706 | 65% | 1989 | 2,198 | 37% | 53% |
| 1953 | 1,753 | 42% | 1979 | 2,173 | 38% | 53% |
| 1954 | 1,746 | 42% | 1975 | 2,119 | 40% | 51% |
| 1955 | 1,116 | 27% | 1993 | 2,102 | 41% | 51% |
| 1956 | 3,120 | 76% | 1942 | 2,092 | 42% | 51% |
| 1957 | 1,846 | 45% | 2003 | 2,086 | 43% | 50% |
| 1958 | 2,738 | 66% | 1963 | 2,074 | 44% | 50% |
| 1959 | 1,696 | 41% | 1948 | 2,070 | 46% | 50% |
| 1960 | 1,656 | 40% | 1946 | 2,064 | 47% | 50% |
| 1961 | 1,538 | 37% | 1922 | 2,055 | 48% | 50% |
| 1962 | 2,205 | 53% | 2002 | 2,019 | 49% | 49% |
| 1963 | 2,074 | 50% | 1971 | 2,014 | 51% | 49% |
| 1964 | 2,003 | 48% | 1940 | 2,008 | 52% | 49% |
| 1965 | 2,206 | 53% | 1964 | 2,003 | 53% | 48% |

Table 7. (cont.) SWP Table A Deliveries for the Most Restrictive OMR criteria with climate change interpolated to 2029 conditions

| 2029 Most Restrictive OMR Estimated Delivery Interpolated to 2029 | | | | | | |
|---|---|---|---|---|---|---|
| Year | SWP Table A Delivery | | Probability Curve | | | |
| | (TAF) | Percent of Maximum Table A | Year | SWP Table A Delivery (TAF) | Exceedence Frequency | Percent of Maximum Table A |
| 1966 | 1,861 | 45% | 2000 | 1,978 | 54% | 48% |
| 1967 | 2,624 | 63% | 1947 | 1,958 | 56% | 47% |
| 1968 | 1,742 | 42% | 1923 | 1,936 | 57% | 47% |
| 1969 | 3,752 | 91% | 1936 | 1,900 | 58% | 46% |
| 1970 | 2,233 | 54% | 1950 | 1,898 | 59% | 46% |
| 1971 | 2,014 | 49% | 1981 | 1,875 | 60% | 45% |
| 1972 | 1,620 | 39% | 1966 | 1,861 | 62% | 45% |
| 1973 | 2,322 | 56% | 1957 | 1,846 | 63% | 45% |
| 1974 | 2,341 | 57% | 1928 | 1,838 | 64% | 44% |
| 1975 | 2,119 | 51% | 1976 | 1,798 | 65% | 44% |
| 1976 | 1,798 | 44% | 1926 | 1,768 | 67% | 43% |
| 1977 | 391 | 9% | 1953 | 1,753 | 68% | 42% |
| 1978 | 2,568 | 62% | 1954 | 1,746 | 69% | 42% |
| 1979 | 2,173 | 53% | 1968 | 1,742 | 70% | 42% |
| 1980 | 2,864 | 69% | 1959 | 1,696 | 72% | 41% |
| 1981 | 1,875 | 45% | 1960 | 1,656 | 73% | 40% |
| 1982 | 3,204 | 78% | 1930 | 1,636 | 74% | 40% |
| 1983 | 3,992 | 97% | 1949 | 1,628 | 75% | 39% |
| 1984 | 2,963 | 72% | 1972 | 1,620 | 77% | 39% |
| 1985 | 2,322 | 56% | 1994 | 1,603 | 78% | 39% |
| 1986 | 2,489 | 60% | 1925 | 1,586 | 79% | 38% |
| 1987 | 901 | 22% | 1961 | 1,538 | 80% | 37% |
| 1988 | 988 | 24% | 1939 | 1,532 | 81% | 37% |
| 1989 | 2,198 | 53% | 1944 | 1,507 | 83% | 36% |
| 1990 | 813 | 20% | 1933 | 1,398 | 84% | 34% |
| 1991 | 1,125 | 27% | 1932 | 1,226 | 85% | 30% |
| 1992 | 904 | 22% | 1991 | 1,125 | 86% | 27% |
| 1993 | 2,102 | 51% | 1955 | 1,116 | 88% | 27% |
| 1994 | 1,603 | 39% | 1931 | 996 | 89% | 24% |
| 1995 | 2,587 | 63% | 1988 | 988 | 90% | 24% |
| 1996 | 2,208 | 53% | 2001 | 944 | 91% | 23% |
| 1997 | 2,842 | 69% | 1992 | 904 | 93% | 22% |
| 1998 | 2,717 | 66% | 1987 | 901 | 94% | 22% |
| 1999 | 2,522 | 61% | 1990 | 813 | 95% | 20% |
| 2000 | 1,978 | 48% | 1924 | 758 | 96% | 18% |
| 2001 | 944 | 23% | 1934 | 718 | 98% | 17% |
| 2002 | 2,019 | 49% | 1929 | 611 | 99% | 15% |
| 2003 | 2,086 | 50% | 1977 | 391 | 100% | 9% |
| Avg | 1,994 | 48% | Avg | 1,994 | | 48% |
| Min | 391 | 9% | Min | 391 | | 9% |
| Max | 3,992 | 97% | Max | 3,992 | | 97% |

Table 8. SWP Article 21 Deliveries under current (2009) conditions for the Least and Most Restrictive OMR criteria

| 2009 Least Restrictive OMR | | 2009 Most Restrictive OMR | |
|---|---|---|---|
| Year | Article 21 Delivery (TAF) | Year | Article 21 Delivery (TAF) |
| 1922 | 16 | 1922 | 16 |
| 1923 | 12 | 1923 | 18 |
| 1924 | 8 | 1924 | 11 |
| 1925 | 454 | 1925 | 16 |
| 1926 | 11 | 1926 | 8 |
| 1927 | 14 | 1927 | 14 |
| 1928 | 8 | 1928 | 16 |
| 1929 | 10 | 1929 | 12 |
| 1930 | 10 | 1930 | 10 |
| 1931 | 6 | 1931 | 8 |
| 1932 | 10 | 1932 | 12 |
| 1933 | 451 | 1933 | 12 |
| 1934 | 10 | 1934 | 12 |
| 1935 | 15 | 1935 | 14 |
| 1936 | 11 | 1936 | 18 |
| 1937 | 112 | 1937 | 16 |
| 1938 | 535 | 1938 | 16 |
| 1939 | 2 | 1939 | 2 |
| 1940 | 14 | 1940 | 14 |
| 1941 | 2 | 1941 | 2 |
| 1942 | 6 | 1942 | 14 |
| 1943 | 9 | 1943 | 14 |
| 1944 | 11 | 1944 | 13 |
| 1945 | 147 | 1945 | 16 |
| 1946 | 12 | 1946 | 20 |
| 1947 | 6 | 1947 | 12 |
| 1948 | 10 | 1948 | 14 |
| 1949 | 12 | 1949 | 12 |
| 1950 | 18 | 1950 | 21 |
| 1951 | 539 | 1951 | 14 |
| 1952 | 2 | 1952 | 2 |
| 1953 | 8 | 1953 | 16 |
| 1954 | 14 | 1954 | 15 |
| 1955 | 42 | 1955 | 16 |
| 1956 | 747 | 1956 | 267 |
| 1957 | 18 | 1957 | 20 |
| 1958 | 139 | 1958 | 18 |
| 1959 | 5 | 1959 | 12 |
| 1960 | 11 | 1960 | 13 |
| 1961 | 8 | 1961 | 12 |
| 1962 | 12 | 1962 | 13 |
| 1963 | 18 | 1963 | 18 |
| 1964 | 8 | 1964 | 16 |
| 1965 | 45 | 1965 | 14 |
| 1966 | 10 | 1966 | 17 |
| 1967 | 21 | 1967 | 18 |

Table 8. (cont.) SWP Article 21 Deliveries under current (2009) conditions for the Least and Most Restrictive OMR criteria

| **2009 Least Restrictive OMR** | | **2009 Most Restrictive OMR** | |
|---|---|---|---|
| Year | Article 21 Delivery (TAF) | Year | Article 21 Delivery (TAF) |
| 1968 | 6 | 1968 | 14 |
| 1969 | 205 | 1969 | 109 |
| 1970 | 250 | 1970 | 10 |
| 1971 | 9 | 1971 | 16 |
| 1972 | 18 | 1972 | 20 |
| 1973 | 16 | 1973 | 15 |
| 1974 | 97 | 1974 | 18 |
| 1975 | 14 | 1975 | 18 |
| 1976 | 10 | 1976 | 16 |
| 1977 | 2 | 1977 | 4 |
| 1978 | 44 | 1978 | 2 |
| 1979 | 4 | 1979 | 9 |
| 1980 | 146 | 1980 | 87 |
| 1981 | 16 | 1981 | 16 |
| 1982 | 443 | 1982 | 87 |
| 1983 | 853 | 1983 | 883 |
| 1984 | 483 | 1984 | 168 |
| 1985 | 2 | 1985 | 3 |
| 1986 | 127 | 1986 | 2 |
| 1987 | 12 | 1987 | 12 |
| 1988 | 10 | 1988 | 11 |
| 1989 | 67 | 1989 | 10 |
| 1990 | 10 | 1990 | 12 |
| 1991 | 12 | 1991 | 14 |
| 1992 | 8 | 1992 | 10 |
| 1993 | 14 | 1993 | 14 |
| 1994 | 10 | 1994 | 10 |
| 1995 | 2 | 1995 | 2 |
| 1996 | 6 | 1996 | 14 |
| 1997 | 60 | 1997 | 14 |
| 1998 | 234 | 1998 | 6 |
| 1999 | 132 | 1999 | 8 |
| 2000 | 14 | 2000 | 16 |
| 2001 | 14 | 2001 | 16 |
| 2002 | 65 | 2002 | 16 |
| 2003 | 12 | 2003 | 14 |
| Avg | 86 | Avg | 31 |
| Min | 2 | Min | 2 |
| Max | 853 | Max | 883 |

Table 9. SWP Article 21 Deliveries under 2029 Conditions for the Least and Most Restrictive OMR criteria without climate change

| **2029 Least Restrictive OMR without Climate Change** | | **2029 Most Restrictive OMR without Climate Change** | |
|---|---|---|---|
| Year | Article 21 Delivery (TAF) | Year | Article 21 Delivery (TAF) |
| 1922 | 16 | 1922 | 16 |
| 1923 | 15 | 1923 | 18 |
| 1924 | 9 | 1924 | 10 |
| 1925 | 500 | 1925 | 14 |
| 1926 | 141 | 1926 | 6 |
| 1927 | 91 | 1927 | 14 |
| 1928 | 12 | 1928 | 14 |
| 1929 | 10 | 1929 | 12 |
| 1930 | 10 | 1930 | 10 |
| 1931 | 8 | 1931 | 8 |
| 1932 | 155 | 1932 | 12 |
| 1933 | 409 | 1933 | 12 |
| 1934 | 10 | 1934 | 10 |
| 1935 | 44 | 1935 | 10 |
| 1936 | 12 | 1936 | 16 |
| 1937 | 56 | 1937 | 15 |
| 1938 | 63 | 1938 | 12 |
| 1939 | 10 | 1939 | 12 |
| 1940 | 14 | 1940 | 14 |
| 1941 | 2 | 1941 | 2 |
| 1942 | 14 | 1942 | 14 |
| 1943 | 12 | 1943 | 16 |
| 1944 | 10 | 1944 | 14 |
| 1945 | 86 | 1945 | 17 |
| 1946 | 18 | 1946 | 19 |
| 1947 | 10 | 1947 | 10 |
| 1948 | 10 | 1948 | 12 |
| 1949 | 11 | 1949 | 12 |
| 1950 | 18 | 1950 | 16 |
| 1951 | 276 | 1951 | 14 |
| 1952 | 1 | 1952 | 2 |
| 1953 | 16 | 1953 | 16 |
| 1954 | 14 | 1954 | 14 |
| 1955 | 11 | 1955 | 18 |
| 1956 | 513 | 1956 | 69 |
| 1957 | 17 | 1957 | 20 |
| 1958 | 8 | 1958 | 15 |
| 1959 | 10 | 1959 | 10 |
| 1960 | 8 | 1960 | 12 |
| 1961 | 8 | 1961 | 10 |
| 1962 | 10 | 1962 | 12 |
| 1963 | 19 | 1963 | 20 |
| 1964 | 14 | 1964 | 17 |
| 1965 | 14 | 1965 | 14 |
| 1966 | 16 | 1966 | 15 |

Table 9. (cont.) SWP Article 21 Deliveries under 2029 Conditions for the Least and Most Restrictive OMR criteria without climate change

| **2029 Least Restrictive OMR without Climate Change** | | **2029 Most Restrictive OMR without Climate Change** | |
|---|---|---|---|
| Year | Article 21 Delivery (TAF) | Year | Article 21 Delivery (TAF) |
| 1967 | 12 | 1967 | 15 |
| 1968 | 12 | 1968 | 13 |
| 1969 | 30 | 1969 | 0 |
| 1970 | 119 | 1970 | 18 |
| 1971 | 14 | 1971 | 15 |
| 1972 | 15 | 1972 | 20 |
| 1973 | 16 | 1973 | 16 |
| 1974 | 15 | 1974 | 16 |
| 1975 | 14 | 1975 | 14 |
| 1976 | 12 | 1976 | 14 |
| 1977 | 4 | 1977 | 4 |
| 1978 | 2 | 1978 | 2 |
| 1979 | 12 | 1979 | 14 |
| 1980 | 8 | 1980 | 48 |
| 1981 | 14 | 1981 | 16 |
| 1982 | 185 | 1982 | 12 |
| 1983 | 549 | 1983 | 510 |
| 1984 | 532 | 1984 | 181 |
| 1985 | 8 | 1985 | 9 |
| 1986 | 145 | 1986 | 2 |
| 1987 | 10 | 1987 | 12 |
| 1988 | 11 | 1988 | 13 |
| 1989 | 53 | 1989 | 8 |
| 1990 | 10 | 1990 | 14 |
| 1991 | 12 | 1991 | 14 |
| 1992 | 8 | 1992 | 10 |
| 1993 | 12 | 1993 | 14 |
| 1994 | 10 | 1994 | 10 |
| 1995 | 1 | 1995 | 1 |
| 1996 | 14 | 1996 | 14 |
| 1997 | 95 | 1997 | 14 |
| 1998 | 58 | 1998 | 4 |
| 1999 | 258 | 1999 | 14 |
| 2000 | 14 | 2000 | 16 |
| 2001 | 14 | 2001 | 15 |
| 2002 | 81 | 2002 | 13 |
| 2003 | 16 | 2003 | 14 |
| Avg | 63 | Avg | 22 |
| Min | 1 | Min | 0 |
| Max | 549 | Max | 510 |

Table 10. SWP Article 21 Deliveries for the Least and Most Restrictive OMR criteria with climate change interpolated to 2029 conditions

| **2029 Least Restrictive OMR interpolated to 2029 Climate Change** | | **2029 Most Restrictive OMR interpolated to 2029 Climate Change** | |
|---|---|---|---|
| Year | 2029 Interpolated Delivery (TAF) | Year | 2029 Interpolated Delivery (TAF) |
| 1922 | 16 | 1922 | 16 |
| 1923 | 17 | 1923 | 18 |
| 1924 | 10 | 1924 | 12 |
| 1925 | 440 | 1925 | 16 |
| 1926 | 77 | 1926 | 8 |
| 1927 | 174 | 1927 | 15 |
| 1928 | 11 | 1928 | 14 |
| 1929 | 76 | 1929 | 12 |
| 1930 | 69 | 1930 | 11 |
| 1931 | 7 | 1931 | 8 |
| 1932 | 203 | 1932 | 13 |
| 1933 | 272 | 1933 | 12 |
| 1934 | 27 | 1934 | 10 |
| 1935 | 28 | 1935 | 10 |
| 1936 | 15 | 1936 | 19 |
| 1937 | 78 | 1937 | 17 |
| 1938 | 38 | 1938 | 12 |
| 1939 | 9 | 1939 | 12 |
| 1940 | 13 | 1940 | 14 |
| 1941 | 2 | 1941 | 2 |
| 1942 | 16 | 1942 | 15 |
| 1943 | 14 | 1943 | 16 |
| 1944 | 11 | 1944 | 15 |
| 1945 | 152 | 1945 | 19 |
| 1946 | 19 | 1946 | 20 |
| 1947 | 10 | 1947 | 10 |
| 1948 | 9 | 1948 | 12 |
| 1949 | 44 | 1949 | 13 |
| 1950 | 19 | 1950 | 18 |
| 1951 | 182 | 1951 | 15 |
| 1952 | 1 | 1952 | 2 |
| 1953 | 17 | 1953 | 16 |
| 1954 | 13 | 1954 | 13 |
| 1955 | 11 | 1955 | 16 |
| 1956 | 541 | 1956 | 56 |
| 1957 | 17 | 1957 | 21 |
| 1958 | 50 | 1958 | 15 |
| 1959 | 10 | 1959 | 11 |
| 1960 | 9 | 1960 | 12 |
| 1961 | 17 | 1961 | 11 |
| 1962 | 10 | 1962 | 10 |
| 1963 | 17 | 1963 | 18 |
| 1964 | 12 | 1964 | 16 |

Table 10. (cont.) SWP Article 21 Deliveries for the Least and Most Restrictive OMR criteria with climate change interpolated to 2029 conditions

| **2029 Least Restrictive OMR interpolated to 2029 Climate Change** | | **2029 Most Restrictive OMR interpolated to 2029 Climate Change** | |
|---|---|---|---|
| Year | 2029 Interpolated Delivery (TAF) | Year | 2029 Interpolated Delivery (TAF) |
| 1965 | 14 | 1965 | 15 |
| 1966 | 15 | 1966 | 17 |
| 1967 | 15 | 1967 | 16 |
| 1968 | 11 | 1968 | 13 |
| 1969 | 28 | 1969 | 1 |
| 1970 | 69 | 1970 | 18 |
| 1971 | 16 | 1971 | 16 |
| 1972 | 17 | 1972 | 21 |
| 1973 | 18 | 1973 | 19 |
| 1974 | 15 | 1974 | 17 |
| 1975 | 16 | 1975 | 17 |
| 1976 | 12 | 1976 | 13 |
| 1977 | 4 | 1977 | 3 |
| 1978 | 1 | 1978 | 1 |
| 1979 | 23 | 1979 | 12 |
| 1980 | 5 | 1980 | 25 |
| 1981 | 14 | 1981 | 15 |
| 1982 | 101 | 1982 | 13 |
| 1983 | 510 | 1983 | 448 |
| 1984 | 531 | 1984 | 181 |
| 1985 | 9 | 1985 | 9 |
| 1986 | 75 | 1986 | 2 |
| 1987 | 52 | 1987 | 12 |
| 1988 | 139 | 1988 | 11 |
| 1989 | 30 | 1989 | 9 |
| 1990 | 11 | 1990 | 14 |
| 1991 | 88 | 1991 | 14 |
| 1992 | 9 | 1992 | 10 |
| 1993 | 17 | 1993 | 16 |
| 1994 | 9 | 1994 | 10 |
| 1995 | 1 | 1995 | 2 |
| 1996 | 15 | 1996 | 16 |
| 1997 | 103 | 1997 | 13 |
| 1998 | 30 | 1998 | 4 |
| 1999 | 139 | 1999 | 16 |
| 2000 | 12 | 2000 | 15 |
| 2001 | 14 | 2001 | 17 |
| 2002 | 115 | 2002 | 14 |
| 2003 | 14 | 2003 | 13 |
| Avg | 62 | Avg | 21 |
| Min | 1 | Min | 1 |
| Max | 541 | Max | 448 |

Figure 1. SWP Table A delivery probability under current conditions

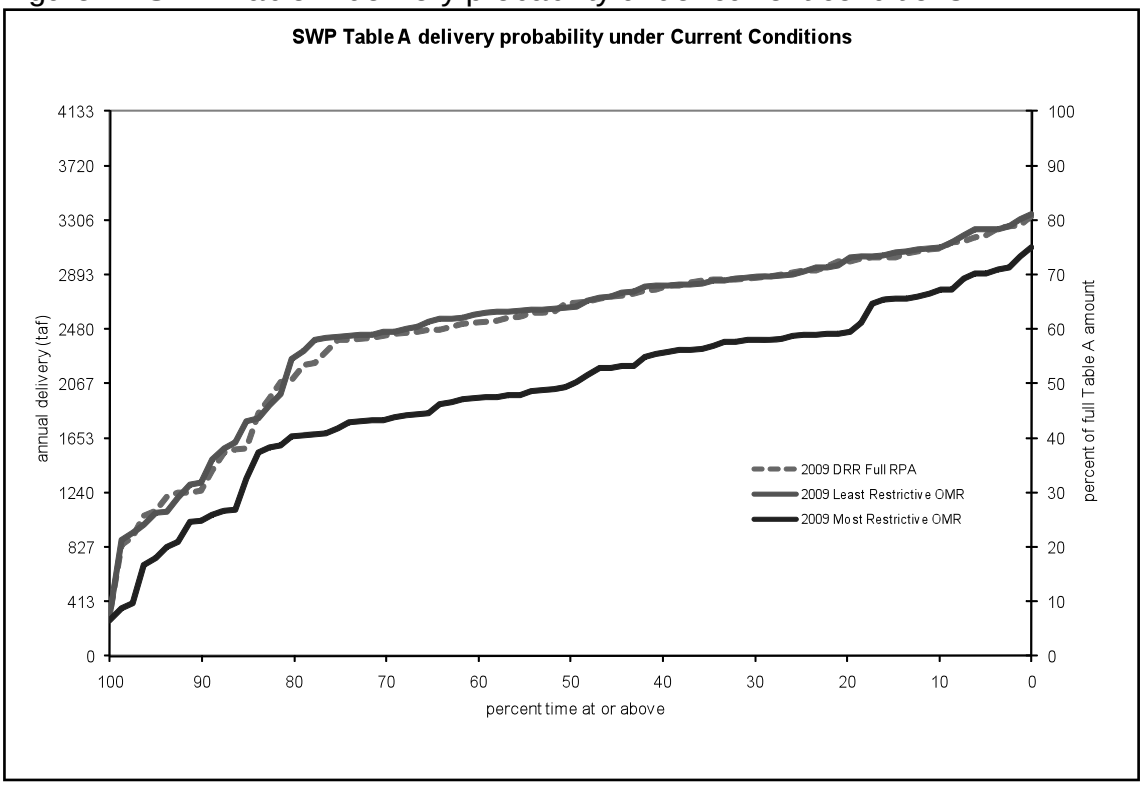



Figure 2. SWP Table A delivery probability under Future Conditions without Climate Change

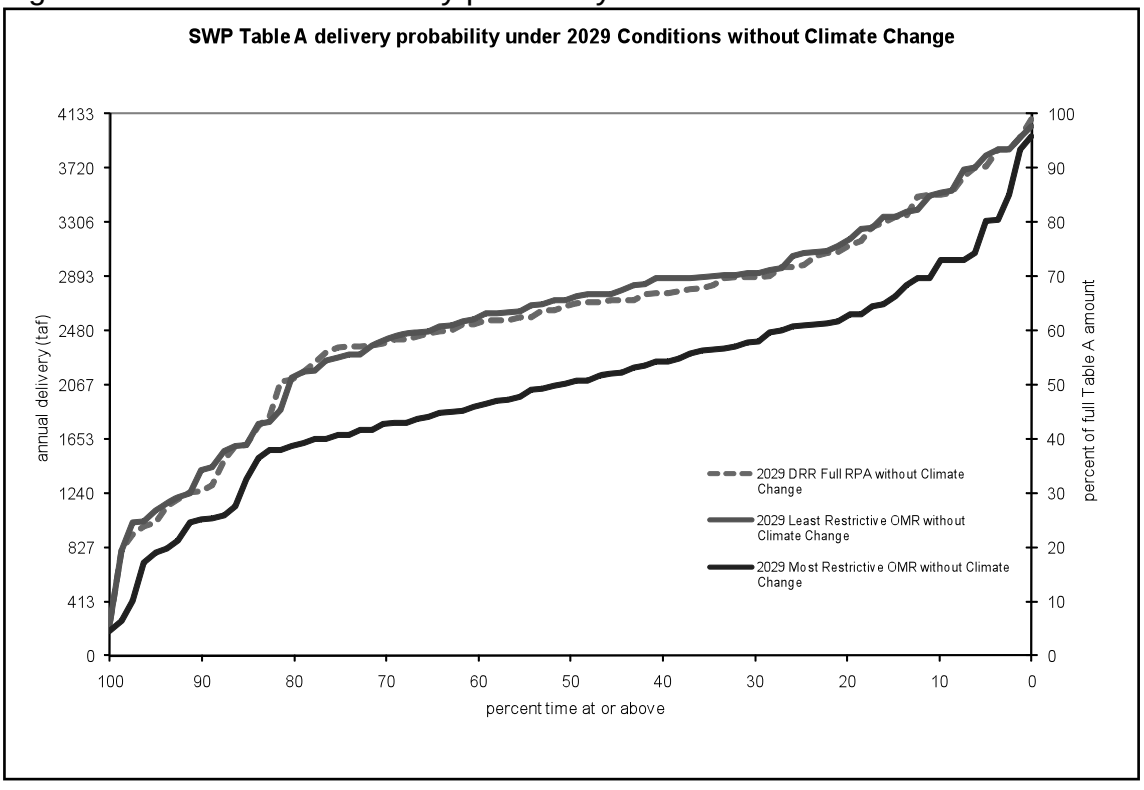
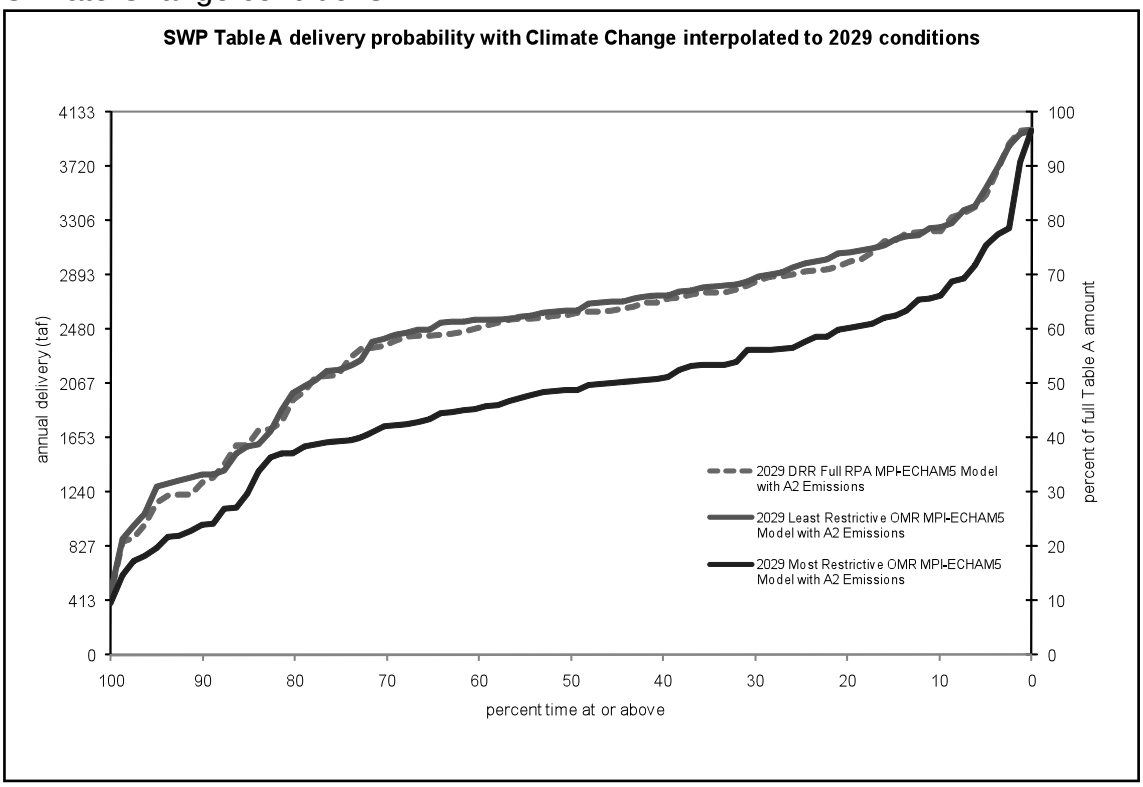


Figure 3. SWP Table A delivery probability under Future Conditions interpolated to assumed 2029 Climate Change conditions



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**Letter from Valencia Water Company to Los Angeles County, June 8, 2011, Regarding Well 201**

Valencia Water Company

24631 Avenue Rockefeller • Valencia, CA 91355-3907
(661) 294-0828 • Fax (661) 294-3806

June 8, 2011

William T. Fujioka
Chief Executive Officer
County of Los Angeles
500 West Temple Street
Los Angeles, CA 90012

Re: Valencia Water Company's Well 201

Dear Mr. Fujioka:

This letter is to inform the County of Los Angeles (County) that Valencia Water Company (Valencia) notified the Whittaker-Bermite property owners that Valencia will seek remediation funds to clean-up a closed well, located east of I-5, near City Hall in Santa Clarita, following routine water quality testing that detected low levels of perchlorate. The remediation funds are being sought under a 2007 settlement agreement among Castaic Lake Water Agency (CLWA), Newhall County Water District, Santa Clarita Water Division, Valencia Water Company, and Whittaker Corporation and others to address clean-up of impacted wells from the former munitions site. Under the settlement agreement, the closed well, Well 201, is eligible for "rapid response" funding. The balance of this letter provides further background, including plans for installation of wellhead treatment at Well 201.

Valencia's Well 201 is a Saugus municipal-supply well. In August, 2010, Valencia Water Company detected perchlorate in Well 201. Although the perchlorate levels were within safe drinking water standards, Valencia immediately took the well out of service and notified the California Department of Public Health. The Department requested that Valencia test the well on a quarterly basis. Valencia continued to monitor the inactive well on a monthly basis and the latest testing has confirmed that perchlorate is still present and that wellhead treatment is needed as outlined in the 2007 settlement agreement with Whittaker.

CLWA and the Whittaker-Bermite property owners negotiated the settlement of litigation over perchlorate contamination of a portion of the groundwater basin in April 2007. As part of the settlement, certain wells were identified as potentially threatened by perchlorate, including Valencia Well 201. As a result, the settlement included "rapid response" funding in the event that one or more of those wells were impacted by perchlorate in the future. This funding, from Whittaker, will be used to install wellhead treatment that removes perchlorate from the water, so that it meets safe drinking water standards. In April 2005, Valencia successfully worked with

the Department of Public Health in implementing wellhead treatment at Well Q2, utilizing the same treatment technology contemplated for Well 201. As a result, Well Q2 was returned to water supply service by October 2005. Since then, Valencia's Well Q2 has had no perchlorate detection, and has been regularly tested and monitored as specified by the Department of Public Health.

The removal of Well 201 from service will not have any near-term or long-term impacts on the quality or cost of water to the end users. Those costs will be addressed under the 2007 settlement agreement and the "rapid response" funding provisions in that agreement. The closing of the well also will not impact the Santa Clarita Valley water suppliers' ability to adequately provide water to customers. CLWA and the water retailers continue to ensure that all drinking water quality standards are met and solutions are put in place to address the presence of perchlorate in small portions of the Valley's groundwater aquifers.

In addition, the perchlorate detected in Valencia's Well 201 will be examined in detail in the pending update of 2010 Santa Clarita Valley Urban Water Management Plan. Based on the analysis already conducted for the draft 2010 UWMP, temporarily taking Well 201 out of service, while wellhead treatment is permitted and installed, will have no impact on the Valley's water supplies, which are sufficient to meet the current and projected water demands in the Santa Clarita Valley, even after taking into account the impacted well.

Last year, a $13 million treatment facility near Bouquet Canyon Road and the Santa Clara River came on line to treat perchlorate in groundwater emanating from the Whittaker-Bermite property site. This treatment facility is part of a larger regulatory program that includes the restoration of two perchlorate-impacted wells to extract contaminated groundwater and control the migration of perchlorate in the Saugus Formation aquifer. The cost of that "pump and treat" system also is covered under the 2007 settlement agreement, which protects the public from paying for the remediation costs.

As stated above, as part of the settlement, certain wells were identified as potentially threatened by perchlorate, including Well 201, due to their location. Thus, while the now-operational pump and treat system is intended to control migration of perchlorate, the possibility of further contamination in the direction of groundwater flow was recognized before installation of the pump and treat system, and provisions were incorporated in the overall program to treat additional wells impacted by perchlorate. Initial operation of the pump and treat system is functioning as planned, and is still applicable for both of its objectives, namely to control contaminant migration near the source, and to extract perchlorate from the Saugus formation aquifer. In short, the detection of perchlorate at Well 201 does not reflect any change in the anticipated long-term effectiveness of the pump and treat system.

Since 1997, seven wells in the Santa Clarita Valley, including this most recent well, have been impacted by perchlorate. Three of those wells have been successfully treated and returned to service, two have been replaced, one is planned to be replaced, and this most recent well will have treatment installed.

Perchlorate is a regulated drinking water contaminant in California with a maximum contaminant level of 6 parts per billion (ppb). Valencia's test in August 2010 at well 201 was 5 ppb. During the last several months, readings have varied from 5.7 ppb to 12 ppb in the most recent test.

Perchlorate is both a naturally occurring and a man-made ion used to form a variety of salts. The primary man-made use of perchlorate is as an oxidizer in solid rocket fuel and other propellants and to a lesser extent, in fireworks, explosives, and air-bag inflators. It is highly soluble in water and has been detected in groundwater and surface water in 26 states. It also has been detected in water supplies in close proximity to sites where solid rocket fuel is manufactured or used, such as in Santa Clarita, where the former Whittaker-Bermite company used rocket fuel on its site during World War II. Based on testing and other published data, Valencia believes the origin of the perchlorate found in well 201 is from the former Whittaker-Bermite site, located at 22116 West Soledad Canyon Road, Santa Clarita Valley, Los Angeles County, California. This site has been the subject of federal, state, and local oversight by several regulatory agencies. Ongoing monitoring of all active municipal wells near the former Whittaker-Bermite site has shown no detection of perchlorate in any other active well.

We believe the preemptive actions taken by Valencia Water Company, in coordination with the other water suppliers in the Santa Clarita Valley, ensure the safety and adequacy of the Valley's groundwater supplies. If you should have any questions, please call me at (661) 295-6501.

Sincerely,

Keith Abercrombie
General Manager

cc: Eric Lardiere, General Counsel, Whittaker Corporation
Dan Masnada, General Manager, Castaic Lake Water Agency
Mauricio Guardado, Retail Manager, Santa Clarita Water Division
Steve Cole, General Manager, Newhall County Water District
Adam Ariki, District Engineer, Los Angeles County Department of Public Works

**Letters to Valencia Water Company**
**and Newhall County Water District Regarding Well Monitoring**
**from the California Department of Public Health, dated August 4, 2011**

State of California—Health and Human Services Agency
California Department of Public Health

RON CHAPMAN, MD, MPH
*Director*

EDMUND G. BROWN JR.
*Governor*

August 4, 2011

Mr. Keith Abercrombie
General Manager
Valencia Water Company
24631 Avenue Rockefeller
P.O. Box 5904
Valencia, CA 91385

Dear Mr. Abercrombie:

**SYSTEM NO. 1910240 – REQUEST TO INCREASE PERCHLORATE MONITORING AT WELLS N, N7, N8, S6, S7, S8, 160, AND 205 FROM ANNUALLY TO QUARTERLY**

Due to the initial perchlorate detection of 5 ug/L in August 2010, Well 201 has since been taken out of service and monitored on a monthly basis. The recent testing continues to show the presence of perchlorate with levels ranging from 5.7 ug/L to 12 ug/L in the well water. Because of this finding, the Department requests that perchlorate monitoring frequency be increased to quarterly at additional sources in proximity that may be vulnerable to perchlorate contamination. These wells include Wells N, N7, N8, S6, S7, S8, 160, and 205. Please begin quarterly monitoring at these wells immediately in the third quarter of 2011 and continue monitoring Well 201 for perchlorate on a monthly basis, and Well Q2 on a quarterly basis.

Please be reminded of the regulatory requirements related to the monitoring and compliance of perchlorate. Per Title 22, Section 64432.3 (d), you are required to do the following whenever you have an MCL exceedance in a single sample of perchlorate:

- Require your laboratory to notify you within 48 hours of the result whenever the level of perchlorate in single sample exceeds the MCL.
- Collect and analyze a confirmation sample within 48 hours of the notification of the original sample.
- Calculate the average of the original and confirmation samples.
- If the average exceeds the MCL, report the results to the Department within 48 hours and issue a Tier 1 notice to your customers within 24 hours after you learn of the violation.

Southern California Drinking Water Field Operations Branch, Southern California Section
500 North Central Ave., Suite 500, Glendale, CA 91203
Telephone: (818)551-2004 Fax: (818)551-2054
Internet Address: www.cdph.ca.gov

In addition to perchlorate detections, VOCs have also been recently detected at the nearby CLWA Saugus Wells 1 and 2 below the MCLs. It is important that you continue to monitor all of your wells annually for VOCs in order to identify any impact of VOCs on your wells. When any VOCs are detected, you are required to increase the monitoring frequency to quarterly per Title 22, Section 64445.1(c). Please also notify the Department of any VOC detections at your wells immediately.

If you have any questions, please call Karen Wong at (818) 551-2037.

Sincerely,

Jeff O'Keefe, P.E.
District Engineer
Metropolitan District

cc: Mr. Dan Masnada
General Manager
Castaic Lake Water Agency
27234 Bouquet Canyon Road
Santa Clarita, CA 91350

Mr. Jose Diaz
Project Manager
Cal-EPA – DTSC Brownfields and Environmental Restoration
9211 Oakdale Avenue
Chatsworth, CA 91311

State of California—Health and Human Services Agency
California Department of Public Health

RON CHAPMAN, MD, MPH
*Director*

EDMUND G. BROWN JR.
*Governor*

August 4, 2011

Mr. Stephen L. Cole
General Manager
Newhall County Water District
23780 North Pine Street
P.O. Box 220970
Santa Clarita, CA 91322-0970

Dear Mr. Cole:

**SYSTEM NO. 1910096 – REQUEST TO INCREASE PERCHLORATE MONITORING AT WELLS 12 AND 13 FROM ANNUALLY TO QUARTERLY**

Due to confirmed perchlorate detections at Valencia Well 201, the Department requests that perchlorate monitoring frequency be increased to quarterly at additional sources in proximity that may be vulnerable to perchlorate contamination. These wells include Newhall County Water District – Newhall System Wells 12 and 13. Please begin quarterly monitoring at these wells immediately in the third quarter of 2011.

Please be reminded of the regulatory requirements related to the monitoring and compliance of perchlorate. Per Title 22, Section 64432.3 (d), you are required to do the following whenever you have an MCL exceedance in a single sample of perchlorate:

- Require your laboratory to notify you within 48 hours of the result whenever the level of perchlorate in single sample exceeds the MCL.
- Collect and analyze a confirmation sample within 48 hours of the notification of the original sample.
- Calculate the average of the original and confirmation samples.
- If the average exceeds the MCL, report the results to the Department within 48 hours and issue a Tier 1 notice to your customers within 24 hours after you learn of the violation.

In addition to perchlorate detections, VOCs have also been recently detected at the nearby CLWA Saugus Wells 1 and 2 below the MCLs. It is important that you continue to monitor all of your wells annually for VOCs in order to identify any impact of VOCs on your wells. When any VOCs are detected, you are required to increase the monitoring

frequency to quarterly per Title 22, Section 64445.1(c). Please also notify the Department of any VOC detections at your wells immediately.
If you have any questions, please call Karen Wong at (818) 551-2037.

Sincerely,

Jeff O'Keefe, P.E.
District Engineer
Metropolitan District

cc: Mr. Dan Masnada
General Manager
Castaic Lake Water Agency
27234 Bouquet Canyon Road
Santa Clarita, CA 91350

Mr. Jose Diaz
Project Manager
Cal-EPA – DTSC Brownfields and Environmental Restoration
9211 Oakdale Avenue
Chatsworth, CA 91311

**Summary of Water Quality Compliance Monitoring Results for Valencia Commerce Center Well E-15, 2006–2009**

SEMITROPIC
GROUNDWATER BANKING
WATER STORAGE DISTRICT

*1101 Central Avenue, P.O. Box 8043*
*Wasco, California 93280-0877*

*Telephone: (661) 758-5113*
*Bakersfield: (661) 327-7144*
*Facsimile: (661) 758-3219*
*Email: mail@semitropic.com*

Newhall Land & Farming Company
Attention: Beverly Langeveldt
25124 Springfield Court, Suite 300
Valencia, CA 91355

Dear Ms. Langeveldt:

As of December 31, 2010, Newhall Land and Farming has 23,167Acre Feet (AF) of water stored in Semitropic Water Storage District.

Please let me know if you need further information.

Sincerely,

Judy Burns

Judy Burns
Accounting Supervisor

NEWHALL LAND

April 27, 2011

Sam Dea
Supervising Regional Planner
County of Los Angeles
Department of Regional Planning
320 West Temple Street, 13th floor
Room 1362
Los Angeles, CA, 90012-3225

Dear Mr. Dea:

This correspondence and attachments are provided in compliance with the Newhall Ranch Specific Plan Final EIR Mitigation Measure 4.11-15 (below) to provide an annual report indicating the amount of groundwater used in Los Angeles County for irrigation.

4.11-15 Groundwater historically and presently used for crop irrigation on the Newhall Ranch Specific Plan site and elsewhere in Los Angeles County shall be made available by the Newhall Land and Farming Company, or its assignee, to partially meet the potable water demands of the Newhall Ranch Specific Plan. The amount of groundwater pumped for this purpose shall not exceed 7,038 AFY. This is the amount of groundwater pumped historically and presently by the Newhall Land and Farming Company in Los Angeles County to support its agricultural operations. Pumping this amount will not result in a net increase in groundwater use in the Santa Clarita Valley. To monitor groundwater use, the Newhall Land and Farming Company, or its assignee, shall provide the County an annual report indicating the amount of groundwater used in Los Angeles County and the specific land upon which that groundwater was historically used for irrigation. For agricultural land located off the Newhall Ranch Specific Plan site in Los Angeles County, at the time agricultural groundwater is transferred from agricultural uses on that land to Specific Plan uses, The Newhall Land and Farming Company, or its assignee, shall provide a verified statement to the County's Department of Regional Planning that Alluvial aquifer water rights on that land will now be used to meet Specific Plan demand. (emphasis added)

The information provided in the attached chart depicts the amount of irrigation water used on Newhall's Los Angeles County farm fields for crop season 2010, using the same methodology from the Final EIR (FEIR). Revised Table 2.5-32 from the FEIR is also attached showing the original information for the years 1996 – 2000 that served as the baseline for determining the estimated annual average usage of 7,038 acre feet. A map is also attached showing the specific land in Los Angeles County upon which the groundwater has historically been used.

Newhall's annual water use varies based upon the amount of irrigated acres, the type of irrigated crops and their water demand as determined by California Irrigation Management Information System.

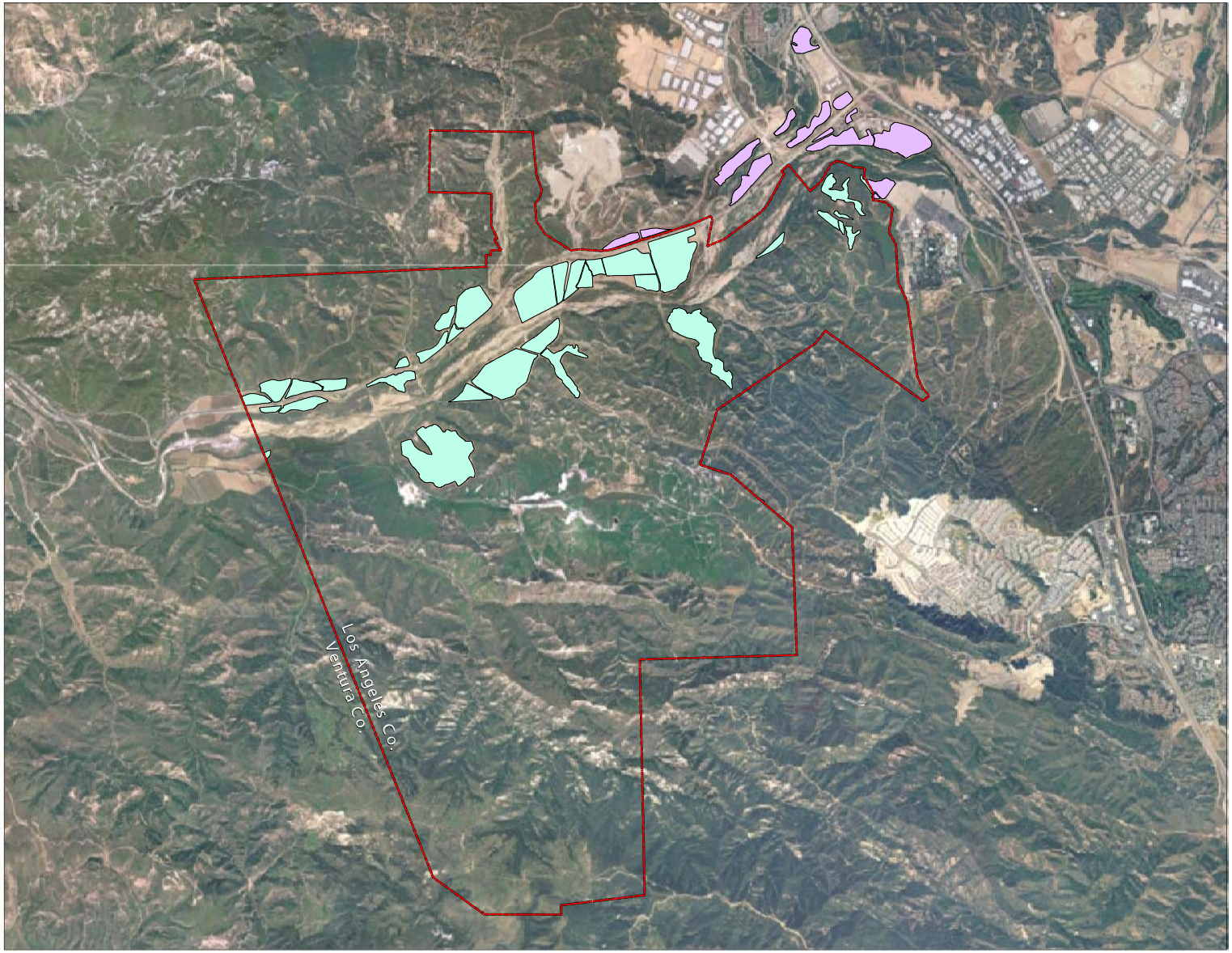
If you have any questions regarding this letter or the attached exhibits please contact me at (661) 255-4449.

Newhall Land

Alex Herrell
Director, Community Development

**Newhall Ranch Specific Plan**
**2010 Annual Report**
**Los Angeles County Agriculture Water Use**
Mitigation Measure 4.11 -15

| Crop Type | Total Irrigated Acres | Adjusted CIMIS Water Use (af/ac) | Adjusted CIMIS Water Use (af/yr) | %of Water use by Crop | Total Pumped Water Based on SCE (af) | Allocation of Total Pumped Water By Crop (af/yr) | Acre Feet/ Year per Acre of Crop | LA Co. Irrigated Crops (acres) | LA Co. Crop Share Of Actual Pumped Water (af/yr) | LA Co. Crop Share Using Adjusted CIMIS (af/yr) |
|---|---|---|---|---|---|---|---|---|---|---|
| Citrus | 273 | 4.33 | 1182 | 9.43% | 11421 | 1077 | 3.95 | | | |
| Alfalfa | 82 | 7.07 | 580 | 4.63% | | 528 | 6.44 | 82 | 528 | 580 |
| Irrigated Hay | 28 | 7.07 | 198 | 1.58% | | 180 | 6.44 | | | |
| Sudan Grass (double Crop) | | 0 | 0 | 0.00% | | 0 | | | | |
| Irrigated Pasture | 231 | 8.25 | 1906 | 15.21% | | 1737 | 7.52 | 231 | 1737 | 1906 |
| Vegetables | 975 | 7.07 | 6893 | 55.00% | | 6282 | 6.44 | 281 | 1810 | 1987 |
| Sod | 164 | 7.07 | 1159 | 9.25% | | 1057 | 6.44 | 164 | 1057 | 1159 |
| Nursery | 199 | 3.09 | 615 | 4.91% | | 560 | 2.82 | | | |
| **Totals** | | | | **100.00%** | | **11,421** | | **758** | **5,132** | **5,632** |




L E G E N D

- Newhall Ranch Specific Plan Boundary
- Irrigated Agricultural Lands - NRSP
- Irrigated Agricultural Lands - outside NRSP

Feet
0 1,000 2,000 4,000
Meters
0 250 500 1,000

FORMA
04-07-2003
agriculturalLacres_040703.mxd

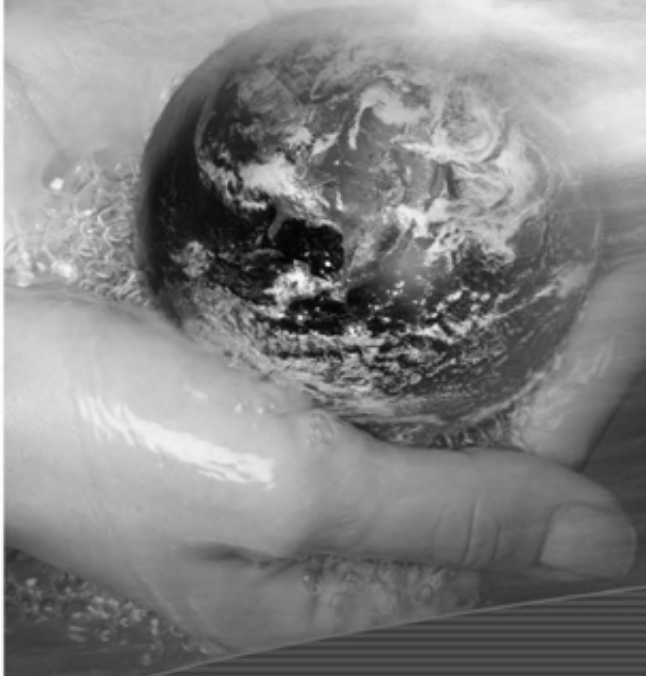
Newhall Land Historically Irrigated Agricultural Areas within Los Angeles County

# 2010 Urban Water Management Plan

Final

*Prepared for:*

**Castaic Lake Water Agency (CLWA)**
**CLWA Santa Clarita Water Division**
**Newhall County Water District**
**Valencia Water Company**
(Los Angeles County Waterworks District No. 36/Cooperating Agency)



*Prepared by:*
**Kennedy/Jenks Consultants**
**Nancy Clemm , P.E.**
**Luhdorff & Scalmanini Consulting Engineers**
**Stacy Miller Public Affairs**

**June 2011**

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## List of Abbreviations and Acronyms

The following abbreviations and acronyms are used in this report.

| | |
|---|---|
| AB | Assembly Bill |
| ACOE | U.S. Army Corps of Engineers |
| Act | California Urban Water Management Planning Act |
| AF | acre-feet |
| AFY | acre-feet per year |
| Agency | Castaic Lake Water Agency |
| APA | Administrative Procedure Act |
| AWRM | Alternative Water Resources Management Program |
| AWWARF | American Water Works Association Research Foundation |
| Basin | Santa Clara River Valley Groundwater Basin, East Subbasin |
| BDCP | Bay Delta Conservation Plan |
| BMPs | Best Management Practices |
| BO | Biological Opinion |
| BVWSD | Buena Vista Water Storage District |
| CCF | One Hundred Cubic Feet |

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| | |
|---|---|
| CCR | Consumer Confidence Report |
| CEQA | California Environmental Quality Act |
| CERCLA | Comprehensive Environmental Response, Compensation and Liability Act |
| CESA | California Endangered Species Act |
| CLWA | Castaic Lake Water Agency |
| CUWCC | California Urban Water Conservation Council |
| CVP | Central Valley Project |
| DBP | Disinfection by-products |
| D/DBP | Disinfectants and Disinfectant By-Products |
| Delta | Sacramento-San Joaquin Delta |
| DFG | California Department of Fish and Game |
| DHS | California Department of Health Services |
| District | Los Angeles County Waterworks District No. 36 |
| DMM | Demand Management Measure |
| DOF | Department of Finance |
| DPH | Department of Public Health |
| DTSC | Department of Toxic Substances Control |
| DWR | California Department of Water Resources |
| EC | Electrical conductivity |
| Edison | Southern California Edison |
| EIR | Environmental Impact Report |
| EPA | Environmental Protection Agency |
| ESA | Endangered Species Act |
| ETo | evapotranspiration |
| FWS | United States Fish and Wildlife Service |
| GPCD | gallons per capita per day |
| gpd | gallons per day |
| gpm | gallons per minute |
| GSWI | groundwater and surface water interaction model |
| GWMP | Groundwater Management Plan |
| HAA5 | Haloacetic Acids |
| KCWA | Kern County Water Agency |
| LACDRP | Los Angeles County Department of Regional Planning |
| LACSD | Sanitation Districts of Los Angeles County |
| LACWWD 36 | Los Angeles County Waterworks District No. 36 |

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| | |
|---|---|
| M&I | Municipal and Industrial |
| MCL | Maximum contaminant level |
| Metropolitan | Metropolitan Water District of Southern California |
| MAF | million acre-feet |
| mgd | million gallons per day |
| mg/L | milligrams per liter |
| MOU | Memorandum of Understanding Regarding Water Conservation in California |
| MWD | Metropolitan Water District of Southern California |
| NCWD | Newhall County Water District |
| NEPA | National Environmental Protection Act |
| NMFS | National Marine Fisheries Service |
| NPDES | National Pollutant Discharge Elimination System |
| OVOV | One Valley One Vision |
| Plan | Urban Water Management Plan 2010 |
| PPHH | persons-per-household |
| PUC | California Public Utilities Commission |
| Purveyor | Supplier of drinking water at the retail level (also retailer and retail purveyor) |
| RAP | Remedial Action Plan |
| RO | Reverse Osmosis |
| RRB | Rosedale-Rio Bravo |
| RRBWSD | Rosedale-Rio Bravo Water Storage District |
| RPA | Reasonable and Prudent Alternative |
| RTP | Regional Transportation Plan |
| RWQCB | Regional Water Quality Control Board |
| SCAG | Southern California Association of Governments |
| SCLLC | Santa Clarita LLC |
| SCOPE | Santa Clarita Organization for Planning the Environment |
| SCVSD | Santa Clarita Valley Sanitation District |
| SCWD | Santa Clarita Water Division |
| SRWS | self-regenerating water-softeners |
| Semitropic | Semitropic Water Storage District |
| SSO | site specific objective |
| SOC | Synthetic organic compounds |
| SWP | State Water Project |
| Suppliers | CLWA and purveyors collectively |

# Table of Contents (cont'd)

| | |
|---|---|
| SWRCB | State Water Resources Control Board |
| TDS | Total Dissolved Solids |
| TMDL | Total Maximum Daily Load |
| THM | Trihomethanes |
| TTHM | Total Trihalomethanes |
| TOC | Total Organic Carbon |
| umhos/cm | Micromhos per centimeter |
| USCR | Upper Santa Clara River |
| UWMP | Urban Water Management Plan |
| Valley | Santa Clarita Valley |
| VOC | Volatile organic compounds |
| VWC | Valencia Water Company |
| WTP | Wastewater Treatment Plant |
| WRP | Water Reclamation Plant |
| WQOs | Water Quality Objectives |

**RESOLUTION NO. 2809**

**RESOLUTION OF THE CASTAIC LAKE WATER AGENCY BOARD OF DIRECTORS ADOPTING THE 2010 URBAN WATER MANAGEMENT PLAN**

**WHEREAS**, the California Urban Water Management Planning Act, Water Code Section 10610, et seq. (the Act) mandates that every urban water supplier providing water for municipal purposes to more than 3,000 customers or supplying more than 3,000 acre feet of water annually, prepare and adopt an updated urban water management plan (UWMP) at least once every five years on or before December 31, in years ending five and zero; and

**WHEREAS**, the Castaic Lake Water Agency (CLWA), which includes the CLWA Santa Clarita Water Division (SCWD), is an urban water supplier for purposes of the Act, and in 2005 approved and adopted its most recent UWMP and submitted its 2005 UWMP to the California Department of Water Resources (DWR); and

**WHEREAS**, the Water Conservation Act of 2009, Water Code Section 10608 et seq. (SBX7-7), extended the time by which urban retail water suppliers must adopt 2010 UWMPs to July 1, 2011 to permit coordination between urban wholesale water suppliers and urban retail water suppliers and, among other things, established requirements for urban retail water suppliers to prepare urban water use targets in accordance with the goals of SBX7-7 to reduce statewide daily per capita water use by 15 percent by the year 2015 and 20 percent by the year 2020; and

**WHEREAS**, the SCWD is an "urban retail water supplier" for purposes of SBX7-7 because it directly provides potable municipal water to more than 3,000 end users; and

**WHEREAS**, Section 10620(d)(1) of the Act encourages urban water suppliers to satisfy the requirements of the Act by participation in area wide urban water management planning where those plans will reduce preparation costs and contribute to the achievement of conservation and efficient water use; and

**WHEREAS**, CLWA, in cooperation with SCWD, Newhall County Water District (NCWD) and the Valencia Water Company (VWC), prepared a document labeled "Public Review Draft 2010 Urban Water Management Plan" for the CLWA service area (Draft 2010 UWMP), upon which Los Angeles County Waterworks District No. 36 (LACWWD #36) participated as a cooperating agency; and

**WHEREAS**, in accordance with applicable law, including the requirements of the Act and of SBX7-7, CLWA has prepared the Draft 2010 UWMP and has undertaken certain agency coordination, public notice, public involvement and outreach, public comment, and other procedures in relation to the Draft 2010 UWMP; and

**WHEREAS**, as authorized by Section 10620(e) of the Act, CLWA has prepared its Draft 2010 UWMP with its own staff, with the assistance of consulting professionals and in cooperation with other governmental agencies, and has utilized and relied upon industry standards and the expertise of industry professionals in preparing its Draft 2010 UWMP, and has, in part, utilized and relied upon the DWR Guidebook to Assist Urban Water Suppliers to Prepare a 2010 Urban Water Management Plan (March 2011) and the DWR Methodologies for Calculating Baseline and Compliance Urban Per Capita Water Use (For the Consistent Implementation of the Water Conservation Act of 2009) (February 2011) in preparing its Draft 2010 UWMP; and

**WHEREAS**, CLWA began its public outreach and community involvement in the preparation of the Draft 2010 UWMP in May 2010, with its first scheduled community workshop, followed by five more community workshops and three public hearings; and

**WHEREAS**, pursuant to Section 10621(b) of the Act, on March 3, 2011, CLWA notified the City of Santa Clarita and the Counties of Ventura and Los Angeles that it would be preparing its 2010 UWMP, and that it would be releasing the Draft 2010 UWMP in April 2011, and subsequently met with, consulted with and obtained comments from the City of Santa Clarita, the United Water Conservation District and the County of Los Angeles; and

**WHEREAS**, in accordance with applicable law, including Water Code Sections 10608.26 and 10642, and Government Code Section 6066, CLWA made its Draft 2010 UWMP available for public inspection, and provided notice of the time and place of each joint public hearing on the Draft UWMP; and

**WHEREAS**, on March 23, 2011, CLWA and NCWD held a joint public hearing, properly noticed pursuant to Section 10642 of the Act and Government Code Section 6066, at which time CLWA's Board of Directors reviewed draft sections and tables for inclusion in the Draft 2010 UWMP, and, as part of that review, considered a presentation regarding the Draft 2010 UWMP by its staff and consultants, and oral and written public comments; and

**WHEREAS**, on May 18, 2011, CLWA and NCWD held a second joint public hearing, properly noticed pursuant to Section 10642 of the Act and Government Code Section 6066, at which time CLWA's Board of Directors considered further oral and written public comments, and responses to those comments by its staff and consultants, which included a presentation of the changes that had been made in the Public Review Draft 2010 UWMP; and

**WHEREAS**, on June 15, 2011, CLWA circulated to each of the members of its Board of Directors a Final Draft 2010 UWMP; and

**WHEREAS**, on June 22, 2011, CLWA and NCWD held a properly noticed joint public meeting and public hearing to consider adoption of the Final Draft 2010 UWMP, at which time CLWA's Board of Directors considered further oral and written public comments, and responses to those comments by its staff and consultants, which included a presentation of the changes that had been made in the Final Draft 2010 UWMP, and reviewed and considered adoption of the Final Draft 2010 UWMP; and

**WHEREAS**, pursuant to Water Code Section 10620(d)(2), CLWA coordinated the preparation of its Draft 2010 UWMP and Final Draft 2010 UWMP with other appropriate agencies in the area, including other water suppliers that share a common source, water management agencies and relevant public agencies, to the extent practicable; and

**WHEREAS**, pursuant to Water Code Section 10620(f), CLWA describes in the Draft 2010 UWMP and in the Draft Final 2010 UWMP water management tools and options used by CLWA that will maximize resources and minimize the need to import water from other regions; and

**WHEREAS**, pursuant to Water Code Section 10641, CLWA consulted with and obtained comments from those public agencies or persons with special expertise with respect to demand management methods and techniques; and

**WHEREAS**, CLWA has encouraged the active involvement of diverse social, cultural and economic elements of the population within the Agency's service area with regard to the preparation of the Draft UWMP and Final Draft UWMP, allowed input by members of the public and any other interested party regarding all aspects of the Draft 2010 UWMP and Final Draft 2010 UWMP, allowed community input regarding SCWD's implementation plan for complying with SBX7-7, considered the economic impacts of the SCWD's implementation plan for complying with SBX7-7 and adopted Method 1 under Water Code Section 10608.20(b) for determining its urban water use targets; and

**WHEREAS**, to assure public participation in the process, CLWA has exceeded the requirements of the Act, by holding more than one public hearing; and

**WHEREAS**, the CLWA Board of Directors has considered the public and Board comments made at the three public hearings, as well as all written public comments on the Draft 2010 UWMP and the Final Draft 2010 UWMP distributed to the Board of Directors; and

**WHEREAS**, the CLWA Board of Directors has carefully reviewed the Final Draft 2010 UWMP, any errata, revisions and modifications made at the hearing; and

**WHEREAS**, the CLWA Board of Directors has carefully reviewed and considered the purposes and requirements of the Act and SBX7-7, the contents of the Final Draft 2010 UWMP, any errata, revisions and modifications made at the hearing, the documentation contained in the administrative record in support of the Final Draft 2010 UWMP, and all public and agency input received with regard to the Final Draft 2010 UWMP, and has determined that the factual analyses and conclusions set forth in the 2010 UWMP are supported by substantial evidence.

**NOW THEREFORE, BE IT RESOLVED** that this Board of Directors of Castaic Lake Water Agency does hereby adopt Method 1 under Water Code Section 10608.20(b) for determining its urban water use targets, and the Final Draft 2010 UWMP attached hereto as Exhibit "A" and incorporated herein by this reference, including any errata, revisions and modifications made at the hearing, is hereby approved and adopted as CLWA's 2010 Urban Water Management Plan, and filed with the Secretary of the Board; and

**RESOLVED FURTHER** that the General Manager of the Agency is hereby authorized and directed to include a copy of this Resolution in the Agency's 2010 Urban Water Management Plan and, in accordance with Water Code Section 10644(a), to file the 2010 Urban Water Management Plan with the California Department of Water Resources, the California State Library, and any city or county within which the Agency provides water supplies within thirty (30) days of this adoption date; and

**RESOLVED FURTHER** that in accordance with Water Code Section 10645, the General Manager is hereby authorized and directed to make the 2010 Urban Water Management Plan available for public review during normal business hours at CLWA's administrative offices at 27234 Bouquet Canyon Road, Santa Clarita, CA, not later than thirty (30) days after filing a copy thereof with the California Department of Water Resources; and

**RESOLVED FURTHER** that in accordance with Water Code Section 10635(b), the General Manager is hereby authorized and directed to provide that portion of the 2010 Urban Water Management Plan prepared pursuant to Water Code Section 10635(a) to any city or county within which the Agency provides water supplies not later than sixty (60) days after filing a copy thereof with the California Department of Water Resources; and

**RESOLVED FURTHER** in accordance with the Urban Water Management Planning Act and SBX7-7, including, but not limited to, the Agency's Water Conservation Programs and its Water Shortage Contingency Plan, the General Manager is hereby authorized and directed to implement the components of the 2010 Urban Water Management Plan; and

**RESOLVED FURTHER** that the General Manager is authorized and directed to recommend to the Board of Directors additional steps necessary or appropriate to effectively carry out the implementation of the 2010 Urban Water Management Plan, the Urban Water Management Planning Act and SBX7-7.

Vice President

I, the undersigned, hereby certify I am the duly appointed and acting Secretary of the Castaic Lake Water Agency and at a regular meeting of the Board of Directors of said Agency held on Wednesday, June 22, 2011, the foregoing Resolution No. 2809 was duly and regularly adopted by said Board, and that said resolution has not been rescinded or amended since the date of its adoption, and it is now in full force and effect.

DATED: June 22, 2011

April Jacobs, Secretary

**EXHIBIT "A"**

**FINAL DRAFT 2010 UWMP**
(Attached hereto)

**RESOLUTION NO. 2011-10**

**RESOLUTION OF THE BOARD OF DIRECTORS OF NEWHALL COUNTY WATER DISTRICT ADOPTING ITS 2010 URBAN WATER MANAGEMENT PLAN**

**WHEREAS**, the California Urban Water Management Planning Act, Water Code Section 10610, et seq. (the Act) mandates that every urban water supplier providing water for municipal purposes to more than 3,000 customers or supplying more than 3,000 acre feet of water annually, prepare and adopt an updated urban water management plan (UWMP) at least once every five years on or before December 31, in years ending five and zero; and

**WHEREAS**, the Newhall County Water District (NCWD) is an urban water supplier for purposes of the Act, and in 2005 approved and adopted its most recent UWMP and submitted its 2005 UWMP to the California Department of Water Resources (DWR); and

**WHEREAS**, the Water Conservation Act of 2009, Water Code section 10608 et seq. (SBX7-7), extended the time by which urban retail water suppliers must adopt 2010 UWMPs to July 1, 2011 and, among other things, established requirements for urban retail water suppliers to prepare urban water use targets in accordance with the goals of SBX7-7 to reduce statewide daily per capita water use by 15 percent by the year 2015 and 20 percent by the year 2020; and

**WHEREAS**, SBX7-7 was amended in 2010, extending the time by which urban water wholesale suppliers must adopt 2010 UWMPs to July 1, 2011, to permit coordination between urban wholesale water suppliers and urban retail water suppliers; and

**WHEREAS**, section 10620(d)(1) of the Act encourages urban water suppliers to satisfy the requirements of the Act by participation in area wide urban water management planning where those plans will reduce preparation costs and contribute to the achievement of conservation and efficient water use; and

**WHEREAS**, NCWD, Castaic Lake Water Agency (CLWA), Santa Clarita Water Division (SCWD) and the Valencia Water Company (VWC) collectively referred to as the Water Suppliers, prepared a document labeled "Public Review Draft 2010 Urban Water Management Plan" (Draft 2010 UWMP), upon which Los Angeles County Waterworks District No. 36 (LACWWD #36) participated as a cooperating agency; and

**WHEREAS**, in accordance with applicable law, including the requirements of the Act and of SBX7-7, the Water Suppliers have prepared the Draft 2010 UWMP and have undertaken certain agency coordination, public notice, public involvement and outreach, public comment, and other procedures in relation to the Draft 2010 UWMP; and

**WHEREAS**, as authorized by Section 10620(e) of the Act, the Water Suppliers have prepared the Draft 2010 UWMP with their own staff, with the assistance of consulting professionals and in cooperation with other governmental agencies, and have utilized and relied upon industry standards and the expertise of industry professionals in preparing the Draft 2010 UWMP, and have, in part, utilized and relied upon the DWR Guidebook to Assist Urban Water Suppliers to Prepare a 2010 Urban Water Management Plan (March 2011) and the DWR Methodologies for Calculating Baseline and Compliance Urban Per Capita Water Use (For the

Consistent Implementation of the Water Conservation Act of 2009) (February 2011) in preparing the Draft 2010 UWMP; and

**WHEREAS**, the Water Suppliers began public outreach and community involvement in the preparation of the Draft 2010 UWMP in May 2010, with the first scheduled community workshop, followed by five more community workshops and three public hearings; and

**WHEREAS**, pursuant to Section 10621(b) of the Act, on March 3, 2011, the Water Suppliers notified the City of Santa Clarita and the Counties of Ventura and Los Angeles that they would be preparing the 2010 UWMP, and that they would be releasing the Draft 2010 UWMP in April 2011; and, in addition the Water Suppliers subsequently met with, consulted with and obtained comments on the 2010 UWMP from the City of Santa Clarita, the United Water Conservation District and the County of Los Angeles; and

**WHEREAS**, in accordance with applicable law, including Water Code sections 10608.26 and 10642, and Government Code section 6066, the Water Suppliers made the Draft 2010 UWMP available for public inspection, and published notice of the time and place of each joint public hearing on the Draft UWMP; and

**WHEREAS**, on March 23, 2011, NCWD and CLWA held a joint public hearing, properly noticed pursuant to Section 10642 of the Act and Government Code section 6066, at which time NCWD's Board of Directors reviewed draft sections and tables for inclusion in the Draft 2010 UWMP, and, as part of that review, considered a presentation regarding the Draft 2010 UWMP by staff and consultants, and oral and written public comments; and

**WHEREAS**, on May 18, 2011, NCWD and CLWA held a second joint public hearing, properly noticed pursuant to Section 10642 of the Act and Government Code section 6066, at which time NCWD's Board considered further oral and written public comments, and responses to those comments by staff and consultants, which included a presentation of the changes that had been made in the Public Review Draft 2010 UWMP; and

**WHEREAS**, on June 15, 2011, NCWD circulated to each of the members of its Board of Directors a Final Draft 2010 UWMP; and

**WHEREAS**, on June 22, 2011, CLWA and NCWD held a properly noticed joint public meeting and public hearing to consider adoption of the Final Draft 2010 UWMP, at which time NCWD's Board of Directors considered further oral and written public comments, and responses to those comments by staff and consultants, which included a presentation of the changes that had been made in the Final Draft 2010 UWMP and reviewed and considered adoption of the Final Draft 2010 UWMP; and

**WHEREAS**, pursuant to Water Code Section 10620(d)(2), the Water Suppliers coordinated the preparation of the Draft 2010 UWMP and Final Draft 2010 UWMP with other appropriate agencies in the area, including other water suppliers that share a common source, water management agencies and relevant public agencies, to the extent practicable; and

**WHEREAS**, pursuant to Water Code Section 10620(f), the Water Suppliers describe in the Draft 2010 UWMP and in the Draft Final 2010 UWMP water management tools and options used by the Water Suppliers which will maximize resources and minimize the need to import water from other regions; and

**WHEREAS**, pursuant to Water Code Section 10641, the Water Suppliers consulted with and obtained comments from those public agencies or persons with special expertise with respect to demand management methods and techniques; and

**WHEREAS**, the Water Suppliers have encouraged the active involvement of diverse social, cultural and economic elements of the population within NCWD's service areas and surrounding communities, with regard to the preparation of the Draft UWMP and Final Draft UWMP, allowed input by members of the public and any other interested party regarding all aspects of the Draft 2010 UWMP and Final Draft 2010 UWMP, allowed community input regarding NCWD's implementation plan for complying with SBX7-7, considered the economic impacts of NCWD's implementation plan for complying with SBX7-7 and adopted Method 1 under Water Code section 10608.20(b) for determining its urban water use targets; and

**WHEREAS**, to assure public participation in the process, the Water Suppliers have exceeded the requirements of the Act, by holding more than one public hearing; and

**WHEREAS**, the NCWD Board of Directors has considered the public and Board comments made at the three public hearings, as well as all written public comments on the Draft 2010 UWMP and the Final Draft 2010 UWMP distributed to the Board of Directors; and

**WHEREAS**, the NCWD Board of Directors has carefully reviewed and considered the purposes and requirements of the Act and SBX7-7, the contents of the Final Draft 2010 UWMP, any errata, revisions and modifications made at the hearing, the documentation contained in the administrative record in support of the Final Draft 2010 UWMP, and all public and agency input received with regard to the Final Draft 2010 UWMP, and has determined that the factual analyses and conclusions set forth in the 2010 UWMP are supported by substantial evidence.

**NOW THEREFORE, BE IT RESOLVED** that the Board of Directors of Newhall County Water District do hereby adopt Method 1 under Water Code section 10608.20(b) for determining its urban water use targets, and the Final Draft 2010 UWMP attached hereto as Exhibit "A" and incorporated herein by this reference, including any errata, revisions and modifications made at the hearing, is hereby approved and adopted as NCWD's 2010 Urban Water Management Plan, and ordered filed with the Secretary of the Board; and

**RESOLVED FURTHER** that the General Manager of the District is hereby authorized and directed to include a copy of this Resolution in the District's 2010 Urban Water Management Plan and, in accordance with Water Code section 10644(a), to file the 2010 Urban Water Management Plan with the California Department of Water Resources, the California State Library, and any city or county within which the District provides water supplies, within thirty (30) days of this adoption date; and

**RESOLVED FURTHER** that in accordance with Water Code section 10645, the General Manager is hereby authorized and directed to make the 2010 Urban Water Management Plan available for public review during normal business hours at NCWD's administrative offices at 23780 North Pine Street, Santa Clarita, CA, not later than thirty (30) days after filing a copy thereof with the California Department of Water Resources; and

**RESOLVED FURTHER** that in accordance with Water Code section 10635(b), the General Manager is hereby authorized and directed to provide that portion of the 2010 Urban Water Management Plan prepared pursuant to Water Code section 10635(a) to any city or county

within which the District provides water supplies not later than sixty (60) days after filing a copy thereof with the California Department of Water Resources; and

**RESOLVED FURTHER** in accordance with the Urban Water Management Planning Act and SBX7-7, including, but not limited to, the District's Water Conservation Programs and its Water Shortage Contingency Plan, the General Manager is hereby authorized and directed to implement the components of the 2010 Urban Water Management Plan; and

**RESOLVED FURTHER** that the General Manager is authorized and directed to recommend to the Board of Directors additional steps necessary or appropriate to effectively carry out the implementation of the 2010 Urban Water Management Plan, the Urban Water Management Planning Act and SBX7-7.

**RESOLVED FURTHER** that the General Manager and District staff are hereby authorized and directed to take such other and further actions as may be necessary or appropriate to carry out the purposes of this resolution, the Act and SBX7-7.

**PASSED, APPROVED AND ADOPTED** at a Special Meeting of the Board of Directors of Newhall County Water District held on June 22, 2011. Resolution No. 2011-10 was adopted by the following vote:

| | | |
|---|---|---|
| **AYES:** | **Directors** | ATKINS, COLLEY, GUTZEIT, MORTENSEN, PLAMBECK |
| **NOES:** | **Directors** | NONE |
| **ABSTAIN:** | **Directors** | NONE |

**Dan Mortensen, President,**
**Board of Directors of the**
**Newhall County Water District**

**ATTEST:**

**Karin J. Russell**
**Secretary of the Board of Directors**

**EXHIBIT "A"**

**2010 UWMP**
(Attached hereto)

STATE OF CALIFORNIA )
) ss.
COUNTY OF LOS ANGELES )

I, Karin J. Russell, Secretary of the Newhall County Water District, DO HEREBY CERTIFY that the foregoing is full, true and correct copy of Resolution No. 2011-10 of the Board of Directors of Newhall County Water District adopted at a Special Meeting held on June 22, 2011, and that the same has not been amended or repealed.

Karin J. Russell
Secretary of the Board of Directors

DATED: 6-22-2011 (SEAL)

# VALENCIA WATER COMPANY
# BOARD OF DIRECTORS MEETING (JUNE 27, 2011)
# RESOLUTION ADOPTING
# THE 2010 URBAN WATER MANAGEMENT PLAN

**WHEREAS,** the California Urban Water Management Planning Act, Water Code Section 10610, et seq. (the Act) mandates that every urban water supplier providing water for municipal purposes to more than 3,000 customers or supplying more than 3,000 acre feet of water annually, prepare and adopt an updated urban water management plan (UWMP) at least once every five years on or before December 31, in years ending five and zero; and

**WHEREAS,** the Valencia Water Company (VWC) is an urban water supplier for purposes of the Act, and in 2005 approved and adopted its most recent UWMP and submitted its 2005 UWMP to the California Department of Water Resources (DWR); and

**WHEREAS,** the Water Conservation Act of 2009, Water Code Section 10608 et seq. (SBX7-7), extended the time by which urban retail water suppliers must adopt 2010 UWMPs to July 1, 2011 to permit coordination between urban wholesale water suppliers and urban retail water suppliers and, among other things, established requirements for urban retail water suppliers to prepare urban water use targets in accordance with the goals of SBX7-7 to reduce statewide daily per capita water use by 15 percent by the year 2015 and 20 percent by the year 2020; and

**WHEREAS,** the VWC is an "urban retail water supplier" for purposes of SBX7-7 because it directly provides potable municipal water to more than 3,000 end users; and

**WHEREAS,** Section 10620(d)(1) of the Act encourages urban water suppliers to satisfy the requirements of the Act by participation in area wide urban water management planning where those plans will reduce preparation costs and contribute to the achievement of conservation and efficient water use; and

**WHEREAS,** Valencia Water Company, in cooperation with Castaic Lake Water Agency (CLWA), the CLWA Santa Clarita Water Division (SCWD), and Newhall County Water District (NCWD), prepared a document labeled "Public Review Draft 2010 Urban Water Management Plan" for the CLWA service area (Draft 2010 UWMP), upon which Los Angeles County Waterworks District No. 36 (LACWWD #36) participated as a cooperating agency; and

**WHEREAS,** in accordance with applicable law, including the requirements of the Act and of SBX7-7, CLWA has prepared the Draft 2010 UWMP and has undertaken certain agency coordination, public notice, public involvement and outreach, public comment, and other procedures in relation to the Draft 2010 UWMP; and

**WHEREAS,** as authorized by Section 10620(e) of the Act, CLWA and the retail purveyors have prepared the Draft 2010 UWMP with their own staff, with the assistance of consulting professionals and in cooperation with other governmental agencies, and has utilized and relied upon industry standards and the expertise of industry professionals in preparing its Draft 2010 UWMP, and have, in part, utilized and relied upon the DWR Guidebook to Assist Urban Water Suppliers to Prepare a 2010 Urban Water Management Plan (March 2011) and the DWR Methodologies for Calculating Baseline and Compliance Urban Per Capita Water Use (For the Consistent Implementation of the Water Conservation Act of 2009) (February 2011) in preparing the Draft 2010 UWMP; and

**WHEREAS,** CLWA and the retail purveyors began the public outreach and community involvement in the preparation of the Draft 2010 UWMP in May 2010, with the first scheduled community

workshop, followed by five more community workshops and three public hearings; and

**WHEREAS,** pursuant to Section 10621(b) of the Act, on March 3, 2011, CLWA notified the City of Santa Clarita and the Counties of Ventura and Los Angeles that it would be preparing the 2010 UWMP, and that the Draft 2010 UWMP would be released in April 2011, and subsequently met with, consulted with and obtained comments from the City of Santa Clarita, the United Water Conservation District and the County of Los Angeles; and

**WHEREAS,** in accordance with applicable law, including Water Code Sections 10608.26 and 10642, and Government Code Section 6066, the Draft 2010 UWMP was made available for public inspection, and notice was provided of the time and place of each joint public hearing on the Draft UWMP; and

**WHEREAS**, on March 23, 2011, CLWA and NCWD held a joint public hearing, properly noticed pursuant to Section 10642 of the Act and Government Code Section 6066, at which time CLWA's Board of Directors reviewed draft sections and tables for inclusion in the Draft 2010 UWMP, and, as part of that review, considered a presentation regarding the Draft 2010 UWMP by its staff and consultants, and oral and written public comments; and

**WHEREAS**, on May 18, 2011, CLWA and NCWD held a second joint public hearing, properly noticed pursuant to Section 10642 of the Act and Government Code Section 6066, at which time CLWA's Board of Directors considered further oral and written public comments, and responses to those comments by its staff and consultants, which included a presentation of the changes that had been made in the Public Review Draft 2010 UWMP; and

**WHEREAS**, on June 3, 2011, the VWC Board Secretary sent each Board of Director the Draft 2010 UWMP, Public Review Draft, dated April 2011, along with six public workshop presentations, two public hearing presentations and transcripts and eight letters/emails received to date from the public commenting on the Plan. At the time, the Secretary informed the Board that a secondary transmittal of information would be forthcoming on June 24, 2011;

**WHEREAS**, on June 15, 2011, CLWA circulated to each of the members of its Board of Directors a Final Draft 2010 UWMP; and

**WHEREAS**, on June 22, 2011, CLWA and NCWD held a properly noticed joint public meeting and public hearing to consider adoption of the Final Draft 2010 UWMP, at which time CLWA's Board of Directors considered further oral and written public comments, and responses to those comments by its staff and consultants, which included a presentation of the changes that had been made in the Final Draft 2010 UWMP, and reviewed and considered adoption of the Final Draft 2010 UWMP; and

**WHEREAS**, on June 24, 2010, the VWC Board received and reviewed a second transmittal, dated June 24, 2011, with additional information about the 2010 UWMP process, further 2010 UWMP documents, and the 2010 UWMP timeline;

**WHEREAS,** pursuant to Water Code Section 10620(d)(2), VWC coordinated the preparation of the Draft 2010 UWMP and Final Draft 2010 UWMP with CLWA and other appropriate agencies in the area, including other water suppliers that share a common source, water management agencies and relevant public agencies, to the extent practicable; and

**WHEREAS,** pursuant to Water Code Section 10620(f), the Draft 2010 UWMP and in the Draft Final 2010 UWMP describe the water management tools and options used by CLWA and the retail purveyors that will maximize resources and minimize the need to import water from other regions; and

**WHEREAS,** pursuant to Water Code Section 10641, CLWA and the retail purveyors consulted with and obtained comments from those public agencies or persons with special expertise with respect to demand management methods and techniques; and

**WHEREAS,** CLWA and the retail purveyors have encouraged the active involvement of diverse social, cultural and economic elements of the population within the CLWA service area with regard to the preparation of the Draft UWMP and Final Draft UWMP, allowed input by members of the public and any other interested party regarding all aspects of the Draft 2010 UWMP and Final Draft 2010 UWMP, allowed community input regarding the implementation plan for complying with SBX7-7, considered the economic impacts of the implementation plan for complying with SBX7-7 and adopted Method 1 under Water Code Section 10608.20(b) for determining its urban water use targets; and

**WHEREAS,** to assure public participation in the process, CLWA and the retail purveyors have exceeded the requirements of the Act, by holding more than one public hearing; and

**WHEREAS,** the VWC Board of Directors has considered the public and Board comments made at the three public hearings, as well as all written public comments on the Draft 2010 UWMP and the Final Draft 2010 UWMP distributed to the Board of Directors; and

**WHEREAS,** the VWC Board of Directors has carefully reviewed the Final Draft 2010 UWMP, any errata, revisions and modifications made at the final public hearing; and

**WHEREAS,** the VWC Board of Directors has carefully reviewed and considered the purposes and requirements of the Act and SBX7-7, the contents of the Final Draft 2010 UWMP, any errata, revisions and modifications made at the final public hearing, the documentation contained in the administrative record in support of the Final Draft 2010 UWMP, and all public and agency input received with regard to the Final Draft 2010 UWMP, and has determined that the factual analyses and conclusions set forth in the 2010 UWMP are supported by substantial evidence.

**NOW THEREFORE, BE IT RESOLVED** that the VWC Board of Directors does hereby adopt Method 1 under Water Code Section 10608.20(b) for determining urban water use targets, and the Final Draft 2010 UWMP, incorporated herein by this reference, including any errata, revisions and modifications made at the final public hearing, is hereby approved and adopted as the 2010 Urban Water Management Plan, and filed with the Secretary of the Board; and

**RESOLVED FURTHER** that the General Manager is hereby authorized and directed to include a copy of this Resolution in the 2010 Urban Water Management Plan and, in accordance with Water Code Section 10644(a), to file the 2010 Urban Water Management Plan with the California Department of Water Resources, the California State Library, and any city or county within which the Valencia Water Company provides water supplies within thirty (30) days of this adoption date; and

**RESOLVED FURTHER** that in accordance with Water Code Section 10645, the General Manager is hereby authorized and directed to make the 2010 Urban Water Management Plan available for public review during normal business hours at VWC's offices not later than thirty (30) days after filing a copy thereof with the California Department of Water Resources; and

**RESOLVED FURTHER** that in accordance with Water Code Section 10635(b), the General Manager is hereby authorized and directed to provide that portion of the 2010 Urban Water Management Plan prepared pursuant to Water Code Section 10635(a) to any city or county within which the Valencia Water Company provides water supplies not later than sixty (60) days after filing a copy thereof with the California Department of Water Resources; and

**RESOLVED FURTHER** in accordance with the Act and SBX7-7, including, but not limited to, the Water Conservation Programs and the Water Shortage Contingency Plan, the General Manager is hereby authorized and directed to implement the components of the 2010 Urban Water Management Plan; and

**RESOLVED FURTHER** that the General Manager is authorized and directed to recommend to the Board of Directors additional steps necessary or appropriate to effectively carry out the implementation of the 2010 Urban Water Management Plan, the Act, and SBX7-7.

**I, the undersigned, hereby certify that I am the duly appointed Secretary of the Valencia Water Company, and that at a regular meeting of the Board of Directors of said Company held on Monday, June 27, 2011, the foregoing Resolution was duly and regularly adopted by said Board, and that said resolution has not been rescinded or amended since the date of its adoption, and that it is in full force and effect.**

**July 8, 2011**

Greg Milleman

**Greg Milleman, Secretary**

# Section 1: Introduction

## 1.1 Overview

This volume presents the Urban Water Management Plan 2010 (Plan) for the Castaic Lake Water Agency (Agency, CLWA) service area, which includes four retail water purveyors. These retail water purveyors are the Santa Clarita Water Division of CLWA, Newhall County Water District, Valencia Water Company and Los Angeles County Waterworks District 36. Together CLWA and the purveyors are the Santa Clarita Valley's 'water suppliers'. This chapter describes the general purpose of the Plan, discusses Plan implementation and provides general information about CLWA, the retail purveyors and service area characteristics.

## 1.2 Purpose

An Urban Water Management Plan (UWMP) is a planning tool that generally guides the actions of urban water suppliers. It provides managers and the public with a broad perspective on a number of water supply issues. It is not a substitute for project-specific planning documents, nor was it intended to be when mandated by the State Legislature. For example, the Legislature mandated that a plan include a section which "…describes the opportunities for exchanges or water transfers on a short-term or long-term basis." (Wat. Code, § 10631, subd. (d)). The identification of such opportunities and the inclusion of those opportunities in a plan's general water service reliability analysis neither commits an urban water supplier to pursue a particular water exchange/transfer opportunity, nor precludes it from exploring exchange/transfer opportunities never identified in its plan. Before an urban water supplier is able to implement any potential future sources of water supply identified in a plan, detailed project plans are prepared and approved, financial and operational plans are developed and all required environmental analysis is completed.

"A plan is intended to function as a planning tool to guide broad-perspective decision making by the management of water suppliers." (*Sonoma County Water Coalition v. Sonoma County Water Agency* (2010) 189 Cal. App. 4th 33, 39.) It should not be viewed as an exact blueprint for supply and demand management. Water management in California is not a matter of certainty and planning projections may change in response to a number of factors. "[L]ong-term water planning involves expectations and not certainties. Our Supreme Court has recognized the uncertainties inherent in long-term land use and water planning and observed that the generalized information required . . . in the early stages of the planning process are replaced by firm assurances of water supplies at later stages." (*Id.*, at 41.) From this perspective, it is appropriate to look at the UWMP as a general planning framework, not a specific action plan. It is an effort to generally answer a series of planning questions including:

- What are the potential sources of supply and what is the reasonable probable yield from them?
- What is the probable demand, given a reasonable set of assumptions about growth and implementation of good water management practices?
- How well do supply and demand figures match up, assuming that the various probable supplies will be pursued by the implementing agency?

Using these "framework" questions and resulting answers, the implementing agency will pursue feasible and cost-effective options and opportunities to meet demands.

The water suppliers will explore enhancing basic supplies from traditional sources such as the State Water Project (SWP) as well as other options. These include groundwater extraction, water exchanges and transfers, water conservation, recycling, brackish water desalination and water banking/conjunctive use. Specific planning efforts will be undertaken in regard to each option, involving detailed evaluations of how each option would fit into the overall supply/demand framework, how each option would impact the environment and how each option would affect customers. The objective of these more detailed evaluations would be to find the optimum mix of conservation and supply programs that ensure that the needs of the customers are met.

The California Urban Water Management Planning Act (Act) requires preparation of a plan that:

- Accomplishes water supply planning over a 20-year period in five year increments. (CLWA and the purveyors are going beyond the requirements of the Act by developing a plan which spans forty years.)
- Identifies and quantifies adequate water supplies, including recycled water, for existing and future demands, in normal, single-dry and multiple-dry years.
- Implements conservation and efficient use of urban water supplies.

Additionally, newly passed State legislation, Senate Bill 7 of Special Extended Session 7 (SBX7-7), was signed into law in November 2009, which calls for progress towards a 20 percent reduction in per capita water use statewide by 2020. As a result, the legislation now mandates each urban retail supplier to develop and report a water use target in the retailer's 2010 UWMP. The legislation further requires that retailers report an interim 2015 water use target, their baseline daily per capita use and 2020 compliance daily per capita use, along with the basis for determining those estimates.

SBX7-7 provides four possible methods for an urban retail water supplier to use to calculate its water use target. The California Department of Water Resources (DWR) has also developed methodologies for calculating base daily per capita water use; baseline commercial, industrial and institutional water use; compliance daily per capita water use; gross water use; service area population; indoor residential water use and landscape area water use.

Also of importance is Assembly Bill (AB) 1420. AB 1420, passed in 2007 and in effect as of January 2009, changes the funding eligibility requirements of Section 10631.5 of the Water Code. For any urban water supplier to be eligible for grant or loan funding administered by DWR, the State Water Resources Control Board (SWRCB) or the Bay-Delta Authority (such as those funding programs Propositions 50 and 84), the supplier must show implementation of water use efficiency demand management measures/best management practices (DMMs/BMPs) listed and described in the Act and the California Urban Water Conservation Council (CUWCC) Memorandum of Understanding Regarding Urban Water Conservation in California (MOU), or show the schedules and budgets by which the supplier will begin implementing the DMMs/BMPs. Any supplier not implementing the measures based on cost-effectiveness must submit proof showing why the measures are not cost-effective. Tables ensuring compliance with AB 1420 are provided in Appendix E.

A checklist to ensure compliance of this Plan with the Act requirements is provided in Appendix A.

It is the stated goal of CLWA and the retail water purveyors to deliver a reliable and high quality water supply to their customers, even during dry periods. Based on conservative water supply and demand assumptions over the next forty years in combination with conservation of non-essential demand during normal water years, the UWMP successfully achieves this goal.

## 1.3 Implementation of the Plan

CLWA has a contract with the State of California, through DWR, to acquire and distribute SWP water to its four local retail water purveyors in the Santa Clarita Valley: CLWA Santa Clarita Water Division (SCWD), Newhall County Water District (NCWD), Valencia Water Company (VWC) and Los Angeles County Waterworks District No. 36 (LACWWD 36). This Plan is required for CLWA and three of the purveyors, SCWD, NCWD and VWC. The fourth purveyor, LACWWD 36, is not required to prepare an UWMP because the District does not provide water to more than 3,000 customers or supply more than 3,000 acre-feet (AF) of water annually; however, LACWWD 36 participated in the development of the Plan on an "ad-hoc" basis. This subsection provides the cooperative framework within which the Plan will be implemented including agency coordination, public outreach and resources maximization.

### 1.3.1 Joint Preparation of the Plan

Water suppliers are permitted by the State to work together to develop a cooperative regional plan for the CLWA service area. This approach has been adopted by the water suppliers in the Santa Clarita Valley (Valley), which are jointly sponsoring the current Plan. Water resource specialists with expertise in water resource management were retained to assist the local water suppliers in preparing the details of the Plan. Agency coordination for this Plan is summarized in Table 1-1.

## TABLE 1-1
## AGENCY COORDINATION SUMMARY

| | Participated in UWMP Development | Received Copy of Draft | Commented on Draft | Attended Public Meetings | Contacted for Assistance | Sent Notice of Intent to Adopt | Invited/Not Involved |
|---|---|---|---|---|---|---|---|
| Aquilar Landscape | | | | X | | | |
| Atkins Environmental Help | | | | X | | | |
| Assembly Member Audra Strickland (representatives) | | | | | | | X |
| Assembly Member Cameron Smyth (representatives) | | | | X | | | |
| Assembly Member Jeff Gorell (representatives) | | | | X | | | |
| Associated Builders and Contractors of CA | | | | X | | | |
| Building Industry Association – Los Angeles/Ventura Chapter | | | | X | | | |
| Burbank Water and Power | | | | X | | | |
| California Department of Water Resources (SoCal; Glendale; retired) | | | | X | X | | |
| Castaic Lake Water Agency | X | | | X | | | |
| Castaic Area Town Council | | | | X | | | |
| City of Los Angeles | | | | X | | | |
| City of Santa Clarita Department of Planning and Building Services | | X | | X | | X | |
| City of Santa Clarita Intergovernmental Relations | | | | X | | X | |
| CLWA Santa Clarita Water Division | X | | | X | | | |
| College of the Canyons | | | | X | | | |
| Congressman Howard McKeon (representatives) | | | | X | | | |
| Friends of the Santa Clara River | | | X | | | | X |
| Grass Is Greener Landscape Design | | | | X | | | |
| Impact Sciences | | | | X | X | | |
| Integrated Property Services Group, Inc. | | | | X | | | |
| Los Angeles County Flood Control Department | | | | X | | | |
| Los Angeles County Department of Public Works | | | | X | | | |
| Los Angeles County Department of Regional Planning | | X | | X | X | X | |
| Los Angeles County LAFCO | | X | | X | | | |
| Los Angeles County Supervisor Mike Antonovich (representatives) | | | | X | | X | |

| | Participated in UWMP Development | Received Copy of Draft | Commented on Draft | Attended Public Meetings | Contacted for Assistance | Sent Notice of Intent to Adopt | Invited/Not Involved |
|---|---|---|---|---|---|---|---|
| Los Angeles County Waterworks District 36 | X | | | X | | | |
| Metropolitan Water District of Southern California | | | | | X | | |
| Newhall County Water District | X | | | X | | | |
| Santa Clarita Organization for Planning the Environment – SCOPE | | | X | X | | | |
| Santa Clarita Valley Chamber of Commerce | | | | X | | | |
| Santa Clarita Valley Fair Elections Committee | | | X | X | | | |
| Santa Clarita Valley Residents Mr. and Mrs. Dunn | | | X | X | | | |
| Santa Clarita Valley Resident Mr. Naoum | | | X | | | | |
| Santa Clarita Valley Resident Ms. Nolltemeyer | | | X | X | | | |
| Santa Clarita Valley Sanitation District | | | | X | X | | |
| Santa Clarita Valley Well Owners Association | | | | | | | X |
| Sierra Club Angeles Chapter | | | X | | | | |
| Southern California Association of Governments | | | | | | | X |
| State Senator George Runner (representatives) | | | | X | | | |
| State Senator Sharon Runner (representatives) | | | | X | | | |
| State Senator Tony Strickland | | | | | | | X |
| Sutters Home Owners Association | | | | X | | | |
| United Water Conservation District | | X | | | X | | |
| Valley Industrial Association of Santa Clarita | | | | | | | X |
| Valencia Water Company | X | | | X | | | |
| Ventura County LAFCO | | X | | | | | |
| Ventura County Resource Management Agency | | X | | | | X | X |
| Vista Ridge Homeowners Association | | | | X | | | |
| Waterwise | | | | X | | | |
| West Ranch Town Council | | | | X | | | |
| Whittaker Bermite Citizens Advisory Group | | | X | X | | | |

### 1.3.2 Plan Adoption

CLWA and the retail purveyors began preparation of this Plan for the CLWA service area in November 2009. The final draft of the Plan was adopted by the Agency Board on June 22, 2011 and submitted to DWR within thirty days of Board approval. NWCD's Board adopted the final draft of the Plan on June 22, 2011. VWC's Board adopted the final draft of the Plan on June 27, 2011. This plan includes all information necessary to meet the requirements of Water Conservation Act of 2009 (Wat. Code, §§ 10608.12-10608.64) and the Urban Water Management Planning Act (Wat. Code, §§ 10610-10656).

### 1.3.3 Public Outreach

The water suppliers have encouraged community participation in water planning. For the current Plan, five public workshop sessions were held to solicit input on the Draft Plan before its adoption. Interested groups were informed about the development of the Plan along with the schedule of public activities. Notices of public meetings were published in the local press and at the water supplier websites. Copies of the Draft Plan were made available at the water suppliers' offices and websites, local public libraries and sent to the City of Santa Clarita, the County of Los Angeles and the County of Ventura, as well as to interested parties as identified in Table 1-1. The water suppliers also convened meetings with various interests to gather data concerning planned development and the probable implementation of approved development. Such informed data gathering on important issues is a means of checking the short-term "reality" of official projections and understanding the concerns of various groups.

CLWA contracted with a local public relations firm to coordinate preparation of the Plan with the local community and stakeholders. CLWA notified the cities and counties within its service area of the opportunity to provide input regarding the Plan. Table 1-2 presents a timeline for public participation during the development of the Plan. A copy of the public outreach materials, including paid advertisements, newsletter covers, website postings and invitation letters are attached in Appendix B.

**TABLE 1-2**
**PUBLIC PARTICIPATION TIMELINE**

| Public Workshops and Hearings | Date | Public Participation Task |
|---|---|---|
| 1st Public Workshop | May 25, 2010 | Presented UWMP requirements and Plan outline |
| 2nd Public Workshop | July 27, 2010 | Progress update on UWMP requirements and process, discuss supplies |
| Presentation to the Upper Santa Clara River IRWMP Stakeholder Group | November 9, 2010 | UWMP requirements, process, preliminary SBX7-7 calculations |
| 3rd Public Workshop | November 16, 2010 | Discussed Santa Clarita Valley supplies and demands, reliability analysis and SBX7-7 calculations |
| 4th Public Workshop | January 25, 2011 | Discussed supply and demand analysis and SBX7-7 calculations |
| 5th Public Workshop | March 8, 2011 | Discussed supply and demand analysis |
| 1st Public Hearing | March 23, 2011 | Presented overview of Draft 2010 UWMP |
| 2nd Public Hearing | May 18, 2011 | Discussed comments on Public Draft 2010 UWMP |
| 3rd Public Hearing | June 22, 2011 | Discussed comments on Public Draft 2010 UWMP |
| Plan Adoption | June 22, 2011 | Adoption Hearing for CLWA and NCWD for Final Draft 2010 UWMP |
| Plan Adoption | June 27, 2011 | Adoption of Final Draft 2010 UWMP by VWC's Board of Directors |
| Plan Submittal | July 21, 2011 | File 2010 UWMP with DWR within thirty days of adoption |

The components of public participation include:

Local Media

- Paid advertisements in local newspapers
- Meeting(s) with local editorial boards (*The Signal*)

Community-Based Outreach

- Building Industry Association
- Castaic Town Council
- Santa Clarita Valley Chamber of Commerce
- Friends of the Santa Clara River
- Santa Clarita Valley Well Owners Association
- Santa Clarita Organization for Planning the Environment
- Sierra Club
- Valley Industrial Association of Santa Clarita Valley
- West Ranch Town Council

Water Suppliers Public Participation

- Presentations to NCWD Board
- Presentations to CLWA Board

City/County Outreach

- Meeting with City of Santa Clarita Planning Division
- Meeting with Los Angeles County Department of Regional Planning
- Meeting with Supervisor Antonovich representatives Rosalind Wayman and Edel Vizcarra

Public Availability of Documents

- Water suppliers' offices and websites
- City Hall
- Local libraries

### 1.3.4 Resources Maximization

Several documents were developed to enable the water suppliers to maximize the use of available resources and minimize use of imported water, including the 2005 CLWA UWMP, CLWA's 2009 Water Supply Reliability Plan Update, the 2008 Integrated Regional Water Management Plan for the Upper Santa Clara River, the 2009 Santa Clarita Valley Water Report, DWR's 2009 State Water Project Delivery Reliability Report, the 2002 Draft Recycled Water Master Plan, the 2009 Basin Yield Analysis by Luhdorff and Scalmanini Consulting Engineers and GSI Water Solutions, Inc., the 2010 Data Document[1] and the 2003 Groundwater Management Plan (GWMP). Chapter 3 of this Plan describes in detail the water resources available to CLWA and the retail purveyors for the forty-year period covered by the Plan. A complete reference list is provided in Section 9 of this Plan.

## 1.4 Water Suppliers of the Santa Clarita Valley

### 1.4.1 Castaic Lake Water Agency

CLWA was formed in 1962 for the purpose of contracting with DWR to acquire and distribute imported SWP water to the water purveyors in the Valley. CLWA serves an area of 195 square miles in Los Angeles and Ventura Counties.

Adequate planning for, and the procurement of, a reliable water supply is a fundamental function of CLWA. CLWA obtains its water supply for wholesale purposes principally from the

[1] CLWA regularly updates its Data Document as the basis for establishing its facility capacity fees. Several significant developments since the last Data Document update in 2008 were incorporated into the 2010 Update: water conservation legislation that could significantly affect water demand projections and the cost of water conservation programs; the need to coordinate water supply and demand projections with the preparation of the 2010 Urban Water Management Plan; establishment of Total Maximum Daily Load allocations for the Santa Clara River that could affect recycled water availability; judicial and regulatory determinations for the Delta that affect SWP reliability; engineering studies completed since the 2008 Data Document, particularly those related to emergency and operating storage, recycled water, and transmission system improvements; and updated cost allocation issues from the 2008 Document.

SWP and currently has a Water Supply Contract with DWR for 95,200 acre-feet per year (AFY) of SWP Table A Amount[2]. The maximum annual Table A Amount in CLWA's SWP Water Supply Contract with DWR was originally 23,000 AF, but was amended to 41,500 AF in 1966. In 1991 CLWA purchased 12,700 AF of annual Table A Amount from a Kern County water district and in 1999 CLWA purchased 41,000 AF of annual Table A Amount from another Kern County water district, for the current total of 95,200 AFY. CLWA also imports water from two other water districts in Kern County. Under the 2007 Water Acquisition Agreement with the Buena Vista Water Storage District (Buena Vista, BVWSD) and the Rosedale-Rio Bravo Water Storage District (Rosedale-Rio Bravo, RRBWSD), Buena Vista's high flow Kern River entitlements (and other acquired waters that may become available) are captured and recharged within the Rosedale-Rio Bravo's service area on an ongoing basis. CLWA receives 11,000 AF of these supplies annually through either exchange of Buena Vista's and Rosedale-Rio Bravo's SWP supplies or through direct delivery of water to the California Aqueduct via the Cross Valley Canal. All imported water is delivered to Castaic Lake through SWP facilities. From Castaic Lake, which serves as the terminal reservoir of the SWP's West Branch, the water is treated at either CLWA's Earl Schmidt Filtration Plant or Rio Vista Water Treatment Plant and delivered to the retail water purveyors through transmission lines owned and operated by CLWA.

CLWA is able to meet approximately half of the Valley's urban demand with imported water. However, the availability of SWP supply is variable. It fluctuates from year to year depending on precipitation, regulatory restrictions, legislative restrictions and operational conditions and is subject to severe curtailment during dry years. Of particular concern is the recent (2007) U.S. District Court ruling whereby the SWP was held in violation of the federal Endangered Species Act due to potential pumping impacts on populations of the Delta smelt, a fish species living in the Sacramento-San Joaquin Delta, resulting in the order to curb water imports from the Delta by up to 35 percent from the SWP and the Central Valley Project. A similar court decision was rendered in 2009 involving endangered salmon. The results of these impacts on environmental resources in the Delta, when combined with recent socioeconomic conditions and hydrology changes, have already reduced the utilization of SWP and other imported supplies in the Region from a high in 2004 of about 47,500 AF to approximately 38,700 AF in 2009. Recently (December 14, 2010), the court overturned these rulings and has required new analysis of Delta pumping requirements. While the results are unknown at this time, it is expected that some level of SWP pumping restrictions will continue into the future. Further, in June 2008, Governor Arnold Schwarzenegger declared California to be in a statewide drought condition, and called for a reduction in statewide water uses by 20 percent by the year 2020, which resulted in the passage of SBX7-7 in late 2009.

CLWA and the retail purveyors mainly meet the balance of their demands with local groundwater and a small amount of recycled water. CLWA has evaluated the long-term water needs (water demand) within its service area based on applicable county and city land use plans and has compared these needs against existing and potential water supplies. Results indicate that as CLWA's water requirements utilize increased proportions of its SWP Table A Amount, conjunctive use, water conservation, water transfers, recycled water and water banking are becoming increasingly more important water management elements for CLWA's long-term water supply strategy.

[2] Table A is a schedule of annual water amounts as set forth in long-term SWP delivery contracts. Table A defines the annual volume of water that could be delivered to a SWP contractor in a given year under regular contract provisions without consideration of surplus SWP water deliveries or other supplies available to a SWP contractor.

Since the preparation of the 2005 Plan, DWR has prepared updates to the SWP Reliability Report in 2007 and 2009. Also, the water demand projections within CLWA's service area have been updated based on detailed information provided by CLWA's retail purveyors. In addition, based on DWR estimates of SWP supply reliability, CLWA has developed additional water supplies as well as capacity in groundwater banks. Together with its SWP Table A supply and the flexible storage allowed under the Monterey Amendments to the SWP Water Supply Contracts, these additional water management strategy elements have created a series of water management options that are addressed in this UWMP Update.

### 1.4.2 Retail Water Purveyors

Four retail purveyors provide water service to most residents of the Valley.

1. LACWWD 36's service area includes the Hasley Canyon area in the unincorporated community of Val Verde. During most years, the District obtains its water supply from CLWA.

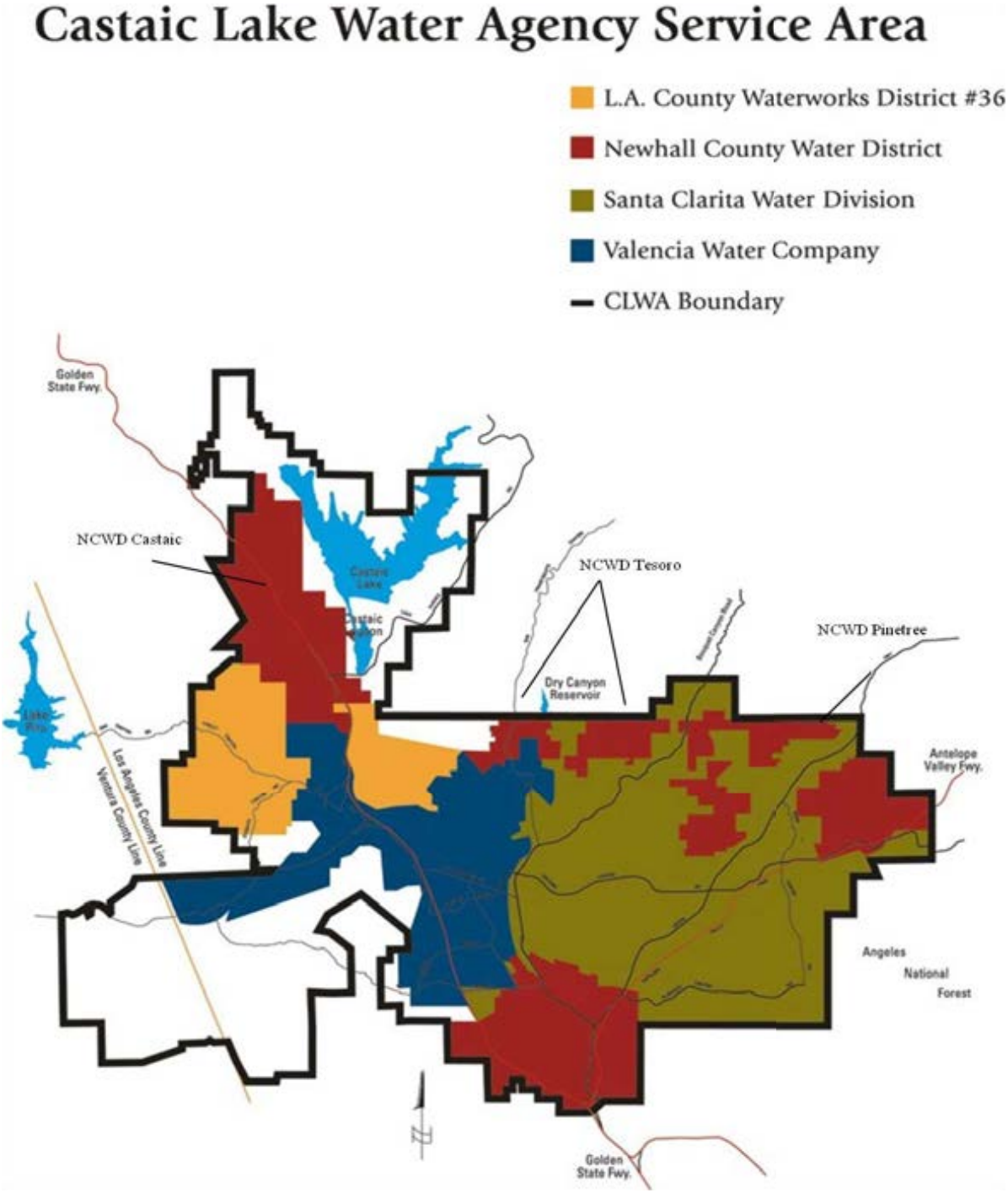
2. NCWD's service area includes portions of the City of Santa Clarita and unincorporated portions of Los Angeles County in the communities of Castaic, Newhall, Valencia and Canyon Country. The District supplies water from local groundwater and CLWA imported water.

3. SCWD's service area includes portions of the city of Santa Clarita and unincorporated portions of Los Angeles County in the communities of Canyon Country, Newhall and Saugus. SCWD supplies water from local groundwater and CLWA imported water.

4. VWC's service area includes a portion of the City of Santa Clarita and unincorporated portions of Los Angeles County in the communities of Valencia, Stevenson Ranch and portions of Castaic, Saugus and Newhall. VWC supplies water from local groundwater, CLWA imported water and recycled water.

The service area for CLWA and the retail water purveyors is shown on Figure 1-1.

**FIGURE 1-1**


Castaic Lake Water Agency Service Area
L.A. County Waterworks District #36
Newhall County Water District
Santa Clarita Water Division
Valencia Water Company
CLWA Boundary
Golden State Fwy.
NCWD Castaic
NCWD Tesoro
NCWD Pinetree
Dry Canyon Reservoir
Los Angeles County Line
Ventura County Line
Antelope Valley Fwy.
Angeles National Forest
Golden State Fwy.

The four retail purveyors – (1) SCWD, (2) NCWD, (3) VWC and (4) LACWWD 36 – deliver these waters to primarily municipal and industrial (M&I) users within the Valley. Together, as shown below in Table 1-3, the purveyors provide water to nearly 70,000 service connections (2009 Santa Clarita Valley Water Report, May 2010).

**TABLE 1-3**
**RETAIL WATER SERVICE CONNECTIONS**

| Retail Water Purveyor | Connections |
|---|---|
| LACWWD 36 | 1,400 |
| NCWD | 9,600 |
| SCWD | 28,700 |
| VWC | 30,000 |
| **Total Connections** | **69,700** |

Source: 2009 Santa Clarita Valley Water Report (May 2010)

## 1.5 Climate

The climate in CLWA's service area is generally semi-arid and warm. Summers are dry with temperatures as high as 110°F. Winters are somewhat cool with temperatures as low as 20°F. Average rainfall since 1980 is about 17.3 inches per year in the flat areas and about 25 to 30 inches in the mountains. The region is subject to wide variations in annual precipitation and also experiences periodic wildfires. The region's average climate conditions are presented in Tables 1-4 and 1-5.

**TABLE 1-4**
**CLIMATE DATA FOR THE SANTA CLARITA VALLEY**

| Month | Standard Monthly Avg. ETo (in.) | Avg. Max. Temperature (Fahrenheit) |
|---|---|---|
| Jan | 3.43 | 65.4 |
| Feb | 3.08 | 67.7 |
| Mar | 5.6 | 74.6 |
| Apr | 6.5 | 79.4 |
| May | 7.94 | 85.5 |
| Jun | 8.36 | 90.3 |
| Jul | 9.15 | 95.8 |
| Aug | 8.76 | 95.5 |
| Sep | 6.75 | 88.7 |
| Oct | 5.24 | 79.5 |
| Nov | 4.03 | 73.9 |
| Dec | 2.58 | 64.3 |
| **Annual** | **71.42** | **80.0** |

Source: California Irrigation Management System (CIMIS) data provided from Santa Clarita Station No. 204, Los Angeles region, January 2007 to December 2010 http://wwwcimis.water.ca.gov/cimis/welcome.jsp.
ETo = evapotranspiration

**TABLE 1-5**
**ANNUAL RAINFALL RECORD FOR THE SANTA CLARITA VALLEY**

| Year | Annual Rainfall (in.) | Year | Annual Rainfall (in.) |
|---|---|---|---|
| 1980 | 24.3 | 1995 | 29.2 |
| 1981 | 13.4 | 1996 | 15.8 |
| 1982 | 20.2 | 1997 | 7.1 |
| 1983 | 39.1 | 1998 | 28.2 |
| 1984 | 12.9 | 1999 | 9.0 |
| 1985 | 8.4 | 2000 | 13.6 |
| 1986 | 18.0 | 2001 | 18.8 |
| 1987 | 14.5 | 2002 | 7.8 |
| 1988 | 16.9 | 2003 | 15.6 |
| 1989 | 7.6 | 2004 | 22.8 |
| 1990 | 7.0 | 2005 | 37.2 |
| 1991 | 17.2 | 2006 | 13.9 |
| 1992 | 32.0 | 2007 | 5.8 |
| 1993 | 22.1 | 2008 | 18.2 |
| 1994 | 10.3 | 2009 | 11.6 |
| | | **Average** | **17.3** |

Source: Data provided from rain gage Newhall-Soledad 32c, January 1980 to January 2009

## 1.6 Potential Effects of Climate Change

A topic of growing concern for water planners and managers is climate change and the potential impacts it could have on California's future water supplies. Climate change models have predicted that potential effects from climatic changes will result in increased temperature, reduction in Sierra Nevada snowpack depth, early snow melt and a rise in sea level.

In June 2005, Governor Arnold Schwarzenegger issued Executive Order S-3-05, which requires biennial reports on climate change impacts in several areas, including water resources. The Climate Action Team (CAT) was formed in response to Executive Order S-3-05. To help unify analysis across topic areas, the CAT worked with scientists from the California Applications Program's California Climate Change Center to select a set of future climate projections to be used for analysis. In the assessment *"Using Future Climate Projections to Support Water Resources Decision Making in California,"* the CAT selected six different global climate change models to evaluate climate change impacts, assuming two different greenhouse gas emission levels (a high end and a low end), for a total of 12 scenarios. The results of the study indicated that climate change has already been observed, in that in the last 100 years air temperatures have risen about one degree Fahrenheit and there has been a documented greater variance in precipitation, with greater extremes in both heavy flooding and severe droughts.

In July 2006, DWR issued "*Progress on Incorporating Climate Change into Management of California's Water Resources*," as required by Executive Order S-3-05. That report demonstrated how various analytical tools could be used to address issues related to climate change. The report presents analysis results showing potential impacts on SWP operations, including reservoir inflows, delivery reliability, and average annual carryover storage, as well as many other operational parameters. Some of the main impacts include changes to south-of-Delta SWP deliveries (from an increase of about one percent in a wetter climate change scenario to about a ten percent reduction for a drier scenario), increased winter runoff and lower

SWP allocations in the three driest scenarios, lower carryover storage in drier scenarios and higher carryover storage in the wetter scenario.

In the 2009 update of the DWR *California Water Plan*, multiple scenarios of future climate conditions are evaluated. These changing hydrological conditions could affect future planning efforts, which are typically based on historic conditions. The *California Water Plan* identifies the following probable impacts due to changes in temperature and precipitation:

- Decrease in snowpack, which is a major part of annual water storage, due to increasing winter temperatures.
- More winter runoff and less spring/summer runoff due to warmer temperatures.
- Greater extremes in flooding and droughts.
- Greater water demand for irrigation and landscape water due to increased temperatures and their impacts on plant water needs.
- Increased sea level rise, further endangering the functions of the SWP, which can depend on movement of water through the low-lying channels of the low-lying Sacramento-San Joaquin Delta. Sea level rise could also require the SWP to release additional storage water to avoid sea water intrusion into the Delta.

In its *State Water Project Delivery Reliability Report (Reliability Report)* (2009), DWR included the potential effects of climate change in its analysis of SWP delivery reliability under future conditions. For that report, DWR used a single climate change scenario, selecting a scenario with median effects out of a number of climate change scenarios it analyzed in 2009.

Even without population changes, water demand could increase. Precipitation and temperature influence water demand for outdoor landscaping and irrigated agriculture. Outdoor water use is a large component of Santa Clarita Valley water demands. Lower spring rainfall increases the need to apply irrigation water. Further, warmer temperatures increase crop evapotranspiration, which increases water demand.

These effects and their potential to impact the supplies available to the Santa Clarita Valley have been evaluated indirectly in DWR's *Reliability Report*, and their potential to impact demand is considered in CLWA's assessment of demands in Chapter 2 of this UWMP.

# Section 2: Water Use

## 2.1 Overview

This chapter describes historic and current water usage and the methodology used to project future demands within CLWA's service area. Water usage is divided into sectors such as residential, industrial, commercial, landscape, agricultural, and other purposes. To undertake this evaluation, existing land use data and new housing construction information were compiled from each of the retail water purveyors and projections evaluated from each retailer's master planning documents. This information was then compared to historical trends for new water service connections and customer water usage information. In addition, weather and water conservation effects on historical water usage were considered in the evaluation.

Several factors can affect demand projections, including:

- Land use revisions
- New regulations
- Consumer choice
- Economic conditions
- Transportation needs
- Highway construction
- Environmental factors
- Conservation programs
- Building and plumbing codes

The foregoing factors affect the amount of water needed, as well as the timing of when it is needed. During an economic recession, there is a major downturn in development and a subsequent slowing of the projected demand for water. The projections in this Plan do not attempt to forecast recessions or droughts. Likewise, no speculation is made about future building and plumbing codes or other regulatory changes. However, the projections do include water conservation consistent with new legislative requirements calling for a 20 percent reduction in per capita demand by 2020 (SBX7-7).

An analysis was performed that combined growth projections with water use data to forecast total water demand in future years. Water uses were broken out into specific categories and assumptions made about each to more accurately project future use. Three separate data sets were collected and included in the model: historical water use by land use type, current population and projected population.

## 2.2 Demographics

Water service is provided to residential, commercial, industrial, institutional, recreational, and agricultural customers and for environmental and other uses, such as fire protection and landscaping.

The total demand trend on water supplies is expected to continue to rise within the Valley area (along with most of California) because of population, economic activity, environmental and water quality needs and regulatory requirements.

## 2.3 Historical Water Use

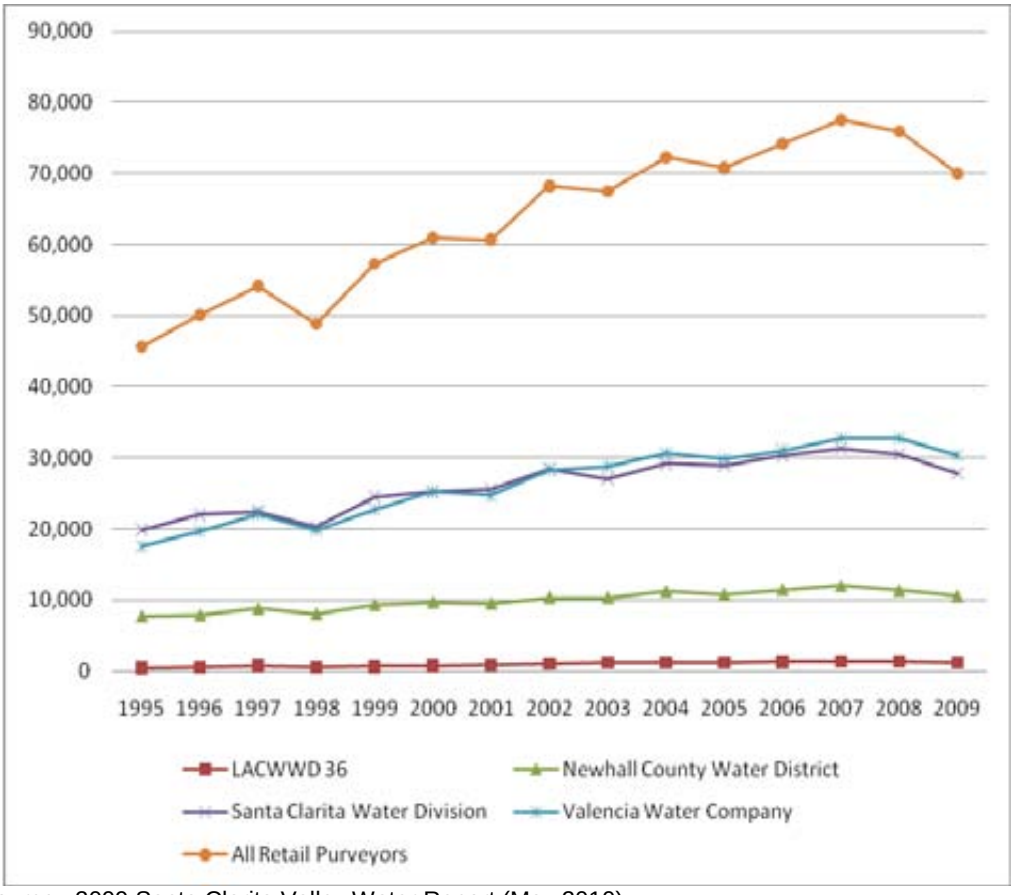
Predicting future water supply requires accurate historic water use patterns and water usage records. The historical use of all water supplies used to meet municipal water requirements, including the use of local groundwater, imported water supplies and recycled water, are summarized in Table 2-1. Figure 2-1 illustrates this use, which shows an increasing trend in Valley water demand since 1995 with a downturn in recent years likely due to weather conditions, response by customers to dry-year conservation efforts and economic conditions.

**TABLE 2-1**
**HISTORICAL WATER USE BY RETAIL WATER PURVEYORS**

| Year | LACWWD 36 | Newhall County Water District | Santa Clarita Water Division | Valencia Water Company | All Retail Purveyors |
|---|---|---|---|---|---|
| 1995 | 477 | 7,755 | 19,898 | 17,543 | 45,673 |
| 1996 | 533 | 7,887 | 22,006 | 19,721 | 50,147 |
| 1997 | 785 | 8,801 | 22,456 | 22,131 | 54,173 |
| 1998 | 578 | 8,087 | 20,319 | 19,874 | 48,858 |
| 1999 | 654 | 9,348 | 24,513 | 22,735 | 57,250 |
| 2000 | 800 | 9,718 | 25,280 | 25,190 | 60,988 |
| 2001 | 907 | 9,525 | 25,544 | 24,715 | 60,691 |
| 2002 | 1,069 | 10,362 | 28,434 | 28,360 | 68,225 |
| 2003 | 1,175 | 10,351 | 27,092 | 28,829 | 67,447 |
| 2004 | 1,234 | 11,217 | 29,191 | 30,654 | 72,296 |
| 2005 | 1,200 | 10,756 | 28,921 | 29,891 | 70,768 |
| 2006 | 1,289 | 11,470 | 30,302 | 31,065 | 74,126 |
| 2007 | 1,406 | 11,975 | 31,355 | 32,756 | 77,492 |
| 2008 | 1,354 | 11,340 | 30,476 | 32,730 | 75,900 |
| 2009 | 1,243 | 10,560 | 27,816 | 30,355 | 69,974 |

Source: 2009 Santa Clarita Valley Water Report (May 2010)

**FIGURE 2-1**
**HISTORICAL WATER USE**




Source: 2009 Santa Clarita Valley Water Report (May 2010)

## 2.4 Projected Water Use

### 2.4.1 Purveyor Projections

Each of the four retail water purveyors provided projected water demands based on development projects that are under evaluation, in the planning process or the result of its own water planning efforts for its service area. The purveyors maintain historical data, as well as work closely with property owners and developers in their service areas, to ensure they have an adequate water supply and the necessary infrastructure to provide water service.

Since there are only four purveyors in the service area, there is close coordination and exchange of data. SCWD's engineering department continually updates expected demands and infrastructure needs. NCWD's master plans provide the basis for projected demands. VWC is an investor-owned utility regulated by the California Public Utilities Commission (PUC) and is required to regularly provide its service plan for rate increases and service area changes.

The projected water demands provided by the four purveyors are shown in Tables 2-3 through 2-6, for LACWWD 36, NCWD, SCWD and VWC, respectively. These tables show current and projected water demand, by customer type and in total, through 2050. Table 2-2 provides a summary from these tables of each purveyor's projected total water demands through 2050.

**TABLE 2-2**
**SUMMARY OF PROJECTED WATER DEMANDS[(a)(b)(c)]**

| | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 | Annual Increase |
|---|---|---|---|---|---|---|---|---|---|---|
| Water Demands | | | | | | | | | | |
| LACWWD 36[(d)] | 1,243 | 1,759 | 2,189 | 2,619 | 3,048 | 3,478 | 3,908 | 4,338 | 4,768 | 3.5% |
| NCWD | 10,560 | 12,571 | 14,246 | 15,922 | 17,598 | 19,273 | 20,949 | 22,624 | 24,300 | 2.2% |
| SCWD | 27,816 | 31,633 | 34,814 | 37,995 | 41,176 | 44,357 | 47,538 | 50,719 | 53,900 | 1.7% |
| VWC | 30,354 | 34,107 | 37,235 | 40,362 | 43,490 | 46,617 | 49,745 | 52,872 | 56,000 | 1.6% |
| Total Demand | 69,973 | 80,070 | 88,484 | 96,898 | 105,313 | 113,725 | 122,141 | 130,553 | 138,968 | 1.8% |

Notes:
(a) Summary of demands from Tables 2-3 to 2-6.
(b) Reflects existing and projected demands in CLWA service area only. CLWA's Annexation Policy requires annexing parties to provide additional fully reliable supplies.
(c) Demands exclude non-purveyor demands. Similarly, supplies evaluated in this UWMP exclude non-purveyor supplies.
(d) LACWWD 36 included for purposes of providing regional completeness; however, it is not required to prepare an UWMP.

## TABLE 2-3
## LOS ANGELES COUNTY WATERWORKS DISTRICT 36
## CURRENT AND PROJECTED WATER DELIVERIES BY CUSTOMER TYPE

| Year | Water Use Sectors | Single Family Residential[a] | Multi Family Residential[a] | Commercial | Construction/ Industrial | Institutional/ Government | Landscape | Total[b] |
|---|---|---|---|---|---|---|---|---|
| 2010 | No. of Accounts | 1,527 | 6 | 5 | 6 | 6 | 6 | 1,555 |
| | Deliveries (AF) | 1,168 | 35 | 1 | 4 | 24 | 13 | 1,243 |
| 2015 | No. of Accounts | 2,155 | 8 | 5 | 8 | 8 | 8 | 2,194 |
| | Deliveries (AF) | 1,649 | 49 | 1 | 5 | 33 | 23 | 1,759 |
| 2020 | No. of Accounts | 2,682 | 10 | 5 | 10 | 10 | 10 | 2,729 |
| | Deliveries (AF) | 2,052 | 61 | 1 | 6 | 42 | 28 | 2,189 |
| 2025 | No. of Accounts | 3,209 | 12 | 5 | 12 | 12 | 12 | 3,264 |
| | Deliveries (AF) | 2,455 | 73 | 1 | 7 | 50 | 34 | 2,619 |
| 2030 | No. of Accounts | 3,735 | 14 | 5 | 14 | 14 | 14 | 3,797 |
| | Deliveries (AF) | 2,857 | 85 | 1 | 9 | 58 | 39 | 3,048 |
| 2035 | No. of Accounts | 4,262 | 17 | 6 | 17 | 17 | 17 | 4,333 |
| | Deliveries (AF) | 3,260 | 97 | 1 | 10 | 66 | 45 | 3,478 |
| 2040 | No. of Accounts | 4,788 | 19 | 6 | 19 | 19 | 19 | 4,863 |
| | Deliveries (AF) | 3,663 | 109 | 1 | 11 | 74 | 50 | 3,908 |
| 2045 | No. of Accounts | 5,315 | 21 | 7 | 21 | 21 | 21 | 5,405 |
| | Deliveries (AF) | 4,066 | 121 | 1 | 12 | 82 | 56 | 4,338 |
| 2050 | No. of Accounts | 5,842 | 23 | 8 | 23 | 23 | 23 | 5,940 |
| | Deliveries (AF) | 4,469 | 133 | 1 | 14 | 91 | 61 | 4,768 |

Notes:
(a) Projected Single Family and Multi-Family residential accounts have been adjusted to reflect dwelling units.
(b) Totals do not include fire services.

## TABLE 2-4
## NEWHALL COUNTY WATER DISTRICT
## CURRENT AND PROJECTED WATER DELIVERIES BY CUSTOMER TYPE

| Year | Water Use Sectors | Single Family Residential[a] | Multi Family Residential[a] | Commercial | Construction/ Industrial | Institutional/ Government | Landscape | Total[b] |
|---|---|---|---|---|---|---|---|---|
| 2010 [c] | No. of Accounts | 8,500 | 4,893 | 400 | 80 | 70 | 250 | 14,193 |
| | Deliveries (AF) | 6,400 | 1,500 | 560 | 100 | 400 | 1,600 | 10,560 |
| 2015 | No. of Accounts | 10,135 | 4,955 | 476 | 95 | 83 | 298 | 16,042 |
| | Deliveries (AF) | 7,631 | 1,785 | 655 | 119 | 476 | 1,906 | 12,571 |
| 2020 | No. of Accounts | 11,485 | 5,003 | 540 | 108 | 94 | 337 | 17,568 |
| | Deliveries (AF) | 8,647 | 2,023 | 742 | 135 | 540 | 2,159 | 14,246 |
| 2025 | No. of Accounts | 12,620 | 5,093 | 600 | 135 | 120 | 375 | 18,493 |
| | Deliveries (AF) | 9,665 | 2,261 | 831 | 151 | 603 | 2,412 | 15,922 |
| 2030 | No. of Accounts | 14,188 | 5,100 | 667 | 133 | 117 | 417 | 20,621 |
| | Deliveries (AF) | 10,682 | 2,499 | 917 | 168 | 667 | 2,666 | 17,598 |
| 2035 | No. of Accounts | 15,538 | 5,148 | 730 | 146 | 128 | 456 | 22,146 |
| | Deliveries (AF) | 11,699 | 2,737 | 1,005 | 182 | 730 | 2,920 | 19,273 |
| 2040 | No. of Accounts | 16,889 | 5,196 | 794 | 159 | 139 | 496 | 23,673 |
| | Deliveries (AF) | 12,716 | 2,975 | 1,091 | 198 | 793 | 3,175 | 20,949 |
| 2045 | No. of Accounts | 18,241 | 5,245 | 857 | 171 | 150 | 536 | 25,200 |
| | Deliveries (AF) | 13,733 | 3,213 | 1,179 | 214 | 857 | 3,428 | 22,624 |
| 2050 | No. of Accounts | 19,591 | 5,293 | 921 | 184 | 161 | 575 | 26,725 |
| | Deliveries (AF) | 14,750 | 3,452 | 1,266 | 230 | 920 | 3,681 | 24,300 |

Notes:

(a) Projected Single Family and Multi-Family residential accounts have been adjusted from the 2005 UWMP to reflect dwelling units.

(b) Totals do not include fire services.

(c) Year 2010 projection based on 2009 actual data. Growth to 2015 reflects six years of data.

## TABLE 2-5
## SANTA CLARITA WATER DIVISION
## CURRENT AND PROJECTED WATER DELIVERIES BY CUSTOMER TYPE

| Year | Water Use Sectors | Single Family Residential[a] | Multi Family Residential[a] | Commercial | Construction/ Industrial | Institutional/ Government | Landscape | Total[b] |
|---|---|---|---|---|---|---|---|---|
| 2010[c] | No. of Accounts | 24,382 | 13,151 | 726 | 71 | 107 | 890 | 39,327 |
| | Deliveries (AF) | 16,189 | 4,200 | 1,029 | 445 | 862 | 5,090 | 27,816 |
| 2015 | No. of Accounts | 26,368 | 14,311 | 781 | 135 | 117 | 990 | 42,702 |
| | Deliveries (AF) | 18,410 | 4,776 | 1,170 | 506 | 982 | 5,789 | 31,633 |
| 2020 | No. of Accounts | 29,019 | 15,750 | 859 | 148 | 129 | 1,089 | 46,994 |
| | Deliveries (AF) | 20,261 | 5,257 | 1,288 | 558 | 1,079 | 6,371 | 34,814 |
| 2025 | No. of Accounts | 31,670 | 17,188 | 938 | 162 | 141 | 1,189 | 51,288 |
| | Deliveries (AF) | 22,111 | 5,737 | 1,406 | 608 | 1,178 | 6,955 | 37,995 |
| 2030 | No. of Accounts | 34,320 | 18,627 | 1,016 | 175 | 152 | 1,288 | 55,578 |
| | Deliveries (AF) | 23,962 | 6,217 | 1,523 | 659 | 1,276 | 7,539 | 41,176 |
| 2035 | No. of Accounts | 36,971 | 20,066 | 1,095 | 189 | 164 | 1,388 | 59,873 |
| | Deliveries (AF) | 25,813 | 6,697 | 1,641 | 715 | 1,375 | 8,116 | 44,357 |
| 2040 | No. of Accounts | 39,622 | 21,504 | 1,174 | 203 | 176 | 1,487 | 64,166 |
| | Deliveries (AF) | 27,664 | 7,177 | 1,759 | 761 | 1,479 | 8,698 | 47,538 |
| 2045 | No. of Accounts | 42,273 | 22,943 | 1,252 | 216 | 188 | 1,587 | 68,459 |
| | Deliveries (AF) | 29,514 | 7,658 | 1,876 | 812 | 1,579 | 9,280 | 50,719 |
| 2050 | No. of Accounts | 44,930 | 24,385 | 1,331 | 230 | 200 | 1,687 | 72,763 |
| | Deliveries (AF) | 31,370 | 8,139 | 1,994 | 862 | 1,671 | 9,864 | 53,900 |

Notes:
(a) Projected Single Family and Multi-Family residential accounts have been adjusted from the 2005 UWMP to reflect dwelling units.
(b) Totals do not include fire services.
(c) Year 2010 projection based on 2009 actual data. Growth to 2015 reflects six years of data.

## TABLE 2-6
## VALENCIA WATER COMPANY
## CURRENT AND PROJECTED WATER DELIVERIES BY CUSTOMER TYPE

| Year | Water Use Sectors | Single Family Residential[a] | Multi Family Residential[a] | Commercial | Industrial | Institutional/ Government | Landscape[b] | Total[c] |
|---|---|---|---|---|---|---|---|---|
| | No. of Accounts | 25,386 | 8,854 | 1,546 | 451 | 646 | 13 | 36,896 |
| 2010[d] | Deliveries (AF) | 14,384 | 1,845 | 6,981 | 1,856 | 4,586 | 702 | 30,354 |
| | No. of Accounts | 26,497 | 11,956 | 1,598 | 485 | 647 | 362 | 41,545 |
| 2015 | Deliveries (AF) | 14,883 | 2,993 | 7,203 | 1,990 | 4,595 | 2,442 | 34,107 |
| | No. of Accounts | 27,423 | 14,542 | 1,641 | 514 | 648 | 652 | 45,419 |
| 2020 | Deliveries (AF) | 15,299 | 3,949 | 7,389 | 2,101 | 4,603 | 3,894 | 37,235 |
| | No. of Accounts | 28,348 | 17,127 | 1,684 | 542 | 650 | 943 | 49,294 |
| 2025 | Deliveries (AF) | 15,715 | 4,906 | 7,575 | 2,213 | 4,611 | 5,343 | 40,362 |
| | No. of Accounts | 29,274 | 19,713 | 1,727 | 570 | 651 | 1,233 | 53,168 |
| 2030 | Deliveries (AF) | 16,130 | 5,862 | 7,760 | 2,324 | 4,619 | 6,794 | 43,490 |
| | No. of Accounts | 30,200 | 22,298 | 1,770 | 599 | 652 | 1,524 | 57,042 |
| 2035 | Deliveries (AF) | 16,546 | 6,818 | 7,946 | 2,436 | 4,627 | 8,244 | 46,617 |
| | No. of Accounts | 31,125 | 24,883 | 1,813 | 627 | 653 | 1,814 | 60,917 |
| 2040 | Deliveries (AF) | 16,962 | 7,775 | 8,131 | 2,548 | 4,635 | 9,696 | 49,745 |
| | No. of Accounts | 32,051 | 27,469 | 1,856 | 656 | 654 | 2,105 | 64,791 |
| 2045 | Deliveries (AF) | 17,378 | 8,731 | 8,317 | 2,659 | 4,643 | 11,144 | 52,872 |
| | No. of Accounts | 32,977 | 30,054 | 1,900 | 684 | 655 | 2,395 | 68,665 |
| 2050 | Deliveries (AF) | 17,793 | 9,687 | 8,503 | 2,771 | 4,650 | 12,596 | 56,000 |

Notes:
(a) Projected Single Family and Multi-Family residential accounts have been adjusted from the 2005 UWMP to reflect dwelling units.
(b) Landscape customers consist of potable and recycled water users for outdoor irrigation.
(c) Totals do not include fire services.
(d) Year 2010 projection based on 2009 actual data. Growth to 2015 reflects six years of data.

## 2.5 Population

### 2.5.1 Historical Population

The methodology for estimating the historical populations of areas served by the water purveyors is prescribed by DWR[3]. The method enables those suppliers whose service areas are not fully contained in existing city boundaries to obtain service area population from a data source such as a regional planning agency or an association of governments (such as Southern California Association of Governments, SCAG), assuming that their estimates use the State Department of Finance (DOF) or U.S. Census Bureau data as a basis. In such situations water suppliers must use DOF, Census or SCAG data to a define persons per Single Family (SF) and Multi-Family (MF) residential connection factor, and then calculate yearly populations based on the number of SF and MF connections each year. This calculation of historical population must cover each year of the period 1995 to 2010.

Accordingly, each purveyor provided an accounting of its historical SF residential and MF residential dwelling units for the years 1995 to 2009 (LACWWD 36 provided 2000-2009 data). Planning assumptions utilized the 2000 U.S. Census, SCAG's 2012 Regional Transportation Plan (RTP) growth forecast (baseline 2008) and the DOF 2000 and 2010 datasets to capture both City of Santa Clarita and the northern portion of unincorporated Los Angeles County within the CLWA service area. Actual data for 2010 SF and MF dwelling units were provided by the purveyors.

The population for each purveyor was estimated by taking the number of accounts for SF and MF in a given year and multiplying by a persons-per-household (PPHH) factor for the number of people living at each type of account, and then summing the result. Using a PPHH factor of 3.11[4] and a growth rate of 0.53 percent, annual historical populations were calculated for each purveyor from 1995, as shown in Table 2-7. The total of these estimates, as summarized in Table 2-8, reflect the total population within the CLWA service area.

[3] See Appendix A in "*Methodologies for Calculating Baseline and Compliance per Capita Urban Water Use"* (DWR 2010).
[4] The PPHH of 3.11 was anchored to the purveyors' year 2000 residential connections and then projected backward to 1995 and forward to 2010 using the calculated growth rate.

## TABLE 2-7
## HISTORICAL POPULATION BY RETAIL PURVEYOR SERVICE AREA

| | NCWD | | | SCWD | | |
|---|---|---|---|---|---|---|
| Year | SF Residential Units[a] | MF Residential Units[a] | Population[b][c] | SF Residential Units[a] | MF Residential Units[a] | Population[b][c][d] |
| 1995 | 5,680 | 4,552 | 30,898 | 17,632 | 10,062 | 83,628 |
| 1996 | 5,723 | 4,589 | 31,323 | 17,812 | 10,100 | 84,784 |
| 1997 | 6,035 | 4,612 | 32,533 | 17,856 | 9,842 | 84,634 |
| 1998 | 6,037 | 4,622 | 32,764 | 18,222 | 9,884 | 86,394 |
| 1999 | 6,202 | 4,651 | 33,561 | 18,671 | 9,994 | 88,642 |
| 2000 | 6,255 | 4,713 | 34,121 | 19,408 | 10,527 | 93,128 |
| 2001 | 6,428 | 4,768 | 35,041 | 20,145 | 10,985 | 97,430 |
| 2002 | 6,777 | 4,823 | 36,526 | 20,691 | 11,458 | 101,230 |
| 2003 | 7,199 | 4,852 | 38,178 | 21,278 | 11,685 | 104,427 |
| 2004 | 7,873 | 4,870 | 40,618 | 22,152 | 12,104 | 109,189 |
| 2005 | 8,163 | 4,875 | 41,814 | 23,035 | 12,479 | 113,897 |
| 2006 | 8,292 | 4,875 | 42,490 | 23,620 | 13,066 | 118,385 |
| 2007 | 8,431 | 4,875 | 43,206 | 24,347 | 13,195 | 121,903 |
| 2008 | 8,450 | 4,875 | 43,539 | 24,398 | 13,133 | 122,631 |
| 2009 | 8,492 | 4,875 | 43,951 | 24,374 | 13,126 | 123,302 |
| 2010 | 8,500 | 4,893 | 44,316 | 24,382 | 13,151 | 124,192 |

Notes:
(a) Single Family (SF) and Multi-Family (MF) residential units provided by each retail purveyor.
(b) Population estimated for non-census years assuming consistent exponential growth 1990-2000 and 2000-2010.
(c) Population derived from DOF population data for City of Santa Clarita. Table 1 Total Population 2000 and 2010 Incorporated Cities by County in California and Table 1 Population Change 1990-2000 Incorporated Cities by County, and City of Santa Clarita, 2000-2010 U.S. Census Bureau, 2000 Summary File 1 (SF1) 100 Percent Data, City of Santa Clarita, 2000, SCAG, Adopted 2008 RTP.
(d) SCWD data for 2010 population based on 2009 population and SCWD Water Master Plan (2008).
(e) LACWWD 36, rather than calculating population based on dwelling units, provided its historical population for 2000-2010.

## TABLE 2-7 CON'T
## HISTORICAL POPULATION BY RETAIL PURVEYOR SERVICE AREA

| | VWC | | | LACWWD 36 | | |
|---|---|---|---|---|---|---|
| Year | SF Residential Units[a] | MF Residential Units[a] | Population[b][c] | SF Residential Units[a] | MF Residential Units[a] | Population[e] |
| 1995 | 14,696 | 4,184 | 57,012 | - | - | - |
| 1996 | 15,433 | 4,285 | 59,895 | - | - | - |
| 1997 | 16,276 | 4,285 | 62,826 | - | - | - |
| 1998 | 17,311 | 5,191 | 69,168 | - | - | - |
| 1999 | 18,264 | 5,457 | 73,353 | - | - | - |
| 2000 | 19,179 | 5,725 | 77,476 | 948 | 5 | 2,965 |
| 2001 | 20,631 | 6,342 | 84,420 | 1,093 | 5 | 3,393 |
| 2002 | 21,818 | 6,941 | 90,556 | 1,177 | 5 | 4,232 |
| 2003 | 22,822 | 7,676 | 96,618 | 1,251 | 5 | 4,508 |
| 2004 | 24,193 | 7,949 | 102,451 | 1,278 | 5 | 4,600 |
| 2005 | 24,953 | 8,405 | 106,983 | 1,289 | 5 | 4,624 |
| 2006 | 25,044 | 8,437 | 108,043 | 1,300 | 5 | 4,660 |
| 2007 | 25,131 | 8,537 | 109,324 | 1,303 | 5 | 4,681 |
| 2008 | 25,211 | 8,590 | 110,443 | 1,310 | 5 | 4,688 |
| 2009 | 25,171 | 8,854 | 111,876 | 1,310 | 5 | 4,684 |
| 2010 | 25,386 | 8,854 | 113,296 | 1,527 | 6 | 4,947 |

Notes:

(a) Single Family (SF) and Multi-Family (MF) residential units provided by each retail purveyor.

(b) Population estimated for non-census years assuming consistent exponential growth 1990-2000 and 2000-2010.

(c) Population derived from DOF population data for City of Santa Clarita. Table 1 Total Population 2000 and 2010 Incorporated Cities by County in California and Table 1 Population Change 1990-2000 Incorporated Cities by County, and City of Santa Clarita, 2000-2010 U.S. Census Bureau, 2000 Summary File 1 (SF1) 100 Percent Data, City of Santa Clarita, 2000, SCAG, Adopted 2008 RTP.

(d) SCWD data for 2010 population based on 2009 population and SCWD Water Master Plan (2008).

(e) LACWWD 36, rather than calculating population based on dwelling units, provided its historical population for 2000-2010.

**TABLE 2-8**
**SUMMARY OF HISTORICAL POPULATION BY RETAIL PURVEYOR SERVICE AREA[(a)]**

| Year | NCWD | SCWD | VWC | LACWWD 36[(b)] | Total CLWA Service Area |
|---|---|---|---|---|---|
| 1995 | 30,898 | 83,628 | 57,012 | - | **171,537** |
| 1996 | 31,323 | 84,784 | 59,895 | - | **176,002** |
| 1997 | 32,533 | 84,634 | 62,826 | - | **179,994** |
| 1998 | 32,764 | 86,394 | 69,168 | - | **188,326** |
| 1999 | 33,561 | 88,642 | 73,353 | - | **195,556** |
| 2000 | 34,121 | 93,128 | 77,476 | 2,965 | **207,690** |
| 2001 | 35,041 | 97,430 | 84,420 | 3,393 | **220,284** |
| 2002 | 36,526 | 101,230 | 90,556 | 4,232 | **232,544** |
| 2003 | 38,178 | 104,427 | 96,618 | 4,508 | **243,730** |
| 2004 | 40,618 | 109,189 | 102,451 | 4,600 | **256,857** |
| 2005 | 41,814 | 113,897 | 106,983 | 4,624 | **267,318** |
| 2006 | 42,490 | 118,385 | 108,043 | 4,660 | **273,578** |
| 2007 | 43,206 | 121,903 | 109,324 | 4,681 | **279,114** |
| 2008 | 43,539 | 122,631 | 110,443 | 4,688 | **281,301** |
| 2009 | 43,951 | 123,302 | 111,876 | 4,684 | **283,813** |
| 2010 | 44,316 | 124,192 | 113,296 | 4,947 | **286,750** |

Notes:
(a) Summary of population from Table 2-7.
(b) LACWWD 36 included for purposes of providing regional completeness; however, it is not required to prepare an UWMP.

## 2.5.2 Population Projections

The population for the CLWA service area was projected for the years 2010 to 2050 using the connection-PPHH method described in Section 2.5.1. The purveyors provided their projections of SF and MF residential dwelling units within their service areas for the years 2010 to 2050, as estimated in their master planning documents. SCWD, rather than providing dwelling units, provided its projections of population at build-out of its service area in 2050.

Using a PPHH factor of 3.31[5] (increased by the growth rate from 3.11 PPHH in year 2000), assumed constant over the projection period, projections of population for years out to 2050 were calculated. The results of these calculations are shown in Table 2-9.

Based on these results, population in the CLWA service area is projected to grow at an average annual rate of approximately 1.5 percent per year over the 40-year planning period to 2050.

[5] The PPHH of 3.31 was projected forward from the year 2000 PPHH of 3.11, using the calculated growth rate.

**TABLE 2-9**
**PROJECTED POPULATION**

| Year | NCWD[(a)] | SCWD[(b)] | VWC[(a)] | LACWWD 36[(a)] | Total CLWA Service Area |
|---|---|---|---|---|---|
| 2010 | 44,316 | 124,192 | 113,296 | 4,947 | **286,750** |
| 2015 | 49,933 | 133,868 | 127,241 | 7,157 | **318,199** |
| 2020 | 54,559 | 143,544 | 138,862 | 8,908 | **345,873** |
| 2025 | 58,612 | 153,220 | 150,477 | 10,658 | **372,967** |
| 2030 | 63,824 | 162,896 | 162,098 | 12,405 | **401,223** |
| 2035 | 68,450 | 172,572 | 173,716 | 14,159 | **428,897** |
| 2040 | 73,079 | 182,248 | 185,330 | 15,906 | **456,564** |
| 2045 | 77,715 | 191,924 | 196,952 | 17,657 | **484,248** |
| 2050 | 82,341 | 201,600 | 208,570 | 19,407 | **511,918** |

Notes:
(a) Based on average household size calculated over the census decade to 3.31 persons per household, and remaining fixed through 2050.
(b) SCWD data based on SCWD Water Master Plan (2008).

### 2.5.3 Comparison to City and County Planning

One Valley, One Vision (OVOV) is a joint planning effort by the City of Santa Clarita and Los Angeles County representing the build-out of the entire Santa Clarita Valley, including Canyon Country, Newhall, Saugus and Valencia and the County communities of Stevenson Ranch, Castaic, Val Verde, Agua Dulce and the future Newhall Ranch. The OVOV includes both City and County jurisdictions in its planning effort which are the development of a General Plan and associated EIR. Both the OVOV area and the Santa Clarita Valley planning area (defined by SCAG) are slightly larger than the CLWA service area and factors into the modest differences in population projections. As the overwhelming majority of the OVOV population is located in the CLWA service area, it is appropriate to compare the CLWA service area population projections to the OVOV projections, as shown in Table 2-10.

**TABLE 2-10**
**POPULATION COMPARISON**

| Year | Total CLWA Service Area[a] | OVOV[b] | Santa Clarita Valley Planning Area |
|---|---|---|---|
| 2010 | 286,750 | 252,000[c] | 267,299[d] |
| 2015 | 318,199 | 278,000 - 280,750 | 319,715[d] |
| 2020 | 345,873 | 304,000 - 309,500 | 352,336[d] |
| 2025 | 372,967 | 330,000 - 338,250 | 384,217[d] |
| 2030 | 401,223 | 356,000 - 367,000 | 397,112[d][e] |
| 2035 | 428,897 | 382,000 - 395,750 | 410,008[d] |
| 2040 | 456,564 | 408,000 - 424,500 | 448,228[f] |
| 2045 | 484,248 | 434,000 - 453,250 | 490,011[f] |
| 2050 | 511,918 | 460,000 - 482,000 | 535,689[f] |

Notes:
(a) See Table 2-9.
(b) OVOV General Plan EIR.
(c) The OVOV estimated population in 2008 was 252,000 which, for this analysis, was assumed to occur in 2010.
(d) 2010 and 2035 Projection for Santa Clarita Valley Planning Area are the sums of the City of Santa Clarita and unincorporated Los Angeles area. The unincorporated area provided by the County of Los Angeles Department of Planning from adjusted GIS data from U.S. Census Bureau & SCAG data provided by email communication, April 5, 2011.
(e) Year 2030 value adjusted. Actual GIS data had 2030 value of 414,612 which was higher than 2035 value. Used growth rate assumptions to correct.
(f) Years 2040-2050 assumed 2010-2035 growth rates.

In Table 2-10, the OVOV projections and SCAG projections indicate a 1.6 to 1.8 percent annual growth rate of population for the Santa Clarita Valley. The purveyor projections of population growth are just slightly below that with a 1.5 percent annual growth rate. These population growth rates align with the annual rate of increase in the purveyors' projected water demands of 1.8 percent, as shown in Table 2-2.

Based on a detailed analysis of the OVOV Planning Area conducted by traffic analysis zones, County and City staff have determined that population of the Santa Clarita Valley at full build-out of the uses shown on the land use map of the Area Plan will be approximately 460,000 to 482,000 residents.

County staff has also provided updated and adjusted 2010 and 2035 population projections using SCAG data for the unincorporated areas of CLWA's service area (using year 2000 Census base data). Based on these projections for the unincorporated area and SCAG's projections for the City, projections for the Santa Clarita Valley at full build-out are about 535,700 persons.

The total population projected in this UWMP for the CLWA service area in 2050 is approximately 512,000 residents. The difference between this and OVOV projections may be due to some purveyors' master planning efforts taking a more conservative approach to ensure an adequate supply of water for all future uses.

## 2.6 Existing and Targeted Per Capita Water Use

### 2.6.1 Base Daily Per Capita Water Use for SBX7-7 Reduction

As described in Senate Bill 7 of Special Extended Session 7 (SBX7-7), it is the intent of the California legislature to increase water use efficiency and the legislature has set a goal of a twenty percent per capita reduction in urban water use statewide by 2020. As SBX7-7 applies to retail water suppliers, NCWD, SCWD and VWC must comport with its requirements. Consistent with SBX7-7, the 2010 UWMP must provide an estimate of Base Daily Per Capita Water Use. This estimate utilizes information on population as well as base gross water use. For the purposes of this UWMP, population was estimated as described in the previous section. Base gross water use is defined as the total volume of water, treated or untreated, entering the distribution systems of the retail purveyors, excluding (1) recycled water, (2) net volume of water placed into long-term storage and (3) water conveyed to another urban water supplier. This calculation of base daily per capita water use is limited to the NCWD, SCWD and VWC retail service areas.

The UWMP Act allows urban water retailers to evaluate their base daily per capita water use using two base periods, a 10 or 15-year continuous period is used to calculate baseline per capita water use. A 5-year base period is used to determine whether the 2020 per capita water use target meets the legislation's minimum water use reduction requirements of at least a 5 percent reduction per capita water use for those suppliers with baseline water use above 100 GPCD. The legislation provided some flexibility in what actual periods of time are used to establish these baselines, to account for short-term water demand variations resulting from weather influences, as well as acknowledging the advances of water suppliers that have already begun using recycled water to reduce potable demands. The 15-year base period within the range January 1, 1990 to December 31, 2010 is allowed if recycled water made up ten percent or more of 2008 retail water deliveries. If recycled water did not make up ten percent or more of the 2008 retail water deliveries, then a retailer must use a 10-year base period within the range January 1, 1995 to December 31, 2010. Recycled water did not make up ten percent of 2008 deliveries by NCWD, SCWD or VWC, and for this reason base daily per capita water use has been based on a 10-year period. The 5-year period required by SBX7-7 must be within the range January 1, 2003 to December 31, 2010.

Tables 2-11 to 2-13 provide the data used to calculate the base daily per capita water use in GPCD, and the 10-year and 5-year base periods for each purveyor. Tables 2-15, 2-17 and 2-19 provide the data used to determine whether the purveyor's 2015 and 2020 per capita water use targets meet the legislation's minimum water use reduction requirement of five percent. If the 2020 target is greater than the 5-year value, the target is reduced to this value. These tables show that the 2020 targets do not exceed these minimum values. Per SBX7-7 requirements, the 2015 interim targets were therefore set to the mid-point between the 10-year baseline per capita water use and the 2020 target.

**TABLE 2-11**
**NEWHALL COUNTY WATER DISTRICT - BASE DAILY PER CAPITA WATER USE**

| Base Period Year | | Distribution System Population | Annual System Gross Water Use (AFY) | Annual Daily Per Capita Water Use (GPCD) | 10-Year Average (GPCD) | 5-Year Average (GPCD) |
|---|---|---|---|---|---|---|
| *Sequence Year* | *Calendar Year* | | | | | |
| 1 | 1995 | 30,898 | 7,755 | 224 | | |
| 2 | 1996 | 31,323 | 7,887 | 225 | | |
| 3 | 1997 | 32,533 | 8,801 | 242 | | |
| 4 | 1998 | 32,764 | 8,087 | 220 | | |
| 5 | 1999 | 33,561 | 9,348 | 249 | | |
| 6 | 2000 | 34,121 | 9,718 | 254 | | |
| 7 | 2001 | 35,041 | 9,525 | 243 | | |
| 8 | 2002 | 36,526 | 10,362 | 253 | | |
| 9 | 2003 | 38,178 | 10,351 | 242 | | |
| 10 | 2004 | 40,618 | 11,217 | 247 | 240 | |
| 11 | 2005 | 41,814 | 10,756 | 230 | 240 | |
| 12 | 2006 | 42,490 | 11,470 | 241 | 242 | |
| 13 | 2007 | 43,206 | 11,975 | 247 | 243 | 241 |
| 14 | 2008 | 43,539 | 11,340 | 233 | 244 | 239 |
| 15 | 2009 | 43,951 | 10,560 | 214 | 240 | 233 |
| | | | | **Period Selected** | **244** | **241** |

Note: Shaded cells show calendar years used in selected 5-year average.

**TABLE 2-12**
**SANTA CLARITA WATER DIVISION - BASE DAILY PER CAPITA WATER USE**

| Base Period Year | | Distribution System Population | Annual System Gross Water Use (AFY) | Annual Daily Per Capita Water Use (GPCD) | 10-Year Average (GPCD) | 5-Year Average (GPCD) |
|---|---|---|---|---|---|---|
| *Sequence Year* | *Calendar Year* | | | | | |
| 1 | 1995 | 83,628 | 19,898 | 212 | | |
| 2 | 1996 | 84,784 | 22,006 | 232 | | |
| 3 | 1997 | 84,634 | 22,456 | 237 | | |
| 4 | 1998 | 86,394 | 20,319 | 210 | | |
| 5 | 1999 | 88,642 | 24,513 | 247 | | |
| 6 | 2000 | 93,128 | 25,280 | 242 | | |
| 7 | 2001 | 97,430 | 25,544 | 234 | | |
| 8 | 2002 | 101,230 | 28,434 | 251 | | |
| 9 | 2003 | 104,427 | 27,092 | 232 | | |
| 10 | 2004 | 109,189 | 29,191 | 239 | 234 | |
| 11 | 2005 | 113,897 | 28,921 | 227 | 235 | |
| 12 | 2006 | 118,385 | 30,302 | 229 | 235 | |
| 13 | 2007 | 121,903 | 31,355 | 230 | 234 | 231 |
| 14 | 2008 | 122,631 | 30,476 | 222 | 235 | 229 |
| 15 | 2009 | 123,302 | 27,816 | 201 | 231 | 222 |
| | | | | **Period Selected** | **235** | **231** |

Note: Shaded cells show calendar years used in selected 5-year average.

**TABLE 2-13**
**VALENCIA WATER COMPANY - BASE DAILY PER CAPITA WATER USE**

| Base Period Year | | Distribution System Population | Annual System Gross Water Use (AFY)[(a)] | Annual Daily Per Capita Water Use (GPCD) | 10-Year Average (GPCD) | 5-Year Average (GPCD) |
|---|---|---|---|---|---|---|
| *Sequence Year* | *Calendar Year* | | | | | |
| 1 | 1995 | 57,012 | 17,543 | 275 | | |
| 2 | 1996 | 59,895 | 19,721 | 294 | | |
| 3 | 1997 | 62,826 | 22,131 | 314 | | |
| 4 | 1998 | 69,168 | 19,874 | 257 | | |
| 5 | 1999 | 73,353 | 22,735 | 277 | | |
| 6 | 2000 | 77,476 | 25,190 | 290 | | |
| 7 | 2001 | 84,420 | 24,715 | 261 | | |
| 8 | 2002 | 90,556 | 28,360 | 280 | | |
| 9 | 2003 | 96,618 | 28,779 | 266 | | |
| 10 | 2004 | 102,451 | 30,234 | 263 | 278 | |
| 11 | 2005 | 106,983 | 29,473 | 246 | 275 | |
| 12 | 2006 | 108,043 | 30,646 | 253 | 271 | |
| 13 | 2007 | 109,324 | 32,286 | 264 | 266 | 258 |
| 14 | 2008 | 110,443 | 32,419 | 262 | 266 | 258 |
| 15 | 2009 | 111,876 | 30,027 | 240 | 263 | 253 |
| | | | | **Period Selected** | **278** | **258** |

Notes: Shaded cells show calendar years used in selected 5-year average.

(a) Excludes recycled water use in years 2003-2009.

## 2.6.2 Urban Water Use Targets for SBX7-7 Reduction

In addition to calculating base gross water use, SBX7-7 requires that NCWC, SCWD and VWC, as retail purveyors, identify their demand reduction targets for year 2015 and 2020 by utilizing one of four options:

- Option 1. 80 percent of baseline GPCD water use (i.e., a 20 percent reduction).
- Option 2. The sum of the following performance standards: indoor residential use (provisional standard set at 55 GPCD); plus landscape use, including dedicated and residential meters or connections equivalent to the State Model Landscape Ordinance (80 percent ETo existing landscapes, 70 percent of ETo for future landscapes); plus 10 percent reduction in baseline commercial, industrial institutional use by 2020.
- Option 3. 95 percent of the applicable state hydrologic region target as set in the DWR "20x2020 Water Conservation Plan" (February, 2010) (20x2020 Plan).
- Option 4. Savings by Water Sector: this provisional method developed by DWR, identifies water savings obtained through identified practices and subtracts them from the base daily per capita water use value identified for the water supplier.

Option 2 and Option 4 were considered and not selected because they required data not currently being collected within the purveyors service areas.

The CLWA service area is within the South Coast Hydrologic Region (#4) as defined by DWR and this hydrologic region has been assigned a 2020 water use target of 149 GPCD per the DWR 20x2020 Plan. Therefore, in order to use Option 3, each purveyor's daily per capita water use for the 5-year base period would have to be close to 95 percent of the 149 GPCD target, or 142 GPCD. Since none of the purveyors 5-year base period is within this limit, as shown in Table 2-14, none of the purveyors chose this option as the target method.

**TABLE 2-14**
**OPTION 3 – 95 PERCENT OF STATE HYDROLOGIC REGION TARGET**

| Purveyor | 5-Year Base Period | 95% of 5-Year Base Period (149 GPCD) |
|---|---|---|
| NCWD | 241 | 229 > 149 |
| SCWD | 231 | 219 > 149 |
| VWC | 258 | 245 > 149 |

Option 1 is the simplest of the options provided and requires reduction to 80 percent of baseline per capita water use. Option 1 is also the most conservative of the four Options provided. Each of the purveyors selected Option 1 to calculate its SBX7-7 target.

This results in the 2020 GPCD targets for the purveyors as shown in Tables 2-15, 2-17, and 2-19. Each purveyor plans to meet the proposed 20X2020 water use targets implementing conservation methods that are discussed in Chapter 7 Demand Management Measures, as well as with recycled water as described in Chapter 4, Recycled Water. Tables 2-16, 2-18, and 2-20, show the calculation of reduction in demand required by each purveyor. SBX7-7 allows for both conservation and recycled water supply to assist in meeting these SBX7-7 conservation requirements.

The 2015 and 2020 projected consumption without additional reduction shown in Tables 2-16, 2-18, to 2-20 are calculated in accordance with SBX7-7 and, therefore, do not match the projected deliveries in Tables 2-4, 2-5 and 2-6 which are based on purveyors' master planning documents.

**TABLE 2-15**
**NCWD - COMPONENTS OF TARGET DAILY PER CAPITA WATER USE**

| Period | Value | | Unit | |
|---|---|---|---|---|
| 10-year period selected for baseline GPCD | First Year | 1999 | Last Year | 2008 |
| 5-year period selected for maximum allowable GPCD | First Year | 2003 | Last Year | 2007 |
| Highest 10-year Average | 244 | | GPCD | |
| Highest 5-year Average | 241 | | GPCD | |
| Compliance Water Use Target (20% Reduction on 10yr) | 195 | | GPCD | |
| Minimum Water Use Reduction Requirement (5% Reduction 5yr) | 229 | | GPCD | |
| **2020 Target** | **195** | | GPCD | |
| **2015 Interim Target** | **219** | | GPCD | |
| **Methodology Used** | **Option #1** | | | |

**TABLE 2-16**
**NCWD - SBX7-7 CONSERVATION SAVINGS SUMMARY**

| Description | Units | 2015 Interim Target | 2020 Compliance Target |
|---|---|---|---|
| Base Daily Water Use | GPCD | 244 | 244 |
| Population | GPCD | 49,933 | 54,559 |
| Method 1 Compliance Target | GPCD | 219 | 195 |
| GPCD Reduction | | 24 | 49 |
| % Reduction | | 10% | 20% |
| Projected Consumption w/out additional Reduction | AFY | 13,647 | 14,912 |
| Projected Consumption at Goal | AFY | 12,283 | 11,929 |
| Reduction to Meet Target | AFY | 1,365 | 2,982 |

**TABLE 2-17**
**SCWD - COMPONENTS OF TARGET DAILY PER CAPITA WATER USE**

| Period | Value | | Unit | |
|---|---|---|---|---|
| 10-year period selected for baseline GPCD | First Year | 1997 | Last Year | 2006 |
| 5-year period selected for maximum allowable GPCD | First Year | 2003 | Last Year | 2007 |
| Highest 10-year Average | 235 | | GPCD | |
| Highest 5-year Average | 231 | | GPCD | |
| Compliance Water Use Target (20% Reduction on 10yr) | 188 | | GPCD | |
| Minimum Water Use Reduction Requirement (5% Requirement 5yr) | 219 | | GPCD | |
| **2020 Target** | **188** | | GPCD | |
| **2015 Interim Target** | **212** | | GPCD | |
| **Methodology Used** | **Option #1** | | | |

**TABLE 2-18**
**SCWD - SBX7-7 CONSERVATION SAVINGS SUMMARY**

| Description | Units | 2015 Interim Target | 2020 Compliance Target |
|---|---|---|---|
| Base Daily Water Use | GPCD | 235 | 235 |
| Population | GPCD | 133,868 | 143,544 |
| Method 1 Compliance Target | GPCD | 212 | 188 |
| GPCD Reduction | | 24 | 47 |
| % Reduction | | 10% | 20% |
| Projected Consumption w/out additional Reduction | AFY | 35,239 | 37,786 |
| Projected Consumption at Goal | AFY | 31,715 | 30,229 |
| Reduction to Meet Target | AFY | 3,524 | 7,557 |

**TABLE 2-19**
**VWC - COMPONENTS OF TARGET DAILY PER CAPITA WATER USE**

| Period | Value | | Unit | |
|---|---|---|---|---|
| 10-year period selected for baseline GPCD | First Year | 1995 | Last Year | 2004 |
| 5-year period selected for maximum allowable GPCD | First Year | 2003 | Last Year | 2007 |
| Highest 10-year Average | 278 | | GPCD | |
| Highest 5-year Average | 258 | | GPCD | |
| Compliance Water Use Target (20% Reduction on 10yr) | 222 | | GPCD | |
| Minimum Water Use Reduction Requirement (5% Reduction 5yr) | 245 | | GPCD | |
| **2020 Target** | **222** | | GPCD | |
| **2015 Interim Target** | **250** | | GPCD | |
| **Methodology Used** | **Option #1** | | | |

**TABLE 2-20**
**VWC – SBX7-7 CONSERVATION SAVINGS SUMMARY**

| Description | Units | 2015 Interim Target | 2020 Compliance Target |
|---|---|---|---|
| Base Daily Water Use | GPCD | 278 | 278 |
| Population | GPCD | 127,241 | 138,862 |
| Method 1 Compliance Target | GPCD | 250 | 222 |
| GPCD Reduction | | 28 | 56 |
| % Reduction | | 10% | 20% |
| Projected Consumption w/out additional Reduction | AFY | 39,623 | 43,242 |
| Projected Consumption at Goal | AFY | 35,661 | 34,593 |
| Reduction to Meet Target | AFY | 3,962 | 8,648 |

LACWWD 36 is not required to comport with the requirements of SBX7-7. However the District does implement conservation measures and will contribute to the conservation savings as indicated in Table 2-21.

**TABLE 2-21**
**LACWWD 36 – CONSERVATION SAVINGS**

| Description | Units | 2015 | 2020 |
|---|---|---|---|
| Projected Consumption w/out additional Reduction | AFY | 1,759 | 2,189 |
| Projected Consumption at Goal | AFY | 1,583 | 1,751 |
| Reduction to Meet Target | AFY | 176 | 438 |

### 2.6.3 Purveyor Projections and SBX7-7 Objectives

Table 2-22 summarizes the retail purveyors' projected water demands through 2050. This summary includes demands without conservation, based on the purveyors' projected water demands shown in Table 2-2, and with conservation, using the SBX7-7 requirements discussed previously in Section 2.6.2. Appendix C includes demand projections for a single-dry water year and a multiple-dry year period, assuming a ten percent increase in demand without conservation in dry years. It should be noted that the SBX7-7 conservation requirements do not change for different year types, so those requirements in the dry years shown in Appendix C are the same as SBX7-7 requirements shown in Table 2-22.

The demand reductions required to comply with SBX7-7 may be achieved through a combination of water conservation measures and the use of recycled water. The anticipated increase in recycled water use after 2020 could potentially reduce the quantity of water conservation needed to achieve the SBX7-7 goals. However, the water conservation amounts achieved by 2020 are assumed in this Plan to be maintained through 2050. These amounts plus planned recycled water use will exceed the SBX7-7 water reduction requirements for the period 2020-2050. Thus potable water reductions shown in Table 2-22 exceed the requirements of SBX7-7.

## TABLE 2-22
## NORMAL YEAR SBX7-7 DEMAND CALCULATIONS (AF)

| | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|---|
| **Water Demands w/ and w/o Conservation[a]** | | | | | | | | |
| **LACWWD 36[b]** | | | | | | | | |
| Demand w/o Conservation[c] | 1,759 | 2,189 | 2,619 | 3,048 | 3,478 | 3,908 | 4,338 | 4,768 |
| Anticipated Conservation Objective[d] | 176 | 438 | 524 | 610 | 696 | 782 | 868 | 954 |
| Reduction from Recycled Water[e] | 0 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| Net Anticipated Water Conservation[f] | 176 | 388 | 474 | 560 | 646 | 732 | 818 | 904 |
| Demand w/ Conservation[g] | 1,583 | 1,801 | 2,145 | 2,489 | 2,833 | 3,177 | 3,520 | 3,864 |
| **SBX7-7 Compliance Calculations** | | | | | | | | |
| **NCWD** | | | | | | | | |
| Demand w/o Conservation[c] | 12,571 | 14,246 | 15,922 | 17,598 | 19,273 | 20,949 | 22,624 | 24,300 |
| 20x2020 Reduction[h] | 1,365 | 2,982 | 3,204 | 3,489 | 3,742 | 3,995 | 4,248 | 4,501 |
| Reduction from Recycled Water[e] | 200 | 500 | 1,000 | 1,275 | 1,775 | 2,275 | 2,775 | 3,275 |
| Reduction from Water Conservation[i] | 1,165 | 2,482 | 2,482 | 2,482 | 2,482 | 2,482 | 2,482 | 2,482 |
| Demand w/ Conservation[j] | 11,406 | 11,764 | 13,440 | 15,115 | 16,791 | 18,466 | 20,142 | 21,818 |
| **SCWD** | | | | | | | | |
| Demand w/o Conservation[c] | 31,633 | 34,814 | 37,995 | 41,176 | 44,357 | 47,538 | 50,719 | 53,900 |
| 20x2020 Reduction[k] | 3,524 | 7,557 | 8,067 | 8,576 | 9,085 | 9,595 | 10,104 | 10,614 |
| Reduction from Recycled Water[e] | 100 | 500 | 1,500 | 2,275 | 2,775 | 3,775 | 4,775 | 5,775 |
| Reduction from Water Conservation[i] | 3,424 | 7,057 | 7,057 | 7,057 | 7,057 | 7,057 | 7,057 | 7,057 |
| Demand w/ Conservation[j] | 28,209 | 27,757 | 30,938 | 34,119 | 37,300 | 40,481 | 43,662 | 46,843 |
| **VWC** | | | | | | | | |
| Demand w/o Conservation[c] | 34,107 | 37,235 | 40,362 | 43,490 | 46,617 | 49,745 | 52,872 | 56,000 |
| 20x2020 Reduction[l] | 3,962 | 8,648 | 9,372 | 10,095 | 10,819 | 11,542 | 12,266 | 12,990 |
| Reduction from Recycled Water[e] | 1,000 | 2,000 | 3,000 | 4,500 | 6,000 | 8,000 | 10,000 | 12,200 |
| Reduction from Water Conservation[i] | 2,962 | 6,648 | 6,648 | 6,648 | 6,648 | 6,648 | 6,648 | 6,648 |
| Demand w/ Conservation[j] | 31,145 | 30,586 | 33,714 | 36,841 | 39,969 | 43,097 | 46,224 | 49,352 |
| **Regional Summary** | | | | | | | | |
| Demand w/o Conservation[c] | 80,070 | 88,484 | 96,898 | 105,312 | 113,726 | 122,140 | 130,554 | 138,968 |
| 20x2020 Reduction | 9,027 | 19,626 | 21,166 | 22,770 | 24,342 | 25,914 | 27,486 | 29,058 |
| Reduction from Recycled Water[m] | 1,300 | 3,050 | 5,550 | 8,100 | 10,600 | 14,100 | 17,600 | 21,300 |
| Reduction from Water Conservation | 7,727 | 16,576 | 16,662 | 16,748 | 16,833 | 16,919 | 17,005 | 17,091 |
| **Demand w/ Conservation** | 72,343 | 71,908 | 80,236 | 88,564 | 96,892 | 105,220 | 113,549 | 121,877 |

Notes:

(a) Reflects existing and projected demands in CLWA service area only. CLWA's Annexation Policy requires annexing parties to provide additional fully reliable supplies. Known parties potentially seeking annexation include Legacy/Stevenson Ranch Phase 5, Tapia Canyon and Tesoro Del Valle.

(b) LACWWD 36 included for purposes of providing regional completeness; however, it is not required to prepare an UWMP.

(c) Demand w/o Conservation from Table 2-2.

(d) LACWWD 36 conservation objective estimated at 20% of projected demand commencing 2020; see Table 2-21.

(e) Recycled water projections from Table 4-3.

(f) Net Anticipated Conservation for LACWWD 36 is Anticipated Conservation Objective minus Reduction from Recycled Water.

(g) Demand w/ Conservation for LACWWD 36 is Demand w/o Conservation minus Net Anticipated Conservation.

(h) NCWD 20x2020 Reduction from Table 2-16. The 20 percent conservation requirement is assumed to continue through 2050 and continue to be met with a mixture of recycled water and conservation.

(i) Reduction from Water Conservation is 20x2020 Reduction minus Reduction from Recycled Water for 2015 and 2020; the quantity of water conservation remains at least at 2020 amounts through 2050.

(j) Demand w/ Conservation is Demand w/o Conservation minus Reduction from Water Conservation.

(k) SCWD 20x2020 Reduction from Table 2-18. The 20 percent conservation requirement is assumed to continue through 2050 and continue to be met with a mixture of recycled water and conservation.

(l) VWC 20x2020 Reduction from Table 2-20. The 20 percent conservation requirement is assumed to continue through 2050 and continue to be met with a mixture of recycled water and conservation.

(m) Recycled water reductions do not include demands from Honor Rancho.

#### 2.6.3.1 Low Income Projected Water Demands

Senate Bill 1087 requires that water use projections of a UWMP include the projected water use for single-family and multi-family residential housing for lower income households as identified in the housing element of any city, county, or city and county general plan in the service area of the supplier.

Housing elements rely on the Regional Housing Needs Allocation (RHNA) generated by the State Department of Housing and Community Development (HCD) to allocate the regional need for housing to the regional Council of Governments (COG) (or a HCD for cities and counties not covered by a COG) for incorporation into housing element updates. Before the housing element is due, the HCD determines the total regional housing need for the next planning period for each region in the state and allocates that need. The COGs then allocate to each local jurisdiction its "fair share" of the RHNA, broken down by income categories – very low, low, moderate and above moderate – over the housing element's planning period.

Jurisdictions located within the region covered by the Southern California Association of Governments (SCAG), including the County of Los Angeles, were required to submit their adopted Housing Elements to the State Department of Housing and Community Development by July 1, 2008.

The City of Santa Clarita and the County last updated their housing elements in 2008, and it covers the planning period 2008-2014. These elements incorporate the formally transmitted Los Angeles County housing allocation that was incorporated into the Final RHNA approved by the SCAG Regional Council on July 12, 2007[6]. The allocation for very low and low income classes as defined by the California Health and Safety Code were the following for the City of Santa Clarita:

- Very Low – 26.0%
- Low – 16.2%

Neither the SCAG RHNA nor the City of Santa Clarita and County housing elements further classify the allocation of low income households into single-family and multi-family residential housing units. For this reason, it is not possible to project water use for lower income households by this specific land use category. However, to remain consistent with the intent of the SB 1087 legislation and also to comply with the UWMP Planning Act, the water use projections for very low and low residential income households based on the income category were identified and their classification percentage was applied to the purveyor's calculated demand projections as shown in Table 2-23 on the following page.

Note that the current planning period for the RHNA is January 1, 2006 to June 30, 2014. The next RHNA planning cycle will cover January 1, 2011 to September 30, 2021. Thus, the 2015 UWMP update will need to be updated with the next RHNA planning cycle and classification percentages.

[6] Final Regional Housing Need Allocation Plan - Planning Period (January 1, 2006 - June 30, 2014) for Jurisdictions within the Six-County SCAG Region (approved by the SCAG Regional Council on July 12, 2007); http://www.scag.ca.gov/housing/pdfs/rhna/RHNA_FinalAllocationPlan071207.pdf

The City of Santa Clarita and/or County will not deny or condition approval of water services, or reduce the amount of services applied for by any proposed development unless one of the following occurs:

- City of Santa Clarita and the County specifically finds that it does not have sufficient water supply.
- City of Santa Clarita and the County is subject to a compliance order issued by the State Department of Public Health (DPH) that prohibits new water connections.
- The applicant has failed to agree to reasonable terms and conditions relating to the provision of services.

**TABLE 2-23**
**LOW INCOME DEMANDS[(a)(b)]**

| | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|---|
| **LACWWD 36** | | | | | | | | |
| Demand w/ Conservation[(c)] | 1,583 | 1,801 | 2,145 | 2,489 | 2,833 | 3,177 | 3,520 | 3,864 |
| Very Low[(d)] | 412 | 468 | 558 | 647 | 737 | 826 | 915 | 1,005 |
| Low[(e)] | 256 | 292 | 347 | 403 | 459 | 515 | 570 | 626 |
| *Subtotal* | *668* | *760* | *905* | *1,050* | *1,195* | *1,341* | *1,486* | *1,631* |
| **NWCD** | | | | | | | | |
| Demand w/ Conservation[(c)] | 11,406 | 11,764 | 13,440 | 15,115 | 16,791 | 18,466 | 20,142 | 21,818 |
| Very Low[(d)] | 2,966 | 3,059 | 3,494 | 3,930 | 4,366 | 4,801 | 5,237 | 5,673 |
| Low[(e)] | 1,848 | 1,906 | 2,177 | 2,449 | 2,720 | 2,992 | 3,263 | 3,534 |
| *Subtotal* | *4,813* | *4,964* | *5,672* | *6,379* | *7,086* | *7,793* | *8,500* | *9,207* |
| **SCWD** | | | | | | | | |
| Demand w/ Conservation[(c)] | 28,209 | 27,757 | 30,938 | 34,119 | 37,300 | 40,481 | 43,662 | 46,843 |
| Very Low[(d)] | 7,334 | 7,217 | 8,044 | 8,871 | 9,698 | 10,525 | 11,352 | 12,179 |
| Low[(e)] | 4,570 | 4,497 | 5,012 | 5,527 | 6,043 | 6,558 | 7,073 | 7,589 |
| *Subtotal* | *11,904* | *11,713* | *13,056* | *14,398* | *15,741* | *17,083* | *18,425* | *19,768* |
| **VWC** | | | | | | | | |
| Demand w/ Conservation[(c)] | 31,145 | 30,586 | 33,714 | 36,841 | 39,969 | 43,097 | 46,224 | 49,352 |
| Very Low[(d)] | 8,098 | 7,952 | 8,766 | 9,579 | 10,392 | 11,205 | 12,018 | 12,831 |
| Low[(e)] | 5,045 | 4,955 | 5,462 | 5,968 | 6,475 | 6,982 | 7,488 | 7,995 |
| *Subtotal* | *13,143* | *12,907* | *14,227* | *15,547* | *16,867* | *18,187* | *19,507* | *20,826* |
| **Total** | **30,529** | **30,345** | **33,860** | **37,374** | **40,889** | **44,403** | **47,917** | **51,432** |

Notes:
(a) Demands already included within purveyor projections.
(b) 2007 Adopted SCAG RHNA; allocation for very low income (26.0%) and low income (16.2%).
(c) From Table 2-22.
(d) 26.0% of total purveyor Demand w/ Conservation.
(e) 16.2% of total purveyor Demand w/ Conservation.

## 2.7 Other Factors Affecting Water Usage

A major factor that affects water usage is weather. Historically, when the weather is hot and dry, water usage increases. The amount of increase varies according to the number of consecutive years of hot, dry weather and the conservation activities imposed. During cool, wet years, historical water usage has decreased, reflecting less water usage for exterior landscaping. This factor is discussed below in detail.

### 2.7.1 Weather Effects on Water Usage

California faces the prospect of significant water management challenges due to a variety of issues including population growth, regulatory restrictions and climate change. Climate change is of special concern because of the range of possibilities and their potential impacts on essential operations, particularly operations of the SWP. The most likely scenarios involve increased temperatures, which will reduce the Sierra Nevada snowpack and shift more runoff to winter months, and accelerated sea level rise. These changes can cause major problems for the maintenance of the present water export system since water supplies are conveyed through the fragile levee system of the Sacramento-San Joaquin Delta. The other much-discussed climate scenario or impact is an increase in precipitation variability, with more extreme drought and flood events posing additional challenges to water managers[7].

Figure 2-2 shows the purveyors overall water use since 2000 as well as total precipitation occurring over the same time period. Past studies have indicated that during dry years within the Santa Clarita Valley, demands can increase from between five to ten percent. This analysis assumes a conservative ten percent increase in per capita demands during dry periods.

Figure 2-3 shows the purveyors average annual monthly water use since 2002. In the Santa Clarita Valley, the largest amount of water use occurs during the end of summer and in the beginning of fall months (July, August and September). Water is used least in the cooler months leading into spring (February, March). This variation gives some indication about how weather affects water demands in the CLWA service area.

### 2.7.2 Conservation Effects on Water Usage

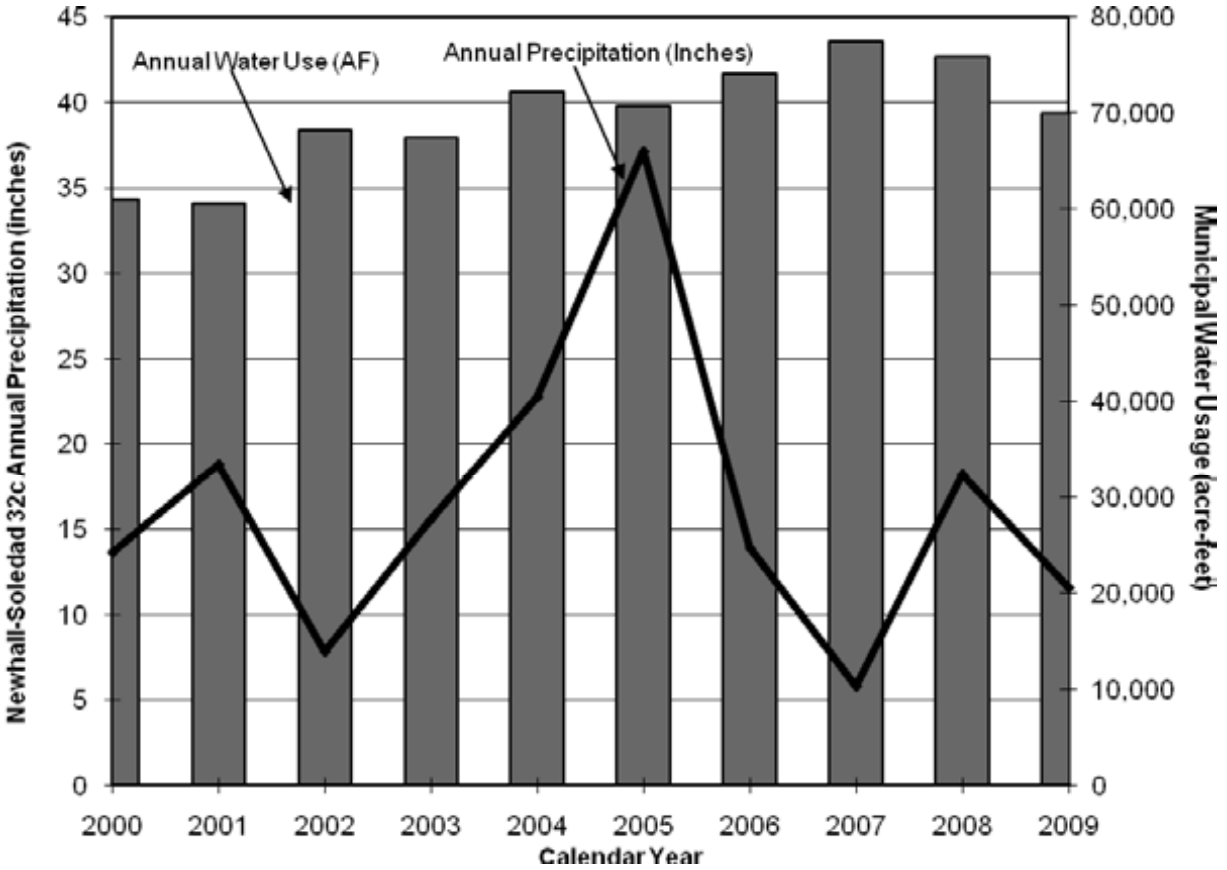
In recent years, water conservation has become an increasingly important factor in water supply planning in California. Since the 2005 UWMP there have been a number of regulatory changes related to conservation including new standards for plumbing fixtures, a new landscape ordinance, a state universal retrofit ordinance, new Green Building standards, demand reduction goals and more. The California plumbing code has also instituted requirements for new construction that mandate the installation of ultra low-flow toilets and low-flow showerheads.

During the 1987 to 1992 drought period, overall water requirements due to the effects of hot, dry weather were projected to increase by approximately ten percent. As a result of extraordinary conservation measures enacted during the period, the overall water requirements actually decreased by more than ten percent.

[7] Final California Water Plan Update 2009 Integrated Water Management: Bulletin 160.

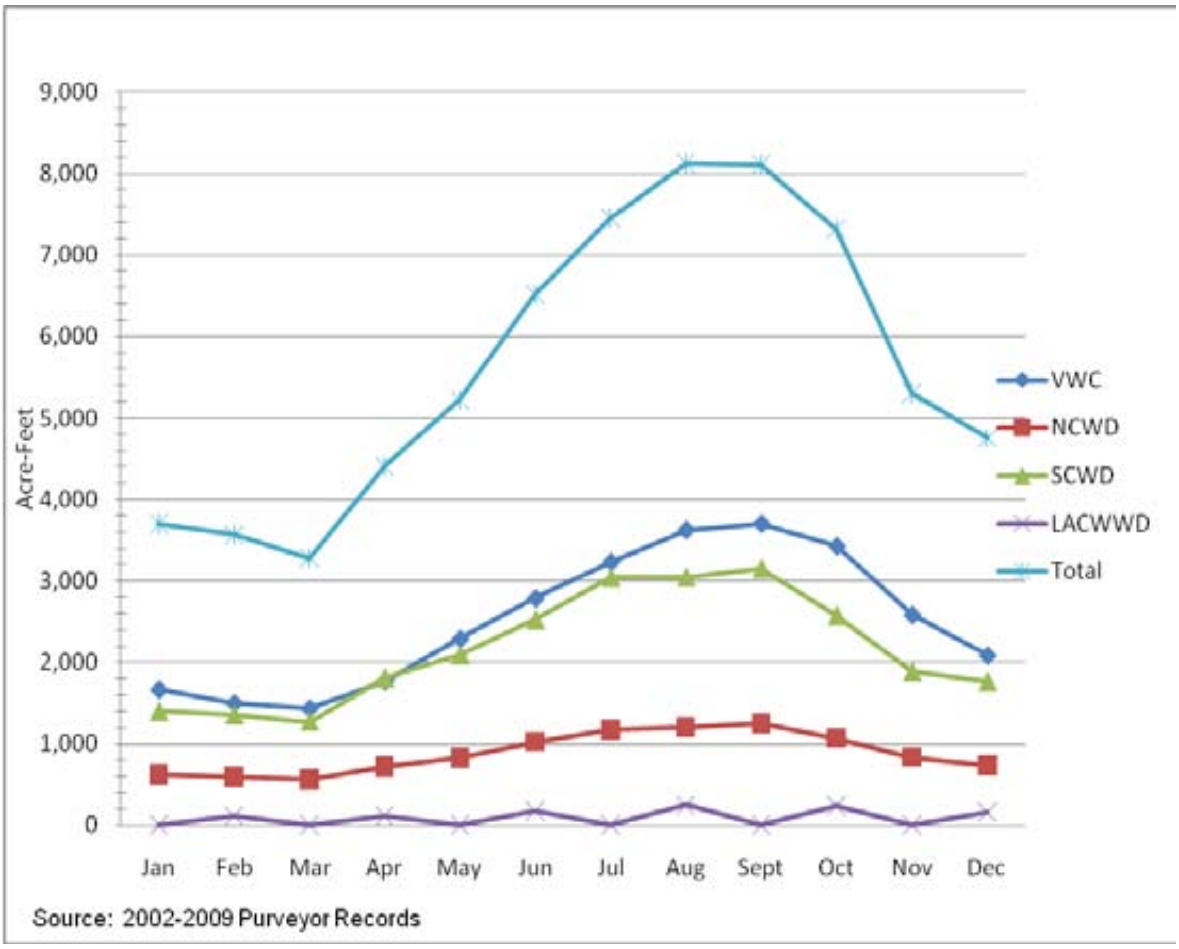
Residential, commercial, and industrial usage can be expected to decrease as a result of the implementation of more aggressive water conservation practices. In southern California, the greatest opportunity for conservation is in developing greater efficiency and reduction in landscape irrigation. The irrigation demand can typically represent as much as seventy percent of the water demand for residential customers depending on lot size and amount of irrigated turf and plants. Conservation efforts will increasingly target this component of water demand.

**FIGURE 2-2**
**HISTORICAL WATER USE AND PRECIPITATION**




Sources: Precipitation data provided from rain gage Newhall-Soledad 32c. Total water use from Table 2-1.

**FIGURE 2-3**
**AVERAGE MONTHLY RETAIL CONSUMPTION**



# Section 3: Water Resources

## 3.1 Overview

This section describes the water resources available to CLWA and the purveyors for the next forty years. The suppliers' existing water resources include wholesale (imported) supplies, local groundwater, recycled water and water from existing groundwater banking programs. Planned supplies include new groundwater production as well as additional banking programs. These existing and planned supplies are summarized in Table 3-1 and discussed in more detail in this section.

The distribution of water supplies presented in this UWMP does not represent an allocation of water rights among the retail water purveyors. Local and imported water resources in the Santa Clarita Valley are managed cooperatively between CLWA and the purveyors. Just as the demands on the sources of supply were identified on an individual purveyor basis in Section 2, the existing and planned sources of supply have also been broken down by source on an individual purveyor basis. These tables have been included in Appendix C.

## TABLE 3-1
## SUMMARY OF CURRENT AND PLANNED WATER SUPPLIES AND BANKING PROGRAMS[a]

| | | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Existing Supplies** | | | | | | | | | | |
| Existing Groundwater[b] | | | | | | | | | | |
| Alluvial Aquifer | | 24,385 | 24,000 | 24,000 | 24,000 | 25,000 | 25,000 | 25,000 | 25,000 | 25,000 |
| Saugus Formation[c] | | 6,725 | 9,225 | 10,225 | 10,225 | 10,225 | 10,225 | 10,225 | 10,225 | 10,225 |
| | **Total Groundwater** | **31,110** | **33,225** | **34,225** | **34,225** | **35,225** | **35,225** | **35,225** | **35,225** | **35,225** |
| Recycled Water[d] | **Total Recycled** | **325** | **325** | **325** | **325** | **325** | **325** | **325** | **325** | **325** |
| Imported Water | | | | | | | | | | |
| State Water Project[e] | | 58,300 | 58,100 | 57,900 | 57,600 | 57,400 | 57,400 | 57,400 | 57,400 | 57,400 |
| Flexible Storage Accounts[f] | | 6,060 | 6,060 | 4,680 | 4,680 | 4,680 | 4,680 | 4,680 | 4,680 | 4,680 |
| Buena Vista-Rosedale | | 11,000 | 11,000 | 11,000 | 11,000 | 11,000 | 11,000 | 11,000 | 11,000 | 11,000 |
| Nickel Water - Newhall Land | | 1,607 | 1,607 | 1,607 | 1,607 | 1,607 | 1,607 | 1,607 | 1,607 | 1,607 |
| | **Total Imported** | **76,967** | **76,767** | **75,187** | **74,887** | **74,687** | **74,687** | **74,687** | **74,687** | **74,687** |
| Existing Banking Programs[g] | | | | | | | | | | |
| Rosedale Rio-Bravo | | 20,000 | 20,000 | 20,000 | 20,000 | 20,000 | 20,000 | 20,000 | 20,000 | 20,000 |
| Semitropic | | 15,000 | 15,000 | 15,000 | - | - | - | - | - | - |
| Semitropic - Newhall Land | | 4,950 | 4,950 | 4,950 | 4,950 | 4,950 | 4,950 | 4,950 | 4,950 | 4,950 |
| | **Total Banking** | **39,950** | **39,950** | **39,950** | **24,950** | **24,950** | **24,950** | **24,950** | **24,950** | **24,950** |
| | | | | | | | | | | |
| **Planned Supplies** | | | | | | | | | | |
| Future Groundwater[h] | | | | | | | | | | |
| Alluvial Aquifer | | - | - | 1,000 | 2,000 | 3,000 | 4,000 | 5,000 | 6,000 | 7,000 |
| Saugus Formation | | - | 1,375 | 1,375 | 1,375 | 1,375 | 1,375 | 1,375 | 1,375 | 1,375 |
| | **Total Groundwater** | **-** | **1,375** | **2,375** | **3,375** | **4,375** | **5,375** | **6,375** | **7,375** | **8,375** |
| **Recycled Water**[i] | **Total Recycled** | **-** | **975** | **2,725** | **5,225** | **7,775** | **10,275** | **13,775** | **17,275** | **20,975** |
| **Banking Programs** | **Total Banking Programs** | **-** | **-** | **-** | **10,000** | **10,000** | **20,000** | **20,000** | **20,000** | **20,000** |

Notes:

(a) The values shown under "Existing Supplies" and "Planned Supplies" are projected to be available in average/normal years. The values shown under "Existing Banking Programs" and "Planned Banking Programs" are the maximum capacity of program withdrawals.

(b) Existing groundwater supplies represent the quantity of groundwater anticipated to be pumped with existing wells. As indicated in Tables 3-8 and 3-9 and Tables 3-4 and 3-5 of the 2009 Groundwater Basin Yield Analysis, individual purveyors may have well capacity in excess of quantities shown in this table. As indicated in Table 3-10, existing and planned groundwater pumping remain within the groundwater operating plan shown on Table 3-5.

(c) SCWD's existing Saugus 1 and Saugus 2 wells resumed production in 2011 with the completion of the perchlorate treatment facility.

(d) Represents recycled water being delivered in 2010 with existing facilities. CLWA currently has 1,700 AFY under contract.

(e) SWP supplies are based on the Department of Water Resources "*2009 State Water Project Delivery Reliability Report*."

(f) Includes both CLWA and Ventura County entities flexible storage accounts. Initial term of agreement with Ventura County entities expires after 2015.

(g) Supplies shown are annual amounts that can be withdrawn and would typically be used only during dry years.

(h) Planned groundwater supplies represent new groundwater well capacity that may be required by an individual purveyor's production objectives in the Alluvial Aquifer and the Saugus Formation. When combined with existing purveyor and non-purveyor groundwater supplies, total groundwater production remains within the sustainable ranges identified in Table 3-8 of 2009 Groundwater Basin Yield Analysis. As indicated in Table 3-10, existing and planned groundwater pumping remain within the basin operating plan shown on Table 3- 5.

(i) See Table 4-3. Total Purveyor Recycled Water less Existing Recycled Supply.

The term "dry" is used throughout this chapter and in subsequent chapters concerning water resources and reliability as a measure of supply availability. As used in this Plan, dry years are those years when supplies are the lowest, which occurs primarily when precipitation is lower than the long-term average precipitation. The impact of low precipitation in a given year on a particular source of supply may differ based on how low the precipitation is, or whether the year follows a high-precipitation year or another low-precipitation year. For the SWP, a low-precipitation year may or may not affect supplies, depending on how much water is in SWP storage at the beginning of the year. Also, dry conditions can differ geographically. For example, a dry year can be local to the Valley area (thereby affecting local groundwater replenishment and production), local to northern California (thereby affecting SWP water deliveries), or statewide (thereby affecting both local groundwater and the SWP). When the term "dry" is used in this Plan, statewide drought conditions are assumed, affecting both local groundwater and SWP supplies at the same time.

## 3.2 Wholesale (Imported) Water Supplies

CLWA's imported water supplies consist primarily of SWP supplies, which were first delivered to CLWA in 1980. From the SWP, CLWA also has access to water from Flexible Storage Accounts in Castaic Lake, which are planned for dry-year use, but are not strictly limited as such. More detail on SWP supplies is provided in Section 3.2.1. In addition to its SWP supplies, CLWA has an imported surface supply from the Buena Vista Water Storage District (BVWSD) and Rosedale Rio-Bravo Water Storage District (RRBWSD) in Kern County, which was first delivered to CLWA in 2007. More information on this supply is provided in Section 3.2.2. CLWA wholesales both these imported supplies to each of the local retail water purveyors. Additionally, Newhall Land has acquired a water transfer supply from a source in Kern County. This supply, referred to as Nickel water, would be made available to VWC through CLWA.

### 3.2.1 State Water Project Supplies

#### 3.2.1.1 Background

##### 3.2.1.1.1 SWP Facilities

The SWP is the largest state-built, multi-purpose water project in the country. It was authorized by the California State Legislature in 1959, with the construction of most initial facilities completed by 1973. Today, the SWP includes 28 dams and reservoirs, 26 pumping and generating plants and approximately 660 miles of aqueducts. The primary water source for the SWP is the Feather River, a tributary of the Sacramento River. Storage released from Oroville Dam on the Feather River flows down natural river channels to the Sacramento-San Joaquin River Delta (Delta). While some SWP supplies are pumped from the northern Delta into the North Bay Aqueduct, the vast majority of SWP supplies are pumped from the southern Delta into the 444-mile-long California Aqueduct. The California Aqueduct conveys water along the west side of the San Joaquin Valley to Edmonston Pumping Plant, where water is pumped over the Tehachapi Mountains and the aqueduct then divides into the East and West Branches. CLWA takes delivery of its SWP water at Castaic Lake, a terminal reservoir of the West Branch. From Castaic Lake, CLWA delivers its SWP supplies to the local retail water purveyors through an extensive transmission pipeline system.

#### *3.2.1.1.2 SWP Water Supply Contracts*

**SWP Water Supplies**

In the early 1960s, DWR entered into individual SWP Water Supply Contracts with urban and agricultural public water supply agencies located throughout northern, central and southern California for SWP water supplies. CLWA is one of 29 water agencies (commonly referred to as "contractors") that have an SWP Water Supply Contract with DWR. Each SWP contractor's SWP Water Supply Contract contains a "Table A," which lists the maximum amount of contract water supply, or "Table A water," an agency may request each year throughout the life of the contract. The Table A Amounts in each contractor's SWP Water Supply Contract ramped up over time, based on projections at the time the contracts were signed of future increases in population and water demand, until they reached a maximum Table A Amount. Most contractor's Table A Amounts reached their maximum levels in the early to mid 1990s. Table A Amounts are used in determining each contractor's proportionate share, or "allocation," of the total SWP water supply DWR determines to be available each year.

The total planned annual delivery capability of the SWP and the sum of all contractors' maximum Table A amounts was originally 4.23 MAF. The initial SWP storage facilities were designed to meet contractors' water demands in the early years of the SWP, with the construction of additional storage facilities planned as demands increased. However, essentially no additional SWP storage facilities have been constructed since the early 1970s. SWP conveyance facilities were generally designed and have been constructed to deliver maximum Table A amounts to all contractors. After the permanent retirement of some Table A amount by two agricultural contractors in 1996, the maximum Table A amounts of all SWP contractors now totals about 4.17 MAF. Currently, CLWA's annual Table A Amount is 95,200 AF[8].

The primary supply of SWP water made available under the SWP Water Supply Contracts is allocated Table A supply. An estimation of Table A supply availability is provided in Section 3.2.1.2. Each contractor has some flexibility in managing the Table A supply allocated to it in a given year. A contractor may take delivery of that supply for direct use or storage within its service area, store that water outside its service area for later withdrawal and use within its service area, or carry over a portion of that supply for storage on an as-available-basis in SWP reservoirs, for delivery the following year.

[8] CLWA's original SWP Water Supply Contract with DWR was amended in 1966 for a maximum annual Table A Amount of 41,500 AF. In 1991, CLWA purchased 12,700 AF of annual Table A Amount from a Kern County water district, and in 1999 purchased an additional 41,000 AF of annual Table A Amount ("41K transfer") from another Kern County water district, for a current total annual Table A Amount of 95,200 AF. Later in 1999 legal action was filed challenging the sufficiency of the Environmental Impact Report ("EIR") prepared in connection with the 41K transfer. (*Friends of the Santa Clara River v. Castaic Lake Water Agency*, LASC Case No. BS 056954.) In late 2004, CLWA approved a revised EIR for the 41K transfer ("2004 EIR"). In 2005, new legal actions were filed (and subsequently consolidated) in the Los Angeles County Superior Court (LASC) challenging the sufficiency of the 2004 EIR. (*Planning & Conservation League v. Castaic Lake Water Agency*, LASC Consolidated Case No. BS 098724.) On December 17, 2009, the Court of Appeal, Second District, issued a published decision upholding the sufficiency of the 2004 EIR under the California Environmental Quality Act ("CEQA"). (*Planning & Conservation League v. Castaic Lake Water Agency* (2009) 180 Cal.App.4th 210) Remittitur was issued on March 19, 2010, and final Judgment was entered on July 12, 2010. The entry of final Judgment by the LASC concluded eleven years of legal challenges concerning the sufficiency of the 41K transfer EIRs prepared by CLWA, and it resolved all issues that may have remained concerning the adequacy of the 2004 EIR and the finality of the 41K transfer.

In addition to Table A supplies, the SWP Water Supply Contracts provide for additional types of water that may periodically be available, including "Article 21" water and Turnback Pool water. Article 21 water (which refers to the SWP contract provision defining this supply) is water that may be made available by DWR when excess flows are available in the Delta (i.e., when Delta outflow requirements have been met, SWP storage south of the Delta is full and conveyance capacity is available beyond that being used for SWP operations and delivery of allocated and scheduled Table A supplies). Article 21 water is made available on an unscheduled and interruptible basis and is typically available only in average to wet years, generally only for a limited time in the late winter. The Turnback Pool is a program through which contractors with allocated Table A supplies in excess of their needs in a given year may "turn back" that excess supply for purchase by other contractors who need additional supplies that year. The Turnback Pool can make water available in all types of hydrologic years, although generally less excess water is turned back in dry years. As urban contractor demands have increased, the amount of water turned back and available for purchase has diminished.

The availability of Article 21 water and Turnback Pool water is uncertain. When available, these supplies provide additional water that CLWA may be able to use, either directly to meet demands or for later use after storage in its groundwater banking programs. Due to the uncertainty in availability of Article 21 water and Turnback Pool water, supplies of these types of SWP water are not included in this report. However, to the extent CLWA is able to make use of these supplies when available, CLWA may be able to improve the reliability of its SWP supplies beyond the values used throughout this Plan.

While not specifically provided for in the SWP Water Supply Contracts, DWR has in critically dry years created Dry Year Water Purchase Programs for contractors needing additional supplies. Through these programs, water is purchased by DWR from willing sellers in areas that have available supplies and is then sold by DWR to contractors willing to purchase those supplies. The availability of these supplies is uncertain, and are therefore not included in this report. However, CLWA's access to these supplies when they are available would enable it to improve the reliability of its dry-year supplies beyond the values used throughout this report.

**Flexible Storage Account**

As part of its water supply contract with DWR, CLWA has access to a portion of the storage capacity of Castaic Lake. This Flexible Storage Account allows CLWA to utilize up to 4,684 AF of the storage in Castaic Lake. Any of this amount that CLWA borrows must be replaced by CLWA within five years of its withdrawal. CLWA manages this storage by keeping the account full in normal and wet years and then delivering that stored amount (or a portion of it) during dry periods. The account is refilled during the next year that adequate SWP supplies are available to CLWA to do so. In 2005, CLWA negotiated with Ventura County SWP contractor agencies to obtain the use of their Flexible Storage Account. This allows CLWA access to another 1,376 AF of storage in Castaic Lake. CLWA access to this additional storage is available on a year-to-year basis through 2015. While it is expected that CLWA and Ventura County will extend the existing flexible storage agreement beyond the 2015 term, it is not assumed to be available beyond 2015 in this Plan.

#### *3.2.1.1.3 Factors Affecting SWP Table A Supplies*

While Table A identifies the maximum annual amount of Table A water a SWP contractor may request, the amount of SWP water actually available and allocated to SWP contractors each

year is dependent on a number of factors and can vary significantly from year to year. The primary factors affecting SWP supply availability include: the availability of water at the source of supply in northern California, the ability to transport that water from the source to the primary SWP diversion point in the southern Delta and the magnitude of total contractor demand for that water.

**Availability of SWP Source Water**

SWP supplies originate in northern California, primarily from the Feather River watershed. The availability of these supplies is dependent on the amount of precipitation in the watershed, the amount of that precipitation that runs off into the Feather River, water use by others in the watershed and the amount of water in storage in the SWP's Lake Oroville at the beginning of the year. Variability in the location, timing, amount and form (rain or snow) of precipitation, as well as how wet or dry the previous year was, produces variability from year to year in the amount of water that flows into Lake Oroville. However, Lake Oroville acts to regulate some of that variability, storing high inflows in wetter years that can be used to supplement supplies in dry years with lower inflows.

As discussed in Section 1.6 and in DWR's *2009 Reliability Report*, climate change adds another layer of uncertainty in estimating the future availability of SWP source water. Current literature suggests that global warming may change precipitation patterns in California from the patterns that occurred historically. While different climate change models show differing effects, potential changes could include more precipitation falling in the form of rain rather than snow and earlier snowmelt, which would result in more runoff occurring in the winter rather than spread out over the winter and spring.

**Ability to Convey SWP Source Water**

As discussed previously, water released from Lake Oroville flows down natural river channels into the Delta. The Delta is a network of channels and reclaimed islands at the confluence of the Sacramento and San Joaquin rivers. The SWP and the federal Central Valley Project (CVP) use Delta channels to convey water to the southern Delta for diversion, making the Delta a focal point for water distribution throughout the state.

A number of issues affecting the Delta can impact the ability to divert water supplies from the Delta, including water quality, fishery protection and levee system integrity. Water quality in the Delta can be adversely affected by both SWP and CVP diversions, which primarily affect salinity, as well as by urban discharge and agricultural runoff that flows into the Delta, which can increase concentrations of constituents such as mercury, organic carbon, selenium, pesticides, toxic pollutants and reduce dissolved oxygen. The Delta also provides a unique estuarine habitat for many resident and migratory fish species, some of which are listed as threatened or endangered. The decline in some fish populations is likely the result of a number of factors, including water diversions, habitat destruction, degraded water quality and the introduction of non-native species. Delta islands are protected from flooding by an extensive levee system. Levee failure and subsequent island flooding can lead to increased salinity requiring the temporary shut down of SWP pumps.

In order to address some of these issues, SWP and CVP operations in the Delta are limited by a number of regulatory and operational constraints. These constraints are primarily incorporated

into the State Water Resources Control Board's (SWRCB) Water Rights Decision 1641 (D-1641), which establishes Delta water quality standards and outflow requirements that the SWP and CVP must comply with. In addition, SWP and CVP operations are further constrained by requirements included in Biological Opinions (BOs) for the protection of threatened and endangered fish species in the Delta, issued by the United States Fish and Wildlife Service (FWS) in December 2008 and the National Marine Fishery Service (NMFS) in June 2009. The requirements in the BOs are based on real-time physical and biological phenomena (such as turbidity, water temperature and location of fish), which results in uncertainty in estimating potential impacts on supply of the additional constraints imposed by the BOs.

**Demand for SWP Water**

The reliability of SWP supplies is affected by the total amount of water requested and used by SWP contractors, since an increase in total requests increases the competition for limited SWP supplies. As previously mentioned, contractor Table A Amounts in the SWP Water Supply Contracts ramped up over time, based on projected increases in population and water demand at the time the contracts were signed. Urban SWP contractors' requests for SWP water were low in the early years of the SWP, but have increased steadily over time, although more slowly than the ramp-up in their Table A Amounts, which reached a maximum for most contractors in the early to mid 1990s. Since that time, urban contractors' requests for SWP water have continued to increase until recent years when nearly all SWP contractors are requesting their maximum Table A Amounts.

Consistent with other urban SWP contractors, SWP deliveries to CLWA have increased as its requests for SWP water have increased. Historical total SWP deliveries to CLWA are shown at the end of this Section 3.2 in Table 3-3. The table shows deliveries to the service area for supply to the purveyors, as well as delivery to storage programs outside the service area. A breakdown of Table 3-3 showing how much imported supply was delivered to each purveyor is provided in Appendix H. SWP demand projections provided by CLWA to DWR are shown at the end of this Section 3.2 in Table 3-4. CLWA demand projections provided to DWR are typically conservative in order to maximize water deliveries available to CLWA in any given year for both deliveries to purveyors and current and future storage programs.

#### 3.2.1.2 SWP Table A Supply Assessment

The "*State Water Project Delivery Reliability Report"* (*Reliability Report*), prepared biennially by DWR, assists SWP contractors and local planners in assessing the reliability of the SWP component of their overall supplies. In its 2009 update of the *Reliability Report*, DWR provides SWP supply estimates for SWP contractors to use in their planning efforts, including for preparing their 2010 Urban Water Management Plans. The 2009 *Reliability Report* includes DWR's estimates of SWP water delivery reliability under both current (2009) and future (2029) conditions.

##### 3.2.1.2.1 Analysis Assumptions

DWR's estimates of SWP deliveries are based on a computer model that simulates monthly operations of the SWP and CVP systems. Key inputs to the model include the facilities included in the system, hydrologic inflows to the system, regulatory and operational constraints on system operations and contractor demands for SWP water. In conducting its model studies, DWR must make assumptions regarding each of these key inputs.

In the model studies for the 2009 *Reliability Report*, DWR assumed existing facilities for the analyses of both current and future conditions, with no additional storage or significant improvements to convey water through or past the Delta. Hydrologic inflows to the model are based on 82 years of historical inflows (1922 through 2003), adjusted to reflect current and future levels of development in the source areas. Hydrologic inflows for the future conditions analysis were further adjusted to reflect potential impacts due to climate change and accompanying sea level rise. The 2009 *Reliability Report* model studies include current regulatory and operational constraints in the analyses of both current and future conditions, including D-1641, the 2008 FWS BO and the 2009 NMFS BO. Contractor demands for SWP water used in the analysis of current conditions are derived from recent historical data and information from the contractors. Contractor demands for the future conditions analysis are assumed at maximum Table A Amounts in all 82 years of the simulation.

#### 3.2.1.2.2 Analysis Results

DWR's 2009 *Reliability Report* estimates that for all contractors combined, the SWP can deliver a total Table A supply of 60 percent of total maximum Table A Amounts on a long-term average basis, under both current and future conditions. In the worst-case single critically dry year, DWR estimates the SWP can deliver a total Table A supply of seven percent of total maximum Table A Amounts under current conditions and eleven percent under future conditions. During multiple-year dry periods, DWR estimates the SWP can deliver a total Table A supply averaging 34 to 36 percent of total maximum Table A Amounts under current conditions and 28 to 32 percent under future conditions.

The results DWR presents in its 2009 *Reliability Report* are of total SWP Table A deliveries, which it also expresses as a percentage of total maximum Table A Amounts. However, these percentages are SWP-wide averages and do not reflect the differences among contractors in assumed SWP requests and use, and the differing allocations to individual contractors that result. For this reason, DWR also made available on its website more detailed results from the same model studies presented in the 2009 *Reliability Report*, showing SWP deliveries to each contractor (http://baydeltaoffice.water.ca.gov/swpreliability/index.cfm).

For this Plan, SWP Table A supplies to CLWA were taken from DWR's more detailed, contractor-specific delivery data from its analyses for the 2009 *Reliability Report*. DWR's analysis of current (2009) conditions is used in this Plan to estimate 2010 SWP supplies and its analysis of future (2029) conditions is used to estimate 2030-2050 SWP supplies. As suggested by DWR, SWP supplies for the five-year increments between 2010 and 2030 are interpolated between these values. Since SWP demands cannot increase beyond the maximum demands assumed in the future conditions analysis, SWP supplies for years beyond 2030 are assumed to be the same as for 2030.

Table 3-2 shows CLWA's contractor-specific SWP supplies projected to be available in average/normal years (based on the average delivery over the study's historic hydrologic period from 1922 through 2003). Table 3-2 also summarizes estimated SWP supply availability in a single dry year (based on a repeat of the worst-case historic hydrologic conditions of 1977) and over a multiple dry year period (based on a repeat of the historic four-year drought of 1931 through 1934).

**TABLE 3-2**
**SWP TABLE A SUPPLY RELIABILITY (AF)[(a)(b)]**

| Wholesaler (Supply Source) | 2010 | 2015 | 2020 | 2025 | 2030-2050 |
|---|---|---|---|---|---|
| *Average Water Year*[(c)] | | | | | |
| DWR (SWP) | | | | | |
| Table A Supply | 58,300 | 58,100 | 57,900 | 57,600 | 57,400 |
| % of Table A Amount[(d)] | 61% | 61% | 61% | 61% | 60% |
| *Single Dry Year*[(e)] | | | | | |
| DWR (SWP) | | | | | |
| Table A Supply | 12,800 | 11,900 | 11,000 | 10,000 | 9,100 |
| % of Table A Amount | 13% | 12% | 12% | 11% | 10% |
| *Multi-Dry Year*[(f)] | | | | | |
| DWR (SWP) | | | | | |
| Table A Supply | 32,800 | 32,900 | 32,900 | 33,000 | 33,000 |
| % of Table A Amount | 34% | 35% | 35% | 35% | 35% |

Notes:
(a) Supplies to CLWA provided by DWR from detailed delivery results from the analyses presented in DWR's "*2009 SWP Delivery Reliability Report*." As indicated in the 2009 *Reliability Report*, the supplies are based on existing SWP facilities and current regulatory and operational constraints.
(b) Table A supplies include supplies allocated in one year that are carried over for delivery the following year.
(c) Based on average deliveries over the study's historic hydrologic period of 1922 through 2003.
(d) Supply as a percentage of CLWA's Table A Amount of 95,200 AF.
(e) Based on the worst case historic single dry year of 1977.
(f) Supplies shown are annual averages over four consecutive dry years, based on the historic four-year dry period of 1931-1934.

#### 3.2.1.2.3 Potential Future SWP Supplies

An ongoing planning effort to increase long-term supply reliability for both the SWP and CVP is taking place through the Bay Delta Conservation Plan (BDCP) process. The co-equal goals of the BDCP are to improve water supply and restore habitat in the Delta. The BDCP is being prepared through a collaboration of state, federal and local water agencies, state and federal fish agencies environmental organizations and other interested parties. Several "isolated conveyance system" alternatives are being considered in the plan that would divert water from the north Delta to the south Delta where water is pumped into the south-of-Delta stretches of the SWP and CVP. The new conveyance facilities would allow for greater flexibility in balancing the needs of the estuary with reliable water supplies.

In December 2010, DWR released a "Highlights of the BDCP" document that summarizes the activities and expected outcomes of the BDCP. The results of preliminary analysis included in the document indicate the proposed conveyance facilities may increase the combined average long-term water supply to the SWP and CVP from 4.7 MAF per year to 5.9 MAF/year. This would represent an increase in SWP supply reliability from 60 to 75 percent. Planned completion of the BDCP and corresponding environmental analysis documents is early 2013.

DWR estimates of SWP supply reliability in its 2009 *Reliability Report* are based on existing facilities, and so do not include the proposed conveyance facilities that are part of the BDCP. Since this Plan uses DWR's 2009 *Reliability Report* to estimate SWP supplies to CLWA, the improvements in SWP supply reliability that would result from the proposed facilities are not included in this Plan. Any of the proposed facilities that are completed would increase SWP reliability beyond the values used throughout this Plan.

### 3.2.1.3 Recent Changes to Factors Affecting SWP Supplies

Since the last round of UWMPs were prepared in 2005, DWR has twice updated its *Reliability Report*. In each of its updates, DWR has projected further reductions in average SWP water deliveries than were projected in 2005. The 2009 *Reliability Report* is the most recent update, and identifies several emerging factors that have the potential to affect the availability and reliability of SWP supplies. Although the 2009 *Reliability Report* presents a conservative projection of SWP delivery reliability, particularly in light of events occurring since its release, it remains the best available information concerning the SWP. Following is information and a brief summary of several factors identified in the 2009 *Reliability Report* having the potential to affect the availability and reliability of SWP supplies. A more detailed discussion of the factors discussed below is attached as Appendix D.

A. FWS and NMFS Biological Opinions

As discussed previously in Subsection 3.2.1.1.3, in December 2008 and June 2009, respectively, the FWS and NMFS issued BOs, with each agency concluding that the operation of the SWP and CVP as proposed by DWR and the Bureau of Reclamation would jeopardize the continued existence of protected species.[9] As required by the Endangered Species Act (ESA), FWS and NMFS each developed a Reasonable and Prudent Alternative (RPA) to the proposed SWP and CVP operations, and included that RPA in its respective BO. If the RPA terms are fully implemented, the resulting SWP and CVP operations are deemed to be in compliance with the ESA.

The RPAs developed and adopted by FWS and NMFS impose many new restrictions and requirements on SWP and CVP operations which can result in substantially reduced water exports from the Delta. Preliminary estimates prepared by DWR indicate that implementation of the RPAs in both BOs could reduce SWP deliveries by 28 to 39 percent during average and dry conditions, respectively. Supply impacts resulting from the BO RPAs can vary from year to year, since the operating restrictions in them are dependent upon highly variable factors such as hydrologic and flow conditions in the Delta, migratory and reproductive patterns of the protected species and numerous other non-SWP and non-CVP factors that impact the abundance of the species. Moreover and as further discussed below, legal challenges have been filed against the FWS and NMFS BOs and, should a court conclude the RPA restrictions are invalid, SWP exports could return to higher levels.

1. FWS BO Litigation

In early 2009, the State Water Contractors, the San Luis Delta-Mendota Water Authority and several individual State and Federal contractor water agencies filed legal challenges against the FWS Delta smelt BO (*The Consolidated Delta Smelt Cases*, E.D. Cal. 1:09-CV-00407-OWW-GSA). Plaintiffs claim that the federal defendants violated the National Environmental Policy Act (NEPA) by failing to perform NEPA analysis prior to provisionally adopting and implementing the FWS BO and RPA and that FWS violated the ESA and the Administrative Procedure Act (APA) in adopting the BO's RPA. In December 2010, the court issued a memorandum decision that invalidated the BO and RPA in several respects and remanded the matter to FWS. Further proceedings are expected to address interim operations of the SWP and CVP while the BO and RPA are revised by FWS.

[9] The December 15, 2008 FWS B.O. evaluated impacts to the Delta smelt. The June 4, 2009 NMFS B.O. evaluated impacts to winter-run and spring-run Chinook salmon, steelhead, green sturgeon and resident killer whales.

2. NMFS BO Litigation

After issuance of the NMFS BO in June 2009, the State Water Contractors and other water agencies filed legal challenges against the NMFS salmonid BO (*The Consolidated Salmon Cases*, E.D. Cal. 1:09-CV-1053-OWW-DLB). In May 2010, the court ruled that the federal defendants violated NEPA by failing to analyze the impact of the BO and RPA on humans and the human environment and authorized the SWP and CVP to operate in accordance with D-1641 until the end of June 2010, unless there was a showing of jeopardy to the species or adverse modification of its critical habitat. Motions for summary judgment to obtain a final ruling in the cases were heard in mid-December 2010 and a decision is expected in 2011.

B. Consistency Determination Litigation

Because the Delta smelt and salmon species are also protected under California's ESA (CESA), the SWP and CVP are required to obtain take authorization for SWP and CVP operations from the California Department of Fish and Game (DFG). In July 2009 and September 2009, respectively, DFG issued "consistency determinations" pursuant to CESA and determined that SWP and CVP operations do not violate that statute to the extent the operations are in compliance with the RPAs set forth in the FWS and NMFS BOs. Because the consistency determinations pose a risk that the SWP could remain bound to the terms of the RPAs even if the BOs are overturned by a federal court, DFG's decisions were challenged in state court by the State Water Contractors and Kern County Water Agency. The cases are currently stayed pending the outcome of *The Consolidated Delta Smelt Cases* and *The Consolidated Salmon Cases* (above).[10]

C. Longfin Smelt Protections

Regulatory actions related to longfin smelt also have the potential to affect the availability and reliability of SWP supplies. In February 2008, longfin smelt were listed as a "candidate" species under CESA and DFG imposed certain interim restrictions on the SWP for protection of the longfin smelt and its critical habitat. In February 2009, shortly before longfin smelt were officially listed as a "threatened" species under CESA, DFG issued Incidental Take Permit No. 2081-2009-001-03 (the Permit) to DWR, which imposes terms and conditions on the ongoing and long-term operations of SWP facilities in the Delta. The operating restrictions under the Permit are based in large part on the restrictions imposed on the SWP by the new FWS BO for Delta smelt (see above). The resulting water supply reductions under the Permit depend on several variable factors, such as Delta hydrology, migratory and reproductive patterns of longfin smelt and other factors affecting species abundance in the Delta. Notably, DWR has not indicated whether any particular reductions in SWP exports are likely to result from the Permit. In March 2009, a legal challenge was filed against the Permit.[11] Although that litigation is currently stayed pursuant to a stipulation of the parties, the challenge puts DFG's ability to enforce the Permit into question.

[10] See, e.g., State Water Contractors v. Cal. Dept. of Fish and Game, Sac. Sup. Ct. Case No. 34-2010-80000552; State Water Contractors v. Cal. Dept. of Fish and Game, Sac. Sup. Ct. Case No. 34-2010-80000560.

[11] See State Water Contractors v. California Dept. of Fish and Game, et al., Sac. Sup. Ct. Case No. 34-2009-80000203.

D. Development of Delta Plan and Delta Flow Criteria Pursuant to New State Laws

In November 2009, the California Legislature enacted SBX7-1 as part of a multi-pronged water package related to water supply reliability, ecosystem health and the Delta.[12] Among other things, SBX7-1 creates the Delta Stewardship Council (Council) and directs the Council to develop a comprehensive management plan for the Delta by January 1, 2012 (the Delta Plan). In addition, the State Water Resources Control Board (SWRCB) was directed to develop flow criteria for the Delta to protect public trust resources, including fish, wildlife, recreation and scenic enjoyment and DFG was required to identify quantifiable biological objectives and flow criteria for species of concern in the Delta.

In August 2010, the SWRCB adopted Resolution No. 2010-0039 approving its report entitled "Development of Flow Criteria for the Sacramento-San Joaquin Delta Ecosystem" (Flow Criteria). The SWRCB report concludes that substantially higher flows are needed through the Delta than in have occurred in previous decades in order to benefit zooplankton and various fish species.[13] Separately, in September 2010, DFG issued a draft report entitled "Quantifiable Biological Objectives and Flow Criteria for Aquatic and Terrestrial Species of Concern Dependent on the Delta" (DFG Report). The DFG Report is based on similar biological objectives and recommends Delta flows similar to those set forth in the SWRCB's Flow Criteria.[14] Notably, both the SWRCB and DFG recognize that their recommended flow criteria for the Delta do *not* balance the public interest or the need to provide an adequate and reliable water supply.[15] Also of importance, both the SWRCB and DFG acknowledge that their recommended flow criteria do not have any regulatory or adjudicatory effect; however, they may be used to inform the Council as it prepares the Delta Plan and may be considered as the BDCP process moves forward.[16]

E. Resulting Effect on SWP Supplies

DWR's latest published report on SWP supply reliability, the 2009 *Reliability Report*, includes assumptions to account for the institutional, environmental, regulatory and legal factors affecting SWP supplies, including but not limited to water quality constraints, fishery protections, other D-1641 requirements and the operational limitations imposed by the FWS and NMFS BOs. The *Reliability Report* assumes that all of these restrictions and limitations will remain in place over the next twenty-year period and that no actions to improve the Delta will occur, even though numerous legal challenges, various Delta restoration processes and new legal requirements for Delta improvements are currently underway (i.e., BDCP, Delta Vision, Delta Plan, etc.). Further, DWR's future conditions analysis incorporates assumptions to account for potential supply impacts related to global climate change.[17] These and other factors result in DWR presenting a conservative projection of SWP delivery reliability in its 2009 *Reliability Report*.

[12] SBX7-1 became effective February 3, 2010 and adds Division 35 to the California Water Code (commencing with Section 85300). Division 35 is referred to as the Sacramento-San Joaquin Delta Reform Act of 2009.
[13] (Flow Criteria at 5-8.)
[14] (DFG Report at 13.)
[15] (Flow Criteria at 4; DFG Report at 16.)
[16] (Flow Criteria at 3, 10; DFG Report at ES-4.)
[17] (*See*, *e.g.*, DWR Report at 19, 29-30, Appendices A-B.)

Conservative projections are useful from a long-range urban water supply planning perspective.[18] But it is noted that recent rulings in various legal actions and other factors described above, among others, support higher estimates of average annual SWP deliveries than projected in DWR's 2009 *Reliability Report*. While this may lead DWR to increase its projections in its next update of the *Reliability Report*, the 2009 *Reliability Report* remains the best available information concerning the long-term delivery reliability of SWP supplies. Therefore, the conservative estimates from the 2009 *Reliability Report* are used in this Plan.

### 3.2.2 Other Imported Supplies

The following supplies are now available to CLWA and the purveyors through transfers that have been executed since 2005. These supplies are now part of the imported supplies available to the service area.

#### 3.2.2.1 Buena Vista-Rosedale

CLWA has executed a long-term transfer agreement for 11,000 AFY with BVWSD and RRBWSD. These two districts, both located in Kern County, joined together to develop a program that provides both a firm water supply and a water banking component. Both districts are member agencies of the Kern County Water Agency (KCWA), a SWP contractor and both districts have contracts with KCWA for SWP Table A Amounts. The supply is based on existing long-standing Kern River water rights held by BVWSD, and is delivered by exchange of the two districts' SWP Table A supplies. This water supply is firm; that is, the total amount of 11,000 AFY is available in all water year types based on the Kern River water right. CLWA began taking delivery of this supply in 2007 as shown in Table 3-3.

#### 3.2.2.2 Nickel Water - Newhall Land

Newhall Land has acquired a water transfer from Kern County sources known as the Nickel water. This source of supply totals 1,607 AFY. The Nickel water comes from a firm source of supply. This source of supply was acquired in anticipation of the Newhall Ranch Specific Plan development. In this UWMP it is anticipated that the water supply will be available to the VWC.

[18] *See*, *e.g.*, *Sonoma County Water Coalition v. Sonoma County Water Agency* (2010) 189 Cal.App.4th 33; *Watsonville Pilots Association v. City of Watsonville* (2010) 183 Cal.App.4th 1059; *Vineyard Area Citizens for Responsible Growth v. City of Rancho Cordova* (2007) 40 Cal.4th 412.

**TABLE 3-3**
**HISTORICAL IMPORTED SUPPLY DELIVERIES (AF)**

| Year | SWP Deliveries to CLWA Service Area[a] | SWP Deliveries to Out-of-Service Area Storage[b] | Withdrawals from Out-of-Service Area Storage[b] | Other Imported Deliveries to CLWA Service Area[c] | Total Imported Supplies to CLWA Service Area |
|---|---|---|---|---|---|
| 1980 | 1,210 | - | - | - | 1,210 |
| 1981 | 5,761 | - | - | - | 5,761 |
| 1982 | 9,516 | - | - | - | 9,516 |
| 1983 | 9,476 | - | - | - | 9,476 |
| 1984 | 11,477 | - | - | - | 11,477 |
| 1985 | 12,401 | - | - | - | 12,401 |
| 1986 | 13,928 | - | - | - | 13,928 |
| 1987 | 16,167 | - | - | - | 16,167 |
| 1988 | 18,904 | - | - | - | 18,904 |
| 1989 | 21,719 | - | - | - | 21,719 |
| 1990 | 22,139 | - | - | - | 22,139 |
| 1991 | 7,357 | - | - | - | 7,357 |
| 1992 | 14,812 | - | - | - | 14,812 |
| 1993 | 13,787 | - | - | - | 13,787 |
| 1994 | 14,919 | - | - | - | 14,919 |
| 1995 | 17,747 | - | - | - | 17,747 |
| 1996 | 18,448 | - | 1,256 | - | 19,704 |
| 1997 | 21,586 | 1,256 | - | - | 21,586 |
| 1998 | 19,782 | - | - | - | 19,782 |
| 1999 | 28,813 | - | - | - | 28,813 |
| 2000 | 31,085 | - | 2,589 | - | 33,674 |
| 2001 | 35,632 | 2,589 | - | - | 35,632 |
| 2002 | 42,080 | 24,000 | 395 | - | 42,475 |
| 2003 | 44,967 | - | - | - | 44,967 |
| 2004 | 47,463 | 32,522 | - | - | 47,463 |
| 2005 | 36,747 | 20,000 | - | - | 36,747 |
| 2006 | 39,622 | 20,395 | - | - | 39,622 |
| 2007 | 34,919 | 8,200 | - | 11,000 | 45,919 |
| 2008 | 31,878 | - | - | 11,000 | 42,878 |
| 2009 | 26,096 | - | 1,650 | 11,000 | 38,746 |

Sources: DWR Bulletin 132, Management of the California State Water Project; and DWR delivery files.
Notes:
(a) Includes deliveries of Table A supplies, carryover water, Article 21 water, Turnback Pool water, local supply (from West Branch reservoirs) and water purchased through DWR.
(b) Out-of-service area storage includes flexible storage in Castaic Lake, the Semitropic Banking Program and the Rosedale-Rio Bravo Banking Program.
(c) Deliveries from Buena Vista-Rosedale.

**TABLE 3-4**
**CLWA DEMAND PROJECTIONS PROVIDED TO WHOLESALE SUPPLIERS[a] (AF)**

| Wholesaler (Supply Source) | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|---|
| DWR (SWP)[b] | 95,200 | 95,200 | 95,200 | 95,200 | 95,200 | 95,200 | 95,200 | 95,200 |
| BVWSD/RRBWSD (Kern River)[c] | 11,000 | 11,000 | 11,000 | 11,000 | 11,000 | 11,000 | 11,000 | 11,000 |

Notes:
(a) Nickel Water is excluded from this table because it is not contractually a CLWA supply. It is a Newhall Land supply that would be conveyed by CLWA and made available to VWC. Under Newhall Land's agreement for this fixed water supply, the provider is required to provide the amount contracted for every year.
(b) CLWA has provided demand projections to DWR through 2035 based on its maximum Table A Amount and anticipates that its demands beyond 2035 will also be at maximum Table A Amounts.
(c) Under the agreement for this fixed water supply, the wholesale provider is required to provide the amount contracted for every year. Therefore, no demand projections are actually provided to BVWSD and RRBWSD.

## 3.3 Groundwater

This section presents information about the purveyors groundwater supplies, including a summary of the adopted groundwater management plan (GWMP).

### 3.3.1 Santa Clara River Groundwater Basin – East Subbasin

The sole source of local groundwater for urban water supply in the Valley is the groundwater Basin identified in the DWR Bulletin 118, 2003 Update as the Santa Clara River Valley Groundwater Basin, East Subbasin (Basin) (Basin No. 4-4.07). The Basin is comprised of two aquifer systems, the Alluvium and the Saugus Formation. The Alluvium generally underlies the Santa Clara River and its several tributaries, to maximum depths of about 200 feet; and the Saugus Formation underlies practically the entire Upper Santa Clara River area, to depths of at least 2,000 feet. There are also some scattered outcrops of Terrace deposits in the Basin that likely contain limited amounts of groundwater. However, since these deposits are located in limited areas situated at elevations above the regional water table and are also of limited thickness, they are of no practical significance as aquifers for municipal water supply; consequently they have not been developed for any significant water supply in the Basin and are not included as part of the existing or planned groundwater supplies described in this UWMP. Figure 3-1 illustrates the mapped extent of the Santa Clara River Valley East Subbasin in DWR Bulletin 118 (2003), which approximately coincides with the outer extent of the Alluvium and Saugus Formation. The CLWA service area is also shown on Figure 3-1.

### 3.3.2 Adopted Groundwater Management Plan

As part of legislation authorizing CLWA to provide retail water service to individual municipal customers, Assembly Bill (AB) 134 (2001) included a requirement that CLWA prepare a GWMP in accordance with the provisions of Water Code Section 10753, which was originally enacted by AB 3030. The general contents of CLWA's GWMP were outlined in 2002, and a detailed plan was adopted in 2003 to satisfy the requirements of AB 134. The plan both complements and formalizes a number of existing water supply and water resource planning and management activities in CLWA's service area, which effectively encompasses the East Subbasin of the Santa Clara River Valley Groundwater Basin. Notably, CLWA's GWMP (provided on CD as Appendix G) also includes a basin-wide monitoring program, the results of which provide input to annual reporting on water supplies and water resources in the Basin, as well as input to assessment of Basin yield for water supply as described herein. The existing

groundwater monitoring program will be reflected in the upcoming groundwater reporting to DWR as part of SBX7-6 implementation.

The GWMP contains four management objectives, or goals, for the Basin including (1) development of an integrated surface water, groundwater and recycled water supply to meet existing and projected demands for municipal, agricultural and other water uses; (2) assessment of groundwater basin conditions to determine a range of operational yield values that use local groundwater conjunctively with supplemental SWP supplies and recycled water to avoid groundwater overdraft; (3) preservation of groundwater quality, including active characterization and resolution of any groundwater contamination problems and (4) preservation of interrelated surface water resources, which includes managing groundwater to not adversely impact surface and groundwater discharges or quality to downstream basin(s).

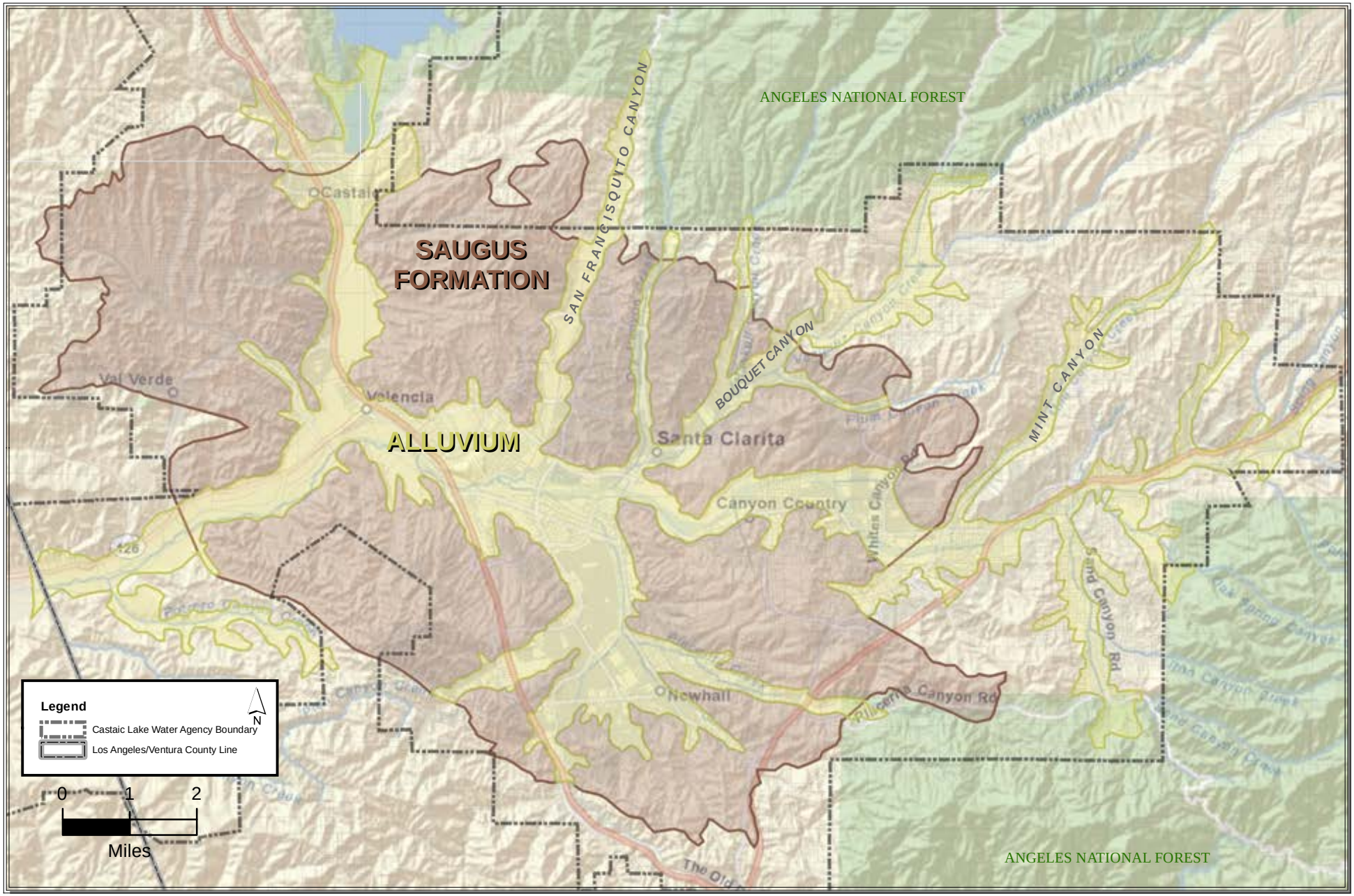



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**Figure 3-1**
**Santa Clara River Valley, East Groundwater Subbasin**

Prior to preparation and adoption of the GWMP, a local Memorandum of Understanding (MOU) process among CLWA, the retail water purveyors and United Water Conservation District (UWCD) in neighboring Ventura County, downstream of the East Subbasin of the Santa Clara River Valley, had produced the beginning of local groundwater management, now embodied in the GWMP. Prepared and implemented in 2001, the MOU was a collaborative and integrated approach to several of the aspects of water resource management included in the GWMP. As a result of the MOU, the cooperating agencies integrated their respective database management efforts and continued to monitor and report on the status of Basin conditions, as well as on geologic and hydrologic aspects of their respective parts of the overall stream-aquifer system. Following adoption of the GWMP, the water suppliers developed and utilized a numerical groundwater flow model for analysis of groundwater basin yield and for analysis of extraction and containment of groundwater contamination. The results of those basin yield and contamination analyses, most recently updated in 2009 (Basin Yield Analysis, 2009), are bases for the amounts and allocations of groundwater supplies in this UWMP.

The adopted GWMP includes 14 elements intended to accomplish the Basin management objectives listed above. In summary, the plan elements include:

- Monitoring of groundwater levels, quality, production and subsidence
- Monitoring and management of surface water flows and quality
- Determination of Basin yield and avoidance of overdraft
- Development of regular and dry-year emergency water supply
- Continuation of conjunctive use operations
- Long-term salinity management
- Integration of recycled water
- Identification and mitigation of soil and groundwater contamination, including involvement with other local agencies in investigation, cleanup and closure
- Development and continuation of local, state and federal agency relationships
- Groundwater management reports
- Continuation of public education and water conservation programs
- Identification and management of recharge areas and wellhead protection areas
- Identification of well construction, abandonment and destruction policies
- Provisions to update the groundwater management plan

Work on a number of the GWMP elements had been ongoing for some time prior to the formal adoption of the GWMP, and expanded work on implementation of the GWMP continues on an ongoing basis. The results of some of that work were incorporated in the last UWMP, and subsequent analyses of the groundwater basin are reflected in this current UWMP. Notable in the implementation of the GWMP has been the annual preparation of a Santa Clarita Valley Water Report that summarizes (1) water requirements, (2) all three sources of water supply (groundwater, imported surface water and recycled water, all as part of the GWMP's overall management objectives) and (3) projected water supply availability to meet the following year's projected water requirements.

#### 3.3.2.1 Available Groundwater Supplies

The groundwater component of overall water supply in the Valley derives from a groundwater operating plan developed and analyzed over the last 25 years to meet water requirements (municipal, agricultural, small domestic) while maintaining the Basin in a sustainable condition, specifically no long-term depletion of groundwater or interrelated surface water. The operating plan also addresses groundwater contamination issues in the Basin, all consistent with the GWMP described above. The groundwater operating plan is based on the concept that pumping can vary from year to year to allow increased groundwater use in dry periods and increased recharge during wet periods to collectively assure that the groundwater Basin is adequately replenished through various wet/dry cycles. As ultimately formalized in the GWMP, the operating yield concept has been quantified as ranges of annual pumping volumes to capture year-to-year pumping fluctuations in response to both hydrologic conditions and customer demand.

Ongoing work through implementation of the GWMP has produced three detailed technical reports in addition to the annual Water Reports (the most recent of which, for 2009, was the twelfth annual report). The first report (CH2M Hill, April 2004) documents the construction and calibration of the groundwater flow model for the Valley. The second report (CH2M Hill and LSCE, August 2005) presents the initial modeling analysis of the purveyors' original groundwater operating plan. The most recent report, an updated analysis of the basin (LSCE and GSI, August, 2009) presents the modeling analysis of the current groundwater operating plan, including restoration of contaminated wells for municipal supply after treatment and also presents a range of potential impacts deriving from climate change considerations. All those results are reflected in this UWMP. The primary conclusion of the modeling analysis is that the groundwater operating plan will not cause detrimental short or long term effects to the groundwater and surface water resources in the Valley and is therefore sustainable. The analysis of sustainability for groundwater and interrelated surface water is described in detail in "Analysis of Groundwater Supplies and Groundwater Basin Yield, Upper Santa Clara River Groundwater Basin, East Subbasin," prepared by Luhdorff and Scalmanini, Consulting Engineers and GSI Water Solutions, Inc. August 2009 (Basin Yield Analysis, 2009).

The updated groundwater operating plan, summarized in Table 3-5, is as follows:

- **Alluvium:** Pumping from the Alluvial Aquifer in a given year is governed by local hydrologic conditions in the eastern Santa Clara River watershed. Pumping ranges between 30,000 and 40,000 AFY during normal and above-normal rainfall years. However, due to hydrogeologic constraints in the eastern part of the Basin, pumping is reduced to between 30,000 and 35,000 AFY during locally dry years.

- **Saugus Formation:** Pumping from the Saugus Formation in a given year is tied directly to the availability of other water supplies, particularly from the SWP. During average-year conditions within the SWP system, Saugus pumping ranges between 7,500 and 15,000 AFY. Planned dry-year pumping from the Saugus Formation ranges between 15,000 and 25,000 AFY during a drought year and can increase to between 21,000 and 25,000 AFY if SWP deliveries are reduced for two consecutive years and between 21,000 and 35,000 AFY if SWP deliveries are reduced for three consecutive years. Such high pumping would be followed by periods of reduced (average-year) pumping, at rates between 7,500 and 15,000 AFY, to further enhance the effectiveness of natural recharge processes that would recover water levels and groundwater storage volumes after the higher pumping during dry years.

**TABLE 3-5**
**GROUNDWATER OPERATING PLAN FOR THE SANTA CLARITA VALLEY**

| | Groundwater Production (AF) | | | |
|---|---|---|---|---|
| **Aquifer** | **Normal Years** | **Dry Year 1** | **Dry Year 2** | **Dry Year 3** |
| Alluvium | 30,000 to 40,000 | 30,000 to 35,000 | 30,000 to 35,000 | 30,000 to 35,000 |
| Saugus Formation | 7,500 to 15,000 | 15,500 to 25,000 | 21,000 to 25,000 | 21,000 to 35,000 |
| **Total** | **37,500 to 55,000** | **45,000 to 60,000** | **51,000 to 60,000** | **51,000 to 70,000** |

Within the groundwater operating plan, three factors affect the availability of groundwater supplies: sufficient source capacity (wells and pumps), sustainability of the groundwater resource to meet pumping demand on a renewable basis and protection of groundwater sources (wells) from known contamination, or provisions for treatment in the event of contamination. The first two factors are briefly discussed below, and more completely addressed in the 2009 Annual Water Report and the aforenoted Basin Yield Analysis (2009).

Protection of groundwater sources and provisions for treatment in the event of contamination are discussed further in Chapter 5.

Recent historical groundwater pumping by the retail water purveyors and other groundwater users is summarized in Table 3-6. Planned future groundwater pumping in normal years, by the retail water purveyors as well as by other groundwater users, is summarized in Table 3-7. Existing and planned groundwater pumping by the retail water purveyors as well as by other groundwater users, for normal, single-dry and multiple-dry years, are summarized in Section 3.3.3.4 and in Tables 3-10 through 3-12 below.

**TABLE 3-6**
**RECENT HISTORICAL GROUNDWATER PRODUCTION[a]**

| Basin Name | Groundwater Pumped (AF) | | | | |
|---|---|---|---|---|---|
| | 2005 | 2006 | 2007 | 2008 | 2009 |
| Santa Clara River Valley East Subbasin | | | | | |
| SCWD | 12,408 | 13,156 | 10,686 | 11,878 | 10,077 |
| Alluvium | 12,408 | 13,156 | 10,686 | 11,878 | 10,077 |
| Saugus Formation | 0 | 0 | 0 | 0 | 0 |
| LACWWD 36 | 343 | 0 | 0 | 0 | 0 |
| Alluvium | 343 | 0 | 0 | 0 | 0 |
| Saugus Formation | 0 | 0 | 0 | 0 | 0 |
| NCWD | 4,824 | 5,572 | 5,497 | 5,912 | 5,728 |
| Alluvium | 1,389 | 2,149 | 1,806 | 1,717 | 1,860 |
| Saugus Formation | 3,435 | 3,423 | 3,691 | 4,195 | 3,868 |
| VWC | 14,741 | 14,333 | 15,570 | 16,094 | 15,295 |
| Alluvium | 12,228 | 11,884 | 13,140 | 14,324 | 12,459 |
| Saugus Formation | 2,513 | 2,449 | 2,367 | 1,770 | 2,836 |
| **Total Purveyor** | **32,316** | **33,061** | **31,690** | **33,884** | **31,100** |
| **Alluvium** | **26,368** | **27,189** | **25,632** | **27,919** | **24,396** |
| **Saugus Formation** | **5,948** | **5,872** | **6,058** | **5,965** | **6,704** |
| Agricultural and Other[b] | 12,785 | 17,312 | 14,768 | 14,750 | 16,564 |
| Alluvium | 12,280 | 15,872 | 13,141 | 13,797 | 15,590 |
| Saugus Formation | 505 | 1,440 | 1,627 | 953 | 974 |
| **Total Basin** | **45,101** | **50,373** | **46,458** | **48,634** | **47,664** |
| **Alluvium** | **38,648** | **43,061** | **38,773** | **41,716** | **39,986** |
| **Saugus Formation** | **6,453** | **7,312** | **7,685** | **6,918** | **7,678** |
| **Groundwater Fraction of Total Municipal Water Supply** | **46%** | **45%** | **41%** | **45%** | **44%** |

Notes:
(a) From 2009 Santa Clarita Valley Water Report (May 2010).
(b) Includes agricultural and other small private well pumping.

**TABLE 3-7**
**PROJECTED GROUNDWATER PRODUCTION (NORMAL YEAR)[a]**

| | Groundwater Pumping (AF) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Basin Name** | **2015** | **2020** | **2025** | **2030** | **2035** | **2040** | **2045** | **2050** |
| Santa Clara River Valley | | | | | | | | |
| East Subbasin | | | | | | | | |
| LACWWD 36 | | | | | | | | |
| Alluvium | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Saugus Formation | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 |
| NCWD | | | | | | | | |
| Alluvium | 1,825 | 1,825 | 1,825 | 1,825 | 1,825 | 1,825 | 1,825 | 1,825 |
| Saugus Formation | 4,400 | 4,400 | 4,400 | 4,400 | 4,400 | 4,400 | 4,400 | 4,400 |
| SCWD | | | | | | | | |
| Alluvium | 10,500 | 10,500 | 10,500 | 11,500 | 11,500 | 11,500 | 11,500 | 11,500 |
| Saugus Formation | 2,850 | 3,350 | 3,350 | 3,350 | 3,350 | 3,350 | 3,350 | 3,350 |
| VWC | | | | | | | | |
| Alluvium | 11,675 | 12,675 | 13,675 | 14,675 | 15,675 | 16,675 | 17,675 | 18,675 |
| Saugus Formation | 2,850 | 3,350 | 3,350 | 3,350 | 3,350 | 3,350 | 3,350 | 3,350 |
| **Total Purveyor** | | | | | | | | |
| **Alluvium** | **24,000** | **25,000** | **26,000** | **28,000** | **29,000** | **30,000** | **31,000** | **32,000** |
| **Saugus Formation** | **10,600** | **11,600** | **11,600** | **11,600** | **11,600** | **11,600** | **11,600** | **11,600** |
| Agricultural and Other[b] | | | | | | | | |
| Alluvium | 14,500 | 13,500 | 12,500 | 10,100 | 9,100 | 8,100 | 7,100 | 6,600 |
| Saugus Formation | 900 | 900 | 900 | 900 | 900 | 900 | 900 | 900 |
| **Total Basin** | | | | | | | | |
| **Alluvium** | **38,500** | **38,500** | **38,500** | **38,100** | **38,100** | **38,100** | **38,100** | **38,600** |
| **Saugus Formation** | **11,500** | **12,500** | **12,500** | **12,500** | **12,500** | **12,500** | **12,500** | **12,500** |

Notes:
(a) Existing and planned pumping by individual purveyors is shown in Appendix C. The distribution of pumping does not represent a formal allocation of water resources among the retail purveyors.
(b) Agricultural and other small private well pumping, including Newhall Land, Robinson Ranch Golf Course, Wayside Honor Rancho, Valencia Golf Course and proposed Palmer Golf Course.

As reflected in Table 3-7, the groundwater operating plan recognizes ongoing pumping for the two major uses of groundwater in the Basin, municipal and agricultural water supply. Consistent with the groundwater operating plan, projected groundwater pumping includes an ongoing conversion of pumping, coincident with planned land-use changes, from agricultural to municipal water supply. This is shown in Table 3-7, with projected pumping by agricultural and other users decreasing as purveyor pumping increases by a similar amount, resulting in total pumping remaining essentially constant through 2050. The groundwater operating plan and projected pumping also includes other small private domestic and related pumping (discussed further below). As shown in Table 3-7, total projected groundwater pumping by all users within each aquifer is within the ranges for normal year pumping identified in the groundwater operating plan (Table 3-5).

During preparation of the 2005 Plan, the Santa Clarita Valley Well Owners' Association submitted some limited information about the nature and magnitude of private well pumping. This included a detailed estimate of private well pumping in the San Francisquito Canyon portion of the Basin – a total of 85 AFY by 73 individual private pumpers, or nearly 1.2 AFY per private well pumper. As a result of that input, it continues to be recognized that total private pumping is likely well within the 500 AFY estimates of small private well pumping in recent annual Water Reports, or about 1 percent of typical Alluvial Aquifer pumping by the purveyors

and other known private well owners, e.g. agricultural pumpers, combined. Thus, while the small private wells are not explicitly modeled in the Basin yield analysis described herein because their locations and operations are not known, their operation creates a pumping stress that is essentially negligible at the scale of the regional model. Ultimately, implementation of the GWMP to maintain overall pumping within the operating plan, including private pumping, will result in sustainable groundwater conditions to support the combination of municipal (purveyor), agricultural and small private groundwater use on an ongoing basis.

Another change that has affected the UWMP is the requirement by DWR pursuant to the UWMP Act to provide estimates of the projected groundwater use of each of the purveyors. For the purposes of this report and compliance with the UWMP Act, the retail water purveyors have each set forth their estimates of projected groundwater use. The Agency and the retail water purveyors recognize that these estimates of projected groundwater use are subject to adjustment based on various factors and conditions occurring from time to time. These estimates are provided for the planning purposes of this report and the UWMP, and do not constitute an allocation of groundwater from the local groundwater basins.

#### 3.3.2.2 Alluvium

Based on a combination of historical operating experience and recent (2005 and 2009) groundwater modeling analyses, the Alluvial Aquifer can supply groundwater on a long-term sustainable basis in the overall range of 30,000 to 40,000 AFY, with a probable reduction in dry years to a range of 30,000 to 35,000 AFY. Both of those ranges include about 15,000 AFY of Alluvial pumping for current agricultural and other non-municipal water uses. The dry year reduction is a result of practical constraints in the eastern part of the Basin, where lowered groundwater levels in dry periods have the effect of reducing pumping capacities in that shallower portion of the aquifer. Over time, directly related to the rate of suburban development and corresponding decrease in agricultural land use the amount of Alluvial pumping for agricultural water supply is expected to decrease, with an equivalent increase in the amount of Alluvial pumping for municipal water supply. On an overall basis, Alluvial pumping is intended to remain within the sustainable ranges in the groundwater operating plan.

***Adequacy of Supply***

For municipal water supply, with existing wells and pumps, the three retail water purveyors with Alluvial wells (NCWD, SCWD and VWC) have a combined pumping capacity from active wells of nearly 42,000 gallons per minute (gpm), which translates into a current full-time Alluvial source capacity of approximately 67,000 AFY. Alluvial pumping capacity from all the active municipal supply wells is summarized in Table 3-8. The locations of the various municipal Alluvial wells throughout the Basin are illustrated on Figure 3-2.

In terms of adequacy and availability, the combined active Alluvial groundwater source capacity of municipal wells, approximately 67,000 AFY, is more than sufficient to meet the current and potential future municipal, or urban, component of groundwater supply from the Alluvium, which in the near term is about 24,000 to 26,000 AFY of the total planned Alluvial pumping of 30,000 to 40,000 AFY. The higher individual and cumulative pumping capacities are, of course, primarily for operational reasons (i.e., to meet daily and other fluctuations from average day to maximum day and peak hour system demands). As noted above, the balance of Alluvial pumping in the operating plan is for agricultural and other non-municipal, including small private, pumping.

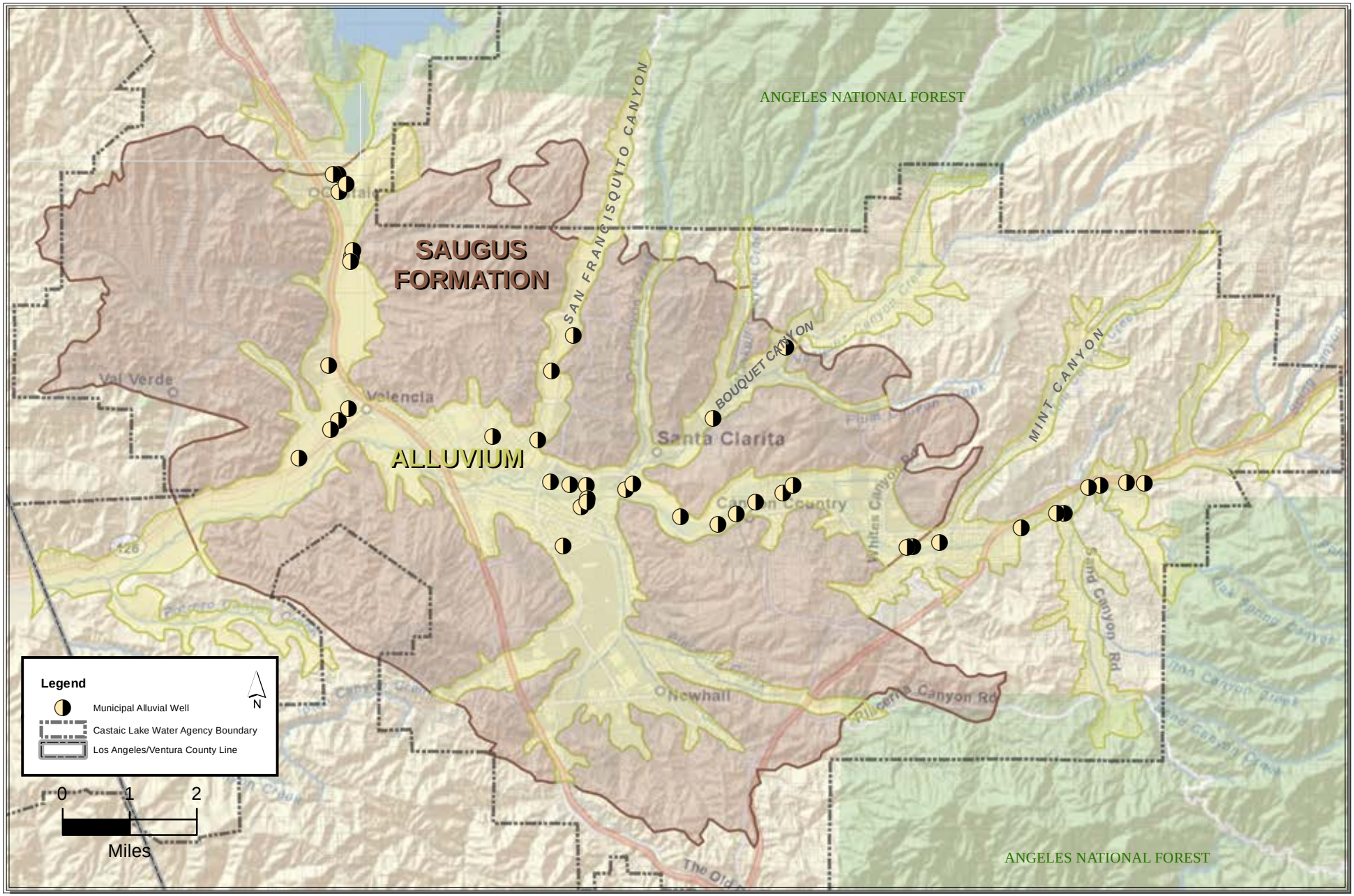


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**Figure 3-2**
**Municipal Alluvial Well Locations**
**Santa Clara River Valley, East Groundwater Subbasin**

**TABLE 3-8**
**ACTIVE MUNICIPAL GROUNDWATER SOURCE CAPACITY — ALLUVIAL AQUIFER WELLS**

| | Well | Pump Capacity (gpm) | Max. Annual Capacity (AF) | Normal Year Production[(a)] (AF) | Dry-Year Production[(a)] (AF) |
|---|---|---|---|---|---|
| NCWD | | | | | |
| | Castaic 1 | 650 | 1,040 | 350 | 250 |
| | Castaic 2 | 450 | 720 | 100 | 100 |
| | Castaic 4 | 270 | 430 | 100 | 0 |
| | Castaic 7 | 1,450 | 2,330 | 300 | 200 |
| | Pinetree 1 | 300 | 480 | 150 | 0 |
| | Pinetree 3 | 550 | 880 | 350 | 300 |
| | Pinetree 4 | 400 | 640 | 300 | 200 |
| | Pinetree 5 | 550 | 880 | 300 | 200 |
| | *NCWD Subtotal* | *4,620* | *7,400* | *1,950* | *1,250* |
| SCWD | | | | | |
| | Clark | 600 | 960 | 700 | 700 |
| | Guida | 1,000 | 1,610 | 1,300 | 1,200 |
| | Honby | 950 | 1,530 | 1,000 | 700 |
| | Lost Canyon 2 | 850 | 1,370 | 300 | 0 |
| | Lost Canyon 2A | 825 | 1,330 | 300 | 0 |
| | Mitchell 5A | 950 | 1,530 | 500 | 200 |
| | Mitchell 5B | 700 | 1,120 | 800 | 300 |
| | N. Oaks Central | 1,275 | 2,050 | 850 | 700 |
| | N. Oaks East | 950 | 1,530 | 800 | 700 |
| | N. Oaks West | 1,300 | 2,290 | 800 | 700 |
| | Sand Canyon | 1,050 | 1,690 | 200 | 0 |
| | Santa Clara | 1,500 | 2,420 | 1,200 | 1,200 |
| | Sierra | 1,500 | 2,420 | 1,100 | 700 |
| | Valley Center | 1,200 | 1,930 | 1,200 | 1,200 |
| | *SCWD Subtotal* | *14,650* | *23,580* | *11,050* | *8,300* |
| VWC | | | | | |
| | Well D | 1,050 | 1,690 | 880 | 880 |
| | Well E-15 | 1,400 | 2,250 | 800 | 800 |
| | Well N | 1,250 | 2,010 | 650 | 650 |
| | Well N7 | 2,500 | 4,030 | 1,160 | 1,160 |
| | Well N8 | 2,500 | 4,030 | 1,160 | 1,160 |
| | Well Q2 | 1,200 | 1,930 | 1,100 | 1,100 |
| | Well S6 | 2,000 | 3,220 | 1,000 | 1,000 |
| | Well S7 | 2,000 | 3,220 | 500 | 500 |
| | Well S8 | 2,000 | 3,220 | 500 | 500 |
| | Well T7 | 1,200 | 1,930 | 750 | 750 |
| | Well U4 | 1,000 | 1,610 | 800 | 800 |
| | Well U6 | 1,250 | 2,010 | 800 | 800 |
| | Well W9 | 800 | 1,290 | 1,000 | 1,000 |
| | Well W10 | 1,500 | 2,420 | 800 | 800 |
| | Well W11 | 1,000 | 1,610 | 950 | 950 |
| | *VWC Subtotal* | *22,650* | *36,470* | *12,850* | *12,850* |
| **Total Purveyors** | | **41,920** | **67,450** | **25,850** | **22,400** |

Note:
(a) Production amounts simulated in the updated Basin Yield analysis (LSCE & GSI, 2009).

***Sustainability***

Until 2003, the long-term renewability of Alluvial groundwater was empirically determined from approximately 60 years of pumping and groundwater level records. Generally, those long-term observations included stability in groundwater levels and storage, with some dry-period fluctuations in the eastern part of the Basin, over a historical range of total Alluvial pumpage from as low as about 20,000 AFY to as high as about 43,000 AFY. Those empirical observations have since been complemented by the development and application of a numerical groundwater flow model, which has been used to simulate aquifer response to the planned operating ranges of pumping. The numerical groundwater flow model has also been used to analyze the control of perchlorate contaminant migration under selected pumping conditions that have now been implemented to restore, with treatment, pumping capacity that was formerly inactivated due to perchlorate contamination detected in some wells in the Basin. To examine the yield of the Alluvium, or the sustainability of the Alluvium on a renewable basis, the original groundwater flow model was used to examine the long-term projected response of the aquifer to pumping for municipal and agricultural uses in the 30,000 to 40,000 AFY range under average/normal and wet conditions and in the 30,000 to 35,000 AFY range under locally dry conditions, documented in the "Analysis of Groundwater Basin Yield, Upper Santa Clara River Groundwater Basin, East Subbasin, Los Angeles County, California, prepared for the Upper Basin Water Purveyors" (2005 Basin Yield Analysis), prepared by CH2M Hill & LSCE, 2005). To examine the response of the entire aquifer system, the original model also incorporated pumping from the Saugus Formation in accordance with the normal (7,500 to 15,000 AFY) and dry year (15,000 to 35,000 AFY) operating plan for that aquifer. The model was run over a synthetic 78-year hydrologic period, which was selected from actual historical precipitation to examine a number of hydrologic conditions expected to affect both groundwater pumping and groundwater recharge.

Simulated Alluvial Aquifer response to the range of hydrologic conditions and pumping stresses was essentially a long-term repeat of the historical conditions that have resulted from similar pumping over the last several decades. The resultant response included (1) generally constant groundwater levels in the middle to western portion of the Alluvium, and fluctuating groundwater levels in the eastern portion as a function of wet and dry hydrologic conditions, (2) variations in recharge that directly correlate with wet and dry hydrologic conditions and (3) no long-term decline in groundwater levels or storage. Consequently, the Alluvial Aquifer was considered in the 2005 UWMP to be a sustainable water supply source to meet the Alluvial portion of the operating plan for the groundwater Basin.

In 2008, partly in preparation for this 2010 UWMP, and partly in response to concerns about events expected to impact the future reliability of supplemental water supply from the SWP, an updated analysis was undertaken to assess groundwater development potential and possible augmentation of the groundwater operating plan. In addition to extending the model's calibration, the updated analysis simulated the historical record of climate and incorporated SWP deliveries for those climatic conditions for an 86-year period from 1922 through 2007, in place of the original model's synthetic 78-year hydrologic period that had been developed prior to the availability of combined climate and SWP deliveries since 1922. While the overall operating plan ranges in the updated basin yield analysis did not change from the original operating plan, prevailing land-use conditions and the specific distributions of pumping reflected in Tables 3-8 and 3-9 were found to produce the same kinds of resultant Alluvial groundwater conditions as concluded to be sustainable in 2005 – (1) no long-term declines in Alluvial groundwater levels and storage; (2) multi-year periods of locally declining, or locally increasing, groundwater levels in response to cycles of below-normal and above-normal precipitation and

(3) short-term impacts on pumping capacities in eastern parts of the basin due to declining groundwater levels during dry periods, mitigable by some redistribution of pumping (reflected in pumping volumes included in this UWMP) and by conformance with the dry-period reduction in Alluvial pumping in the operating plan (Table 3-5). Based on the results of the updated basin yield analysis (LSCE & GSI, 2009), the operating plan is considered to reflect ongoing sustainable groundwater supply rates. In the Alluvium, sustainability was found via explicit simulation of pumping in wet/normal years near the upper end of the operating plan range. In dry years, sustainability was found via explicit simulation of pumping throughout the dry-year operating plan range, with the additional consideration that some pumping redistribution (reflected in this UWMP) be implemented to achieve pumping rates near the upper end of the dry-period range.

#### 3.3.2.3 Saugus Formation

Based on historical operating experience and recent (2005 and 2009) groundwater modeling analysis, the Saugus Formation can supply water on a long-term sustainable basis in a normal range of 7,500 to 15,000 AFY, with intermittent increases to 25,000 to 35,000 AF in dry years. The dry-year increases, based on limited historical observation and modeled projections, demonstrate that a small amount of the large groundwater storage in the Saugus Formation can be pumped over a relatively short (dry) period. This would be followed by recharge (replenishment) of that storage during a subsequent normal-to-wet period when pumping would be reduced.

***Adequacy of Supply***

For municipal water supply with existing wells, the three retail water purveyors with Saugus wells (NCWD, SCWD and VWC) have a combined pumping capacity from active wells of nearly 17,000 gpm, which translates into a full-time Saugus source capacity of about 27,000 AFY. Saugus pumping capacity from all the active municipal supply wells is summarized in Table 3-9; the locations of the various active municipal Saugus wells are illustrated on Figure 3-3. These capacities include two Saugus wells contaminated by perchlorate (Saugus 1 and 2), which have now been returned to service with treatment facilities for use of the treated water for municipal supply under permit from the State Department of Public Health. They also reflect the most recent replacement well, VWC's Well 207, in a non-impacted part of the basin. Excluded from these capacities is VWC Well 201 that was recently impacted by the detection of perchlorate. The well represents a total of 2,400 gpm of pumping capacity (for a dry-year production capacity of 3,777 AFY). VWC has removed Well 201 from service.

**TABLE 3-9**
**MUNICIPAL GROUNDWATER SOURCE CAPACITY—SAUGUS FORMATION WELLS**

| Well | Pump Capacity (gpm) | Max. Annual Capacity (AF) | Normal Year Production[(a)] (AF) | Dry-Year Production[(a)] (AF) |
|---|---|---|---|---|
| NCWD | | | | |
| 12 | 2,400 | 3,870 | 1,765 | 2,494 |
| 13 | 2,250 | 3,630 | 1,765 | 2,494 |
| *NCWD Subtotal* | *4,650* | *7,500* | *3,530* | *4,988* |
| VWC | | | | |
| 159 | 500 | 800 | 50 | 50 |
| 160 | 2,000 | 3,220 | 500 | 830 |
| 205 | 2,700 | 4,350 | 1,211 | 4,038 |
| 206 | 2,500 | 4,030 | 1,175 | 3,500 |
| 207 | 2,500 | 4,030 | 1,175 | 3,500 |
| *VWC Subtotal* | *10,200* | *16,430* | *4,111* | *11,918* |
| SCWD | | | | |
| Saugus 1 | 1,100 | 1,770 | 1,772 | 1,772 |
| Saugus 2 | 1,100 | 1,770 | 1,772 | 1,772 |
| *SCWD Subtotal* | *2,200* | *3,540* | *3,544* | *3,544* |
| **Total Purveyors** | **17,050** | **27,470** | **11,185** | **20,450** |

Note:
(a) Production amounts simulated in the updated Basin Yield analysis (LSCE & GSI, 2009).

In terms of adequacy and availability, the combined active Saugus groundwater source capacity of municipal wells of 27,000 AFY is more than sufficient to meet the planned use of Saugus groundwater in normal years of 7,500 to 15,000 AFY. This currently active capacity is more than sufficient to meet water demands, in combination with other sources. In order to supplement near term dry-year supplies, VWC Well 201 could be brought back into service within two years utilizing treatment technologies currently being used in the Santa Clarita Valley (See Section 5). This estimate is conservative because, in 2005, VWC Well Q2 was restored to service in October 2005, six months after perchlorate was detected in the well in April 2005. In addition, in 2005 there was no third-party funding initially available to pay for the cost of putting the well back into service; VWC negotiated a separate agreement with the Whittaker-Bermite property owners to pay for the cost. Also in May 2007, the perchlorate litigation settlement agreement was executed, which established a "Rapid Response Fund" to immediately treat any additional wells that could be become impacted by perchlorate.

With the restored capacity of the VWC Well 201, the Saugus Formation groundwater source capacity of municipal wells would be increased to 31,000 AFY. In order to accommodate longer-term dry-year needs, additional Saugus wells are planned by 2020 and expected to have a combined capacity of 10,000 AFY.

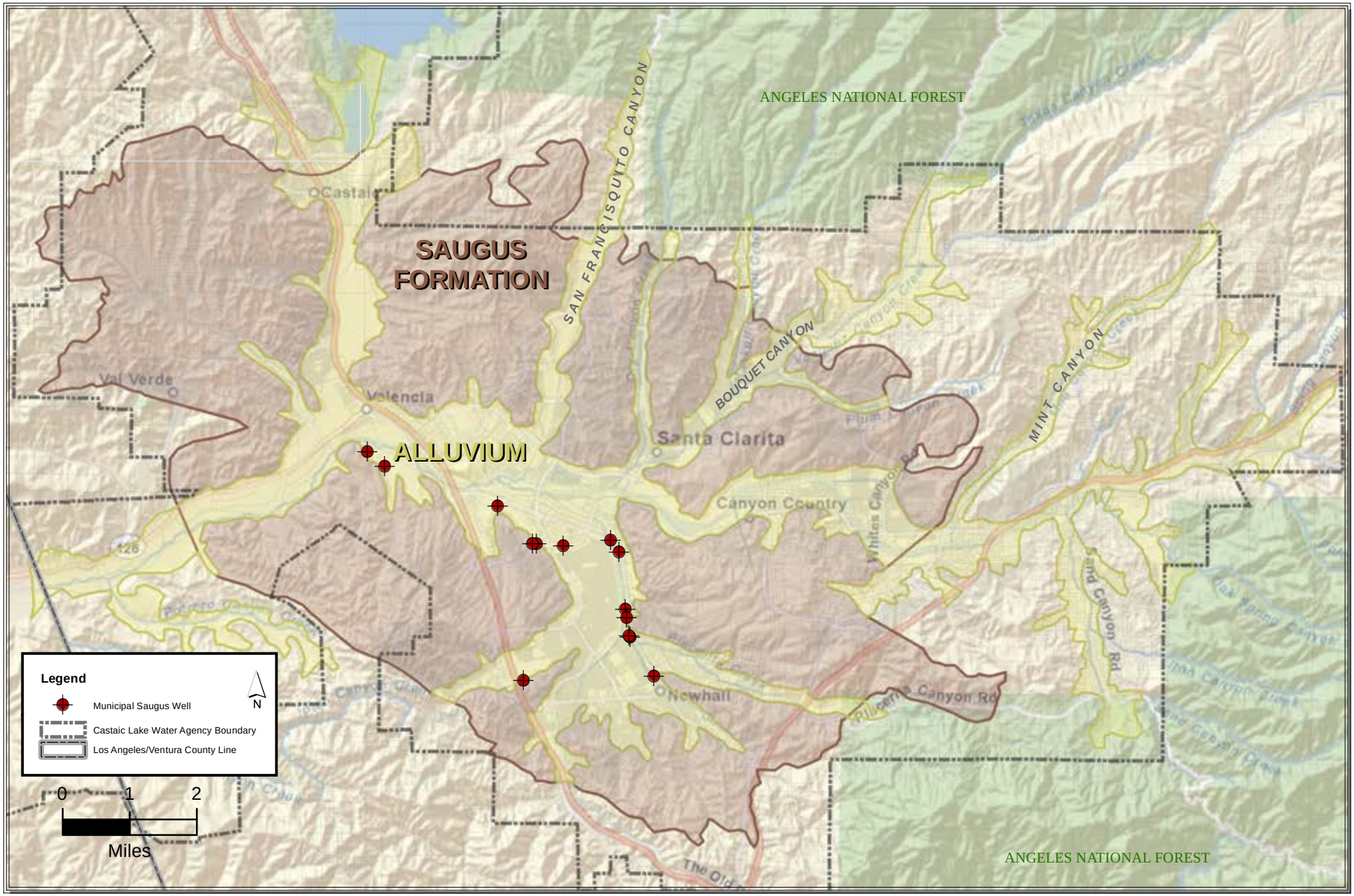


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**Figure 3-3**
**Saugus Well Locations**
**Santa Clara River Valley, East Groundwater Subbasin**

***Sustainability***

Until 2003, the long-term sustainability of Saugus groundwater was empirically estimated from limited historical experience. Historically (and continuing to the present), pumping from the Saugus has been fairly low in most years, with one four-year period of increased pumping up to about 15,000 AFY that had short-term water level impacts but produced no long-term depletion of the substantial groundwater storage in the Saugus. Those empirical observations have now been complemented by the development and application of the numerical groundwater flow model, which has been used to examine aquifer response to the operating plan for pumping from both the Alluvium and the Saugus and also to examine the effectiveness of pumping for both contaminant extraction and control of contaminant migration within the Saugus Formation. The latter aspects of Saugus pumping were being studied at the time of the 2005 UWMP, and were thus reflected at that time as groundwater extraction capacity to be restored. As discussed in Section 3.3.3 those restoration efforts have been undertaken and that pumping is thus reflected in this UWMP as part of the Saugus operating plan (Table 3-5) and pumping distribution (Table 3-9).

To examine the yield of the Saugus Formation, or its sustainability on a renewable basis, the original groundwater flow model was used to examine long-term projected response to pumping from both the Alluvium and the Saugus over the synthetic 78-year period of hydrologic conditions that incorporated alternating wet and dry periods as have historically occurred (CH2M Hill and LSCE, 2005). The pumping simulated in the model was in accordance with the then-current operating plan for the Basin. For the Saugus, simulated pumping included the then-planned restoration of historic pumping from the perchlorate-impacted wells.

The originally simulated Saugus Formation response to the ranges of operating plan pumping under assumed recurrent historical hydrologic conditions was consistent with actual experience under smaller pumping rates: (1) short-term declines in groundwater levels and storage near pumped wells during dry-period pumping, (2) recovery of groundwater levels and storage after cessation of dry-period pumping and (3) no long-term decreases or depletion of groundwater levels or storage. The combination of actual experience with Saugus recharge and pumping up to about 15,000 AFY, complemented by modeled projections of aquifer response that showed long-term utility of the Saugus at 7,500 to 15,000 AFY in normal years and rapid recovery from higher pumping rates during intermittent dry periods, was the basis for concluding that the Saugus Formation could be considered a sustainable water supply source to meet the Saugus portion of the operating plan for the groundwater Basin.

As discussed under Sustainability of the Alluvium above, an updated basin yield analysis was undertaken in 2008 to assess groundwater development potential and possible augmentation of the groundwater operating plan. After extended and updated model calibration and incorporation of extended historical records, the overall operating plan (Table 3-5) and specific distribution of Saugus pumping (Table 3-9) were found to produce the same kinds of resultant Saugus groundwater conditions as concluded to be sustainable in 2005 – (1) long-term stability of groundwater levels, with no sustained declines; (2) groundwater levels slightly below historic Saugus levels, in response to greater long-term utilization of the Saugus and (3) maintenance of sufficiently high Saugus groundwater levels to ensure achievement of planned individual pumping capacities (Table 3-9). Thus, the operating plan for the Saugus, with fairly low pumping in wet/normal years and increased pumping through dry periods, is concluded to reflect sustainable groundwater supply rates.

## 3.3.3 Existing and Planned Groundwater Pumping

### 3.3.3.1 Impacted Well Capacity

As discussed in the 2000 UWMP Perchlorate Contamination Amendment, and again in the 2005 UWMP, certain wells in the Basin were impacted by perchlorate contamination and thus represented a temporary loss of well capacity within CLWA's service area. Six wells were ultimately taken out of service upon the detection of perchlorate including four Saugus wells and two Alluvial wells. All have either been (1) abandoned and replaced, (2) returned to service with the addition of treatment facilities that allow the wells to be used for municipal water supply as part of the overall water supply systems permitted by the State Department of Public Health (DPH) or (3) will be replaced under an existing perchlorate litigation settlement agreement (See Section 5). The restored wells (two Saugus wells and one Alluvial well) and the replacement wells (one Saugus and one Alluvial well), which collectively restore much of the temporarily lost well capacity, are now included as parts of the active municipal groundwater source capacities delineated in Tables 3-8 and 3-9. An additional two wells will be drilled to fully restore 4,200 gpm (6,776 AFY) of the impacted well capacity, thus restoring the operational flexibility that existed prior to the perchlorate being discovered. The cost of drilling the remaining two wells will be fully reimbursed under the terms of the perchlorate litigation settlement agreement. Additional information concerning water quality issues and maintenance of pumping capacity is provided in Section 5.

Most recently, in August 2010, VWC's Well 201, located downgradient from the Whittaker-Bermite site and downgradient from the initially impacted Saugus 1, Saugus 2 and V157 wells, had detectable concentrations of perchlorate and the well was taken out of service. Water sampling tests from August 2010 through April 2011 also confirmed the presence of perchlorate over the adopted regulatory standard. This well was immediately taken out of service in August 2010 and its capacity is not included in active groundwater sources delineated in Table 3-9. VWC plans to actively seek remediation under the settlement agreement and restore the impacted well capacity in the near term.

### 3.3.3.2 Alluvium

In terms of adequacy and availability, the combined active Alluvial Aquifer groundwater sources of municipal wells, approximately 67,000 AFY, are more than sufficient to meet the current and potential future urban component of the groundwater supply from the Alluvium. The potential future urban component of groundwater from the Alluvium in the near-term is about 24,000 to 26,000 AFY of the total planned Alluvial pumping of 30,000 to 40,000 AFY. The higher individual and cumulative pumping capacities of the purveyors are for operational reasons (i.e., to meet daily and other fluctuations from average day to maximum day and peak hour system demands).

Tables 6-2, 6-3 and 6-4 as well as Tables C-2, C-5 and C-8 include planned Alluvial Aquifer supplies. These planned supplies do not increase the quantity of water being withdrawn from Alluvial Aquifer, but represent anticipated or potential shifts in pumping involving different or new wells.

For example, VWC's planned Alluvial Aquifer supplies represent a shifting of pumping from Newhall Land agricultural uses to VWC for the anticipated Newhall Ranch project. While new or improved wells would be required, no net change in Alluvial Production would be anticipated. There is also a potential that SCWD may require additional well capacity to meet the total

anticipated pumping for a single dry year as described in Tables C-4 and C-5. Overall purveyor and non-purveyor supplies remain consistent with the operating plan shown on Table 3-5.

#### 3.3.3.3 Saugus Formation

In terms of adequacy and availability, the combined active Saugus groundwater source municipal well capacity of 27,000 AFY is more than sufficient to meet the planned use of Saugus groundwater in normal years of 7,500 to 15,000 AFY. This current active capacity is also more than sufficient to meet water demands, in combination with other sources. In order to supplement near term dry-year supplies, VWC Well 201 could conservatively be brought back into service within two years utilizing treatment technologies currently being used in the Santa Clarita Valley (see Section 5). In order to accommodate the longer-term demands, additional Saugus wells would be required to meet the planned use of 35,000 AFY of Saugus groundwater during a multiple-dry year period.

Tables 6-2, 6-3 and 6-4 as well as Tables C-2, C-5 and C-8 include planned Saugus Formation supplies. Planned Saugus Formation pumping would only increase the quantity of water being withdrawn from Saugus Formation to levels consistent with the operating plan shown on Table 3-5. To obtain full Saugus Formation supplies of 35,000 AFY in certain dry years, restoration of the perchlorate impacted well (VWC Well 201) along with additional wells with a collective combined total production of approximately 14,000 AFY would be required.

LACWWD 36 anticipates planned Saugus Formation supplies of 500 AFY to be available beginning in 2011. This planned supply included in Tables C-2, C-5 and C-8 is incorporated into Tables 6-2, 6-3 and 6-4; however, the total purveyor and non-purveyor Saugus Formation supplies remain consistent with the operating plan shown on Table 3-5.

There is also a potential that NCWD may require additional well capacity to meet anticipated pumping levels included in Tables C-2, C-5 and C-8 and incorporated into Tables 6-2, 6-3 and 6-4. Overall NCWD existing and planned Saugus Formation supplies, along with the supplies of the other purveyors and non-purveyors, are consistent with the operating plan shown on Table 3-5.

As previously discussed in this section, VWC expects to remediate the capacity from its recently impacted Well 201 in the near term under conservative projections (i.e., within two years utilizing replacement well construction and/or treatment technologies currently being used in the Santa Clarita Valley; see Section 5).

The need for additional new Saugus Formation wells to achieve full dry-year pumping has been planned for some time. Most notably, as part of the 2009 Updated Basin Yield Analysis, three new Saugus wells were simulated in the western part of the basin, remote from the Whittaker-Bermite site and perchlorate-impacted Saugus wells. The conclusion of the analysis that Saugus pumping is sustainable included multiple dry-year pumping at a combined capacity for the three wells of 9,750 AFY.

#### 3.3.3.4 Summary

Overall, the total municipal supply in this Plan includes a groundwater component that is, in turn, part of the overall groundwater supply of the Valley. As such, the municipal groundwater supply, distributed among the retail purveyors, recognizes the existing and projected future uses of groundwater by overlying interests in the Valley such that the combination of municipal and

all other groundwater pumping remains within the groundwater operating plan (Table 3-5) that has been analyzed for sustainability. The distribution of groundwater among the purveyors are detailed in Appendix C and aggregated for all the purveyors in Chapter 6 for normal years, single dry years and multiple dry years. Relative to the 2009 Groundwater Basin Yield Analysis, total groundwater pumping, by all other pumpers as well as by the purveyors from their existing and planned wells, is summarized in Tables 3-10 through 3-12 for normal, single-dry and multiple-dry years.

**TABLE 3-10**
**AVERAGE/NORMAL YEAR EXISTING AND PLANNED GROUNDWATER USAGE IN UPPER SANTA CLARA RIVER BASIN (AF)**

| Alluvium Supplies | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|---|
| Purveyors Existing | 24,000 | 24,000 | 24,000 | 25,000 | 25,000 | 25,000 | 25,000 | 25,000 |
| Purveyors Planned | 0 | 1,000 | 2,000 | 3,000 | 4,000 | 5,000 | 6,000 | 7,000 |
| Purveyors Existing and Planned | 24,000 | 25,000 | 26,000 | 28,000 | 29,000 | 30,000 | 31,000 | 32,000 |
| Non purveyors | 14,500 | 13,500 | 12,500 | 10,100 | 9,100 | 8,100 | 7,100 | 6,600 |
| **Total Alluvium Production** | **38,500** | **38,500** | **38,500** | **38,100** | **38,100** | **38,100** | **38,100** | **38,600** |
| *Alluvium Yield* | *38,600* | *38,600* | *38,600* | *38,600* | *38,600* | *38,600* | *38,600* | *38,600* |

| Saugus Formation Supplies | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|---|
| Purveyors Existing | 9,225 | 10,225 | 10,225 | 10,225 | 10,225 | 10,225 | 10,225 | 10,225 |
| Purveyors Planned | 1375 | 1375 | 1375 | 1375 | 1375 | 1375 | 1375 | 1375 |
| Purveyors Existing and Planned | 10,600 | 11,600 | 11,600 | 11,600 | 11,600 | 11,600 | 11,600 | 11,600 |
| Non Purveyors | 900 | 900 | 900 | 900 | 900 | 900 | 900 | 900 |
| **Total Saugus** | **11,500** | **12,500** | **12,500** | **12,500** | **12,500** | **12,500** | **12,500** | **12,500** |
| *Saugus Yield* | *12,500* | *12,500* | *12,500* | *12,500* | *12,500* | *12,500* | *12,500* | *12,500* |

**TABLE 3-11**
**SINGLE-DRY YEAR EXISTING AND PLANNED GROUNDWATER USAGE IN UPPER SANTA CLARA RIVER BASIN (AF)**

| Alluvium Supplies | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|---|
| Purveyors Existing | 20,300 | 20,250 | 20,200 | 21,050 | 21,050 | 21,025 | 21,000 | 20,650 |
| Purveyors Planned | 200 | 1,250 | 2,300 | 3,850 | 4,850 | 5,875 | 6,900 | 7,750 |
| Purveyors Existing and Planned | 20,500 | 21,500 | 22,500 | 24,900 | 25,900 | 26,900 | 27,900 | 28,400 |
| Non purveyors | 14,350 | 13,350 | 12,350 | 9,950 | 8,950 | 7,950 | 6,950 | 6,450 |
| **Total Alluvium Production** | **34,850** | **34,850** | **34,850** | **34,850** | **34,850** | **34,850** | **34,850** | **34,850** |
| *Alluvium Yield* | *34,850* | *34,850* | *34,850* | *34,850* | *34,850* | *34,850* | *34,850* | *34,850* |

| Saugus Formation Supplies | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|---|
| Purveyors Existing | 20,400 | 20,400 | 20,400 | 20,400 | 20,400 | 20,400 | 20,400 | 20,400 |
| Purveyors Planned (Restored Well) | 825 | 3,777 | 3,777 | 3,777 | 3,777 | 3,777 | 3,777 | 3,750 |
| Purveyors Planned (New Wells) | 2,875 | 9,923 | 9,923 | 9,923 | 9,923 | 9,923 | 9,923 | 9,950 |
| Purveyors Existing and Planned | 24,100 | 34,100 | 34,100 | 34,100 | 34,100 | 34,100 | 34,100 | 34,100 |
| Non purveyors | 900 | 900 | 900 | 900 | 900 | 900 | 900 | 900 |
| **Total Saugus** | **25,000** | **35,000** | **35,000** | **35,000** | **35,000** | **35,000** | **35,000** | **35,000** |
| *Saugus Yield* | *25,000* | *35,000* | *35,000* | *35,000* | *35,000* | *35,000* | *35,000* | *35,000* |

**TABLE 3-12**
**MULTIPLE-DRY YEAR EXISTING AND PLANNED GROUNDWATER USAGE IN UPPER SANTA CLARA RIVER BASIN (AF)**

| Alluvium Supplies | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|---|
| Purveyors Existing | 20,425 | 20,425 | 20,425 | 21,825 | 21,825 | 21,825 | 21,825 | 21,325 |
| Purveyors Planned | 0 | 1,000 | 2,000 | 3,000 | 4,000 | 5,000 | 6,000 | 7,000 |
| Purveyors Existing and Planned | 20,425 | 21,425 | 22,425 | 24,825 | 25,825 | 26,825 | 27,825 | 28,325 |
| Non purveyors | 14,425 | 13,425 | 12,425 | 10,025 | 9,025 | 8,025 | 7,025 | 6,525 |
| **Total Alluvium Production** | **34,850** | **34,850** | **34,850** | **34,850** | **34,850** | **34,850** | **34,850** | **34,850** |
| *Alluvium Yield* | *34,850* | *34,850* | *34,850* | *34,850* | *34,850* | *34,850* | *34,850* | *34,850* |

| Saugus Formation Supplies | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|---|
| Purveyors Existing | 19,700 | 19,700 | 19,700 | 19,700 | 19,700 | 19,700 | 19,700 | 19,700 |
| Purveyors Planned (Restored Well) | 2,375 | 1,625 | 1,500 | 1,400 | 1,275 | 1,125 | 1,000 | 875 |
| Purveyors Planned (New Wells) | 2,250 | 10,325 | 10,450 | 10,550 | 10,675 | 10,825 | 10,950 | 11,075 |
| Purveyors Existing and Planned | 24,325 | 31,650 | 31,650 | 31,650 | 31,650 | 31,650 | 31,650 | 31,650 |
| Non purveyors | 900 | 900 | 900 | 900 | 900 | 900 | 900 | 900 |
| **Total Saugus** | **25,225** | **32,550** | **32,550** | **32,550** | **32,550** | **32,550** | **32,550** | **32,550** |
| *Saugus Yield* | *25,225* | *32,550* | *32,550* | *32,550* | *32,550* | *32,550* | *32,550* | *32,550* |

## 3.4 Transfers and Exchanges

An opportunity available to CLWA to increase water supplies is to participate in voluntary water transfer programs. Since the drought of 1987-1992, the concept of water transfer has evolved into a viable supplemental source to improve supply reliability. The initial concept for water transfers was codified into law in 1986 when the California Legislature adopted the "Katz" Law (California Water Code, Sections 1810-1814) and the Costa-Isenberg Water Transfer Law of 1986 (California Water Code, Sections 470, 475, 480-483). These laws help define parameters for water transfers and set up a variety of approaches through which water or water rights can be transferred among individuals or agencies.

Up to 27 MAF of water are delivered for agricultural use every year. Over half of this water use is in the Central Valley, and much of it is delivered by, or adjacent to, SWP and CVP conveyance facilities. This proximity to existing water conveyance facilities could allow for the voluntary transfer of water to many urban areas, including CLWA, via the SWP. Such water transfers can involve water sales, conjunctive use and groundwater substitution and water sharing. They usually occur as a form of spot, option or core transfers agreements. The costs of a water transfer would vary depending on the type, term and location of the transfer. The most likely voluntary water transfer programs would probably involve the Sacramento or southern San Joaquin Valley areas.

One of the most important aspects of any resource planning process is flexibility. A flexible strategy minimizes unnecessary or redundant investments (or stranded costs). The voluntary transfer of water between willing sellers and buyers can be an effective means of achieving flexibility. However, not all water transfers have the same effectiveness in meeting resource

needs. Through the resource planning process and ultimate implementation, several different types of water transfers could be undertaken.

### 3.4.1 Core Transfers

Core transfers are agreements to purchase a defined quantity of water every year. These transfers have the benefit of more certainty in costs and supply, but in some years can be surplus to imported water (available in most years) that is already paid for.

### 3.4.2 Spot Market Transfers

Spot market transfers involve water purchased only during the time of need (usually a drought). Payments for these transfers occur only when water is actually requested and delivered, but there is usually greater uncertainty in terms of costs and availability of supply. Examples of such transfers were the Drought Water Banks of 1991, 1992 and 1994 and DWR Dry Year Water Purchase Programs in 2001 through 2004 and 2008. An additional risk of spot market transfers is that the purchases may be subject to institutional limits or restricted access (e.g., requiring the purchasing agency to institute rationing before it is eligible to participate in the program).

### 3.4.3 Option Contracts

Option contracts are agreements that specify the amount of water needed and the frequency or probability that the supply will be called upon (an option). Typically, a relatively low up-front option payment is required and, if the option is actually called upon, a subsequent payment would be made for the amount called. These transfers have the best characteristics of both core and spot transfers. With option contracts, the potential for redundant supply is minimized, as are the risks associated with cost and supply availability.

### 3.4.4 Future Market Transfers

The most viable types of water transfers are core and option transfers and, as such, represent CLWA's long-term strategy. The most recent costs for this type of transfer is estimated to be about $300 per AFY (equivalent to $5,500 per AF for Table A Amount) for core transfers.

## 3.5 Groundwater Banking Programs

With recent developments in conjunctive use and groundwater banking, significant opportunities exist to improve water supply reliability for CLWA. Conjunctive use is the coordinated operation of multiple water supplies to achieve improved supply reliability. Most conjunctive use concepts are based on storing surface supplies in groundwater basins in times of surplus for withdrawal and use during dry periods and drought when surface water supplies would likely be reduced.

Groundwater banking programs involve storing available SWP surface water supplies during wet years in groundwater basins in, for example, the San Joaquin Valley. Water would be stored either directly by surface spreading or injection, or indirectly by supplying surface water to farmers for their use in lieu of their intended groundwater pumping. During water shortages, the stored water could be pumped out and conveyed through the California Aqueduct to CLWA

as the banking partner, or used by the farmers in exchange for their surface water allocations, which would be delivered to CLWA as the banking partner through the California Aqueduct.

CLWA is a partner in two existing groundwater banking programs, the Semitropic Banking Program and RRBWSD Banking Program, discussed below in Sections 3.5.1 and 3.5.2, respectively. Newhall Land is also a partner in the Semitropic Banking Program, as discussed in Section 3.5.3, with its supplies assumed to be available to VWC. In addition, CLWA has updated its plan to enhance its overall supply reliability, including the need for additional banking programs, as discussed in Section 3.5.4.

### 3.5.1 Semitropic Banking Program

Semitropic Water Storage District (Semitropic) provides SWP water to farmers for irrigation. Semitropic is located in the San Joaquin Valley in the northern part of Kern County immediately east of the California Aqueduct. Using its available groundwater storage capacity (approximately one MAF), Semitropic has developed a groundwater banking program, that takes available SWP supplies in wet years and returns the water in dry years. As part of this dry-year return, Semitropic can leave its SWP water in the Aqueduct for delivery to a banking partner and increase its groundwater production for its farmers. Semitropic constructed facilities so that groundwater can be pumped into a Semitropic canal and, through reverse pumping plants, be delivered to the California Aqueduct. Semitropic currently has six long-term first priority banking partners: the Metropolitan Water District of Southern California (Metropolitan), Santa Clara Valley Water District, Alameda County Water District, Alameda County Flood Control and Water Conservation District Zone 7, Vidler Water Company and Newhall Land and Farming. The total amount of storage under contract is approximately one MAF.

In 2002, CLWA entered into a temporary storage agreement with Semitropic, and stored an available portion of its Table A supply (24,000 AF) in an account in Semitropic's program. In 2004, 32,522 AF of available 2003 Table A supply was stored in a second temporary Semitropic account. In accordance with the terms of CLWA's storage agreements with Semitropic, 90 percent of the banked amount, or a total of 50,870 AF, was recoverable through 2013 to meet CLWA water demands when needed. Each account had a term of ten years for the water to be withdrawn and delivered to CLWA.[19] Of this recoverable storage, 4,950 AF has been withdrawn, with 1,650 AF delivered in 2009 and 3,300 AF delivered in 2010, leaving a balance of 45,920 AF in storage available to meet future CLWA needs. CLWA executed an amendment for a ten-year extension of each banking agreement with Semitropic in April 2010. A negative declaration for the program extension was approved by CLWA's Board of Directors on January 19, 2011 and by the Semitropic Board of Directors on April 6, 2011.

Current operational planning includes use of the water stored in Semitropic for dry-year supply. Accordingly, it is reflected in the available supplies delineated in this section, and it is also reflected as contributing only to dry-year supply reliability in Chapter 6, through 2023.

### 3.5.2 Rosedale-Rio Bravo Banking Program

Also located in Kern County, immediately adjacent to the Kern Water Bank, RRBWSD has developed a Water Banking and Exchange Program. CLWA has entered into a long-term agreement with RRBWSD that provides it with storage and pumpback capacity of 20,000 AFY,

[19] Thereafter, the remaining amount of project water would be forfeited from the account.

with up to 100,000 AF of storage capacity. CLWA began storing water in this program in 2005 and has since reached the program's maximum storage capacity, with 100,000 AF currently available for withdrawal.

This project is a water management program to improve the reliability of CLWA's existing dry-year supplies; it is not an annual supply that could support growth. Accordingly, it is reflected in the available supplies delineated in this section and it is also reflected as contributing only to dry-year supply reliability in Chapter 6.

### 3.5.3 Semitropic Banking Program – Newhall Land

As mentioned above, one of Semtropic's long-term groundwater banking partners is Newhall Land. In its agreement with Semitropic, Newhall Land has available to it a pumpback capacity of 4,950 AFY and a storage capacity of 55,000 AF. Newhall Land has a current storage balance of 18,828 AF. This supply is assumed to be available to VWC and is planned to be used only in dry years. Accordingly, it is reflected in the available supplies delineated in this section, and it is also reflected as contributing only to dry-year supply reliability in Chapter 6.

### 3.5.4 Other Opportunities

In 2003, CLWA produced a Water Supply Reliability Plan (Reliability Plan), and updated it in 2009. The Reliability Plan outlines primary elements that CLWA should include in its water supply mix to obtain maximum overall supply reliability enhancement. These elements include both conjunctive use and groundwater banking programs, which enhance the reliability of both the existing and future supplies, as well as water acquisitions. The Reliability Plan recommends water banking storage and pumpback capacity north and south of Tehachapi Mountains, the latter of which would provide an emergency supply in case of catastrophic outage along the California Aqueduct. The Reliability Plan also contains a recommended implementation plan and schedule. CLWA has made significant progress on its water supply reliability program, obtaining storage capacity in two banking programs north of the Tehachapi Mountains, with approximately 146,000 AF of water currently banked in those programs and available for withdrawal. Negotiations with one program south of the Tehachapis were initiated, but identification of a program for emergency outage storage remains ongoing.

The 2009 update of the Reliability Plan presents the implementation schedule recommended for both storage and pumpback capacity beginning in 2010 and incrementally increasing through 2050. CLWA's plans call for development of additional groundwater banking programs, with pumpback capacity of at least an additional 10,000 AF by 2025, and a second additional 10,000 AF by 2035. Table 3-13 summarizes CLWA's future reliability enhancement programs.

**TABLE 3-13**
**FUTURE RELIABILITY ENHANCEMENT PROGRAMS**

| Project Name | Year Available | Proposed Quantities (AF) Average/ Normal Year | Single Dry Year[(a)] | Multiple Dry Years[(b)] |
|---|---|---|---|---|
| Additional Planned Banking Programs | 2025 | 0 | 10,000 | 7,500 |
| | 2035 | 0 | 20,000 | 15,000 |

Notes:
(a) Supplies shown are maximum annual withdrawal capacity.
(b) Supplies shown are average withdrawals during four consecutive dry years.

## 3.6 Planned Water Supply Projects and Programs

The Reliability Plan also discusses the potential for acquiring additional water supplies to meet future demands (the plan refers to these as "water transfer opportunities"). CLWA has been participating in the initial planning stages of the Garden Bar Water and Power Supply Project. This north-of-Delta water supply project is sponsored by the South Sutter Water District (SSWD). The project consists of a new dam and associated hydroelectric facilities. SSWD is investigating a reservoir with a storage capacity of between 245,000 and 350,000 AF. Table 3-14 summarizes CLWA's transfer and exchange opportunities.

**TABLE 3-14**
**TRANSFER AND EXCHANGE OPPORTUNITIES**

| Source Transfer Agency | Transfer/ Exchange | Year Available | Short/Long Term | Proposed Quantity (AFY) |
|---|---|---|---|---|
| South Sutter Water District | Transfer | 2020-2025 | Long Term | TBD |

## 3.7 Development of Desalination

The California UWMP Act requires a discussion of potential opportunities for use of desalinated water (Water Code Section 10631[i]). CLWA has explored such opportunities, and they are described in the following section, including opportunities for desalination of brackish water, groundwater and seawater. However, at this time, none of these opportunities are practical or economically feasible for CLWA and CLWA has no current plans to pursue them. Therefore, desalinated supplies are not included in the supply summaries in this Plan (e.g., Tables 3-1, 6-2, 6-3 and 6-4).

### 3.7.1 Opportunities for Brackish Water and/or Groundwater Desalination

As discussed in Chapter 3, the two sources of groundwater in the Santa Clarita Valley are drawn from the Alluvial Aquifer and from the Saugus Formation. Neither of these supplies can be considered brackish in nature, and desalination is not required.

However, CLWA and the retail water purveyors could team with other SWP contractors and provide financial assistance in construction of other regional groundwater desalination facilities in exchange for SWP supplies. The desalinated water would be supplied to users in communities near the desalination plant, and a similar amount of SWP supplies would be exchanged and allocated to CLWA from the SWP contractor. A list summarizing the groundwater desalination plans of other SWP contractors is not available; however, CLWA would begin this planning effort should the need arise.

In addition, should an opportunity emerge with a local agency other than a SWP contractor, an exchange of SWP deliveries would most likely involve a third party, such as Metropolitan. Most local groundwater desalination facilities would be projects implemented by retailers of SWP contractors and, if an exchange program was implemented, would involve coordination and wheeling of water through the contractor's facilities to CLWA.

### 3.7.2 Opportunities for Seawater Desalination

Because the Santa Clarita Valley is not in a coastal area, it is neither practical nor economically feasible for CLWA and its purveyors to implement a seawater desalination program. However, similar to the brackish water and groundwater desalination opportunities described above, CLWA and the purveyors could provide financial assistance to other SWP contractors in the construction of their seawater desalination facilities in exchange for SWP supplies.

CLWA and the purveyors have been following the existing and proposed seawater desalination projects along California's coast. Table 3-15 provides a summary of the status of several of California's municipal/domestic seawater desalination facilities.

As shown Table 3-15, most of the existing and proposed seawater desalination facilities are/would be operated by agencies that are not SWP contractors. However, in these cases as described above, an exchange for SWP deliveries would most likely involve a third party (SWP contractor), the local water agency and CLWA.

**TABLE 3-15**
**EXISTING AND PROPOSED SEAWATER DESALINATION FACILITIES ALONG THE CALIFORNIA COAST**

| Project | Member Agency Service Area | AF per Year | Status |
|---|---|---|---|
| Long Beach Seawater Desalination Project | Long Beach Water Department | 10,000 | Pilot study |
| South Orange Coastal Ocean Desalination Project | Municipal Water District of Orange County | 16,000-28,000 | Pilot study |
| Carlsbad Seawater Desalination Project | San Diego County Water Authority | 56,000 | Permitting |
| West Basin Seawater Desalination Project | West Basin Municipal Water District | 20,000 | Pilot study |
| Huntington Beach Seawater Desalination Project | Municipal Water District of Orange County | 56,000 | Permitting |
| Camp Pendleton Seawater Desalination Project | San Diego County Water Authority | 56,000 to 168,000 | Planning |
| Rosarito Beach Seawater Desalination Feasibility Study | San Diego County Water Authority | 28,000 to 56,000 | Feasibility study |
| | **Total AFY** | **102,000-280,000** | |

Source: MWD 2010 UWMP

Although not listed in Table 3-15, the Bay Area Regional Desalination Partnership, comprised of five agencies collaborating on a Regional Desalination Project in the San Francisco Bay area, is working to develop desalination as a water supply for the region. The agencies are the San Francisco Public Utilities Commission, Santa Clara Valley Water District, East Bay Municipal Utilities District, Contra Costa Water District and Alameda County Flood Control and Water Conservation District Zone 7. This regional desalination project is an example of the type of project that CLWA could participate in on an exchange basis.

To date the Partnership has completed a feasibility study to refine the institutional, technical, environmental and scientific merits of developing a regional facility and are planning to build and test a pilot plant in Contra Costa County. Construction is planned for 2012.

# Section 4: Recycled Water

This section of the Plan describes the existing and future recycled water opportunities available to the CLWA service area. The description includes estimates of potential recycled water supply and demand for 2010 to 2050 in five year increments, as well as CLWA's proposed incentives and implementation plan for recycled water.

## 4.1 Recycled Water Master Plan

In normal years, approximately 55 percent of the demands within CLWA's service area is met with imported water. However, the reliability of the imported SWP supply is variable (due in part to its dependence on current year hydrology in northern California and prior year storage in SWP reservoirs). When sufficient imported water is not available, the balance is met with local groundwater provided by the purveyors and from water banking programs.

It is anticipated that water demands will continue to increase. Accordingly, additional reliable sources of water are necessary to meet projected water demands. CLWA recognizes that recycled water is an important and reliable source of additional water. Recycled water enhances reliability in that it provides an additional source of supply and allows for more efficient utilization of CLWA's groundwater and imported water supplies. Draft Recycled Water System Master Plans for the CLWA service area were completed in 1993 and 2002. These master plans considered significant developments affecting recycled water sources, supplies, users and demands so that CLWA could develop a cost-effective recycled water system within its service area. In 2007, CLWA completed California Environmental Quality Act (CEQA) analysis of the 2002 Recycled Water Master Plan (Recycled Plan). This analysis consisted of a Program Environmental Impact Report (EIR) covering the various phases for a recycled water system as outlined in the Recycled Plan. The Program EIR was certified by the CLWA Board in March 2007.

Table 4-1 provides a list of the agencies that participate in the implementation of the Recycled Plan.

CLWA has constructed Phase I of the Recycled Plan, which can deliver 1,700 AFY of water to the VWC service area. Deliveries of recycled water began in 2003 for irrigation water supply at a golf course and in roadway median strips. In 2009, recycled water deliveries were 328 AF.

**TABLE 4-1**
**PARTICIPATING AGENCIES**

| Participating Agencies | Role in Plan Development |
|---|---|
| Castaic Lake Water Agency | Wholesale water provider |
| Newhall County Water District | Retail water purveyor |
| Santa Clarita Water Division | Retail water purveyor |
| Valencia Water Company | Retail water purveyor |
| Los Angeles County Waterworks District No. 36 | Retail water purveyor |
| Los Angeles County Sanitation District No. 26[20] | Recycled water supplier |
| Los Angeles County Sanitation District No. 32[21] | Recycled water supplier |
| Berry Petroleum | Potential recycled water supplier |

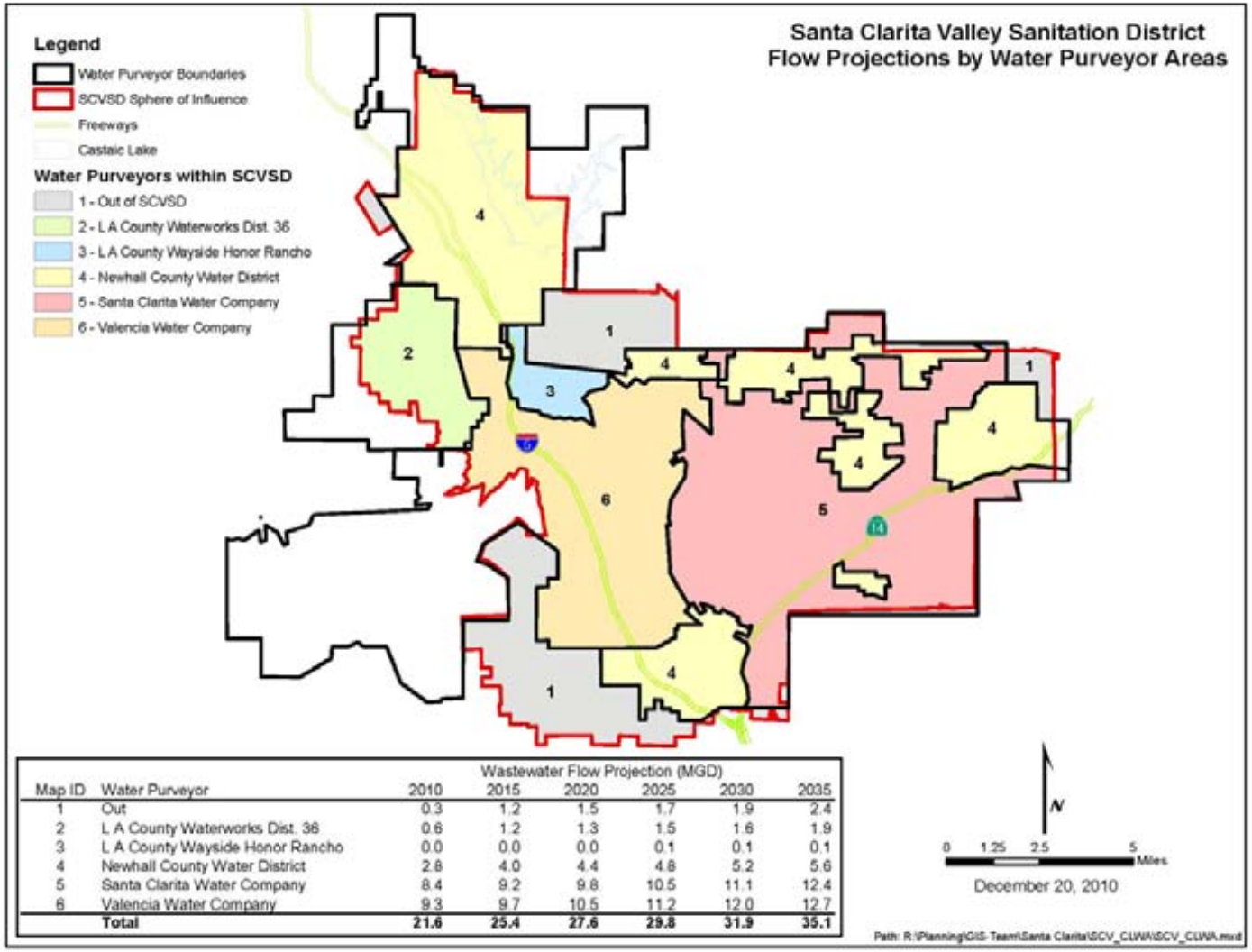
Overall, the Recycled Plan along with the Newhall Ranch development is expected to ultimately recycle up to 22,800 AF of treated (tertiary) wastewater suitable for reuse on golf courses, landscaping and other non-potable uses.

CLWA completed a preliminary design report in 2009 on the second phase of the Recycled Plan (Phase 2A) that will take water from the Saugus Water Reclamation Plant (WRP) and distribute it to identified users to the north, across the Santa Clara River and then to the west and east. Customers included in the Phase 2A expansion will be Santa Clarita Central Park and the Bridgeport and River Village developments. Large irrigation customers will be served with this expansion with a collective design that will increase recycled water deliveries by 500 AFY.

Recycled water will be further expanded with the South End Recycled Water project (Phase 2C). VWC has initiated project design expanding the existing recycled water transmission and distribution system southerly to supply recycled water to additional customers as well as to potentially supply a source of recycled water to customers of adjacent water agencies. Phase 2C of the Recycled Plan will result in the use of 910 AFY of recycled water.

[20] Los Angeles County Sanitation District No. 26 and No. 32, the majority of which serve the City of Santa Clarita, have been consolidated into the Santa Clarita Valley Sanitation District.
[21] Ibid.

**FIGURE 4-1**
**SANTA CLARITA VALLEY SANITATION DISTRICT FLOW PROJECTIONS BY WATER PURVEYOR SERVICE AREA**




| Map ID | Water Purveyor | Wastewater Flow Projection (MGD) 2010 | 2015 | 2020 | 2025 | 2030 | 2035 |
|---|---|---|---|---|---|---|---|
| 1 | Out | 0.3 | 1.2 | 1.5 | 1.7 | 1.9 | 2.4 |
| 2 | L A County Waterworks Dist. 36 | 0.6 | 1.2 | 1.3 | 1.5 | 1.6 | 1.9 |
| 3 | L A County Wayside Honor Rancho | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 0.1 |
| 4 | Newhall County Water District | 2.8 | 4.0 | 4.4 | 4.8 | 5.2 | 5.6 |
| 5 | Santa Clarita Water Company | 8.4 | 9.2 | 9.8 | 10.5 | 11.1 | 12.4 |
| 6 | Valencia Water Company | 9.3 | 9.7 | 10.5 | 11.2 | 12.0 | 12.7 |
| | **Total** | **21.6** | **25.4** | **27.6** | **29.8** | **31.9** | **35.1** |

## 4.2 Existing Wastewater Treatment Facilities

The Santa Clarita Valley Sanitation District (SCVSD) of Los Angeles County owns and operates two Water Reclamation Plants (WRPs), the Saugus WRP and the Valencia WRP, within the CLWA service area. The water is treated to tertiary levels and, with the exception of water used in Phase I of the Recycled Plan, is discharged to the Santa Clara River. The Newhall Ranch development is also planning to construct a WRP, and non-potable recycled water from this source may be incorporated into CLWA's recycled water system.

The Valencia WRP, completed in 1967, is located on The Old Road near Magic Mountain Amusement Park. The Valencia WRP has a current treatment capacity of 21.6 million gallons per day (MGD), equivalent to 24,192 AFY, developed over time in stages. In 2010, the Valencia WRP produced an average of 15.17 MGD (16,993 AFY) of tertiary recycled water. Use of recycled water from the Valencia WRP is permitted under Los Angeles Regional Water Quality Control Board (RWQCB) Order Nos. 87-48 and 97-072.

The Saugus WRP, completed in 1962, is located southeast of the intersection of Bouquet Canyon Road and Soledad Canyon Road. The Saugus WRP has a current treatment capacity of 6.5 MGD (7,280 AFY). No future expansions are possible at the plant due to space limitations at the site. In 2010, the Saugus WRP produced an average of 5.02 MGD (5,623 AFY) of tertiary recycled water. Use of recycled water from this facility is permitted under Los Angeles RWQCB Order Nos. 87-49 and 97-072.

The Saugus and Valencia WRPs operated independently until 1980, at which time the two plants were linked by a bypass interceptor. The interceptor was installed to transfer a portion of flows received at the Saugus WRP to the Valencia WRP. Together, the Valencia and Saugus WRPs have a design capacity of 28.1 MGD (31,472 AFY). In 2008 they produced an average of 20.9 MGD (23,422 AFY). The primary sources of wastewater to the Saugus and Valencia WRPs are domestic. Both plants are tertiary treatment facilities and produce high quality effluent. Historically, the effluent from the two WRPs has been discharged to the Santa Clara River. The Saugus WRP effluent outfall is located approximately 400 feet downstream (west) of Bouquet Canyon Road. Effluent from the Valencia WRP is discharged to the Santa Clara River at a point approximately 2,000 feet downstream (west) of The Old Road Bridge.

Phase 1 of the Recycled Plan has been constructed and begins with a 4,000 gpm pump station at the Valencia Water Reclamation Plant that connects to a 1.5 mg reservoir in the Westridge area with 15,600 linear feet of 24- and 20-inch pipeline. It serves landscape customers along The Old Road and the Tournament Players Club golf course, all of which are VWC customers. Phase 2C of the Recycled Plan (the South End project) would use this existing system and connect at The Old Road and Valencia Boulevard. From there it would cross the freeway and run south in Rockwell Canyon Road, ultimately reaching the intersection of Orchard Village Road and Lyons Avenue. The proposed Recycled Plan Phase 2A project would start at the Saugus WRP and cross the Santa Clara River through an existing pipeline. It would then serve customers on the north side of the river, generally along Newhall Ranch Road both west and east of Bouquet Canyon Road (Figure 4-2).

**FIGURE 4-2**
**RECYCLED WATER MASTER PLAN PHASES 2A, 2B, 2C**

## 4.3 Wastewater Treatment Facility Improvements and Expansions

To accommodate anticipated growth in the Santa Clarita Valley, a 6 MGD expansion of the Valencia WRP is planned as indicated in the 2015 Joint Sewerage System Facilities Plan and EIR (Los Angeles County Sanitation District [LACSD] 1998). With this expansion, the capacity of the Valencia WRP would be 27.6 MGD (30,912 AFY), a need the SCVSD projects by 2035. No expansion is planned at the Saugus WRP. The total current planned capacity for both WRPs is 34.1 MGD (38,197 AFY). Based on the Recycled Plan, reuse of the tertiary treated water from these two plants is anticipated at 15.5 MGD (17,400 AFY) by year 2030. As this UWMP plans to 2050, supplies in the Recycled Plan projected to be available by year 2030 have similarly been assumed to be available through 2050 and beyond.

A third Valley reclamation plant, the Newhall Ranch WRP, is proposed as part of the Newhall Ranch project. This proposed facility would be located near the western edge of the development project along the south side of State Route 126. The plant would be constructed in stages, with an ultimate capacity of 6.8 MGD (7,616 AFY) as stated in the RWQCB's Order R4-2007-0046. According to the Draft Newhall Ranch Resource Management and Development Plan/Spineflower Conservation Plan EIS/EIR, April 2009, approximately 5,400 AFY of the tertiary treated water from this plant is projected to be used by the Newhall Ranch Project. The WRP will serve the Newhall Ranch Specific Plan and a new County Sanitation District has been created to operate and maintain the Newhall Ranch WRP.

Table 4-2 provides the projected wastewater flows in each purveyor's service area from the combined Valencia and Saugus WRP planning area and from the proposed Newhall Ranch WRP. Projected wastewater flow for the Valencia and Saugus WRPs was determined using projected populations from Table 2-9 and the wastewater generation factor SCVSD uses for planning of 86 GPCD, and for the Newhall Ranch WRP based on its projections of production capacity.

Table 4-2 does not reflect Newhall Ranch WRP production capacity from 2010 through 2024. During this interim period, Newhall Ranch-generated wastewater would be temporarily treated at the Valencia WRP based on the need to build-up an adequate, steady flow of wastewater until construction of the Newhall Ranch WRP. The Valencia WRP has sufficient capacity to tertiary-treat wastewater from Newhall Ranch during this interim period, consistent with the Interconnection Agreement approved by SCVSD in 2002.

## TABLE 4-2
## PROJECTED WASTEWATER FLOWS

| | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|---|---|
| **Projected Populations** | | | | | | | | | |
| LACWWD 36 | 4,947 | 7,157 | 8,908 | 10,658 | 12,405 | 14,159 | 15,906 | 17,657 | 19,407 |
| NCWD | 44,316 | 49,933 | 54,559 | 58,612 | 63,824 | 68,450 | 73,079 | 77,715 | 82,341 |
| SCWD | 124,192 | 133,868 | 143,544 | 153,220 | 162,896 | 172,572 | 182,248 | 191,924 | 201,600 |
| VWC | 113,296 | 127,241 | 138,862 | 150,477 | 162,098 | 173,716 | 185,330 | 196,952 | 208,570 |
| **Total Projected Populations[a]** | **286,751** | **318,199** | **345,873** | **372,967** | **401,223** | **428,897** | **456,563** | **484,248** | **511,918** |
| **Wastewater Generation** | | | | | | | | | |
| LACWWD 36 | 476 | 689 | 858 | 1,027 | 1,195 | 1,364 | 1,532 | 1,701 | 1,869 |
| NCWD | 4,269 | 4,810 | 5,255 | 5,646 | 6,148 | 6,593 | 7,039 | 7,486 | 7,931 |
| SCWD | 11,962 | 12,894 | 13,826 | 14,758 | 15,690 | 16,622 | 17,554 | 18,486 | 19,418 |
| VWC | 10,913 | 12,256 | 13,375 | 14,494 | 15,613 | 16,732 | 17,851 | 18,970 | 20,089 |
| **Total Wastewater Generated (AF)[b]** | **27,620** | **30,649** | **33,314** | **35,924** | **38,646** | **41,311** | **43,976** | **46,643** | **49,308** |
| **WRP Production Capacity** | | | | | | | | | |
| Saugus and Valencia WRPs | | | | | | | | | |
| Treatment Capacity (MGD)[c] | 28.1 | 28.1 | 28.1 | 28.1 | 28.1 | 34.1 | 34.1 | 34.1 | 34.1 |
| Treatment Capacity (AF) | 31,472 | 31,472 | 31,472 | 31,472 | 31,472 | 38,192 | 38,192 | 38,192 | 38,192 |
| Newhall Ranch WRP (MGD)[d] | - | - | - | 2.0 | 2.0 | 4.0 | 4.0 | 6.8 | 6.8 |
| Newhall Ranch WRP (AF) | - | - | - | 2,240 | 2,240 | 4,480 | 4,480 | 7,616 | 7,616 |
| **Total WRP Production Capacity (AF)** | **31,472** | **31,472** | **31,472** | **33,712** | **33,712** | **42,672** | **42,672** | **45,808** | **45,808** |
| **Wastewater Treated (AF)[e]** | **27,620** | **30,649** | **31,472** | **33,712** | **33,712** | **41,311** | **42,672** | **45,808** | **45,808** |

Notes:
(a) From Table 2-9.
(b) Based on projected populations and SCVSD's wastewater generation planning factor of 86 GPCD.
(c) Existing WRP capacity of 28.1 MGD, plus planned Valencia WRP expansion assumed on line by 2035, for total planned capacity of 34.1 MGD. Timing for increase in WRP treatment capacity is based on SCVSD's population projections, which are lower than those presented in this table. SCVSD will continue to monitor sewer flows and expand Valencia WRP when available capacity becomes limited.
(d) Per RWQCB Order No. R4-2007-0046, the Newhall Ranch WRP will incrementally increase its design capacity to accommodate the development project as completed (2.0 MGD in Phase I, 4.0 MGD in Phase II and 6.8 MGD in Phase III). For the purposes of this analysis, Phase I begins in 2025 commensurate with increased planned recycled water demand.
(e) Lesser of Wastewater Generated and Total WRP Production Capacity.

## 4.4 Recycled Water Supply

The use of wastewater effluent is limited by various state water laws, codes and court decisions. These regulatory limitations are described in greater detail in the Recycled Plan.

CLWA is currently approved to use 1,700 AFY. Any additional ultimate use of existing wastewater for recycled water use is governed by, among other things, the availability of native versus foreign water as shown in Table 4-3 and the impacts to legal users of water. Native water is water that under natural conditions would contribute to a given stream or other body of water (i.e., surface water or upwelling groundwater). "Foreign" water is water that is not natural to a watercourse and occurs in the watercourse through human efforts. Foreign water can be removed from a watercourse without infringing on the water rights of downstream water users. Use may also be restricted to protect biological resources in the river. The Santa Clarita Valley Sanitation District will need to assess the issues of water rights and protection of biological resources relative to Sections 1210 and 1211 of the Water Code as CLWA's recycled water program expands.

In 2010, the Valley's potable water supply was approximately less than one percent recycled water, 44 percent groundwater (native water) and 55 percent imported water (foreign water)[22]. Projected potable water demand less recycled water for 2050 is 99,077 with conservation, 56 percent derived from foreign water and 44 percent derived from native sources, in a normal year. Accordingly, the potential recycled water component would consist of approximately 56 percent (55,477 AF foreign/99,077 AF total) of projected wastewater generation. This volume is determined by multiplying the percentage of foreign water by the wastewater flow. The future foreign water portion of wastewater is 27,609 AFY (56 percent times 49,308 AFY). It is important to note that these percentages are of potable water demand only (i.e., they do not include the use of recycled water in the calculation) and as such are not percentages of total water demand. The demand numbers used for the calculation reflect the implementation of SBX7-7, which requires retailers to reduce demand by 20 percent by 2020. Although the foreign water percentage of potable water demand only increases by one percent from 2010 to 2050, actual use of foreign water increases by nearly 50 percent.

Assuming the capacities and recycled water demand (as discussed in Section 4.3), the existing and projected wastewater flows and potential recycled water use are as summarized in Table 4-3. These numbers differ slightly from those presented in the Recycled Plan and are more conservative in terms of wastewater flows. Table 4-3 also shows the associated wastewater generation through 2050.

[22] Demand for foreign water is calculated as demand with conservation, less recycled water use, less local groundwater pumping.

## TABLE 4-3
## PROJECTED WASTEWATER GENERATION AVAILABLE FOR RECYCLED WATER USE (AF)

| | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|---|---|
| **Projected Wastewater Generation[a]** | **27,620** | **30,649** | **33,314** | **35,924** | **38,646** | **41,311** | **43,976** | **46,643** | **49,308** |
| Demand w/ Conservation[b] | 69,673 | 72,343 | 71,908 | 80,236 | 88,564 | 96,892 | 105,220 | 113,549 | 121,877 |
| Recycled Water | | | | | | | | | |
| LACWWD 36 | 0 | 0 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| NCWD | 0 | 200 | 500 | 1,000 | 1,275 | 1,775 | 2,275 | 2,775 | 3,275 |
| SCWD | 0 | 100 | 500 | 1,500 | 2,275 | 2,775 | 3,775 | 4,775 | 5,775 |
| VWC | 325 | 1,000 | 2,000 | 3,000 | 4,500 | 6,000 | 8,000 | 10,000 | 12,200 |
| Total Purveyor | 325 | 1,300 | 3,050 | 5,550 | 8,100 | 10,600 | 14,100 | 17,600 | 21,300 |
| Non-Purveyor (Honor Rancho) | 0 | 0 | 0 | 0 | 1,500 | 1,500 | 1,500 | 1,500 | 1,500 |
| **Total Purveyor and Non-Purveyor Recycled Water[c]** | **325** | **1,300** | **3,050** | **5,550** | **9,600** | **12,100** | **15,600** | **19,100** | **22,800** |
| Potable Demand[d] | 69,348 | 71,043 | 68,858 | 74,686 | 78,964 | 84,792 | 89,620 | 94,449 | 99,077 |
| Supplies to Meet Potable Demand | | | | | | | | | |
| Groundwater[e] | 31,100 | 34,600 | 36,600 | 37,600 | 39,600 | 40,600 | 41,600 | 42,600 | 43,600 |
| Imported (foreign) water[f] | 38,248 | 36,443 | 32,258 | 37,086 | 39,364 | 44,192 | 48,020 | 51,849 | 55,477 |
| Foreign % of Potable Demand | 55% | 51% | 47% | 50% | 50% | 52% | 54% | 55% | 56% |
| **Potentially Available for Recycled Water Use[g]** | **15,233** | **15,722** | **15,607** | **17,838** | **19,265** | **21,531** | **23,563** | **25,605** | **27,609** |

Notes:
(a) From Table 4-2.
(b) From Table 2-22.
(c) Projected recycled water demand based on implementation of complete build-out of Recycled Water Master Plan.
(d) Demand w/ Conservation minus Recycled Water.
(e) From Table 3-7.
(f) Potable Demand minus Groundwater.
(g) Projected Wastewater Generation multiplied by Foreign Percent of Potable Demand.

### 4.4.1 Alternative Water Resources Management Program

Salinity and nutrient management concerns in the Upper Santa Clara River Watershed are primarily driven by salt sensitive crops located downstream. High chloride levels are of particular concern since high value, chloride sensitive crops like strawberries and avocados grown in the lower watershed utilize surface waters or ground water influenced by surface water for irrigation. Findings from previous reports cite the sources of chloride as source waters and residential self-regenerating water-softeners (SRWS). In 2003, SCVSD passed an ordinance banning the installation of all new SRWSs, and by passage of Senate Bill 475, the District has authority to remove all SRWSs remaining in the Santa Clarita Valley that were installed prior to 2003.

A Total Maximum Daily Load (TMDL) for chloride in the Upper Santa Clara River (Reaches 5 and 6) was adopted by the Los Angeles RWQCB and became effective on May 5, 2005. The Basin Plan Amendment for the chloride TMDL in the Upper Santa Clara River was unanimously adopted by the RWQCB on December 11, 2008. The TMDL established waste load allocations of 100 mg/L for the Saugus and Valencia WRPs. The TMDL implementation schedule allows for several special studies to determine whether existing Water Quality Objectives (WQOs) and waste-load allocations for chloride can be revised, and provides for an 11-year schedule to attain compliance with the final water quality objectives and waste-load allocations for chloride.

In 2008, the SCVSD evaluated the Alternative Water Resources Management (AWRM) Program. This program was developed jointly between Upper Basin Water Purveyors, Ventura County agricultural and water interests and the SCVSD to comply with the chloride WQOs established by the TMDL. Stakeholders along the Los Angeles County and Ventura County stretches of the Santa Clara River collaboratively developed an alternative approach to water resources management that will achieve TMDL compliance. The AWRM uses a basin water supply management approach to achieve the final water quality objectives and waste-load allocation for chloride determined through the TMDL collaborative process. AWRM permits a TMDL for the Santa Clara River that diverges from the Basin Plan, but protects beneficial uses while establishing feasible site specific objectives (SSOs). The program requires studies that showed the alternative WQO was protective of threatened and endangered species, sensitive agriculture and groundwater under the influence of surface water. AWRM, in comparison with the conventional approach, would have a number of benefits in terms of economics, public acceptance, feasibility and environmental quality.

A groundwater and surface water interaction model (GSWI) was developed (March 2008) to evaluate the impact of WRP effluent discharges to the Santa Clara River on downstream surface water and groundwater in the Los Angeles and Ventura County portion of the watershed. The same model is now being used by the AWRM Program to study the link between imported water quality, chloride and total dissolved solids (TDS) in the Upper Santa Clara River. In the model, historical water levels, flows, concentrations and movements within the time period of 1975 through 2005 were simulated and then calibrated to assess the assimilative capacity of surface water in Reaches 4 through 6 and the underlying groundwater basins in these areas. Additional assessments were made regarding (1) the gradient of chloride concentrations from the Saugus and Valencia WRP outfalls to receiving water stations located downstream, (2) the impacts of the WRP effluent in the USCR's groundwater and (3) simulations of potential chloride impacts projected for 2007 through 2030. These findings[23]

[23] The results of the initial GSWI Study are presented in a report entitled “Task 2B-1 Numerical Model Development and Scenario Results” (CH2M Hill, 2008; Geomatrix, 2008a).

resulted in the development of the AWRM Program where chloride WQOs would be increased in select groundwater basins and reaches of the USCR watershed while being decreased in the eastern Piru Basin where the ultimate objective would be an overall reduction in chloride loading and benefits to the water supply.

Given the benefits of chloride reduction and in the context of achieving a salt balance for the watershed, RWQCB staff proposed conditional SSOs that support the AWRM, while still being protective of beneficial uses. When implemented with the AWRM Program, the conditional SSOs of 117 mg/L during normal conditions and 130 mg/L during drought conditions in Reach 4B and the underlying groundwater will protect agricultural uses in the area (USCR Chloride TMDL Conditional SSOs Staff Report, Los Angeles RWQCB 2008). These conditional SSOs apply and supersede the existing regional water quality objectives of 100 mg/L only when chloride load reductions and/or chloride export projects are in operation by the SCVSD according to the implementation provisions provided in the RWQCB's Staff Report (RWQCB 2008).

Special studies were required for the implementation of AWRM and to evaluate whether the SSOs were protective of beneficial uses. The GSWI model was used to evaluate the effectiveness of the AWRM after the program was implemented. A study using the model showed that the AWRM WQOs could meet SSOs for chloride under drought and non-drought conditions. Based on the Final Staff Report from the Los Angeles RWQCB, the additional studies showed the chloride level protective of the most chloride-sensitive organisms for which data are available and is below the U.S. Environmental Protection Agency aquatic life chloride criteria. The conditional SSOs are not expected to harm in-stream or riparian species or habitat.

Due to ratepayer concerns regarding the perceived high cost of the AWRM Program, the recommended wastewater rate increases to implement AWRM were not approved by the SCVSD Board. In response, SCVSD and the water suppliers have been exploring alternative approaches that could result in revisions to the TMDL. These evaluations are ongoing.

## 4.5 Other Potential Sources of Recycled Water

Oilfield produced water is a by-product of oil production generated when oil is extracted from the oil reservoir. It is generally of poor quality and unsuitable for potable, industrial or irrigation use without treatment. Because of the poor water quality, reinjection has often been the most cost-effective disposal option. Treatment processes can produce potable quality water; yet, because of the poor initial water quality and the organic constituents, it is often more appropriate for treated oilfield produced water to be used for irrigation or industrial purposes to offset potable water demand. The economics of oil production are market-driven and are different from those of drinking water supplies. As oil prices rise or drop, oilfield production is increased or decreased as dictated by economics. Also, oilfields are eventually depleted of supply and abandoned. Therefore, while oilfield produced water should be considered as long-term, it is not a completely firm supply and is not permanent.

Berry Petroleum has expressed interest in treating oilfield produced water from the Placerita Oilfield for sale to CLWA for non-potable uses. Studies of the potential reuse of treated oilfield produced water from the Placerita Oilfield have indicated that approximately 44,000 barrels per day (1.8 MGD or 2,016 AFY) of treated oilfield produced water may be available. Pilot studies performed at the Placerita Oilfield have indicated that, even with reverse osmosis (RO) treatment, some organic compounds such as naphthalene, 2-butanone and ethylbenzene can

be detected in the RO effluent. For irrigation reuse, the produced water would need to be cooled and treated to remove hardness, silica, total dissolved solids (TDS), boron, ammonia and total organic carbon (TOC).

## 4.6 Recycled Water Demand

Currently, recycled water is served to landscape irrigation customers, including the TPC Golf Course. Potential recycled water users have been identified through a number of sources including:

- 1993 Recycled Water Master Plan
- Water consumption records for LACWWD 36, NCWD, SCWD and VWC
- Land use maps
- General Plans and Specific Plans for the City of Santa Clarita and County of Los Angeles
- Discussions with City, County, water purveyor and land developer staff
- On-site surveys of the CLWA service area
- 2002 Recycled Water Master Plan

In order to be considered as a potential recycled water user, the user has to be located within CLWA's service area and have a potential non-potable water demand of at least 4 AFY. A total potential demand for existing and future recycled water users is 34,500 AFY for 2015 as identified in the Recycled Plan. As this volume is already greater than the anticipated source of recycled water supply, additional future recycled users were not identified at this time. However, CLWA reevaluates the list of recycled users as conditions change or during the designing of projects under the Recycled Plan including users not identified in 2002. For example, the Los Angeles County Sheriff's Honor Rancho has undertaken sod farming operations. CLWA has therefore identified it as a potential future customer for 1,500 AFY of recycled water.

The initial list of potential recycled water users was reduced by evaluating the potential users that would be most expensive to serve until potential users totaled approximately 17,400 AF. The unit cost to serve each user was calculated using the capital costs for pipelines, reservoirs and pump stations as well as operational costs for pumping. The areas retained for recycled water service have costs ranging from $120 to $5,000 per AFY. Areas eliminated from service had costs as high as $13,000 per AFY. However, only two of the proposed phases in the Recycled Plan had costs above $1,000 per AFY. In addition, the Newhall Ranch project will require about 5,400 AFY. The resulting proposed recycled water service area encompasses a large portion of CLWA's western service area.

The total potential annual recycled water demand identified in the Recycled Plan and for the Newhall Ranch project that is cost effective to serve is approximately 22,800 AFY. Of this total 21,300 AFY is projected use by purveyor customers. Implementation of the recycled water system is expected to occur over the next 40 years.

## 4.7 Recycled Water Comparison

The 2005 Santa Clarita Valley UWMP projected a total recycled water demand of 1,600 AFY by the year 2010. Although it did not specifically state a projected 2005 demand, CLWA had approval for 1,700 AFY of recycled water use and was in the process of constructing the necessary facilities to deliver this amount at the time the 2005 UWMP was written. Approximately 325 AFY was served in 2010 to landscape irrigation customers, including the TPC Golf Course. Current demand is lower than originally predicted due to lack of funding available to expand the recycled water distribution system. Table 4-4 provides a comparison of the 2005 projected demand versus the actual 2010 demand.

**TABLE 4-4**
**RECYCLED WATER USES - 2005 PROJECTION COMPARED WITH 2010 USE**

| User Type | 2005 Projection for 2010 (AF) | 2010 Use (AF) |
|---|---|---|
| Landscape | 1,600 | 325 |
| **Total** | **1,600** | **325** |

Table 4-5 provides the comparison of anticipated demands and supplies. As shown in the table, potential demand for recycled water is equal to supplies.

**TABLE 4-5**
**POTENTIAL RECYCLED WATER SUPPLIES AND DEMANDS**

| Demand | Supply (AF) | Adjusted Demands (AF) |
|---|---|---|
| Recycled Plan | 17,400 | |
| Newhall Ranch Project | 5,400 | |
| **Total** | **22,800** | **22,800** |

## 4.8 Methods to Encourage Recycled Water Use

In order to provide an incentive to recycled water users, it was recommended in the Recycled Plan that CLWA issue a monthly rebate directly to each recycled water user. CLWA plans on making recycled water available at a reduced rate relative to the cost of potable water. CLWA may consider providing financial assistance to retail water providers to offset the costs of extending the recycled water conveyance system or to existing customers to cover all or a portion of the costs to convert their potable water systems to receive recycled water.

## 4.9 Implementation Plan for the Recycled Water Plan

Production from the WRPs is not anticipated to be adequate to meet the total demands of the existing system. However, as potable water demands increase and, consequently, recycled water production increases, the water available to meet system demands would also increase. Therefore, it is recommended that construction of the recycled water system be phased to utilize the increases in plant production.

Oilfield produced water would also not be available immediately, nor would it be available as a permanent source of supply. Instead, this alternative water source could be used as an interim long-term supply when the field is in operation and inadequate recycled water is available from

the Valencia and Saugus WRPs. Oilfield produced water is anticipated to be available for approximately the next twenty years. Implementation phasing considers when this water source would be available. A detailed discussion of the recommended phasing plan is provided in the Recycled Plan.

Phasing implementation of the recycled water system is recommended for the following reasons:

- A number of the potential recycled water users are future users that do not yet need recycled water.
- The current flow of the Valencia WRP is not adequate to meet the total demands of the recycled water users.
- Capital funding requirements would be spread over CLWA's current planning period through 2050.
- Oilfield produced water is not immediately (nor permanently) available.
- Demand is increasing due to development of Newhall Ranch.

The recycled water system is divided into implementation phases based primarily on service zone boundaries.

In general, the following factors were considered in developing a phasing plan:

- Ease or willingness of customers to connect to recycled water
- Retrofit costs
- Regulatory requirements
- Community impacts and development requirements
- Water utility involvement/cooperation
- Funding availability
- Reliability and operational costs considerations
- System flexibility

The implementation phases are prioritized based on the status of the users (existing or future), the anticipated construction schedule of future users and the proximity of the users to the non-potable water source (e.g., Valencia WRP, Saugus WRP or Placerita Oilfield).

## 4.10 Additional Considerations Relating to the Use of Recycled Water

### 4.10.1 Salt and Nutrient Management Plan

The SWRCB adopted a statewide Recycled Water Policy (Policy) on February 3, 2009 to establish uniform requirements for the use of recycled water. The purpose of this Policy is to increase the use of recycled water from municipal wastewater sources that meet the definition in Water Code Section 13050, subdivision (n), in a manner that implements state and federal

water quality laws. As part of this Policy, the preparation of a salt and nutrient management plan for each basin/subbasin in California, including compliance with CEQA and participation by Los Angeles RWQCB staff, is required by 2014. The Policy states that salts and nutrients from all sources should be managed on a basin wide or watershed wide basis in a manner that ensures attainment of water quality objectives and protection of beneficial uses.

The SWRCB finds that the appropriate way to address salt and nutrient issues is through the development of regional or sub-regional salt and nutrient management plans rather than through imposing requirements solely on individual recycled water projects. These plans shall be consistent with the DWR Bulletin 160 as appropriate and shall be locally developed. The salt and nutrient plan should include a basin/sub basin wide monitoring plan that specifies an appropriate network of monitoring locations. The monitoring plan should be site specific and must be adequate to provide a reasonable, cost-effective means of determining whether the concentrations of salt, nutrients and other constituents of concern as identified in the salt and nutrient plans are consistent with applicable water quality objectives.

CLWA, along with other Upper Santa Clara River Integrated Regional Water Management Plan participants, applied for a Proposition 84 Planning Grant that would update the IRWMP including preparation of a salt and nutrient management plan. In January 2011 CLWA was notified that its proposal was placed on the list of proposals recommended for funding. CLWA anticipates completing the study in 2012 at which time its impacts on the proposed recycled water supply and costs would be assessed.

## 4.10.2 Basin Plan

The Santa Clara River watershed has basin objectives established by the Regional Water Quality Control Board Los Angeles Region (Region 4). Water quality objectives were established to protect the various beneficial uses for that particular water body or reach. Table 4-6 shows the water quality objectives for salt and nutrients for the Santa Clara River watershed.

## TABLE 4-6
## WATER QUALITY OBJECTIVES FOR WATERS IN THE SANTA CLARA RIVER WATERSHED

| | TDS (mg/L) | Chloride (mg/L)[a] | Sulfate (mg/L) | Nitrogen (mg/L) | SAR (mg/L)[b] | Boron (mg/L) |
|---|---|---|---|---|---|---|
| **Inland Surface Waters** | | | | | | |
| Above Lang gaging station | 500 | 50 | 100 | 5 | 5 | 0.5 |
| Between Lang gaging station and Bouquest Canyon Road Bridge | 800 | 100 | 150 | 5 | 5 | 1.0 |
| Between Bouquet Canyon Road Bridge and West Pier Highway 99 | 1000 | 100 | 300 | 10 | 5 | 1.5 |
| Between West Pier Highway 99 and Blue Cut gaging station | 1000 | 100 | 400 | 5 | 10 | 1.5 |
| Between Piru Creek and A Street, Fillmore[c] | 1300 | 100 | 600 | 5 | 5 | 1.5 |
| Between Blue Cut gaging station and Piru Creek, Fillmore[c] | 1300 | 100 | 600 | 5 | 5 | 1.5 |
| Between A Street, Fillmore and Freeman Diversion "Dam" near Saticoy[d] | 1300 | 100 | 650 | 5 | 5 | 1.5 |
| Between Freeman Diversion "Dam" near Saticoy and Highway 101 Bridge | 1200 | 150 | 600 | - | - | 1.5 |
| Between Highway 101 Bridge and Santa Clara River Estuary[e] | | | See basin plan | | | |
| Santa Paula Creek above Santa Paula Water Works diversion Dam | 600 | 45 | 250 | 5 | 5 | 1.0 |
| Sespe Creek above gaging station 500' downstream from Little Sespe Creek | 800 | 60 | 320 | 5 | 5 | 1.5 |
| Piru Creek above gaging station below Santa Felicia Dam | 800 | 60 | 400 | 5 | 5 | 1.0 |
| **Groundwater Basins** | | | | | | |
| Acton Valley | 550 | 100 | 150 | 10;45;10;1[f] | NA | 1.0 |
| Sierra Pelona Valley (Agua Dulce) | 600 | 100 | 100 | 10;45;10;1[f] | NA | 0.5 |
| Upper Mint Canyon | 700 | 100 | 150 | 10;45;10;1[f] | NA | 0.5 |
| Upper Bouquet Canyon | 400 | 30 | 50 | 10;45;10;1[f] | NA | 0.5 |
| Green Valley | 400 | 25 | 50 | 10;45;10;1[f] | NA | - |
| Lake Elizabeth-Lake Hughes area | 500 | 50 | 100 | 10;45;10;1[f] | NA | 0.5 |
| Santa Clara-Mint Canyon | 800 | 150 | 150 | 10;45;10;1[f] | NA | 1.0 |
| South Fork | 700 | 100 | 200 | 10;45;10;1[f] | NA | 0.5 |
| Placerita Canyon | 700 | 100 | 150 | 10;45;10;1[f] | NA | 0.5 |
| Santa Clara-Bouquet and San Francisquito Canyons | 700 | 100 | 250 | 10;45;10;1[f] | NA | 1.0 |
| Castaic Valley | 1000 | 150 | 350 | 10;45;10;1[f] | NA | 1.0 |
| Saugus Formation | - | - | - | | NA | - |

Notes:
(a) The RWQCB has adopted revised SSOs for chloride. See Section 4.4.1 and RWQCB Order No. R4-2008-012,
(b) SAR = Sodium adsorption ratio.
(c) The reach of the Santa Clara River between Blue Cut gaging station and A Street, Fillmore has been split into two reaches, between the confluence of Piru Creek and A Street, Fillmore and between the Blue Cut gaging station and the confluence of Piru Creek under RWQCB Resolution No. R4-2007-018.
(d) The chloride objective for this reach has been revised from 80 mg/L to 100 mg/L under RWQCB Resolution No. 2003-015.
(e) The reach between Highway 101 bridge and the Santa Clara River Estuary have not be designated with specific water quality objectives. In this case general objectives to protect specific beneficial uses are assigned in the basin plan.
(f) 10 mg/L nitrogen (as nitrate + nitrite); 45 mg/L nitrate (as $NO_3$); 10 mg/L nitrate-nitrogen; 1 mg/L nitrite-nitrogen

## 4.10.3 Nutrients

The LARWQCB found that the Santa Clara River was being impacted by ammonia and nitrate plus nitrite (nitrogen compounds) with the primary source being wastewater discharge into the river. Nitrogen compounds can cause or contribute to eutrophic effects such as low dissolved oxygen, algae blooms and reduced benthic macro invertebrates. Three reaches in the Santa Clara River have been identified as impaired due to ammonia (Reaches 3, 7 and 8), two of which exceed Basin Plan water quality objectives. These findings lead to a Basin Plan Amendment for a nitrogen compounds TMDL for the Santa Clara River that was adopted on March 23, 2004. The TMDL includes numeric targets for ammonia as listed in Table 4-7, and also for nitrate plus nitrite as shown in Table 4-8.

In 2005 the SCVSD upgraded the treatment processes at the Valencia and Saugus WRPs to include nitrification/denitrification to address nutrients. The 2010 average ammonia levels in the Valencia and Saugus WRP recycled water were 1.05 and 1.16 mg/L, respectively (SCVSD Industrial Waste Pretreatment Program, 2011). The 2010 average nitrate plus nitrite levels in Valencia and Saugus WRP recycled water were 2.41 and 4.08 mg/L, respectively (SCVSD Industrial Waste Pretreatment Program, 2011).

**TABLE 4-7**
**TMDL FOR AMMONIA ON THE SANTA CLARA RIVER**

| Reach | One-hour NT (mg-N/L) | Thirty-day NT (mg-N/L) |
|---|---|---|
| Reach 8 | 14.8 | 3.2 |
| Reach 7 above Valencia | 4.8 | 2.0 |
| Reach 7 below Valencia | 5.5 | 2.0 |
| Reach 7 at County Line | 3.4 | 1.2 |
| Reach 3 above Santa Paula | 2.4 | 1.9 |
| Reach 3 at Santa Paula | 2.4 | 1.9 |
| Reach 3 below Santa Paula | 2.2 | 1.7 |

Source: LARWQCB Santa Clara River TMDL for Nitrogen Compounds Staff Report, June 2003

**TABLE 4-8**
**TMDL FOR NITRATE PLUS NITRITE ON THE SANTA CLARA RIVER**

| Reach | Thirty-day Average (mg-N/L) |
|---|---|
| Reach 8 | 9.0 |
| Reaches 3 and 7 above Valencia | 4.5 |

Source: LARWQCB Santa Clara River TMDL for Nitrogen Compounds Staff Report, June 2003

## 4.10.4 Projected Salt Levels from Recycled Water

Salt balances depend on the amount imported and the amount exported. The total salt and nutrient loads in waste water discharges primarily depend on the levels in source waters and the type of treatment process that the water agency employs. Recycled water does not import additional salt into the watershed; instead the salt is transferred and cycled within the watershed. Recycled water generally contains salt levels 150 to 400 mg/L above potable water levels and 15 to 50 mg/L of ammonia.

Within California, agricultural irrigation is the largest consumer of recycled water followed by landscape irrigation, which are also typical uses in the Santa Clara River watershed. However, in the Los Angeles region, which is governed by RWQCB Region 4, groundwater recharge is the largest use of recycled water.

Table 4-9 represents the amount of salt above baseline levels that will need management. These levels are projected and may vary due to regulatory changes or changes in the source waters. The amounts do not represent the total loading but represent salt that will not be exported from the watershed through discharge into surface waters Management of salts and nutrients within the watershed is anticipated to be addressed through development of Salt and Nutrient Management Plans discussed in Section 4.10.1.

**TABLE 4-9**
**ESTIMATED SALT ABOVE POTABLE LEVELS BY RECYCLED WATER USERS**

| | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|---|---|
| Projected recycled water use (AF)[(a)] | 325 | 1,300 | 3,050 | 5,550 | 9,600 | 12,100 | 15,600 | 19,100 | 22,800 |
| Non-exported salt levels (tons/yr)[(b)(c)(d)] | 121 | 486 | 1,140 | 2,075 | 3,589 | 4,524 | 5,833 | 7,142 | 8,525 |

Notes:
(a) From Table 4-3.
(b) Amounts are in addition to baseline levels.
(c) Assumes average salt in recycled water is 275 mg/L based on Salt Management Guide for Landscape Irrigation with Recycled Water in Coastal Southern California, A Comprehensive Literature Review. The range cited for most recycled water is 150-400 mg/L.
(d) Based on the following conversions: 456,592 mg/lb; 0.0006063 lb/L; 1,233,481 L/AF; 747.82 lb/AF; 2,000 lb/ton.

# Section 5: Water Quality

## 5.1 Overview

The quality of any natural water is dynamic in nature. This is true for the SWP and the local groundwater of the Basin. During periods of intense rainfall or snowmelt, routes of surface water movement are changed and new constituents are mobilized and enter the water while other constituents are diluted or eliminated. The quality of water changes over the course of a year. These same basic principles apply to groundwater. Depending on water depth, groundwater will pass through different layers of rock and sediment and leach different materials from those strata. Water depth is a function of local rainfall and snowmelt. During periods of drought, the mineral content of groundwater increases. Water quality is not a static feature of water, and these dynamic variables must be recognized.

Water quality regulations also change. This is the result of the discovery of new contaminants, changing understanding of the health effects of previously known as well as new contaminants, development of new analytical technology and the introduction of new treatment technology. All water suppliers are subject to drinking water standards set by the United States Environmental Protection Agency (EPA) and DPH. Additionally, investor-owned water utilities, such as VWC, are subject to water quality regulation by the PUC. CLWA provides imported water from the SWP and other sources, while local retail water purveyors combine local groundwater with treated imported water from CLWA for delivery to their customers. (While LACWWD 36 currently exclusively takes imported water from CLWA, it anticipates bringing a groundwater well into production soon). An annual Consumer Confidence Report (CCR) or Water Quality Report is provided to all Valley residents who receive water from CLWA and one of the four retail water purveyors. That report includes detailed information about the results of quality testing of the water supplied during the preceding year (Water Quality Report 2010). Water quality is also addressed in the annual Santa Clarita Valley Water Report (CLWA et. al., 2009), which describes the current water supply conditions in the Valley and provides information about the water requirements and water supplies of the Santa Clarita Valley.

The quality of water received by individual customers will vary depending on whether they receive imported water, groundwater or a blend. Some will receive only imported water at all times, while others will receive only groundwater. Others may receive water from one well at one time, water from another well at a different time, different blends of well and imported water at other times, and only imported water at yet other times. These times may vary over the course of a day, a week, or a year.

This section provides a general description of the water quality of the supplies within the Valley, aquifer protection and a discussion of potential water quality impacts on the reliability of these supplies.

## 5.2 Water Quality Constituents of Interest

The Santa Clarita Valley's water suppliers (Section 1.4) are committed to providing their customers with high quality water that meets all federal and state primary drinking water standards. Some contaminants are naturally-occurring minerals and radioactive material. In some cases the presence of animals or human activity can contribute to the constituents in the

source waters. The following sections address constituents reported in the 2010 CCR that may impact water quality.

### 5.2.1 Perchlorate

Perchlorate, a chemical used in making rocket and ammunitions propellants, has been a water quality concern in the Santa Clarita Valley since 1997 when it was originally detected in four wells operated by the purveyors in the eastern part of the Saugus Formation, near the former Whittaker-Bermite facility. In late 2002, the contaminant was detected in a fifth well, an Alluvial well (SCWD's Stadium Well) also located near the former Whittaker-Bermite site, which was immediately taken out of service. Perchlorate was detected again in early 2005 in a second Alluvial well (VWC's Well Q2) near the former Whittaker-Bermite site, and in 2006 in very low concentrations (below the detection limit for reporting) in a Saugus well (NCWD's NC-13) near one of the originally impacted wells. The maximum contaminant level (MCL) of 6 µg/L was adopted by DPH in 2007.

In August 2010, perchlorate was detected VWC's Saugus Well 201. Confirmation sampling in the months that followed confirmed the detection of perchlorate at concentrations that ranged from 5.7 to 12 micrograms per liter (µg/L). VWC removed Well 201 from service when perchlorate was first detected and is currently evaluating remediation alternatives including wellhead treatment in order to return the well to service and restore impacted well capacity. To date, perchlorate has been detected in a total of 8 wells, in both the Saugus Formation and the Alluvium. Table 5-1 summarizes the current remediation status of all wells where perchlorate has been detected.

The following is a summary of the status of perchlorate remediation and restoration of perchlorate-impacted groundwater supply. A more detailed discussion of pertinent events related to perchlorate contamination, containment, remediation and water supply restoration is included in Appendix I. As part of the evaluation of the containment system's effectiveness, the groundwater model is being updated and recalibrated using actual pumping data. These discussions are provided to illustrate that work toward the reactivation of impacted groundwater supply wells has progressed on several integrated fronts over the last ten years and is being expanded to include VWC Well 201. With the updated model VWC will be evaluating response actions to the contamination in Well 201.

**TABLE 5-1**
**STATUS OF IMPACTED WELLS**

| Year Perchlorate Detected | Purveyor Well | Groundwater Aquifer | Status |
|---|---|---|---|
| 1997 | SCWD Saugus 1 | Saugus | DPH approved well return to service in January 2011; well in active service utilizing approved perchlorate treatment. |
| 1997 | SCWD Saugus 2 | Saugus | DPH approved wells return to service in January 2011; well in active service utilizing approved perchlorate treatment. |
| 1997 | VWC Well 157 | Saugus | Sealed and capacity replaced by new well. |
| 1997 | NCWD Well 11 | Saugus | Out of service. |
| 2002 | SCWD Stadium Well | Alluvium | Sealed and capacity replaced by new well. |
| 2005 | VWC Well Q2 | Alluvium | DPH approved perchlorate treatment removal in 2007; treatment was installed in 2005 and relocated for potential future use; well remains in service. |
| 2006 | NCWD Well NC-13 | Saugus | DPH approved annual monitoring, results have always been below the detection limit for reporting; well remains in service. |
| 2010 | VWC Well 201 | Saugus | Out of service pending additional monitoring and evaluation of remediation alternatives. |

In 2002 CLWA and the U.S. Army Corps of Engineers (ACOE) signed a cost-sharing agreement for a feasibility study of the area. Under federal and state law, the owners of the Whittaker-Bermite property have the responsibility for the groundwater cleanup. CLWA, the purveyors, and the Department of Toxic Substances Control (DTSC) signed an oversight agreement in 2003 regarding studies of treatment technologies for removing perchlorate from water supplies, and have also been working with DPH to obtain the necessary permits for these treatment processes. Treatment method pilot studies were conducted during 2003, and in 2004 CLWA and the purveyors selected ion exchange as the preferred treatment method for removing perchlorate.

Although that agreement expired in January 2005 the parties, under DTSC oversight, jointly developed a plan to “pump and treat” contaminated water from two of the purveyors’ impacted wells to stop migration of the contaminant plume and to partially restore the municipal well capacity that has been impacted by perchlorate. The containment plan specifies that wells Saugus 1 and Saugus 2 operate at a continuous pumping rate of 1,100 gpm at each well, for a combined total of 2,200 gpm from the two wells. The annual pumping volume of 1,772 AFY per well assumes that pumping will occur continuously, except for occasional maintenance purposes.

A final settlement to fund, remediate and treat the contaminated water was completed and executed by the parties in April 2007. Design of the CLWA treatment facilities and related pipelines was completed in 2007. Construction of the treatment facility and pipelines began in

November 2007 and treatment of the water began in 2010. Since January 2011 when DPH issued a permit for CLWA to serve this water, CLWA has included this water as part of its supply and has been delivering this water to purveyors. This water is shown as part of the regional supply in Section 3, and as part of NCWD's and SCWD's supply in the detailed supply tables by purveyor in Appendix C.

VWC and CLWA are pursuing the funding for evaluating remediation alternatives, including wellhead treatment of contaminated water from VWC Well 201 through the final settlement agreement. The schedule for restoring service to Well 201 is in development but is projected to be less than two years. During that time, however, the removal from service of Well 201 will not limit the ability to meet dry year target production levels from the Saugus Formation since there is sufficient capacity in the remaining, non-impacted Saugus production facilities to make up for the temporary loss of capacity from VWC Well 201 through the first two years of a multiple dry-year period. Restoration of VWC Well 201 and new Saugus well construction are planned to achieve full Saugus Formation capacity through a third year or longer dry period as discussed in Section 3.

Returning the impacted Saugus well (VWC Well 201) to municipal water supply service by installing treatment requires DPH approval before the water can be considered potable and safe for delivery to customers. The permit requirements are contained in DPH Policy Memo 97-005 for direct domestic use of impaired water sources.

Before issuing a permit to a water utility for use of an impaired source as part of the utility's overall water supply permit, DPH requires that studies and engineering work be performed to demonstrate that pumping the well and treating the water will be protective of public health for users of the water. The Policy Memo 97-005 requires that DPH review the local retail water purveyor's plan, establish appropriate permit conditions for the wells and treatment system, and provide overall approval of returning the impacted wells to service for potable use. Ultimately, VWC's plan and the DPH requirements are intended to ensure that the water introduced to the potable water distribution system has no detectable concentration of perchlorate.

The DPH Policy Memo 97-005 requires, among other things, the completion of a source water assessment for the impacted well intended to be returned to service. The purpose of the assessment is to determine the extent to which the aquifer is vulnerable to continued migration of perchlorate and other contaminants of interest from the Whittaker-Bermite site. The assessment includes the following:

- Delineation of the groundwater capture zone caused by operating the impacted wells.
- Identification of contaminants found in the groundwater at or near the impacted wells.
- Identification of chemicals or contaminants used or generated at the Whittaker-Bermite facility.
- Determination of the vulnerability of pumping the impacted wells to these contaminant sources.

The groundwater model that was developed for use in analyzing the operating yield and sustainability of groundwater in the Basin was also used for simulating the capture and control of perchlorate contamination in the originally impacted Saugus wells. The results of that work are summarized in "Analysis of Perchlorate Containment in Groundwater Near the Whittaker-Bermite Property, Santa Clarita, California" (CH2M Hill, December 2004). The recent detection

of perchlorate in VWC Well 201 was not totally unexpected in light of the previously identified gradient for groundwater flow (westerly) from the source location and previously impacted wells. That gradient is now being controlled by the containment and extraction program that is in operation for the originally impacted wells, as discussed in this section and in Appendix I. The analysis is expected to be used in the development of the source water assessment of VWC Well 201.

All proceedings and data are available to the public through a DTSC information repository as well as public meetings.

### 5.2.2 Metals and Salts

Metals and salts are tested in wells at least every three years and in Castaic Lake water every month. Small quantities of naturally occurring arsenic are found in Castaic Lake and in a few wells. Inorganic compounds such as salts and metals can be naturally occurring or result from urban storm water runoff, industrial or domestic wastewater discharges, oil and gas production, mining or farming. Arsenic levels in the Santa Clarita Valley are below the MCL (Luhdorff & Scalmanini, 2010).

Nitrate in drinking water at levels above 45 mg/L is a health risk for infants less than six months of age due to the possibility of methemoglobinemia. Nitrate levels may rise quickly for short periods of time because of rainfall or agricultural activity. Principal sources of nitrogen to a watershed typically include discharges from water reclamation plants and runoff from agricultural activities. Elevated nitrogen concentrations (ammonia, nitrate and nitrite) can cause impairments in warm water fish and wildlife habitat, along with contributing to eutrophic effects such as algae growth and low dissolved oxygen. Nitrates are tested at least annually and the drinking water meets federal and state MCL standards (CCR, 2010).

A chloride TMDL was established in 1998 due to the listing of Reaches 5 and 6 of the Upper Santa Clara River for chloride on the 303(d) list. Sources of chloride include water softeners, SWP and other imported water and wastewater effluent. The chloride TMDL includes a number of special studies to provide scientific certainty over the appropriate waste load allocations and objectives for chloride that are necessary to support various beneficial uses, including salt-sensitive agriculture, groundwater and endangered species. The special studies performed for the TMDL found that the WQO of 100 mg/L could not be achieved as adopted in 2005. As a result, conditional site specific objectives were adopted in 2008 as described by the Los Angeles RWQCB Staff Report on the Upper Santa Clara River Chloride TMDL Reconsideration and Conditional Site-Specific Objectives. To comply with the chloride TMDL, a stakeholder-driven group developed the Alternative Water Resources Management (AWRM) Plan that provides multiple benefits for stakeholders in Los Angeles and Ventura Counties. These benefits include the revision of water quality objectives that will support water recycling and thereby increase water supplies in the CLWA service area. In addition, the AWRM will implement water supply facilities in Ventura County that will allow for the conjunctive use of groundwater and surface water resources to increase water supplies and improve water quality in groundwater and surface waters of the Santa Clara River watershed. As part of the agreement, the SCVSD and CLWA plan to amend the existing recycled water agreement to expand the quantity of recycled water that can be purchased by the water suppliers from the SVCSD. The AWRM also calls for accelerated expansion of CLWA's Recycled Plan, which would reduce chloride mass loading in the Santa Clara River, particularly during dry seasons, additional information provided in Chapter 4.

SCVSD, CLWA and the retail water purveyors have been exploring alternative approaches towards developing an adaptive management strategy that could reduce the cost of implementing the AWRM.

### 5.2.3 Disinfection By-Products

CLWA uses ozone and chloramines to disinfect its water. Disinfection By-Products (DBPs), which include Trihalomethanes (THMs) and Haloacetic Acids (HAA5), are generated by the interaction between naturally occurring organic matter and disinfectants such as chlorine and ozone. THMs and HAA5 are measured at several points in each system and averaged once per quarter and reported as a running annual average.

Ozone is a very powerful disinfectant that not only kills organisms that no other disinfectant can, but also destroys organic chemicals that causes unpleasant tastes and odors. However, ozone can also interact with bromide, a naturally occurring salt, to produce bromate. As a result, CLWA is required to analyze the water leaving its two treatment plants for bromate once a month under federal regulations and the State's adopted Disinfectants and Disinfection Byproducts Rule (D/DBP Rule).

### 5.2.4 Hardness

In 2008, the VWC began a demonstration project delivering pre-softened groundwater from one of its wells to approximately 420 residents located in the Copperhill Community of Valencia. Hard water is the primary complaint from Valley customers and it is estimated that more than 50 percent have installed individual water softening units in their homes. In addition to having high operating costs, many of these units are designed to discharge a brine (salt) solution to the sanitary sewer system that is eventually discharged to the Santa Clara River. The environmental impact of such discharges was the subject of the chloride TMDL investigation which concluded with a commitment by the purveyors to achieve surface water quality goals for instream discharge from the basin. VWC's project is aimed at improving the quality of water for its customers to eliminate the need for home softening devices and to achieve the environmental benefits of reduced chloride discharge to the river.

The demonstration project utilizes softening technology that removes calcium and produces small calcium carbonate pellets that can be reused in a variety of industries. The demonstration project has now been operated for over two years and provides VWC with customer feedback and technical/financial information to assess potential future expansion of treatment to other well sites.

### 5.2.5 Microbiological

Microbial contaminants, such as viruses and bacteria, can be naturally occurring or result from urban storm water runoff, sewage treatment plants, septic systems, agricultural livestock operations and wildlife. Water is tested throughout the systems weekly for Total Coliform bacteria and testing for *Escherichia coli* (*E. coli*) occurs when coliform testing is positive. No *E. coli* was detected in any drinking waters in 2010. The MCL for total coliforms is 5 percent of all monthly tests showing positives for larger systems. Bacteriological tests met federal and state requirements. Additional microbiological tests for the water-borne parasites *Cryptosporidium parvum* and *Giardia lamblia* were performed on Castaic Lake water, and none were detected.

### 5.2.6 Radiological Tests

Radioactive compounds can be found in both ground and surface waters, and can be naturally occurring or be the result of oil and gas production and mining activities. Testing is conducted for two types of radioactivity; alpha and beta. If none is detected at concentrations above five picoCuries per liter no further testing is required. If it is detected, the water must be checked for uranium and radium. Although naturally occurring radioactivity can be detected, the levels meet the federal and state MCL standards.

### 5.2.7 Organic Compounds

Organic chemical contaminants, including synthetic and volatile organic chemicals, are by-products of industrial processes and petroleum production, and can also come from gas stations, urban storm water runoff and septic systems. Organic compounds also include pesticides and herbicides, which may come from a variety of sources such as agriculture, urban storm water runoff and residential uses. Water is tested for two types of organic compounds, volatile organic compounds (VOCs) and non-volatile synthetic organic compounds (SOCs). These organic compounds are synthetic chemicals produced from industrial and agricultural uses. Castaic Lake water is checked annually for VOCs and SOCs. Tetrachloroethylene (TCE) was found in trace levels below the MCL in groundwater in the Valley. Local wells are tested at least annually for VOCs and periodically for SOCs.

## 5.3 Imported Water Quality

CLWA provides SWP and other imported water to the Valley. The source of SWP water is rain and snow of the Sierra Nevada, Cascade and Coastal mountain ranges. This water travels to the Delta through a series of rivers and various SWP structures. From there it is pumped into a series of canals and reservoirs, which provide water to urban and agricultural users throughout the San Francisco Bay Area and central and southern California. The most southern reservoir on the West Branch of the SWP California Aqueduct is Castaic Lake. CLWA receives water from Castaic Lake and distributes it to the purveyors following treatment.

CLWA operates two water treatment plants, the Earl Schmidt Filtration Plant located near Castaic Lake and the Rio Vista Water Treatment Plant located in Saugus. CLWA produces water that meets drinking water standards set by the U.S. EPA and DPH. SWP water has different aesthetic characteristics than groundwater, with lower dissolved mineral concentrations (total dissolved solids) of approximately 250 to 360 mg/L, and lower hardness (as calcium carbonate) of about 105 to 135 mg/L. Historically, the chloride content of SWP water varies widely from over 100 milligrams per liter (mg/L) to below 40 mg/L, depending on Delta conditions; however as discussed below, SWP operations have changed significantly since historic levels of chloride were experienced.

Historically, the SWP delivered only surface water from the Sacramento-San Joaquin River Delta. However, CLWA and other SWP users, in anticipation of increased demand and dry periods, began “water banking” programs where SWP water could be stored or exchanged during wet years and withdrawn in dry years. The last three years have seen severe statewide drought. As a result, water has been withdrawn from the banking programs. This withdrawn water can either be delivered by exchange with SWP supplies allocated to others, or by pumping it into the SWP system. During the period of 2008 through 2010, a greater portion of water in the SWP has been this “pumped-in” water. The “pumped-in” water has met all water

quality standards established by DWR under its anti-degradation policy for the SWP. In particular, the pumped-in water serves to reduce the chloride concentration in SWP water. CLWA, on behalf of the SCVSD, is currently developing a SWP water quality model to quantify potential chloride reductions in SWP water due to "pumped-in" water. The results of this modeling will inform potential modifications to the AWRM Plan.

The SWP water chemistry may fluctuate and is influenced by its passage through the Delta in which large amounts of organic material are present and salt water from San Francisco Bay that contributes bromide and chlorides. Chloride levels from the Delta elevate chloride locally resulting in concern for local agriculture that grows chloride sensitive crops. Additionally, bromide and total organic carbon (TOC) may react with disinfectants such as ozone, chlorine, or DBPs. All constituents meet the federal and state MCL levels as reported in the CCR but remain a management concern in the watershed.

## 5.4 Surface Water Quality

CLWA does not deliver and treat water from the Santa Clara River as a source of supply; however, this source is a continual source of recharge to the underlying groundwater basin.

Surface water quality data for the Upper Santa Clara River in the County is based on the DWR investigation of water quality and beneficial uses conducted for the Upper Santa Clara River Hydrologic Area (DWR 1993). The investigation found that Castaic Lake and Castaic Lagoon water are influenced by thermal stratification and biochemical processes. Castaic Lake contains a high level of sodium chloride from SWP deliveries to the system; while sodium-calcium bicarbonate to sodium bicarbonate dominates Bouquet Canyon due to water deliveries from the Los Angeles Aqueduct (Mono-Owens water) that is stored in Bouquet Reservoir.

The surface water quality data in the Upper Santa Clara River are obtained from continuous sampling records at two gaging stations at the Old Highway Bridge and at the Los Angeles - Ventura County Line and historical records at two stations near Ravenna and Lang. The period of water quality records for these stations is from 1951 to 1990 (UWCD and CLWA 1996). These data have shown increasing concentrations of TDS and sulfate downstream and an overall general decrease, respectively, over the studied time period.

Nitrate ranged from 9 to 35 milligrams per liter (mg/L) nitrate at the Blue Cut gaging station near the County line but it generally occurs in very low concentrations in the undeveloped drainages north of the Santa Clara River. Chloride concentrations tend to also be relatively low in undeveloped portions of the watershed and higher in developed areas. Sources of chloride include water softeners, SWP water and wastewater effluent. Salt loading during 2001-2007 from the Saugus and Valencia WRP ranged from 23,500 pounds per day (ppd) to 28,500 ppd. SWP chloride contributions measured between 28 mg/L to 128 mg/L based on records from the past thirty years (Los Angeles RWQCB 2008) and have averaged just over 70 mg/L for the past few years.

## 5.5 Groundwater Quality

The groundwater basin has two sources of groundwater, the Alluvial Aquifer whose quality is primarily influenced by rainfall and stream flow, and the Saugus Formation which is a much deeper aquifer and recharged primarily by a combination of rainfall and deep percolation from the partially overlying Alluvium. A larger part of the Valley's groundwater supply is from the

Alluvial Aquifer, between 30,000 to 40,000 AFY; and a smaller portion of the Valley's water supply is drawn from the Saugus Formation, between 7,500 and 15,000 AFY in normal water years.

Local groundwater does not have microbial water quality problems. Parasites, bacteria and viruses are filtered out as the water percolates through the soil, sand and rock on its way to the aquifer. Even so, disinfectants are added to local groundwater when it is pumped by wells to protect public health. Local groundwater has very little TOC and generally has very low concentrations of bromide, minimizing potential for DPB formation. Taste and odor problems from algae are not an issue with groundwater.

The mineral content of local groundwater is very different from SWP water. The groundwater is very "hard," and it has high concentrations of calcium and magnesium (approximately 250 to 600 mg/L total hardness as $CaCO_3$). Groundwater may also contain higher concentrations of nitrates and chlorides when compared to SWP water. However, all groundwater meets drinking water standards.

### 5.5.1 Water Quality - Alluvium

Groundwater quality is a key factor in assessing the Alluvial Aquifer as a municipal and agricultural water supply. Groundwater quality details and long-term conditions, examined by integration of individual records from several wells completed in the same aquifer materials and in close proximity to each other, have been discussed in the annual Water Reports and in the 2005 UWMP. There were some changes in groundwater quality in 2009 that reflect fluctuations, trends or other groundwater quality conditions. Most of the trends show a significant lowering of the specific conductance values by half following the wet years of 2004-2005. Since then, those trends have returned to 2004 levels but do not exceed historical levels. In summary, those conditions include no long-term overall trend and, most notably, no long-term decline in Alluvial groundwater quality; a general groundwater quality "gradient" from east to west, with lowest dissolved mineral content to the east, increasing in a westerly direction; and periodic fluctuations in some parts of the basin, where groundwater quality has inversely varied with precipitation and stream flow. Those variations are typically characterized by increased mineral concentrations through dry periods of lower stream flow and lower groundwater recharge, followed by lower mineral concentrations through wetter periods of higher stream flow and higher groundwater recharge.

Specific conductance throughout the Alluvium is currently below the Secondary (aesthetic) MCL of 1,600 micromhos per centimeter (µmhos/cm). The presence of long-term consistent water quality patterns, although intermittently affected by wet and dry cycles, supports the conclusion that the Alluvial aquifer is a viable ongoing water supply source in terms of groundwater quality.

The most notable groundwater quality issue in the Alluvium is perchlorate contamination. Section 5.2.1 describes this issue in detail.

### 5.5.2 Water Quality - Saugus Formation

Water quality in the Saugus Formation has not historically exhibited the precipitation-related fluctuations seen in the Alluvium. As discussed above for the Alluvium, groundwater quality is a key factor in also assessing the Saugus Formation as a municipal and agricultural water supply. Long-term Saugus groundwater quality data are not sufficiently extensive to permit any sort of

basin-wide analysis or assessment of pumping-related impacts on quality. However, integration of individual records from several wells has been used to examine general water quality trends. Based on those records, water quality in the Saugus Formation had not historically exhibited the precipitation-related fluctuations seen in the Alluvium. Based on available data over the last fifty years, groundwater quality in the Saugus had exhibited a slight overall increase in dissolved mineral content. More recently, several wells within the Saugus Formation exhibited an additional increase in dissolved mineral content, similar to short term changes in the Alluvium, possibly as a result of recharge to the Saugus Formation from the Alluvium. Since 2005, however, these levels have been steadily dropping or remaining constant.

Dissolved mineral concentrations in the Saugus Formation remain below the Secondary (aesthetic) MCL. Groundwater quality within the Saugus will continue to be monitored to ensure that degradation that presents concern relative to the long-term viability of the Saugus as an agricultural or municipal water supply does not occur.

As with the Alluvium, the most notable groundwater quality issue in the Saugus Formation is perchlorate contamination. Perchlorate was originally detected in four Saugus wells operated by the retail water purveyors in the eastern part of the Saugus Formation in 1997, near the former Whittaker-Bermite facility. Two of those impacted wells have now been "restored" and returned to municipal water supply service as described in Section 5.2.1. A third impacted well has been abandoned and replaced by a new well, distant from the perchlorate-impacted part of the Saugus Formation. The fourth impacted well remains out of service, with its capacity made up from the restored and other non-impacted Saugus wells. The inactivation of that well does not limit the ability of the purveyors to meet water requirements. The local retail water purveyors continue to test for perchlorate in active water supply wells near the Whittaker-Bermite site. While perchlorate was detected in a fifth Saugus well nearby, the concentration was very low and below the detection limit for reporting. The sixth Saugus well with recently detected perchlorate concentrations that exceed the maximum contaminant levels for drinking water has been taken out of service pending evaluation of remediation alternatives including wellhead treatment and reactivation. There has been no additional detection of perchlorate above the detection limit for reporting in any other municipal Saugus well.

## 5.6 Aquifer Protection

There has been extensive investigation of the extent of perchlorate contamination which, in combination with the groundwater modeling previously described in Section 3.3.2.1, has led to the now-implemented plan for integrated control of contamination migration and restoration of impacted pumping (well) capacity. While most of the perchlorate contamination control and restoration plan is focused on the Saugus Formation, part of that plan includes potential capture of contaminated groundwater in the Alluvium by pumping of selected Saugus wells. Specific long-term resolution of perchlorate contamination in the Alluvium, which impacted two water supply wells, had focused on a combination of temporary wellhead treatment at one well, VWC's Well Q2, replacement of the second impacted well, SCWD's Stadium well, and several source control methods such as on-site pumping and treatment in the northern Alluvium (at the northerly portion of the former Whittaker-Bermite site). An ongoing challenge is protection of active Alluvial wells that could be impacted, including what effect that might have on adequacy of Alluvial groundwater pumping capacity and what response will be taken.

In April 2005, perchlorate was detected in VWC's Well Q2. VWC's response was to remove the well from active water supply service and to rapidly seek approval for installation of wellhead

treatment and return of the well to service. As part of outlining its plan for treatment and return of the well to service, VWC analyzed the impact of the temporary inactivation of the well on its water supply capability; the analysis determined that VWC's other sources are sufficient to meet demand and that the inactivation of Well Q2 had no impact on VWC's water supply capability (LSCE, 2005). VWC proceeded through mid-2005 to gain approval for installation of wellhead treatment (ion-exchange as described below), including environmental review and completed the installation of the wellhead treatment facilities in September 2005. Well Q2 was returned to active water supply service in October 2005.

After nearly two years of operation with wellhead treatment, including regular monitoring specified by DPH, all of which resulted in no detection of perchlorate in Well Q2, Valencia requested that DPH allow treatment to be discontinued. DPH approved that request in August 2007, and treatment was subsequently discontinued. DPH-specified monitoring for perchlorate continues at Well Q2, which remains in service; there has been no detection of perchlorate since discontinuation of wellhead treatment.

Ongoing monitoring of all active municipal wells near the Whittaker-Bermite site has shown no detections of perchlorate in any active Alluvial wells. However, based on a combination of proximity to the Whittaker-Bermite site and prevailing groundwater flow directions, complemented by findings in the ongoing on-site and off-site investigations by Whittaker-Bermite and the ACOE, there is logical concern that perchlorate could impact nearby, downgradient Alluvial wells. As a result, provisions are in place to respond to perchlorate contamination if it should occur. The groundwater model was used to examine capture zones around Alluvial wells under planned operating conditions (pumping capacities and volumes) (Technical Memorandum "*Analysis of Near-Term Groundwater Capture Areas for Production Wells Located Near the Whittaker-Bermite Property (Santa Clarita, California)*", CH2M Hill, December 2004). The capture zone analysis of Alluvial wells generally near the Whittaker-Bermite site suggests that inflow to those wells will either be upgradient of the contamination site, or will be from the Alluvium beyond where perchlorate is most likely to be transported, with the possible exception of the VWC's Pardee wellfield (which includes Wells N, N7 and N8). Although the capture zone analysis does not show the Pardee wells to be impacted, they are considered to be at some potential risk due to the proximity of their capture zone to the Whittaker-Bermite site.

The combined pumping capacity of VWC's Pardee wells is 6,200 gpm, which equates to about 10,000 AF of maximum annual capacity. However, in the operating plan for both normal and dry-year Alluvial pumping, the planned use of those wells represents 2,940 AFY of the total 30,000 to 40,000 AFY Alluvial groundwater supply. Thus, if the wells were to become contaminated with perchlorate, they would represent an amount of the total Alluvial supply that could be readily replaced on a short-term interim basis by utilizing an equivalent amount of imported water from CLWA or by utilizing existing capacity from other Alluvial wells. However, if the Pardee wells were to become contaminated by perchlorate contamination, VWC has made site provisions at its Pardee wellfield for installation of wellhead treatment. Such treatment would be the same methodology as installed at its Well Q2.

On the Whittaker-Bermite site, soil remediation activities in operating unit subareas started in 2005. Groundwater "pump and treat" operations in the Northern Alluvium also started in 2005 and is ongoing. Expanded pumping, intended to effect perchlorate containment as well as to treat 'hot spots' in the Northern Alluvium, became operational in October 2007.

In addition, on-site remediation, a Work Plan for a Pilot Remediation Pumping Program in the Northern Alluvium and certain on-site sub-areas east/southeast, or generally upgradient of the impacted Stadium Well, was completed in June 2005. The pilot program began sustained operation in October 2007. That program involves the establishment of containment, generally along the northern boundary of the Whittaker-Bermite site, upgradient of the Stadium Well, by continuous pumping of a former Whittaker-Bermite facility well, complemented by pumping at several groundwater "hot spots" also generally upgradient of the Stadium Well. Due to the low conductivity of the aquifer materials at the various "hot spots," pumping for containment at those locations would be from several wells at low pumping capacities. Extracted water would be treated at Whittaker-Bermite's existing on-site treatment system. Generally consistent with the Saugus restoration concept, the Northern Alluvium pumping program would have the concurrent objectives of preventing site-related contaminants from leaving the site and removing some contamination from groundwater such that it can be removed in the on-site treatment process prior to discharge of the water back to the groundwater Basin.

In February 2003, DTSC and the impacted purveyors entered into a voluntary cleanup agreement entitled *Environmental Oversight Agreement*. Under the Agreement, DTSC is providing review and oversight of the response activities being undertaken by CLWA and the purveyors related to the detection of perchlorate in the impacted wells. Under the Agreement's Scope of Work, CLWA and impacted purveyors prepared a Work Plan for sampling the production wells, a report on the results and findings of the production well sampling, a draft Human Health Risk Assessment, a draft Remedial Action Work Plan, an evaluation of treatment technologies and an analysis showing the integrated effectiveness of a project to restore impacted pumping capacity, extract perchlorate-impacted groundwater from two Saugus wells for treatment, and control the migration of perchlorate in the Saugus Formation. Environmental review of that project was completed in 2005 with adoption of a mitigated Negative Declaration. The Final Interim Remedial Action Plan for containment and extraction of perchlorate was completed and approved by DTSC in January 2006. Design and construction of the treatment facilities and related pipelines to implement the pump and treat program and to also restore inactivated municipal well capacity has been completed and the restored wells are now returned to service as part of the operational Saugus groundwater supply (see Section 3.3).

A Rapid Response Fund has also been established under the terms of the CLWA Litigation Settlement Agreement. The fund will be used if the remedy to contain perchlorate contamination in the Alluvial Aquifer and portions of the Saugus Formation does not prevent migration of the perchlorate plume towards downgradient threatened wells (VWC Wells N, N-7, N-8, S6, S7, S8, 201 and 205 and NCWD Wells NC-10, NC-12 and NC-13). The Rapid Response Fund provides up to $10 million for any additional costs of providing replacement water, associated operations and maintenance costs of treatment equipment and resin under the terms of the Agreement. As noted, VWC Well 201 was a downgradient threatened well, so it is anticipated that the fund will be used for evaluating remediation alternatives, including wellhead treatment, of perchlorate recently detected in Well 201.

## 5.7 Water Quality Impacts on Reliability

Three factors affecting the availability of groundwater are sufficient source capacity (wells and pumps),sustainability of the groundwater resource to meet pumping demand on a renewable basis and protection of groundwater sources (wells) from known contamination, or provisions for treatment in the event of contamination. The first two of those factors are addressed in Section 3. The resolution of contamination for aquifer protection is addressed below.

Perchlorate has been a water quality concern in the Valley since 1997 when it was originally detected in four wells operated by the purveyors in the eastern part of the Saugus Formation, near the former Whittaker-Bermite facility. Subsequent monitoring well installation has been completed; and a focused study of the Saugus Formation has ultimately been incorporated into the overall groundwater remediation and perchlorate containment. All remedial action has been reviewed by the DTSC.

Overall, the plans developed for groundwater operation will allow CLWA and the retail purveyors to meet near term and long term demand within the CLWA service area. Any well impacted by perchlorate will be removed from service in the near term and the loss of capacity will be met by near-term excess capacity in non-impacted wells or through the installation of replacement well(s), if necessary, until remediation alternatives, including wellhead treatment, and DPH approval is obtained for restoration of the impacted supply. The current removal of VWC Well 201 from service does not limit the reliability of the water supply since there is sufficient excess capacity in Saugus wells to meet water supply projections during the period required for its restoration. Therefore, no anticipated change in reliability or supply due to water quality is anticipated based on the present data, as is shown in Table 5-2.

**TABLE 5-2**
**CURRENT AND PROJECTED WATER SUPPLY CHANGES DUE TO WATER QUALITY - PERCENTAGE CHANGE**

| Water source | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|---|---|
| Groundwater | | | | | | | | | |
| Alluvial | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Saugus | 16%[(a)] | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Imported Water | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Recycled Water | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Banking Programs | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |

Note:

(a) The removal of VWC Well 201 would on a temporary basis reduce the quantity of water available from the Saugus Formation by 3,777 AFY in certain dry years. The 16% water supply impact shown in this table represents the percentage of VWC Well 201 capacity to the total 24,100 AFY single dry year well capacity from the Saugus Formation as indicated in Table 3-11. Table 8-3 illustrates that the removal of VWC Well 201 would not result in inadequate well capacity should a multi-year dry period occur in the near term. Further, Tables 6-4 and 6-5 illustrate that, for a single dry year, existing and planned water supplies exceed demand by more than 28,000 AFY and 36,000 AFY assuming 2015 levels of demand. In conclusion, the temporary loss of capacity from VWC Well 201, as discussed in Sections 3, 5, 6 and 8 and Appendices C and I, does not result in a shortage to the water suppliers.

# Section 6: Reliability Planning

## 6.1 Overview

The Act requires urban water suppliers to assess water supply reliability that compares total projected water use with the expected water supply over the next twenty years in five year increments. The Act also requires an assessment for a single dry year and multiple dry years. This chapter presents the reliability assessment for CLWA's service area.

It is the stated goal of CLWA and the retail water purveyors to deliver a reliable and high quality water supply for their customers, even during dry periods. Based on conservative water supply and demand assumptions over the next forty years in combination with conservation of non-essential demand during certain dry years, the Plan successfully achieves this goal.

## 6.2 Reliability of Water Supplies

Each water supply source has its own reliability characteristics. In any given year, the variability in weather patterns around the state may affect the availability of supplies to the Valley differently. For example, from 2000 through 2002, southern California experienced dry conditions in all three years. During the same period, northern California experienced one dry year and two normal years. The Valley is typical in terms of water management in southern California; local groundwater supplies are used to a greater extent when imported supplies are less available due to dry conditions in the north, and larger amounts of imported water supplies are used during periods when northern California has wetter conditions. This pattern of "conjunctive use" has been in effect since SWP supplies first came to the Valley in 1980. SWP and other imported water supplies have supplemented the overall supply of the Valley, which previously depended solely on local groundwater supplies.

To supplement these local groundwater supplies, CLWA contracted with DWR for delivery of SWP water, providing an imported water supply to the Valley. However, the variability in SWP supplies affects the ability of the purveyors to meet the overall water supply needs for the service area. While each of the Valley's available supply sources has some variability, the variability in SWP supplies has the largest effect on overall supply reliability.

As discussed in Section 3.2, each SWP contractor's Water Supply Contract contains a Table A Amount that identifies the maximum amount of Table A water that contractor may request each year. However, the amount of SWP water actually allocated to contractors each year is dependent on a number of factors than can vary significantly from year to year. The primary factors affecting SWP supply availability include the availability of water at the source of supply in northern California, the ability to transport that water from the source to the primary SWP diversion point in the southern Delta and the magnitude of total contractor demand for that water. In many years, the availability of SWP supplies to CLWA and the other SWP contractors is less than their maximum Table A Amounts, and can be significantly less in very dry years.

DWR's *Reliability Report*, prepared biennially assists SWP contractors and local planners in assessing the reliability of the SWP component of their overall supplies. In its Reliability Reports, DWR presents the results of its analysis of the reliability of SWP supplies, based on

model studies of SWP operations. In general, DWR model studies show the anticipated amount of SWP supply that would be available for a given SWP water demand, given an assumed set of physical facilities and operating constraints, based on 82 years of historic hydrology. The results are interpreted as the capability of the SWP to meet the assumed SWP demand, over a range of hydrologic conditions, for that assumed set of physical facilities and operating constraints.

DWR's 2009 update of the *Reliability Report* presents the results of model studies for years 2009 and 2029. In these model studies, DWR assumed existing SWP facilities and operating constraints for both the 2009 and 2029 studies. The primary differences between the two studies are an increase in projected SWP contractor demands, an increase in projected upstream demands (which affects SWP supplies by reducing the amount of inflows available for the SWP), and the inclusion in the 2029 study of potential impacts on historic hydrology of the effects of climate change and accompanying sea level rise. In the report, DWR presents the SWP delivery capability resulting from these studies as a percent of maximum contractor Table A Amounts. To estimate supply capability in intermediate years between 2009 and 2029, DWR interpolates between the results of those studies.

## 6.3 Normal, Single-Dry, and Multiple-Dry Year Planning

The water suppliers have various water supplies available to meet demands during normal, single-dry, and multiple-dry years. The following sections elaborate on the different supplies available to the water suppliers including groundwater, recycled water and imported supplies.

### 6.3.1 Groundwater

In accordance with the groundwater operating plan for the basin, groundwater supplies for all uses from the Alluvial Aquifer are planned to be in the range 30,000 to 40,000 AFY in average years and 30,000 to 35,000 AFY in dry years; supplies from the Saugus Formation are projected to be 7,500 to 15,000 AFY in average years and 15,000 to 35,000 AFY in dry years. The updated Basin Yield analysis (LSCE and GSI, 2009) concluded pumping in those ranges to be sustainable. While there is sufficient Alluvial pumping capacity to achieve the Alluvial groundwater supply (Table 3-8), it is planned that VWC will develop some future capacity as it constructs municipal supply wells to replace existing agricultural wells when planned development converts existing agricultural land use to municipal land use. Existing Saugus pumping capacity is sufficient to achieve about 27,000 AFY (Table 3-9), or about 77 percent of the upper end of the Saugus operating plan. Hence, it is planned that restored capacity (VWC Well 201) and future Saugus pumping capacity (new wells) will be added to achieve the full range of the Saugus operating plan.

The existing and planned groundwater supplies used in this Plan are generally the pumping rates, within the operating plan ranges, that were analyzed in the Basin Yield update. As such, they tend toward the upper ends of the respective ranges except for normal year Saugus pumping, which is closer to mid-range of the Saugus operating plan. For the multiple-dry year period, it was assumed that pumping from the Saugus Formation would be governed by the groundwater operating plan summarized in Table 3-5, with average pumping over the 4-year dry period of about 21,500 AFY. Total projected Alluvial and Saugus pumping, including pumping by the purveyors and by agricultural and other users, is shown by year type in Tables 3-7 to

3-12 in Section 3. As shown there, total pumping in each year type remains within the pumping ranges in the groundwater operating plan.

### 6.3.2 Recycled Water

Recycled water is available from the Saugus WRP and Valencia WRP. Recycled water is also anticipated to be produced by the Newhall WRP for the Newhall Ranch Specific Plan development, as described in Section 4.

CLWA has completed construction of Phase I of its Recycled Plan, a multi-phased program to deliver recycled water in the Valley. Phase 1 can deliver 1,700 AFY of water through the VWC system. Deliveries of recycled water began in 2003 for irrigation water supply at a golf course and in roadway median strips. In 2010, recycled water deliveries were approximately 325 AF.

CLWA completed a preliminary design report in 2009 on the second phase of the Recycled Plan (Phase 2A), which will take water from the Saugus WRP and distribute it to identified users to the north, across the Santa Clara River and then to the west and east. Large irrigation customers will be served with this expansion with a collective design that will increase recycled water deliveries by 500 AFY.

Recycled water will be further expanded within the region with the South End Recycled Water project (Phase 2C), which will expand the existing recycled water transmission and distribution system southerly to supply recycled water to additional VWC customers, as well as some customers served by NCWD and the SCWD. The Project includes the planning, designing and construction of Phase 2C of the region's Recycled Plan, with recycled water improvements including various recycled water pipelines and pumping stations resulting in the use of an estimated 910 AFY of recycled water.

Overall, the recycled water program is expected to ultimately deliver up to 22,800 AFY of treated (tertiary) wastewater suitable for reuse on golf courses, landscaping and other non-potable uses. Of this total, 21,300 AFY is projected use by purveyor customers. This supply is assumed to be available in an average year, a single-dry year, and in each year of a multiple-dry year period.

### 6.3.3 State Water Project Table A Supply

For this Plan, the availability of SWP supplies to CLWA was based on DWR's 2009 *Reliability Report*, taken from more detailed results provided by DWR from the model studies presented in the 2009 *Reliability Report*. For the three hydrologic conditions evaluated here, the SWP deliveries to CLWA were taken from DWR's analyses based on the following: average/normal year based on the average deliveries over the studies' 82-year historical hydrologic study period (1922-2003), single-dry year based on a repeat of the worst-case historical hydrologic conditions of 1977, and multiple-dry year period based on a repeat of the historical four-year drought of 1931-1934.

As discussed in more detail in Section 3 (see Section 3.2.1.2.3), a planning effort to increase long-term supply reliability for both the SWP and CVP is taking place through the Bay Delta Conservation Plan (BDCP). While the proposed conveyance facilities that are part of the BDCP would increase SWP supply reliability, that increase is not included here. Any of the proposed

facilities that are completed would increase SWP reliability beyond the values used throughout this Plan.

#### 6.3.3.1 Flexible Storage Account

Under the Water Supply Contracts with DWR for SWP water, the contractors that share in the repayment of Castaic Lake may access a portion of the storage in that reservoir. This accessible storage is referred to as "flexible storage." The contractors may withdraw water from flexible storage, in addition to their allocated Table A supplies, on an as-needed basis. A contractor must replace any water it withdraws from this storage within five years. As one of the three contractors sharing in the repayment of Castaic Lake, CLWA has access to this flexible storage. Its share of the total flexible storage is currently 4,684 AF. After negotiations with Ventura County water agencies in 2005, CLWA gained access to their 1,376 AF of flexible storage for ten years through 2015. While it is expected that CLWA and Ventura County will extend the existing flexible storage agreement beyond the 2015 term, in this Plan it is not assumed to be available beyond 2015.

CLWA plans to use this supply only in dry years. For the single-dry year condition, it was assumed the entire amount would be used. For the multiple-dry year condition, it was assumed that the entire amount would be used sometime during the four-year period, so the average annual supply during that period would be one fourth of the total. Any water withdrawn was assumed to be replaced in intervening average and wet years and would be available again for use in the next dry year.

### 6.3.4 Buena Vista-Rosedale

BVWSD and RRBWSD, both member districts of KCWA, have jointly developed a program that provides both a firm water supply of 11,000 AFY and a water banking component. This supply program provides a firm annual water supply available every year based on existing and long-standing Kern River water rights, which is delivered by exchange of Buena Vista's and Rosedale's SWP Table A supplies.

### 6.3.5 Nickel Water - Newhall Land

This supply is similar to Buena Vista-Rosedale supply both in regard to its source (Kern River water rights) and level of reliability. The supply from this program is up to 1,607 AFY of firm supply, which is available in every year. It was acquired by the developer of the Newhall Ranch project to supplement groundwater and recycled water sources of supply for that project, which is in the CLWA service area. In this Plan, it is anticipated that this water supply will be available to VWC.

### 6.3.6 Semitropic Banking Program

In 2002, CLWA stored 24,000 AF of its allocated SWP Table A supply through a groundwater banking agreement with Semitropic. In 2004, CLWA stored 32,522 AF of its 2003 allocated SWP Table A supply in a second Semitropic storage account. Under the terms of those agreements, and after consideration for losses within the groundwater basin, CLWA could withdraw up to 50,870 AF when needed within ten years of when the water was stored. Of this storage, CLWA withdrew 4,950 AF in 2009 and 2010, leaving 45,920 AF currently available for

withdrawal. CLWA executed an amendment for a ten-year extension of each banking agreement with Semitropic in April 2010.

In addition to this short-term storage for CLWA, Semitropic has a long-term groundwater banking program with several other partners. The facilities that Semitropic may use in the return of CLWA's banked water supply are the same facilities that Semitropic may use to return banked water to its long-term banking program partners. As a result, there may be competition for use of those facilities in a particularly dry year, which could limit CLWA's ability to access the water in that year.

CLWA plans to use this supply only in dry years. For the single dry year, it was assumed that competition among Semitropic's banking partners for use of return facilities would limit CLWA's supply to about one third of the storage available, or about 15,000 AF. For the multiple-dry year period, it was assumed that the entire amount would be accessible and used sometime during the four-year period, so the average annual supply during that period would be one fourth of the total available, or about 11,500 AF. Under the agreements for this program, including the agreement for the ten-year time extension, the stored water must be withdrawn within twenty years of when it was stored. Therefore, it was assumed that this supply is available only through 2023.

### 6.3.7 Semitropic Banking Program - Newhall Land

As was the case for the Nickel water, the banking program was entered into by the developer of the Newhall Ranch project to firm up the reliability of the water supply for the project, which is in the CLWA service area. The storage capacity of this program is 55,000 AF. Newhall Land currently has 18,892 AF stored in this program. It is anticipated that this supply will be available to VWC.

VWC plans to use this supply only in dry years. For the single-dry year, supplies were assumed at the program's maximum withdrawal capacity of 4,950 AFY. For the multiple-dry year period, supplies in each year of the dry period were assumed at the program's maximum withdrawal capacity of 4,950 AFY and that additional supplies would be banked during wetter years to allow withdrawal of this amount.

### 6.3.8 Rosedale-Rio Bravo Banking Program

RRBWSD has also developed a water banking and exchange program. CLWA has entered into a long-term agreement with RRBWSD which provides it with storage and withdrawal capacity of 20,000 AFY and up to 100,000 AF of storage capacity. Withdrawals from the program can be made by exchange of Rosedale's SWP Table A supply, or by pumpback into the California Aqueduct. CLWA began storing water in this program in 2005 and has since reached the program's maximum storage capacity, with 100,000 AF currently available for withdrawal.

CLWA plans to use this supply only in dry years. For the single-dry year, supplies were assumed at the program's maximum withdrawal capacity of 20,000 AF. For the multiple-dry year period, it was assumed that supplies would average at least 15,000 AFY over the dry period and that additional supplies would be banked during wetter years to allow withdrawal of at least this amount.

### 6.3.9 Additional Planned Banking

CLWA's 2009 update of its Reliability Plan identifies a need for additional banking programs to firm up the dry-year reliability of service area supplies, and includes an implementation schedule to increase both storage and pumpback capacity beginning in 2010 and incrementally increasing through 2050. While a specific banking program has not yet been identified, CLWA's plans call for development of additional groundwater banking programs with pumpback capacity of at least an additional 10,000 AF by 2025, and a second additional 10,000 AF by 2035. For the single-dry year, supplies were assumed at the programs' pumpback capacity. For the multiple-dry year period, it was assumed that supplies would average at least 75 percent of the pumpback capacity over the dry period.

## 6.4 Supply and Demand Comparisons

The available supplies and water demands for CLWA's service area were analyzed to assess the region's ability to satisfy demands during three scenarios: a normal water year, single-dry year and multiple-dry years. The tables in this section present the supplies and demands for the various drought scenarios for the projected planning period of 2015-2050 in five year increments. The available supplies and water demands broken down by purveyor during the same three scenarios were also analyzed over the project planning period, and these tables are provided in Appendix C. Table 6-1 presents the base years for the development of water year data. Tables 6-2, 6-3 and 6-4 at the end of this section summarize, respectively, Normal Water Year, Single-Dry Water Year and Multiple-Dry Year supplies.

The reader is referred to Chapter 2 for development of retail purveyor demands and current and projected water supplies are developed in Chapters 3 and 4.

**TABLE 6-1**
**BASIS OF WATER YEAR DATA**

| Water Year Type | Base Years | Historical Sequence |
|---|---|---|
| Normal Water Year | Average | 1922-2003 |
| Single-Dry Water Year | 1977 | -- |
| Multiple-Dry Water Years | 1931-1934 | -- |

### 6.4.1 Normal Water Year

Table 6-2 summarizes the water suppliers' supplies available to meet demands over the 40-year planning period during an average/normal year. As presented in the table, the water suppliers' water supply is broken down into existing and planned water supply sources, including wholesale (imported) water, local supplies and banking programs. Demands are shown with and without the urban demand reduction resulting from SBX7-7 conservation objectives.

See Appendix C for the breakdown by purveyor of supplies available to meet demands over the 40-year planning period during an average/normal year.

## TABLE 6-2
## PROJECTED AVERAGE/NORMAL YEAR SUPPLIES AND DEMANDS

| | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|---|
| **Existing Supplies** | | | | | | | | |
| Existing Groundwater[a] | | | | | | | | |
| Alluvial Aquifer | 24,000 | 24,000 | 24,000 | 25,000 | 25,000 | 25,000 | 25,000 | 25,000 |
| Saugus Formation[b] | 9,225 | 10,225 | 10,225 | 10,225 | 10,225 | 10,225 | 10,225 | 10,225 |
| **Total Groundwater** | **33,225** | **34,225** | **34,225** | **35,225** | **35,225** | **35,225** | **35,225** | **35,225** |
| Recycled Water[c] | 325 | 325 | 325 | 325 | 325 | 325 | 325 | 325 |
| Imported Water | | | | | | | | |
| State Water Project[d] | 58,100 | 57,900 | 57,600 | 57,400 | 57,400 | 57,400 | 57,400 | 57,400 |
| Flexible Storage Accounts | - | - | - | - | - | - | - | - |
| Buena Vista-Rosedale | 11,000 | 11,000 | 11,000 | 11,000 | 11,000 | 11,000 | 11,000 | 11,000 |
| Nickel Water - Newhall Land | 1,607 | 1,607 | 1,607 | 1,607 | 1,607 | 1,607 | 1,607 | 1,607 |
| **Total Imported** | **70,707** | **70,507** | **70,207** | **70,007** | **70,007** | **70,007** | **70,007** | **70,007** |
| Banking Programs[e] | | | | | | | | |
| Rosedale Rio-Bravo | - | - | - | - | - | - | - | - |
| Semitropic | - | - | - | - | - | - | - | - |
| Semitropic - Newhall Land | - | - | - | - | - | - | - | - |
| **Total Banking** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** |
| **Total Existing Supplies** | **104,257** | **105,057** | **104,757** | **105,557** | **105,557** | **105,557** | **105,557** | **105,557** |
| **Planned Supplies** | | | | | | | | |
| Future Groundwater[f] | | | | | | | | |
| Alluvial Aquifer | - | 1,000 | 2,000 | 3,000 | 4,000 | 5,000 | 6,000 | 7,000 |
| Saugus Formation | 1,375 | 1,375 | 1,375 | 1,375 | 1,375 | 1,375 | 1,375 | 1,375 |
| **Total Groundwater** | **1,375** | **2,375** | **3,375** | **4,375** | **5,375** | **6,375** | **7,375** | **8,375** |
| Recycled Water[c] | 975 | 2,725 | 5,225 | 7,775 | 10,275 | 13,775 | 17,275 | 20,975 |

| | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|---|
| Banking Programs[e] | - | - | - | - | - | - | - | - |
| **Total Planned Supplies** | **2,350** | **5,100** | **8,600** | **12,150** | **15,650** | **20,150** | **24,650** | **29,350** |
| **Total Existing and Planned Supplies** | **106,607** | **110,157** | **113,357** | **117,707** | **121,207** | **125,707** | **130,207** | **134,907** |
| Demand w/o Conservation[g] | 80,070 | 88,484 | 96,898 | 105,312 | 113,726 | 122,140 | 130,554 | 138,968 |
| 20x2020 Reduction[h] | 9,027 | 19,626 | 21,166 | 22,770 | 24,342 | 25,914 | 27,486 | 29,058 |
| Reduction from Recycled Water[i] | 1,300 | 3,050 | 5,550 | 8,100 | 10,600 | 14,100 | 17,600 | 21,300 |
| Reduction from Water Conservation[j] | 7,727 | 16,576 | 16,662 | 16,748 | 16,833 | 16,919 | 17,005 | 17,091 |
| **Demand w/ Conservation[k]** | **72,343** | **71,908** | **80,236** | **88,564** | **96,892** | **105,220** | **113,549** | **121,877** |

Notes:

(a) Existing groundwater supplies represent the quantity of groundwater anticipated to be pumped with existing wells. As indicated in Tables 3-8 and 3-9 and Tables 3-4 and 3-5 of the 2009 Groundwater Basin Yield Analysis, individual purveyors may have well capacity in excess of quantities shown in this table. As indicated in Table 3-10, existing and planned groundwater pumping remain within the groundwater operating plan shown on Table 3-5.
(b) SCWD's existing Saugus 1 and Saugus 2 wells resumed production in 2011 with the completion of the perchlorate treatment facility.
(c) Recycled water projections from Table 4-3.
(d) SWP supplies are based on the Department of Water Resources "2009 State Water Project Delivery Reliability Report."
(e) Not needed in average/normal years.
(f) Planned groundwater supplies represent new groundwater well capacity that may be required by an individual purveyor's production objectives in the Alluvial Aquifer and the Saugus Formation. As indicated in Table 3-10, existing and planned groundwater pumping remain within the groundwater operating plan shown on Table 3- 5.
(g) Demand w/o Conservation data from Table 2-2.
(h) 20x2020 Reduction for the Region from Table 2-22.
(i) Recycled Water Reduction for the Region from Table 2-22; does not include demands from Honor Rancho.
(j) Reduction from Water Conservation calculation for Region from Table 2-22.
(k) Demand w/ Conservation is Demand w/o Conservation minus Reduction from Water Conservation.

### 6.4.2 Single-Dry Year

The water supplies and demands for the water suppliers over the 40-year planning period were analyzed in the event that a single-dry year occurs, similar to the drought that occurred in California in 1977. Table 6-3 summarizes the existing and planned supplies available to meet demands during a single-dry year. Base demand (demand without conservation) during dry years was assumed to increase by 10 percent. Demands are also shown with the urban demand reduction resulting from SBX7-7 conservation objectives.

See Appendix C for the breakdown by purveyor of supplies available to meet demands over the 40-year planning period during a single-dry year.

## TABLE 6-3
## PROJECTED SINGLE-DRY YEAR SUPPLIES AND DEMANDS

| | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|---|
| **Existing Supplies** | | | | | | | | |
| Existing Groundwater[a] | | | | | | | | |
| Alluvial Aquifer | 20,300 | 20,250 | 20,200 | 21,050 | 21,050 | 21,025 | 21,000 | 20,650 |
| Saugus Formation | 20,400 | 20,400 | 20,400 | 20,400 | 20,400 | 20,400 | 20,400 | 20,400 |
| **Total Groundwater** | **40,700** | **40,650** | **40,600** | **41,450** | **41,450** | **41,425** | **41,400** | **41,050** |
| Recycled Water[b] | 325 | 325 | 325 | 325 | 325 | 325 | 325 | 325 |
| Imported Water | | | | | | | | |
| State Water Project[c] | 11,900 | 11,000 | 10,000 | 9,100 | 9,100 | 9,100 | 9,100 | 9,100 |
| Flexible Storage Accounts[d] | 6,060 | 4,680 | 4,680 | 4,680 | 4,680 | 4,680 | 4,680 | 4,680 |
| Buena Vista-Rosedale | 11,000 | 11,000 | 11,000 | 11,000 | 11,000 | 11,000 | 11,000 | 11,000 |
| Nickel Water - Newhall Land | 1,607 | 1,607 | 1,607 | 1,607 | 1,607 | 1,607 | 1,607 | 1,607 |
| **Total Imported** | **30,567** | **28,287** | **27,287** | **26,387** | **26,387** | **26,387** | **26,387** | **26,387** |
| Banking Programs | | | | | | | | |
| Rosedale Rio-Bravo[e] | 20,000 | 20,000 | 20,000 | 20,000 | 20,000 | 20,000 | 20,000 | 20,000 |
| Semitropic[f] | 15,000 | 15,000 | - | - | - | - | - | - |
| Semitropic - Newhall Land[g] | 4,950 | 4,950 | 4,950 | 4,950 | 4,950 | 4,950 | 4,950 | 4,950 |
| **Total Banking** | **39,950** | **39,950** | **24,950** | **24,950** | **24,950** | **24,950** | **24,950** | **24,950** |
| **Total Existing Supplies** | **111,542** | **109,212** | **93,162** | **93,112** | **93,112** | **93,087** | **93,062** | **92,712** |
| **Planned Supplies** | | | | | | | | |
| Future Groundwater[h] | | | | | | | | |
| Alluvial Aquifer | 200 | 1,250 | 2,300 | 3,850 | 4,850 | 5,875 | 6,900 | 7,750 |
| Saugus Formation (Restored Well) | 825 | 3,777 | 3,777 | 3,777 | 3,777 | 3,777 | 3,777 | 3,750 |
| Saugus Formation (New Wells) | 2,875 | 9,923 | 9,923 | 9,923 | 9,923 | 9,923 | 9,923 | 9,950 |
| **Total Groundwater** | **3,900** | **14,950** | **16,000** | **17,550** | **18,550** | **19,575** | **20,600** | **21,450** |
| Recycled Water[b] | 975 | 2,725 | 5,225 | 7,775 | 10,275 | 13,775 | 17,275 | 20,975 |

| | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|---|
| Banking Programs[i] | - | - | 10,000 | 10,000 | 20,000 | 20,000 | 20,000 | 20,000 |
| **Total Planned Supplies** | **4,875** | **17,675** | **31,225** | **35,325** | **48,825** | **53,350** | **57,875** | **62,425** |
| **Total Existing and Planned Supplies** | **116,417** | **126,887** | **124,387** | **128,437** | **141,937** | **146,437** | **150,937** | **155,137** |
| Demand w/o Conservation[j] | 88,077 | 97,333 | 106,588 | 115,843 | 125,099 | 134,354 | 143,609 | 152,865 |
| 20x2020 Reduction[k] | 9,027 | 19,626 | 21,166 | 22,770 | 24,342 | 25,914 | 27,486 | 29,058 |
| Reduction from Recycled Water[l] | 1,300 | 3,050 | 5,550 | 8,100 | 10,600 | 14,100 | 17,600 | 21,300 |
| Reduction from Water Conservation[m] | 7,727 | 16,576 | 16,662 | 16,748 | 16,833 | 16,919 | 17,005 | 17,091 |
| **Demand w/ Conservation[n]** | **80,350** | **80,757** | **89,926** | **99,096** | **108,265** | **117,434** | **126,604** | **135,773** |

Notes:

(a) Existing groundwater supplies represent the quantity of groundwater anticipated to be pumped with existing wells. As indicated in Tables 3-8 and 3-9 and Tables 3-4 and 3-5 of the 2009 Groundwater Basin Yield Analysis, individual purveyors may have well capacity in excess of quantities shown in this table. As indicated in Table 3-11, existing and planned groundwater pumping remain within the groundwater operating plan shown on Table 3-5. SCWD's existing Saugus 1 and Saugus 2 wells resumed production in 2011 with the completion of the perchlorate treatment facility.

(b) Recycled water projections from Table 4-3.

(c) SWP supplies are based on the Department of Water Resources "*2009 State Water Project Delivery Reliability Report*."

(d) Includes both CLWA and Ventura County entities flexible storage accounts. Initial Term of agreement with Ventura County entities expires after 2015.

(e) CLWA has a maximum withdrawal capacity of 20,000 AFY and a storage capacity of 100,000 AF. As of 6/1/2011, there is 100,000 AF of recoverable water.

(f) CLWA has 45,920 AF of recoverable water as of 6/1/2011.

(g) Newhall Land has a maximum withdrawal capacity of 4,950 AFY and a storage capacity of 55,000 AF. As of 6/1/2011 there is 18,892 AF of recoverable water. Delivery of stored water from the Newhall Land's Semitropic Water Banking and Exchange Program is assumed available to VWC.

(h) Planned groundwater supplies represent new groundwater well capacity that may be required by an individual purveyor's production objectives in the Alluvial Aquifer and the Saugus Formation, including 3,777 AFY of restored capacity from VWC Well 201 and approximately 10,000 AFY of new Saugus Formation well capacity. When combined with existing purveyor and non-purveyor groundwater supplies, total groundwater production is consistent with the 1977 single dry-year levels identified in Table 3-8 of the 2009 Groundwater Basin Yield Analysis. As indicated in Table 3-11, existing and planned groundwater pumping remain within the groundwater operating plan shown on Table 3-5.

(i) Includes banking programs with 10,000 AF of additional pumpback capacity by 2025 and a second additional 10,000 AF by 2035.

(j) Demand w/o Conservation data from Table 2-2. Includes a 10 percent increase in demand during dry years.

(k) 20x2020 Reduction for the Region from Table 2-22.

(l) Recycled Water Reduction for the Region from Table 2-22; does not include demands from Honor Rancho.

(m) Reduction from Water Conservation calculation for Region from Table 2-22.

(n) Demand w/ Conservation is Demand w/o Conservation minus Reduction from Water Conservation.

### 6.4.3 Multiple-Dry Year

The water supplies and demands for the water suppliers' water supply over the 40-year planning period were analyzed in the event that a four-year multiple-dry year event occurs, similar to the drought that occurred during the years 1931 to 1934. Table 6-4 summarizes the existing and planned supplies available to meet demands during multiple-dry years. Base demand during dry years was assumed to increase by 10 percent. Demands are also shown with the urban demand reduction resulting from SBX7-7 conservation objectives.

See Appendix C for the breakdown by purveyor of supplies available to meet demands over the 40-year planning period during a multiple-dry year.

## TABLE 6-4
## PROJECTED MULTIPLE-DRY YEAR SUPPLIES AND DEMANDS

| | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|---|
| **Existing Supplies** | | | | | | | | |
| Existing Groundwater[a] | | | | | | | | |
| Alluvial Aquifer | 20,425 | 20,425 | 20,425 | 21,825 | 21,825 | 21,825 | 21,825 | 21,325 |
| Saugus Formation | 19,700 | 19,700 | 19,700 | 19,700 | 19,700 | 19,700 | 19,700 | 19,700 |
| **Total Groundwater** | **40,125** | **40,125** | **40,125** | **41,525** | **41,525** | **41,525** | **41,525** | **41,025** |
| Recycled Water[b] | 325 | 325 | 325 | 325 | 325 | 325 | 325 | 325 |
| Imported Water | | | | | | | | |
| State Water Project[c] | 32,900 | 32,900 | 33,000 | 33,000 | 33,000 | 33,000 | 33,000 | 33,000 |
| Flexible Storage Accounts[d] | 1,510 | 1,170 | 1,170 | 1,170 | 1,170 | 1,170 | 1,170 | 1,170 |
| Buena Vista-Rosedale | 11,000 | 11,000 | 11,000 | 11,000 | 11,000 | 11,000 | 11,000 | 11,000 |
| Nickel Water - Newhall Land | 1,607 | 1,607 | 1,607 | 1,607 | 1,607 | 1,607 | 1,607 | 1,607 |
| **Total Imported** | **47,017** | **46,677** | **46,777** | **46,777** | **46,777** | **46,777** | **46,777** | **46,777** |
| Banking Programs | | | | | | | | |
| Rosedale Rio-Bravo[e] | 15,000 | 15,000 | 15,000 | 15,000 | 15,000 | 15,000 | 15,000 | 15,000 |
| Semitropic[f] | 11,500 | 11,500 | - | - | - | - | - | - |
| Semitropic - Newhall Land[g] | 4,950 | 4,950 | 4,950 | 4,950 | 4,950 | 4,950 | 4,950 | 4,950 |
| **Total Banking** | **31,450** | **31,450** | **19,950** | **19,950** | **19,950** | **19,950** | **19,950** | **19,950** |
| **Total Existing Supplies** | **118,917** | **118,577** | **107,177** | **108,577** | **108,577** | **108,577** | **108,577** | **108,077** |
| Planned Supplies | | | | | | | | |
| Future Groundwater[h] | | | | | | | | |
| Alluvial Aquifer | - | 1,000 | 2,000 | 3,000 | 4,000 | 5,000 | 6,000 | 7,000 |
| Saugus Formation (Restored Well) | 2,375 | 1,625 | 1,500 | 1,400 | 1,275 | 1,125 | 1,000 | 875 |
| Saugus Formation (New Wells) | 2,250 | 10,325 | 10,450 | 10,550 | 10,675 | 10,825 | 10,950 | 11,075 |
| **Total Groundwater** | **4,625** | **12,950** | **13,950** | **14,950** | **15,950** | **16,950** | **17,950** | **18,950** |
| Recycled Water[b] | 975 | 2,725 | 5,225 | 7,775 | 10,275 | 13,775 | 17,275 | 20,975 |

| | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|---|
| Banking Programs[i] | - | - | 7,500 | 7,500 | 15,000 | 15,000 | 15,000 | 15,000 |
| **Total Planned Supplies** | **5,600** | **15,675** | **26,675** | **30,225** | **41,225** | **45,725** | **50,225** | **54,925** |
| **Total Existing and Planned Supplies** | **124,517** | **134,252** | **133,852** | **138,802** | **149,802** | **154,302** | **158,802** | **163,002** |
| Demand w/o Conservation[j] | 88,077 | 97,333 | 106,588 | 115,843 | 125,099 | 134,354 | 143,609 | 152,865 |
| 20x2020 Reduction[k] | 9,027 | 19,626 | 21,166 | 22,770 | 24,342 | 25,914 | 27,486 | 29,058 |
| Reduction from Recycled Water[l] | 1,300 | 3,050 | 5,550 | 8,100 | 10,600 | 14,100 | 17,600 | 21,300 |
| Reduction from Water Conservation[m] | 7,727 | 16,576 | 16,662 | 16,748 | 16,833 | 16,919 | 17,005 | 17,091 |
| **Demand w/ Conservation[n]** | **80,350** | **80,757** | **89,926** | **99,096** | **108,265** | **117,434** | **126,604** | **135,773** |

Notes:

(a) Existing groundwater supplies represent the quantity of groundwater anticipated to be pumped with existing wells. As indicated in Tables 3-8 and 3-9 and Tables 3-4 and 3-5 of the 2009 Groundwater Basin Yield Analysis, individual purveyors may have well capacity in excess of quantities shown in this table. As indicated in Table 3-12, existing and planned groundwater pumping remain within the groundwater operating plan shown on Table 3-5. SCWD's existing Saugus 1 and Saugus 2 wells resumed production in 2011 with the completion of the perchlorate treatment facility.

(b) Recycled water projections from Table 4-3.

(c) SWP supplies are based on the Department of Water Resources "*2009 State Water Project Delivery Reliability Report*."

(d) Includes both CLWA and Ventura County entities flexible storage accounts. Initial Term of agreement with Ventura County entities expires after 2015.

(e) CLWA has a maximum withdrawal capacity of 20,000 AFY and a storage capacity of 100,000 AF. As of 6/1/2011, there is 100,000 AF of recoverable water.

(f) CLWA has 45,920 AF of recoverable water as of 6/1/2011.

(g) Newhall Land has a maximum withdrawal capacity of 4,950 AFY and a storage capacity of 55,000 AF. As of 6/1/2011 there is 18,892 AF of recoverable water. Delivery of stored water from the Newhall Land's Semitropic Water Banking and Exchange Program is assumed available to VWC.

(h) Planned groundwater supplies represent new groundwater well capacity that may be required by an individual purveyor's production objectives in the Alluvial Aquifer and the Saugus Formation, including 3,777 AFY of restored capacity from VWC Well 201 and approximately 10,000 AFY of new Saugus Formation well capacity. When combined with existing purveyor and non-purveyor groundwater supplies, total groundwater production is consistent with the 1931-1934 multiple dry-year levels identified in Table 3-8 of the 2009 Groundwater Basin Yield Analysis. As indicated in Table 3-12, existing and planned groundwater pumping remain within the groundwater operating plan shown on Table 3-5.

(i) Includes banking programs with 10,000 AF of additional pumpback capacity by 2025 and a second additional 10,000 AF by 2035.

(j) Demand w/o Conservation data from Table 2-2. Includes a 10 percent increase in demand during dry years.

(k) 20x2020 Reduction for the Region from Table 2-22.

(l) Recycled Water Reduction for the Region from Table 2-22; does not include demands from Honor Rancho.

(m) Reduction from Water Conservation calculation for Region from Table 2-22.

(n) Demand w/ Conservation is Demand w/o Conservation minus Reduction from Water Conservation.

### 6.4.4 Summary of Comparisons

As shown in the analyses above, CLWA and the retail purveyors have adequate supplies to meet CLWA service area demands during normal, single-dry, and multiple-dry years throughout the 40-year planning period.

# Section 7: Water Demand Management Measures

This section describes the water Demand Management Measures (DMMs) implemented by CLWA and the retail purveyors as a part of the effort to reduce water demand in the Valley.

## 7.1 Overview

CLWA and the retail purveyors are subject to the Urban Water Management Planning Act, AB1420 and SBX7-7 requirements, in addition to the commitment of compliance with the Best Management Practices (BMPs) as signatories to the Memorandum of Understanding Regarding Water Conservation in California (MOU). In the CLWA service area, demand management is addressed at both the local (retail agency) and regional (Santa Clarita Valley-wide) levels.

The MOU and BMPs were revised by the California Urban Water Conservation Council (CUWCC) in 2008. The revised BMPs now contain a category of "Foundational BMPs" that signatories are expected to implement as a matter of their regular course of business. These include Utility Operations (metering, water loss control, pricing, conservation coordinator, wholesale agency assistance programs and water waste ordinances) and Public Education (public outreach and school education programs). The remaining "Programmatic" BMPs have been placed into three categories: Residential, Large Landscape, and Commercial, Industrial, Institutional (CII) Programs and are similar to the original quantifiable BMPs. These revisions are reflected in the CUWCC reporting database starting with reporting year 2009 and the 2010 UWMP's DMM compliance requirements. The new category of foundational BMPs is a significant shift in the revised MOU. For CLWA and other wholesalers however, these changes do not represent a substantive shift in requirements.

A key intent of the recent MOU revision was to provide retail water agencies with more flexibility in meeting requirements and allow them to choose program options most suitable to their specific needs. Therefore, as alternatives to the traditional Programmatic BMP requirements, agencies may also implement the MOU Flex Track or GPCD options.

Under the Flex Track option, an agency is responsible for achieving water savings greater than or equal to those it would have achieved using only the BMP list items. The CUWCC has developed three Flex Track Menus – Residential, CII, and Landscape – and each provides a list of program options that may be implemented in part or any combination to meet the water savings goal of that BMP. Custom measures can also be developed and require documentation on how savings were realized and the method and calculations for estimating savings.

The GPCD option sets a water use reduction goal of 18 percent reduction by 2018. The MOU defines the variables involved in setting the baseline and determining final and interim targets. The GPCD option and requirements track well with the requirements of SBX7-7. All three retail suppliers – SCWD, VWC and NCWD – have chosen to implement the GPCD compliance option.

Signatories to the urban MOU are allowed by Water Code Section 10631(j) to include their biennial CUWCC BMP reports in an UWMP to meet the requirements of the DMM sections of the UWMP Act. The retail suppliers have chosen to comply with the requirements of the Act by providing the information required by the DMMs in this section of the Plan instead of attaching the 2009 and 2010 BMP Reports. CLWA has filed its 2009 and 2010 BMP reports (attached as Appendix E).

As a wholesaler MOU signatory, CLWA assists SCWD, VWC and NCWD with BMP implementation and reporting, although CLWA files BMP reports only for itself. LACWWD 36 BMP implementation and reporting is done by the County of Los Angeles on behalf of all its Waterworks Districts.

As the water wholesaler for the region, CLWA is responsible for the implementation of a subset of the BMPs. However, CLWA in partnership with the water purveyors has taken a leadership role in the implementation and support of a number of the BMPs that extend beyond a wholesaler's responsibilities in the MOU. The following sections provide more detail on the water suppliers' conservation programs and compliance with the BMPs.

## 7.2 Castaic Lake Water Agency

In 2001 CLWA became a signatory to the MOU and a member of the CUWCC, establishing a firm commitment to the implementation of the BMPs or DMMs. The CUWCC is a consensus-based partnership of agencies and organizations concerned with water supply and conservation of natural resources in California. By becoming a signatory, CLWA committed to implement a specific set of locally cost-effective conservation practices in its service area.

In addition to meeting its MOU commitments, CLWA is working with its retail purveyors to identify and implement water use efficiency programs that meet long-term reduction goals. In 2007, CLWA and the retail water purveyors entered into an MOU to prepare a Santa Clarita Valley Water Use Efficiency Strategic Plan (SCVWUESP). The purpose of the effort was to prepare a comprehensive long-term conservation plan for the Santa Clarita Valley by adopting objectives, policies and programs designed to promote proven and cost-effective conservation practices. A consultant was hired to prepare the SCVWUESP, which included input from stakeholders and the community at large. The SCVWUESP was completed in 2008 and provides a detailed study of existing residential and commercial water use, and recommends programs designed to reduce overall Valley-wide water demand by ten percent by 2030. The programs are designed to provide Valley residents with the tools and education to use water more efficiently. The seven programs identified in the SCVWUESP are:

1. HET Rebates (Single and Multi-Family)
2. Large Landscape Audits (with incentives)
3. CII Audits and Customized Incentives
4. Landscape Contractor Certification
5. HE Clothes Washer Rebates
6. New Construction Building Code
7. Valley-Wide Marketing

In addition to these seven programs, the SCVWUESP also identifies other key factors that will help reduce the Valley's overall water demand including passive conservation and new, more water efficient building ordinances. By 2009, CLWA and the water purveyors were implementing the majority of the programs identified in the SCVWUESP in some form.

Finally, the SCVWUESP includes an Appendix with more aggressive water use efficiency measures designed to meet a potential twenty percent reduction in water use by 2020. This

includes funding more active conservation programs, retrofit on resale ordinances, water rate reform, water budget based rates and a more aggressive recycled water program.

By implementing a portfolio of water use efficiency programs, Santa Clarita Valley water suppliers and their customers benefit in a number of ways:

- **Cost Avoidance for Purchased Water:** Although the Santa Clarita Valley has projected adequate water supply for the near future, the cost of water has risen dramatically and is expected to continue to rise. The best way to avoid purchasing expensive imported water is to use less through efficiency. Programs are an effective efficiency mechanism.
- **Limited State Resources:** California's water resources are becoming increasingly stretched due to population, housing growth and decreased water supply from state water projects. Agencies need to stretch water supplies and increase efficiencies.
- **Drought Preparedness:** It is inevitable that southern California, as well as the state, will experience another drought. The big question is when and how severe the next one will be. One way to lessen the severity of a drought's effect on Santa Clarita Valley is to prepare in advance for this event by creating a community that operates at a high level of efficiency.
- **Reduced Carbon Footprint:** The production and delivery of water requires a tremendous amount of energy on both a statewide and local level. The Santa Clarita Valley can do its part to reduce green house gases by using water more efficiently.
- **Reduced Waste Water Flows:** Sanitation plants and systems must be sized to meet historic and planned wastewater flows. Increasing the efficient use of water will result in a reduction of wastewater into the system.
- **Reduced Urban Runoff:** Achieving increased water use efficiency outdoors means less water running off landscaped areas into the streets, storm drains and ultimately into the Santa Clara River. Education efforts and installation of efficient technologies will ensure that more of our valuable water is delivered to appropriate landscaping and less of it as urban runoff.

The water suppliers are administering, managing and financing the SCVWUESP programs. Since the adoption of the SCVWUESP, SBX7-7 was enacted, which requires a more aggressive demand reduction target of 20 percent by 2020. CLWA and the purveyors are currently developing an implementation plan that builds on the SCVWUESP while accelerating and expanding its goals to identify other opportunities that will help meet long-term goals such as those required by SBX7-7. This UWMP provides an overview of the programs proposed for implementation to meet the SBX7-7 requirements.

## 7.2.1 Utility Operations

### 7.2.1.1 Conservation Coordinator

CLWA has one full time staff person that works in collaboration with its retail purveyors and exclusively on conservation programs. CLWA also employs a number of consultants to work on program development and implementation.

#### 7.2.1.2 Wholesale Agency Assistance Programs

CLWA provides both technical and financial assistance to the retail purveyors. In addition to the requirements specified in the BMPs, CLWA provides the following support to its retail purveyors:

- **Program Planning:** CLWA hired consultants and worked closely with the purveyors to implement the programs in the SCVWUESP. CLWA is currently providing a similar service in developing implementation options for meeting SBX7-7 requirements.
- **Residential Landscape Program:** This program targets residential landscape maintenance providers in the Santa Clarita Valley and individual homeowners eligible to participate. It is primarily designed to provide gardeners incentives to install residential water efficiency devices such as weather-based irrigation controllers (WBIC). The program offers homeowners and gardeners free landscape classes. After completing the landscape class, a resident receives one free WBIC and gardeners can keep receiving WBICs after confirmation that the previous WBIC was installed properly on a property within CLWA service area. The program is projected to save 50 AF in the first year.
- **Large Landscape Program:** This program offers homeowners associations, parks and landscape maintenance divisions the opportunity for a CLWA representative to visit the site and develop a customized plan and offer rebates for items to further water conservation.
- **Commercial, Industrial and Institutional (CII) Audit and Customized Incentive Program:** The CII Program offers businesses and institutions the opportunity to save money and water by signing up for free water use check-ups. As part of the check-up, a CLWA representative visits the site and develops a customized plan and offers rebates for the items to further water conservation.
- **High Efficiency Toilet (HET) Replacement Program:** HET toilet replacement vouchers are provided to retail purveyors for distribution. Homes older than 1992 are eligible for up to $115 per toilet.
- **Landscape Education Program:** Free monthly workshops are provided in a classroom and garden setting for residents who want to learn more about gardening and conservation.
- **School and Public Information Programs:** See Section 7.2.2.

#### 7.2.1.3 Water Loss Control

CLWA has completed AWWA's M36 Water Loss analysis, which consists of a component analysis of leaks into "revenue" and "non-revenue" categories, among others, and an economic analysis of recoverable loss. Pre-screen results range from 99.5 to 100 percent. CLWA's M36 'Reporting Worksheet' for 2010 is provided in Appendix E.

### 7.2.2 Education

#### 7.2.2.1 Public Information

In 2008 CLWA hired a social marketing firm to develop a Valley-wide conservation outreach plan. The "What's your water number?" campaign had its kick-off that summer and focused on proper irrigation and landscape maintenance. The campaign utilizes radio, billboards, television

and print. CLWA also distributes a monthly electronic community newsletter that addresses water conservation.

In October 2010, CLWA conducted a phone survey to measure the response to the campaign's messages to determine the most successful outlets used to deliver the messages among Santa Clarita Valley residents. Results indicated that overall campaign messaging was effective, with more than one-third of respondents stating the conservation tips made them re-think their current water use. Respondents also reported a substantial decrease in their total outdoor water use versus 2008. Eighty-seven percent of single-family home respondents said they reduced outdoor water usage already or are likely to do so in the near future. Respondents also reported a strong recall of the campaign. The majority of respondents recalled seeing or hearing conservation tips in the past six months. Results suggest that residents who previously watered every day, water every other day post-campaign.

In addition to its conservation outreach campaign, CLWA has a water-efficient landscape demonstration garden open to the public and which hosts about 60 school classes each year. CLWA also maintains an active website and Facebook page with water saving tips for residents and businesses, conservation checklists and program and incentive information.

#### 7.2.2.2 School Education

Started in 1993, CLWA's award-winning Education Program is dedicated to helping students in school learn through age-appropriate programs, from kindergarten all the way through high school. The program provides hands-on field trips and in-class presentations for elementary and junior high school students at public and private schools in the Santa Clarita Valley (Table 7-1). In 2008, CLWA provided almost 350 class presentations and hosted 14 teacher workshops. In addition to the presentations and field trips, CLWA's Education Department administers the local high school Water Challenge scholarship program, which is open to students in grades 9 through 12. Through 2010, the Education Program has educated more than 104,000 students about the importance of efficient water use.

**TABLE 7-1**
**SCHOOL EDUCATION (NUMBER OF STUDENTS)**

| Grade Level | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|
| K - 3 | 5,677 | 7,320 | 6,290 | 6,686 | 7,296 |
| 4 - 6 | 3,753 | 4,872 | 4,195 | 4,768 | 5,212 |
| 7 - 8 | 798 | 1,102 | 1,345 | 1,210 | 315 |
| 9 - 12 | 0 | 223 | 141 | 40 | 491 |
| **Totals** | **10,228** | **13,517** | **11,971** | **12,704** | **13,314** |

## 7.3 Regional BMP Implementation

In 2001, the CLWA Board approved signing the CUWCC's MOU on behalf of both the wholesale and retail service areas (CLWA and SCWD), thus meeting one of the recommendations of the 2000 UWMP. Los Angeles County signed the MOU prior to the 2000 UWMP on behalf of all its Waterworks Districts; NCWD signed the MOU on its own behalf in September 2002 and VWC signed in 2006. In 2009, the CUWCC changed its policy to specify that each signatory had to join individually and that a wholesaler could no longer be a signatory on behalf of its retailers.

The following sections provide a summary of the BMP status of the retail purveyors, in addition to the SCVWUESP activities.

## 7.4 Santa Clarita Water Division

Programs and planning efforts that focus on demand management have increased significantly since the 2005 UWMP. These efforts have been both by SCWD individually as well as regional approaches that involve CLWA and the retailers.

In 2001, the CLWA Board approved signing the CUWCC's MOU for both the wholesale and retail service areas (CLWA and SCWD). Since that time, SCWD has been reporting and filing BMP reports as a signatory. SCWD filed BMP reports through 2008. In 2009, the CUWCC changed its policy to specify that each signatory had to join individually and that a wholesaler could no longer be a signatory on behalf of its retailers. As a result, SCWD is no longer included as member of the CUWCC.

SCWD developed a Water Conservation Plan (WCP) in April 2009 to complement the SCVWUESP adopted by the CLWA Board of Directors in February 2009. In its WCP, SCWD recognizes the need to implement the urban water conservation BMPs as described by the CUWCC and identify additional conservation measures that could accelerate savings in the SCWD service area. The WCP identified the elements, processes, costs, staff resources and activities to further promote conservation and further complement the SCVWUESP. The WCP also identified activities not addressed in the regional plan.

SCWD is implementing all of the Foundational BMPs as required in the revised MOU and UWMP Act. The Programmatic BMPs are being implemented through a GPCD approach. The BMP and SBX7-7 goals and implementation plan are discussed further in Sections 7.4.2 and 7.4.3.

The following sections describe the various programs and conservation activities currently being implemented by SCWD.

### 7.4.1 Foundational BMPs

#### 7.4.1.1 Utility Operations

Conservation Coordinator

SCWD's conservation program is staffed in various ways. Internally, management, administration and oversight are the responsibility of the Associate Water Resources Planner. In addition, SCWD has helped fund a conservation coordinator position at CLWA since 2004; this position supports regional planning and implementation. SCWD also utilizes consultant services to support program planning and management as well as to implement the various programs including residential landscape training as well as residential, CII and large landscape audits.

Water Waste Prevention

SCWD supports water waste prevention activities through both direct Board activities and in collaboration with the City of Santa Clarita.

On September 10, 2008, the CLWA Board of Directors signed Resolution No. 2605 declaring an Agency-wide water supply and conservation alert. The resolution encourages residents to follow the Voluntary Water Conservation Action Plan (Plan) and achieve a ten percent overall reduction in water demand. The Plan establishes voluntary water conservation measures to be taken by residents and businesses and includes a set of guidelines and recommendations for both indoor and outdoor water use improvements.

SCWD is also actively supporting the City and County in establishing terms of service for water efficient design in new development, complaint with AB 1881. SCWD participates in compliance review of new water efficient landscaping requirements, reviewing the Water Efficient Landscape Worksheet (WELW) and, after a project is completed, conducting periodic audits and tracking consumption to ensure the project remains in compliance with the water allowance requirements.

SCWD also has a Water Shortage Contingency Plan (see Appendix F) and works closely with the City and County in supporting all local ordinances that prohibit water waste.

Water Loss Control

SCWD monitors its water losses on a monthly basis. Production losses in 2008 and 2009 were estimated at 7.9 and 6.0 percent, respectively. SCWD has completed AWWA's M36 Water Loss analysis, which consists of a component analysis of leaks into "revenue" and "non-revenue" categories, among others, and an economic analysis of recoverable loss. SCWD's M36 'Reporting Worksheet' for 2009 is provided in Appendix E.

Results of the preliminary analysis show a water audit data validity score of 64 and an Infrastructure Leakage Index (ILI) of 3.79. A validity score between 51 and 70 indicates that the validity of the data is reasonable, with opportunity for improvement. According to general guidelines, an ILI between 3 and 5 is appropriate when water resources can be developed or purchased at a reasonable expense; existing water supply capability is sufficient to meet long-term demand as long as reasonable leakage management controls are in place; and water resources are believed to be sufficient but demand management measures are included in long-term planning. The audit highlights some strengths and weaknesses of the system. SCWD is evaluating the preliminary results and recommendations of the audit.

Metering with Commodity Rates for all New Connections and Retrofit of Existing Connections

All of SCWD's customers are metered and billed volumetrically. Commercial, industrial and institutional accounts and parks are encouraged to have dedicated irrigation meters, and many do. In addition, SCWD has identified the Automated Meter Reading (AMR)/ Advanced Metering Infrastructure (AMI) technologies as a conservation priority. This technology is being implemented and will be very helpful in identifying leaks, mitigating losses, and monitoring customer usage.

Retail Conservation Pricing

All of SCWD's customers are metered and billed monthly. On January 1, 2010, SCWD migrated its residential customers to a tiered rate structure and its landscape customers to a fixed rate set at the highest tier rate.

Since 2007 the proportion of revenue from fixed charge has met the BMP requirement of not to exceed 30 percent. Table 7-2 shows the portion of revenues that come from fixed charges. Total revenue includes meter, consumption, energy, purchased water and other small miscellaneous charges. Note that 2010 data are only through September and do not reflect a full year's revenue; SCWD expects to meet the threshold requirements once a full year's data is incorporated.

**TABLE 7-2**
**REVENUE**

| Operating Revenues | 2007 | 2008 | 2009 | 2010[(a)] |
|---|---|---|---|---|
| Fixed Charges | $ 5,880,400 | $ 6,282,400 | $ 6,354,900 | $ 5,500,100 |
| Volumetric Charges | $ 13,629,600 | $14,401,100 | $ 15,516,300 | $12,261,800 |
| **% Fixed Charges** | **30%** | **30%** | **29%** | **31%** |

Note:
(a) Reflects revenues only through September 2010. BMP requirement anticipated to be met with complete 2010 revenue accounted for.

### 7.4.1.2 Education

Public Information Programs

SCWD provides informational materials to customers through media events, neighborhood expos and other activities (Table 7-3). SCWD also communicates with its customers in coordination with CLWA through a variety of media outlets including Santa Clarita Valley TV, billboards, newspapers, magazines, radio, paid advertising, bill inserts, its website (http://www.scwater.org/) and public service announcements. Conservation messages are also included on customers' monthly bills. Two tips ran in October and December 2008 and one ran on every bill issued in 2009. In 2009 SCWD instituted an automatic calling campaign to alert its customers of dry conditions and the importance of conservation. Almost 70,000 calls were made between December 2009 and October 2010.

**TABLE 7-3**
**SCWD OUTREACH EVENTS**

| 2009 | 2010 |
|---|---|
| Earth Day | Earth Day |
| Home and Garden Expo | Water Awareness |
| Water Awareness | River Rally |
| River Rally | Make a Difference Day |
| Neighborhood Expo (3): Canyon County, Saugus, Newhall | Realtors' Breakfast |
| Emergency Expo | |

School Education Programs

SCWD implements its school programs in coordination with the CLWA, reaching almost 6,400 students a year since 2007 (Table 7-4). The CLWA's award winning program is available to grades K through 8 and includes in class presentations and field trips. See Section 7.2.2.2 for more information on CLWA's school programs.

**TABLE 7-4**
**SCHOOL EDUCATION (NUMBER OF STUDENTS)**

| Grade Level | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|
| K - 3 | 2,474 | 2,694 | 3,300 | 2,947 |
| 4 - 6 | 2,656 | 1,600 | 2,412 | 2,063 |
| 7 - 8 | 335 | 860 | 605 | 94 |
| 9 - 12 | 63 | 141 | 40 | 348 |
| **Totals** | **5,528** | **5,295** | **6,357** | **5,452** |

## 7.4.2 Programmatic BMPs

Prior to 2007, SCWD focused most of its conservation programs on the Foundational type of activities. In 2007, SCWD starting expanding its programs by incorporating incentives and other elements. In 2009, the SCVWUESP was adopted by the CLWA Board of Directors in February and SCWD developed its own Water Conservation Plan (WCP) in April. These documents set, for the first time, water savings goals, identified activities to meet the goals and developed a long-term conservation program. In its WCP, SCWD recognizes the need to implement the BMPs and identify additional conservation measures that could accelerate savings in the SCWD service area.

The majority of SCWD's programmatic BMPs are being implemented in collaboration with CLWA. In order to maintain consistency the SBX7-7 planning process, SCWD has chosen the GPCD alternative for complying with the MOU.

The following sections describe the programs being implemented in the service area.

### 7.4.2.1 Residential Programs

The largest customer class in the SCWD service area is residential, accounting for approximately 90 percent of customers and 70 percent of total use. SCWD has about 21,200 SF and 4,700 MF residential accounts. SCWD is focusing the majority of its conservation efforts on residential use.

1) **Residential Audit Program**
   SCWD's indoor residential audit program is structured to respond to customer requests but does not currently actively promote indoor audits. SCWD provides water conservation items that include low-flow showerheads, conservation materials, hose nozzles and aerators. These items are provided at festivals, fairs and other events, and are available for pick up at the SCWD office. This distribution program started in 2008; SCWD distributed about 600 conservation items in 2009 and 2010.

2) **Landscape Training and Incentive Program**
   Residential landscapes are a significant use in SCWD's service area. SCWD is working with CLWA to offer a program that combines training and fixtures in the form of landscape classes and WBICs to its residential customers. The program offers homeowners and gardeners free landscape classes; after residents or their gardeners complete the training, they receive free WBICs. They also receive free inspections of their WBIC installations and programming to ensure they are properly installed and programmed. The classes are offered in both English and Spanish and have been very

popular with residents. At the end of 2010, six classes were held and 70 WBICs have been installed and inspected within the SCWD service area.

SCWD has focused its landscape surveys on its largest users, although all customers are welcome. These are typically homeowners associations (HOAs). HOA customers with dedicated irrigation meters are classified as "irrigation" customers rather than "residential" and the program is designed to develop an appropriate water budget and help them implement it. The program is further described in Section 7.4.2.3.

**3) High Efficiency Toilet Rebate Program**

The SCVWUESP estimates that in 2008 about 62 percent of residential toilets used 1.6 gallons per flush or less. A program at least as effective as a retrofit on resale, which is the BMP threshold, requires SCWD to provide about 200 rebates per year. SCWD is currently participating in CLWA's HET voucher rebate program and has provided 900 rebates since 2007, almost 70 percent of which were rebated in 2010. The program has been ramping up steadily and the goal is to provide 600 rebates a year. Incentives valued at $115 are provided for HETs replacing models that flush at 3.5 gpf or more.

In addition, SCWD will be realizing the benefits of SB 407, effective January 1, 2014. SB 407 requires that all pre-1994 residential, multi-family and commercial customers replace non-compliant plumbing fixtures (including toilets, faucets, and showerheads) with water-conserving fixtures when making certain improvements or alterations to a building. By 2017, all single-family homes must replace non-compliant plumbing fixtures and by 2019 all multifamily and commercial buildings must have compliant water-conserving plumbing fixtures in place.

**4) WaterSense Specification for New Residential Development**

SCWD is working closely with the City of Santa Clarita's response in its development and implementation of landscape requirements that comply with AB 1881.

SCWD is supporting adoption of the 2010 California Green Building Standards Code, which went into effect January 2011. The Code sets mandatory green building measures, including a twenty percent reduction in indoor water use, as well as dedicated meter requirements and regulations addressing landscape irrigation and design. Local jurisdictions, at a minimum, must adopt the mandatory measures; the Code also identifies voluntary measures that set a higher standard of efficiency, which can also be adopted. SCWD will review the proposed standards and determine the most appropriate approach.

#### 7.4.2.2 Commercial, Industrial, and Institutional (CII) BMPs

CII use does not account for a large portion of consumption in SCWD's service area. SCWD has about 840 CII accounts which use about 1,900 AFY, or 7 percent of total use.

In FY 2010/11 the CLWA began implementing a CII Audit and Customized Incentive Program which offers comprehensive water audits with follow-up reports that provide recommendations, information on costs, savings, payback and other implementation-oriented information. The program targets high use and high savings potential customers such as amusement parks, colleges and universities, hotels and hospitals. Recommendations include both site-specific and general opportunities. The key decision makers are identified and contacted to enlist

participation. The goal is to tailor the amount of incentive to the water savings based upon the findings of the audit. Customers are eligible to receive financial incentives to offset any investments in water use efficiency in the amount of up to $300 per AF of water saved.

To date forty large water users have been contacted and twenty within SCWD service area are moving forward.

#### 7.4.2.3 Landscape

SCWD encourages installation of dedicated irrigation meters on all commercial, industrial and institutional accounts, parks and city landscaping. SCWD has 864 dedicated irrigation accounts, the majority of which are HOAs.

SCWD is working on developing water budgets for all its dedicated irrigation accounts; to date 188 accounts have water budgets. The budgets are developed based on historical water use data, landscape acreage and the Maximum Applied Water Allowance as defined by DWR. If the accounts exceed their budgets, SCWD contacts the customer with offers of a free audit, nozzles and/or WBICs (when available) as well as a free walk-through with the landscape contractor followed up with a report containing findings and recommendations.

SCWD is also participating in the CLWA-sponsored large landscape program which offers audits to its large landscape customers. Currently forty sites are enrolled; eighteen are within the SCWD service area where the focus is on HOA customers. The program offers large landscape customers such as HOAs, parks and landscape maintenance districts the opportunity to receive free water-use and cost-benefit analysis reports, free workshops for property management and landscapers and rebates for water-saving measures and devices. Customers are also eligible to receive financial incentives to offset any investments in landscape efficiency in the amount of up to $300 per AF of water saved. CLWA works with its retailers to select sites that meet the large landscape specifications.

To date, five sites have final reports; one site has completed recommended infrastructure modifications and has received the rebate based on an estimated potential savings of 4.21 AFY. The others will complete modifications throughout 2011 and 2012.

### 7.4.3 SCWD DMM and SBX7-7 Implementation Plan

SCWD recognizes the need to expand conservation programs and efforts in order to meet both its SBX7-7 and DMM requirements.

The SBX7-7 baseline and target calculations are addressed in Chapter 2. The DMM GPCD goals, shown in Table 7-5 are determined by calculating the following:

1. *Baseline GPCD = average annual Potable Water GPCD for the years 1997 through 2006*

2. *2018 GPCD Target = Baseline GPCD multiplied by 0.82 (an 18% reduction)*

3. *Biennial GPCD Targets = Baseline GPCD multiplied by that year's Target (% Baseline). A retail water agency may choose a starting point as either its Baseline GPCD or its 2006 Potable Water GPCD.*

**TABLE 7-5**
**DMM GPCD TARGET CALCULATIONS**

| Year | Per Capita Water Use (GPCD) |
|---|---|
| 1997 | 237 |
| 1998 | 210 |
| 1999 | 247 |
| 2000 | 242 |
| 2001 | 234 |
| 2002 | 251 |
| 2003 | 232 |
| 2004 | 239 |
| 2005 | 227 |
| 2006 | 229 |
| **Baseline** | **234** |
| **Target (2018)** | **192** |

Compliance is evaluated in relation to the Compliance Table below (Table7-6) and relative progress toward the goal will be acknowledged in Council Compliance Reports. The compliance tables are read as five increments with reporting goals relative to their first through fifth Compliance reports.

**TABLE 7-6**
**ANNUAL COMPLIANCE TARGETS (IN GPCD)**

| Year | Compliance Report | Target | Highest Acceptable Bound |
|---|---|---|---|
| 2010 | 1 | 220 | 234 |
| 2012 | 2 | 217 | 225 |
| 2014 | 3 | 209 | 217 |
| 2016 | 4 | 200 | 209 |
| 2018 | 5 | 192 | 192 |

The GPCD option for MOU compliance and the SBX7-7 targets are consistent with one another (Table 7-7) and SCWD is utilizing the SCVWUESP as well as its own WCP to implement programs that meet these goals.

**TABLE 7-7**
**COMPLIANCE TARGETS**

| | | Target GPCP | | |
|---|---|---|---|---|
| | **Baseline GPCD** | **2015** | **2018** | **2020** |
| MOU/AB 1420 | 234 | | 192 | |
| SBX7-7 | 235 | 211 | | 188 |

In the 2008 SCVWUESP, a comprehensive assessment of SCWD's demographics, levels of past conservation, age of housing, natural turnover, the effects of plumbing codes and more was completed to determine the potential of future conservation activities and programs.

SCWD has already begun implementing five of the seven programs identified in the SCVWUESP: HET rebates (Single family), large landscape audits (with incentives), CII audits and customized incentives, landscape contractor certification and valley-wide marketing; HET clothes washer rebates and multi-family HET rebates are planned for implementation in 2011.

Both the regional SCVWUESP and SCWD's WCP recognize the need to expand conservation programs and efforts. The adoption of SBX7-7 has increased the urgency for implementation. CLWA is in the process of reviewing its incentive programs and SCWD is currently working with CLWA as well as the other purveyors to identify programs that could be implemented regionally.

The programs identified to meet future requirements combine financial incentives, regulation and information elements, and building onto existing activities. Included in the programs being considered for implementation are the following:

**Financial Incentives**

1) High-Efficiency Clothes Washers (HECWs): Clothes washer rebates are on the list of programs identified for implementation in the SCVWUESP. CLWA will be expanding its program to include clothes washer rebates in FY 2011/12 and SCWD will participate.

2) Zero and Low-Flow Urinal Rebates: Rebates will include CII fixtures such as zero consumption and ultra low volume urinals as well as CII specific HETs. This program will launch in FY 2011/12.

3) Expansion of fixture rebates to CII and Multi-family customers: Currently the toilet rebate program is only available to single-family residential customers. Starting 2011, the programs will be expanded to all customers and there will be increased focus on marketing to large HOA accounts.

4) Expand rebates to include a larger variety of fixtures: Being considered for inclusion are hot water distribution tanks, pressurized water brooms and high-pressure spray nozzles.

5) Cash for Grass Rebate: Customers will be provided with an incentive of up to $1 per acre-foot of turf removed and replaced with landscape appropriate plants. The program is being considered for both residential and CII customers.

6) Expansion of large landscape program: The purveyors will be evaluating the effectiveness of the current landscape program in FY 2011/12 and adjusting depending on the results. If the program is found to be successful at meeting reduction targets, the program will be accelerated and more devices will be offered, such as Precision Nozzles.

**Building Code/New Standards**

The SCVWUESP developed a comprehensive list of new building standards, beyond those currently in code. Code changes that improve the efficiency of fixtures and design account for about 60 percent of the expected reduction in demand, and will therefore be a significant program priority. Some of the changes proposed will be captured in the State Model Efficient Landscape Ordinance effective January 2010, CAL Green Building Code adopted January 2011, and SB 407 and standard updates for toilets and washers that are being phased in.

**Information/Tracking**

Information and tracking represents a new element to the existing programs focusing on collecting and processing information and ensuring that the programs are on track to meet the goals. These activities will also help in program design by providing more robust information about customers and their water use patterns. The immediate priorities include:

1) Automatic Meter Reading (AMR): SCWD has identified AMR as a priority in its WCP and critical to obtaining real time data for water usage and utilizing it to identify customer-side leaks. This information can also help SCWD monitor the impacts of existing programs, make adjustments where necessary and develop new programs.

2) Water Use Tracking Tools: Another WCP priority, SCWD plans to design and develop database tracking tools for water savings associated with its conservation plans and increase flexibility by adding or changing program elements.

SCWD is developing a plan that includes accelerating the current programs, adding additional elements that include programmatic, regulatory and information-based activities to meet the requirements of SBX7-7. This planning process was started in 2010 and implementation will begin in 2011.

**Evaluating Effectiveness of the DMMs**

SCWD will continue to track all program activities including outreach activities, rebate distribution and audits. Program effectiveness and per capita use will be monitored through the billing and consumption system.

**Impacts of Conservation**

It is not expected that, at this time, the conservation programs currently being implemented or scheduled for implementation will have any significant negative effect on water use within SCWD's service area or affect SCWD's ability to further reduce demand. The funding for current and future programs is being identified.

**Economic Impacts**

Analysis of the requirements for BMP compliance yields program costs of roughly $500,000.

## 7.5 Valencia Water Company

VWC recognizes that conserving water is an integral component of a responsible water strategy and is committed to providing education, tools and incentives to help its customers reduce the amount of water they use. VWC is implementing programs locally as well as leveraging the conservation resources available through CLWA. In 2006, VWC became a signatory to the CUWCC MOU, establishing a firm commitment to the implementation of the BMPs or DMMs. Prior to signing the MOU, VWC had been actively engaged in conservation and implemented several of the CUWCC recommended conservation programs.

In 2007, VWC coordinated the development and execution of a MOU with the other retail water purveyors and CLWA to prepare the SCVWUESP. VWC served as the project administrator for

the Santa Clarita Valley water suppliers in developing the SCVWUESP. The SCVWUESP recommended programs to reduce the overall valley wide water demand by ten percent by 2030 (see Section 7.2 for more information), but also included more aggressive programs to achieve greater demand reductions at an accelerated pace. These programs were designed to provide Valley residents and businesses with the tools and education to use water more efficiently.

Since 2002, VWC's focus on demand management has continued to increase. In addition to the activities identified in the SCVWUESP, VWC has implemented a number of other conservation activities to meet the requirements of the MOU and SBX7-7 goals. VWC has an internal Water Use and Energy Efficiency Plan (WUEEP). The WUEEP provides a broad framework defining VWC's conservation policies as well as detailed conservation programs. The WUEEP is reviewed annually and updated every three years.

VWC is implementing all of the Foundational BMPs as required in the revised MOU and UWMP Act. The Programmatic BMPs are being implemented through a GPCD approach. The BMP and SBX7-7 goals and implementation plans are discussed further in Section 7.5.2 and 7.5.3.

The following sections describe the various programs and conservation activities implemented by VWC.

## 7.5.1 Foundational BMPs

### 7.5.1.1 Utility Operations

Conservation Coordinator

VWC has had a full-time conservation coordinator since 2005 and added a second in 2009; there are currently two full-time equivalent (FTE) positions dedicated to conservation. The coordinators manage BMP implementation and other water conservation implementation and planning activities. VWC also utilizes consultant services to implement the various programs including water audits, landscape training and public outreach. In the future, VWC plans to establish a third conservation position to focus on CII activities.

Water Waste Prohibition

VWC operates under CPUC-approved rules that include Rule No. 14.1, the Water Conservation and Rationing Plan, and Rule 11, Discontinuance and Restoration of Service.

Rule 11, Discontinuance and Restoration of Service, allows the company to restrict and/or disconnect water service for customers using water in a wasteful manner.

The PUC's methodology for water utilities to implement water conservation plans is documented in Standard Practice U-40-W, "Instructions for Water Conservation, Rationing, and Service Connection Moratoria." Water shortage contingency plans must be approved by the PUC prior to implementation by VWC. As stated in the Standard Practice U-40-W, the PUC shall authorize mandatory conservation and rationing by approving Schedule No. 14.1, Mandatory Water Conservation and Rationing. Schedule No. 14.1 sets forth water use violation fines, charges for removal of flow restrictors, and the period during which mandatory conservation and rationing measures will be in effect.

Water Loss Control

VWC's overall water delivery system is relatively new with a weighted average plant in service life of 11 years. As a newer system, VWC doesn't experience a significant amount of water loss. Nonetheless, VWC conducts quarterly pre-screening system audits which calculate verifiable use as a percent of total production. VWC's historic annual water loss since 2000, as a percent of total production, ranged from one to seven percent.

VWC has completed AWWA's M36 Water Loss analysis, which consists of a component analysis of leaks into "revenue" and "non-revenue" categories, among others, and an economic analysis of recoverable loss. VWC's M36 'Reporting Worksheet' for 2009 and 2010 are provided in Appendix E. Results of the preliminary audits show a water audit validity score of 89 for both 2009 and 2010 and ILI of 0.62 and 0.20 for 2009 and 2010, respectively. VWC intends to refine and improve its assumptions used per M36 manual as its system expands and matures.

VWC's maintenance program also helps minimize water losses. This program helps keep the VWC production system in optimal condition, thus reducing water losses. This program includes, among other things, daily inspections of water wells and pumping equipment, weekly inspections of water tanks and exercising critical system valves. VWC also calibrates its production meters annually.

When a leak occurs, VWC responds quickly to isolate the leak and repair it. VWC tracks leaks in its GIS system, which gives it the ability to visually monitor leak locations and identify potential problem areas or trends.

VWC's meter change-out program replaces its older water meters on a regular basis to ensure metering accuracy. Based on AWWA standards and VWC's experience, this program targets change-outs at 15 years or less.

Metering with Commodity Rates for all New Connections and Retrofit of Existing Connections

All of VWC's customers are metered and billed volumetrically on a monthly basis.

Monthly water allocations (i.e., water budgets) were introduced in late 2009 under the new WaterSMART Allocation program, in which individually metered residential customers receive their monthly allocations on billing statements. In, 2011 a tiered pricing structure based on WaterSMART allocations was implemented.

Retail Conservation Pricing

On February 1, 2011 VWC changed its single volumetric rate structure to a tiered structure (Table 7-8). The tiered system was designed to support the WaterSMART Allocation (WSA) program, which sets customer specific allocations for all individually metered residential customers. Starting in 2009, customer bills included information on their allocation, allowing time for acclimation to the new approach before it was fully implemented with tiered rates in 2011.

The rate structure is designed to provide support and encourage appropriate use. If a customer's water use is within the designated "efficient" range for their allocated volume, the customer is charged standard rates. If the customer uses less than the efficient limit, the

customer is charged at a lower rate and, conversely, if the customer uses more, the customer is charged at the higher rates. There are five (5) tiers, ranging from Super Efficient at $1.144/CCF to Wasteful at $2.878/CCF. Customers are encouraged to access their allocation and billing information on the company's website.

Residential class customers were the first to be placed on WSA and the tiered rate structure as this group represents approximately 54 percent of VWC's total consumption. Dedicated landscape irrigation meters, including those at CII customer locations will be placed on WSA with a tiered rate structure in 2012. VWC will evaluate the challenges of migrating the remaining customer classifications to WSA and tiered rates in the future.

**TABLE 7-8**
**QUANTITY RATES AND SERVICE CHARGES**

| | | Quantity rates: |
|---|---|---|
| **Tier Name** | **Level** | **Rate per 100 cubic feet** |
| Super Efficient | Tier 1: Indoor monthly water allocation | $1.144 |
| Efficient | Tier 2: Outdoor monthly water allocation (Tiers 1+2=100% of monthly allocation) | $1.362 |
| Inefficient | Tier 3: 101% to 150% of monthly water allocation | $1.703 |
| Excessive | Tier 4: 151%-200% of monthly water allocation | $2.214 |
| Wasteful | Tier 5: Use in excess of 200% of monthly water allocation | $2.878 |
| Non-residential | (not applicable) | $1.362 |

The proportion of revenue from volumetric charges meets the BMP requirement at about 71 to 73 percent (Table 7-9).

**TABLE 7-9**
**REVENUE**

| | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|
| Fixed Charges | NR | $5,258,800 | $6,122,000 | $6,150,500 | $6,153,500 |
| Volumetric Charges | NR | $13,921,300 | $14,788,900 | $14,784,500 | $15,287,500 |
| Total Revenue | NR | $19,180,100 | $20,910,900 | $20,935,000 | $21,441,000 |
| **% Volumetric** | **NR** | **73%** | **71%** | **71%** | **71%** |

### 7.5.1.2 Education

Public Information

VWC implements public outreach in coordination with CLWA. See Section 7.2.2.1 for detail on specific programs administered by CLWA.

In addition to the regional activities, VWC provides information on efficient water use on customer bills and on its website. Bills show current water usage in comparison with the previous year's usage for that period, and for residential customers it shows their WaterSMART allocations. VWC maintains an active website that provides information on the various programs available to customers, conservation tips, links and full details on the WaterSMART program. In addition, VWC representatives promote conservation at local special events,

including the Emergency Expo, Earth/Arbor Day, CLWA Water Awareness, River Rally and Make a Difference Day. Outreach activities are summarized in Table 7-10.

**TABLE 7-10**
**SUMMARY OF OUTREACH ACTIVITIES**

| Item | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|
| Bill Inserts / Newsletters / Brochures | NR | 0 | 1 | 2 | 1 |
| Bill showing current water usage in comparison with prior year usage | NR | Yes | Yes | Yes | Yes |
| Special Events | NR | 4 | 4 | 3 | 4 |
| Program to coordinate with other government agencies, industry, public interest groups and media | NR | Yes | Yes | Yes | Yes |

School Education

VWC's school education program is implemented in coordination with CLWA at no cost to school districts. The CLWA's award winning program is available to grades K through 12 and includes in class presentations and field trips (Table 7-11). See Section 7.2.2.2 for more information on CLWA's school programs.

VWC previously contracted with Resource Action Programs, partnering with Southern California Edison (SCE) and Southern California Gas Company (SCGC) to implement the Living Wise Program. This program was designed to teach communities about conservation and increase environmental awareness. Sixth graders received Resource Action Living Wise Activity Kits, which enabled them to perform home water/energy audits. The program was active thru mid-2009.

**TABLE 7-11**
**SCHOOL EDUCATION (NUMBER OF STUDENTS)**

| Grades | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|
| K-3 | 1,984 | 3,501 | 2,372 | 2,115 | 3,016 |
| 4 - 6 | 1,559 | 1,593 | 1,895 | 1,577 | 2,176 |
| 7 - 8 | 527 | 737 | 485 | 350 | 0 |
| 9 - 12 | 0 | 160 | 0 | 0 | 143 |
| **Totals** | **4,070** | **5,991** | **4,752** | **4,042** | **5,335** |

## 7.5.2 Programmatic BMPs

VWC is pursuing a GPCD approach to complying with the Programmatic BMPs. The following section describes VWC program activities.

### 7.5.2.1 Residential Programs

Almost 54 percent of VWC's total water use is residential, the majority of which are single-family accounts.

**1) Residential Survey and Retrofit Programs**

VMC has two programs that address residential surveys, – a traditional audit program and a leak only audit – to best address specific customer needs, increase responsiveness and improve water use efficiency.

Since 2007, VWC has offered a free residential water audits to its residential customers, which include both an indoor and landscape element. The program is administered and implemented by a consultant. Customers are notified of the program by consultant outreach efforts, VWC referrals and advertisement on VWC's website, reception area and at community events. The goals of the program are to provide customers with a better understanding of their water use; identify inefficient uses; and offer incentives for replacement of high-water use devices such as toilets and WBICs. The number of surveys that were conducted is summarized in Table 7-12.

In addition to the full audit, VWC initiated a supplemental program in January 2011 to specifically address leaks. This program was developed to be cost-effective, and to respond quickly and mitigate unnecessary losses resulting from leaks and other unintentional water consumption. In order to better serve its customers, VWC combines smart Automated Meter Reading (AMR) and current manual read systems to notify customers when their consumption has either registered higher than normal or if continuous flow has been detected by the meter (alerts automatically occur when the meter registers continuous flow for 24 consecutive hours). VWC customers can respond to the notification by requesting a Leak Only audit or a full residential audit to assist with the identification and quantification of the abnormal water use and to provide instructions to stabilize or reduce consumption.

VWC's device distribution programs have continued over the years (Table 7-12); devices are distributed as part of the surveys as well as through community events and the Living Wise program (described below). Devices include low-flow showerheads and aerators. In addition, CLWA distributes free water-saving devices to Valley residents at community events.

VWC previously benefited from audits conducted by students through the Living Wise Program in schools (see Section 7.5.1.2). The Living Wise surveys are each counted as the equivalent of one-third of a survey in terms of BMP reporting (only indoor use is evaluated in the program). The program was active through 2009.

**TABLE 7-12**
**RESIDENTIAL SURVEYS AND RETROFITS**

| | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|
| **Single Family Accounts** | | | | | |
| Surveys Offered | NR | 2,520 | 13,969 | 4,308 | 20,901 |
| Surveys Completed | NR | 542 | 813 | 528 | 238 |
| **Multi-Family Accounts** | | | | | |
| Surveys Offered | NR | 0 | 156 | 0 | 0 |
| Surveys Completed | NR | 0 | 126 | 0 | 0 |
| **Devices** | | | | | |
| Showerheads | NR | 1,583 | 2,357 | 1,303 | 460 |
| Aerators | NR | 3,154 | 4,610 | 2,473 | 564 |

Audit and retrofit program participation is tracked through a manual spreadsheet; water savings are estimated at 32 AFY.

2) **Residential Landscape Water Survey Program**
VWC has identified landscape conservation as a priority program and has developed various tools to address irrigation use. Section 1) above describes the residential water audit programs, including both the full audit and leak only programs, which are a combined indoor and landscape audit. In addition to those programs, VWC is working with CLWA to offer a program that combines training and fixtures in the form of landscape classes and WBICs to its residential customers.

The CLWA sponsored WBIC program began in 2009. It offers homeowners and gardeners free landscape classes and, after residents or their gardeners complete the training, they receive free WBICs. The classes have been very popular with Valley residents. Classes are offered in both English and Spanish and, after completing the training, attendees, as well as their gardeners, receive official certification for attending the workshop and committing to water efficient practices at their sites. VWC is working with CLWA and the other retailers to track program participation and actual water savings in this first year of the program, and will make adjustments to the program as necessary.

For VWC customers who take the CLWA class and receive a WBIC, VWC provides free installation and programming service, which is not part of the CLWA program. At the end of 2010, there have been six classes, and 70 WBICs that have been distributed to VWC customers through the CLWA WBIC program. VWC has installed four of these WBICs through this program in December 2010. VWC encourages participation in CLWA's program.

From 2007 to late 2010, VWC held landscape irrigation courses and provided free WBICs, including installation, to customers with irrigated areas greater than 2,500 square feet. VWC terminated the WBIC program during 2010 to gain efficiencies by combining this program with the CLWA WBIC program. The VWC standalone WBIC program resulted in 338 installed WBICs at customer homes over the four years of the program. Additionally, since 2007 VWC has required developers to install WBICs in all new residential homes constructed in its service area.

3) **WaterSense Specification Toilets**
VWC and CLWA both offer rebates to VWC customers for purchase and installation of high-efficiency toilets (HETs) using 1.28 gpf or less. Rebates are up to $115 for homes built before 1993, or $50 for homes built after that year.

A summary of rebates that have been issued is provided in Table 7-13.

**TABLE 7-13**
**TOILET REBATE AND REPLACEMENT PROGRAMS**

| Type | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|
| **Single-Family** | | | | | |
| HET Rebate | NR | 33 | 110 | 477 | 1,200 |
| **Multi-Family** | | | | | |
| HET Distribution | NR | 0 | 87 | 0 | 0 |

Customers are notified about the program through advertising in the lobby, high bill inquiries, water audits consultants, community events, in-store promotions and through VWC website; the program is also marketed regionally by CLWA. Program participation is being tracked through VWC. VWC is exceeding the BMP requirement by about 270 retrofits per year, and estimates that the program will provide about 300 AF of water savings (cumulative) through 2020. Additionally, in 2008 VWC provided a one-time incentive at a multi-family senior center complex and replaced 87 toilets with 1.28 gallons per flush HETs.

In addition to the rebates, VWC will be realizing the benefits of SB 407, effective January 1, 2014. SB 407 requires installation of water-conserving plumbing fixtures (including toilets, faucets, and showerheads). The saturation rate of conservation fixtures will be accelerated by compliance with SB 407. This regulation requires all residential, multi-family and commercial customers with pre-1994, non-compliant fixtures to replace them with water-conserving fixtures when making certain improvements or alterations to a building. By 2017, all single-family homes must replace non-compliant plumbing fixtures and, by 2019, all multifamily and commercial buildings must have compliant water-conserving plumbing fixtures in place.

#### 7.5.2.2 Commercial, Industrial, and Institutional (CII)

CII water use accounts for about 44 percent of VWC's total water use. These accounts have been identified and ranked by water use.

VWC has identified approximately 1,250 meters in its CII accounts that are dedicated to irrigating landscapes. During 2011, simply as an administrative procedure, VWC will move these metered accounts from CII to Landscape customers. Regardless of the current customer classification, VWC will target its Large Landscape conservation programs to all meters that are dedicated to landscape irrigation, including those currently included in CII.

VWC provides free audits for CII customers through CLWA's Water Checkup Program (Table 7-14). The audits focus on five areas: irrigation, plumbing fixtures, cooling towers (HVAC systems), manufacturing processes and other efficiency opportunities. After audits are completed, reports are created that summarize findings and suggestions and these are discussed in-person with the customers. Customers that complete and implement the recommended conservation upgrades are eligible for $300 per AF saved rebates. Five industries with the most promising opportunities to provide water savings have been targeted for the program:

- Amusement Park
- Colleges and Universities
- Hotels (Hospitality Industry)
- Hospitals
- Restaurants

Prior to the Water Checkup Program VWC provided free indoor and landscape water audits to CII customers through a program that ended in mid-2009 (Table 7-14). The audit included testing equipment, reviewing water use patterns and sharing water use efficiency information

with the customer. After the audit, the customer received a report identifying water efficiency opportunities, recommending courses of action, estimating water savings, and providing a cost benefit analysis. The recommended efficiency measures included devices such as pre-rinse spray nozzles, efficient toilets and urinals, cooling tower conductivity controllers, high-efficiency clothes washers, irrigation clock management and use of drought tolerant plants. Audits were provided to a wide variety of customers including restaurants, schools, hotels, manufacturing companies and others.

Customers are notified about the CLWA program through VWC's website, referrals by VWC and through direct contacts from the contractor. Program participation and estimated savings for 2010 are tracked by CLWA; prior to 2010, the program participation was tracked by VWC. Limited follow-up for the CII surveys occurred during the transitional years 2009 and 2010. The CLWA program includes follow-up, so VWC anticipates customers receiving surveys will be contacted thereafter.

**TABLE 7-14**
**CII SURVEY PROGRAM**

| CII Surveys | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|
| **Surveys Offered** | | | | | |
| Commercial | NR | 62 | 30 | 15 | 6 |
| Industrial | NR | 61 | 48 | 5 | 1 |
| Institutional | NR | 0 | 0 | 0 | 4 |
| Mixed Use/Landscape | NR | 124/0 | 86/0 | 8/18 | 4/8 |
| **Surveys Completed** | | | | | |
| Commercial | NR | 0 | 6 | 15 | 1 |
| Industrial | NR | 7 | 12 | 5 | 0 |
| Institutional | NR | 0 | 0 | 0 | 2 |
| Mixed Use/Landscape | NR | 7/0 | 20/0 | 8/18 | 0/4 |
| **Follow-up within 1 year** | | | | | |
| Commercial | NR | 2 | 0 | 0 | 0 |
| Industrial | NR | 3 | 3 | 0 | 0 |
| Institutional | NR | 2 | 0 | 0 | 0 |

#### 7.5.2.3 Large Landscape

VWC has 13 metered accounts dedicated to irrigation in 2010 that are classified as Landscape and that account for approximately two percent of total water use. This is comprised of three potable meters and ten recycled water meters. The ten recycled water users consist of one golf course and nine street medians.

Additionally, VWC has identified approximately 1,250 meters included in its CII accounts that are dedicated to irrigating landscapes. VWC will target its Large Landscape conservation programs to all meters that are dedicated to irrigating landscapes, including those currently included in CII.

VWC is participating in the CLWA-sponsored large landscape program that offers audits to its large landscape customers. Currently 40 sites are enrolled in the program, including 17 within the VWC service area, where the focus is primarily HOA customers. The program offers large landscape customers such as HOAs and parks and landscape maintenance districts the

opportunity to receive free water-use and cost/benefit analysis reports, free workshops for property management and landscapers and rebates for water-saving measures and devices.

Targeted customers, both public and private sector, are contacted by phone to solicit participation. During the audit, the efficiency of the irrigation system is assessed and leaks and repair needs may be identified. Following the site visit, irrigation system efficiency is evaluated to determine an effective watering schedule, and a water budget is developed based on the size of the landscape. The audit report includes upgrade recommendations, available incentives, new irrigation schedules, the water budget and a benefit/cost analysis. The report is delivered in person to further educate the customer.

Customers are eligible to receive financial incentives to offset investments in landscape efficiency of up to $300 per AF of water saved. CLWA works with its retailers to select sites that meet the large landscape specifications. To date, final reports have been generated for five sites; recommended infrastructure modifications have been completed and five rebates were issued. Modifications at another site will be implemented throughout 2011 and 2012.

Currently, customers are notified about the program through VWC's website, referrals or through direct contact from the contractor. Program participation and estimated savings are tracked through the contractor administering the program.

Prior to 2010, the Large Landscape Audit program was conducted and monitored by VWC. The results of these surveys are included in Table 7-14 above.

### 7.5.3 VWC DMM and SBX7-7 Implementation Plan

VWC recognizes the need to expand conservation programs and efforts in order to meet both its SBX7-7 and DMM requirements.

The SBX7-7 baseline and target calculations are addressed in Chapter 2. The DMM GPCD goals, shown in Table 7-15, are determined by calculating the following:

1. *Baseline GPCD = average annual Potable Water GPCD for the years 1997 through 2006*

2. *2018 GPCD Target = Baseline GPCD multiplied by 0.82 (an 18% reduction)*

3. *Biennial GPCD Targets = Baseline GPCD multiplied by that year's Target (% Baseline). A retail water agency may choose a starting point as either its Baseline GPCD or its 2006 Potable Water GPCD.*

**TABLE 7-15**
**DMM GPCD TARGET CALCULATIONS**

| Year | Per Capita Water Use (GPCD) |
|---|---|
| 1997 | 314 |
| 1998 | 257 |
| 1999 | 277 |
| 2000 | 290 |
| 2001 | 261 |
| 2002 | 280 |
| 2003 | 266 |
| 2004 | 263 |
| 2005 | 246 |
| 2006 | 253 |
| **Baseline** | **271** |
| **Target (2018)** | **222** |

Compliance is evaluated in relation to the Compliance Table below (Table 7-16) and relative progress toward the goal will be acknowledged in Council Compliance Reports. The compliance tables are read as five increments with reporting goals relative to their first through fifth Compliance reports.

**TABLE 7-16**
**ANNUAL COMPLIANCE TARGETS (IN GPCD)**

| Year | Compliance Report | Target | Highest Acceptable Bound |
|---|---|---|---|
| 2010 | 1 | 254 | 271 |
| 2012 | 2 | 251 | 261 |
| 2014 | 3 | 241 | 251 |
| 2016 | 4 | 232 | 241 |
| 2018 | 5 | 222 | 222 |

The GPCD option for MOU compliance and the SBX7-7 targets are consistent with one another (Table 7-17) and VWC is currently building on the SCVWUESP as well as its WUEEP to implement programs that meet these goals.

**TABLE 7-17**
**COMPLIANCE TARGETS**

| | | Target GPCD | | |
|---|---|---|---|---|
| | Baseline GPCD | 2015 | 2018 | 2020 |
| MOU/AB 1420 | 271 | | 222 | |
| SBX7-7 | 278 | 250 | | 222 |

The SCVWUESP recognizes the need to expand conservation programs and efforts. The adoption of SBX7-7 and the twenty percent reduction goal has increased the urgency for

implementation. CLWA is in the process of reviewing its incentive programs and VWC is currently working with CLWA as well as the other purveyors to identify programs that could be implemented regionally. Conservation programs identified to meet future requirements combine financial incentives, regulations and informational elements, and build on the existing activities. Included in the programs considered for implementation are the following:

**Financial Incentives**

1) High-Efficiency Clothes Washers (HECWs): Clothes washer rebates are on the list of programs identified for implementation in the SCVWUESP. CLWA will be expanding its program to include clothes washer rebates in FY 2011/12 and VWC will participate.

2) Zero and Low-Flow Urinal Rebates: Rebates will include CII fixtures such as zero consumption and ultra low volume urinals as well as CII specific HETs. This program will launch in FY 2011/12.

3) Expansion of Fixture Rebates to CII and Multi-family Customers: Currently the CLWA toilet rebate program is only available to single-family residential customers. Starting 2011, the programs will be expanded to all customers and there will be increased focus on marketing to large HOA accounts.

4) Expand Rebates to Include a Larger Variety of Fixtures: Being considered for inclusion are hot water storage tanks, pressurized water brooms and high-pressure spray nozzles.

5) Cash for Grass Rebate: Customers would be provided with an incentive of up to $1 per square foot of turf removed and replaced with climate appropriate plants. The program is being considered for both residential and CII customers.

6) Expansion of Large Landscape Program: The purveyors will be evaluating the effectiveness of the current landscape program in FY 2011/12 and making adjustments depending on the results. If the program is found to be successful at meeting reduction targets, the program will be accelerated and more devices will be offered, such as Precision Nozzles.

**Building Code/New Standards**

The SCVWUESP developed a comprehensive list of new building standards beyond those currently in the building code. Code changes that improve the efficiency of fixtures and design account for about 60 percent of the expected reduction in demand, and will therefore be a significant program priority. Some of the proposed changes will be captured in the State Model Efficient Landscape Ordinance effective January 2010, CAL Green Building Code adopted in January 2011, and SB 407 and standard updates for toilets and washers that are being phased in.

In addition to conservation programs, VWC is committed to expanding recycled water in its service area to offset potable water use for landscape irrigation. Currently recycled water provides about 325 AFY. VWC plans to expand its recycled water use to 2,000 AFY by 2020.

The near term plans to expand recycled water are discussed in Section 6. Recycled water will be further expanded with the South End Recycled Water project (Phase 2C), which will expand the existing recycled water transmission and distribution system southerly to supply recycled

water to VWC, NCWD and SCWD customers. The project will result in the use of approximately 910 AFY of recycled water.

**Information/Tracking**

Information and tracking represents a new element to the existing programs focusing on collecting and processing information and ensuring that the programs are on track to meet the goals. VWC has already initiated this tool with the WaterSMART Allocation program for its individually metered residential customers. VWC will be expanding the WaterSMART Allocation program to its meters that are dedicated to irrigating landscapes. These activities will help program development by providing more robust information about customers and their water use patterns.

**Evaluating Effectiveness of the DMMs**

VWC will continue to track all program activities including outreach activities, rebate distribution, audits and leak interventions. Program effectiveness and per capita use will be monitored through the billing and consumption system.

VWC will monitor its WaterSMART Allocation program to measure its effectiveness in assisting customers to use water more efficiently.

**Impacts of Conservation**

It is not expected that, at this time, the conservation programs currently being implemented or scheduled for implementation will have any significant negative effect on water use within VWC's service area or affect VWC's ability to further reduce demand. The funding for current and future programs is being identified.

**Economic Impacts**

Analysis of the requirements for BMP compliance yields program costs of roughly $450,000 per year.

## 7.6 Newhall County Water District

NCWD is implementing programs locally as well as leveraging the conservation resources available through CLWA.

In 2002, NCWD became a signatory to the CUWCC MOU, establishing a firm commitment to the implementation of the BMPs or DMMs. Many of NCWD's conservation programs have been ongoing since 2003 or earlier.

NCWD subsequently joined CLWA and the other retail water purveyors in signing a 2007 MOU to prepare the SCVWUESP. The SCVWUESP recommended programs to reduce the overall valley wide water demand by ten percent by 2030 (see Section 7.2 for more information). These programs were designed to provide Valley residents with the tools and education to use water more efficiently.

NCWD is currently implementing all of the Foundational BMPs as required in the revised MOU and UWMP Act. The Programmatic BMPs are being implemented through a BMP approach. The BMP and SBX7-7 goals and implementation plan are discussed further in Sections 7.6.2 and 7.6.3.

## 7.6.1 Foundational BMPs

### 7.6.1.1 Utility Operations

Conservation Coordinator

NCWD has had a conservation coordinator since 2002, when it was half a full-time equivalent (FTE) position. The coordinator manages BMP implementation and other water conservation implementation and planning activities. Including the coordinator, NCWD has four FTE staff positions that focus part-time on conservation.

Water Waste Prohibition

NCWD adopted a water conservation ordinance in 1991. The ordinance was revised in 2005 due to water supply conditions at that time. The ordinance provides a water conservation plan to minimize the effect of water shortages on customers. It lists prohibited uses, sets irrigation hours and schedules to optimize water efficiency and states that inspection for leaks and repairs are everyone's responsibility. In addition, State of California, County of Los Angeles, and City of Santa Clarita ordinances also apply to NCWD customers.

Water Loss Control

NCWD conducts annual pre-screening system audits which calculate verifiable use as a percent of total production. NCWD also compares production and sales records monthly to identify losses.

NCWD has completed AWWA's M36 Water Loss analysis, which consists of a component analysis of leaks into "revenue" and "non-revenue" categories, among others, and an economic analysis of recoverable loss. NCWD's M36 'Reporting Worksheet' for 2010 is provided in Appendix E. Results of the preliminary analysis show an Infrastructure Leakage Index (ILI) of 1.8 and a score of 96, which indicates appropriate loss control. NCWD will continue its water loss practices and review the recommendations, which include annual audits and other incremental improvements.

Metering with Commodity Rates for all New Connections and Retrofit of Existing Connections

All of NCWD's customers are metered and billed volumetrically on a monthly basis. All meters have been replaced in the past ten years and NCWD is currently updating its maintenance plans.

Retail Conservation Pricing

Since 2005, NCWD has employed a four-tier increasing block rate structure for individually three-quarter inch metered residential accounts that is designed to promote water use efficiency and conservation. Rates range from $0.80 per CCF in the first tier to $1.456 per CCF in the fourth tier. The tiers are structured differently depending on meter size.

Non-residential accounts are charged for consumption at a uniform volumetric rate. All accounts are charged a flat fee for water availability, plus variable charges based on usage for energy, infrastructure and purchased water form CLWA. The proportion of revenue from variable charges meets the BMP requirement of 70 percent Table 7-18.

**TABLE 7-18**
**REVENUE**

| | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|
| Fixed: Service Charge | $2,160,400 | $2,619,900 | $2,808,100 | $2,831,100 | $2,834,600 |
| Variable | $6,056,900 | $7,166,200 | $7,202,900 | $6,982,900 | $6,656,800 |
| Total Revenue | $8,217,300 | $9,786,100 | $10,011,000 | $9,814,000 | $9,491,300 |
| **Percentage Variable** | **74%** | **73%** | **72%** | **71%** | **70%** |

### 7.6.1.2 Education

Public Information

NCWD has had a public information program since the late 1990s. Activities are summarized in Table 7-19. NCWD distributes conservation information to new residential customers as part of a welcome package and to children through free activity books. NCWD participates in community outreach events, mails its customers quarterly newsletters that include conservation tips and provide information on available rebate programs, conservation tips and links to other conservation resources on its website. Water bills were redesigned in 2010 to show water usage for the prior 13 months and suggest potential conservation actions.

Further outreach is implemented in coordination with CLWA. Refer to the Public Information section of CLWA's DMM summary for information on specific programs administered by CLWA.

**TABLE 7-19**
**SUMMARY OF OUTREACH ACTIVITIES**

| Item | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|
| Paid advertising | 0 | 0 | 5 | 2 | 2 |
| Bill Inserts / Newsletters / Brochures | 4 | 4 | 4 | 4 | 4 |
| Bill showing current water usage in comparison with prior year usage | Yes | Yes | Yes | Yes | Yes |
| Demonstration gardens | 1 | 1 | 1 | 1 | 1 |
| Special Events | 3 | 3 | 3 | 4 | 4 |
| Program to coordinate with other government agencies, industry, public interest groups and media | Yes | Yes | Yes | Yes | Yes |

School Education

NCWD's school education program is implemented by CLWA at no cost to school districts and has reached over 10,000 students in NCWD's service area since 2006 (Table 7-20). Refer to the Section 7.2.2 for CLWA's DMM summary of detailed information on age-appropriate presentations, activities and field trips offered to schools, as well as the Water Challenge scholarship program.

**TABLE 7-20**
**SCHOOL EDUCATION (NUMBER OF STUDENTS)**

| Grade Level | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|
| K-3 | 1,325 | 1,345 | 1,224 | 1,271 | 1,333 |
| 4 - 6 | 954 | 623 | 700 | 779 | 973 |
| 7 - 8 | 100 | 30 | 0 | 255 | 221 |
| 9 - 12 | 0 | 0 | 0 | 0 | 0 |
| **Totals** | **2,379** | **1,998** | **1,924** | **2,305** | **2,527** |

## 7.6.2 Programmatic BMPs

The Programmatic BMPs are described below. NCWD is pursuing a GPCD approach to complying with the Programmatic BMPs. The following section describes NCWD program activities.

### 7.6.2.1 Residential Programs

The largest customer class in the NCWD service area is residential users, accounting for approximately 72 percent of total use.

1) **Residential Survey and Retrofit Programs**
In 2007, NCWD sent all of its single family residential customers a water use self survey that reflected the information requirements of BMPs 1 and 2. Each customer that returned a completed survey received $10 (Table 7-21). NCWD tracked the survey results with a database developed for that purpose.

**TABLE 7-21**
**RESIDENTIAL SURVEYS AND RETROFITS**

| | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|
| **Accounts** | | | | | |
| Surveys Offered | 0 | 7,000 | 0 | 0 | 0 |
| Surveys Completed | 0 | 375 | 216 | 0 | 0 |
| **Devices** | | | | | |
| Showerheads | 105 | 400 | 171 | 263 | 312 |
| Aerators | 122 | 184 | 184 | 148 | 173 |

Water-saving devices are distributed by mail following surveys, or picked up at local events and from the District office; recipients of these devices are tracked in a database. NCWD customers

also receive devices from CLWA, which distributes free water-saving devices to Santa Clarita Valley residents at community events.

**2) Residential Landscape Water Survey Program**

NCWD's residential landscape water survey program was combined with the indoor water surveys described in Section 1), which are a combined indoor and landscape audit. NCWD has identified landscape conservation as a priority program and has developed various tools to address irrigation use.

NCWD offers its residential customers an ET Controller (Smart Sprinkler) Rebate Program, which started in 2006. The program is available to single family homeowners with a minimum of 1,200 square feet of irrigated landscapes and working in-ground irrigation systems operated by working timers and controllers. The rebate is $40 per active valve, up to a maximum of $480 per residence. NCWD also pays up to $120 for standard installation. At the end of 2010 there have been 48 WBICs installed and inspected within the NCWD service area.

NCWD also provides a free nozzle for each purchased spray head to replace all the sprinklers in a residential front yard turf area. These nozzles have 1/3 the flow of a conventional sprinkler and reduce irrigation application rates to less than 1 inch per hour. This reduces both water use and runoff losses. At the end of 2010 there have been 182 nozzles installed within the NCWD service area.

NCWD is also working with CLWA to offer a program that combines training and fixtures in the form of landscape classes and WBICs give-aways to its residential customers. The program offers homeowners and gardeners free landscape classes; after residents or their gardeners complete the training, they receive free WBICs. They also receive free inspections of their WBIC installations and programming to ensure they are properly installed. The classes are offered in both English and Spanish and have been very popular with residents. At the end of 2010, there have been six classes, and 13 WBICs have been installed and inspected within the NCWD service area.

After completing the training, attendees, as well as their gardeners, receive official certification for attending the workshop and committing to water efficient practices at their sites.

**3) WaterSense Specification Toilets**

NCWD participates in toilet rebate program sponsored by CLWA, which provides $50 per qualifying toilet. NCWD is also offering HET rebates of up to $115 for single family homes built prior to 1993. The EPA's list of WaterSense labeled products is used to identify qualifying equipment. As of 2008, NCWD had achieved about 65 percent saturation of ULFTs in single family homes and 48 percent in multi-family homes. A summary of rebates that have been issued is provided in Table 7-22. In 2006 NCWD stopped offering ULFT rebates and migrated its incentive program towards HETs.

Compliance with the BMP requires that NCWD rebate about 700 toilets over 10 years, for a total water savings of about 78 AF by 2020. Since 2008, NCWD rebates have been on track to meet the coverage requirement.

**TABLE 7-22**
**TOILET REBATE PROGRAMS**

| Toilet Type | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|
| HET (1.28 gal/flush) | | | | 126 | 227 |
| ULFT Rebates (1.6 gal/flush) | 26 | 13 | 126 | | |

In addition, NCWD will be realizing the benefits SB 407, effective January 1, 2014. SB 407 requires that all pre-1994 residential, multi-family and commercial customers replace non-compliant plumbing fixtures (including toilets, faucets, and showerheads) with water-conserving fixtures when making certain improvements or alterations to a building. By 2017, all single-family homes must replace non-compliant plumbing fixtures, and by 2019, all multifamily and commercial buildings must have compliant water-conserving plumbing fixtures in place.

#### 7.6.2.2 Commercial, Industrial, and Institutional (CII)

NCWD has about 470 CII accounts, which use about 1,300 AFY, or about 12 percent of NCWD's total water use. These accounts have been identified and ranked by water use.

NCWD provides free audits for CII customers through CLWA's Water Checkup Program. The audits focus on five areas: irrigation, plumbing fixtures, cooling towers (HVAC systems), manufacturing processes and other efficiency opportunities. After the audit is complete, a report is created that summarizes findings and suggestions, and these are discussed with the customer in-person. The report also identifies rebates that are available to provide motivation for implementing the recommended retrofits. Customers are eligible to receive financial incentives to offset any investment in efficiency opportunities in the amount of up to $300 per AF of water saved.

Customers are notified about the CLWA program through bill inserts, the District's website and direct contact from the contractor. Program participation and estimated savings are tracked by CLWA. To date two audits within the NCWD's service have been completed, both for schools.

#### 7.6.2.3 Large Landscape

NCWD has about 230 dedicated irrigation meter accounts that use almost 1,700 AFY, or 15 percent of total use. NCWD customers can take advantage of CLWA's Water Use Efficiency Program for Large Landscapes. Currently 40 sites are enrolled in the program, including four within the NCWD service area where the focus is primarily HOA customers. The program offers large landscape customers such as HOAs, parks and landscape maintenance districts the opportunity to receive free water-use and cost-benefit analysis reports, free workshops for property management and landscapers, and rebates for water-saving measures and devices.

Targeted customers are contacted via phone to solicit participation. During the audit, the efficiency of the irrigation system is assessed and leaks and repair needs may be identified. Following the site visit, irrigation system efficiency is evaluated to determine an effective watering schedule, and a water budget is developed based on the size of the landscape. The audit report includes upgrade recommendations, available incentives, new irrigation schedules, the water budget and a benefit/cost analysis. The report is delivered in person to further educate the customer.

Customers are eligible to receive financial incentives to offset any investment in landscape efficiency in the amount of up to $300 per AF of water saved. CLWA works with its retailers to select sites that meet the large landscape specifications. To date, final reports have been generated for two sites.

Customers are notified about the program through bill inserts, the website and direct contact from the contractor. Program participation and estimated savings are tracked through the contractor administering the program.

### 7.6.3 NCWD DMM and SBX7-7 Implementation Plan

NCWD recognizes the need to expand conservation programs and efforts in order to meet both its SBX7-7 and DMM requirements.

The SBX7-7 baseline and target calculations are addressed in Chapter 2. The DMM GPCD goals, shown in Table 7-23 are determined by calculating the following:

1. *Baseline GPCD = average annual Potable Water GPCD for the years 1997 through 2006*

2. *2018 GPCD Target = Baseline GPCD multiplied by 0.82 (an 18% reduction)*

3. *Biennial GPCD Targets = Baseline GPCD multiplied by that year's Target (% Baseline). A retail water agency may choose a starting point as either its Baseline GPCD or its 2006 Potable Water GPCD.*

**TABLE 7-23**
**DMM GPCD TARGET CALCULATIONS**

| Year | Per Capita Water Use (GPCD) |
|---|---|
| 1997 | 242 |
| 1998 | 220 |
| 1999 | 249 |
| 2000 | 254 |
| 2001 | 243 |
| 2002 | 253 |
| 2003 | 242 |
| 2004 | 247 |
| 2005 | 230 |
| 2006 | 241 |
| **Baseline** | **242** |
| **Target (2018)** | **199** |

Compliance is evaluated in relation to the Compliance Table below (Table 7-24) and relative progress toward the goal will be acknowledged in Council Compliance Reports. The compliance tables are read as five increments with reporting goals relative to their first through fifth Compliance reports.

**TABLE 7-24**
**ANNUAL COMPLIANCE TARGETS (GPCD)**

| Year | Compliance Report | Target | Highest Acceptable Bound |
|---|---|---|---|
| 2010 | 1 | 228 | 242 |
| 2012 | 2 | 225 | 233 |
| 2014 | 3 | 216 | 225 |
| 2016 | 4 | 207 | 216 |
| 2018 | 5 | 199 | 199 |

The GPCD option for MOU compliance and the SBX7-7 targets are consistent with one another (Table 7-25).

**TABLE 7-25**
**COMPLIANCE TARGETS**

| | | Target GPCD | | |
|---|---|---|---|---|
| | Baseline GPCD | 2015 | 2018 | 2020 |
| MOU/AB 1420 | 242 | | 199 | |
| SBX7-7 | 244 | 220 | | 195 |

The regional plan, the SCVWUESP, recognizes the need to expand conservation programs and efforts. The adoption of SBX7-7 and the twenty percent reduction goal has increased the urgency for implementation. CLWA is in the process of reviewing its incentive programs, and NCWD is currently working with CLWA as well as the other purveyors to identify programs that could be implemented regionally.

Programs that NCWD has identified to meet future requirements combine financial incentives, advances in building codes and improved implementation tracking. NCWD is considering implementing of the following:

**Financial Incentives**

1) High-Efficiency Clothes Washers (HECWs): Clothes washer rebates are on the list of programs identified for implementation in the SCVWUESP. CLWA will be expanding its program to include clothes washer rebates in FY 2011/12 and NCWD will participate.

2) Zero and Low-Flow Urinal Rebates: Rebates will include CII fixtures such as zero consumption and ultra low volume urinals as well as CII specific HETs. This program will launch in FY 2011/12.

3) Expansion of Fixture Rebates to CII and Multi-family Customers: Currently the toilet rebate program is only available to single-family residential customers. Starting 2011, the programs will be expanded to all customers and there will be increased focus on marketing to large HOA accounts.

4) Expand Rebates to Include a Larger Variety of Fixtures: Being considered for inclusion are hot water distribution tanks, pressurized water brooms and high-pressure spray nozzles.

5) Cash for Grass Rebate: Customers will be provided with an incentive of up to $1 per acre-foot of turf removed and replaced with landscape appropriate plants. The program is being considered for both residential and CII customers.

6) Expansion of Large Landscape Program: The purveyors will be evaluating the effectiveness of the current landscape program in FY 2011/12 and adjusting depending on the results. If the program is found to be successful at meeting reduction targets, the program will be accelerated and more devices will be offered, such as Precision Nozzles.

**Building Codes/New Standards**

The SCVWUESP developed a comprehensive list of new building standards beyond those currently in the building code. Code changes that improve the efficiency of fixtures and design account for about 60 percent of the expected reduction in demand, and will therefore be a significant program priority. Some of the proposed changes will be captured in the State Model Efficient Landscape Ordinance effective January 2010, CAL Green Building Code, adopted in January 2011 and SB 407 and standard updates for toilets and washers that are being phased in.

**Implementation Tracking**

Tracking is intended to bring new accountability to existing programs. This is implemented by collecting and processing information to ensure that the programs are on track to meet the defined goals.

**Evaluating Effectiveness of the DMMs**

NCWD will continue to track all program activities including outreach activities, rebate distribution, audits, water-saving device distribution and ET controller distribution. Program effectiveness and per capita use will be monitored through the billing and consumption system.

**Impacts of Conservation**

It is not expected, at this time, that conservation programs that are currently being implemented or are scheduled for implementation will have any significant negative impact on water use within NCWD's service area or will affect NCWD's ability to further reduce demand. The funding for current and future programs is being identified.

**Economic Impacts**

Analysis of the requirements for BMP compliance yields program costs of roughly $430,000.

# Section 8: Water Shortage Contingency Planning

## 8.1 Overview

Water supplies may be interrupted or reduced significantly in a number of ways, such as a drought that limits supplies, an earthquake that damages water delivery or storage facilities, a regional power outage or a toxic spill that affects water quality. This chapter of the Plan describes how CLWA and the retail water purveyors plan to respond to such emergencies promptly and equitably.

To date, both a Water Shortage Contingency Plan and a Drought Emergency Water Sharing Agreement have been prepared by CLWA and the retail purveyors. Prohibitions, penalties and financial impacts of shortages have been developed by SCWD, NCWD, and VWC and are summarized in this chapter.

## 8.2 Coordinated Planning

CLWA and the purveyors have coordinated efforts in the past to meet water shortages. During 1991 (the fifth year of a six-year drought), the purveyors and CLWA prepared a Water Shortage Contingency Plan. Since this plan was first prepared, the Valley has experienced two water shortages: in 1991-1992 due to the continuation of the 1987-1992 drought and in 1994 due to the January 17, 1994 Northridge earthquake. The plan worked extremely well in both instances, and minor updates were made to incorporate actual experience during these two periods. It is envisioned that the Water Shortage Contingency Plan will be implemented whenever needed in the future.

### 8.2.1 CLWA and the Retail Water Purveyors

During times of normal supply, the local water suppliers meet periodically to review total water supply and demand in the Valley and any new regulations affecting the water industry.

During the drought year of 1991, the local purveyors met more frequently (about once per month). Monthly water production and demand reports were produced and shared with the City of Santa Clarita Drought Committee. After the 1987-1992 drought, CLWA and the retail purveyors cooperated in sharing available water from all sources without regard to contractual or other water rights for the duration of the emergency, and to facilitate among themselves water transfers, exchanges and arrangements to use each others' distribution facilities. During the recent 2007 to 2009 drought period, the purveyors resumed the monthly meetings and monitored valley-wide water demand, and strengthened conservation planning and response planning.

## 8.3 Stages of Action to Respond to Water Shortages

The Saugus Formation has underground storage of approximately 1.65 MAF. In times of continued drought, the Saugus Formation can be pumped for temporary periods above its normal year production. During a dry year or an extended drought, the purveyors would temporarily increase pumping in the Saugus Formation above the normal-year production of 7,500 to 15,000 AFY, and plan to upgrade the pumping capacity of their wells, restore lost

capacity and drill additional wells to enable this increased pumping. As developed in the Valley's groundwater operating plan and presented in Table 3-5 in Section 3, production in the Saugus Formation can be as high as 25,000 to 35,000 AFY during multiple-dry year periods.

The Alluvium would be most affected by a continued local drought. As developed in the Valley's groundwater operating plan and further presented in Table 3-5, sustainable production during normal years can range from 30,000 to 40,000 AFY. However, due to operational constraints in the eastern part of the Basin, production would be reduced to approximately 30,000 to 35,000 AFY during locally dry years.

Table 8-1 presents the four-stage rationing and demand reduction goals for the Valley[24].

**TABLE 8-1**
**RATIONING AND REDUCTION GOALS**

| Deficiency | Stage | Demand Reduction Goal | Type of Program |
|---|---|---|---|
| Up to 15% | 1 | 15% reduction | Voluntary |
| 15-25% | 2 | 25% reduction | Mandatory |
| 25-35% | 3 | 35% reduction | Mandatory |
| 35-50% | 4 | 50+% reduction | Mandatory |

Priorities for use of available water, based on Chapter 3 of the California Water Code, are:

- Health and Safety: Interior residential, sanitation and fire protection
- Commercial, Industrial, and Governmental: Maintain jobs and economic base
- Existing Landscaping: Especially trees and shrubs
- New Demand: Projects with permits when shortage declared

Water quantity calculations used to determine the interior household GPCD requirements for health and safety are provided in Table 8-2. As developed in Table 8-2, the California Water Code Stage 2, 3, and 4 health and safety allotments are 68 GPCD, or 33 CCF (100 cubic feet) per person per year. When considering this allotment and the Valley population of 286,750 in 2010 as presented in Section 2 (Table 2-8), the total annual water supply required to meet the first priority use during a water shortage is approximately 21,839 AFY.

[24] LACWWD has a nine-stage rationing and demand reduction method plan. Anticipated shortages that trigger the phases of action range from 10 percent to 50 percent, while associated conservation target reductions similarly range from 10 percent to 50 percent, with mandatory rationing after Stage 2.

**TABLE 8-2**
**PER CAPITA HEALTH AND SAFETY WATER QUANTITY CALCULATIONS**

| | Non-Conserving Fixtures | | Habit Changes | | Conserving Fixtures | |
|---|---|---|---|---|---|---|
| Toilets | 5 flushes x 5.5 gpf = | 27.5 | 3 flushes x 5.5 gpf = | 16.5 | 5 flushes x 1.6 gpf = | 8.0 |
| Showers | 5 min x 4.0 gpm = | 20.0 | 4 min x 3.0 gpm = | 12.0 | 5 min x 2.0 gpm = | 10.0 |
| Washers | 12.5 GPCD (1/3 load) = | 12.5 | 11.5 GPCD (1/3 load) = | 11.5 | 11.5 GPCD (1/3 load) = | 11.5 |
| Kitchens | 4 GPCD = | 4.0 | 4 GPCD = | 4.0 | 4 GPCD = | 4.0 |
| Other | 4 GPCD = | 4.0 | 4 GPCD = | 4.0 | 4 GPCD = | 4.0 |
| Total GPCD | | 68.0 | | 48.0 | | 37.5 |
| CCF per capita per year | | 33.0 | | 23.0 | | 18.0 |

## 8.4 Minimum Water Supply Available During Next Three Years

The minimum water supply available during the next three years would occur during a three-year multiple-dry year event between the years 2011 and 2013. As shown in Table 8-3, the total water supply available during each of the next three years is about 128,400 AFY. When comparing these supplies to the demand projections provided in Chapter 2 of this Plan, CLWA and the purveyors have adequate supplies available to meet projected demands should a multiple-dry year period occur during the next three years.

**TABLE 8-3**
**ESTIMATE OF MINIMUM SUPPLY FOR THE NEXT THREE YEARS**

| | Supply (AF) | | |
|---|---|---|---|
| **Source** | **2011** | **2012** | **2013** |
| Wholesale (Imported) | | | |
| SWP Table A Supply[(a)] | 30,700 | 30,700 | 30,700 |
| Buena Vista-Rosedale | 11,000 | 11,000 | 11,000 |
| Nickel Water - Newhall Land | 1,607 | 1,607 | 1,607 |
| Flexible Storage Account (CLWA)[(b)] | 1,560 | 1,560 | 1,560 |
| Flexible Storage Account (Ventura County)[(b)] | 460 | 460 | 460 |
| *Total Imported Supplies* | *45,327* | *45,327* | *45,327* |
| Local Supplies | | | |
| Groundwater Supplies | | | |
| Alluvial Aquifer[(c)] | 20,425 | 20,425 | 20,425 |
| Saugus Formation[(c)] | 19,700 | 19,700 | 19,700 |
| Recycled Water | 325 | 325 | 325 |
| *Total Local Supplies* | *40,450* | *40,450* | *40,450* |
| Banking Programs | | | |
| Semitropic Water Bank[(d)] | 15,300 | 15,300 | 15,300 |
| Rosedale-Rio Bravo[(e)] | 20,000 | 20,000 | 20,000 |
| Semitropic Water Bank - Newhall Land[(e)] | 4,950 | 4,950 | 4,950 |
| *Total Banking Programs* | *40,250* | *40,250* | *40,250* |
| **Total Supplies** | **126,027** | **126,027** | **126,027** |

Notes:
(a) SWP supplies to CLWA based on detailed delivery results provided by DWR from the analyses presented in DWR's *2009 SWP Delivery Reliability Report*, for the worst case three-year dry period of 1990-1992. SWP deliveries to CLWA over this three year period average 32% of CLWA's 95,200 AF of Table A Amount.
(b) Based on total amount of storage available divided by 3 (3-year dry period).
(c) Based on existing groundwater supplies available during a multiple-dry year period.
(d) Based on total amount of water currently in storage (45,920 AF) divided by 3 (3-year dry period).
(e) Based on maximum annual pumpback capacity.

## 8.5 Actions to Prepare for Catastrophic Interruption

### 8.5.1 General

The Valley is located approximately 20 miles southwest of the San Andreas Fault, which traverses the length of the southern San Joaquin Valley. A major earthquake along this portion of the San Andreas Fault would affect the Valley. The California Division of Mines and Geology has stated that two of the aqueduct systems that import water to southern California (including the California Aqueduct) could be ruptured by displacement on the San Andreas Fault. The situation would be further complicated by physical damage to pumping equipment and local loss of electrical power.

DWR has an Aqueduct Outage Plan for restoring the California Aqueduct to service should a major break occur, which it estimates would take approximately four months to repair.

Limitations on supplies of groundwater and/or imported water for an extended period, due to power outages and/or equipment damage, could result in severe water shortages until the supplies could be restored.

Combined water storage of the local water suppliers totals approximately 190 MG of water in storage tanks, which can be gravity fed to Valley businesses and residences, even if there is a power outage. The public would be asked to reduce consumption to minimum health and safety levels, extending the supply to a minimum of seven days. This would provide sufficient time to restore a significant amount of groundwater production. After the groundwater supply is restored, the pumping capacity of the four retail purveyors could meet the reduced demand until such time that the imported water supply was reestablished. Updates on the water situation would be made as often as necessary.

The Valley's water sources are generally of good quality, and no insurmountable problems resulting from industrial or agricultural contamination are foreseen. If contamination did result from a toxic spill or similar accident, the contamination would be isolated and should not significantly impact the total water supply. In addition, such an event would be covered by the purveyors Emergency Response Plan.

### 8.5.2 SWP Emergency Outage Scenarios

In addition to earthquakes, the SWP could experience other emergency outage scenarios. Past examples include slippage of aqueduct side panels into the California Aqueduct near Patterson in the mid-1990s, the Arroyo Pasajero flood event in 1995 (which also destroyed part of Interstate 5 near Los Banos) and various subsidence repairs needed along the East Branch of the Aqueduct since the 1980s. All these outages were short-term in nature (on the order of weeks), and DWR's Operations and Maintenance Division worked diligently to devise methods to keep the Aqueduct in operation while repairs were made. Thus, the SWP contractors experienced no interruption in deliveries.

One of the SWP's important design engineering features is the ability to isolate parts of the system. The Aqueduct is divided into "pools." Thus, if one reservoir or portion of the California Aqueduct is damaged in some way, other portions of the system can still remain in operation. The principal SWP facilities are shown on Figure 8-1.

**FIGURE 8-1**
**PRIMARY SWP FACILITIES**

Other events could result in significant outages and potential interruption of service. Examples of possible nature-caused events include a levee breach in the Delta near the Harvey O. Banks Pumping Plant, a flood or earthquake event that severely damages the Aqueduct along its San Joaquin Valley traverse, or an earthquake event along either the West or East Branches. Such events could impact some or all SWP contractors south of the Delta.

The response of DWR, CLWA and other SWP contractors to such events would be highly dependent on the type and location of any such events. In typical SWP operations, water flowing through the Delta is diverted at the SWP's main pumping facility, located in the southern Delta, and is pumped into the California Aqueduct. During the relatively heavier runoff period in the winter and early spring, Delta diversions generally exceed SWP contractor demands and the excess is stored in San Luis Reservoir. Storage in SWP aqueduct terminal reservoirs, such as Pyramid and Castaic Lakes, is also refilled during this period. During the summer and fall, when diversions from the Delta are generally more limited and less than contractor demands, releases from San Luis Reservoir are used to make up the difference in deliveries to contractors. The SWP share of maximum storage capacity at San Luis Reservoir is 1,062,000 AF.

CLWA receives its SWP deliveries through the West Branch of the California Aqueduct at Castaic Lake. The only other contractors receiving deliveries from the West Branch are Metropolitan and Ventura County Watershed Protection District (formerly known as the Ventura County Flood Control District). The West Branch has two terminal reservoirs, Pyramid Lake and Castaic Lake, which were designed to provide emergency storage and regulatory storage (i.e., storage to help meet peak summer deliveries) for CLWA and the other two West Branch contractors. Maximum operating capacity at Pyramid and Castaic lakes is 169,900 and 323,700 AF, respectively.

In addition to SWP storage south of the Delta in San Luis and the terminal reservoirs, a number of contractors have stored water in groundwater banking programs in the San Joaquin Valley, and many also have surface and groundwater storage within their own service areas.

Three scenarios that could impact the delivery to CLWA of its SWP supply, previously banked supplies or other supplies delivered to it through the California Aqueduct are described below. For each of these scenarios, it was assumed that an outage of six months could occur. CLWA's ability to meet demands during the worst of these scenarios is presented following the scenario descriptions.

#### 8.5.2.1 Scenario 1: Levee Breach Near Banks Pumping Plant

As demonstrated by the June 2004 Jones Tract levee breach and previous levee breaks, the Delta's levee system is fragile. The SWP's main pumping facility, Banks Pumping Plant, is located in the southern Delta. Should a major levee in the Delta near these facilities fail catastrophically, salt water from the eastern portions of San Francisco Bay would flow into the Delta, displacing the fresh water runoff that supplies the SWP. All pumping from the Delta would be disrupted until water quality conditions stabilized and returned to pre-breach conditions. The re-freshening of Delta water quality would require large amounts of additional Delta inflows, which might not be immediately available, depending on the time of year of the levee breach. The Jones Tract repairs took several weeks to accomplish and months to complete; a more severe breach could take much longer, during which time pumping from the Delta might not be available on a regular basis.

Assuming that the Banks Pumping Plant would be out of service for six months, DWR could continue making at least some SWP deliveries to all southern California contractors from water stored in San Luis Reservoir. The water available for such deliveries would be dependent on the storage in San Luis Reservoir at the time the outage occurred and could be minimal if it occurred in the late summer or early fall when San Luis Reservoir storage is typically low. In addition to supplies from San Luis Reservoir, water from the West Branch terminal reservoirs would also be available to the three West Branch contractors, including CLWA. CLWA water stored in groundwater banking programs in the San Joaquin Valley may also be available for withdrawal and delivery to CLWA.

#### 8.5.2.2 Scenario 2: Complete Disruption of the California Aqueduct in the San Joaquin Valley

The 1995 flood event at Arroyo Pasajero demonstrated vulnerabilities of the California Aqueduct (the portion that traverses the San Joaquin Valley from San Luis Reservoir to Edmonston Pumping Plant). Should a similar flood event or an earthquake damage this portion of the aqueduct, deliveries from San Luis Reservoir could be interrupted for a period of time. DWR has informed the SWP contractors that a four-month outage could be expected in such an event. CLWA's assumption for this Plan is a more conservative six-month outage.

Arroyo Pasajero is located downstream of San Luis Reservoir and upstream of the primary groundwater banking programs in the San Joaquin Valley. Assuming an outage at a location near Arroyo Pasajero that takes the California Aqueduct out of service for six months, supplies from San Luis Reservoir would not be available to those SWP contractors located downstream of that point. However, CLWA water stored in groundwater banking programs in the San Joaquin Valley could be withdrawn and delivered to CLWA, and water from the West Branch terminal reservoirs would also be available to the three West Branch contractors, including CLWA. Assuming an outage at a location on the California Aqueduct south of the groundwater banking programs in the San Joaquin Valley, these supplies would not be available to CLWA, but water from the West Branch terminal reservoirs would be available to the three West Branch contractors, including CLWA.

#### 8.5.2.3 Scenario 3: Complete Disruption of the West Branch of the California Aqueduct

The West Branch of the California Aqueduct begins at a bifurcation of the Aqueduct south of Edmonston Pumping Plant, which pumps SWP water through and across the Tehachapi Mountains. From the point of bifurcation, the West Branch is an open canal through Quail Lake, a small flow regulation reservoir, to the Peace Valley Pipeline, which conveys water into Pyramid Lake. From Pyramid Lake, water is released into the Angeles Tunnel, through Castaic Powerplant into Elderberry Forebay, and then into Castaic Lake.

If a major earthquake (an event similar to or greater than the 1994 Northridge earthquake) were to damage a portion of the West Branch, deliveries could be interrupted. The exact location of such damage along the West Branch would be key to determining emergency operations by DWR and the three West Branch SWP contractors. For this scenario, it was assumed that the West Branch would suffer a single-location break and deliveries of SWP water from north of the Tehachapi Mountains or of CLWA water stored in groundwater banking programs in the San Joaquin Valley would not be available. It was also assumed that Pyramid and Castaic dams would not be damaged by the event and that water in Pyramid and Castaic Lakes would be available to the three West Branch SWP contractors, including CLWA.

In any of these three SWP emergency outage scenarios, DWR and the SWP contractors would coordinate operations to minimize supply disruptions. Depending on the particular outage scenario or outage location, some or all of the SWP contractors south of the Delta might be affected. But even among those contractors, potential impacts would differ given each contractor's specific mix of other supplies and available storage. During past SWP outages, the SWP contractors have worked cooperatively to minimize supply impacts among all contractors. Past examples of such cooperation have included certain SWP contractors agreeing to rely more heavily on alternate supplies, allowing more of the outage-limited SWP supply to be delivered to other contractors, and exchanges among SWP contractors, allowing delivery of one contractor's SWP or other water to another contractor, with that water being returned after the outage was over.

#### 8.5.2.4 Assessment of Worst-Case Scenario

Of these three SWP outage scenarios, the West Branch outage scenario presents the worst-case scenario for the CLWA service area. In this scenario, the water suppliers would rely on local supplies and water available to CLWA from Pyramid and Castaic Lakes. See Section 8.5.3 below regarding recommendations for emergency outage storage using co-agreements with other SWP contractors and individual groundwater banking programs. An assessment of the supplies available to meet demands in CLWA's service area during a six-month West Branch outage and the additional levels of conservation projected to be needed are presented in Table 8-4 for 2010 through 2050.

During an outage, the local supplies available would consist of groundwater from the Alluvial Aquifer and the Saugus Formation, as well as recycled water. It was assumed that local well production would be unimpaired by the outage and that the outage would occur during a year when average/normal supplies would be available from the Alluvial Aquifer. Pumping from the Saugus was assumed to be one-half of the single-dry year supplies. Note that adequate well and aquifer capacity exists to pump at levels higher than those assumed in this assessment, particularly during a temporary period such as an outage. However, to be conservative, groundwater production was assumed to be one-half of annual supplies. Based on the assumption that additional voluntary conservation could reduce the amount of waste discharge, and therefore the amount of recycled water available, the amount of recycled water available is assumed to be available 25 percent less than average/normal year supplies.

The water available to CLWA from Pyramid and Castaic Lakes includes flexible storage available to CLWA at Castaic Lake and emergency and potentially regulatory storage available in both Pyramid and Castaic Lakes. Regulatory storage, which is used to help meet high peak summer deliveries, may or may not be available depending on what time of year an outage occurs. For this assessment, regulatory storage was assumed to be unavailable. The amount of emergency storage assumed to be available to CLWA was based on CLWA's proportionate share of usable storage in each reservoir, where usable storage is maximum operating storage, less regulatory and dead pool storage. At Castaic Lake, this usable storage determination also excludes the three West Branch contractors' total Flexible Storage Accounts. CLWA's proportionate share of usable storage was assumed to be slightly less than three percent, based on its share of capital cost repayment at each reservoir. On this cost repayment basis, the proportionate shares of the Metropolitan and Ventura County Watershed Protection District are about 96 percent and one percent, respectively.

Table 8-4 shows that, for a six-month emergency outage, additional conservation beyond SBX7-7 conservation objectives described in Chapter 2 would be required, with the additional

demand reductions ranging from one to 11 percent of total demand beginning in 2035. It is likely that potential cooperation among SWP contractors and/or temporarily increased purveyor groundwater production during such an outage could increase supplies so that lower amounts, or even no amount, of additional conservation would be needed. Further, the acquisition of emergency storage, as discussed in Section 8.5.3, could reduce or eliminate the need for additional conservation. However, even without such supply increases, these levels of additional conservation would be readily achievable. In an emergency such as this, these levels of additional conservation would likely be achieved through voluntary conservation, but mandatory measures would be enacted if needed.

**TABLE 8-4**
**PROJECTED SUPPLIES AND DEMANDS DURING SIX MONTH DISRUPTION OF IMPORTED SUPPLY (AF)[a]**

| Water Supply Sources | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|---|
| **Existing Supplies** | | | | | | | | |
| Groundwater | | | | | | | | |
| Alluvial Aquifer[b] | 12,000 | 12,000 | 12,000 | 12,500 | 12,500 | 12,500 | 12,500 | 12,500 |
| Saugus Formation[c] | 10,200 | 10,200 | 10,200 | 10,200 | 10,200 | 10,200 | 10,200 | 10,200 |
| Recycled Water[d][e] | 120 | 120 | 120 | 120 | 120 | 120 | 120 | 120 |
| **Planned Supplies** | | | | | | | | |
| Future Groundwater | | | | | | | | |
| Alluvial Aquifer[b] | - | 500 | 1,000 | 1,500 | 2,000 | 2,500 | 3,000 | 3,500 |
| Saugus Formation (Restored Well)[c] | 425 | 1,900 | 1,900 | 1,900 | 1,900 | 1,900 | 1,900 | 1,875 |
| Saugus Formation (New Wells)[c] | 1,475 | 4,950 | 4,950 | 4,950 | 4,950 | 4,950 | 4,950 | 4,975 |
| Recycled Water[d] | 370 | 1,020 | 1,960 | 2,920 | 3,850 | 5,170 | 6,480 | 7,870 |
| ***Total Existing and Planned Supplies*** | ***24,590*** | ***30,690*** | ***32,130*** | ***34,090*** | ***35,520*** | ***37,340*** | ***39,150*** | ***41,040*** |
| **SWP West Branch Storage Available** | | | | | | | | |
| SWP Flexible Storage Accounts[f] | 6,060 | 4,680 | 4,680 | 4,680 | 4,680 | 4,680 | 4,680 | 4,680 |
| Emergency Storage | | | | | | | | |
| Pyramid Lake[g] | 4,370 | 4,370 | 4,370 | 4,370 | 4,370 | 4,370 | 4,370 | 4,370 |
| Castaic Lake[h] | 3,370 | 3,370 | 3,370 | 3,370 | 3,370 | 3,370 | 3,370 | 3,370 |
| ***Total West Branch Storage*** | ***13,800*** | ***12,420*** | ***12,420*** | ***12,420*** | ***12,420*** | ***12,420*** | ***12,420*** | ***12,420*** |
| **Total Local Supplies and West Branch Storage** | **38,390** | **43,110** | **44,550** | **46,510** | **47,940** | **49,760** | **51,570** | **53,460** |
| **Demands[i]** | | | | | | | | |
| Total Demand w/o Conservation | 40,035 | 44,242 | 48,449 | 52,656 | 56,863 | 61,070 | 65,277 | 69,484 |
| 20x2020 Reduction | 4,514 | 9,813 | 10,583 | 11,385 | 12,171 | 12,957 | 13,743 | 14,529 |
| Reduction from Recycled Water | 650 | 1,525 | 2,775 | 4,050 | 5,300 | 7,050 | 8,800 | 10,650 |
| Reduction from Water Conservation | 3,864 | 8,288 | 8,331 | 8,374 | 8,417 | 8,460 | 8,503 | 8,546 |
| **Total Demand w/ Conservation** | **36,172** | **35,954** | **40,118** | **44,282** | **48,447** | **52,611** | **56,775** | **60,939** |
| Additional Conservation Required[j] | 0 | 0 | 0 | 0 | 507 | 2,851 | 5,205 | 7,479 |
| Additional Conservation as Percent of Demand[k] | 0% | 0% | 0% | 0% | 1% | 5% | 8% | 11% |

Notes:
(a) Assumes complete disruption in SWP supplies and in deliveries through the California Aqueduct for six months.
(b) Pumping from the Alluvial Aquifer is assumed to be one-half of the average normal year supplies (see Table 6-2).
(c) Pumping from the Saugus Formation is assumed to be one-half of the single-dry year supplies (see Table 6-3).
(d) Recycled water supply is based on one-half of projected use.
(e) Assumes 25% reduction in waste discharge, and therefore in recycled water availability, due to additional voluntary conservation.
(f) Includes both CLWA and Ventura County entities flexible storage accounts. Initial term of agreement with the Ventura County entities expires after 2015.
(g) CLWA's share of usable storage at Pyramid Lake, based on its 2.817% proportionate share of capital cost repayment of the reservoir, and assumed usable storage of 155,100 AF.
(h) CLWA's share of usable storage at Castaic Lake, based on its 2.927% proportionate share of capital cost repayment of the reservoir, and assumed usable storage of 115,100 AF.
(i) All demand data are assumed to be one-half of average/normal year Regional Summary demands from Table 2-22.
(j) Additional Conservation Required is difference between Total Demand w/ Conservation and Total Local Supplies and West Branch Storage. A portion or all of this could be met with the acquisition of emergency storage (see Section 8.5.3).
(k) Expressed as percent of Total Demand w/o Conservation.

### 8.5.3 Recommendations for Emergency Storage

The various outage scenarios described in Section 8.5.2 highlight the benefit of CLWA having water stored in multiple banking programs south of the Delta. Banking programs located in Kern County, which have access to the California Aqueduct, are ideally suited to meet at least part of CLWA's emergency needs. The worst-case scenario described above (a complete disruption on the West Branch of the aqueduct) demonstrates the desirability that CLWA also has water stored in at least one water banking program geographically located south of the Tehachapi Mountains.

Storage located south of the Tehachapi Mountains may necessitate an exchange agreement with another West Branch contractor so that the contractor could be served from CLWA's banked water, and CLWA could be served by a portion of the contractor's water in Pyramid or Castaic Lake (this worst case scenario also assumes that CLWA has access to its full Flexible Storage Account in Castaic Lake, in addition to emergency storage).

The most likely and utilizable arrangement would be with the Metropolitan Water District, which retains a significant portion of the storage capacity in Castaic Lake. CLWA could store varying amounts of its water in groundwater storage or banking programs within or adjacent to Metropolitan's service area. In the event of an outage or other emergency, Metropolitan would serve its customers with CLWA's stored water and CLWA would serve its customers with a like amount of Metropolitan's water in Castaic Lake. Amounts of storage required and locations of potential banking programs are as follows:

- Emergency outage storage capacity: 5,000 AF of storage capacity in 2010, increasing to approximately 14,000 AF by 2050.
- Emergency pumpback capacity: approximately 1,000 AF per month of pumpback capacity in 2010, increasing to 2,300 AF per month by 2050.

Potential banking programs, where CLWA could be served by a portion of the contractor's water in Pyramid or Castaic Lake for a potential exchange of emergency outage storage include the following locations:

- **Semitropic-Rosamond Water Bank Authority**
  - This project is located in eastern Kern County, in the northern portion of the Antelope Valley. It is adjacent to both the East Branch of the California Aqueduct and the Los Angeles Aqueduct. This program is active and is seeking participants.
- **Antelope Valley-East Kern Water Agency Water Supply Stabilization Program and Groundwater Recharge Project**
  - This is a project proposed by the Antelope Valley-East Kern Water Agency (AVEK), a SWP wholesaler located in the Antelope Valley area of southeastern Kern County and northern Los Angeles County. The project is adjacent to the East Branch of the California Aqueduct. AVEK is conducting the environmental analysis for the proposed project.
- **Calleguas Municipal Water District Las Posas Groundwater Recharge Project**
  - This project is an in-lieu and Aquifer Storage and Recovery project located in central Ventura County, within the service area of Metropolitan. CLWA could purchase or store water in the program and in the event of an emergency outage, would

exchange the water for use in Metropolitan's service area. CLWA would then utilize a like amount of Metropolitan's water stored in Castaic Lake. This is a conceptual project.

## 8.5.4 Regional Power Outage Scenarios

For a major emergency such as an earthquake, Southern California Edison (Edison) has declared that in the event of an outage, power would be restored within a 24 hour period. Following the Northridge earthquake, Edison was able to restore power within 19 hours. Edison experienced extensive damage to several key power stations, yet was still able to recover within a 24-hour timeframe.

### 8.5.4.1 CLWA

To specifically address the concern of water outages due to loss of power, CLWA has equipped its two treatment plants with generators to produce power for treating water to comply with the California Safe Drinking Water Act and the Health and Safety Code. The Rio Vista Water Treatment Plant and Intake Pump Station emergency generator system provides electrical power to treat 30 MGD for 72 hours without fuel replacement. The Earl Schmidt Filtration Plant emergency generator system provides electrical power to treat 33 MGD for 72 hours without fuel replacement.

### 8.5.4.2 SCWD

SCWD has prepared emergency operations procedures for the effective use of resources during various emergency situations. Emergency situations include but are not limited to earthquakes, major fire emergencies, water outages due to loss of power, localized flooding, water contamination and acts of sabotage.

To specifically address the concerns of water outages due to loss of power, SCWD has purchased and maintains five mobile generators and has the ability to obtain emergency access to others. The current generators are trailer mounted and have the capability of supplying up to 450 Kilovolt-Amperes (KVA). This capacity provides the capability to run any facility within its service area. Most primary pumping facilities are equipped with emergency transfer switches and SCWD employees are trained regularly to install and operate the generators. The generator's run time is only limited by the amount of available diesel fuel.

SCWD has an above-ground diesel fuel storage tank with a capacity of 1,000 gallons located at its warehouse in the City of Santa Clarita. SCWD also has the assistance of a commercial fuel supplier when needed. SCWD maintains a trailer-mounted 100-gallon diesel tank that will be deployed as required to preserve services. SCWD would respond to power outages on a prioritized basis and would continue its response to the power emergency as long as necessary. In addition to the generators, SCWD has a gas driven pump capable of delivering a maximum 2,000 gpm. This pump can be installed at select facilities and run as required.

### 8.5.4.3 NCWD

NCWD has procedures for earthquakes, major fire emergencies, water outages due to loss of power, localized flooding, water contamination and acts of sabotage. To specifically address the concerns of water outages due to loss of power, NCWD has purchased and maintains three

mobile generators. The generators are trailer mounted and have the following capacities: 600 KVA; 300 KVA; and 180 KVA.

These capacities provide the capability to run any facility within NCWD's service area. All primary pumping facilities are equipped with emergency transfer switches, and NCWD employees are trained regularly to maximize the speed to install and operate the generators. The generator run time is only limited by the amount of available diesel fuel.

NCWD has an above ground diesel fuel storage tank with a capacity of 1,000 gallons located at its main office in the City of Santa Clarita. Multiple crew trucks are equipped with 100 gallon diesel tanks and the necessary fueling equipment to refill the generators. NCWD would respond to power outages on a prioritized basis and would continue its response to the power emergency as long as necessary. In addition to the generators, NCWD has one gas driven pump and one diesel driven pump capable of delivering 600 gpm and 1,200 gpm, respectively. All NCWD pumping facilities have been equipped with the necessary appurtenances to quickly connect the portable pumps to restore pumping operations.

#### 8.5.4.4 VWC

In the event that a power outage occurs, VWC has two mobile generators capable of powering any of VWC's wells, turnouts or booster stations. VWC would use the generators as back-up to ensure water service remained until Edison was able to restore power. Besides the significant fuel storage capacity of each generator, VWC has access multiple sources for fuel as needed. For regional power outages, VWC would rely on Edison's reliability criteria for restoring service with the longest outage assumed not to exceed 24 hours. This length of outage would not have a significant impact on water service.

## 8.6 Mandatory Prohibitions During Shortages

All Valley residents live within the boundaries of the City of Santa Clarita or Los Angeles County. Several ordinances were passed in 1991, during the last long-term drought, by the various governmental entities in the Santa Clarita Valley outlawing wasteful water practices. It is expected that, if the Valley experienced another dry-year period, the same ordinances passed in 1991 would be reactivated, as follows:

- On February 14, 1991, the NCWD Board of Directors adopted Resolution No. 101 outlawing wasteful water practices. The ordinance was amended on October 15, 1991, with the adoption of Ordinance No. 102, and further amended on July 14, 2005, with the adoption of Ordinance No. 112.

- On March 13, 1991, the City of Santa Clarita adopted Ordinance No. 91-16 outlawing wasteful water practices and calling for voluntary water conservation. The ordinance was amended on October 8, 1991 by the adoption of Ordinance No. 91-48.

- On March 21, 1991, the Los Angeles County Board of Supervisors adopted Ordinance No. 91-0046U, which prohibits wasteful water practices. The Water Conservation Requirements (Ordinance No. 2008-00052U) was amended by the Los Angeles County Board of Supervisors on October 7, 2008.

Most of the ordinances mentioned above had sunset provisions that were effective January 1, 1992; however, these ordinances could be reinstituted as needed. During more recent conditions of limited supply, in 2008, CLWA adopted Resolution No. 2605 mandating a voluntary program of water conservation in the Santa Clarita Valley.

## 8.7 Consumptive Reduction Methods During Restrictions

### 8.7.1 Supply Shortage Triggering Levels

The Santa Clarita Valley water suppliers will manage water supplies to minimize the social and economic impact of water shortages. The supply shortage strategy is designed to provide a minimum 50 percent of normal supply during a severe or extended water shortage.

Demand reduction stages may be triggered by a shortage in any one of the water sources in the Valley or by shortages in a combination of supplies. The guidelines for triggering the stages are listed in Table 8-5. However, circumstances may arise where the purveyors may deviate from these guidelines, such as in a case where the Governor declares a water shortage emergency and/or institutes a statewide rationing program.

**TABLE 8-5**
**WATER DEFICIENCY TRIGGERING LEVELS**

| Stage | Percent Shortage |
|---|---|
| 1 | Up to 15% water deficiency |
| 2 | 15 to 25% water deficiency |
| 3 | 25 to 35% water deficiency |
| 4 | 35 to 50+% water deficiency |

### 8.7.2 Consumption Limits

The Valley-wide consumption allocation method for each customer type is as follows:

- Single Family Hybrid of Per-capita and Percentage Reduction
- Multi Family Hybrid of Per-capita and Percentage Reduction
- Commercial Percentage Reduction
- Industrial Percentage Reduction
- Governmental Percentage Reduction
- Recreational Percentage Reduction
- Irrigation Percentage Reduction

The percentage reductions at each stage and for each customer type correspond to the figures listed in Table 8-5. In a drought situation (multiple-dry year period), individual customer allotments will be based on a normal year consumption table. The water purveyors will classify each customer and calculate each customer's allotment according to Table 8-5. Each customer will be notified of its classification and allotment by mail before the implementation of a mandatory program. New customers and connections will be notified at the time service

commences if a mandatory program is in effect. Any customer may appeal its classification on the basis of use or the allotment on the basis of incorrect calculation.

In a disaster, prior notice of allotment may not be possible. Notice will be provided by the most efficient means available, if necessary, through the terms of the water suppliers' emergency response plans.

### 8.7.3 New Demand

During any declared water shortage emergency requiring mandatory rationing, CLWA and the retail purveyors recommend that the City and County building departments continue to process applications for grading and building permits, but not issue the actual permits until mandatory rationing is rescinded. In Stages 3 and 4, it may be necessary to discontinue all use of grading water, even if permits have been issued, and consider banning all use of water for non-essential uses, such as new landscaping and pools.

## 8.8 Penalties for Excessive Use

The following section provides a summary of the penalties, if any, that are implemented for excessive water use for SCWD, NCWD and VWC.

### 8.8.1 SCWD

In September 2009, the CLWA Board of Directors adopted Resolution No. 2678 establishing retail water rates that encourage the responsible use of water resources. These rates took effect January 1, 2010. For single family residential customers, SCWD implemented a three tiered rate structure allowing every customer the choice to use water efficiently or pay a premium. Excessive water use results in higher cost per unit of water. Irrigation customers have a separate uniform water rate comparable to the highest Tier 3 (conservation) rate for the single family. All other customers have a uniform flat rate equal to the Tier 2 rate for the single family.

This rate structure is designed to minimize water waste; other than the rate structure, there are no excessive use penalties in place.

### 8.8.2 NCWD

In July 2005, NCWD's Board of Directors adopted Ordinance No. 112, which addresses water conservation, shortage, drought and emergency response procedures. NCWD's Water Conservation Action Plan states that no water user shall waste water or make, cause or permit the use of water for any purpose contrary to any provision of Ordinance No. 112, or in quantities in excess of the use permitted by the conservation stage in effect. If excessive use (water leaks and/or waste) is detected from any water user, the following enforcement plan will be followed:

- **Efficient Water Use and Stage 1 Enforcement:**
  - Any sign of water leaks and/or waste will be documented.
  - NCWD will then determine the appropriate level of action to inform the water user of the guidelines in Ordinance No. 112 and will encourage more efficient water use.

- **Stages 2, 3, and 4 Enforcement:**
  - First Violation: NCWD shall issue a verbal warning to the water user and recommend corrective action.
  - Second Violation: NCWD shall issue a written warning to the water user, and a fine of $40 shall be added to the water user's bill if the corrective action is not taken within 30 days after receiving the written warning.
  - Third Violation: A fine of $100 shall be added to the water user's bill if the corrective action is not taken within 30 days after receiving the written warning. In addition, the NCWD Board or General Manager may require installation of a flow-restricting device on the water user's service connection.
  - Fourth Violation: For the fourth and any additional violations, a fine of $250 shall be added to the water user's bill at the property where the violation occurred. NCWD may also discontinue the water user's water service at the property where the violation occurred. Reconnection shall be permitted only when there is reasonable protection against future violations, such as a flow-restricting device on the customer's service connection, as determined at NCWD's discretion.

- **NCWD Enforcement Costs:**
  - NCWD shall be reimbursed for its costs and expenses in enforcing the provisions of Ordinance No. 112, including costs incurred for staff to investigate and monitor the water user's compliance with the terms of the Ordinance. Charges for installation of flow-restricting devices or for discontinuing or restoring water service, as NCWD incurs those charges, shall be added to the water user's bill at the property where the enforcement costs were incurred.

### 8.8.3 VWC

VWC is regulated by the PUC. During times of threatened or actual water shortage, the PUC will require that VWC apportion its available water supply among its customers. In the absence of direction from the PUC, VWC will apportion the supply in the manner that appears most equitable under circumstances then prevailing and with the cooperation of the Valley water purveyors with due regard to public health and safety.

The PUC's methodology for water utilities to implement Water Conservation Plans is documented in Standard Practice U-40-W, "Instructions for Water Conservation, Rationing, and Service Connection Moratoria." Water shortage contingency plans must be approved by the PUC prior to implementation by VWC. As stated in the Standard Practice U-40-W, the PUC shall authorize mandatory conservation and rationing by approving Schedule No. 14.1, Mandatory Water Conservation and Rationing. Schedule No. 14.1 sets forth water use violation fines, charges for removal of flow restrictors, and the period during which mandatory conservation and rationing measures will be in effect.

## 8.9 Financial Impacts of Actions During Shortages

The following section addresses the financial impacts of actions during water shortages for SCWD, NCWD and VWC.

### 8.9.1 SCWD

SCWD's rates were developed to meet the cost of service. The retail water bill includes two components: a meter service charge and a commodity charge. For the FY 2010/11 Budget, the meter service charge accounts for 31 percent of SCWD's revenues and the commodity charge accounts for 69 percent of SCWD's revenues. The meter service charge is fixed and is based on the meter size. The commodity charge is variable and includes the cost for water consumption and pass-through charges for purchased water and electricity for pumping. Variable costs increase or decrease in direct proportion with the increase or decrease of water used by customers. Customers who use more water will pay a proportionately higher percentage of these costs.

Approximately 44 percent of SCWD's expenses are variable and will be reduced proportionately with any reduction of sales. Since 69 percent of SCWD's revenues are estimated to come from the commodity charges, a supply reduction of 25 percent or more would affect the financial stability of SCWD and impact its ability to meet payment obligations. A Rate Stabilization Fund was established in January 2004 and is to be funded over a ten year period. This fund is to be used when there are variations in water sales resulting from unusual seasons, major consumption reduction due to voluntary or mandatory conservation or to correct for a net loss of revenues in the event of a catastrophic loss of imported water supplies. The Rate Stabilization Fund is used to defer rate increases due to temporary reductions in water sales. Currently the Rate Stabilization Fund is set at 2 percent of annual revenues.

### 8.9.2 NCWD

NCWD's rates are designed with the intent that NCWD will generate adequate revenues to meet the costs of operating the water system. For FY 2010/11, it is expected that 28 percent of NCWD's total water revenues will come from the service charge and about 72 percent of the total revenues will come from the commodity charge. The service charge is based on meter size and the commodity charge is based on the quantity of water consumed.

The nature of NCWD's operation (as with any water utility) is that the majority of the operating costs are fixed in nature and do not increase or decrease in direct proportion with increases or decreases in water use by customers. For NCWD, fixed costs constitute about 57 percent of its total operating costs in a normal year. If water availability issues or shortages cause NCWD to request a voluntary reduction in the customer's water use, 57 percent of the operating costs will remain the same even though less water is sold. This would result in a substantial revenue shortfall.

In an effort to address this shortfall, NCWD established a reserve policy (Resolution 2009-10) that includes a "rate stabilization" fund to be used in situations where actual consumption of water is reduced as a direct result of a water shortage situation as defined in Table 8-1 of this Plan.

In the event of a declaration of a water shortage situation, NCWD's Board of Directors will consider options and actions intended to replenish the rate stabilization reserve to its ideal level. These actions may include but are not limited to rate increases or surcharges, per customer assessments and utilization of other reserve funds.

### 8.9.3 VWC

The PUC allows the investor owned water utilities it regulates to track and seek recovery of lost revenues and expense increases due to mandatory or voluntary water rationing during a drought. PUC regulated utilities' rates are set based on an assumed level of customer water usage during normal weather conditions. Therefore, when a drought occurs and customers conserve water, a utility's revenue declines and it is difficult for the utility to fully fund its operating expenses. In order to provide an incentive for utilities to promote water conservation during periods of drought, the PUC developed a mechanism whereby utilities can track lost revenues, net of reduced water production costs, as well as increases in expenses due to drought conditions. Utilities can then recover a portion of their lost revenues and expense increases via a surcharge to customers. This reduces the financial strain conservation programs place on investor owned utilities while furthering the statewide goal of water conservation during periods of drought.

## 8.10 Water Shortage Contingency Resolution

If a water shortage crisis reoccurs, such as the 1987-1992 drought, the Santa Clarita Valley water suppliers would call a public hearing to declare a water shortage pursuant to Sections 351 and 352 of the California Water Code.

The Los Angeles County Board of Supervisors (on behalf of LACWWD 36) and NCWD's and CLWA's (including SCWD) respective Boards of Directors would adopt ordinances, similar to those adopted in 1991, implementing the Water Shortage Contingency Plan. In February 1991 the CLWA Board of Directors adopted Resolution No. 804, which recognized reductions in requested delivery of SWP supply and mandated water conservation in the Valley.

VWC would file an advice letter with the CPUC implementing the Water Shortage Contingency Plan. The Water Shortage Contingency would become VWC's Schedule 14.1.

## 8.11 Mechanism to Determine Reductions in Water Use

### 8.11.1 Demand

NCWD, SCWD, and VWC bill their customers on a monthly basis. The prior year's consumption is included on most customer bills. This allows comparison of the total consumption from each billing period to the same billing period from the prior year.

### 8.11.2 Production

Under normal conditions, CLWA, NCWD, SCWD, and VWC prepare monthly production reports, which are reviewed and compared to production reports and pumping statistics from the same period of the prior year. Under water shortage conditions, these production reports could be prepared as often as daily.

### 8.11.3 Stage 1 and 2 Water Shortages

During Stages 1 and 2 Water Shortages, retail purveyors would review selected production reports on a daily basis, and CLWA would provide each retail purveyor with a copy of its daily

production report. The water suppliers would meet as frequent a basis as necessary to review water supply and demand in the Valley. Billing reports would be reviewed to identify users who are not abiding by the plan.

### 8.11.4 Stage 3 and 4 Water Shortages

During Stages 3 and 4 Water Shortages, the retail purveyors would review all production reports and pumping statistics on a daily basis. The water suppliers would continue to monitor the supply and demand in the Valley. Water transfers and agreements to use each other's distribution facilities would be implemented as needed. Billing reports would be reviewed to identify users who are not abiding by the plan.

### 8.11.5 Disaster Shortage

During a disaster shortage, the Santa Clarita Valley water suppliers would continually monitor production figures, and will work to transfer water and use each other's distribution facilities where feasible.

# Section 9: References

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# Appendix A

DWR Checklist

**APPENDIX A**
**Urban Water Management Plan Checklist (Organized by Legislation)**

| No. | UWMP requirement [a] | Calif. Water Code Reference | UWMP Location by Retail Purveyor | | | |
|---|---|---|---|---|---|---|
| | | | Castaic Lake Water Agency | Newhall County Water District | CLWA Santa Clarita Water Division | Valencia Water Company |
| 1 | Provide baseline daily per capita water use, urban water use target, interim urban water use target, and compliance daily per capita water use, along with the bases for determining those estimates, including references to supporting data. | 10608.20(e) | NA, Wholesale District | 2.6.2, Tables 2-15 & 2-16, pgs 2-18 & 2-19 | 2.6.2, Tables 2-17 & 2-18, pg 2-19 | 2.6.2, Tables 2-19 & 2-20, pg 2-20 |
| 2 | *Wholesalers:* Include an assessment of present and proposed future measures, programs, and policies to help achieve the water use reductions. *Retailers:* Conduct at least one public hearing that includes general discussion of the urban retail water supplier's implementation plan for complying with the Water Conservation Bill of 2009. | 10608.36 10608.26(a) | 7.2, 7.3 | 1.3.3, Table 1-2, 7.6.3, pgs 1-6 to 1-8 & 7-32 to 7-34 | 1.3.3, Table 1-2, 7.4.3, pgs 1-6 to 1-8 & 7-11 to 7-14 | 1.3.3, Table 1-2, 7.5.3, pgs 1-6 to 1-8 & 7-23 to 7-26 |
| 3 | Report progress in meeting urban water use targets using the standardized form. | 10608.4 | NA | NA | NA | NA |
| 4 | Each urban water supplier shall coordinate the preparation of its plan with other appropriate agencies in the area, including other water suppliers that share a common source, water management agencies, and relevant public agencies, to the extent practicable. | 10620(d)(2) | 1.3.1 & 1.3.3, Table 1-1, pgs 1-3 to 1-8 | 1.3.1 & 1.3.3, Table 1-1, pgs 1-3 to 1-8 | 1.3.1 & 1.3.3, Table 1-1, pgs 1-3 to 1-8 | 1.3.1 & 1.3.3, Table 1-1, pgs 1-3 to 1-8 |
| 5 | An urban water supplier shall describe in the plan water management tools and options used by that entity that will maximize resources and minimize the need to import water from other regions. | 10620(f) | 1.3.4, pg 1-8 | 1.3.4, pg 1-8 | 1.3.4, pg 1-8 | 1.3.4, pg 1-8 |
| 6 | Every urban water supplier required to prepare a plan pursuant to this part shall, at least 60 days prior to the public hearing on the plan required by Section 10642, notify any city or county within which the supplier provides water supplies that the urban water supplier will be reviewing the plan and considering amendments or changes to the plan. The urban water supplier may consult with, and obtain comments from, any city or county that receives notice pursuant to this subdivision. | 10621(b) | 1.3.3, Table 1-1, pgs 1-3 to 1-8, Appendix B | 1.3.3, Table 1-1, pgs 1-3 to 1-8, Appendix B | 1.3.3, Table 1-1, pgs 1-3 to 1-8, Appendix B | 1.3.3, Table 1-1, pgs 1-3 to 1-8, Appendix B |
| 7 | The amendments to, or changes in, the plan shall be adopted and filed in the manner set forth in Article 3 (commencing with Section 10640). | 10621(c) | 1.3.1 & 1.3.3, Table 1-1, pgs 1-3 to 1-8 | 1.3.1 & 1.3.3, Table 1-1, pgs 1-3 to 1-8 | 1.3.1 & 1.3.3, Table 1-1, pgs 1-3 to 1-8 | 1.3.1 & 1.3.3, Table 1-1, pgs 1-3 to 1-8 |
| 8 | Describe the service area of the supplier | 10631(a) | 1.4.1, Fig. 1-1, pgs 1-8 to 1-11 | 1.4.2, Fig. 1-1, pgs 1-10 to 1-11 | 1.4.2, Fig. 1-1, pgs 1-10 to 1-11 | 1.4.2, Fig. 1-1, pgs 1-10 to 1-11 |
| 9 | (Describe the service area) climate | 10631(a) | 1.5, Table 1-4, pgs 1-12 to 1-13 | 1.5, Table 1-4, pgs 1-12 to 1-13 | 1.5, Table 1-4, pgs 1-12 to 1-13 | 1.5, Table 1-4, pgs 1-12 to 1-13 |
| 10 | (Describe the service area) current and projected population . . . The projected population estimates shall be based upon data from the state, regional, or local service agency population projections within the service area of the urban water supplier . . . | 10631(a) | 2.5; Tables 2-7, 2-8, & 2-9; pgs 2-9 to 2-14 | 2.5; Tables 2-7, 2-8, & 2-9; pgs 2-9 to 2-14 | 2.5; Tables 2-7, 2-8, & 2-9; pgs 2-9 to 2-14 | 2.5; Tables 2-7, 2-8, & 2-9; pgs 2-9 to 2-14 |
| 11 | . . . (population projections) shall be in five-year increments to 20 years or as far as data is available. | 10631(a) | Table 2-9, pg 2-13 | Table 2-9, pg 2-13 | Table 2-9, pg 2-13 | Table 2-9, pg 2-13 |
| 12 | Describe . . . other demographic factors affecting the supplier's water management planning | 10631(a) | 2.2, pgs 2-1 to 2-2 | 2.2, pgs 2-1 to 2-2 | 2.2, pgs 2-1 to 2-2 | 2.2, pgs 2-1 to 2-2 |

**APPENDIX A**
**Urban Water Management Plan Checklist (Organized by Legislation)**

| No. | UWMP requirement [a] | Calif. Water Code Reference | UWMP Location by Retail Purveyor | | | |
|---|---|---|---|---|---|---|
| | | | Castaic Lake Water Agency | Newhall County Water District | CLWA Santa Clarita Water Division | Valencia Water Company |
| 13 | Identify and quantify, to the extent practicable, the existing and planned sources of water available to the supplier over the same five-year increments described in subdivision (a). | 10631(b) | Table 3-1, pg 3-2 | Table 3-1, pg 3-2 | Table 3-1, pg 3-2 | Table 3-1, pg 3-2 |
| 14 | (Is) groundwater . . . identified as an existing or planned source of water available to the supplier . . .? | 10631(b) | □3.3, pgs 3-15 to 3-37 | □3.3, pgs 3-15 to 3-37 | □3.3, pgs 3-15 to 3-37 | □3.3, pgs 3-15 to 3-37 |
| 15 | (Provide a) copy of any groundwater management plan adopted by the urban water supplier, including plans adopted pursuant to Part 2.75 (commencing with Section 10750), or any other specific authorization for groundwater management. Indicate whether a groundwater management plan been adopted by the water supplier or if there is any other specific authorization for groundwater management. Include a copy of the plan or authorization. | 10631(b)(1) | Appendix G, □3.3.2, pg 3-15 | Appendix G, □3.3.2, pg 3-15 | Appendix G, □3.3.2, pg 3-15 | Appendix G, □3.3.2, pg 3-15 |
| 16 | (Provide a) description of any groundwater basin or basins from which the urban water supplier pumps groundwater. | 10631(b)(2) | □□3.3.1 & 3.3.2, Fig. 3-1, pgs 3-15 to 3-33 | □□3.3.1 & 3.3.2, Fig. 3-1, pgs 3-15 to 3-33 | □□3.3.1 & 3.3.2, Fig. 3-1, pgs 3-15 to 3-33 | □□3.3.1 & 3.3.2, Fig. 3-1, pgs 3-15 to 3-33 |
| 17 | For those basins for which a court or the board has adjudicated the rights to pump groundwater, (provide) a copy of the order or decree adopted by the court or the board | 10631(b)(2) | NA | NA | NA | NA |
| 18 | (Provide) a description of the amount of groundwater the urban water supplier has the legal right to pump under the order or decree. | 10631(b)(2) | NA | NA | NA | NA |
| 19 | For basins that have not been adjudicated, (provide) information as to whether the department has identified the basin or basins as overdrafted or has projected that the basin will become overdrafted if present management conditions continue, in the most current official departmental bulletin that characterizes the condition of the groundwater basin, and a detailed description of the efforts being undertaken by the urban water supplier to eliminate the long-term overdraft condition. | 10631(b)(2) | □3.3.2, pgs 3-15 to 3-33 | □3.3.2, pgs 3-15 to 3-33 | □3.3.2, pgs 3-15 to 3-33 | □3.3.2, pgs 3-15 to 3-33 |
| 20 | (Provide a) detailed description and analysis of the location, amount, and sufficiency of groundwater pumped by the urban water supplier for the past five years. The description and analysis shall be based on information that is reasonably available, including, but not limited to, historic use records. | 10631(b)(3) | □□3.3.2.2 & 3.3.2.3; Table 3-6; pgs 3-22, 3-24 to 3-33 | □□3.3.2.2 & 3.3.2.3; Table 3-6; pgs 3-22, 3-24 to 3-33 | □□3.3.2.2 & 3.3.2.3; Table 3-6; pgs 3-22, 3-24 to 3-33 | □□3.3.2.2 & 3.3.2.3; Table 3-6; pgs 3-22, 3-24 to 3-33 |
| 21 | (Provide a) detailed description and analysis of the amount and location of groundwater that is projected to be pumped by the urban water supplier. The description and analysis shall be based on information that is reasonably available, including, but not limited to, historic use records. | 10631(b)(4) | □3.3.2; Tables 3-5 & 3-7; pgs 3-15 to 3-33 | □3.3.2; Tables 3-5 & 3-7; pgs 3-15 to 3-33 | □3.3.2; Tables 3-5 & 3-7; pgs 3-15 to 3-33 | □3.3.2; Tables 3-5 & 3-7; pgs 3-15 to 3-33 |
| 22 | Describe the reliability of the water supply and vulnerability to seasonal or climatic shortage, to the extent practicable, and provide data for each of the following: (A) An average water year, (B) A single dry water year, (C) Multiple dry water years. | 10631(c)(1) | □□3.2.1.1.3, 3.2.1.2; pgs 3-5 to 3-9, □□3.3.2.2, 3.3.2.3, 6.4.1, 6.4.2, 6.4.3; pgs 3-24 to 3-33 & 6-6 to 6-14, Appendix C | □□3.2.1.1.3, 3.2.1.2; pgs 3-5 to 3-9, □□3.3.2.2, 3.3.2.3, 6.4.1, 6.4.2, 6.4.3; pgs 3-24 to 3-33 & 6-6 to 6-14, Appendix C | □□3.2.1.1.3, 3.2.1.2; pgs 3-5 to 3-9, □□3.3.2.2, 3.3.2.3, 6.4.1, 6.4.2, 6.4.3; pgs 3-24 to 3-33 & 6-6 to 6-14, Appendix C | □□3.2.1.1.3, 3.2.1.2; pgs 3-5 to 3-9, □□3.3.2.2, 3.3.2.3, 6.4.1, 6.4.2, 6.4.3; pgs 3-24 to 3-33 & 6-6 to 6-14, Appendix C |

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| No. | UWMP requirement [a] | Calif. Water Code Reference | UWMP Location by Retail Purveyor | | | |
|---|---|---|---|---|---|---|
| | | | Castaic Lake Water Agency | Newhall County Water District | CLWA Santa Clarita Water Division | Valencia Water Company |
| 23 | For any water source that may not be available at a consistent level of use - given specific legal, environmental, water quality, or climatic factors - describe plans to supplement or replace that source with alternative sources or water demand management measures, to the extent practicable. | 10631(c)(2) | 3.3.2.2, 3.3.2.3; pgs 3-28 to 3-29, 3-33, 5.7; pgs 5-12 to 5-13; 6.2; pgs 6-1 to 6-2 | 3.3.2.2, 3.3.2.3; pgs 3-28 to 3-29, 3-33, 5.7; pgs 5-12 to 5-13; 6.2; pgs 6-1 to 6-2 | 3.3.2.2, 3.3.2.3; pgs 3-28 to 3-29, 3-33, 5.7; pgs 5-12 to 5-13; 6.2; pgs 6-1 to 6-2 | 3.3.2.2, 3.3.2.3; pgs 3-28 to 3-29, 3-33, 5.7; pgs 5-12 to 5-13; 6.2; pgs 6-1 to 6-2 |
| 24 | Describe the opportunities for exchanges or transfers of water on a short-term or long-term basis. | 10631(d) | 3.4, pgs 3-37 & 3-38 | 3.4, pgs 3-37 & 3-38 | 3.4, pgs 3-37 & 3-38 | 3.4, pgs 3-37 & 3-38 |
| 25 | Quantify, to the extent records are available, past and current water use, and projected water use (over the same five-year increments described in subdivision (a)), identifying the uses among water use sectors, including, but not necessarily limited to, all of the following uses: (A) Single-family residential; (B) Multifamily; (C) Commercial; (D) Industrial; (E) Institutional and governmental; (F) Landscape; (G) Sales to other agencies; (H) Saline water intrusion barriers, groundwater recharge, or conjunctive use, or any combination thereof;(I) Agricultural. | 10631(e)(1) | NA | 2.4.1, Table 2-4, pg 2-6 | 2.4.1, Table 2-5, pg 2-7 | 2.4.1, Table 2-6, pg 2-8 |
| 26 | (Describe and provide a schedule of implementation for) each water demand management measure that is currently being implemented, or scheduled for implementation, including the steps necessary to implement any proposed measures, including, but not limited to, all of the following: (A) Water survey programs for single-family residential and multifamily residential customers; (B) Residential plumbing retrofit; (C) System water audits, leak detection, and repair; (D) Metering with commodity rates for all new connections and retrofit of existing connections; (E) Large landscape conservation programs and incentives; (F) High-efficiency washing machine rebate programs; (G) Public information programs; (H) School education programs; (I) Conservation programs for commercial, industrial, and institutional accounts; (J) Wholesale agency programs; (K) Conservation pricing; (L) Water conservation coordinator; (M) Water waste prohibition;(N) Residential ultra-low-flush toilet replacement programs. | 10631(f)(1) | 7.2 & 7.3, pgs 7-2 to 7-5 | 7.6, pgs 7-26 to 7-34 | 7.4, pgs 7-6 to 7-14 | 7.5, pgs 7-14 to 7-26 |
| 27 | A description of the methods, if any, that the supplier will use to evaluate the effectiveness of water demand management measures implemented or described under the plan. | 10631(f)(3) | 7.2 & 7.3, pgs 7-2 to 7-5 | 7.6.3, pg 7-34 | 7.4.3, pg 7-14 | 7.5.3, pg 7-26 |
| 28 | An estimate, if available, of existing conservation savings on water use within the supplier's service area, and the effect of the savings on the supplier's ability to further reduce demand. | 10631(f)(4) | 7.2 & 7.3, pgs 7-2 to 7-5 | 7.6.3, pg 7-34 | 7.4.3, pg 7-14 | 7.5.2.3, pg 7-26 |
| 29 | An evaluation of each water demand management measure listed in paragraph (1) of subdivision (f) that is not currently being implemented or scheduled for implementation. In the course of the evaluation, first consideration shall be given to water demand management measures, or combination of measures, that offer lower incremental costs than expanded or additional water supplies. This evaluation shall do all of the following: (1) Take into account economic and noneconomic factors, including environmental, social, health, customer impact, and technological factors; (2) Include a cost-benefit analysis, identifying total benefits and total costs; (3) Include a description of funding available to implement any planned water supply project that would provide water at a higher unit cost; (4) Include a description of the water supplier's legal authority to implement the measure and efforts to work with other relevant agencies to ensure the implementation of the measure and to share the cost of implementation. | 10631(g) | 7.2 & 7.3, pgs 7-2 to 7-5 | 7.6.2, pgs 7-29 to 7-32, NCWD is using GPCD approach to comply with CUWCC MOU | 7.4.2, pgs 7-9 to 7-11, SCWD is using GPCD approach to comply with CUWCC MOU | 7.5.2, pgs 7-18 to 7-23, VWC is using GPCD approach to comply with CUWCC MOU |

**APPENDIX A**
**Urban Water Management Plan Checklist (Organized by Legislation)**

| No. | UWMP requirement [a] | Calif. Water Code Reference | UWMP Location by Retail Purveyor | | | |
|---|---|---|---|---|---|---|
| | | | Castaic Lake Water Agency | Newhall County Water District | CLWA Santa Clarita Water Division | Valencia Water Company |
| 30 | (Describe) all water supply projects and water supply programs that may be undertaken by the urban water supplier to meet the total projected water use as established pursuant to subdivision (a) of Section 10635. The urban water supplier shall include a detailed description of expected future projects and programs, other than the demand management programs identified pursuant to paragraph (1) of subdivision (f), that the urban water supplier may implement to increase the amount of the water supply available to the urban water supplier in average, single-dry, and multiple-dry water years. The description shall identify specific projects and include a description of the increase in water supply that is expected to be available from each project. The description shall include an estimate with regard to the implementation timeline for each project or program. | 10631(h) | 3.4, 3.5, & 3.6; pgs 3-37 to 3-41; 4.4, Table 4-3, pgs 4-8 to 4-9 | 3.4, 3.5, & 3.6; pgs 3-37 to 3-41; 4.4, Table 4-3, pgs 4-8 to 4-9 | 3.4, 3.5, & 3.6; pgs 3-37 to 3-41; 4.4, Table 4-3, pgs 4-8 to 4-9 | 3.4, 3.5, & 3.6; pgs 3-37 to 3-41; 4.4, Table 4-3, pgs 4-8 to 4-9 |
| 31 | Describe the opportunities for development of desalinated water, including, but not limited to, ocean water, brackish water, and groundwater, as a long-term supply. | 10631(i) | 3.7, pgs 3-41 to 3-42 | 3.7, pgs 3-41 to 3-42 | 3.7, pgs 3-41 to 3-42 | 3.7, pgs 3-41 to 3-42 |
| 32 | Include the annual reports submitted to meet the Section 6.2 requirement (of the MOU), if a member of the CUWCC and signer of the December 10, 2008 MOU. | 10631(j) | 7, Appendix E | 7 | 7 | 7 |
| 33 | Urban water suppliers that rely upon a wholesale agency for a source of water shall provide the wholesale agency with water use projections from that agency for that source of water in five-year increments to 20 years or as far as data is available. The wholesale agency shall provide information to the urban water supplier for inclusion in the urban water supplier's plan that identifies and quantifies, to the extent practicable, the existing and planned sources of water as required by subdivision (b), available from the wholesale agency to the urban water supplier over the same five-year increments, and during various water-year types in accordance with subdivision (c). An urban water supplier may rely upon water supply information provided by the wholesale agency in fulfilling the plan informational requirements of subdivisions (b) and (c). | 10631(k) | Table 3-4, pg 3-15 | NA | NA | NA |
| 34 | The water use projections required by Section 10631 shall include projected water use for single-family and multifamily residential housing needed for lower income households, as defined in Section 50079.5 of the Health and Safety Code, as identified in the housing element of any city, county, or city and county in the service area of the supplier. | 10631.1(a) | 2.6.3.1, pg 2-23 to 2-24 | 2.6.3.1, Table 2-23, pgs 2-23 to 2-24 | 2.6.3.1, Table 2-23, pgs 2-23 to 2-24 | 2.6.3.1, Table 2-23, pgs 2-23 to 2-24 |
| 35 | Stages of action to be undertaken by the urban water supplier in response to water supply shortages, including up to a 50 percent reduction in water supply, and an outline of specific water supply conditions which are applicable to each stage. | 10632(a) | 8.3, Table 8-1, pgs 8-1 to 8-3 | 8.3, Table 8-1, pgs 8-1 to 8-3 | 8.3, Table 8-1, pgs 8-1 to 8-3 | 8.3, Table 8-1, pgs 8-1 to 8-3 |
| 36 | Provide an estimate of the minimum water supply available during each of the next three water years based on the driest three-year historic sequence for the agency's water supply. | 10632(b) | 8.4, Table 8-3, pg 8-3 | 8.4, Table 8-3, pg 8-3 | 8.4, Table 8-3, pg 8-3 | 8.4, Table 8-3, pg 8-3 |
| 37 | (Identify) actions to be undertaken by the urban water supplier to prepare for, and implement during, a catastrophic interruption of water supplies including, but not limited to, a regional power outage, an earthquake, or other disaster. | 10632(c) | 8.5, pgs 8-4 to 8-12 | 8.5, pgs 8-4 to 8-12 | 8.5, pgs 8-4 to 8-12 | 8.5, pgs 8-4 to 8-12 |
| 38 | (Identify) additional, mandatory prohibitions against specific water use practices during water shortages, including, but not limited to, prohibiting the use of potable water for street cleaning. | 10632(d) | 8.6, pg 8-12 | 8.6, pg 8-12 | 8.6, pg 8-12 | 8.6, pg 8-12 |
| 39 | (Specify) consumption reduction methods in the most restrictive stages. Each urban water supplier may use any type of consumption reduction methods in its water shortage contingency analysis that would reduce water use, are appropriate for its area, and have the ability to achieve a water use reduction consistent with up to a 50 percent reduction in water supply. | 10632(e) | 8.7, pgs 8-13 to 8-14 | 8.7, pgs 8-13 to 8-14 | 8.7, pgs 8-13 to 8-14 | 8.7, pgs 8-13 to 8-14 |

**APPENDIX A**
**Urban Water Management Plan Checklist (Organized by Legislation)**

| No. | UWMP requirement [a] | Calif. Water Code Reference | UWMP Location by Retail Purveyor | | | |
|---|---|---|---|---|---|---|
| | | | Castaic Lake Water Agency | Newhall County Water District | CLWA Santa Clarita Water Division | Valencia Water Company |
| 40 | (Indicated) penalties or charges for excessive use, where applicable. | 10632(f) | 8.8.1, pg 8-14 | 8.8.2, pgs 8-14 to 8-15 | 8.8.1, pg 8-14 | 8.8.3, pg 8-15 |
| 41 | An analysis of the impacts of each of the actions and conditions described in subdivisions (a) to (f), inclusive, on the revenues and expenditures of the urban water supplier, and proposed measures to overcome those impacts, such as the development of reserves and rate adjustments. | 10632(g) | Appendix F | 8.9.2, pg 8-16 | 8.9.1, pg 8-15 to 8-16 | 8.9.3, pg 8-16 |
| 42 | (Provide) a draft water shortage contingency resolution or ordinance. | 10632(h) | Appendix F | Appendix F | Appendix F | Appendix F |
| 43 | (Indicate) a mechanism for determining actual reductions in water use pursuant to the urban water shortage contingency analysis. | 10632(i) | 8.11, pgs 8-17 to 8-18 | 8.11, pgs 8-17 to 8-18 | 8.11, pgs 8-17 to 8-18 | 8.11, pgs 8-17 to 8-18 |
| 44 | Provide, to the extent available, information on recycled water and its potential for use as a water source in the service area of the urban water supplier. The preparation of the plan shall be coordinated with local water, wastewater, groundwater, and planning agencies that operate within the supplier's service area | 10633 | 4.4, Table 4-3, pgs 4-8 to 4-9 | 4.4, Table 4-3, pgs 4-8 to 4-9 | 4.4, Table 4-3, pgs 4-8 to 4-9 | 4.4, Table 4-3, pgs 4-8 to 4-9 |
| 45 | (Describe) the wastewater collection and treatment systems in the supplier's service area, including a quantification of the amount of wastewater collected and treated and the methods of wastewater disposal. | 10633(a) | 4.2, pgs 4-4 to 4-5 | 4.2, pgs 4-4 to 4-5 | 4.2, pgs 4-4 to 4-5 | 4.2, pgs 4-4 to 4-5 |
| 46 | (Describe) the quantity of treated wastewater that meets recycled water standards, is being discharged, and is otherwise available for use in a recycled water project. | 10633(b) | 4.2, Table 4-3, pgs 4-4 to 4-5 and 4-9 | 4.2, Table 4-3, pgs 4-4 to 4-5 and 4-9 | 4.2, Table 4-3, pgs 4-4 to 4-5 and 4-9 | 4.2, Table 4-3, pgs 4-4 to 4-5 and 4-9 |
| 47 | (Describe) the recycled water currently being used in the supplier's service area, including, but not limited to, the type, place, and quantity of use. | 10633(c) | 4.2 and 4.7, pgs 4-4 to 4-5 & 4-13 | 4.2 and 4.7, pgs 4-4 to 4-5 & 4-13 | 4.2 and 4.7, pgs 4-4 to 4-5 & 4-13 | 4.2 and 4.7, pgs 4-4 to 4-5 & 4-13 |
| 48 | (Describe and quantify) the potential uses of recycled water, including, but not limited to, agricultural irrigation, landscape irrigation, wildlife habitat enhancement, wetlands, industrial reuse, groundwater recharge, indirect potable reuse, and other appropriate uses, and a determination with regard to the technical and economic feasibility of serving those uses. | 10633(d) | 4.6, pg 4-12 | 4.6, pg 4-12 | 4.6, pg 4-12 | 4.6, pg 4-12 |
| 49 | (Describe) The projected use of recycled water within the supplier's service area at the end of 5, 10, 15, and 20 years, and a description of the actual use of recycled water in comparison to uses previously projected pursuant to this subdivision. | 10633(e) | 4.4 & 4.7, Table 4-3, pgs 4-8 to 4-11 & 4-13 | 4.4 & 4.7, Table 4-3, pgs 4-8 to 4-11 & 4-13 | 4.4 & 4.7, Table 4-3, pgs 4-8 to 4-11 & 4-13 | 4.4 & 4.7, Table 4-3, pgs 4-8 to 4-11 & 4-13 |
| 50 | (Describe the) actions, including financial incentives, which may be taken to encourage the use of recycled water, and the projected results of these actions in terms of acre-feet of recycled water used per year. | 10633(f) | 4.8, pg 4-13 | 4.8, pg 4-13 | 4.8, pg 4-13 | 4.8, pg 4-13 |
| 51 | (Provide a) plan for optimizing the use of recycled water in the supplier's service area, including actions to facilitate the installation of dual distribution systems, to promote recirculating uses, to facilitate the increased use of treated wastewater that meets recycled water standards, and to overcome any obstacles to achieving that increased use. | 10633(g) | 4.4.1, pgs 4-11 to 4-12, 4.9, pgs 4-13 to 4-14, 4.10, pgs 4-15 to 4-19 | 4.4.1, pgs 4-11 to 4-12, 4.9, pgs 4-13 to 4-14, 4.10, pgs 4-15 to 4-19 | 4.4.1, pgs 4-11 to 4-12, 4.9, pgs 4-13 to 4-14, 4.10, pgs 4-15 to 4-19 | 4.4.1, pgs 4-11 to 4-12, 4.9, pgs 4-13 to 4-14, 4.10, pgs 4-15 to 4-19 |
| 52 | The plan shall include information, to the extent practicable, relating to the quality of existing sources of water available to the supplier over the same five-year increments as described in subdivision (a) of Section 10631, and the manner in which water quality affects water management strategies and supply reliability. | 10634 | 5.7, Table 5-2, pg 5-12-13, Appendix I | 5.7, Table 5-2, pg 5-12-13, Appendix I | 5.7, Table 5-2, pg 5-12-13, Appendix I | 5.7, Table 5-2, pg 5-12-13, Appendix I |

**APPENDIX A**
**Urban Water Management Plan Checklist (Organized by Legislation)**

| No. | UWMP requirement [a] | Calif. Water Code Reference | UWMP Location by Retail Purveyor | | | |
|---|---|---|---|---|---|---|
| | | | Castaic Lake Water Agency | Newhall County Water District | CLWA Santa Clarita Water Division | Valencia Water Company |
| 53 | Every urban water supplier shall include, as part of its urban water management plan, an assessment of the reliability of its water service to its customers during normal, dry, and multiple dry water years. This water supply and demand assessment shall compare the total water supply sources available to the water supplier with the total projected water use over the next 20 years, in five-year increments, for a normal water year, a single dry water year, and multiple dry water years. The water service reliability assessment shall be based upon the information compiled pursuant to Section 10631, including available data from state, regional, or local agency population projections within the service area of the urban water supplier. | 10635(a) | 6.4, Tables 6-2 to 6-4, pgs 6-6 to 6-15, Appendix C | 6.4, Tables 6-2 to 6-4, pgs 6-6 to 6-15, Appendix C | 6.4, Tables 6-2 to 6-4, pgs 6-6 to 6-15, Appendix C | 6.4, Tables 6-2 to 6-4, pgs 6-6 to 6-15, Appendix C |
| 54 | The urban water supplier shall provide that portion of its urban water management plan prepared pursuant to this article to any city or county within which it provides water supplies no later than 60 days after the submission of its urban water management plan. | 10635(b) | 1.3.3, pgs 1-6 to 1-8, Appendix B | 1.3.3, pgs 1-6 to 1-8, Appendix B | 1.3.3, pgs 1-6 to 1-8, Appendix B | 1.3.3, pgs 1-6 to 1-8, Appendix B |
| 55 | Each urban water supplier shall encourage the active involvement of diverse social, cultural, and economic elements of the population within the service area prior to and during the preparation of the plan. | 10642 | 1.3.1 &1.3.3, Table 1-2, pgs 1-3 to 1-8 | 1.3.1 &1.3.3, Table 1-2, pgs 1-3 to 1-8 | 1.3.1 &1.3.3, Table 1-2, pgs 1-3 to 1-8 | 1.3.1 &1.3.3, Table 1-2, pgs 1-3 to 1-8 |
| 56 | Prior to adopting a plan, the urban water supplier shall make the plan available for public inspection and shall hold a public hearing thereon. Prior to the hearing, notice of the time and place of hearing shall be published within the jurisdiction of the publicly owned water supplier pursuant to Section 6066 of the Government Code. The urban water supplier shall provide notice of the time and place of hearing to any city or county within which the supplier provides water supplies. A privately owned water supplier shall provide an equivalent notice within its service area. | 10642 | 1.3.1 & 1.3.3, Table 1-2, pgs 1-3 to 1-8, Appendix B | 1.3.1 & 1.3.3, Table 1-2, pgs 1-3 to 1-8, Appendix B | 1.3.1 & 1.3.3, Table 1-2, pgs 1-3 to 1-8, Appendix B | 1.3.1 & 1.3.3, Table 1-2, pgs 1-3 to 1-8, Appendix B |
| 57 | After the hearing, the plan shall be adopted as prepared or as modified after the hearing. | 10642 | 1.3.2, Table 1-2, pgs 1-6 to 1-7 | 1.3.2, Table 1-2, pgs 1-6 to 1-7 | 1.3.2, Table 1-2, pgs 1-6 to 1-7 | 1.3.2, Table 1-2, pgs 1-6 to 1-7 |
| 58 | An urban water supplier shall implement its plan adopted pursuant to this chapter in accordance with the schedule set forth in its plan. | 10643 | 1.3, pgs 1-3 to 1-8 | 1.3, pgs 1-3 to 1-8 | 1.3, pgs 1-3 to 1-8 | 1.3, pgs 1-3 to 1-8 |
| 59 | An urban water supplier shall submit to the department, the California State Library, and any city or county within which the supplier provides water supplies a copy of its plan no later than 30 days after adoption. Copies of amendments or changes to the plans shall be submitted to the department, the California State Library, and any city or county within which the supplier provides water supplies within 30 days after adoption. | 10644(a) | Table 1-2, pg 1-7 | Table 1-2, pg 1-7 | Table 1-2, pg 1-7 | Table 1-2, pg 1-7 |
| 60 | Not later than 30 days after filing a copy of its plan with the department, the urban water supplier and the department shall make the plan available for public review during normal business hours. | 10645 | 1.3.3, pgs 1-6 to 1-8 | 1.3.3, pgs 1-6 to 1-8 | 1.3.3, pgs 1-6 to 1-8 | 1.3.3, pgs 1-6 to 1-8 |

# Appendix B

Public Outreach Materials

# Public Outreach Record

## 2010 Santa Clarita Valley
## Urban Water Management Plan

**Master List for 2010 SCV UWMP Notification of Workshops and Draft Availability**

| | |
|---|---|
| Jarrod Degonia<br>Assemblymember Cameron Smyth<br>23734 Valencia Blvd. #303<br>Santa Clarita, CA 91355 | Ernie Villegas<br>Assemblymember Jeff Gorell<br>2659 Townsgate Road, Suite 236<br>Westlake Village, CA 91361 |
| Dana Nielsen<br>Assemblymember Audra Strickland<br>2659 Townsgate Road, Suite 236<br>Westlake Village, CA 91361 | Kevin Korenthal<br>Associated Builders & Contractors of CA; ABC-CCC<br>28005 Smyth Dr., Suite 129<br>Valencia, CA 91355 |
| Holly Schroeder<br>BIA - Los Angeles/Ventura Chapter<br>28480 Avenue Stanford, Suite 240<br>Santa Clarita, CA 91355 | Sandy Sanchez<br>BIA - Los Angeles/Ventura Chapter<br>28481 Avenue Stanford, Suite 240<br>Santa Clarita, CA 91355 |
| David Inouye<br>CA Department of Water Resources<br>770 Fairmont Avenue, Suite 102<br>Glendale, CA 91203-1035 | Robert Kelly<br>Castaic Area Town Council<br>P.O. Box 325<br>Castaic, CA 91310 |
| Mike Murphy<br>City of Santa Clarita<br>23920 Valencia Blvd.#300<br>Santa Clarita, CA 91355 | Jason Smisko<br>City of Santa Clarita<br>23920 Valencia Blvd.#300<br>Valencia, CA 91355 |
| Bruce Fortine<br>College of the Canyons<br>24153 Tossano Drive<br>Valencia, CA 91355-2010 | Bob Haueter<br>Congressman Howard McKeon<br>26650 The Old Road # 203<br>Santa Clarita, CA 91355 |
| Chris Stephens<br>County of Ventura Resource Management Agency<br>800 South Victoria Ave<br>Ventura, CA 93009 | Ron Bottorff<br>Friends of the Santa Clara River<br>660 Randy Drive<br>Newbury Park, CA 91320-3036 |

| | | |
|---|---|---|
| Mark Pestrella<br>LA County Department of Public Works<br>900 South Fremont Ave<br>Alhambra, CA 91803 | | Richard Bruckner<br>LA County Department of Regional Planning<br>1390 Hall of Records, 320 West Temple Street<br>Los Angeles, CA 90012 |
| Jessica Bunker<br>LA County WWD<br>P.O. Box 1460<br>Alhambra, CA 91802-1460 | | Lynn Plambeck<br>Santa Clarita Organization for Planning the Environment - SCOPE<br>P.O. Box 1182<br>Canyon Country, CA 91386-1182 |
| Robert Fleck<br>Santa Clarita Valley Well Owners Association<br>16654 Soledad Canyon Road<br>Santa Clarita, CA 91387 | | Terry Kingery<br>SCV Chamber of Commerce<br>27451 Tourney Road, #160<br>Santa Clarita, CA 91355 |
| Ed Masterson<br>SCV Chamber of Commerce<br>27451 Tourney Road, #160<br>Santa Clarita, CA 91355 | | Sierra Club Angeles Chapter<br>3435 Wilshire Blvd # 320<br>Los Angeles, CA 90010-1904 |
| Mark Butala<br>Southern CA Association of Governments<br>818 W. Seventh Street, 12th Floor<br>Los Angeles, CA 90017 | | Jackie Bick<br>State Senator George Runner<br>23920 Valencia Blvd. Ste. 250<br>Santa Clarita, CA 91355 |
| Jackie Bick<br>State Senator Sharon Runner<br>23920 Valencia Blvd. Ste. 250<br>Santa Clarita, CA 91355 | | Scott Wilk Jr.<br>State Senator Tony Strickland<br>2655 First St., Suite 230<br>Simi Valley, CA 93065 |
| David Perry<br>Supervisor Michael Antonovich, 5th District<br>23920 Valencia Blvd. # 265<br>Santa Clarita, CA 91355 | | Rosalind Wayman<br>Supervisor Michael Antonovich, 5th District<br>23920 Valencia Blvd. # 265<br>Valencia, CA 91355 |

| | | |
|---|---|---|
| E. Michael Solomon<br>United Water Conservation District<br>106 N 8th Street<br>Santa Paula, CA 93060 | | Kathy Norris<br>Valley Industrical Association of Santa Clarita (VIA)<br>25709 Rye Cyn Rd #105<br>Santa Clarita, CA 91355 |
| Ron Mechsner<br>West Ranch Town Council<br>25876 The Old Road #213<br>Stevenson Ranch, CA 91381 | | *** Orgs shaded above will receive letter return receipt requested |
| | | |
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| | | |
| | | |

# May 2010 UWMP Workshop
## Public Outreach Record

# 2010 Santa Clarita Valley
# Urban Water Management Plan

Stacy Miller
PUBLIC AFFAIRS
Creative Solutions to Complex Situations

May 10, 2010

«AddressBlock»

Subject: 2010 Urban Water Management Plan

«GreetingLine»

The Santa Clarita Valley's water agencies, Castaic Lake Water Agency, CLWA Santa Clarita Water Division, Newhall County Water District and Valencia Water Company have begun to prepare the 2010 Urban Water Management Plan (UWMP). The Urban Water Management Plan, mandated by the State of California, presents a picture of the valley's water situation through the year 2035. It describes the long-range water needs of the community and the means to supply the necessary water.

In an effort to ensure all interested parties are fully informed and involved in our process, we have scheduled the first of several community workshops as follows:

| | |
|---|---|
| Date: | Tuesday, May 25, 2010 |
| Time: | 4:00 pm |
| Location: | Castaic Lake Water Agency<br>27234 Bouquet Canyon Road |

The purpose of this kick-off workshop is to present an overview of the state requirements and outline of the contents of the 2010 Urban Water Management Plan. I encourage your participation and look forward to seeing you then. If you have any questions, please feel free to contact me.

Sincerely,

Stacy Miller
Public Outreach Manager
2010 SCV UWMP

Government Affairs, Public Relations & Communication
P.O. Box 55745, Valencia, CA 91385 [818] 402-5806 [661] 222-9733 Fax stacy@StacyMillerPA.com
www.StacyMillerPA.com

# Santa Clarita Valley
# 2010 Urban Water Management Plan

**Castaic Lake Water Agency**
**CLWA Santa Clarita Water Division**
**Newhall County Water District**
**Valencia Water Company**

The Signal
5-18-10

Announce the preparation of the
**2010 Urban Water Management Plan**

The Urban Water Management Plan. mandated by the State of California. presents a picture of the valley's water situation through the year 2035. It describes the long-range water needs of the community and the means to supply the necessary water. We encourage your input, interest and involvement.

## Kick Off Community Workshop

**Date:** **Tuesday, May 25, 2010**

**Time:** **4:00 pm**

**Location:** **Castaic Lake Water Agency**
**27234 Bouquet Canyon Road**

**Purpose:**

This kick-off workshop will present an overview of the state requirements and provide an outline of the content of the 2010 UWMP. Our team will provide an overview of the many opportunities for public comment and will also be available for questions. We encourage public participation and input.

For more information
please call (661) 297-1600

**Castaic Lake Water Agency**
**CLWA Santa Clarita Water Division**
**Newhall County Water District**
**Valencia Water Company**

# Santa Clarita Valley
# 2010 Urban Water Management Plan

**Castaic Lake Water Agency**
**CLWA Santa Clarita Water Division**
**Newhall County Water District**
**Valencia Water Company**

The Signal
Sunday
5-23-2010

Announce the preparation of the
**2010 Urban Water Management Plan**

The Urban Water Management Plan, mandated by the State of California, presents a picture of the valley's water situation through the year 2035. It describes the long-range water needs of the community and the means to supply the necessary water. We encourage your input, interest and involvement

## Kick Off Community Workshop

**Date:** **Tuesday, May 25, 2010**

**Time:** **4:00 pm**

**Location:** **Castaic Lake Water Agency**
**27234 Bouquet Canyon Road**

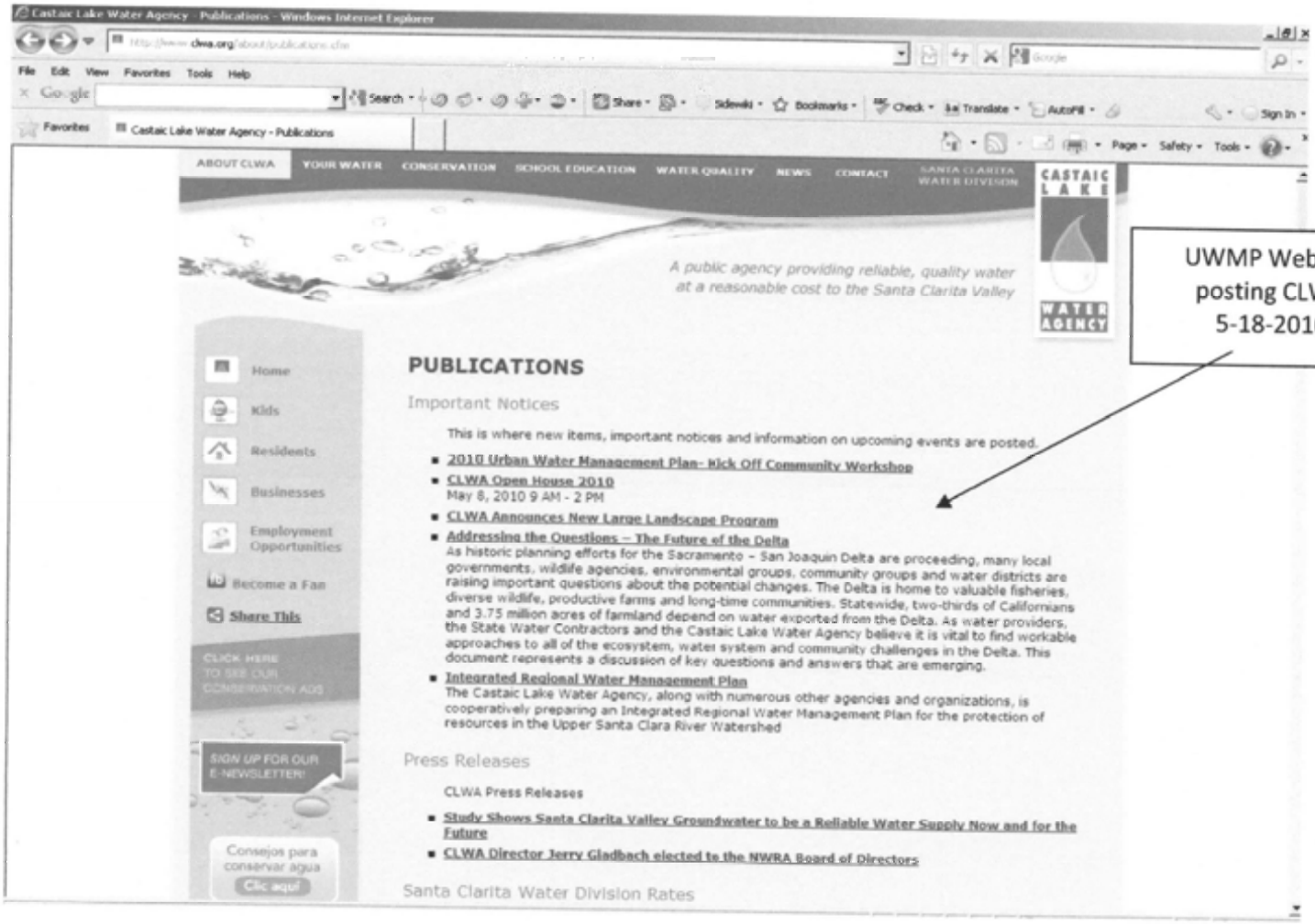
**Purpose**:

This kick-off workshop will present an overview of the state requirements and provide an outline of the content of the 2010 UWMP. Our team will provide an overview of the many opportunities for public comment and will also be available for questions. We encourage public participation and input.

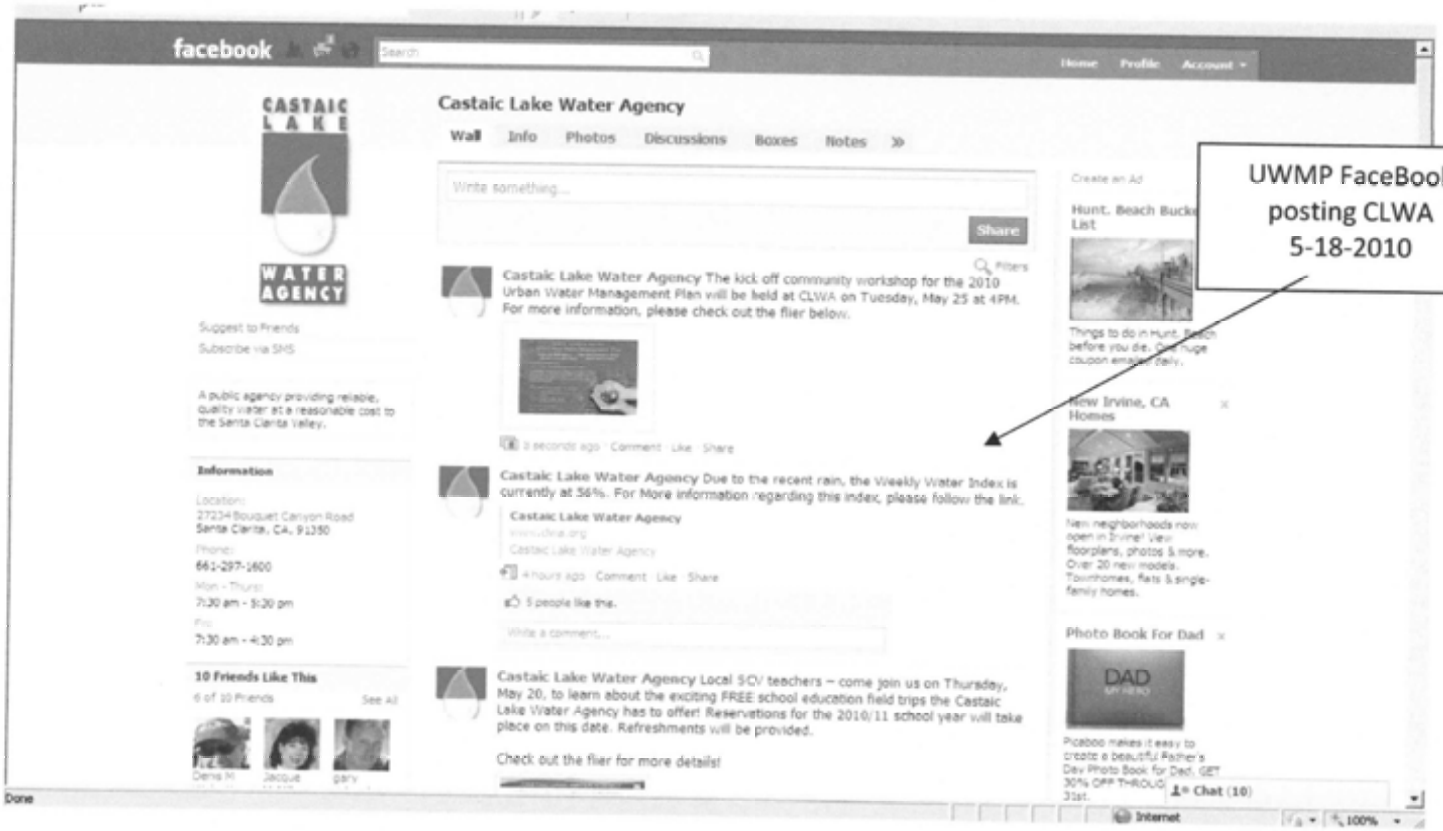
For more information
please call (661) 297-1600

**Castaic Lake Water Agency**
**CLWA Santa Clarita Water Division**
**Newhall County Water District**
**Valencia Water Company**

# UWMP May 25, 2010 Kick-off workshop
# CLWA website & FaceBook postings

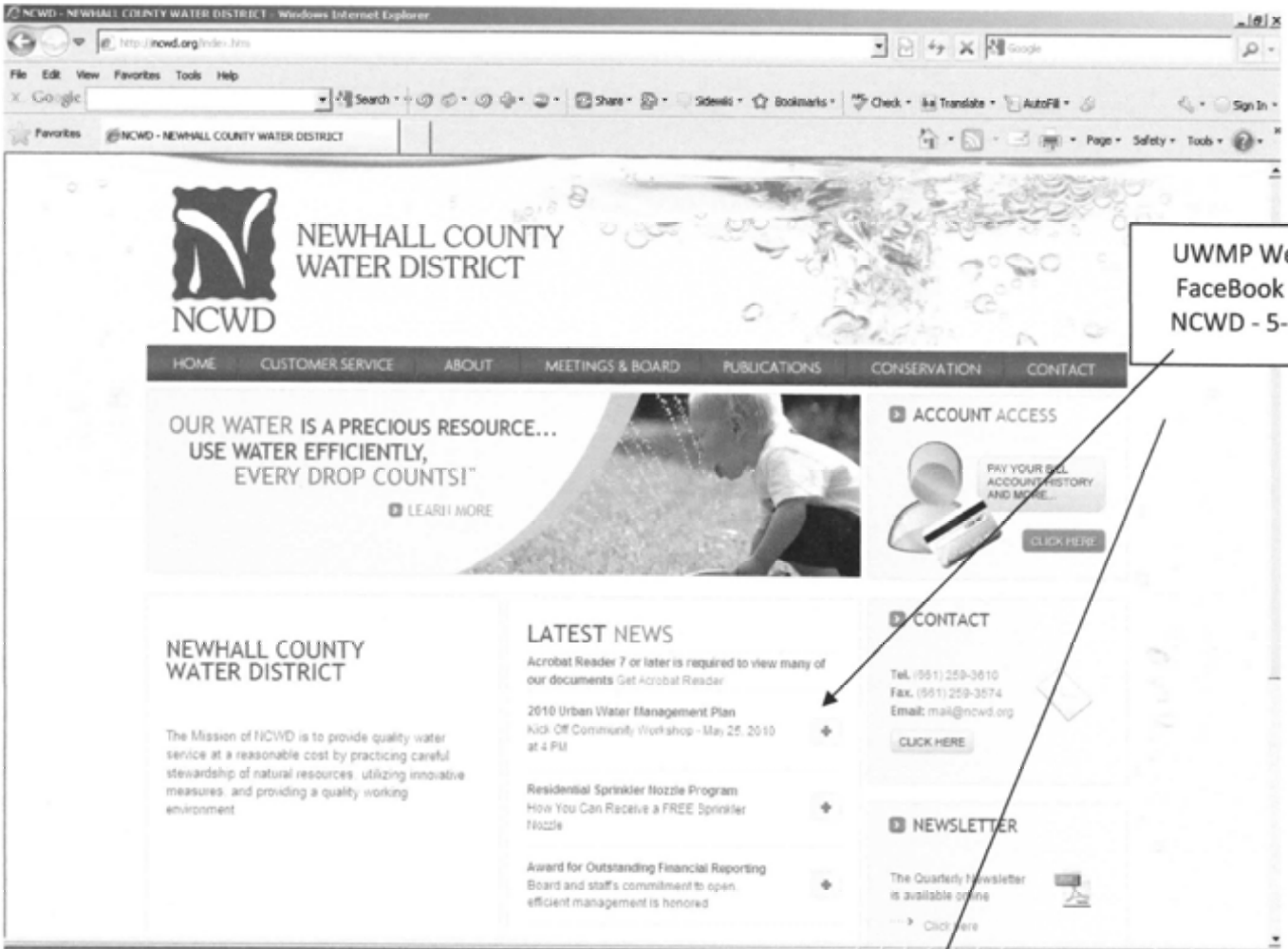



UWMP Website posting CLWA 5-18-2010

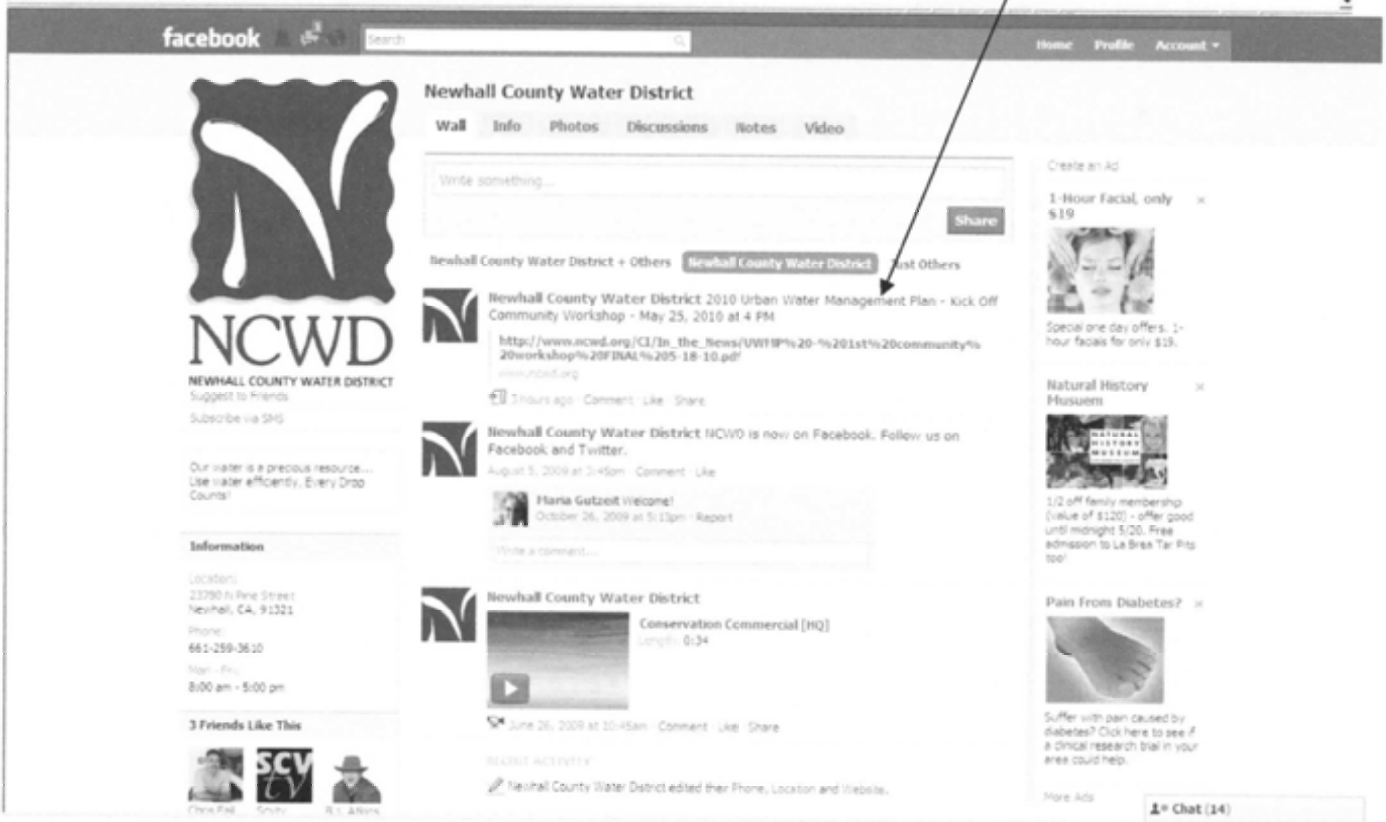



UWMP FaceBook posting CLWA 5-18-2010

# UWMP May 25, 2010 Kick-off workshop
# Newhall County Water District Website & FaceBook posting



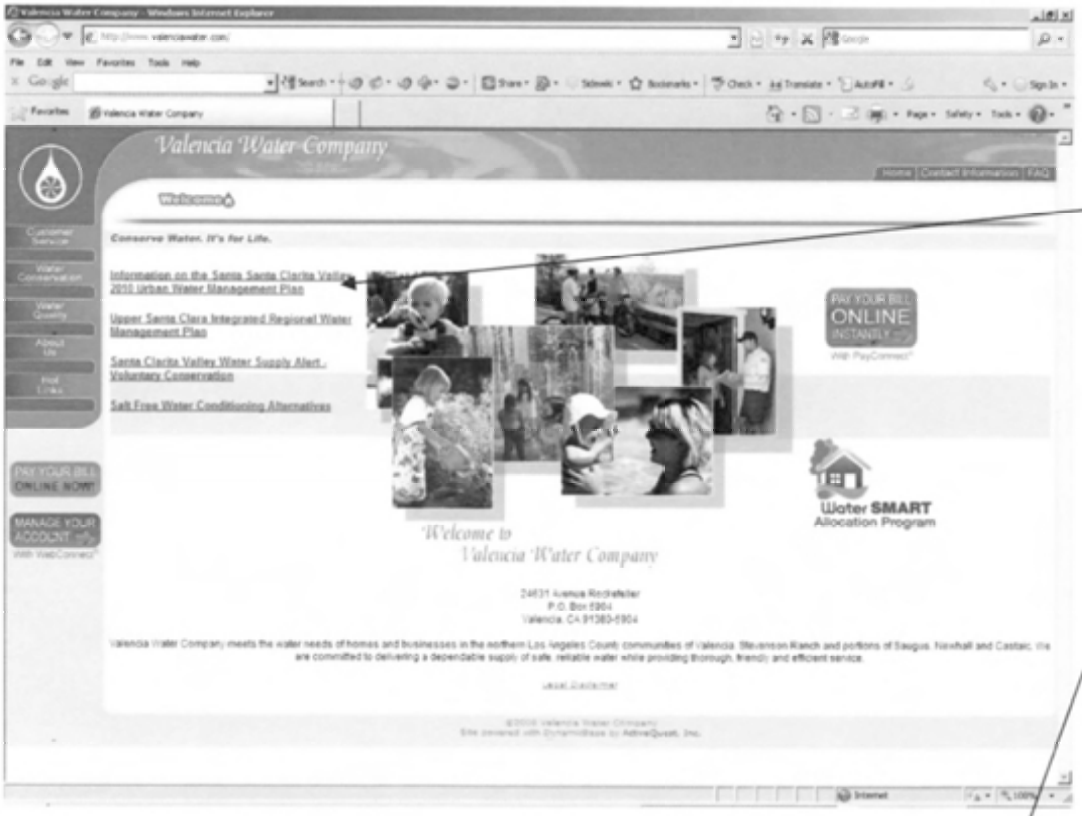

UWMP Website & FaceBook posting NCWD - 5-17-2010



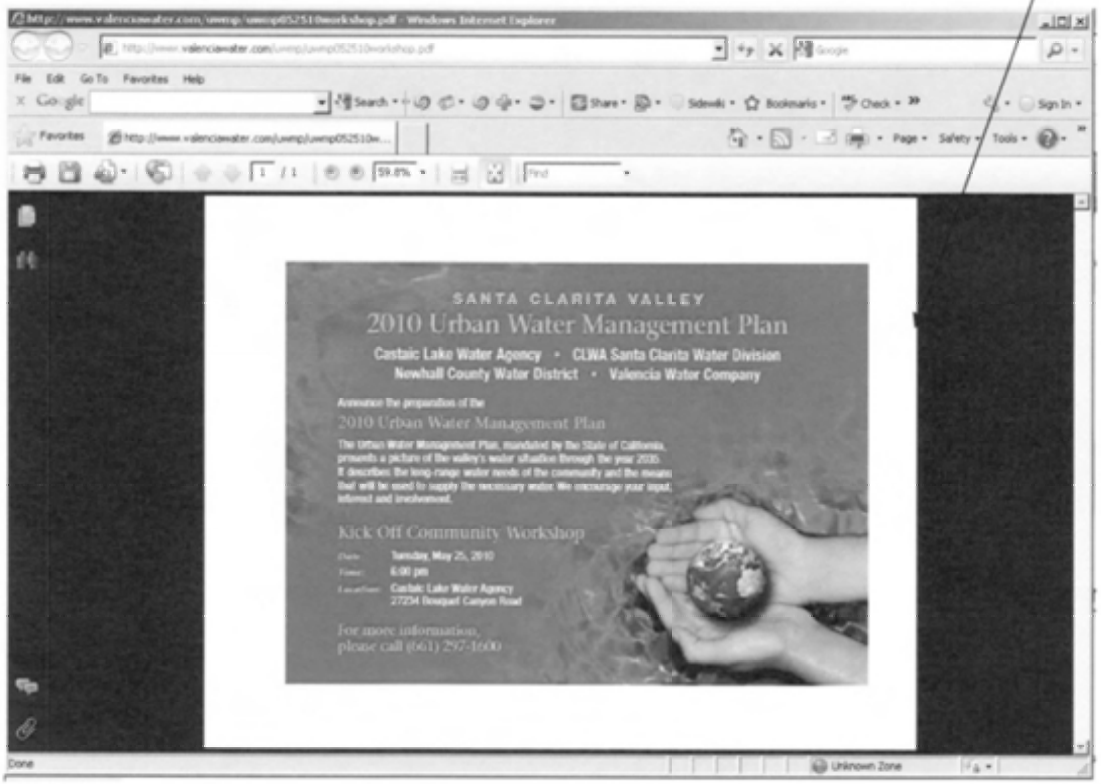
**UWMP May 25, 2010 Kick-off workshop**
**Santa Clarita Water Division (SCWD) website postings**

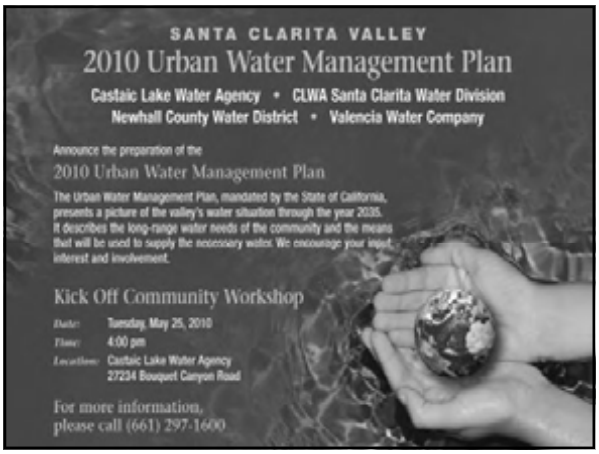
**Valencia Water Co Website Posting**

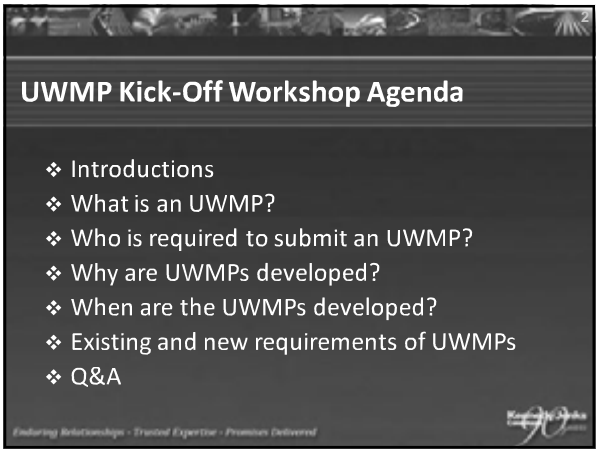
May 25, 2010 - UWMP Kick Off Community Workshop




UWMP Website posting
Valencia Water Co
5-17-2010




SANTA CLARITA VALLEY
2010 Urban Water Management Plan
Castaic Lake Water Agency • CLWA Santa Clarita Water Division
Newhall County Water District • Valencia Water Company
Announce the preparation of the
2010 Urban Water Management Plan
The Urban Water Management Plan, mandated by the State of California, presents a picture of the valley's water situation through the year 2035. It describes the long-range water needs of the community and the means that will be used to supply the necessary water. We encourage your input, interest and involvement.
Kick Off Community Workshop
Date: Tuesday, May 25, 2010
Time: 4:00 pm
Location: Castaic Lake Water Agency
27234 Bouquet Canyon Road
For more information,
please call (661) 297-1600


2
UWMP Kick-Off Workshop Agenda
Introductions
What is an UWMP?
Who is required to submit an UWMP?
Why are UWMPs developed?
When are the UWMPs developed?
Existing and new requirements of UWMPs
Q&A
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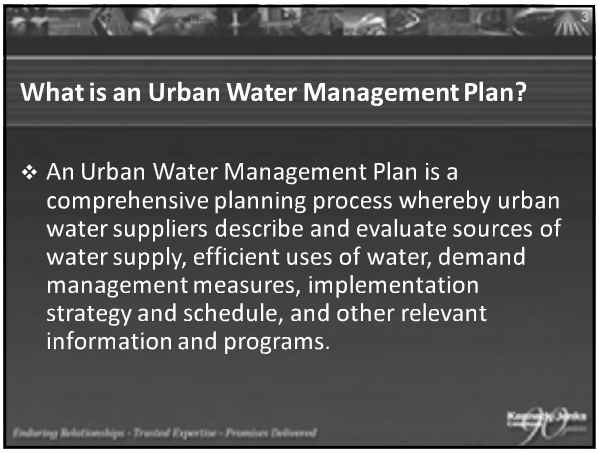
3
What is an Urban Water Management Plan?
An Urban Water Management Plan is a comprehensive planning process whereby urban water suppliers describe and evaluate sources of water supply, efficient uses of water, demand management measures, implementation strategy and schedule, and other relevant information and programs.
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## Who is required to prepare an UWMP?

- Publicly or privately owned water suppliers (including wholesalers), providing water for municipal purposes either directly or indirectly to more than 3,000 customers or supplying more than 3,000 acre-feet annually.

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## Why are UWMPs Developed?

- In adherence to the 1983 Urban Water Management Planning (UWMP) Act and subsequent legislation
- To develop a framework for agencies to integrate programs and projects that enhance the quality and quantity of regional water supplies
- To identify gaps between supply and demand through time (20-year analysis required)
- To provide detailed description of all supply sources (surface, recycled, groundwater)

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## Why are UWMPs Developed? (Cont'd.)

- To identify Demand Management Measures (water conservation programs)
- To address water quality issues
- To develop water shortage contingency planning
- To describe how demand will be met through time, in all hydrologic year types (normal, multiple dry, critical dry)

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## When are UWMP Plans Developed?

- Suppliers are required to update UWMP every five-years (years ending in 0 or 5).
- 2010 – current update
- July 1, 2011 for retailers (SBx7-7 extended UWMP deadline for retailers but silent on extension for wholesalers.)
  - Under current UWMP Act, wholesalers should complete UWMP by December 31, 2010. But "cleanup legislation" (AB 2776 and SB 1478) anticipated that will extend deadline to July 1, 2011 for wholesalers.



## Coordination and Notification Requirements

"Each urban water supplier shall coordinate the preparation of its plan with other appropriate agencies in the area, including other water suppliers that share a common source, water management agencies, and relevant public agencies, to the extent practical."



## Coordination and Notification Requirements

Other:

- Must hold public hearing prior to adoption of UWMP
- Must give cities and counties in service area 60 days notice prior to public hearing
- Must provide cities and counties and LAFCO in service area with copies of UWMP within 30 days of adoption

## Penalties

- Ineligible for State Grant and Loan Funding (at least until plan is completed to DWR satisfaction)



## What, Who, Why, When, etc…

- Q&A/Discussion



## New Requirements for 2010 UWMP

- New Law: SBX7-7 ("20% x 2020"), reporting starts with 2010 UWMPs
  - Base gross water use in gpcd: must be calculated using one of three methodologies
  - Target reduction from base by 2020: reporting requirements differ for retailers vs. wholesalers
  - Must be calculated using one of four methodologies
  - Agencies must hold public hearing to explain how targets will be met (can be held as part of UWMP hearing)

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## New UWMP Requirements

- Base gross water use in gpcd: calculation

  Total volume of water (treated or not) entering the retail distribution system, divided by the total population of the service area

  *(Excludes: recycled water, net volume into long-term storage, water conveyed to another retailer, agricultural water)*



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## New UWMP Requirements

- Base gross water use in gpcd: methodologies
  - 10-year average
    - *ending no earlier than 2004 – no later than 2010*
  - 15-year average if 10% of 2008 demand met by recycled water
    - *get to add 5 years to calculation*
  - 5-year average if agency is already close to target
    - *100 gpcd; at least 5% reduction*
    - *ending no earlier than 2007 – no later than 2010*



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## New UWMP Requirements

- Base gross water use in gallons per capita per day (gpcd)
  - Averages are determined on a rolling basis
  - Should review demands over various periods to determine hydrologic and demand year types
  - Recent economic impacts and drought response may have reduced demand!

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## New UWMP Requirements

- Target reduction methodology options
  1. 20% reduction from base (i.e., 80% of average gross water use in gpcd)
  2. Combination of state standards:
     - 55 gpcd indoor residential + landscape use at 70% -80% ETo + 10% reduction in commercial/industrial/institutional use
  3. DWR 20x2020 hydrologic region target (South Coast region = 149 gpcd)
  4. Option to be developed by October 2010



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## New UWMP Requirements

- Reduction Target Option 4
  - Subject to DWR public process during 2010
  - Will identify targets to achieve cumulative statewide 20% reduction
  - Must allow flexibility for water supplier service area characteristics



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## New UWMP Requirements

- Proposals for Option 4
  - DWR: developing a methodology for public review
  - CA Urban Water Conservation Council: all agencies in CA follow terms and options of the Urban MOU
  - ACWA: submitted Option 4 proposal
    - Relies on comparison to a Reference Area (an area that has met/nearly met hydrologic region target).

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## New UWMP Requirements

- Issues: DWR will derive methodologies for calculations: population, base water use, gross water use, sector water use, Option 4, others
  - If DWR derives new methodology standards, agencies may be required to use them
  - Won't be final until October 2010 (ps. December)
  - If work has already been done, it may need to be repeated
  - If agency has already adopted UWMP, it may need to be amended
  - = Reason for UWMP deadline extension to July 1, 2011

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## New UWMP Requirements

- Other
  - SB 1087 (Florez) - requires an UWMP to include projected water use for single-family and multi-family residential housing for lower income households as identified in the housing element of any city, county, or city and county in the service area of the supplier.

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21

## Consultant Team

- Kennedy/Jenks Consultants
- Luhdorff and Scalmanini
- Nancy Clemm, P.E.
- Stacy Miller Public Affairs

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# Santa Clarita Valley Urban Water Management Plan
## May 25, 2010 - Community Workshop Sign In Sheet

| | PRINT NAME | ORGANIZATION | TITLE | PHONE | EMAIL |
|---|---|---|---|---|---|
| 1. | David Inouye | DWR. So. Region | Chief, Water Conserv. Sec. | (818) 500-1615, x 246 | davidi@water.ca.gov |
| 2. | RONALD MECHSNER | WEST RANCH TOWN COUNCIL | PRESIDENT | 661.753.6182 | RMECHSNER@westranchtowncouncil.com |
| 3. | Cathy Holloman | SCWD | Assoc | 661-259-2737 | cholloman@scwater.org |
| 4. | Mauricio Guardado | SCWD | Retail MGR | " | MGuardado@scwater.org |
| 5. | Mary Lu Cotter | KCS | | | |
| 6. | Patrick Bryant | City of Santa Clarita | Admin. Analyst | 661-255-4902 | pbryant@santa-clarita.com |
| 7. | Jeggian Bunker | LADWP | CIVIL ENG - Water Resources Unit | 626-300-3315 | jbunker@ladpw.org |
| 8. | Bruce Fortine | COC | Trustee | 661-253-0060 | fortine@earthlink.net |
| 9. | Keo in Korenthal | AVL-CCC | E.D. | (661) 310-0769 | kkorenthal@avlchamber.org |
| 10. | JANET KEITH | VWC | CONSER COORD. | 661 295-6531 | jkeith@valenciawater.com |
| 11. | Brett Walter | Buck McKeon | Senior Field Rep | 661-254-2111 | brett.walter@mail.house.gov |
| 12. | Jason Swisloo | Santa Clarita | Senior Planner | 661-255-4306 | jswisloo@santa-clarita.com |
| 13. | Jerry Gladbach | CLWA | | | |
| 14. | DIANA SHAW | DIANA SHAW for 38th Assembly | candidate | | ElectDianaShaw.com |
| 15. | Bob Diprimio | Valencia Water Co. | President | (661) 295-6501 | rdiprimio@valenciawater.com |
| 16. | ED MASTERSON | SCV CHAMBER | PRES. / CEO | (661) 702-6977 | EMASTERSON@SCVCHAMBER.COM |
| 17. | Jackie Bick | Sen. Runner | Dist Rep | 661-286-1471 | JACKIE.BICK@SEN.CA.GOV |
| 18. | | | | | |

# July 2010 UWMP Workshop
## Public Outreach Record

## 2010 Santa Clarita Valley
## Urban Water Management Plan

Stacy Miller
PUBLIC AFFAIRS
Creative Solutions to Complex Situations

July 6, 2010

«AddressBlock»

Subject: 2010 Urban Water Management Plan Workshop

«GreetingLine»

The Santa Clarita Valley's water agencies, Castaic Lake Water Agency, CLWA Santa Clarita Water Division, Newhall County Water District and Valencia Water Company are currently preparing the 2010 Urban Water Management Plan (UWMP).

In an effort to ensure all interested parties are fully informed and involved in this process, we have scheduled our second community workshop as follows and welcome your participation:

| | |
|---|---|
| Date: | Tuesday, July 27, 2010 |
| Time: | 4:00 pm |
| Location: | Castaic Lake Water Agency<br>27234 Bouquet Canyon Road |

The Urban Water Management Plan presents a picture of the valley's water situation through the year 2035, describes the long-range water needs of the community and the means to supply the necessary water. This workshop will provide the most current information on components of the 2010 UWMP.

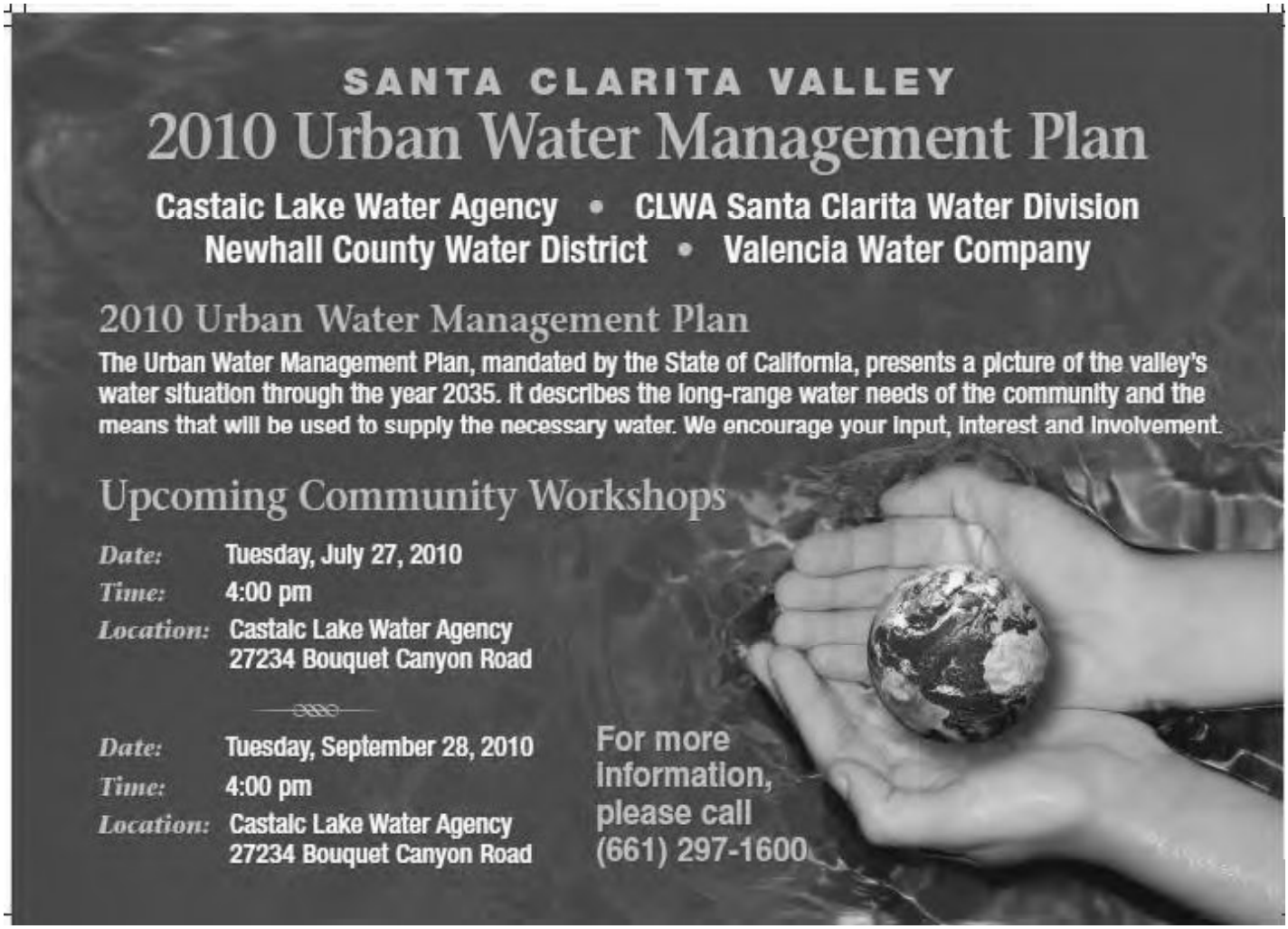
I encourage your participation and look forward to seeing you then. If you have any questions, please feel free to contact me.

Sincerely,

Stacy Miller
Public Outreach Manager
2010 SCV Urban Water Management Plan

Government Affairs, Public Relations & Communication
P.O. Box 55745, Valencia, CA 91385 [818] 402-5806 [661] 222-9733 Fax stacy@StacyMillerPA.com
www.StacyMillerPA.com

**Post card sent to all entities with water connections in the CLWA, CLWA SCWD, VWC and NCWD service areas**



SANTA CLARITA VALLEY

# 2010 Urban Water Management Plan

## COMMUNITY WORKSHOP

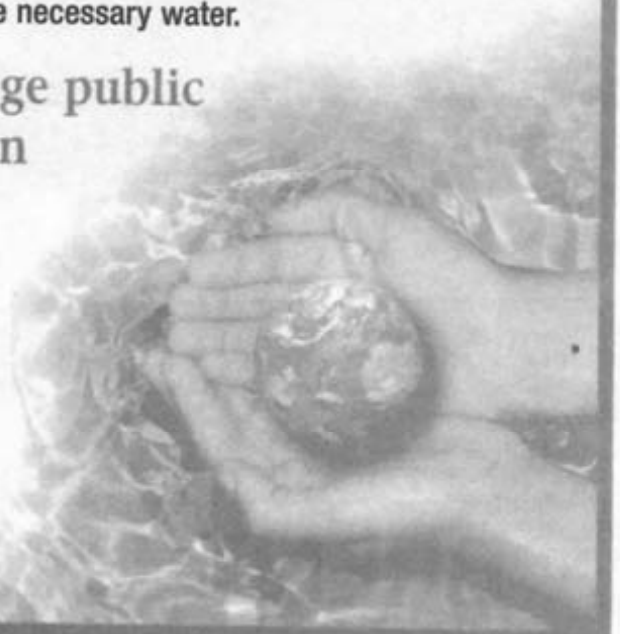
The Signal 7-25-10

*Date:* Tuesday, July 27, 2010
*Time:* 4:00 pm
*Location:* Castaic Lake Water Agency
27234 Bouquet Canyon Road

This workshop will provide the most current information on components of the 2010 UWMP. Our team will provide an overview of the opportunities for public comment and will also be available for questions.

The Urban Water Management Plan, mandated by the State of California, presents a picture ofthe valley's water situation through the year 2035. It describes the long-range water needs of the community and the means to supply the necessary water.

We encourage public participation and input



**For more information, please call (661) 297-1600**

Castaic Lake Water Agency
CLWA Santa Clarita Water Division
Newhall County Water District
Valencia Water Company

SANTA CLARITA VALLEY

# 2010 Urban Water Management Plan

## COMMUNITY WORKSHOP

The Signal 7-20-10

***Date:*** Tuesday, July 27, 2010

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27234 Bouquet Canyon Road

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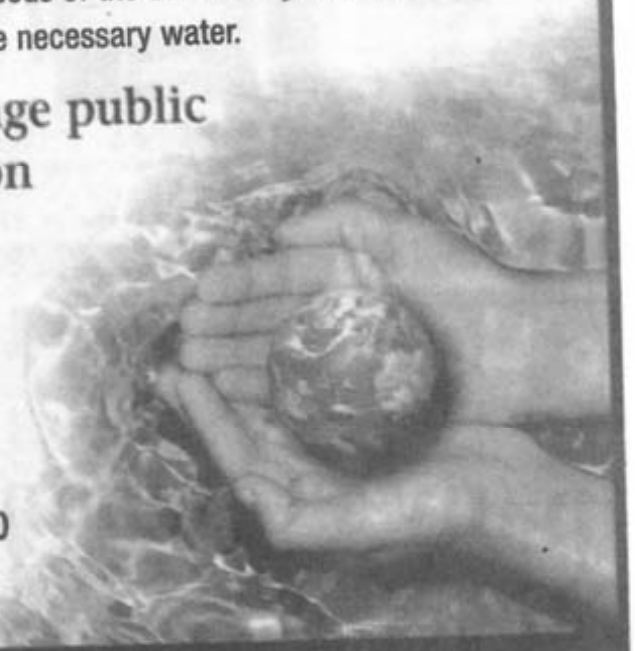

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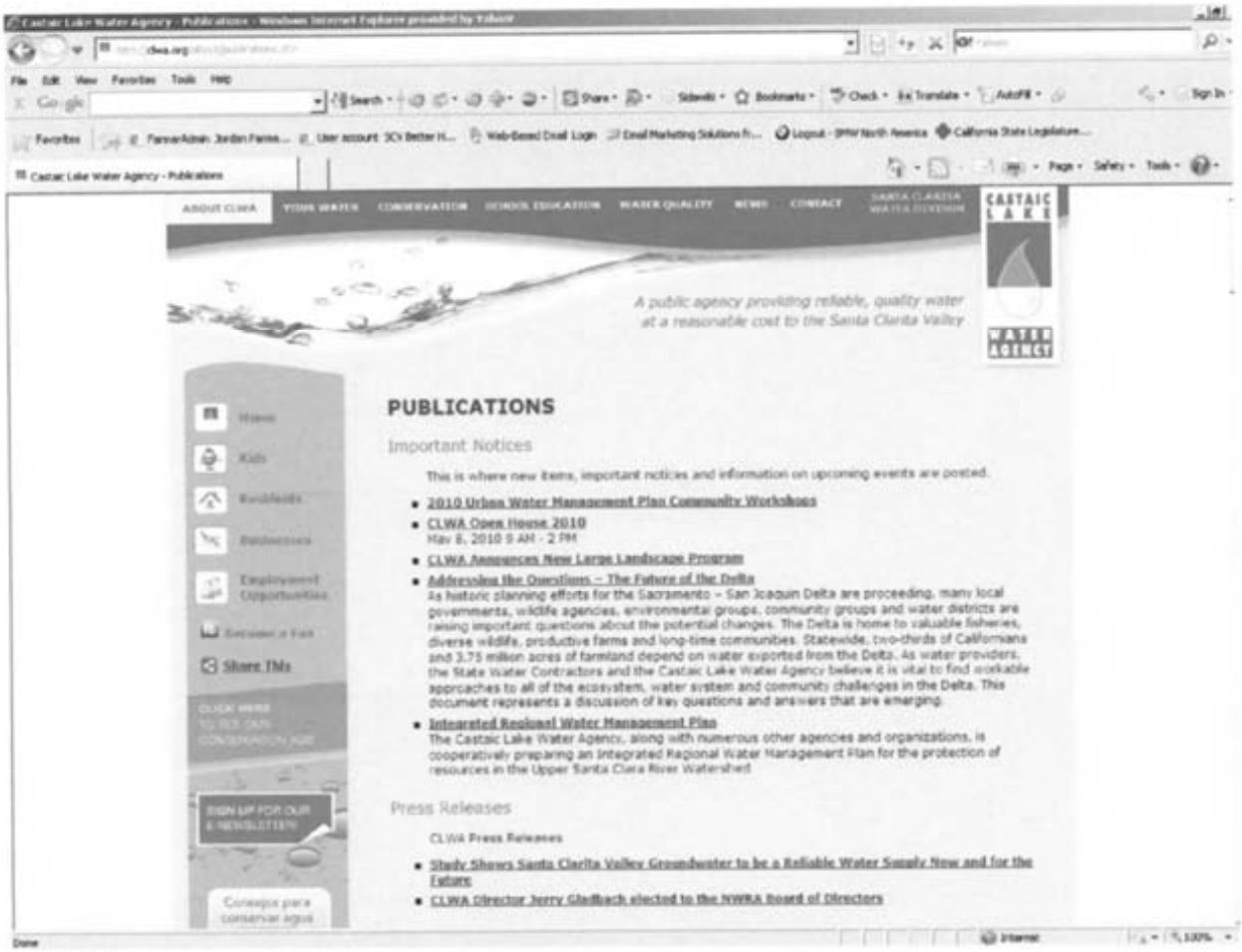
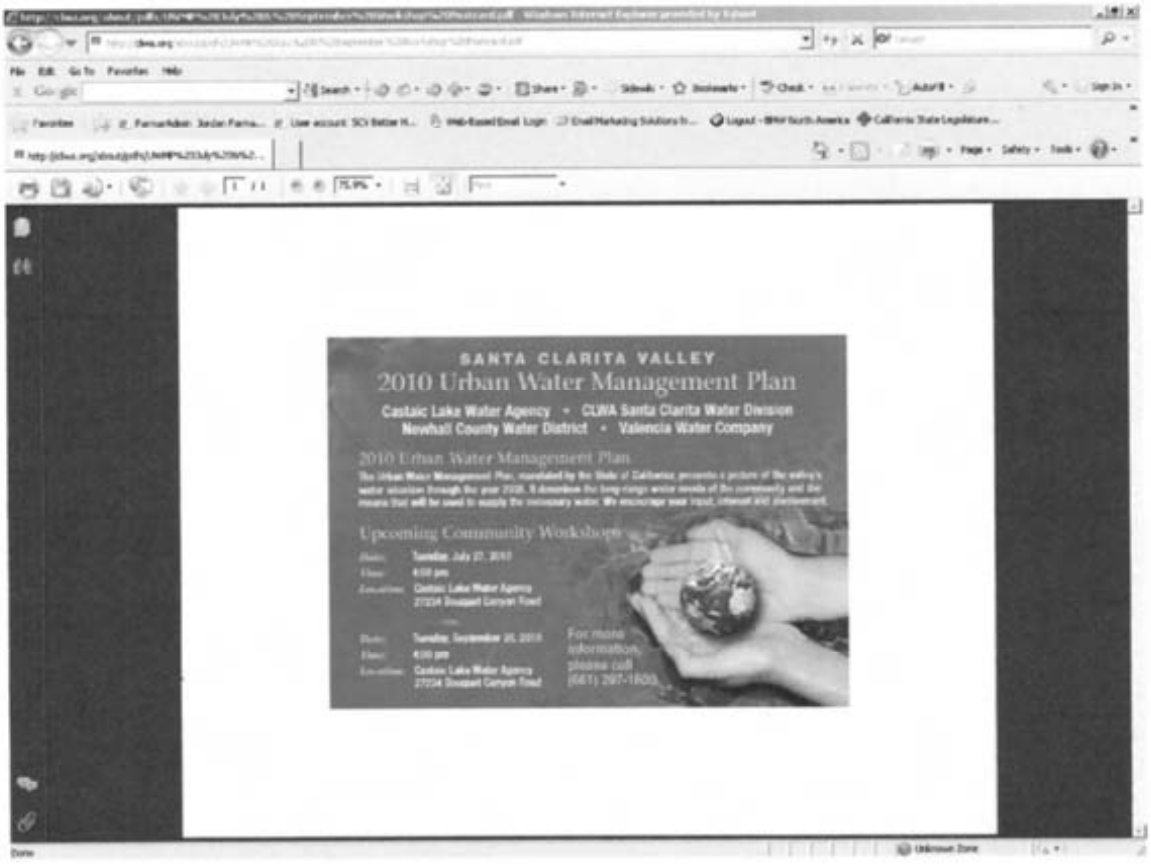
Castaic Lake Water Agency
CLWA Santa Clarita Water Division
Newhall County Water District
Valencia Water Company

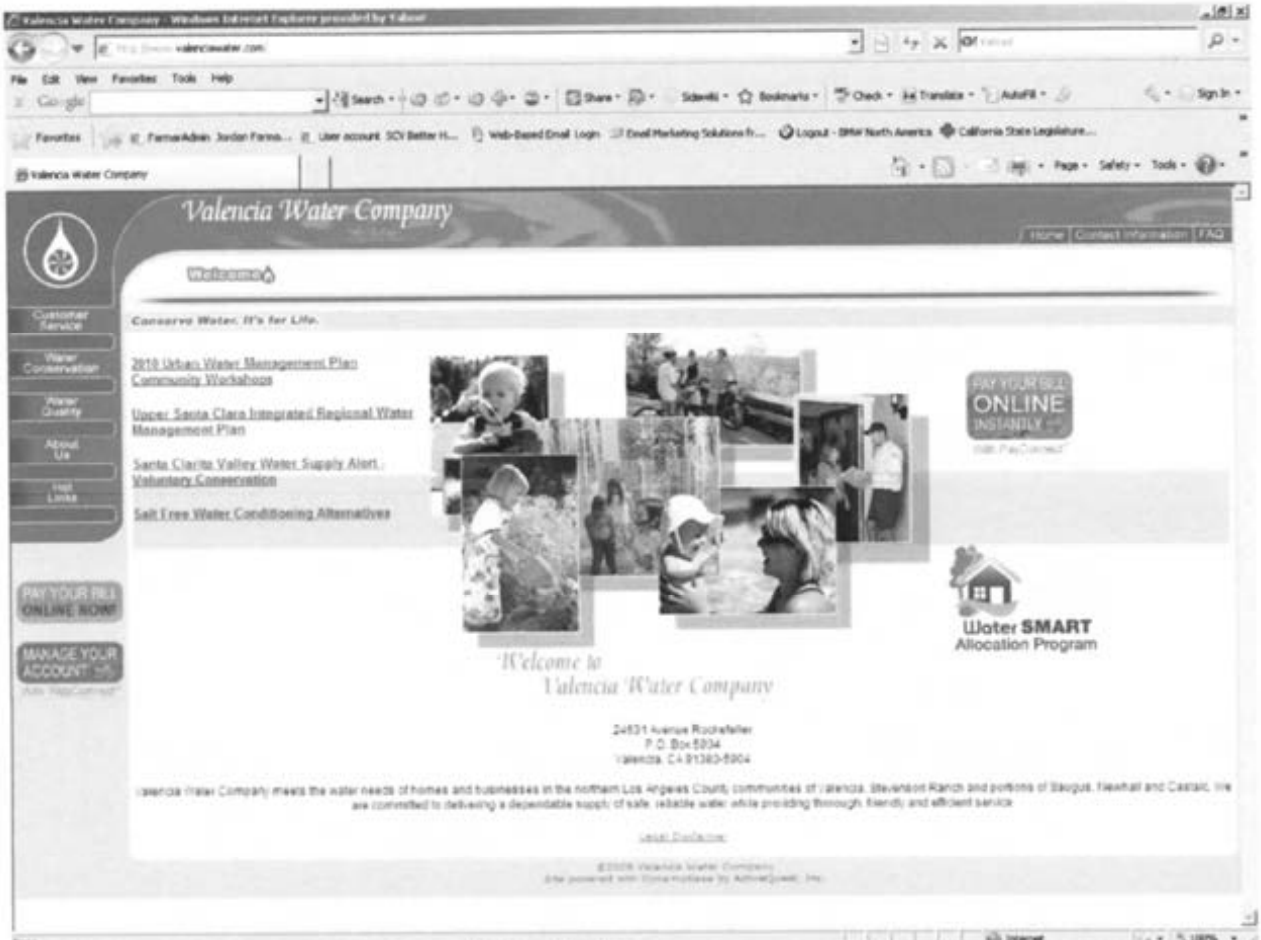
# UWMP July & September 2010 Community Workshop Announcements
# CLWA Website - June 28, 2010

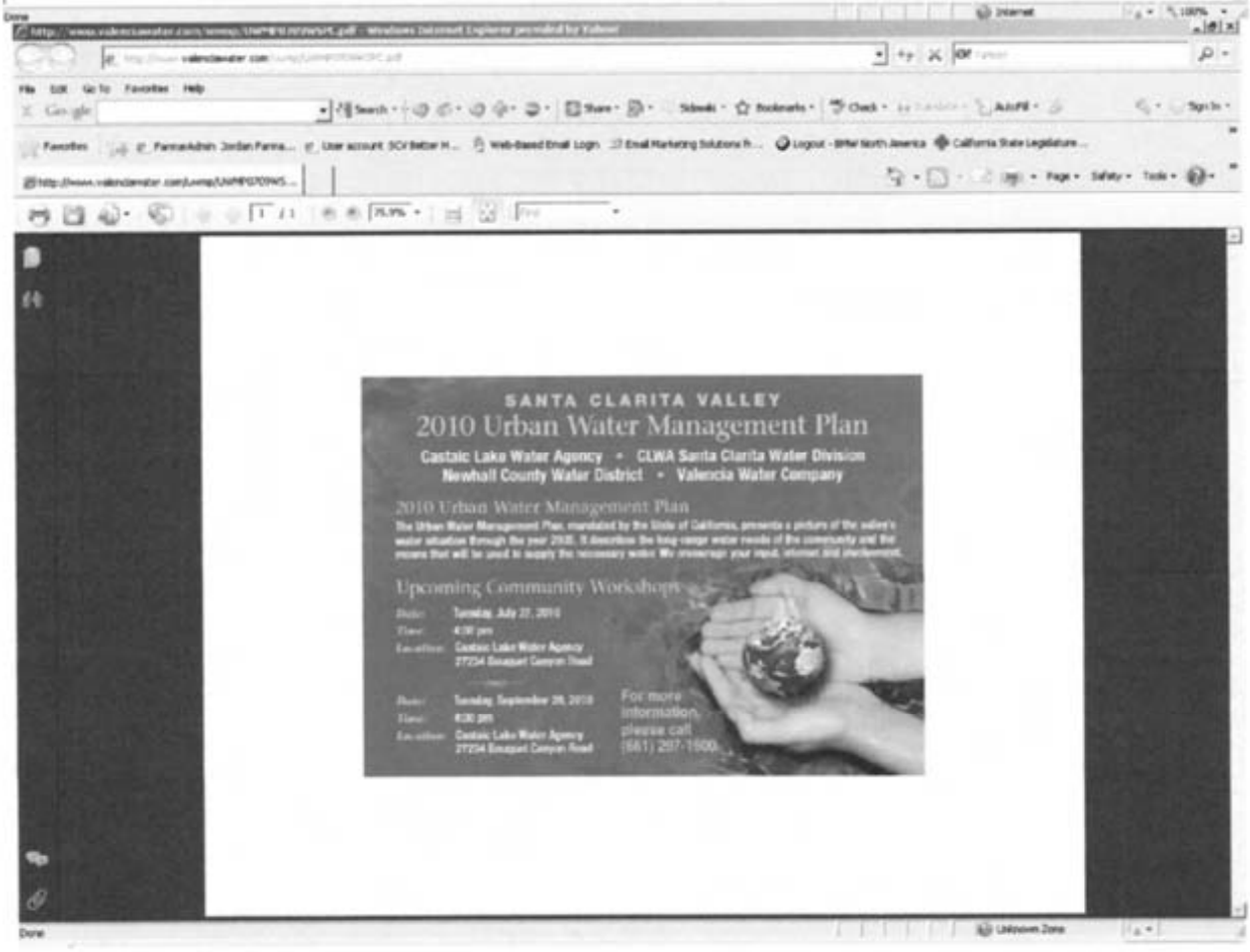


# UWMP July & September 2010 Community Workshop Announcements
# CLWA Facebook Post - June 28, 2010

# UWMP July & September 2010 Community Workshop Announcements
## Valencia Water Co Website - June 28, 2010



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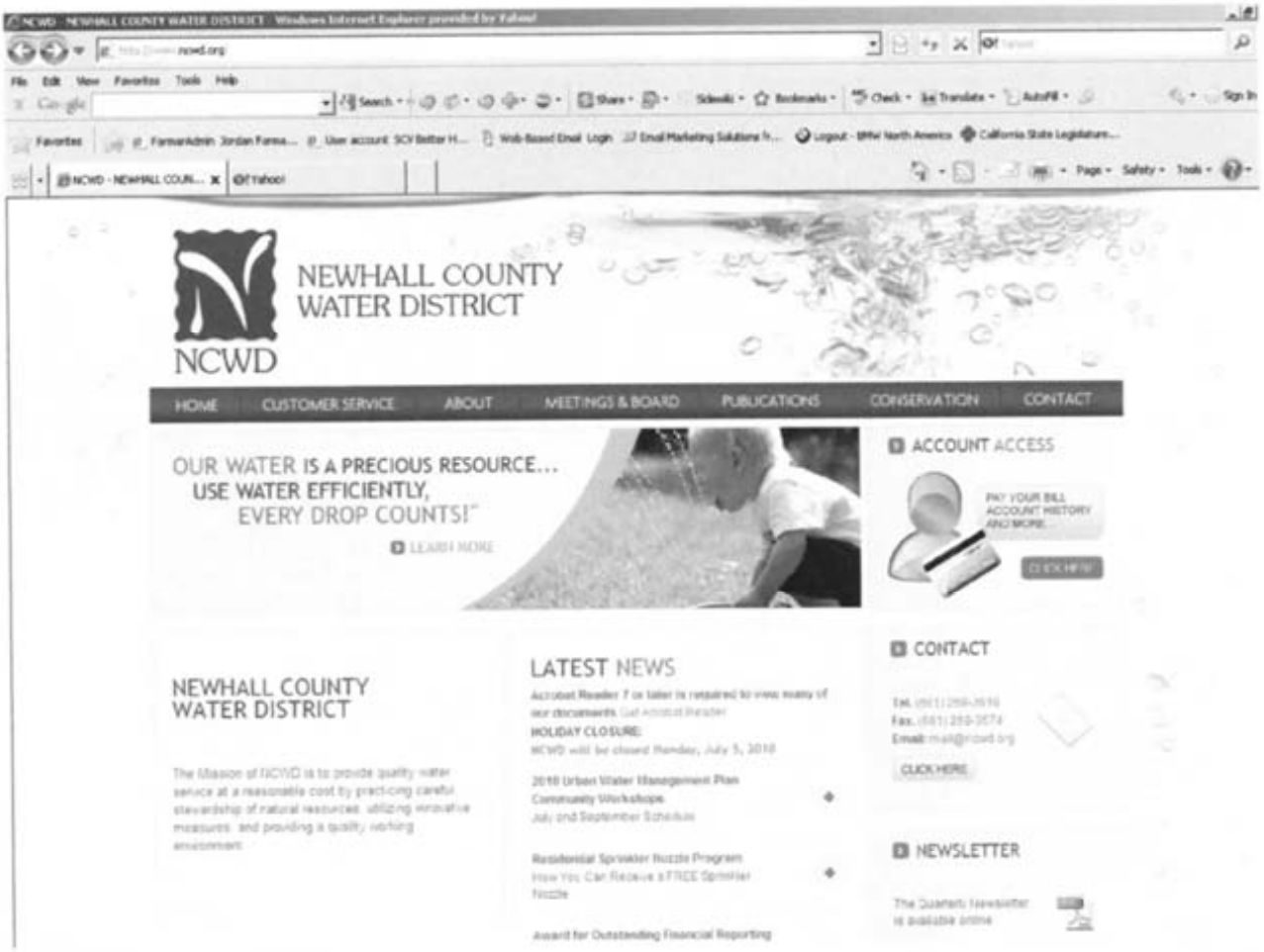

# UWMP July & September 2010 Community Workshop Announcements
## NCWD Facebook Post - June 28, 2010

## UWMP Community Workshop
**July 27, 2010**

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Kennedy Jenks Consultants

## Agenda

- Welcome & Introductions
- SBX7-7 Requirements
- Recycled Water
- Groundwater Supplies
- State Water Project Reliability
- Questions & Answers
- Next Workshop & Timelines

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Kennedy Jenks Consultants

## 2010 UWMP SBX7-7

- Mary Lou Cotton, Kennedy/Jenks Consultants

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Kennedy Jenks Consultants

## 2010 UWMP

- New Law: SBX7-7 ("20% x 2020"), reporting starts with 2010 UWMPs, applies to retailers
  - Base gross water use in gpcd: must be calculated using one of three methodologies
  - Target reduction from base by 2020: must be calculated using one of four methodologies
  - Supplier must hold public hearing to explain how targets will be met (can be held as part of UWMP hearing)



## 2010 UWMP

- Base gross water use in gpcd: methodologies
  - 10-year average
    - *ending no earlier than 2004 – no later than 2010*
  - 15-year average if 10% of 2008 demand met by recycled water
    - *get to add 5 years to calculation*
  - *And*: 5-year average
    - *ending no earlier than 2007 – no later than 2010*
    - *100 gpcd; at least 5% reduction for all agencies in CA over 100 gpcd*



## 2010 UWMP

- Target reduction methodology options
  1. 20% reduction from base (i.e., 80% of average gross water use in gpcd)
  2. Combination of state standards:
     - 55 gpcd indoor residential + landscape use at 70% ETo + 10% reduction in commercial/industrial/institutional use
  3. DWR 20x2020 hydrologic region target (South Coast region = 149 gpcd)
  4. Option to be developed by October 2010

## 2010 UWMP

- Reduction Target Option 4
  - Subject to DWR public process during 2010
  - Will identify targets to achieve cumulative statewide 20% reduction
  - Must allow flexibility for water supplier service area characteristics



## 2010 UWMP

- Wholesalers (such as CLWA) must describe in the UWMP "an assessment of present and proposed future measures, programs and polices to help achieve the water use reductions required" of retailers in their service areas.



## 2010 UWMP

- DWR Public Process Issues
  - DWR will derive methodologies for SBX7-7 calculations: population, base gross water use, compliance levels, sector water use, others
  - If DWR derives new standards, agencies will be required to use them
  - Won't be final until October 2010
  - Option 4 method won't be final until December 2010.

## 2010 UWMP

- DWR Public Process Issues, (cont'd.)
  - If work has already been done, it may need to be repeated;
  - If agency has already adopted UWMP, it may need to be amended
  - = Reason for UWMP deadline extension to July 1, 2011 (Note: wholesaler UWMPs still due by Dec 31, 2010; legislation in process to apply extension to them)



## SBX7-7 Methodologies Status

- DWR has convened the Urban Stakeholder Committee ("USC")
  - Co-chaired by DWR and CUWCC
- Has formed an Agency Team: DWR, SWRCB, CPUC, CDPH, CBDA, USBR
- Has hired a consultant team (mainly economists and statisticians)



## SBX7-7 Methodologies Status

- USC has held three meetings to date (next: tomorrow, 7/28/10)
- DWR has defined several technical methodologies efforts, based on statute
- DWR Legal has reviewed statute and provided guidance to DWR staff and consultant team
- Developed a set of Issue Papers for each methodology in statute
- Has created groupings according to task:

## SBX7-7 Methodologies Status

- U3:
  - Gross water use
  - Service area population
  - Base daily per capita use
  - Compliance daily per capita use
  - Landscape area water use
  - Baseline CII use
  - Compliance year adjustment criteria
  - Indoor residential use



## SBX7-7 Methodologies Status

- U4:Target Reduction Option 4
  - Proposal from ACWA
  - Two proposals from various CUWCC members (IRWD/City of San Luis Obispo/City of Long Beach; and Western Municipal Water District)
  - DWR/Consulting Team proposal
- U4 Workgroup set up, focus on how to formulate methodology



## SBX7-7 Methodologies Status

- U5: Process Water
  - Use by Commercial, Industrial, Institutional customers
- U6: Regional Compliance
  - Guidance for Regional UWMPs and Conservation Target Reductions

## SBX7-7 Methodologies Status

- Schedule:
  - June 22 & 23 USC and U4 Meetings at IEUA
  - July 28 USC Meeting
  - **August 5 & 6 U3 Public Workshops**
  - August 26 USC Meeting
  - September 21 USC Meeting
  - October 1 finalize U3 methodologies
  - **October 27 & 29 U4 Public Meetings**
  - November 15 USC Meeting
  - December 31 U4 method finalized



## 2010 UWMP- SBX7-7

- SBX7-7 Questions?



## Recycled Water

- Lynn Takaichi, Kennedy/Jenks Consultants

## Recycled Water

- Based on 2002 Recycled Water Master Plan and 2006 Programmatic EIR
  - Modified Phasing and Pipeline Alignments
  - Both VWRP and SWRP Utilized
  - Potential Onsite RW Production
- Current Production = 430 AFY
- Ultimate Production = 17,400 AFY, plus 5,344 AFY from Newhall Ranch WRP
- Will Help the SCV Meet 20x2020 Goals

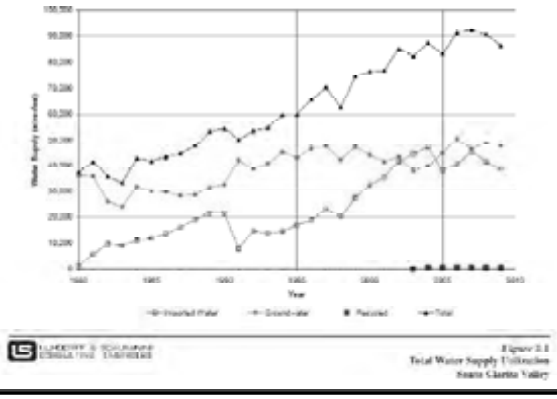


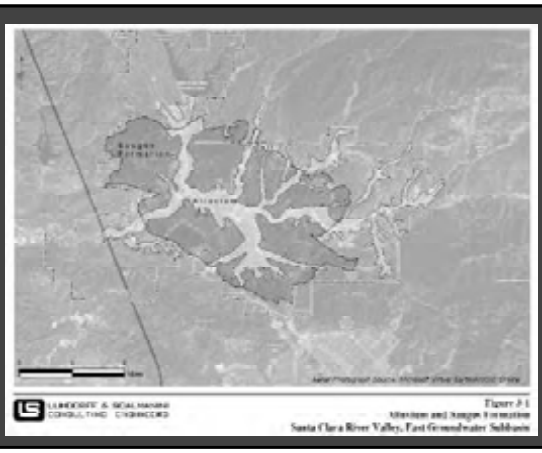
## Groundwater Supplies

- Joe Scalmanini - Luhdorff and Scalmanini

## Groundwater Component of Water Supplies 2010 Urban Water Management Plan

• Castaic Lake Water Agency • CLW larita Water Division
• Los Angeles County Waterworks District 36
• Newhall County Water District • Valencia Water Company





## Groundwater Management Plan (2003)

**Management Objectives (Goals) for the Basin**

- development of integrated surface water, groundwater, and recycled water supply to meet existing and projected uses
- determination of operational groundwater yield to avoid overdraft = sustainability
- preservation of groundwater quality, including solution of contamination problems
- preservation of interrelated surface water resources = maintenance of surface water flows and non-degradation of quality

## Groundwater Management Plan (2003)

**Elements**

- groundwater monitoring
- surface water monitoring
- basin yield analysis
- regular and dry year water supplies
- continued conjunctive use
- long-term salinity management
- integration of recycled water
- mitigate contamination
- local, state and federal relationships
- public education and water conservation
- recharge wellhead protection areas
- well construction and destruction policies
- provisions to add additional components

## Annual Water Reports (1998-present)

**Annual Water Requirements and Supplies**
- actual water use
- sources of supply to meet actual use

**Groundwater**
- Alluvial and Saugus aquifer conditions

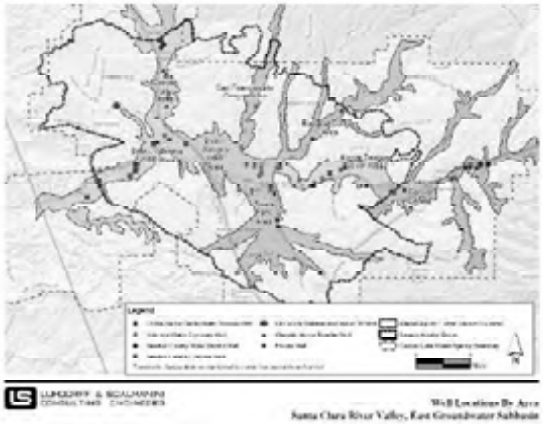
**Supplemental Water Supplies**
- State Water Project
- banking and other programs

**Water Quality**

**Recycled Water**

**Santa Clara River**
- outflows from Santa Clarita Valley

**Short-Term (one year) Outlook**
- water requirements adjusted from UWMP
- surface water, groundwater and recycled water supplies
- adequacy of water supplies



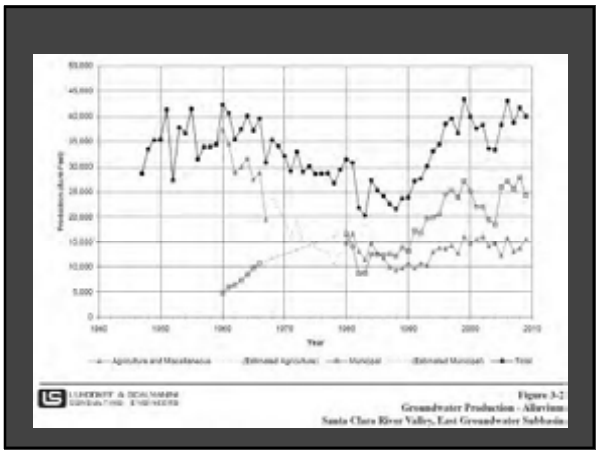



Figure 3-2
Groundwater Production - Alluvium
Santa Clara River Valley, East Groundwater Subbasin

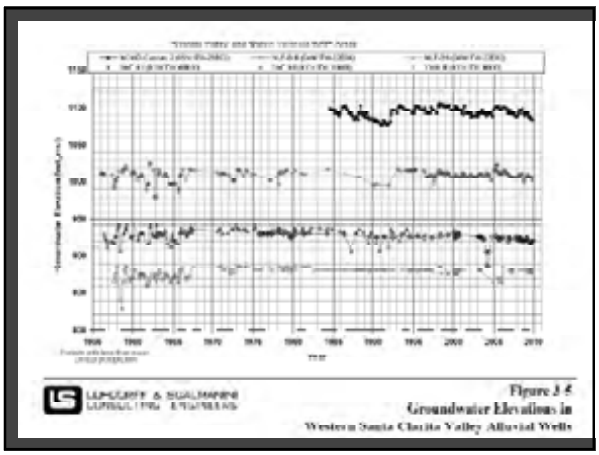



Figure 3-5
Groundwater Elevations in
Western Santa Clarita Valley Alluvial Wells

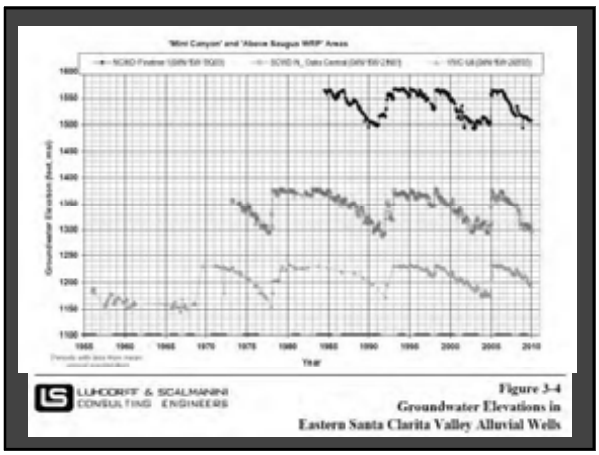
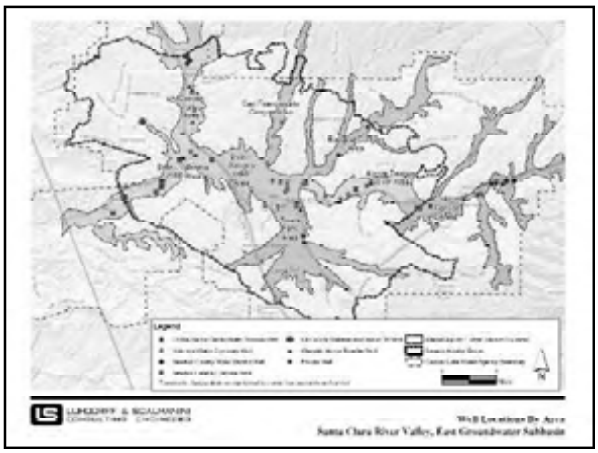



Figure 3-4
Groundwater Elevations in
Eastern Santa Clarita Valley Alluvial Wells




Well Locations By Agency
Santa Clara River Valley, East Groundwater Subbasin

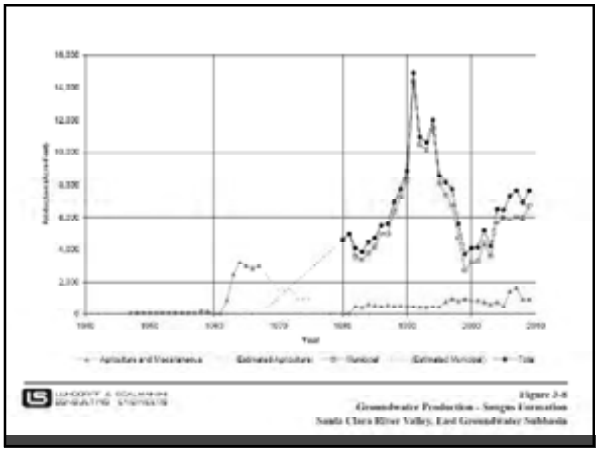



Figure 3-8
Groundwater Production - Saugus Formation
Santa Clara River Valley, East Groundwater Subbasin

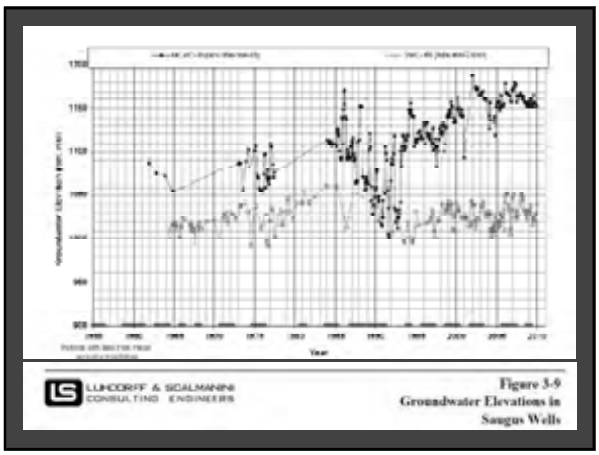
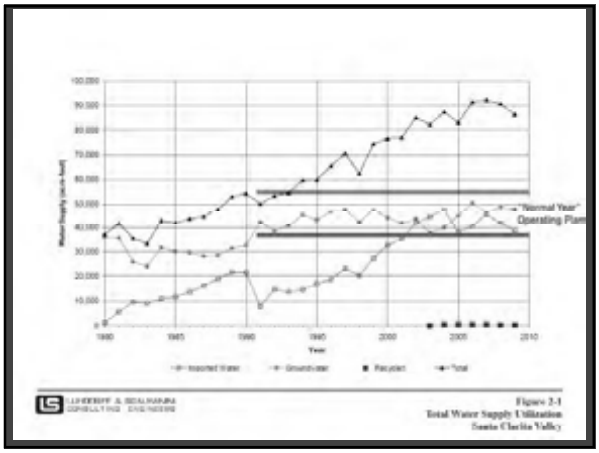



Figure 3-9
Groundwater Elevations in
Saugus Wells

## 2008 Groundwater Operating Plan

| Groundwater Pumping 2010 UWMP | | | | |
|---|---|---|---|---|
| **Aquifer** | **Normal Y** | | | |
| **Alluvium** | 30,000-40,000 (38,600) | 30,000-35,000 (36,500) | 30,000-35,000 (34,850) | 30,000-35,000 (34,850) |
| **Saugus** | 7,500-15,000 (12,485) | 15,000-25,000 (19,125) | 21,000-25,000 (25,227) | 21,000-35,000 (34,977) |




## Sustainability and Achievability

**Sustainability**

"lack of chronic, or sustained, depletion of groundwater storage, as indicated by projected groundwater levels, over a reasonable range of wet, normal, and dry hydrologic conditions" (86 years: 1922-2007)

"maintenance of surface water flows in the western portion of the basin (which are partially maintained by groundwater discharge) and surface water outflow to downstream basins over the same range of hydrologic conditions"

**Achievability**

maintenance of groundwater levels above, or only temporarily slightly into, the intake (screened or perforated) sections of production wells

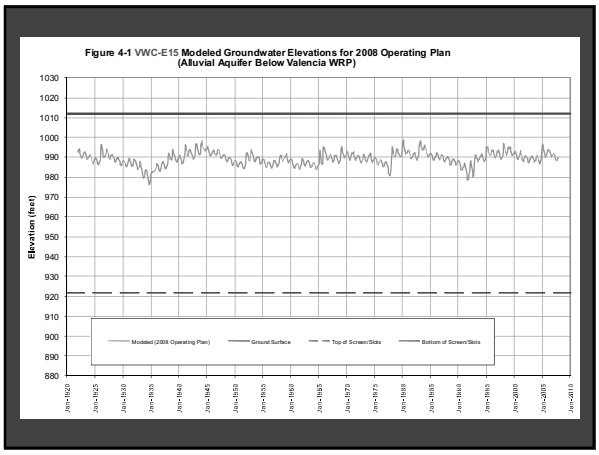


Figure 4-1 VWC-E15 Modeled Groundwater Elevations for 2008 Operating Plan
(Alluvial Aquifer Below Valencia WRP)
Elevation (feet)
Modeled (2008 Operating Plan)
Ground Surface
Top of Screen/Slots
Bottom of Screen/Slots

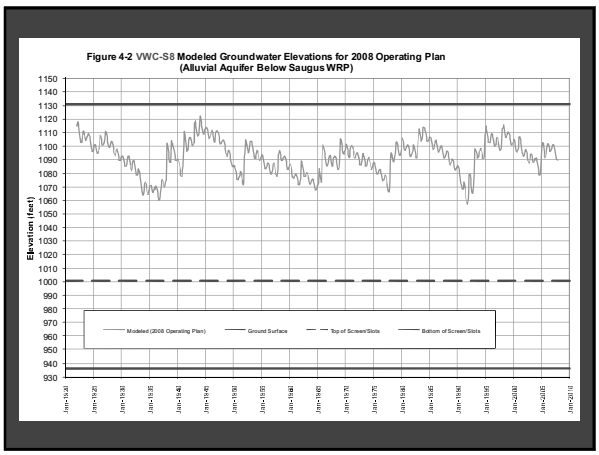


Figure 4-2 VWC-S8 Modeled Groundwater Elevations for 2008 Operating Plan
(Alluvial Aquifer Below Saugus WRP)
Elevation (feet)
Modeled (2008 Operating Plan)
Ground Surface
Top of Screen/Slots
Bottom of Screen/Slots

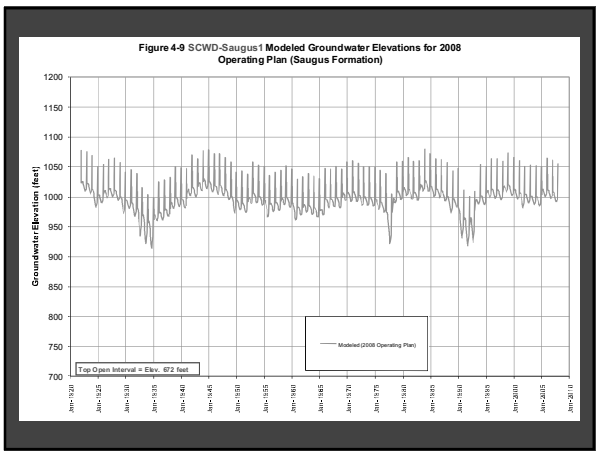
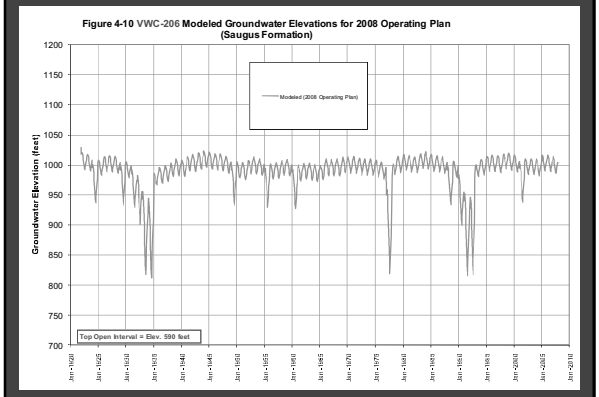


Figure 4-9 SCWD-Saugus1 Modeled Groundwater Elevations for 2008
Operating Plan (Saugus Formation)
Groundwater Elevation (feet)
Modeled (2008 Operating Plan)
Top Open Interval = Elev. 672 feet




## 2008 Operating Plan Conclusions

**Operating Plan is fully sustainable (no chronic groundwater level declines; no depleted stream flow) and mostly achievable (limited dry-period declines in eastern part of Valley)**

**Achievability issues in extended dry periods can be resolved by redistribution of some pumping to the west**

- with redistribution, retain dry-period Alluvial pumping near 35,000 afy
- without redistribution, dry-period Alluvial pumping closer to 30,000 afy

## Climate Change Impacts

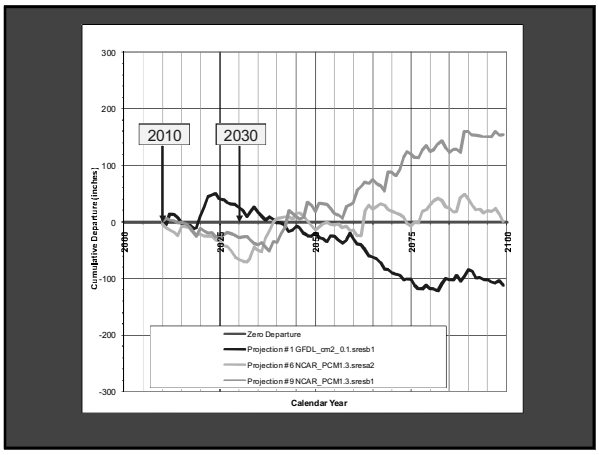
**Studied 9 of 112 published climate change projections; same 9 projections as evaluated by DWR for reliability of SWP**

**Selected 3 projections for variety of rainfall cycles during UWMP planning horizon and beyond**

- #1 = considerable fluctuation and generally wetter through UWMP, then long-term drying of climate
- #9 = less fluctuation and generally drier through UWMP, then sustained long-term wetting of climate
- #6 = less fluctuation and generally drier through UWMP, then long-term fluctuating cycles of below-normal and above-normal rainfall

**Simulated customized operating plan for 86 years: 2010-2095**

- simulated revised infiltration of precipitation, storm water, River inflow and Castaic Creek for three climate projections
- varied year-to-year Alluvial pumping dependant on prior year hydrology


2010
2030
Cumulative Departure (inches)
Calendar Year
Zero Departure
Projection #1 GFDL_cm2_0.1.sresb1
Projection #6 NCAR_PCM1.3.sresa2
Projection #9 NCAR_PCM1.3.sresb1

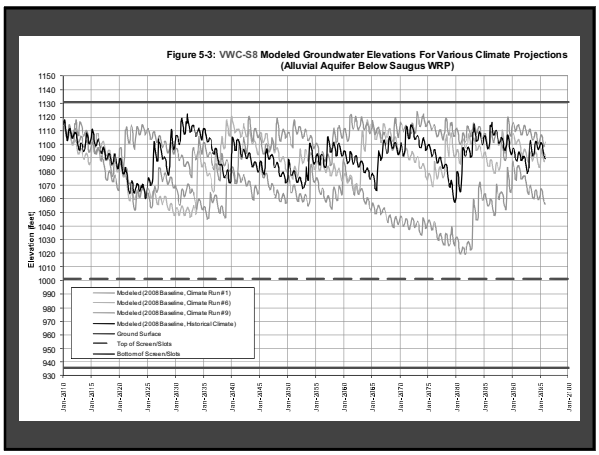
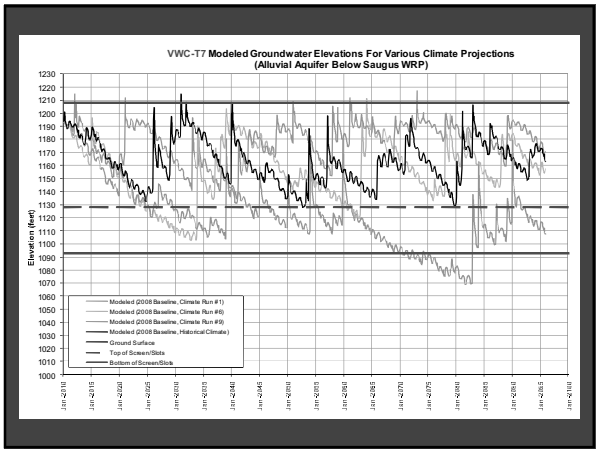


Figure 5-3: VWC-S8 Modeled Groundwater Elevations For Various Climate Projections
(Alluvial Aquifer Below Saugus WRP)
Elevation (feet)
Modeled (2008 Baseline, Climate Run #1)
Modeled (2008 Baseline, Climate Run #6)
Modeled (2008 Baseline, Climate Run #9)
Modeled (2008 Baseline, Historical Climate)
Ground Surface
Top of Screen/Slots
Bottom of Screen/Slots


VWC-T7 Modeled Groundwater Elevations For Various Climate Projections
(Alluvial Aquifer Below Saugus WRP)
Elevation (feet)
Modeled (2008 Baseline, Climate Run #1)
Modeled (2008 Baseline, Climate Run #6)
Modeled (2008 Baseline, Climate Run #9)
Modeled (2008 Baseline, Historical Climate)
Ground Surface
Top of Screen/Slots
Bottom of Screen/Slots

## Climate Change "Conclusions"

**No assurance of nature of potential climate change**

**For broad range of climate change possibilities, Operating Plan sustainable and achievable through shorter-term horizon of UWMP**

**Broad range of potential climate change extends from long-term dry to wet**

- Operating Plan sustainable through average to wetter "changed" climate
- Operating Plan unsustainable through long-term drying climate due to decreased local recharge and resultant declining groundwater levels

## Total Groundwater Supply Santa Clarita Valley

| | Normal Y | | |
|---|---|---|---|
| | Alluvium (afy) | Saugus Fm. (afy) | Total (afy) |
| Municipal Purveyors | 25,850 | 11,485 | 37,335 |
| Agriculture & Others | 12,750 | 1,000 | 13,750 |
| **Total** | **38,600** | **12,485** | **51,085** |

| | Multiple Dry Years | | |
|---|---|---|---|
| | Alluvium (afy) | Saugus Fm. (afy) | Total (afy) |
| Municipal Purveyors | 23,800-22,250 | 18,125-33,975 | 41,975-56,225 |
| Agriculture & Others | 12,700-12,600 | 1,000 | 13,700-13,600 |
| **Total** | **36,500-34,850** | **19,125-34,975** | **55,675-69,825** |

## State Water Project Supply Reliability

Nancy Clemm, P.E.

## State Water Project Supply Reliability

- Source: "Draft State Water Project Delivery Reliability Report 2009," Department of Water Resources (DWR).
- Includes estimates of current (2009) and future (2029) water delivery reliability of the State Water Project (SWP).
- Delivery estimates made using DWR's operations simulation model of SWP/Central Valley Project system.

## Model Studies in 2009 SWP Reliability Report

**Current (2009)**

- Represents estimates of current reliability under existing conditions.
- Based on historical hydrology, existing SWP facilities, existing operating constraints, and current demands.

**Future (2029)**

- Represents estimates of future reliability if no change to SWP facilities or operating constraints.
- Based on hydrology adjusted to reflect effect of climate change, and increased future demands.

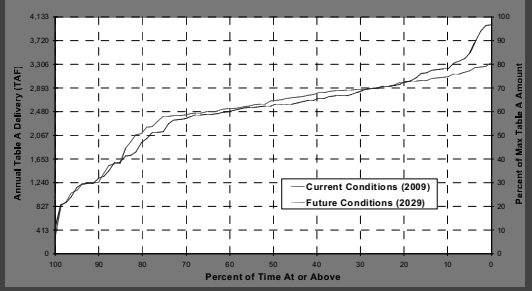
## Modeling Assumptions in 2009 SWP Reliability Report

| | Current (2009) | Future (2029) |
|---|---|---|
| Hydrology | Historical (based on 1922-2003) | Historical, adjusted for effect of climate change |
| SWP Facilities | Existing | Same |
| Operating Criteria | SWRCB D-1641<br>FWS Biological Opinion<br>NMFS Biological Opinion | Same |
| SWP Demands | | |
| Table A water | 3.0 – 4.1 MAF | 4.1 MAF (Max Table A amount) |
| Article 21 water | 414 or 214 TAF/mo | Same |

## Changes Since 2005 Reliability Report: Modeling Assumptions

- Extended hydrologic period: now 1922-2003.
- Inclusion of effects of climate change in future study.
- Addition of operational constraints from FWS and NMFS Biological Opinions.
- Higher SWP demands (both Table A and Article 21 water).
- Inclusion of contractor carryover.

## Results from 2009 Reliability Report: SWP Table A Delivery Probability




## Results from 2009 Reliability Report: Average and Dry Period Deliveries

| Total SWP Table A Delivery from Delta (in percent of max Table A amount*) | | | | | | |
|---|---|---|---|---|---|---|
| Study | Average (1922-2003) | Single dry year (1977) | 2-year drought (1976-77) | 4-year drought (1931-34) | 6-year drought (1987-92) | 6-year drought (1929-34) |
| Current (2009) | 60% | 7% | 36% | 34% | 35% | 34% |
| Future (2029) | 60% | 11% | 38% | 35% | 32% | 36% |

* Total maximum Table A amount from Delta is 4,133 TAF.

## Comparison to 2005 Reliability Report: Delivery Results

- Lower average SWP deliveries.
- Higher single dry year deliveries (1977).
- Variable effect on multiple dry year deliveries.

| Total SWP Table A Delivery from Delta (in percent of max Table A amounts) | | | | | | |
|---|---|---|---|---|---|---|
| Study | Average (1922-94/2003) | Single dry year (1977) | 2-year drought (1976-77) | 4-year drought (1931-34) | 6-year drought (1987-92) | 6-year drought (1929-34) |
| 2005 Report | | | | | | |
| Current | 68% | 4% | 41% | 32% | 42% | 37% |
| Future | 77% | 5% | 40% | 33% | 42% | 38% |
| 2009 Report | | | | | | |
| Current | 60% | 7% | 36% | 34% | 35% | 34% |
| Future | 60% | 11% | 38% | 35% | 32% | 36% |

## Applying SWP Reliability Report Results to Castaic Lake Water Agency

- SWP Reliability Reports show total SWP deliveries.
- Prior to 2009 report, DWR directed SWP contractors to determine their share of total deliveries as the proportion of their agency's Table A amount to sum of all contractors' Table A amounts.
- In 2009 report, DWR directs using this same method for average deliveries, but recommends using contractor-specific delivery data for single year or short periods.

## Applying SWP Reliability Report Results to Castaic Lake Water Agency (con't)

- In studies for 2009 report, delivery results differ by contractor due to differing contractor demands and inclusion of modeling of contractor carryover water.
- Carryover water is Table A water allocated to a contractor in one year which, if storage is available in SWP's San Luis Reservoir, can be "carried over" for delivery to that contractor the following year.
- Carryover can provide additional supply in dry years, but availability and usability differ by contractor.
- CLWA service area demands are currently low relative to its Table A amount, so carryover is likely to provide dry-year supply in near term.

## Results from 2009 Reliability Report Studies: Deliveries to CLWA

| Total SWP Table A Delivery to CLWA (including carryover) | | | | | | |
|---|---|---|---|---|---|---|
| Study | Average (1922-2003) | Single dry year (1977) | 2-year drought (1976-77) | 4-year drought (1931-34) | 6-year drought (1987-92) | 6-year drought (1929-34) |
| Current (2009) | | | | | | |
| Delivery (TAF) | 58.3 | 12.8 | 44.0 | 32.8 | 34.4 | 33.4 |
| % of Table A* | 61% | 13% | 46% | 34% | 36% | 35% |
| Future (2029) | | | | | | |
| Delivery (TAF) | 57.4 | 9.1 | 34.1 | 33.0 | 29.6 | 33.8 |
| % of Table A* | 60% | 10% | 36% | 35% | 31% | 36% |
| * CLWA Table A amount is 95.2 TAF. | | | | | | |

## Comparison to 2005 Reliability Report: Deliveries to CLWA

- Lower average SWP deliveries.
- Higher single dry year deliveries (1977).
- Variable effect on multiple dry year deliveries.

| Total SWP Table A Delivery to CLWA | | | | | | |
|---|---|---|---|---|---|---|
| Study | Average (1922-94/2003) | Single dry year (1977) | 2-year drought (1976-77) | 4-year drought (1931-34) | 6-year drought (1987-92) | 6-year drought (1929-34) |
| 2005 Report | | | | | | |
| Current | 64.7 | 3.8 | 39.0 | 30.5 | 40.0 | 35.2 |
| Future | 73.3 | 4.8 | 38.1 | 31.4 | 40.0 | 36.2 |
| 2009 Report | | | | | | |
| Current* | 58.3 | 12.8 | 44.0 | 32.8 | 34.4 | 33.4 |
| Future | 57.4 | 9.1 | 34.1 | 33.0 | 29.6 | 33.8 |
| * Includes deliveries of carryover water. | | | | | | |

## State Water Project Supply Reliability

Q & A -

## Urban Water Management Plan 2010

Questions and Answers

Enduring Relationships · Trusted Expertise · Promises Delivered

Kennedy Jenks

62

## Consultant Team

- Kennedy/Jenks Consultants
- Luhdorff and Scalmanini
- Nancy Clemm, P.E.
- Stacy Miller Public Affairs

Enduring Relationships · Trusted Expertise · Promises Delivered

Kennedy Jenks

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## Future Meeting Dates and Times

- Public Workshops
  - May 25, 2010
  - July 27, 2010
  - September 28, 2010
- Hearings (Tentative)
  - October 1
  - November 30
- Adoption (Tentative)
  - CLWA December 31, 2010?
  - Purveyors June 2011?

Enduring Relationships · Trusted Expertise · Promises Delivered

Kennedy Jenks

(ORIGINAL)

# Santa Clarita Valley Urban Water Management Plan
## July 27, 2010 - Community Workshop Sign In Sheet

| | PRINT NAME | ORGANIZATION | TITLE | PHONE | EMAIL |
|---|---|---|---|---|---|
| 1. | MARSHALL PASTER | | | (661) 252 6057 | 20701 Soledad Cyn Rd 358 Canyon Country CA 91351 |
| 2. | Stacy Miller | SCMPA | | | |
| 3. | Dirk Marks | CLWA | WRM | | |
| 4. | Mary Lou Cotton | K/J | | | |
| 5. | Matt Dickens | VWC | Resource Conservation Manager | 661-25[illegible]5132 | MDickens@valleywater.org |
| 6. | JANICE THOMAS | private | | 661 222-7450 | 22pupperwolf@att.net |
| 7. | Kevin Korenthal | Self | | (661) 310-0769 | — |
| 8. | Cathy Hollomon | SCWA | Assoc WR Planner | 661-259-2737 | chollomon@scwater.org |
| 9. | Harold Geiger | private | Homeowner | 661 254 6478 | htgeiger@sbcglobal.net |
| 10. | Kendra Geiger | " | " | " " " | " |
| 11. | PAUL BSTRICKLAND | ASSEMBLYMAN CAMPBELL SMYTH | FIELD REP | 661 714 6999 | LUCK4US@ca.rr.com |
| 12. | Patrick Bryant | City of SC | Admin Analyst | 661-255-4902 | pbryant@santa-clarita.com |
| 13. | mari johnson | Self | | 661 360 8178 | marijohns7@yahoo.com |
| 14. | Steve Cole | NEWS | G.M | | SCOLE@NEWS.ORG |
| 15. | L Adams | HOA | | | |
| 16. | S Moss | HOA | | | |
| 17. | B Bothara | HOA | | | |
| 18. | Jorge H Aguila | Aguila Landscaping | owner | 661-259-5641 | aguilaland@sbcglobal.net |

# Santa Clarita Valley Urban Water Management Plan
## July 27, 2010 - Community Workshop Sign In Sheet

| | PRINT NAME | ORGANIZATION | TITLE | PHONE | EMAIL |
|---|---|---|---|---|---|
| 1. | Maureen Wade | Interested Citizen | | 661-254-2370 | mobrownies@cc.rr.c |
| 2. | Ronald Wynn | SDS | | | |
| 3. | JEFF SAUNDERS | RESIDENT | | | JBSAWNDERS@AOL |
| 4. | JASON SMISKO | Santa Clarita | | | |
| 5. | Rebecca Correa | Waterwise | | | rcorrea@waterwise-consulting.com |
| 6. | DAN RAMLER | SANTA CLARITA | | | |
| 7. | Robert DiPrimio | Valencia Water | | | rdiprimio@valenciawater. |
| 8. | David Fryhm | self | | | engrdave@mac.com |
| 9. | Julie Molinare | Grass Greener Landscape Designs | | | |
| 10. | Jackie Bick | Sen. M. Runner | | | |
| 11. | Henry Schultz | SELF | | 661-284 5613 | HENRYSO@PACBELL.NET |
| 12. | JESSICA BUNKER | LAC WWD | | 626-300-3315 | jbunker@dpw.lacounty.gov |
| 13. | RAY ARSNOW | HOMEOWNER | | ——— | IRSTEAMERR@yhoo.com |
| 14. | | | | | |
| 15. | | | | | |
| 16. | | | | | |
| 17. | | | | | |
| 18. | | | | | |

# Santa Clarita Valley Urban Water Management Plan
## July 27, 2010 - Community Workshop Sign In Sheet

| | PRINT NAME | ORGANIZATION | TITLE | PHONE | EMAIL |
|---|---|---|---|---|---|
| 1. | Sally Bowler | Self | 4 | 661-313-8324 | salbowler@yahoo |
| 2. | Sandra Cattell | Sierra Club | | 661 2590433 | Sumcatt@yahoo.com |
| 3. | Carole Jurbes | SCV Fair Elections | | 661-755 3772 | Carolelutness@att.net |
| 4. | DAN MASNADA | CLWA | G.M. | 661 297 1600 | |
| 5. | Danny Andrews | Retired DWR | | 661-295-6771 | |
| 6. | Frank Smathers | customer | | 661-296-0511 | thunder1road@gmail.com |
| 7. | | | | | |
| 8. | | | | | |
| 9. | | | | | |
| 10. | | | | | |
| 11. | | | | | |
| 12. | | | | | |
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| 15. | | | | | |
| 16. | | | | | |
| 17. | | | | | |
| 18. | | | | | |

# September 2010 UWMP Workshop Notification of Postponement

## Public Outreach Record

# 2010 Santa Clarita Valley Urban Water Management Plan

Stacy Miller
PUBLIC AFFAIRS
Creative Solutions to Complex Situations

September 14, 2010

«AddressBlock»

Subject: **September 2010 UWMP Workshop Postponed**

«GreetingLine»

Thank you for your interest in the 2010 Urban Water Management Plan (UWMP) and/or your attendance at one of the recent community workshops.

This is to notify you that the originally scheduled **September 28, 2010 UWMP workshop** has been **postponed** as we are awaiting UWMP document guidelines from the State of California which will not be released until the end of October, 2010.

The next 2010 UWMP community workshop will provide the most current information on components of the 2010 planning document and will take place as follows:

| | |
|---|---|
| Date: | Tuesday, November 16, 2010 |
| Time: | 4:00 pm |
| Location: | Castaic Lake Water Agency<br>27234 Bouquet Canyon Road |

The Urban Water Management Plan presents a picture of the valley's water situation through the year 2035 and describes the long-range water needs of the community and the means to supply the necessary water.

I encourage your participation at the November community workshop and look forward to seeing you then. If you have any questions, please feel free to contact me.

Sincerely,

Stacy Miller
Public Outreach Manager
2010 SCV Urban Water Management Plan

Government Affairs, Public Relations & Communication
P.O. Box 55745, Valencia, CA 91385 [818] 402-5806 [661] 222-9733 Fax stacy@StacyMillerPA.com
www.StacyMillerPA.com

SANTA CLARITA VALLEY

# 2010 Urban Water Management Plan

## COMMUNITY WORKSHOP

**POSTPONED**

Friday 9-24-10 Signal

The originally scheduled September 28, 2010 UWMP workshop has been postponed as we are awaiting UWMP document guidelines from the State of California which will not be released until the end of October, 2010.

The next 2010 UWMP community workshop will provide the most current information on components of the 2010 planning document and will take place as follows:

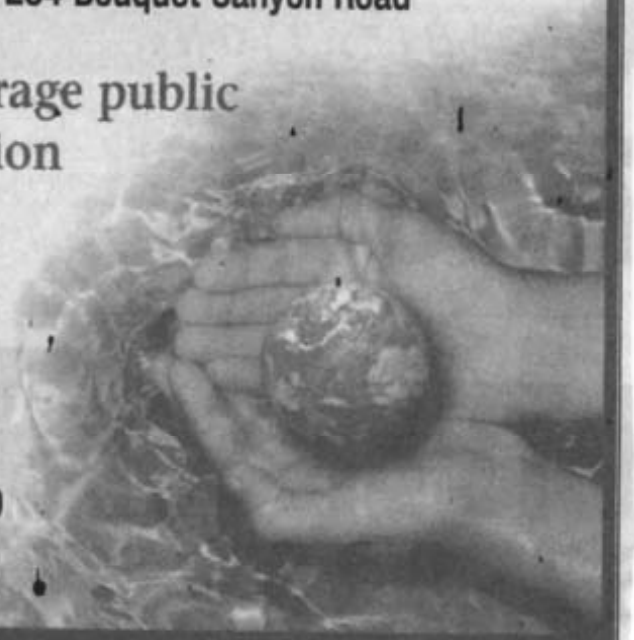
***New Workshop Date is:***

***Date:*** Tuesday, November 16, 2010

***Time:*** 4:00 pm

***Location:*** Castaic Lake Water Agency
27234 Bouquet Canyon Road

We encourage public participation and input



**For more information, please call (661) 297-1600**

Castaic Lake Water Agency
CLWA Santa Clarita Water Division
Newhall County Water District
Valencia Water Company

# November IRWM Stakeholder Presentation

## Public Outreach Record

## 2010 Santa Clarita Valley Urban Water Management Plan

# November 9 Upper Santa Clara River IRWM Stakeholders Meeting Notification

**To:** Jeff Ford
**Cc:** Jeff Ford
**Subject:** RE: November 9 Upper Santa Clara River IRWM Stakeholders Meeting

**From:** Jeff Ford
**Sent:** Thursday, October 28, 2010 7:55 AM
**To:** Jeff Ford
**Subject:** November 9 Upper Santa Clara River IRWM Stakeholders Meeting

Dear Upper Santa Clara River IRWM Stakeholders:

Our next meeting will be one week from today at the City's Activities Center. We have had several meetings at this location now, but you can go to the City's website if you need directions, or map the address (20880 Centre Pointe Parkway, Santa Clarita, California 91350). On the agenda is an update of our grant applications, an update of the activities of the Invasive Weeds Task Force and an overview of the 2010 Urban Water Management Plan for the Santa Clarita Valley presented by the consultants working on it (an agenda is attached). We will start as usual at 2:30 p.m., but probably end a little later than normal given the items on the agenda.

Hope to see you all there.

Regards,

*Jeff Ford*
*Principal Water Resources Planner*
*Castaic Lake Water Agency*
*(661) 513-1281*

## Urban Water Management Plan

**Upper Santa Clara River Watershed**
**Integrated Regional Water Management Plan**
**Stakeholder Meeting**
**Tuesday, November 9, 2010**

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## IRWMP Stakeholder Meeting
## UWMP Overview

- What is an UWMP?
- Who is required to submit an UWMP?
- Why are UWMPs developed?
- When are the UWMPs developed?
- Existing and new requirements of UWMPs
- Q&A

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## What is an Urban Water Management Plan?

- An Urban Water Management Plan is a comprehensive planning process whereby urban water suppliers describe and evaluate sources of water supply, efficient uses of water, demand management measures, implementation strategy and schedule, and other relevant information and programs.

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## Who is required to prepare an UWMP?

- Publicly or privately owned water suppliers (including wholesalers), providing water for municipal purposes either directly or indirectly to more than 3,000 customers or supplying more than 3,000 acre-feet annually.

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## Why are UWMPs Developed?

- In adherence to the 1983 Urban Water Management Planning (UWMP) Act and subsequent legislation
- To develop a framework for agencies to integrate programs and projects that enhance the quality and quantity of regional water supplies
- To identify gaps between supply and demand through time (20-year analysis required)
- To provide detailed description of all supply sources (surface, recycled, groundwater)

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## Why are UWMPs Developed? (Cont'd.)

- To identify Demand Management Measures (water conservation programs)
- To address water quality issues
- To develop water shortage contingency planning
- To describe how demand will be met through time, in all hydrologic year types (normal, multiple dry, critical dry)

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## When are UWMP Plans Developed?

- Suppliers are required to update UWMP every five-years (years ending in 0 or 5).
- 2010 – current update
- July 1, 2011 for retailers (SBx7-7 extended UWMP deadline for retailers but silent on extension for wholesalers.)
  - Under current UWMP Act, wholesalers should complete UWMP by December 31, 2010. But "cleanup legislation" (AB 2776 and SB 1478) extended deadline to July 1, 2011 for wholesalers.



## Coordination and Notification Requirements

"Each urban water supplier shall coordinate the preparation of its plan with other appropriate agencies in the area, including other water suppliers that share a common source, water management agencies, and relevant public agencies, to the extent practical."



## Coordination and Notification Requirements

Other:

- Must hold public hearing prior to adoption of UWMP
- Must give cities and counties in service area 60 days notice prior to public hearing
- Must provide cities and counties and LAFCO in service area with copies of UWMP within 30 days of adoption

## Penalties

- Ineligible for State Grant and Loan Funding (at least until plan is completed to DWR satisfaction)
- Vital to the IRWMP process!



## What, Who, Why, When, etc…

- Q&A/Discussion



## New Requirements for 2010 UWMP

- New Law: SBX7-7 ("20% x 2020"), reporting starts with 2010 UWMPs
  - Base gross water use in gpcd: must be calculated using one of three methodologies
  - Target reduction from base by 2020: reporting requirements differ for retailers vs. wholesalers
  - Must be calculated using one of four methodologies
  - Agencies must hold public hearing to explain how targets will be met (can be held as part of UWMP hearing)

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## New UWMP Requirements

- Base gross water use in gpcd: calculation

  Total volume of water (treated or not) entering the retail distribution system, divided by the total population of the service area

  *(Excludes: recycled water, net volume into long-term storage, water conveyed to another retailer, agricultural water)*



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## New UWMP Requirements

- Base gross water use in gpcd: methodologies
  - 10-year average
    - *ending no earlier than 2004 – no later than 2010; OR*
  - 15-year average if 10% of 2008 demand met by recycled water
    - *get to add 5 years to calculation; AND*
  - 5-year average
    - *at least 5% reduction if agency is already close to 100 gpcd*
    - *ending no earlier than 2007 – no later than 2010*



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## New UWMP Requirements

- Base gross water use in gallons per capita per day (gpcd)
  - Averages are determined on a rolling basis
  - Should review demands over various periods to determine hydrologic and demand year types
  - Recent economic impacts and drought response may have reduced demand!

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## New UWMP Requirements

- Target reduction methodology options
  1. 20% reduction from base (i.e., 80% of average gross water use in gpcd)
  2. Combination of state standards:
     - 55 gpcd indoor residential + landscape use at 70% -80% ETo + 10% reduction in commercial/industrial/institutional use
  3. DWR 20x2020 hydrologic region target (South Coast region = 149 gpcd)
  4. Option to be developed by October 2010



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## New UWMP Requirements

- Reduction Target Option 4
  - Subject to DWR public process during 2010
  - Will identify targets to achieve cumulative statewide 20% reduction
  - Must allow flexibility for water supplier service area characteristics



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## New UWMP Requirements

- Issues: DWR will derive methodologies for calculations: population, base water use, gross water use, sector water use, Option 4, others
  - As DWR derives new methodology standards, agencies may be required to use them
  - Won't be final until December 2010
  - If work has already been done, it may need to be repeated
  - = Reason for UWMP deadline extension to July 1, 2011

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## New UWMP Requirements

- Other
  - SB 1087 (Florez) - requires an UWMP to include projected water use for single-family and multi-family residential housing for lower income households as identified in the housing element of any city, county, or city and county in the service area of the supplier.

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## Consultant Team

- Kennedy/Jenks Consultants
- Luhdorff and Scalmanini
- Nancy Clemm, P.E.
- Stacy Miller Public Affairs

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## Questions, Answers and Discussion

CASTAIC LAKE WATER AGENCY

NCWD

SCWD

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Future Meeting Dates and Times
Public Workshops
May 25, 2010
July 2, 2010
November 16, 2010
January 11, 2011 (tentative)
March 8, 2011 (tentative)
Public Hearings
January 26, 2011 (tentative)
March 23, 2011 (tentative)
April 27, 2011 (tentative)
Adoption
June 2011
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# Upper Santa Clara River Watershed
# Integrated Regional Water Management Plan

Stakeholder Meeting #18
Tuesday, November 9, 2010
***2:30 pm –4:30 pm***
**City of Santa Clarita Activities Center**
**20880 Centre Pointe Parkway**
**Santa Clarita, California 91350**

***Meeting Objectives:***

- Updates on Grants
- Invasive Weeds Task Force Report
- 2010 Urban Water Management Plan Workshop

## AGENDA

| | | |
|---|---|---|
| ***2:30*** | **I.** | **Welcome and Introductions**<br>A. Meeting purpose and outcomes<br>B. Stakeholder self-introductions<br>*Jeff Ford, CLWA* |
| ***2:35*** | **II.** | **Project Updates/Prioritzation**<br>A. Planning Grant Update<br>B. Planning Grant Schedule<br>C. Implementation Grant Update<br>D. Final Suite of Projects<br>E. Implementation Grant Schedule<br>*Jeff Ford, CLWA* |
| ***2:45*** | **III** | **Santa Clara River Invasive Weeds Task Force**<br>A. Results of October Meeting<br>B. Future Activites<br>*Heather Merenda, City of Santa Clarita* |
| ***3:00*** | **IV.** | **2010 Urban Water Management Plan** |
| ***4:30*** | **V.** | **Close** |

# UPPER SANTA CLARA RIVER
# INTEGRATED REGIONAL WATER MANAGEMENT PLAN

## Stakeholder Meeting #18

**November 9, 2010**
**City of Santa Clarita, Activities Center**

## Meeting Summary

### PURPOSE AND MEETING OVERVIEW

The purpose of this 18th stakeholder meeting was to:

- Update Stakeholders on Grants
- Report on the Invasive Weeds Task Force
- Hold a Workshop on the 2010 Urban Water Management Plan

Stakeholders representing public agencies and private, non-profit organizations attended this meeting.

### UPDATE ON THE IRWM PROCESS

Jeff Ford provided a recap and explanation of the progress on grant applications for both the Planning Grant and the Implementation Grant including:

- Overview of new Plan requirements
- The submittal of a Planning Grant application in September and the schedule for DWR to award.
- Progress on preparing an Implementation Grant application and the expected schedule for DWR to accept applications and make awards.
- Review of the final project suite in the Implementation Grant application and approval of including a project not in the adopted IRWMP: the Valencia Water Company's Santa Clarita Valley Southern End Recycled Water Project.

### UPDATE ON THE SANTA CLARA RIVER INVASIVE WEEDS TASK FORCE

Heather Merenda from the City of Santa Clarita discussed the Task Force's progress to date and gave an overview of the goals of the Task Force. She noted that the next meeting was scheduled for January in Filmore. More details will be sent to the stakeholders as they become available, but interested parties were encouraged to join the Task Force directly.

## OVERVIEW OF THE 2010 URBAN WATER MANAGEMENT PLAN

Stacy Miller of Stacy Miller Public Affairs and Mary Lou Cotton of Kennedy/Jenks Consultants gave an overview of the requirements of the UWMP Act, the contents of the UWMP and the progress to date on the 2010 UWMP. They detailed the schedule of workshops and hearings leading the adoption of the UWMP in June of 2011.

## OTHER ITEMS

Jeff Ford announced that the next Stakeholders Meeting is tentatively scheduled for January at a location TBD. Meeting notices will be emailed to stakeholders once a date is determined.

# IRWMP Invitee & Attendee List - 11-9-10

| Organization | Telephone Number | Fax Number | e-mail address | Initial |
|---|---|---|---|---|
| LA County Regional Planning | (213) 974-6476 | | madams@planning.lacounty.gov | |
| DWR, Glendale, CA | (818, 500-1645 | | ljurkevi@water.ca.gov | |
| California Native Plant Society | | | | |
| LA Co Flood Control District Meherva Ariki | 626-458-4314 | | mariki@dpw.lacounty.gov | |
| Atkins Environmental | (661) 266-2260 | (661) 253-3555 | bj@atkinsenvironmental.com | |
| Building Industry Association | (661) 257-5046 | | nayala@biaglav.org | |
| Acton Town Council | (661) 269-2588 | | Airspecial@aol.com | |
| UCCE Water Quality Program | | | | |
| West Ranch Town Council | | | | |
| Senator George Runner | (661) 286-1471 | | jackie.bick@sen.ca.gov | |
| Los Angeles Sheriffs Department | | | wfbennet@lasd.org | |
| California Dept. of Water Resources | | | | |
| UCCE - Los Angeles | | | | |
| California Dept. of Water Resources | | | | |
| California Regional Water Quality Control Board | (213) 576-6679 | | sbirosik@waterboards.ca.gov | |
| LA County Flood Control District | | | HBORDAS@dpw.lacounty.gov | |
| CDFG | (661)259-3750 | | | |
| Friends of the Santa Clara River | (805) 498-4373 | | bottorffm@verizon.net | |
| UCCE Center for Water Resources | | | | |
| U.A.P. Timberland | | | | |
| California Coastal Conservancy | | | | |
| NRCS-Somis | | | | |
| U.S. Army Corps of Engineers | (213) 452-4057 | | darrell.w.buxton@usace.army.mil | |
| VCRCD-Wildscape Restoration | (805) 644-6852 | (805) 642-2127 | noreen@wildscaperestoration.com | |
| Los Angeles County DPW | (661) 947-7173 | | mcaddick@dpw.lacounty.gov | |
| USDA Forest Service | | | jcapell@fs.fed.us | |
| California Dept of Fish and Game | (805) 640-1852 | | mcardenas@dfg.ca.gov | |
| MIG Associates | | | joanc@migcom.com | |
| Newhall County Water District | (661) 259-3610 | | scole@ncwd.org | |
| Acton Town Council | (661) 269-5675 | | | |
| The Nature Conservancy | | | | |
| Kennedy/Jenks Consultants | (805) 658-0607 | | MaryLouCotton@KennedyJenks.com | |
| California Dept. of Fish and Game | (661) 263-8306 | | bcourtney@dfg.ca.gov | |
| Kennedy/Jenks Consultants | (805) 658-0607 | | MeredithClement@kennedyjenks.com | |
| | (818) 365-9847 | | d r crane@hotmail.com | |
| LA County DPW | (626) 458-3524 | (626) 458-3534 | ascruz@dpw.lacounty.gov | |
| Valley Crest Tree Company | (818) 737-2697 | | rcrudup@vctree.com | |
| Acton Town Council | (661) 269-3682 | (661) 269-3683 | wdavis289@hughes.net | |
| Assemblyman Cameron Smith | (661) 286-1565 | | jarrod.degoria@asm.ca.gov | |
| LA Co DPW | (626) 458-4313 | | bdepoto@dpw.lacounty.gov | |
| Valencia Water Company | (661) 294-0828 | | rdiprimio@valencia.com | |

| Organization | Telephone Number | Fax Number | e-mail address | Initial |
|---|---|---|---|---|
| The Nature Conservancy | | | tdoherty@tnc.org | |
| University of California Cooperative Extension | (323) 266-3404 | | sldrill@ucdavis.edu | |
| University of California, Santa Barbara | (805) 893-2911 | | tdudley@msi@uscsb.edu | |
| | (661) 251-9729 | (661) 259-1845 | water@dslextreme.com | |
| Santa Clarita Valley Well Owners Association | (661) 298-2000 | | rfleck@socal.rr.com | |
| Castaic Lake Water Agency | (661) 513-1281 | | jford@clwa.org | |
| LA Co DPW | (626) 458-6158 | | afuentes@dpw.lacounty.gov | |
| LA Co DPW Waterworks | (626) 300-3324 | (626) 300-3358 | hgallardy@dpw.lacounty.gov | |
| | | | avrcd@carcd.org | |
| LA Co Dept. of Regional Planning | (213) 974-6417 | | rglaser@planning.lacounty.gov | |
| Acton Town Council | | | | |
| | | | tgrant@ladpw.org | |
| Los Angeles County Sanitation Disrict | | | fguerrero@lacsd.org | |
| West Ranch Town Council | (661) 254-6116 | | grf497@aol.com | |
| SCWD | | | | |
| Los Angeles County Sanitation Disrict | (562) 908-4288 x 2832 | | fguerrero@lacsd.org | |
| Santa Clarita Valley Environmental Coalition | | | mgutzeit@ca.rr.com | |
| LA County Public Works Department | (626) 458-5918 | | bhamamo@ladpw.org | |
| California DFG | | | spharris@cdfg.ca.gov | |
| Director Regional Planning | | | | |
| L.A. County Supv'r Mike | | | | |
| CLWA | (661) 513-1253 | | Thawes@clwa.org | |
| Agua Dulce Town Council | (661) 268-1731 | | | |
| Agua Dulce Town Council | (661) 268-1731 | | BH33605@AOL.com | |
| | (661) 295-7300 | | John@gruber-systems.com | |
| SCWD | (661) 259-2737 | | chollomon@scwater.org | |
| County of Ventura | | | Susan.Hughes@Ventura.org | |
| U.S. Army Corps of Engineers | (213) 452-3826 | | james.d.hutchison@spl01.usace.army.mil | |
| Agua Dulce Town Council | | | jjennings3570@sbcglobal.net | |
| Evironmental Protection Agency | | | | |
| Vulcan Materials Co., | | | | |
| CalTrans, District 7 - IGR/CEQA Branch | (213) 897-1346 | | edwin_kapmann@dot.ca.gov | |
| Valencia Industrial Association | | | | |
| LA County DPW | (626) 458-4350 | | fkim@dpw.lacountry.gov | |
| LA County Waterworks | (626) 300-3327 | | tjkim@dpw.lacounty.gov | |
| Castaic Area Town Council | | | | |
| LA County Flood Control District | (626) 458-4350 | | Fkuo@dpw.lacounty.gov | |
| City of Santa Clarita | (661) 255-4337 | | TLANGE@santa-clarita.com | |
| Lakes Town Council | (661) 724-0150 | | cedar91@verizon.net | |
| | | | redraggles2@earthlink.net | |
| NRCS | (661) 945-2604 X 110 | | jae.lee@causda.gov | |

| Organization | Telephone Number | Fax Number | e-mail address | Initial |
|---|---|---|---|---|
| Angeles National Forest | | | mlambardo@fs.fed.us | |
| SCOPE | | | | |
| Los Angeles County Sanitation Disrict | (562) 699-7411 X 2802 | | blouie@lacsd.org | |
| Santa Clarita Valley Chamber of Commerce | (661) 702-6977 | | Lmankin@scvchamber.com | |
| Castaic Lake Water Agency | | | | |
| Aqua Dulce Town Council | | | | |
| Ventura Cty Watershed Protection District | | | | |
| LA County Dept. of Public Works | (661) 947-7173 | | mcaddick@dpw.lacounty.gov | |
| The Nature Conservancy | (805) 642-0345 ext. 502 | | cmccalvin@tnc.org | |
| L. A. County Regional Planning | | | | |
| United Water Conservation District | | | | |
| City of Santa Clarita | (661) 284-1413 | | hmerenda@santa-clarita.com | |
| County of Ventura Ag. Commisioner's Office | | | | |
| The Nature Conservancy | (661) 642-0345 X 502 | | smatsumoto@tnc.org | |
| United Water Conservation District | | | | |
| Valencia Water Company | (661) 295-6512 | | gmilleman@valencia.com | |
| City of Santa Clarita | (661) 284-1413 | | hmerenda@santa-clarita.com | |
| Ventura County Resource Conservation District (VCRCD) | (805) 386-4685 | (805) 386-4890 | marty.melvin@vcred.org | |
| County of Ventura | | | | |
| Kennedy/Jenks Consultants | | | | |
| City of Santa Clarita | (661) 255-4959 | | cmonde@santa-clarita.com | |
| NRCS | | | | |
| County of Los Angeles, Department of Parks and Recreation | | | | |
| | | | TNGOV@dpw.lacounty.gov | |
| SCOPE | (661) 255-7112 | | | |
| Ventura Cty Watershed Protection District | | | kirk.norman@ventura.org | |
| | | | kathy@via.org | |
| Stillwater Sciences | (510) 848-8098 ext. 111 | | bruce@stillwatersci.com | |
| Tataviam Band of Mission Indians | | | | |
| | (661)251-6113 | | DOJTRUM@SOCAL.RR.COM | |
| South Coast Wildlands Project | | | | |
| Newhall Land | (661)257-1095 | | cperez@newhall.com | |
| Association of Water Agencies of Ventura County | | | | |
| Supervisor Antonovich's Office | (661) 287-3657 | | dperry@lacbos.org | |
| Los Angeles County Flood Control District | (805) 57-0497 | | | |
| SCOPE | | | | |
| Well Owner | (661) 297-4401 | | | |
| | | | avconservancy@yahoo.com | |
| SCV Well Owners Association | | | | |
| The Sierra Club, Angeles Chapter | | | | |
| County of Ventura | (805) 654-2455 | | lynn.rodriguez@ventura.org | |

| Organization | Telephone Number | Fax Number | e-mail address | Initial |
|---|---|---|---|---|
| Ventura Cty Watershed Protection District | | | | |
| County of Ventura | | | | |
| Newhall County Water District | (661) 259-3610 | | krussell@ncwd.org | |
| LA County Waterworks District #36 & 37 | | | DRYDMAN@dpw.lacounty.gov | |
| Rivers and Mountains Conservancy | (626) 458-4315 | | fsimpson@rmc.ca.gov | |
| Aqua Dulce/Acton Country Journal | (661) 269-5804 | (661) 269-5532 | countryjournal@bigplanet.com | |
| Friends of the Santa Clara River | (661) 644-2802 | | rsweet46@hotmail.com | |
| Santa Monica Mountains Conservancy | | | | |
| Sierra Club | (661) 296-1212 | | kms39005@csun.edu | |
| US Fish and Wildlife Service | (805) 644-1766 X 339 | | Steurer_denise@fws.gov | |
| Wetlands Recovery Project | | | | |
| Rivers and Mountains Conservancy | (626) 815-1019 x110 | | ltorres@rmc.ca.gov | |
| Foothill Associates | (661) 284-3018 | | jeff.trow@foothill.com | |
| Mountains Recreation and Conservation Authority | | | | |
| Ventura Cty Watershed Protection District | | | | |
| Friends of the Santa Clara River | | | | |
| Supervisor Antonovich's Office | (661) 287-3657 | | rwayman@lacbos.org | |
| | (661) 251-7790 | | | |
| Councilmember, City Of Santa Clarita | | | | |
| West Ranch Town Council | (661) 799-8089 | | rg@rgwinter.com | |
| United Water Conservation District | | | | |
| LA County-DPW | (626) 458-6159 | | alwong@dpw.lacounty.gov | AWW |
| State of California, Dept of Water Resources | (916) 651-9283 | | bwycoff@water.ca.gov | |
| Santa Clarita Valley Sanitation District | (562) 699-7411 X 2820 | | mzauner@lacsd.org | |
| LA County-Dept. Water Resources | (626) 456-6188 | | kzimmer@ladpw.gov | |

SMPA - Stacy Meller 818402-5806 Stacy@StacyMellerPA.com

Mark Dickens - Valencia water 661-510-9733 mDickens@Valleywater.com

K Russell NCWD 661-2593610

D. Marks CLWA

Roger A. Harris CCA 805-641-3781 rah@agriculturesucss.com

# November 2010 UWMP Workshop
## Public Outreach Record

# 2010 Santa Clarita Valley
# Urban Water Management Plan

Stacy Miller
PUBLIC AFFAIRS
Creative Solutions to Complex Situations

November 3, 2010

*** Orgs shaded above will receive letter return receipt requested See Attached

Subject: 2010 Urban Water Management Plan November Workshop

Dear Sir or Madam,

The Santa Clarita Valley's water agencies, Castaic Lake Water Agency, CLWA Santa Clarita Water Division, Newhall County Water District and Valencia Water Company are currently preparing the 2010 Urban Water Management Plan (UWMP).

In an effort to ensure all interested parties are fully informed and involved in this process, the water agencies have scheduled their third community workshop on November 16, 2010 and welcome your participation. This workshop will provide the most current information on components of the 2010 UWMP.

| | |
|---|---|
| Date: | Tuesday, November 16, 2010 |
| Time: | 4:00 pm |
| Location: | Castaic Lake Water Agency<br>27234 Bouquet Canyon Road |

The Urban Water Management Plan presents a picture of the valley's water situation through the year 2035, describes the long-range water needs of the community and the means to supply the necessary water.

I encourage your participation and look forward to seeing you then. If you have any questions, please feel free to contact me.

Sincerely,

Stacy Miller
Public Outreach Manager
2010 SCV Urban Water Management Plan

Government Affairs, Public Relations & Communication
P.O. Box 55745, Valencia, CA 91385 [818] 402-5806 [661] 222-9733 Fax stacy@StacyMillerPA.com
www.StacyMillerPA.com

SANTA CLARITA VALLEY

# 2010 Urban Water Management Plan

## COMMUNITY WORKSHOP

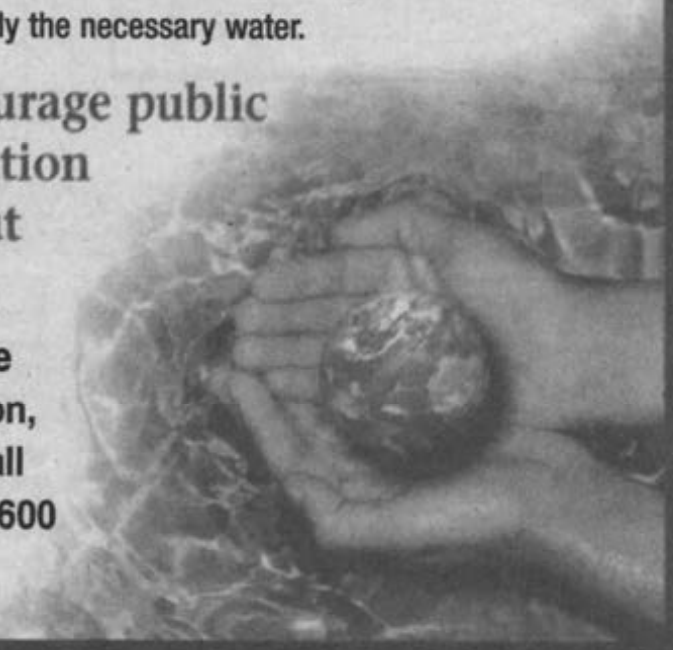
The Signal
11-9-10

***Date:*** Tuesday, November 16, 2010
***Time:*** 4:00 pm
***Location:*** Castaic Lake Water Agency
27234 Bouquet Canyon Road

This workshop will provide the most current information on components of the 2010 UWMP. Our team will provide an overview of the opportunities for public comment and will also be available for questions.

The Urban Water Management Plan, mandated by the State of California, presents a picture of the valley's water situation through the year 2035. It describes the long-range water needs of the community and the means to supply the necessary water.

We encourage public participation and input



**For more information, please call (661) 297-1600**

Castaic Lake Water Agency
CLWA Santa Clarita Water Division
Newhall County Water District
Valencia Water Company

SANTA CLARITA VALLEY

# 2010 Urban Water Management Plan

## COMMUNITY WORKSHOP

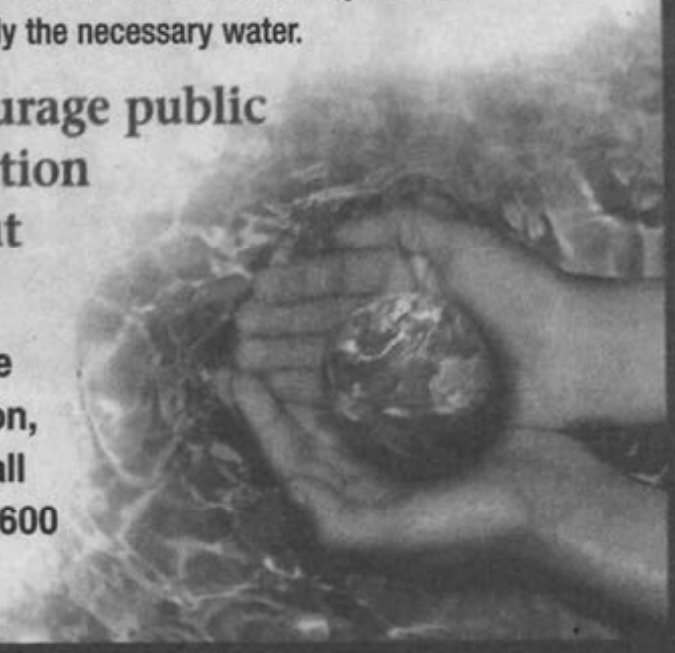
The Signal
11-14-10

***Date:*** Tuesday, November 16, 2010
***Time:*** 4:00 pm
***Location:*** Castaic Lake Water Agency
27234 Bouquet Canyon Road

This workshop will provide the most current information on components of the 2010 UWMP. Our team will provide an overview of the opportunities for public comment and will also be available for questions.

The Urban Water Management Plan, mandated by the State of California, presents a picture of the valley's water situation through the year 2035. It describes the long-range water needs of the community and the means to supply the necessary water.

**We encourage public participation and input**



**For more information, please call (661) 297-1600**

Castaic Lake Water Agency
CLWA Santa Clarita Water Division
Newhall County Water District
Valencia Water Company

# URBAN WATER MANAGEMENT PLAN UPDATE

## 2010 UWMP offers creative solutions to SCV water issues

The California Urban Water Planning Act requires water utilities to update and submit an Urban Water Management Plan (UWMP) every five years. CLWA and the local water retailers are preparing a draft of the Santa Clarita Valley 2010 Urban Water Management Plan for review this winter and spring of 2011. All California urban water suppliers having more than 3,000 service connections or selling more than 3,000 acre-feet of water annually are required by the California Water Code to prepare a UWMP every five years.

CLWA is one of approximately 450 water suppliers in California preparing such a plan. CLWA, Santa Clarita Water Division, Newhall County Water District (NCWD) and Valencia Water Company are working together to prepare a draft of the 2010 plan for the valley. The Los Angeles County Waterworks District No. 36 is participating on an ad hoc basis, as the Los Angeles County Department of Public Works must prepare its own UWMP.

*Every Drop Counts*

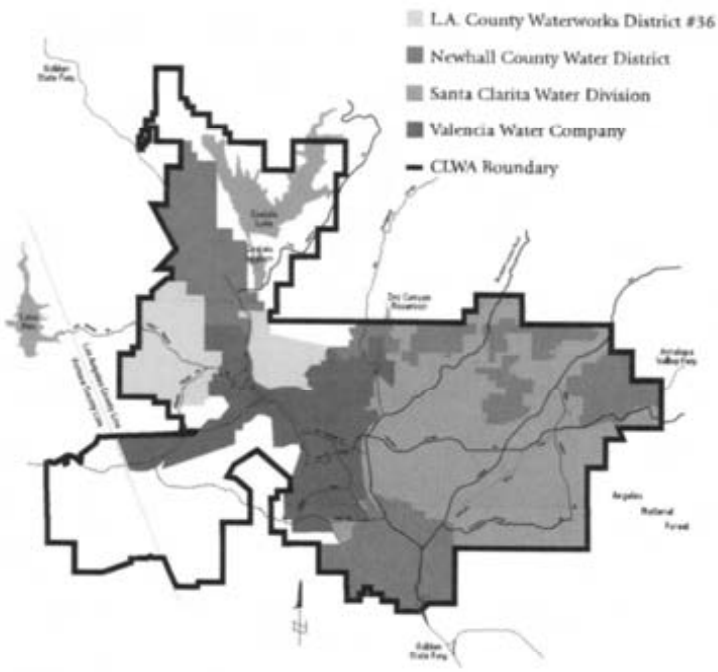
A UWMP must consider projected demands and supplies for a minimum 20-year period, in five-year increments. It must also assess water supply and demand scenarios for average/normal water years (i.e, periods of normal precipitation), a single dry year, and multiple dry years.

The draft 2010 UWMP for the valley will identify current local and imported water supply sources, as well as potential future sources. Current sources include the State Water Project, other sources of imported water, local groundwater and recycled water. Future potential sources include all of these plus water transfers and additional recycled water. The 2010 UWMP will also address the required levels of water conservation both to meet state law and ensure adequate supplies.

The plan will identify future demand based on growth projections. By assessing projected demand along with projected supply, the 2010 UWMP will show how the valley will meet its water needs through at least 2035.

**There have been public workshops held to explain the UWMP and the process, and there will be several more along with a least two public hearings in 2011 by the CLWA and NCWD Boards of Directors. Public participation at all of these events is encouraged. The UWMP must be adopted no later than June 30, 2011.**

### Castaic Lake Water Agency Service Area




YOUR QUESTIONS AND COMMENTS ARE IMPORTANT TO US
PLEASE CALL (661) 297-1600 OR EMAIL US AT MAIL@CLWA.ORG

CASTAIC LAKE WATER AGENCY
27234 BOUQUET CANYON ROAD
SANTA CLARITA, CALIFORNIA
91350
(661) 297-1600
WWW.CLWA.ORG

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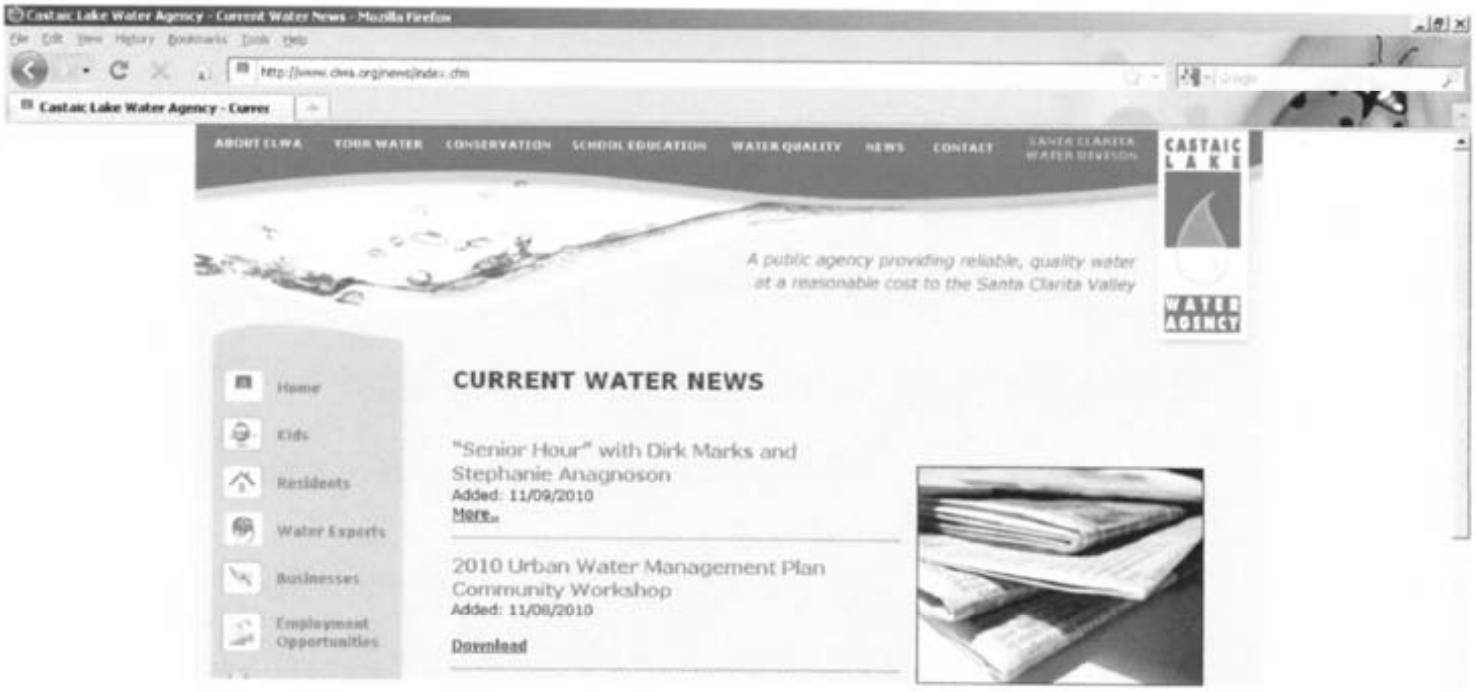
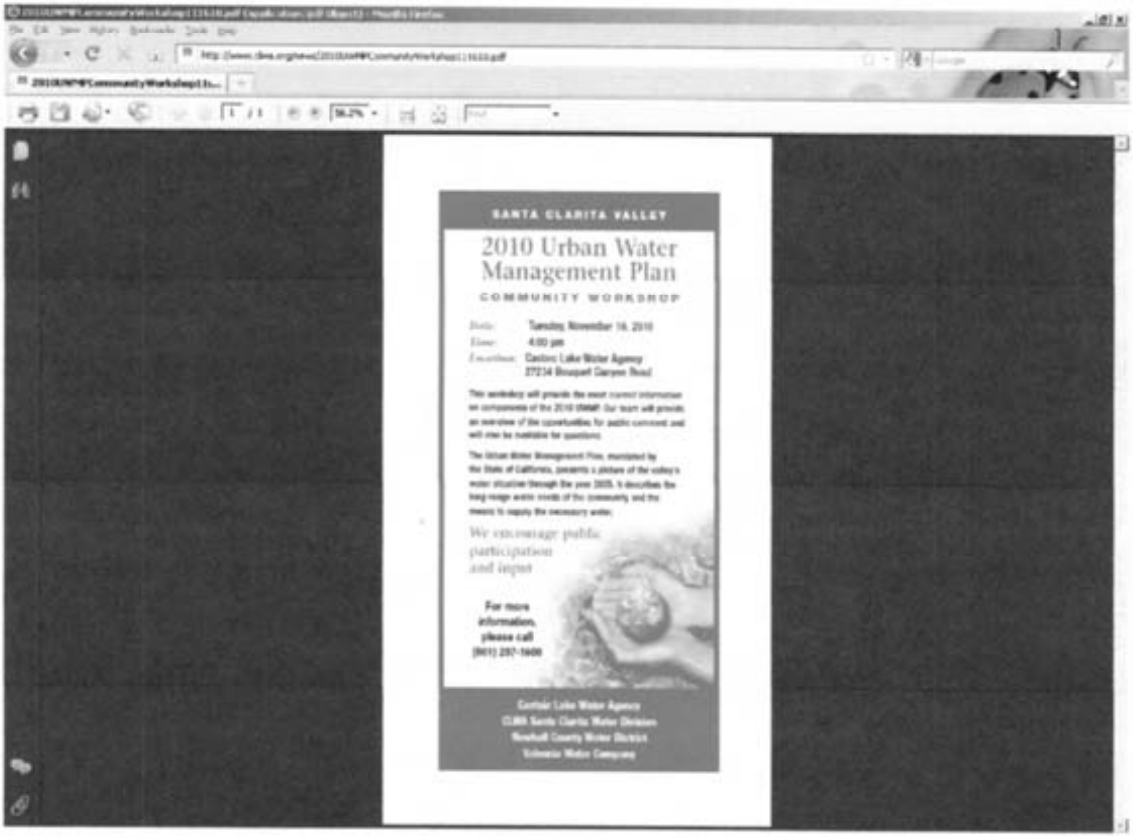
Water Currents
Newsletter
Fall 2010

PRINTED ON RECYCLED PAPER. EACH TON OF RECYCLED PAPER SAVES 7,000 GALLONS OF WATER.

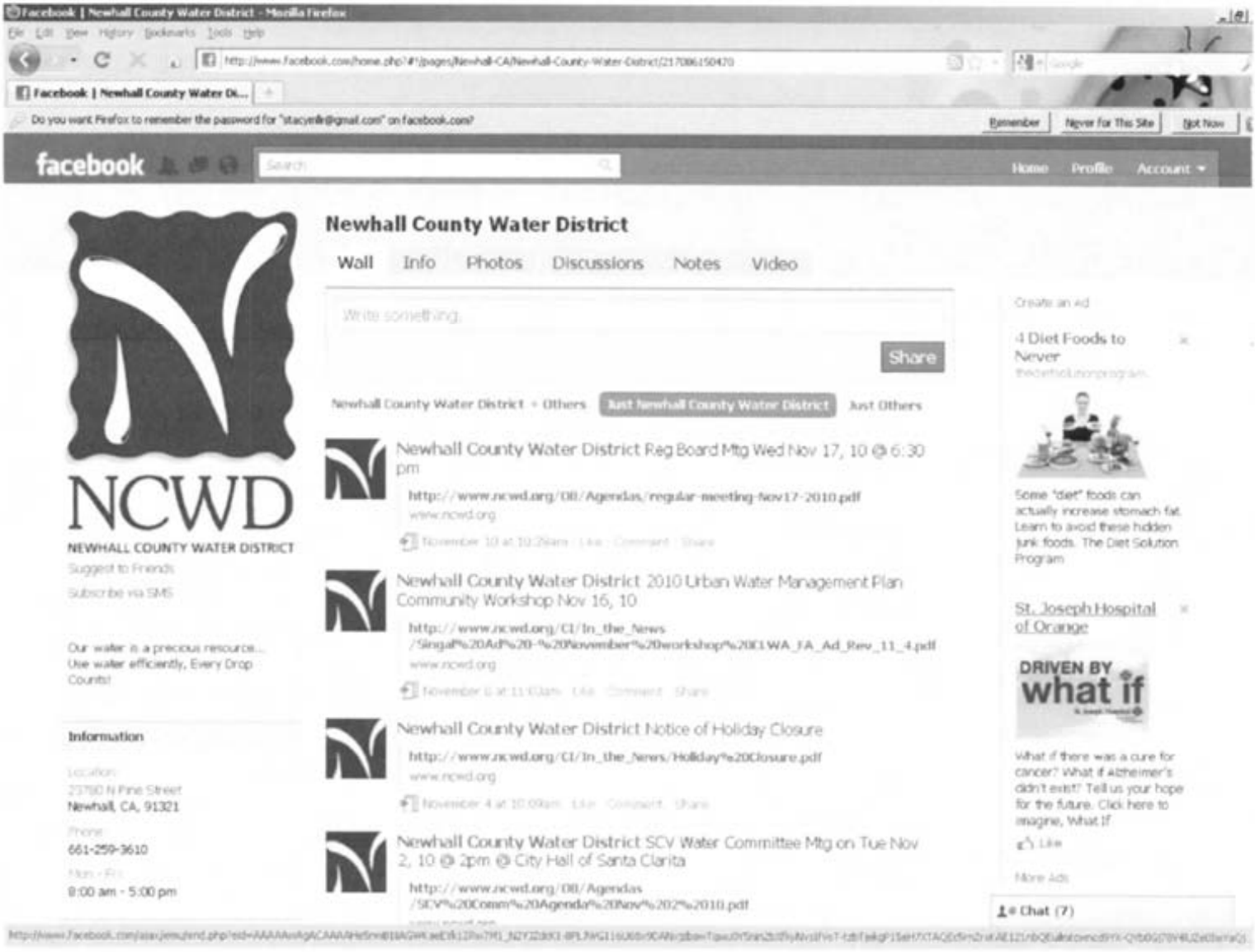
**Castaic Lake Water Agency**
**Webpage & Facebook Posting – November 2010 UWMP Workshop**
**Monday, November 08, 2010**



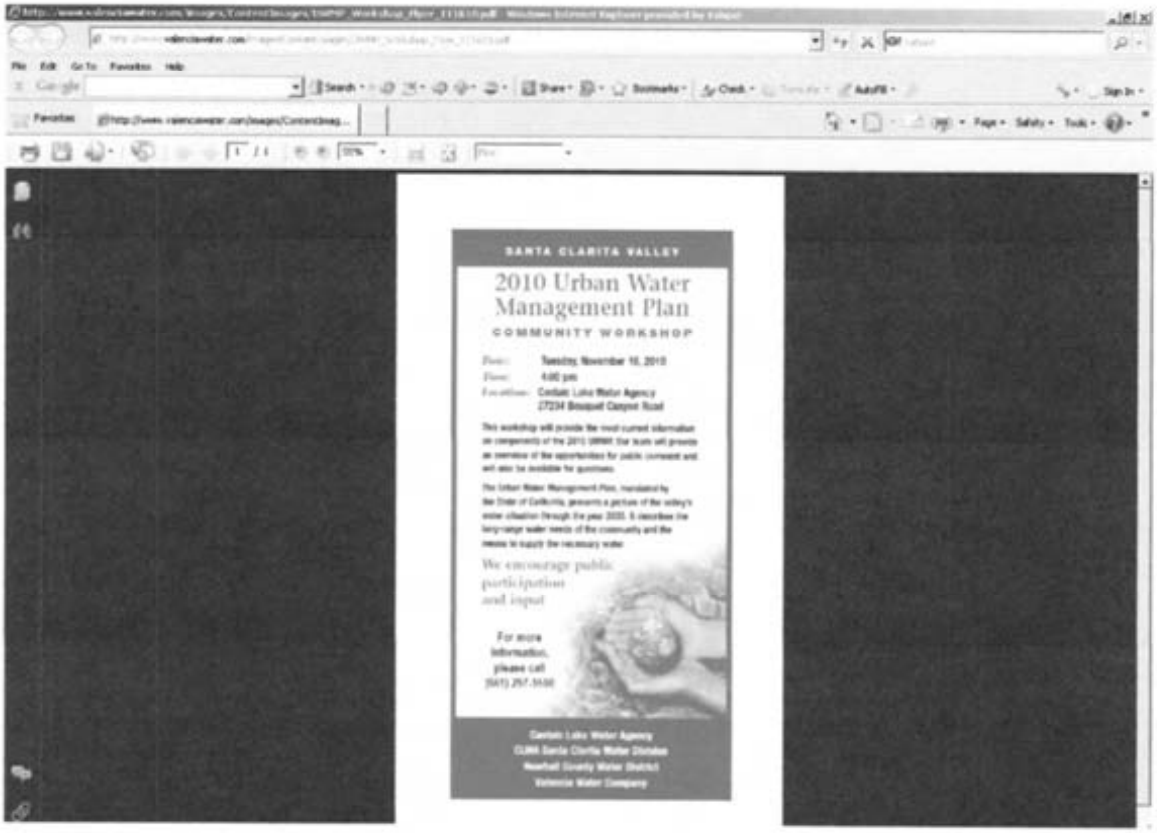
**Castaic Lake Water Agency**
**Webpage & Facebook Posting – November 2010 UWMP Workshop**
**Monday, November 08, 2010**



**Newhall County Water District**
**Webpage & Facebook posting – November 2010 UWMP Workshop**
**Monday, November 08, 2010**


Facebook | Newhall County Water District - Mozilla Firefox
Do you want Firefox to remember the password for "stacyenk@gmail.com" on facebook.com?
Remember
Never for This Site
Not Now
facebook
Home
Profile
Account
Newhall County Water District
Wall
Info
Photos
Discussions
Notes
Video
Write something...
Share
Newhall County Water District + Others
Just Newhall County Water District
Just Others
Newhall County Water District Reg Board Mtg Wed Nov 17, 10 @ 6:30 pm
http://www.ncwd.org/DB/Agendas/regular-meeting-Nov17-2010.pdf
www.ncwd.org
Newhall County Water District 2010 Urban Water Management Plan Community Workshop Nov 16, 10
http://www.ncwd.org/CI/In_the_News/Singal%20Ad%20-%20November%20workshop%20E1WA_FA_Ad_Rev_11_4.pdf
www.ncwd.org
Newhall County Water District Notice of Holiday Closure
http://www.ncwd.org/CI/In_the_News/Holiday%20Closure.pdf
www.ncwd.org
Newhall County Water District SCV Water Committee Mtg on Tue Nov 2, 10 @ 2pm @ City Hall of Santa Clarita
http://www.ncwd.org/DB/Agendas/SCV%20Comm%20Agenda%20Nov%202%2010.pdf
NCWD
NEWHALL COUNTY WATER DISTRICT
Suggest to Friends
Subscribe via SMS
Our water is a precious resource... Use water efficiently, Every Drop Counts!
Information
Location
23780 N Pine Street
Newhall, CA, 91321
Phone
661-259-3610
Mon - Fri
8:00 am - 5:00 pm
Create an Ad
4 Diet Foods to Never
Some "diet" foods can actually increase stomach fat. Learn to avoid these hidden junk foods. The Diet Solution Program
St. Joseph Hospital of Orange
DRIVEN BY what if
What if there was a cure for cancer? What if Alzheimer's didn't exist? Tell us your hope for the future. Click here to imagine, What If
Like
More Ads
Chat (7)

**Valencia Water Company**
**Webpage posting – November 2010 UWMP Workshop**
**Friday, November 05, 2010**



# Santa Clarita Valley Urban Water Management Plan

## Community Workshop

November 16, 2010
4:00 pm
Castaic Lake Water Agency

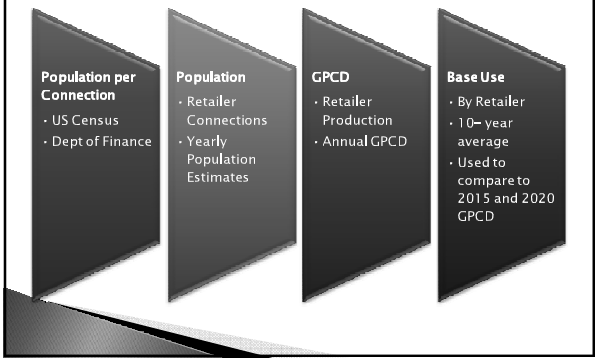
## Agenda

- Introductions
- Review/status of UWMP process
- SBX7-7 GPCD population assumptions and calculations, and targets by retailer
- Questions and Answers

## New Law: SBX7-7 ("20% x 2020")

- 20% demand reduction statewide by 2020
- Sets mandatory demand reduction goal for each retail water supplier
- Reporting starts with 2010 UWMPs
  - Base gross water use in gallons per capita per day (GPCD): must be calculated using one of three methodologies
  - Target reduction from base by 2020: must be calculated using one of four methodologies
  - Supplier must hold public hearing to explain how targets will be met (can be held as part of UWMP hearing)

## Process for Determining SBX7-7 Base Gross Water Use (in GPCD)



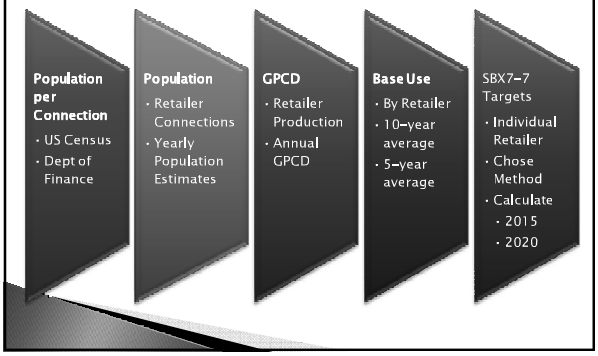

## Base Gross Water Use Method

- Base water use in GPCD: methodologies
  - 10-year average
    - ending no earlier than Dec 31, 2004 – no later than Dec 31, 2010 *OR*:
  - 15-year average if 10% of 2008 demand met by recycled water
    - get to add 5 years to calculation (SCV retailers do not qualify)
  - And: 5-year average
    - ending no earlier than Dec 31, 2007 – no later than Dec 31, 2010
    - 100 gpcd; at least 5% reduction for all agencies in CA over 100 gpcd

## Example: Newhall County Water District Draft GPCD Calculation

| Year | Single Family | Multi-Family | People per Unit | Population | Production (AF) | GPCD | 10-year Average |
|---|---|---|---|---|---|---|---|
| 1995 | 5,680 | 4,552 | 3.020 | 30898 | 7,755 | 224 | 240 |
| 1996 | 5,723 | 4,589 | 3.038 | 31323 | 7,887 | 225 | 241 |
| 1997 | 6,035 | 4,612 | 3.056 | 32533 | 8,801 | 242 | 242 |
| 1998 | 6,037 | 4,622 | 3.074 | 32764 | 8,087 | 220 | 243 |
| 1999 | 6,202 | 4,651 | 3.092 | 33561 | 9,348 | 249 | 244 |
| 2000 | 6,255 | 4,713 | 3.111 | 34121 | 9,718 | 254 | |
| 2001 | 6,428 | 4,768 | 3.130 | 35041 | 9,525 | 243 | |
| 2002 | 6,777 | 4,823 | 3.149 | 36526 | 10,362 | 253 | |
| 2003 | 7,199 | 4,852 | 3.168 | 38178 | 10,351 | 242 | |
| 2004 | 7,873 | 4,870 | 3.187 | 40618 | 11,217 | 247 | |
| 2005 | 8,163 | 4,875 | 3.207 | 41814 | 10,756 | 230 | |
| 2006 | 8,292 | 4,875 | 3.227 | 42490 | 11,470 | 241 | |
| 2007 | 8,431 | 4,875 | 3.247 | 43206 | 11,975 | 247 | |
| 2008 | 8,450 | 4,875 | 3.267 | 43539 | 11,340 | 233 | |
| 2009 | 8,492 | 4,875 | 3.288 | 43951 | 10,559 | 214 | |
| 2010 | 8,529 | 4,875 | 3.288 | 43951 | 10,559 | 214 | |

## Process for Determining SBx7-7 Base Use and GPCD Reduction Targets




## Draft Base Gross Water Use Results

| Agency | 5-year GPCD | 10-year GPCD |
|---|---|---|
| CLWA Santa Clarita Water Division | 230 | 235 |
| Newhall County Water District | 241 | 244 |
| Valencia Water Company | 258 | 278 |

## Target Demand Reduction Methodology Options

- 1.) 20% reduction from base (i.e., 80% of average gross water use in GPCD)
- 2.) Combination of state standards:
  - 55 gpcd indoor residential + landscape use at 70% ETo + 10% reduction in commercial/ industrial/institutional use
- 3.) DWR 20x2020 hydrologic region target (South Coast region = 149 GPCD)
- 4.) Option to be developed by DWR Public Process

## Draft GPCD Target Demand Reductions Option 1 : 80% of base use

| Agency | 2015 Objective | 2020 Objective | 2009 GPCD (current) |
|---|---|---|---|
| VWC | 250 | 222 | 240 |
| NCWD | 219 | 195 | 214 |
| SCWD | 211 | 188 | 201 |
| Regional | 219 | 195 | 219 |

Method normalizes for:

- Low economic activity
- High vacancy rates
- Year to year weather variances

*Note: Note: 2009 is 3rd year of drought*

*Fut* *l demands*

## Consultant Team

- Kennedy/Jenks Consultants
- Luhdorff and Scalmanini
- Nancy Clemm, P.E.
- Stacy Miller Public Affairs

## Questions and Answers

## Public Workshops and Hearings

- **Public Workshops**
  - May 25, 2010
  - July 2, 2010
  - November 9, 2010 (IRWMP Stakeholders)
  - November 16, 2010
  - January 11, 2011 (tentative)
  - March 8, 2011 (tentative)
- **Public Hearings**
  - January 26, 2011 (tentative)
  - March 23, 2011 (tentative)
  - April 27, 2011 (tentative)
- **Adoption**
  - June 2011

# Santa Clarita Valley Urban Water Management Plan
## November 16, 2010 - Community Workshop Sign In Sheet

| | PRINT NAME | ORGANIZATION | TITLE | PHONE | EMAIL |
|---|---|---|---|---|---|
| 1. | JOSE ZEGARRA | COC | | (661) 287 4403 | JOSEZEGARRA@HOTMAIL |
| 2. | Genaro Vallejo | COC | | 323-243-2638 | genarovallejo@att.net |
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| 5. | KEITH ABERCROMBIE | VWC | GM | 661-295-6501 | KABercrombie@Valleyh2o |
| 6. | GENE MUTO | COC | | 661 250-8414 | GMUTO@BEVERLYHILLS.ORG |
| 7. | BILL DEPOTO | LACFCD | | 626.458.4313 | BDEPOTO@LADPW.ORG |
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| 10. | Sharon Sorensen | City of Santa Clarita | Sr. Planner | 661/267-5234 | SSorensen@santaclarita.com |
| 11. | JESSICA BUNKER | LACWWD NO. 36 | Assoc. CE | 626/300-3315 | jbunker@ladpw.org |
| 12. | Tom Worthington | Impact Sciences | President | 805 443-5170 | tomworthington@impactsciences.com |
| 13. | KEVIN AGUILAR | COC | | (661) 250-0737 | K.Aguilar@SCVCHAMBER.COM |
| 14. | Jeff Ford | CLWA | WR Planner | (661) 513-1281 | Jford@clwa.org |
| 15. | Dirk Marks | " | WR Manager | 661 513 1257 | dmarks@clwa.org |
| 16. | BRIJESH MISRA | LA City | Inspector | (818) 830-0420 | Brijeshcmisra@gmail.com |
| 17. | BJ Atkins | Atkins Env. HELP | Owner | 661 510 3663 | bj@atkinsenvironmental.com |
| 18. | STEVE MCLEAN | — | — | 661-259-4767 | MCLEAN.STEPHEN@CH.RR.COM |

# Santa Clarita Valley Urban Water Management Plan
## November 16, 2010 - Community Workshop Sign In Sheet

| | PRINT NAME | ORGANIZATION | TITLE | PHONE | EMAIL |
|---|---|---|---|---|---|
| 1. | Francisco Guerrero | LACSD | Senior Engineer | 562 903 4299 x 2532 | FGuerrero@lacsd.org |
| 2. | Stacey Miller | SMPA | Consult | 818 403-5800 | Smiller@SMP |
| 3. | LUIS MARGHERITIS | CLWA | TECH. | (661) 510-4448 | LMARGHERITIS@CLWA.ORG |
| 4. | COLETTE HILLARD | | | | |
| 5. | GRANTS, ERIC | | | 661-406-3219 | ERICERIC@YAHOO.COM |
| 6. | Linda Purpus | UWCD | Env. Scientist | 805-525-4431 | lindap@unitedwater.org |
| 7. | Dusty Osmonson | | Public | 661-644-6546 | lifted horsey@yahoo.com |
| 8. | ERNI N | | public | 661-296 2775 | nie.manif yahoo.com |
| 9. | Renee Sabol | Castaic Town Council | Council person | 661-803 7123 | ReneeSabol@AOL.com |
| 10. | Sharren Naulls | | | 661 862-9221 | snaulls@csc.edu |
| 11. | Betty Cameron | | | 661 297-8116 | |
| 12. | Greg Kring | Burbank Water & Power | Pipefitter Apprentice | 626) 475-0413 | Hailgeebus@Yahoo.com |
| 13. | Chad Brightwell | BWP | " | (818) 621-5726 | highryder98@yahoo.com |
| 14. | FRANCK ROSENTHAL | COC | STUDENT | 818-261-2036 | FRANCK-IE@YAHOO.COM |
| 15. | Bonnie Deagon | ——— | Pubic | 661-373-8341 | Bjdhugs@aol.com |
| 16. | | | | | |
| 17. | | | | | |
| 18. | | | | | |

# Santa Clarita Valley Urban Water Management Plan
## November 16, 2010 - Community Workshop Sign In Sheet

| | PRINT NAME | ORGANIZATION | TITLE | PHONE | EMAIL |
|---|---|---|---|---|---|
| 1. | K. C. Valvo | BWP | App | 818) 238-3500 | |
| 2. | JAMES ROWLANDS | BWP | APP | (818) 926-0978 | |
| 3. | Bonnie Deagon | | | 661. 373-8341 | |
| 4. | Leah Schulman | | | 661- 645-6344 | leah.schulman@gmail.com |
| 5. | | | | | |
| 6. | | | | | |
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# January 2011 UWMP Workshop
## Public Outreach Record

# 2010 Santa Clarita Valley
# Urban Water Management Plan

Stacy Miller
PUBLIC AFFAIRS
Creative Solutions to Complex Situations

January 10, 2011

*** Orgs shaded above will receive letter return receipt requested (See attached)

Subject: January 2011 Workshop - 2010 Urban Water Management Plan

Dear Sir or Madam,

The Santa Clarita Valley water suppliers, Castaic Lake Water Agency, CLWA Santa Clarita Water Division, Newhall County Water District and Valencia Water Company, are currently preparing the 2010 Urban Water Management Plan (UWMP).

In an effort to ensure all interested parties are fully informed and involved in this process, the water agencies have scheduled their fourth community workshop on January 25, 2011 and welcome your participation. This workshop will provide the most current information on components of the UWMP.

| | |
|---|---|
| Date: | Tuesday, January 25, 2011 |
| Time: | 4:00 pm |
| Location: | Castaic Lake Water Agency<br>27234 Bouquet Canyon Road |

The Urban Water Management Plan presents a picture of the valley's future water situation, describes the long-range water needs of the community and the means to supply the necessary water.

I encourage your participation and look forward to seeing you then. If you have any questions, please feel free to contact me.

Sincerely,

Stacy Miller
Public Outreach Manager
2010 SCV Urban Water Management Plan

Government Affairs, Public Relations & Communication
P.O. Box 55745, Valencia, CA 91385 [818] 402-5806 [661] 222-9733 Fax stacy@StacyMillerPA.com
www.StacyMillerPA.com

or four years down the road? — but our government has sarily those of The Signal.

SANTA CLARITA VALLEY

# 2010 Urban Water Management Plan

## COMMUNITY WORKSHOP

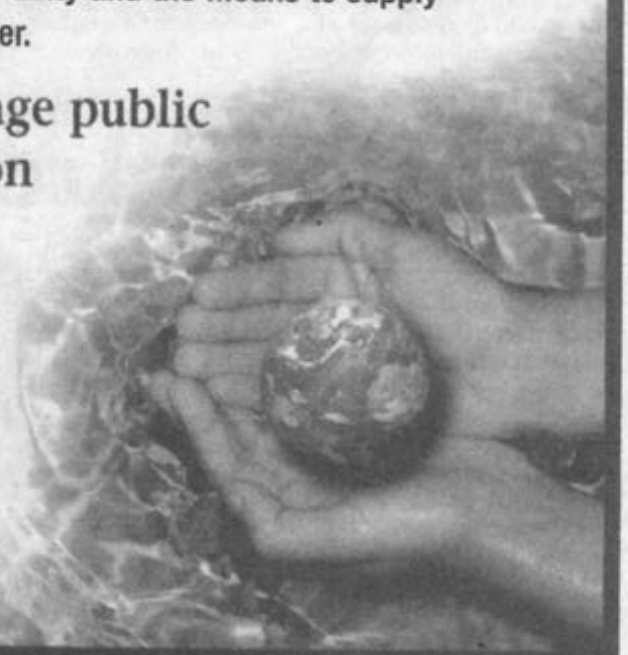
The Signal 1-18-11

***Date:*** Tuesday, January 25, 2011
***Time:*** 4:00 pm
***Location:*** Castaic Lake Water Agency
27234 Bouquet Canyon Road

This workshop will provide the most current information on components of the 2010 UWMP. Our team will provide an overview of the opportunities for public comment and will also be available for questions.

The Urban Water Management Plan, mandated by the State of California, presents a picture of the valley's water situation, describes the long-range water needs of the community and the means to supply the necessary water.

We encourage public participation and input



**For more information, please call (661) 297-1600**

Castaic Lake Water Agency
CLWA Santa Clarita Water Division
Newhall County Water District
Valencia Water Company

SANTA CLARITA VALLEY

# 2010 Urban Water Management Plan

## COMMUNITY WORKSHOP

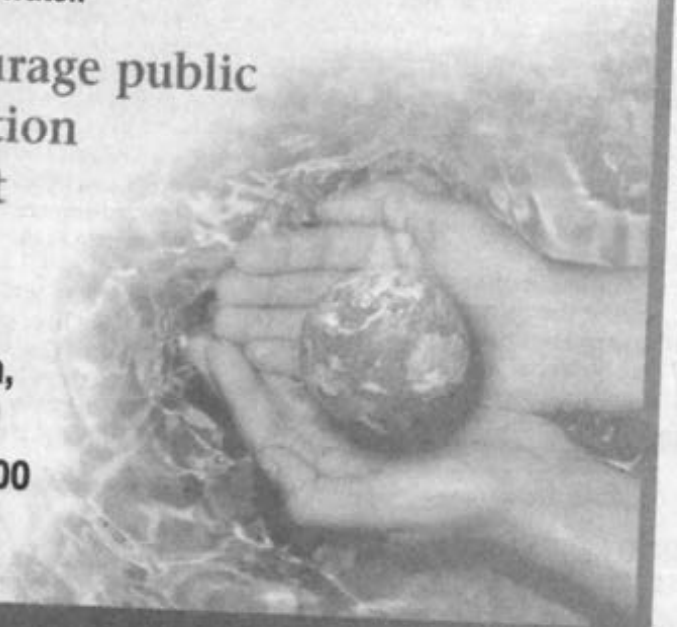
The Signal 1-23-11

*Date:* Tuesday, January 25, 2011
*Time:* 4:00 pm
*Location:* Castaic Lake Water Agency
27234 Bouquet Canyon Road

This workshop will provide the most current information on components of the 2010 UWMP. Our team will provide an overview of the opportunities for public comment and will also be available for questions.

The Urban Water Management Plan, mandated by the State of California, presents a picture of the valley's water situation, describes the long-range water needs of the community and the means to supply the necessary water.

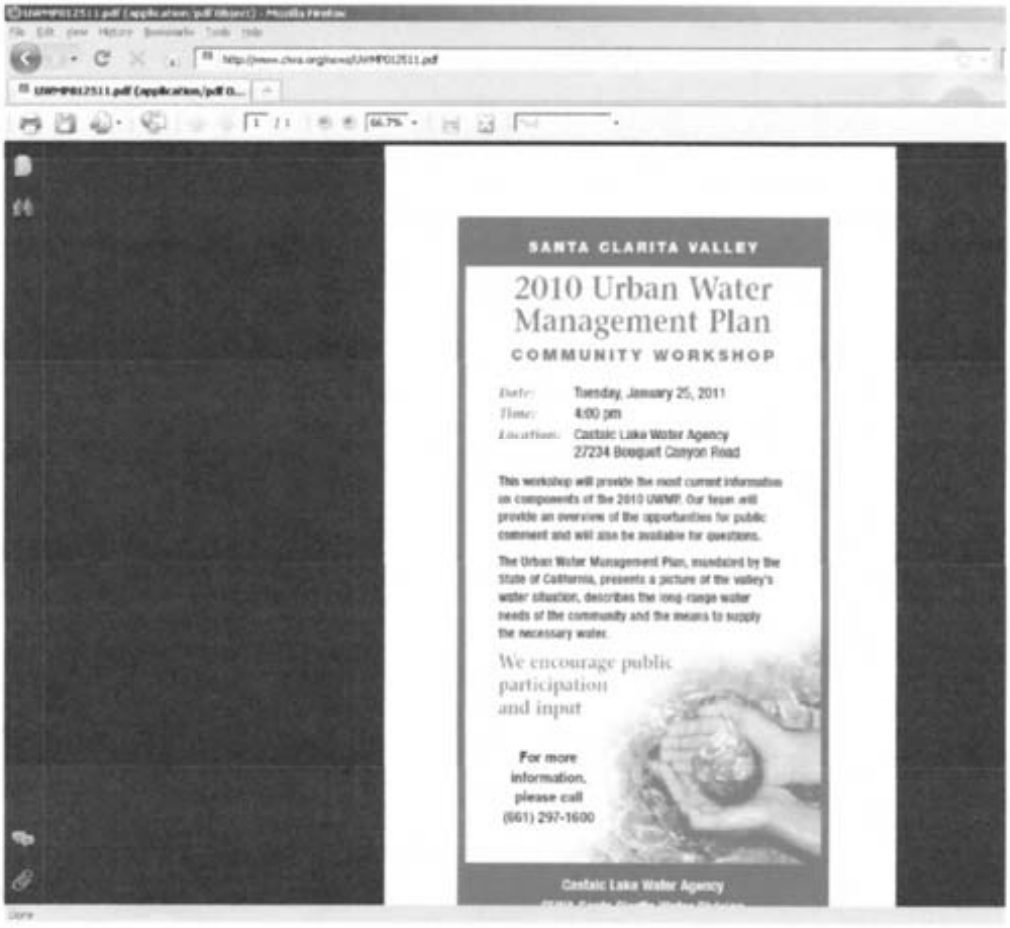
We encourage public participation and input



**For more information, please call (661) 297-1600**

Castaic Lake Water Agency
CLWA Santa Clarita Water Division
Newhall County Water District
Valencia Water Company

# Castaic Lake Water Agency
## Webpage & Facebook Posting – January 2011 UWMP Workshop

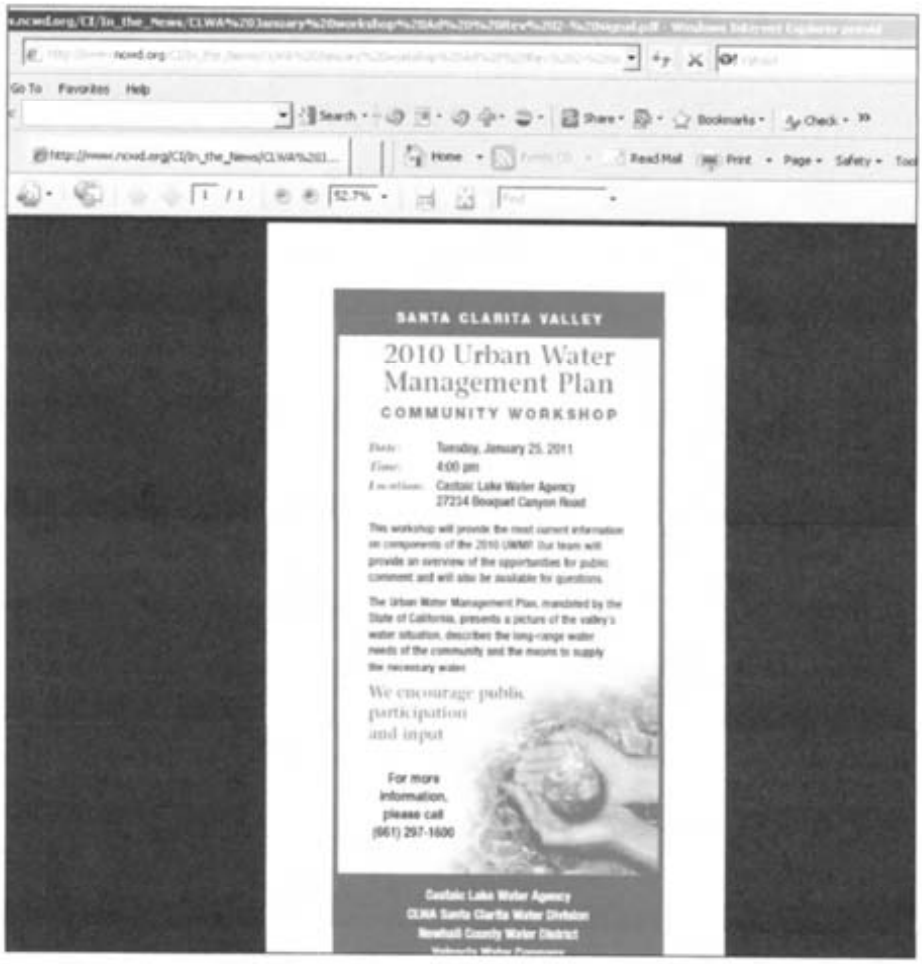


# Castaic Lake Water Agency
## Webpage & Facebook Posting – January 2011 UWMP Workshop

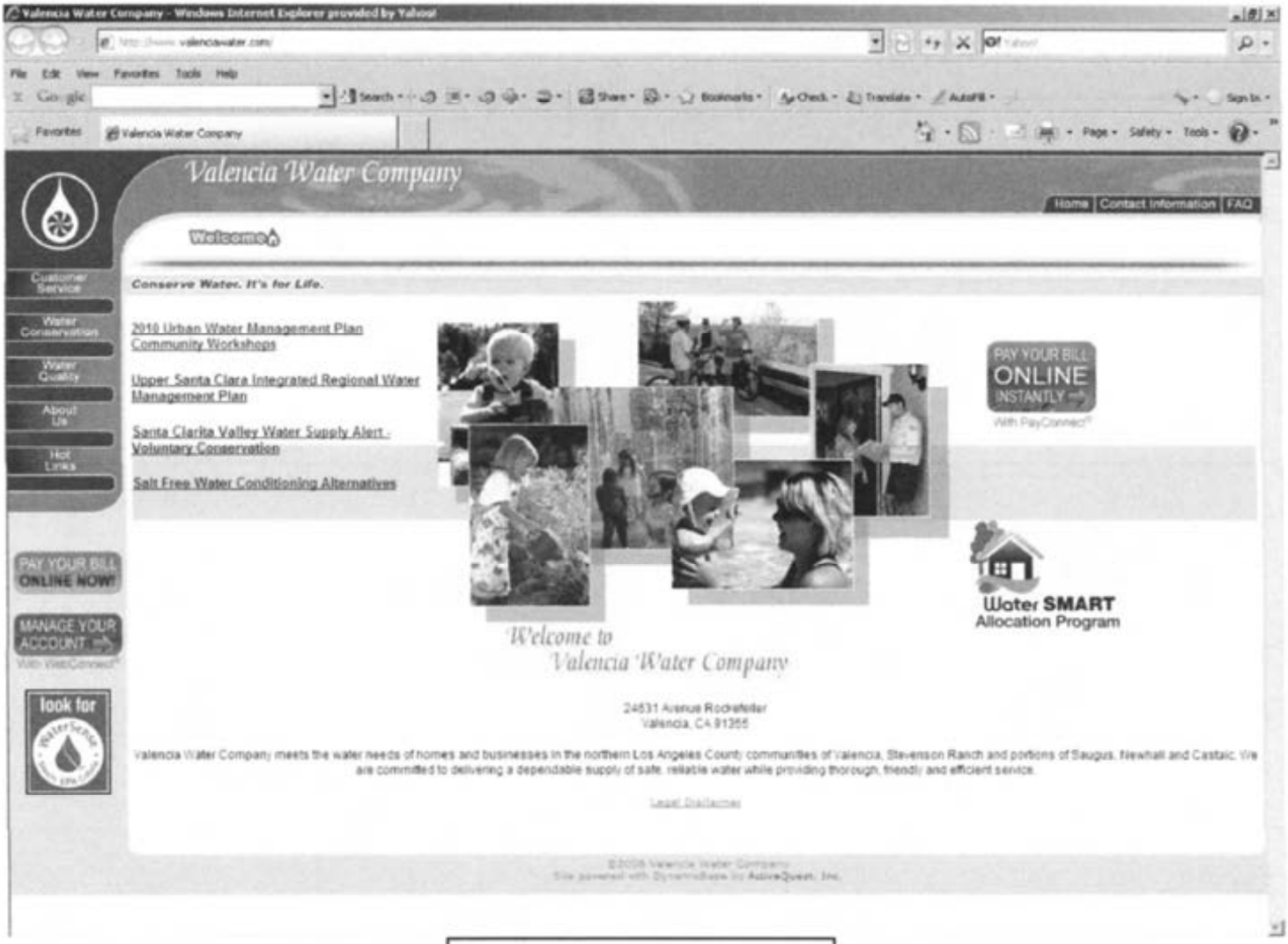
**Newhall County Water District**
**Webpage & Facebook posting – January 2011 UWMP Workshop**

(next)

**Newhall County Water District**
**Webpage & Facebook posting – January 2011 UWMP Workshop**



# Valencia Water Co
# Website Posting – January 2011 UWMP Workshop



# Santa Clarita Valley Urban Water Management Plan

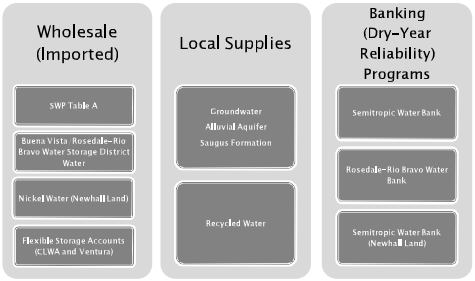
## Community Workshop

January 25, 2011
4:00 pm
Castaic Lake Water Agency

## Agenda

- Introductions
- Overview of water supplies
- SWP reliability update
- CLWA reliability planning update
- SBX7-7 ("20x2020") calculations and targets
- Overview of water supplies and demands
- Schedule
- Questions and Answers

## Santa Clarita Valley Water Supplies



## SWP Reliability Update

- DWR finalized the 2009 State Water Project Delivery Reliability Report
- Captures impacts on the SWP from recent regulatory and judicial decisions related to endangered species in the Delta
  - Average year long-term SWP deliveries = 60%
  - Single-dry year deliveries = 7%
  - Multiple-dry year deliveries = 34-36%

## CLWA Reliability Planning Update

- Basis of the Plan:
  - Water Demand Projections by Purveyors
  - 2009 DWR SWP Delivery Reliability Report
  - Updated GW Operating Plan
  - Recycled Water Master Plan (as modified)

## Preliminary Results
## Water Supply Reliability Plan Update

- At 95% confidence level:
  - 6-year pumpback = no storage needed with current practices
  - 1-year pumpback (most severe drought) = 20,000 AF
- Results consider the following variables:
  - Conservation
  - Levee failure in the Delta

## Preliminary Results
## Storage and Pumpback Requirements

**1. No levee failure and no conservation**

| Percentile (%) | 1-Year Pumpback (AFY) | 6-Year Storage (AF) |
|---|---|---|
| 90 | 34,000 | 83,000 |
| 95 | 38,000 | 100,000 |
| 99 | 51,000 | 164,000 |

**2. Levee failure and no conservation**

| Percentile (%) | 1-Year Pumpback (AFY) | 6-Year Storage (AF) |
|---|---|---|
| 90 | 60,000 | 136,000 |
| 95 | 61,000 | 153,000 |
| 99 | 62,000 | 219,000 |

## Preliminary Results
## Storage and Pumpback Requirements

**3. Conservation and no levee failure**

| Percentile (%) | 1-Year Pumpback (AFY) | 6-Year Storage (AF) |
|---|---|---|
| 90 | 9,000 | 0 |
| 95 | 13,000 | 0 |
| 100 | 24,000 | 17,000 |

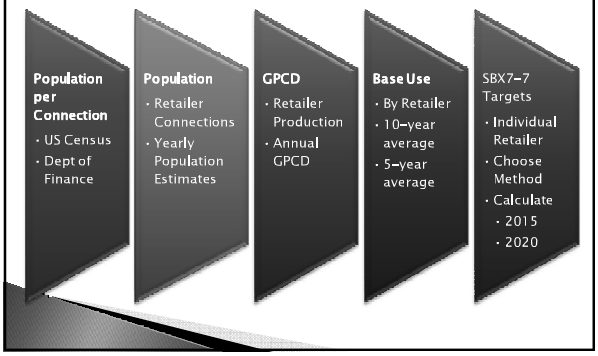
**4. Conservation and levee failure**

| Percentile (%) | 1-Year Pumpback (AFY) | 6-Year Storage (AF) |
|---|---|---|
| 90 | 20,000 | 0 |
| 95 | 20,000 | 0 |
| 100 | 21,000 | 28,000 |

## Update on SBX7-7 ("20% x 2020") Calculations and Targets

- 20% demand reduction statewide by 2020
- Sets mandatory demand reduction goal for each retail water supplier
- Reporting starts with 2010 UWMPs
  - Base gross water use in gallons per capita per day (GPCD): must be calculated using one of three methodologies
  - Target reduction from base by 2020: must be calculated using one of four methodologies
  - Supplier must hold public hearing to explain how targets will be met (can be held as part of UWMP hearing)

## Process for Determining SBx7-7 Base Use and GPCD Reduction Targets




## GPCD Target Demand Reduction Options

1. 20% reduction from base (i.e., 80% of average gross water use in gpcd)
2. Combination of state standards:
   - 55 gpcd indoor residential + landscape use at 70% ETo + 10% reduction in commercial/industrial/institutional use
   - *Requires specific data not available in SCV*
3. DWR 20x2020 hydrologic region target (South Coast region = 149 gpcd)
4. *Option to be developed by October 2010: not completed by DWR and Urban Stakeholder Committee*

## Updated (January 2011) GPCD Target Demand Reduction Calculations

| Agency | Base Daily Per Capita Water Use (GPCD) | Compliance Year | Selected Urban Water Use Target Method<br>Method 1– 80% of Base Daily Per Capita Water Use |
|---|---|---|---|
| VWC | 278 | 2015 | 250 |
| | | 2020 | 222 |
| NWCD | 244 | 2015 | 219 |
| | | 2020 | 195 |
| SCWD | 235 | 2015 | 211 |
| | | 2020 | 188 |

## Santa Clarita Valley Existing Water Supplies– Avg / Normal Year (acre-feet)

| EXISTING SUPPLIES | 2015 | 2020 | 2030 | 2040 | 2050 |
|---|---|---|---|---|---|
| *Groundwater (Basin Yield)* | *51,100* | *51,100* | *51,100* | *51,100* | *51,100* |
| Alluvial Aquifer | 38,600 | 38,600 | 38,600 | 38,600 | 38,600 |
| Saugus Formation | 12,500 | 12,500 | 12,500 | 12,500 | 12,500 |
| *Projected Groundwater to Non–Purveyors* | *15,400* | *14,400* | *11,000* | *9,000* | *7,5* |
| Il Land and Farming | 10,500 | 9,500 | 7,500 | 5,500 | 4,000 |
| Honor Ranch | 3,400 | 3,400 | 2,000 | 2,000 | 2,000 |
| Other Non–Purveyors | 1,500 | 1,500 | 1,500 | 1,500 | 1,500 |
| **Projected Groundwater to Purveyors** | **34,600** | **36,600** | **39,600** | **41,600** | **43,600** |
| Alluvial Aquifer | 24,000 | 25,000 | 28,000 | 30,000 | 32,000 |
| Saugus Formation | 10,600 | 11,600 | 11,600 | 11,600 | 11,600 |
| Projected Groundwater to Purveyors and Non–Purveyors | 50,000 | 51,000 | 50,600 | 50,600 | 51,100 |
| **Recycled Water** | **1,300** | **1,700** | **1,700** | **1,700** | **1,700** |
| **Imported Water** | **69,727** | **69,727** | **69,727** | **69,727** | **69,727** |
| SWP Table A Supply | 57,120 | 57,120 | 57,120 | 57,120 | 57,120 |
| Buena Vista–Rosedale | 11,000 | 11,000 | 11,000 | 11,000 | 11,000 |
| Nickel Water – Newhall Land | 1,607 | 1,607 | 1,607 | 1,607 | 1,607 |
| **Total Supplies Available to Purveyors** | **105,627** | **108,027** | **111,027** | **113,027** | **115,027** |

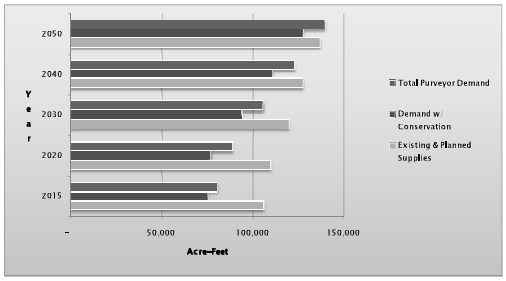
## Santa Clarita Valley Existing and Planned Water Supplies– Avg / Normal Year (acre-feet)

| PLANNED SUPPLIES | 2015 | 2020 | 2030 | 2040 | 2050 |
|---|---|---|---|---|---|
| ***Recycled Water*** | ***0*** | ***1,350*** | ***7,900*** | ***13,900*** | ***21,100*** |
| Recycled Water to Non–Purveyor (Honor Ranch) | 0 | 0 | 1,500 | 1,500 | 1,500 |
| Recycled Water to Purveyors | 0 | 1,350 | 6,400 | 12,400 | 19,600 |
| **Total Planned Supplies** | **0** | **1,350** | **7,900** | **13,900** | **21,100** |
| **Total Supplies Available to Purveyors** | **105,627** | **108,027** | **111,027** | **113,027** | **115,027** |
| **Total Existing and Planned Supplies Available to Purveyors** | **105,627** | **109,377** | **118,927** | **126,927** | **136,127** |

## Santa Clarita Valley Projected Water Demands – Avg / Normal Year (acre-feet)

| SB7x7 DEMAND REDUCTION | 2015 | 2020 | 2030 | 2040 | 2050 |
|---|---|---|---|---|---|
| Total Purveyor Demand | 80,070 | 88,484 | 105,312 | 122,140 | 138,968 |
| Sum of Purveyor Demand Reductions | 6,691 | 14,937 | 18,949 | 21,161 | 24,274 |
| *Reduction from Recycled Water* | *1,300* | *3,050* | *9,6* | *5,600* | *22,8* |
| | *,3 1* | *11,8* | *11,8* | *11,887* | *11,887* |
| **Total Action to Meet SB7x7** | **6,691** | **14,937** | **21,487** | **27,487** | **34,687** |
| **Demand w/ Conservation** | **74,679** | **76,597** | **93,425** | **110,253** | **127,081** |

## Santa Clarita Valley Water Supplies and Demands – Avg / Normal Year




## Schedule

- **Public Workshops and Hearings**
  - **Workshops**
    - May 25, 2010
    - July 27, 2010
    - November 9, 2010 (IR lders)
    - November 16, 2010
    - January 25, 2011
    - March 8, 2011
  - **Hearings**
    - March 23, 2011 (tentative)
    - April 27, 2011 (tentative)
- **Adoption**
  - June 2011 (due to DWR within 30 days after adoption)

## Questions and Answers

CASTAIC LAKE WATER AGENCY

NCWD

SCWD

# Santa Clarita Valley Urban Water Management Plan
## January 25, 2011 - Community Workshop Sign In Sheet

| | PRINT NAME | ORGANIZATION | TITLE | PHONE | EMAIL |
|---|---|---|---|---|---|
| 1. | Stacy Meeler | SMPA | Pres | 818 402-5806 | Stacy@StacyMeelerPA.com |
| 2. | Lauren Everett | KJ | planner | 805-913-5706 | laureneverett@kennedyjenks. |
| 3. | Ed Colley | CLWA | Director | — | — |
| 4. | Bonnie Deagon | — | — | | |
| 5. | Dirk Marks | CLWA | Water Resource Manager | | |
| 6. | Rosalind Wayman | SDS | | | |
| 7. | Jarrod DeGonia | Asm. Smyth | District Director | (661) 286-1565 | jarrod.degonia@asm.ca.gov |
| 8. | Jeff Ford | CLWA | WR Planner | (661) 513-1281 | jford@clwa.org |
| 9. | DAN MASNADA | CLWA | C.M. | (661) 297 1600 | dmasnada@clwa.org |
| 10. | ERNIE VILLEGAS | ASM. GORELL | DIST. DIRECTOR | (805) 230-9167 | ernie.villegas@asm.ca.gov |
| 11. | | | | | |
| 12. | | | | | |
| 13. | | | | | |
| 14. | | | | | |
| 15. | | | | | |
| 16. | | | | | |
| 17. | | | | | |
| 18. | | | | | |

# Santa Clarita Valley Urban Water Management Plan
## January 25, 2011 - Community Workshop Sign In Sheet

| | PRINT NAME | ORGANIZATION | TITLE | PHONE | EMAIL |
|---|---|---|---|---|---|
| 1. | Marilyn Cotton ✓ | RJ | | | |
| 2. | Steve Cole ✓ | NCWD | G.M. | | SCOLE@NCWD.ORG |
| 3. | CHARLES GILL ✓ | IPSG | | 6612949355 | CGILL@IPSGINC.COM |
| 4. | Keith Abercrombie ✓ | VWC | GM | | |
| 5. | Cathy Holloman ✓ | SCWA | Assoc WR Planner | 626-259-2737 | choloman@scwater.org |
| 6. | Sandy Sandy | BVA | G.A.D. | 310-995-4456 | ssandy@bialav.org |
| 7. | | | | | |
| 8. | | | | | |
| 9. | | | | | |
| 10. | | | | | |
| 11. | | | | | |
| 12. | | | | | |
| 13. | | | | | |
| 14. | | | | | |
| 15. | | | | | |
| 16. | | | | | |
| 17. | | | | | |
| 18. | | | | | |

# Third & Final Public Hearing
# June 22, 2011
## Public Outreach Record

# 2010 Santa Clarita Valley
# Urban Water Management Plan

June 8, 2011

Richard J. Bruckner, Director
LA County Dept. Regional Planning
Los Angeles County
1390 Hall of Records
320 West Temple Street
Los Angeles 90012

Subject: Revised Notification of Public Hearings for the 2010 Santa Clarita Valley Urban Water Management Plan

Dear Mr. Bruckner,

In a March 3, 2011, letter we notified you of the upcoming Public Hearings for the 2010 Santa Clarita Valley Urban Water Management Plan. As noted in the letter, the first public hearing was held on Wednesday, March 23, 2011. The second public hearing originally scheduled for Wednesday, May 4, 2011 at 6:15 p.m. was rescheduled to Wednesday, May 18, 2011 at 6:15 PM. The third public hearing has been scheduled on June 22, 2011 will take place at the CLWA Boardroom located on the 1st floor of the Administration Building at the Rio Vista Water Treatment Plant, 27234 Bouquet Canyon Road, Santa Clarita, California 91350.

For additional information regarding the public hearings, please contact me at (661) 297-1600.

Sincerely,

Dirk Marks,
Water Resources Manager

CASTAIC LAKE WATER AGENCY

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GENERAL COUNSEL
McCORMICK, KIDMAN & BEHRENS, LLP
SECRETARY
APRIL JACOBS

June 8, 2011

Mark Pestrella
LA County Dept. Public Works
Los Angeles County
P.O. Box 1460
Alhambra 91802-1460

Subject: Revised Notification of Public Hearings for the 2010 Santa Clarita Valley Urban Water Management Plan

Dear Mr. Pestrella,

In a March 3, 2011, letter we notified you of the upcoming Public Hearings for the 2010 Santa Clarita Valley Urban Water Management Plan. As noted in the letter, the first public hearing was held on Wednesday, March 23, 2011. The second public hearing originally scheduled for Wednesday, May 4, 2011 at 6:15 p.m. was rescheduled to Wednesday, May 18, 2011 at 6:15 PM. The third public hearing has been scheduled on June 22, 2011 will take place at the CLWA Boardroom located on the 1st floor of the Administration Building at the Rio Vista Water Treatment Plant, 27234 Bouquet Canyon Road, Santa Clarita, California 91350.

For additional information regarding the public hearings, please contact me at (661) 297-1600.

Sincerely,

Dirk Marks,
Water Resources Manager

CASTAIC LAKE WATER AGENCY

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DAN MASNADA
GENERAL COUNSEL
McCORMICK, KIDMAN & BEHRENS, LLP
SECRETARY
APRIL JACOBS

June 8, 2011

Chris Stevens, Director
Resource Management Agency
County of Ventura
800 South Victoria Avenue
Ventura, CA 93009-1740

Subject: Revised Notification of Public Hearings for the 2010 Santa Clarita Valley Urban Water Management Plan

Dear Mr. Stevens,

In a March 3, 2011, letter we notified you of the upcoming Public Hearings for the 2010 Santa Clarita Valley Urban Water Management Plan. As noted in the letter, the first public hearing was held on Wednesday, March 23, 2011. The second public hearing originally scheduled for Wednesday, May 4, 2011 at 6:15 p.m. was rescheduled to Wednesday, May 18, 2011 at 6:15 PM. The third public hearing has been scheduled on June 22, 2011 will take place at the CLWA Boardroom located on the 1st floor of the Administration Building at the Rio Vista Water Treatment Plant, 27234 Bouquet Canyon Road, Santa Clarita, California 91350.

For additional information regarding the public hearings, please contact me at (661) 297-1600.

Sincerely,

Dirk Marks,
Water Resources Manager

CASTAIC LAKE WATER AGENCY

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June 8, 2011

Jason Smisko
Senior Planner
City of Santa Clarita Planning Division
23920 Valencia Blvd., Suite 300
Santa Clarita, CA 91355

Subject: Revised Notification of Public Hearings for the 2010 Santa Clarita Valley Urban Water Management Plan

Dear Mr. Smisko,

In a March 3, 2011, letter we notified you of the upcoming Public Hearings for the 2010 Santa Clarita Valley Urban Water Management Plan. As noted in the letter, the first public hearing was held on Wednesday, March 23, 2011. The second public hearing originally scheduled for Wednesday, May 4, 2011 at 6:15 p.m. was rescheduled to Wednesday, May 18, 2011 at 6:15 PM. The third public hearing has been scheduled on June 22, 2011 will take place at the CLWA Boardroom located on the 1st floor of the Administration Building at the Rio Vista Water Treatment Plant, 27234 Bouquet Canyon Road, Santa Clarita, California 91350.

For additional information regarding the public hearings, please contact me at (661) 297-1600.

Sincerely,

Dirk Marks

Dirk Marks,
Water Resources Manager

CASTAIC LAKE WATER AGENCY

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DAN MASNADA

GENERAL COUNSEL
McCORMICK, KIDMAN & BEHRENS, LLP

SECRETARY
APRIL JACOBS

June 8, 2011

Mike Murphy
Intergovernmental Relations Officer
City of Santa Clarita
23920 Valencia Blvd., Suite 300
Santa Clarita, CA 91355

Subject: Revised Notification of Public Hearings for the 2010 Santa Clarita Valley Urban Water Management Plan

Dear Mr. Murphy,

In a March 3, 2011, letter we notified you of the upcoming Public Hearings for the 2010 Santa Clarita Valley Urban Water Management Plan. As noted in the letter, the first public hearing was held on Wednesday, March 23, 2011. The second public hearing originally scheduled for Wednesday, May 4, 2011 at 6:15 p.m. was rescheduled to Wednesday, May 18, 2011 at 6:15 PM. The third public hearing has been scheduled on June 22, 2011 will take place at the CLWA Boardroom located on the 1st floor of the Administration Building at the Rio Vista Water Treatment Plant, 27234 Bouquet Canyon Road, Santa Clarita, California 91350.

For additional information regarding the public hearings, please contact me at (661) 297-1600.

Sincerely,

Dirk Marks,
Water Resources Manager

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GENERAL COUNSEL
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APRIL JACOBS

June 8, 2011

Jeff W. Hogan, AICP
Interim Planning Manager
City of Santa Clarita Planning Division
23920 Valencia Blvd., Suite 300
Santa Clarita, CA 91355

Subject: Revised Notification of Public Hearings for the 2010 Santa Clarita Valley Urban Water Management Plan

Dear Mr. Hogan,

In a March 3, 2011, letter we notified you of the upcoming Public Hearings for the 2010 Santa Clarita Valley Urban Water Management Plan. As noted in the letter, the first public hearing was held on Wednesday, March 23, 2011. The second public hearing originally scheduled for Wednesday, May 4, 2011 at 6:15 p.m. was rescheduled to Wednesday, May 18, 2011 at 6:15 PM. The third public hearing has been scheduled on June 22, 2011 will take place at the CLWA Boardroom located on the 1st floor of the Administration Building at the Rio Vista Water Treatment Plant, 27234 Bouquet Canyon Road, Santa Clarita, California 91350.

For additional information regarding the public hearings, please contact me at (661) 297-1600.

Sincerely,

Dirk Marks

Dirk Marks,
Water Resources Manager

CASTAIC LAKE WATER AGENCY

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GENERAL MANAGER
DAN MASNADA
GENERAL COUNSEL
McCORMICK, KIDMAN & BEHRENS, LLP
SECRETARY
APRIL JACOBS

June 8, 2011

Jessica Bunker, P.E.
Waterworks Division
P.O. Box 1460
Alhambra, CA 91802-1460

Subject: Revised Notification of Public Hearings for the 2010 Santa Clarita Valley Urban Water Management Plan

Dear Ms. Bunker,

In a March 3, 2011, letter we notified you of the upcoming Public Hearings for the 2010 Santa Clarita Valley Urban Water Management Plan. As noted in the letter, the first public hearing was held on Wednesday, March 23, 2011. The second public hearing originally scheduled for Wednesday, May 4, 2011 at 6:15 p.m. was rescheduled to Wednesday, May 18, 2011 at 6:15 PM. The third public hearing has been scheduled on June 22, 2011 will take place at the CLWA Boardroom located on the 1st floor of the Administration Building at the Rio Vista Water Treatment Plant, 27234 Bouquet Canyon Road, Santa Clarita, California 91350.

For additional information regarding the public hearings, please contact me at (661) 297-1600.

Sincerely,

Dirk Marks

Dirk Marks,
Water Resources Manager

CASTAIC LAKE WATER AGENCY

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GENERAL MANAGER
DAN MASNADA
GENERAL COUNSEL
McCORMICK, KIDMAN & BEHRENS, LLP
SECRETARY
APRIL JACOBS

June 8, 2011

Rosalind Wayman, Field Deputy
Los Angeles County
Fifth Supervisorial District
23920 Valencia Blvd., Suite 265
Santa Clarita, CA 91355

Subject: Revised Notification of Public Hearings for the 2010 Santa Clarita Valley Urban Water Management Plan

Dear Ms. Wayman,

In a March 3, 2011, letter we notified you of the upcoming Public Hearings for the 2010 Santa Clarita Valley Urban Water Management Plan. As noted in the letter, the first public hearing was held on Wednesday, March 23, 2011. The second public hearing originally scheduled for Wednesday, May 4, 2011 at 6:15 p.m. was rescheduled to Wednesday, May 18, 2011 at 6:15 PM. The third public hearing has been scheduled on June 22, 2011 will take place at the CLWA Boardroom located on the 1st floor of the Administration Building at the Rio Vista Water Treatment Plant, 27234 Bouquet Canyon Road, Santa Clarita, California 91350.

For additional information regarding the public hearings, please contact me at (661) 297-1600.

Sincerely,

Dirk Marks

Dirk Marks,
Water Resources Manager

CASTAIC LAKE WATER AGENCY

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THE SIGNAL NEWSPAPER
24000 Creekside Rd
Valencia, Ca 91355

# Proof of Publication
(2015.5 C.C.P.)

STATE OF CALIFORNIA,
COUNTY OF LOS ANGELES

I am a citizen of the United States,and a resident of the county aforesaid; I am over the age of eighteen years; and I am not a party to or interestedin the notice published. I am the chief legal advertising clerk of the publisher of the

**SIGNAL NEWSPAPER**

a newspaper of general circulation, printed and published **Daily** in the city of Santa Clarita County of Los Angeles, and which newspaper has been adjudged a newspaper of general circulation by the Superior Court of the County of Los Angeles State of California, under the date of **March 25, 1988**
Case number **NVC15880**, that the notice, of which the annexed is a printed copy, has been published in each regular and entire issue of said newspaper and not in any supplement thereof on the following dates, to-wit:

5/26, 6/2, 6/9, 6/16

All in the year 20 11

I certify (or declare) under penalty of perjury' that the foregoing is true and correct

Dated at Valencia, California, this
16th day of June, 20 11

Signature

**NOTICE OF THIRD PUBLIC HEARING 2010 URBAN WATER MANAGEMENT PLAN**

Castaic Lake Water Agency ("CLWA"), CLWA Santa Clarita Water Division, Newhall County Water District and Valencia Water Company have directed the preparation of a joint regional 2010 Urban Water Management Plan ("UWMP") for the Santa Clarita Valley, as encouraged by the Urban Water Management Planning Act ("Act"). Los Angeles County Waterworks District No. 36 is participating in the process on an ad hoc basis. Adoption of the 2010 UWMP is required under the Act by July 1, 2011.

While the Act only requires that an urban water supplier hold one public hearing before adopting a plan, in order to ensure sufficient opportunity for public feedback, input and suggestions concerning the 2010 UWMP, a third public hearing has been scheduled.

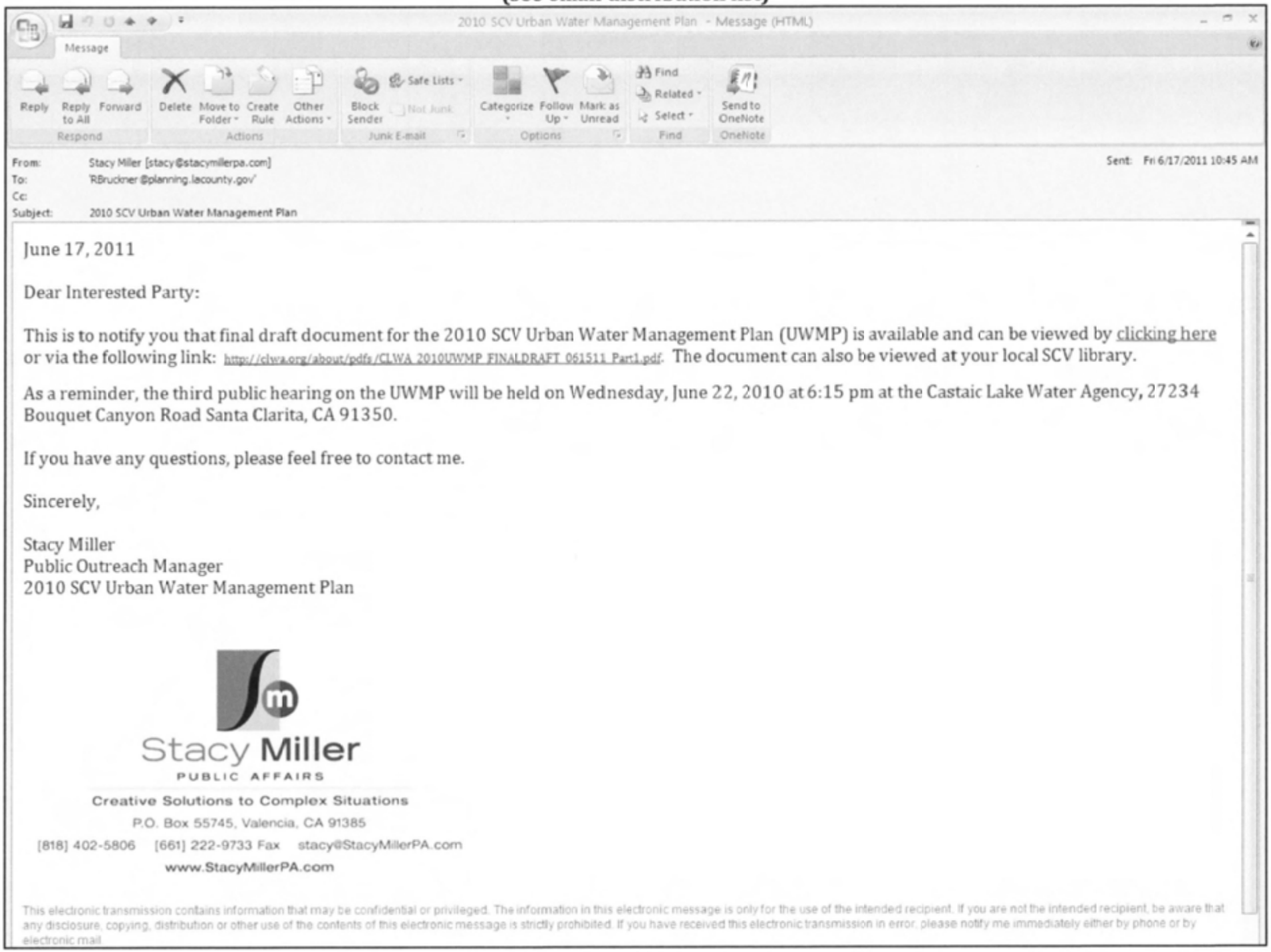
The first public hearing was held on March 23, 2011and the second on May18, 2011. The third hearing will be held at 6:15 p.m. on Wednesday, June 22, 2011 and will take place at the CLWA Boardroom, located on the 1st floor of the Administration Building at the Rio Vista Water Treatment Plant, 27234 Bouquet Canyon Road, Santa Clarita, California 91350.

For additional information regarding the public hearings, please contact Dirk Marks, CLWA Water Resources Manager, at (661) 297-1600.

**The Signal 5/26, 6/2 & 6/9 & 6/16 2011**

ProofPublicationAffidavit_JH

**Emails sent regarding**
**Final Draft Document Availability & 3rd Public Hearing Reminder**
**(See email distribution list)**



2010 SCV Urban Water Management Plan - Message (HTML)

Message

Reply | Reply to All | Forward | Delete | Move to Folder | Create Rule | Other Actions | Block Sender | Safe Lists | Not Junk | Categorize | Follow Up | Mark as Unread | Find | Related | Select | Send to OneNote

Respond | Actions | Junk E-mail | Options | Find | OneNote

From: Stacy Miller [stacy@stacymillerpa.com]
To: 'RBruckner @planning.lacounty.gov'
Cc:
Subject: 2010 SCV Urban Water Management Plan

Sent: Fri 6/17/2011 10:45 AM

June 17, 2011

Dear Interested Party:

This is to notify you that final draft document for the 2010 SCV Urban Water Management Plan (UWMP) is available and can be viewed by clicking here or via the following link: http://clwa.org/about/pdfs/CLWA_2010UWMP_FINALDRAFT_061511_Part1.pdf. The document can also be viewed at your local SCV library.

As a reminder, the third public hearing on the UWMP will be held on Wednesday, June 22, 2010 at 6:15 pm at the Castaic Lake Water Agency, 27234 Bouquet Canyon Road Santa Clarita, CA 91350.

If you have any questions, please feel free to contact me.

Sincerely,

Stacy Miller
Public Outreach Manager
2010 SCV Urban Water Management Plan

Stacy Miller
PUBLIC AFFAIRS
Creative Solutions to Complex Situations
P.O. Box 55745, Valencia, CA 91385
[818] 402-5806 [661] 222-9733 Fax stacy@StacyMillerPA.com
www.StacyMillerPA.com

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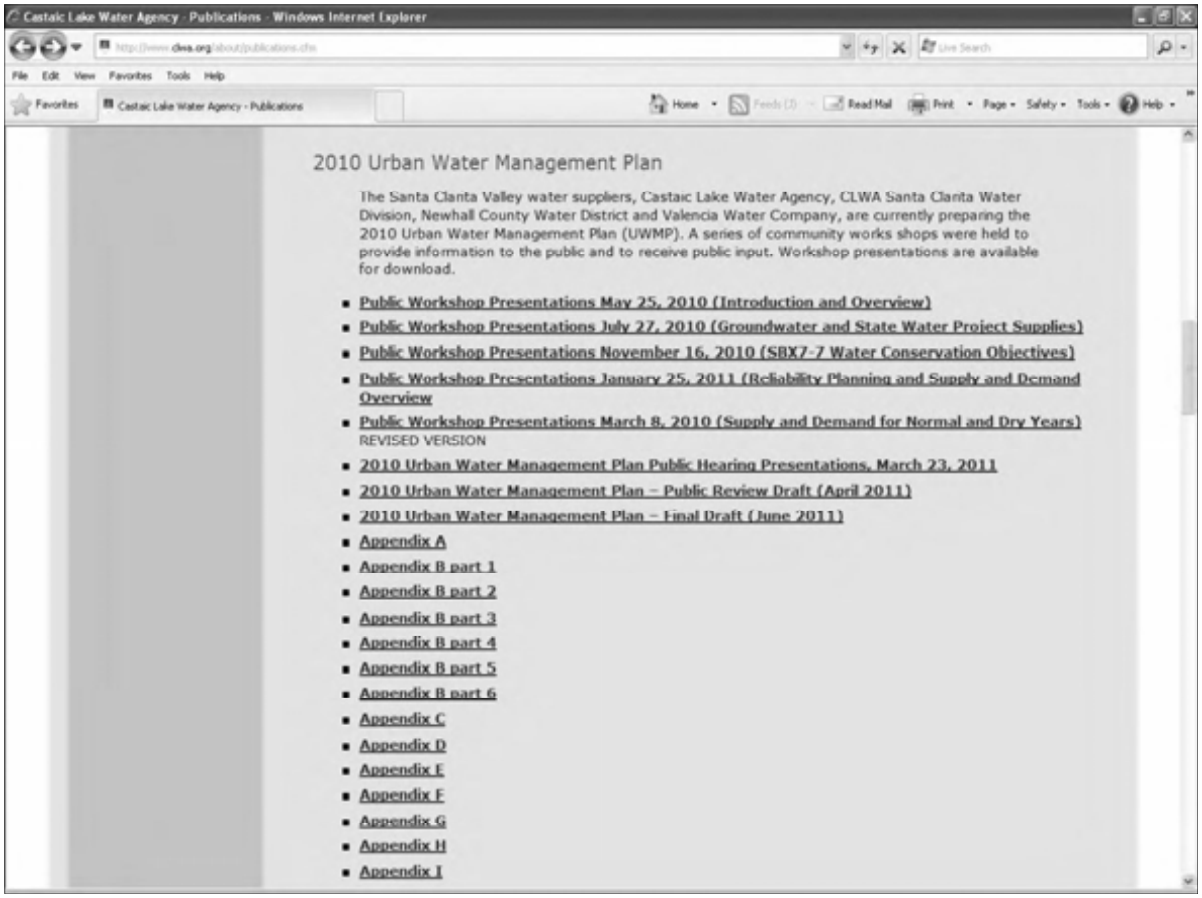
**Master Email List**
**Extension of UWMP comment period and notification of revised draft document and next public hearing**
**Sent June 17, 2011**

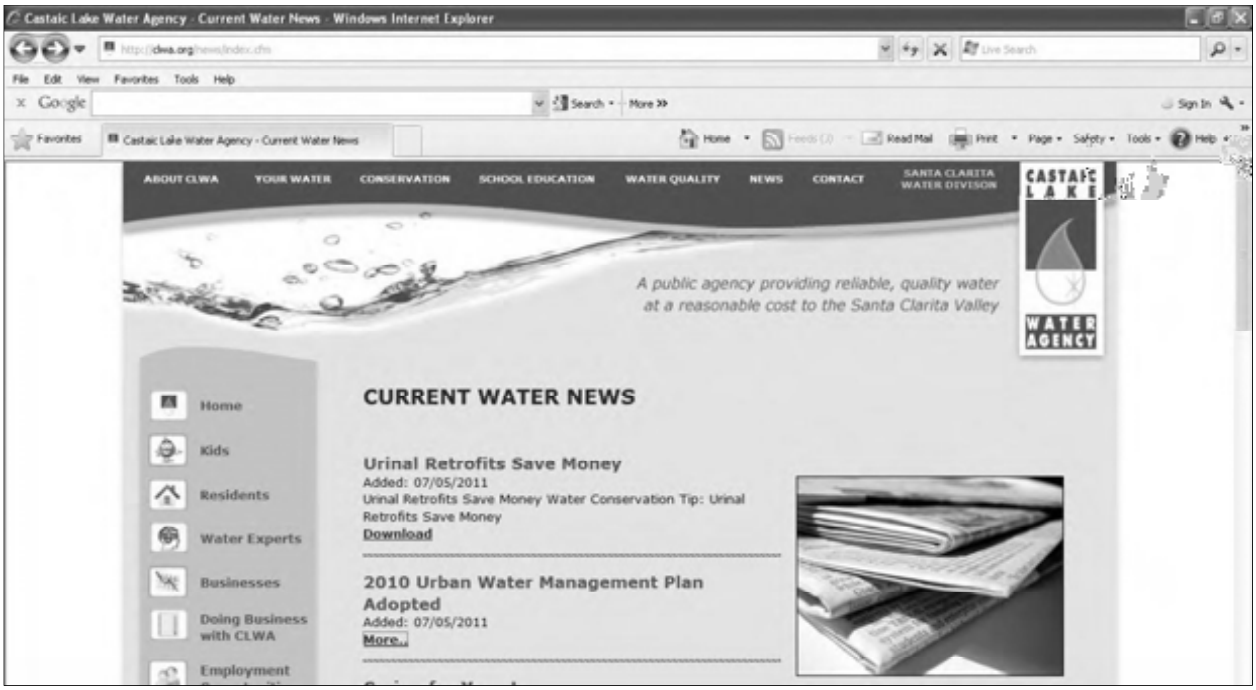
| | | |
|---|---|---|
| Jarrod Degonia<br>Assemblymember Cameron Smyth<br>Jarrod.DeGonia@asm.ca.gov | Ernie Villegas<br>Assemblymember Jeff Gorell<br>Ernie.Villegas@asm.ca.gov | Kevin Korenthal<br>Associated Builders & Contractors of CA; ABC-CCC<br>kkorenthal@abc-ccc.org |
| Holly Schroeder<br>BIA - Los Angeles/Ventura Chapter<br>hschroeder@bialav.org | Sandy Sanchez<br>BIA - Los Angeles/Ventura Chapter<br>ssanchez@bialav.org | David Inouye<br>CA Department of Water Resources<br>davidi@water.ca.gov |
| Robert Kelly<br>Castaic Area Town Council<br>RobertKelly@CastaicAreaTownCouncil.org | Mike Murphy<br>City of Santa Clarita<br>mmurphy@santa-clarita.com | Jason Smisko<br>City of Santa Clarita<br>JSmisko@santa-clarita.com |
| Bruce Fortine<br>College of the Canyons<br>fortine@earthlink.net | Bob Haueter<br>Congressman Howard McKeon<br>Bob.Haueter@mail.house.gov | Chris Stephens<br>County of Ventura Resource Management Agency<br>Chris.Stephens@ventura.org |
| Ron Bottorff<br>Friends of the Santa Clara River<br>bottorffm@verizon.net | Mark Pestrella<br>LA County Department of Public Works<br>mpestrel@dpw.lacounty.gov | Richard Bruckner<br>LA County Department of Regional Planning<br>RBruckner@planning.lacounty.gov |
| Jessica Bunker<br>LA County WWD<br>jbunker@ladpw.org | Lynn Plambeck<br>Santa Clarita Organization for Planning the Environment - SCOPE<br>lynne.plambeck@scope.org | Robert Fleck<br>Santa Clarita Valley Well Owners Association<br>rfleck@socal.rr.com |
| Terry Kingery<br>SCV Chamber of Commerce<br>tkingery@scvchamber.com | Sierra Club Angeles Chapter<br>Contact.us@angeles.sierraclub.org | Mark Butala<br>Southern CA Association of Governments<br>butala@scag.ca.gov |
| Jackie Bick<br>State Senator Sharon Runner<br>Jackie.Bick@sen.ca.gov | Scott Wilk Jr.<br>State Senator Tony Strickland<br>scott.wilk@sen.ca.gov | David Perry<br>Supervisor Michael Antonovich, 5th District<br>dperry@lacbos.org |
| Rosalind Wayman<br>Supervisor Michael Antonovich, 5th District<br>rwayman@lacbos.org | E. Michael Solomon<br>United Water Conservation District<br>msolomon@unitedwater.org | Kathy Norris<br>Valley Industrical Association of Santa Clarita (VIA)<br>kathy@via.org |
| Ron Mechsner<br>West Ranch Town Council<br>Rmechsner@WestRanchTownCouncil.com | Carol Lutness<br>SCV Fair Elections Committee<br>santaclarita-info@caclean.org | Katherine Squires<br>Sierra Club Angeles Chapter<br>katherine.m.squires@csun.edu |
| Dunn<br>Residents<br>water@dslextreme.com | Mitch Glaser<br>LA Co Department of Regional Planning<br>mglaser@planning.lacounty.gov | Also sent via US Mail to<br>• Mr. & Mrs. Dunn<br>• Cam Nolltemeyer<br>• Michael A. Naoum<br>• Carol Lutness |

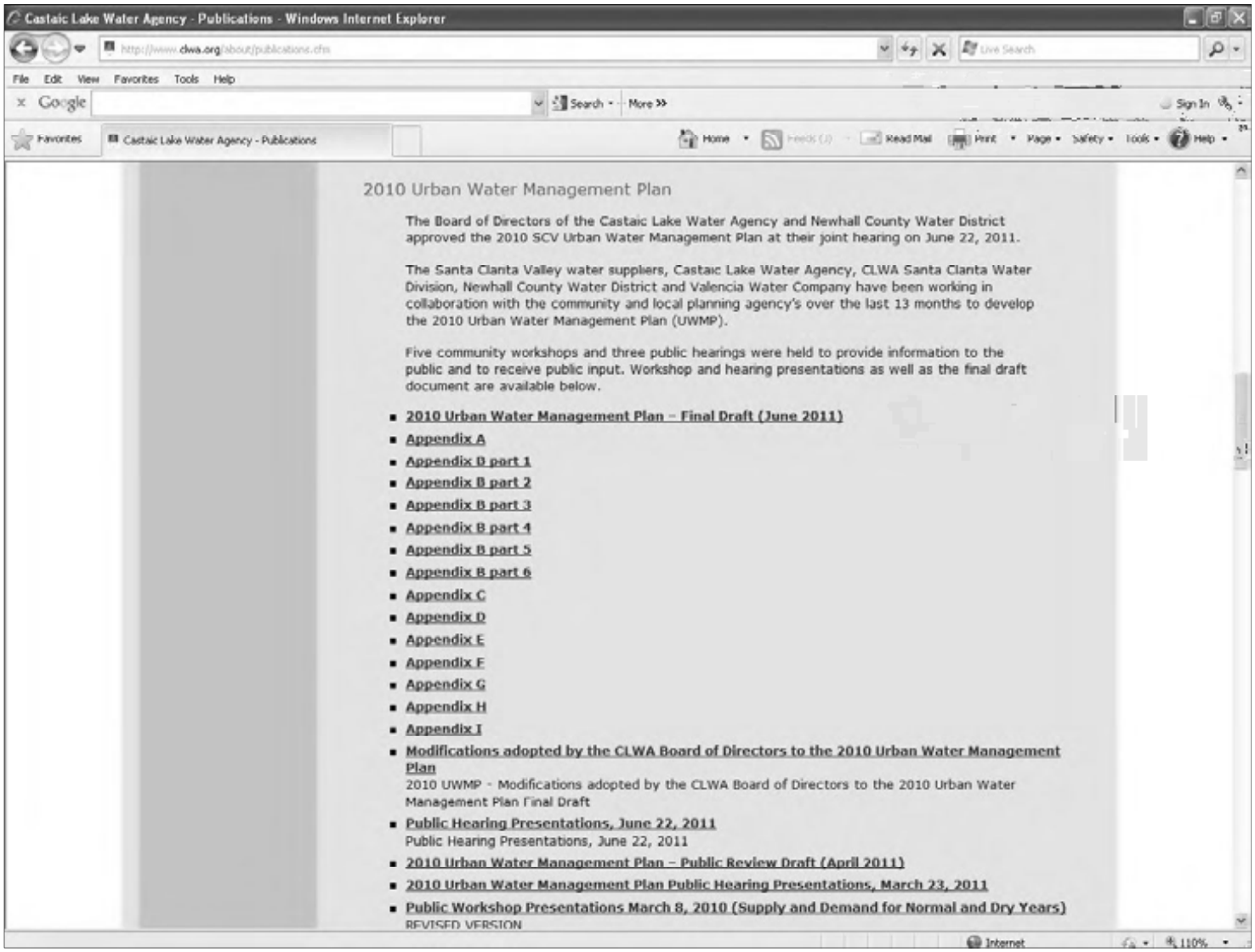
**UWMP –June Hearing & Final Draft Document Notice**
**CLWA Website**



**UWMP –June Hearing & Final Draft Document Notice**
**NCWD Website**

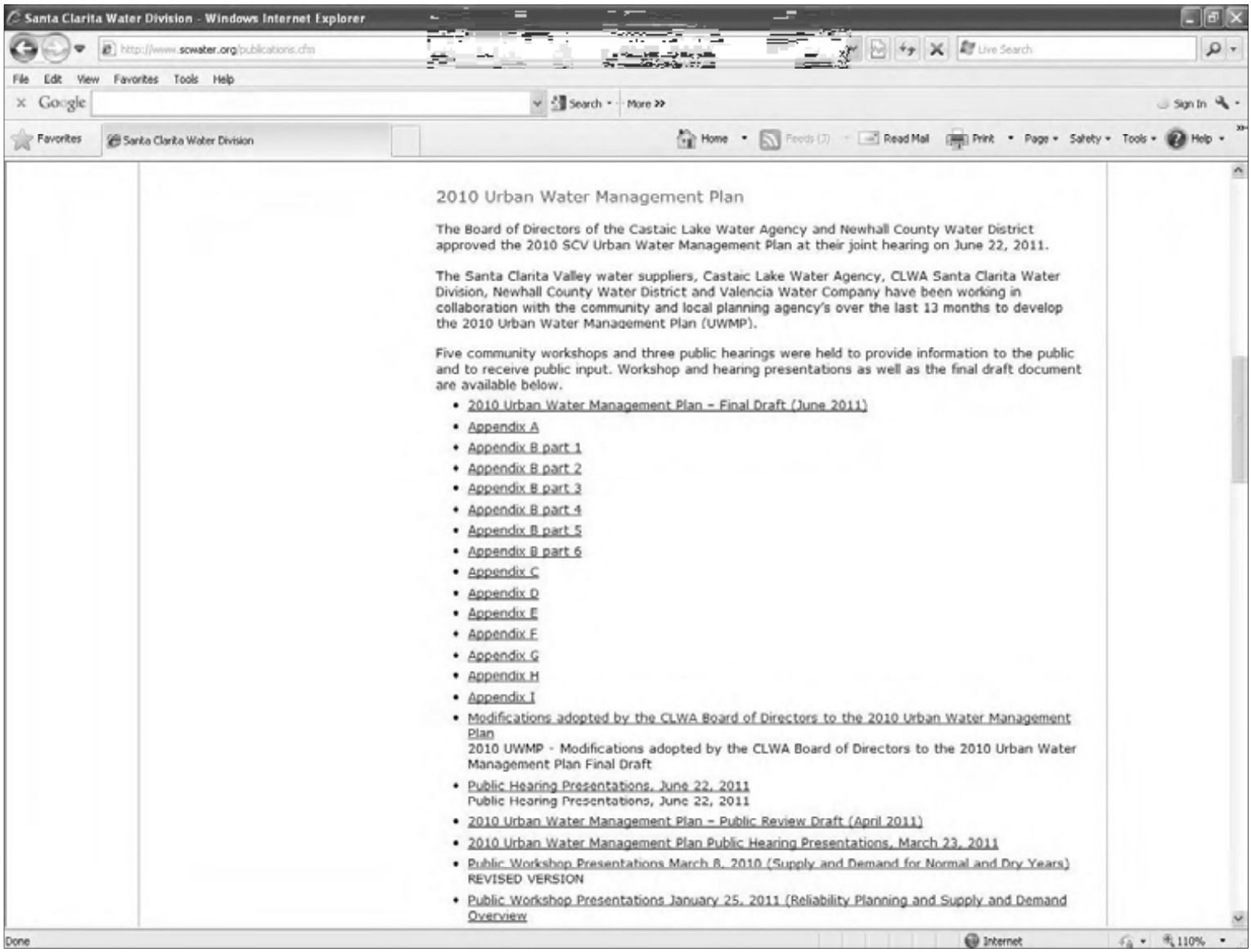
**UWMP Adoption Notice**
**CLWA Website June 2011**



**2010 UWMP Adoption Notice**
**NCWD Website**
**June 2011**

**2010 UWMP Adoption Notice**
**SCWD Website**
**June 2011**




## 2010 Urban Water Management Plan

The Board of Directors of the Castaic Lake Water Agency and Newhall County Water District approved the 2010 SCV Urban Water Management Plan at their joint hearing on June 22, 2011.

The Santa Clarita Valley water suppliers, Castaic Lake Water Agency, CLWA Santa Clarita Water Division, Newhall County Water District and Valencia Water Company have been working in collaboration with the community and local planning agency's over the last 13 months to develop the 2010 Urban Water Management Plan (UWMP).

Five community workshops and three public hearings were held to provide information to the public and to receive public input. Workshop and hearing presentations as well as the final draft document are available below.

- 2010 Urban Water Management Plan – Final Draft (June 2011)
- Appendix A
- Appendix B part 1
- Appendix B part 2
- Appendix B part 3
- Appendix B part 4
- Appendix B part 5
- Appendix B part 6
- Appendix C
- Appendix D
- Appendix E
- Appendix F
- Appendix G
- Appendix H
- Appendix I
- Modifications adopted by the CLWA Board of Directors to the 2010 Urban Water Management Plan
  2010 UWMP - Modifications adopted by the CLWA Board of Directors to the 2010 Urban Water Management Plan Final Draft
- Public Hearing Presentations, June 22, 2011
  Public Hearing Presentations, June 22, 2011
- 2010 Urban Water Management Plan – Public Review Draft (April 2011)
- 2010 Urban Water Management Plan Public Hearing Presentations, March 23, 2011
- Public Workshop Presentations March 8, 2010 (Supply and Demand for Normal and Dry Years) REVISED VERSION
- Public Workshop Presentations January 25, 2011 (Reliability Planning and Supply and Demand Overview

NEWHALL COUNTY WATER DISTRICT

NCWD

## New Regional Urban Water Management Plan Approved

*Santa Clarita Valley Family of Water Suppliers Approve Critical Planning Tool*

**Santa Clarita, CA** –The Boards of Directors of the Newhall County Water District and Castaic Lake Water Agency unanimously approved the 2010 Santa Clarita Valley Urban Water Management Plan at a joint public hearing on June 22, 2010.

"The approval by the two Boards is a testament to the quality of this document and the team that has worked so hard on its preparation," stated Daniel Mortensen, NCWD Board President.

The creation of the Santa Clarita Valley Urban Water Management Plan began in May 2010 and included opportunities for input from our community, water partners, environmental groups, elected officials, business groups and other community stakeholders during the five community workshops and three public hearings that were held on the plan.

"We have gone far beyond the public participation requirements cited in the Urban Water Management Plan regulations to ensure that all residents and interested parties had ample opportunity to participate, comment and weigh in on this important process," stated Tom Campbell, CLWA Board President.

The Urban Water Management Plan presents a picture of the valley's future water situation and describes the long-range water needs of our community and the means to supply the necessary water to the year 2050. Every five years, the water suppliers who deliver in excess of 3,000 acre feet of water or serve over 3,000 connections per year are required by law to prepare an Urban Water Management Plan.

The SCV Family of Water Suppliers partnered in this planning effort to ensure a collaborative planning approach. This plan is not a project-specific document, nor does it take the place of individual project requirements; rather it is a tool that helps guide the local water suppliers' actions and offers a broad perspective on a wide variety of water issues. The plan concludes that the combination of existing and

planned programs to increase supply and conservation will meet the Valley's water needs through 2050.

"I am proud of the tremendous amount of time and work that has been put into the development of this plan by the community, our staff, consultants and my fellow Board members," stated Bill Cooper, CLWA Board Vice President . "Our Urban Water Management Plan serves as the 'gold standard' of planning documents throughout the state and is followed closely for its content and thoroughness."

The final SCV Urban Water Management Plan will be delivered to the State Department of Water Resources before the end of July 2011. The final draft and additional amendments that were made at the recent board meetings are currently available for review online at www.ncwd.org.

# Santa Clarita Valley Urban Water Management Plan

Public Hearing
June 22, 2011
Castaic Lake Water Agency

## Agenda

- Open public hearing
- Review of public input process and public comment letters
- Public comment period
- Presentation on Groundwater Basin
- Presentations on Perchlorate Restoration, VWC Well 201
- Presentations on Water Banking, SWP reliability, Water Conservation, Chlorides/AWRM
- Board questions and answers
- Description of UWMP document finalization process
- Close hearing and next steps

## UWMP Act Process

### ACT REQUIREMENTS

- Coordinate preparation of UWMP with other appropriate agencies in the area.
- 60 days notice to city and counties, and may consult with, and obtain comments from, city and counties receiving notice.
- Encourage active involvement of diverse social, cultural, and economic elements of the population within the service area prior to and during the preparation of the plan.

### ACT REQUIREMENTS EXCEEDED

- Draft Final UWMP, §§1.3.1 & 1.3.3, Table 1-1, pgs 1-3 to 1-8.
- Draft Final UWMP, §1.3.3, Table 1-1, pgs 1-3 to 1-8, Appendix B.
- Five Public Workshops between May 2010 and March 2011; three CLWA/NCWD joint public hearings; written public comment period; written public comment deadline extended; Draft Final UWMP, §§1.3.1 &1.3.3, Table 1-2, pgs 1-3 to 1-8.

## UWMP Act Process

| ACT REQUIREMENTS | ACT REQUIREMENTS EXCEEDED |
|---|---|
| Prior to adopting a plan, the urban water supplier shall make the plan available for public inspection. | Draft UWMP has been available since April 15, 2011; Final Draft UWMP, §§1.3.1 & 1.3.3, Table 1-2, pgs 1-3 to 1-8, Appendix B. |
| One Public hearing. | Three CLWA/NCWD joint public hearings. |
| Notice of hearing in compliance with Gov. Code § 6066. | Final Draft UWMP, §§1.3.1 & 1.3.3, Table 1- 2, pgs 1-3 to 1-8, Appendix B. |

## UWMP Act Process

| ACT REQUIREMENTS | ACT REQUIREMENTS EXCEEDED |
|---|---|
| Notice of hearing to any city or county within which the supplier provides water supplies. | Final Draft UWMP, §§1.3.1 & 1.3.3, Table 1-2, pgs 1-3 to 1-8, Appendix B. |
| After the hearing, the plan shall be adopted as prepared or as modified after the hearing. | June 22, 2011 Joint Meeting and 3rd Joint Public Hearing |

## Past Workshops

**May 2010**
- UWMP purposed and process – What, Who, Why and When
- Existing and new requirements of UWMPs

**July 2010**
- SBX7-7 ("20x2020") Requirements
- Recycled Water
- Groundwater Supplies
- State Water Project Reliability

**November 2010** –
- Presentation to IRWMP Stakeholders

## Past Workshops (continued)

**November 2010**
- GPCD population assumptions and calculations
- SBX7-7 Targets by retailer

**January 2011**
- Overview of water supplies
- SWP reliability update
- CLWA reliability planning update
- SBX7-7 calculations and targets
- Overview of water supplies and demand

**March 2011**
- Water Supply and Demands

## Public Hearings and Draft Document

1st public hearing March 23, 2011
- Public Draft document made available April 15, 2011
- Comment period through May 20, 2011

2nd public hearing May 18, 2011
- Comment period extended through May 27, 2011
- Final Draft document made available June 15, 2011

3rd public hearing June 22, 2011

## Comment Letters Received

- Friends of the Santa Clara River
- Santa Clarita resident and Valencia Water ratepayer
- Sierra Club
- Mr. and Mrs. Dunn
- Mr. Naoum
- Mr. Dunn
- Sierra Club
- SCOPE
- Whittaker-Bermite Citizens Advisory Group
- Babak Naficy
- Santa Clarita Valley Fair Elections Committee

## Broad Categories of Comments Received

- Groundwater overdraft claims
- Perchlorate and VWC Well 201
- Organic compounds
- Water banking program issues; State Water Project reliability and contingency planning
- Water conservation accounting
- Chloride water quality issues (TMDL/AWRM)

## Santa Clarita Valley Urban Water Management Plan

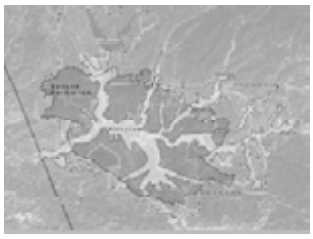
Public Comment Period

## Groundwater Supplies and Related Issues, e.g. "Overdraft"

- Joe Scalmanini –
  Luhdorff and Scalmanini, Consulting Engineers

## Groundwater Component of Water Supplies

## 2010 Urban Water Management Plan



- Castaic Lake Water Agency
- CLWA Santa Clarita Water Division
- Los Angeles County Waterworks District 36
- Newhall County Water District
- Valencia Water Company

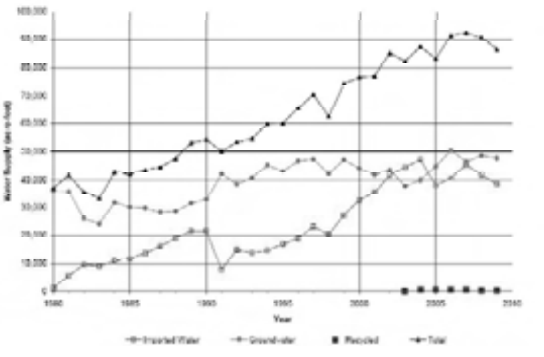



Figure 2-1
Total Water Supply Utilization
Santa Clarita Valley

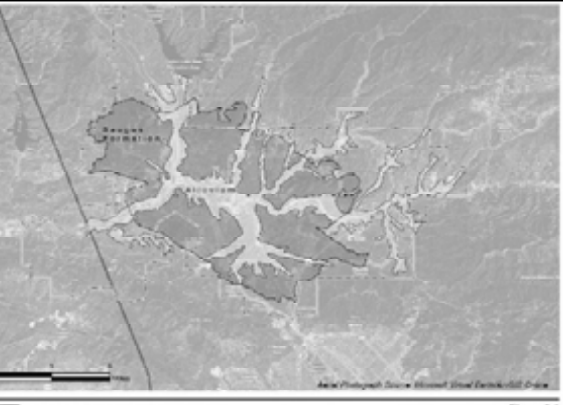


Figure 3-1
Alluvium and Saugus Formation

## Groundwater Management Plan (2003)

**Management Objectives (Goals) for the Basin**

- Development of integrated surface water, groundwater, and recycled water supply to meet existing and projected uses
- Determination of operational groundwater yield to avoid overdraft = sustainability
- Preservation of groundwater quality, including solution of contamination problems
- Preservation of interrelated surface water resources = maintenance of surface water flows and non-degradation of quality

## Groundwater Management Plan (2003)

Elements

- Groundwater monitoring
- Surface water monitoring
- Basin yield analysis
- Regular and dry year water supplies
- Continued conjunctive use
- Long-term salinity management
- Integration of recycled water
- Mitigate contamination
- Local, state and federal relationships
- Public education and water conservation
- Recharge wellhead protection areas
- Well construction and destruction policies
- Provisions to add additional components

## Annual Water Reports (1998-present)

**Annual Water Requirements and Supplies**

- Actual water use
- Sources of supply to meet actual use

**Groundwater**

- Alluvial and Saugus aquifer conditions

**Supplemental Water Supplies**

- State Water Project
- banking and other programs

**Water Quality**

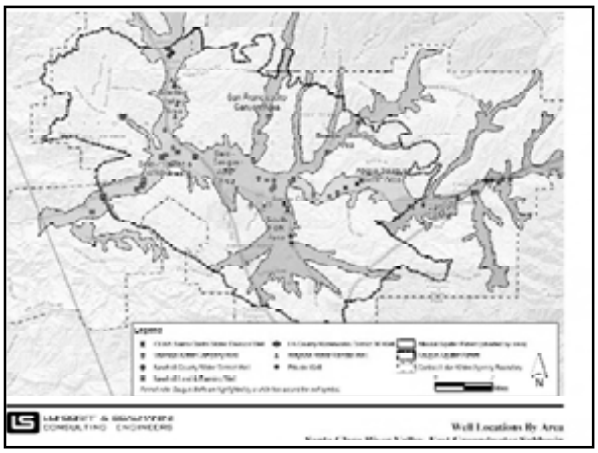
**Recycled Water**

**Santa Clara River**

- Outflows from Santa Clarita Valley

**Short-Term (one year) Outlook**

- Water requirements adjusted from UWMP
- Surface water, groundwater and recycled water supplies
- Adequacy of water supplies



Well Locations By Area

Figure 3-2
Groundwater Production - Alluvium
Santa Clara River Valley, East Groundwater Subbasin

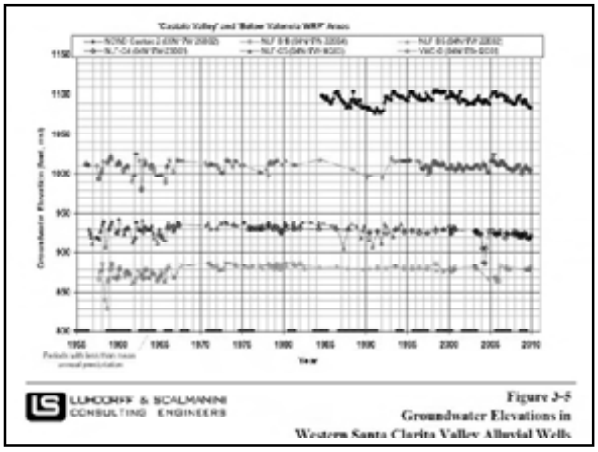



Figure 3-5
Groundwater Elevations in
Western Santa Clarita Valley Alluvial Wells

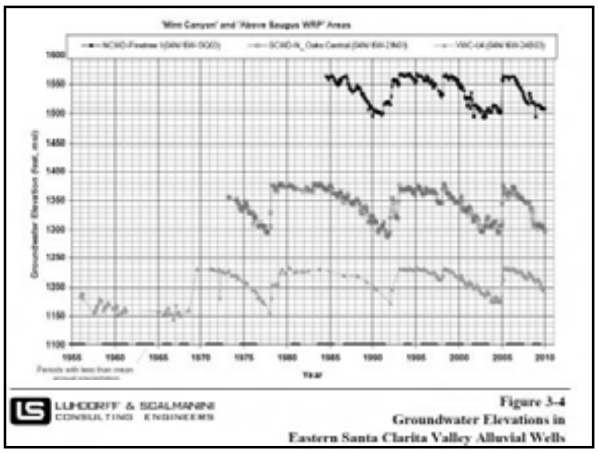
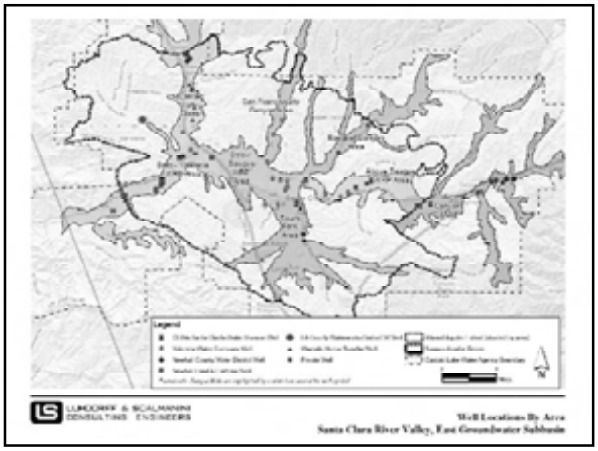



Figure 3-4
Groundwater Elevations in
Eastern Santa Clarita Valley Alluvial Wells




Well Locations By Area
Santa Clara River Valley, East Groundwater Subbasin

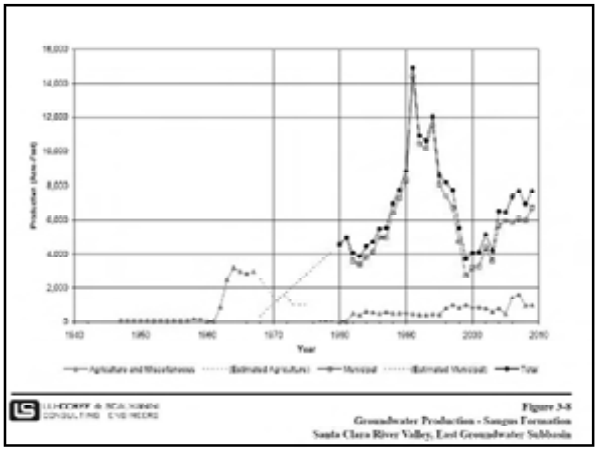



Figure 3-8
Groundwater Production - Saugus Formation
Santa Clara River Valley, East Groundwater Subbasin

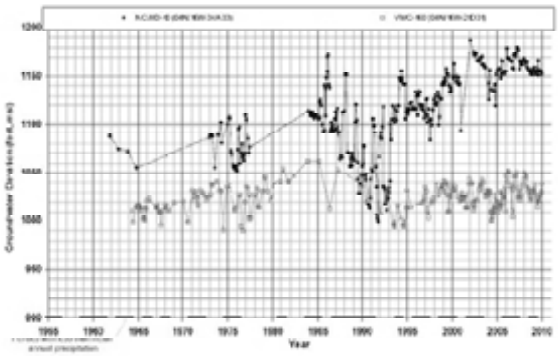



Figure 3-9
Groundwater Elevations in Saugus Wells

## Total Groundwater Supply
## Santa Clarita Valley

| | Normal Years | | |
|---|---|---|---|
| | Alluvium (afy) | Saugus Fm. (afy) | Total (afy) |
| Municipal Purveyors | 25,850 | 11,485 | 37,335 |
| Agriculture & Others | 12,750 | 1,000 | 13,750 |
| **Total** | **38,600** | **12,485** | **51,085** |

| | Multiple Dry Years | | |
|---|---|---|---|
| | Alluvium (afy) | Saugus Fm. (afy) | Total (afy) |
| Municipal Purveyors | 23,800-22,250 | 18,125-33,975 | 41,975-56,225 |
| Agriculture & Others | 12,700-12,600 | 1,000 | 13,700-13,600 |
| **Total** | **36,500-34,850** | **19,125-34,975** | **55,675-69,825** |

## 2008 Groundwater Operating Plan

| Groundwater Pumping 2010 UWMP | | | | |
|---|---|---|---|---|
| **Aquifer** | **Normal Years** | **Dry Year 1** | **Dry Year 2** | **Dry Year 3+** |
| **Alluvium** | 30,000-40,000 (38,600) | 30,000-35,000 (36,500) | 30,000-35,000 (34,850) | 30,000-35,000 (34,850) |
| **Saugus** | 7,500-15,000 (12,485) | 15,000-25,000 (19,125) | 21,000-25,000 (25,227) | 21,000-35,000 (34,977) |

**from 2009 Basin Yield Update (LSCE & GSI), following 2001 Groundwater Update Report (Slade) & 2005 Basin Yield Analysis (CH2M Hill & LSCE)**

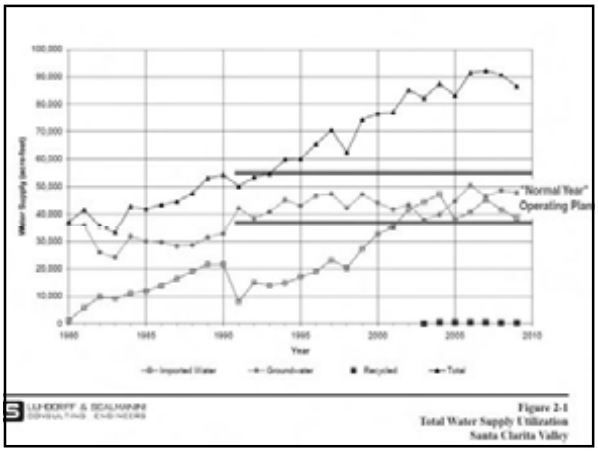



Figure 2-1
Total Water Supply Utilization
Santa Clarita Valley

## Sustainability and Achievability

**Sustainability**

" lack of chronic, or sustained, depletion of groundwater storage, as indicated by projected groundwater levels, over a reasonable range of wet, normal, and dry hydrologic conditions" (86 years: 1922-2007)

"maintenance of surface water flows in the western portion of the basin (which are partially maintained by groundwater discharge) and surface water outflow to downstream basins over the same range of hydrologic conditions"

**Achievability**

maintenance of groundwater levels above, or only temporarily slightly into, the intake (screened or perforated) sections of production wells

**from 2009 Basin Yield Update (LSCE & GSI)**

## 2008 Operating Plan Conclusions

**Operating Plan is fully sustainable (no chronic groundwater level declines; no depleted stream flow), i.e. not overdraft, and mostly achievable (limited dry-period declines in eastern part of Valley)**

**Lack of any projected overdraft is consistent with actual historical basin response to the same range of groundwater pumping**

**Achievability issues in extended dry periods can be resolved by redistribution of some pumping to the west**

- with redistribution, retain dry-period Alluvial pumping near 35,000 afy
- without redistribution, dry-period Alluvial pumping closer to 30,000 afy

## Subsidence

**In alluvial aquifers, results from "aquitard drainage" and resulting consolidation of the "aquitard"**

- requires extensive, thick aquitard (fine-grained sediments, i.e. clay bed)
- requires chronically depressed groundwater levels (to allow clay to drain)

**Santa Clarita Valley Alluvium**

- up to 240 ft. thick, but lacking any extensive, thick aquitard => geology not conducive to subsidence, regardless of groundwater levels
- some near-constant and some fluctuating groundwater levels, but no chronically depressed groundwater levels anywhere => hydrology not conducive to subsidence.

**No physical evidence of subsidence, e.g. lowering of land surface.**

## Small Private Pumping

Limited submittal of pumping-related data, approx. 5-6 years ago, for two tributary canyons; quantified less than 200 afy

No information submitted about well completions, e.g. whether in Alluvium or bedrock, pump capacities, water level records

No information about well failures, e.g. "going dry"

Extrapolated limited pumping data to conservatively estimate 500 afy of basin-wide small private pumping; included in Annual Water Report

Reported, and continue to expect, all private Alluvial wells to experience the same groundwater level fluctuations as monitored and reported in Annual Water Report

## Monitoring

**CA Health and Safety Code, Title 22**

- Domestic Water Quality and Monitoring
- Waterworks Standards

**CA Dept of Public Health**

- Domestic Water Supply Permits
- Application of Health & Safety Code and DPH Policies

**Santa Clarita Valley Purveyors**

- Permitted and regulated as above
- In compliance with above for quantity and quality of water supplies

## Perchlorate Treatment

- Groundwater Quality
  - Perchlorate treatment and restoration

## Perchlorate

| Year Perchlorate Detected | Purveyor Well | Groundwater Aquifer | Status |
|---|---|---|---|
| 1997 | SCWD Saugus 1 | Saugus | DPH approved well return to service in January 2011; well in active service utilizing approved perchlorate treatment. |
| 1997 | SCWD Saugus 2 | Saugus | DPH approved wells return to service in January 2011; well in active service utilizing approved perchlorate treatment. |
| 1997 | VWC Well 157 | Saugus | Sealed and capacity replaced by new well. |
| 1997 | NCWD Well 11 | Saugus | Out of service |
| 2002 | SCWD Stadium Well | Alluvium | Sealed and capacity replaced by new well. |
| 2005 | VWC Well Q2 | Alluvium | DPH approved perchlorate treatment removal in 2007; treatment was installed in 2005 and relocated for potential future use; well remains in service. |
| 2005 | DTSC approved Interim Remedial Action Plan | | |
| 2006 | NCWD Well NC-13 | Saugus | DPH approved annual monitoring, results have always been below the detection limit for reporting; well remains in service. |
| 2007 | Settlement Agreement | | |
| 2010 | VWC Well 201 | Saugus | Out of service pending additional monitoring and evaluation of remediation alternatives. |

*Rapid Response Fund* provides $10M in reimbursement funds to CLWA as fail-safe.

## Perchlorate Impact

Valencia Water Company
Well 201

## Site Location -- Former Whittaker Bermite Facility

*From 2005 UWMP - Appendix D*

## Perchlorate Concentrations

Initial Detection (August, 2010) 5.0 ug/l
well removed from water supply service

Quarterly/Monthly Confirmation Sampling (November, 2010 – April, 2011) fluctuations between 5.7 and 12 ug/l

## Logical Occurrence or Completely Unexpected?

**Initial Perchlorate Contamination in Saugus Wells - 1997**
Saugus 1 & 2; V 157; NCWD 11

**Groundwater Flow**
westerly gradient and flow direction – pre-1997 to 2010

**Gradient Control = "Containment" via Restoration of Saugus 1 & 2**
modeled – 2004
permitting, litigation, Settlement Agreement – 2007
design, construction – 2010
DPH water supply permit – 2010
start-up operations – 2010
full-time operation – January 2011

**Valencia 201**
first down-gradient Saugus well from original impacts
13-year elapsed time from initial impacts to V 201 impact
listed as "threatened" well in Settlement Agreement
while not a foregone conclusion, detection is a logical occurrence, and not completely unexpected

## Water Supply Impact

**Recent Operations**

capture zone analysis □2004
reduced pumping to avg. 180 afy □2004-2010
replaced pumping with other Saugus well capacity

**Saugus Formation**

7,500 □15,000 afy □normal year□water supply
15,000 □35,000 afy □dry year□water supply

**V 201**

key well in dry years
3,777 afy of total □dry year□water supply
capacity needs to be restored before next potential dry year, i.e., within two years

## V 201 Response

Removed from Water Supply Service at Initial Detection (August, 2010)

Quarterly-Monthly Confirmation Sampling

Alternatives
restoration with □wellhead□treatment
well replacement

Groundwater Modeling
perchlorate migration
need for secondary □containment□
updated assessment of □threatened□wells

Dept. of Public Health Permitting

Design and Construction

## Existing and Planned Saugus Well Locations

## Organic Compounds

- Volatile and Synthetic Organic Compounds
  - Trichloroethylene (TCE) and Tetrachloroethylene (PCE)
    - Cleaning solvents, legacy contamination, urban stormwater runoff, septic systems
- CLWA annually monitors for these compounds;
  - TCE was found below the MCL in trace levels in groundwater in the Valley.
  - Not currently affecting production or needing treatment.

## Water Banking Program Terms

## Water Banking Programs

| Banking Program | Extraction Capacity (AFY) | Contract Term |
|---|---|---|
| Rosedale Rio-Bravo | 20,000 | Through term of SWP contract |
| Semitropic interim programs | 15,000 | Through 2012/13 originally; through 2022/23 with Amendment |
| Semitropic - Newhall Land | 4,950 | Through 2035 with renewal by mutual agreement |

## State Water Project Reliability Comment Areas

- Supply Reliability
- Facility Reliability
- SWP and West Branch Conveyance
- Catastrophic Supply Interruption

## SWP Supply Reliability

- Supply data from DWR's 2009 SWP Delivery Reliability Report.
- Based on model studies using 82 years of historical hydrology (1922 – 2003).
- Historical period includes several significant drought periods.
- Estimate for future (2029) includes adjustments to hydrology to reflect climate change.

## SWP Facility Reliability

- Past SWP outages have been short-term (typically weeks in duration).
- Longest West Branch outage was planned three-month winter outage (Dec 1998 – Feb 1999).
- CLWA ideally located immediately downstream of two large SWP reservoirs – Pyramid and Castaic Lakes.
- Location allows deliveries to continue to CLWA and other West Branch Contractors even with outage in aqueduct upstream.
- No past SWP outages have impacted deliveries to CLWA.
- Potential supply impacts of future outage evaluated in UWMP Section 8.

## SWP Conveyance

- SWP facilities are owned by State and operated by DWR.
- West Branch facilities, including aqueduct and Pyramid and Castaic Reservoirs, are part of SWP.
- CLWA and 28 other SWP Contractors each have a Water Supply Contract with DWR for water supply and delivery, with similar terms.
- Water Supply Contract:
  - Dictates terms for water delivery.
  - Provides for delivery of SWP water, supplies to and from out-of-service area banking programs, and non-SWP water.

## SWP Conveyance (cont.)

- Each SWP Contractor has same priority for delivery within proportion of aqueduct capacity they pay for.
- Deliveries in excess of that capacity may be made through unused capacity of other Contractors.
- DWR requires separate delivery agreements for Contractor programs needing delivery through SWP facilities.
- CLWA has agreements with DWR for deliveries to and from its San Joaquin Valley banking programs and for delivery of its Buena Vista-Rosedale supply.

## West Branch Conveyance

- DWR controls deliveries to each of three West Branch Contractors (CLWA, MWD, Ventura Co WPD).
- In dry years when SWP supplies are low, capacity normally used to convey SWP water is available to deliver other supplies.
- CLWA withdrawals from banking programs are planned only for dry years, when capacity would be available to convey it.

## Catastrophic Supply Interruption

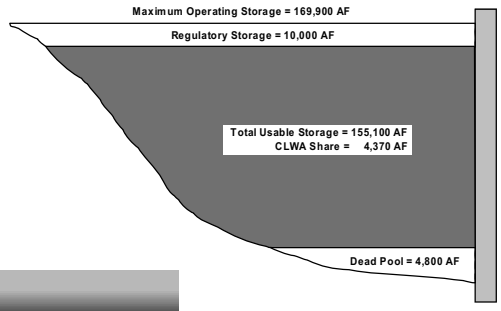
- Three SWP emergency outage scenarios considered:
  - Levee breach in Delta
  - California Aqueduct in San Joaquin Valley
  - West Branch Aqueduct
- Worst-case outage: West Branch Aqueduct
  - No SWP or other supplies through aqueduct
  - No supplies from groundwater banking in San Joaquin Valley

## Catastrophic Supply Interruption

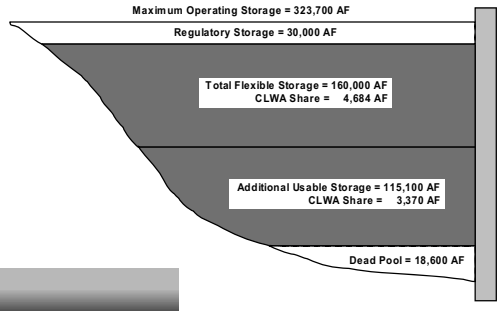
Outage assumptions:

- Six-month outage
- Occurs in normal/average year
- Supplies limited to:
  - Local Supplies
    - Groundwater
    - Recycled water
  - CLWA share of storage in West Branch reservoirs
    - Flexible storage
    - Emergency storage

## Pyramid Lake Storage



## Castaic Lake Storage




## Six-Month West Branch Aqueduct Outage: Water Supplies and Demand (AF)

| Water Supply Sources | 2015 | 2020 | 2035 | 2050 |
|---|---|---|---|---|
| **Local Supplies** | | | | |
| Existing Supplies | | | | |
| Groundwater | 22,200 | 22,200 | 22,700 | 22,700 |
| Recycled Water | 120 | 120 | 120 | 120 |
| Planned Supplies | | | | |
| Future Groundwater | 1,900 | 7,350 | 8,850 | 10,350 |
| Recycled Water | 370 | 1,020 | 3,850 | 7,870 |
| **Total Local Supplies** | **24,590** | **30,690** | **35,520** | **41,040** |
| | | | | |
| **SWP West Branch Storage Available** | | | | |
| SWP Flexible Storage Accounts | 6,060 | 4,680 | 4,680 | 4,680 |
| Emergency Storage | | | | |
| Pyramid Lake | 4,370 | 4,370 | 4,370 | 4,370 |
| Castaic Lake | 3,370 | 3,370 | 3,370 | 3,370 |
| **Total West Branch Storage** | **13,800** | **12,420** | **12,420** | **12,420** |
| | | | | |
| **Total Local Supplies and West Branch Storage** | **38,390** | **43,110** | **47,940** | **53,460** |
| | | | | |
| **Demands** | | | | |
| Total Demand w/o Conservation | 40,035 | 44,242 | 56,863 | 69,484 |
| **Total Demand w/ Conservation** | **36,172** | **35,954** | **48,447** | **60,939** |
| | | | | |
| **Additional Supply and/or Conservation Required** | **-** | **-** | **507** | **7,479** |
| As Percent of Demand | 0% | 0% | 1% | 11% |

## SBX7-7 Calculations and Water Conservation Accounting

## SBX7-7 Calculations

- All values reported in UWMP by purveyors are required in statute passed in late 2009
- Methodologies developed through a DWR public committee process also required in statute; Kennedy/Jenks is a committee member
- Demand reduction targets calculated for each retail purveyor
- Purveyors may reach targets by combination of water conservation and recycled water programs

## Water Conservation Accounting

- Estimates of future savings made by reviewing a wide variety of water conservation measures and programs, and then applying industry-accepted savings factors to them
- Saving factors are determined by in-depth technical studies, mainly done by the California Urban Water Conservation Council (CUWCC) and the American Waterworks Association
- CUWCC reports all savings calculations for its signatory agencies to SWRCB annually
- Detailed SCV Water Use Efficiency Strategic Plan is implementation plan for demand reductions

## SBX7-7 Calculations and Water Conservation Accounting

- Document website links
  - SBX7-7 Methodologies: http://www.water.ca.gov/wateruseefficiency/sb7/committees/urban/u3/
  - CUWCC SWRCB Report: http://www.cuwcc.org/about/annual-reports
  - SCV Water Use Efficiency Strategic Plan: http://www.scvh2o.org/ http://www.clwa.org/about/publications.cfm

## Chlorides/AWRM

- Imported Water Quality
  - Chloride TMDL
  - Alternative Water Resources Management Program (AWRM)
  - SWP Water Quality Modeling

## Chlorides (continued)

- Imported Water Quality
  - Chloride TMDL (2005) – 100 mg/L from Saugus/Valencia WRPs
- Alternative Water Resources Management Program (AWRM) (2008)
  - Established conditional site specific objectives for chloride;
  - Provides water quality and water supply benefits, and protects biological resources;
  - SWP Water Quality Modeling

## Santa Clarita Valley Urban Water Management Plan

**Directors' Question and Answer Period**

Santa Clarita Valley
Urban Water Management Plan

Next Steps

# Consultant Team Resumes
## Public Outreach Record

# 2010 Santa Clarita Valley
# Urban Water Management Plan

# Lynn M. Takaichi, P.E.

## Chairman

### Education

MS in Civil Engineering (Sanitary), University of California, Berkeley, 1972
BS in Civil Engineering, University of California, Berkeley, 1971
Special Study in Environmental Impact Assessment, University of California
Study in City and Regional Planning, University of California
Study in Water Resources Planning Civil Defense Preparedness Agency, Certificate of Achievement in Multi-Protection Design, University of Hawaii

### Registration

Civil Engineer in California

### Professional Summary

Mr. Takaichi is responsible for major planning and design projects, particularly assignments involving complex institutional and financial arrangements. He has directed a wide range of water projects including water resource studies, water system master plans, water treatment investigations, water facilities design and utility management plans. In addition, he has managed the preparation of numerous environmental impact assessments.

Mr. Takaichi has particular expertise in complex institutional arrangements and he works closely with specialized legal counsel, financial consultants, and water managers. His experience includes water agency formation, drafting of enabling legislation, negotiation of water supply and water service agreements, development of annexation policies and agreements, and management of a wide variety of water programs. He also has expertise in water system appraisals and has assisted numerous public agencies with the acquisition of investor-owned utilities.

#### Water Demand Models

- Comprehensive water system plan update for the Lakehaven Utility District.
- Modeling of water and reclaimed water systems for the Cambria Community Services District.
- Comprehensive water system master plan update for the City of Oxnard.
- Comprehensive water plan and capital improvement program ($380 million) for the Castaic Lake Water Agency.
- Water master plan for the City of Chino.
- Water Supply Reliability Plan Update and Optimization Model for the Castaic Lake Water Agency.
- Integrated Regional Water Management Plan for the Antelope Valley for the County of Los Angeles.
- Water Demand Model for the Mojave Water Agency.

#### Water Resource Studies

- Water Supply Reliability Evaluation for the San Gorgonio Pass Water Agency.
- Strategic planning consultant for local water resources development for the Los Angeles Department of Water & Power.

- Expert witness for water rights valuation for Squaw Creek Resort.
- Integrated Regional Water Management Plan for the Antelope Valley for the County of Los Angeles.
- Water Supply Reliability Plan Update and Optimization Model for the Castaic Lake Water Agency.
- Alternative Water Management Plan for the Santa Clara River for the Los Angeles County Sanitation Districts.
- Negotiation of numerous water transfer and exchange agreements for public and private clients.
- Evaluation of potential water marketing concepts at Lake Elizabeth for Ridgetop Ranch Properties.
- Peer review of SB 610/221 Water Supply Assessment for the Centennial Development (27,000 homes).
- Numerous groundwater evaluations and groundwater management plans.
- Preparation of numerous urban water management plans. Among these are plans for the Antelope Valley, Castaic Lake Water Agency, Hi-Desert Water District, City of Oxnard, City of Santa Paula, and Twentynine Palms Water District.
- Feasibility Evaluation of Alternative Spreading Facilities at the Cucamonga Spreading Grounds for the San Antonio Water Company.
- Evaluation of water banking requirements (Water Supply Reliability Plan) for the Castaic Lake Water Agency.
- Strategy Development for the Santa Ana River Recharge Facilities for the San Bernardino Valley Water Conservation District.
- Water resource evaluation of the Antelope Valley.
- West Ventura County water supply reliability study for the cities of Ventura and Oxnard.
- Water Resources Plan for the Cambria Community Services District.
- Concept Plan for the restoration of the Santa Rosa Basin for the Camrosa Water District.
- McGrath Lake preliminary watershed study for the McGrath State Beach Area Trustee Council.
- Water production alternatives study for the City of Camarillo.
- Evaluation of supplemental water supplies for the Nipomo Community Services District.
- Baseline water supply study for the Cambria Community Services District.
- Preliminary evaluation of the potential use of freeway dewatering water as a water supply for the City of Downey.
- Water resources study for the City of Santa Paula.
- Water Resources Element (LA County) of the Santa Clara River Enhancement and Management Plan for the Castaic Lake Water Agency.
- Optimization study of state water importation into Ventura County.
- Evaluation of potential water resources for the Hidden Valley Municipal Water District.
- Water resources evaluation and environmental assessment of 200,000 acres in Hawaii for the Soil Conservation Service.

## Affiliations

American Society of Civil Engineers
American Water Works Association
National Society of Professional Engineers
Society of American Military Engineers
Water Environment Federation

National Association of Corrosion Engineers

## Publications

Levi Brekke, Milton D. Larsen, Mary Ausburn, and Lynn Takaichi. 2002. *Suburban Water Demand Modeling Using Stepwise Regression.* Journal – American Water Work Association, October 2002.

# Mary Lou Cotton, C.C.P.

## Technical/Policy Advisor and QA/QC

### Education

MS, Geological Sciences, University of Southern California
BS, Biological Sciences, University of Southern California

### Registrations

Certified Water Conservation Practitioner, AWWA-CA/NV

### Affiliations

California Urban Water Conservation Council
American Water Works Association, Water Conservation Certification Committee
Association of California Water Agencies, Water Use Efficiency and Communications Committees

### Professional Summary

Mary Lou Cotton is a water resources planning and water conservation expert, with over 17 years of management experience with water agencies statewide, specifically in conducting water resource planning and management programs including surface water and groundwater investigations; water transfer, banking and exchange transactions and agreements; water conservation planning and management; master planning and design studies; water quality and hazardous waste investigations; and supporting the preparation of CEQA Compliance documents and obtaining project permits. Ms. Cotton is working in an advisory capacity for several clients on a wide variety of water banking (supply reliability) programs, as well as water transfers or exchanges for short-term and long-term water supplies. In addition, Ms. Cotton assists the State Water Contractors in an advisory capacity on Bay-Delta matters and is also serving as the General Manager of the State Water Project Contractors Authority.

Ms. Cotton has served on the California Urban Water Conservation Council for over a dozen years, as representative for Council members Kern County water Agency, Castaic Lake Water Agency and now Kennedy/Jenks Consultants. She has served on the Council Steering Committee for eight years, and is currently Secretary/Treasurer of the organization; this experience has made her extremely familiar with the requirements of the Memorandum of Understanding Regarding Urban Water Conservation in California (MOU). Ms. Cotton is also a member of the Association of California Water Agencies Water Use Efficiency and Communications Committees. She is an AWWA registered Level 1 Water Conservation Practitioner and currently serves on the AWWA Water Conservation Certification Committee.

This wide experience has made Ms. Cotton an expert on all aspects of California water management policy and practice. She has participated in numerous high-level efforts regarding water conservation in California, including the CALFED Bay-Delta Program Water Use Efficiency advisory committee and the Department of Water Resources Urban Water Management Plan guidebook advisory committee, and has worked on various pieces of conservation-related legislation. In addition, she has served on numerous CUWCC project advisory committees and participated in the 1997 and 2008 revisions of the MOU.

### Project Experience

**2010 Urban Water Management Plan Update, Castaic Lake Water Agency, Santa Clarita, CA.** Project Manager for preparation of the 2010 regional Urban Water Management Plan (UWMP), which is being completed on behalf of CLWA and its four retail purveyors. The water supply analysis includes the SWP, local groundwater, reliability programs, other imported supplies and recycled water. The UWMP also includes an evaluation of the various alternative water management strategies and supplies available to the Valley and based on the evaluation, will recommend water supply strategies.

**2010 Urban Water Management Plan Update, Mojave Water Agency, Apple Valley, CA.** QA/QC. Kennedy/Jenks is currently providing planning services to product Mojave Water Agency's (MWA) 2010 UWMP with particular focus on Best Management Practices (BMPs) and new regulations. A State Water Project contractor, MWA's plan is to be completed in cooperation with numerous retailers from within their service area. This update will also include analysis of the various agencies' water conservation programs status for the purposes of evaluating compliance with AB 1420 and SBX7, in coordination with the local Alliance for Water Awareness and Conservation.

**2010 Urban Water Management Plan Update, Western Municipal Water District, Riverside County, CA.** QA/QC for preparation of the District's 2010 UWMP update, including water supplies, demands, and conservation measures.

**2010 Urban Water Management Plan Update for Improvement District 4, Kern County Water Agency, Bakersfield, CA.** Project Manager for preparation of the 2010 regional UWMP, for the Kern County Water Agency's (KCWA) Improvement District No. 4 (ID4), which represents the urban portion of KCWA's State Water Project wholesale service area. The water supply analysis includes the SWP, local groundwater, reliability programs, other imported supplies and recycled water. In addition to the water supply analyses required by the UWMP Act, this UWMP update will also include analysis of local water conservation program status for the purposes of evaluating compliance with AB 1420 and SBX7.

**2010 Urban Water Management Plan Update, Port Hueneme Water Agency, Port Hueneme, CA.** QA/QC for preparation of the Agency's 2010 UWMP update, which will include 25 years of water supply/demand analysis, new legislative requirements, water supply demand forecasting, Demand Management Measures review and analysis, and contingency planning.

**2010 Urban Water Management Plan Update, City of Port Hueneme, CA.** QA/QC for update of the City's 2010 UWMP. Project included review of the City's existing and future water supplies and demands, water supply reliability, summary of current conservation measures, an evaluation of recommended conservation measures, and an implementation plan.

**2010 Urban Water Management Plan Update, San Bernardino Valley Municipal Water District, San Bernardino, CA.** QA/QC for update of the District's 2010 UWMP with particular focus on Best Management Practices (BMP's) and new regulations. The work will also include coordination with California Department of Water Resources reviews and approvals.

**2010 Urban Water Management Plan, Lake Arrowhead Community Services District, Lake Arrowhead, CA.** Project Manager for production of this retail water purveyor's 2010 UWMP update.

**2010 Urban Water Management Plan, North of the River Municipal Water District and Oildale Mutual Water Company, Kern County, CA.** QA/QC for preparation of the 2010 UWMP update for Kern County Water Agency Improvement District No. 4's (ID4) participating retail purveyors, North of the River

Municipal Water District and Oildale Mutual Water Company. The UWMP update will provide information on ID4's wholesale service area and operations and will include data and information about the ID4 retail purveyor service areas and operations. The UWMP update will also include information on ID4 retail purveyor service areas that recover groundwater within ID4.

**2010 Urban Water Management Plan, City of Ventura, CA.** Project Manager for production of the City's 2010 UWMP update. The water supply analysis includes local groundwater, reliability programs, other imported supplies and recycled water. In addition to the water supply analyses required by the UWMP Act, this UWMP update will also include analysis of local water conservation program status for the purposes of evaluating compliance with AB 1420 and SBX7.

**2010 Urban Water Management Plan, Central Coast Water Authority, Ventura County, CA.** Currently providing QA/QC and third-party technical review for the CCWA's 2010 UWMP update.

**2010 Urban Water Management Plan Update, Western Municipal Water District, Riverside County, CA.** QA/QC for preparation of the District's 2010 UWMP update, including water supplies, demands, and conservation measures.

**Water Use Efficiency Master Plan, Western Municipal Water District, Riverside County, CA:** Project Manager. In concert with the growing emphasis on water use efficiency programs, WMWD commissioned the preparation of a Water Use Efficiency Master Plan to comprehensively address the long term use of water resources within their service area by adopting objectives, policies and programs designed to promote innovative emerging technologies and practices, as well as proven and cost-effective conservation measures. Ms. Cotton managed and authored several sections of the Plan, conducted an evaluation of water conservation measures through development of a weighted scoring matrix, and reviewed and assisted in the production of the Master Plan.

**Water Conservation Master Plan, City of Riverside, Riverside County, CA:** Technical Advisor & QA/QC. Recently selected for the preparation of a Water Conservation Master Plan to comprehensively address the long term use of water resources within the City's service area by adopting objectives, policies and programs designed to promote innovative emerging technologies and practices, as well as proven and cost-effective conservation measures.

**Integrated Water Resources Management Plan (IWRMP), Western Municipal Water District, Riverside, CA:** Project Team Member. Preparation of an integrated water resources plan for the Western Municipal Water District and retail agencies within the District (Riverside County). Project involved assistance to, and coordination of, a six member management group and approximately 20 stakeholders. Developed materials for stakeholder education, assisted with identification of water management objectives, and evaluation of projects put forth by stakeholders for consistency with objectives, financial feasibility, and compliance with State mandated requirements.

**Upper Santa Clara Integrated Water Resources Management Plan, County of Los Angeles, CA:** Project manager for the preparation of an integrated water resources plan for the Upper Santa Clara River Region (Los Angeles County). Project involves assistance to, and coordination of, an eight member management group and approximately 30 stakeholders. Develop materials for stakeholder education,

assist with identification of water management objectives, and evaluate projects put forth by stakeholders for consistency with objectives, financial feasibility, and compliance with State mandated requirements.

**Hollister Area 2008 Urban Water Management Plan, Sunnyslope County Water District, City of Hollister, San Benito County Water District, CA.** Provided QA/QC for a collaborative Urban Water Management Plan (UWMP) Update by the Sunnyslope County Water District (Sunnyslope), City of Hollister (City), and the San Benito County Water District (District). The latest amendment to the Plan incorporates a water shortage contingency plan, alternative water conservation measures and water reclamation programs.

### Experience Prior to Kennedy/Jenks

**Castaic Lake Water Agency, Water Resources Manager, Santa Clarita, CA**. At the direction of the General Manager, work consisted of managing all aspects of the Agency's water resources projects, specifically dealing with water supply issues at the state and local levels. Prepared, facilitated, reviewed and submitted all water sale/transfer contracts, various agreements, and attendant resolutions to the Agency's Board of Directors and the Department of Water Resources. Prepared all documentation and conducted negotiations for three separate groundwater banking projects. Prepared in-house technical reports and other materials, including overseeing the production of the Agency's Urban Water Management Plan. Served in scientific advising capacity in reviewing all environmental regulatory documentation, particularly in regard to CEQA requirements, including consultant reports and other scientific documents. Served as the Agency's Water Conservation Coordinator; responsible for implementation of water conservation Best Management Practices as contained in the Memorandum of Understanding of the California Urban Water Conservation Council. Responsible for the Agency's public information program and oversee all its aspects. Represented the Agency on various committees, including several State Water Contractors standing committees, the California Urban Water Conservation Council Steering Committee, and the Association of California Water Agencies Communications and Program Committees.

**Castaic Lake Water Agency, Assistant to the General Manager, Santa Clarita, CA.** Worked at the direction of the General Manager, specifically dealing with water supply issues at the state and local levels. Prepared, facilitated, reviewed and submitted water sale/transfer contracts, various agreements, and attendant resolutions to the Agency's Board of Directors. Served in scientific advising capacity in reviewing environmental regulatory documentation, particularly in regard to the CALFED Bay-Delta Program; environmental impact reports; consultant reports and other scientific documents. Served as the Agency's Water Conservation Coordinator; responsible for implementation of water conservation Best Management Practices as contained in the Memorandum of Understanding of the California Urban Water Conservation Council. Responsible for the Agency's public information program. Prepared, compiled, wrote, and edited the Agency's quarterly newsletter and other Agency public information materials. Prepared in-house technical reports and other materials, including the Agency's Urban Water Management Plan. Represented the Agency on various committees, including several State Water

Contractors standing committees and the Association of California Water Agencies Communications and Program Committees.

**Kern County Water Agency, Water Resources Planner, Bakersfield, CA.** Attached to the Agency's Water Resources Department, specifically dealing with water supply issues, at both the state and local levels. Prepared, facilitated, reviewed and submitted water sale/transfer contracts, various agreements, and attendant resolutions to the Agency's Board of Directors. Served in scientific advising capacity in reviewing environmental regulatory documentation, particularly in regard to the CALFED Bay-Delta Program; environmental impact reports; consultant reports and other scientific documents. Served as the Agency's Water Conservation Coordinator; assist the Agency's Urban Bakersfield Advisory Committee. Responsible for implementation of water conservation Best Management Practices as contained in the Memorandum of Understanding of the California Urban Water Conservation Council. Also assisted with the Agency's participation in the AB3616 Agricultural Water Management Council. Responsible for majority of the Agency's public information program. Prepared, compiled, wrote, and edited the Agency's monthly newsletter. Prepared and wrote Agency public information materials. Prepared in-house technical reports and other materials including the Agency's Urban Water Management Plan. . Represented the Agency on various committees, including several State Water Contractors standing committees and budget review committee, the California Water Clearinghouse (for CALFED and Bay-Delta issues), the Association of California Water Agencies Communications (vice-chair) and Program Committees, and the Executive Committee of the Water Association of Kern County.

*RESUME*

# Joseph C. Scalmanini

***Specialization:***

Forty-three years of practice in groundwater development and management, and oil and gas production. Assessments of groundwater resources and implementation of groundwater basin management in various areas throughout California; groundwater development and management encompassing well design, construction, operation, and maintenance; groundwater monitoring as part of basin management and as part of groundwater contamination investigations; artificial groundwater recharge facilities and practices; injection of industrial waste water; development of brackish and saline groundwater for municipal (desalination) and industrial water supply; water supply master planning.

***Professional Registration:***

Registered Civil Engineer, California, CE 28233

***Academic Degrees:***

| | |
|---|---|
| M.E. Civil Engineering, University of California, Davis, CA | 1984 |
| B.S. Mechanical Engineering, University of Santa Clara, Santa Clara, CA | 1967 |

***Professional Experience:***

| | |
|---|---|
| Luhdorff and Scalmanini, Consulting Engineers, Woodland, CA | |
| President | 2004 - Present |
| Principal Partner | 1989 - 2004 |
| Partner | 1980 - 1989 |
| University of California, Davis, Davis, CA | |
| Associate Development Engineer | 1973 - 1979 |
| Shell Oil Company | |
| Mechanical and Facilities Engineer | 1967 - 1973 |

***Representative Professional Assignments:***

Consultant to water districts and utilities, municipalities, corporate and individual farming interests, corporate and private industry, and other engineering firms on groundwater development, utilization and management, including preparation and implementation of AB 3030 and other groundwater management plans, and plans for supplemental water supply and conjunctive use management. Consultation with public agencies, corporate and private concerns regarding groundwater contamination, its identification, monitoring, and management. Consultation with legal profession on technical aspects of groundwater development and utilization, including all aspects of groundwater basin yield and management, well design and construction, and application of pumping equipment.

***Representative Professional Assignments continued:***

Mr. Scalmanini directed and conducted a ground-water basin assessment in the Santa Maria Valley, including developing plans for conjunctive use of imported SWP water, recaptured return flows and increased artificial recharge of natural stream flow. After the adjudication of the Santa Maria Valley Groundwater Basin, he was appointed Basin Engineer, responsible for monitoring basin conditions and annually reporting to the court on the state of the basin.

Mr. Scalmanini directed the development of an alternative basin management plan for diversion of stream flow to replace coastal groundwater pumping and halt historical seawater intrusion in the Salinas Valley. He has developed several ground-water substitution programs for both public and private farming interests in Sacramento, Yolo and Sutter Counties, and authored Ground-Water Management Plans for these respective areas.

Mr. Scalmanini served as the court-appointed technical advisor to the Special Referee in the Chino Basin for development and implementation of an Optimum Basin Management Program to preserve and potentially increase the safe yield of the aquifer system, incorporate conjunctive use within storage limits in the aquifer, and make beneficial use of degraded water quality in the lower end of the basin by desalting ground water for future domestic water supply.

Mr. Scalmanini is directing ongoing engineering and hydrogeological analyses of local groundwater and imported State Water Project water supplies in the Upper Santa Clara River Area (Santa Clarita Valley) in Los Angeles County, including the preparation of annual Water Reports over the last eleven years. As part of that work, Mr. Scalmanini developed a cooperative technical program to integrate water resource analysis with the adjacent downstream basins, and has coordinated technical analysis of sustainable yield of the groundwater basin for ongoing agricultural, municipal, and other local water requirements since 2001. Mr. Scalmanini is the primary author of the AB3030 Groundwater Management Plan that has been adopted for the basin. He also prepared the Amendment to the 2000 Urban Water Management Plan for the State Water Contractor and all the water purveyors in the Valley to specifically address the adequacy of groundwater supplies in the wake of perchlorate contamination and the plan to contain contaminant migration while restoring contaminated wells to water supply service through the installation of wellhead treatment. He subsequently co-prepared an analysis of groundwater basin sustainable yield and a subsequent analysis of the adequacy of groundwater supply after another Alluvial well was impacted by perchlorate. He prepared the groundwater components of the 2005 Urban Water Management Plan, which was based on all the preceding analyses. Most recently, Mr. Scalmanini co-prepared an updated analysis of sustainable groundwater basin yield, including consideration of potential climate change impacts, for use in ongoing basin management and in the 2010 Urban Water Management Plan.

Mr. Scalmanini also currently serves as Chairman of the Ground-Water Committee that is developing and analyzing the potential for development of additional ground water throughout the Sacramento Valley as part of the Sacramento Valley Water Management Agreement reached in Phase 8 of the SWRCB Bay-Delta Water Rights Hearings.

***Professional Affiliations:***

National Ground Water Association
- Association of Ground Water Scientists and Engineers

American Water Works Association
California Groundwater Association
Groundwater Resources Association of California

***Public Service:***

- **Yolo County Aggregate Resources Committee (1975-79)**, Alternate delegate, hydrologist - analysis of impacts and development of management plans for extraction of aggregate from Cache Creek basin.
- **California Tenth Biennial Conference on Ground Water (1975)**, Member, Planning Committee
- **Chancellor's Campus (Univ. of Calif., Davis) Water Committee (1976-78)**, Staff Engineer - analysis of water supplies and uses, projection of requirements, development of conservation and management plans.
- **City of Davis Water Planning and Conservation Committee (1977-79)**, Chairman - analysis of water supplies and uses, projection of requirements, consideration of alternative supplies, development of conservation and management plans.
- **Yolo County Water Resources Task Force (1979)**, Member - development of county-wide master water plan.
- **Pacific Gas and Electric Co. ACT$^2$ Irrigation Pumping Demonstration Project (1992)**, Technical Advisor
- **Association of California Water Agencies (1994-1996)**, Member - Groundwater Committee
- **Cache Creek Conservancy**, **(2000-2002)**, Director

***Teaching Activities:***

Course Coordinator and Instructor University Extension Courses, University of California, Davis:

Concepts of Ground Water Management (1974, 1976, 1978, 1981)
Legal and Policy Considerations in Ground Water Management (1975, 1976, 1980)
Water Supply Wells and Pumps (1977, 1978,1981, 1983, 1985, 1986)
Groundwater Law, Hydrology and Management (2001-2010)

Instructor, University of California, Davis, Water Science 198, Introductory Hydraulics (1977, 1978, 1979)

Lecturer, University of California, Davis, Water Science 2, 140, 160; Ecology 230; Civil Engineering / Geology 175 (1975 - 1979)

Lecturer on Aquifer Characteristics, Well Hydraulics, and Groundwater Development, in Technical Training Classes at the U.S. Army Corps of Engineers' Hydraulic Engineering Center, Davis, CA.

***Publications and Presentations:***

Scott, V.H. and J.C. Scalmanini, **Water Wells and Pumps: Their Design, Construction, Operation, and Maintenance**, University of California Division of Agricultural Sciences Bulletin No. 1889, 1977.

Helweg, O.J., Scott, V.H., and J.C. Scalmanini, **Improving Well and Pump Efficiency**, American Water Works Association, 1983.

***Publications and Presentations continued:***

Scalmanini, J.C., and Scott V.H., **Design and Operational Criteria for Artificial Groundwater Recharge Facilities**, Water Science and Engineering Paper No. 2009, University of California, Davis, 1979.

Scalmanini, J.C., Scott, V.H., and O.J. Helweg, **Energy and Efficiency in Wells and Pumps**, presented at Twelfth Biennial Ground Water Conference, 1979.

Scalmanini, J.C., Johnson Jr., R.M., and E.E. Luhdorff Jr., **Development of a Groundwater Monitoring Program as a Basis for Coastal Groundwater Basin Management**, presented at the Fall Conference, American Water Works Association, CA-NV Section, 1983.

Scalmanini, J.C., **3030 Hindsight and 2020 Foresight, Actual Groundwater Management Experience Over the Last 15 Years, Soquel Creek Water District**, presented at the Association of California Water Agencies' Groundwater Management Conference, March 1994.

Scalmanini, J.C., **Legal and Technical Issues Related to Surface Water and Groundwater Interaction**, presented at the Groundwater Resources Association's California Ground Water & Efficient Usage for the Year 2000 and Beyond, October 1998.

Scalmanini, J.C., A. Schneider, and V. Cahill (panel presentation), **Groundwater Classification: Is the State Water Resources Control Board's Jurisdiction Over Ground Water Changing?**, presented at the Water Education Foundation's 2000 Update on Water Law and Policy, July 2000.

Scalmanini, J.C., **What the Heck's a Sub-Basin? Defining Basins and Sub-Basins**, presented at the Association of California Water Agencies' Groundwater Management: Will CalFed Help or Hinder Workshop, November 2000.

Scalmanini, J.C., **"Groundwater Law, Policy and Science: What can Be Done About The Disconnect",** presented at the Water Education Foundation's 2005 Water Law and Policy Briefing, San Diego, July 2005.

# *Nancy Clemm, P.E.*

## WORK SUMMARY

Nancy Clemm is a civil engineer with 30 years water resources planning experience, including 20 years working primarily on State Water Project (SWP) and Bay/Delta issues. Ms. Clemm is very familiar with SWP system operations, including reservoir, Delta, and conveyance facility operations, as well as with the Department of Water Resources (DWR) planning model used to estimate SWP delivery reliability. She has assisted in the preparation of numerous water supply planning documents, focused primarily on SWP supplies and facilities, including the 2005 and 2010 Urban Water Management Plans (UWMP) for Castaic Lake Water Agency (CLWA), the 1995 Regional Urban Water Management Plan and 1996 Integrated Water Resources Plan for the Metropolitan Water District of Southern California (MWD), and several environmental impact reports (EIR) dealing with SWP supplies and/or use of SWP conveyance facilities.

## EXPERIENCE

**WATER RESOURCES CONSULTANT**, Los Angeles, California, 1999 - Present.
(Self-employed)

**2005 and 2010 UWMPs:** For CLWA, participated in preparation of 2005 and 2010 UWMPs, primarily focused on determining availability of SWP water supplies and assessing overall supply reliability.

**Monterey Plus EIR:** For MWD, provided technical support to SWP contractor representatives on advisory committee to DWR regarding water supply analyses and SWP contract issues, for preparation of new environmental document for Monterey Amendment to SWP water supply contract.

**Water Program EIRs:** For CLWA, assisted in preparation of EIRs for water programs involving use of SWP conveyance facilities, for CLWA's Rosedale Rio Bravo Water Storage District Water Banking Program, and its water acquisition from Buena Vista Water Storage District/Rosedale Rio Bravo Water Storage District.

**SWP Table A Transfer EIR:** For CLWA EIR for permanent transfer of SWP Table A amount, conducted SWP water supply reliability and water allocation analyses using data from DWR model studies, performed SWP aqueduct capacity rights and availability analysis, and prepared overall CLWA supply reliability assessment.

**SWP Water Operations and Water Transfers:** For State Water Contractors (SWC), participating in SWC Water Operations Committee, addressing SWP annual water supply and operational issues; and in SWC Water Transfers Committee, reviewing and providing recommendations regarding approval of proposed SWP contractor transfers and exchanges.

**Reservoir Reoperation Report:** For CALFED, drafted report on potential water supply and environmental benefits of reoperation of hydroelectric facilities in northern and central California.

**Hydrologic Model:** For Salt River Project, assisted with enhancements to runoff forecasting model, including making programming revisions, assisting with addition of user-interface, and writing user's manual and program documentation.

**METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA**, Los Angeles, California, 1991 - 98. (Senior Engineer, SWP Branch, 1993 - 98; Engineer, Bay Delta Branch, 1992; Engineer, SWP Branch, 1991)

**SWP Water Supply Analyses:** Assisted in preparation of several planning documents, including 1995 Regional Urban Water Management Plan and 1996 Integrated Water Resources Plan. Conducted numerous additional analyses to estimate future availability of SWP supplies, and to evaluate proposed SWP operational constraints, future water supply options, and SWP contract provisions.

**SWP Supply Operations:** Participated in SWC committee monitoring DWR's reservoir and Delta operations, addressing operational issues and various contractor issues such as equity and current supply versus risk of future shortage.

**Water Contracts:** Provided significant support in development of Monterey Amendment to SWP contract, including providing technical support for urban contractor negotiating team; assisting in amendment drafting and completion of environmental documentation; and resolution of implementation issues. Participated in drafting numerous agreements between MWD, DWR, and other agencies related to establishment of and water delivery to groundwater banking and exchange programs.

**SWP Supply Planning:** Participated in SWC committee monitoring DWR planning efforts to enhance SWP supplies, including review of proposed projects' feasibility, supply yield, water quality, environmental effects and mitigation, and costs.

**SALT RIVER PROJECT**, Phoenix, Arizona, 1981 - 90. (Senior Water Resources Analyst, 1985 - 90; Engineer III, 1983 - 84; Rotational Engineer, 1981 - 82)

**Water Supply Analyses:** Worked extensively with reservoir operations simulation model of Salt River Project system to conduct supply studies, to estimate future supplies and evaluate supply impacts given proposed physical and operational changes. Made major programming modifications and wrote program documentation.

**Other Computer Modeling:** Developed runoff forecasting model to estimate real-time runoff to reservoir system, including all model design, programming, and documentation. Assisted in development of water demand forecasting model based on land use, including model design, development, and implementation.

**Water Contracts / Accounting:** Developed detailed knowledge of existing water delivery and reservoir storage contracts. Participated in several negotiations for new water contracts, primarily concerning water delivery, accounting, and measurement.

## EDUCATION

Bachelor of Science in Civil Engineering, Arizona State University, 1981.
Graduate courses in water resources modeling, Arizona State University.

## REGISTRATION

Civil Engineer, California and Arizona

# J. Lauren Everett

## Water Resources Specialist

### Education

B.S., Environmental Studies, University of California, Santa Barbara, 1999
M.S., Donald Bren School of Environmental Science and Management University of California, Santa Barbara, 2001

### Professional Summary

Ms. Everett is a Water Resources Specialist, with over 8 years of experience in environmental and regulatory compliance providing technical planning support for a diverse range of water resource projects. Ms. Everett is currently involved with implementing DWR's Proposition 84 Integrated Regional Water Management Grant Program, urban water management planning, and supply and demand forecasting. Lauren has served as the liaison between planning, and engineering teams, and appreciates the teamwork and communication skills needed to successfully integrate planning and design concepts to meet regulatory requirements. She has also served as the project manager and project specialist for numerous water resource studies in Southern California.

### Professional Experience

- *Castaic Lake Water Agency (CLWA), 2010 Urban Water Management Plan Update, Santa Clarita, CA:* Preparation of the 2010 regional Urban Water Management Plan (UWMP) is being completed on behalf of CLWA and its four retail purveyors. The water supply analysis includes the SWP, local groundwater, reliability programs, other imported supplies and recycled water. Ms. Everett is the technical lead on the UWMP development.

- *2010 Urban Water Management Plan Update for Improvement District 4, Kern County Water Agency, Bakersfield, CA.* Preparation of the 2010 regional UWMP, for the Kern County Water Agency's (KCWA) Improvement District No. 4 (ID4), which represents the urban portion of KCWA's State Water Project wholesale service area includes the SWP, local groundwater, reliability programs, other imported supplies and recycled water. Ms. Everett is the technical lead on the UWMP development.

- *Castaic Lake Water Agency (CLWA), Upper Santa Clara River IRWMP Proposition 84 Implementation Grant Application, Santa Clarita, CA:* The Project is the preparation of an Implementation Grant application requesting funds from the Proposition 84 Integrated Regional Water Management (IRWM) Implementation Grant Program for five Candidate Projects within the Upper Santa Clara River IRWM Plan. Ms. Everett managed the effort and was the technical lead on the application preparation.

- *Castaic Lake Water Agency (CLWA), Upper Santa Clara River IRWMP Proposition 84 Planning Grant Application, Santa Clarita, CA:* The Project is the preparation of a Planning Grant application requesting funds from the Proposition 84 IRWM Planning Grant Program for the 2010 Update of the Upper Santa Clara River IRWM Plan. Ms. Everett managed the effort and was the technical lead on the application preparation.

- *Los Angeles County Department of Public Works, Antelope Valley Integrated Regional Water Management Plan (Plan):* Ms. Everett managed the development of the Plan, which was

designed with a regional focus for the sustainable management of water resources in the Antelope Valley Region for the next twenty-five years. Over 40 agencies within the Antelope Valley participated in the planning process.

- *Los Angeles County Department of Public Works, Antelope Valley Integrated Regional Water Management Plan, Proposition 50 Round 2 Step 1 & Step 2 Grant Application, Antelope Valley, CA:* Kennedy/Jenks submitted a proposal for an implementation grant requesting $25 million for seven projects that targeted reducing the mismatch between supply and demand projected for the Region by 2035. Ms. Everett managed the preparation of the Step 1 and Step 2 grant applications.

- *Los Angeles County Department of Public Works, Antelope Valley Integrated Regional Water Management Plan, Region Acceptance Process (RAP) Application, Antelope Valley, CA:* Kennedy/Jenks submitted a proposal successfully defending the IRWMP Region's boundary to the Department of Water Resources allowing the IRWMP Region to remain in the Proposition 84 IRWMP Program. Ms. Everett managed the RAP effort.

- *Kern County Water Agency, Tulare Lake Basin Portion of Kern County Integrated Regional Water Management Plan (Plan), Kern County, CA:* Ms. Everett is currently assisting in the development of the integrated regional planning document, and providing assistant management responsibilities. Over 40 agencies within the Kern Region are participating in the Kern Region IRWM planning process.

- *Kern County Water Agency, Tulare Lake Basin Portion of Kern County Integrated Regional Water Management Plan, Region Acceptance Process Application, Kern County, CA:* Kennedy/Jenks submitted a proposal successfully defending the IRWMP Region's boundary to the Department of Water Resources allowing the IRWMP Region to remain in the Proposition 84 IRWMP Program. Ms. Everett managed the RAP effort.

- *Castaic Lake Water Agency (CLWA), Water Supply Reliability Plan Update, Santa Clarita, CA:* The plan and update are needed in order to evaluate the technical, environmental, and economic issues associated with potential water supply reliability projects. Ms. Everett's responsibilities include characterization of the water supply and demands for the region, and general report content.

- *Los Angeles County Department of Public Works, North Los Angeles/Kern County Regional Recycled Water Master Plan Environmental Impact Report, Antelope Valley, CA:* Kennedy/Jenks assisted Environmental Science Associates in preparing the hydrology, hazards and hazardous materials, and geology sections of the Environmental Impact Report. Ms. Everett managed the Kennedy/Jenks team on this effort.

- *Ventura County Waterworks District No. 8 Recycled Water Master Plan, Simi Valley, CA:* This project consists of the design of a recycled water distribution system to serve municipal and industrial customers within the City of Simi Valley. Ms. Everett's responsibilities included characterization of the environmental issues associated with implementing the system, identification of required permits and approvals, and general report coordination.

# *Dana Haasz*

## Project Manager

### Education

M.S., Applied Geography, New Mexico State University, Las Cruces, NM
B.S., Geography and Environmental Science, McGill University, Montreal, Canada

### Affiliations

California Urban Water Conservation Council
Western Water Alliance Steering Committee and Hiring Committee
Technical Advisor to CALFED Appropriate Water Measurement Panel/Agricultural and Urban
Environmental Justice Coalition for Water Steering Committee
Water Education Foundation, Water Leader (2003) and Water Leader Mentor (2009)

### Professional Summary

Dana Haasz has 13 years experience in water conservation, demand modeling and resource planning. She currently manages the water use efficiency projects and programs for Kennedy/Jenks. Projects range from planning, program assessment, demand modeling and helping agencies to meet regulatory requirements, to the development of implementation programs, budgets, monitoring and quantification.

Dana spent the six years as the Water Conservation Administrator at San Francisco Public Utilities Commission. Ms. Haasz has extensive experience in regulatory compliance issues and long-term water supply planning for the retail and wholesale service areas, including planning, organizing, developing and administering retail water conservation programs including the identification, evaluation, and public promotion of conservation with industry, builders, developers, public agencies, customers, and community groups. Ms. Haasz's activities also extended to policy development, from legislative initiatives and statewide conservation issues to development of a revolving loan program and other efficiency-related activities at the local level.

In Ms. Haasz's six years at San Francisco Public Utilities Commission, she directly managed and implemented the growth of the Conservation department from a customer-service based residential rebate program to a multi-faceted approach that includes all customers, various types of incentives and services, outreach, education, policy and coordination with local, regional and state level activities. Her approach towards the expansion of the program was to merge public policy needs with solid business principles and quantified outcomes so as to make obvious and appropriate efficiency decisions for the customer as well as honoring the agency's responsibility to the ratepayer.

Prior to the SFPUC, Dana developed modeling and theoretical skills at the Pacific Institute for Water, Development and Environment where she co-authored an analysis quantifying water conservation potential for the state and policies and programs designed to achieve that goal.

### Project Experience

**2010 Urban Water Management Plans (18 water systems), Golden State Water Company, Rancho Cordova, CA.** Currently providing water conservation services for GSWC's 2010 UWMP update for the 18 water systems that meet the criteria for the requirements of an UWMP. Updates will include analysis of water conservation programs status for the purposes of evaluating compliance with AB 1420 and SBX7, in coordination with the local Alliance for Water Awareness and Conservation.

**2010 Urban Water Management Plan Update, Stockton East Water District, Stockton, CA.** Currently providing water conservation services for preparation of the District's 2010 UWMP update, including water supplies, demands, and conservation measures, as well as addressing AB 1420 and SBX7-7 regulations.

The update will also include a water shortage contingency plan as it applies to Stockton East Water District being an urban water wholesaler.

**Complete Water Conservation and Demand Reduction Program Evaluation, City of Roseville, Roseville, CA.** Developed an implementation plan, including a review of past activities, identification of potential conservation measures, cost benefit analysis, program modeling and design to prepare conservation plan for City of Roseville, that meets the 20x2020 requirements.

**Water Conservation Efficiency Master Plan, City of Riverside, Riverside, CA** developed a conservation implementation program for the City of Riverside. Evaluated Riverside's past water use efficiency program, identified potential conservation measures, performed cost benefit analysis, modeled potential programs and developed a scored options matrix to assist Riverside with efforts to effectively comply the 20x2020 requirements and guide program design and implementation.

**2010 Urban Water Management Plan Update, Castaic Lake Water Agency, Santa Clarita, CA.** Currently providing water conservation services for preparation of the 2010 regional Urban Water Management Plan (UWMP), which is being completed on behalf of CLWA and its four retail purveyors. The water supply analysis includes the SWP, local groundwater, reliability programs, other imported supplies and recycled water. The UWMP also includes an evaluation of the various alternative water management strategies and supplies available to the Valley and based on the evaluation, will recommend water supply strategies.

**2010 Urban Water Management Plan Update, Mojave Water Agency, Apple Valley, CA.** Currently providing water conservation services to produce Mojave Water Agency's (MWA) 2010 UWMP with particular focus on Best Management Practices (BMPs) and new regulations. A State Water Project contractor, MWA's plan is to be completed in cooperation with numerous retailers from within their service area. This update will also include analysis of the various agencies' water conservation programs status for the purposes of evaluating compliance with AB 1420 and SBX7, in coordination with the local Alliance for Water Awareness and Conservation.

**2010 Urban Water Management Plan Update, Western Municipal Water District, Riverside County, CA.** Currently providing water conservation services for preparation of the District's 2010 UWMP update, including water supplies, demands, and conservation measures.

**2010 Park Water Company Urban Water Management Plan and Water Use Efficiency Plan, CA.** Currently providing water conservation services for preparation of the District's 2010 UWMP update, including water supplies, demands, and conservation measures.

**2010 Suburban Water Systems Urban Water Management Plan, Oxnard, CA.** Currently providing water conservation services for preparation of the District's 2010 UWMP update, including water supplies, demands, and conservation measures.

**2010 Urban Water Management Plan Update for Improvement District 4, Kern County Water Agency, Bakersfield, CA.** Currently providing water conservation services for preparation of the 2010 regional UWMP, for the Kern County Water Agency's (KCWA) Improvement District No. 4 (ID4), which represents the urban portion of KCWA's State Water Project wholesale service area. The water supply analysis includes the SWP, local groundwater, reliability programs, other imported supplies and recycled water. In addition to the water supply analyses required by the UWMP Act, this UWMP update will also include analysis of local water conservation program status for the purposes of evaluating compliance with AB 1420 and SBX7.

**2010 Urban Water Management Plan Update, San Bernardino Valley Municipal Water District, San Bernardino, CA.** Currently providing water conservation services for update of the District's 2010 UWMP with particular focus on Best Management Practices (BMP's) and new regulations. The work will also include coordination with California Department of Water Resources reviews and approvals.

**2010 Urban Water Management Plan, Lake Arrowhead Community Services District, Lake Arrowhead, CA.** Currently providing water conservation services for production of this retail water purveyor's 2010 UWMP update.

**2010 Urban Water Management Plan, North of the River Municipal Water District and Oildale Mutual Water Company, Kern County, CA.** Currently providing water conservation services for preparation of the 2010 UWMP update for Kern County Water Agency Improvement District No. 4's (ID4) participating retail purveyors, North of the River Municipal Water District and Oildale Mutual Water Company. The UWMP update will provide information on ID4's wholesale service area and operations and will include data and information about the ID4 retail purveyor service areas and operations. The UWMP update will also include information on ID4 retail purveyor service areas that recover groundwater within ID4.

**2010 Urban Water Management Plan, City of Ventura, CA.** Currently providing water conservation services for production of the City's 2010 UWMP update. The water supply analysis includes local groundwater, reliability programs, other imported supplies and recycled water. In addition to the water supply analyses required by the UWMP Act, this UWMP update will also include analysis of local water conservation program status for the purposes of evaluating compliance with AB 1420 and SBX7.

**2010 Urban Water Management Plan, Central Coast Water Authority, Ventura County, CA.** Currently providing QA/QC and third-party technical review regarding water conservation practices for the CCWA's 2010 UWMP update.

**2010 Urban Water Management Plan Update, Western Municipal Water District, Riverside County, CA.** Currently providing water conservation services for preparation of the District's 2010 UWMP update, including water supplies, demands, and conservation measures.

## Project Experience Prior to Kennedy/Jenks

### Water Conservation Administrator, San Francisco Public Utilities Commission

**Water Saver Program:** Developed market-based approach to conservation programs. The program aimed to secure permanent water savings for large commercial and industrial customers by providing technical support and financial incentive incentives based on the volume of saved water. The program allowed SFPUC to support larger process-oriented uses and other specific needs that are not part of the traditional fixture-based rebate programs. Participants included hotels, hospitals, colleges, and food growers.

**Unaccounted for Water Analysis:** Managed the first large urban agency implementation of the full AWWA M36 Water Loss process. The multi-phase analysis to discover, diagnose, and develop an implementation plan for capturing water system losses consisted of quantification and categorization of losses, identifying cost effective potential recovery and ,disaggregating city zones to prioritize and develop leak detection and repair implementation plan and providing leak detection training to City staff at the SFPUC.

**Data Management:** Managed design and development of database designed to improve the analytic capacity of conservation programs and link activities to water savings - actual and estimated – customer type, spatial information and more. The system also incorporated administrative tasks such as issuing rebates, mailings, inspection scheduling and follow up.

**Low-income Direct Install Program:** Developed high-efficiency toilet (HET) direct-installation and water audit program in coordination with community groups in order to save water in a hard to reach population and mitigate the impacts of rising water rates. The program provided free HETs to single family customers and a voucher program for multi-family residents in low-income communities. Local nonprofit groups were enlisted and community members trained in conservation principles in order to help market the program. program received two grants of $200,000 each, one from the California Department of Water Resources and one from the U.S. Bureau of Reclamation.

**Education:** Developed materials and an implementation plan for a water resources education program that would be compliant with both state and CUWCC requirements.

**Municipal:** Launched municipal audit program with detailed potential efficiency improvements, costs and implementation recommendations.

**Conservation Legislation:** Developed and worked to pass local conservation ordinances including a residential retrofit on resale for ordinance and a replacement ordinance for commercial accounts. Improvements include fixture replacement (toilets, showerheads aerators) and leak repair. Worked with the San Francisco Department of Building Inspection to train City inspectors, develop implementation materials and process.

**Baseline Analysis:** Participated in modeling of baseline use in San Francisco by customer type, potential demand reduction opportunities, costs and implementation options. Preferred alternative became the basis for SFPUC program activities.

**California Urban Water Conservation Council:** Represented Group 1 water agencies as convener of the CUWCC, 2005-2006 / Represented Group 2 Environmental Organizations as convener 2003-2004.

# Third & Final Public Hearing
# June 22, 2011
## Public Outreach Record

# 2010 Santa Clarita Valley
# Urban Water Management Plan

June 8, 2011

Richard J. Bruckner, Director
LA County Dept. Regional Planning
Los Angeles County
1390 Hall of Records
320 West Temple Street
Los Angeles 90012

Subject: Revised Notification of Public Hearings for the 2010 Santa Clarita Valley Urban Water Management Plan

Dear Mr. Bruckner,

In a March 3, 2011, letter we notified you of the upcoming Public Hearings for the 2010 Santa Clarita Valley Urban Water Management Plan. As noted in the letter, the first public hearing was held on Wednesday, March 23, 2011. The second public hearing originally scheduled for Wednesday, May 4, 2011 at 6:15 p.m. was rescheduled to Wednesday, May 18, 2011 at 6:15 PM. The third public hearing has been scheduled on June 22, 2011 will take place at the CLWA Boardroom located on the 1st floor of the Administration Building at the Rio Vista Water Treatment Plant, 27234 Bouquet Canyon Road, Santa Clarita, California 91350.

For additional information regarding the public hearings, please contact me at (661) 297-1600.

Sincerely,

Dirk Marks,
Water Resources Manager

CASTAIC LAKE WATER AGENCY

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APRIL JACOBS

June 8, 2011

Mark Pestrella
LA County Dept. Public Works
Los Angeles County
P.O. Box 1460
Alhambra 91802-1460

Subject: Revised Notification of Public Hearings for the 2010 Santa Clarita Valley Urban Water Management Plan

Dear Mr. Pestrella,

In a March 3, 2011, letter we notified you of the upcoming Public Hearings for the 2010 Santa Clarita Valley Urban Water Management Plan. As noted in the letter, the first public hearing was held on Wednesday, March 23, 2011. The second public hearing originally scheduled for Wednesday, May 4, 2011 at 6:15 p.m. was rescheduled to Wednesday, May 18, 2011 at 6:15 PM. The third public hearing has been scheduled on June 22, 2011 will take place at the CLWA Boardroom located on the 1st floor of the Administration Building at the Rio Vista Water Treatment Plant, 27234 Bouquet Canyon Road, Santa Clarita, California 91350.

For additional information regarding the public hearings, please contact me at (661) 297-1600.

Sincerely,

Dirk Marks,
Water Resources Manager

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June 8, 2011

Chris Stevens, Director
Resource Management Agency
County of Ventura
800 South Victoria Avenue
Ventura, CA 93009-1740

Subject: Revised Notification of Public Hearings for the 2010 Santa Clarita Valley Urban Water Management Plan

Dear Mr. Stevens,

In a March 3, 2011, letter we notified you of the upcoming Public Hearings for the 2010 Santa Clarita Valley Urban Water Management Plan. As noted in the letter, the first public hearing was held on Wednesday, March 23, 2011. The second public hearing originally scheduled for Wednesday, May 4, 2011 at 6:15 p.m. was rescheduled to Wednesday, May 18, 2011 at 6:15 PM. The third public hearing has been scheduled on June 22, 2011 will take place at the CLWA Boardroom located on the 1st floor of the Administration Building at the Rio Vista Water Treatment Plant, 27234 Bouquet Canyon Road, Santa Clarita, California 91350.

For additional information regarding the public hearings, please contact me at (661) 297-1600.

Sincerely,

Dirk Marks,
Water Resources Manager

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June 8, 2011

Jason Smisko
Senior Planner
City of Santa Clarita Planning Division
23920 Valencia Blvd., Suite 300
Santa Clarita, CA 91355

Subject: Revised Notification of Public Hearings for the 2010 Santa Clarita Valley Urban Water Management Plan

Dear Mr. Smisko,

In a March 3, 2011, letter we notified you of the upcoming Public Hearings for the 2010 Santa Clarita Valley Urban Water Management Plan. As noted in the letter, the first public hearing was held on Wednesday, March 23, 2011. The second public hearing originally scheduled for Wednesday, May 4, 2011 at 6:15 p.m. was rescheduled to Wednesday, May 18, 2011 at 6:15 PM. The third public hearing has been scheduled on June 22, 2011 will take place at the CLWA Boardroom located on the 1st floor of the Administration Building at the Rio Vista Water Treatment Plant, 27234 Bouquet Canyon Road, Santa Clarita, California 91350.

For additional information regarding the public hearings, please contact me at (661) 297-1600.

Sincerely,

Dirk Marks

Dirk Marks,
Water Resources Manager

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GENERAL COUNSEL
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June 8, 2011

Mike Murphy
Intergovernmental Relations Officer
City of Santa Clarita
23920 Valencia Blvd., Suite 300
Santa Clarita, CA 91355

Subject: Revised Notification of Public Hearings for the 2010 Santa Clarita Valley Urban Water Management Plan

Dear Mr. Murphy,

In a March 3, 2011, letter we notified you of the upcoming Public Hearings for the 2010 Santa Clarita Valley Urban Water Management Plan. As noted in the letter, the first public hearing was held on Wednesday, March 23, 2011. The second public hearing originally scheduled for Wednesday, May 4, 2011 at 6:15 p.m. was rescheduled to Wednesday, May 18, 2011 at 6:15 PM. The third public hearing has been scheduled on June 22, 2011 will take place at the CLWA Boardroom located on the 1st floor of the Administration Building at the Rio Vista Water Treatment Plant, 27234 Bouquet Canyon Road, Santa Clarita, California 91350.

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Sincerely,

Dirk Marks,
Water Resources Manager

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GENERAL COUNSEL
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June 8, 2011

Jeff W. Hogan, AICP
Interim Planning Manager
City of Santa Clarita Planning Division
23920 Valencia Blvd., Suite 300
Santa Clarita, CA 91355

Subject: Revised Notification of Public Hearings for the 2010 Santa Clarita Valley Urban Water Management Plan

Dear Mr. Hogan,

In a March 3, 2011, letter we notified you of the upcoming Public Hearings for the 2010 Santa Clarita Valley Urban Water Management Plan. As noted in the letter, the first public hearing was held on Wednesday, March 23, 2011. The second public hearing originally scheduled for Wednesday, May 4, 2011 at 6:15 p.m. was rescheduled to Wednesday, May 18, 2011 at 6:15 PM. The third public hearing has been scheduled on June 22, 2011 will take place at the CLWA Boardroom located on the 1st floor of the Administration Building at the Rio Vista Water Treatment Plant, 27234 Bouquet Canyon Road, Santa Clarita, California 91350.

For additional information regarding the public hearings, please contact me at (661) 297-1600.

Sincerely,

Dirk Marks

Dirk Marks,
Water Resources Manager

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DAN MASNADA
GENERAL COUNSEL
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June 8, 2011

Jessica Bunker, P.E.
Waterworks Division
P.O. Box 1460
Alhambra, CA 91802-1460

Subject: Revised Notification of Public Hearings for the 2010 Santa Clarita Valley Urban Water Management Plan

Dear Ms. Bunker,

In a March 3, 2011, letter we notified you of the upcoming Public Hearings for the 2010 Santa Clarita Valley Urban Water Management Plan. As noted in the letter, the first public hearing was held on Wednesday, March 23, 2011. The second public hearing originally scheduled for Wednesday, May 4, 2011 at 6:15 p.m. was rescheduled to Wednesday, May 18, 2011 at 6:15 PM. The third public hearing has been scheduled on June 22, 2011 will take place at the CLWA Boardroom located on the 1st floor of the Administration Building at the Rio Vista Water Treatment Plant, 27234 Bouquet Canyon Road, Santa Clarita, California 91350.

For additional information regarding the public hearings, please contact me at (661) 297-1600.

Sincerely,

Dirk Marks

Dirk Marks,
Water Resources Manager

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June 8, 2011

Rosalind Wayman, Field Deputy
Los Angeles County
Fifth Supervisorial District
23920 Valencia Blvd., Suite 265
Santa Clarita, CA 91355

Subject: Revised Notification of Public Hearings for the 2010 Santa Clarita Valley Urban Water Management Plan

Dear Ms. Wayman,

In a March 3, 2011, letter we notified you of the upcoming Public Hearings for the 2010 Santa Clarita Valley Urban Water Management Plan. As noted in the letter, the first public hearing was held on Wednesday, March 23, 2011. The second public hearing originally scheduled for Wednesday, May 4, 2011 at 6:15 p.m. was rescheduled to Wednesday, May 18, 2011 at 6:15 PM. The third public hearing has been scheduled on June 22, 2011 will take place at the CLWA Boardroom located on the 1st floor of the Administration Building at the Rio Vista Water Treatment Plant, 27234 Bouquet Canyon Road, Santa Clarita, California 91350.

For additional information regarding the public hearings, please contact me at (661) 297-1600.

Sincerely,

Dirk Marks

Dirk Marks,
Water Resources Manager

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THE SIGNAL NEWSPAPER
24000 Creekside Rd
Valencia, Ca 91355

# Proof of Publication
(2015.5 C.C.P.)

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COUNTY OF LOS ANGELES

I am a citizen of the United States,and a resident of the county aforesaid; I am over the age of eighteen years; and I am not a party to or interestedin the notice published. I am the chief legal advertising clerk of the publisher of the

**SIGNAL NEWSPAPER**

a newspaper of general circulation, printed and published **Daily** in the city of Santa Clarita County of Los Angeles, and which newspaper has been adjudged a newspaper of general circulation by the Superior Court of the County of Los Angeles State of California, under the date of **March 25, 1988**
Case number **NVC15880**, that the notice, of which the annexed is a printed copy, has been published in each regular and entire issue of said newspaper and not in any supplement thereof on the following dates, to-wit:

5/26, 6/2, 6/9, 6/16

All in the year 20 11

I certify (or declare) under penalty of perjury' that the foregoing is true and correct

Dated at Valencia, California, this
16th day of June, 20 11

Signature

**NOTICE OF THIRD PUBLIC HEARING 2010 URBAN WATER MANAGEMENT PLAN**

Castaic Lake Water Agency ("CLWA"), CLWA Santa Clarita Water Division, Newhall County Water District and Valencia Water Company have directed the preparation of a joint regional 2010 Urban Water Management Plan ("UWMP") for the Santa Clarita Valley, as encouraged by the Urban Water Management Planning Act ("Act"). Los Angeles County Waterworks District No. 36 is participating in the process on an ad hoc basis. Adoption of the 2010 UWMP is required under the Act by July 1, 2011.

While the Act only requires that an urban water supplier hold one public hearing before adopting a plan, in order to ensure sufficient opportunity for public feedback, input and suggestions concerning the 2010 UWMP, a third public hearing has been scheduled.

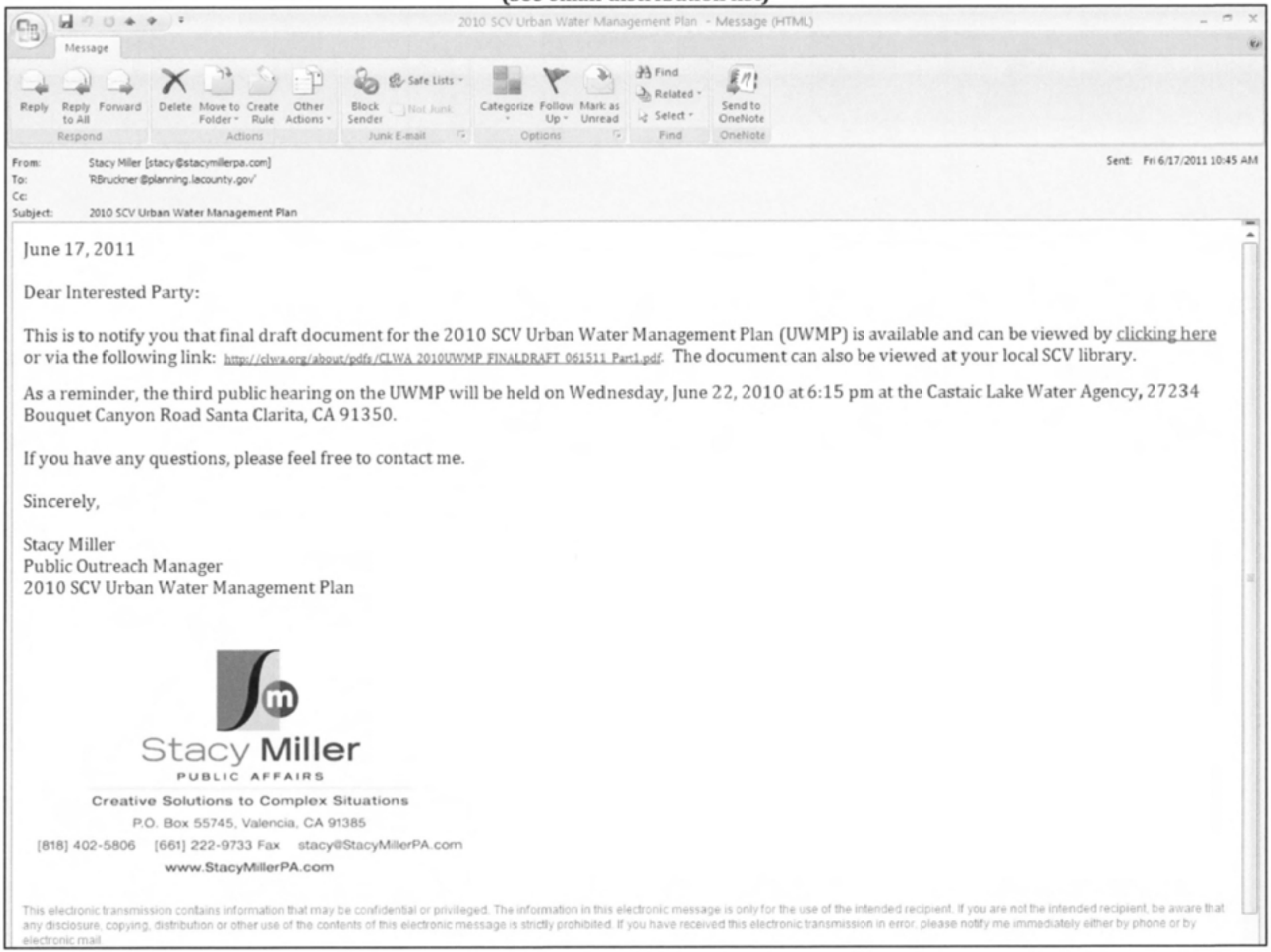
The first public hearing was held on March 23, 2011and the second on May18, 2011. The third hearing will be held at 6:15 p.m. on Wednesday, June 22, 2011 and will take place at the CLWA Boardroom, located on the 1st floor of the Administration Building at the Rio Vista Water Treatment Plant, 27234 Bouquet Canyon Road, Santa Clarita, California 91350.

For additional information regarding the public hearings, please contact Dirk Marks, CLWA Water Resources Manager, at (661) 297-1600.

**The Signal 5/26, 6/2 & 6/9 & 6/16 2011**

ProofPublicationAffidavit_JH

**Emails sent regarding**
**Final Draft Document Availability & 3rd Public Hearing Reminder**
**(See email distribution list)**



2010 SCV Urban Water Management Plan - Message (HTML)

Message

Reply | Reply to All | Forward | Delete | Move to Folder | Create Rule | Other Actions | Block Sender | Safe Lists | Not Junk | Categorize | Follow Up | Mark as Unread | Find | Related | Select | Send to OneNote

Respond | Actions | Junk E-mail | Options | Find | OneNote

From: Stacy Miller [stacy@stacymillerpa.com]
To: 'RBruckner @planning.lacounty.gov'
Cc:
Subject: 2010 SCV Urban Water Management Plan

Sent: Fri 6/17/2011 10:45 AM

June 17, 2011

Dear Interested Party:

This is to notify you that final draft document for the 2010 SCV Urban Water Management Plan (UWMP) is available and can be viewed by clicking here or via the following link: http://clwa.org/about/pdfs/CLWA_2010UWMP_FINALDRAFT_061511_Part1.pdf. The document can also be viewed at your local SCV library.

As a reminder, the third public hearing on the UWMP will be held on Wednesday, June 22, 2010 at 6:15 pm at the Castaic Lake Water Agency, 27234 Bouquet Canyon Road Santa Clarita, CA 91350.

If you have any questions, please feel free to contact me.

Sincerely,

Stacy Miller
Public Outreach Manager
2010 SCV Urban Water Management Plan

Stacy Miller
PUBLIC AFFAIRS
Creative Solutions to Complex Situations
P.O. Box 55745, Valencia, CA 91385
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www.StacyMillerPA.com

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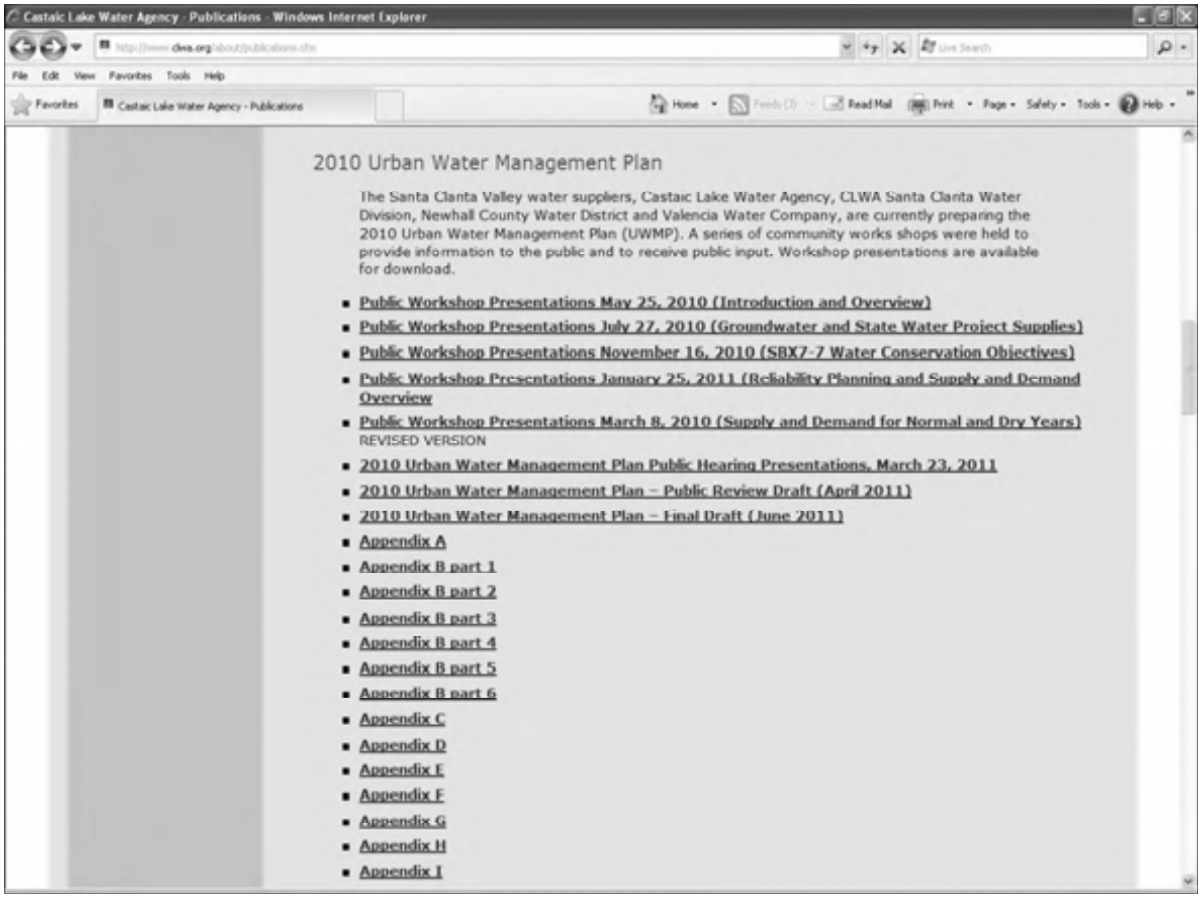
**Master Email List**
**Extension of UWMP comment period and notification of revised draft document and next public hearing**
**Sent June 17, 2011**

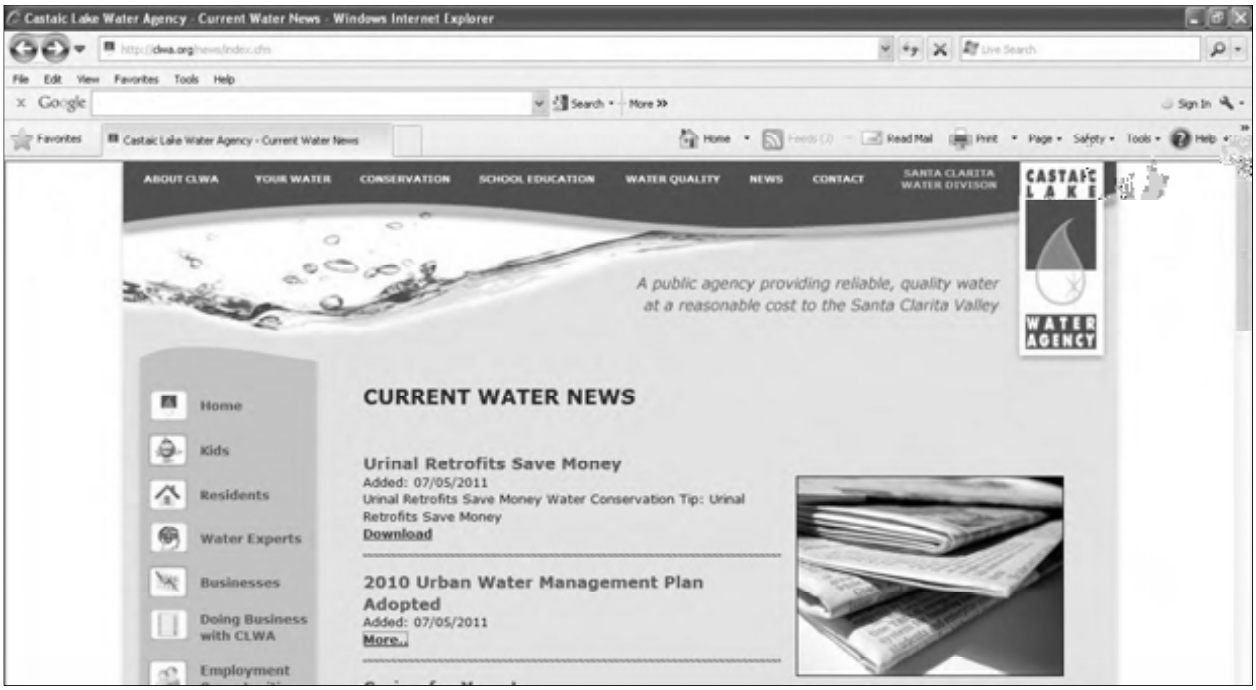
| | | |
|---|---|---|
| Jarrod Degonia<br>Assemblymember Cameron Smyth<br>Jarrod.DeGonia@asm.ca.gov | Ernie Villegas<br>Assemblymember Jeff Gorell<br>Ernie.Villegas@asm.ca.gov | Kevin Korenthal<br>Associated Builders & Contractors of CA; ABC-CCC<br>kkorenthal@abc-ccc.org |
| Holly Schroeder<br>BIA - Los Angeles/Ventura Chapter<br>hschroeder@bialav.org | Sandy Sanchez<br>BIA - Los Angeles/Ventura Chapter<br>ssanchez@bialav.org | David Inouye<br>CA Department of Water Resources<br>davidi@water.ca.gov |
| Robert Kelly<br>Castaic Area Town Council<br>RobertKelly@CastaicAreaTownCouncil.org | Mike Murphy<br>City of Santa Clarita<br>mmurphy@santa-clarita.com | Jason Smisko<br>City of Santa Clarita<br>JSmisko@santa-clarita.com |
| Bruce Fortine<br>College of the Canyons<br>fortine@earthlink.net | Bob Haueter<br>Congressman Howard McKeon<br>Bob.Haueter@mail.house.gov | Chris Stephens<br>County of Ventura Resource Management Agency<br>Chris.Stephens@ventura.org |
| Ron Bottorff<br>Friends of the Santa Clara River<br>bottorffm@verizon.net | Mark Pestrella<br>LA County Department of Public Works<br>mpestrel@dpw.lacounty.gov | Richard Bruckner<br>LA County Department of Regional Planning<br>RBruckner@planning.lacounty.gov |
| Jessica Bunker<br>LA County WWD<br>jbunker@ladpw.org | Lynn Plambeck<br>Santa Clarita Organization for Planning the Environment - SCOPE<br>lynne.plambeck@scope.org | Robert Fleck<br>Santa Clarita Valley Well Owners Association<br>rfleck@socal.rr.com |
| Terry Kingery<br>SCV Chamber of Commerce<br>tkingery@scvchamber.com | Sierra Club Angeles Chapter<br>Contact.us@angeles.sierraclub.org | Mark Butala<br>Southern CA Association of Governments<br>butala@scag.ca.gov |
| Jackie Bick<br>State Senator Sharon Runner<br>Jackie.Bick@sen.ca.gov | Scott Wilk Jr.<br>State Senator Tony Strickland<br>scott.wilk@sen.ca.gov | David Perry<br>Supervisor Michael Antonovich, 5th District<br>dperry@lacbos.org |
| Rosalind Wayman<br>Supervisor Michael Antonovich, 5th District<br>rwayman@lacbos.org | E. Michael Solomon<br>United Water Conservation District<br>msolomon@unitedwater.org | Kathy Norris<br>Valley Industrical Association of Santa Clarita (VIA)<br>kathy@via.org |
| Ron Mechsner<br>West Ranch Town Council<br>Rmechsner@WestRanchTownCouncil.com | Carol Lutness<br>SCV Fair Elections Committee<br>santaclarita-info@caclean.org | Katherine Squires<br>Sierra Club Angeles Chapter<br>katherine.m.squires@csun.edu |
| Dunn<br>Residents<br>water@dslextreme.com | Mitch Glaser<br>LA Co Department of Regional Planning<br>mglaser@planning.lacounty.gov | Also sent via US Mail to<br>• Mr. & Mrs. Dunn<br>• Cam Nolltemeyer<br>• Michael A. Naoum<br>• Carol Lutness |

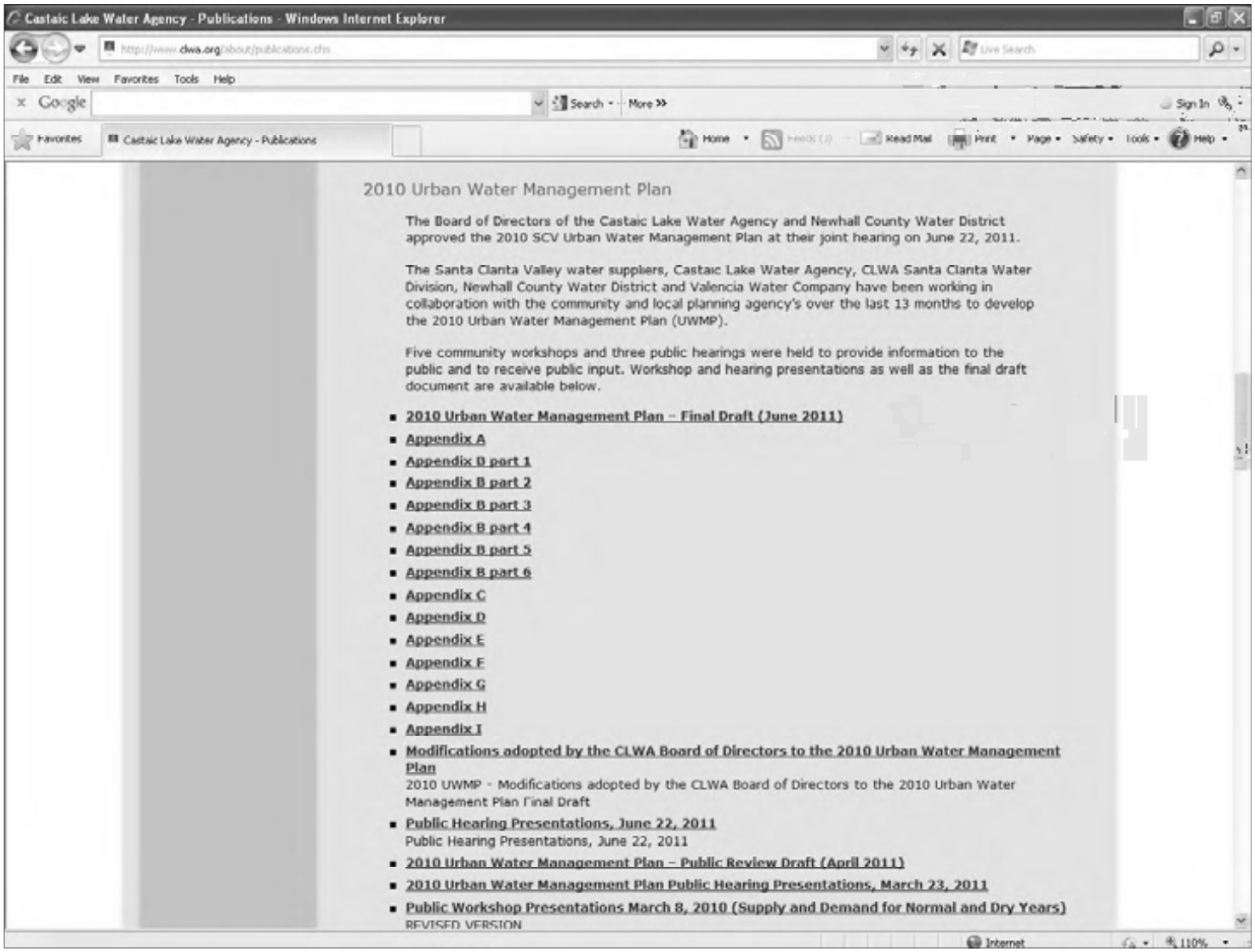
**UWMP –June Hearing & Final Draft Document Notice**
**CLWA Website**



**UWMP –June Hearing & Final Draft Document Notice**
**NCWD Website**

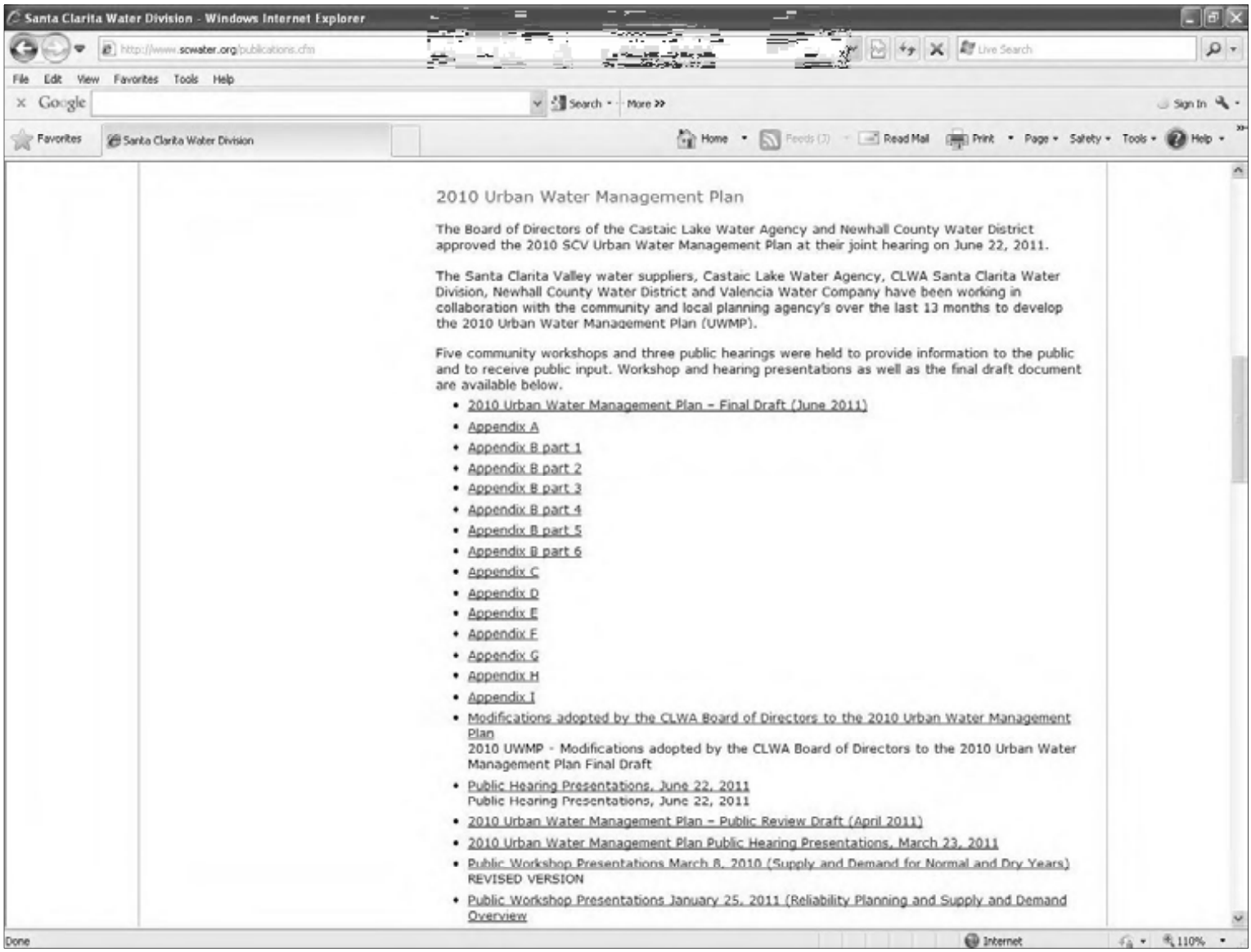
**UWMP Adoption Notice**
**CLWA Website June 2011**



**2010 UWMP Adoption Notice**
**NCWD Website**
**June 2011**

**2010 UWMP Adoption Notice**
**SCWD Website**
**June 2011**




## 2010 Urban Water Management Plan

The Board of Directors of the Castaic Lake Water Agency and Newhall County Water District approved the 2010 SCV Urban Water Management Plan at their joint hearing on June 22, 2011.

The Santa Clarita Valley water suppliers, Castaic Lake Water Agency, CLWA Santa Clarita Water Division, Newhall County Water District and Valencia Water Company have been working in collaboration with the community and local planning agency's over the last 13 months to develop the 2010 Urban Water Management Plan (UWMP).

Five community workshops and three public hearings were held to provide information to the public and to receive public input. Workshop and hearing presentations as well as the final draft document are available below.

- 2010 Urban Water Management Plan – Final Draft (June 2011)
- Appendix A
- Appendix B part 1
- Appendix B part 2
- Appendix B part 3
- Appendix B part 4
- Appendix B part 5
- Appendix B part 6
- Appendix C
- Appendix D
- Appendix E
- Appendix F
- Appendix G
- Appendix H
- Appendix I
- Modifications adopted by the CLWA Board of Directors to the 2010 Urban Water Management Plan
  2010 UWMP - Modifications adopted by the CLWA Board of Directors to the 2010 Urban Water Management Plan Final Draft
- Public Hearing Presentations, June 22, 2011
  Public Hearing Presentations, June 22, 2011
- 2010 Urban Water Management Plan – Public Review Draft (April 2011)
- 2010 Urban Water Management Plan Public Hearing Presentations, March 23, 2011
- Public Workshop Presentations March 8, 2010 (Supply and Demand for Normal and Dry Years) REVISED VERSION
- Public Workshop Presentations January 25, 2011 (Reliability Planning and Supply and Demand Overview

NEWHALL COUNTY WATER DISTRICT

NCWD

## New Regional Urban Water Management Plan Approved

*Santa Clarita Valley Family of Water Suppliers Approve Critical Planning Tool*

**Santa Clarita, CA** –The Boards of Directors of the Newhall County Water District and Castaic Lake Water Agency unanimously approved the 2010 Santa Clarita Valley Urban Water Management Plan at a joint public hearing on June 22, 2010.

"The approval by the two Boards is a testament to the quality of this document and the team that has worked so hard on its preparation," stated Daniel Mortensen, NCWD Board President.

The creation of the Santa Clarita Valley Urban Water Management Plan began in May 2010 and included opportunities for input from our community, water partners, environmental groups, elected officials, business groups and other community stakeholders during the five community workshops and three public hearings that were held on the plan.

"We have gone far beyond the public participation requirements cited in the Urban Water Management Plan regulations to ensure that all residents and interested parties had ample opportunity to participate, comment and weigh in on this important process," stated Tom Campbell, CLWA Board President.

The Urban Water Management Plan presents a picture of the valley's future water situation and describes the long-range water needs of our community and the means to supply the necessary water to the year 2050. Every five years, the water suppliers who deliver in excess of 3,000 acre feet of water or serve over 3,000 connections per year are required by law to prepare an Urban Water Management Plan.

The SCV Family of Water Suppliers partnered in this planning effort to ensure a collaborative planning approach. This plan is not a project-specific document, nor does it take the place of individual project requirements; rather it is a tool that helps guide the local water suppliers' actions and offers a broad perspective on a wide variety of water issues. The plan concludes that the combination of existing and

planned programs to increase supply and conservation will meet the Valley's water needs through 2050.

"I am proud of the tremendous amount of time and work that has been put into the development of this plan by the community, our staff, consultants and my fellow Board members," stated Bill Cooper, CLWA Board Vice President . "Our Urban Water Management Plan serves as the 'gold standard' of planning documents throughout the state and is followed closely for its content and thoroughness."

The final SCV Urban Water Management Plan will be delivered to the State Department of Water Resources before the end of July 2011. The final draft and additional amendments that were made at the recent board meetings are currently available for review online at www.ncwd.org.

# Santa Clarita Valley Urban Water Management Plan

Public Hearing
June 22, 2011
Castaic Lake Water Agency

## Agenda

- Open public hearing
- Review of public input process and public comment letters
- Public comment period
- Presentation on Groundwater Basin
- Presentations on Perchlorate Restoration, VWC Well 201
- Presentations on Water Banking, SWP reliability, Water Conservation, Chlorides/AWRM
- Board questions and answers
- Description of UWMP document finalization process
- Close hearing and next steps

## UWMP Act Process

### ACT REQUIREMENTS

- Coordinate preparation of UWMP with other appropriate agencies in the area.
- 60 days notice to city and counties, and may consult with, and obtain comments from, city and counties receiving notice.
- Encourage active involvement of diverse social, cultural, and economic elements of the population within the service area prior to and during the preparation of the plan.

### ACT REQUIREMENTS EXCEEDED

- Draft Final UWMP, §§1.3.1 & 1.3.3, Table 1-1, pgs 1-3 to 1-8.
- Draft Final UWMP, §1.3.3, Table 1-1, pgs 1-3 to 1-8, Appendix B.
- Five Public Workshops between May 2010 and March 2011; three CLWA/NCWD joint public hearings; written public comment period; written public comment deadline extended; Draft Final UWMP, §§1.3.1 &1.3.3, Table 1-2, pgs 1-3 to 1-8.

## UWMP Act Process

| ACT REQUIREMENTS | ACT REQUIREMENTS EXCEEDED |
|---|---|
| Prior to adopting a plan, the urban water supplier shall make the plan available for public inspection. | Draft UWMP has been available since April 15, 2011; Final Draft UWMP, §§1.3.1 & 1.3.3, Table 1-2, pgs 1-3 to 1-8, Appendix B. |
| One Public hearing. | Three CLWA/NCWD joint public hearings. |
| Notice of hearing in compliance with Gov. Code § 6066. | Final Draft UWMP, §§1.3.1 & 1.3.3, Table 1- 2, pgs 1-3 to 1-8, Appendix B. |

## UWMP Act Process

| ACT REQUIREMENTS | ACT REQUIREMENTS EXCEEDED |
|---|---|
| Notice of hearing to any city or county within which the supplier provides water supplies. | Final Draft UWMP, §§1.3.1 & 1.3.3, Table 1-2, pgs 1-3 to 1-8, Appendix B. |
| After the hearing, the plan shall be adopted as prepared or as modified after the hearing. | June 22, 2011 Joint Meeting and 3rd Joint Public Hearing |

## Past Workshops

**May 2010**
- UWMP purposed and process – What, Who, Why and When
- Existing and new requirements of UWMPs

**July 2010**
- SBX7-7 ("20x2020") Requirements
- Recycled Water
- Groundwater Supplies
- State Water Project Reliability

**November 2010** –
- Presentation to IRWMP Stakeholders

## Past Workshops (continued)

**November 2010**
- GPCD population assumptions and calculations
- SBX7-7 Targets by retailer

**January 2011**
- Overview of water supplies
- SWP reliability update
- CLWA reliability planning update
- SBX7-7 calculations and targets
- Overview of water supplies and demand

**March 2011**
- Water Supply and Demands

## Public Hearings and Draft Document

1st public hearing March 23, 2011
- Public Draft document made available April 15, 2011
- Comment period through May 20, 2011

2nd public hearing May 18, 2011
- Comment period extended through May 27, 2011
- Final Draft document made available June 15, 2011

3rd public hearing June 22, 2011

## Comment Letters Received

- Friends of the Santa Clara River
- Santa Clarita resident and Valencia Water ratepayer
- Sierra Club
- Mr. and Mrs. Dunn
- Mr. Naoum
- Mr. Dunn
- Sierra Club
- SCOPE
- Whittaker-Bermite Citizens Advisory Group
- Babak Naficy
- Santa Clarita Valley Fair Elections Committee

## Broad Categories of Comments Received

- Groundwater overdraft claims
- Perchlorate and VWC Well 201
- Organic compounds
- Water banking program issues; State Water Project reliability and contingency planning
- Water conservation accounting
- Chloride water quality issues (TMDL/AWRM)

## Santa Clarita Valley Urban Water Management Plan

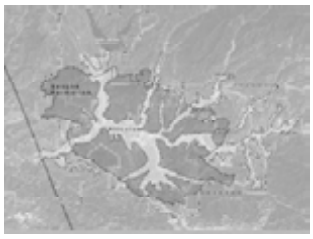
Public Comment Period

## Groundwater Supplies and Related Issues, e.g. "Overdraft"

- Joe Scalmanini –
  Luhdorff and Scalmanini, Consulting Engineers

## Groundwater Component of Water Supplies

## 2010 Urban Water Management Plan



- Castaic Lake Water Agency
- CLWA Santa Clarita Water Division
- Los Angeles County Waterworks District 36
- Newhall County Water District
- Valencia Water Company

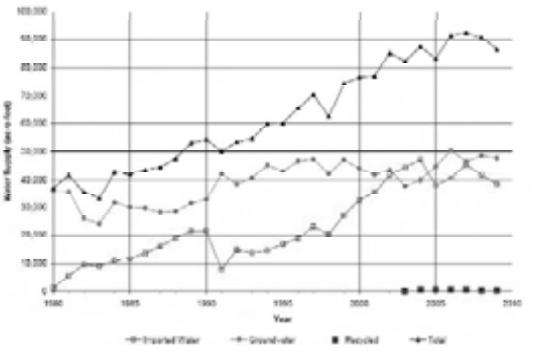



Figure 2-1
Total Water Supply Utilization
Santa Clarita Valley

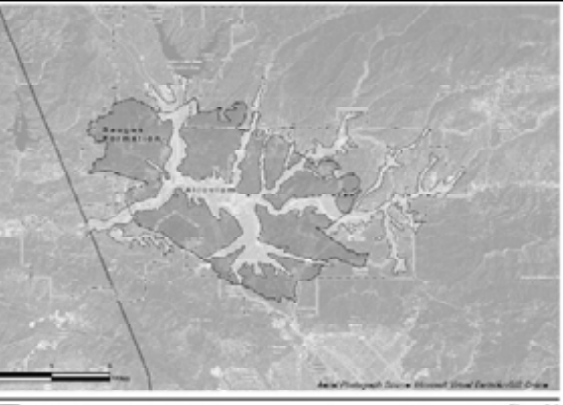


Figure 3-1
Alluvium and Saugus Formation

## Groundwater Management Plan (2003)

**Management Objectives (Goals) for the Basin**

- Development of integrated surface water, groundwater, and recycled water supply to meet existing and projected uses
- Determination of operational groundwater yield to avoid overdraft = sustainability
- Preservation of groundwater quality, including solution of contamination problems
- Preservation of interrelated surface water resources = maintenance of surface water flows and non-degradation of quality

## Groundwater Management Plan (2003)

Elements

- Groundwater monitoring
- Surface water monitoring
- Basin yield analysis
- Regular and dry year water supplies
- Continued conjunctive use
- Long-term salinity management
- Integration of recycled water
- Mitigate contamination
- Local, state and federal relationships
- Public education and water conservation
- Recharge wellhead protection areas
- Well construction and destruction policies
- Provisions to add additional components

## Annual Water Reports (1998-present)

**Annual Water Requirements and Supplies**

- Actual water use
- Sources of supply to meet actual use

**Groundwater**

- Alluvial and Saugus aquifer conditions

**Supplemental Water Supplies**

- State Water Project
- banking and other programs

**Water Quality**

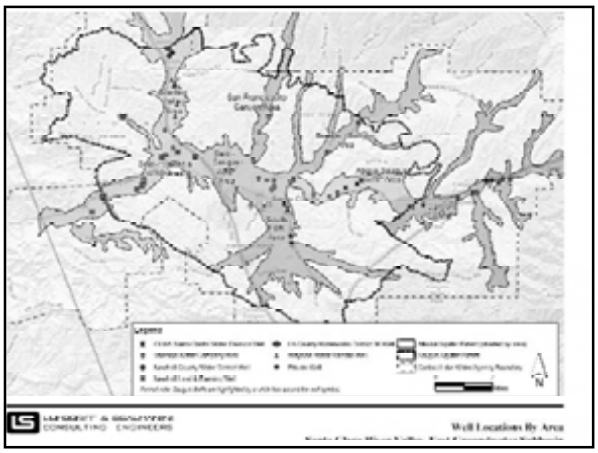
**Recycled Water**

**Santa Clara River**

- Outflows from Santa Clarita Valley

**Short-Term (one year) Outlook**

- Water requirements adjusted from UWMP
- Surface water, groundwater and recycled water supplies
- Adequacy of water supplies



Well Locations By Area

Figure 3-2
Groundwater Production - Alluvium
Santa Clara River Valley, East Groundwater Subbasin

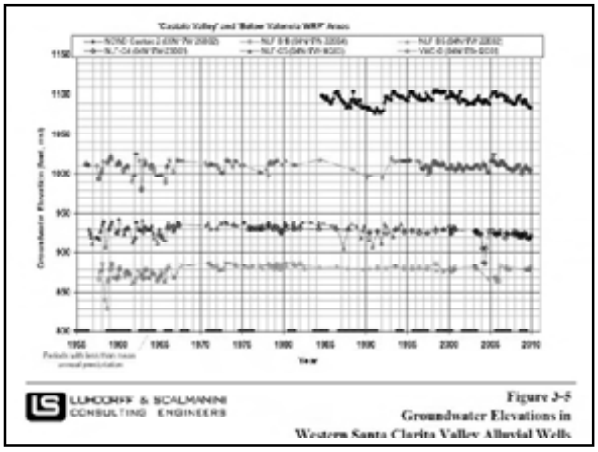



Figure 3-5
Groundwater Elevations in
Western Santa Clarita Valley Alluvial Wells

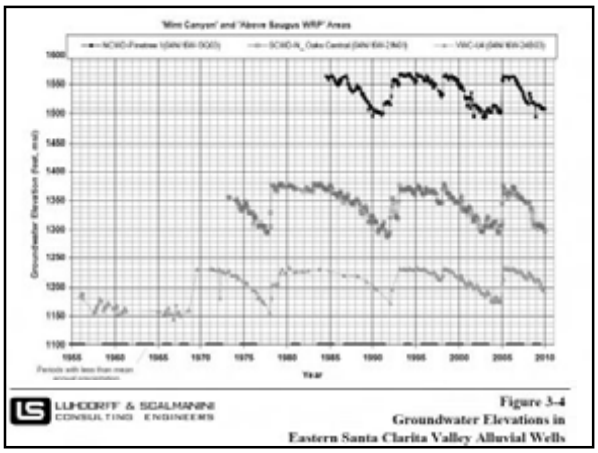
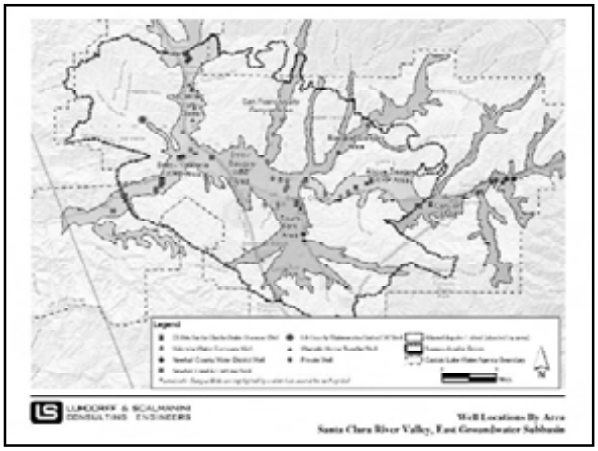



Figure 3-4
Groundwater Elevations in
Eastern Santa Clarita Valley Alluvial Wells




Well Locations By Area
Santa Clara River Valley, East Groundwater Subbasin

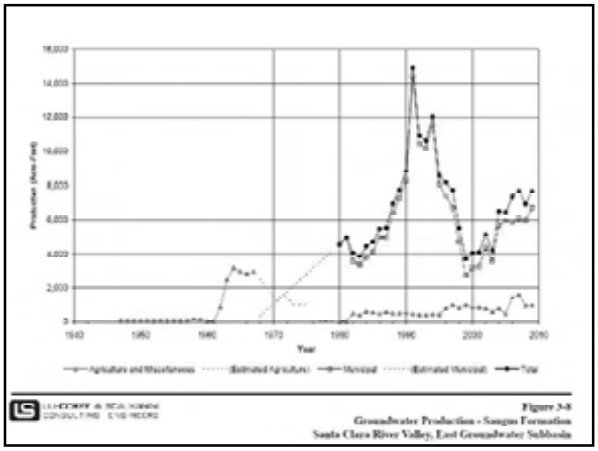



Figure 3-8
Groundwater Production - Saugus Formation
Santa Clara River Valley, East Groundwater Subbasin

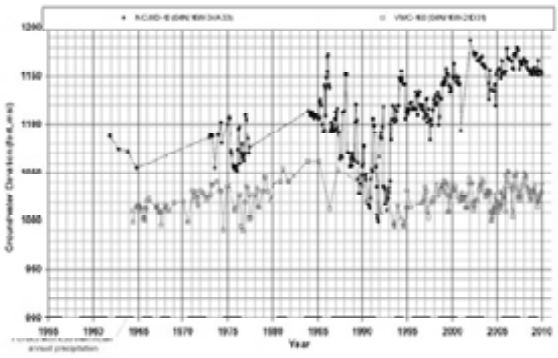



Figure 3-9
Groundwater Elevations in Saugus Wells

## Total Groundwater Supply
## Santa Clarita Valley

| | Normal Years | | |
|---|---|---|---|
| | Alluvium (afy) | Saugus Fm. (afy) | Total (afy) |
| Municipal Purveyors | 25,850 | 11,485 | 37,335 |
| Agriculture & Others | 12,750 | 1,000 | 13,750 |
| **Total** | **38,600** | **12,485** | **51,085** |

| | Multiple Dry Years | | |
|---|---|---|---|
| | Alluvium (afy) | Saugus Fm. (afy) | Total (afy) |
| Municipal Purveyors | 23,800-22,250 | 18,125-33,975 | 41,975-56,225 |
| Agriculture & Others | 12,700-12,600 | 1,000 | 13,700-13,600 |
| **Total** | **36,500-34,850** | **19,125-34,975** | **55,675-69,825** |

## 2008 Groundwater Operating Plan

| Groundwater Pumping 2010 UWMP | | | | |
|---|---|---|---|---|
| **Aquifer** | **Normal Years** | **Dry Year 1** | **Dry Year 2** | **Dry Year 3+** |
| **Alluvium** | 30,000-40,000 (38,600) | 30,000-35,000 (36,500) | 30,000-35,000 (34,850) | 30,000-35,000 (34,850) |
| **Saugus** | 7,500-15,000 (12,485) | 15,000-25,000 (19,125) | 21,000-25,000 (25,227) | 21,000-35,000 (34,977) |

**from 2009 Basin Yield Update (LSCE & GSI), following 2001 Groundwater Update Report (Slade) & 2005 Basin Yield Analysis (CH2M Hill & LSCE)**

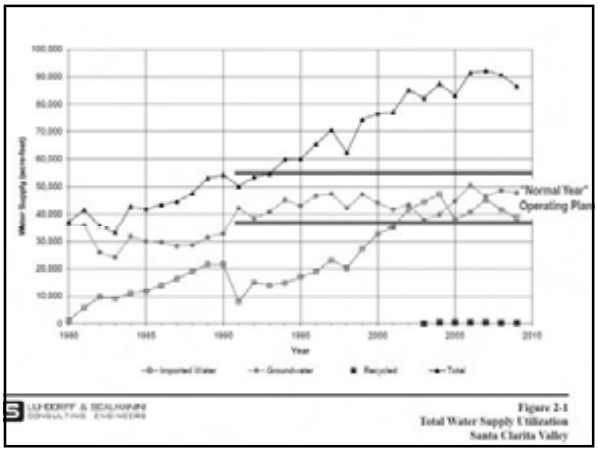



Figure 2-1
Total Water Supply Utilization
Santa Clarita Valley

## Sustainability and Achievability

**Sustainability**

" lack of chronic, or sustained, depletion of groundwater storage, as indicated by projected groundwater levels, over a reasonable range of wet, normal, and dry hydrologic conditions" (86 years: 1922-2007)

"maintenance of surface water flows in the western portion of the basin (which are partially maintained by groundwater discharge) and surface water outflow to downstream basins over the same range of hydrologic conditions"

**Achievability**

maintenance of groundwater levels above, or only temporarily slightly into, the intake (screened or perforated) sections of production wells

**from 2009 Basin Yield Update (LSCE & GSI)**

## 2008 Operating Plan Conclusions

**Operating Plan is fully sustainable (no chronic groundwater level declines; no depleted stream flow), i.e. not overdraft, and mostly achievable (limited dry-period declines in eastern part of Valley)**

**Lack of any projected overdraft is consistent with actual historical basin response to the same range of groundwater pumping**

**Achievability issues in extended dry periods can be resolved by redistribution of some pumping to the west**

- with redistribution, retain dry-period Alluvial pumping near 35,000 afy
- without redistribution, dry-period Alluvial pumping closer to 30,000 afy

## Subsidence

**In alluvial aquifers, results from "aquitard drainage" and resulting consolidation of the "aquitard"**

- requires extensive, thick aquitard (fine-grained sediments, i.e. clay bed)
- requires chronically depressed groundwater levels (to allow clay to drain)

**Santa Clarita Valley Alluvium**

- up to 240 ft. thick, but lacking any extensive, thick aquitard => geology not conducive to subsidence, regardless of groundwater levels
- some near-constant and some fluctuating groundwater levels, but no chronically depressed groundwater levels anywhere => hydrology not conducive to subsidence.

**No physical evidence of subsidence, e.g. lowering of land surface.**

## Small Private Pumping

Limited submittal of pumping-related data, approx. 5-6 years ago, for two tributary canyons; quantified less than 200 afy

No information submitted about well completions, e.g. whether in Alluvium or bedrock, pump capacities, water level records

No information about well failures, e.g. "going dry"

Extrapolated limited pumping data to conservatively estimate 500 afy of basin-wide small private pumping; included in Annual Water Report

Reported, and continue to expect, all private Alluvial wells to experience the same groundwater level fluctuations as monitored and reported in Annual Water Report

## Monitoring

**CA Health and Safety Code, Title 22**

- Domestic Water Quality and Monitoring
- Waterworks Standards

**CA Dept of Public Health**

- Domestic Water Supply Permits
- Application of Health & Safety Code and DPH Policies

**Santa Clarita Valley Purveyors**

- Permitted and regulated as above
- In compliance with above for quantity and quality of water supplies

## Perchlorate Treatment

- Groundwater Quality
  - Perchlorate treatment and restoration

## Perchlorate

| Year Perchlorate Detected | Purveyor Well | Groundwater Aquifer | Status |
|---|---|---|---|
| 1997 | SCWD Saugus 1 | Saugus | DPH approved well return to service in January 2011; well in active service utilizing approved perchlorate treatment. |
| 1997 | SCWD Saugus 2 | Saugus | DPH approved wells return to service in January 2011; well in active service utilizing approved perchlorate treatment. |
| 1997 | VWC Well 157 | Saugus | Sealed and capacity replaced by new well. |
| 1997 | NCWD Well 11 | Saugus | Out of service |
| 2002 | SCWD Stadium Well | Alluvium | Sealed and capacity replaced by new well. |
| 2005 | VWC Well Q2 | Alluvium | DPH approved perchlorate treatment removal in 2007; treatment was installed in 2005 and relocated for potential future use; well remains in service. |
| 2005 | DTSC approved Interim Remedial Action Plan | | |
| 2006 | NCWD Well NC-13 | Saugus | DPH approved annual monitoring, results have always been below the detection limit for reporting; well remains in service. |
| 2007 | Settlement Agreement | | |
| 2010 | VWC Well 201 | Saugus | Out of service pending additional monitoring and evaluation of remediation alternatives. |

*Rapid Response Fund* provides $10M in reimbursement funds to CLWA as fail-safe.

## Perchlorate Impact

Valencia Water Company
Well 201

## Site Location -- Former Whittaker Bermite Facility

*From 2005 UWMP - Appendix D*

## Perchlorate Concentrations

Initial Detection (August, 2010) 5.0 ug/l
well removed from water supply service

Quarterly/Monthly Confirmation Sampling (November, 2010 – April, 2011) fluctuations between 5.7 and 12 ug/l

## Logical Occurrence or Completely Unexpected?

**Initial Perchlorate Contamination in Saugus Wells - 1997**
Saugus 1 & 2; V 157; NCWD 11

**Groundwater Flow**
westerly gradient and flow direction – pre-1997 to 2010

**Gradient Control = "Containment" via Restoration of Saugus 1 & 2**
modeled – 2004
permitting, litigation, Settlement Agreement – 2007
design, construction – 2010
DPH water supply permit – 2010
start-up operations – 2010
full-time operation – January 2011

**Valencia 201**
first down-gradient Saugus well from original impacts
13-year elapsed time from initial impacts to V 201 impact
listed as "threatened" well in Settlement Agreement
while not a foregone conclusion, detection is a logical occurrence, and not completely unexpected

## Water Supply Impact

**Recent Operations**

capture zone analysis □2004
reduced pumping to avg. 180 afy □2004-2010
replaced pumping with other Saugus well capacity

**Saugus Formation**

7,500 □15,000 afy □normal year□water supply
15,000 □35,000 afy □dry year□water supply

**V 201**

key well in dry years
3,777 afy of total □dry year□water supply
capacity needs to be restored before next potential dry year, i.e., within two years

## V 201 Response

Removed from Water Supply Service at Initial Detection (August, 2010)

Quarterly-Monthly Confirmation Sampling

Alternatives
restoration with □wellhead□treatment
well replacement

Groundwater Modeling
perchlorate migration
need for secondary □containment□
updated assessment of □threatened□wells

Dept. of Public Health Permitting

Design and Construction

## Existing and Planned Saugus Well Locations

## Organic Compounds

- Volatile and Synthetic Organic Compounds
  - Trichloroethylene (TCE) and Tetrachloroethylene (PCE)
    - Cleaning solvents, legacy contamination, urban stormwater runoff, septic systems
- CLWA annually monitors for these compounds;
  - TCE was found below the MCL in trace levels in groundwater in the Valley.
  - Not currently affecting production or needing treatment.

## Water Banking Program Terms

## Water Banking Programs

| Banking Program | Extraction Capacity (AFY) | Contract Term |
|---|---|---|
| Rosedale Rio-Bravo | 20,000 | Through term of SWP contract |
| Semitropic interim programs | 15,000 | Through 2012/13 originally; through 2022/23 with Amendment |
| Semitropic - Newhall Land | 4,950 | Through 2035 with renewal by mutual agreement |

## State Water Project Reliability Comment Areas

- Supply Reliability
- Facility Reliability
- SWP and West Branch Conveyance
- Catastrophic Supply Interruption

## SWP Supply Reliability

- Supply data from DWR's 2009 SWP Delivery Reliability Report.
- Based on model studies using 82 years of historical hydrology (1922 – 2003).
- Historical period includes several significant drought periods.
- Estimate for future (2029) includes adjustments to hydrology to reflect climate change.

## SWP Facility Reliability

- Past SWP outages have been short-term (typically weeks in duration).
- Longest West Branch outage was planned three-month winter outage (Dec 1998 – Feb 1999).
- CLWA ideally located immediately downstream of two large SWP reservoirs – Pyramid and Castaic Lakes.
- Location allows deliveries to continue to CLWA and other West Branch Contractors even with outage in aqueduct upstream.
- No past SWP outages have impacted deliveries to CLWA.
- Potential supply impacts of future outage evaluated in UWMP Section 8.

## SWP Conveyance

- SWP facilities are owned by State and operated by DWR.
- West Branch facilities, including aqueduct and Pyramid and Castaic Reservoirs, are part of SWP.
- CLWA and 28 other SWP Contractors each have a Water Supply Contract with DWR for water supply and delivery, with similar terms.
- Water Supply Contract:
  - Dictates terms for water delivery.
  - Provides for delivery of SWP water, supplies to and from out-of-service area banking programs, and non-SWP water.

## SWP Conveyance (cont.)

- Each SWP Contractor has same priority for delivery within proportion of aqueduct capacity they pay for.
- Deliveries in excess of that capacity may be made through unused capacity of other Contractors.
- DWR requires separate delivery agreements for Contractor programs needing delivery through SWP facilities.
- CLWA has agreements with DWR for deliveries to and from its San Joaquin Valley banking programs and for delivery of its Buena Vista-Rosedale supply.

## West Branch Conveyance

- DWR controls deliveries to each of three West Branch Contractors (CLWA, MWD, Ventura Co WPD).
- In dry years when SWP supplies are low, capacity normally used to convey SWP water is available to deliver other supplies.
- CLWA withdrawals from banking programs are planned only for dry years, when capacity would be available to convey it.

## Catastrophic Supply Interruption

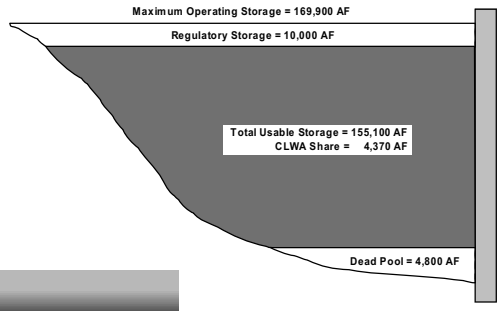
- Three SWP emergency outage scenarios considered:
  - Levee breach in Delta
  - California Aqueduct in San Joaquin Valley
  - West Branch Aqueduct
- Worst-case outage: West Branch Aqueduct
  - No SWP or other supplies through aqueduct
  - No supplies from groundwater banking in San Joaquin Valley

## Catastrophic Supply Interruption

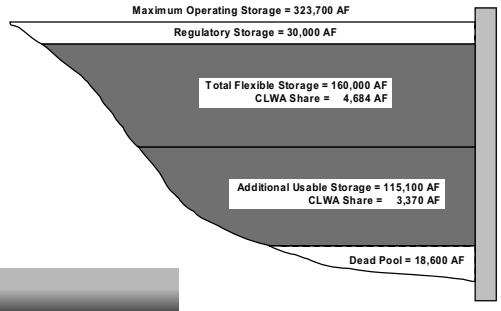
Outage assumptions:

- Six-month outage
- Occurs in normal/average year
- Supplies limited to:
  - Local Supplies
    - Groundwater
    - Recycled water
  - CLWA share of storage in West Branch reservoirs
    - Flexible storage
    - Emergency storage

## Pyramid Lake Storage



## Castaic Lake Storage




## Six-Month West Branch Aqueduct Outage: Water Supplies and Demand (AF)

| Water Supply Sources | 2015 | 2020 | 2035 | 2050 |
|---|---|---|---|---|
| **Local Supplies** | | | | |
| Existing Supplies | | | | |
| Groundwater | 22,200 | 22,200 | 22,700 | 22,700 |
| Recycled Water | 120 | 120 | 120 | 120 |
| Planned Supplies | | | | |
| Future Groundwater | 1,900 | 7,350 | 8,850 | 10,350 |
| Recycled Water | 370 | 1,020 | 3,850 | 7,870 |
| **Total Local Supplies** | **24,590** | **30,690** | **35,520** | **41,040** |
| | | | | |
| **SWP West Branch Storage Available** | | | | |
| SWP Flexible Storage Accounts | 6,060 | 4,680 | 4,680 | 4,680 |
| Emergency Storage | | | | |
| Pyramid Lake | 4,370 | 4,370 | 4,370 | 4,370 |
| Castaic Lake | 3,370 | 3,370 | 3,370 | 3,370 |
| **Total West Branch Storage** | **13,800** | **12,420** | **12,420** | **12,420** |
| | | | | |
| **Total Local Supplies and West Branch Storage** | **38,390** | **43,110** | **47,940** | **53,460** |
| | | | | |
| **Demands** | | | | |
| Total Demand w/o Conservation | 40,035 | 44,242 | 56,863 | 69,484 |
| **Total Demand w/ Conservation** | **36,172** | **35,954** | **48,447** | **60,939** |
| | | | | |
| **Additional Supply and/or Conservation Required** | **-** | **-** | **507** | **7,479** |
| As Percent of Demand | 0% | 0% | 1% | 11% |

## SBX7-7 Calculations and Water Conservation Accounting

## SBX7-7 Calculations

- All values reported in UWMP by purveyors are required in statute passed in late 2009
- Methodologies developed through a DWR public committee process also required in statute; Kennedy/Jenks is a committee member
- Demand reduction targets calculated for each retail purveyor
- Purveyors may reach targets by combination of water conservation and recycled water programs

## Water Conservation Accounting

- Estimates of future savings made by reviewing a wide variety of water conservation measures and programs, and then applying industry-accepted savings factors to them
- Saving factors are determined by in-depth technical studies, mainly done by the California Urban Water Conservation Council (CUWCC) and the American Waterworks Association
- CUWCC reports all savings calculations for its signatory agencies to SWRCB annually
- Detailed SCV Water Use Efficiency Strategic Plan is implementation plan for demand reductions

## SBX7-7 Calculations and Water Conservation Accounting

- Document website links
  - SBX7-7 Methodologies: http://www.water.ca.gov/wateruseefficiency/sb7/committees/urban/u3/
  - CUWCC SWRCB Report: http://www.cuwcc.org/about/annual-reports
  - SCV Water Use Efficiency Strategic Plan: http://www.scvh2o.org/ http://www.clwa.org/about/publications.cfm

## Chlorides/AWRM

- Imported Water Quality
  - Chloride TMDL
  - Alternative Water Resources Management Program (AWRM)
  - SWP Water Quality Modeling

## Chlorides (continued)

- Imported Water Quality
  - Chloride TMDL (2005) – 100 mg/L from Saugus/Valencia WRPs
- Alternative Water Resources Management Program (AWRM) (2008)
  - Established conditional site specific objectives for chloride;
  - Provides water quality and water supply benefits, and protects biological resources;
  - SWP Water Quality Modeling

## Santa Clarita Valley Urban Water Management Plan

**Directors' Question and Answer Period**

Santa Clarita Valley
Urban Water Management Plan

Next Steps

# Consultant Team Resumes
## Public Outreach Record

# 2010 Santa Clarita Valley
# Urban Water Management Plan

# Lynn M. Takaichi, P.E.

## Chairman

### Education

MS in Civil Engineering (Sanitary), University of California, Berkeley, 1972
BS in Civil Engineering, University of California, Berkeley, 1971
Special Study in Environmental Impact Assessment, University of California
Study in City and Regional Planning, University of California
Study in Water Resources Planning Civil Defense Preparedness Agency, Certificate of Achievement in Multi-Protection Design, University of Hawaii

### Registration

Civil Engineer in California

### Professional Summary

Mr. Takaichi is responsible for major planning and design projects, particularly assignments involving complex institutional and financial arrangements. He has directed a wide range of water projects including water resource studies, water system master plans, water treatment investigations, water facilities design and utility management plans. In addition, he has managed the preparation of numerous environmental impact assessments.

Mr. Takaichi has particular expertise in complex institutional arrangements and he works closely with specialized legal counsel, financial consultants, and water managers. His experience includes water agency formation, drafting of enabling legislation, negotiation of water supply and water service agreements, development of annexation policies and agreements, and management of a wide variety of water programs. He also has expertise in water system appraisals and has assisted numerous public agencies with the acquisition of investor-owned utilities.

#### Water Demand Models

- Comprehensive water system plan update for the Lakehaven Utility District.
- Modeling of water and reclaimed water systems for the Cambria Community Services District.
- Comprehensive water system master plan update for the City of Oxnard.
- Comprehensive water plan and capital improvement program ($380 million) for the Castaic Lake Water Agency.
- Water master plan for the City of Chino.
- Water Supply Reliability Plan Update and Optimization Model for the Castaic Lake Water Agency.
- Integrated Regional Water Management Plan for the Antelope Valley for the County of Los Angeles.
- Water Demand Model for the Mojave Water Agency.

#### Water Resource Studies

- Water Supply Reliability Evaluation for the San Gorgonio Pass Water Agency.
- Strategic planning consultant for local water resources development for the Los Angeles Department of Water & Power.

- Expert witness for water rights valuation for Squaw Creek Resort.
- Integrated Regional Water Management Plan for the Antelope Valley for the County of Los Angeles.
- Water Supply Reliability Plan Update and Optimization Model for the Castaic Lake Water Agency.
- Alternative Water Management Plan for the Santa Clara River for the Los Angeles County Sanitation Districts.
- Negotiation of numerous water transfer and exchange agreements for public and private clients.
- Evaluation of potential water marketing concepts at Lake Elizabeth for Ridgetop Ranch Properties.
- Peer review of SB 610/221 Water Supply Assessment for the Centennial Development (27,000 homes).
- Numerous groundwater evaluations and groundwater management plans.
- Preparation of numerous urban water management plans. Among these are plans for the Antelope Valley, Castaic Lake Water Agency, Hi-Desert Water District, City of Oxnard, City of Santa Paula, and Twentynine Palms Water District.
- Feasibility Evaluation of Alternative Spreading Facilities at the Cucamonga Spreading Grounds for the San Antonio Water Company.
- Evaluation of water banking requirements (Water Supply Reliability Plan) for the Castaic Lake Water Agency.
- Strategy Development for the Santa Ana River Recharge Facilities for the San Bernardino Valley Water Conservation District.
- Water resource evaluation of the Antelope Valley.
- West Ventura County water supply reliability study for the cities of Ventura and Oxnard.
- Water Resources Plan for the Cambria Community Services District.
- Concept Plan for the restoration of the Santa Rosa Basin for the Camrosa Water District.
- McGrath Lake preliminary watershed study for the McGrath State Beach Area Trustee Council.
- Water production alternatives study for the City of Camarillo.
- Evaluation of supplemental water supplies for the Nipomo Community Services District.
- Baseline water supply study for the Cambria Community Services District.
- Preliminary evaluation of the potential use of freeway dewatering water as a water supply for the City of Downey.
- Water resources study for the City of Santa Paula.
- Water Resources Element (LA County) of the Santa Clara River Enhancement and Management Plan for the Castaic Lake Water Agency.
- Optimization study of state water importation into Ventura County.
- Evaluation of potential water resources for the Hidden Valley Municipal Water District.
- Water resources evaluation and environmental assessment of 200,000 acres in Hawaii for the Soil Conservation Service.

## Affiliations

American Society of Civil Engineers
American Water Works Association
National Society of Professional Engineers
Society of American Military Engineers
Water Environment Federation

National Association of Corrosion Engineers

## Publications

Levi Brekke, Milton D. Larsen, Mary Ausburn, and Lynn Takaichi. 2002. *Suburban Water Demand Modeling Using Stepwise Regression.* Journal – American Water Work Association, October 2002.

# Mary Lou Cotton, C.C.P.

## Technical/Policy Advisor and QA/QC

### Education

MS, Geological Sciences, University of Southern California
BS, Biological Sciences, University of Southern California

### Registrations

Certified Water Conservation Practitioner, AWWA-CA/NV

### Affiliations

California Urban Water Conservation Council
American Water Works Association, Water Conservation Certification Committee
Association of California Water Agencies, Water Use Efficiency and Communications Committees

### Professional Summary

Mary Lou Cotton is a water resources planning and water conservation expert, with over 17 years of management experience with water agencies statewide, specifically in conducting water resource planning and management programs including surface water and groundwater investigations; water transfer, banking and exchange transactions and agreements; water conservation planning and management; master planning and design studies; water quality and hazardous waste investigations; and supporting the preparation of CEQA Compliance documents and obtaining project permits. Ms. Cotton is working in an advisory capacity for several clients on a wide variety of water banking (supply reliability) programs, as well as water transfers or exchanges for short-term and long-term water supplies. In addition, Ms. Cotton assists the State Water Contractors in an advisory capacity on Bay-Delta matters and is also serving as the General Manager of the State Water Project Contractors Authority.

Ms. Cotton has served on the California Urban Water Conservation Council for over a dozen years, as representative for Council members Kern County water Agency, Castaic Lake Water Agency and now Kennedy/Jenks Consultants. She has served on the Council Steering Committee for eight years, and is currently Secretary/Treasurer of the organization; this experience has made her extremely familiar with the requirements of the Memorandum of Understanding Regarding Urban Water Conservation in California (MOU). Ms. Cotton is also a member of the Association of California Water Agencies Water Use Efficiency and Communications Committees. She is an AWWA registered Level 1 Water Conservation Practitioner and currently serves on the AWWA Water Conservation Certification Committee.

This wide experience has made Ms. Cotton an expert on all aspects of California water management policy and practice. She has participated in numerous high-level efforts regarding water conservation in California, including the CALFED Bay-Delta Program Water Use Efficiency advisory committee and the Department of Water Resources Urban Water Management Plan guidebook advisory committee, and has worked on various pieces of conservation-related legislation. In addition, she has served on numerous CUWCC project advisory committees and participated in the 1997 and 2008 revisions of the MOU.

### Project Experience

**2010 Urban Water Management Plan Update, Castaic Lake Water Agency, Santa Clarita, CA.** Project Manager for preparation of the 2010 regional Urban Water Management Plan (UWMP), which is being completed on behalf of CLWA and its four retail purveyors. The water supply analysis includes the SWP, local groundwater, reliability programs, other imported supplies and recycled water. The UWMP also includes an evaluation of the various alternative water management strategies and supplies available to the Valley and based on the evaluation, will recommend water supply strategies.

**2010 Urban Water Management Plan Update, Mojave Water Agency, Apple Valley, CA.** QA/QC. Kennedy/Jenks is currently providing planning services to product Mojave Water Agency's (MWA) 2010 UWMP with particular focus on Best Management Practices (BMPs) and new regulations. A State Water Project contractor, MWA's plan is to be completed in cooperation with numerous retailers from within their service area. This update will also include analysis of the various agencies' water conservation programs status for the purposes of evaluating compliance with AB 1420 and SBX7, in coordination with the local Alliance for Water Awareness and Conservation.

**2010 Urban Water Management Plan Update, Western Municipal Water District, Riverside County, CA.** QA/QC for preparation of the District's 2010 UWMP update, including water supplies, demands, and conservation measures.

**2010 Urban Water Management Plan Update for Improvement District 4, Kern County Water Agency, Bakersfield, CA.** Project Manager for preparation of the 2010 regional UWMP, for the Kern County Water Agency's (KCWA) Improvement District No. 4 (ID4), which represents the urban portion of KCWA's State Water Project wholesale service area. The water supply analysis includes the SWP, local groundwater, reliability programs, other imported supplies and recycled water. In addition to the water supply analyses required by the UWMP Act, this UWMP update will also include analysis of local water conservation program status for the purposes of evaluating compliance with AB 1420 and SBX7.

**2010 Urban Water Management Plan Update, Port Hueneme Water Agency, Port Hueneme, CA.** QA/QC for preparation of the Agency's 2010 UWMP update, which will include 25 years of water supply/demand analysis, new legislative requirements, water supply demand forecasting, Demand Management Measures review and analysis, and contingency planning.

**2010 Urban Water Management Plan Update, City of Port Hueneme, CA.** QA/QC for update of the City's 2010 UWMP. Project included review of the City's existing and future water supplies and demands, water supply reliability, summary of current conservation measures, an evaluation of recommended conservation measures, and an implementation plan.

**2010 Urban Water Management Plan Update, San Bernardino Valley Municipal Water District, San Bernardino, CA.** QA/QC for update of the District's 2010 UWMP with particular focus on Best Management Practices (BMP's) and new regulations. The work will also include coordination with California Department of Water Resources reviews and approvals.

**2010 Urban Water Management Plan, Lake Arrowhead Community Services District, Lake Arrowhead, CA.** Project Manager for production of this retail water purveyor's 2010 UWMP update.

**2010 Urban Water Management Plan, North of the River Municipal Water District and Oildale Mutual Water Company, Kern County, CA.** QA/QC for preparation of the 2010 UWMP update for Kern County Water Agency Improvement District No. 4's (ID4) participating retail purveyors, North of the River

Municipal Water District and Oildale Mutual Water Company. The UWMP update will provide information on ID4's wholesale service area and operations and will include data and information about the ID4 retail purveyor service areas and operations. The UWMP update will also include information on ID4 retail purveyor service areas that recover groundwater within ID4.

**2010 Urban Water Management Plan, City of Ventura, CA.** Project Manager for production of the City's 2010 UWMP update. The water supply analysis includes local groundwater, reliability programs, other imported supplies and recycled water. In addition to the water supply analyses required by the UWMP Act, this UWMP update will also include analysis of local water conservation program status for the purposes of evaluating compliance with AB 1420 and SBX7.

**2010 Urban Water Management Plan, Central Coast Water Authority, Ventura County, CA.** Currently providing QA/QC and third-party technical review for the CCWA's 2010 UWMP update.

**2010 Urban Water Management Plan Update, Western Municipal Water District, Riverside County, CA.** QA/QC for preparation of the District's 2010 UWMP update, including water supplies, demands, and conservation measures.

**Water Use Efficiency Master Plan, Western Municipal Water District, Riverside County, CA:** Project Manager. In concert with the growing emphasis on water use efficiency programs, WMWD commissioned the preparation of a Water Use Efficiency Master Plan to comprehensively address the long term use of water resources within their service area by adopting objectives, policies and programs designed to promote innovative emerging technologies and practices, as well as proven and cost-effective conservation measures. Ms. Cotton managed and authored several sections of the Plan, conducted an evaluation of water conservation measures through development of a weighted scoring matrix, and reviewed and assisted in the production of the Master Plan.

**Water Conservation Master Plan, City of Riverside, Riverside County, CA:** Technical Advisor & QA/QC. Recently selected for the preparation of a Water Conservation Master Plan to comprehensively address the long term use of water resources within the City's service area by adopting objectives, policies and programs designed to promote innovative emerging technologies and practices, as well as proven and cost-effective conservation measures.

**Integrated Water Resources Management Plan (IWRMP), Western Municipal Water District, Riverside, CA:** Project Team Member. Preparation of an integrated water resources plan for the Western Municipal Water District and retail agencies within the District (Riverside County). Project involved assistance to, and coordination of, a six member management group and approximately 20 stakeholders. Developed materials for stakeholder education, assisted with identification of water management objectives, and evaluation of projects put forth by stakeholders for consistency with objectives, financial feasibility, and compliance with State mandated requirements.

**Upper Santa Clara Integrated Water Resources Management Plan, County of Los Angeles, CA:** Project manager for the preparation of an integrated water resources plan for the Upper Santa Clara River Region (Los Angeles County). Project involves assistance to, and coordination of, an eight member management group and approximately 30 stakeholders. Develop materials for stakeholder education,

assist with identification of water management objectives, and evaluate projects put forth by stakeholders for consistency with objectives, financial feasibility, and compliance with State mandated requirements.

**Hollister Area 2008 Urban Water Management Plan, Sunnyslope County Water District, City of Hollister, San Benito County Water District, CA.** Provided QA/QC for a collaborative Urban Water Management Plan (UWMP) Update by the Sunnyslope County Water District (Sunnyslope), City of Hollister (City), and the San Benito County Water District (District). The latest amendment to the Plan incorporates a water shortage contingency plan, alternative water conservation measures and water reclamation programs.

### Experience Prior to Kennedy/Jenks

**Castaic Lake Water Agency, Water Resources Manager, Santa Clarita, CA**. At the direction of the General Manager, work consisted of managing all aspects of the Agency's water resources projects, specifically dealing with water supply issues at the state and local levels. Prepared, facilitated, reviewed and submitted all water sale/transfer contracts, various agreements, and attendant resolutions to the Agency's Board of Directors and the Department of Water Resources. Prepared all documentation and conducted negotiations for three separate groundwater banking projects. Prepared in-house technical reports and other materials, including overseeing the production of the Agency's Urban Water Management Plan. Served in scientific advising capacity in reviewing all environmental regulatory documentation, particularly in regard to CEQA requirements, including consultant reports and other scientific documents. Served as the Agency's Water Conservation Coordinator; responsible for implementation of water conservation Best Management Practices as contained in the Memorandum of Understanding of the California Urban Water Conservation Council. Responsible for the Agency's public information program and oversee all its aspects. Represented the Agency on various committees, including several State Water Contractors standing committees, the California Urban Water Conservation Council Steering Committee, and the Association of California Water Agencies Communications and Program Committees.

**Castaic Lake Water Agency, Assistant to the General Manager, Santa Clarita, CA.** Worked at the direction of the General Manager, specifically dealing with water supply issues at the state and local levels. Prepared, facilitated, reviewed and submitted water sale/transfer contracts, various agreements, and attendant resolutions to the Agency's Board of Directors. Served in scientific advising capacity in reviewing environmental regulatory documentation, particularly in regard to the CALFED Bay-Delta Program; environmental impact reports; consultant reports and other scientific documents. Served as the Agency's Water Conservation Coordinator; responsible for implementation of water conservation Best Management Practices as contained in the Memorandum of Understanding of the California Urban Water Conservation Council. Responsible for the Agency's public information program. Prepared, compiled, wrote, and edited the Agency's quarterly newsletter and other Agency public information materials. Prepared in-house technical reports and other materials, including the Agency's Urban Water Management Plan. Represented the Agency on various committees, including several State Water

Contractors standing committees and the Association of California Water Agencies Communications and Program Committees.

**Kern County Water Agency, Water Resources Planner, Bakersfield, CA.** Attached to the Agency's Water Resources Department, specifically dealing with water supply issues, at both the state and local levels. Prepared, facilitated, reviewed and submitted water sale/transfer contracts, various agreements, and attendant resolutions to the Agency's Board of Directors. Served in scientific advising capacity in reviewing environmental regulatory documentation, particularly in regard to the CALFED Bay-Delta Program; environmental impact reports; consultant reports and other scientific documents. Served as the Agency's Water Conservation Coordinator; assist the Agency's Urban Bakersfield Advisory Committee. Responsible for implementation of water conservation Best Management Practices as contained in the Memorandum of Understanding of the California Urban Water Conservation Council. Also assisted with the Agency's participation in the AB3616 Agricultural Water Management Council. Responsible for majority of the Agency's public information program. Prepared, compiled, wrote, and edited the Agency's monthly newsletter. Prepared and wrote Agency public information materials. Prepared in-house technical reports and other materials including the Agency's Urban Water Management Plan. . Represented the Agency on various committees, including several State Water Contractors standing committees and budget review committee, the California Water Clearinghouse (for CALFED and Bay-Delta issues), the Association of California Water Agencies Communications (vice-chair) and Program Committees, and the Executive Committee of the Water Association of Kern County.

*RESUME*

# Joseph C. Scalmanini

***Specialization:***

Forty-three years of practice in groundwater development and management, and oil and gas production. Assessments of groundwater resources and implementation of groundwater basin management in various areas throughout California; groundwater development and management encompassing well design, construction, operation, and maintenance; groundwater monitoring as part of basin management and as part of groundwater contamination investigations; artificial groundwater recharge facilities and practices; injection of industrial waste water; development of brackish and saline groundwater for municipal (desalination) and industrial water supply; water supply master planning.

***Professional Registration:***

Registered Civil Engineer, California, CE 28233

***Academic Degrees:***

| | |
|---|---|
| M.E. Civil Engineering, University of California, Davis, CA | 1984 |
| B.S. Mechanical Engineering, University of Santa Clara, Santa Clara, CA | 1967 |

***Professional Experience:***

| | |
|---|---|
| Luhdorff and Scalmanini, Consulting Engineers, Woodland, CA | |
| President | 2004 - Present |
| Principal Partner | 1989 - 2004 |
| Partner | 1980 - 1989 |
| University of California, Davis, Davis, CA | |
| Associate Development Engineer | 1973 - 1979 |
| Shell Oil Company | |
| Mechanical and Facilities Engineer | 1967 - 1973 |

***Representative Professional Assignments:***

Consultant to water districts and utilities, municipalities, corporate and individual farming interests, corporate and private industry, and other engineering firms on groundwater development, utilization and management, including preparation and implementation of AB 3030 and other groundwater management plans, and plans for supplemental water supply and conjunctive use management. Consultation with public agencies, corporate and private concerns regarding groundwater contamination, its identification, monitoring, and management. Consultation with legal profession on technical aspects of groundwater development and utilization, including all aspects of groundwater basin yield and management, well design and construction, and application of pumping equipment.

***Representative Professional Assignments continued:***

Mr. Scalmanini directed and conducted a ground-water basin assessment in the Santa Maria Valley, including developing plans for conjunctive use of imported SWP water, recaptured return flows and increased artificial recharge of natural stream flow. After the adjudication of the Santa Maria Valley Groundwater Basin, he was appointed Basin Engineer, responsible for monitoring basin conditions and annually reporting to the court on the state of the basin.

Mr. Scalmanini directed the development of an alternative basin management plan for diversion of stream flow to replace coastal groundwater pumping and halt historical seawater intrusion in the Salinas Valley. He has developed several ground-water substitution programs for both public and private farming interests in Sacramento, Yolo and Sutter Counties, and authored Ground-Water Management Plans for these respective areas.

Mr. Scalmanini served as the court-appointed technical advisor to the Special Referee in the Chino Basin for development and implementation of an Optimum Basin Management Program to preserve and potentially increase the safe yield of the aquifer system, incorporate conjunctive use within storage limits in the aquifer, and make beneficial use of degraded water quality in the lower end of the basin by desalting ground water for future domestic water supply.

Mr. Scalmanini is directing ongoing engineering and hydrogeological analyses of local groundwater and imported State Water Project water supplies in the Upper Santa Clara River Area (Santa Clarita Valley) in Los Angeles County, including the preparation of annual Water Reports over the last eleven years. As part of that work, Mr. Scalmanini developed a cooperative technical program to integrate water resource analysis with the adjacent downstream basins, and has coordinated technical analysis of sustainable yield of the groundwater basin for ongoing agricultural, municipal, and other local water requirements since 2001. Mr. Scalmanini is the primary author of the AB3030 Groundwater Management Plan that has been adopted for the basin. He also prepared the Amendment to the 2000 Urban Water Management Plan for the State Water Contractor and all the water purveyors in the Valley to specifically address the adequacy of groundwater supplies in the wake of perchlorate contamination and the plan to contain contaminant migration while restoring contaminated wells to water supply service through the installation of wellhead treatment. He subsequently co-prepared an analysis of groundwater basin sustainable yield and a subsequent analysis of the adequacy of groundwater supply after another Alluvial well was impacted by perchlorate. He prepared the groundwater components of the 2005 Urban Water Management Plan, which was based on all the preceding analyses. Most recently, Mr. Scalmanini co-prepared an updated analysis of sustainable groundwater basin yield, including consideration of potential climate change impacts, for use in ongoing basin management and in the 2010 Urban Water Management Plan.

Mr. Scalmanini also currently serves as Chairman of the Ground-Water Committee that is developing and analyzing the potential for development of additional ground water throughout the Sacramento Valley as part of the Sacramento Valley Water Management Agreement reached in Phase 8 of the SWRCB Bay-Delta Water Rights Hearings.

***Professional Affiliations:***

National Ground Water Association
- Association of Ground Water Scientists and Engineers

American Water Works Association
California Groundwater Association
Groundwater Resources Association of California

***Public Service:***

- **Yolo County Aggregate Resources Committee (1975-79)**, Alternate delegate, hydrologist - analysis of impacts and development of management plans for extraction of aggregate from Cache Creek basin.
- **California Tenth Biennial Conference on Ground Water (1975)**, Member, Planning Committee
- **Chancellor's Campus (Univ. of Calif., Davis) Water Committee (1976-78)**, Staff Engineer - analysis of water supplies and uses, projection of requirements, development of conservation and management plans.
- **City of Davis Water Planning and Conservation Committee (1977-79)**, Chairman - analysis of water supplies and uses, projection of requirements, consideration of alternative supplies, development of conservation and management plans.
- **Yolo County Water Resources Task Force (1979)**, Member - development of county-wide master water plan.
- **Pacific Gas and Electric Co. ACT$^2$ Irrigation Pumping Demonstration Project (1992)**, Technical Advisor
- **Association of California Water Agencies (1994-1996)**, Member - Groundwater Committee
- **Cache Creek Conservancy**, **(2000-2002)**, Director

***Teaching Activities:***

Course Coordinator and Instructor University Extension Courses, University of California, Davis:

Concepts of Ground Water Management (1974, 1976, 1978, 1981)
Legal and Policy Considerations in Ground Water Management (1975, 1976, 1980)
Water Supply Wells and Pumps (1977, 1978,1981, 1983, 1985, 1986)
Groundwater Law, Hydrology and Management (2001-2010)

Instructor, University of California, Davis, Water Science 198, Introductory Hydraulics (1977, 1978, 1979)

Lecturer, University of California, Davis, Water Science 2, 140, 160; Ecology 230; Civil Engineering / Geology 175 (1975 - 1979)

Lecturer on Aquifer Characteristics, Well Hydraulics, and Groundwater Development, in Technical Training Classes at the U.S. Army Corps of Engineers' Hydraulic Engineering Center, Davis, CA.

***Publications and Presentations:***

Scott, V.H. and J.C. Scalmanini, **Water Wells and Pumps: Their Design, Construction, Operation, and Maintenance**, University of California Division of Agricultural Sciences Bulletin No. 1889, 1977.

Helweg, O.J., Scott, V.H., and J.C. Scalmanini, **Improving Well and Pump Efficiency**, American Water Works Association, 1983.

***Publications and Presentations continued:***

Scalmanini, J.C., and Scott V.H., **Design and Operational Criteria for Artificial Groundwater Recharge Facilities**, Water Science and Engineering Paper No. 2009, University of California, Davis, 1979.

Scalmanini, J.C., Scott, V.H., and O.J. Helweg, **Energy and Efficiency in Wells and Pumps**, presented at Twelfth Biennial Ground Water Conference, 1979.

Scalmanini, J.C., Johnson Jr., R.M., and E.E. Luhdorff Jr., **Development of a Groundwater Monitoring Program as a Basis for Coastal Groundwater Basin Management**, presented at the Fall Conference, American Water Works Association, CA-NV Section, 1983.

Scalmanini, J.C., **3030 Hindsight and 2020 Foresight, Actual Groundwater Management Experience Over the Last 15 Years, Soquel Creek Water District**, presented at the Association of California Water Agencies' Groundwater Management Conference, March 1994.

Scalmanini, J.C., **Legal and Technical Issues Related to Surface Water and Groundwater Interaction**, presented at the Groundwater Resources Association's California Ground Water & Efficient Usage for the Year 2000 and Beyond, October 1998.

Scalmanini, J.C., A. Schneider, and V. Cahill (panel presentation), **Groundwater Classification: Is the State Water Resources Control Board's Jurisdiction Over Ground Water Changing?**, presented at the Water Education Foundation's 2000 Update on Water Law and Policy, July 2000.

Scalmanini, J.C., **What the Heck's a Sub-Basin? Defining Basins and Sub-Basins**, presented at the Association of California Water Agencies' Groundwater Management: Will CalFed Help or Hinder Workshop, November 2000.

Scalmanini, J.C., **"Groundwater Law, Policy and Science: What can Be Done About The Disconnect",** presented at the Water Education Foundation's 2005 Water Law and Policy Briefing, San Diego, July 2005.

# *Nancy Clemm, P.E.*

## WORK SUMMARY

Nancy Clemm is a civil engineer with 30 years water resources planning experience, including 20 years working primarily on State Water Project (SWP) and Bay/Delta issues. Ms. Clemm is very familiar with SWP system operations, including reservoir, Delta, and conveyance facility operations, as well as with the Department of Water Resources (DWR) planning model used to estimate SWP delivery reliability. She has assisted in the preparation of numerous water supply planning documents, focused primarily on SWP supplies and facilities, including the 2005 and 2010 Urban Water Management Plans (UWMP) for Castaic Lake Water Agency (CLWA), the 1995 Regional Urban Water Management Plan and 1996 Integrated Water Resources Plan for the Metropolitan Water District of Southern California (MWD), and several environmental impact reports (EIR) dealing with SWP supplies and/or use of SWP conveyance facilities.

## EXPERIENCE

**WATER RESOURCES CONSULTANT**, Los Angeles, California, 1999 - Present.
(Self-employed)

**2005 and 2010 UWMPs:** For CLWA, participated in preparation of 2005 and 2010 UWMPs, primarily focused on determining availability of SWP water supplies and assessing overall supply reliability.

**Monterey Plus EIR:** For MWD, provided technical support to SWP contractor representatives on advisory committee to DWR regarding water supply analyses and SWP contract issues, for preparation of new environmental document for Monterey Amendment to SWP water supply contract.

**Water Program EIRs:** For CLWA, assisted in preparation of EIRs for water programs involving use of SWP conveyance facilities, for CLWA's Rosedale Rio Bravo Water Storage District Water Banking Program, and its water acquisition from Buena Vista Water Storage District/Rosedale Rio Bravo Water Storage District.

**SWP Table A Transfer EIR:** For CLWA EIR for permanent transfer of SWP Table A amount, conducted SWP water supply reliability and water allocation analyses using data from DWR model studies, performed SWP aqueduct capacity rights and availability analysis, and prepared overall CLWA supply reliability assessment.

**SWP Water Operations and Water Transfers:** For State Water Contractors (SWC), participating in SWC Water Operations Committee, addressing SWP annual water supply and operational issues; and in SWC Water Transfers Committee, reviewing and providing recommendations regarding approval of proposed SWP contractor transfers and exchanges.

**Reservoir Reoperation Report:** For CALFED, drafted report on potential water supply and environmental benefits of reoperation of hydroelectric facilities in northern and central California.

**Hydrologic Model:** For Salt River Project, assisted with enhancements to runoff forecasting model, including making programming revisions, assisting with addition of user-interface, and writing user's manual and program documentation.

**METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA**, Los Angeles, California, 1991 - 98. (Senior Engineer, SWP Branch, 1993 - 98; Engineer, Bay Delta Branch, 1992; Engineer, SWP Branch, 1991)

**SWP Water Supply Analyses:** Assisted in preparation of several planning documents, including 1995 Regional Urban Water Management Plan and 1996 Integrated Water Resources Plan. Conducted numerous additional analyses to estimate future availability of SWP supplies, and to evaluate proposed SWP operational constraints, future water supply options, and SWP contract provisions.

**SWP Supply Operations:** Participated in SWC committee monitoring DWR's reservoir and Delta operations, addressing operational issues and various contractor issues such as equity and current supply versus risk of future shortage.

**Water Contracts:** Provided significant support in development of Monterey Amendment to SWP contract, including providing technical support for urban contractor negotiating team; assisting in amendment drafting and completion of environmental documentation; and resolution of implementation issues. Participated in drafting numerous agreements between MWD, DWR, and other agencies related to establishment of and water delivery to groundwater banking and exchange programs.

**SWP Supply Planning:** Participated in SWC committee monitoring DWR planning efforts to enhance SWP supplies, including review of proposed projects' feasibility, supply yield, water quality, environmental effects and mitigation, and costs.

**SALT RIVER PROJECT**, Phoenix, Arizona, 1981 - 90. (Senior Water Resources Analyst, 1985 - 90; Engineer III, 1983 - 84; Rotational Engineer, 1981 - 82)

**Water Supply Analyses:** Worked extensively with reservoir operations simulation model of Salt River Project system to conduct supply studies, to estimate future supplies and evaluate supply impacts given proposed physical and operational changes. Made major programming modifications and wrote program documentation.

**Other Computer Modeling:** Developed runoff forecasting model to estimate real-time runoff to reservoir system, including all model design, programming, and documentation. Assisted in development of water demand forecasting model based on land use, including model design, development, and implementation.

**Water Contracts / Accounting:** Developed detailed knowledge of existing water delivery and reservoir storage contracts. Participated in several negotiations for new water contracts, primarily concerning water delivery, accounting, and measurement.

## EDUCATION

Bachelor of Science in Civil Engineering, Arizona State University, 1981.
Graduate courses in water resources modeling, Arizona State University.

## REGISTRATION

Civil Engineer, California and Arizona

# J. Lauren Everett

## Water Resources Specialist

### Education

B.S., Environmental Studies, University of California, Santa Barbara, 1999
M.S., Donald Bren School of Environmental Science and Management University of California, Santa Barbara, 2001

### Professional Summary

Ms. Everett is a Water Resources Specialist, with over 8 years of experience in environmental and regulatory compliance providing technical planning support for a diverse range of water resource projects. Ms. Everett is currently involved with implementing DWR's Proposition 84 Integrated Regional Water Management Grant Program, urban water management planning, and supply and demand forecasting. Lauren has served as the liaison between planning, and engineering teams, and appreciates the teamwork and communication skills needed to successfully integrate planning and design concepts to meet regulatory requirements. She has also served as the project manager and project specialist for numerous water resource studies in Southern California.

### Professional Experience

- *Castaic Lake Water Agency (CLWA), 2010 Urban Water Management Plan Update, Santa Clarita, CA:* Preparation of the 2010 regional Urban Water Management Plan (UWMP) is being completed on behalf of CLWA and its four retail purveyors. The water supply analysis includes the SWP, local groundwater, reliability programs, other imported supplies and recycled water. Ms. Everett is the technical lead on the UWMP development.

- *2010 Urban Water Management Plan Update for Improvement District 4, Kern County Water Agency, Bakersfield, CA.* Preparation of the 2010 regional UWMP, for the Kern County Water Agency's (KCWA) Improvement District No. 4 (ID4), which represents the urban portion of KCWA's State Water Project wholesale service area includes the SWP, local groundwater, reliability programs, other imported supplies and recycled water. Ms. Everett is the technical lead on the UWMP development.

- *Castaic Lake Water Agency (CLWA), Upper Santa Clara River IRWMP Proposition 84 Implementation Grant Application, Santa Clarita, CA:* The Project is the preparation of an Implementation Grant application requesting funds from the Proposition 84 Integrated Regional Water Management (IRWM) Implementation Grant Program for five Candidate Projects within the Upper Santa Clara River IRWM Plan. Ms. Everett managed the effort and was the technical lead on the application preparation.

- *Castaic Lake Water Agency (CLWA), Upper Santa Clara River IRWMP Proposition 84 Planning Grant Application, Santa Clarita, CA:* The Project is the preparation of a Planning Grant application requesting funds from the Proposition 84 IRWM Planning Grant Program for the 2010 Update of the Upper Santa Clara River IRWM Plan. Ms. Everett managed the effort and was the technical lead on the application preparation.

- *Los Angeles County Department of Public Works, Antelope Valley Integrated Regional Water Management Plan (Plan):* Ms. Everett managed the development of the Plan, which was

designed with a regional focus for the sustainable management of water resources in the Antelope Valley Region for the next twenty-five years. Over 40 agencies within the Antelope Valley participated in the planning process.

- *Los Angeles County Department of Public Works, Antelope Valley Integrated Regional Water Management Plan, Proposition 50 Round 2 Step 1 & Step 2 Grant Application, Antelope Valley, CA:* Kennedy/Jenks submitted a proposal for an implementation grant requesting $25 million for seven projects that targeted reducing the mismatch between supply and demand projected for the Region by 2035. Ms. Everett managed the preparation of the Step 1 and Step 2 grant applications.

- *Los Angeles County Department of Public Works, Antelope Valley Integrated Regional Water Management Plan, Region Acceptance Process (RAP) Application, Antelope Valley, CA:* Kennedy/Jenks submitted a proposal successfully defending the IRWMP Region's boundary to the Department of Water Resources allowing the IRWMP Region to remain in the Proposition 84 IRWMP Program. Ms. Everett managed the RAP effort.

- *Kern County Water Agency, Tulare Lake Basin Portion of Kern County Integrated Regional Water Management Plan (Plan), Kern County, CA:* Ms. Everett is currently assisting in the development of the integrated regional planning document, and providing assistant management responsibilities. Over 40 agencies within the Kern Region are participating in the Kern Region IRWM planning process.

- *Kern County Water Agency, Tulare Lake Basin Portion of Kern County Integrated Regional Water Management Plan, Region Acceptance Process Application, Kern County, CA:* Kennedy/Jenks submitted a proposal successfully defending the IRWMP Region's boundary to the Department of Water Resources allowing the IRWMP Region to remain in the Proposition 84 IRWMP Program. Ms. Everett managed the RAP effort.

- *Castaic Lake Water Agency (CLWA), Water Supply Reliability Plan Update, Santa Clarita, CA:* The plan and update are needed in order to evaluate the technical, environmental, and economic issues associated with potential water supply reliability projects. Ms. Everett's responsibilities include characterization of the water supply and demands for the region, and general report content.

- *Los Angeles County Department of Public Works, North Los Angeles/Kern County Regional Recycled Water Master Plan Environmental Impact Report, Antelope Valley, CA:* Kennedy/Jenks assisted Environmental Science Associates in preparing the hydrology, hazards and hazardous materials, and geology sections of the Environmental Impact Report. Ms. Everett managed the Kennedy/Jenks team on this effort.

- *Ventura County Waterworks District No. 8 Recycled Water Master Plan, Simi Valley, CA:* This project consists of the design of a recycled water distribution system to serve municipal and industrial customers within the City of Simi Valley. Ms. Everett's responsibilities included characterization of the environmental issues associated with implementing the system, identification of required permits and approvals, and general report coordination.

# *Dana Haasz*

## Project Manager

### Education

M.S., Applied Geography, New Mexico State University, Las Cruces, NM
B.S., Geography and Environmental Science, McGill University, Montreal, Canada

### Affiliations

California Urban Water Conservation Council
Western Water Alliance Steering Committee and Hiring Committee
Technical Advisor to CALFED Appropriate Water Measurement Panel/Agricultural and Urban
Environmental Justice Coalition for Water Steering Committee
Water Education Foundation, Water Leader (2003) and Water Leader Mentor (2009)

### Professional Summary

Dana Haasz has 13 years experience in water conservation, demand modeling and resource planning. She currently manages the water use efficiency projects and programs for Kennedy/Jenks. Projects range from planning, program assessment, demand modeling and helping agencies to meet regulatory requirements, to the development of implementation programs, budgets, monitoring and quantification.

Dana spent the six years as the Water Conservation Administrator at San Francisco Public Utilities Commission. Ms. Haasz has extensive experience in regulatory compliance issues and long-term water supply planning for the retail and wholesale service areas, including planning, organizing, developing and administering retail water conservation programs including the identification, evaluation, and public promotion of conservation with industry, builders, developers, public agencies, customers, and community groups. Ms. Haasz's activities also extended to policy development, from legislative initiatives and statewide conservation issues to development of a revolving loan program and other efficiency-related activities at the local level.

In Ms. Haasz's six years at San Francisco Public Utilities Commission, she directly managed and implemented the growth of the Conservation department from a customer-service based residential rebate program to a multi-faceted approach that includes all customers, various types of incentives and services, outreach, education, policy and coordination with local, regional and state level activities. Her approach towards the expansion of the program was to merge public policy needs with solid business principles and quantified outcomes so as to make obvious and appropriate efficiency decisions for the customer as well as honoring the agency's responsibility to the ratepayer.

Prior to the SFPUC, Dana developed modeling and theoretical skills at the Pacific Institute for Water, Development and Environment where she co-authored an analysis quantifying water conservation potential for the state and policies and programs designed to achieve that goal.

### Project Experience

**2010 Urban Water Management Plans (18 water systems), Golden State Water Company, Rancho Cordova, CA.** Currently providing water conservation services for GSWC's 2010 UWMP update for the 18 water systems that meet the criteria for the requirements of an UWMP. Updates will include analysis of water conservation programs status for the purposes of evaluating compliance with AB 1420 and SBX7, in coordination with the local Alliance for Water Awareness and Conservation.

**2010 Urban Water Management Plan Update, Stockton East Water District, Stockton, CA.** Currently providing water conservation services for preparation of the District's 2010 UWMP update, including water supplies, demands, and conservation measures, as well as addressing AB 1420 and SBX7-7 regulations.

The update will also include a water shortage contingency plan as it applies to Stockton East Water District being an urban water wholesaler.

**Complete Water Conservation and Demand Reduction Program Evaluation, City of Roseville, Roseville, CA.** Developed an implementation plan, including a review of past activities, identification of potential conservation measures, cost benefit analysis, program modeling and design to prepare conservation plan for City of Roseville, that meets the 20x2020 requirements.

**Water Conservation Efficiency Master Plan, City of Riverside, Riverside, CA** developed a conservation implementation program for the City of Riverside. Evaluated Riverside's past water use efficiency program, identified potential conservation measures, performed cost benefit analysis, modeled potential programs and developed a scored options matrix to assist Riverside with efforts to effectively comply the 20x2020 requirements and guide program design and implementation.

**2010 Urban Water Management Plan Update, Castaic Lake Water Agency, Santa Clarita, CA.** Currently providing water conservation services for preparation of the 2010 regional Urban Water Management Plan (UWMP), which is being completed on behalf of CLWA and its four retail purveyors. The water supply analysis includes the SWP, local groundwater, reliability programs, other imported supplies and recycled water. The UWMP also includes an evaluation of the various alternative water management strategies and supplies available to the Valley and based on the evaluation, will recommend water supply strategies.

**2010 Urban Water Management Plan Update, Mojave Water Agency, Apple Valley, CA.** Currently providing water conservation services to produce Mojave Water Agency's (MWA) 2010 UWMP with particular focus on Best Management Practices (BMPs) and new regulations. A State Water Project contractor, MWA's plan is to be completed in cooperation with numerous retailers from within their service area. This update will also include analysis of the various agencies' water conservation programs status for the purposes of evaluating compliance with AB 1420 and SBX7, in coordination with the local Alliance for Water Awareness and Conservation.

**2010 Urban Water Management Plan Update, Western Municipal Water District, Riverside County, CA.** Currently providing water conservation services for preparation of the District's 2010 UWMP update, including water supplies, demands, and conservation measures.

**2010 Park Water Company Urban Water Management Plan and Water Use Efficiency Plan, CA.** Currently providing water conservation services for preparation of the District's 2010 UWMP update, including water supplies, demands, and conservation measures.

**2010 Suburban Water Systems Urban Water Management Plan, Oxnard, CA.** Currently providing water conservation services for preparation of the District's 2010 UWMP update, including water supplies, demands, and conservation measures.

**2010 Urban Water Management Plan Update for Improvement District 4, Kern County Water Agency, Bakersfield, CA.** Currently providing water conservation services for preparation of the 2010 regional UWMP, for the Kern County Water Agency's (KCWA) Improvement District No. 4 (ID4), which represents the urban portion of KCWA's State Water Project wholesale service area. The water supply analysis includes the SWP, local groundwater, reliability programs, other imported supplies and recycled water. In addition to the water supply analyses required by the UWMP Act, this UWMP update will also include analysis of local water conservation program status for the purposes of evaluating compliance with AB 1420 and SBX7.

**2010 Urban Water Management Plan Update, San Bernardino Valley Municipal Water District, San Bernardino, CA.** Currently providing water conservation services for update of the District's 2010 UWMP with particular focus on Best Management Practices (BMP's) and new regulations. The work will also include coordination with California Department of Water Resources reviews and approvals.

**2010 Urban Water Management Plan, Lake Arrowhead Community Services District, Lake Arrowhead, CA.** Currently providing water conservation services for production of this retail water purveyor's 2010 UWMP update.

**2010 Urban Water Management Plan, North of the River Municipal Water District and Oildale Mutual Water Company, Kern County, CA.** Currently providing water conservation services for preparation of the 2010 UWMP update for Kern County Water Agency Improvement District No. 4's (ID4) participating retail purveyors, North of the River Municipal Water District and Oildale Mutual Water Company. The UWMP update will provide information on ID4's wholesale service area and operations and will include data and information about the ID4 retail purveyor service areas and operations. The UWMP update will also include information on ID4 retail purveyor service areas that recover groundwater within ID4.

**2010 Urban Water Management Plan, City of Ventura, CA.** Currently providing water conservation services for production of the City's 2010 UWMP update. The water supply analysis includes local groundwater, reliability programs, other imported supplies and recycled water. In addition to the water supply analyses required by the UWMP Act, this UWMP update will also include analysis of local water conservation program status for the purposes of evaluating compliance with AB 1420 and SBX7.

**2010 Urban Water Management Plan, Central Coast Water Authority, Ventura County, CA.** Currently providing QA/QC and third-party technical review regarding water conservation practices for the CCWA's 2010 UWMP update.

**2010 Urban Water Management Plan Update, Western Municipal Water District, Riverside County, CA.** Currently providing water conservation services for preparation of the District's 2010 UWMP update, including water supplies, demands, and conservation measures.

## Project Experience Prior to Kennedy/Jenks

### Water Conservation Administrator, San Francisco Public Utilities Commission

**Water Saver Program:** Developed market-based approach to conservation programs. The program aimed to secure permanent water savings for large commercial and industrial customers by providing technical support and financial incentive incentives based on the volume of saved water. The program allowed SFPUC to support larger process-oriented uses and other specific needs that are not part of the traditional fixture-based rebate programs. Participants included hotels, hospitals, colleges, and food growers.

**Unaccounted for Water Analysis:** Managed the first large urban agency implementation of the full AWWA M36 Water Loss process. The multi-phase analysis to discover, diagnose, and develop an implementation plan for capturing water system losses consisted of quantification and categorization of losses, identifying cost effective potential recovery and ,disaggregating city zones to prioritize and develop leak detection and repair implementation plan and providing leak detection training to City staff at the SFPUC.

**Data Management:** Managed design and development of database designed to improve the analytic capacity of conservation programs and link activities to water savings - actual and estimated – customer type, spatial information and more. The system also incorporated administrative tasks such as issuing rebates, mailings, inspection scheduling and follow up.

**Low-income Direct Install Program:** Developed high-efficiency toilet (HET) direct-installation and water audit program in coordination with community groups in order to save water in a hard to reach population and mitigate the impacts of rising water rates. The program provided free HETs to single family customers and a voucher program for multi-family residents in low-income communities. Local nonprofit groups were enlisted and community members trained in conservation principles in order to help market the program. program received two grants of $200,000 each, one from the California Department of Water Resources and one from the U.S. Bureau of Reclamation.

**Education:** Developed materials and an implementation plan for a water resources education program that would be compliant with both state and CUWCC requirements.

**Municipal:** Launched municipal audit program with detailed potential efficiency improvements, costs and implementation recommendations.

**Conservation Legislation:** Developed and worked to pass local conservation ordinances including a residential retrofit on resale for ordinance and a replacement ordinance for commercial accounts. Improvements include fixture replacement (toilets, showerheads aerators) and leak repair. Worked with the San Francisco Department of Building Inspection to train City inspectors, develop implementation materials and process.

**Baseline Analysis:** Participated in modeling of baseline use in San Francisco by customer type, potential demand reduction opportunities, costs and implementation options. Preferred alternative became the basis for SFPUC program activities.

**California Urban Water Conservation Council:** Represented Group 1 water agencies as convener of the CUWCC, 2005-2006 / Represented Group 2 Environmental Organizations as convener 2003-2004.

# Appendix C

Purveyor Supply and Demand Tables

**TABLE C-1**
**AVERAGE/NORMAL YEAR: EXISTING WATER SUPPLIES**

| EXISTING SUPPLIES[a] | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|---|
| **Existing Groundwater[b]** | | | | | | | | |
| Alluvial Aquifer | | | | | | | | |
| LACWWD 36[c] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NCWD | 1,825 | 1,825 | 1,825 | 1,825 | 1,825 | 1,825 | 1,825 | 1,825 |
| SCWD | 10,500 | 10,500 | 10,500 | 11,500 | 11,500 | 11,500 | 11,500 | 11,500 |
| VWC | 11,675 | 11,675 | 11,675 | 11,675 | 11,675 | 11,675 | 11,675 | 11,675 |
| *Total* | *24,000* | *24,000* | *24,000* | *25,000* | *25,000* | *25,000* | *25,000* | *25,000* |
| Saugus Formation | | | | | | | | |
| LACWWD 36[c] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NCWD | 3,525 | 3,525 | 3,525 | 3,525 | 3,525 | 3,525 | 3,525 | 3,525 |
| SCWD[d] | 2,850 | 3,350 | 3,350 | 3,350 | 3,350 | 3,350 | 3,350 | 3,350 |
| VWC | 2,850 | 3,350 | 3,350 | 3,350 | 3,350 | 3,350 | 3,350 | 3,350 |
| *Total* | *9,225* | *10,225* | *10,225* | *10,225* | *10,225* | *10,225* | *10,225* | *10,225* |
| **Recycled Water[e]** | | | | | | | | |
| LACWWD 36[c] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NCWD | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SCWD | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| VWC | 325 | 325 | 325 | 325 | 325 | 325 | 325 | 325 |
| *Total* | *325* | *325* | *325* | *325* | *325* | *325* | *325* | *325* |
| **Imported Water** | | | | | | | | |
| SWP Table A and Carryover[f] | | | | | | | | |
| LACWWD 36[c] | 1,656 | 1,943 | 2,217 | 2,489 | 2,688 | 2,901 | 3,091 | 3,269 |
| NCWD | 8,084 | 8,918 | 9,320 | 10,060 | 10,349 | 10,755 | 11,116 | 11,469 |
| SCWD | 23,918 | 24,263 | 24,268 | 23,963 | 24,541 | 24,979 | 25,369 | 25,787 |
| VWC | 24,442 | 22,776 | 21,795 | 20,888 | 19,822 | 18,765 | 17,825 | 16,875 |
| *Total* | *58,100* | *57,900* | *57,600* | *57,400* | *57,400* | *57,400* | *57,400* | *57,400* |
| SWP Flexible Storage Accounts[g] | | | | | | | | |
| LACWWD 36[c] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NCWD | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SCWD | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| VWC | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Total* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* |

**TABLE C-1 CON'T**

| | | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|---|---|
| Buena Vista-Rosedale | | | | | | | | | |
| LACWWD 36[(c)] | | 325 | 375 | 450 | 500 | 525 | 575 | 625 | 650 |
| NCWD | | 1,600 | 1,750 | 1,825 | 1,975 | 2,050 | 2,100 | 2,175 | 2,250 |
| SCWD | | 4,675 | 4,775 | 4,775 | 4,725 | 4,825 | 4,900 | 4,975 | 5,050 |
| VWC | | 4,400 | 4,100 | 3,950 | 3,800 | 3,600 | 3,425 | 3,225 | 3,050 |
| | *Total* | *11,000* | *11,000* | *11,000* | *11,000* | *11,000* | *11,000* | *11,000* | *11,000* |
| Nickel Water - Newhall Land | | | | | | | | | |
| VWC | *Total* | 1,607 | 1,607 | 1,607 | 1,607 | 1,607 | 1,607 | 1,607 | 1,607 |
| **Banking Programs**[(g)] | | | | | | | | | |
| Rosedale Rio-Bravo | | | | | | | | | |
| LACWWD 36[(c)] | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NCWD | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SCWD | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| VWC | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | *Total* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* |
| Semitropic | | | | | | | | | |
| LACWWD 36[(c)] | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NCWD | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SCWD | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| VWC | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | *Total* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* |
| Semitropic – Newhall Land | | | | | | | | | |
| VWC | *Total* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **TOTAL EXISTING SUPPLIES** | | | | | | | | | |
| LACWWD 36[(c)] | | 1,981 | 2,318 | 2,667 | 2,989 | 3,213 | 3,476 | 3,716 | 3,919 |
| NCWD | | 15,034 | 16,018 | 16,495 | 17,385 | 17,749 | 18,205 | 18,641 | 19,069 |
| SCWD | | 41,943 | 42,888 | 42,893 | 43,538 | 44,216 | 44,729 | 45,194 | 45,687 |
| VWC | | 45,299 | 43,833 | 42,702 | 41,645 | 40,379 | 39,147 | 38,007 | 36,882 |
| | **Total** | **104,257** | **105,057** | **104,757** | **105,557** | **105,557** | **105,557** | **105,558** | **105,557** |

Notes:

(a) The distribution of existing and planned supplies does not represent a formal allocation of water supplies among purveyors.

(b) Existing groundwater supplies represent the quantity of groundwater anticipated to be pumped with existing wells. As indicated in Tables 3-8 and 3-9 and Tables 3-4 and 3-5 of the 2009 Groundwater Basin Yield Analysis, individual purveyors may have well capacity in excess of quantities shown in this table. As indicated in Table 3-10, existing and planned groundwater pumping remain within the groundwater operating plan shown on Table 3-5.

(c) LACWWD 36 included for purposes of providing regional completeness; however, it is not required to prepare an UWMP.

(d) SCWD's existing Saugus 1 and Saugus 2 wells resumed production in 2011 with the completion of the perchlorate treatment facility.

(e) Per CLWA Draft Recycled Water Master Plan and Newhall Ranch Specific Plan.

(f) SWP supplies are based on the Department of Water Resources "*2009 State Water Project Delivery Reliability Report*."

(g) Not needed in average/normal years.

**TABLE C-2**
**AVERAGE/NORMAL YEAR: PLANNED AND TOTAL WATER SUPPLIES**

| PLANNED SUPPLIES[a] | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|---|
| **Future Groundwater**[b] | | | | | | | | |
| Alluvial Aquifer | | | | | | | | |
| LACWWD 36[c] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NCWD | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SCWD | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| VWC[d] | 0 | 1,000 | 2,000 | 3,000 | 4,000 | 5,000 | 6,000 | 7,000 |
| *Total* | - | *1,000* | *2,000* | *3,000* | *4,000* | *5,000* | *6,000* | *7,000* |
| Saugus Formation | | | | | | | | |
| LACWWD 36[c][e] | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 |
| NCWD | 875 | 875 | 875 | 875 | 875 | 875 | 875 | 875 |
| SCWD | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| VWC | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Total* | *1,375* | *1,375* | *1,375* | *1,375* | *1,375* | *1,375* | *1,375* | *1,375* |
| **Recycled Water**[f] | | | | | | | | |
| LACWWD 36[c] | 0 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| NCWD | 200 | 500 | 1,000 | 1,275 | 1,775 | 2,275 | 2,775 | 3,275 |
| SCWD | 100 | 500 | 1,500 | 2,275 | 2,775 | 3,775 | 4,775 | 5,775 |
| VWC | 675 | 1,675 | 2,675 | 4,175 | 5,675 | 7,675 | 9,675 | 11,875 |
| *Total* | *975* | *2,725* | *5,225* | *7,775* | *10,275* | *13,775* | *17,275* | *20,975* |
| **Banking Programs**[g] | | | | | | | | |
| LACWWD 36[c] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NCWD | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SCWD | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| VWC | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Total* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* |
| **TOTAL PLANNED SUPPLIES** | | | | | | | | |
| LACWWD 36[c] | 500 | 550 | 550 | 550 | 550 | 550 | 550 | 550 |
| NCWD | 1,075 | 1,375 | 1,875 | 2,150 | 2,650 | 3,150 | 3,650 | 4,150 |
| SCWD | 100 | 500 | 1,500 | 2,275 | 2,775 | 3,775 | 4,775 | 5,775 |
| VWC | 675 | 2,675 | 4,675 | 7,175 | 9,675 | 12,675 | 15,675 | 18,875 |
| **Total** | **2,350** | **5,100** | **8,600** | **12,150** | **15,650** | **20,150** | **24,650** | **29,350** |

**TABLE C-2 CON'T**

| PURVEYOR EXISTING AND PLANNED SUPPLIES | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|---|
| LACWWD 36[(c)] | 2,481 | 2,868 | 3,217 | 3,539 | 3,763 | 4,026 | 4,266 | 4,469 |
| NCWD | 16,109 | 17,393 | 18,370 | 19,535 | 20,399 | 21,355 | 22,291 | 23,219 |
| SCWD | 42,043 | 43,388 | 44,393 | 45,813 | 46,991 | 48,504 | 49,969 | 51,462 |
| VWC | 45,974 | 46,508 | 47,377 | 48,820 | 50,054 | 51,822 | 53,682 | 55,757 |
| **Total** | **106,607** | **110,157** | **113,357** | **117,707** | **121,207** | **125,707** | **130,208** | **134,907** |

Notes:

(a) The distribution of existing and planned supplies does not represent a formal allocation of water supplies among purveyors.

(b) Planned groundwater supplies represent new groundwater well capacity that may be required by an individual purveyor's production objectives in the Alluvial Aquifer and the Saugus Formation. When combined with existing purveyor and non-purveyor groundwater supplies, total groundwater production remains within the sustainable ranges identified in Table 3-7 of 2009 Groundwater Basin Yield Analysis. As indicated in Table 3-10, existing and planned groundwater pumping remain within the basin operating plan shown on Table 3- 5.

(c) LACWWD 36 included for purposes of providing regional completeness; however, it is not required to prepare an UWMP.

(d) Conversion of Newhall Land agricultural groundwater supplies to VWC M&I supplies.

(e) LACWWD 36 anticipates connecting a newly completed well in 2011.

(f) Per CLWA Draft Recycled Water Master Plan and Newhall Ranch Specific Plan.

(g) Not needed in average/normal years.

**TABLE C-3**
**AVERAGE/NORMAL YEAR: DEMANDS WITH SBX7-7 REDUCTIONS AND COMPARISON TO TOTAL SUPPLIES**

| WATER DEMANDS W/ AND W/O CONSERVATION[a] | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|---|
| **LACWWD 36[b]** | | | | | | | | |
| Demand w/o Conservation[c] | 1,759 | 2,189 | 2,619 | 3,048 | 3,478 | 3,908 | 4,338 | 4,768 |
| Anticipated Conservation Objective[d] | 176 | 438 | 524 | 610 | 696 | 782 | 868 | 954 |
| Reduction from Recycled Water[e] | 0 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| Net Anticipated Water Conservation[f] | 176 | 388 | 474 | 560 | 646 | 732 | 818 | 904 |
| Demand w/ Conservation[g] | 1,584 | 1,802 | 2,146 | 2,489 | 2,833 | 3,177 | 3,521 | 3,865 |
| *Existing and Planned Supplies* | *2,481* | *2,868* | *3,217* | *3,539* | *3,763* | *4,026* | *4,266* | *4,469* |
| **SBX7-7 Compliance Calculations** | | | | | | | | |
| **NCWD** | | | | | | | | |
| Demand w/o Conservation[c] | 12,571 | 14,246 | 15,922 | 17,598 | 19,273 | 20,949 | 22,624 | 24,300 |
| 20x2020 Reduction[h] | 1,365 | 2,982 | 3,204 | 3,489 | 3,742 | 3,995 | 4,248 | 4,501 |
| Reduction from Recycled Water[e] | 200 | 500 | 1,000 | 1,275 | 1,775 | 2,275 | 2,775 | 3,275 |
| Reduction from Water Conservation[i] | 1,165 | 2,482 | 2,482 | 2,482 | 2,482 | 2,482 | 2,482 | 2,482 |
| Demand w/ Conservation[j] | 11,406 | 11,764 | 13,439 | 15,116 | 16,791 | 18,467 | 20,142 | 21,818 |
| *Existing and Planned Supplies* | *16,109* | *17,393* | *18,370* | *19,535* | *20,399* | *21,355* | *22,291* | *23,219* |
| **SCWD** | | | | | | | | |
| Demand w/o Conservation[c] | 31,633 | 34,814 | 37,995 | 41,176 | 44,357 | 47,538 | 50,719 | 53,900 |
| 20x2020 Reduction[k] | 3,524 | 7,557 | 8,067 | 8,576 | 9,085 | 9,595 | 10,104 | 10,614 |
| Reduction from Recycled Water[e] | 100 | 500 | 1,500 | 2,275 | 2,775 | 3,775 | 4,775 | 5,775 |
| Reduction from Water Conservation[i] | 3,424 | 7,057 | 7,057 | 7,057 | 7,057 | 7,057 | 7,057 | 7,057 |
| Demand w/ Conservation[j] | 28,209 | 27,757 | 30,938 | 34,119 | 37,300 | 40,481 | 43,662 | 46,843 |
| *Existing and Planned Supplies* | *42,043* | *43,388* | *44,393* | *45,813* | *46,991* | *48,504* | *49,969* | *51,462* |
| **VWC** | | | | | | | | |
| Demand w/o Conservation[c] | 34,107 | 37,235 | 40,362 | 43,490 | 46,617 | 49,745 | 52,872 | 56,000 |
| 20x2020 Reduction[l] | 3,962 | 8,648 | 9,372 | 10,095 | 10,819 | 11,542 | 12,266 | 12,990 |
| Reduction from Recycled Water[e] | 1,000 | 2,000 | 3,000 | 4,500 | 6,000 | 8,000 | 10,000 | 12,200 |
| Reduction from Water Conservation[i] | 2,962 | 6,648 | 6,648 | 6,648 | 6,648 | 6,648 | 6,648 | 6,648 |
| Demand w/ Conservation[j] | 31,144 | 30,587 | 33,714 | 36,842 | 39,968 | 43,097 | 46,223 | 49,352 |
| *Existing and Planned Supplies* | *45,974* | *46,508* | *47,377* | *48,820* | *50,054* | *51,822* | *53,682* | *55,757* |

**TABLE C-3 CON'T**

| REGIONAL SUMMARY | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|---|
| Demand w/o Conservation[(c)] | 80,070 | 88,484 | 96,898 | 105,312 | 113,726 | 122,140 | 130,554 | 138,968 |
| Total 20x2020 Reduction | 9,027 | 19,626 | 21,166 | 22,770 | 24,342 | 25,914 | 27,486 | 29,058 |
| Total Reduction from Recycled Water[(m)] | 1,300 | 3,050 | 5,550 | 8,100 | 10,600 | 14,100 | 17,600 | 21,300 |
| Total Reduction from Water Conservation | 7,727 | 16,576 | 16,662 | 16,748 | 16,833 | 16,919 | 17,005 | 17,091 |
| **Demand w/ Conservation** | **72,343** | **71,908** | **80,236** | **88,564** | **96,892** | **105,220** | **113,549** | **121,877** |
| **TOTAL EXISTING AND PLANNED SUPPLIES** | **106,607** | **110,157** | **113,357** | **117,707** | **121,207** | **125,707** | **130,208** | **134,907** |

Notes:

(a) Reflects existing and projected demands in CLWA service area only. CLWA's Annexation Policy requires annexing parties to provide additional fully reliable supplies. Known parties potentially seeking annexation include Legacy/Stevenson Ranch Phase 5, Tapia Canyon and Tesoro Del Valle.
(b) LACWWD 36 included for purposes of providing regional completeness; however, it is not required to prepare an UWMP.
(c) Demand w/o Conservation from Table 2-2.
(d) LACWWD 36 conservation objective estimated at 20% of projected demand commencing 2020; see Table 2-21.
(e) Recycled water projections from Table 4-3.
(f) Net Anticipated Conservation for LACWWD 36 is Anticipated Conservation Objective minus Reduction from Recycled Water.
(g) Demand w/ Conservation for LACWWD 36 is Demand w/o Conservation minus Net Anticipated Conservation.
(h) NCWD 20x2020 Reduction from Table 2-16. The 20% conservation requirement is assumed to continue through 2050 and continue to be met with a mixture of recycled water and conservation.
(i) Reduction from Water Conservation is 20x2020 Reduction minus Reduction from Recycled Water for 2015 and 2020; the quantity of water conservation remains at least at 2020 amounts through 2050.
(j) Demand w/ Conservation is Demand w/o Conservation minus Reduction from Water Conservation.
(k) SCWD 20x2020 Reduction from Table 2-18. The 20% conservation requirement is assumed to continue through 2050 and continue to be met with a mixture of recycled water and conservation.
(l) VWC 20x2020 Reduction from Table 2-20. The 20% conservation requirement is assumed to continue through 2050 and continue to be met with a mixture of recycled water and conservation.
(m) Recycled water reductions do not include demands from Honor Rancho.

**TABLE C-4**
**SINGLE-DRY YEAR: EXISTING WATER SUPPLIES**

| EXISTING SUPPLIES[a] | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|---|
| **Existing Groundwater**[b] | | | | | | | | |
| Alluvial Aquifer | | | | | | | | |
| LACWWD 36[c] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NCWD | 1,150 | 1,150 | 1,150 | 1,225 | 1,250 | 1,250 | 1,250 | 1,225 |
| SCWD | 8,150 | 8,150 | 8,150 | 8,150 | 8,150 | 8,150 | 8,150 | 8,150 |
| VWC | 11,000 | 10,950 | 10,900 | 11,675 | 11,650 | 11,625 | 11,600 | 11,275 |
| *Total* | *20,300* | *20,250* | *20,200* | *21,050* | *21,050* | *21,025* | *21,000* | *20,650* |
| Saugus Formation | | | | | | | | |
| LACWWD 36[c] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NCWD | 4,975 | 4,975 | 4,975 | 4,975 | 4,975 | 4,975 | 4,975 | 4,975 |
| SCWD[d] | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 |
| VWC | 11,925 | 11,925 | 11,925 | 11,925 | 11,925 | 11,925 | 11,925 | 11,925 |
| *Total* | *20,400* | *20,400* | *20,400* | *20,400* | *20,400* | *20,400* | *20,400* | *20,400* |
| **Recycled Water**[e] | | | | | | | | |
| LACWWD 36[c] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NCWD | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SCWD | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| VWC | 325 | 325 | 325 | 325 | 325 | 325 | 325 | 325 |
| *Total* | *325* | *325* | *325* | *325* | *325* | *325* | *325* | *325* |
| **Imported Water** | | | | | | | | |
| SWP Table A and Carryover[f] | | | | | | | | |
| LACWWD 36[c] | 405 | 436 | 440 | 444 | 468 | 499 | 522 | 543 |
| NCWD | 1,722 | 1,734 | 1,657 | 1,630 | 1,670 | 1,731 | 1,786 | 1,826 |
| SCWD | 6,171 | 5,892 | 5,208 | 4,736 | 4,720 | 4,710 | 4,701 | 4,696 |
| VWC | 3,602 | 2,938 | 2,694 | 2,290 | 2,242 | 2,161 | 2,091 | 2,036 |
| *Total* | *11,900* | *11,000* | *9,999* | *9,100* | *9,100* | *9,101* | *9,100* | *9,101* |
| SWP Flexible Storage Accounts[g] | | | | | | | | |
| LACWWD 36[c] | 206 | 185 | 206 | 228 | 241 | 257 | 268 | 279 |
| NCWD | 877 | 738 | 776 | 838 | 859 | 890 | 918 | 939 |
| SCWD | 3,143 | 2,507 | 2,438 | 2,436 | 2,427 | 2,422 | 2,418 | 2,415 |
| VWC | 1,834 | 1,250 | 1,261 | 1,177 | 1,153 | 1,111 | 1,075 | 1,047 |
| *Total* | *6,060* | *4,680* | *4,681* | *4,679* | *4,680* | *4,680* | *4,679* | *4,680* |
| Buena Vista-Rosedale | | | | | | | | |
| LACWWD 36[c] | 400 | 450 | 500 | 550 | 575 | 625 | 650 | 675 |
| NCWD | 1,650 | 1,800 | 1,900 | 2,025 | 2,075 | 2,150 | 2,225 | 2,250 |
| SCWD | 5,925 | 6,150 | 5,950 | 5,925 | 5,875 | 5,850 | 5,825 | 5,825 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| VWC | | 3,025 | 2,600 | 2,650 | 2,500 | 2,475 | 2,375 | 2,300 | 2,250 |
| | *Total* | *11,000* | *11,000* | *11,000* | *11,000* | *11,000* | *11,000* | *11,000* | *11,000* |
| Nickel Water - Newhall Land | | | | | | | | | |
| VWC | *Total* | 1,607 | 1,607 | 1,607 | 1,607 | 1,607 | 1,607 | 1,607 | 1,607 |
| **Banking Programs** | | | | | | | | | |
| Rosedale Rio-Bravo[h] | | | | | | | | | |
| LACWWD 36[c] | | 775 | 900 | 1,000 | 1,075 | 1,125 | 1,200 | 1,250 | 1,275 |
| NCWD | | 3,275 | 3,625 | 3,725 | 4,000 | 4,050 | 4,150 | 4,250 | 4,325 |
| SCWD | | 11,750 | 12,275 | 11,725 | 11,575 | 11,400 | 11,300 | 11,200 | 11,125 |
| VWC | | 4,200 | 3,200 | 3,550 | 3,350 | 3,425 | 3,350 | 3,300 | 3,275 |
| | *Total* | *20,000* | *20,000* | *20,000* | *20,000* | *20,000* | *20,000* | *20,000* | *20,000* |
| Semitropic[i] | | | | | | | | | |
| LACWWD 36[c] | | 510 | 594 | 0 | 0 | 0 | 0 | 0 | 0 |
| NCWD | | 2,170 | 2,364 | 0 | 0 | 0 | 0 | 0 | 0 |
| SCWD | | 7,778 | 8,035 | 0 | 0 | 0 | 0 | 0 | 0 |
| VWC | | 4,541 | 4,007 | 0 | 0 | 0 | 0 | 0 | 0 |
| | *Total* | *15,000* | *15,000* | *0* | *0* | *0* | *0* | *0* | *0* |
| Semitropic - Newhall Land[j] | | | | | | | | | |
| VWC | *Total* | 4,950 | 4,950 | 4,950 | 4,950 | 4,950 | 4,950 | 4,950 | 4,950 |
| **TOTAL EXISTING SUPPLIES** | | | | | | | | | |
| LACWWD 36[c] | | 2,296 | 2,565 | 2,146 | 2,297 | 2,409 | 2,581 | 2,690 | 2,772 |
| NCWD | | 15,819 | 16,386 | 14,183 | 14,693 | 14,879 | 15,146 | 15,404 | 15,540 |
| SCWD | | 46,417 | 46,509 | 36,971 | 36,322 | 36,072 | 35,932 | 35,794 | 35,711 |
| VWC | | 47,009 | 43,752 | 39,862 | 39,799 | 39,752 | 39,429 | 39,173 | 38,690 |
| | **Total** | **111,542** | **109,212** | **93,162** | **93,111** | **93,112** | **93,088** | **93,061** | **92,713** |

Notes:

(a) The distribution of existing and planned supplies does not represent a formal allocation of water supplies among purveyors.

(b) Existing groundwater supplies represent the quantity of groundwater anticipated to be pumped with existing wells. As indicated in Tables 3-8 and 3-9 and Tables 3-4 and 3-5 of the 2009 Groundwater Basin Yield Analysis, individual purveyors may have well capacity in excess of quantities shown above. Existing pumping is consistent with Table 3-8 of the 2009 Groundwater Basin Yield Analysis for 1977 single-dry year. As indicated in Table 3-11, existing and planned groundwater pumping remain within the groundwater operating plan shown on Table 3-5.

(c) LACWWD 36 included for purposes of providing regional completeness; however, it is not required to prepare an UWMP.

(d) SCWD's existing Saugus 1 and Saugus 2 wells resumed production in 2011 with the completion of the perchlorate treatment facility.

(e) Per CLWA Draft Recycled Water Master Plan and Newhall Ranch Specific Plan.

(f) SWP supplies are based on the Department of Water Resources "2009 State Water Project Delivery Reliability Report."

(g) Includes both CLWA and Ventura County entities flexible storage accounts. Initial term of agreement with Ventura County entities expires after 2015.

(h) CLWA has a maximum withdrawal capacity of 20,000 AFY and a storage capacity of 100,000 AF. As of 6/1/2011, there is 100,000 AF of recoverable water.

(i) CLWA has 45,920 AF of recoverable water as of 6/1/2011.

(j) Newhall Land has a maximum withdrawal capacity of 4,950 AFY and a storage capacity of 55,000 AF. As of 6/1/2011 there is 18,892 AF of recoverable water. Delivery of stored water from the Newhall Land's Semitropic Water Banking and Exchange Program is assumed available to VWC.

**TABLE C-5**
**SINGLE-DRY YEAR: PLANNED AND TOTAL WATER SUPPLIES**

| PLANNED SUPPLIES[a] | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|---|
| **Future Groundwater[b]** | | | | | | | | |
| Alluvial Aquifer | | | | | | | | |
| LACWWD 36[c] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NCWD | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SCWD | 200 | 250 | 300 | 850 | 850 | 875 | 900 | 750 |
| VWC[d] | 0 | 1,000 | 2,000 | 3,000 | 4,000 | 5,000 | 6,000 | 7,000 |
| *Total* | *200* | *1,250* | *2,300* | *3,850* | *4,850* | *5,875* | *6,900* | *7,750* |
| Saugus Formation | | | | | | | | |
| LACWWD 36[c][e] | 500 | 825 | 875 | 925 | 975 | 1,000 | 1,050 | 1,075 |
| NCWD | 1,400 | 2,950 | 3,025 | 3,150 | 3,200 | 3,275 | 3,325 | 3,400 |
| SCWD | 975 | 5,175 | 5,200 | 5,150 | 5,250 | 5,325 | 5,400 | 5,475 |
| VWC (Restored Well) | 825 | 3,777 | 3,777 | 3,777 | 3,777 | 3,777 | 3,777 | 3,750 |
| VWC (New Wells) | - | 973 | 823 | 698 | 498 | 323 | 148 | - |
| *Total* | *3,700* | *13,700* | *13,700* | *13,700* | *13,700* | *13,700* | *13,700* | *13,700* |
| **Recycled Water[f]** | | | | | | | | |
| LACWWD 36[c] | 0 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| NCWD | 200 | 500 | 1,000 | 1,275 | 1,775 | 2,275 | 2,775 | 3,275 |
| SCWD | 100 | 500 | 1,500 | 2,275 | 2,775 | 3,775 | 4,775 | 5,775 |
| VWC | 675 | 1,675 | 2,675 | 4,175 | 5,675 | 7,675 | 9,675 | 11,875 |
| *Total* | *975* | *2,725* | *5,225* | *7,775* | *10,275* | *13,775* | *17,275* | *20,975* |
| **Banking Programs[g]** | | | | | | | | |
| LACWWD 36[c] | 0 | 0 | 440 | 488 | 1,028 | 1,097 | 1,147 | 1,193 |
| NCWD | 0 | 0 | 1,657 | 1,791 | 3,670 | 3,804 | 3,925 | 4,012 |
| SCWD | 0 | 0 | 5,208 | 5,205 | 10,374 | 10,351 | 10,332 | 10,321 |
| VWC | 0 | 0 | 2,694 | 2,516 | 4,928 | 4,749 | 4,596 | 4,474 |
| *Total* | *0* | *0* | *10,000* | *10,000* | *20,000* | *20,000* | *20,000* | *20,000* |
| **TOTAL PLANNED SUPPLIES** | | | | | | | | |
| LACWWD 36[c] | 500 | 875 | 1,365 | 1,463 | 2,053 | 2,147 | 2,247 | 2,318 |
| NCWD | 1,600 | 3,450 | 5,682 | 6,216 | 8,645 | 9,354 | 10,025 | 10,687 |
| SCWD | 1,275 | 5,925 | 12,208 | 13,480 | 19,249 | 20,326 | 21,407 | 22,321 |
| VWC | 1,500 | 7,425 | 11,969 | 14,166 | 18,878 | 21,524 | 24,196 | 27,099 |
| **Total** | **4,875** | **17,675** | **31,225** | **35,325** | **48,825** | **53,350** | **57,875** | **62,425** |

**TABLE C-5 CON'T**

| PURVEYOR EXISTING AND PLANNED SUPPLIES | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| LACWWD 36[(c)] | 2,796 | 3,440 | 3,511 | 3,760 | 4,462 | 4,728 | 4,937 | 5,090 |
| NCWD | 17,419 | 19,836 | 19,865 | 20,909 | 23,524 | 24,500 | 25,429 | 26,227 |
| SCWD | 47,692 | 52,434 | 49,179 | 49,802 | 55,321 | 56,258 | 57,201 | 58,032 |
| VWC | 48,509 | 51,177 | 51,831 | 53,965 | 58,630 | 60,953 | 63,369 | 65,789 |
| **Total** | **116,417** | **126,887** | **124,387** | **128,436** | **141,937** | **146,438** | **150,936** | **155,138** |

Notes:

(a) The distribution of existing and planned supplies does not represent a formal allocation of water supplies among purveyors.

(b) Planned groundwater supplies represent new groundwater well capacity that may be required by an individual purveyor's production objectives in the Alluvial Aquifer and the Saugus Formation, including 3,777 AFY of restored capacity from VWC Well 201 and approximately 10,000 AFY of new Saugus Formation well capacity. When combined with existing purveyor and non-purveyor groundwater supplies, total groundwater production is consistent with the 1977 single dry-year levels identified in Table 3-8 of the 2009 Groundwater Basin Yield Analysis. As indicated in Table 3-11, existing and planned groundwater pumping remain within the groundwater operating plan shown on Table 3- 5.

(c) LACWWD 36 included for purposes of providing regional completeness; however, it is not required to prepare an UWMP.

(d) Conversion of Newhall Land agricultural groundwater supplies to VWC M&I supplies.

(e) Includes 500 AFY from a newly completed well in 2011.

(f) Per CLWA Draft Recycled Water Master Plan and Newhall Ranch Specific Plan.

(g) Includes 10,000 AF of additional banking programs by 2025 and an additional 10,000 AF by 2035.

**TABLE C-6**
**SINGLE-DRY YEAR: DEMANDS WITH SBX7-7 REDUCTIONS AND COMPARISON TO TOTAL SUPPLIES**

| WATER DEMANDS W/ AND W/O CONSERVATION[a] | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|---|
| **LACWWD 36[b]** | | | | | | | | |
| Demand w/o Conservation[c] | 1,935 | 2,408 | 2,881 | 3,353 | 3,826 | 4,299 | 4,772 | 5,245 |
| Anticipated Conservation Objective[d] | 176 | 438 | 524 | 610 | 696 | 782 | 868 | 954 |
| Reduction from Recycled Water[e] | 0 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| Net Anticipated Water Conservation[f] | 176 | 388 | 474 | 560 | 646 | 732 | 818 | 904 |
| Demand w/ Conservation[g] | 1,759 | 2,020 | 2,407 | 2,794 | 3,181 | 3,568 | 3,955 | 4,342 |
| *Existing and Planned Supplies* | *2,796* | *3,440* | *3,511* | *3,760* | *4,462* | *4,728* | *4,937* | *5,090* |
| **SBX7-7 Compliance Calculations** | | | | | | | | |
| **NCWD** | | | | | | | | |
| Demand w/o Conservation[c] | 13,828 | 15,671 | 17,514 | 19,358 | 21,200 | 23,044 | 24,886 | 26,730 |
| 20x2020 Reduction[h] | 1,365 | 2,982 | 3,204 | 3,489 | 3,742 | 3,995 | 4,248 | 4,501 |
| Reduction from Recycled Water[e] | 200 | 500 | 1,000 | 1,275 | 1,775 | 2,275 | 2,775 | 3,275 |
| Reduction from Water Conservation[i] | 1,165 | 2,482 | 2,482 | 2,482 | 2,482 | 2,482 | 2,482 | 2,482 |
| Demand w/ Conservation[j] | 12,663 | 13,188 | 15,031 | 16,876 | 18,718 | 20,562 | 22,404 | 24,248 |
| *Existing and Planned Supplies* | *17,419* | *19,836* | *19,865* | *20,909* | *23,524* | *24,500* | *25,429* | *26,227* |
| **SCWD** | | | | | | | | |
| Demand w/o Conservation[c] | 34,796 | 38,295 | 41,795 | 45,294 | 48,793 | 52,292 | 55,791 | 59,290 |
| 20x2020 Reduction[k] | 3,524 | 7,557 | 8,067 | 8,576 | 9,085 | 9,595 | 10,104 | 10,614 |
| Reduction from Recycled Water[e] | 100 | 500 | 1,500 | 2,275 | 2,775 | 3,775 | 4,775 | 5,775 |
| Reduction from Water Conservation[i] | 3,424 | 7,057 | 7,057 | 7,057 | 7,057 | 7,057 | 7,057 | 7,057 |
| Demand w/ Conservation[j] | 31,372 | 31,238 | 34,737 | 38,236 | 41,736 | 45,235 | 48,734 | 52,233 |
| *Existing and Planned Supplies* | *47,692* | *52,434* | *49,179* | *49,802* | *55,321* | *56,258* | *57,201* | *58,032* |
| **VWC** | | | | | | | | |
| Demand w/o Conservation[c] | 37,517 | 40,959 | 44,398 | 47,839 | 51,278 | 54,720 | 58,159 | 61,600 |
| 20x2020 Reduction[l] | 3,962 | 8,648 | 9,372 | 10,095 | 10,819 | 11,542 | 12,266 | 12,990 |
| Reduction from Recycled Water[e] | 1,000 | 2,000 | 3,000 | 4,500 | 6,000 | 8,000 | 10,000 | 12,200 |
| Reduction from Water Conservation[i] | 2,962 | 6,648 | 6,648 | 6,648 | 6,648 | 6,648 | 6,648 | 6,648 |
| **Demand w/ Conservation[j]** | **34,555** | **34,310** | **37,750** | **41,191** | **44,630** | **48,072** | **51,511** | **54,951** |
| *Existing and Planned Supplies* | *48,509* | *51,177* | *51,831* | *53,965* | *58,630* | *60,953* | *63,369* | *65,789* |

**TABLE C-6 CON'T**

| REGIONAL SUMMARY | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|---|
| Demand w/o Conservation[(c)] | 88,077 | 97,333 | 106,588 | 115,843 | 125,099 | 134,354 | 143,609 | 152,865 |
| Total 20x2020 Reduction | 9,027 | 19,626 | 21,166 | 22,770 | 24,342 | 25,914 | 27,486 | 29,058 |
| Total Reduction from Recycled Water[(m)] | 1,300 | 3,050 | 5,550 | 8,100 | 10,600 | 14,100 | 17,600 | 21,300 |
| Total Reduction from Water Conservation | 7,727 | 16,576 | 16,662 | 16,748 | 16,833 | 16,919 | 17,005 | 17,091 |
| **Demand w/ Conservation** | **80,350** | **80,757** | **89,926** | **99,096** | **108,265** | **117,434** | **126,604** | **135,773** |
| **TOTAL EXISTING AND PLANNED SUPPLIES** | **116,417** | **126,887** | **124,387** | **128,436** | **141,937** | **146,438** | **150,936** | **155,138** |

Notes:

(a) Reflects existing and projected demands in CLWA service area only. CLWA's Annexation Policy requires annexing parties to provide additional fully reliable supplies. Known parties potentially seeking annexation include Legacy/Stevenson Ranch Phase 5, Tapia Canyon and Tesoro Del Valle.
(b) LACWWD 36 included for purposes of providing regional completeness; however, it is not required to prepare an UWMP.
(c) Demand w/o Conservation from Table 2-2. Includes a 10% increase in demand during dry years.
(d) LACWWD 36 conservation objective estimated at 20% of projected demand commencing 2020; see Table 2-21.
(e) Recycled water projections from Table 4-3.
(f) Net Anticipated Conservation for LACWWD 36 is Anticipated Conservation Objective minus Reduction from Recycled Water.
(g) Demand w/ Conservation for LACWWD 36 is Demand w/o Conservation minus Net Anticipated Conservation.
(h) NCWD 20x2020 Reduction from Table 2-16. The 20% conservation requirement is assumed to continue through 2050 and continue to be met with a mixture of recycled water and conservation.
(i) Reduction from Water Conservation is 20x2020 Reduction minus Reduction from Recycled Water for 2015 and 2020; the quantity of water conservation remains at least at 2020 amounts through 2050.
(j) Demand w/ Conservation is Demand w/o Conservation minus Reduction from Water Conservation.
(k) SCWD 20x2020 Reduction from Table 2-18. The 20% conservation requirement is assumed to continue through 2050 and continue to be met with a mixture of recycled water and conservation.
(l) VWC 20x2020 Reduction from Table 2-20. The 20% conservation requirement is assumed to continue through 2050 and continue to be met with a mixture of recycled water and conservation.
(m) Recycled water reductions do not include demands from Honor Rancho.

**TABLE C-7**
**EXISTING MULTIPLE-DRY YEAR: EXISTING WATER SUPPLIES**

| EXISTING SUPPLIES[a] | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|---|
| **Existing Groundwater**[b] | | | | | | | | |
| Alluvial Aquifer | | | | | | | | |
| LACWWD 36[c] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NCWD | 1,125 | 1,125 | 1,125 | 1,200 | 1,200 | 1,200 | 1,200 | 1,175 |
| SCWD | 7,650 | 7,675 | 7,700 | 8,175 | 8,175 | 8,175 | 8,175 | 8,025 |
| VWC | 11,650 | 11,625 | 11,600 | 12,450 | 12,450 | 12,450 | 12,450 | 12,125 |
| *Total* | *20,425* | *20,425* | *20,425* | *21,825* | *21,825* | *21,825* | *21,825* | *21,325* |
| Saugus Formation | | | | | | | | |
| LACWWD 36[c] | | | | | | | | |
| NCWD | 4,975 | 4,975 | 4,975 | 4,975 | 4,975 | 4,975 | 4,975 | 4,975 |
| SCWD[d] | 3,550 | 3,550 | 3,550 | 3,550 | 3,550 | 3,550 | 3,550 | 3,550 |
| VWC | 11,175 | 11,175 | 11,175 | 11,175 | 11,175 | 11,175 | 11,175 | 11,175 |
| *Total* | *19,700* | *19,700* | *19,700* | *19,700* | *19,700* | *19,700* | *19,700* | *19,700* |
| **Recycled Water**[e] | | | | | | | | |
| LACWWD 36[c] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NCWD | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SCWD | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| VWC | 325 | 325 | 325 | 325 | 325 | 325 | 325 | 325 |
| *Total* | *325* | *325* | *325* | *325* | *325* | *325* | *325* | *325* |
| **Imported Water** | | | | | | | | |
| SWP Table A and Carryover[f] | | | | | | | | |
| LACWWD 36[c] | 1,117 | 1,278 | 1,423 | 1,592 | 1,691 | 1,801 | 1,895 | 1,968 |
| NCWD | 4,915 | 4,149 | 4,543 | 5,058 | 5,310 | 5,592 | 5,834 | 6,029 |
| SCWD | 18,006 | 16,666 | 16,406 | 16,492 | 16,519 | 16,542 | 16,574 | 16,601 |
| VWC | 8,862 | 10,807 | 10,628 | 9,858 | 9,479 | 9,065 | 8,697 | 8,401 |
| *Total* | *32,900* | *32,900* | *33,000* | *33,000* | *33,000* | *33,000* | *33,000* | *33,000* |
| SWP Flexible Storage Accounts[g] | | | | | | | | |
| LACWWD 36[c] | 51 | 45 | 50 | 56 | 60 | 64 | 67 | 70 |
| NCWD | 226 | 148 | 161 | 179 | 188 | 198 | 207 | 214 |
| SCWD | 826 | 593 | 582 | 585 | 586 | 586 | 588 | 589 |
| VWC | 407 | 384 | 377 | 350 | 336 | 321 | 308 | 298 |
| *Total* | *1,510* | *1,170* | *1,170* | *1,170* | *1,170* | *1,170* | *1,170* | *1,170* |
| Buena Vista-Rosedale | | | | | | | | |
| LACWWD 36[c] | 400 | 450 | 500 | 550 | 575 | 625 | 650 | 675 |
| NCWD | 1,700 | 1,450 | 1,575 | 1,750 | 1,825 | 1,925 | 2,000 | 2,050 |
| SCWD | 6,250 | 5,800 | 5,650 | 5,675 | 5,675 | 5,650 | 5,650 | 5,650 |
| VWC | 2,650 | 3,300 | 3,275 | 3,025 | 2,925 | 2,800 | 2,700 | 2,625 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | *Total* | *11,000* | *11,000* | *11,000* | *11,000* | *11,000* | *11,000* | *11,000* | *11,000* |
| Nickel Water - Newhall Land | | | | | | | | | |
| VWC | *Total* | 1,607 | 1,607 | 1,607 | 1,607 | 1,607 | 1,607 | 1,607 | 1,607 |
| **Banking Programs** | | | | | | | | | |
| Rosedale Rio-Bravo[h] | | | | | | | | | |
| LACWWD 36[c] | | 577 | 662 | 723 | 801 | 842 | 890 | 931 | 961 |
| NCWD | | 2,540 | 2,150 | 2,308 | 2,545 | 2,643 | 2,763 | 2,865 | 2,944 |
| SCWD | | 9,306 | 8,636 | 8,336 | 8,297 | 8,222 | 8,174 | 8,139 | 8,107 |
| VWC | | 2,577 | 3,552 | 3,633 | 3,357 | 3,292 | 3,173 | 3,065 | 2,988 |
| | *Total* | *15,000* | *15,000* | *15,000* | *15,000* | *15,000* | *15,000* | *15,000* | *15,000* |
| Semitropic[i] | | | | | | | | | |
| LACWWD 36[c] | | 390 | 447 | 0 | 0 | 0 | 0 | 0 | 0 |
| NCWD | | 1,718 | 1,450 | 0 | 0 | 0 | 0 | 0 | 0 |
| SCWD | | 6,294 | 5,826 | 0 | 0 | 0 | 0 | 0 | 0 |
| VWC | | 3,098 | 3,777 | 0 | 0 | 0 | 0 | 0 | 0 |
| | *Total* | *11,500* | *11,500* | *0* | *0* | *0* | *0* | *0* | *0* |
| Semitropic – Newhall Land[j] | | | | | | | | | |
| VWC | | 4,950 | 4,950 | 4,950 | 4,950 | 4,950 | 4,950 | 4,950 | 4,950 |
| **TOTAL EXISTING SUPPLIES** | | | | | | | | | |
| LACWWD 36[c] | | 2,536 | 2,882 | 2,696 | 3,000 | 3,168 | 3,380 | 3,543 | 3,674 |
| NCWD | | 17,200 | 15,447 | 14,687 | 15,707 | 16,142 | 16,654 | 17,080 | 17,387 |
| SCWD | | 51,882 | 48,745 | 42,224 | 42,774 | 42,727 | 42,678 | 42,676 | 42,522 |
| VWC | | 47,300 | 51,502 | 47,570 | 47,096 | 46,540 | 45,866 | 45,278 | 44,494 |
| | **Total** | **118,917** | **118,577** | **107,177** | **108,577** | **108,577** | **108,577** | **108,577** | **108,077** |

Notes:

(a) The distribution of existing and planned supplies does not represent a formal allocation of water supplies among purveyors.

(b) Existing groundwater supplies represent the quantity of groundwater anticipated to be pumped with existing wells. As indicated in Tables 3-8 and 3-9 and Tables 3-4 and 3-5 of the 2009 Groundwater Basin Yield Analysis, individual purveyors may have well capacity in excess of quantities shown above. Existing pumping is consistent with Table 3-8 of the 2009 Groundwater Basin Yield Analysis for 1931-1934 multiple dry-year levels. As indicated in Table 3-12, existing and planned groundwater pumping remain within the groundwater operating plan shown on Table 3-5.

(c) LACWWD 36 included for purposes of providing regional completeness; however, it is not required to prepare an UWMP.

(d) SCWD's existing Saugus 1 and Saugus 2 wells resumed production in 2011 with the completion of the perchlorate treatment facility.

(e) Per CLWA Draft Recycled Water Master Plan and Newhall Ranch Specific Plan.

(f) SWP supplies are based on the Department of Water Resources "2009 State Water Project Delivery Reliability Report."

(g) Includes both CLWA and Ventura County entities flexible storage accounts. Initial term of agreement with Ventura County entities expires after 2015.

(h) CLWA has a maximum withdrawal capacity of 20,000 AFY and a storage capacity of 100,000 AF. As of 6/1/2011, there is 100,000 AF of recoverable water.

(i) CLWA has 45,920 AF of recoverable water as of 6/1/2011.

(j) Newhall Land has a maximum withdrawal capacity of 4,950 AFY and a storage capacity of 55,000 AF. As of 6/1/2011 there is 18,892 AF of recoverable water. Delivery of stored water from the Newhall Land's Semitropic Water Banking and Exchange Program is assumed available to VWC.

**TABLE C-8**
**MULTIPLE-DRY YEAR: PLANNED AND TOTAL WATER SUPPLIES**

| PLANNED SUPPLIES[a] | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|---|
| **Future Groundwater[b]** | | | | | | | | |
| Alluvial Aquifer | | | | | | | | |
| LACWWD 36[c] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NCWD | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SCWD | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| VWC[d] | 0 | 1,000 | 2,000 | 3,000 | 4,000 | 5,000 | 6,000 | 7,000 |
| *Total* | *0* | *1,000* | *2,000* | *3,000* | *4,000* | *5,000* | *6,000* | *7,000* |
| Saugus Formation | | | | | | | | |
| LACWWD 36[c][e] | 500 | 750 | 800 | 825 | 850 | 875 | 900 | 925 |
| NCWD | 1,250 | 3,875 | 3,950 | 4,050 | 4,075 | 4,125 | 4,175 | 4,225 |
| SCWD | 500 | 5,700 | 5,700 | 5,675 | 5,750 | 5,825 | 5,875 | 5,925 |
| VWC (Restored Well) | 2,375 | 1,625 | 1,500 | 1,400 | 1,275 | 1,125 | 1,000 | 875 |
| VWC (New Wells) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Total* | *4,625* | *11,950* | *11,950* | *11,950* | *11,950* | *11,950* | *11,950* | *11,950* |
| **Recycled Water[f]** | | | | | | | | |
| LACWWD 36[c] | 0 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| NCWD | 200 | 500 | 1,000 | 1,275 | 1,775 | 2,275 | 2,775 | 3,275 |
| SCWD | 100 | 500 | 1,500 | 2,275 | 2,775 | 3,775 | 4,775 | 5,775 |
| VWC | 675 | 1,675 | 2,675 | 4,175 | 5,675 | 7,675 | 9,675 | 11,875 |
| *Total* | *975* | *2,725* | *5,225* | *7,775* | *10,275* | *13,775* | *17,275* | *20,975* |
| **Banking Programs[g]** | | | | | | | | |
| LACWWD 36[c] | 0 | 0 | 323 | 362 | 769 | 819 | 861 | 895 |
| NCWD | 0 | 0 | 1,032 | 1,150 | 2,414 | 2,542 | 2,652 | 2,741 |
| SCWD | 0 | 0 | 3,729 | 3,748 | 7,509 | 7,519 | 7,534 | 7,546 |
| VWC | 0 | 0 | 2,416 | 2,240 | 4,309 | 4,120 | 3,953 | 3,819 |
| *Total* | *0* | *0* | *7,500* | *7,500* | *15,000* | *15,000* | *15,000* | *15,000* |
| **TOTAL PLANNED SUPPLIES** | | | | | | | | |
| LACWWD 36[c] | 500 | 800 | 1,173 | 1,237 | 1,669 | 1,744 | 1,811 | 1,870 |
| NCWD | 1,450 | 4,375 | 5,982 | 6,475 | 8,264 | 8,942 | 9,602 | 10,241 |
| SCWD | 600 | 6,200 | 10,929 | 11,698 | 16,034 | 17,119 | 18,184 | 19,246 |
| VWC | 3,050 | 4,300 | 8,591 | 10,815 | 15,259 | 17,920 | 20,628 | 23,569 |
| **Total** | **5,600** | **15,675** | **26,675** | **30,225** | **41,225** | **45,725** | **50,225** | **54,925** |

**TABLE C-8 CON'T**

| PURVEYOR EXISTING AND PLANNED SUPPLIES | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| LACWWD 36[(c)] | 3,036 | 3,682 | 3,869 | 4,237 | 4,837 | 5,124 | 5,354 | 5,544 |
| NCWD | 18,650 | 19,822 | 20,670 | 22,182 | 24,406 | 25,596 | 26,682 | 27,628 |
| SCWD | 52,482 | 54,945 | 53,152 | 54,472 | 58,761 | 59,797 | 60,860 | 61,768 |
| VWC | 50,350 | 55,802 | 56,161 | 57,912 | 61,799 | 63,786 | 65,906 | 68,063 |
| **Total** | **124,517** | **134,252** | **133,852** | **138,802** | **149,802** | **154,302** | **158,802** | **163,002** |

Notes:

(a) The distribution of existing and planned supplies does not represent a formal allocation of water supplies among purveyors.

(b) Planned groundwater supplies represent new groundwater well capacity that may be required by an individual purveyor's production objectives in the Alluvial Aquifer and the Saugus Formation, including 3,777 AFY of restored capacity from VWC Well 201 and approximately 10,000 AFY of new Saugus Formation well capacity. When combined with existing purveyor and non-purveyor groundwater supplies, total groundwater production is consistent with the 1931-1934 multiple dry-year levels identified in Table 3-8 of the 2009 Groundwater Basin Yield Analysis. As indicated in Table 3-12, existing and planned groundwater pumping remain within the groundwater operating plan shown on Table 3- 5.

(c) LACWWD 36 included for purposes of providing regional completeness; however, it is not required to prepare an UWMP.

(d) Conversion of Newhall Land agricultural groundwater supplies to VWC M&I supplies.

(e) Includes 500 AFY from a newly completed well in 2011.

(f) Per CLWA Draft Recycled Water Master Plan and Newhall Ranch Specific Plan.

(g) Includes 10,000 AF of additional banking programs by 2025 and an additional 10,000 AF by 2035.

**TABLE C-9**
**MULTIPLE-DRY YEAR: DEMANDS WITH SBX7-7 REDUCTIONS AND COMPARISON TO TOTAL SUPPLIES**

| WATER DEMANDS W/ AND W/O CONSERVATION[a] | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|---|
| **LACWWD 36[b]** | | | | | | | | |
| Demand w/o Conservation[c] | 1,935 | 2,408 | 2,881 | 3,353 | 3,826 | 4,299 | 4,772 | 5,245 |
| Anticipated Conservation Objective[d] | 176 | 438 | 524 | 610 | 696 | 782 | 868 | 954 |
| Reduction from Recycled Water[e] | 0 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| Net Anticipated Water Conservation[f] | 176 | 388 | 474 | 560 | 646 | 732 | 818 | 904 |
| Demand w/ Conservation[g] | 1,759 | 2,020 | 2,407 | 2,794 | 3,181 | 3,568 | 3,955 | 4,342 |
| *Existing and Planned Supplies* | *3,036* | *3,682* | *3,869* | *4,237* | *4,837* | *5,124* | *5,354* | *5,544* |
| **SBX7-7 Compliance Calculations** | | | | | | | | |
| **NCWD** | | | | | | | | |
| Demand w/o Conservation[c] | 13,828 | 15,671 | 17,514 | 19,358 | 21,200 | 23,044 | 24,886 | 26,730 |
| 20x2020 Reduction[h] | 1,365 | 2,982 | 3,204 | 3,489 | 3,742 | 3,995 | 4,248 | 4,501 |
| Reduction from Recycled Water[e] | 200 | 500 | 1,000 | 1,275 | 1,775 | 2,275 | 2,775 | 3,275 |
| Reduction from Water Conservation[i] | 1,165 | 2,482 | 2,482 | 2,482 | 2,482 | 2,482 | 2,482 | 2,482 |
| Demand w/ Conservation[j] | 12,663 | 13,188 | 15,031 | 16,876 | 18,718 | 20,562 | 22,404 | 24,248 |
| *Existing and Planned Supplies* | *18,650* | *19,822* | *20,670* | *22,182* | *24,406* | *25,596* | *26,682* | *27,628* |
| **SCWD** | | | | | | | | |
| Demand w/o Conservation[c] | 34,796 | 38,295 | 41,795 | 45,294 | 48,793 | 52,292 | 55,791 | 59,290 |
| 20x2020 Reduction[k] | 3,524 | 7,557 | 8,067 | 8,576 | 9,085 | 9,595 | 10,104 | 10,614 |
| Reduction from Recycled Water[e] | 100 | 500 | 1,500 | 2,275 | 2,775 | 3,775 | 4,775 | 5,775 |
| Reduction from Water Conservation[i] | 3,424 | 7,057 | 7,057 | 7,057 | 7,057 | 7,057 | 7,057 | 7,057 |
| Demand w/ Conservation[j] | 31,372 | 31,238 | 34,737 | 38,236 | 41,736 | 45,235 | 48,734 | 52,233 |
| *Existing and Planned Supplies* | *52,482* | *54,945* | *53,152* | *54,472* | *58,761* | *59,797* | *60,860* | *61,768* |
| **VWC** | | | | | | | | |
| Demand w/o Conservation[c] | 37,517 | 40,959 | 44,398 | 47,839 | 51,278 | 54,720 | 58,159 | 61,600 |
| 20x2020 Reduction[l] | 3,962 | 8,648 | 9,372 | 10,095 | 10,819 | 11,542 | 12,266 | 12,990 |
| Reduction from Recycled Water[e] | 1,000 | 2,000 | 3,000 | 4,500 | 6,000 | 8,000 | 10,000 | 12,200 |
| Reduction from Water Conservation[i] | 2,962 | 6,648 | 6,648 | 6,648 | 6,648 | 6,648 | 6,648 | 6,648 |
| **Demand w/ Conservation[j]** | **34,555** | **34,310** | **37,750** | **41,191** | **44,630** | **48,072** | **51,511** | **54,951** |
| *Existing and Planned Supplies* | *50,350* | *55,802* | *56,161* | *57,912* | *61,799* | *63,786* | *65,906* | *68,063* |

**TABLE C-9 CON'T**

| REGIONAL SUMMARY | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|---|
| Demand w/o Conservation[(c)] | 88,077 | 97,333 | 106,588 | 115,843 | 125,099 | 134,354 | 143,609 | 152,865 |
| Total 20x2020 Reduction | 9,027 | 19,626 | 21,166 | 22,770 | 24,342 | 25,914 | 27,486 | 29,058 |
| Total Reduction from Recycled Water[(m)] | 1,300 | 3,050 | 5,550 | 8,100 | 10,600 | 14,100 | 17,600 | 21,300 |
| Total Reduction from Water Conservation | 7,727 | 16,576 | 16,662 | 16,748 | 16,833 | 16,919 | 17,005 | 17,091 |
| **Demand w/ Conservation** | **80,350** | **80,757** | **89,926** | **99,096** | **108,265** | **117,434** | **126,604** | **135,773** |
| **TOTAL EXISTING AND PLANNED SUPPLIES** | **124,517** | **134,252** | **133,852** | **138,802** | **149,802** | **154,302** | **158,802** | **163,002** |

Notes:

(a) Reflects existing and projected demands in CLWA service area only. CLWA's Annexation Policy requires annexing parties to provide additional fully reliable supplies. Known parties potentially seeking annexation include Legacy/Stevenson Ranch Phase 5, Tapia Canyon and Tesoro Del Valle.
(b) LACWWD 36 included for purposes of providing regional completeness; however, it is not required to prepare an UWMP.
(c) Demand w/o Conservation from Table 2-2. Includes a 10% increase in demand during dry years.
(d) LACWWD 36 conservation objective estimated at 20% of projected demand commencing 2020; see Table 2-21.
(e) Recycled water projections from Table 4-3.
(f) Net Anticipated Conservation for LACWWD 36 is Anticipated Conservation Objective minus Reduction from Recycled Water.
(g) Demand w/ Conservation for LACWWD 36 is Demand w/o Conservation minus Net Anticipated Conservation.
(h) NCWD 20x2020 Reduction from Table 2-16. The 20% conservation requirement is assumed to continue through 2050 and continue to be met with a mixture of recycled water and conservation.
(i) Reduction from Water Conservation is 20x2020 Reduction minus Reduction from Recycled Water for 2015 and 2020; the quantity of water conservation remains at least at 2020 amounts through 2050.
(j) Demand w/ Conservation is Demand w/o Conservation minus Reduction from Water Conservation.
(k) SCWD 20x2020 Reduction from Table 2-18. The 20% conservation requirement is assumed to continue through 2050 and continue to be met with a mixture of recycled water and conservation.
(l) VWC 20x2020 Reduction from Table 2-20. The 20% conservation requirement is assumed to continue through 2050 and continue to be met with a mixture of recycled water and conservation.
(m) Recycled water reductions do not include demands from Honor Rancho.

# Appendix D

Recent Factors Affecting SWP Supplies

# APPENDIX D
# RECENT FACTORS AFFECTING SWP SUPPLIES

Since the last round of Urban Water Management Plans (UWMPs) were prepared in 2005, the California Department of Water Resources (DWR) has twice updated its State Water Project (SWP) Delivery Reliability Report. In each of its updates, DWR has projected further reductions in average SWP water deliveries than were projected in 2005. The 2009 Report is the most recent update, and identifies several emerging factors that have the potential to affect the availability and reliability of SWP supplies. Although the 2009 Report presents an extremely conservative projection of SWP delivery reliability, particularly in light of events occurring since its release, it remains the best available information concerning the SWP. Following is information and a brief summary of several factors identified in the 2009 Report having the potential to affect the availability and reliability of SWP supplies.

## New U.S. Fish and Wildlife Service Biological Opinion for Delta Smelt and Related Litigation Matters

SWP operations have been challenged in connection with potential impacts to the Delta smelt, a small fish that resides only in the Delta and is protected under CESA and the ESA. In February 2005, the United States Fish and Wildlife Service (FWS) issued a "no jeopardy" determination and biological opinion (B.O.) analyzing potential impacts to the Delta smelt in connection with the long-term coordinated operations of the California State Water Project (SWP) and the federal Central Valley Project (CVP) through the year 2030. The project/action evaluated in the B.O., formally known as the "Operations Criteria and Plan" (or OCAP), includes existing pumping operations, proposals to increase SWP pumping over the next 30-year period, and other proposed long-term operational changes. In February 2005, several environmental groups filed suit in federal court against FWS and the Secretary of the Interior challenging the validity of the B.O. (*Natural Resources Defense Council v. Kempthorne*, USDC Case No. 05-CV-1207-OWW.)

In May 2007, the Federal District Court for the Eastern District of California determined that the B.O. violated the requirements of the ESA. In order that the SWP and CVP could continue to operate, the court established interim operating requirements for the Projects that would remain in place until a new B.O. was completed (the Interim Remedies)(December 14, 2007). The Interim Remedies were based on various factors occurring in the Delta, such as prevailing hydrologic and flow conditions, and the distribution and spawning status of Delta smelt. For the 2007-2008 water year, the Interim Remedies were reported to have reduced SWP supplies by approximately 500,000 acre-feet.

On December 15, 2008, FWS issued its new B.O. The B.O. concludes that the proposed long-term coordinated CVP and SWP operations will "jeopardize" the Delta smelt and "adversely modify" its critical habitat according to ESA standards. Pursuant to the ESA, because the B.O. is a "jeopardy" opinion, FWS was required to formulate and adopt as part of the B.O. a "Reasonable and Prudent Alternative" (RPA) to the proposed action that FWS believes will not cause jeopardy to the Delta smelt or adversely modify or destroy its critical habitat, and which can be implemented by Reclamation and DWR. (16 U.S.C. § 1536(b)(3)(A).) The RPA adopted as part of the B.O. imposed various new operating restrictions upon the CVP and SWP and has the potential to result in substantial water supply reductions from the Projects.

Soon after the B.O. was issued, DWR published information estimating that in comparison to the level of SWP exports from the Delta previously authorized under State Water

Resources Control Board (State Board) Decision 1641 (D-1641),[1] the FWS B.O. could reduce those deliveries by 18 to 29 percent during average and dry conditions, respectively. As with the Interim Remedies, potential water supply restrictions under the new B.O. are dependent on highly variable factors such as hydrologic conditions affecting Delta water supplies, flow conditions in the Delta, migratory and reproductive patterns of Delta smelt, and numerous other non-Project factors that impact the health and abundance of Delta smelt and its critical habitat.

Due to a number of alleged scientific and other deficiencies in the new FWS B.O., in early 2009 the State Water Contractors, the San Luis and Delta-Mendota Water Authority and several individual State and Federal contractor water agencies filed legal challenges against the B.O., which were consolidated in the Federal District Court for the Eastern District of California. (*The Consolidated Delta Smelt Cases*, Lead Case No. 1:09-CV-00407-OWW-GSA.) Early on in the proceedings, several of the plaintiff water agencies and the federal defendants filed cross-motions for summary judgment to determine whether a violation of the National Environmental Policy Act (NEPA) occurred in connection with federal defendants' adoption and implementation of the NMFS B.O. and its RPA. In a Memorandum Decision issued in November 2009, the court ruled that the moving plaintiffs were entitled to summary judgment on their claim that the federal defendants violated NEPA by failing to perform any NEPA analysis prior to adopting and implementing the new FWS B.O. and its RPA. (*The Consolidated Delta Smelt Cases*, Doc. No. 399 at 46-47.)

Separately, several of the plaintiffs filed a motion for preliminary injunction against the implementation of Component 2 (Action 3) of the RPA that proposed to restrict Delta exports during a particular timeframe in spring and summer months, depending on certain biological and environmental parameters. In May 2010, the court issued its Findings of Fact and Conclusions of Law Regarding Plaintiffs' Request for Preliminary Injunction Against Implementation of RPA Component 2 (a/k/a Action 3). In that decision, the court reconfirmed its earlier ruling that the federal defendants failed to examine the potential environmental and human consequences of the RPA actions adopted under the B.O. in violation of NEPA. (*Consolidated Delta Smelt Cases*, Doc. No. 704 at 120-122.) The court also ruled that the plaintiffs were likely to prevail on their claims that FWS violated the ESA and the federal Administrative Procedure Act (APA) in formulating and adopting RPA Component 2 without support of the best available science and without adequate explanation regarding its biological benefit to Delta smelt. (*Id.* at 123-125.)

In the meantime, the parties also filed cross motions for summary judgment to obtain a final ruling in the cases. Those motions were argued in early July 2010. In December 2010, the court issued a memorandum decision that invalidated the B.O. and RPA in several respects and remanded the matter to FWS. Further proceedings are expected to address interim operations of the SWP and CVP.

Because Delta smelt are also protected under the California ESA, the SWP and CVP are required to obtain take authorization from the California Department of Fish and Game (DFG). In July 2009, DFG issued a "consistency determination" pursuant to Fish and Game Code section 2080.1. That determination provides that operations of the SWP and CVP are in compliance with CESA so long as those operations occur in accordance with the FWS Delta smelt B.O. and RPA. Because the consistency determination posed a risk that the SWP could remain bound to the terms of the RPA even if the FWS B.O. was eventually overturned by a

[1] See additional discussion below regarding SWP exports as authorized under D-1641.

federal court, DFG's decision was challenged in state court by the State Water Contractors and the Kern County Water Agency. (*State Water Contractors v. California Department of Fish and Game, et al.*, Kern County Superior Court Case No. S-1500-CV-268074[2]; *Kern County Water Agency v. Department of Fish and Game, et al.*, Sacramento County Superior Court Case No. 34-2010-80000450.) The challenges assert, among other things, that DFG's consistency determination is invalid because it relies upon and seeks to enforce restrictions established under the new FWS B.O. that are alleged under *The Consolidated Delta Smelt Cases* to be invalid and unenforceable. The case is currently stayed by stipulation of the parties, pending the outcome of *The Consolidated Delta Smelt Cases*.

These litigation matters challenging the validity of the FWS B.O. and the DFG consistency determination give rise to the possibility that the restrictions on SWP exports could be relaxed and that SWP exports may return to the levels allowed by the Interim Remedies (above) or State Board Decision D-1641[3] pending issuance of a new B.O. and/or the implementation of the Bay-Delta Conservation Plan (BDCP). As an additional factor, by letter dated May 3, 2010, the federal Secretaries of the Department of Interior and the Department of Commerce have announced a joint initiative to develop a single integrated B.O. for the Delta and related water operations of the CVP and SWP.[4] The timing, nature and extent of the regulatory measures to be contained in any such B.O., and whether those measures would be legally challenged or upheld, cannot be predicted with any degree of certainty at this time.

New National Marine Fisheries Service Biological Opinion Salmon/Anadromous Species and Related Litigation Matters

SWP operations have also been challenged in connection with potential impacts to anadromous species in the San Francisco Bay-Delta estuary. In October 2004, the National Marine Fisheries Service (NMFS) issued a "no jeopardy" determination and B.O. analyzing potential impacts to federally listed winter-run and spring-run salmon and steelhead trout related to the long-term coordinated operations of the CVP and SWP through the year 2030. As with the 2005 FWS B.O. and *Kempthorne* case discussed above, OCAP was the project/action evaluated in the 2004 NMFS B.O., which included the Projects' existing Delta pumping operations, proposals to increase SWP pumping by 20 percent over the long term, and other operational changes. In August 2005, several environmental groups filed suit in federal court against NMFS and the Secretary of Commerce challenging the validity of the B.O. (*Pacific Coast Federation of Fishermen's Associations, et al. v. Gutierrez, et al*., Case No. 1:06-CV-00245-OWW-GSA.)

In April 2008, the United States District Court for the Eastern District of California issued

[2] In June 2010, the case was transferred to Sacramento, California, where it is now referenced as *State Water Contractors v. California Department of Fish and Game, et al.,* Sacramento County Superior Court Case No. 34-2010-80000552.

[3] D-1641 implements the objectives of the 1995 Bay-Delta Plan and imposes flow and water quality objectives to assure protection of beneficial uses in the Delta. The requirements of D-1641 address, among other things, standards for fish and wildlife protection, municipal and industrial water quality, agricultural water quality, and salinity. D-1641 imposed a new operating regime for the Delta, including measures such as X2, an export/inflow ratio, and the Vernalis Adaptive Management Program (VAMP). The standards under D-1641 are accomplished through requirements and conditions imposed on the water right permits for the SWP, the CVP and others. (*See*, California Water Plan Update 2009, Regional Reports Volume 3, Sacramento-San Joaquin River Delta at DB-6.)

[4] http://www.doi.gov/news/pressreleases/upload/Roy.pdf

its decision invalidating the NMFS B.O. for failing to comply with the requirements of the federal ESA. As with the *Kempthorne* case (above), the court did not vacate the B.O., meaning that SWP and CVP operations were authorized to continue pending the preparation of a new B.O. and any interim remedies imposed by the court. Remedy proceedings were held similar to those conduced in the *Kempthorne* case discussed above and, in separate Findings of Fact and Conclusions of Law issued in July and October 2008, Judge Wanger determined that additional water supply restrictions beyond those required in *Kempthorne* (i.e., the Interim Remedies for Delta smelt) were not required at that time for the anadromous species.

On June 4, 2009, NMFS issued a new B.O. regarding the effects of SWP and CVP operations on listed winter and spring-run salmon, steelhead trout, green sturgeon, and southern resident killer whales. Like the new FWS B.O. discussed above, the NMFS B.O. concludes that the proposed long-term coordinated operations of the CVP and SWP will jeopardize the species and adversely modify the critical habitats of most of those species. Pursuant to the ESA, because the B.O. is a "jeopardy" opinion, NMFS was required to formulate and adopt a Reasonable and Prudent Alternative (RPA) to the proposed action that NMFS believed would not cause jeopardy to the species or adversely modify or destroy their critical habitats, and which can be implemented by Reclamation and DWR. (16 U.S.C. § 1536(b)(3)(A).) The RPA adopted by NMFS imposed various new operating restrictions upon the CVP and SWP which have the potential to result in substantial reductions in water supply from the Projects.

NMFS calculated that its new B.O. has the potential to reduce SWP deliveries from the Delta by 7 percent in addition to the potential reductions under the new FWS B.O. for Delta smelt (above). DWR has estimated that average annual reductions to SWP deliveries could be closer to 10 percent beyond the restrictions imposed under the FWS B.O. (thus, a total of 28 to 39 percent during average and dry conditions, respectively, in comparison to SWP exports authorized under D-1641). As with the FWS B.O., potential water supply restrictions under the NMFS B.O. are dependent on several variable factors, such as hydrologic conditions in the Delta region, migratory and reproductive patterns of protected salmonid species, and other non-Project factors that impact the health and abundance of the species and their habitats.

In June 2009, numerous legal challenges were filed against the new NMFS B.O. and consolidated in the United States District Court for the Eastern District of California alleging, among other things, that the operating restrictions set forth in the B.O. are in violation of the federal ESA, the federal APA, and other laws. (*The Consolidated Salmonid Cases*, Lead Case No. 1:09-CV-1053-OWW-DLB.) Early in the proceedings, several of the plaintiff water agencies and the federal defendants filed cross-motions for summary judgment to determine whether a NEPA violation occurred in connection with federal defendants' adoption and implementation of the NMFS B.O. and its RPA. The court heard oral argument on the motions in February 2010, and took the matter under submission.

Separately, in January 2010, several of the plaintiff water agencies filed applications for a temporary restraining order and motions for preliminary injunction regarding the implementation of RPA Actions IV.2.1 and IV.2.3, which are designed to restrict Delta exports during a particular timeframe in spring and summer months, depending on certain biological and environmental parameters. In February 2010, the court issued its Memorandum Decision and Order Re Plaintiffs' Motion for Temporary Restraining Order. The decision found that federal defendants violated NEPA by failing to consider the potential human and environmental impacts

caused by implementation of the RPA Actions, and that a temporary injunction against RPA Action IV.2.3 would not cause jeopardy to the species, whereas a failure to enjoin the Action would cause irreparable water supply impacts to the plaintiffs. (*The Consolidated Salmonid Cases*, Doc. No. 202 at 20-22.) In subsequent rulings issued in March 2010, the court ordered that plaintiffs were entitled to summary judgment on their claims that federal defendants violated NEPA by failing to prepare any NEPA documentation in the adoption and implementation of the NMFS B.O. and its RPA. (*The Consolidated Salmonid Cases*, Doc. Nos. 266 and 288 at 3.)

Plaintiffs' motions for a preliminary injunction were heard in April and May 2010, and in May 2010 the court issued Findings of Fact and Conclusions of Law Re Plaintiffs' Request for Preliminary Injunction. In that decision, the court reconfirmed its previous ruling that federal defendants violated NEPA by failing to undertake an analysis of whether the RPA Actions adopted by NMFS under its new B.O. would adversely impact humans and the human environment. (*The Consolidated Salmonid Cases*, Doc. No. 347 at 129-130, 138.) Further, the court ruled that the plaintiff water agencies had a substantial likelihood of being able to show that the federal defendants violated the ESA and the APA by failing to adequately justify, through generally recognized scientific principles, the precise flow prescriptions imposed by RPA Actions IV.2.1 and IV.2.3. (*Id.* at 130, 133-134.)[5]

Following its May 18th ruling, the court conducted further proceedings and accepted additional evidence to address the proposed injunction and whether the relief requested by the plaintiffs would adversely affect the species (namely, Central Valley spring-run Chinook salmon and Central Valley steelhead). Based on those proceedings, in June 2010, the court issued Supplemental Findings of Fact and Conclusions of Law Re Plaintiffs' Request for Preliminary Injunction. (*The Consolidated Salmonid Cases*, Doc. No. 380.) The Supplemental Findings noted that if RPA Actions IV.2.1 and IV.2.3 were enjoined through June 15, 2010, the FWS B.O. for Delta smelt (above) would control Project operations between May 26th and June 15th, unless those restrictions were also enjoined, in which case Project operations would be controlled by D-1641.[6] (Doc. No. 380 at 12.) Accordingly, the court granted an injunction against RPA Actions IV.2.1 and IV.2.3 and authorized Project operations in accordance with D-1641, provided that export pumping could be reduced on shortened notice upon a showing of jeopardy to the species or adverse modification of its critical habitat. (*Id.* at 17-18.)

In August and November 2010, the parties also filed motions for summary judgment to obtain a final ruling in the cases. Those motions were argued on December 16 and 17, 2010, and the court is expected to issue a memorandum decision on the motions.

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[5] RPA Action IV.2.1 limits combined water exports by the CVP and SWP based on San Joaquin River flows as measured at Vernalis. (NMFS B.O. at 642.) When flows at Vernalis range from 0 to 6,000 cfs, Action IV.2.1 limits combined CVP and SWP exports to 1,500 cfs. (NMFS B.O. at 642.) When flows at Vernalis range from 6,000 to 21,750 cfs, Action IV.2.1 imposes an inflow to combined CVP and SWP exports ratio of 4:1. (NMFS B.O. at 642.) The pumping restrictions associated with Action IV.2.1 terminate May 31st. (NMFS B.O. at 641-642.) RPA Action IV.2.3 limits Old and Middle River (OMR) flows to no more negative than -2,500 cfs between January 1 and June 15, or until the average daily water temperature at Mossdale is greater than 72 degrees Fahrenheit for seven consecutive days, whichever occurs first. (NMFS B.O. at 648-650.)

[6] Among other things, D-1641 limits Project exports to a combined total of not more than 35 percent of total Delta inflow and further limits Project operations to ensure that certain water quality standards are met as measured by the location of the isohaline condition referred to as spring X2. (See *The Consolidated Salmonid Cases*, Doc. No. 380 at 12-14.)

# APPENDIX D
# RECENT FACTORS AFFECTING SWP SUPPLIES

Because the salmon species covered by the new NMFS B.O. are also protected under CESA, the SWP and CVP are required to obtain take authorization from DFG. In September 2009, DFG issued a "consistency determination" pursuant to Fish and Game Code section 2080.1. That determination provides that operations of the SWP and CVP are in compliance with CESA so long as those operations occur in accordance with the RPA set forth in the NMFS B.O. Because the consistency determination posed a risk that the SWP could remain bound to the terms of the RPA even if the NMFS B.O. was eventually overturned by a federal court, DFG's decision was challenged in state court by the State Water Contractors and the Kern County Water Agency. (*State Water Contractors v. California Department of Fish and Game, et al.*, Kern County Superior Court Case No. S-1500-CV-268497.)[7] The challenge asserts, among other things, that DFG's consistency determination is invalid because it relies upon and seeks to enforce restrictions established under the NMFS B.O. that are alleged under *The Consolidated Salmon Cases* to be invalid and unenforceable. As described above, the Federal District Court for the Eastern District of California has ruled that plaintiffs have a strong likelihood of being able to show that portions of the NMFS B.O. fail to comply with the ESA and the APA, and has enjoined implementation of several RPA Actions. Because the court's ruling effectively modified aspects of the NMFS B.O. for 2010, DWR requested that DFG make a determination that the NMFS B.O., as modified by the court, remained consistent with the provisions of CESA. In May 2010, DFG issued a new consistency determination, finding the court-modified NMFS B.O. consistent with CESA. In June 2010, an amended complaint was filed against the May 24th consistency determination. By stipulation of the parties, the case is currently stayed pending the outcome of *The Consolidated Salmonid Cases*.

The current legal challenges regarding the validity of the new NMFS B.O. and the DFG consistency determination give rise to the possibility that the restrictions on SWP exports could be relaxed and that SWP exports may return to the higher levels allowed by the Interim Remedies decision in *Kempthorne* (above) or D-1641 pending the issuance of a new B.O. and/or implementation of the BDCP. Furthermore, as noted above, in May 2010 the Department of Interior and the Department of Commerce announced a joint initiative to develop a single, integrated B.O. for the coordinated operations of the CVP and SWP in the Delta.[8] The timing, nature, and extent of the regulatory measures to be contained that B.O., and whether those measures would be legally challenged or upheld, cannot be predicted with any degree of certainty at this time.

Watershed Enforcers v. California Department of Water Resources

Another litigation matter concerning SWP operations is *Watershed Enforcers v. Cal. Dept. of Water Resources* (2010) 185 Cal. App. 4th 969 (Alameda County Superior Court Case No. RG06292124). In that case, a plaintiffs group filed suit against DWR alleging the SWP was being operated without "take authorization" under CESA. The case was heard by the Alameda County Superior Court in November 2006 and, in April 2007, the court ordered DWR to cease and desist further operations of the Harvey O. Banks pumping plant facilities of the SWP unless DWR obtained proper authorization from DFG for the take of Delta smelt and salmon species listed under CESA. The trial court decision was appealed by DWR and several water agency

[7] In June 2010, the case was transferred to Sacramento, California, where it is now referenced as *State Water Contractors v. California Department of Fish and Game, et al.,* Sacramento County Superior Court Case No. 34-2010-80000560.

[8] http://www.doi.gov/news/pressreleases/upload/Roy.pdf

parties and the court's order was stayed pending the appeal, meaning that DWR was not required to cease its operations of the Banks facilities.

As discussed above, the new FWS and NMFS B.O.s were issued while the *Watershed Enforcers* case was pending on appeal. Based on those new B.O.s, DFG issued consistency determinations and take authorization for the SWP under CESA with respect to Delta smelt and the listed anadromous species. (Also discussed above, those consistency determinations have been challenged in state court.) Thereafter, in September 2009, DWR and one of the water agency parties dismissed their appeals in the *Watershed Enforcers* case. The case remained active in 2009-2010, however, for purposes of resolving the discrete legal issue raised by the remaining water agency parties as to whether DWR is the type of entity that is subject to the take prohibitions under CESA. In a June 2010 decision, the First District Court of Appeal affirmed the trial court decision in all respects, including the determination that DWR qualifies as a "person" within the meaning of CESA, which means that DWR is subject to CESA's permitting requirements. (*Watershed Enforcers v. Department of Water Resources* (2010) 185 Cal. App. 4th 969, 973.)

California Department of Fish and Game Incidental Take Permit for Longfin Smelt and Related Litigation Matters

Regulatory actions related to longfin smelt also have the potential to affect the availability and reliability of SWP supplies. In February 2008, the California Fish and Game Commission (Commission) approved a petition to list the longfin smelt as a "candidate" species under CESA. Under CESA, once a species is granted candidate status, it is entitled to protections until the Commission determines whether to list the species as threatened or endangered. To afford such interim protection, in February 2008, the Commission adopted the first in a series of emergency take regulations that authorized the CVP and SWP to take longfin smelt, yet established certain operating restrictions on Project exports from the Delta in an effort to protect the species. The emergency regulations were proposed to remain in effect until February 2009, at which time the Commission was required to decide whether to list the longfin as a threatened or endangered species. Initially, the Commission's take regulation imposed the same Delta export restrictions that were established in the *Kempthorne* case (i.e., the Interim Remedies discussed above). In November 2008, however, the Commission revised its emergency regulations in a manner that threatened to impose export restrictions beyond those established for Delta smelt. According to information published by DWR, the Commission's 2008-2009 revised emergency take regulations had the potential to reduce SWP supplies in the January to February 2009 period by up to approximately 300,000 acre-feet under a worst-case scenario. Under other scenarios, however, the SWP delivery reductions were expected to be no greater than those imposed under the new FWS B.O. for Delta smelt. In December 2008, several water agency interests filed suit against the Commission's revised take regulation, alleging it violated CESA.

In March 2009, the Commission determined that the listing of longfin smelt as a "threatened" species was warranted under CESA. CESA sets forth a general prohibition against the take of a threatened species except as otherwise authorized by statute. One such authorization is provided by California Fish and Game Code section 2081, wherein DFG may authorize the incidental taking of a threatened species in connection with an otherwise lawful activity through the issuance of a permit. In February 2009, in advance of an official listing of the species as threatened, DFG issued Incidental Take Permit No. 2081-2009-001-03 (Permit)

to DWR which imposes terms and conditions on the ongoing and long-term operation of SWP facilities in the Delta for the protection of longfin smelt. The operating restrictions under the Permit are based in large part on the restrictions imposed on the SWP by the new FWS B.O. for Delta smelt (see above).

In June 2009, the Commission officially listed longfin smelt as a threatened species under CESA. As with the FWS B.O., potential water supply restrictions under the Permit are dependent on several variable factors, such as hydrologic conditions in the Delta region, migratory and reproductive patterns of longfin smelt, and other non-Project factors affecting longfin smelt abundance in the Delta. DWR has not indicated whether any particular reductions in SWP exports are likely to result from the Permit. As previously noted, however, DWR has estimated that the restrictions imposed by the FWS B.O. and RPA for Delta smelt could reduce SWP deliveries between 18 and 29 percent in comparison to Project deliveries authorized under D-1641. In March 2009, due to a number of alleged scientific and other deficiencies in the Permit, the State Water Contractors challenged the Permit in Sacramento County Superior Court. (*State Water Contractors v. California Dept. of Fish and Game, et al.*, Sac. Sup. Ct. Case No. 34-2009-80000203.) That case puts DFG's ability to enforce the Permit into question.

California Drought Conditions

On June 4, 2008, the Governor of California proclaimed a statewide drought due to record-low rainfall in Spring 2008 and court-ordered restrictions on Delta exports as discussed above. (Executive Order S-06-08.) Soon thereafter, the Governor proclaimed a state of drought emergency to exist within the Counties of Sacramento, San Joaquin, Stanislaus, Merced, Madera, Fresno, Kings, Tulare and Kern. (Proclamation dated June 12, 2008.) On February 27, 2009, the Governor declared a statewide water supply emergency to combat California's third consecutive year of drought conditions, evidenced by low reservoir storage and estimated snowpack water content at that time. (Proclamation dated February 27, 2009.)

Since then, statewide hydrologic conditions have improved, although the State's water supply emergency declaration has not been lifted. In March 2010, DWR announced that both manual and electronic readings indicate that the water content in California's mountain snowpack was 107 percent of normal and stated that the "readings boost our hope that we will be able to increase the State Water Project allocation by this spring to deliver more water to our cities and farms." Among these readings, DWR reported that electronic sensor readings showed northern Sierra snow water equivalents at 126 percent of normal for that date, central Sierra at 93 percent, and southern Sierra at 109 percent.[9] As of January 2011, DWR reported snow water equivalents for the northern Sierra at 164 percent of normal, 186 percent of normal for the central Sierra, and 260 percent for the southern Sierra.[10] According to DWR's California Data Exchange Center, hydrologic conditions in California as of December 1, 2010 were as follows: statewide precipitation was 155 percent of average; statewide runoff was 115 percent of average; and key historical average statewide reservoir storage was at 105 percent, with two of the state's largest reservoirs, Lake Shasta (CVP) and Lake Oroville (SWP), respectively storing 116 percent and 75 percent of their historical averages.[11]

[9] http://www.water.ca.gov/news/newsreleases/2010/030310snow.pdf
[10] http://cdec.water.ca.gov/cgi-progs/snow/DLYSWEQ
[11] http://cdec.water.ca.gov/cgi-progs/reports/EXECSUM

# APPENDIX D
# RECENT FACTORS AFFECTING SWP SUPPLIES

Development of Delta Plan and Delta Flow Criteria Pursuant to New State Laws

In November 2009, the California Legislature enacted SBX7-1 as one of several bills passed as part of a comprehensive water package related to water supply reliability, ecosystem health, and the Delta. SBX7-1 became effective on February 3, 2010 and adds Division 35 to the California Water Code (commencing with Section 85300), referred to as the Sacramento-San Joaquin Delta Reform Act of 2009 (Act). Among other things, the Act creates the Delta Stewardship Council (Council) as an independent agency of the state. (Wat. Code § 85200.) SBX7-1 also amends the California Public Resources Code to specify changes to the Delta Protection Commission and to create the Delta Conservancy. (Pub. Res. Code §§ 29702-29780.) The Act directs the Council to develop a comprehensive management plan for the Delta by January 1, 2012 (Delta Plan) and to first develop an Interim Plan that includes recommendations for early actions, projects, and programs for the Delta. (*See generally*, Second Draft Interim Plan, Prepared for Consideration by the Delta Stewardship Council at 1.)

In addition to these and other requirements, SBX7-1 requires the State Board to use the best available scientific information to develop flow criteria for the Delta ecosystem necessary to protect public trust resources, including fish, wildlife, recreation and scenic enjoyment. Similarly, DFG is required to identify quantifiable biological objectives and flow criteria for species of concern in the Delta. In August 2010, the State Board adopted Resolution No. 2010-0039 approving its report entitled "Development of Flow Criteria for the Sacramento-San Joaquin Delta Ecosystem" (Flow Criteria). The State Board report concludes that substantially higher flows are needed through the Delta than in have occurred in previous decades in order to benefit zooplankton and various fish species. (Flow Criteria at 5-8.) Separately, in September 2010, DFG issued a draft report entitled "Quantifiable Biological Objectives and Flow Criteria for Aquatic and Terrestrial Species of Concern Dependent on the Delta" (DFG Report). The DFG Report is based on similar biological objectives and recommends Delta flows similar to those set forth in the State Board's Flow Criteria. (DFG Report at 13.) Notably, both the State Board and DFG recognize that their recommended flow criteria for the Delta do *not* balance the public interest or the need to provide an adequate and reliable water supply. (Flow Criteria at 4; DFG Report at 16.) Also of importance, both the State Board and DFG acknowledge that their recommended flow criteria do not have any regulatory or adjudicatory effect; however, they may be used to inform the Council as it prepares the Delta Plan, and may be considered as the Bay Delta Conservation Plan (BDCP) process moves forward. (Flow Criteria at 3, 10; DFG Report at ES-4.)

DWR's Final 2009 SWP Delivery Reliability Report

DWR continues to evaluate the issues affecting SWP exports from the Delta and how those issues may affect the long-term availability and reliability of SWP deliveries to the SWP Contractors. In September 2010, DWR released its Final 2009 SWP Delivery Reliability Report (DWR Report), which forecasts additional reductions to SWP supplies in comparison to the 2007 Report. According to DWR, the long-term average delivery of contractual SWP Table A supply is projected to be 60 percent under current and future conditions over the 20-year projection. (DWR Report at 43, 48, Tables 6.3 and 6.12.) Within that long-term average, SWP Table A deliveries can range from 7 percent (single dry year) to 68 percent (single wet year) of contractual amounts under current conditions, and from 11 percent (single dry year) to 97 percent (single wet year) under future conditions. (Id. at 43-44, 49, Tables 6.4, 6.5, 6.13 and 6.14.) Contractual amounts are projected to range from 32 to 38 percent during multiple-dry

year periods, and from 79 to 93 percent during multiple wet periods. (Id. at 49, Tables 6.13 and 6.14.)

To ensure a conservative analysis, the DWR Report expressly assumes and accounts for the institutional, environmental, regulatory, and legal factors affecting SWP supplies, including, but not limited to, water quality constraints, fishery protections, other D-1641 requirements and the operational limitations imposed by the FWS and NMFS B.O.s that are discussed above. The DWR Report also considers the potential effects of Delta levee failures and other seismic or flood events. (*See*, *e.g.*, DWR Report at 19-24, 25-28, 29-35, Appendices A, A-1, A-2, B.) Notably, the DWR Report assumes that all of these restrictions and limitations will remain in place over the next 20-year period and that no actions to improve the Delta will occur, even though numerous legal challenges, various Delta restoration processes, and new legal requirements for Delta improvements are currently underway (i.e., BDCP, Delta Vision, Delta Plan, etc.). Finally, DWR's long-term SWP delivery reliability analyses incorporate assumptions that are intended to account for potential supply shortfalls related to global climate change. (*See*, *e.g.*, DWR Report at 19, 29-30, Appendices A-B.) Based on these and other factors, the DWR Report presents a conservative projection of SWP delivery reliability.

Conclusion

DWR's most recently published SWP Delivery Reliability Report (September 2010) demonstrates that the projected long-term average delivery amounts of contractual SWP Table A supplies have decreased in comparison to previous estimates. However, as noted, the projections developed by DWR are predicated on conservative assumptions, which make the projections useful from a long-range urban water supply planning perspective.[12] Indeed, recent rulings in various legal actions and other factors described above, among others, support higher estimates of average annual SWP deliveries than projected in DWR's 2009 Report. While this may lead DWR to increase its projections in its next scheduled Report, the 2009 Report remains the best available information concerning the long-term delivery reliability of SWP supplies.

[12] *See*, *e.g.*, *Sonoma County Water Coalition v. Sonoma County Water Agency* (2010) 189 Cal.App.4th 33; *Watsonville Pilots Association v. City of Watsonville* (2010) 183 Cal.App.4th 1059; *Vineyard Area Citizens for Responsible Growth v. City of Rancho Cordova* (2007) 40 Cal.4th 412.

# Appendix E

Demand Management Measures

STATE OF CALIFORNIA – CALIFORNIA NATURAL RESOURCES AGENCY

**DEPARTMENT OF WATER RESOURCES**
1416 NINTH STREET, P.O. BOX 942836
SACRAMENTO, CA 94236-0001
(916) 653-5791

ARNOLD SCHWARZENEGGER, *Governor*

RECEIVED
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By

November 9, 2010

Mr. Dirk Marks, Water Resources Manager
Castaic Lake Water Agency
27234 Bouquet Canyon Road
Santa Clarita, California 91350-2173

Dear Mr. Marks:

The Department of Water Resources (DWR) has reviewed the Castaic Lake Water Agency's (CLWA) Self-Certification Statement – Table 1 dated October 26, 2010, regarding implementation of the Urban Best Management Practices (BMPs).

The purpose of DWR's review is to determine eligibility of CLWA to receive water management grant or loan funds. DWR has followed the *Draft AB 1420 Compliance Requirements* dated June 1, 2009. For detailed information, please visit http://www.water.ca.gov/wateruseefficiency/finance/.

Based on DWR's review of the information in Table 1, CLWA has and is currently implementing the BMPs consistent with AB 1420 and, therefore, is eligible to receive water management grant or loan funds.

DWR reserves the right to request additional information and documentation, including reports from CLWA to substantiate the accuracy of the information provided in Table 1. DWR may reverse or modify its eligibility determination and notify you and the funding agency if inaccuracies are found in the supporting documentation or in Table 1.

If you have any questions, please contact me at (916) 651-7025 or Jodi Evans at (916) 651-7026.

Sincerely,

Fethi BenJemaa
Ag Water Use Efficiency Section Chief

## AB 1420 Self- Certification Statement Table 1

**Note: Table 1 documents Status of Past and Current BMP implementation.**

**Self-Certification Statement: The Urban Water Supplier and its authorized representative certifies, under penalty of perjury, that all information and claims, stated in this table, regarding compliance and implementation of the BMPs, including alternative conservation approaches, are true and accurate. This signed AB 1420 Self-Certification Statement Table 1, and Table 2 are the basis for granting funds by the Funding Agency. Falsification and/or inaccuracies in AB 1420 Self Certification Statement Table 1, and Table 2 and in any supporting documents substantiating such claims may, at the discretion of the funding agency, result in loss of all State funds to the applicant. Additionally, the Funding Agency, in its sole discretion, may halt disbursement of grant or loan funds, not pay pending invoices, and/or pursue any other applicable legal remedy and refer the matter to the Attorney General's Office.**

Name of Signatory Dirk Marks Title of Signatory Water Resources Manager Signature of signatory Dat 26-Oct-10

**Application Date:**

Proposal Identification Number: CUWCC Member? Yes/No Yes

Has Urban Water Supplier submitted a 2005 Urban Water Management Plan? Yes/No Yes

Is the UWMP Plan Deemed Complete by DWR? Yes/No Yes

Applicant Name: Castaic Lake Water Agency

**Project Title:**

Applicant's Contact Information: Name: Dirk Marks Phone: 661-513-1297 E-mail: dmarks @clwa.org

Participants:

| *Retailer (List Below)* | *Wholesaler (List Below)* |
|---|---|
| | |
| | |
| | |
| | |
| | |

| C1 | C2 | C3 | C4 | C5 | *C6 | C7 | **C8 | **C9 | **C10 | C11 | C12 | C13 | C14 | C15 | C16 | C17 | C18 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | BMP Implemented by Retailers and/or Wholesalers / *BMP* | | | Compliance Options/Alternative Conservation Approaches (1) | | | BMP Is Exempt (2) | | | BMP Implementation Requirements Met | | | | |
| BMPs required for Wholesale Supplier | BMPs required for Retail Supplier | BMPs | Retailer *Yes/No* | Wholesaler *Yes/No* | Regional *Yes/No* | BMP Checklist | Flex Track | Gallons Per Capita Per Day GPCD | Not Cost Effective | Lack of Funding | Lack of Legal Authority | CUWCC MOU Requirement Met: Retailer *Yes/No* | CUWCC MOU Requirement Met: Wholesaler *Yes/No* | Date of BMP Report Submitted to CUWCC for (2007-2008) (MOU Signatories) | Date BMP Implementation Data Submitted to DWR in CUWCC Format (Non MOU Signatories) (3) | All Supporting Documents have been Submitted Yes/No | |
| | ✓ | BMP 1 Water Survey for Single/Multi-Family Residential Customers | | | | | | | | | | | | | | | |
| | ✓ | BMP 2 Residential Plumbing Retrofit | | | | | | | | | | | | | | | |
| ✓ | ✓ | BMP 3 System Water Audits, Leak Detection | | Yes | | ✓ | | | | | | | Yes | | | Yes | |
| ✓ | ✓ | BMP 3 Leak Repairs | | Yes | | ✓ | | | | | | | Yes | | | Yes | |
| | ✓ | BMP 4 Metering with Commodity Rates for All New connections | | | | | | | | | | | | | | | |
| | ✓ | BMP 4 Retrofit of Existing Connections | | | | | | | | | | | | | | | |

| C1 | C2 | C3 | C4 | C5 | *C6 | C7 | **C8 | **C9 | **C10 | C11 | C12 | C13 | C14 | C15 | C16 | C17 | C18 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | **BMP Implemented by Retailers and/or Wholesalers / *BMP*** | | | **Compliance Options/Alternative Conservation Approaches (1)** | | | **BMP is Exempt (2)** | | | **BMP Implementation Requirements Met** | | | | |
| BMPs required for Wholesale Supplier | BMPs required for Retail Supplier | BMPs | Retailer *Yes/No* | Wholesaler *Yes/No* | Regional *Yes/No* | BMP Checklist | Flex Track | Gallons Per Capita Per Day GPCD | Not Cost Effective | Lack of Funding | Lack of Legal Authority | CUWCC MOU Requirement Met Retailer Yes/No | CUWCC MOU Requirement Met Wholesaler *Yes/No* | Date of BMP Report Submitted to CUWCC for (2007-2008) (MOU Signatories) | Date BMP Implementation Data Submitted to DWR in CUWCC Format (Non MOU Signatories) (3) | All Supporting Documents have been Submitted Yes/No |
| | ✓ | BMP 5 Large Landscape Conservation Programs and Incentives | | | | | | | | | | | | | | |
| | ✓ | BMP 6 High-Efficiency Washing Machine Rebate Programs | | | | | | | | | | | | | | |
| ✓ | ✓ | BMP 7 Public Information | | Yes | | ✓ | | | | | | | Yes | | | Yes |
| ✓ | ✓ | BMP 8 School Education | | Yes | | ✓ | | | | | | | Yes | | | Yes |
| | ✓ | BMP 9 Conservation programs for Commercial, Industrial, and Institutional (CII) Accounts | | | | | | | | | | | | | | |
| ✓ | | BMP 10 Wholesale Agency Assistance Programs | | Yes | | ✓ | | | | | | | Yes | | | Yes |
| | ✓ | BMP 11 Conservation Pricing | | | | | | | | | | | | | | |
| ✓ | ✓ | BMP 12 Conservation Coordinator | | Yes | | ✓ | | | | | | | Yes | | | Yes |
| | ✓ | BMP 13 Water Waste Prohibitions | | | | | | | | | | | | | | |
| | ✓ | BMP 14 Residential ULFT Replacement Programs | | | | | | | | | | | | | | |

*C6: Wholesaler may also be a retailer (supplying water to end water users)

**C8, **C9, **, and C10: Agencies choosing an alternative conservation approach are responsible for achieving water savings equal or greater than that which they would have achieved using only BMP list.

(1) For details, please see: http://www.cuwcc.org/mou/exhibit-1-bmp-definitions-schedules-requirements.aspx.

(2) BMP is exempt based on cost-effectiveness, lack of funding, and lack of legal authority criteria as detailed in the CUWCC MOU

(3) Non MOU signatories must submit to DWR reports and supporting documents in the same format as CUWCC.

STATE OF CALIFORNIA – CALIFORNIA NATURAL RESOURCES AGENCY
EDMUND G. BROWN JR., *Governor*

**DEPARTMENT OF WATER RESOURCES**
1416 NINTH STREET, P.O. BOX 942836
SACRAMENTO, CA 94236-0001
(916) 653-5791

RECEIVED
JAN 31 2011
NCWD

January 26, 2011

Mr. Stephen L. Cole
General Manager
Newhall County Water Agency
Post Office Box 220970
Santa Clarita, California 91322-0970

Dear Mr. Cole:

The Department of Water Resources (DWR) has reviewed the Newhall County Water Agency's (NCWA) Self-Certification Statement – Tables 1 and 2 submitted on January 18, 2011, regarding implementation of the Urban Best Management Practices (BMPs).

The purpose of DWR's review is to determine eligibility of the NCWA to receive water management grant or loan funds. DWR has followed the *Draft AB 1420 Compliance Requirements* dated June 1, 2009. For detailed information, please visit http://www.water.ca.gov/wateruseefficiency/finance/.

Based on DWR's review of the information in Tables 1 and 2, the NCWA has and is currently implementing the BMPs consistent with AB 1420 and, therefore, is eligible to receive water management grant or loan funds.

DWR reserves the right to request additional information and documentation, including reports from the NCWA to substantiate the accuracy of the information provided in Tables 1 and 2. DWR may reverse or modify its eligibility determination and notify you and the funding agency if inaccuracies are found in the supporting documentation or in Tables 1 and 2.

If you have any questions, please contact me at (916) 651-7025 or Jodi Evans at (916) 651-7026.

Sincerely,

Fethi BenJemaa
Ag Water Use Efficiency Section Chief

## AB 1420 Self- Certification Statement Table 1

**Note: Table 1 documents Status of Past and Current BMP implementation.**

**Self-Certification Statement: The Urban Water Supplier and its authorized representative certifies, under penalty of perjury, that all information and claims, stated in this table, regarding compliance and implementation of the BMPs, including alternative conservation approaches, are true and accurate. This signed AB 1420 Self-Certification Statement Table 1, and Table 2 are the basis for granting funds by the Funding Agency. Falsification and/or inaccuracies in AB 1420 Self Certification Statement Table 1, and Table 2 and in any supporting documents substantiating such claims may, at the discretion of the funding agency, result in loss of all State funds to the applicant. Additionally, the Funding Agency, in its sole discretion, may halt disbursement of grant or loan funds, not pay pending invoices, and/or pursue any other applicable legal remedy and refer the matter to the Attorney General's Office.**

Name of Signatory Stephen L Cole Title of Signatory General Manager Signature of signatory Date 11/23/10

**Application Date: 11/23/2010**

Proposal Identification Number: CUWCC Member? Yes/No Yes

Has Urban Water Supplier submitted a 2005 Urban Water Management Plan? Yes/No Yes Is the UWM Plan Deemed Complete by DWR? Yes/No Submitting 2010

Applicant Name: Newhall County Water District

**Project Title: Santa Clara River Sewer Trunk Line Relocation "Phase 1"**

Applicant's Contact Information: Name: Michael Alvord Phone: 661-259-3610 E-mail: malvord@ncwd.org

Participants:

| *Retailer (List Below)* | *Wholesaler (List Below)* |
|---|---|
| *Newhall County Water District* | *Castaic Lake Water Agency* |

| C1 | C2 | C3 | C4 | C5 | *C6 | C7 | **C8 | **C9 | **C10 | C11 | C12 | C13 | C14 | C15 | C16 | C17 | C18 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | BMP Implemented by Retailers and/or Wholesalers / *BMP* | | | Compliance Options/Alternative Conservation Approaches (1) | | | BMP Is Exempt (2) | | | BMP Implementation Requirements Met | | | | |
| BMPs required for Wholesale Supplier | BMPs required for Retail Supplier | BMPs | Retailer *Yes/No* | Wholesaler *Yes/No* | Regional *Yes/No* | BMP Checklist | Flex Track | Gallons Per Capita Per Day GPCD | Not Cost Effective | Lack of Funding | Lack of Legal Authority | CUWCC MOU Requirement Met: Retailer *Yes/No* | CUWCC MOU Requirement Met: Wholesaler *Yes/No* | Date of BMP Report Submitted to CUWCC for (2007-2008) (MOU Signatories) | Date BMP Implementation Data Submitted to DWR in CUWCC Format (Non MOU Signatories) (3) | All Supporting Documents have been Submitted Yes/No |
| | ✓ | BMP 1 Water Survey for Single/Multi-Family Residential Customers | ✓ | | | | ✓ | | | | | No | | 12/30/2008 | | Yes |
| | ✓ | BMP 2 Residential Plumbing Retrofit | ✓ | | | | ✓ | | | | | No | | 12/30/2008 | | Yes |
| ✓ | ✓ | BMP 3 System Water Audits, Leak Detection | ✓ | ✓ | | ✓ | | | | | | Yes | Yes | 12/30/2008 | | Yes |
| ✓ | ✓ | BMP 3 Leak Repairs | ✓ | ✓ | | ✓ | | | | | | Yes | Yes | 12/30/2008 | | Yes |
| | ✓ | BMP 4 Metering with Commodity Rates for All New connections | ✓ | | | ✓ | | | | | | Yes | | 12/30/2008 | | Yes |
| | ✓ | BMP 4 Retrofit of Existing Connections | ✓ | | | ✓ | | | | | | Yes | | 12/30/2008 | | Yes |

| C1 | C2 | C3 | C4 | C5 | *C6 | C7 | **C8 | **C9 | **C10 | C11 | C12 | C13 | C14 | C15 | C16 | C17 | C18 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | **BMP Implemented by Retailers and/or Wholesalers / *BMP*** | | | **Compliance Options/Alternative Conservation Approaches (1)** | | | **BMP Is Exempt (2)** | | | **BMP Implementation Requirements Met** | | | | |
| BMPs required for Wholesale Supplier | BMPs required for Retail Supplier | BMPs | Retailer *Yes/No* | Wholesaler *Yes/No* | Regional *Yes/No* | BMP Checklist | Flex Track | Gallons Per Capita Per Day GPCD | Not Cost Effective | Lack of Funding | Lack of Legal Authority | CUWCC MOU Requirement Met: Retailer *Yes/No* | CUWCC MOU Requirement Met: Wholesaler *Yes/No* | Date of BMP Report Submitted to CUWCC for (2007-2008) (MOU Signatories) | Date BMP Implementation Data Submitted to DWR in CUWCC Format (Non MOU Signatories) (3) | All Supporting Documents have been Submitted Yes/No |
| | ✓ | BMP 5 Large Landscape Conservation Programs and Incentives | ✓ | ✓ | | ✓ | | | | | | Yes | | 12/30/2008 | | Yes |
| | ✓ | BMP 6 High-Efficiency Washing Machine Rebate Programs | ✓ | | | | ✓ | | | | | No | | 12/30/2008 | | Yes |
| ✓ | ✓ | BMP 7 Public Information | ✓ | ✓ | | ✓ | | | | | | Yes | Yes | 12/30/2008 | | Yes |
| ✓ | ✓ | BMP 8 School Education | ✓ | ✓ | | ✓ | | | | | | Yes | Yes | 12/30/2008 | | Yes |
| | ✓ | BMP 9 Conservation programs for Commercial, Industrial, and Institutional (CII) Accounts | ✓ | ✓ | | ✓ | | | | | | Yes | | 12/30/2008 | | Yes |
| ✓ | | BMP 10 Wholesale Agency Assistance Programs | | ✓ | | ✓ | | | | | | | Yes | 12/30/2008 | | Yes |
| | ✓ | BMP 11 Conservation Pricing | ✓ | | | | | | | | | Yes | | 12/30/2008 | | Yes |
| ✓ | ✓ | BMP 12 Conservation Coordinator | ✓ | ✓ | | ✓ | | | | | | Yes | Yes | 12/30/2008 | | Yes |
| | ✓ | BMP 13 Water Waste Prohibitions | ✓ | | | ✓ | | | | | | Yes | | 12/30/2008 | | Yes |
| | ✓ | BMP 14 Residential ULFT Replacement Programs | ✓ | ✓ | | ✓ | | | | | | Yes | | 12/30/2008 | | Yes |

***C6:** Wholesaler may also be a retailer (supplying water to end water users)
****C8, **C9, **, and C10:** Agencies choosing an alternative conservation approach are responsible for achieving water savings equal or greater than that which they would have achieved using only BMP list.

**(1)** For details, please see: http://www.cuwcc.org/mou/exhibit-1-bmp-definitions-schedules-requirements.aspx.
**(2)** BMP is exempt based on cost-effectiveness, lack of funding, and lack of legal authority criteria as detailed in the CUWCC MOU
**(3)** Non MOU signatories must submit to DWR reports and supporting documents in the same format as CUWCC.

## AB 1420 Self- Certification Statement Table 2

## Provide Schedule, Budget, and Finance Plan to Demonstrate Commitment to Implement All BMP's to Become in Compliance with BMP Implementation - Commencing Within 1st Year of Agreement for Which Applicant Receives Funds.

**Self-Certification Statement: The Urban Water Supplier and its authorized representative certifies, under penalty of perjury, that all information and claims, stated in this table, regarding compliance and implementation of the BMPs, including alternative conservation approaches, are true and accurate. This signed AB 1420 Self-Certification Statement Table 1 and Table 2 are the basis for granting funds by the Funding Agency. Falsification and/or inaccuracies in AB 1420 Self Certification Statement Table 1 and Table 2, and in any supporting documents substantiating such claims may, at the discretion of the funding agency, result in loss of all State funds to the applicant. Additionally, the Funding Agency, in its sole discretion, may halt disbursement of grant or loan funds, not pay pending invoices, and/or pursue any other applicable legal remedy and refer the matter to the Attorney General's Office.**

Name of Signatory Stephen L Cole Title of Signatory General Manager Signature of signatory _____ Date 11/23/10

**Application Date: 11/23/2010**

Proposal Identification Number: | CUWCC Member? Yes/No: Yes

Applicant Name: Newhall County Water District | Is the UWM Plan Deemed Complete by DWR? Yes/No: Submitting 2010

Project Title: Santa Clara River Sewer Trunk Line Relocation "Phase 1"

Applicant's Contact Information: Name: Michael Alvord

| | Retailer (List Below) | | |
|---|---|---|---|
| Participants: | Newhall County Water District | | |
| | | | |
| | | | |
| | | | |

| C1 | C2 | C3 | C4 | C5 | *C6 | C7 | C8 | **C9 | **C10 | **C11 | C12 | | | C13 | C14 | C15 | C16 | C17 | C18 | C19 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | BMP Implemented by Retailers and/or Wholesalers | | | | Compliance Options / Alternative Conservation Approaches (1) | | | BMP is Exempt (2) | | | Implementation Scheduled to Commence within 1st Year of Agreement | | | | | | |
| CUWCC 2010 Flex Track BMPs | BMPs required for Wholesale Supplier | BMPs required for Retail Supplier | BMPs | Retailer *Yes/No* | Wholesaler *Yes/No* | Regional *Yes/No* | Alternative Conservation Approaches Yes/No | BMP Checklist | Flex Track | Gallons Per Capita Per Day GPCD | Not Cost Effective | Lack of Funding | Lack of Legal Authority | Start Date (MM/YR) | Completion Level (%) | BMP Completion Date (MM/YR) | Budget (Dollars) | Funding Source & Finance Plan to Implement BMPs | Meets CUWCC Coverage Yes/No | Funds Requested, if Available. (See AB 1420 Compliance Table 3) Yes/No |
| | 1. Utility Operations Programs | | | | | | | | | | | | | | | | | | | |
| 1.11 | | | BMP 12 Conservation Coordinator | | | | | | | | | | | | | | | | | |
| 1.12 | | | BMP 13 Water Waste Prohibitions | | | | | | | | | | | | | | | | | |
| 1.13 | | | BMP 10 Wholesale Agency Assistance Programs | | | | | | | | | | | | | | | | | |
| 1.20 | | | BMP 3 System Water Audits, Leak Detection/Repair | | | | | | | | | | | | | | | | | |
| 1.30 | | | BMP 4 Metering with Commodity Rates for All New/**Retrofit of Existing** connections | | | | | | | | | | | | | | | | | |
| 1.40 | | | BMP 11 Conservation Pricing | | | | | | | | | | | | | | | | | |
| | 2. Educational Programs | | | | | | | | | | | | | | | | | | | |
| 2.10 | | | BMP 7 Public Information | | | | | | | | | | | | | | | | | |
| 2.20 | | | BMP 8 School Education | | | | | | | | | | | | | | | | | |
| | 3. Residential | | | | | | | | | | | | | | | | | | | |
| 3.11 | | ✓ | BMP 1 **Indoor** Water Survey for Single/Multi-Family Residential Customers | Yes | No | | Yes | | ✓ | | | | | Jul-11 | 90% | Jun-13 | $2,500.00 | Water Rates | Yes | |
| 3.12 | | ✓ | BMP 1 **Outdoor** Water Survey for Single/Multi-Family Residential Customers | Yes | No | | Yes | | ✓ | | | | | Jul-11 | 90% | Jun-13 | $2,500.00 | Water Rates | Yes | |
| 3.20 | | ✓ | BMP 2 Residential Plumbing Retrofit | Yes | No | | Yes | | ✓ | | | | | Jul-11 | 50% | Jun-15 | $6,000.00 | Water Rates | Yes | |

| CUWCC 2010 Flex Track BMPs | BMPs required for Wholesale Supplier | BMPs required for Retail Supplier | BMPs | BMP Implemented by Retailers and/or Wholesalers | | | | Compliance Options / Alternative Conservation Approaches (1) | | | BMP is Exempt (2) | | | Implementation Scheduled to Commence within 1st Year of Agreement | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Retailer *Yes/No* | Wholesaler *Yes/No* | Regional *Yes/No* | Alternative Conservation Approaches Yes/No | BMP Checklist | Flex Track | Gallons Per Capita Per Day GPCD | Not Cost Effective | Lack of Funding | Lack of Legal Authority | Start Date (MM/YR) | Completion Level (%) | BMP Completion Date (MM/YR) | Budget (Dollars) | Funding Source & Finance Plan to Implement BMPs | Meets CUWCC Coverage Yes/No | Funds Requested, if Available. (See AB 1420 Compliance Table 3) Yes/No |
| 3.30 | | ✓ | BMP 6 High-Efficiency Washing Machine Rebate Programs | Yes | No | | Yes | | ✓ | | | | | Jul-11 | 0% | Jun-17 | $18,000.00 | Water Rates | Yes | |
| 3.40 | | | BMP 14 Residential ULFT Replacement Programs | | | | | | | | | | | | | | | | | |
| **4. Commercial, Industrial, Institutional** | | | | | | | | | | | | | | | | | | | | |
| 4.00 | | | BMP 9 Conservation programs for Commercial, Industrial, and Institutional (CII) Accounts | | | | | | | | | | | | | | | | | |
| **5. Landscape** | | | | | | | | | | | | | | | | | | | | |
| 5.00 | | | BMP 5 Large Landscape Conservation Programs and Incentives | | | | | | | | | | | | | | | | | |

*C6: Wholesaler may also be a retailer (supplying water to end water users)
**C9, ** C10, and **C11: Agencies choosing an alternative conservation approach are responsible for achieving water savings equal or greater than that which they would have achieved using only BMP list.
(1) For details, please see http://www.cuwcc.org/mou/exhibit-1-bmp-definitions-schedules-requirements.aspx.
(2) BMP is exempt based on cost-effectiveness, lack of funding, or lack of legal authority, as detailed in the CUWCC MOU.

STATE OF CALIFORNIA – CALIFORNIA NATURAL RESOURCES AGENCY EDMUND G. BROWN JR., Governor

**DEPARTMENT OF WATER RESOURCES**
1416 NINTH STREET, P.O. BOX 942836
SACRAMENTO, CA 94236-0001
(916) 653-5791

January 26, 2011

Mr. Matthew Dickens
Resource Conservation Manager
Valencia Water Company
Post Office Box 5904
24631 Avenue Rockefeller
Valencia, California 91380

Dear Mr. Dickens:

The Department of Water Resources (DWR) has reviewed the Valencia Water Company's (VWC) Self-Certification Statement – Table 1 submitted on January 13, 2011, regarding implementation of the Urban Best Management Practices (BMPs).

The purpose of DWR's review is to determine eligibility of the VWC to receive water management grant or loan funds. DWR has followed the *Draft AB 1420 Compliance Requirements* dated June 1, 2009. For detailed information, please visit http://www.water.ca.gov/wateruseefficiency/finance/.

Based on DWR's review of the information in Table 1, the VWC has and is currently implementing the BMPs consistent with AB 1420 and, therefore, is eligible to receive water management grant or loan funds.

DWR reserves the right to request additional information and documentation, including reports from the VWC to substantiate the accuracy of the information provided in Table 1. DWR may reverse or modify its eligibility determination and notify you and the funding agency if inaccuracies are found in the supporting documentation or in Table 1.

If you have any questions, please contact me at (916) 651-7025 or Jodi Evans at (916) 651-7026.

Sincerely,

Fethi BenJemaa
Ag Water Use Efficiency Section Chief

## AB 1420 Self- Certification Statement Table 1

**Note: Table 1 documents Status of Past and Current BMP implementation.**

**Self-Certification Statement: The Urban Water Supplier and its authorized representative certifies, under penalty of perjury, that all information and claims, stated in this table, regarding compliance and implementation of the BMPs, including alternative conservation approaches, are true and accurate. This signed AB 1420 Self-Certification Statement Table 1, and Table 2 are the basis for granting funds by the Funding Agency. Falsification and/or inaccuracies in AB 1420 Self Certification Statement Table 1, and Table 2 and in any supporting documents substantiating such claims may, at the discretion of the funding agency, result in loss of all State funds to the applicant. Additionally, the Funding Agency, in its sole discretion, may halt disbursement of grant or loan funds, not pay pending invoices, and/or pursue any other applicable legal remedy and refer the matter to the Attorney General's Office.**

**Name of Signatory** Matthew S. Dickens **Title of Signatory** Resource Conservation Manager **Signature of signatory** _____ **Date** 12/21/2010

**Application Date:**

**Proposal Identification Number:** _____ **CUWCC Member? Yes/No** Yes

**Has Urban Water Supplier submitted a 2005 Urban Water Management Plan? Yes/No** Yes **Is the UWM Plan Deemed Complete by DWR? Yes/No** Yes

**Applicant Name:** Castaic Lake Water Agency

**Project Title:**

**Applicant's Contact Information:** **Name:** Matthew S. Dickens **Phone:** 661-295-6543 **E-mail:** mdickens@valenciawater.com

**Participants:**

| *Retailer (List Below)* | *Wholesaler (List Below)* |
|---|---|
| *Valencia Water Company* | *Castaic Lake Water Agency* |
| | |
| | |
| | |
| | |

| C1 | C2 | C3 | C4 | C5 | *C6 | C7 | **C8 | **C9 | **C10 | C11 | C12 | C13 | C14 | C15 | C16 | C17 | C18 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | **BMP Implemented by Retailers and/or Wholesalers / *BMP*** | | | **Compliance Options/Alternative Conservation Approaches (1)** | | | **BMP Is Exempt (2)** | | | **BMP Implementation Requirements Met** | | | | |
| BMPs required for Wholesale Supplier | BMPs required for Retail Supplier | BMPs | Retailer *Yes/No* | Wholesaler *Yes/No* | Regional *Yes/No* | BMP Checklist | Flex Track | Gallons Per Capita Per Day GPCD | Not Cost Effective | Lack of Funding | Lack of Legal Authority | CUWCC MOU Requirement Met: Retailer *Yes/No* | CUWCC MOU Requirement Met: Wholesaler *Yes/No* | Date of BMP Report Submitted to CUWCC for (2007-2008) (MOU Signatories) | Date BMP Implementation Data Submitted to DWR in CUWCC Format (Non MOU Signatories) (3) | All Supporting Documents have been Submitted Yes/No | |
| | ✓ | BMP 1 Water Survey for Single/Multi-Family Residential Customers | Yes | | | X | | | | | | Yes | | 3/30/2009 | | Yes | |
| | ✓ | BMP 2 Residential Plumbing Retrofit | Yes | | | X | | | | | | Yes | | 3/30/2009 | | Yes | |
| ✓ | ✓ | BMP 3 System Water Audits, Leak Detection | Yes | | | X | | | | | | Yes | | 3/30/2009 | | Yes | |
| ✓ | ✓ | BMP 3 Leak Repairs | Yes | | | X | | | | | | Yes | | 3/30/2009 | | Yes | |
| | ✓ | BMP 4 Metering with Commodity Rates for All New connections | Yes | | | X | | | | | | Yes | | 3/30/2009 | | Yes | |
| | ✓ | BMP 4 Retrofit of Existing Connections | Yes | | | X | | | | | | Yes | | 3/30/2009 | | Yes | |

| C1 | C2 | C3 | C4 | C5 | *C6 | C7 | **C8 | **C9 | **C10 | C11 | C12 | C13 | C14 | C15 | C16 | C17 | C18 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | **BMP Implemented by Retailers and/or Wholesalers / *BMP*** | | | **Compliance Options/Alternative Conservation Approaches (1)** | | | **BMP Is Exempt (2)** | | | **BMP Implementation Requirements Met** | | | | |
| BMPs required for Wholesale Supplier | BMPs required for Retail Supplier | BMPs | Retailer *Yes/No* | Wholesaler *Yes/No* | Regional *Yes/No* | BMP Checklist | Flex Track | Gallons Per Capita Per Day GPCD | Not Cost Effective | Lack of Funding | Lack of Legal Authority | CUWCC MOU Requirement Met: Retailer *Yes/No* | CUWCC MOU Requirement Met: Wholesaler *Yes/No* | Date of BMP Report Submitted to CUWCC for (2007-2008) (MOU Signatories) | Date BMP Implementation Data Submitted to DWR in CUWCC Format (Non MOU Signatories) (3) | All Supporting Documents have been Submitted Yes/No |
| | ✓ | BMP 5 Large Landscape Conservation Programs and Incentives | Yes | | | X | | | | | | Yes | | 3/30/2009 | | Yes |
| | ✓ | BMP 6 High-Efficiency Washing Machine Rebate Programs | Yes | | | X | | | | | | No | | 3/30/2009 | | Yes |
| ✓ | ✓ | BMP 7 Public Information | Yes | | | X | | | | | | Yes | | 3/30/2009 | | Yes |
| ✓ | ✓ | BMP 8 School Education | Yes | | | X | | | | | | Yes | | 3/30/2009 | | Yes |
| | ✓ | BMP 9 Conservation programs for Commercial, Industrial, and Institutional (CII) Accounts | Yes | | | X | | | | | | Yes | | 3/30/2009 | | Yes |
| ✓ | | BMP 10 Wholesale Agency Assistance Programs | NA | | | NA | | | | | | NA | | NA | | NA |
| | ✓ | BMP 11 Conservation Pricing | Yes | | | X | | | | | | Yes | | 3/30/2009 | | Yes |
| ✓ | ✓ | BMP 12 Conservation Coordinator | Yes | | | X | | | | | | Yes | | 3/30/2009 | | Yes |
| | ✓ | BMP 13 Water Waste Prohibitions | Yes | | | X | | | | | | Yes | | 3/30/2009 | | Yes |
| | ✓ | BMP 14 Residential ULFT Replacement Programs | Yes | | | X | | | | | | Yes | | 3/30/2009 | | Yes |

***C6:** Wholesaler may also be a retailer (supplying water to end water users)

****C8, **C9, **, and C10:** Agencies choosing an alternative conservation approach are responsible for achieving water savings equal or greater than that which they would have achieved using only BMP list.

**(1)** For details, please see: http://www.cuwcc.org/mou/exhibit-1-bmp-definitions-schedules-requirements.aspx.
**(2)** BMP is exempt based on cost-effectiveness, lack of funding, and lack of legal authority criteria as detailed in the CUWCC MOU
**(3)** Non MOU signatories must submit to DWR reports and supporting documents in the same format as CUWCC.

## AB 1420 Self- Certification Statement Table 2

## Provide Schedule, Budget, and Finance Plan to Demonstrate Commitment to Implement All BMP's to Become in Compliance with BMP Implementation - Commencing Within 1st Year of Agreement for Which Applicant Receives Funds.

**Self-Certification Statement: The Urban Water Supplier and its authorized representative certifies, under penalty of perjury, that all information and claims, stated in this table, regarding compliance and implementation of the BMPs, including alternative conservation approaches, are true and accurate. This signed AB 1420 Self-Certification Statement Table 1 and Table 2 are the basis for granting funds by the Funding Agency. Falsification and/or inaccuracies in AB 1420 Self Certification Statement Table 1 and Table 2, and in any supporting documents substantiating such claims may, at the discretion of the funding agency, result in loss of all State funds to the applicant. Additionally, the Funding Agency, in its sole discretion, may halt disbursement of grant or loan funds, not pay pending invoices, and/or pursue any other applicable legal remedy and refer the matter to the Attorney General's Office.**

Name of Signatory Matthew S. Dickens Title of Signatory Resource Conservation Manager Signature of signatory _____ Date 12/22/2010

**Application Date:**

**Proposal Identification Number:**

**CUWCC Member?** Yes/No: Yes

**Applicant Name:** Castaic Water Agency

**Is the UWM Plan Deemed Complete by DWR?** Yes/No: Yes

**Project Title:**

**Applicant's Contact Information:** Name: Matthew S. Dickens

| | *Retailer (List Below)* | | |
|---|---|---|---|
| Participants: | Valencia Water Company | | |
| | | | |
| | | | |
| | | | |

| C1 | C2 | C3 | C4 | C5 | *C6 | C7 | C8 | **C9 | **C10 | **C11 | C12 | | | C13 | C14 | C15 | C16 | C17 | C18 | C19 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | BMP Implemented by Retailers and/or Wholesalers | | | | Compliance Options / Alternative Conservation Approaches (1) | | | BMP is Exempt (2) | | | Implementation Scheduled to Commence within 1st Year of Agreement | | | | | | |
| CUWCC 2010 Flex Track BMPs | BMPs required for Wholesale Supplier | BMPs required for Retail Supplier | BMPs | Retailer *Yes/No* | Wholesaler *Yes/No* | Regional *Yes/No* | Alternative Conservation Approaches Yes/No | BMP Checklist | Flex Track | Gallons Per Capita Per Day GPCD | Not Cost Effective | Lack of Funding | Lack of Legal Authority | Start Date (MM/YR) | Completion Level (%) | BMP Completion Date (MM/YR) | Budget (Dollars) | Funding Source & Finance Plan to Implement BMPs | Meets CUWCC Coverage Yes/No | Funds Requested, if Available. (See AB 1420 Compliance Table 3) Yes/No |
| **1. Utility Operations Programs** | | | | | | | | | | | | | | | | | | | | |
| 1.11 | ✓ | ✓ | BMP 12 Conservation Coordinator | Yes | | | | X | | | | | | | | | | | | |
| 1.12 | | ✓ | BMP 13 Water Waste Prohibitions | Yes | | | | X | | | | | | | | | | | | |
| 1.13 | ✓ | | BMP 10 Wholesale Agency Assistance Programs | | | | | | | | | | | | | | | | | |
| 1.20 | ✓ | ✓ | BMP 3 System Water Audits, Leak Detection/**Repair** | Yes | | | | X | | | | | | | | | | | | |
| 1.30 | | ✓ | BMP 4 Metering with Commodity Rates for All New/**Retrofit of Existing** connections | Yes | | | | X | | | | | | | | | | | | |
| 1.40 | | ✓ | BMP 11 Conservation Pricing | Yes | | | | X | | | | | | | | | | | | |
| **2. Educational Programs** | | | | | | | | | | | | | | | | | | | | |
| 2.10 | ✓ | ✓ | BMP 7 Public Information | Yes | | | | X | | | | | | | | | | | | |
| 2.20 | ✓ | ✓ | BMP 8 School Education | Yes | | | | X | | | | | | | | | | | | |
| **3. Residential** | | | | | | | | | | | | | | | | | | | | |
| 3.11 | | ✓ | BMP 1 **Indoor** Water Survey for Single/Multi-Family Residential Customers | Yes | | | | X | | | | | | | | | | | | |
| 3.12 | | ✓ | BMP 1 **Outdoor** Water Survey for Single/Multi-Family Residential Customers | Yes | | | | X | | | | | | | | | | | | |
| 3.20 | | ✓ | BMP 2 Residential Plumbing Retrofit | Yes | | | | X | | | | | | | | | | | | |

| CUWCC 2010 Flex Track BMPs | BMPs required for Wholesale Supplier | BMPs required for Retail Supplier | BMPs | BMP Implemented by Retailers and/or Wholesalers | | | Compliance Options / Alternative Conservation Approaches (1) | | | | BMP is Exempt (2) | | | Implementation Scheduled to Commence within 1st Year of Agreement | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Retailer *Yes/No* | Wholesaler *Yes/No* | Regional *Yes/No* | Alternative Conservation Approaches Yes/No | BMP Checklist | Flex Track | Gallons Per Capita Per Day GPCD | Not Cost Effective | Lack of Funding | Lack of Legal Authority | Start Date (MM/YR) | Completion Level (%) | BMP Completion Date (MM/YR) | Budget (Dollars) | Funding Source & Finance Plan to Implement BMPs | Meets CUWCC Coverage Yes/No | Funds Requested, if Available. (See AB 1420 Compliance Table 3) Yes/No |
| 3.30 | | ✓ | BMP 6 High-Efficiency Washing Machine Rebate Programs | Yes | | | | X | | | X | | | | | | | | | |
| 3.40 | | ✓ | BMP 14 Residential ULFT Replacement Programs | Yes | | | | X | | | | | | | | | | | | |
| **4. Commercial, Industrial, Institutional** | | | | | | | | | | | | | | | | | | | | |
| 4.00 | | ✓ | BMP 9 Conservation programs for Commercial, Industrial, and Institutional (CII) Accounts | Yes | | | | X | | | | | | | | | | | | |
| **5. Landscape** | | | | | | | | | | | | | | | | | | | | |
| 5.00 | | ✓ | BMP 5 Large Landscape Conservation Programs and Incentives | Yes | | | | X | | | | | | | | | | | | |

*C6: Wholesaler may also be a retailer (supplying water to end water users)
**C9, ** C10, and **C11: Agencies choosing an alternative conservation approach are responsible for achieving water savings equal or greater than that which they would have achieved using only BMP list.
(1) For details, please see http://www.cuwcc.org/mou/exhibit-1-bmp-definitions-schedules-requirements.aspx.
(2) BMP is exempt based on cost-effectiveness, lack of funding, or lack of legal authority, as detailed in the CUWCC MOU.

STATE OF CALIFORNIA – CALIFORNIA NATURAL R. OURCES AGENCY
EDMUND G. BROWN JR., Governor

**DEPARTMENT OF WATER RESOURCES**
1416 NINTH STREET, P.O. BOX 942836
SACRAMENTO, CA 94236-0001
(916) 653-5791

March 16, 2011

Ms. Cathy Z. Hollomon
Associate Water Resources Planner
Santa Clarita Water District
Post Office Box 903
Santa Clarita, California 91380-9003

Dear Ms. Hollomon:

The Department of Water Resources (DWR) has reviewed the Santa Clarita Water District's (SCWD) Self-Certification Statement – Tables 1 and 2 submitted on February 15, 2011, regarding implementation of the Urban Best Management Practices (BMPs).

The purpose of DWR's review is to determine eligibility of SCWD to receive water management grant or loan funds. DWR has followed the *Draft AB 1420 Compliance Requirements* dated June 1, 2009. For detailed information, please visit http://www.water.ca.gov/wateruseefficiency/finance/.

Based on DWR's review of the information in Tables 1 and 2, SCWD has and is currently implementing the BMPs consistent with AB 1420 and, therefore, is eligible to receive water management grant or loan funds.

DWR reserves the right to request additional information and documentation, including reports from SCWD to substantiate the accuracy of the information provided in Tables 1 and 2. DWR may reverse or modify its eligibility determination and notify you and the funding agency if inaccuracies are found in the supporting documentation or in Tables 1 and 2.

If you have any questions, please contact me at (916) 651-7025 or Jodi Evans at (916) 651-7026.

Sincerely,

Fethi BenJemaa
Ag Water Use Efficiency Section Chief

## AB 1420 Self- Certification Statement Table 1

**Note: Table 1 documents Status of Past and Current BMP implementation.**

**Self-Certification Statement: The Urban Water Supplier and its authorized representative certifies, under penalty of perjury, that all information and claims, stated in this table, regarding compliance and implementation of the BMPs, including alternative conservation approaches, are true and accurate. This signed AB 1420 Self-Certification StatementTable 1, and Table 2 are the basis for granting funds by the Funding Agency. Falsification and□or inaccuracies in AB 1420 Self Certification Statement Table 1,and Table 2 and in any supporting documents substantiating such claims may, at the discretion of the funding agency, result in loss of all State funds to the applicant. Additionally, theFunding Agency, in its sole discretion, may halt disbursement of grant or loan funds, not pay pending invoices, and□or pursue any other applicable legal remedy and refer the matter to the Attorney General's Office.**

**Name of Signatory** Cathy Z. Hollomon **Title of Signatory** Associate Water resources Planner **Signature of signatory** □□□□□□□□□□□□□□□□□□□□□□□□□□□□□ **Date** □□□□□□□□□□□□□□□□□

**Application Date:**

**Proposal Identification Number:** | **CUWCC Member? Yes No** No (see letter)

**Has Urban Water Supplier submitted a 2005 Urban Water Management Plan? Yes□No** Yes | **Is the UWM Plan Deemed Complete by DWR? Yes□No** Yes

**Applicant Name:** Santa Clarita Water Division

**Project Title:**

**Applicant's Contact Information:** **Name:** Cathy Z. Hollomon **Phone:** 661-964-3997 **E-mail:** chollomon□scwater.org

**Participants:**

| *Retailer (List Below)* | *Wholesaler (List Below)* |
|---|---|
| *Santa Clarita water Division* | |
| | |
| | |
| | |
| | |

C1 C2 C3 C4 C5 □C6 C7 □C8 □C9 □C10 C11 C12 C13 C14 C15 C16 C17 C18

| BMPs required for Wholesale Supplier | BMPs required for Retail Supplier | BMPs | BMP Implemented by Retailers and□or Wholesalers / *BMP* | | | Compliance Options□Alternative Conservation Approaches (1) | | | BMP Is Exempt (2) | | | BMP Implementation Requirements Met | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Retailer *Yes/No* | Wholesaler *Yes/No* | Regional *Yes/No* | BMP Checklist | Flex Track | Gallons Per Capita Per Day GPCD | Not Cost Effective | Lack of Funding | Lack of Legal Authority | CUWCC MOU Requirement Met: Retailer *Yes/No* | CUWCC MOU Requirement Met: Wholesaler *Yes/No* | Date of BMP Report Submitted to CUWCC for (2007-2008) (MOU Signatories) | Date BMP Implementation Data Submitted to DWR in CUWCC Format (Non MOU Signatories) (3) | All Supporting Documents have been Submitted Yes/No |
| | ✓ | BMP 1 Water Survey for Single/Multi-Family Residential Customers | ✓ | | | | ✓ | | | | | No | | 3/2/2008 | | Yes |
| | ✓ | BMP 2 Residential Plumbing Retrofit | ✓ | | | ✓ | | | | | | No | | 3/2/2008 | | Yes |
| ✓ | ✓ | BMP 3 System Water Audits, Leak Detection | ✓ | | | ✓ | | | | | | Yes | | 3/2/2008 | | Yes |
| ✓ | ✓ | BMP 3 Leak Repairs | ✓ | | | ✓ | | | | | | Yes | | 3/2/2008 | | Yes |
| | ✓ | BMP 4 Metering with Commodity Rates for All New connections | ✓ | | | ✓ | | | | | | Yes | | 3/2/2008 | | Yes |
| | ✓ | BMP 4 Retrofit of Existing Connections | ✓ | | | ✓ | | | | | | Yes | | 3/2/2008 | | Yes |

| C1 | C2 | C3 | C4 | C5 | C6 | C7 | C8 | C9 | C10 | C11 | C12 | C13 | C14 | C15 | C16 | C17 | C18 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | **BMP Implemented by Retailers and/or Wholesalers / *BMP*** | | | **Compliance Options/Alternative Conservation Approaches (1)** | | | **BMP Is Exempt (2)** | | | **BMP Implementation Requirements Met** | | | | |
| BMPs required for Wholesale Supplier | BMPs required for Retail Supplier | BMPs | Retailer *Yes/No* | Wholesaler *Yes/No* | Regional *Yes/No* | BMP Checklist | Flex Track | Gallons Per Capita Per Day GPCD | Not Cost Effective | Lack of Funding | Lack of Legal Authority | CUWCC MOU Requirement Met: Retailer *Yes/No* | CUWCC MOU Requirement Met: Wholesaler *Yes/No* | Date of BMP Report Submitted to CUWCC for (2007-2008) (MOU Signatories) | Date BMP Implementation Data Submitted to DWR in CUWCC Format (Non MOU Signatories) (3) | All Supporting Documents have been Submitted Yes/No |
| | ✓ | BMP 5 Large Landscape Conservation Programs and Incentives | ✓ | | ✓ | ✓ | | | | | | No | | 3/2/2008 | | Yes |
| | ✓ | BMP 6 High-Efficiency Washing Machine Rebate Programs | ✓ | | | ✓ | | | | | | No | | 3/2/2008 | | Yes |
| ✓ | ✓ | BMP 7 Public Information | ✓ | | ✓ | ✓ | | | | | | Yes | | 3/2/2008 | | Yes |
| ✓ | ✓ | BMP 8 School Education | ✓ | | ✓ | ✓ | | | | | | Yes | | 3/2/2008 | | Yes |
| | ✓ | BMP 9 Conservation programs for Commercial, Industrial, and Institutional (CII) Accounts | ✓ | | | ✓ | | | | | | No | | 3/2/2008 | | Yes |
| ✓ | | BMP 10 Wholesale Agency Assistance Programs | | | | | | | | | | NA | | | | Yes |
| | ✓ | BMP 11 Conservation Pricing | ✓ | | | ✓ | | | | | | Yes | | 3/2/2008 | | Yes |
| ✓ | ✓ | BMP 12 Conservation Coordinator | ✓ | | | ✓ | | | | | | Yes | | 3/2/2008 | | Yes |
| | ✓ | BMP 13 Water Waste Prohibitions | ✓ | | | ✓ | | | | | | Yes | | 3/2/2008 | | Yes |
| | ✓ | BMP 14 Residential ULFT Replacement Programs | ✓ | | ✓ | ✓ | | | | | | No | | 3/2/2008 | | Yes |

**C6:** Wholesaler may also be a retailer (supplying water to end water users)
**C8, C9, and C10:** Agencies choosing an alternative conservation approach are responsible for achieving water savings equal or greater than that which they would have achieved using only BMP list.

**(1)** For details, please see: http://www.cuwcc.org/mou/exhibit-1-bmp-definitions-schedules-requirements.aspx.
**(2)** BMP is exempt based on cost-effectiveness, lack of funding, and lack of legal authority criteria as detailed in the CUWCC MOU
**(3)** Non MOU signatories must submit to DWR reports and supporting documents in the same format as CUWCC.

## AB 1420 Self- Certification Statement Table 2

## Provide Schedule, Budget, and Finance Plan to Demonstrate Commitment to Implement All BMP's to Become in Compliance with BMP Implementation - Commencing Within 1st Year of Agreement for Which Applicant Receives Funds.

**Self-Certification Statement: The Urban Water Supplier and its authorized representative certifies, under penalty of perjury, that all information and claims, stated in this table, regarding compliance and implementation of the BMPs, including alternative conservation approaches, are true and accurate. This signed AB 1420 Self-Certification Statement Table 1 and Table 2 are the basis for granting funds by the Funding Agency. Falsification and□or inaccuracies in AB 1420 Self Certification Statement Table 1 and Table 2, and in any supporting documents substantiating such claims may, at the discretion of the funding agency, result in loss of all State funds to the applicant. Additionally, the Funding Agency, in its sole discretion, may halt disbursement of grant or loan funds, not pay pending invoices, and□or pursue any other applicable legal remedy and refer the matter to the Attorney General's Office.**

**Name of Signatory□Cathy Z. Hollomon□□□Title of Signatory □Associate Water Resources PLanner□ Signature of signatory□□□□□□□□□□□□□□□□□□□□□□□□ Date □□□□□□□□□□□□□□□□□□□□**

**Application Date:**

**Proposal Identification Number:**

**CUWCC Member?** Yes□No: No (see letter)

**Applicant Name:** Cathy Z. Hollomon

**Is the UWM Plan Deemed Complete by DWR?** Yes□No: Yes

**Project Title:**

**Applicant's Contact Information:** **Name** Santa Clarita Water Division

| | *Retailer (List Below)* | | |
|---|---|---|---|
| **Participants:** | | | |
| | | | |
| | | | |
| | | | |

| C1 | C2 | C3 | C4 | C5 | □C6 | C7 | C8 | □C9 | □C10 | □C11 | C12 | | | C13 | C14 | C15 | C16 | C17 | C18 | C19 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | **BMP Implemented by Retailers and□or Wholesalers** | | | | **Compliance Options □ Alternative Conservation Approaches (1)** | | | **BMP is Exempt (2)** | | | **Implementation Scheduled to Commence within 1st Year of Agreement** | | | | | | |
| CUWCC 2010 Flex Track BMPs | BMPs required for Wholesale Supplier | BMPs required for Retail Supplier | BMPs | Retailer *Yes/No* | Wholesaler *Yes/No* | Regional *Yes/No* | Alternative Conservation Approaches Yes/No | BMP Checklist | Flex Track | Gallons Per Capita Per Day GPCD | Not Cost Effective | Lack of Funding | Lack of Legal Authority | Start Date (MM/YR) | Completion Level (□) | BMP Completion Date (MM/YR) | Budget (Dollars) | Funding Source & Finance Plan to Implement BMPs | Meets CUWCC Coverage Yes/No | Funds Requested, if Available. (See AB 1420 Compliance Table 3) Yes/No |
| | **1. Utility Operations Programs** | | | | | | | | | | | | | | | | | | | |
| 1.11 | ✓ | ✓ | BMP 12 Conservation Coordinator | | | | | | | | | | | | | | | | | |
| 1.12 | | ✓ | BMP 13 Water Waste Prohibitions | | | | | | | | | | | | | | | | | |
| 1.13 | ✓ | ✓ | BMP 10 Wholesale Agency Assistance Programs | | | | | | | | | | | | | | | | | |
| 1.20 | ✓ | ✓ | BMP 3 System Water Audits, Leak Detection/**Repair** | | | | | | | | | | | | | | | | | |
| 1.30 | | ✓ | BMP 4 Metering with Commodity Rates for All New/**Retrofit of Existing** connections | | | | | | | | | | | | | | | | | |
| 1.40 | | ✓ | BMP 11 Conservation Pricing | | | | | | | | | | | | | | | | | |
| | **2. Educational Programs** | | | | | | | | | | | | | | | | | | | |
| 2.10 | ✓ | ✓ | BMP 7 Public Information | | | | | | | | | | | | | | | | | |
| 2.20 | ✓ | ✓ | BMP 8 School Education | | | | | | | | | | | | | | | | | |
| | **3. Residential** | | | | | | | | | | | | | | | | | | | |
| 3.11 | | ✓ | BMP 1 **Indoor** Water Survey for Single/Multi-Family Residential Customers | | | | | | ✓ | | | | | Jul-08 | 30 | Jun-15 | program to be combined with BMP 5 - large landscape Conservation, which focuses on HOA properties | water rates | Yes | |

| CUWCC 2010 Flex Track BMPs | BMPs required for Wholesale Supplier | BMPs required for Retail Supplier | BMPs | BMP Implemented by Retailers and/or Wholesalers | | | | Compliance Options / Alternative Conservation Approaches (1) | | | BMP is Exempt (2) | | | Implementation Scheduled to Commence within 1st Year of Agreement | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Retailer *Yes/No* | Wholesaler *Yes/No* | Regional *Yes/No* | Alternative Conservation Approaches Yes/No | BMP Checklist | Flex Track | Gallons Per Capita Per Day GPCD | Not Cost Effective | Lack of Funding | Lack of Legal Authority | Start Date (MM/YR) | Completion Level (%) | BMP Completion Date (MM/YR) | Budget (Dollars) | Funding Source & Finance Plan to Implement BMPs | Meets CUWCC Coverage Yes/No | Funds Requested, if Available. (See AB 1420 Compliance Table 3) Yes/No |
| 3.12 | | | BMP 1 **Outdoor** Water Survey for Single/Multi-Family Residential Customers | | | | | | ✓ | | | | | Jul-09 | 30 | Jun-15 | program to be combined with BMP 5 - large landscape Conservation, which focuses on HOA properties | water rates | Yes | |
| 3.20 | | ✓ | BMP 2 Residential Plumbing Retrofit | | | | | ✓ | | | | | | Jun-08 | 80 | Jun-13 | $4,000 | water rates | Yes | |
| 3.30 | | ✓ | BMP 6 High-Efficiency Washing Machine Rebate Programs | | | | | ✓ | | | | | | Jul-11 | 0 | Jun-20 | $37,500 | water rates | Yes | |
| 3.40 | | ✓ | BMP 14 Residential ULFT Replacement Programs | | | | | ✓ | | | | | | Jun-07 | 40 | Jun-15 | $20,000 | water rates | Yes | |
| | **4. Commercial, Industrial, Institutional** | | | | | | | | | | | | | | | | | | | |
| 4.00 | | ✓ | BMP 9 Conservation programs for Commercial, Industrial, and Institutional (CII) Accounts | | | | | ✓ | | | | | | Jun-09 | 20 | Jun-15 | $30,000 | water rates | Yes | |
| | **5. Landscape** | | | | | | | | | | | | | | | | | | | |
| 5.00 | | ✓ | BMP 5 Large Landscape Conservation Programs and Incentives | | | | | ✓ | | | | | | Jun-09 | 20 | Jun-15 | $100,000 | water rates | Yes | |

C6: Wholesaler may also be a retailer (supplying water to end water users)
C9, C10, and C11: Agencies choosing an alternative conservation approach are responsible for achieving water savings equal or greater than that which they would have achieved using only BMP list.
(1) For details, please see http://www.cuwcc.org/mou/exhibit-1-bmp-definitions-schedules-requirements.aspx.
(2) BMP is exempt based on cost-effectiveness, lack of funding, or lack of legal authority, as detailed in the CUWCC MOU.

CLWA DMM Materials

# CUWCC BMP COVERAGE REPORT FOR WHOLESALE AGENCIES

## Foundation Best Management Practices for Urban Water Efficiency

**Agency:** Castaic Lake Water Agency **District Name:** Castaic Lake Water Agency **CUWCC Unit #:** 6278

**Primary Contact** Stephanie Anagnoson **Email:** sanagnoson@clwa.org

Base Year: Calendar or FiscalYear Reporting **Report Date:** 27-May-11

**Foundational BMPs**

**BMP 1.1.3 Wholesale Agency Assistance Programs**

Date of 2009 Data Download

Date of 2010 Data Download

| a) Financial investments and building partnerships<br>Value of resources provided to retailers for:<br>2009 | 2009 Monetary Amount for Financial Incentives | 2009 Monetary Amount for Equivalent Resources |
|---|---|---|
| BMP 2.1 Public Outreach | $ 81,000 | $ 200,700 |
| BMP 2.2 Education | $ 100,000 | $ 266,373 |
| BMPs 3, 4, 5 (not designated by BMP) | $ 43,975 | $ 133,773 |
| Total Value of Resources | $ 224,975 | $ 600,846 |
| | On Track | On Track |

"On Track" if Retailer accepted offer and Wholesaler provided resources. "Not on Track" if Retailer accepted offer and Wholesaler did not provde resources.

| a) Financial investments and building partnerships<br>Value of resources provided to retailers for:<br>2010 | 2010 Monetary Amount for Financial Incentives | 2010 Monetary Amount for Equivalent Resources |
|---|---|---|
| BMP 2.1 Public Outreach | $ 89,000 | $ 264,200 |
| BMP 2.2 Education | $ 108,000 | $ 244,195 |
| BMPs 3, 4, 5 (not designated by BMP) | $ 127,645 | $ 671,593 |
| Total Value of Resources | $ 324,645 | $ 1,179,988 |
| | On Track | On Track |

Agency: **Castaic Lake Water Agency** District Name: **Castaic Lake Water Agency** CUWCC Unit #: **6278**

| | 2009 Technical Support Description | 2010 Technical Support Description | |
|---|---|---|---|
| b) Technical Support | Provide conservation coordinator servies; fund and prepare Urban Water Management Plan and other planning documents; conduct Valley-wide public outreach for conservation. | Provide conservation coordinator services; fund and prepare Urban Water Management Plan and other planning documents; conduct Valley-wide public outreach for conservation; manage residential high-efficiency toilet rebate program, residential landscape program (with weather-based irrigation incentive), commercial, industrial and institutional program and large landscape audit program. | " On Track" if Retailer accepted and Wholesaler provided and described Technical Support |
| | On Track | On Track | |

| | 2009 | | 2010 | |
|---|---|---|---|---|
| | c) Retail Angency | Programs Managed for Retailers | c) Retail Angency | Programs Managed for Retailers |
| | | | | " On Track" if Retailer accepted and Wholesaler provided and lists programs managed for retailers |

| | 2009 | | 2010 | |
|---|---|---|---|---|
| d) Water Shortage Allocation | | | | |
| Has Water shortage plan or policy been adopted? | November 9, 2005 | Adoption Date | November 9, 2005 | "OnTrack" if plan /policy adopted and document provided. "Not on Track" if no water shortage plan or policy adopted or document not provided. |
| | 2005UWMPCh8WaterShortage | File Name | 2005UWMPCh8WaterShortage | |
| | On Track | | On Track | |
| e) Non signatory Reporting of BMP implementation by non-signatory agencies | n/a | | n/a | Report if possible |

| | List Efforts to recruit retailers | List Efforts to recruit retailers | |
|---|---|---|---|
| f) Encourage CUWCC Membership List Efforts to recruit retailers | Santa Clarita Water Division has been encouraged to join during conservation coordinator meetings. | Santa Clarita Water Division has been encouraged to join during conservation coordinator meetings. | "On Track" if efforts listed or dues paid. |
| | On Track | On Track | |

Agency: **Castaic Lake Water Agency** District Name: **Castaic Lake Water Agency** CUWCC Unit #: **6278**

## BMP 1.2 Water Loss Control

Date of 2009 Data Submittal: N/A
Date of 2010 Data Submittal: June 1, 2011

| | 2009 | |
|---|---|---|
| Complete a prescreening Audit | Yes | On Track if Yes |
| Metered Sales AF | 37,820 | Metered sales to retail agencies |
| Verifiable Other Uses AF | 37,820 | |
| Total Supply AF | 39,051 | Into wholesale system |
| (Metered Sales + System uses)/ Total Supply >0.89 | 1.94 | On Track if >0.89, Not on Track if No |
| If ratio is less than 0.9, complete a full scale Audit in 2009? | Yes | On Track if Yes |
| Verify Data with Records on File? | Yes | On Track if Yes |
| Operate a system Leak Detection Program? | Yes | On Track if Yes |
| Comments | On Track | |

For wholesalers AWWA methodology applies to supplies to wholesalers, sales to retail agencies or sub wholesalers, and pipelines operated by wholesalers. End use retail customers are not considered in this

| | 2010 | |
|---|---|---|
| Compile Standard Water Audit using AWWA Software? | Yes | On Track if Yes, Not on Track if No |
| AWWA file provided to CUWCC? | Yes | On Track if Yes, Not on Track if No |
| AWWA Water Audit Validity Score? | 77 | Info only until 2012 |
| Completed Training in AWWA Audit Method? | no | Info only until 2012 |
| Completed Training in Component Analysis Process? | No | Info only until 2012 |
| Complete Component Analysis? | no | Info only until 2012 |
| Repaired all leaks and breaks to the extent cost effective? | Yes | On Track if Yes, Not on Track if No |
| Locate and repair unreported leaks to the extent cost effective. | Yes | On Track if Yes, Not on Track if No |
| Maintain a record-keeping system for the repair of reported leaks, including time of report, leak location, type of leaking pipe segment or fitting, and leak running time from report to repair. | | Info only until 2012 |
| Provided 7 types of Water Loss Control Info | | info only until 2012 |

| Leaks Repaire | Value Real Losses | Value Apparent Losses | Miles Surveyed | Press Reduction | Cost Interventions | Water Lost from Leaks AF |
|---|---|---|---|---|---|---|
| 0 | $ 560,689 | $ 152,318 | 0 | No | $ - | no data |

On Track

Agency: **Castaic Lake Water Agency** District Name: **Castaic Lake Water Agency** CUWCC Unit #: **6278**

## 1.3 METERING WITH COMMODITY RATES FOR ALL NEW CONNECTIONS AND RETROFIT OF EXISTING CONNECTIONS

Date of 2009 Data Submittal: June 1, 2011
Date of 2010 Data Submittal: June 1, 2011

| | 2009 | 2010 | |
|---|---|---|---|
| Exemption requested? | No | No | |
| At least as Effective As Requested? | No | No | |
| Does Agency have Unmetered Deliveries to Retail Agencies or Other Wholesalers? | No | No | |
| Metered Accounts billed by volume of use | Yes | Yes | Volumetric billing required for all connections on same schedule as metering |
| Completed a written plan, policy or program to test, repair and replace meters | No | No | info only until 2012 |
| | On Track | On Track | |

**Agency:** Castaic Lake Water Agency
WHOLESALE Water Supplier

**District Name:** Castaic Lake Water Agency

**CUWCC Unit #:** 6278

Coverage Report Date: May 19, 2011

**Primary Contact** Stephanie Anagnoson

**Email:** sanagnoson@clwa.org

## BMP 2. EDUCATION PROGRAMS

date 2009 datafile downloaded: June 1, 2011

date 2010 datafile downloaded:

### BMP 2.1 Public Outreach Actions Implemented and Reported to CUWCC

| | 2009 | 2010 |
|---|---|---|
| 1) Contacts with the public (minimum 4 times per year) | 134 | 129 |
| 2) Water supplier contacts with media (minimum 4 times per year, i.e., at least quarterly). | 219 | 50 |
| 3) An actively maintained website that is updated regularly (minimum 4 times per year, i.e., at least quarterly). | Yes | Yes |
| 4) Description of materials used to meet minimum requirement. | Website<br>General water conservation information<br>Email Messages<br>Newsletter articles on conservation<br>Articles or stories resulting from outreach<br>Editorial board visits<br>News releases<br>Radio contacts | Newsletter articles on conservation<br>Website<br>General water conservation information<br>Email Messages<br>Landscape water conservation media campaig<br>Articles or stories resulting from outreach<br>Editorial board visits<br>Radio and TV contacts |
| 5) Annual budget for public outreach program. | $ 378,747 | $ 1,063,235 |
| 6) Description of all other outreach programs | n/a | watering index (updated weekly)<br>3 Easy Tips (water conservation social marketing campaign) (updated throughout the summer)<br>Water Conservation Tips (updated weekly)<br>Cll Water Conservation (updated throughout year) |
| | On Track for 5 Actions | On Track for 5 Actions |

All 6 action types implemented and reported to CUWCC to be 'On Track')

Agency: **Castaic Lake Water Agency** District Name: **Castaic Lake Water Agency** CUWCC Unit □: **6278**

WHOLESALE Water Supplier Coverage Report Date: May 19, 2011

## 2.2 School Education Programs Implemented and Reported to CUWCC

date 2009 datafile downloaded: June 1, 2011

date 2010 datafile downloaded: June 1, 2011

| | 2009 | 2010 | |
|---|---|---|---|
| Does this wholesale agency implement School Education Programs for Sub Wholesalers or Retail unility's benefit? | Yes | Yes | |
| Names of Sub Wholesale and Retail Agencies benefiting from Program? | Newhall County Water District, Santa Clarita Water Division, Valencia Water Company | Newhall County Water District, Santa Clarita Water Division, Valencia Water Company | |
| 1) Curriculum materials developed and/or provided by wholesale agency | Curricula that covers science, social studies, and math standards mandated by State of California | Curricula that covers science, social studies, and math standards mandated by State of California | All 5 actions types implemented and reported to CUWCC to be 'On Track' |
| 2) Materials meet state education framework requirements and are grade-level appropriate? | Yes | Yes | |
| 3) Materials Distributed to K-6? | Yes | Yes | |
| Describe K-6 Materials | Materials cover science, social studies, and math standards mandated by State of California as they relate to water, water quality, water conservation and water supply issues. | Materials cover science, social studies, and math standards mandated by State of California as they relate to water, water quality, water conservation and water supply issues. | Describe materials to meet minimum requirements |
| Materials distributed to 7-12 students? | Yes | Yes | Info Only |
| 4) Annual budget for school education program. | $ 337,164 | $ 352,195 | |
| 5) Description of all other water supplier education programs | n/a | n/a | |
| | On Track | On Track | |

# AWWA WLCC Free Water Audit Software: Reporting Worksheet

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WAS v4.2

Back to Instructions

? Click to access definition

Water Audit Report for: Castaic Lake Water Agency

Reporting Year: 40796 7/2009 - 6/2010

Please enter data in the white cells below. Where available, metered values should be used; if metered values are unavailable please estimate a value. Indicate your confidence in the accuracy of the input data by grading each component (1-10) using the drop-down list to the left of the input cell. Hover the mouse over the cell to obtain a description of the grades

**All volumes to be entered as: ACRE-FEET PER YEAR**

**WATER SUPPLIED** << Enter grading in column 'E'

| | | | | | |
|---|---|---|---|---|---|
| Volume from own sources: | ? | 8 | 36,675.000 | acre-ft/yr | |
| Master meter error adjustment (enter positive value): | ? | 8 | 3.600 | over-registered | acre-ft/yr |
| Water imported: | ? | 8 | 34,885.000 | acre-ft/yr | |
| Water exported: | ? | 10 | 34,610.000 | acre-ft/yr | |
| **WATER SUPPLIED:** | | | 36,946.400 | acre-ft/yr | |

**AUTHORIZED CONSUMPTION**

Click here: ? for help using option buttons below

| | | | | | Pcnt: | Value: |
|---|---|---|---|---|---|---|
| Billed metered: | ? | 10 | 35,353.000 | acre-ft/yr | | |
| Billed unmetered: | ? | 10 | 0.000 | acre-ft/yr | | |
| Unbilled metered: | ? | 10 | 0.000 | acre-ft/yr | | |
| Unbilled unmetered: | ? | | 461.830 | acre-ft/yr | 1.25% | |

Default option selected for Unbilled unmetered - a grading of 5 is applied but not displayed

Use buttons to select percentage of water supplied **OR** value

| | | | | |
|---|---|---|---|---|
| **AUTHORIZED CONSUMPTION:** | ? | | 35,814.830 | acre-ft/yr |

**WATER LOSSES (Water Supplied - Authorized Consumption)** 1,131.570 acre-ft/yr

**Apparent Losses**

| | | | | | Pcnt: | Value: |
|---|---|---|---|---|---|---|
| Unauthorized consumption: | ? | | 92.366 | acre-ft/yr | 0.25% | |

Default option selected for unauthorized consumption - a grading of 5 is applied but not displayed

| | | | | | | |
|---|---|---|---|---|---|---|
| Customer metering inaccuracies: | ? | 5 | 357.101 | acre-ft/yr | 1.00% | |
| Systematic data handling errors: | ? | 5 | | acre-ft/yr | | |

Systematic data handling errors are likely, please enter a non-zero value; otherwise grade = 5

Choose this option to enter a percentage of billed metered consumption. This is NOT a default value

| | | | |
|---|---|---|---|
| Apparent Losses: | ? | 449.467 | |

**Real Losses (Current Annual Real Losses or CARL)**

| | | | |
|---|---|---|---|
| Real Losses = Water Losses - Apparent Losses: | ? | 682.103 | acre-ft/yr |
| **WATER LOSSES:** | | 1,131.570 | acre-ft/yr |

**NON-REVENUE WATER**

| | | | |
|---|---|---|---|
| **NON-REVENUE WATER:** | ? | 1,593.400 | acre-ft/yr |

= Total Water Loss + Unbilled Metered + Unbilled Unmetered

**SYSTEM DATA**

| | | | | | |
|---|---|---|---|---|---|
| Length of mains: | ? | 10 | 43.0 | miles | |
| Number of active AND inactive service connections: | ? | 10 | 25 | | |
| Connection density: | | | 1 | conn./mile main | |
| Average length of customer service line: | ? | 10 | | ft | (pipe length between curbstop and customer meter or property boundary) |
| Average operating pressure: | ? | 10 | 110.0 | psi | |

**COST DATA**

| | | | | |
|---|---|---|---|---|
| Total annual cost of operating water system: | ? | 10 | $107,299,883 | $/Year |
| Customer retail unit cost (applied to Apparent Losses): | ? | 5 | $1.04 | $/1000 gallons (US) |
| Variable production cost (applied to Real Losses): | ? | 5 | $822.00 | $/acre-ft |

Retail costs are less than (or equal to) production costs; please review and correct if necessary

**PERFORMANCE INDICATORS**

**Financial Indicators**

| | |
|---|---|
| Non-revenue water as percent by volume of Water Supplied: | 4.3% |
| Non-revenue water as percent by cost of operating system: | 1.0% |
| Annual cost of Apparent Losses: | $152,318 |
| Annual cost of Real Losses: | $560,689 |

**Operational Efficiency Indicators**

| | | |
|---|---|---|
| Apparent Losses per service connection per day: | 16050.33 | gallons/connection/day |
| Real Losses per service connection per day*: | N/A | gallons/connection/day |
| Real Losses per length of main per day*: | 14,161.45 | gallons/mile/day |
| Real Losses per service connection per day per psi pressure: | | gallons/connection/day/psi |
| ? Unavoidable Annual Real Losses (UARL): | Not Valid | |

*** UARL cannot be calculated as either average pressure, number of connecions or length of mains is too small: SEE UARL DEFINITION ***

| | |
|---|---|
| From Above, Real Losses = Current Annual Real Losses (CARL): | 682.10 |
| ? Infrastructure Leakage Index (ILI) [CARL/UARL]: | |

* only the most applicable of these two indicators will be calculated

**WATER AUDIT DATA VALIDITY SCORE:**

***** YOUR SCORE IS: 77 out of 100 *****

A weighted scale for the components of consumption and water loss is included in the calculation of the Water Audit Data Validity Score

**PRIORITY AREAS FOR ATTENTION:**

Based on the information provided, audit accuracy can be improved by addressing the following components:

1: Volume from own sources

2: Customer metering inaccuracies

3: Customer retail unit cost (applied to Apparent Losses)

For more information, click here to see the Grading Matrix worksheet

The fields in red are required.

Agency name: Castaic Lake Water Agency

Reporting unit name (District name): Castaic Lake Water Agency

Reporting unit number: 6278

Primary contact:

First name: Stephanie

Last name: Anagnoson

Email: sanagnoson@clwa.org

You must enter the reporting unit number that we have on record for your agency. Click here to open a table to obtain this number.

Link to FAQs

# 2009

## BMP 1.1 Operations Practices

Comments:

See the complete MOU: View MOU

See the coverage requirements for this BMP:

### Conservation Coordinator

Conservation Coordinator ◯ Yes ◯ No

### Contact Information

First Name: Thomas

Last Name: Hawes

Title: water conservation program coordinat

Phone: 661.513.1231

Email: thawes@clwa.org

Note that the contact information may be the same as the primary contact information at the top of the page. If this is your case, excuse the inconvenience but please enter the information again.

### Water Waste Prevention

Water Agency shall do one or more of the following:

a. Enact and enforce an ordinance or establish terms of service that prohibit water waste
b. Enact and enforce an ordinance or establish terms of service for water efficient design in new development
c. Support legislation or regulations that prohibit water waste
d. Enact an ordinance or establish terms of service to facilitate implementation of water shortage response measures
e. Support local ordinances that prohibit water waste
f. Support local ordinances that establish permits requirements for water efficient design in new

To document this BMP, provide the following:

a. A description of, or electronic link to, any ordinances or terms of service
b. A description of, or electronic link to, any ordinances or requirements adopted by local jurisdictions or regulatory agencies with the water agency's service area.
c. A description of any water agency efforts to cooperate with other entities in the adoption or enforcement of local requirement
d. description of agency support positions with respect to adoption of legislation or regulations

**You can show your documentation by providing files, links (web addresses), and/or entering a description.**

**File name(s): Email files to natalie@cuwcc.org**

**Web address(s) URL: comma-separated list**: http://dpw.lacounty.gov/wwd/web/docs/Water%20Wasting%20Ordinance%20final.pdf

**Enter a description:**

We can provide documentation on the following aspects of water waste prevention:
c. Supported local ordinance that prohibits water waste in unincorporated LA County (http://dpw.lacounty.gov/wwd/web/docs/Water%20Wasting%20Ordinance%20final.pdf)
d. Supported City of Santa Clarita's Municipal Code 9.38.015 Water Conservation Action Plan.

The fields in red are required.

Agency name: Castaic Lake Water Agency

Reporting unit name (District name): Castaic Lake Water Agency

Reporting unit number: 6278

Primary contact:

First name: Stephanie

Last name: Anagnoson

Email: sanagnoson@clwa.org

You must enter the reporting unit number that we have on record for your agency. Click here to open a table to obtain this number.

Link to FAQs

# 2010

## BMP 1.1 Operations Practices

**Comments:**

See the complete MOU: View MOU

See the coverage requirements for this BMP:

### Conservation Coordinator

Conservation Coordinator ◯ Yes ◯ No

### Contact Information

| | |
|---|---|
| First Name | Thomas |
| Last Name | Hawes |
| Title | water conservation program coordinat |
| Phone | 661.513.1231 |
| Email | thawes@clwa.org |

Note that the contact information may be the same as the primary contact information at the top of the page. If this is your case, excuse the inconvenience but please enter the information again.

### Water Waste Prevention

Water Agency shall do one or more of the following:

a. Enact and enforce an ordinance or establish terms of service that prohibit water waste
b. Enact and enforce an ordinance or establish terms of service for water efficient design in new development
c. Support legislation or regulations that prohibit water waste
d. Enact an ordinance or establish terms of service to facilitate implementation of water shortage response measures
e. Support local ordinances that prohibit water waste
f. Support local ordinances that establish permits requirements for water efficient design in new

To document this BMP, provide the following:

a. A description of, or electronic link to, any ordinances or terms of service
b. A description of, or electronic link to, any ordinances or requirements adopted by local jurisdictions or regulatory agencies with the water agency's service area.
c. A description of any water agency efforts to cooperate with other entities in the adoption or enforcement of local requirement
d. description of agency support positions with respect to adoption of legislation or regulations

**You can show your documentation by providing files, links (web addresses), and/or entering a description.**

**File name(s): Email files to natalie@cuwcc.org**

**Web address(s) URL: comma-separated list**

http://dpw.lacounty.gov/wwd/web/docs/Water%20Wasting%20Ordinance%20final.pdf

**Enter a description:**

We can provide documentation on the following aspects of water waste prevention:
c. Supported local ordinance that prohibits water waste in unincorporated LA County (http://dpw.lacounty.gov/wwd/web/docs/Water%20Wasting%20Ordinance%20final.pdf)
d. Supported City of Santa Clarita's Municipal Code 9.38.015 Water Conservation Action Plan.

The fields in red are required.

Agency name: Castaic Lake Water Agency

Reporting unit name (District name): Castaic Lake Water Agency

Reporting unit number: 6278

Primary contact:

First name: Stephanie

Last name: Anagnoson

Email: sanagnoson@clwa.org

You must enter the reporting unit number that we have on record for your agency. Click here to open a table to obtain this number.

Link to FAQs

View MOU

# 2009 BMP 1.2 Water Loss Control

**Did your agency complete a pre-screening system audit in 2009?** Yes ○ No ●

**If yes, answer the following:**

**Determine metered sales in AF:** 37,820.00

Definition: other accountable uses not included in metered sales, such as unbilled water use, fire suppression, etc.

**Determine system verifiable uses AF:** [illegible].00

**Determine total supply into the system in AF:** 39,051.00

**Does your agency keep necessary data on file to verify the answers above?** Yes No

**Did your agency complete a full-scale system water audit during 2009?** Yes No ●

**Does your agency maintain in-house records of audit results or the completed AWWA worksheet for the completed audit which could be forwarded to CUWCC?** Yes No ○

**Did your agency operate a system leak detection program?** Yes No

## Comments:

version 1.0 2009

The fields in red are required.

Agency name: Castaic Lake Water Agency

Reporting unit name (District name): Castaic Lake Water Agency

Reporting unit number: 6278

Primary contact:

First name: Stephanie

Last name: Anagnoson

Email: sanagnoson@clwa.org

You must enter the reporting unit number that we have on record for your agency. Click here to open a table to obtain this number.

Link to FAQs

# 2010 BMP 1.2 Water Loss Control

View MOU

## AWWA Water Audit

Agency to complete a Water Audit & Balance Using The AWWA Software ◉ Yes ○ No

Email to natalie@cuwcc.org - Worksheets (AWWA Water Audit). Enter the name of the file below:

CLWA Water Audit 2010

Water Audit Validity Score from AWWA spreadsheet: 77

Agency Completed Training In The AWWA Water Audit Method ○ Yes ◉ No

Agency Completed Training In The Component Analysis Process ○ Yes ◉ No

Completed/Updated the Component Analysis (at least every 4 years)? ○ Yes ◉ No

Component Analysis Completed/Updated Date:

## Water Loss Performance

Agency Repaired All Reported Leaks & Breaks To The Extent Cost Effective ◉ Yes ○ No

### Recording Keeping Requirements:

| | |
|---|---|
| Date/Time Leak Reported | Leak Location |
| Type of Leaking Pipe Segment or Fitting | Leak Running Time From Report to Repair |
| Leak Volume Estimate | Cost of Repair |

Agency Located and Repaired Unreported Leaks to the Extent Cost Effective ◉ Yes ○ No

Type of Program Activities Used to Detect Unreported Leaks

monthly reconciling of water purchased to water sold

## Annual Summary Information

**Complete the following table with annual summary information (required for reporting years 2-5 only)**

| Total Leaks Repaired | Economic Value Of Real Loss | Economic Value Of Apparent Loss | Miles Of System Surveyed For Leaks | Pressure Reduction Undertaken for loss reduction | Cost Of Interventions | Water Saved (AF/Year) |
|---|---|---|---|---|---|---|
| 0 | $560,689.00 | $152,318.00 | | | | |

Comments: Please note that the AWWA M36 spreadsheet presents a number of unanswerable questions for wholesalers, including line 65 (average length of customer line --- we have only retailers as customers). We also have trouble with line 78 (our retail costs are less than production costs) and line 101 (UARL).

version 1.0

2009

The fields in red are required.

Agency name: Castaic Lake Water Agency

Reporting unit name (District name): Castaic Lake Water Agency

Reporting unit number: 6278

Primary contact:

First name: Stephanie

Last name: Anagnoson

Email: sanagnoson@clwa.org

You must enter the reporting unit number that we have on record for your agency. Click here to open a table to obtain this number.

# BMP 1.3 Metering with Commodity

Link to FAQs

See the complete MOU: View MOU

See the coverage requirements for this BMP:

## Implementation

Does your agency have any unmetered service connections? ○ Yes ○ No

If YES, has your agency completed a meter retrofit plan? ○ Yes ○ No

Enter the number of previously unmetered accounts fitted with meters during reporting year:

Are all new service connections being metered? ○ Yes ○ No

Are all new service connections being billed volumetrically? ○ Yes ○ No

Has your agency completed and submitted electronically to the Council a written plan, policy or program to test, repair and replace meters? ○ Yes ○ No

**Please Fill Out The Following Matrix**

| Account Type | # Metered Accounts | # Metered Accounts Read | # Metered Accounts Billed by Volume | Billing Frequency Per Year | # of estimated bills/yr |
|---|---|---|---|---|---|
| Other | 26 | 26 | 26 | Monthly | 12 |
| Other | | | | Monthly | |
| Other | | | | Other | |
| Other | | | | Other | |
| Other | | | | Other | |
| Other | | | | Other | |
| Other | | | | Other | |
| Other | | | | Other | |
| Other | | | | Other | |
| Other | | | | Other | |

Number of CII Accounts with Mixed-use Meters: 0

Number of CII Accounts with Mixed-use Meters Retrofitted with Dedicated Irrigation Meters during Reporting Period:

## Feasibility Study

Has your agency conducted a feasibility study to assess the merits of a program to provide incentives to switch mixed-use accounts to dedicated landscape meters? ○ Yes ○ No

**If YES, please fill in the following information:**

A. When was the Feasiblity Study conducted

B. Email or provide a link to the feasibility study (or description of):

**File name(s): Email files to natalie@cuwcc.org** Enter the file name here e.g. WaterWastePreventionOrdinance

**Web address(s) URL: comma-separated list** Enter the URL to your documentation.

**General Comments about BMP 1.3:**

The fields in red are required.

Agency name: Castaic Lake Water Agency

Reporting unit name (District name): Castaic Lake Water Agency

Reporting unit number: 6278

Primary contact:

First name: Stephanie

Last name: Anagnoson

Email: sanagnoson@clwa.org

You must enter the reporting unit number that we have on record for your agency. Click here to open a table to obtain this number.

# BMP 1.3 Metering with Commodity 2010

Link to FAQs

See the complete MOU: View MOU

See the coverage requirements for this BMP:

## Implementation

Does your agency have any unmetered service connections? ○ Yes ○ No

If YES, has your agency completed a meter retrofit plan? ○ Yes ○ No

Enter the number of previously unmetered accounts fitted with meters during reporting year:

Are all new service connections being metered? ○ Yes ○ No

Are all new service connections being billed volumetrically? ○ Yes ○ No

Has your agency completed and submitted electronically to the Council a written plan, policy or program to test, repair and replace meters? ○ Yes ○ No

**Please Fill Out The Following Matrix**

| Account Type | # Metered Accounts | # Metered Accounts Read | # Metered Accounts Billed by Volume | Billing Frequency Per Year | # of estimated bills/yr |
|---|---|---|---|---|---|
| Other | 26 | 26 | 26 | Monthly | 12 |
| Other | | | | Monthly | |
| Other | | | | Other | |
| Other | | | | Other | |
| Other | | | | Other | |
| Other | | | | Other | |
| Other | | | | Other | |
| Other | | | | Other | |
| Other | | | | Other | |
| Other | | | | Other | |

Number of CII Accounts with Mixed-use Meters: 0

Number of CII Accounts with Mixed-use Meters Retrofitted with Dedicated Irrigation Meters during Reporting Period:

## Feasibility Study

Has your agency conducted a feasibility study to assess the merits of a program to provide incentives to switch mixed-use accounts to dedicated landscape meters? ○ Yes ○ No

**If YES, please fill in the following information:**

A. When was the Feasiblity Study conducted

B. Describe, upload or provide an electronic link to the Feasibility Study Upload File

**File name(s): Email files to natalie@cuwcc.org** Enter the file name here e.g. WaterWastePreventionOrdinance

**Web address(s) URL: comma-separated list** Enter the URL to your documentation.

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Reporting unit number: 6278

Primary contact:

First name: Stephanie

Last name: Anagnoson

Email: sanagnoson@clwa.org

Click here to open a table that displays your agency name reporting unit name and reporting unit number. Please ensure that you enter the correct information.

Link to FAQs

# 2009

## BMP 2.1 Public Outreach

View MOU

**Is your agency performing Public Outreach for your Retailers?**

Are there one or more retail agencies that count on your agency to help them comply with this BMP? ○ Yes ○ No

**Enter the name(s) of the retail agency (comma delimited)**: Newhall County Water District, Santa Clarita Water Division, Valencia Water Company, LA County Waterworks #36

**Is your agency performing public outreach?**

Report a minimum of 4 water conservation related contacts your agency had with the public during the year.

**Public Information Programs List**

Did at least one contact take place during each quarter of the reporting year? ✓

| Number of Public Contacts | Public Information Programs |
|---|---|
| 4 | Newsletter articles on conservation |
| 52 | Website |
| 37 | General water conservation information |
| 4 | Email Messages |
| 37 | Landscape water conservation media campaigns |

**Contact with the Media**

Are there one or more retail agencies that count on your agency to help them comply with this BMP? ○ Yes ○ No

**Enter the name(s) of the retail agency (comma delimited)**: Newhall County Water District, Santa Clarita Water Division, Valencia Water Company, LA County Waterworks #36

**OR Wholesale Agency (Contacts with the Media)**

**Media Contacts List**

**Did at least one contact take place during each quarter of the reporting year?** ✓

| Number of Media Contacts | Did at least one contact take place during each quarter of the reporting year? | Media Contact Types |
|---|---|---|
| 45 | | Articles or stories resulting from outreach |
| 0 | | Editorial board visits |
| 5 | | News releases |
| 163 | | Radio contacts |
| 1,040 | | Television contacts |
| 5 | | Written editorials |

**Is a Wholesale Agency Performing Website Updates?**

Did one or more retail agencies rely on your agency's responsibility for meeting the requirements of and for CUWCC reporting of this BMP? ○Yes ○No

**Enter the name(s) of the retail agency (comma delimited)**

Santa Clarita Water Division

**Is Your Agency Performing Website Updates?**

Enter your agency's URL (website address): http://www.clwa.org

Describe a minimum of four water conservation related updates to your agency's website that took place during the year:

watering index (updated weekly)
Plants of the Conservatory Garden
Water Conservation Tips
Fire-Retardant, Water-wise Plants
Water Conservation Tips (updated weekly)

Did at least one Website Update take place during each quarter of the reporting year? ○Yes ○No

**Public Outreach Annual Budget**

Enter budget for public outreach programs. You may enter total budget in a single line or brake the budget into discrete categories by entering many rows. Please indicate if personnel costs are included in the entry.

| Category | Amount | | Personnel Costs Included? If yes, check the box. | Comments | |
|---|---|---|---|---|---|
| PR Consulting | $150,512 | | ✓ | Social marketing campaign | |
| Public Outreach | $33,512 | | ✓ | Public events | |
| Publications | $51,512 | | ✓ | Quarterly newsletter, yearly water quality repor | |
| BMP Implementat | $143,211 | | ✓ | Conservation Programs, including outreach | |
| | | | | | |
| | | | | | |

**Comments:**

The fields in red are required.

Agency name: Castaic Lake Water Agency

Reporting unit name (District name): Castaic Lake Water Agency

Reporting unit number: 6278

Primary contact:

First name: Stephanie

Last name: Anagnoson

Email: sanagnoson@clwa.org

Click here to open a table that displays your agency name reporting unit name and reporting unit number. Please ensure that you enter the correct information.

Link to FAQs

# 2010

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View MOU

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| 1,040 | | Television contacts |
| 5 | | Written editorials |

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Did one or more retail agencies rely on your agency's responsibility for meeting the requirements of and for CUWCC reporting of this BMP? ○Yes ○No

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Enter budget for public outreach programs. You may enter total budget in a single line or brake the budget into discrete categories by entering many rows. Please indicate if personnel costs are included in the entry.

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| | | | | | |
| | | | | | |

**Comments:**

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Reporting unit number: 6278

Primary contact:

First name: Stephanie

Last name: Anagnoson

Email: sanagnoson@clwa.org

Click here to open a table that displays your agency name reporting unit name and reporting unit number. Please ensure that you enter the correct information.

Link to FAQs

# 2009

## BMP 2.2 School Education Programs

View MOU

### School Programs

Is your agency implementing school programs which can be counted to help another agency comply with this BMP? ○ Yes ○ No

Enter retailer names, separated by commas: Newhall County Water District, Santa Clarita Water Division, Valencia Water Company

☑ Materials meet state education framework requirements?

Description of Materials: Curricula that covers science, social studies, and math standards mandated by State of California

☑ Materials distributed to K-6 Students?

Description of materials distributed to K-6 Students: Materials cover science, social studies, and math standards mandated by State of California as they relate to water, water quality, water conservation and water supply issues.

Number of students reached: 11,135

☑ Materials distributed to 7-12 Students?

Description of materials distributed to 7-12 Students: Soil Permeability,Water Born Diseases, and Water Quality materials for 7-8 grades that correlate to the State of California Standards.

Number of Distribution: 812

Annual budget for school education program: $337,164.00

Description of all other water supplier education programs:

### School Program Activities

**Classroom presentations:**

Number of presentations: 445

Number of attendees: 11135

**Large group assemblies:**

Number of presentations: 0

Number of attendees: 0

**Children's water festivals or other events:**

Number of presentations: 1

Number of attendees: 5000

**Cooperative efforts with existing science/water education programs (various workshops, science fair awards or judging) and follow-up:**

Number of presentations: 0

Number of attendees: 0

**Other methods of disseminating information (i.e. themed age-appropriate classroom loaner kits):**

Description

Number distributed

**Staffing children's booths at events & festivals:**

Number of booths: 4 | Number of attendees: 6700

**Water conservation contests such as poster and photo:**

Description

Number distributed

**Offer monetary awards/funding or scholarships to students:**

Number Offered: 5 | Total Funding: 16500

**Teacher training workshops:**

Number of presentations: 0 | Number of attendees: 0

**Fund and/or staff student field trips to treatment facilities, recycling facilities, water conservation gardens, etc.:**

Number of tours or field trips: 159 | Number of participants: 5565

**College internships in water conservation offered:**

Number of internships: 0 | Total funding: 0

**Career fairs/workshops:**

Number of presentations: 1 | Number of attendees: 5,000

**Additional program(s) supported by agency but not mentioned above:**

Description

Number of events (if applicable): 37 | Number of participants: 10000

**Total reporting period budget expenditures for school education programs (include all agency costs):** $337164

Comments

The fields in red are required.

Agency name: Castaic Lake Water Agency

Reporting unit name (District name): Castaic Lake Water Agency

Reporting unit number: 6278

Primary contact:

First name: Stephanie

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2010

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Number of attendees: 5000

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Number distributed

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Description

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**Total reporting period budget expenditures for school education programs (include all agency costs):** $337164

Comments

# AWWA WLCC Free Water Audit Software: Reporting Worksheet

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Back to Instructions

? Click to access definition

Water Audit Report for: Santa Clarita Water Division
Reporting Year: 2009 1/2009 - 12/2009

Please enter data in the white cells below. Where available, metered values should be used; if metered values are unavailable please estimate a value. Indicate your confidence in the accuracy of the input data by grading each component (1-10) using the drop-down list to the left of the input cell. Hover the mouse over the cell to obtain a description of the grades

**All volumes to be entered as: ACRE-FEET PER YEAR**

| WATER SUPPLIED | | << Enter grading in column 'E' | | | |
|---|---|---|---|---|---|
| Volume from own sources: | ? | 7 | 10,077.000 | acre-ft/yr | |
| Master meter error adjustment (enter positive value): | ? | 2 | 1,334.000 | under-registered | acre-ft/yr |
| Water imported: | ? | 7 | 17,739.000 | acre-ft/yr | |
| Water exported: | ? | n/a | 0.000 | acre-ft/yr | |
| **WATER SUPPLIED:** | | | 29,150.000 | acre-ft/yr | |

| AUTHORIZED CONSUMPTION | | | | | Click here: ? for help using option buttons below |
|---|---|---|---|---|---|
| Billed metered: | ? | 7 | 26,132.000 | acre-ft/yr | |
| Billed unmetered: | ? | 10 | 59.000 | acre-ft/yr | |
| Unbilled metered: | ? | n/a | 0.000 | acre-ft/yr | Pcnt: Value: |
| Unbilled unmetered: | ? | 7 | 39.000 | acre-ft/yr | ○ ◉ 39.000 |
| **AUTHORIZED CONSUMPTION:** | ? | | 26,230.000 | acre-ft/yr | Use buttons to select percentage of water supplied OR value |

| WATER LOSSES (Water Supplied - Authorized Consumption) | | | | | |
|---|---|---|---|---|---|
| | | | 2,920.000 | acre-ft/yr | |
| **Apparent Losses** | | | | | Pcnt: Value: |
| Unauthorized consumption: | ? | 3 | 5.000 | acre-ft/yr | ○ ◉ 5.000 |
| Customer metering inaccuracies: | ? | 5 | 263.960 | acre-ft/yr | 1.00% ◉ ○ |
| Systematic data handling errors: | ? | 5 | | acre-ft/yr | |
| Systematic data handling errors are likely, please enter a non-zero value; otherwise grade = 5 | | | | | Choose this option to enter a percentage of billed metered consumption. This is NOT a default value |
| Apparent Losses: | ? | | 268.960 | | ? |
| **Real Losses (Current Annual Real Losses or CARL)** | | | | | |
| Real Losses = Water Losses - Apparent Losses: | ? | | 2,651.040 | acre-ft/yr | |
| **WATER LOSSES:** | | | 2,920.000 | acre-ft/yr | |

| NON-REVENUE WATER | | | | |
|---|---|---|---|---|
| **NON-REVENUE WATER:** | ? | | 2,959.000 | acre-ft/yr |
| = Total Water Loss + Unbilled Metered + Unbilled Unmetered | | | | |

| SYSTEM DATA | | | | | |
|---|---|---|---|---|---|
| Length of mains: | ? | 5 | 308.0 | miles | |
| Number of active AND inactive service connections: | ? | 7 | 28,687 | | |
| Connection density: | | | 93 | conn./mile main | |
| Average length of customer service line: | ? | 10 | 15.0 | ft | (pipe length between curbstop and customer meter or property boundary) |
| Average operating pressure: | ? | 7 | 95.0 | psi | |

| COST DATA | | | | |
|---|---|---|---|---|
| Total annual cost of operating water system: | ? | 8 | $15,613,461 | $/Year |
| Customer retail unit cost (applied to Apparent Losses): | ? | 7 | $1.26 | $/100 cubic feet (ccf) |
| Variable production cost (applied to Real Losses): | ? | 7 | $263.54 | $/acre-ft |

## PERFORMANCE INDICATORS

### Financial Indicators

| | |
|---|---|
| Non-revenue water as percent by volume of Water Supplied: | 10.2% |
| Non-revenue water as percent by cost of operating system: | 5.5% |
| Annual cost of Apparent Losses: | $147,620 |
| Annual cost of Real Losses: | $698,655 |

### Operational Efficiency Indicators

| | | |
|---|---|---|
| Apparent Losses per service connection per day: | 8.37 | gallons/connection/day |
| Real Losses per service connection per day*: | 82.50 | gallons/connection/day |
| Real Losses per length of main per day*: | N/A | |
| Real Losses per service connection per day per psi pressure: | 0.87 | gallons/connection/day/psi |
| ? Unavoidable Annual Real Losses (UARL): | 700.26 | acre-feet/year |
| From Above, Real Losses = Current Annual Real Losses (CARL): | 2,651.04 | acre-feet/year |
| ? Infrastructure Leakage Index (ILI) [CARL/UARL]: | 3.79 | |

* only the most applicable of these two indicators will be calculated

**WATER AUDIT DATA VALIDITY SCORE:**

***** YOUR SCORE IS: 64 out of 100 *****

A weighted scale for the components of consumption and water loss is included in the calculation of the Water Audit Data Validity Score

**PRIORITY AREAS FOR ATTENTION:**

Based on the information provided, audit accuracy can be improved by addressing the following components:

1: Master meter error adjustment
2: Water imported
3: Customer metering inaccuracies

For more information, click here to see the Grading Matrix worksheet

VWC DMM Materials

# AWWA WLCC Free Water Audit Software: Reporting Worksheet

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WAS v4.0

Back to Instructions

? Click to access definition

**Water Audit Report for:** VALENCIA WATER COMPANY
**Reporting Year:** 2009 | 1/2009 - 12/2009

Please enter data in the white cells below. Where available, metered values should be used; if metered values are unavailable please estimate a value. Indicate your confidence in the accuracy of the input data by grading each component (1-10) using the drop-down list to the left of the input cell. Hover the mouse over the cell to obtain a description of the grades

**All volumes to be entered as: ACRE-FEET PER YEAR**

## WATER SUPPLIED

<< Enter grading in column 'E'

| | | | | | |
|---|---|---|---|---|---|
| Volume from own sources: | ? | 10 | 15,320.591 | acre-ft/yr | |
| Master meter error adjustment (enter positive value): | ? | 4 | 110.308 | over-registered | acre-ft/yr |
| Water imported: | ? | 10 | 14,730.873 | acre-ft/yr | |
| Water exported: | ? | 10 | 0.000 | acre-ft/yr | |
| **WATER SUPPLIED:** | | | 29,941.156 | acre-ft/yr | |

## AUTHORIZED CONSUMPTION

Click here: ? for help using option buttons below

| | | | | | Pcnt: | Value: |
|---|---|---|---|---|---|---|
| Billed metered: | ? | 10 | 28,964.492 | acre-ft/yr | | |
| Billed unmetered: | ? | 7 | 0.000 | acre-ft/yr | | |
| Unbilled metered: | ? | 10 | 0.737 | acre-ft/yr | | |
| Unbilled unmetered: | ? | | 374.264 | acre-ft/yr | 1.25% | |

Default option selected for Unbilled unmetered - a grading of 5 is applied but not displayed

Use buttons to select percentage of water supplied **OR** value

| | | | | |
|---|---|---|---|---|
| **AUTHORIZED CONSUMPTION:** | ? | | 29,339.493 | acre-ft/yr |

## WATER LOSSES (Water Supplied - Authorized Consumption)

601.663 acre-ft/yr

### Apparent Losses

| | | | | | Pcnt: | Value: |
|---|---|---|---|---|---|---|
| Unauthorized consumption: | ? | | 74.853 | acre-ft/yr | 0.25% | |

Default option selected for unauthorized consumption - a grading of 5 is applied but not displayed

| | | | | | | |
|---|---|---|---|---|---|---|
| Customer metering inaccuracies: | ? | 10 | 145.554 | acre-ft/yr | 0.50% | |
| Systematic data handling errors: | ? | | 0.000 | acre-ft/yr | | |

Systematic data handling errors are likely, please enter a non-zero value; otherwise grade = 5

Choose this option to enter a percentage of billed metered consumption. This is NOT a default value

| | | | |
|---|---|---|---|
| Apparent Losses: | ? | 220.407 | |

### Real Losses

| | | | |
|---|---|---|---|
| Real Losses = Water Losses - Apparent Losses: | ? | 381.256 | acre-ft/yr |
| **WATER LOSSES:** | | 601.663 | acre-ft/yr |

## NON-REVENUE WATER

| | | | |
|---|---|---|---|
| **NON-REVENUE WATER:** | ? | 976.664 | acre-ft/yr |

= Total Water Loss + Unbilled Metered + Unbilled Unmetered

## SYSTEM DATA

| | | | | | |
|---|---|---|---|---|---|
| Length of mains: | ? | 10 | 352.3 | miles | |
| Number of active AND inactive service connections: | ? | 10 | 29,948 | | |
| Connection density: | | | 85 | conn./mile main | |
| Average length of customer service line: | ? | 10 | 0.0 | ft | (pipe length between curbstop and customer meter or property boundary) |
| Average operating pressure: | ? | 8 | 86.0 | psi | |

## COST DATA

| | | | | |
|---|---|---|---|---|
| Total annual cost of operating water system: | ? | 10 | $19,374,217 | $/Year |
| Customer retail unit cost (applied to Apparent Losses): | ? | 10 | $1.10 | $/100 cubic feet (ccf) |
| Variable production cost (applied to Real Losses): | ? | 10 | $208.49 | $/acre-ft/yr |

## PERFORMANCE INDICATORS

### Financial Indicators

| | |
|---|---|
| Non-revenue water as percent by volume of Water Supplied: | 3.3% |
| Non-revenue water as percent by cost of operating system: | 1.4% |
| Annual cost of Apparent Losses: | $105,802 |
| Annual cost of Real Losses: | $79,486 |

### Operational Efficiency Indicators

| | | |
|---|---|---|
| Apparent Losses per service connection per day: | 6.57 | gallons/connection/day |
| Real Losses per service connection per day*: | 11.37 | gallons/connection/day |
| Real Losses per length of main per day*: | N/A | |
| Real Losses per service connection per day per psi pressure: | 0.13 | gallons/connection/day/psi |
| ? Unavoidable Annual Real Losses (UARL): | 200.84 | million gallons/year |
| ? Infrastructure Leakage Index (ILI) [Real Losses/UARL]: | 0.62 | |

* only the most applicable of these two indicators will be calculated

## WATER AUDIT DATA VALIDITY SCORE:

***** YOUR SCORE IS: 89 out of 100 *****

A weighted scale for the components of consumption and water loss is included in the calculation of the Water Audit Data Validity Score

## PRIORITY AREAS FOR ATTENTION:

Based on the information provided, audit accuracy can be improved by addressing the following components:

1: Master meter error adjustment
2: Unauthorized consumption
3: Systematic data handling errors

For more information, click here to see the Grading Matrix worksheet

# AWWA WLCC Free Water Audit Software: Reporting Worksheet

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WAS v4.0

Back to Instructions

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**Reporting Year:** 2010 | 1/2010 - 12/2010

Please enter data in the white cells below. Where available, metered values should be used; if metered values are unavailable please estimate a value. Indicate your confidence in the accuracy of the input data by grading each component (1-10) using the drop-down list to the left of the input cell. Hover the mouse over the cell to obtain a description of the grades

**All volumes to be entered as: ACRE-FEET PER YEAR**

## WATER SUPPLIED

<< Enter grading in column 'E'

| | | | | | |
|---|---|---|---|---|---|
| Volume from own sources: | ? | 10 | 16,080.171 | acre-ft/yr | |
| Master meter error adjustment (enter positive value): | ? | 4 | 115.777 | over-registered | acre-ft/yr |
| Water imported: | ? | 10 | 11,212.962 | acre-ft/yr | |
| Water exported: | ? | 10 | 0.000 | acre-ft/yr | |
| **WATER SUPPLIED:** | | | 27,177.356 | acre-ft/yr | |

## AUTHORIZED CONSUMPTION

Click here: ? for help using option buttons below

| | | | | | Pcnt: | Value: |
|---|---|---|---|---|---|---|
| Billed metered: | ? | 10 | 26,512.654 | acre-ft/yr | | |
| Billed unmetered: | ? | 7 | 0.000 | acre-ft/yr | | |
| Unbilled metered: | ? | 10 | 0.779 | acre-ft/yr | | |
| Unbilled unmetered: | ? | | 339.717 | acre-ft/yr | 1.25% | |

Default option selected for Unbilled unmetered - a grading of 5 is applied but not displayed

Use buttons to select percentage of water supplied **OR** value

| | | | | |
|---|---|---|---|---|
| **AUTHORIZED CONSUMPTION:** | ? | | 26,853.150 | acre-ft/yr |

## WATER LOSSES (Water Supplied - Authorized Consumption)

324.206 acre-ft/yr

### Apparent Losses

| | | | | | Pcnt: | Value: |
|---|---|---|---|---|---|---|
| Unauthorized consumption: | ? | | 67.943 | acre-ft/yr | 0.25% | |

Default option selected for unauthorized consumption - a grading of 5 is applied but not displayed

| | | | | | | |
|---|---|---|---|---|---|---|
| Customer metering inaccuracies: | ? | 10 | 133.233 | acre-ft/yr | 0.50% | |
| Systematic data handling errors: | ? | | 0.000 | acre-ft/yr | | |

Systematic data handling errors are likely, please enter a non-zero value; otherwise grade = 5

Choose this option to enter a percentage of billed metered consumption. This is NOT a default value

| | | | |
|---|---|---|---|
| Apparent Losses: | ? | | 201.177 |

### Real Losses

| | | | |
|---|---|---|---|
| Real Losses = Water Losses - Apparent Losses: | ? | 123.029 | acre-ft/yr |
| **WATER LOSSES:** | | 324.206 | acre-ft/yr |

## NON-REVENUE WATER

| | | | |
|---|---|---|---|
| **NON-REVENUE WATER:** | ? | 664.702 | acre-ft/yr |

= Total Water Loss + Unbilled Metered + Unbilled Unmetered

## SYSTEM DATA

| | | | | | |
|---|---|---|---|---|---|
| Length of mains: | ? | 10 | 357.4 | miles | |
| Number of active AND inactive service connections: | ? | 10 | 30,080 | | |
| Connection density: | | | 84 | conn./mile main | |
| Average length of customer service line: | ? | 10 | 0.0 | ft | (pipe length between curbstop and customer meter or property boundary) |
| Average operating pressure: | ? | 10 | 86.0 | psi | |

## COST DATA

| | | | | |
|---|---|---|---|---|
| Total annual cost of operating water system: | ? | 10 | $19,083,083 | $/Year |
| Customer retail unit cost (applied to Apparent Losses): | ? | 10 | $1.10 | $/100 cubic feet (ccf) |
| Variable production cost (applied to Real Losses): | ? | 10 | $245.96 | $/acre-ft/yr |

## PERFORMANCE INDICATORS

### Financial Indicators

| | |
|---|---|
| Non-revenue water as percent by volume of Water Supplied: | 2.4% |
| Non-revenue water as percent by cost of operating system: | 1.1% |
| Annual cost of Apparent Losses: | $96,571 |
| Annual cost of Real Losses: | $30,260 |

### Operational Efficiency Indicators

| | | |
|---|---|---|
| Apparent Losses per service connection per day: | 5.97 | gallons/connection/day |
| Real Losses per service connection per day*: | 3.65 | gallons/connection/day |
| Real Losses per length of main per day*: | N/A | |
| Real Losses per service connection per day per psi pressure: | 0.04 | gallons/connection/day/psi |
| ? Unavoidable Annual Real Losses (UARL): | 202.33 | million gallons/year |
| ? Infrastructure Leakage Index (ILI) [Real Losses/UARL]: | 0.20 | |

* only the most applicable of these two indicators will be calculated

## WATER AUDIT DATA VALIDITY SCORE:

***** YOUR SCORE IS: 89 out of 100 *****

A weighted scale for the components of consumption and water loss is included in the calculation of the Water Audit Data Validity Score

## PRIORITY AREAS FOR ATTENTION:

Based on the information provided, audit accuracy can be improved by addressing the following components:

1: Master meter error adjustment
2: Unauthorized consumption
3: Systematic data handling errors

For more information, click here to see the Grading Matrix worksheet

NCWD DMM Materials

# AWWA WLCC Free Water Audit Software: Reporting Worksheet

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WAS v4.2

Back to Instructions

? Click to access definition

Water Audit Report for: Newhall County Water District
Reporting Year: 2010 | 7/2009 - 6/2010

Please enter data in the white cells below. Where available, metered values should be used; if metered values are unavailable please estimate a value. Indicate your confidence in the accuracy of the input data by grading each component (1-10) using the drop-down list to the left of the input cell. Hover the mouse over the cell to obtain a description of the grades

**All volumes to be entered as: ACRE-FEET PER YEAR**

## WATER SUPPLIED

<< Enter grading in column 'E'

| | | | | |
|---|---|---|---|---|
| Volume from own sources: | ? | 10 | 5,828.810 | acre-ft/yr |
| Master meter error adjustment (enter positive value): | ? | | | acre-ft/yr |
| Water imported: | ? | 10 | 4,108.730 | acre-ft/yr |
| Water exported: | ? | | | acre-ft/yr |
| **WATER SUPPLIED:** | | | 9,937.540 | acre-ft/yr |

## AUTHORIZED CONSUMPTION

Click here: ? for help using option buttons below

| | | | | | Pcnt: | Value: |
|---|---|---|---|---|---|---|
| Billed metered: | ? | 10 | 9,281.320 | acre-ft/yr | | |
| Billed unmetered: | ? | n/a | | acre-ft/yr | | |
| Unbilled metered: | ? | 10 | 22.290 | acre-ft/yr | | |
| Unbilled unmetered: | ? | | 124.219 | acre-ft/yr | 1.25% | |

Default option selected for Unbilled unmetered - a grading of 5 is applied but not displayed

Use buttons to select percentage of water supplied **OR** value

| | | | | |
|---|---|---|---|---|
| **AUTHORIZED CONSUMPTION:** | ? | | 9,427.829 | acre-ft/yr |

## WATER LOSSES (Water Supplied - Authorized Consumption)

509.711 acre-ft/yr

### Apparent Losses

| | | | | | Pcnt: | Value: |
|---|---|---|---|---|---|---|
| Unauthorized consumption: | ? | | 0.000 | acre-ft/yr | | |

Enter a positive value, otherwise a default percentage of 0.25% and a grading of 5 is applied

| | | | | | | |
|---|---|---|---|---|---|---|
| Customer metering inaccuracies: | ? | 10 | 0.000 | acre-ft/yr | | |
| Systematic data handling errors: | ? | 10 | 5.000 | acre-ft/yr | | |

Choose this option to enter a percentage of billed metered consumption. This is NOT a default value

| | | | |
|---|---|---|---|
| Apparent Losses: | ? | 5.000 | |

### Real Losses (Current Annual Real Losses or CARL)

| | | | |
|---|---|---|---|
| Real Losses = Water Losses - Apparent Losses: | ? | 504.711 | acre-ft/yr |
| **WATER LOSSES:** | | 509.711 | acre-ft/yr |

## NON-REVENUE WATER

| | | | |
|---|---|---|---|
| **NON-REVENUE WATER:** | ? | 656.220 | acre-ft/yr |

= Total Water Loss + Unbilled Metered + Unbilled Unmetered

## SYSTEM DATA

| | | | | | |
|---|---|---|---|---|---|
| Length of mains: | ? | 10 | 158.5 | miles | |
| Number of active AND inactive service connections: | ? | 10 | 9,604 | | |
| Connection density: | | | 61 | conn./mile main | |
| Average length of customer service line: | ? | 6 | 15.0 | ft | (pipe length between curbstop and customer meter or property boundary) |
| Average operating pressure: | ? | 6 | 100.0 | psi | |

## COST DATA

| | | | | |
|---|---|---|---|---|
| Total annual cost of operating water system: | ? | 10 | $3,530,399 | $/Year |
| Customer retail unit cost (applied to Apparent Losses): | ? | 10 | $0.97 | $/100 cubic feet (ccf) |
| Variable production cost (applied to Real Losses): | ? | 10 | $355.25 | $/acre-ft |

## PERFORMANCE INDICATORS

### Financial Indicators

| | |
|---|---|
| Non-revenue water as percent by volume of Water Supplied: | 6.6% |
| Non-revenue water as percent by cost of operating system: | 6.6% |
| Annual cost of Apparent Losses: | $2,108 |
| Annual cost of Real Losses: | $179,298 |

### Operational Efficiency Indicators

| | | |
|---|---|---|
| Apparent Losses per service connection per day: | 0.46 | gallons/connection/day |
| Real Losses per service connection per day*: | 46.92 | gallons/connection/day |
| Real Losses per length of main per day*: | N/A | |
| Real Losses per service connection per day per psi pressure: | 0.47 | gallons/connection/day/psi |
| ? Unavoidable Annual Real Losses (UARL): | 280.34 | acre-feet/year |
| From Above, Real Losses = Current Annual Real Losses (CARL): | 504.71 | acre-feet/year |
| ? Infrastructure Leakage Index (ILI) [CARL/UARL]: | 1.80 | |

* only the most applicable of these two indicators will be calculated

### WATER AUDIT DATA VALIDITY SCORE:

***** YOUR SCORE IS: 96 out of 100 *****

A weighted scale for the components of consumption and water loss is included in the calculation of the Water Audit Data Validity Score

### PRIORITY AREAS FOR ATTENTION:

Based on the information provided, audit accuracy can be improved by addressing the following components:

1: Unauthorized consumption
2: Unbilled unmetered
3: Average length of customer service line

For more information, click here to see the Grading Matrix worksheet

# Appendix F

Draft Water Shortage Contingency Plans/Ordinances

**This appendix contains examples that were adopted in 1991 to address water shortage conditions and will be used as models for future water shortage contingency ordinances.**

Appendix I

## DROUGHT EMERGENCY WATER SHARING AGREEMENT

1. Parties. The parties to this agreement are: Valencia Water Company, Santa Clarita Water Company, Los Angeles County Waterworks District No. 36-Val Verde, Newhall County Water District, and the Castaic Lake Water Agency.

2. Critical Water Shortage Conditions. The State of California is experiencing a fifth year of drought, which has caused critical water shortages in many areas of the state, including the service area of the Castaic Lake Water Agency. The Agency has recently been informed that the State Water Project will have insufficient water to meet its demands for the coming year.

3. Water Sharing Agreement. In order to alleviate the emergency water shortage caused by the Drought and by insufficient agency water to meet demands, the undersigned parties agree to cooperate in sharing available water from all sources among themselves without regard to water, contractual or other rights for the duration of the emergency, and to facilitate among themselves water transfers, exchanges, and wheeling arrangements.

4. Preservation of Rights. By entering into this emergency water pooling and transfer, the parties do not waive their individual claims to water rights, or to contractual or other claims to water or the use of water. Each party agrees that no party hereto will lose any water right, contract right, or other entitlement to water by entering into this agreement,

nor shall any party attempt to use this agreement or the emergency exchange of water as a basis for a claim against any other party of a continued right to the use of that water. This agreement shall not be construed as constituting any alteration in the respective priorities or terms of any of the rights held by any party, nor as an admission with respect to any rights or claims. Each party further agrees that no party hereto will lose any water or other right by a claim of non-use by another party, prescription, or dedication to public use by entering into this agreement.

5. Termination. This agreement shall terminate upon the cessation of drought conditions affecting the service area of the Castaic Lake Water Agency, or January 1, 1992, whichever is sooner, but may be extended by mutual consent of all the parties.

6. Counterparts. This agreement shall be executed in counterparts, each of which shall be deemed an original.

7. Effective Date. The effective date of this agreement shall be that date upon which all the parties hereto have executed the agreement.

Valencia Water Company

Date: FEBRUARY 13, 1991

Attest:

by

Santa Clarita Water Company

by W. J. Manthei

Date: February 26, 1991

Attest:

Benjamin P. Borelli

Los Angeles County Waterworks
District No. 36

by ORIGINAL SIGNED BY

Date: 8/27/91

Attest:

PS 21

Newhall County Water District

by ORIGINAL SIGNED BY

Date: 2/19/91

Attest:

PS 22

Castaic Lake Water Agency

by ORIGINAL SIGNED BY

Date: 2/28/91

Attest:

PS 23

s/Los Angeles County Waterworks District No. 36

Date: AUG 27 1991

by [signature]

Attest:

ATTEST: LARRY J. MONTEILH
EXECUTIVE OFFICER —
CLERK OF THE BOARD OF SUPERVISORS

By [signature] Deputy

s/Newhall County Water District

Date: ____________

Attest:

by ____________

____________

s/Castaic Lake Water Agency

Date: 7/28/91

Attest:

by [signature]

[signature]

ADOPTED
BOARD OF SUPERVISORS
COUNTY OF LOS ANGELES

89 AUG 27 1991

[signature]
LARRY J. MONTEILH
EXECUTIVE OFFICER

APPROVED AS TO FORM
County Counsel

BY [signature]
DEPUTY



15647

s/ Newhall County Water District

Date: 2/19/71

Attest:

by [signature] President [signature] Secy

s/ Castaic Lake Water Agency

Date: _____

Attest:

by _____

_____

s/Los Angeles County Waterworks
District No. 36

Date:_____

Attest:

by_____

_____

s/Newhall County Water District

Date:_____

Attest:

by_____

_____

s/Castaic Lake Water Agency

Date: 2/28/91

Attest:

by

**Appendix II**

RESOLUTION NO. 804

RESOLUTION OF THE BOARD OF DIRECTORS OF CASTAIC LAKE WATER AGENCY
RECOGNIZING REDUCTIONS IN REQUESTED DELIVERY OF
STATE WATER PROJECT SUPPLY FOR YEAR 1991
AND MANDATING A PROGRAM OF WATER CONSERVATION
IN THE SANTA CLARITA VALLEY

WHEREAS, the Castaic Lake Water Agency is a public entity organized and operating pursuant to the California Water Code, Appendix, Chapter 103, and is primarily empowered to supply water at wholesale to retail water distributors within the Santa Clarita Valley; and

WHEREAS, the Agency's source of water is by contract with the State Water Project of the California Department of Water Resources; and

WHEREAS, the State Water Project, and the entire State of California is experiencing protracted drought conditions of unprecedented recent duration; and

WHEREAS, the California Department of Water Resources in a letter dated February 2, 1991 advised the Agency to plan for "severe reductions" in its State Water Project supply; and

WHEREAS, the letter further reported, "there is a 50% probability that the Department will only be able to deliver about half of the water requested for municipal and industrial use in 1991"; and

WHEREAS, half of the requested State Water Project supply of the Castaic Lake Water Agency would be 13,050 acre feet; and

WHEREAS, the retail water distributors within the Santa Clarita Valley operate ground water production facilities that have been planned to make up some portion of the delivery reductions in State Project Water; and

WHEREAS, the retail water distributors and the Agency, have pursuant to Water Code, Sections 10610 through 10656, adopted a URBAN WATER MANAGEMENT PROGRAM for retail sales which contains water conservation measures including, metering, leak detection, public education, public information, home retrofit devices, drip and sprinkler irrigation restrictions, and a landscape suggestion for use of drought tolerant plantings; and

WHEREAS, heretofore, the Castaic Lake Water Agency adopted Resolution No. 667 relating to a voluntary water conservation program to reduce water consumption by 10 percent; and

WHEREAS, it is now essential to enact a mandatory program;

NOW, THEREFORE, BE IT RESOLVED that this Agency's Board of Directors does hereby find and determine the following:

1. That the General Manager of the Agency be authorized to execute a "Drought Emergency Water Sharing Agreement" with the local water purveyors to make it clear that emergency drought sharing of Agency water supplies during year 1991 not result in any waiver of contractual or other right to use of Agency water.

2. That the General Manager confer with the retail water purveyors to coordinate the distribution and use of the limited State Project Water supply to maximize the distribution of the ground water production capacity of the combined facilities operated by the retail water purveyors.

3. That the Agency request both the City of Santa Clarita and the County of Los Angeles to adopt mandatory water use ordinances with terms generally as follows:

I. A WATER CONSERVATION ORDINANCE WHICH SHALL TERMINATE ON JANUARY 1, 1992 UNLESS RENEWED OR TERMINATED EARLIER

A. Hose Watering-Prohibition.

No person shall hose-water or wash down any sidewalks, walkways, driveways, parking areas, or other paved surfaces. Willful violation hereof shall be an infraction punishable by a fine of $100.00 for the first infraction and $500.00 each for subsequent infraction.

B. Watering of Lawns and Landscaping

1. No person shall water or cause to be watered any lawn or landscaping between the hours of 10:00 a.m. and 5:00 p.m.

2. No person shall water or cause to be watered any lawn or landscaping more than once a day.

3. No person shall water or cause to be watered any lawn or landscaping to such an extent that runoff into adjoining streets, parking lots or alleys occurs due to incorrectly directed or maintained sprinklers or excessive watering.

4. It shall be the duty of all persons to inspect all hoses, faucets and sprinkling systems for leaks and to cause all leaks to be repaired as soon as is reasonably practicable.

5. Willful violation hereof shall be an infraction punishable by a fine of $100.00 for the first infraction and $500.00 each for subsequent infractions.

C. Indoor Plumbing and Fixtures.

1. It shall be the duty of all persons to inspect all accessible indoor plumbing and faucets for leaks and to cause all leaks to be repaired as soon as is reasonably practicable.

2. Any new or replacement toilets installed in any residence or business shall be of a low-flow variety.

3. Willful violation hereof shall be an infraction punishable by a fine of $500.00.

D. Washing Vehicles

No vehicle of any type may be washed, except at a commercial car wash, unless such vehicle is washed by using a hand-held bucket or a water-hose equipped with an automatic shutoff nozzle. No person shall leave a water hose running while washing a vehicle or at any other time. Willful violation hereof shall be an infraction punishable by a fine of $100.00 for the first infraction and $500.00 each for subsequent infraction.

E. Public Eating Places

No restaurant, cafeteria, coffee shop, or other public place where food is sold or served shall serve drinking water to any customer unless specifically requested to do so by such customer. Willful violation hereof shall be an infraction punishable by a fine of $100.00 for the first infraction and $500.00 each for subsequent infractions.

F. Decorative Fountains

No person shall use water to clean, fill, or maintain levels in decorative fountains unless such water flows through a recycling system. Willful violation hereof shall be an infraction punishable by a fine of $100.00 for the first infraction and $500.00 each for subsequent infractions.

4. That the above cited three paragraphs are deemed appropriate as PHASE ONE of the Agency's mandatory conservation program with recognition of the possibility that the California Department of Water Resources may declare deeper finite reductions for the municipal and industrial water supplies of the State Water Project. Residents of the Agency are put on notice that further and additional phases of the mandatory conservation program may be enacted by the Agency and could include the following:

A. Odd/Even landscape irrigation restriction, based upon address

B. A financial penalty of say triple the water rate for metered water service that exceeds historic use

C. Complete prohibition of landscape irrigation

I, the undersigned, hereby certify: That I am the duly appointed and acting Secretary of the Castaic Lake Water Agency, and that at a special meeting of the Board of Directors of said Agency held on Monday, February 11, 1991, the foregoing Resolution No. 804 was duly and regularly adopted by said Board, and that said resolution has not been rescinded or amended since the date of its adoption, and that it is now in full force and effect.

Betty L. Castleberry
Secretary

DATED: 2/12/91

**Appendix III**

ORDINANCE NO. 101

WATER CONSERVATION ORDINANCE OF
NEWHALL COUNTY WATER DISTRICT

* * * * * * * * * * * * * *

BE IT ORDAINED BY THE BOARD OF DIRECTORS OF NEWHALL COUNTY WATER DISTRICT, LOS ANGELES COUNTY, CALIFORNIA AS FOLLOWS:

Section 1: Because of the water supply conditions prevailing within the District's service area, the general welfare requires that water resources available to the District be put to the maximum beneficial use to the extent to which they are capable, and that the waste or unreasonable use, or unreasonable method of use of water be prevented, and that the conservation of such water be practiced with the view to the reasonable and beneficial use thereof in the interest of the people of the District, and for the public welfare. The purpose of this Ordinance is to provide a water conservation plan to minimize the effect of a shortage of water supplies on the customers of the District.

Section 2: No customer of the District shall make, cause, use or permit the use of water from the District in a manner contrary to any provision of this Ordinance.

Section 3: Watering of Lawns or Landscaping.

(a) No person shall water or cause to be watered any lawn or landscaping between the hours of 10:00 a.m. and 5:00 p.m.

(b) No person shall water or cause to be watered any lawn or landscaping more than once a day.

(c) No person shall water or cause to be watered any lawn or landscaping to such an extent that runoff into adjoining streets, parking lots or alleys occurs due to incorrectly directed or maintained sprinklers or excessive watering.

(d) It shall be the duty of all persons to inspect all hoses, faucets and sprinkling systems for leaks and to cause all leaks to be repaired as soon as is reasonably practicable.

Section 4: Indoor Plumbing and Fixtures.

(a) It shall be the duty of all persons to inspect all accessible indoor plumbing and faucets for leaks and to cause all leaks to be repaired as soon as is reasonably practicable.

(b) For new or replacement toilets installed in any residence or business, local low-flow types are recommended.

Section 5: Washing Vehicles. No vehicle of any type may be washed, except at a commercial car wash, unless such vehicle is washed by using a hand-held bucket or a water-hose equipped with an automatic shutoff nozzle. No person shall leave a water hose running while washing a vehicle or at any other time.

Section 6: Public Eating Places. No restaurant, cafeteria, coffee shop or other public place where food is sold or served shall serve drinking water to any customer unless specifically requested to do so by such customer.

Section 7: No person shall use water to clean, fill or maintain levels in decorative fountains unless such water flows through a recycling system.

Section 8: Water Conservation Kits. Water conservation kits are available without charge to the District's customers at the District's office. In most cases, the kits include a plastic displacement bag, two sets of shower flow restrictors, two dye tablets to check for toilet leaks and a brochure which explains the use of the kit. The kits are to be installed by the District's customers.

Section 9: Effective Date. The water use restrictions of this Ordinance are effective immediately. Other provisions of this Ordinance are effective on March 21, 1991.

ADOPTED, SIGNED AND APPROVED by the Board of Directors of NEWHALL COUNTY WATER DISTRICT this 19th day of February, 1991.

MARY JUNE HERRINGTON, President of the Board of Directors of the NEWHALL COUNTY WATER DISTRICT

A T T E S T:

JAMES E. JINKS, Secretary of the Board of Directors of the NEWHALL COUNTY WATER DISTRICT

STATE OF CALIFORNIA )
) ss.
COUNTY OF LOS ANGELES )

I hereby certify that the foregoing Ordinance No. 101 was duly and regularly adopted and passed by the Board of Directors of the NEWHALL COUNTY WATER DISTRICT at a regular meeting thereof on the 19th day of February, 1991 by the following vote of the members thereof:

| | | |
|---|---|---|
| AYES: | DIRECTORS: | Herrington, Hayes, Wade, Agajanian and Whiteside |
| NOES: | DIRECTORS: | None |
| ABSENT: | DIRECTORS: | None |
| ABSTAINED: | DIRECTORS: | None |

JAMES E. JINKS, Secretary of the Board of Directors of the NEWHALL COUNTY WATER DISTRICT

ORDINANCE NO. 102

ORDINANCE AMENDING SECTION 3 OF ORDINANCE NO. 101 OF NEWHALL COUNTY WATER DISTRICT RE WATER CONSERVATION

* * * * * * * * * * * * * * *

BE IT ORDAINED BY THE BOARD OF DIRECTORS OF NEWHALL COUNTY WATER DISTRICT, LOS ANGELES COUNTY, CALIFORNIA AS FOLLOWS:

Section 1: Section 3 of Ordinance No. 101 is amended to provide as follows:

"Section 3: Watering of Lawns or Landscaping.

(a) No person shall water or cause to be watered any lawn or landscaping between the hours of 8:00 a.m. and 6:00 p.m.

(b) No person shall water or cause to be watered any lawn or landscaping more than once a day, or for a period of time not to exceed ten minutes per watering station or cycle.

(c) No person shall water or cause to be watered any lawn or landscaping to such an extent that runoff into adjoining streets, parking lots or alleys occurs due to incorrectly directed or maintained sprinklers or excessive watering.

(d) It shall be the duty of all persons to inspect all hoses, faucets and sprinkling systems for leaks and to cause all leaks to be repaired as soon as is reasonably practicable."

Section 2: The provisions of this Ordinance shall be effective on November 19, 1991.

ADOPTED, SIGNED AND APPROVED by the Board of Directors of NEWHALL COUNTY WATER DISTRICT this 15th day of October, 1991.

Mary June Herrington

MARY JUNE HERRINGTON, President of the Board of Directors of the NEWHALL COUNTY WATER DISTRICT

ATTEST:

James E. Jinks

JAMES E. JINKS, Secretary of the Board of Directors of the NEWHALL COUNTY WATER DISTRICT

STATE OF CALIFORNIA }
} ss.
COUNTY OF LOS ANGELES }

I hereby certify that the foregoing Ordinance No. 102 was duly and regularly adopted and passed by the Board of Directors of the NEWHALL COUNTY WATER DISTRICT at a regular meeting thereof on the 15th day of October, 1991 by the following vote of the members thereof:

| | | |
|---|---|---|
| AYES: | DIRECTORS: | Harrington, Hayes, Wade, Agajanian and Whiteside |
| NOES: | DIRECTORS: | None |
| ABSENT: | DIRECTORS: | None |
| ABSTAINED: | DIRECTORS: | None |

JAMES E. JINKS, Secretary of the Board of Directors of the NEWHALL COUNTY WATER DISTRICT

Appendix IV

ORDINANCE NO. 91-16

AN ORDINANCE OF THE CITY OF SANTA CLARITA
ADDING CHAPTER 9.38 TO TITLE 9
OF THE SANTA CLARITA MUNICIPAL CODE

WHEREAS, the State of California is experiencing a prolonged drought; and

WHEREAS, the delivery of State Project Water to the Castaic Lake Water Agency has been reduced by 90% of the requested delivery levels.

THE CITY COUNCIL OF THE CITY OF SANTA CLARITA DOES HEREBY ORDAIN AS FOLLOWS:

Section 1. The Santa Clarita Municipal Code is amended adding Chapter 9.38 to Title 9 relating to water conservation to read as follows:

CHAPTER 9.38

WATER CONSERVATION

Sections:


9.38.010 Drought Committee
9.38.015 Water Conservation Regulations
9.38.020 Penalties
9.38.025 Termination of Ordinance
9.38.030 Ordinance 91-16 Amended


9.38.010 Drought Committee

A. A drought committee shall be established, whose function shall be:

1. to review all available data on water consumption, water supply and ground water conditions;

2. to evaluate the level of compliance with the terms of this Ordinance;

3. to evaluate the level of achievement of the stated water consumption reductions;

4. to make recommendations to the City Council concerning the timing of and need for implementation of future additional water restrictions as may be developed; and

5. to make recommendations to the water purveyors in the City of Santa Clarita concerning additional measures to encourage water conservation, including but not limited to; conservation goals for individual water accounts, surcharges for excessive water use and the installation of flow restriction devices in water services.

B. The members of the Drought Committee shall include representatives from the staff of the City of Santa Clarita, the Upper Santa Clara Water Committee, other appointees as the City Council deems appropriate, and the staff of the Castaic Lake Water Agency.

9.38.015 Water Conservation Regulations

A. Water conservation shall be achieved through the restriction and/or prohibition of various types of water use. The restrictions and prohibitions shall be implemented immediately.

B. The following conditions and restrictions shall apply to the use of water within the City of Santa Clarita:

1. Hose Water Prohibition.

a. No person shall hose-water or wash down any sidewalks, walkways, driveways, parking areas, or other paved surface.

2. Watering of Lawns and Landscaping.

a. No person shall water or cause to be watered any lawn or landscaping between the hours of 8:00 a.m. and 6:00 p.m. except as provided in Section 9.38.015.B.2.e.

b. Lawns and landscaping shall be watered no more frequently than every other day.

c. No person shall water or cause to be watered any lawn or landscaping to such an extent that runoff into adjoining streets, parking lots or alleys occurs due to incorrectly directed or maintained sprinklers or to excessive watering.

d. It shall be the duty of all persons to inspect all hoses, faucets and sprinkling systems for leaks and to cause all leaks to be repaired as soon as is reasonably practicable.

e. Commercial gardeners and landscapers, municipal water uses, commercial nurseries, golf courses and other water-dependent industries shall not water or cause to be watered any lawn of landscaping between the hours of 10:00 a.m. and 3:00 p.m., and no more frequently than every other day, unless reclaimed water is used.

f. The maintenance and testing of irrigation systems may be performed without the restrictions specified in Section 9.38.015.B.2.a and 9.38.015.B.2.e.

3. Indoor Plumbing.

   a. Accessible indoor plumbing and fixtures must be inspected for leaks and repaired as soon as reasonably practicable.

   b. New and replacement toilets, showers and faucets shall be of a low-flow type. New or replacement faucets shall be equipped with aerators.

4. Washing Vehicles.

   a. Vehicles must be washed by hand-held bucket or with a hose equipped with automatic shutoff nozzle. Hoses may not be left running.

   b. These restrictions shall not be applied to commercial vehicle washing facilities and operations.

5. Public Eating Places.

   a. Water may be served only upon request by the customer.

6. Decorative Fountains.

   a. Water may not be used to clean, fill or maintain levels in decorative fountains unless the fountain has a water recycling system.

7. Landscaping and Irrigation Plans.

   a. All new landscaping and irrigation improvements shall be approved by the City of Santa Clarita Director of Parks and Recreation prior to construction.

   b. No person or entity shall be required to implement any landscaping requirements of any association, developer or governing agency until the termination of this ordinance.

C. Conservation Goal

1. The goal of this Water Conservation Ordinance is to achieve at least 25% reduction of overall water consumption within the City of Santa Clarita.

9.38.020 Penalties.

A. Willful violations of the terms of this Ordinance shall be subject to written warnings and/or citations. A written warning shall be issued upon the first violation of any part of this Ordinance. The second violation shall result in a fine of $50.00. The third violation shall result in a fine of $100.00, and all subsequent violations shall result in a fine of $300.00 for each violation.

9.38.025 Termination of Ordinance.

A. This Ordinance shall terminate on January 1, 1992, unless renewed or termination earlier by ordinance.

Section 2. The City Council hereby declares that the provisions of this Ordinance are severable and if for any reason a court or competent jurisdiction shall hold any sentence, paragraph or section of this Ordinance to be invalid, such decision shall not affect the validity of the remaining parts of this Ordinance.

Section 3. This Ordinance is adopted as an urgency measure. The facts of the urgency are these: The State of California is currently suffering from the effects of a five-year drought, and the deliveries of State Project water to local water agencies are being reduced. This Ordinance restricts or prohibits certain types of water usage. The immediate enactment of this Ordinance is therefore necessary to ensure the adequacy of the water supply for the City of Santa Clarita and is thereby directly related to public health, safety and welfare. Therefore, this Ordinance shall be effective immediately upon adoption.

Section 4. The City Clerk shall certify to the passage of this Ordinance and shall cause it to be published in the manner prescribed by law.

9.38.030 Ordinance 91-12 Amended

A. Ordinance 91-12 is hereby amended, deleting Section 9.38.015.b.8 in its entirety.

PASSED, APPROVED AND ADOPTED this 13th day of March, 1991.

Carl Boyer
CARL BOYER, MAYOR

ATTEST:

Donna M. Grindey
DONNA GRINDEY, CITY CLERK

STATE OF CALIFORNIA )
COUNTY OF LOS ANGELES ) ss.
CITY OF SANTA CLARITA )

I, Donna M. Grindey, City Clerk of the City of Santa Clarita, do hereby certify that the foregoing Ordinance No. 91-16 was duly adopted as an urgency ordinance at a regular meeting of the City Council on the 13th day of March, 1991, by the following four-fifths vote, to wit:

AYES: COUNCILMEMBERS Darcy, Heidt, McKeon, Boyer

NOES: COUNCILMEMBERS Klajic

ABSENT: COUNCILMEMBERS None

Donna M. Grindey
CITY CLERK

AGN:gmm-394

ORDINANCE NO. 91-48

AN ORDINANCE OF THE CITY COUNCIL OF THE CITY OF SANTA CLARITA, CALIFORNIA, AMENDING CHAPTER 9.38 OF THE SANTA CLARITA MUNICIPAL CODE RELATING TO WATER CONSERVATION

THE CITY COUNCIL OF THE CITY OF SANTA CLARITA, CALIFORNIA, DOES ORDAIN AS FOLLOWS:

SECTION 1. The Santa Clarita Municipal Code is hereby amended at Subsection 9.38.015.B.2.b to read as follows:

b. Lawns and landscaping shall be watered no more than 10 minutes per watering station or cycle per day.

SECTION 2. The Santa Clarita Municipal Code at Subsection 9.38.015.B.2.e is hereby amended to read as follows:

e. Commercial gardeners and landscapers, municipal water uses, commercial nurseries, golf courses and other water-dependent industries shall not water or cause to be watered any lawn or landscaping between the hours of 10:00 a.m. and 3:00 p.m., and no more than 10 minutes per watering station or cycle per day unless reclaimed water is used. This subsection does not apply to residential lawns which are subject to the time limitations indicated in the other subsections of this Ordinance.

SECTION 3. Section 9.38.015.C.1 is hereby amended to read as follows:

1. The goal of this Water Conservation Ordinance is to achieve a significant reduction of overall water consumption within the City of Santa Clarita.

SECTION 4. This Ordinance is adopted as an urgency measure. The facts of the urgency are these: The State of California is currently suffering from the effects of a five-year drought, and the deliveries of State Project water to local water agencies are being reduced. This Ordinance restricts or prohibits certain types of water usage. The immediate enactment of this Ordinance is therefore necessary to ensure the adequacy of the water supply for the City of Santa Clarita and is thereby directly related to public health, safety and welfare. Therefore, this Ordinance shall be effective immediately upon adoption.

SECTION 2. The City Clerk shall certify to the passage of this Ordinance and shall cause it to be published in the manner prescribed by law.

PASSED, APPROVED AND ADOPTED this 8th day of October, 1991.

Carl Boyer

Carl Boyer, Mayor

ATTEST:

Donna M. Grindey

Donna M. Grindey, City Clerk

STATE OF CALIFORNIA )
COUNTY OF LOS ANGELES) ss
CITY OF SANTA CLARITA)

I, Donna M. Grindey, City Clerk of the City of Santa Clarite, do hereby certify that the foregoing Ordinance No. 91-48 was duly adopted as an urgency ordinance at a regular meeting of the City Council on the 8th day of October, 19 91 by the following four-fifths vote, to wit:

AYES: COUNCILMEMBERS: Darcy, Heidt, McKeon, Boyer

NOES: COUNCILMEMBERS: Klajic

ABSENT: COUNCILMEMBERS: None

Donna M. Grindey

Donna M. Grindey, City Clerk

Appendix V

ORDINANCE NO. 91-00460

An urgency ordinance amending Title 11, Chapter 11.38 of the Los Angeles County Code relating to Water and Sewers to add Part 4, Water Conservation.

The Board of Supervisors of the County of Los Angeles ordains as follows:

Section 1. Title 11, Chapter 11.38 of the County Code is amended by adding Part 4, to read:

Part 4. Water Conservation Requirements For The Unincorporated Los Angeles County Area.

Section 11.38.620 Hose Watering Prohibition.
No person shall hose water or wash down any sidewalks, walkways, driveways, parking areas or other paved surfaces, except as is required for the benefit of public health and safety. Willful violation hereof shall be an infraction punishable by a fine of $100.00 for the first infraction and $500.00 each for subsequent infractions.

Section 11.38.630 Watering of Lawns and Landscaping.

a). No person shall water or cause to be watered any lawn or landscaping between the hours of 10:00 a.m. and 5:00 p.m.

b). No person shall water or cause to be watered any lawn or landscaping more than once a day.

c). No person shall water or cause to be watered any lawn or landscaping to such an extent that runoff into adjoining streets, parking lots or alleys occurs due to incorrectly directed or maintained sprinklers or excessive watering.

d). It shall be the duty of all persons to inspect all hoses, faucets and sprinkling systems for leaks and to cause all leaks to be repaired as soon as is reasonably practicable.

e). Willful violation hereof shall be an infraction punishable by a fine of $100.00 for the first infraction and $500.00 each for subsequent infractions.

Section 11.38.640 Indoor Plumbing and Fixtures.

a). It shall be the duty of all persons to inspect all accessible indoor plumbing and faucets for leaks and to cause all leaks to be repaired as soon as is reasonably practicable.

b). Willful violation hereof shall be an infraction punishable by a fine of $500.00.

Section 11.38.650 Washing Vehicles.
No motor vehicle, boat, trailer or other type of mobile equipment may be washed, except at a commercial car wash or with reclaimed water, unless such vehicle is washed by using a hand-held bucket or a water-hose equipped with an automatic shutoff nozzle. No person shall leave a water hose running while washing a vehicle or at any other time. Willful violation hereof shall be an infraction punishable by a fine of $100.00 for the first infraction and $500.00 each for subsequent infractions.

Section 11.38.660 Public Eating Places.
No restaurant, hotel, cafeteria, cafe or other public place where food is sold or served shall serve drinking water to any customer unless specifically requested to

do so by such customer. Willful violation hereof shall be an infraction punishable by a fine of $100.00 for the first infraction and $500.00 each for subsequent infractions.

Section 11.38.670 Decorative Fountains.
No person shall use water to clean, fill or maintain levels in decorative fountains, ponds, lakes, or other similar aesthetic structures unless such water flows through a recycling system. Willful violation hereof shall be an infraction punishable by a fine of $100.00 for the first infraction and $500.00 each for subsequent infractions.

Section 2. This ordinance shall terminate on January 1, 1993, unless renewed or terminated earlier by ordinance.

Section 3. Due to the severity of the drought in the State of California, there is an immediate need to prohibit the wasting of water in the Los Angeles County unincorporated area to better utilize the available water supplies. This ordinance is urgently needed for the preservation of the public health, safety and general welfare and shall take effect immediately.

Section 4. This ordinance shall be published in

Metropolitan News Enterprise

a newspaper printed and published in the County of Los Angeles.

Michael D. Antonovich
Chairman

ATTEST:

Executive Officer
Board of Supervisors
of the County of Los Angeles

I hereby certify that at its meeting of March 21, 1991, the foregoing ordinance was adopted by the Board of Supervisors of said County of Los Angeles by the following vote, to wit:

| Ayes: | | Noes: | |
|---|---|---|---|
| Supervisors | Gloria Molina | Supervisors | None |
| | Edmund D. Edelman | | |
| | Deane Dana | | |
| | Michael D. Antonovich | | |
| | | | |

Executive Officer
Board of Supervisors
of the County of Los Angeles

Effective Date: March 21, 1991

~~Operative Date:~~ _____

I hereby certify that pursuant to Section 25103 of the Government Code, delivery of this document has been made.
LARRY J. MONTEILH
Executive Officer
Clerk of the Board of Supervisors
By _____ DEPUTY

APPROVED AS TO FORM:
DE WITT W. CLINTON
County Counsel
By _____
GERALD F. CRUMP
Chief Assistant County Counsel

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. . . S A M P L E  N O T I C E . . .

LOS ANGELES COUNTY WATER WASTING ORDINANCE
NOTICE OF WARNING

Date _____

Address: _____
_____
_____
_____

Dear Customer:

Due to the severity of the current drought, the County Board of Supervisors, on March 21, 1991, adopted an Ordinance that specifies a number of water saving measures. The Ordinance applies to the unincorporated areas of the County and includes the following provisions:

__ Washing down of paved surfaces is prohibited, except as required for public health and safety.

__ Lawn and landscape watering is prohibited between the hours of 10:00 a.m. and 5:00 p.m.

__ Landscape watering that results in runoff into adjoining streets, parking lots or alleys due to misdirected sprinklers or excessive watering is prohibited.

__ Leaking hoses, faucets and sprinkling systems must be repaired as soon as is reasonably practicable.

__ Leaks to indoor plumbing systems must be repaired as soon as is reasonably practicable.

__ Washing of a motor vehicle, boat or trailer is prohibited except at a commercial car wash or with a hand-held bucket or water hose equipped with an automatic shutoff nozzle.

__ Serving drinking water to customers at public eating places is prohibited unless specifically requested by such customers.

__ Water cannot be used in decorative fountains, ponds, lakes and other similar aesthetic structures unless the water flows through a recycling system.

We observed the violation(s) of the above noted provisions on your property. We request your support in complying with the provisions of this ordinance so that we can avoid unnecessary waste and stretch our limited water supplies for the duration of the drought. Violation of this Ordinance is punishable by a fine of up to $500. If you have any questions regarding this ordinance or its enforcement please contact (your office and phone number).

(WW3901)

Appendix VI

RESOLUTION

ADOPTING A WATER SHORTAGE CONTINGENCY PLAN
FOR THE SANTA CLARITA WATER COMPANY

WHEREAS, the California Legislature enacted Assembly Bill 11X during the 1991 Extraordinary Session of the California Legislature (an act to amend the California Water Code Sections 10620, 10621, 10631, and 10652, and to add Section 10656 to the California Water Code, relating to water); and

WHEREAS, AB 11X mandates that every urban water supplier providing municipal water directly or indirectly to more than 3,000 customers or supplying more than 3,000 acre feet of water annually to develop a Water Shortage Contingency Plan; and

WHEREAS, AB 11X mandates that said Plan be filed with the California Department of Water Resources by January 31, 1992; and

WHEREAS, the Santa Clarita Water Company is an urban supplier of water providing water to more than 3,000 customers, and has therefore prepared and circulated for public review a Draft Water Shortage Contingency Plan, in compliance with the requirements of AB 11X, has held a properly noticed public hearing on January 29, 1992, regarding said Draft Plan, and has thereafter prepared a Final Water Shortage Contingency Plan;

NOW, THEREFORE, BE IT RESOLVED by the Santa Clarita Water Company's Board as follows:

1. A Final Water Shortage Contingency Plan is hereby adopted and is attached hereto as Exhibit "A" hereof, which exhibit is hereby incorporated herein;

2. The President is hereby authorized and directed to file the Plan with the California Department of Water Resources;

3. The President is hereby also authorized to follow lawful procedures to declare a Water Shortage Emergency and to implement this Water Shortage Contingency Plan; and

4. The President shall recommend to the Santa Clarita Water Company's Board additional procedures, rules, and regulations to carry out effective and equitable allocation of water resources during a water shortage.

Appendix VI

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FOR THE SANTA CLARITA WATER COMPANY

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WHEREAS, AB 11X mandates that every urban water supplier providing municipal water directly or indirectly to more than 3,000 customers or supplying more than 3,000 acre feet of water annually to develop a Water Shortage Contingency Plan; and

WHEREAS, AB 11X mandates that said Plan be filed with the California Department of Water Resources by January 31, 1992; and

WHEREAS, the Santa Clarita Water Company is an urban supplier of water providing water to more than 3,000 customers, and has therefore prepared and circulated for public review a Draft Water Shortage Contingency Plan, in compliance with the requirements of AB 11X, has held a properly noticed public hearing on January 29, 1992, regarding said Draft Plan, and has thereafter prepared a Final Water Shortage Contingency Plan;

NOW, THEREFORE, BE IT RESOLVED by the Santa Clarita Water Company's Board as follows:

1. A Final Water Shortage Contingency Plan is hereby adopted and is attached hereto as Exhibit "A" hereof, which exhibit is hereby incorporated herein;

2. The President is hereby authorized and directed to file the Plan with the California Department of Water Resources;

3. The President is hereby also authorized to follow lawful procedures to declare a Water Shortage Emergency and to implement this Water Shortage Contingency Plan; and

4. The President shall recommend to the Santa Clarita Water Company's Board additional procedures, rules, and regulations to carry out effective and equitable allocation of water resources during a water shortage.

**Newhall County Water District's Ordinance No. 112**

**ORDINANCE NO.112**
**WATER CONSERVATION, SHORTAGE, DROUGHT AND EMERGENCY RESPONSE ORDINANCE**

* * * * * * * * * * * * * * * * * * * * * * * * * * * *

***Section 1:*** ***PURPOSE*****:** Article 10, Section 2 of the California Constitution declares that waters of the State are to be put to beneficial use, that waste, unreasonable use, or unreasonable method of use be prevented, and that water be conserved for the public welfare. The specific provisions of this Ordinance are necessary and proper to conserve water resources and minimize cost to the customer. This ordinance requires that available water resources be put to the maximum beneficial use, and that water efficient practices be used to reach this objective. This further finds that water supplies may be reduced because of drought, failure of facilities, or catastrophic events such as earthquakes and regional power failures. Anti-waste and water conservation requirements are necessary to achieve demand reduction without unneeded hardship.

***Section 2:*** ***DEFINITIONS AND TERMS:***

***A.*** ***Water efficient practices****:* Cost-effective practices that require the least amount of water to generate the greatest benefit (water and cost savings) to the customer.

***B.*** ***Water Waste:*** To use or expend water carelessly or needlessly.

***C.*** ***Water User:*** Business or residential customer.

***D.*** ***Water Conservation Stages:*** The General Manager shall determine the conservation stage, except that the Board shall determine any conservation stage more restrictive than Stage 1. A water deficiency occurs when the current or near-term water demand exceeds the current or near-term water supply.

***Stage 1 Water Alert:*** Water deficiencies range between 1 and 15 percent.

***Stage 2 Water Warning:*** Water deficiencies range from more than 15 and up to 25 percent.

***Stage 3 Water Emergency:*** Water deficiencies range from more than 25 and up to 35 percent.

***Stage 4 Water Crisis:*** Water deficiencies are more than 35 percent.

***E.*** ***Water Deficiency:*** A water deficiency occurs when the current or near-term water demand exceeds the current or near-term water supply, based on a yearly assessment. (Percent or deficiency = (1 – water supply/water demand) x 100

***F.*** ***Water Conservation Goals:***

***Stage 1 Water Alert:*** ***Achieve a Conservation level of up to 10 percent.***

***Stage 2 Water Warning:*** ***Achieve a Conservation level of up to 20 percent.***

***Stage 3 Water Emergency:*** ***Achieve a Conservation level of up to 30 percent.***

***Stage 4 Water Crisis:*** ***Achieve a Conservation level of over 30 percent.***

***Section 3:*** ***WATER CONSERVATION ACTION PLAN:*** This plan establishes water conservation measures to be taken in response to current and anticipated levels of deficiency in State and/or local water supplies. No Water User shall waste water or make, cause, or permit the use of water for any purpose contrary to any provision of this Ordinance, or in quantities in excess of the use permitted by the conservation stage in effect pursuant to this Ordinance.

***3.1 Efficient Water Use.*** *Because more severe effects of a water shortage are often brought about due to wasteful water use habits carried over from times of sufficient supply, certain voluntary water-use practices are encouraged at all times.*

***3.1.1 Outdoor Water Use Efficiency Guidelines and Recommendations:***

***a)*** Sprinklers should be maintained and adjusted so that overspray, runoff, and water waste is avoided. The most effective and water-efficient irrigation should be used, and drip irrigation should be considered where appropriate.

***b)*** All leaks in plumbing and irrigation systems should be repaired promptly

***c)*** Vehicles should be washed using a hose equipped with automatic shutoff nozzle.

***d)*** Sidewalks, walkways, driveways, parking lots or any other hard-surfaced areas should not be washed down, except for health and safety purposes.

***e)*** Low-water-use native or drought-tolerant vegetation should be used to minimize the need for irrigation. Plants and trees with similar water needs should be grouped together for most efficient irrigation. (Please see our website (agency site) for more information and links to other websites listing drought tolerant plants.)

***f)*** Landscape should be installed in a manner that will reduce the amount of water needed for irrigation. For example, the use of mulches and watering basins is encouraged where appropriate.

***g)*** Irrigation should occur during optimal watering hours, avoiding wind and heat. The following hours are considered the most efficient hours for (Agency)customers to effectively irrigate lawns and landscaped areas:

***Winter/Fall (November through April)*** – 6 PM to 10 AM

***Spring/Summer (May through October)*** –8 PM to 9 AM

***h)*** Water usage on any decorative fountains, ponds or other types of water streams should be minimized by incorporating a water recycling system so the water is continually recovered and reused.

***i)*** Pool and spa safety covers or evaporation-reducing water treatments should be considered if safe and appropriate for the situation. These will help minimize water loss due to evaporation. Pool and spa chemistry should be balanced and maintained to help reduce the frequency of pool/spa draining and refilling.

***3.1.2 <u>Indoor Water Use Efficiency Guidelines and Recommendations</u>:***

***a)*** All leaks and/or damage to faucets, toilets, and indoor pipes should be repaired immediately.

***b)*** Low flow devices for indoor plumbing fixtures including faucets, kitchen spray nozzles, toilets, and showers should be used where possible.

***c)*** Install 1.3 or less gallon per flush (gpf) high efficiency toilets or .08/1.6 gallon per flush (gpf) dual-flush toilets.

***d)*** Water-efficient Energy Star® approved appliances including, but not limited to, clothes washers and dishwashers should be used.

***e)*** Clothes washers and dishwashers should be run using full loads to maximize water efficiency.

***f)*** A source specific hot water dispenser or a whole house hot water recirculation system should be considered. These devices generate hot water within seconds, minimizing running the water until it is hot.

***g)*** All commercial establishments where food or beverages are provided should encourage the serving of water to their customers only when specifically requested by the customer.

***3.1.3 <u>New Construction Water Efficiency Guidelines:</u>*** As new technology advances, builders of new structures or persons retrofitting existing facilities should consider options such as evapotranspiration-controlled sprinkler systems, grey water or non-potable water systems (where legally acceptable), storm water cisterns, and landscape designs minimizing the use of turf and water-intensive plants. Businesses should review industry-specific guidance for ways to reduce water usage and should consider programs such as multi-pass cooling towers and process water recycling. Conveyor car wash and commercial laundry systems must utilize a recirculating system. Decorative water fountains, ponds or other types of water streams must incorporate a water recycling system.

***3.2 <u>Water Conservation Stage 1 Water Alert –</u>:*** *At this stage of water deficiency, the Water Users are strongly encouraged to adhere to all the guidelines in section 3.1, Water Use Efficiency Guidelines. The following practices are also strongly suggested during Stage 1 water deficiencies:*

***a)*** Outdoor irrigation of all vegetation including lawns and landscaping is limited to three times per week and no more than 10 minutes per watering station. Irrigation should occur during the following hours:

***Winter/Fall (November through April)*** – 6 PM to 10 AM

***Spring/Summer (May through October)*** – 8 PM to 9 AM

***b)*** Repair all water leaks within five (5) days of notification by Water Purveyor.

***3.3 <u>Water Conservation Stage 2 Water Warning:</u>*** *At this stage of water deficiency, Efficient Water Use Guidelines (3.1.1-3.1.2 above) and Stage 1 practices (3.2 above) become mandatory requirements. Further mandatory practices during Stage 2 are as follows:*

- ***a)*** All new landscaping shall be limited to widely accepted drought-tolerant plants requiring less than typical water requirements.
- ***b)*** No new lawns, whether by seed or sod, shall be installed.
- ***c)*** No filling of pools or spas. Water levels may be maintained.
- ***d)*** No filling of or re-filling of decorative fountains, ponds or other types of water streams, except to the extent needed to sustain aquatic life, provided that such animals are of significant value and have been actively managed within the water feature prior to the enactment of a stage 2 water warning.
- ***e)*** Repair all water leaks within seventy-two (72) hours of notification by Water Purveyor.

***3.4 <u>Water Conservation Stage 3 Water Emergency:</u>*** *At this stage of water deficiency, Efficient Water Use Guidelines (3.1.1-3.1.2 above), Stage 1 practices (3.2 above), and Stage 2 practices (3.3 above) become mandatory requirements. Further mandatory practices during Stage 3 are as follows:*

- ***a)*** No new applications for service will be accepted.
- ***b)*** No water for grading will be allowed.
- ***c)*** Washing vehicles is prohibited, except at commercial facilities that recycle water.
- ***d)*** Street cleaning with potable water is prohibited.
- ***e)*** Repair all water leaks within forty-eight (48) hours of notification by Water Purveyor.

***3.5 <u>Water Conservation Stage 4 Water Crisis:</u>*** *At this stage of water deficiency, Efficient Water Use Guidelines (3.1.1- 3.1.2 above), Stage 1 practices (3.2 above), Stage 2 practices (3.3 above), and Stage 3 practices (3.4 above) become mandatory requirements. Further mandatory practices during Stage 4 are as follows:*

- ***a)*** Outdoor irrigation of all vegetation including lawns and landscaping is prohibited. Existing trees and larger shrubs will be exempt.
- ***b)*** No new landscaping shall be permitted.

Repair all water leaks within twenty-four (24) hours of notification by Water Purveyor.

***Section 4:*** ***ENFORCEMENT:***

***4.1*** ***Efficient Water Use and Stage 1 Enforcement:***

***a)*** Any notification of signs or indications of water leaks or water waste will be documented. The Purveyor will confirm the water waste prior to any further action.

***b)*** The Purveyor shall determine the action to be taken to inform the Water User of the guidelines in this Ordinance and to encourage more efficient and cost-effective water use.

***4.2*** ***Stage 2, 3 and 4 Enforcement.*** *The Purveyor has the duty and is authorized to enforce provisions of Stage 2, 3, and 4 of this Ordinance. If a violation is ongoing, the Purveyor may disconnect service until the violation is corrected.*

***4.2.1*** ***First Violation.*** For a first violation, an elevated usage letter shall be issued to the Water User.

***4.2.2*** ***Second Violation.*** For a second violation, a corrective action letter shall be issued to the Water User, and a fine of $40 shall be added to the Water User's bill at the property where the violation occurred if the corrective action is not taken within 10 days after receiving the written warning.

***4.2.3*** ***Third Violation.*** For a third violation, a fine of $100 shall be added to the Water User's bill at the property where the violation occurred if the corrective action is not taken within 10 days after receiving the written warning. In addition to the fine, the Purveyor may require installation of a flow restricting device on the Water User's service connection.

***4.2.4*** ***Fourth Violation.*** For the fourth and any additional violations, a fine of $250 shall be added to the Water User's bill at the property where the violation occurred. The Purveyor may also discontinue the Water User's water service at the property where the violation occurred. Re-connection shall be permitted only when there is reasonable protection against future violations, such as a flow-restricting device on the customer's service connection, as determined at the Purveyor's discretion.

***4.3*** ***District Enforcement Costs.*** The Purveyor shall be reimbursed for its costs and expenses in enforcing the provisions of this Ordinance, including such costs as incurred for Purveyor staff to investigate and monitor the Water User's compliance with the terms of this Ordinance. The charges for the installation of flow restricting devices or for discontinuing or restoring water service, as the Purveyor incurs those charges, shall be added to the Water User's bill at the property where the enforcement costs were incurred.

***Section 5:*** ***ADMINISTRATION:***

***5.1*** ***General.*** The provisions of this Ordinance shall be administered and enforced by the Purveyor , who may delegate such enforcement to one or more employees or contractors of the Purveyor. The Purveyor may implement additional demand reduction practices, including surcharges, rationing, and specific water allocations, in times of severe shortage or emergency situations.

***5.1.1*** ***Water Utility Accounts.*** Accounts shall not be established for new customers, including the transfer of accounts upon change of ownership, until the customer agrees to comply with the provisions of this Ordinance.

***5.1.2*** ***Discretionary Exemptions.*** The Purveyor may, in its discretion, exempt Water Users and individual facilities of Water Users from the provisions of this Ordinance, or impose reasonable conditions in lieu of compliance with this Ordinance, if it is found that any of the following conditions exist:

***a)*** Hardship. The requirements of this Ordinance would cause an unnecessary and undue hardship upon the Water User, the Water User facility or the public.

***b)*** Health and Safety. Strict compliance with the requirements of this Ordinance would create an emergency condition, as determined by the Purveyor or other governmental entity with appropriate jurisdiction, affecting the health, protection or safety of the Water User or the public.

***c)*** No Impact on Water Use. The granting of the exemption or imposition of reasonable conditions in lieu of compliance with this Ordinance would not increase the quantity of water consumed by the Water User or otherwise adversely affect service to other Water Users. In other words, the Water User will create an offset. In granting any such relief, the departure from the requirements of this Ordinance shall be limited to the minimum necessary to address the circumstances upon which such departure is required by a Water User.

***5.1.3*** ***Appeals.*** Any customer or applicant for a water service may appeal any decision under this Ordinance to the Purveyor whose decision shall be final.

RULE N0. 14.1

## WATER CONSERVATION AND RATIONING PLAN

### GENERAL INFORMATION (C)

1. If water supplies are projected to be insufficient to meet normal customer demand, and are beyond the control of the utility, the utility may elect to implement voluntary conservation using the portion of this plan set forth in Section A of this Rule, after notifying the Director of the Commission's Division of Water and Audits of its intent, via a letter in both hard-copy and e-mailed formats.

2. Prior to declaration of mandatory rationing, a utility may request authorization of a Schedule 14.1 – Staged Mandatory Water Conservation and Rationing tariff, via a Tier 2 advice letter.

3. If, in the opinion of the utility, more stringent water measures are required, the utility shall request Commission authorization to implement the staged mandatory conservation and rationing measures set forth in Sections B through E.

4. The utility shall file a Tier 1 advice letter to request activation of a particular stage of Schedule 14.1 – Staged Mandatory Water Conservation and Rationing tariff.

   a. If a Declaration of Mandatory Rationing is made by utility or governing agency, or

   b. If the utility is unable to address voluntary conservation levels set by itself, supplier, or governing agency, or

   c. If the utility chooses to subsequently activate a different stage

5. When Schedule 14.1 is in effect and the utility determines that water supplies are again sufficient to meet normal demands, and mandatory conservation and rationing measures are no longer necessary, the utility shall seek Commission approval via a Tier 1 advice letter to de-activate the particular stage of mandatory rationing that had been authorized.

6. In the event of a water supply shortage requiring a voluntary or mandatory program, the utility shall make available to its customers water conservation kits as required by its version of Rule 20. The utility shall notify all customers of the availability of conservation kits via a bill insert or direct mailers.

(continued) (C)

RULE N0. 14.1
(continued)

## WATER CONSERVATION AND RATIONING PLAN

### A. CONSERVATION - NON-ESSENTIAL OR UNAUTHORIZED WATER USE (C)

No customer shall use utility-supplied water for non-essential or unauthorized uses, including but not limited to:

1. Use of potable water for more than minimal landscaping, as defined in the landscaping regulated of the jurisdiction or as described in Article 10.8 of the California Government Code in connection with new construction;
2. Use through any meter when the company has notified the customer in writing to repair a broken or defective plumbing, sprinkler, watering or irrigation system and the customer has failed to effect such repairs within five business days;
3. Use of potable water which results in flooding or runoff in gutters or streets;
4. Individual private washing of cars with a hose except with the use of a positive action shut-off nozzle. Use of potable water for washing commercial aircraft, cars, buses, boats, trailers, or other commercial vehicles at any time, except at commercial or fleet vehicle or boat washing facilities operated at a fixed location where equipment using water is properly maintained to avoid wasteful use;
5. Use of potable water washing buildings, structures, , driveways, patios, parking lots, tennis courts, or other hard-surfaced areas, except in the cases where health and safety are at risk;
6. Use of potable water to irrigate turf, lawns, gardens, or ornamental landscaping by means other than drip irrigation, or hand watering without quick acting positive action shut-off nozzles, on a specific schedule, for example: 1) before 9:00 a.m. and after 5:00 p.m.; 2) every other day; or 3) selected days of the week;
7. Use of potable water for watering streets with trucks, except for initial wash-down for construction purposes (if street sweeping is not feasible), or to protect the health and safety of the public;

(continued) (C)

RULE NO. 14.1
(continued)

## WATER CONSERVATION AND RATIONING PLAN

### A. CONSERVATION – NON-ESSENTIAL OR UNAUTHORIZED WATER USE (CONT.) (C)

8. Use of potable water for construction purposes, such as consolidation of backfill, dust control, or other uses unless no other source of water or other method can be used.
9. Use of potable water for construction purposes unless no other source of water or other method can be used;
10. Use of potable water for street cleaning;
11. Operation of commercial car washes without recycling at least 50% of the potable water used per cycle;
12. Use of potable water for watering outside plants, lawn, landscape and turf areas during certain hours if and when specified in Schedule No. 14.1 when the schedule is in effect;
13. Use of potable water for decorative fountains or the filling or topping off of decorative lakes or ponds. Exceptions are made for those decorative fountains, lakes, or ponds which utilize recycled water;
14. Use of potable water for the filling or refilling of swimming pools.
15. Service of water by any restaurant except upon the request of a patron; and
16. Use of potable water to flush hydrants, except where required for public health or safety.

### B. STAGED MANDATORY RATIONING OF WATER USAGE

1. Prior to declaration of mandatory rationing, a utility may request authorization of a Schedule 14.1 – Staged Mandatory Water Conservation and Rationing tariff, via a Tier 2 advice letter, with full justification. The utility may not institute Schedule 14.1 until it has been authorized to do so by the Commission.

(continued) (C)

RULE NO. 14.1
(continued)

## WATER CONSERVATION AND RATIONING PLAN

B. STAGED MANDATORY RATIONING OF WATER USAGE (Cont) (C)

a. A staged Schedule 14.1 that has been authorized by the Commission shall remain dormant until triggered by specific conditions detailed in the Schedule 14.1 tariff and utility has requested and received authorization for activating a stage by Commission.

b. Notice of the Tier 2 advice letter and associated public participation hearing shall be provided to customers under General Order (GO) 96-B rules.

c. Utility shall comply with all requirements of Sections 350-358 of the California Water Code.

d. The Tier 2 advice letter requesting institution of a Schedule 14.1 shall include but not be limited to:

   i. Proposed Schedule 14.1 tariff, which shall include but not be limited to:

      1. Applicability,
      2. Territory applicable to,
      3. A detailed description of each Stage of Rationing,
      4. A detailed description of the Trigger that Activates each Stage of Rationing,
      5. A detailed description of each water use restriction for each stage of rationing.
      6. Water use violation levels, written warning levels, associated fines, and exception procedures,
      7. Conditions for installation of a flow restrictor,
      8. Charges for removal of flow restrictors, and
      9. Special Conditions (C)

(continued)

RULE N0. 14.1
(continued)

## WATER CONSERVATION AND RATIONING PLAN

B. STAGED MANDATORY RATIONING OF WATER USAGE (Cont) (C)

ii. Justification for, and documentation and calculations in support of plan, including but not limited to each item in B.1.d.i above.

2. Number of Stages requested by each utility/district may vary, depending on specifics of water shortage event.

3. The utility shall file a Tier 1 advice letter to request activation of a particular stage of Schedule 14.1 -- Staged Mandatory Water Conservation and Rationing tariff.

a. If a Declaration of Mandatory Rationing is made by utility or governing agency,

b. If the utility is unable to address voluntary conservation levels set by itself or governing agency, or

c. If the utility chooses to subsequently activate a different stage.

d. The Tier 1 advice letter requesting activation of a Schedule 14.1 shall include but not be limited to:

i. Justification for activating this particular stage of mandatory rationing, as well as period during which this particular stage of mandatory conservation and rationing measures will be in effect.

ii. When the utility requests activation of a particular Stage, it shall notify its customers as detailed in Section E, below.

4. All monies collected by the utility through water use violation fines shall not be accounted for as income.

5. All expenses incurred by utility to implement Rule 14.1 and Schedule 14.1 that have not been considered in a General Rate Case or other proceeding, shall be recoverable by utility if determined to be reasonable by Commission.

a. These monies shall be accumulated by the utility in a separate memorandum account for disposition as directed or authorized from time to time by the Commission. (C)

(continued)

Valencia Water Company
24631 Avenue Rockefeller
Valencia, CA 91355
Los Angeles County

Original Cal. P.U.C. Sheet No. 617-W
Canceling Cal. P.U.C. Sheet No.

RULE NO. 14.1

WATER CONSERVATION AND RATIONING PLAN

C. ENFORCEMENT OF STAGED MANDATORY CONSERVATION AND RATIONING (N)

1. The water use restrictions of the conservation program, in Section A of this rule, become mandatory when the authorized Schedule 14.1-Staged Mandatory Rationing Program is triggered, the utility files a Tier 1 advice letter requesting activation of a particular stage, and authorization is received from the Commission.

a. In the event a customer is observed to be using water for any nonessential or unauthorized use as defined in Section A of this rule, the utility may charge a water use violation fine in accordance with Schedule No. 14.1.

2. The utility may, after one verbal and one written warning, install a flow-restricting device on the service line of any customer observed by utility personnel to be using water for any non-essential or unauthorized use as defined in Section A above.

3. A flow restrictor shall not restrict water delivery by greater than 50% of normal flow and shall provide the premise with a minimum of 3 Ccf/person/month. The restricting device may be removed only by the utility, only after a three-day period has elapsed, and only upon payment of the appropriate removal charge as set forth in Schedule No. 14.1.

4. After the removal of the restricting device, if any non-essential or unauthorized use of water shall continue, the utility may install another flow-restricting device. This device shall remain in place until water supply conditions warrant its removal and until the appropriate charge for removal has been paid to the utility.

5. Any tampering with flow restricting device by customer can result in fines or discontinuation of water use at the utility's discretion.

6. If, despite installation of such flow-restricting device pursuant to the provisions of the previous enforcement conditions, any such non-essential or unauthorized use of water shall continue, then the utility may discontinue water service to such customer. In such latter event, a charge as provided in Rule No. 11 shall be paid to the utility as a condition to restoration of service. (N)

(continued)

(To be inserted by utility)
Advice Letter No. 134
Decision No.

Issued by
Keith Abercrombie
NAME
General Manager
TITLE

(To be inserted by Cal. P.U.C.)
Date Filed MAR - 3 2011
Effective MAR - 3 2011
Resolution No.

RULE NO. 14.1

WATER CONSERVATION AND RATIONING PLAN

C. ENFORCEMENT OF STAGED MANDATORY CONSERVATION AND RATIONING (Cont) (N)

7. All monies collected by the utility through water use violation fines shall not be accounted for as income. All expenses incurred by utility to implement Rule 14.1 and Schedule 14.1 that have not been considered in a General Rate Case or other proceeding, shall be recoverable by utility if determined to be reasonable by Commission. These additional monies shall be accumulated by the utility in a separate memorandum account for disposition as directed or authorized from time to time by the Commission.

8. The charge for removal of a flow-restricting device shall be in accordance with Schedule No. 14.1.

D. APPEAL PROCEDURE

1. Any customer who seeks a variance from any of the provisions of this water conservation and rationing plan shall notify the utility in writing, explaining in detail the reason for such a variation. The utility shall respond to each such request in writing.

2. Any customer not satisfied with the utility's response may file an appeal with the staff of the Commission. The customer and the utility will be notified of the disposition of such appeal by letter from the Executive Director of the Commission. (N)

(continued)

RULE NO. 14.1
(continued)

WATER CONSERVATION AND RATIONING PLAN

D. APPEAL PROCEDURE

3. If the customer disagrees with such disposition, the customer shall have the right to file a formal complaint with the Commission. Except as set forth in this Section, no person shall have any right or claim in law or in equity, against the utility because of, or as a result of, any matter or thing done or threatened to be done pursuant to the provisions of this water conservation and rationing plan. (N)

E. PUBLICITY

1. As stated under Section B.1.b and c, when a utility requests authorization of a Schedule 14.1 -- Staged Mandatory Water Conservation and Rationing tariff, via a Tier 2 advice letter, it shall provide notice of the Tier 2 advice letter and associated public meeting provided to customers, under General Order (GO) 96-B rules, and shall comply with all requirements of Sections 350-358 of the California Water Code (CWC), including but not limited to the following:

a. In order to be in compliance with both the GO and CWC, the utility shall provide notice via both newspaper and bill insert/direct mailing.

b. Utility shall file one notice for each advice letter filed, that includes both notice of the filing of the Tier 2 advice letter as well as the details of the public meeting (date, time, place, etc).

c. The public meeting shall be held after the utility files the Tier 2 advice letter, and before the Commission authorizes implementation of the tariff.

d. Utility shall consult with Division of Water and Audits staff prior to filing advice letter, in order to determine details of public meeting. (N)

(continued)

Valencia Water Company
24631 Avenue Rockefeller
Valencia, CA 91355
Los Angeles County

Original Cal. P.U.C. Sheet No. 620-W
Canceling _____ Cal. P.U.C. Sheet No. _____

RULE N0. 14.1
(continued)

WATER CONSERVATION AND RATIONING PLAN

E. PUBLICITY (Cont)

2. In the event that a Schedule 14.1-Staged Mandatory Rationing Plan is triggered, and a utility requests activation through the filing of a Tier 1 advice letter, the utility shall notify its customers and provide each customer with a copy of Schedule 14.1 by means of bill insert or direct mailing. Notification shall take place prior to imposing any fines associated with this plan. (N)

3. During the period that a stage of Schedule 14.1 is activated, the utility shall provide customers with updates in at least every other bill, regarding its water supply status and the results of customers' conservation efforts. (N)

# CALIFORNIA PUBLIC UTILITIES COMMISSION

Water Division

# INSTRUCTIONS FOR WATER CONSERVATION, RATIONING AND SERVICE CONNECTION MORATORIA

Standard Practice U-40-W

**SAN FRANCISCO, CALIFORNIA**

**July 2007**

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INSTRUCTIONS FOR WATER CONSERVATION,
RATIONING AND SERVICE CONNECTION MORATORIA

## A—PURPOSE AND SCOPE

1. The purpose of this standard practice is to provide guidance to Water Division staff, to the public and to utilities as to steps to be taken when the utility suffers from a water shortage. The three levels of action are voluntary rationing, mandatory rationing and a service connection moratorium.

## B—BACKGROUND

2. General Order 103, Chart 1, and Standard Practice U-22-W, Determination of Water Supply Requirements of Water Systems, address water supply requirements, but supply can be affected temporarily due to drought or decreased production of a utility's wells. When this happens, utilities may have to resort to mandatory conservation or may have to institute a service connection moratorium.

3. Parties may also protest service area extensions (see Standard Practice U-14-W) over concern that the available supplies may be inadequate to serve the new customers, which would be the equivalent of a service connection moratorium (see Section F)[1].

4. The position of the Commission in overall water supply planning was set forth in Decision 99-04-061, April 22, 1999 (see Appendix A to this Standard Practice).

## C—DEVELOPMENT OF CONSERVATION AND RATIONING

5. In mid-1976, due to a drought, the Commission opened an Order Instituting Investigation (OII, Case No. 10114, June 8, 1976) to determine what actions to take. In early 1977, the Commission issued an emergency decision that allowed water utilities to distribute water conservation kits and to implement cost effective water conservation programs.

6. The Commission was once again faced with drought conditions in mid-1988. The Commission opened OII 89-03-005 that allowed all classes of water utilities to file a water conservation and rationing plan consisting of two distinct parts: Rule 14.1 (a "voluntary conservation" program) and Schedule 14.1 (the mandatory rationing and penalty part). This plan was based primarily upon the Department of Water Resources and Metropolitan Water District's model plans, but also

[1] In Resolution No. 4154, August 5, 1999, the Sierra Club protested Valencia Water Company's Advice Letters 84 and 85 for service area extension. The Commission found in the favor of Valencia, that it had adequate supplies, but ordered the utility to file its Water Management Program by application so the long-term water availability issues could be heard.

incorporated aspects of the North Marin Water District, East Bay Municipal Utility District, and California Water Service Company's existing conservation and rationing plans. The main objective of Rule 14.1 and Schedule 14.1 was to have a plan readily available for any utility that needed conservation and/or rationing methods. This plan allowed regulated utilities to achieve conservation of 17.5% to 26%.

7. The drought was officially declared over in February 1993 and the OII was closed. Because history shows that drought occurs in California about once every ten years, Rule 14.1 has remained in place. When conditions become severe, the utility may file an advice letter to institute Schedule 14.1. The Commission must approve implementation of this schedule by resolution.

## D—VOLUNTARY RATIONING

8. Voluntary rationing consists of the steps described in Rule 14.1 (Appendix B). This Tariff Rule should be in the tariff book of every utility that might suffer from a water shortage.

## E—MANDATORY RATIONING

9. Mandatory rationing consists of the steps described in Schedule 14.1. The utility adds schedule 14.1 to its tariff book by filing an advice letter with full justification. Staff will prepare a resolution for consideration by the Commission. The Commission must approve the imposition of mandatory conservation.

10. Schedule 14.1 may be modified to fit the needs of the utility and its particular water shortage situation. The following provisions are examples of what might be included in a typical Schedule 14.1:

A. Prohibit nonessential and unauthorized water use, including:
   i. use for more than minimal landscaping in connection with new construction;
   ii. use through any meter when the company has notified the customer in writing to repair a broken or defective plumbing, sprinkler, watering or irrigation system and the customer has failed to effect such repairs within five days;
   iii. use of water which results in flooding or runoff in gutters or streets;
   iv. use of water through a hose for washing cars, buses, boats, trailers or other vehicles without a positive automatic shut-off valve on the outlet end of the hose;
   v. use of water through a hose for washing buildings, structures, sidewalks, walkways, driveways, patios, parking lots, tennis courts, or other hard-surfaced areas;
   vi. use of water to clean, fill or maintain levels in decorative fountains;

vii. use of water for construction purposes unless no other source of water or other method can be used;
viii. service of water by any restaurant except upon the request of a patron; and
ix. use of water to flush hydrants, except where required for public health or safety.

B. Establish customer water allocations at a percentage of historical usage with the corresponding billing periods of a non-drought year being the base.

C. Establish an allocation of a percentage of historical usage with the corresponding billing periods of a non-drought year being the base for consumption for users of process water (water used to manufacture, alter, convert, clean, grow, heat or cool a product, including water used in laundries and car wash facilities that recycle the water used).

D. Establish a minimum allocation of a number of Ccf per month (one Ccf is one hundred cubic feet) for any customer regardless of historical usage.

E. Establish an exceptions procedure for customers with no prior billing period record or where unusual circumstances dictate a change in allocation.

F. Establish a penalty ("conservation fee") of $2.00 per Ccf for usage over allocated amounts, provided, however, that banking of underusage from month to month is allowed.

G. Provide that penalty funds are not to be accounted for as income, but are to be kept in a separate reserve account for disposition as directed by the Commission.

H. Provide that, after written warning for nonessential or unauthorized water use, for subsequent violations the utility may install a flow restrictor to be left in a minimum of three days. The second time a flow restrictor is installed it may be left in until rationing ends.

I. Establish charges of $25, $50, or actual cost depending on meter size for removing restrictors, and provide that continuing nonessential or unauthorized use may result in disconnection.

J. Establish an appeal procedure first through the utility, then to the Commission staff through the Executive Director, then to the Commission via a formal complaint.

## F—SERVICE CONNECTION MORATORIUM

11. A service connection moratorium is sometimes imposed by the California Department of Health Services. The California Water Code, Section 350 et seq.,

provides that any public water supplier may, after public notice and hearing, declare a water shortage emergency within its service area whenever it determines that the ordinary demands and requirements of its consumers cannot be satisfied without depleting the water supply to the extent that there would be insufficient water for human consumption, sanitation, and fire protection. After it has declared a water shortage emergency, it must adopt such regulations and restrictions on water delivery and consumption as it finds will conserve its water supply for the greatest public benefit. Section 357 requires that suppliers which are subject to regulation by the CPUC shall secure its approval before making such regulations and restrictions effective.

12. Section 2708 of the Public Utilities Code states:

> **2708.** Whenever the commission, after a hearing had upon its own motion or upon complaint, finds that any water company which is a public utility operating within this State has reached the limit of its capacity to supply water and that no further consumers of water can be supplied from the system of such utility without injuriously withdrawing the supply wholly or in part from those who have theretofore been supplied by the corporation, the commission may order and require that no such corporation shall furnish water to any new or additional consumers until the order is vacated or modified by the commission. The commission, after hearing upon its own motion or upon complaint, may also require any such water company to allow additional consumers to be served when it appears that service to additional consumers will not injuriously withdraw the supply wholly or in part from those who theretofore had been supplied by such public utility.

13. To establish a service connection moratorium the utility must:

a. Hold a public meeting under Section 350 and 351 of the Water Code
b. Add the following language to each service schedule:

> "MORATORIUM
> No service shall be provided to any premises not previously served within the _____ Service Area as defined on the Service Area Map filed as a part of these tariffs."

## G—EXEMPTIONS

14. Some decisions to impose a moratorium contain exceptions. For example in Citizen's Utilities (CUCC) Montara District:

> "The moratorium shall not apply to owners of real property who are customers of CUCC on or before the date of this order, or their successors in interest, if any change in the use of their property

will not increase their demand upon the system." (D.86-05-078, Ordering Paragraph 3.)

15. D.86-05-078 also provided that prospective customers could seek an exemption from the moratorium by filing an application with the Commission showing that extraordinary circumstances required an exemption.

16. In D.00-06-020, June 8, 2000 the Commission granted an application and authorized Citizens Utilities to install a water service connection to applicant's property at APN 037-278-090 following cessation of service at applicant's property at 888 Ocean Boulevard in Montara. Costs were to be borne by applicant. The order made it clear that water service could not be reinstated at 888 Ocean Boulevard absent a lifting or easing of the moratorium. Such determinations were also delegated to staff[2].

[2] D.86-05-078, May 28, 1986, Ordering Paragraph 4.

The Commission's Role in Water Planning

The two state agencies primarily responsible for overseeing water planning are the California Department of Water Resources, which is manages the State Water Project and produces the California Water Plan, and the State Water Quality Control Board and Regional Water Quality Control Boards which have authority over water allocation and water quality protection.

In addition to the state agencies which have broad planning and management powers, local government also has a part in water use decisions. For example, county boards of supervisors, county water agencies, land use planning agencies, city governments, municipal water districts and many special districts all have a role in the use of water in California.

In this context, the Commission has recognized the futility of one party taking unilateral action to protect a groundwater basin:

> Rehabilitation of the Santa Maria Groundwater Basin is not the responsibility of, and is beyond the physical and financial resources of any single individual, company, or agency. Even if [Southern California Water Company] were to stop drawing from the basin entirely and injected into the basin the entire 7,900 AFY it desires to obtain from the [Central Coast Water Authority], the basin's fundamental problems of declining quantity and water quality would not be solved. Most simply put, the basin's salvation as a water resource requires the immediate, undivided, sincere and selfless attention of all its users.

(Re Southern California Water Company, 48 CPUC2d 511, 519 (D.93-03-066)(emphasis in original).)

The Commission's role is limited to ensuring that each jurisdictional water utility provides its customers with "just and reasonable service, . . . and facilities as are necessary to promote the safety, health, comfort and convenience of its patrons, employees, and the public." (§ 451.) The Commission has further delineated the service standard in its General Order 103 where it proscribes Standards of Service

including water quality, water supply, and water pressure, as well as many other details of service.

The Commission has not, however, dictated to investor-owned utilities what method of obtaining water must be used to meet its present and future responsibility of providing safe and adequate supply of water at reasonable rates. (Southern California Water, 48 CPUC2d at 517.)

Which is not to suggest that the Commission ignores issues of water availability in its regulation of water utilities. The Commission requires that all water utilities prepare, file, and update a water management plan which includes identification of water sources as well as consumption projections over 15 years. These plans are updated by the utility as part of its general rate case.

RULE N0. 14.1
WATER CONSERVATION AND RATIONING PLAN

GENERAL INFORMATION

If water supplies are projected to be insufficient to meet normal customer demand, and are beyond the control of the utility, the utility may elect to implement voluntary conservation using the portion of this plan set forth in Section A of this Rule after notifying the Commission's Water Division of its intent. If, in the opinion of the utility, more stringent water measures are required, the utility shall request Commission authorization to implement the mandatory conservation and rationing measures set forth in Section B.

The Commission shall authorize mandatory conservation and rationing by approving Schedule No. 14.1, Mandatory Water Conservation and Rationing. When Schedule No. 14.1 has expired, or is not in effect, mandatory conservation and rationing measures will not be in force. Schedule No. 14.1 will set forth water use violation fines, charges for removal of flow restrictors, and the period during which mandatory conservation and rationing measures will be in effect.

When Schedule No. 14.1 is in effect and the utility determines that water supplies are again sufficient to meet normal demands, and mandatory conservation and rationing measures are no longer necessary, the utility shall seek Commission approval to rescind Schedule No. 14.1 to discontinue rationing.

In the event of a water supply shortage requiring a voluntary or mandatory program, the utility shall make available to its customers water conservation kits as required by Rule 20. The utility shall notify all customers of the availability of conservation kits.

(continued)

RULE N0. 14.1
(continued)

## WATER CONSERVATION AND RATIONING PLAN

### A. CONSERVATION - NON-ESSENTIAL OR UNAUTHORIZED WATER USE

No customer shall use utility-supplied water for non-essential or unauthorized uses as defined below:

1. Use of water through any connection when the utility has notified the customer in writing to repair a broken or defective plumbing, sprinkler, watering or irrigation system and the customer has failed to make such repairs within 5 days after receipt of such notice.

2. Use of water which results in flooding or run-off in gutters, waterways, patios, driveway, or streets.

3. Use of water for washing aircraft, cars, buses, boats, trailers or other vehicles without a positive shut-off nozzle on the outlet end of the hose. Exceptions include washing vehicles at commercial or fleet vehicle washing facilities operated at fixed locations where equipment using water is properly maintained to avoid wasteful use.

4. Use of water through a hose for washing buildings, structures, sidewalks, walkways, driveways, patios, parking lots, tennis courts, or other hard-surfaced areas in a manner which results in excessive run-off or waste.

5. Use of water for watering streets with trucks, except for initial wash-down for construction purposes (if street sweeping is not feasible), or to protect the health and safety of the public.

6. Use of water for construction purposes, such as consolidation of backfill, dust control, or other uses unless no other source of water or other method can be used.

7. Use of water for more than minimal landscaping in connection with any new construction.

(continued)

RULE N0. 14.1
(continued)

# WATER CONSERVATION AND RATIONING PLAN

A. CONSERVATION – NON-ESSENTIAL OR UNAUTHORIZED WATER USE (CONT.)

8. Use of water for outside plants, lawn, landscape, and turf areas more often than every other day, with even numbered addresses watering on even numbered days of the month and odd numbered addresses watering on the odd numbered days of the month, except that this provision shall not apply to commercial nurseries, golf courses and other water-dependent industries.

9. Use of water for watering outside plants, lawn, landscape and turf areas during certain hours if and when specified in Schedule No. 14.1 when the schedule is in effect.

10. Use of water for watering outside plants and turf areas using a hand-held hose without a positive shut-off valve.

11. Use of water for decorative fountains or the filling or topping off of decorative lakes or ponds. Exceptions are made for those decorative fountains, lakes, or ponds which utilize recycled water.

12. Use of water for the filling or refilling of swimming pools.

13. Service of water by any restaurant except upon the request of the patron.

B. RATIONING OF WATER USAGE

In the event the conservation measures required by Section A are insufficient to control the water shortage, the utility shall, upon Commission approval, imposed mandatory conservation and rationing. Rationing shall be in accordance with the conditions set forth in Schedule No. 14.1 as filed at the time such rationing is approved by the Commission.

Before mandatory conservation and rationing is authorized by the Commission, the utility shall hold public meetings and takes all other applicable steps required by Sections 350 through 358 of the California Water Code.

(continued)

RULE N0. 14.1
(continued)

# WATER CONSERVATION AND RATIONING PLAN

C. ENFORCEMENT OF MANDATORY CONSERVATION AND RATIONING

1. The water use restrictions of the conservation program, in Section A of this rule, become mandatory when the rationing program goes into effect. In the event a customer is observed to be using water for any nonessential or unauthorized use as defined in Section A of this rule, the utility may charge a water use violation fine in accordance with Schedule No. 14.1.

2. The utility may, after one verbal and one written warning, install a flow-restricting device on the service line of any customer observed by utility personnel to be using water for any non-essential or unauthorized use as defined in Section A above.

3. A flow restrictor shall not restrict water delivery by greater than 50% of normal flow and shall provide the premise with a minimum of 6 Ccf/month. The restricting device may be removed only by the utility, only after a three-day period has elapsed, and only upon payment of the appropriate removal charge as set forth in Schedule No. 14.1.

4. After the removal of the restricting device, if any non-essential or unauthorized use of water shall continue, the utility may install another flow-restricting device. This device shall remain in place until water supply conditions warrant its removal and until the appropriate charge for removal has been paid to the utility.

5. If, despite installation of such flow-restricting device pursuant to the provisions of the previous enforcement conditions, any such non-essential or unauthorized use of water shall continue, then the utility may discontinue water service to such customer. In such latter event, a charge as provided in Rule No. 11 shall be paid to the utility as a condition to restoration of service.

6. Any monies collected by the utility through water use violation fines shall not be accounted for as income, but shall be accumulated by the utility in a separate account for disposition as directed or authorized from time to time by the Commission.

7. The charge for removal of a flow-restricting device shall be in accordance with Schedule No. 14.1.

(continued)

RULE N0. 14.1
(continued)

# WATER CONSERVATION AND RATIONING PLAN

## D. APPEAL PROCEDURE

Any customer who seeks a variance from any of the provisions of this water conservation and rationing plan shall notify the utility in writing, explaining in detail the reason for such a variation. The utility shall respond to each such request.

Any customer not satisfied with the utility's response may file an appeal with the staff of the Commission. The customer and the utility will be notified of the disposition of such appeal by letter from the Executive Director of the Commission.

If the customer disagrees with such disposition, the customer shall have the right to file a formal complaint with the Commission. Except as set forth in this Section, no person shall have any right or claim in law or in equity, against the utility because of, or as a result of, any matter or thing done or threatened to be done pursuant to the provisions of this water conservation and rationing plan.

## E. PUBLICITY

In the event the utility finds it necessary to implement this plan, it shall notify customers and hold public hearings concerning the water supply situation, in accordance with Chapter 3, Water Shortage Emergencies, Sections 350 to 358, of the California Water Code. The utility shall also provide each customer with a copy of this plan by means of billing inserts or special mailings; notification shall take place prior to imposing any fines associated with this plan. In addition, the utility shall provide customers with periodic updates regarding its water supply status and the results of customers' conservation efforts. Updates may be by bill insert, special mailing, poster, flyer, newspaper, television or radio spot/advertisement, community bulletin board, or other appropriate methods.

SCHEDULE NO. 14.1
MANDATORY WATER CONSERVATION AND RATIONING

APPLICABILITY

This schedule applies to all water customers served under all tariff rates schedules authorized by the Commission. It is only effective in times of rationing, as required by Rule No. 14.1, and only for the period noted in the Special Conditions section below.

TERRITORY

This schedule is applicable within the entire territory served by the utility.

WATER USE VIOLATION FINE

When this schedule is in effect, the water use restrictions of the conservation program, in Section A of Rule 14.1, become mandatory. If a customer is seen violating the water usage restrictions, as outlined in Rule No. 14.1 and the Special Conditions below, the customer will be subject to the following fine structure:

| | |
|---|---|
| First offense - written warning | |
| Second offense - (of the same restriction) | $25 |
| Third offense - (of the same restriction) | $50 |
| Each additional offense - (of the same restriction) | $25 more than the previous fine imposed. |

Offenses for separate water use restrictions will each start at the warning stage.

The water use violation fine is in addition to the regular rate schedule charges.

(continued)

SCHEDULE NO. 14.1
MANDATORY WATER CONSERVATION AND RATIONING (CONT.)

FLOW RESTRICTOR REMOVAL CHARGE

The charge for removal of a flow-restricting device shall be:

| Connection Size | Removal Charges |
|---|---|
| 5/8" to 1" . . . . . | $25.00 |
| 1-1/2" to 2" . . . . . | $50.00 |
| 3" and larger . . . . . | Actual cost |

SPECIAL CONDITIONS

1. This tariff schedule shall remain in effect for period of six (6) months from the effective date set forth below.

2. There shall be no use of utility-supplied water for outside plants, lawn, landscape, and turf areas between the hours of 3:00 a.m. to 8:00 p.m., regardless of address or day of the month.

3. Water use violation fines may be applied to violations of Section A of Rule No. 14.1, which prohibits non-essential and unauthorized uses of water.

4. Water use violation fines must be separately identified on each bill.

5. All bills are subject to the reimbursement fee set forth on Schedule No. UF.

# LACWWD No. 36 Water Shortage Conservation Ordinance

MINUTES OF THE BOARD OF SUPERVISORS
COUNTY OF LOS ANGELES, STATE OF CALIFORNIA

Sachi A. Hamai, Executive Officer-
Clerk of the Board of Supervisors
383 Kenneth Hahn Hall of Administration
Los Angeles, California 90012

At its meeting held October 7, 2008, the Board took the following action:

72

The following item was called up for consideration:

Urgency Ordinance for introduction amending the County Code, Title 11 - Health and Safety, to readopt Part 4 of Chapter 11.38 - Water Conservation Requirements for the Unincorporated County area, which establishes water conservation and waste prevention requirements with a written warning for the first violation and a fine of $100 for each subsequent violation; and find that adoption of ordinance is exempt from the California Environmental Quality Act.

On motion of Supervisor Molina, seconded by Supervisor Antonovich, duly carried by the following vote: Ayes: Supervisors Molina, Yaroslavsky, Knabe, Antonovich and Burke; Noes: None, the Board introduced, waived reading and adopted the attached Ordinance No. 2008-0052U entitled, "An urgency ordinance amending Title 11 - Health and Safety of the Los Angeles County Code, relating to water conservation requirements for the Unincorporated Los Angeles County Area." This ordinance shall take effect October 7, 2008.

02100708_72

Attachment

Copies distributed:
Each Supervisor
Chief Executive Officer
County Counsel
Acting Director of Public Works
Acting Director of Beaches and Harbors
Director of Internal Services
Director of Parks and Recreation
Director of Planning
Director of Public Health

(ALSO SEE BOARD ORDER NO. 40 THIS DATE)

## ANALYSIS

This ordinance amends Title 11 – Health and Safety of the Los Angeles County Code, relating to Water and Sewers, to readopt Part 4 of Chapter 11.38 – Water Conservation Requirements for the Unincorporated Los Angeles County Area.

Pursuant to Section 2 of Ordinance No. 91-0046U, Part 4 of Chapter 11.38 – Water Conservation Requirements for the Unincorporated Los Angeles County Area, terminated on January 1, 1993. This ordinance readopts the same provisions, which were previously set forth in Part 4, except that this ordinance does not have a sunset date, revises the fine amounts, and sets forth a review mechanism.

This ordinance is an urgency measure and requires a four-fifths vote by the Board of Supervisors for adoption.

RAYMOND G. FORTNER, JR.
County Counsel

By
TRUC L. MOORE
Deputy County Counsel
Public Works Division

TLM:ia

08/13/08 (Requested)

09/17/08 (Revised)

553230_1

**ORDINANCE NO. 2008-00052U**

An urgency ordinance amending Title 11 – Health and Safety of the Los Angeles County Code, relating to water conservation requirements for the Unincorporated Los Angeles County Area.

The Board of Supervisors of the County of Los Angeles ordains as follows:

**SECTION 1.** Chapter 11.38, Part 4, is hereby readopted as amended to read as follows:

## Part 4. Water Conservation Requirements for the Unincorporated Los Angeles County Area

### 11.38.620 Hose watering prohibition.

No person shall hose water or wash down any sidewalks, walkways, driveways, parking areas or other paved surfaces, except as is required for the benefit of public health and safety. Willful violation hereof shall be subject to a written warning for the first violation, and shall be an infraction punishable by a fine of $100.00 ~~for the first infraction and $500.00 each~~ for each subsequent ~~infractions~~violation.

### 11.38.630 Watering of lawns and landscaping.

A. No person shall water or cause to be watered any lawn or landscaping between the hours of 10:00 a.m. and 5:00 p.m.

B. No person shall water or cause to be watered any lawn or landscaping more than once a day.

C. No person shall water or cause to be watered any lawn or landscaping to such an extent that runoff into adjoining streets, parking lots or alleys occurs due to incorrectly directed or maintained sprinklers or excessive watering.

D. It shall be the duty of all persons to inspect all hoses, faucets and sprinkling systems for leaks, and to cause all leaks to be repaired as soon as is reasonably practicable.

E. Willful violation hereof shall be subject to a written warning for the first violation, and shall be an infraction punishable by a fine of $100.00 ~~for the first infraction and $500.00 each~~ for each subsequent ~~infractions~~violation.

**11.38.640 Indoor plumbing and fixtures.**

A. It shall be the duty of all persons to inspect all accessible indoor plumbing and faucets for leaks, and to cause all leaks to be repaired as soon as is reasonably practicable.

B. Willful violation hereof shall be subject to a written warning for the first violation, and shall be an infraction punishable by a fine of ~~$500~~100.00 for each subsequent violation.

**11.38.650 Washing vehicles.**

No motor vehicle, boat, trailer, or other type of mobile equipment may be washed, except at a commercial carwash or with reclaimed water, unless such vehicle is washed by using a hand-held bucket or a water-hose equipped with an automatic shutoff nozzle. No person shall leave a water hose running while washing a vehicle or at any other time. Willful violation hereof shall be subject to a written warning for the

first violation, and shall be an infraction punishable by a fine of $100.00 ~~for the first infraction and $500.00 each~~ for each subsequent ~~infractions~~violation.

**11.38.660 Public eating places.**

No restaurant, hotel, cafeteria, café, or other public place where food is sold or served shall serve drinking water to any customer unless specifically requested to do so by such customer. Willful violation hereof shall be subject to a written warning for the first violation, and shall be an infraction punishable by a fine of $100.00 ~~for the first infraction and $500.00 each~~ for each subsequent ~~infractions~~violation.

**11.38.670 Decorative fountains.**

No person shall use water to clean, fill, or maintain levels in decorative fountains, ponds, lakes, or other similar aesthetic structures unless such water flows through a recycling system. Willful violation hereof shall be subject to a written warning for the first violation, and shall be an infraction punishable by a fine of $100.00 ~~for the first infraction and $500.00 each~~ for each subsequent ~~infractions~~violation.

**11.38.680 Procedural requirements.**

The Director of Public Works, with input and concurrence from the Director of Public Health, shall periodically review the provisions of this Part and recommend necessary updates to the Board of Supervisors. The review of these provisions and preparation of resulting recommendations, if any, shall be performed, at a minimum, every two years following the first review, which shall to be completed by December 31, 2010.

**SECTION 2.** Due to the severity of the drought in the State of California, there is an immediate need to prohibit the wasting of water in the Los Angeles County unincorporated area to better utilize the available water supplies. This ordinance is urgently needed for the preservation of the public health, safety, and general welfare, and shall take effect immediately.

[1138WATERTMCC]

**SECTION 3.** This ordinance shall be published in The Metropolitan News a newspaper printed and published in the County of Los Angeles.

Chair

ATTEST:

Sachi A. Hamai
Executive Officer -
Clerk of the Board of Supervisors
County of Los Angeles

I hereby certify that at its meeting of October 7, 2008 the foregoing ordinance was adopted by the Board of Supervisors of said County of Los Angeles by the following vote, to wit:

| | Ayes | | Noes |
|---|---|---|---|
| Supervisors | Gloria Molina | Supervisors | None |
| | Zev Yaroslavsky | | |
| | Don Knabe | | |
| | Michael D. Antonovich | | |
| | Yvonne B. Burke | | |

Effective Date: October 7, 2008

~~Operative Date:~~

Sachi A. Hamai
Executive Officer -
Clerk of the Board of Supervisors
County of Los Angeles

APPROVED AS TO FORM:
RAYMOND G. FORTNER, JR.
County Counsel

By Leela Kapur
Leela Kapur
Chief Deputy County Counsel

# Groundwater Management Plan

## Santa Clara River Valley Groundwater Basin, East Subbasin

## Los Angeles County, California

CASTAIC LAKE WATER AGENCY

December, 2003

LUHDORFF & SCALMANINI
CONSULTING ENGINEERS

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# *I. Introduction*

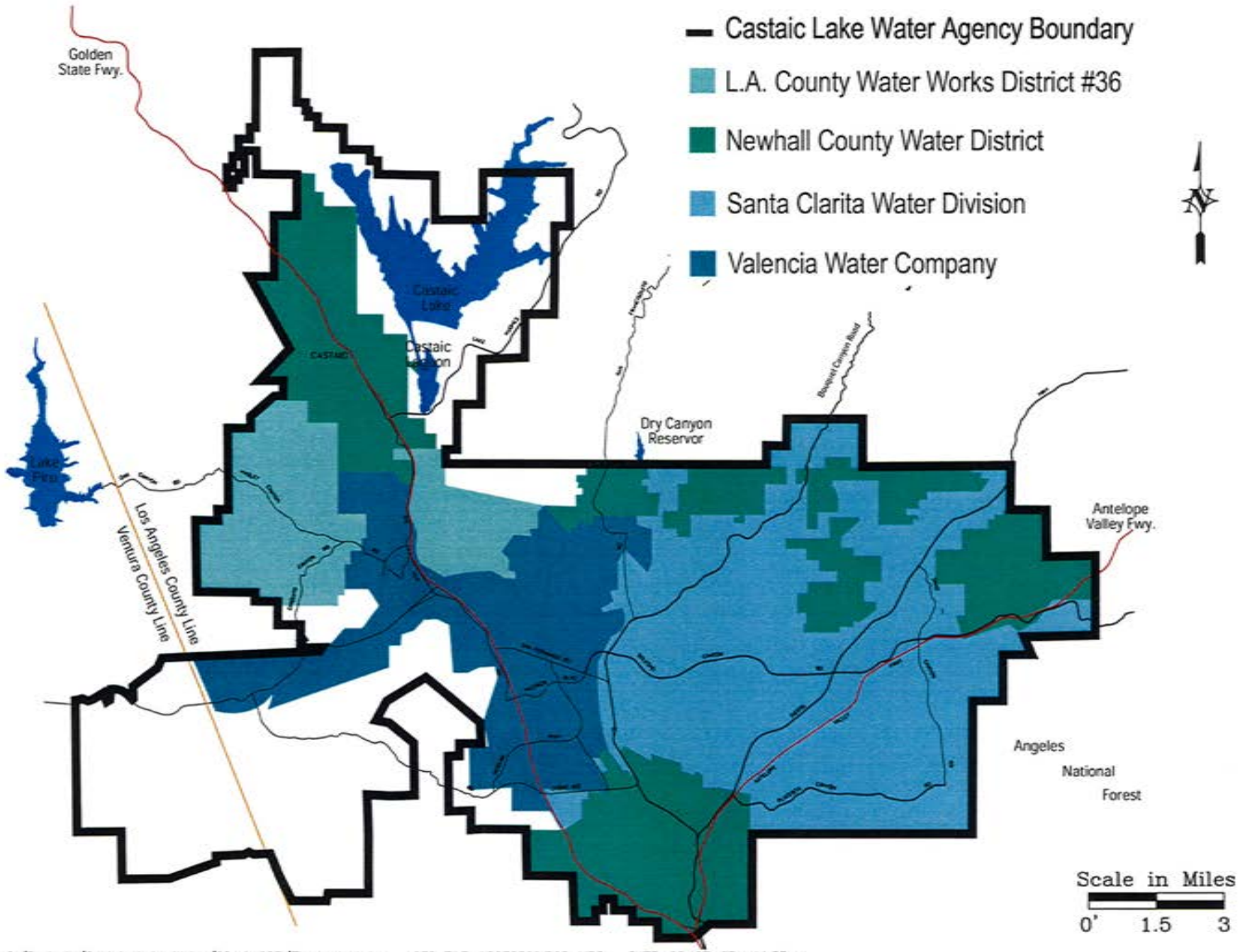
**Castaic Lake Water Agency**

Castaic Lake Water Agency (CLWA) was formed in 1962 as a State Water Project Contractor to provide wholesale water supply from the State Water Project (SWP) to retail water purveyors in the Upper Santa Clara River area, most notably to Newhall County Water District, Los Angeles County Waterworks District No. 36, Santa Clarita Water Company and Valencia Water Company. In 2001, as part of legislation authorizing CLWA to provide retail water service to individual municipal customers in addition to its ongoing wholesale water supply, Assembly Bill 134 included a requirement that CLWA prepare a groundwater management plan in accordance with the provisions of Water Code Section 10750 et seq., which was originally enacted by, and is commonly known as, Assembly Bill 3030. This groundwater management plan has been prepared to satisfy the requirements of AB 134 and to both complement and formalize a number of existing water supply and water resource planning and management activities in the CLWA service area.

The CLWA service area encompasses all of the existing and currently planned municipal water service areas of the Upper Santa Clara River area, i.e. the suburban areas generally proximate to the Santa Clara River in Los Angeles County, generally between hills of the San Gabriel Mountains and the Santa Susana Mountains on the north and south, and between the Los Angeles/Ventura County line and Lang Station on the west and east, respectively. The extent of the CLWA service area and the geographical locations of the individual water purveyors within the CLWA service area are illustrated in Figure 1-1.

**Santa Clara River Valley Groundwater Basin, East Subbasin**

The groundwater basin generally beneath the CLWA service area, identified in DWR Bulletin 118 as the Santa Clara River Valley Groundwater Basin, East Subbasin (Basin No. 4-4.07), is comprised of two aquifer systems, the Alluvium generally underlying the Santa Clara River and its several tributaries, and the Saugus Formation which underlies much of the entire Upper Santa Clara River area. The mapped extent of the Santa Clara River Valley East Subbasin in Bulletin 118, which is approximately the outer extent of the Alluvium and the Saugus Formation, and its

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LUHDORFF & SCALMANINI
CONSULTING ENGINEERS

**Figure 1-1**
**CLWA and Purveyors` Service Areas**

relationship to the extent of the CLWA service area are illustrated in Figure 1-2.

The two aquifer systems that comprise the groundwater basin are described in detail in this plan. For purposes of this plan, the groundwater basin is encompassed by the CLWA service area, and CLWA is the logical public water supply agency to prepare and implement a groundwater management plan for the Santa Clara River Valley East groundwater subbasin.

**Overview of Water Requirements and Supplies**

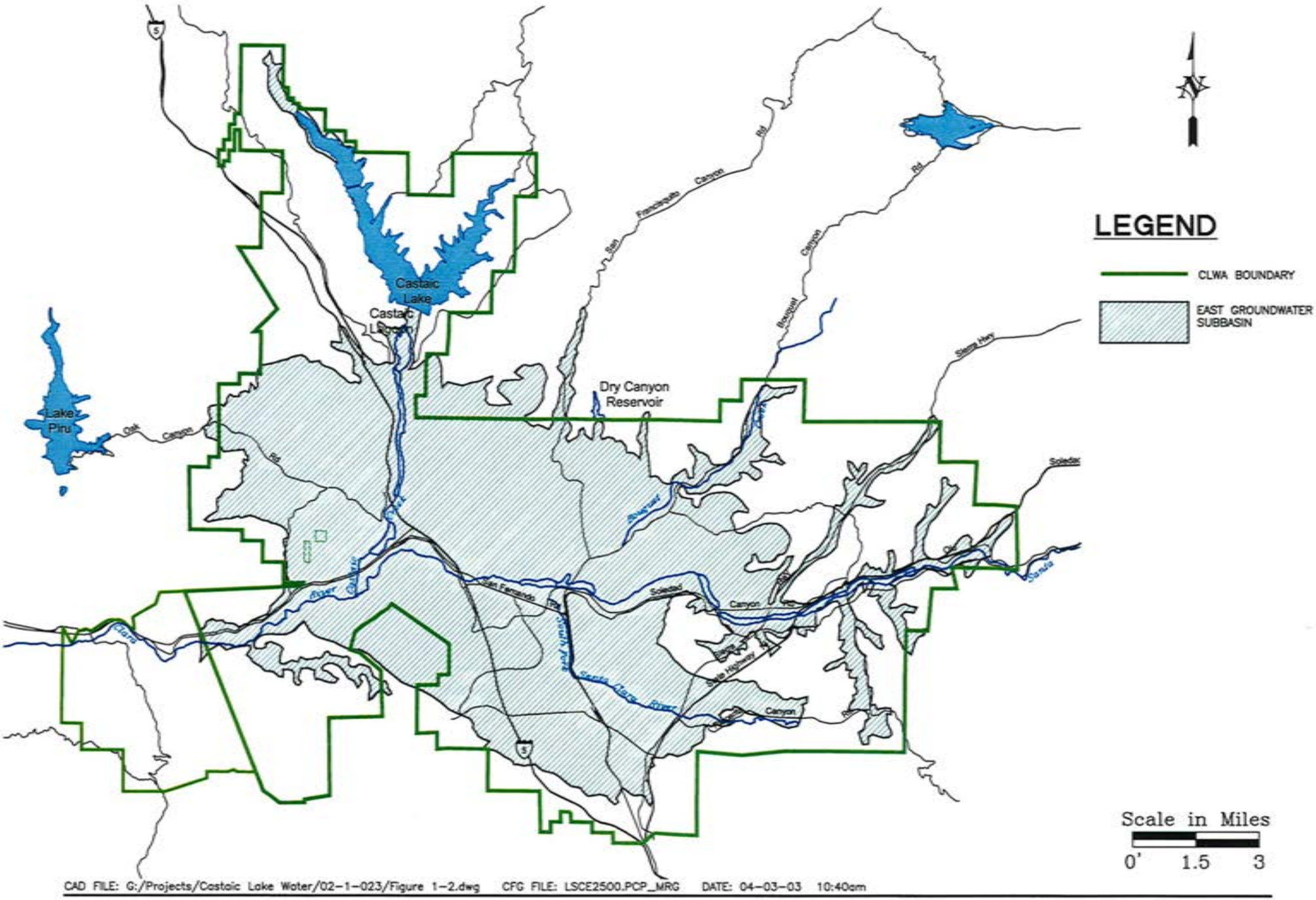
Historically, while development of local water supplies dates back at least 100 years, the earliest complete records of water use in the basin date from the late 1940's, when practically all water demand was for agricultural use. From that time through the early 1960's, agricultural water use, which was solely supplied by local groundwater, ranged from about 27,000 to about 42,000 acre-feet per year (afy). Over the succeeding three decades, agricultural water use progressively declined, into the range of about 8,000 to 10,000 afy, followed by a slight increase into the range of about 12,000 to 15,000 afy over the last ten years. Current projections are for agricultural water use to substantially decline, to about 7,000 afy, over the next 20 years.

Significant municipal water use in the basin did not begin until the early 1960's, when municipal uses, which were met exclusively at that time by local groundwater, were in the range of about 5,000 to 10,000 afy. By 1980, when supplemental surface water from the State Water Project (SWP) began to be imported to the basin, municipal water demands had increased to about 22,000 afy. Since then, municipal water demands have further increased, to their current level of about 61,000 afy, about 60 percent of which is supplied by SWP water, with the balance supplied by local groundwater. Current projections are for municipal water requirements to increase to about 106,000 afy over the next 20 years.

Historical and projected water requirements and supplies in the basin are discussed in more detail in Section IV of this Plan.

**Water Code Section 10750 et. seq.**

In 1992, the California State Legislature adopted Assembly Bill 3030 (AB 3030); that legislation was subsequently incorporated into the Water Code, Section 10750 et seq., to encourage local public agencies/water purveyors to adopt a formal plan to manage groundwater resources within

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CONSULTING ENGINEERS

**Figure 1-2**
**Santa Clara River Valley**
**East Groundwater Subbasin**

their jurisdictions. Within the scope of Water Code Section 10753.8, a local groundwater management plan can potentially include up to twelve specific components. Although the plan need not be restricted to those specific components, the listed components are quite broad and cover essentially all of the groundwater management elements which are part of this plan or are likely to be considered for implementation into this plan in the foreseeable future. To a considerable extent, a number of the groundwater management activities listed in Water Code Section 10753.8 have been implemented in the Santa Clara River Valley East groundwater subbasin as part of an organized effort by the local municipal water purveyors, including CLWA, to manage the groundwater basin within its sustainable yield for the benefit of local water supply, and also to integrate management of the basin with the management of surface and groundwater immediately downstream on the Santa Clara River, in this case specifically with United Water Conservation District in Ventura County, as discussed in more detail herein.

The potential components of a groundwater management plan listed in Water Code Section 10753.8 include:

- the control of saline water intrusion.
- identification and management of wellhead protection areas and recharge areas.
- regulation of the migration of contaminated groundwater.
- the administration of a well abandonment and well destruction program.
- mitigation of conditions of overdraft.
- replacement of groundwater extracted by water producers.
- monitoring of groundwater levels and storage.
- facilitating conjunctive use operations.
- identification of well construction policies.
- the construction and operation by the local agency of groundwater contamination cleanup, recharge, storage, conservation, water recycling, and extraction projects.
- the development of relationships with state and federal regulatory agencies.
- the review of land use plans and coordination with land use planning agencies to assess activities which create a reasonable risk of groundwater contamination.

In 2002, the Legislature adopted Senate Bill 1938 (SB 1938) to amend and add to Water Code Section 10750 et seq. regarding the implementation of local groundwater management plans. While the provisions of SB 1938 did not alter the potential components of a local groundwater management plan, as listed above, it did add the following notable provisions:

- The local agency, in preparing a groundwater management plan, shall make available to the public a written statement describing how interested parties may participate in developing the plan; for purposes of carrying out the preceding requirement, the local agency may appoint, and consult with, a technical advisory committee consisting of interested parties. AB 134 actually anticipated this last item by requiring CLWA to form an Advisory Committee to review its Plan. The membership of the Advisory Committee was specified to consist of one representative from each retail water purveyor within CLWA and one representative from each groundwater producer within CLWA who pumped more than 100 acre-feet in the preceding water year (2000). In conformance with that requirement, CLWA formed an Advisory Committee consisting of representatives from the following organizations, who collectively fulfill the description of the membership specified in AB134:

    - CLWA Santa Clarita Water Division
    - Los Angeles County Sheriff's Department
    - Los Angeles County Waterworks District No. 36
    - Newhall County Water District
    - Newhall Land and Farming Company
    - Robinson Ranch
    - Valencia Water Company

- In order to qualify for funding assistance for groundwater projects or groundwater quality projects, for funds administered by DWR, a local agency must accomplish all the following relative to groundwater management:

    - prepare and implement, or participate in, or consent to be subject to, a groundwater management plan, a basin-wide management plan, or other integrated regional water management program or plan that meets the provisions listed below.

    - include groundwater management components that address monitoring and management of water levels, groundwater quality degradation, inelastic land subsidence, and changes in surface flows and quality that either affect groundwater or are affected by groundwater pumping.

- include provisions to cooperatively work with other public (and presumably private) entities whose service area or boundary overlies the groundwater basin.

- include mapping of the groundwater basin, as defined in DWR's Bulletin 118, and the boundaries of the local agency subject to the plan, plus the boundaries of other local agencies that overlie the basin.

- adopt monitoring protocols designed to detect changes in groundwater levels, groundwater quality, inelastic land subsidence (for basins where subsidence has been identified as a potential problem), and flow and quality of surface water that either directly affect groundwater, or are directly affected by groundwater pumping.

Of the potential groundwater management activities listed in Water Code Section 10753.8, those already being investigated and actively implemented as part of less formal groundwater management by the purveyors include avoidance of overdraft, implementation of conjunctive use, monitoring of groundwater levels and quality, initiation of groundwater contamination control, analysis of basin yield for ongoing avoidance of overdraft, and annual analysis and reporting on basin conditions. The historic focus of informal groundwater management in the Santa Clara River Valley East groundwater subbasin has been on water supply, quantity and quality, to avoid conditions of overdraft, primarily by augmenting local groundwater supplies with a supplemental, imported surface water supply from the State Water Project. More recently, efforts have been added to include ongoing monitoring and the compilation of data into a data management system that is integrated with a comparable database system for the downstream surface water resources and groundwater basins on the Santa Clara River. Recent efforts have also included initiation of a process to develop a numerical groundwater flow model of the basin for analysis of basin response to various water supply, recharge, and conjunctive use management alternatives that might be applicable for the basin. The potential groundwater management provisions not historically implemented have been those more focused on groundwater contamination; however, very recent activities have added this component to local groundwater management as a result of impacts on several municipal water supply wells from a former munitions manufacturing site in the basin, as discussed in more detail herein.

In summary, in many respects, the local municipal water purveyors, including CLWA, have

already begun developing and implementing important parts of a formal local groundwater management program as part of developing reliable water supplies for in-basin needs. To ensure the reliability of the groundwater component of water supplies to meet existing and projected demands, those parts of local groundwater management planning already include monitoring, formulation of a data base, and integration with the database for adjoining downstream basins, analysis of groundwater conditions and annual reporting on water conditions in the basin, initiation of groundwater flow modeling, ongoing conjunctive use of local groundwater and imported SWP supplies, and initiation of investigation and control of localized groundwater contamination. The groundwater management plan described herein can be envisioned as a formalization, and some expansion, of those ongoing management efforts in the Santa Clara River Valley East groundwater subbasin.

The balance of this plan is organized to first establish a set of management objectives, or goals, for the basin; to then describe existing groundwater basin conditions, including areas of concern and identified problems; to present historical and projected water demands in the basin; and to finally present a set of groundwater management actions which, in aggregate, are the elements of this groundwater management plan.

# *II. Management Objectives (Goals) for the Basin*

Prior to 1980, all water supplies in the Upper Santa Clara River Area were developed from local groundwater. Since 1980, the major water purveyors within the CLWA service area have developed their water supplies from a combination of local groundwater and imported supplemental surface water from the State Water Project (SWP). CLWA is the state SWP Contractor which holds the contract for SWP water. CLWA also operates the treatment and distribution system for delivery of SWP water to the local purveyors. Some imported SWP water has historically been delivered for non-municipal uses although, in aggregate, total non-municipal uses have been almost negligible (less than one percent).

A relatively small fraction of water supply in the area is still devoted to agricultural and other irrigation, and essentially all of that remains developed from groundwater. Over the last two decades, that use has been in a range between about 10,000 and 17,000 acre-feet per year.

The development and importation of a supplemental surface water supply from the State Water Project represents the first of a number of water resource and water supply management actions, all of which are formalized in this plan, aimed at what can be considered to be the overall goals or objectives for the basin. In no priority, those management objectives for the basin can be expressed as follows:

1. Development of an integrated surface water, groundwater, and recycled water supply to meet existing and projected demands for municipal, agricultural, and other water supply; since pumpage for other uses is from the same aquifer system, this objective includes agricultural, small community, non-agricultural irrigation, and individual domestic uses.

2. Assessment of groundwater basin conditions to determine a range of operational yield values that will make use of local groundwater conjunctively with SWP and recycled water to avoid groundwater overdraft and the undesirable effects associated with it. In effect, this objective equates to more detailed quantification of the yield of the basin in order to continue to avoid overdraft, consistent with what has historically been the case in the basin. In addition to avoiding the traditional overdraft symptoms

and effects, e.g. chronic water level decline, loss of groundwater storage, onset of land subsidence, groundwater quality degradation, a corresponding basin objective is to manage groundwater levels and associated groundwater discharge to the Santa Clara River at the west end of the basin, and thus not adversely impact surface and groundwater discharges to the downstream basin(s).

3. Preservation of groundwater quality for beneficial use in the basin, and for beneficial use of surface water and groundwater discharges from the basin. Included in this management goal will be the active characterization and solution of any groundwater contamination problems, through cooperation with responsible parties or through independent action if timely action by responsible parties is not forthcoming and the preceding management objectives are thereby impacted or constrained.

4. Preservation of interrelated surface water resources. Included in this management goal will be the maintenance of appropriate surface water flows and non-degradation of surface water quality as a result of managing groundwater conditions to meet the other management goals for the basin.

Quantitatively, the preceding goals translate into general preservation of groundwater levels and quality in the Alluvial aquifer system consistent with the last 30 years, including fluctuations through seasonal demands and local hydrologic variations (wet and dry periods). As discussed in more detail in the next chapter, the hydrogeologic setting in the area has resulted in smaller Alluvial groundwater level fluctuations toward the western half of the basin (generally west of Bouquet Canyon), and larger fluctuations to the east. However, largely due in part to the importation of supplemental surface water over the last 20 years, and the integrated or conjunctive use of that supplemental water with local groundwater, there has been no chronic decline in groundwater levels or storage. A continuation of such basin conditions, possibly complemented by management actions to decrease the historical water level fluctuations in the eastern part of the basin, will accomplish the second basin objective (continued avoidance of overdraft as has been the ongoing historical condition in the basin) while continuing to utilize local groundwater to meet part of projected water requirements. Corresponding management actions to sustain recharge and not overdraft groundwater storage will accomplish the third basin objective by replenishing the aquifer system with sufficient water to sustain what has been generally consistent quality of groundwater on a long-term basis.

In general, the same goals of preservation of groundwater levels and quality pertain to the Saugus Formation as well as to the Alluvium. However, while those goals are generally expected to equate to Alluvial pumping rates comparable to recent historical pumping, the Saugus Formation may be intermittently utilized at higher than historical pumping rates for dry-period and/or emergency water supply. Interpretation of historical pumping fluctuations and corresponding aquifer response suggests that such intermittent utilization of a small fraction of the Saugus' large storage capacity can successfully contribute to a firming of local water supplies while still accomplishing all the management objectives listed above, primarily via reduction in Saugus pumping during wet-normal conditions, possibly complemented by management actions to accelerate recharge of the Saugus.

# *III. Groundwater Basin Conditions*

**Occurrence of Groundwater**

Groundwater in the Santa Clara River Valley East groundwater subbasin occurs in two aquifer systems, the Alluvium associated with the Santa Clara River and its tributaries, and the Saugus Formation. There are also some scattered outcrops of Terrace deposits in the basin that likely have the capacity to contain limited amounts of groundwater; however, since these deposits are located in limited areas that are situated at elevations above the regional water table and are also of limited thickness, they are of no practical significance as aquifers and have consequently not been developed for water supply.

The Alluvial aquifer system, of Quaternary to Holocene (Recent) geologic age, consists primarily of stream channel and flood plain deposits of the Santa Clara River and its tributaries. The Alluvium is deepest along the center of the present river channel, with a maximum thickness of about 200 feet near the area known as Saugus. It thins toward the flanks of the adjoining hills and toward the eastern and western boundaries of the basin and, in the tributaries, becomes a mere veneer in their upper reaches. The spatial extent of the Alluvium throughout the basin is illustrated in Figure 3-1.

The Alluvium is the most permeable of the local aquifer units. Based on well yields and aquifer testing, transmissivity values in the range of 50,000 to 500,000 gallons per day per foot (gpd/ft) have been reported for the Alluvium, with the higher values where the Alluvium is thickest in the center of the valley and generally west of Bouquet Canyon (Slade 1986 and 2002). The amount of groundwater in storage can vary considerably because of the effects of recharge, discharge and pumping from the aquifer. The maximum storage capacity of the Alluvium has been estimated to be about 240,000 acre-feet (af) (Slade, 1986 and 2002).

The Saugus Formation, of Pliocene to Pleistocene geologic age, has traditionally been divided into two stratigraphic units: the lowermost, geologically older Sunshine Ranch member, which is of mixed marine to terrestrial (non-marine) origin; and the overlying, or upper, portion of the Formation which is entirely terrestrial in origin. The Sunshine Ranch Member of the Saugus Formation has a maximum thickness of about 3,000 to 3,500 feet in the central part of the valley;

# *III. Groundwater Basin Conditions*

**Occurrence of Groundwater**

Groundwater in the Santa Clara River Valley East groundwater subbasin occurs in two aquifer systems, the Alluvium associated with the Santa Clara River and its tributaries, and the Saugus Formation. There are also some scattered outcrops of Terrace deposits in the basin that likely have the capacity to contain limited amounts of groundwater; however, since these deposits are located in limited areas that are situated at elevations above the regional water table and are also of limited thickness, they are of no practical significance as aquifers and have consequently not been developed for water supply.

The Alluvial aquifer system, of Quaternary to Holocene (Recent) geologic age, consists primarily of stream channel and flood plain deposits of the Santa Clara River and its tributaries. The Alluvium is deepest along the center of the present river channel, with a maximum thickness of about 200 feet near the area known as Saugus. It thins toward the flanks of the adjoining hills and toward the eastern and western boundaries of the basin and, in the tributaries, becomes a mere veneer in their upper reaches. The spatial extent of the Alluvium throughout the basin is illustrated in Figure 3-1.

The Alluvium is the most permeable of the local aquifer units. Based on well yields and aquifer testing, transmissivity values in the range of 50,000 to 500,000 gallons per day per foot (gpd/ft) have been reported for the Alluvium, with the higher values where the Alluvium is thickest in the center of the valley and generally west of Bouquet Canyon (Slade 1986 and 2002). The amount of groundwater in storage can vary considerably because of the effects of recharge, discharge and pumping from the aquifer. The maximum storage capacity of the Alluvium has been estimated to be about 240,000 acre-feet (af) (Slade, 1986 and 2002).

The Saugus Formation, of Pliocene to Pleistocene geologic age, has traditionally been divided into two stratigraphic units: the lowermost, geologically older Sunshine Ranch member, which is of mixed marine to terrestrial (non-marine) origin; and the overlying, or upper, portion of the Formation which is entirely terrestrial in origin. The Sunshine Ranch Member of the Saugus Formation has a maximum thickness of about 3,000 to 3,500 feet in the central part of the valley;

however, due to its marine origin and fine-grained nature, it is not considered to be a viable source of groundwater for municipal or other comparable supply. Above the Sunshine Ranch Member, the Saugus Formation is coarser grained, consisting mainly of lenticular beds of sandstone and conglomerate that are interbedded with lesser amounts of sandy mudstone, which were deposited in stream channels, flood plains, and alluvial fans by one or more ancestral drainage systems in the valley. The sand and gravel units that represent aquifer materials in the upper part of the Saugus Formation are generally located between depths of about 300 and 2,500 feet. The spatial extent of the Saugus Formation throughout the basin is illustrated in Figure 3-1.

While much thicker and more spatially extensive throughout the basin when compared to the Alluvium, and while significant in terms of groundwater storage and individual well capacity, the Saugus Formation has typically lower values of transmissivity, in the range of 80,000 to 160,000 gpd/ft, with the higher values in the upper portions of the Formation (Slade, 1988 and 2002). The storage capacity of the Saugus has most recently been estimated to be 1.65 million acre-feet between depths of 300 feet and 2,500 feet (or the base of the Saugus or the base of fresh water if shallower than 2,500 ft.) (Slade, 2002).

**Historical Groundwater Development**

Of the two aquifer systems in the basin, the predominant development of groundwater for agricultural and municipal water supply has historically been from the Alluvium, a condition that remains the case at present. Prior to 1980, all water supply in the valley was developed from local groundwater; since 1980, local groundwater has been supplemented by imported surface water from the State Water Project. Details of historical water requirements, and water supplies to meet those requirements, are discussed and illustrated in Chapter IV of this Plan.

In general, over the last two decades, since the inception of SWP deliveries in 1980, total pumpage from the Alluvium has ranged from a low of about 20,000 afy (in 1983) to slightly more than 43,000 afy (in 1999). For comparison, agricultural pumpage from the Alluvium throughout the 1950's was consistently in the range of about 33,000 to 41,000 afy. During that same time, municipal pumpage was quite small, less than 4,000 afy. Overall, over the last two decades, there has been a change in municipal/agricultural pumping distribution, toward a slightly higher fraction for municipal water supply (from about 50% to nearly 60% of alluvial pumpage) which is indicative of the general land use changes in the area.

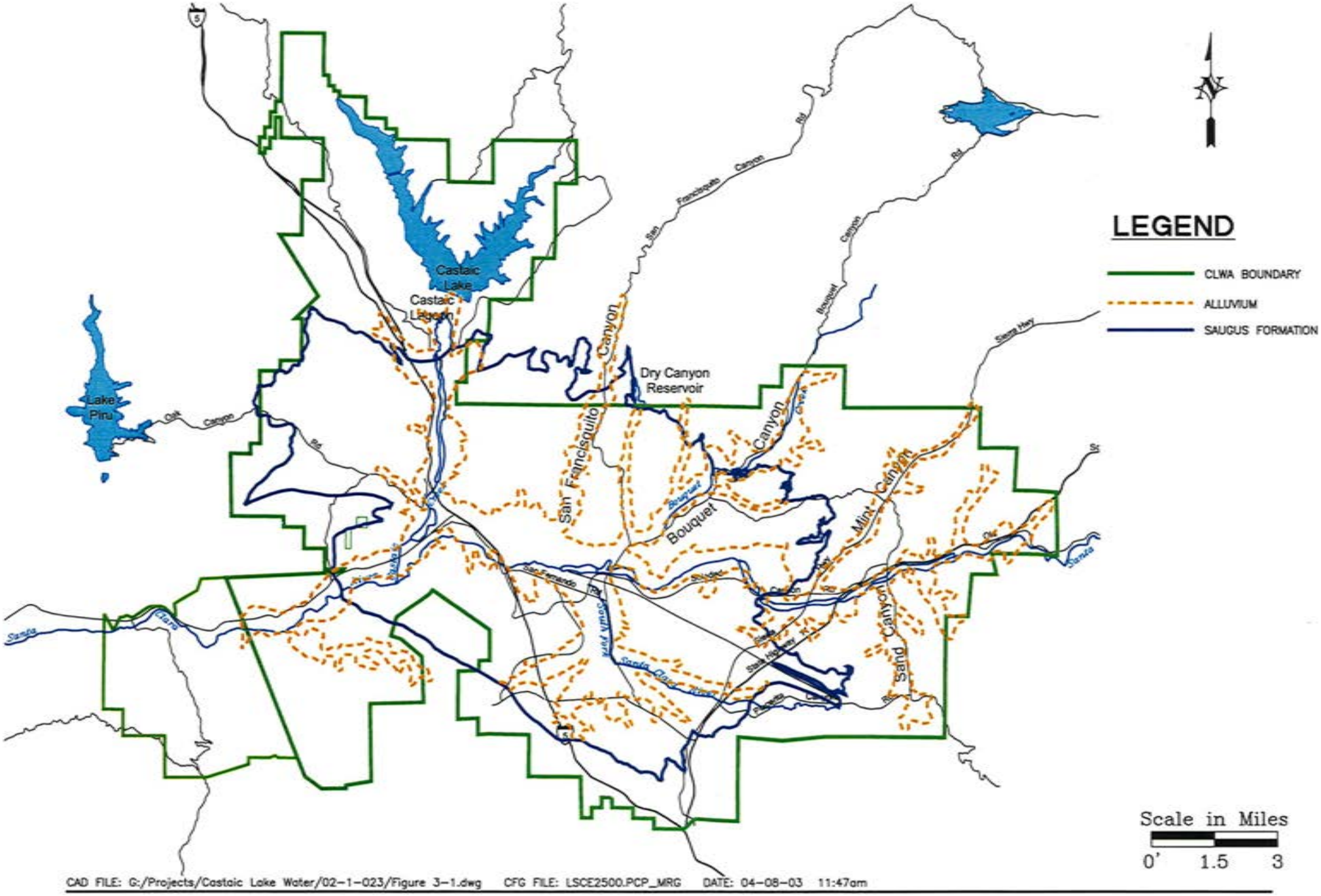


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**Figure 3-1**
**Alluvial and Saugus Formations**
**Santa Clara River Valley East Groundwater Subbasin**

Since 1980, total pumpage from the Saugus Formation has ranged between about 3,850 afy and nearly 15,000 afy; average pumpage over that period has been about 6,900 afy. The great majority of pumpage from the Saugus is for municipal supply (nearly 6,300 afy, or 92 percent, on average). For comparison, although historical Saugus pumping records prior to 1980 are limited, there appears to have been essentially no pumping from the Saugus prior to 1960 (on the order of about 100 af in most years, beginning in 1948), and some increased pumping for agricultural water supply beginning in about 1962 (about 900 af). The largest amount of agricultural pumping from the Saugus was during the mid-1960's, when annual Saugus pumpage was about 3,000 af. Agricultural pumping from the Saugus declined to near zero by the late 1970's, but has been generally in the 500 to 1,000 afy range since 1982. There was no Saugus pumpage for municipal supply in the early 1960's; limited data suggests that municipal pumping from the Saugus began in the 1970's, and reached nearly 5,000 afy by 1980-81. The most significant period of Saugus pumpage was 1991 through 1994, when pumpage ranged from 10,600 afy to nearly 15,000 afy and averaged over 12,000 afy, during which time SWP water deliveries were reduced at the end of extended drought conditions.

**Groundwater Monitoring Network and Program**

There is no formal groundwater monitoring network of wells for groundwater level measurements and/or groundwater quality sampling in the basin. Consequently, one component of this Plan is to formalize both a network of wells for groundwater monitoring and a program for water level measurements, water quality sampling, and other pertinent groundwater data collection (Primary Plan Element 1). Despite the lack of an existing formal groundwater monitoring network and program, however, there is a significant amount of historical groundwater data, some of which dates back into the 1940's, on which to base reasonable assessments of groundwater conditions in the basin. For example, groundwater level measurements have been made over varying periods of record in a total of 154 wells, mostly alluvial wells, throughout the basin. Similarly, groundwater quality data, consisting of varying numbers of constituents analyzed, are available from some wells, but a much smaller number than is the case for groundwater level data. These data, along with direct measurements or indirect estimates of pumpage, primarily from high capacity municipal and agricultural wells, allow for analysis of groundwater basin conditions, as discussed in this Plan, and also provide the bases on which a groundwater model can be developed (Primary Plan Element 3) and on which various management criteria such as operational yield, baseline groundwater quality, etc. can be determined (Primary Plan Elements 3, 6, etc.).

**Groundwater Levels and Storage**

Groundwater level data in various parts of the basin illustrate basin response to the historical pumpage from the Alluvium. Organized into hydrograph form (depth to groundwater or groundwater elevation vs. time), historical groundwater levels were lower in the 1950's and 60's than current levels in the middle to western part of the basin, logically in response to the higher pumpage of the 1950's before the importation of SWP water and the associated increase in return flows to the river that have augmented groundwater recharge in that part of the basin. Groundwater levels in those areas notably recovered as pumpage declined through the 1960's and 1970's. They have subsequently sustained generally high levels for much of the last 30 years, with two dry-period exceptions: mid-1970's and late 1980's - early 1990's; recoveries to previous high groundwater levels have followed both of those dry-period declines. Based on this data, there is no evidence of any historic or recent trend toward permanent water level or storage decline. In general, throughout the Alluvium, groundwater levels have been generally higher over the last 30 years than was consistently the case for the preceding 20 years (1950's - 60's).

During the last 20 to 30 years, in essentially all the alluvial portions of the basin, groundwater levels have fluctuated from near the ground surface when the basin is full, to as much as 100 feet lower during intermittent dry periods of reduced recharge. Selected hydrographs of groundwater elevations illustrate the above described conditions throughout the basin. Figure 3-2 illustrates groundwater level conditions and trends at multiple locations in the Alluvium along the main channel of the Santa Clara River, from east near the mouth of Sand Canyon, to the area between Mint Canyon and Bouquet Canyon, to farther west immediately below the mouth of Bouquet Canyon. Similar long-term conditions are evident in the tributary canyons.

A comment about some of the groundwater fluctuations illustrated in Figure 3-2 is appropriate since they are illustrative of the most substantial intermittent changes in the basin. As noted above, the Alluvium has historically experienced a number of alternating wet and dry hydrologic conditions as illustrated in Figure 3-2. Since the Alluvium is thinner to the east, the fluctuations in water levels of 75 to 100 feet impact well yields and pumping capacities when water levels are occasionally lower. When that occurs, as is currently the case due to locally dry hydrologic conditions, the affected purveyors shift a portion of their water demands to imported SWP water, thus reducing pumpage and reducing drawdown of water levels. Recovery of groundwater levels

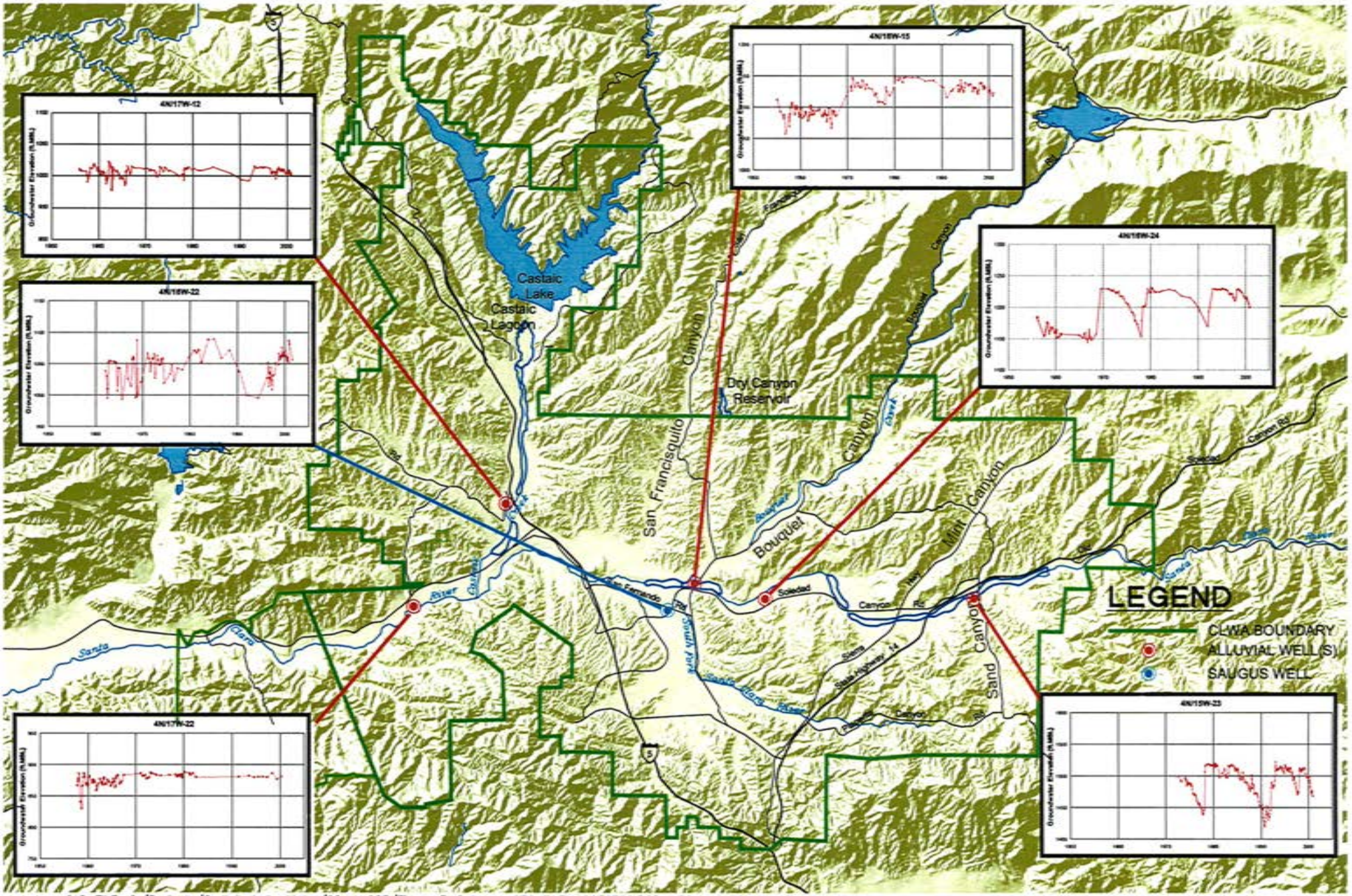


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**Figure 3-2**
**Historical Groundwater Elevations**
**Santa Clara River Valley East Groundwater Subbasin**

and storage occurs upon a return of stream flow to contribute to natural recharge.

Depending on the period of available data, all the hydrographs of alluvial groundwater levels show the same general picture: recent (last 30 years) groundwater levels are generally higher than over the preceding 20 years. In some locations, there are intermittent dry-period declines (and an associated use of some groundwater from storage) followed by wet-period recoveries (and associated refilling of storage space). On a long-term basis, whether over the last 20 years since the inception of conjunctive use via importation of SWP water, or over the last 40 to 50 years, the Alluvium shows no signs of water level-related overdraft, i.e., no trend toward decreasing groundwater levels and storage, a condition that is intended to be maintained via implementation of this Plan, e.g. via Primary Plan Elements 3 and 5.

Unlike the Alluvium, there are limited Saugus water level data; however, the limited data indicate that, although there have been seasonal water level changes in response to pumpage, the long-term trend in the Saugus (over the last 35 to 40 years) has been one of relative groundwater level stability (see, for example, Figure 3-2). There is no trend toward a sustained decline in Saugus water levels or storage that would be indicative of overdraft.

Land subsidence as a result of groundwater extractions is a concern in a number of groundwater basins in California. The potential for land subsidence caused by groundwater extractions derives from a combination of the geologic makeup of the aquifer materials and the history of groundwater level fluctuations. In the Santa Clara Valley East Subbasin, the most notable groundwater level fluctuations have occurred in the Alluvium to the east of Bouquet Canyon, with the greatest fluctuations (up to nearly 100 feet) recorded in the vicinity of Sand Canyon. Fortunately, those fluctuations have been intermittent, and have varied directly with local wet and dry conditions. From a subsidence perspective, they have also fluctuated in an unconfined aquifer that is comprised of essentially all coarse-grained material. The lack of any significant fine-grained material in the aquifer where groundwater levels have fluctuated results in two notable local conditions in regards to subsidence: there is no recorded historical subsidence or indirect evidence of its occurrence, i.e. subsidence-related impacts on surface structures, drainage facilities, etc.; and there is minimal potential for inelastic subsidence to occur in response to ongoing groundwater level fluctuations in the Alluvium.

The Saugus Formation contains a greater fraction of fine-grained material interbedded with the coarser aquifer materials that yield water to wells. Consequently, the Saugus has a greater

potential to undergo consolidation, with attenuant subsidence impacts at the ground surface, if groundwater levels are substantially lowered for long time periods. Historical Saugus pumping has not caused such conditions to occur. Current water supply planning, as described in this Plan, is to rely on the Saugus Formation for a relatively small component of water supply on an ongoing basis, with intermittent increased pumping during dry periods.

The long-term objective for groundwater management, as described in this Plan, is to not overdraft either the Alluvium or the Saugus, i.e. to not chronically lower groundwater levels. Satisfaction of the latter objective will have the correlative impact of minimizing the potential for inelastic land subsidence attributable to pumping from the Saugus Formation; combined with the lack of fine-grained material in the Alluvium, satisfaction of that objective will also have the correlative impact of ensuring the improbability of any subsidence attributable to pumping from that aquifer.

**Groundwater Quality**

Groundwater quality is, or course, a key factor in assessing both the Alluvial aquifer and the Saugus Formation as municipal and agricultural water supplies. At present, however, there is no convenient long-term record of water quality, i.e. water quality data in one or more wells that span several decades and continue to the present. Thus, in order to examine a long-term record of water quality in the Alluvium, an integration of individual records from several wells, completed in the same aquifer materials and in close proximity to each other, can be used to generally show long-term trends in groundwater quality. Figure 3-3 illustrates groundwater quality conditions and trends at multiple locations in the Alluvium along the main channel of the Santa Clara River from the area near the mouth of Mint Canyon, to areas immediately above and near the mouth of Bouquet Canyon, to the area below San Francisquito Canyon. Based on these records of groundwater quality, there have been historical fluctuations in concentrations of total dissolved solids (TDS), as well as corresponding fluctuations of individual constituents of TDS. In general, however, and similar to groundwater levels, there has been no long-term trend toward groundwater quality degradation.

Groundwater quality variations are common throughout the Alluvium and generally correlate inversely with precipitation and stream flow: wet periods have produced substantial recharge of higher quality (low TDS) water and dry periods have resulted in the notable declines in water levels described above, with a corresponding increase in TDS (and individual component

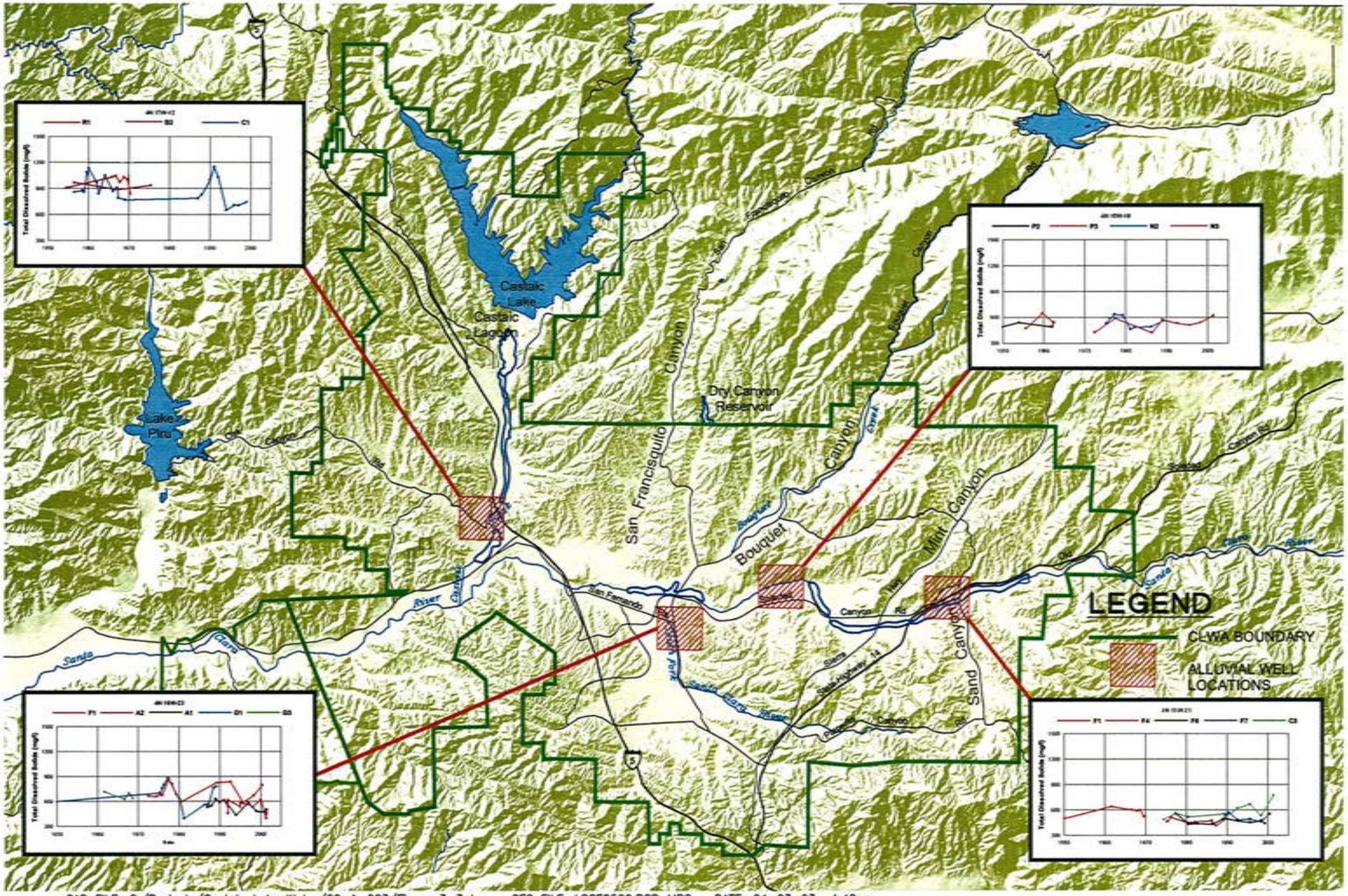


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**Figure 3-3**
**Historical Groundwater Quality by Section**
**Santa Clara River Valley East Groundwater Subbasin**

constituents) in the deeper parts of the Alluvium.

Due to a much more limited number of wells and the limited spatial extent of groundwater development in the Saugus Formation, long-term Saugus groundwater quality data are not sufficiently extensive to permit any sort of basin-wide analysis or assessment of pumping-related impacts on quality. Based on the most complete historical record, over the last 35 years, however, groundwater quality in the Saugus has remained generally constant. The Saugus Formation is, on a groundwater quality basis, a viable agricultural and municipal water supply.

The most notable groundwater quality issue in the basin centers around the detection and impact of perchlorate on several Saugus wells and one Alluvial well in the central part of the basin near the location of the former Whittaker Bermite facility, which is immediately southeast of the confluence of the main Santa Clara River and its South Fork tributary. In 1997, routine water quality sampling detected the presence of perchlorate in four municipal wells completed in the Saugus Formation (CLWA Santa Clarita Water Division Saugus Wells 1 and 2, Newhall County Water District Well 11, and Valencia Water Company Well 157). While there remains no primary or secondary drinking water standard for perchlorate, and although only some of the detected concentrations of perchlorate in the Saugus wells exceeded the Action Level established by the State Department of Health Services at that time (18 ug/l), all those wells were inactivated by their respective owners after detection of perchlorate; those wells remain out of municipal water supply service since then.

More recently, in late 2002, routine water quality sampling of Alluvial wells detected perchlorate in one of them (CLWA Santa Clarita Water Division Stadium Well) at a concentration which slightly exceeds the current Action Level (4 ug/l). This well has also been voluntarily inactivated, and remains removed from municipal water supply service.

This Plan, notably through Primary Plan Elements 1, 6 and 8, is intended to incorporate both short-term and long-term groundwater quality considerations in the management of the groundwater basin in order to formalize groundwater quality monitoring and assessment, to investigate and correct groundwater contamination problems, and to preserve or improve groundwater quality for ongoing water supply as well as for avoiding adverse water quality impacts on interconnected surface waters.

**Areas of Concern and Identified Problems**

A number of concerns have been expressed about groundwater conditions in the basin. While not all of the expressed concerns have been substantiated, they are listed and briefly discussed here, and they are addressed in the management objectives for the basin, intended to be achieved via implementation of the various primary and secondary elements in this Plan.

At present, the most notable concern in the basin is the impact of perchlorate contamination on a number of municipal water supply wells, thus affecting the available pumping capacity from some municipal wells. While perchlorate impacts on a few wells do not preclude the ability to pump groundwater in accordance with existing water supply plans, activities to characterize the contamination, and ultimately to control it and treat it, have been initiated in order to return the impacted wells' pumping capacity to water supply service. Primary Element 8 is included in this Plan to formalize the addressing of groundwater contamination issues in the basin.

Concern has also been expressed that groundwater development in the basin will adversely impact the quantity and/or quality of surface flows leaving the basin via the Santa Clara River. Such concern extends to the potential impact on groundwater in the next downstream basin, the Piru Basin in Ventura County. While there are no established provisions regarding surface flows out of the Santa Clara River Valley East subbasin, Primary Element 2 is included in this Plan to formally address the monitoring and management of surface water flows and quality within, and flowing out of, the basin. Some work is already ongoing related to this area of concern via a Memorandum of Understanding (MOU) among CLWA, other retail water purveyors within CLWA's service area, and United Water Conservation District, which manages surface water and groundwater in the downstream basins on the Santa Clara River in Ventura County. That cooperative effort, which is incorporated into this Plan via Primary Element 9, includes integration of databases, development of a numerical groundwater flow model, and interpretation and reporting on surface water and groundwater conditions.

A third expressed concern in the basin, is that groundwater is already overdrafted. Associated with that expressed concern is a related issue that reliance on overdrafted groundwater results in an overstated water supply in the basin. As discussed earlier in this section, long-term groundwater levels, storage, and quality all indicate the basin is in balance (i.e., no overdraft exists). As also discussed above, the importation of supplemental surface water over the last 23 years, and the associated initiation of conjunctive use operations have directly resulted in an

overall adequacy of water supplies while sustaining an undepleted groundwater supply. Primary Elements 3, 4 and 5 are key parts of this Plan to more formally quantify the yield of the groundwater basin, and to continue to meet overall water requirements via continuation of conjunctive use of local groundwater with imported supplemental surface water, ultimately complemented by integration of recycled water for non-potable water supply (Primary Element 7).

Finally with regard to areas of concern in the basin, the historically larger fluctuations in the eastern part of the basin have been highlighted for their impacts on private wells in that area. Some focused study has been done to address whether certain pumping directly affects private wells in Sand Canyon; its conclusions were that such direct effects were not occurring. Subsequently, a nearby development contracted for delivery of up to 120 acre-feet of imported SWP water from CLWA in order to reduce its use of groundwater for domestic and irrigation water supply. Primary Element 1 is partly intended to acquire site-specific data regarding private wells, their locations, the aquifers in which they are completed, their yields and pumping capacities as well as their quality, and their water level records. Primary Element 3 is partly intended to analyze such data in order to assess whether local aquifer depletion is occurring and, if so, what remedy is appropriate.

# *IV. Historical and Projected Water Requirements and Supplies*

**Historical Water Requirements**

The initial development of water supplies in the Santa Clarita area began in the 1800's for irrigation on the San Francisquito Ranch after its purchase by Henry Mayo Newhall. While there are some records in the form of waterworks drawings that show early diversion and distribution facilities on the ranch in 1911 and some mapping of well locations in the 1930's, the earliest complete records of water use date from shortly after the end of World War II. From 1947 through the mid 1960's, groundwater pumping for agriculture ranged from about 27,000 to about 42,000 acre-feet per year (afy). For most of the same period, until 1960, there are no detailed records of water use for municipal supply. The first records of municipal water use begin in 1960, when municipal water requirements were about 5,000 afy; by the mid-1960's, municipal water requirements had increased to about 10,000 afy. Throughout that time, all municipal water supply was from local groundwater.

From the mid-1960's through about 1980, groundwater pumping for agricultural water supply declined into the range of about 10,000 to 15,000 afy. In the late 1980's through the early 1990's, agricultural groundwater pumping further declined into the range of about 8,000 to 10,000 afy; over about the last ten years, agricultural water requirements, which continue to be fully met by local groundwater pumping, have been in the range of about 12,000 to 15,000 afy. The history and trends of agricultural water use in the basin are illustrated in Figure 4-1.

Detailed records of municipal water use are not available from the mid-1960's through 1980, when imported surface water was first used in the basin for municipal water supply. However, the available municipal water use data at the beginning and at the end of that period, combined with estimated declining agricultural water use for the same period, suggest there was a generally steady increase in municipal water use from about 11,000 af in 1966 to about 22,000 af in 1980. Since then, municipal water use has increased to about 68,000 afy. With the addition of imported surface water from the State Water Project beginning in 1980, however, groundwater pumping for municipal supply declined in the early 1980's. Throughout the 1990's, municipal

pumping fluctuated between about 27,000 and 32,000 afy. The history and trend of municipal groundwater use in the basin are illustrated in Figure 4-1.

As noted above, until 1980, all water supply in the basin was from local groundwater. Imported surface water was first available from the State Water Project (SWP) in 1980, when a total of 1,125 af were imported into the basin. Since then, importations of SWP water have increased in two separate steady trends, interrupted by a notable decrease at the end of, and following, the 1987-1992 drought period: a steady increase beginning in 1980, to about 21,600 afy in each of 1989 and 1990, followed by a substantial decrease, to less than 8,000 af in 1991, and then a steady increase back to about 21,000 afy in 1997 and 1998, followed by further increases to nearly 42,000 af in 2002. The history and trends in importation of SWP water to the basin are illustrated in Figure 4-2, which also illustrates the historical trends in groundwater pumping and total water use in the basin since the importation of SWP water.

In the context of this groundwater management plan, the historical utilization of imported SWP water to augment local groundwater represents the initiation of conjunctive use of surface water and groundwater supplies, a groundwater management principle which is intended to be continued via adoption of Primary Element 5 of this plan.

**Projected Water Requirements**

Detailed projections of municipal water requirements were most recently completed as part of the Urban Water Management Plan prepared by CLWA and the municipal water purveyors (Newhall County Water District, Santa Clarita Water Company, and Valencia Water Company) in 2000. Those projections, which are forecast for a 20-year period, also recognize an ongoing but decreasing agricultural water demand over the same period, from about 15,000 afy in 2005 to about 7,000 afy by 2020. The municipal water demand projections in the Urban Water Management Plan are derived from utilization and interpretation of multiple projection methods, including per-capita water-use applied to population projections; extrapolation of number of service connections (using two different projection techniques, an average rate and an accelerated rate projection) applied to the rate of service connection additions since 1990; and land use projections combined with unit water use factors on multiple land use categories (urban, including residential, commercial, industrial and recreational; irrigated agricultural; and vacant and open space). The water demand projections in the Urban Water Management Plan also consider weather effects (variations due to hot-dry years vs. cool-wet years) and conservation

**Historical Groundwater Production**
Upper Santa Clara Valley Groundwater Basin
East Subbasin

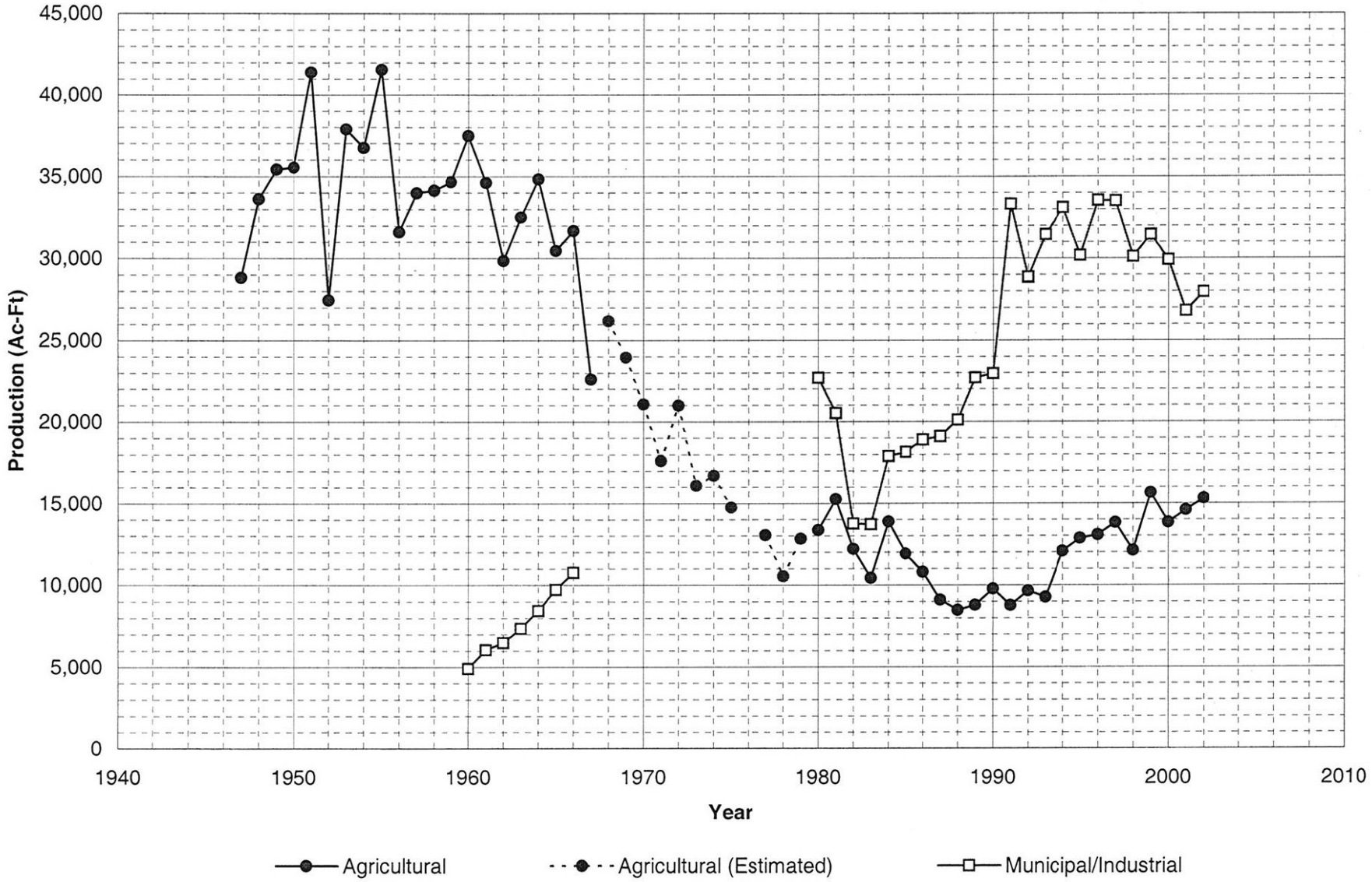


Figure 4-1

effects on water usage.

The net result of application and interpretation of the various water demand projection methods in the 2000 Urban Water Management Plan is summarized in Figure 4-2, which reflects projected urban and agricultural water demand through 2020, absent potential increased conservation savings, which are estimated to be ten percent of urban water demand. Numerically, urban water use without increased conservation savings is projected to increase to nearly 67,000 afy by 2005, and then continue to increase to 106,000 afy by 2020. As noted above, agricultural water use over the same period is projected to decrease to 15,000 afy by 2005, followed by an ongoing decrease to 7,100 afy by 2020. In addition to the graphical presentation of projected water demands in the basin through 2020 in Figure 4-2, projected water demands are tabulated, both with and without potential increased conservation savings, in Table 4-1.

**Table 4-1**
**Projected Normal/Average Year Water Demands**
(acre-feet per year)

| | **2005** | **2010** | **2015** | **2020** |
|---|---|---|---|---|
| Urban | 66,600 | 77,700 | 90,900 | 106,000 |
| Agriculture | 15,100 | 12,400 | 9,800 | 7,100 |
| **Total Projected Demand** | **81,700** | **90,100** | **100,700** | **113,100** |
| Increased Conservation Savings | 6,600 | 7,700 | 9,100 | 10,600 |
| **Total Projected Demand** *(with increased conservation)* | **75,100** | **82,400** | **91,600** | **102,500** |

**Existing and Projected Water Supplies**

As noted above, existing water supplies to meet current water demands are comprised of local groundwater and imported SWP surface water. In 2001, for example, to meet a total water demand of nearly 76,800 af, local groundwater pumping amounted to 41,400 af (about 54% of total demand) and imported SWP water amounted to 35,400 af (about 46% of total demand).

Water supplies to meet projected water demands are expected to continue to be primarily a combination of local groundwater and imported SWP surface water, augmented by local recycled

**Historical and Projected Water Use**
Upper Santa Clara Valley Groundwater Basin
East Subbasin

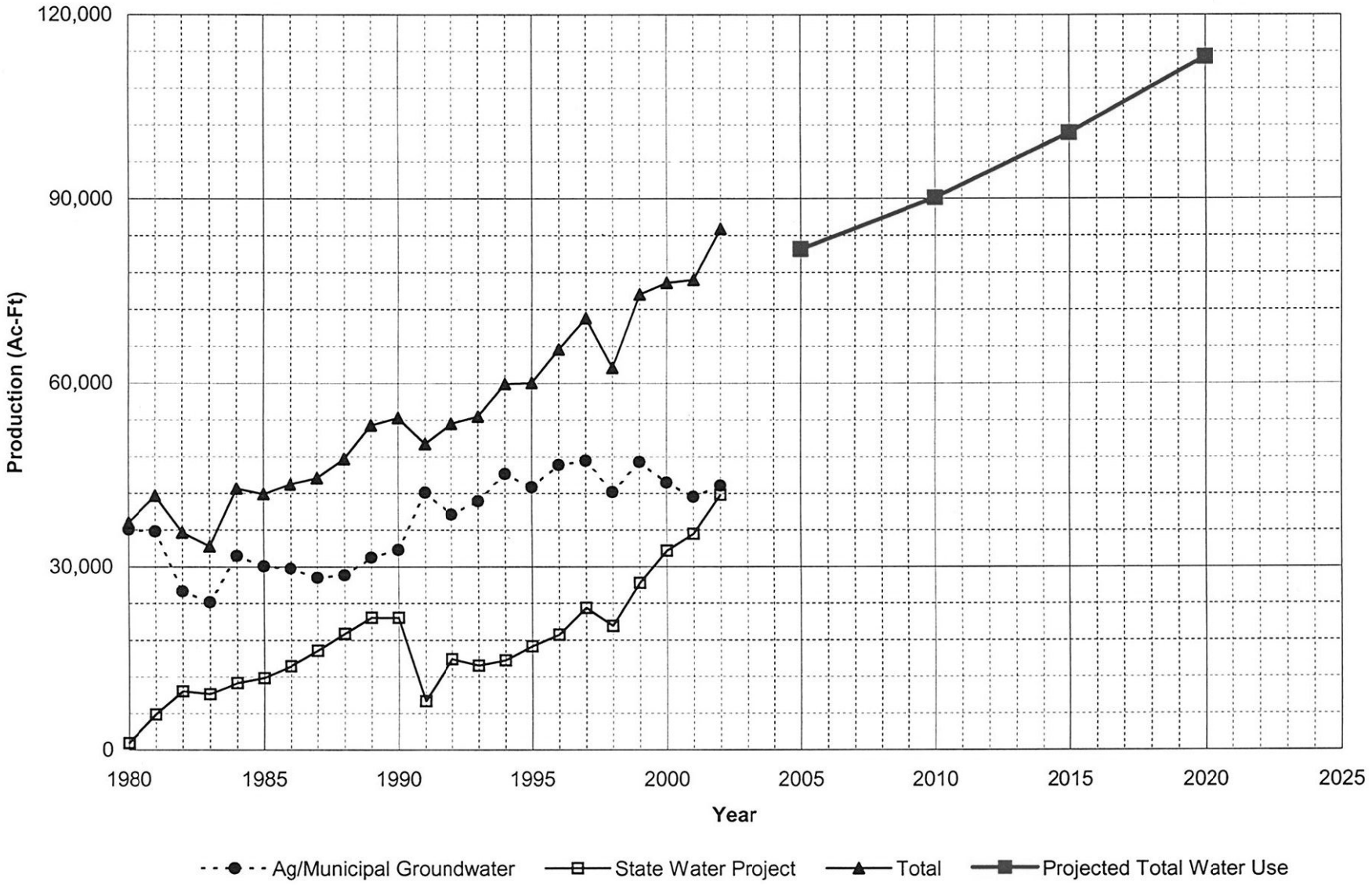


Figure 4-2

water and possibly some water supply derived from water transfers and desalination outside the basin.

**Local Groundwater** - Local groundwater has historically been developed from the two aquifers that comprise the groundwater basin, the Alluvium that underlies the Santa Clara River and its tributaries, and the Saugus Formation that underlies much of the CLWA service area. Those two aquifers, and the groundwater basin they comprise, are the focus of this groundwater management plan. Based on historical experience and observation of groundwater conditions, it is currently expected that ongoing utilization of local groundwater will continue to be in amounts that are generally comparable to what has historically been pumped, 30,000 to 40,000 afy from the Alluvium and 7,500 to 15,000 afy from the Saugus Formation. It is also expected that there is some additional development potential in the Saugus Formation, in the range of 10,000 to 20,000 af which might be intermittently extracted during one or more dry years when supplemental imported water supplies might be reduced. Ultimately, it is expected that local groundwater will continue to be a component of water supply in the basin at appropriate production levels from both aquifers. The intent of this groundwater management plan is to ensure that ongoing utilization of local groundwater continues to result in acceptable aquifer conditions, i.e. avoidance of overdraft (Primary Plan Element 3), no degradation of quality (Primary Plan Element 6), no adverse impacts to surface waters (Primary Plan Element 2), all via continuation of conjunctive use operations that have been ongoing since the initial importation of supplemental surface water in 1980 (Primary Plan Element 5) and via monitoring and interpretation of surface water and groundwater conditions on an ongoing basis (Primary Plan Elements 1 and 2).

**Supplemental (SWP) Surface Water** - CLWA has a Table A contract amount of 95,200 af of water from the SWP. CLWA's original contract, signed in 1963, was for 23,000 af; that Table A amount was later increased to 41,500 af. In 1988, CLWA purchased a Table A amount of 12,700 af from Devil's Den Water District, and it acquired another 41,000 af of Table A amount in 1999 from Kern County Water Agency and its member district, the Wheeler Ridge-Maricopa Water Storage District. There is ongoing CEQA-related litigation over the most recent acquisition of the 41,000 af Table A amount. However, there has been no invalidation of the completed agreement to transfer the 41,000 af Table A amount to CLWA and current water supply planning includes that Table A amount as CLWA corrects the CEQA technicality by preparing a new EIR to address the environmental consequences of the transfer.

**Recycled Water** - In 1993, CLWA prepared a draft Recycled Water System Master Plan that outlined a multi-phase program to integrate recycled water into the overall water supply system in the basin. Phase I of that project, which will deliver approximately 1,700 afy, began deliveries of recycled water for golf course irrigation in mid-2003. Overall, by 2020, recycled water is expected to ultimately reclaim up to 17,000 afy of treated waste water suitable for irrigation of golf courses, landscaping, and other non-potable uses.

# *V. Elements of the Groundwater Management Plan*

As part of long-term water supply planning in the Santa Clara River Valley East groundwater subbasin, Castaic Lake Water Agency (CLWA) and the municipal water purveyors in the basin, in concert with other groundwater pumpers in the basin, began conjunctive use operations in 1980 by importing supplemental surface water from the State Water Project and integrating it with local groundwater to meet all the water requirements in the basin. Prior to that time, and continuing to the present, various groundwater pumpers and other entities in the basin, including CLWA, have collected groundwater and related data on which historical and ongoing analyses of groundwater basin conditions have been made. Those monitoring efforts and basin analyses have allowed CLWA and other entities in the basin to progressively define and understand basin conditions, and to continue to meet increasing water demands over the last 23 years. Information derived from the monitoring and management efforts to date has allowed the various public and private pumpers in the basin to continue to rely on the groundwater basin for some or all of their water supply without significant concern that the resource was either overdrafted or otherwise negatively impacted.

In light of the preceding, complemented most recently by the Memorandum of Understanding process that has initiated integrated management with United Water Conservation District, which serves as the manager of adjacent downstream basins on the Santa Clara River (as described in Primary Element 9), local groundwater management has already been initiated consistent with the opportunity provided by Water Code Section 10753. However, despite those ongoing accomplishments, CLWA recognizes the concerns and issues that are discussed herein relative to groundwater and the adequacy of water supplies in the basin. With that recognition, and in part prompted by the requirements of AB 134, CLWA has prepared this broader-based groundwater management plan.

To continue historical groundwater management activities and to address identified concerns and issues related to groundwater and water supply in the area, this Groundwater Management Plan has been developed to provide a framework for present and future actions. As has been the case for the groundwater management activities by CLWA and other local entities over the past 23 years, it is expected that this plan will be updated as new data are developed, particularly in light

of the key role that groundwater monitoring (water levels and quality) has played, and will continue to play, in defining groundwater conditions and aquifer response to management actions.

The management objectives, or goals, for the Santa Clara River East groundwater basin include the following:

**Goal 1:** Development of Local Groundwater for Water Supply
**Goal 2:** Avoidance of Overdraft and Associated Undesirable Effects
**Goal 3:** Preservation of Groundwater Quality
**Goal 4:** Preservation of Interrelated Surface Water Resources

To accomplish those goals, with recognition of the opportunities encouraged by Water Code Section 10750 et seq. for local agency management of groundwater resources, this plan incorporates a number of components which are divided into primary, or essential, elements and secondary, or potential, elements. In both categories, the elements formally recognize the effectiveness of a number of ongoing water resource management activities. They recognize the need for additional activity, such as expanded conjunctive use of supplemental surface water, and recycled water, with local groundwater. They also reflect the wider focus on local groundwater management, such as continuing cooperation with the municipal water purveyors and other pumpers in the basin, and with other water resource management entities on the Santa Clara River, most notably United Water Conservation District, to address the impacts of regional resource opportunities and/or challenges. In summary, this Groundwater Management Plan will enable CLWA, the retail water purveyors, and their neighbors to continue use of local groundwater for regular water supply, to expand their use of local groundwater during dry periods or emergencies, and to work with other agencies via implementation of the following management plan elements.

**Primary (Essential) Plan Elements**

1. Monitoring of Groundwater Levels, Quality, Production and Subsidence
2. Monitoring and Management of Surface Water Flows and Quality
3. Determination of Basin Yield and Avoidance of Overdraft
    - wet and dry period pumping
    - control of well field drawdown

4. Development of Regular and Dry Year/Emergency Water Supply
5. Continuation of Conjunctive Use Operations
6. Long Term Salinity Management
7. Integration of Recycled Water
8. Identification and Mitigation of Soil and Groundwater Contamination
    - involvement with other local agencies in investigation, cleanup, and closure
9. Development and Continuation of Local, State and Federal Agency Relationships
10. Groundwater Management Reports

**Secondary (Potential) Elements**

1. Continuation of Public Education and Water Conservation Programs
2. Identification and Management of Recharge Areas and Wellhead Protection Areas
    - involvement in land use planning process
3. Identification of Well Construction, Abandonment, and Destruction Policies
    - water quality protection
    - manage vertical distribution of pumpage
4. Provisions to Update the Groundwater Management Plan

**Primary Element 1 - Monitoring of Groundwater Levels, Quality, Production, and Subsidence**

Prior to 1980, all water supply in the Upper Santa Clara River Area was developed from local groundwater; since 1980, imported surface water has become an increasing component of overall water supply in the area, but groundwater continues to meet all agricultural water demand and a significant part of municipal water demand. As a result of the long term development and use of groundwater in the area, there is a fairly substantial amount of historical groundwater level data, and a useful amount of groundwater quality data and groundwater pumping data that has been collected in the basin. All the available historical groundwater level, quality, and pumping data have been organized into a computerized data base for the Upper Santa Clara River Area. That data base, while separate, has been coordinated with an equivalent data base maintained by United Water Conservation District for the downstream basins on the Santa Clara River. The intent of database coordination has been to facilitate interpretation and reporting on groundwater and other water resource related issues by the respective agencies overlying the various basins along the river.

The networks of wells from which groundwater level and groundwater quality data have been collected are illustrated in Figures 5-1 and 5-2. The networks are comprised of a combination of active production wells, inactive production wells, and dedicated monitoring wells, shown on Figures 5-1 and 5-2. Data collection has historically varied from randomly infrequent to regularly scheduled but infrequent (e.g. semi-annual). The historical data collection efforts cannot be classified as an organized area-wide program of groundwater data collection, there are generally sufficient data available on which to interpret basin conditions. Ultimately, it is recognized that monitoring of existing wells, and expansion of the network of both production and monitoring wells, are key to accomplishing all the goals for the basin in this management plan. Monitored groundwater levels, quality, and pumping will collectively provide the basis for defining basin conditions and developing operational protocols that allow conjunctive use to support ongoing groundwater supply while avoiding undesirable conditions such as chronically depressed groundwater levels or degraded groundwater quality. Thus, a primary element of this plan is to develop and implement a groundwater monitoring program that is comprised of a network of wells, mostly as illustrated in Figures 5-1 and 5-2, but possibly expanded to include some dedicated monitoring wells as well as some potential new production wells. The frequencies and types of groundwater data collection will vary as a function of specific monitoring objectives in various parts of the basin. For initial implementation purposes , basin-wide groundwater monitoring protocols (locations and types of measurements, frequencies, etc.) are included in the Appendix to this Plan.

It should be noted, in light of the lack of historical subsidence and the low potential for it to occur as discussed in Section III above, that no formal subsidence monitoring is planned, i.e. no extensometers, fixed-point ground surveys or remote sensing. However, if the analysis of planned additional dry-year pumping indicates the potential for subsidence attributable to lower groundwater levels, monitoring or other appropriate action (e.g. re-distributed or reduced pumping) will be undertaken.

**Primary Element 2 - Monitoring and Management of Surface Water Flows and Quality**

The geologic and hydrologic configuration of the groundwater basin and the Santa Clara River system that overlies the aquifers in the basin is such that the River and the Alluvial aquifer can directly interact. Further, although the Saugus Formation has hydraulic characteristics that indicate it to be locally confined, groundwater can move between the Alluvium and the Saugus. The net result of the overall river-aquifer configuration is that groundwater is readily recharged

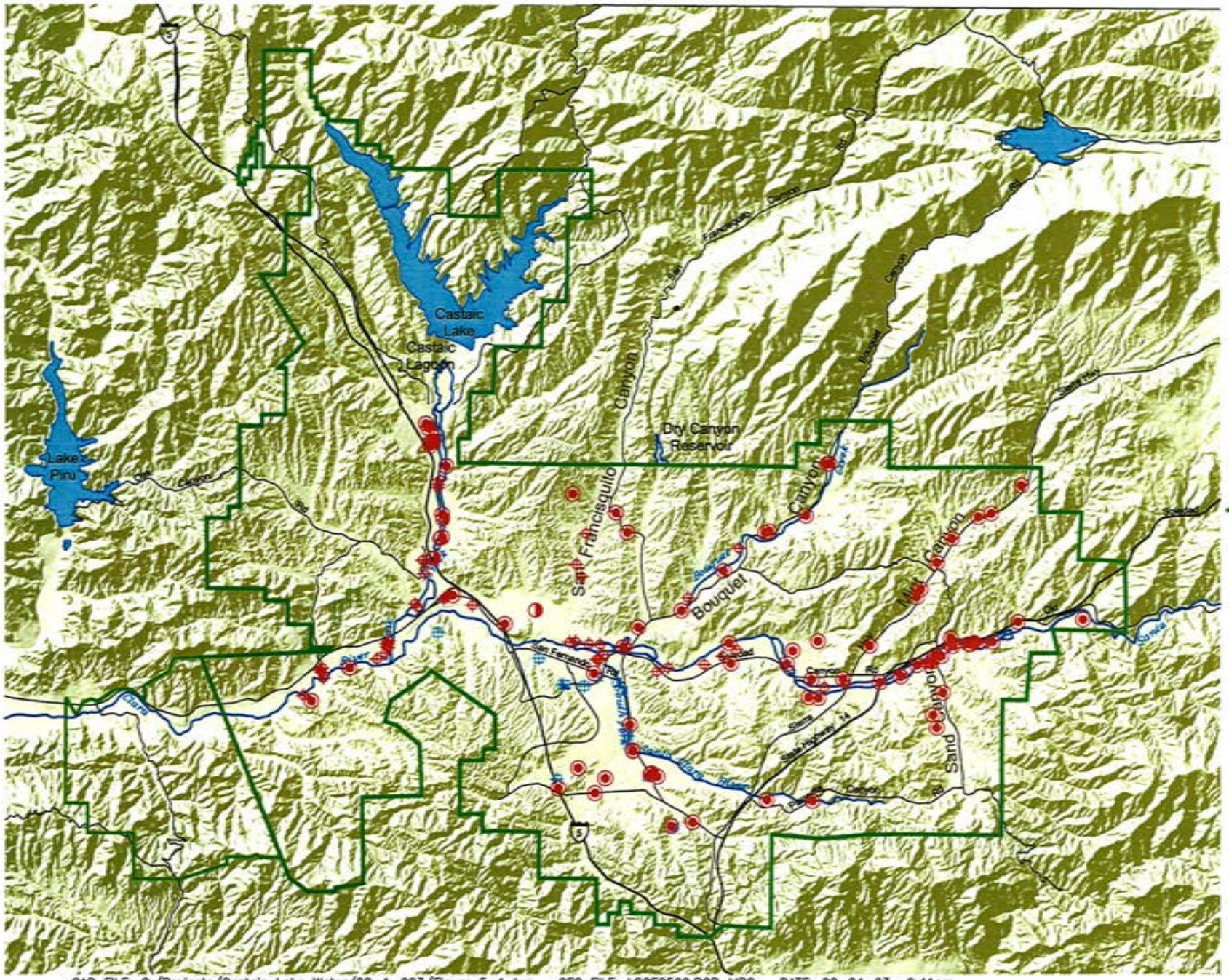


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**Figure 5-1**
**Water Level Monitoring Well Network**
**Santa Clara River Valley East Groundwater Subbasin**

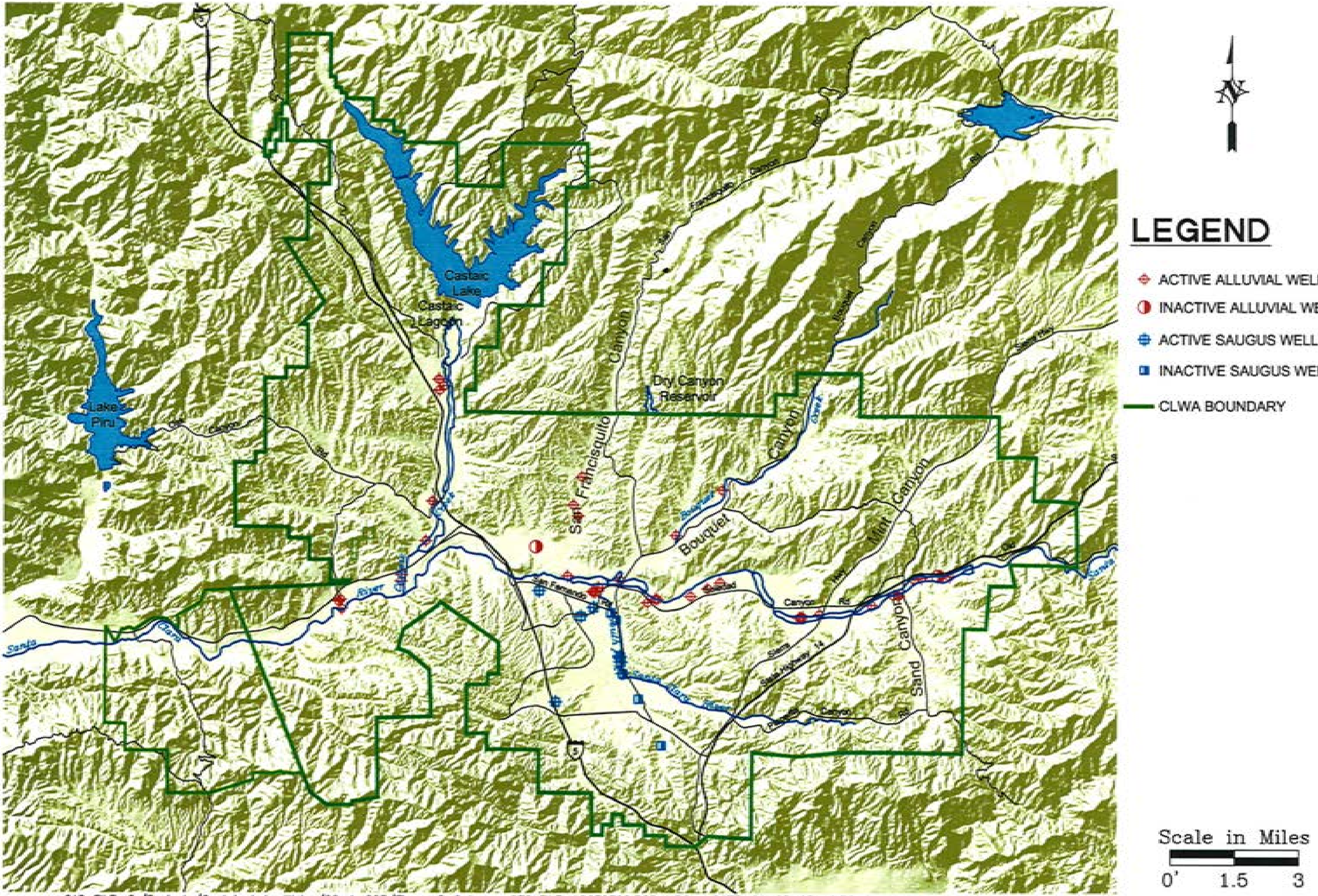


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**Figure 5-2**
**Water Quality Monitoring Network**
**Santa Clara River Valley East Groundwater Subbasin**

by periodic natural surface water flows in parts of the basin, generally to the east of Bouquet Canyon; and groundwater discharges to the river in other parts of the basin, generally to the west of Bouquet Canyon. As a result of the latter groundwater discharges to the river, in combination with treated waste water discharges from the two local regional treatment plants, there is a significant surface water outflow from the basin in the Santa Clara River. That surface water flow to the west across the County line has increased over the last 20 years (Figure 5-3).

When considered in concert with the other elements of this groundwater management plan, a number of challenges related to surface water flow and quality are evident. First, knowledge of surface flow rates and quality, and variations in both, will be essential to incorporating surface water considerations into management of the interconnected aquifer system. Thus, monitoring of surface water flows and quality will be part of this plan; and the resultant data will be incorporated in the database of groundwater data that results from implementation of this element and Primary Element 1.

Secondly, continuation of some surface flow and non-degradation of surface water quality would appear to be appropriate objectives, particularly as recycled water use is integrated into the overall water supply in the basin, and as dry-year dependence on groundwater increases. Those issues have begun to be addressed in the MOU process with neighboring United Water Conservation District, as described in Primary Element 9 of this Plan, but they will be addressed on a more comprehensive basis as monitored data is collected, as a numerical groundwater flow model is developed and utilized (Primary Element 3), and as recycled water becomes part of the integrated water supply (Primary Element 7). Basin management of surface water flows and quality will also relate to potential groundwater management actions intended to augment yield, e.g. artificial groundwater recharge (Primary Elements 3 and 5), and groundwater management actions intended to preserve groundwater quality (Primary Element 6). For initial implementation purposes, surface water monitoring protocols (locations and types of measurements, frequencies, etc.) are included in the Appendix to this Plan.

In light of the preceding, this plan element is included in the overall groundwater management plan to address surface water flows and quality in concert with analysis and management of groundwater levels and quality. The implementation of this plan element will be essential to accomplishment of the fourth management objective (goal) for the basin.

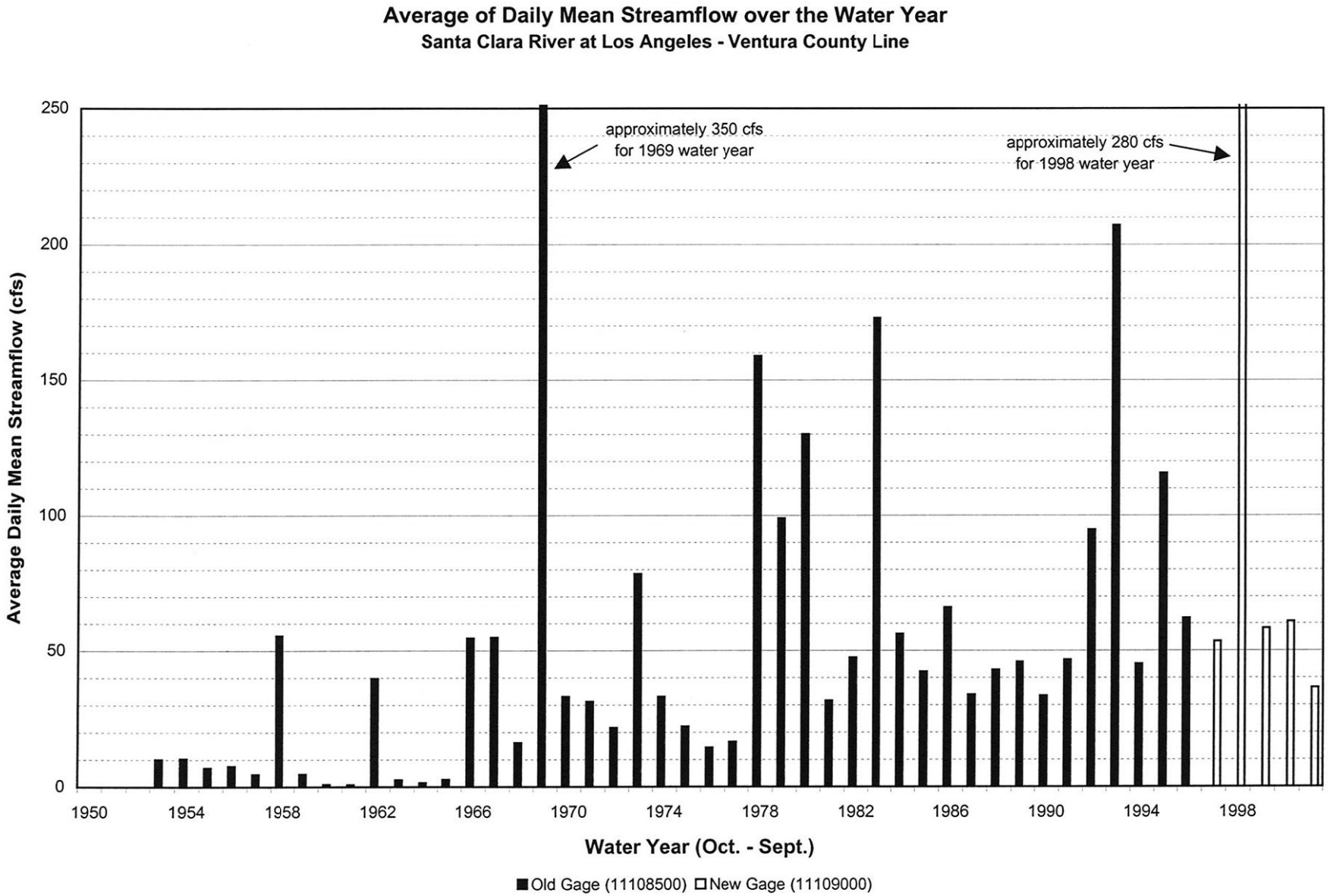

Average of Daily Mean Streamflow over the Water Year
Santa Clara River at Los Angeles - Ventura County Line
Average Daily Mean Streamflow (cfs)
250
200
150
100
50
0
approximately 350 cfs
for 1969 water year
approximately 280 cfs
for 1998 water year
1950
1954
1958
1962
1966
1970
1974
1978
1982
1986
1990
1994
1998
Water Year (Oct. - Sept.)
Old Gage (11108500)
New Gage (11109000)

Figure 5-3

**Primary Element 3 - Determination of Basin Yield and Avoidance of Overdraft**

In order to accomplish all the goals for the basin, it will be essential to determine what yield can be developed on both a regular and an intermittent (dry period or emergency) basis. Such a determination of basin yield will be made to accomplish the main objective of operating within the yield of the groundwater basin, avoidance of overdraft.

On a long-term basis, there has not been any widespread, steady degradation of groundwater conditions that might be indicative of overdraft, i.e. decrease in groundwater levels or storage as a result of pumping in excess of the yield of the basin. There have been, and continue to be, short-term fluctuations in groundwater levels that are basically related to variations in local hydrological conditions, alternating increases and decreases in storage in response to wet and dry conditions (and associated fluctuations in recharge and pumping). Such fluctuations are typical of groundwater basin conditions in any conjunctive use setting, such as in this basin; groundwater is utilized from storage during dry years, or dry periods, and that storage is replenished during alternate wet years, or periods. The observation of these historical groundwater conditions, in combination with knowledge of pumpage from both the Alluvial and Saugus Aquifers, has led to current operational practices as well as general expectations regarding the approximate yield of the local groundwater system.

While historical operating experience, complemented by observed groundwater conditions, is an appropriate basis for generally planning for available groundwater supplies, it is possible and appropriate to more precisely analyze the basin to determine values or ranges of yield under varying hydrologic conditions, and to assess the impacts of various management actions that might be implemented in the basin. The MOU process described in Primary Element 9 of this Plan includes the development of a numerical groundwater flow model which is intended to be utilized for determination of the yield of the basin under existing land use and under existing groundwater and surface water development conditions. It is also expected to be used for implementation of this Plan Element to assess the yield of the basin under future land use conditions as well as future ranges of surface water importation, groundwater development, and recycled water use through varying hydrologic conditions, i.e. wet and dry periods that affect the availability of imported surface water.

The ultimate intent of this Plan Element is to develop an understanding and quantification of the yield of the basin, under varying hydrologic conditions and developing local cultural conditions,

so that groundwater development and use can be managed in such a way to meet an appropriate fraction of total water demand while avoiding levels of groundwater use that would result in overdraft conditions. Thus, implementation of this Plan Element is essential to accomplishing the first and second management objectives (goals) for the basin.

**Primary Element 4 - Development of Regular and Dry Year/Emergency Water Supply**

The most recent updated Urban Water Management Plan (UWMP, December 2000) prepared by CLWA and the retail water purveyors in the basin (Newhall County Water District, Santa Clarita Water Company and Valencia Water Company) includes plans to develop 30,000 to 40,000 acre-feet per year (afy) from the Alluvial aquifer and 7,500 to 15,000 afy from the Saugus Formation in average/normal years. Both ranges of numbers are consistent with recent historical pumping that has not resulted in any indication of overdraft or other undesirable conditions. The UWMP also includes plans to slightly reduce Alluvial pumping in dry years (in recognition of historical experience with decreased groundwater levels in the eastern part of the basin during dry periods) to 30,000 to 35,000 afy, while potentially increasing dry-period Saugus pumping to 21,000 to 35,000 afy depending on the duration of dry conditions.

A major consideration in this plan is the accomplishing ~~of~~ this element in concert with Primary Element 3, i.e. development of both regular and dry year/emergency groundwater supply within the yield of the basin in order to avoid overdraft. Toward that goal, the model described in Primary Element 3 will be used to analyze projected results, i.e. groundwater levels, storage and stream flow impacts, in order to design the optimal distribution of pumpage or to refine the ranges of regular or dry period/emergency pumping volumes. The result will facilitate a water transmission and distribution design, and will also facilitate planning for supplemental water supplies and planning for proactive recharge activities to augment basin yield as necessary to meet water supply requirements. Thus, implementation of this Plan Element, within the confines of Primary Element 3, will be essential to accomplishment of the first management objective (goal) for the basin.

**Primary Element 5 - Continuation of Conjunctive Use Operations**

Beginning with the initial delivery of imported surface water from the State Water Project (SWP) in 1980, CLWA and the retail water purveyors in the basin have been practicing the conjunctive

use of imported surface water and local groundwater. Conjunctive use in this setting has consisted of meeting water demands with a combination of imported surface water and local groundwater. Groundwater pumping has remained within a range that has not caused any evidence of overdraft, or associated undesirable impacts, and has fluctuated within that range to meet a larger fraction of water demand during periods of reduced surface water availability, such as at the end of the 1987-1992 drought and for several years immediately thereafter. Imported surface water use, on the other hand, progressively increased from 1980 through 1990, substantially decreased in the early 1990's due to extended drought conditions in Northern California, returned slowly to pre-drought levels over about a five year period, and has progressively increased again since 1996. The historical trend in water demand and the trends in groundwater and imported (SWP) surface water use to meet that demand are illustrated in Figure 5-4.

Conjunctive use of local groundwater and imported surface water will continue to be a key element in meeting all the goals for the basin, most notably utilizing groundwater for water supply without overdrafting the basin. Historical experience with groundwater pumping and aquifer response to varying hydrologic conditions has shown that the groundwater basin can support notable variations in pumping during wet and dry periods, but it cannot support continuous pumping at rates high enough to meet total local water demand. Thus, utilization of imported surface water in conjunction with local groundwater is essential to the management of groundwater for water supply without overdrafting that resource.

As part of conjunctively using surface water and groundwater, it is recognized that, particularly when the surface water supply is imported from the State Water Project, there will be variations in the amount of available surface water supply from year to year. Similarly, there are expected to be variations in local groundwater conditions as a function of local hydrologic conditions which affect, among other things, the natural recharge to the groundwater basin from year to year. In the case of this basin, local (Southern California) hydrology which affects local groundwater conditions may not necessarily be the same as the hydrology in a distant (i.e., northern California) location that directly affects the availability of supplemental, imported surface water in any given year. Thus, conjunctive use management is necessary to ensure that the groundwater basin is maintained to meet a regular component of water supply and to also provide a larger component of water supply during "dry periods" that affect supplemental surface water availability. Conjunctive use management is similarly important to ensure that local groundwater can be replenished, via reduced pumping and/or as a result of wetter local

**Historical and Projected Water Use**
Upper Santa Clara Valley Groundwater Basin
East Subbasin

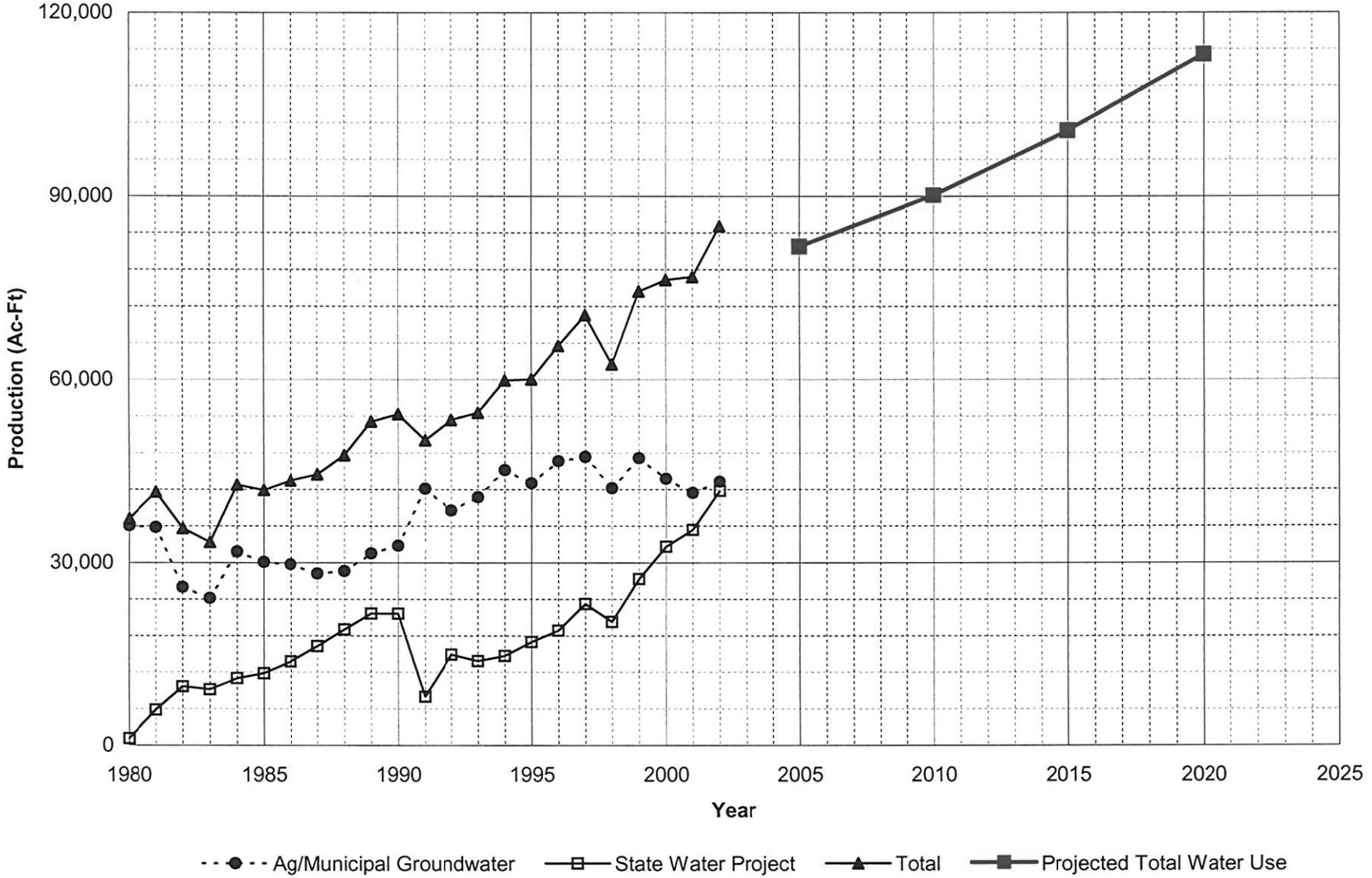



Figure 5-4

hydrologic conditions, during periods of wet/normal surface water availability. In light of all the preceding, implementation of this Plan Element is essential to accomplishing all the management objectives (goals) for the basin.

**Primary Element 6 - Long Term Salinity Management**

In general, groundwater quality in the basin is such that groundwater supplies meet standards for beneficial use in the basin, most of which is for municipal (domestic) use but some of which remains for agricultural and some other irrigation (non-domestic) use. There also have been no notable historical trends of groundwater quality degradation in the basin over time. However, a number of geologic and hydrologic factors suggest that observations and interpretation of groundwater quality warrant attention to ensure long-term preservation of groundwater quality. Notable among those geologic and hydrologic factors are: 1) the largely "closed" geologic nature of the aquifer system at the western limit of the basin (other than a thin section of Alluvium beneath the Santa Clara River, there is no continuity of aquifer materials between the Santa Clara River Valley East groundwater subbasin and the next downstream groundwater basin on the Santa Clara River, the Piru Basin in Ventura County); 2) the predominant groundwater flow direction in the basin toward the west, where there is the lack of continuity of aquifer materials for groundwater outflow; 3) a certain amount of rising groundwater discharge into the Santa Clara River; and 4) an increasing discharge of treated waste water into the Santa Clara River toward the western end of the basin which, when accounting for the planned use of a substantial amount of recycled water in the Basin (Primary Element 7) will result in higher salt concentrations than other sources of water supply in the Basin. The combination of the preceding factors suggests that, on a long-term basis, there could be an accumulation of dissolved minerals in the aquifer system if salinity is not managed in a way to avoid undesirable groundwater quality degradation. Consequently, this primary element is included in the overall groundwater management plan to include the interpretation of groundwater quality data (Primary Element 1) and to incorporate groundwater quality as an important consideration in the implementation of the other elements of the plan, most notably Continuation of Conjunctive Use Operations (Primary Element 5), Integration of Recycled Water (Primary Element 7), and Identification and Cleanup of Contaminated Groundwater (Primary Element 8). The Long Term Salinity Management element of the plan is essential to accomplishing the third management objective (goal) of preserving groundwater quality in the basin.

**Primary Element 7 - Integration of Recycled Water**

In 1993, CLWA prepared a Reclaimed Water System Master Plan that outlined a multi-phase program to deliver highly treated, recycled water in the Valley. At that time, potential recycled water uses in excess of 10,000 afy, of which about 9,000 afy were located within the CLWA service area, were identified. The first phase of the Reclaimed Water System Master Plan to deliver 1,700 afy has been environmentally reviewed and is being implemented, with initial deliveries having commenced in August 2003.

The 1993 recycled water plan expected to reclaim up to 10,000 afy. CLWA has been updating that plan to ultimately provide up to about 17,000 afy for irrigation and other non-potable uses. It has also been recognized that, if the Newhall Ranch project is approved, total annual demands for recycled water in the area could ultimately approach 20,000 afy.

This plan element is included in the groundwater management plan primarily because recycled water use in the Valley will supplant a substantial fraction of fresh water demand that would otherwise be met with potable water from some combination of pumped groundwater and imported surface (SWP) water. With total municipal, agricultural and other water demands projected to increase from about 75,000 afy at present to slightly more than 100,000 afy by 2020, the progressive increase in recycled water use from 1,700 afy to as much as 17,000 to 20,000 afy, recycled water use would reduce demands on potable sources (groundwater and imported SWP water) by up to nearly 20 percent. Accomplishment of this Plan Element will benefit the accomplishment of Elements 3 and 4, and will also contribute to the accomplishment of all four of the Basin Goals.

**Primary Element 8 - Identification and Mitigation of Soil and Groundwater Contamination**

As in numerous other groundwater basins in California, there have been a number of leaking underground storage tanks or other similar situations which have released organic constituents into soil, and possibly into groundwater, in the basin. None of those has impacted municipal or other water supply wells and, consequently, there has been no adverse impact on groundwater supply in municipal or other water supply systems in the basin. However, the detection of perchlorate in the discharge from four Saugus wells (CLWA Santa Clarita Water Division Saugus Wells 1 and 2, Newhall County Water District Well 11, and Valencia Water Company Well 157) in 1997, followed by the detection of perchlorate in one Alluvial well (CLWA Santa Clarita Water Division Stadium Well) in 2002, has led to the inactivation of all those wells.

They remain out of municipal water supply service to date.

Experts retained by CLWA have opined that the cause of perchlorate contamination in the Saugus Formation is former operations associated with munitions manufacturing on property formerly owned by Whittaker-Bermite Corporation, which is immediately adjacent to all the impacted wells. Investigation and characterization of the perchlorate contamination, and initiation of control and cleanup are ongoing; however, remediation actions have not yet commenced. Consequently, the municipal water purveyors continue to be impacted by the loss of water supply capacity of the impacted wells. Associated with that loss is a concern about the migration of perchlorate contamination in a generally downgradient direction, toward other active wells completed in the Saugus Formation and the Alluvium and toward other potential well sites. In light of both the inactivation of wells and the potential downgradient impact on the aquifers, CLWA and the other retail water purveyors had initiated both legal action against responsible parties and technical investigation of the contamination. Recently the parties have entered into an interim settlement agreement which is intended to complete investigation and characterization of the contamination in a collaborative effort. This effort will facilitate and expedite remediation actions.

The primary purpose for technical investigation of the perchlorate contamination by CLWA and the other municipal purveyors is to ultimately recover the currently unavailable water supply capacity that has resulted from the inactivation of impacted wells. Conceptually, that may be accomplished by some combination of reactivation of impacted wells and new well construction. CLWA has joined with the U.S. Army Corps of Engineers in a study to develop information about the contamination. CLWA and the retail water purveyors have also independently commissioned an assessment to conclude what treatment technology is appropriate for removal of perchlorate from pumped groundwater; they have also independently commissioned the application of a numerical groundwater flow and quality model to determine an optimal pumping program for 1) perchlorate removal from the aquifer, 2) control of its migration in the aquifer, and 3) restoration of impacted pumping capacity for water supply. With data derived from that work, CLWA and the other purveyors are preparing to submit an application to the State Department of Health Services, by late 2004, for a permit to return to pumping from the locally impaired Saugus Formation. The proposed pumping would be combined with approved wellhead treatment to render the treated water suitable for municipal supply. In addition to the latter objective to recover currently inactivated water supply, the proposed pumping would be designed and operated to remove contaminated groundwater and to control any further migration

of contaminated groundwater toward other Saugus wells to the west. CLWA and the retail water purveyors then expect to be able to design and implement, alone or in concert with responsible parties, a contamination control and treatment program at or near their impacted wells that can, in part, make groundwater available for municipal or other beneficial use. They also expect that such a program will provide some hydraulic and associated water quality protection for other parts of the aquifer system to keep contamination from impacting other wells or other parts of the aquifers in which water supply wells might be completed.

Regarding the balance of the aquifer system, water supply planning to date (i.e. the current Urban Water Management Plan) includes expanded development of the Saugus Formation for dry-period and emergency water supply. Data development and control and treatment of groundwater contamination in the Saugus Formation will be critical to accomplishing that water supply plan. In terms of this groundwater management plan, accomplishment of this plan element will contribute to the accomplishment of all four management objectives (goals) for the basin.

**Primary Element 9 - Development and Continuation of Local, State and Federal Agency Relationships**

As the local SWP contractor, CLWA has long-established working relationships with local and state agencies that will continue on an ongoing basis. By nature of its primary function, CLWA will continue to interact with state agencies, most notably the Department of Water Resources, on the operation of the State Water Project. The latter, of course, has been the source of supplemental imported surface water that has made the initiation and continuation of conjunctive use operations possible since 1980. It will also be the primary component, with local groundwater, in continuation of conjunctive use operations in the future (Primary Element 5 of this Plan).

CLWA is the treated surface water provider to all the retail water purveyors, including Newhall County Water District, Los Angeles County Waterworks District No. 36, Valencia Water Company, and its own Santa Clarita Water Division. CLWA has a historical and ongoing working relationship with all those local agencies, as well as with other local groundwater pumpers, to manage water supplies to effectively meet water demands within the available yields of imported surface water and local groundwater. In fact, the Advisory Council convened to assist in the preparation of this Plan is comprised representatives of all the local water purveyors

and significant groundwater pumpers.

A local Memorandum of Understanding (MOU) process among CLWA, other purveyors within CLWA's service area, and United Water Conservation District (UWCD) in neighboring Ventura County is a classic illustration of a local agency relationship that has produced the beginnings of local groundwater management, now embodied in this comprehensive plan, most notably in Primary Elements 1 through 5. In 2001, out of a willingness to seek opportunities to work together and develop programs that mutually benefit the region as well as their individual communities, those agencies prepared and executed the MOU that initiated a collaborative and integrated approach to several of the aspects of water resource management that are now included in this Plan. UWCD manages surface water and groundwater resources in seven groundwater basins, all located in Ventura County, downstream of the East Subbasin of the Santa Clara River Valley that is the focus of this Plan. United is thus a logical partner in the cooperation of management efforts to accomplish the objectives (goals) for this basin, particularly as they relate to preservation of surface water resources that flow through the respective basins. As a result of that MOU, the cooperating agencies have integrated their database management efforts (part of Primary Elements 1 and 2 of this Plan), have initiated the development of a numerical groundwater flow model (for utilization in Primary Elements 3, 4 and 5 of this Plan), and are continuing to prepare reports on the status of basin conditions, as well as on geologic and hydrologic aspects of the overall stream-aquifer system.

A local extension of the interaction among CLWA, the retail water purveyors, and UWCD is an ongoing working relationship with the City of Santa Clarita. CLWA and the retail water purveyors meet regularly with City staff and also present water supply conditions via study sessions with the City Council on a routine basis. It is expected that the implementation of this Plan will result in the availability of a broader range of information transfer with the City relative to the existing and future water supply to its residents. An additional expectation of this Plan with respect to the relationship among CLWA, the retail water purveyors, and the City is the intent of CLWA and the purveyors to provide input to the City as a reviewer of proposed development relative to any potential contamination of groundwater associated with such proposed development. CLWA provides input to the City, as suggested in Water Code Section 10753.8, via review of land use plans and coordination with the City Planning Department to identify and assess any development-related activities which might pose a risk of groundwater contamination. By expressing this expectation of its groundwater management plan, CLWA is not intending to insert itself into the jurisdiction or authorization of any other land use permitting

agency; rather, CLWA is intending to provide review and input to the land use permitting process to protect the groundwater supply against any potential contamination that might occur as a result of any given development project.

This Primary Element is included in this Plan to formalize the historical local and state agency working relationships as part of comprehensively managing local groundwater, in concert with imported surface water and local recycled water, to accomplish all the management objectives (goals) for the basin.

**Primary Element 10 - Groundwater Management Reports**

As briefly described in the Introduction of this Plan, local groundwater management planning already includes, among several other activities, analysis of groundwater conditions and preparation of annual reports on groundwater and all other aspects of water resources and water supplies in the Santa Clara River Valley East groundwater basin. In addition, recently formalized cooperative work with neighboring UWCD includes both regular reporting on the status of groundwater conditions and specific reporting on geologic and hydrologic aspects of the overall stream-aquifer system. For example, documentation of the numerical groundwater modeling work currently in progress is expected to be the first of the latter reports in the next year.

Beginning in 1998, CLWA and the retail water purveyors in the basin have prepared a series of annual reports, known locally as the Santa Clarita Valley Water Report, to describe all aspects of water supply and water resource conditions in the basin. That report provides current information to local City and County land use agencies, and to other interested parties, about current water requirements, use of groundwater and treated imported surface water to meet those water requirements, groundwater conditions (pumping, groundwater levels and quality, etc.), local surface water conditions, the status of imported surface water supplies including details of delivered SWP water in the reported year as well as an up-to-date summary of available imported SWP water for the next year, a short-term projection of water requirements in the next year, and other appropriate details about water requirements and supplies such as, for example, the status of introducing recycled water as a component of non-potable water supply.

*In light of the frequency and comprehensive nature of the annual Water Reports, and also in light of the planned preparation of more detailed technical reports on various aspects of the basin as appropriate, the continued preparation of those reports will serve as regular and*

*complete reporting on all aspects of this groundwater management plan.*

**Secondary Element 1 - Continuation of Public Education and Water Conservation Programs**

CLWA has provided water conservation and public education programs that will continue and will be expanded as a complement to and an element of this groundwater management plan. The expansion of water conservation will largely stem from CLWA's having signed the "Memorandum of Understanding Regarding Water Conservation in California" (Urban MOU) in 2001, which made CLWA a wholesaler member of the California Urban Water Conservation Council. CLWA has thus committed to implementation of cost-effective water conservation measures known as Best Management Practices (BMPs) that are included in the Urban MOU and are intended to reduce California's long-term urban water demands. The BMPs have been incorporated into the water demand management measures section of the Urban Water Management Planning Act.

Water conservation and related public education measures have generally been developed in California to achieve the following goals:

- meet legal mandates
- reduce average annual potable water demands
- reduce sewer flows
- reduce water demands during peak seasons
- meet drought restrictions.

As a wholesaler of imported surface water CLWA has implemented the following BMPs for several years prior to signing the MOU:

- distribution system water audits, leak detection and repair
- public information
- school education
- wholesale agency assistance
- conservation pricing
- conservation coordinator.

As a signatory to the MOU, CLWA's water conservation and public education program will expand to include the following BMPs found to be locally cost-effective, as detailed in the 2000 Urban Water Management Plan for CLWA and the Santa Clarita Valley retail purveyors.

- water survey programs for single-family residential and multi-family residential programs
- residential plumbing retrofits
- metering with commodity rates for all new connections and retrofit of existing connections
- large landscape conservation programs and incentives
- high-efficiency washing machine rebate programs (when also provided by local energy providers or wastewater utilities)
- conservation programs for commercial, industrial, and institutional accounts
- wholesale agency programs to financially or otherwise support water conservation efforts by retailers (this measure will be expanded)
- residential ultra-low-flow toilet replacement program.

This Secondary Element, while identical to independent CLWA efforts in water conservation and public education, is incorporated in this Plan to complement other Plan elements, and to move toward accomplishment of all management objectives (goals) for the groundwater basin.

**Secondary Element 2 - Identification and Management of Recharge Areas and Wellhead Protection Areas**

The 1986 Amendments to the federal Safe Drinking Water Act (SDWA) established a new Wellhead Protection Program (WPP) to protect groundwater that supplies drinking water wells for public water systems. Each state was required to prepare a WPP and submit it to the USEPA by June 19, 1989. However, California did not develop an active state-wide Wellhead Protection Program at that time. Subsequently, in 1996, reauthorization of the SDWA established a related program called the Source Water Assessment Program. In 1999, the California Department of Health Services (DHS) Division of Drinking Water and Environmental Management developed its Drinking Water Source Assessment Program (DWSAP), and EPA approved it. The overall objective of the DWSAP is to ensure that the quality of drinking water sources is protected.

As discussed in Section 1 of this Plan, the potential groundwater management plan component

"identification and management of wellhead protection areas and recharge areas" is stated, even in the most recently amended version of Water Code Section 10753.8, as one that "may" be included. However, the wellhead protection aspect of this component, which was optional when AB 3030 was adopted, is now essentially required as a result of the 1996 SDWA reauthorization. In California, the DWSAP satisfies the mandates of both the 1986 and 1996 SDWA amendments. The California DWSAP includes delineation of the areas (i.e., protection areas or Groundwater Protection Zones) surrounding an existing or proposed drinking water source where contaminants have the potential to migrate and reach that source. The program includes preparation of an inventory of activities that may lead to the release of contaminants within these zones. The activities, referred to in the DWSAP as Potentially Contaminating Activities, include such land uses as gas stations and dry cleaners, as well as many other land uses. The activities also include known contaminant plumes regulated by local, state, and federal agencies. The zones, which are calculated based on local hydrogeological conditions and also well operation and construction parameters, represent the approximate area from which groundwater may be withdrawn during 2, 5, and 10 year time periods. These zones also represent the area in which contaminants released to groundwater could migrate and potentially affect the groundwater extracted by wells located within the designated zones. The DWSAP assessment also includes a risk or vulnerability ranking based on a combined numerical score that results from points assigned to various evaluations conducted as part of the DWSAP process. This ranking provides a relative indication of the potential susceptibility of drinking water sources to contamination.

Although DHS is responsible for conducting drinking water source assessments for systems existing prior to the adoption of the California program, DHS has encouraged purveyors to perform their own assessments. Assessments for existing systems were due at the end of 2002; however, DHS received an extension allowing its assessment work to be completed by May 2003. Permitting of a new water supply well requires that a DWSAP be completed as part of the permit process, and this is responsibility of the applicant. Within CLWA, DWSAP assessments have been completed for the three municipal water purveyors who utilize groundwater for some of their water supply, including 15 for the CLWA Santa Clarita Water Division, 20 for Valencia Water Company, and 13 for Newhall County Water District.

The results of the DWSAPs can be used as a planning tool to guide land use development in the vicinity of water sources. The DWSAPs prepared for water sources in the basin should, in some fashion, be reviewed every five years and updated more frequently as appropriate. The collective DWSAP information can also be integrated with other management activities (e.g., the

geographical position of potential or existing contaminating activities can be incorporated in the monitoring program database; plume extents, as available, can be graphically displayed by aquifer and isoconcentrations) to aid siting of new wells, particularly when contaminant migration problems are also evaluated with respect to local hydrogeological conditions and the potential influence of nearby wells on plume migration.

In addition to the wellhead protection program that is focused on wells that are sources of drinking water, a broader aspect of this Plan Element is protection of the overall recharge areas of the aquifer system in the basin. As discussed in Section III, the most developed aquifer, the Alluvium, has experienced historical fluctuations in groundwater levels in the eastern portion of the basin, but has had essentially constant groundwater levels in the western portion of the basin. The characteristic difference between the two portions of the basin, generally divided at the confluence of the Santa Clara River and its Bouquet Canyon tributary, is the perennial flow in the Santa Clara River to the west of that location versus the intermittent flow in the river to the east. The intermittent fluctuations in groundwater levels east of Bouquet Canyon are indicative of rapid response, i.e. recharge, from streamflow when it is present. Similarly, the relatively constant groundwater levels west of Bouquet Canyon are indicative of ongoing response, i.e. recharge, from the perennial flow in the river. In light of those conditions, part of this Plan Element is intended to protect the overall channel system of the Santa Clara River and its tributary system, notably where they overlie Alluvial aquifer materials of significant extent. Protection in this case is intended to mean preservation of the infiltration capacity of the stream channel so that both intermittent and perennial flows can continue to recharge the aquifer as has historically occurred.

Finally, with regard to protection of recharge areas, it is expected that additional exploration and development of the Saugus Formation, for additional water supply as described in this Plan, will lead to further understanding of the locations and mechanisms for recharge of that aquifer, which is exposed at the surface throughout much of the area of this Plan. As that understanding evolves, part of this Plan Element will be to identify means of ensuring that significant portions of Saugus recharge are not compromised by land development activities.

This Plan Element is included to incorporate the DWSAP efforts and the overall protection of groundwater recharge into the local groundwater management plan. Completion of DWSAP efforts to comply with state DHS requirements and preservation of overall aquifer recharge are key parts of accomplishing the first and third management objectives (goals) for the basin.

**Secondary Element 3 - Identification of Well Construction, Abandonment, and Destruction Policies**

Well construction permitting in the basin is administered by the Los Angeles County Health Department, which effectively implements the State Well Standards for water wells, monitoring wells, and cathodic protection wells. Permitting of municipal supply wells is also within the purview of the State Department of Health Services. One goal of this management plan for the area, protection and preservation of groundwater quality requires that all wells be properly constructed and maintained during their operational lives, and properly destroyed after their useful lives, so that they not adversely affect groundwater quality by, for example, serving as conduits for movement of contaminants from the ground surface and/or from a poor quality aquifer to one of good quality. Toward that end, this element is included in the overall plan to support well construction and destruction policies, and to participate in their implementation in the Basin, particularly with regard to surface and inter-aquifer well sealing and proper well destruction, which are critical in the management of a multiple aquifer system that has some connection with the Santa Clara River and its tributaries.

**Secondary Element 4 - Provisions to Update the Groundwater Management Plan**

The primary and secondary elements of this local area groundwater management plan reflect the current understanding of the occurrence of groundwater in the Santa Clara River East Valley groundwater subbasin, and specific problems or areas of concern about that resource. Those management elements are designed to achieve specified goals to develop local groundwater for regular and dry year/emergency water supply while protecting and preserving groundwater quantity and quality for overlying beneficial use into the foreseeable future, and while also protecting and preserving valuable surface water resources that are directly related or connected to groundwater. While the groundwater management plan provides a framework for present and future actions, new data will be developed as a result of implementing the plan. That new data could define conditions which will require modifications to currently definable management actions. As a result, this plan is intended to be a flexible document which will be reviewed and updated to modify existing elements and/or incorporate new elements as appropriate in order to recognize and respond to future groundwater and surface water conditions. Although not intended to be a rigid schedule, review and updating of this plan will initially be conducted in five years, with subsequent future updates scheduled as appropriate at that time. In accordance with Primary Element 10, the retail purveyors and CLWA will continue to produce the Santa

Clarita Valley Water Report on an annual basis. Data and information from these reports will be compiled and utilized as part of the review and updating of this plan.

# Appendix I

# Groundwater and Surface Water Monitoring Protocols

The CLWA Groundwater Management Plan includes two Elements (Primary Elements 1 and 2) that relate directly to ongoing, and expanded as appropriate, monitoring of key hydrologic quantities associated with the implementation of the Plan. Notable among the data to be collected are groundwater levels, groundwater quality, pumpage from water supply wells, and surface water flows and quality. Other hydrologic data such as precipitation are intended to be measured and maintained in accordance with the standards in place for the respective precipitation gage stations in the Valley; consequently, this Appendix does not address the specific establishment of protocols for precipitation gaging. On another matter of hydrologic data, land subsidence, the Plan discusses the low probability for subsidence in the Valley, particularly as related to historical groundwater pumping from both the Alluvial and Saugus Formation aquifers. Consequently, the Appendix does not address the establishment of protocols for measuring land subsidence. As noted in the Plan, if future analysis of increased pumping from the Saugus Formation, as currently planned, suggests changes in groundwater levels that might be conducive to inelastic subsidence, the need for subsidence monitoring will be reconsidered at that time; and some combination of land surface elevation surveying, remote sensing of land surface deformation, and measurement of earth consolidation via extensometers would be considered as part of establishing protocols for monitoring subsidence.

**Groundwater Monitoring**

For purposes of Plan implementation, the most essential groundwater-related data are water levels, water quality, and pumpage. Consequently, the following discussion of monitoring protocols focuses on those hydrologic parameters.

**Groundwater Levels** - The distribution and frequency of current groundwater level measurements in Alluvial wells and in Saugus Formation wells are illustrated in Figures A1 and A2, respectively. Tables A1, A1a and A2 show the dates that groundwater level measurements were made in Alluvial and Saugus Formation wells. As discussed in the Plan, for the Alluvium, the distribution of monitoring is sufficient to interpret water level and groundwater storage trends. Thus, it is intended that the fundamental distribution and frequency of Alluvial groundwater level measurements remain generally as illustrated in Figure A1: general semi-annual measurements complemented by some quarterly measurements disbursed throughout the Alluvial aquifer. The only exception to the preceding intention is in the western-most portion of the Alluvium, where agricultural pumping remains the water supply objective and water level measurements are primarily annual. In part to conform to the balance of Alluvial groundwater

level measurements, and more importantly to monitor stream-aquifer connection near the western, or downgradient, end of the Alluvium in the basin, it is the intent of Plan implementation to increase that water level monitoring to semi-annual to quarterly frequency.

In the Saugus Formation, the distribution of groundwater level measurements is limited by the number and location of wells; the locations in Figure A2 reflect where the Saugus has been developed for water supply. Ultimately, as future exploration and development of the Saugus expand, it is expected that the distribution of groundwater level measurements will expand to those future well locations. For Plan implementation purposes, the existing monthly frequency of water level monitoring is intended to continue.

Water level measurement methodology, which is dominated by utilization of electric sounders, is expected to remain largely unchanged. Some calibrated airlines and possibly some dedicated electro-hydraulic transducers are expected to complement electric sounders in certain wells. All those water level measurement methods are sufficiently accurate to satisfy the needs to which the resultant data is to be put.

**Groundwater Quality** - The distribution and frequency of current groundwater quality monitoring in Alluvial wells and in Saugus Formation wells are illustrated in Figures A3 and A4, respectively. Tables A3 and A4 show the dates that groundwater quality (total dissolved solids) was monitored in Alluvial and Saugus wells. For the most part, the distribution and frequency of water quality sampling are sufficient to interpret general quality trends. One notable constraint in the Alluvium, however, is the discontinuation of water quality data collection in some wells since 1988, mostly toward the western, or downgradient, end of the basin. In order to restore an ongoing historical record, part of Plan implementation will be to attempt to re-establish regular, i.e. yearly to triennial, water quality sampling and analyses in those wells with some form of historical water quality record. In the same vein, part of Plan implementation will include selection of a number of wells in key locations, e.g. near the mouths of canyons, for semi-annual analysis of indicator parameters as a basis for assessing seasonal or other variations in groundwater quality.

Finally with regard to groundwater quality, the spatial limitations on Saugus water quality data are comparable to the limitations related to Saugus groundwater levels, but as a result of the limited, localized development of the Saugus for water supply. While the regular monitoring of quality will continue via Plan implementation, the expansion of Saugus water quality data is expected to follow the expanded exploration and development of that aquifer as described for

groundwater levels above.

**Production (Pumpage)** - The great majority of water supply wells in the basin are now dedicated to municipal supply; consequently, those wells are equipped with production meters which allow direct monitoring of pumpage on any desired frequency, e.g. instantaneous flow rate, or cumulative volumes on a daily, monthly, or other frequency. A few wells remain dedicated to agricultural water supply, and those wells are not equipped with flow meters. However, long-standing practice at all those wells has been to meter power consumption for each well and to combine that data with the results of annual pump performance testing in order to indirectly compute approximate pumpage from each agricultural well. That methodology is sufficiently accurate for ongoing documentation of pumpage and interpretation of basin response to pumping; it is also sufficiently accurate for groundwater flow model input as part of assessing basin yield, all as part of this Plan. Consequently, implementation of this Plan includes regular reading of flow meters on municipal supply wells and continued indirect computation of agricultural pumpage from the remaining agricultural water supply wells in the basin.

**Surface Water Monitoring**

Part of Plan implementation is the development of a surface water quality monitoring network. Of particular concern is establishing a surface water quality data set that, combined with groundwater data, will allow for a more detailed analysis of stream-aquifer interactions. The data of primary interest for this and other Plan purposes are surface water flow and surface water quality, discussed below.

**Surface Water Flow** - The existing surface water flow monitoring network within the basin consists of stream flow gaging stations along the Santa Clara River and its tributaries, and measurements of discharge to the River from the Saugus and Valencia Water Reclamation Plants. Monitoring of stream flow gages along the River and its tributaries has been mostly sporadic and limited to times prior to 1977, although measurements at some gages resumed in 2002. One exception is the gage at the Los Angeles-Ventura County line, where the daily mean stream flow was monitored from 1953 to 1996; the gage was replaced with one downstream near Piru in 1996. The Los Angeles County Sanitation Districts monitors the average discharge flow of treated wastewater from the Saugus and Valencia Water Reclamation Plants to the Santa Clara River.

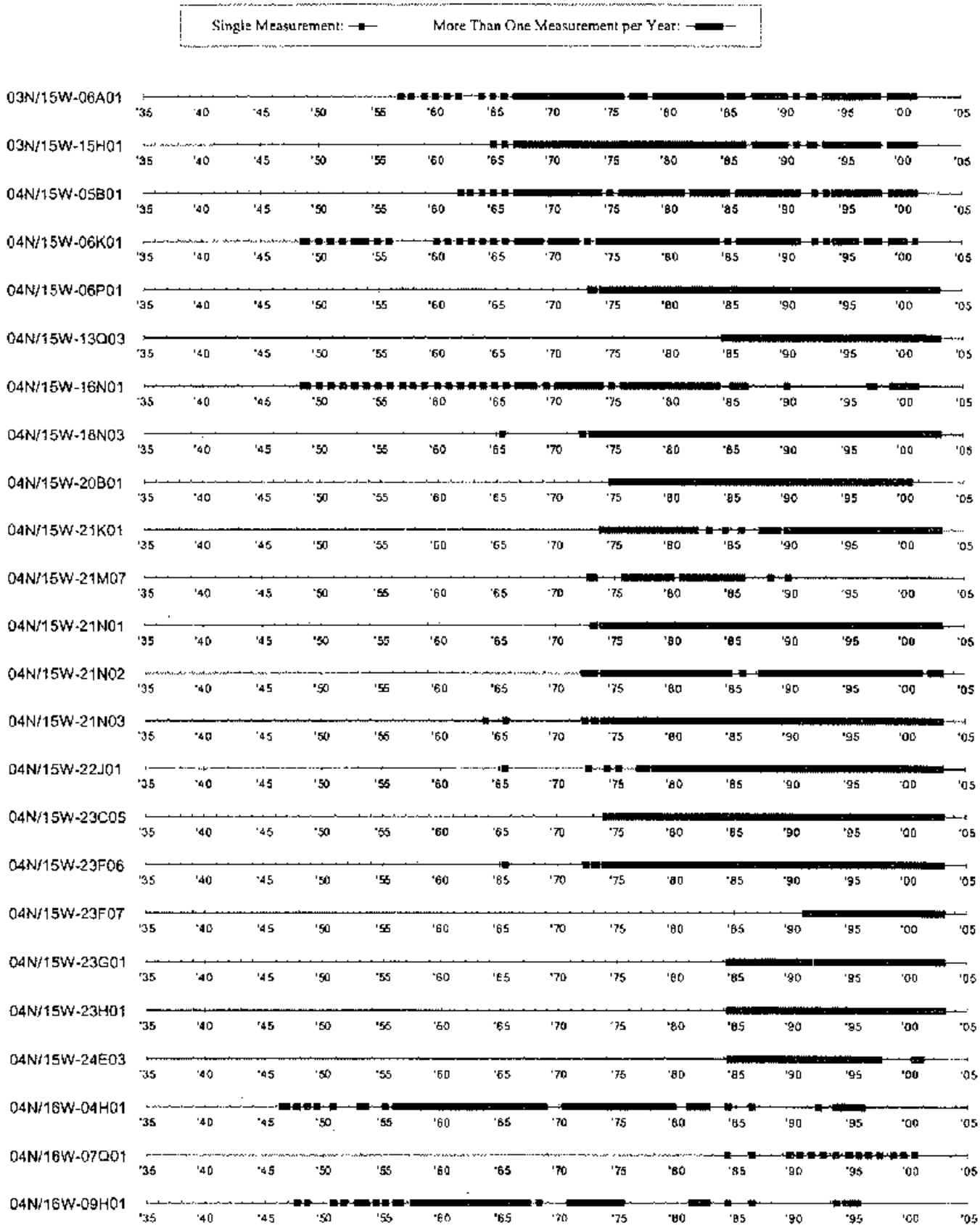
Plan implementation will include evaluating the distribution, future accessibility and

configuration of the existing stream flow gaging stations to determine if they will be suitable for inclusion in the ongoing surface water flow monitoring network. Plan implementation will further include installation and operation of gage station modifications, as well as installation and operation of additional dedicated gaging stations as determined to be required.

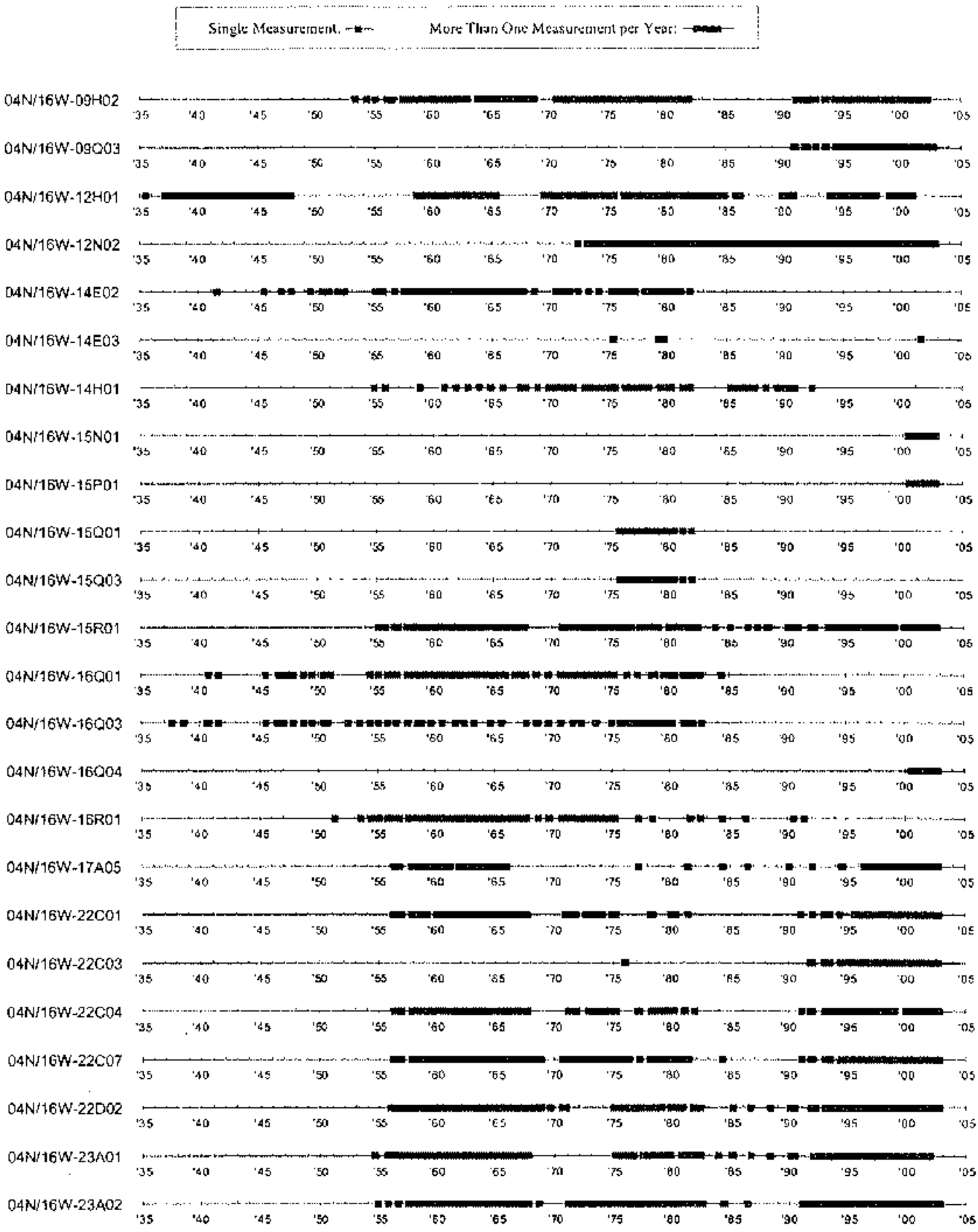
**Surface Water Quality** - Surface water quality has been analyzed at many locations along the Santa Clara River and its tributaries but, with few exceptions, the data is limited to several measurements at each location. Water quality in the Santa Clara River at the Los Angeles-Ventura County line was analyzed on a semi-annual basis from 1951 to 1988, and is currently measured quarterly by United Water Conservation District. Since 2002, the Los Angeles County Department of Public Works has monitored water quality in the Santa Clara River near Interstate 5 during four wet weather events and at two other times each year to comply with the requirements of a National Pollution Discharge Elimination System (NPDES) permit that covers the County and 84 incorporated cities. The Saugus and Valencia Water Reclamation Plants also monitor the quality of the treated wastewater they discharge to the Santa Clara River as part of compliance with the requirements of their NPDES permits.

Plan implementation will include identifying key locations for future surface water quality monitoring, identification of constituents of concern and monitoring frequency for each location, and implementation of appropriate sampling and analytical methodology at the selected key sites.

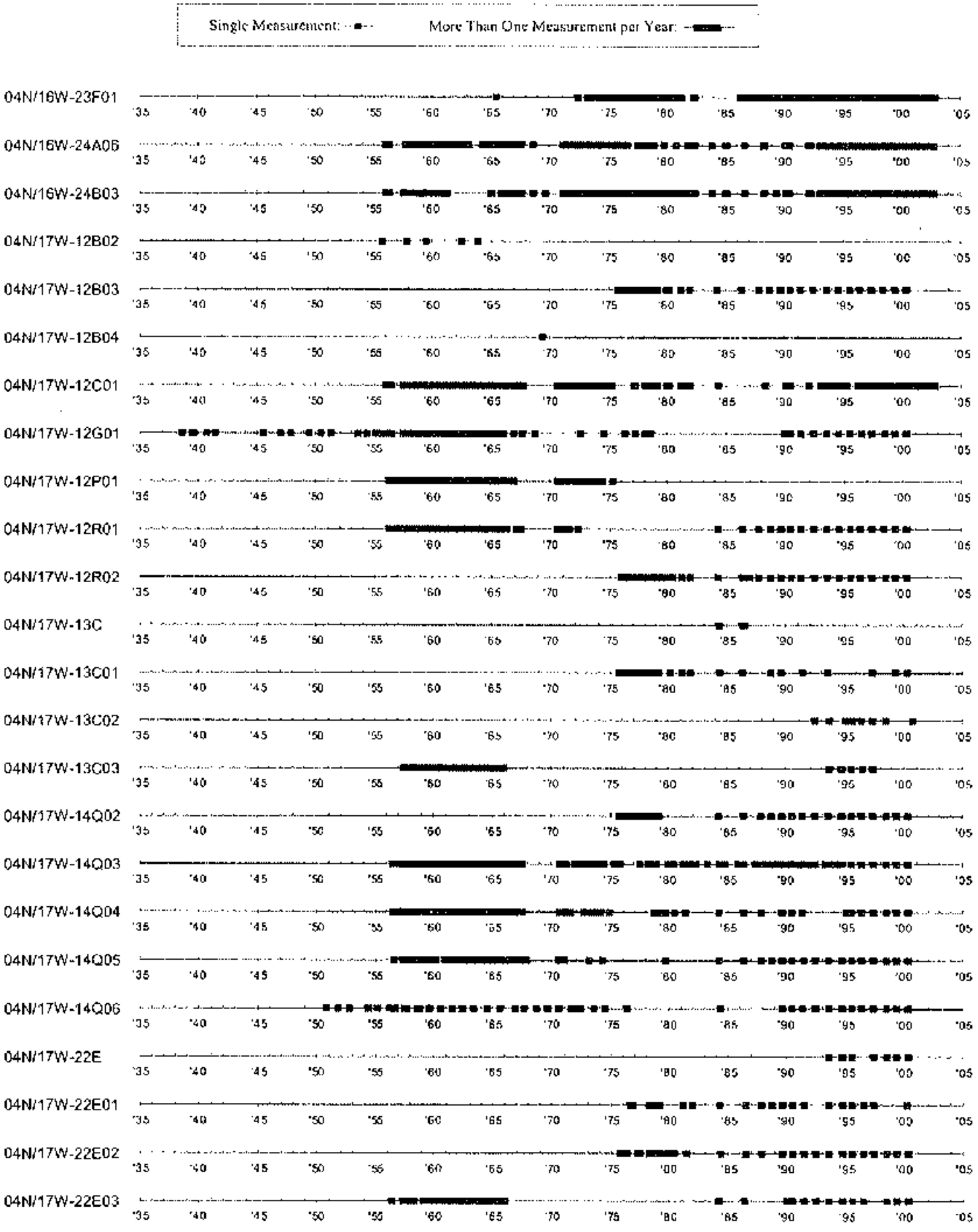
# Table A1
## Dates of Historic Water Level Measurements in Alluvial Wells
## Santa Clara River Valley Groundwater Basin, East Subbbasin



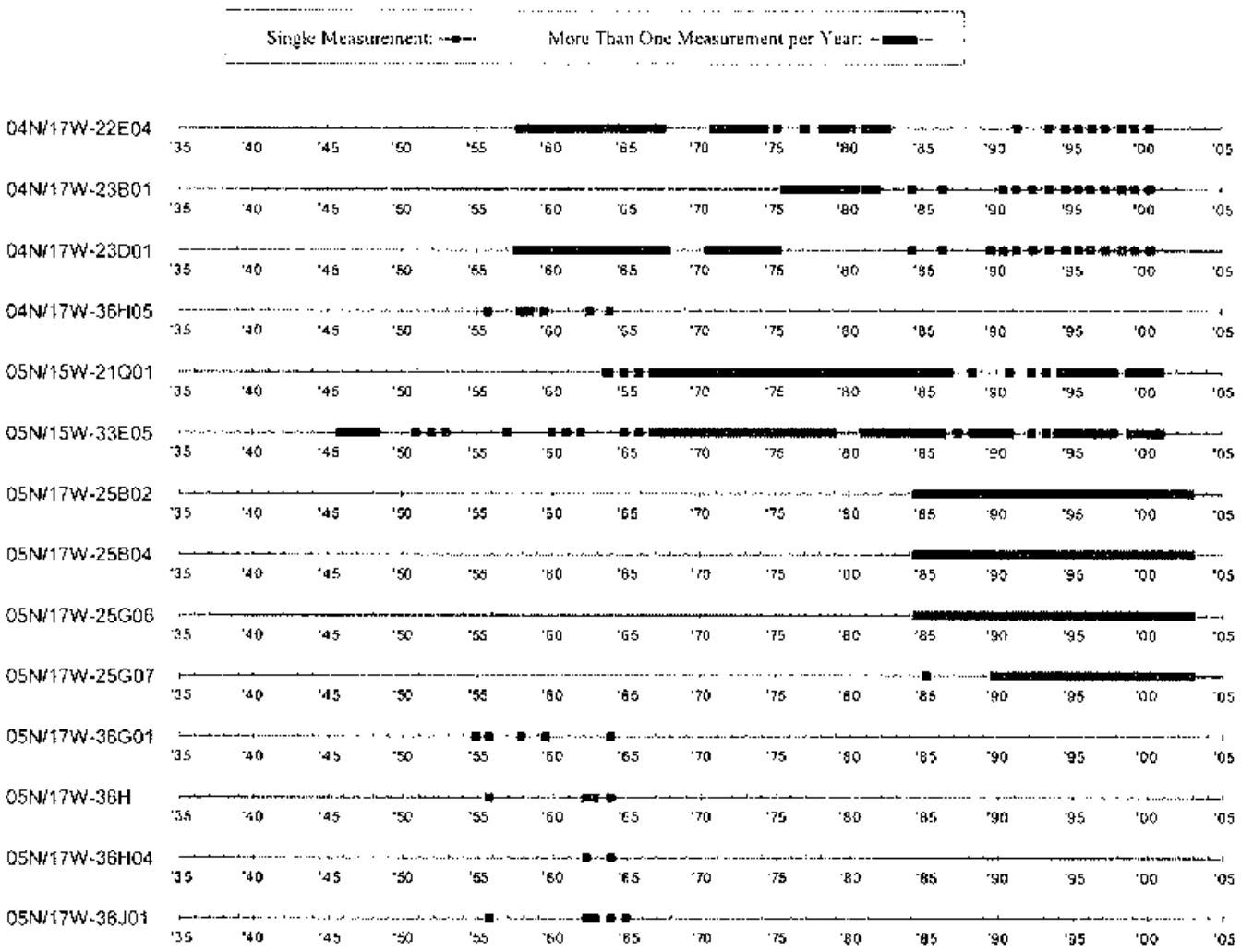
# Table A1 - Continued
## Dates of Historic Water Level Measurements in Alluvial Wells
## Santa Clara River Valley Groundwater Basin, East Subbbasin



# Table A1 - Continued
## Dates of Historic Water Level Measurements in Alluvial Wells
## Santa Clara River Valley Groundwater Basin, East Subbbasin



# Table A1 - Continued
## Dates of Historic Water Level Measurements in Alluvial Wells
## Santa Clara River Valley Groundwater Basin, East Subbbasin



# Table A1a
## Dates of Historic Water Level Measurements in LACFCD Alluvial Wells
## Santa Clara River Valley Groundwater Basin, East Subbbasin

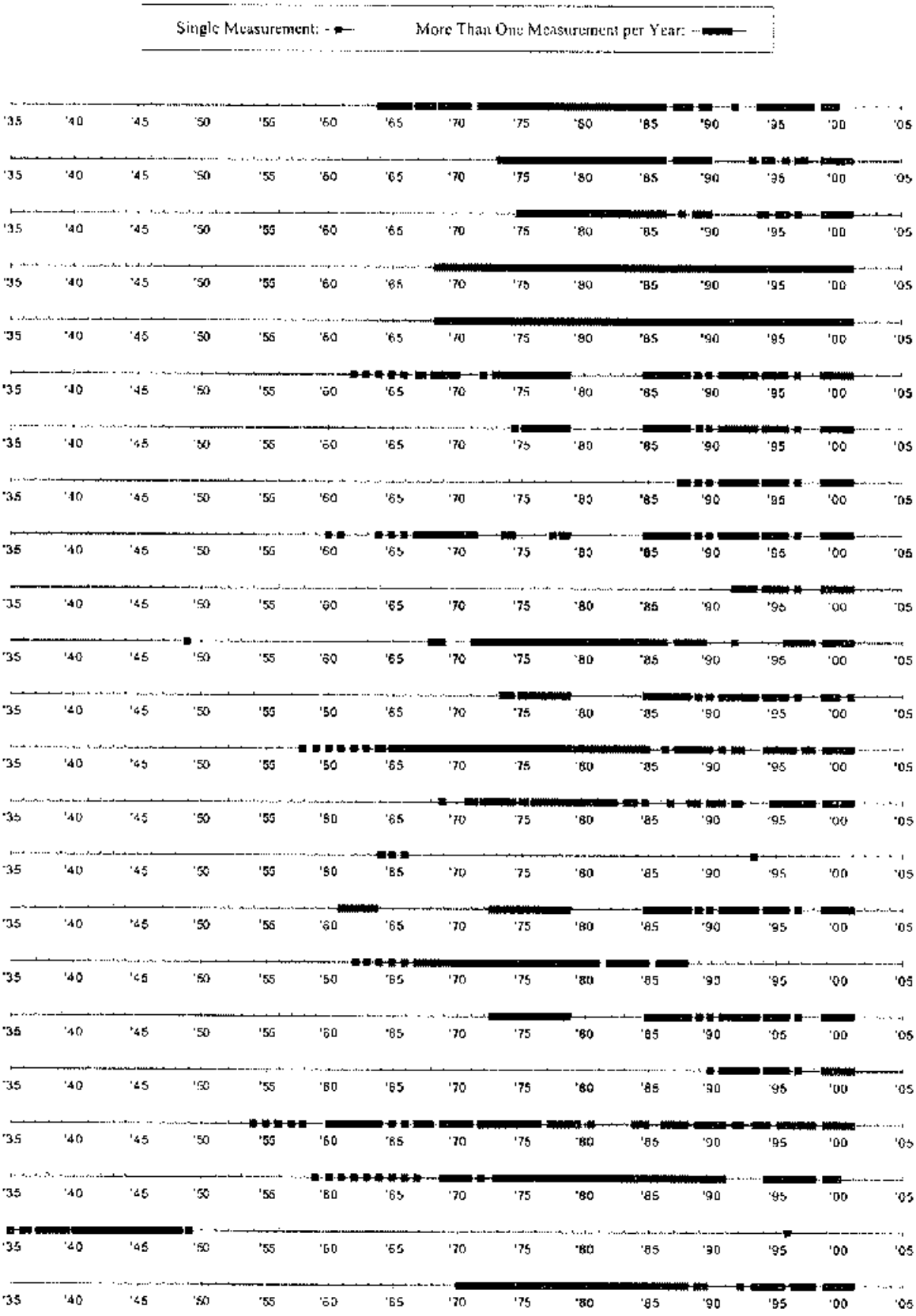


Table A1a - Continued
Dates of Historic Water Level Measurements in LACFCD Alluvial Wells
Santa Clara River Valley Groundwater Basin, East Subbbasin

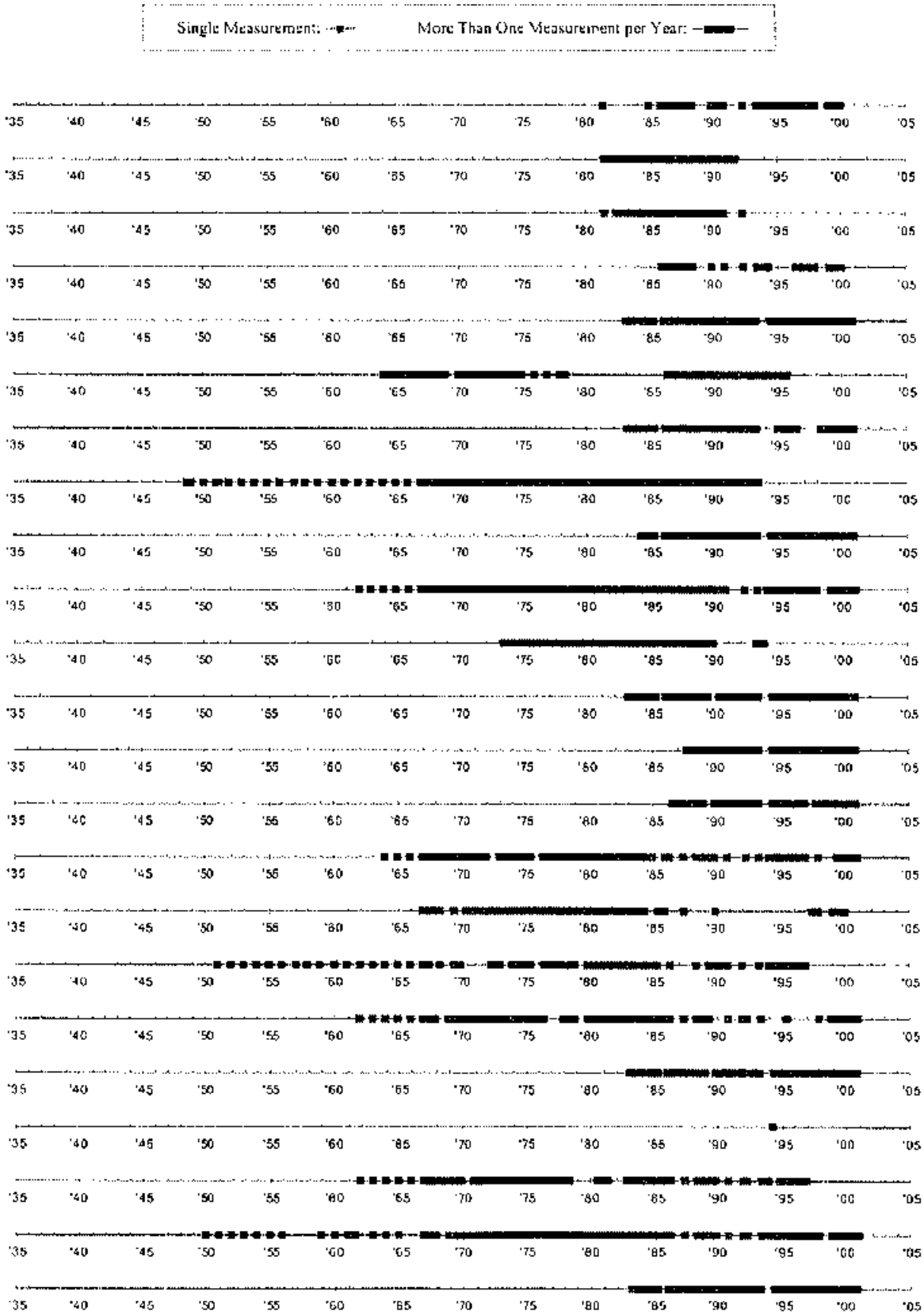


Table A1a - Continued
Dates of Historic Water Level Measurements in LACFCD Alluvial Wells
Santa Clara River Valley Groundwater Basin, East Subbbasin

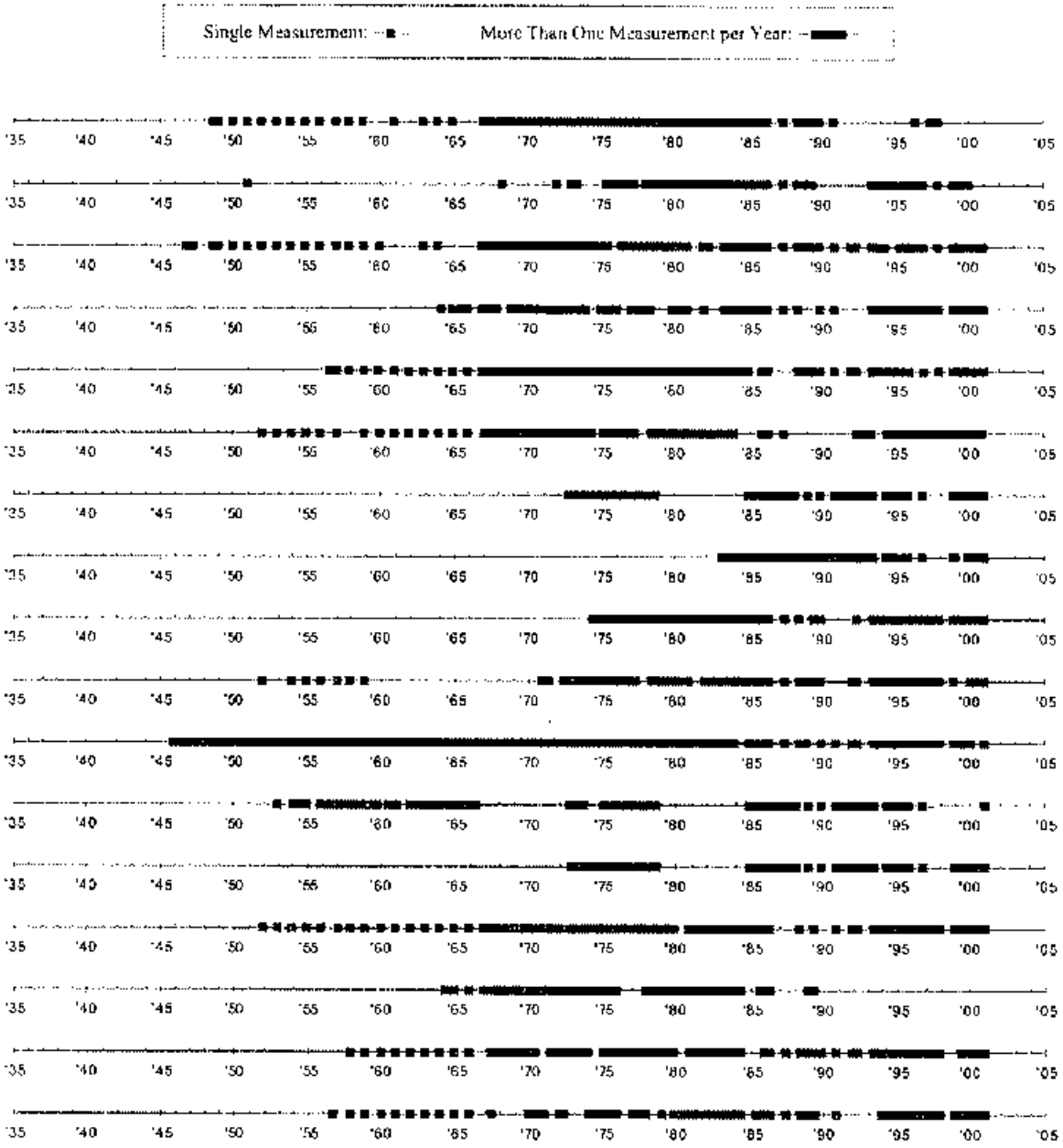
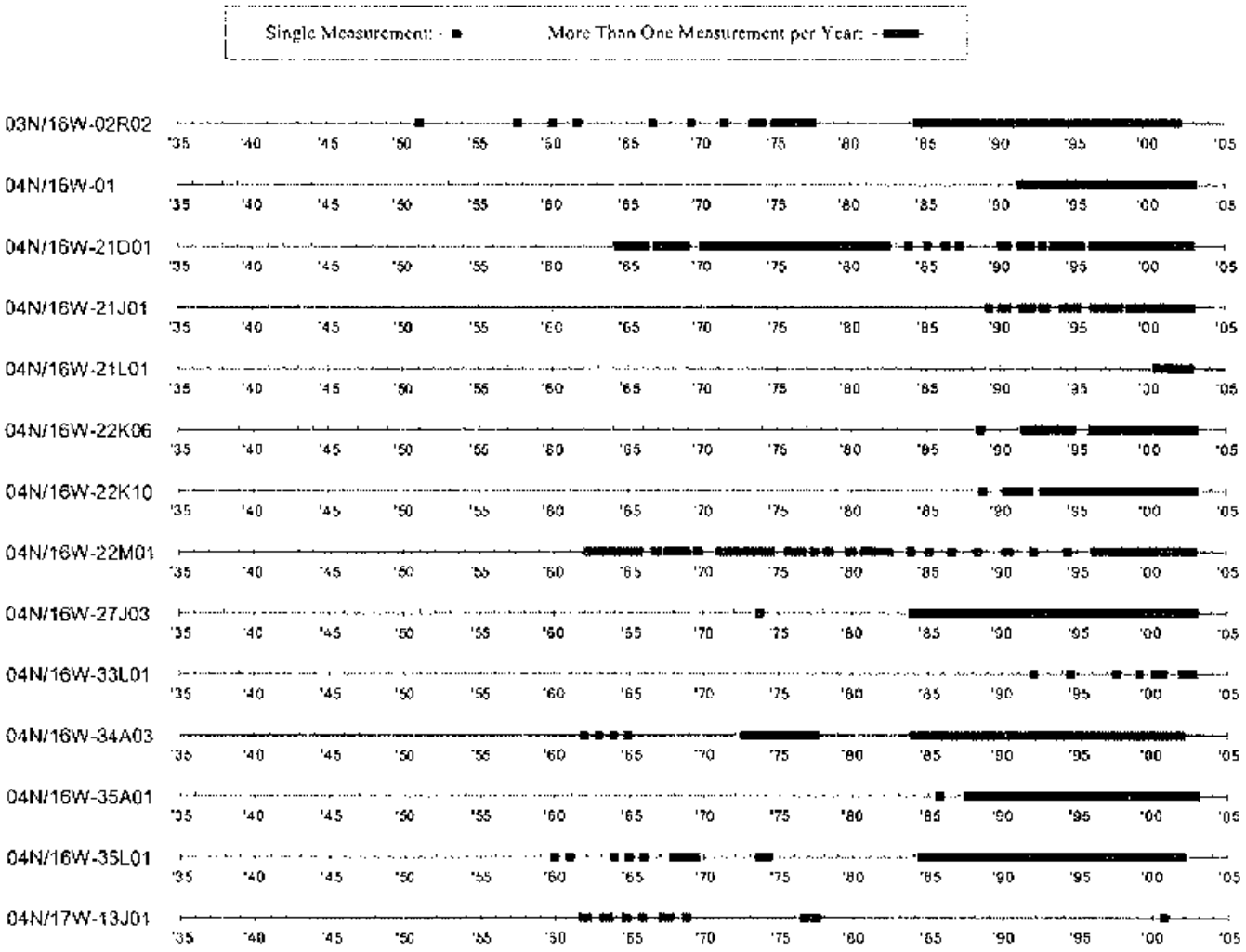
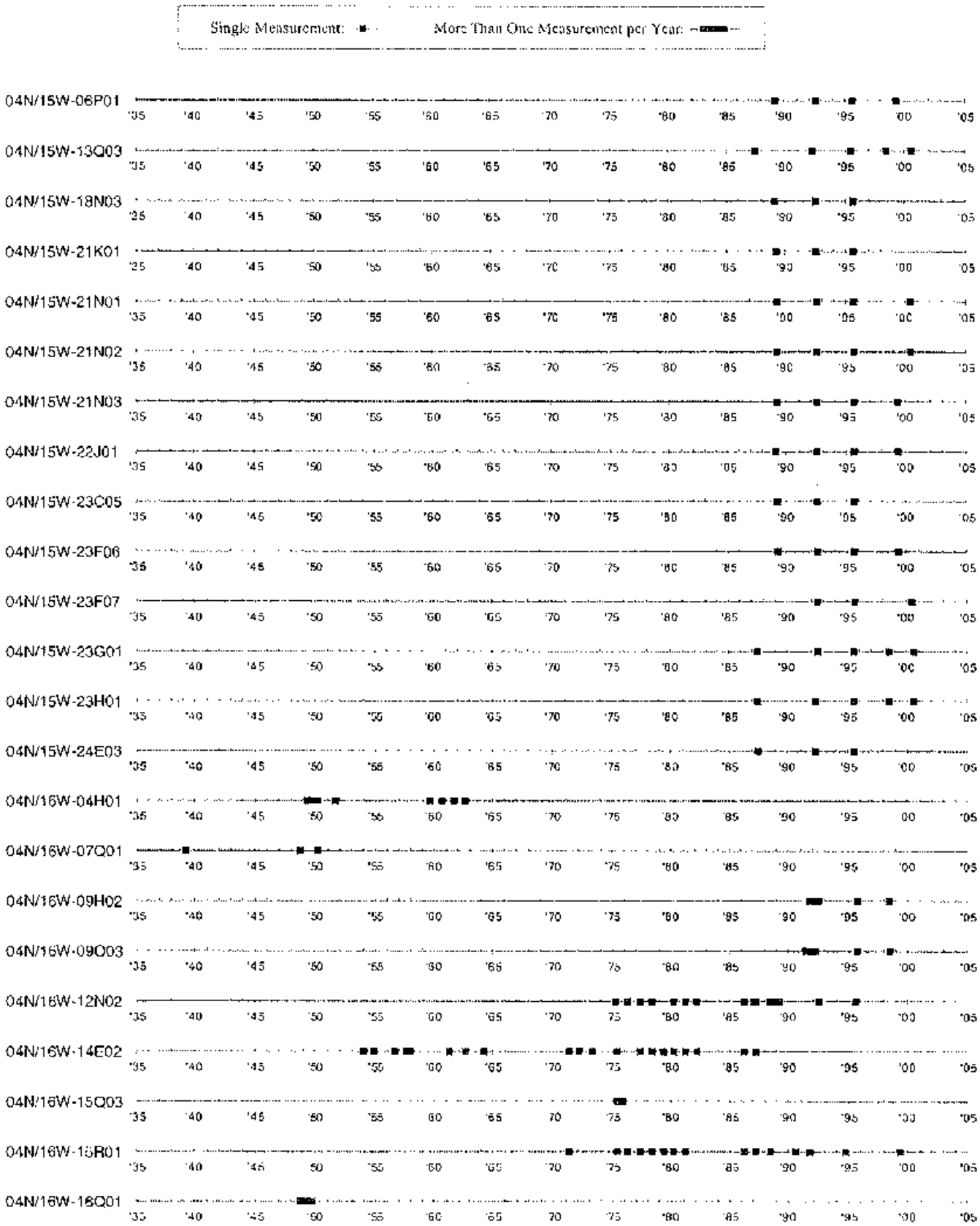


Table A2
Dates of Historic Water Level Measurements in Saugus Wells
Santa Clara River Valley Groundwater Basin, East Subbbasin



# Table A3
## Dates of Historic Water Quality Measurements (TDS) in Alluvial Wells
## Santa Clara River Valley Groundwater Basin, East Subbbasin



# Table A3 - Continued
## Dates of Historic Water Quality Measurements (TDS) in Alluvial Wells
## Santa Clara River Valley Groundwater Basin, East Subbbasin

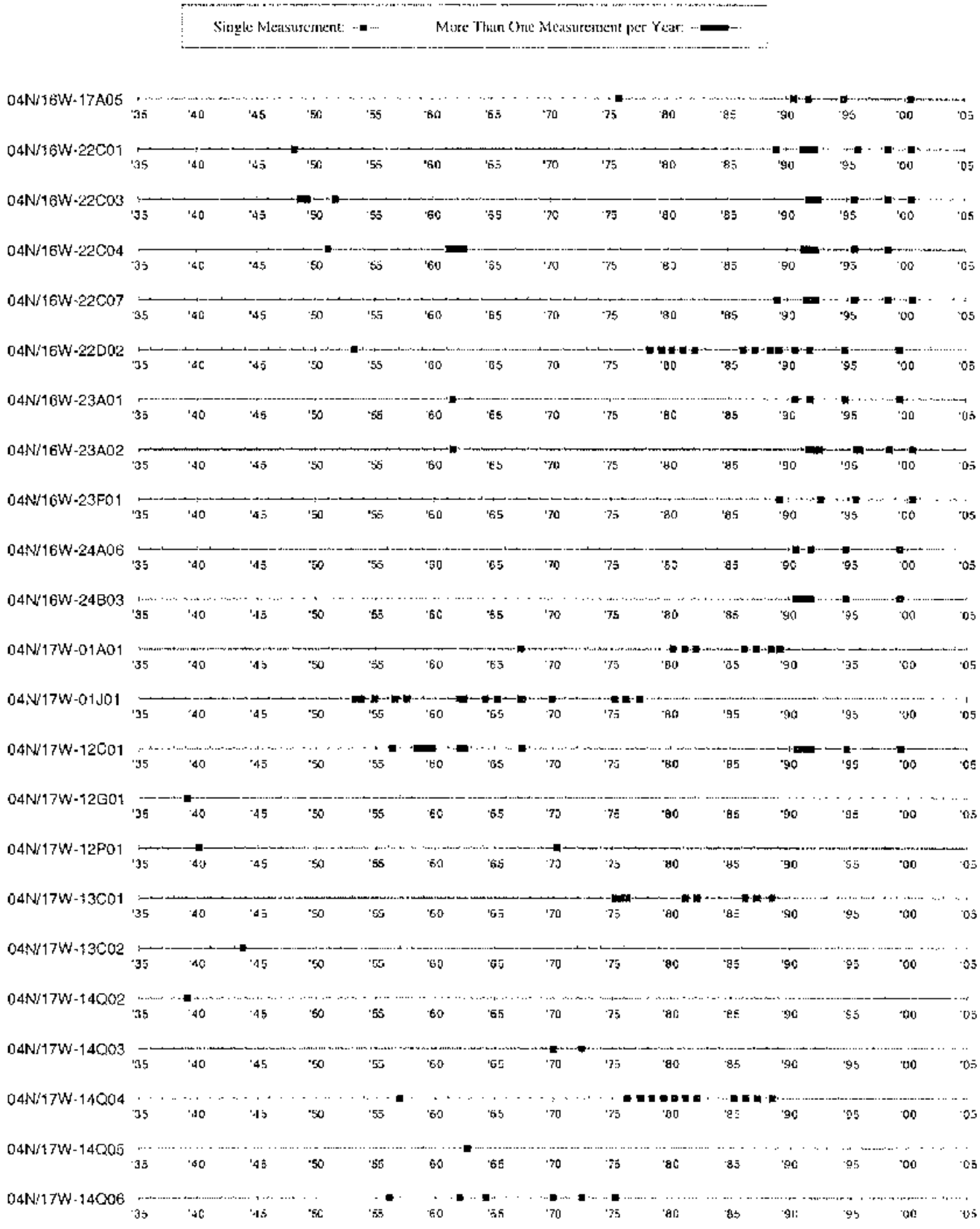
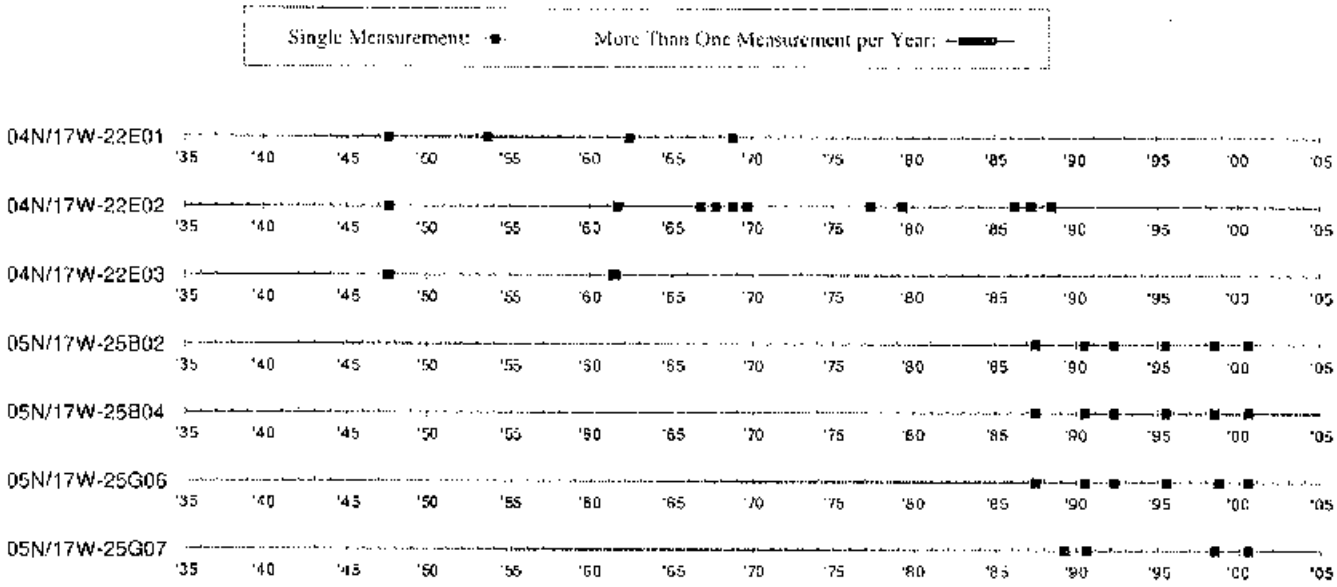
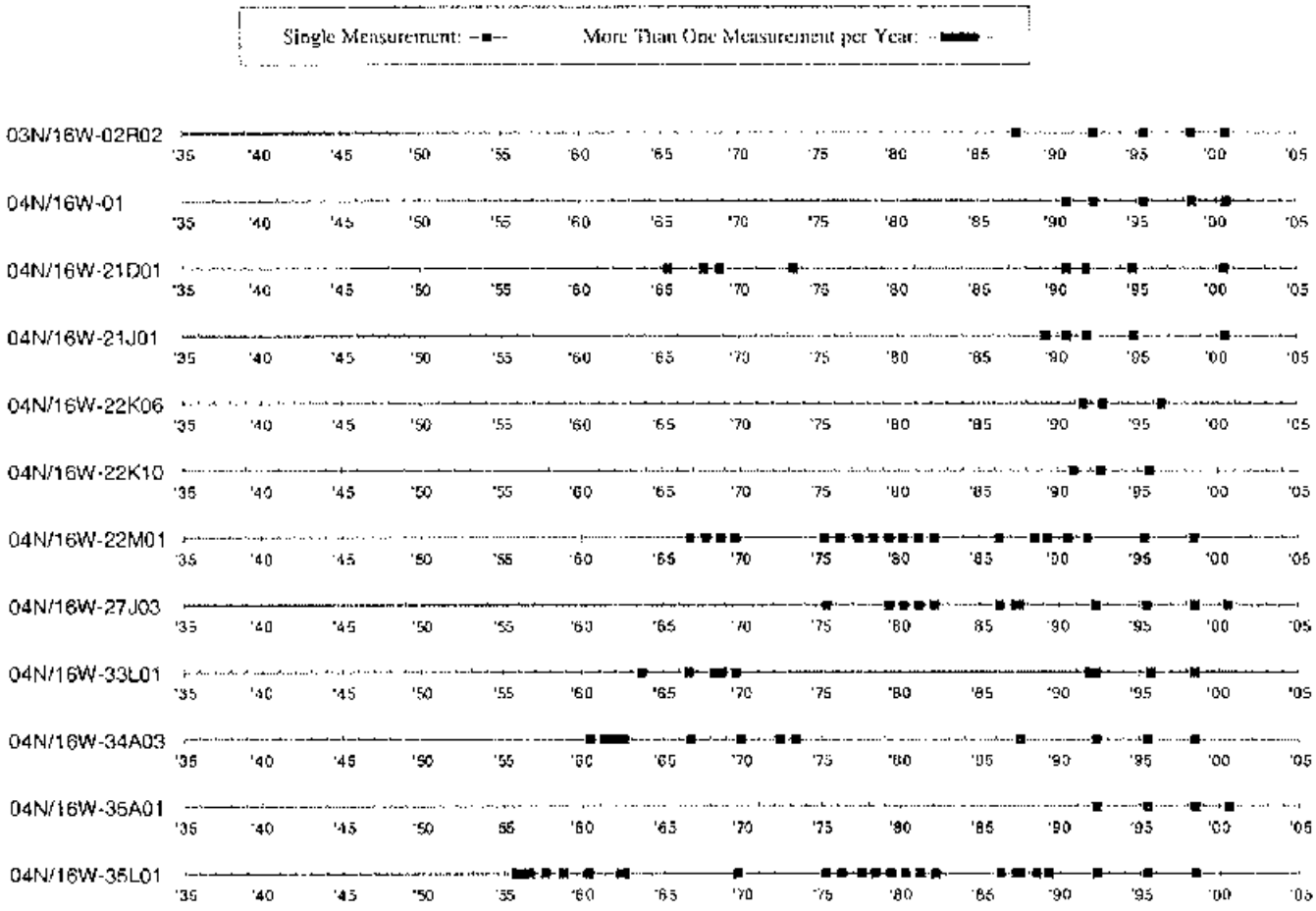
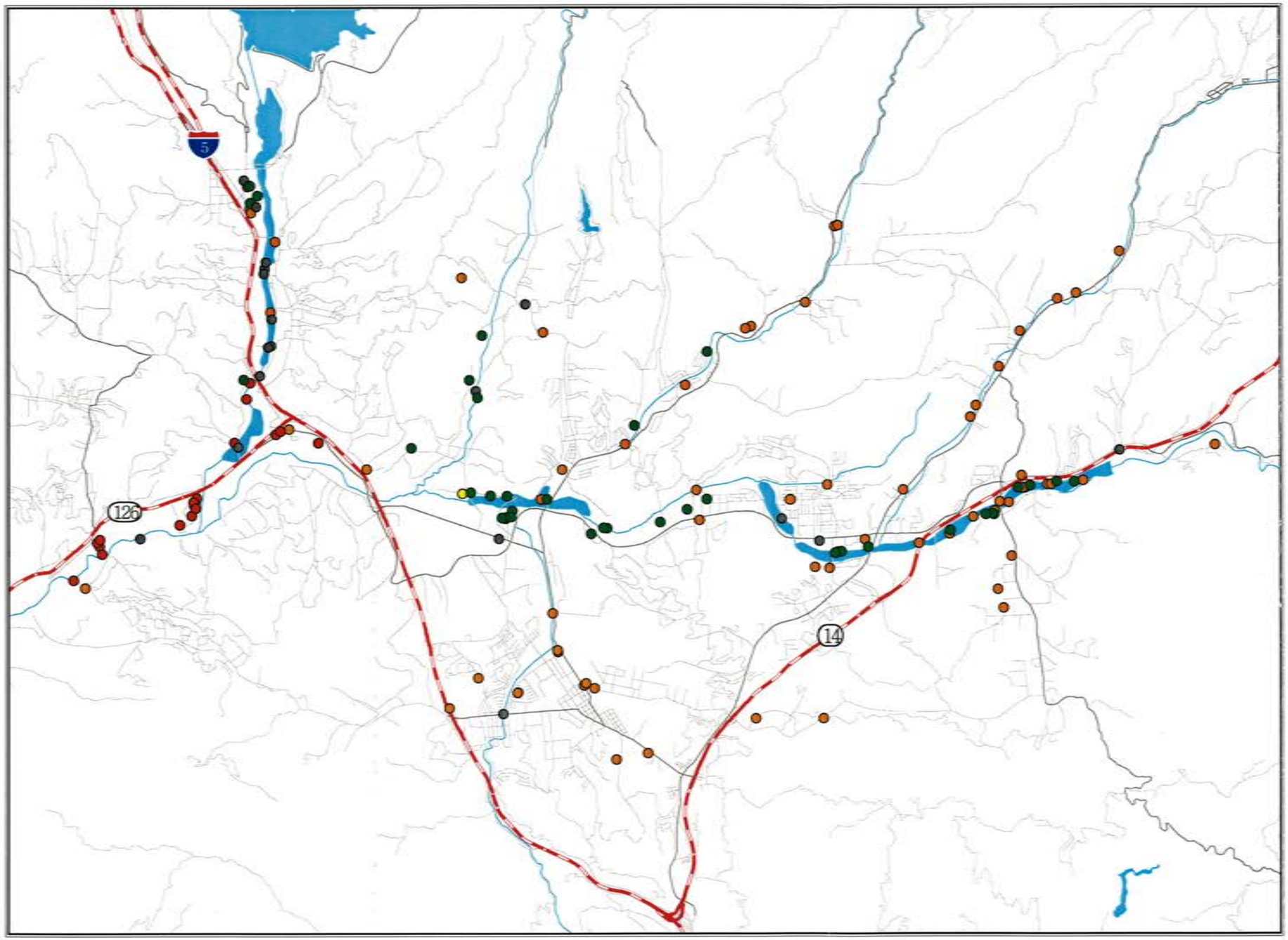


Table A3 - Continued
Dates of Historic Water Quality Measurements (TDS) in Alluvial Wells
Santa Clara River Valley Groundwater Basin, East Subbbasin



# Table A4
## Dates of Historic Water Quality Measurements (TDS) in Saugus Wells
## Santa Clara River Valley Groundwater Basin, East Subbbasin






## LEGEND

- Monthly
- Quarterly
- Twice Yearly
- Yearly
- Unknown Status

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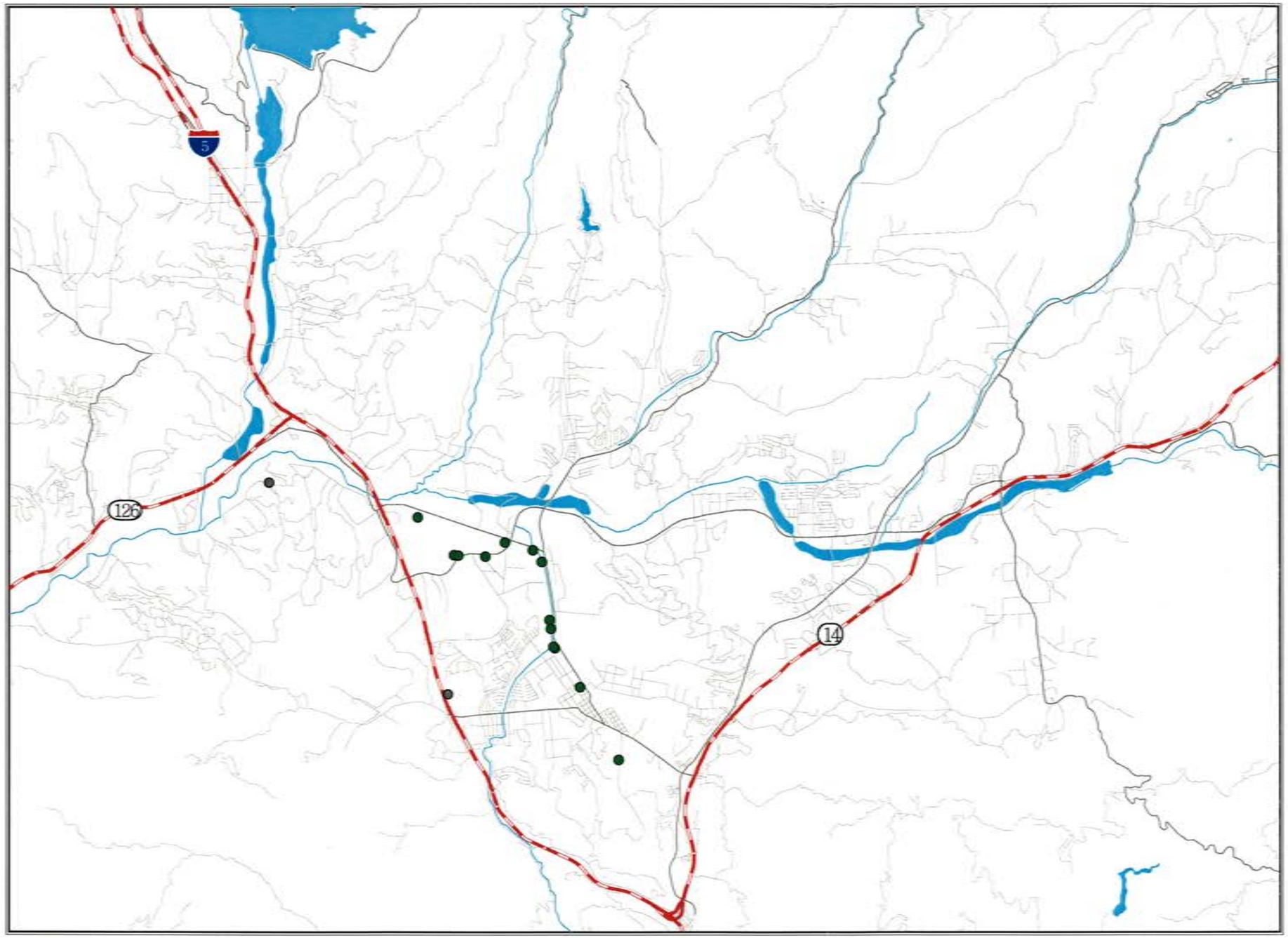
**Figure A1**
**Frequency of Water Level Measurements in Alluvial Wells**
**Santa Clara River Valley Groundwater Basin, East Subbasin**




## LEGEND

- Monthly
- Unknown Status

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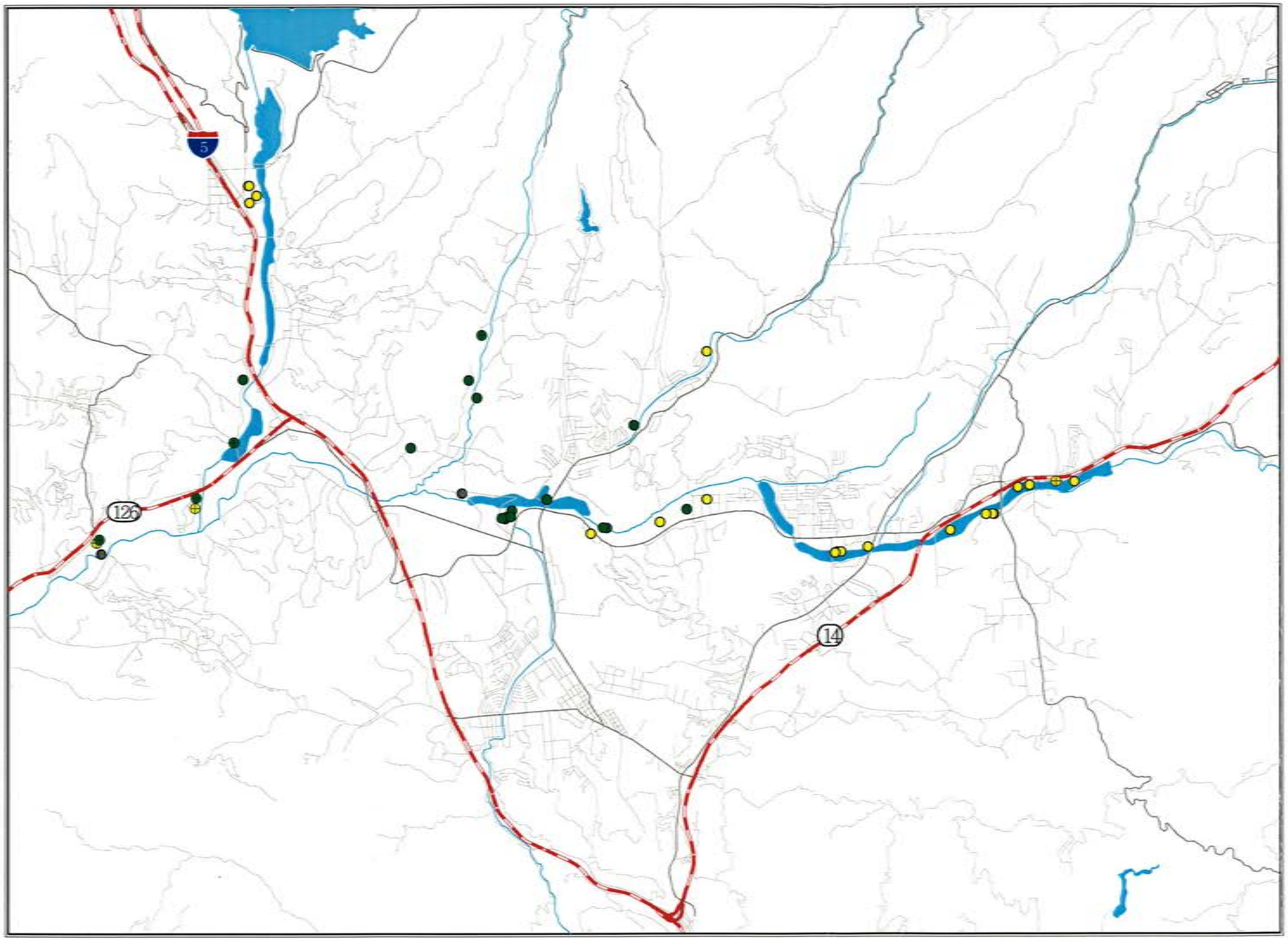
**Figure A2**
**Frequency of Water Level Measurements in Saugus Wells**
**Santa Clara River Valley Groundwater Basin, East Subbasin**




## LEGEND

- Every 1 to 3 Years
- Every 1 to 3 Years (through 1988)
- Every 3 Years
- Every 3 Years (through 1988)
- Some Historic

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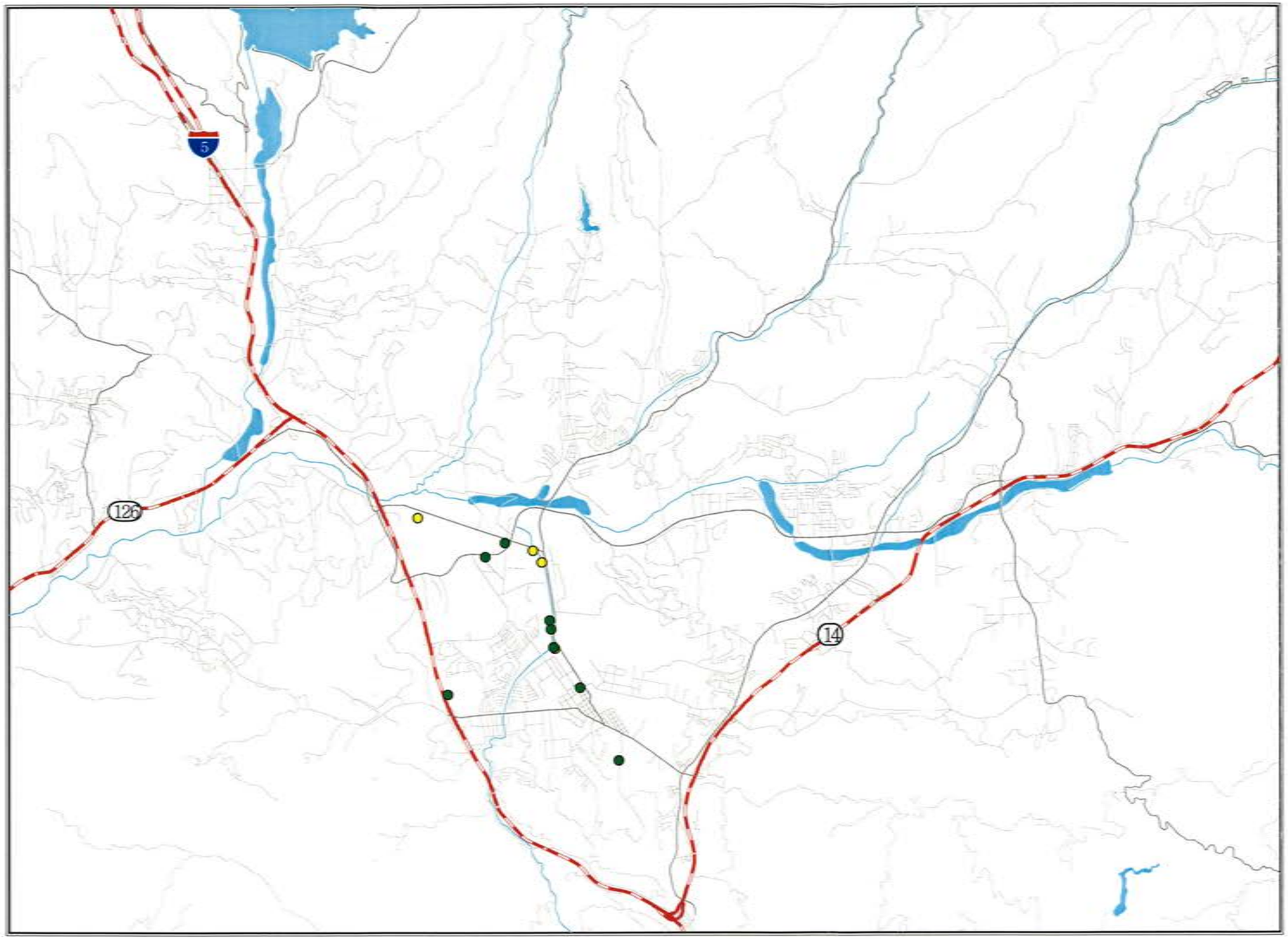
**Figure A3**
**Frequency of Water Quality Measurements in Alluvial Wells**
**Santa Clara River Valley Groundwater Basin, East Subbasin**




## LEGEND

- Every 1 to 3 Years
- Every 3 Years

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**Figure A4**
**Frequency of Water Quality Measurements in Saugus Wells**
**Santa Clara River Valley Groundwater Basin, East Subbasin**

# Appendix II

# Groundwater Management Plan
# Public Comments

| PARTY | COMMENT | APPLICABLE GWMP SECTION/ COMPLIANCE[1] | RESPONSE |
|---|---|---|---|
| UWCD #5 | Under Primary Element 2 related to surface flows, in addition to SWP water contributing to the increased flow of the Santa Clara River, other considerations should be noted (hydrologic cycle, Alluvial pumping). | Primary Element 2 | As noted above, discussion of groundwater–related conditions is included in the Plan as a frame of reference for the Plan objectives and elements. Future interpretation and reporting will take such details as the impacts of the hydrologic cycle and Alluvial pumping into account. |
| **Santa Clarita Organization for Planning and the Environment** #1 | Extensive pumping and lack of protection of recharge areas have resulted in almost complete elimination of surface flows and summer ponding necessary to wildlife as well as causing water level drops in wells that have resulted in water quality and availability problems for small users. | Section III (Groundwater Levels and Storage) and (Groundwater Quality) and Primary Elements 1, 2 and 3 | See responses to SCOPE Comments 5, 6 and 9, Sand Canyon Comments 1 and 7, and Sierra Club Comment 3 regarding pumping within basin yield, avoidance of overdraft, preservation of recharge areas, and consideration of riparian conditions. |
| SCOPE #2 | Concern that environmental organizations, small well owners, City of Santa Clarita, LA County, and others were not included on the Advisory Board. | Water Code Appendix § 103-15.1(e)(2) | CLWA legal counsel has confirmed that CLWA complied with the requirements of AB 134 regarding the composition of the Advisory Council. LA County was represented by LA Co. WWD #36 and LA County Sheriff's Department |
| SCOPE #3 | The GWMP should include a timeline for completion of the plan components. | AB 3030[2] and AB 134[3] | AB 3030 and AB 134 do not require the inclusion of a timeline. |
| SCOPE #4 | The GWMP is lacking in the review of land use plans and coordination with land use agencies. Land use issues should be given higher priority. This may include a wellhead protection plan. | Water Code § 10753.8(l); Primary Element 9 and Secondary Element 2 | Primary Element 9 and Secondary Element 2 have been expanded to further address general preservation of recharge areas and appropriate review of land use plans to protect against potential groundwater contamination. |
| SCOPE #5 | GWMP should address maintaining tributaries in a natural state to enhance water recharge and quality. | This is not explicitly required by AB 3030 but does relate to Secondary Element 2. | Secondary Element 2 has been expanded to address preservation of in-channel recharge areas in both the Santa Clara River and its tributaries. |

[2] Stats. 1992, Ch. 947.
[3] Stats. 2001, Ch. 929.

| PARTY | COMMENT | APPLICABLE GWMP SECTION/ COMPLIANCE[1] | RESPONSE |
|---|---|---|---|
| SCOPE #6 | GWMP should find ways to increase water recharge. Water agencies should also coordinate to prevent paving of prime recharge areas. | This is not explicitly required by AB 3030 but relates to Primary Elements 3, 4 and 5 and Secondary Element 2. | Potentially increasing groundwater recharge will be part of Primary Elements 3, 4 and 5. Prevention of paving prime recharge areas is included in the expanded Secondary Element 2. |
| SCOPE #7 | Number One Goal should not be "Development of Local Groundwater for Water Supply" because groundwater has many other important uses (recreational, biological, etc…) | This is not required by AB 3030 or AB 134. See Section II of GWMP. | The text of Section II, Management Objectives (Goals) for the Basin does not indicate a preference of any one objective over the others. The listing is not intended to indicate that any objective will not be attempted; all objectives are intended to be achieved. |
| SCOPE #8 | Agricultural water usage in the GWMP is overestimated with the perennial yield (40,000 afy) estimate higher than that in a Richard Slade report; less agricultural runoff water is available for recharge today. | Section IV (Existing and Projected Water Supplies) | Reported historical agricultural pumping is consistent with all available records. A perennial yield of 40,000 afy is not included or implied in the GWMP. Rather, estimated ranges of 30,000 to 40,000 afy, depending on hydrologic conditions, are included as expected yield from the Alluvium. That range is consistent with historical reports, and with observations of actual Alluvial aquifer response to pumping in that range for at least the last 50 years. |
| SCOPE #9 | Disappearance of year round Santa Clara River flow is indication of overdraft. "There are numerous records and observations by long-time residents indicating that surface flow usually occurred year round." | Section III (Areas of Concern and Identified Problems); Water Code § 10753.8(e). | Disappearance of year round stream flow does not necessarily indicate groundwater overdraft. In fact, stream flow west of Bouquet Canyon is now perennial. Part of implementing Primary Element 1 will be to obtain the "numerous records" of year round stream flow that are noted to have usually occurred. |
| SCOPE #10 | GWMP should disclose the reduction in production capability because of perchlorate contamination. | Primary Element 8; § 10753.8(j). | The GWMP notes the inactivation of wells that have been impacted by perchlorate contamination. |
| **Sand Canyon Area Well Owners Assoc.** #1 | Groundwater is extensively pumped and recharge areas are not adequately protected; water level in four wells has dropped from 12 ft in 1997 to 93 ft currently. | This relates to Primary Elements 1 and 3, and Secondary Element 2. | The noted groundwater level fluctuations are consistent with those described in Section III and illustrated in Figure 3-2 for the Sand Canyon area. Section III also describes and illustrates the historical recovery from such declines. Avoidance of overdraft, i.e. continuous lowering of water levels, and protection of recharge areas are included in Primary Element 3 and Secondary Element 2, respectively. |

| PARTY | COMMENT | APPLICABLE GWMP SECTION/ COMPLIANCE[1] | RESPONSE |
|---|---|---|---|
| Sand Canyon #2 | Advisory board lacks representation by rural well owners. | Water Code Appendix § 103-15.1(e)(2) | CLWA complied with the requirements of AB 134 regarding the composition of the Advisory Council. |
| Sand Canyon #3 | GWMP should include timelines for completing its phases. | AB 3030 and AB 134. | Timelines are not required by AB 3030 or AB 134. |
| Sand Canyon #4 | GWMP is lacking in its review of land use plans and coordination with land use agencies. | Water Code §10753.8(l) | See response to SCOPE Comment 3 above. |
| Sand Canyon #5 | Perennial yield estimates for the Santa Clara River are higher than that provided in a Richard Slade report. Agricultural runoff is no longer a factor; agricultural usage was not metered historically, and former recharge areas have been paved. | Section IV (Existing and Projected Water Supplies) | See response to SCOPE Comment 8 above. |
| Sand Canyon #6 | Santa Clara River should not be defined in terms of percolating groundwater. GWMP should clarify relationship between river and Saugus formation. | Section III | The GWMP is not an appropriate document in which to define the legal classification of groundwater, whether in the Alluvium or the Saugus Formation; consequently, there is no expression in the GWMP to describe the legal classification of groundwater in the basin. The entire focus of the GWMP is management of groundwater toward long-term preservation of both the quantity and quality of the resource. |
| Sand Canyon #7 | GWMP's assertions against existence of overdraft or other undesirable conditions are incorrect since water levels in wells have reached historic lows. In addition, riparian conditions on the Santa Clara River and tributaries show signs of water deprivation. | Section III (Areas of Concern and Identified Problems) | See response to Sand Canyon Comment 1. Further, intermittent fluctuations reaching the equivalent of historic low levels is not overdraft. Primary Elements 1 and 3 are included to monitor groundwater levels throughout the basin, and to operate in an ongoing manner to avoid overdraft. Finally, the statement that riparian conditions show signs of water deprivation is non-specific as to location and is otherwise unsubstantiated. Primary Elements 1 and 2 are included in the Plan to quantify the existence and extent of such conditions, if they occur; Primary Element 3 is included to avoid overdraft- related conditions of the type noted. |

| PARTY | COMMENT | APPLICABLE GWMP SECTION/ COMPLIANCE[1] | RESPONSE |
|---|---|---|---|
| Sand Canyon #8 | GWMP should include reports regarding water contamination from Robinson Ranch. City of Santa Clarita had stipulated that water quality adjacent to the golf course be monitored with results published in a report. | Primary Element 1 | See response to UWCD Comment 1 regarding extent of detail regarding occurrence of groundwater as framework for understanding the objectives and elements of the GWMP. As regards this comment, there is no documented groundwater contamination from Robinson Ranch, including that golf course. Required reports on Robinson Ranch have not shown any contamination as alleged in this comment. Monitoring in accordance with Primary Element 1 is intended to detect any groundwater contamination of the nature alleged in this comment. |
| **Friends of the Santa Clara River** #1 | Disappointed that GWMP's primary goal is "Development of Local Groundwater for Water Supply" because other objectives should include protection of groundwater resources. | AB 3030 and AB 134. Section II of GWMP. | See response to SCOPE Comment 7 above regarding lack of priority for all management objectives, and lack of "primary" status for "Development of Local Groundwater for Water Supply". |
| Friends #2 | GWMP should emphasize that paving of streams reduces recharge and should be avoided. Buffer zones around streams should be discussed. | This is not explicitly required by AB 3030 but relates to Primary Elements 3, 4 and 5 and Secondary Element 2. | See response to SCOPE Comments 4, 5 and 6. Further, given the importance of in-channel recharge to the yield of the Alluvium, a priority in implementation of the Plan can logically be expected to be avoidance of paving stream channels. |
| Friends #3 | Advisory Board should include representatives from environmental groups and county agencies. | Water Code Appendix § 103-15.1(e)(2) | CLWA complied with the requirements of AB 134 regarding the composition of the Advisory Council. |
| **Santa Clarita Sierra Club Group** #1 | GWMP should include timelines for completion of components. | AB 3030 and AB 134. | Timelines are not required by AB 3030 or AB 134 |

| PARTY | COMMENT | APPLICABLE GWMP SECTION/ COMPLIANCE[1] | RESPONSE |
|---|---|---|---|
| Sierra Club #2 | GWMP does not account for loss of groundwater from perchlorate contamination. "The numbers do not adequately represent the real water supply." | Primary Element 8; Water Code §10753.8(j) | See response to SCOPE Comment 10 regarding the inactivation of wells impacted by perchlorate contamination. The inactivation of certain wells impacts pumping capacity until the wells can be reactivated, with treatment if necessary, or replaced. However, perchlorate contamination does not reduce the available yield of the aquifer system; hence, the numbers included in the GWMP accurately reflect the current state of water supply. |
| Sierra Club #3 | Loss of groundwater due to development and pavement is not considered. GWMP must address coordination of land use with water necessities. | This is not explicitly required by AB 3030 but relates to Primary Elements 3, 4 and 5 and Secondary Element 2. | See responses to SCOPE Comments 4 and 6. Further, there has been no "loss" of groundwater due to development or pavement; groundwater conditions remain as generally described in Section III, with nearly constant water levels to the west and repetitive fluctuations to the east (see response to Sand Canyon Comment 1). |
| Sierra Club #4 | Drought planning is inadequate as it fails to take account of loss of primary water sources and reclaimed water. | Primary Element 3, 4, 5 and 7. | Drought planning is embedded in the GWMP in that the Plan is intended to result in groundwater management that ensures adequacy of groundwater supplies through both wet and dry (drought) hydrologic cycles. While "drought planning", per se, relates more specifically to overall water supply planning, of which groundwater is only one component, this Plan is intended to manage groundwater in such a way that it will be a reliable component of overall water supply through dry periods without being overdrafted on a long-term basis, e.g. through wet/normal periods that follow dry periods. Primary Elements 3, 4, 5 and 7 in the Plan relate to drought planning as well as parts of groundwater management through long-term fluctuations in hydrologic conditions. |
| Sierra Club #5 | GWMP does not adequately discuss maintaining river and tributary habitats. Sierra Club supports a citizen monitoring program for water quality. | This is not explicitly required by AB 3030 but does relate to Secondary Element 2. | See response to SCOPE Comment 5 and Friends Comment 2. |

| PARTY | COMMENT | APPLICABLE GWMP SECTION/ COMPLIANCE[1] | RESPONSE |
|---|---|---|---|
| Sierra Club #6 | CLWA should involve the public and other government and private entities in its water supply planning. | Water Code Appendix § 103-15.1(e)(2) | CLWA complied with the requirements of AB 134 regarding the composition of the Advisory Council. |
| **Ed & Joan Dunn** #1 | Concern because CLWA did not hold more public meetings before release of draft. Concern whether CLWA has regularly met with Advisory Board. | Water Code § 10753 et seq. | CLWA has complied with all requirements thus far regarding public meetings and gone beyond that legally required. |
| **Dunn** #2 | Doubt regarding replenishment of water in the Alluvial Aquifer. | Primary Elements 3, 4 and 5 | Fundamentally, as discussed in the Plan, the long-term objectives for the basin include utilizing groundwater for water supply while not overdrafting the basin. As also discussed in the Plan, historically, in the western part of the basin there has been sufficient water for recharge to maintain an essentially full basin throughout both wet and dry hydrologic periods. Part of the reference to "sustain recharge" relates to that historical condition. Whether or not additional artificial recharge will be implemented in other parts of the basin, and what water sources might be used for such recharge, are to be addressed via implementation of the Plan, particularly Primary Elements 3, 4 and 5. |
| Dunn #3 | Doubt over Richard Slade's assertion as to Alluvial Aquifer capacity. | This challenges evidence which the GWMP cites. | The analysis and determination of the storage capacity of the Alluvium has been exhaustively described in Slade's reports. The comment conveys no specific aspect of its "question"; the commentors are referred to Slade's reports, which address the storage calculations in proper technical detail. |
| **Dunn** #4 | GWMP should state that SWP water was interrupted for 6 months in 1991. Newspaper clipping is provided for this point. | Primary Elements 3, 4 and 5 | Primary Elements 3, 4 and 5 are included in the GWMP to ensure the maximum reliability of local groundwater in order to endure any future drought-related impacts on SWP deliveries, such as occurred in 1991. |

| PARTY | COMMENT | APPLICABLE GWMP SECTION/ COMPLIANCE[1] | RESPONSE |
|---|---|---|---|
| Dunn #5 | Statement in GWMP that no wells exceeded DHS action level for perchlorate is false. Newspaper clippings provided. | Section III (Groundwater Quality) | The Plan has been revised to reflect that, while there remains no primary or secondary drinking water standard for perchlorate, and although only some of the detected concentrations of perchlorate in the Saugus wells exceeded the Action Level established by the State Department of Health Services at that time (18 ug/l), all those wells were inactivated by their respective owners after detection of perchlorate; those wells remain out of municipal water supply service since then. |
| Dunn #6 | Statement that perchlorate contamination has not reduced groundwater capacity is misleading. | Primary Element 8 | See response to SCOPE Comment 10 and Sierra Club Comment 2. |
| Dunn #7 | The Urban Water Management Plan should not be referred to because it is under legal attack. | While it has been challenged, the UWMP is still a valid document. | While it has been challenged, the UWMP is still a valid document and represents the current plan for urban water supply through its 20 year planning horizon. The Kern County Superior Court in February 2003 ruled completely in favor of the water suppliers in their defense of the UWMP litigation. The remaining petitioners have appealed. |
| Dunn #8 | The Saugus Formation does NOT underlie the entire CLWA service area. | Section I (Santa Clara River Valley Groundwater Basin) | The text of the Plan has been revised to reflect that the Saugus Formation underlies much of the CLWA service area. |
| Dunn #9 | GWMP should state CLWA's inability to transport additional SWP to Santa Clarita Valley. | Section IV (Existing and Projected Water Supplies) | CLWA does not have an inability to transport additional SWP water to the Santa Clarita Valley. Fundamentally, the comment is erroneous since the State conveys SWP water to CLWA's diversion points from Castaic Lake; from there CLWA has sufficient treatment and conveyance capacity for its current water demands, and is in the process of designing additional treatment plant capacity to treat and distribute additional water to accommodate projected increased demand. |

| PARTY | COMMENT | APPLICABLE GWMP SECTION/ COMPLIANCE[1] | RESPONSE |
|---|---|---|---|
| Dunn #10 | CLWA's recycled water program is for private business only, not public agencies. | Primary Element 7 | The recycled water program has no restrictions against use by public agencies. As described in Primary Element 7, the integration of recycled water to meet some non-potable demand is expected to decrease overall demand for potable water by up to 17,000 afy. As public agencies develop capabilities to utilize recycled water for non-potable uses, they are expected to reduce potable water demands by integrating recycled water into their overall water delivery systems. Finally, recycled water service to a specific user or area frees up potable water supplies for other users or areas, thus enhancing the reliability of the overall water supply of the Valley. |
| Dunn #11 | Groundwater production from both the Alluvium and Saugus Formation is overstated. | Section IV (Existing and Projected Water Supplies) | The comment is unsubstantiated and includes no support in the form of records or other data to validate it. The historical use of groundwater reported in the Plan is based on a combination of metered pumping and indirect estimation of pumping based on metered power consumption and pump performance testing. There is no basis for claiming that reported groundwater production is "overstated". |
| Dunn #12 | CLWA should develop an emergency plan. | Primary Elements 3, 4 and 5 | Development of an emergency plan, presumably an emergency water supply plan, is beyond the scope of a GWMP. However, Primary Elements 3, 4 and 5 are intended to further develop both a regular and a dry year/emergency component of water supply from local groundwater. |
| Dunn #13 | Chart depicting SWP water received in 1991 is erroneous. Newspaper clipping provided. | Figure 4-1 | The final 1991 M&I allocation was 30% (October 1991). CLWA's M&I entitlement at that time was 41,500 af. The total amount made available to CLWA by DWR was 13,050 af. Since by October, CLWA and the retail purveyors had already instituted emergency operations, the entire amount was not used. |

| PARTY | COMMENT | APPLICABLE GWMP SECTION/ COMPLIANCE[1] | RESPONSE |
|---|---|---|---|
| Dunn #14 | Claim that CLWA meetings with retail water purveyors, the City, and UWCD have not occurred. | Primary Element 9 | The Commentors' lack of knowledge of such meetings does not mean they have not occurred. Appropriate documentation of such meetings, including presentation materials, discussion topics, and resultant work assignments, are maintained by meeting participants. |
| Dunn #15 | Secret meetings and secret reports related to Primary Element 10 should not be included as part of the GWMP. | Primary Element 10 | The preparation of the annual Water Reports does not indicate that any secret meetings have taken place. Previous Water Reports have been prepared, and future Water Reports are envisioned to be prepared with few, if any, meetings of any type; both public and private meetings have been convened to present and discuss the findings of the various Water Reports, and such meetings are intended to occur in the future for the same purpose. |
| Dunn #16 | CLWA should provide an accounting of water conserved. | N/A | Providing an accounting of water conserved is beyond the scope of the GWMP. More water sales are occurring through time due to increasing demand in the Valley. Water conservation measures result in water savings even though demand is increasing. |
| **Diane Trautman** (City Planning Commissioner) #1 | What percentage of water demand will be drawn from local groundwater? | Primary Element 5 | In terms of groundwater management planning, projected urban water demand (the 106,000 afy projected urban demand in 2020) does not represent total valley-wide demand; total projected demand is 113,100 afy, including both urban and agricultural. In that light, on an average basis, local groundwater is expected to be utilized to meet about 40 percent of total water demand. |

| PARTY | COMMENT | APPLICABLE GWMP SECTION/ COMPLIANCE[1] | RESPONSE |
|---|---|---|---|
| Trautman #2 | Will pumping of the Alluvial Aquifer reduce recharge of the Saugus Formation and reduce water that can be produced from the Saugus Formation during dry periods? | Primary Elements 3, 4 and 5 | No. Since the Saugus Formation is recharged over a much larger area, beyond the spatial extent of the Alluvium, there is a limited relationship between Alluvial pumping and recharge to the Saugus Formation. The fundamental tenet of the GWMP is to utilize groundwater for water supply within its sustainable yield (see the Management Objectives, or Goals, for the Basin, GWMP Section II; see also the various GWMP Elements intended to achieve those objectives, GWMP Section V). In that light, it is expected and intended to operate in such a way that recharge to the Saugus Formation will not be "reduced" by pumping from the Alluvial Aquifer and that groundwater will be available in varying amounts, as needed depending on weather year-types, within the sustainable yields of the respective aquifers (i.e. without overdrafting them). |
| Trautman #3 | Does CLWA have sufficient data regarding the Alluvial Aquifer and Saugus Formation; if not, how will it obtain such data? | Section III and Primary Element 1. | The reference to "useful amount of groundwater quality data" in the GWMP includes both Alluvial and Saugus data. However, due to the historically greater development and use of groundwater from the Alluvium (number and distribution of wells, volume of pumping), and due to the historically smaller development and use of the Saugus Formation (fewer wells, smaller geographical distribution of wells, smaller pumpage), there is comparatively limited ability to examine relationships among pumping, recharge, and quality in the Saugus Formation. CLWA and the other purveyors intend to expand the overall knowledge of the Saugus Formation as that resource is further explored and developed (number of wells, additional sampling as new wells are added, etc.). All that data will be included in ongoing implementation of GWMP Primary Element 1, Monitoring of Groundwater Levels, Quality and Production. |
| Trautman #4 | The 2002 Water Report indicates that "there are limited Saugus (Formation) water level data." Does CLWA plan to collect more comprehensive data on the Saugus Formation? | Section III and Primary Element 1 | The "limited nature of Saugus water level data" is a result of the same smaller extent of historical Saugus development described in the preceding answer. Acquisition of additional data on the Saugus Formation is planned as also described in the preceding answer. |

| PARTY | COMMENT | APPLICABLE GWMP SECTION/ COMPLIANCE[1] | RESPONSE |
|---|---|---|---|
| Trautman #5 | Is CLWA sharing detailed information with the City of Santa Clarita regarding contamination risks in relation to existing closed wells? | Primary Element 9 | All publicly available information regarding the investigation of perchlorate contamination, its extent, its impact on water supply, and plans for cleanup, control of migration, etc. is available to the City. Representatives of CLWA and the purveyors meet routinely with City representatives to review the status of perchlorate cleanup and remediation activities. CLWA and the impacted water purveyors will continue to pursue control and cleanup of perchlorate contamination in order to restore impacted groundwater pumping capacity and to ensure the long-term quantity and quality of groundwater in accordance with the GWMP. As a practical matter, there are no surface contamination risks relating to perchlorate that would affect land use development adjacent to the impacted wells. |
| Trautman #6 | Where is the Stadium Well located? | Section IV (Groundwater Quality) | The Stadium Well is located on the south side of the Santa Clara River, approximately two miles upstream (east) of its confluence with the South Fork tributary, or about 4,000 feet east of the Bouquet Canyon Road crossing of the Santa Clara River. |
| Trautman #7 | Why isn't conservation a primary element (instead of secondary) since it may reduce water demand by 10%? | Secondary Element 1 | The assignment of "primary" or "secondary" status to any GWMP element is discretionary and certainly not absolute. Secondary status is not intended to indicate that any element of the GWMP will not be implemented; all elements are intended to be implemented. Final status of all GWMP elements will be reviewed by the Advisory Council and the CLWA Board. |

| PARTY | COMMENT | APPLICABLE GWMP SECTION/ COMPLIANCE[1] | RESPONSE |
|---|---|---|---|
| Trautman #8 | How is CLWA delivering recycled water? | Primary Element 7 | Recycled water is being delivered to the TPC golf course, the first customer of the system, via the dedicated, recycled water distribution system, which is also capable of delivering water to other non-potable water users, and which will be expanded in accordance with the Draft Recycled Water Master Plan. The costs and time frame for expanding recycled water distribution and use are included in the Draft Recycled Water Master Plan, which is complementary to, but beyond the scope of the Groundwater Management Plan. The intent is to develop 17,000 afy of recycled water use by 2020. The capital cost of the complete system is estimated to be $68 million, and will be funded through CLWA's connection fee program. |
| Trautman #9 | How is recycled water reprocessed? | Primary Element 7 | Recycled water is not "reprocessed" at points of use such at the TPC golf course. In general, recycled water is highly treated (tertiary treated) waste water. In the case of the Santa Clarita Valley, treatment already occurs at the Valencia Reclamation Plant operated by the Sanitation Districts of Los Angeles County. The treated water, ready for non-potable use, is distributed from the plant site in a dedicated transmission pipeline system to end users such as the TPC. Pesticide and fertilizer uses, as part of cultural practices at end-user locations such as golf courses, are discretionary actions of the respective end users of recycled water. |
| Trautman #10 | What is the average per capita water usage? | N/A | Most water agencies no longer use "per capita" water use as a standard because it is not an accurate representation of actual per person water use, mainly due to the effects of landscape and commercial/industrial water use. (It is also expressed in "gallons per day," rather than "acre-feet per year," since it refers to individual water usage.) In general for the South Coast hydrologic region of California, water use is approximately 200 gallons per person per day (DWR Bulletin 160-98). Per capita use for the Santa Clarita Valley is slightly higher due to landscape irrigation demands caused by local climatic conditions. |

| PARTY | COMMENT | APPLICABLE GWMP SECTION/ COMPLIANCE[1] | RESPONSE |
|---|---|---|---|
| Trautman #11 | The Semitropic Water Bank/Transfer is not mentioned in discussion of the Supplemental (SWP) Surface Water on page 21. Is that because it is a relatively short-term water supply? Are any of the other water transfers – Kern Water Bank, Kern Delta Water, North Las Posas Water Bank – as listed on UWMP p. 2-16, of limited duration? And if the Semitropic Water Bank Transfer is short term, how can it be included in the 105,000 – 106,000 afy need projected for the next 20 years? What will take its place? | Section IV (Existing and Projected Supplies) | The SWP is referred to as "supplemental" water because that is the original purpose of the SWP: to serve as a supply that would "supplement" local supplies (whether groundwater or local surface water or both). The specific amounts referred to in the GWMP are from the contractual terms between CLWA and the California Department of Water Resources. The water banked in the Semitropic Water Storage Program during 2002 is a short-term, dry period supply. The program has a term of ten years (i.e., the water must be returned to CLWA for use in its service area within that time period). Thus it is not included as a supply for long-term needs. However, the other programs listed in the UWMP (most of which, by the way, are not water "transfers," but are instead groundwater banking programs) are long-term sources of supply. CLWA is in the process of designing and implementing a Long-Term Reliability Plan to begin bringing such long-term programs on line as a means to store water available in wet years, for use in later dry years. CEQA analysis, with its accompanying public comment opportunities, will be part of the long-term reliability program approval process. |
| Trautman #12 | What specific efforts will be made to manage salinity? | Primary Element 6 | Primary Element 6 – Long Term Salinity Management is included in the GWMP for the reasons presented in the text discussion of that element. The element recognizes the need to plan for salinity management but also recognizes that, to the present, there has been no extraordinary trend of salinity increase. Hence, there are no specific efforts currently in place to "manage" salinity. It is envisioned that specific efforts will be developed over time in response to implementation of the GWMP and, in particular, its Primary Element 6. CLWA is participating in efforts by the Sanitation Districts of Los Angeles County to address the Los Angeles Regional Water Quality Control Board's proposed TMDL standard for chloride in the Santa Clara River. This effort is separate from and beyond the scope of the Groundwater Management Plan. |

Board of Directors
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Legal Counsel
Philip D. Gregorio

General Manager
Dan D. Masnada

# UNITED WATER CONSERVATION DISTRICT

"Conserving Water Since 1927"

August 7, 2003

Dan Masnada
Castaic Lake Water Agency
27234 Bouquet Canyon Road
Santa Clarita, CA 91350

Re: Response on Draft Groundwater Management Plan, Santa Clara River Valley Groundwater Basin, East Sub-basin

Thank you for giving us the opportunity to review and comment on your *Draft Groundwater Management Plan, Santa Clara River Valley Groundwater Basin, East Sub-basin*. United Water considers this plan as one piece of a broader effort at groundwater management that is being accomplished as part of the Memorandum of Understanding between United Water and water purveyors in the Santa Clarita area. We offer some specific comments and suggestions for your consideration.

Comments include:

*Figure 3-2.* The vertical and horizontal scales associated with the hydrographs are very difficult to read. The T4N/R17W, Section 22 well, in the western arm of the Alluvial Aquifer does not show data from approximately 1983 through 1991. In previous reports and analyses, the NLF #C5 well was used for this area. This well depicted variable groundwater levels for the period from the mid-1980s to the early 1990s. Because this is the discharge area of the Alluvial Aquifer to the Santa Clara River, we need to understand the response of the system to the onset of agricultural pumping in this area in the mid-1980s. The T4N/R17W, Section 22 well does not possess the data needed to show that response;

*Page 15.* The comment near the top of the page that "*over the last 35 years, groundwater quality in the Saugus has remained generally constant*" would be more supportable if it was accompanied by a groundwater quality map similar to Figure 3-3, with a few groundwater quality time-series specific to the Saugus Formation;

*Figure 5-3.* The average daily mean streamflow data appears to be shifted one year on the histogram graph. As an example to show the error, the histograms suggest that there were high flow years in 1968 and 1997. The high flow years were actually 1969 and 1998;

UNITED WATER CONSERVATION DISTRICT

*Page 21. Local Groundwater.* The planned production of 30,000 to 40,000 acre-feet per year from the Alluvial Aquifer and 7,500 to 15,000 acre-feet per year from the Saugus Formation, along with 10,000 to 20,000 acre-feet per year from the Saugus in dry years, has yet to be implemented. The current development of a regional transient groundwater flow model for the East Sub-basin is for the expressed purpose of evaluating the potential impacts to the basin and surface water outflow into Ventura County, to this increased pumping. Irrespective of the modeling results, only real groundwater and surface water data can verify the influence of significantly increased pumping within the sub-basin; and

*Page 26, Primary Element 2 – Monitoring and Management of Surface Water Flows and Quality.* While imported SWP water no doubt contributes to the observed increased flow in the Santa Clara River at the Ventura County line, there exist additional explanations for a portion of the increased flow. Other considerations include:

1. Influence of the hydrologic cycle. The cumulative departure for precipitation was declining during the 1950s and first half of the 1960s. The cumulative departure improved significantly during the period of 1978 through 1986; and
2. The amount of Alluvial Aquifer pumping may influence flow at the Ventura County line. During the latter half of the 1960s and through the 1970s, groundwater pumping of the Alluvial Aquifer declined by 70%. Pumping during the 1980s was 30% lower than during the 1950s and early 1960s.

In this particular case, it would be very difficult to differentiate between the influence on streamflow from changes to groundwater pumping and the hydrologic changes.

If you have any questions about United Water's comments, please contact Steve Bachman at (805) 525-4431.

Sincerely,

Dana L. Wisehart

Dana L. Wisehart
General Manager

cc: BRRF
Lowell Preston, Ph.D., Ventura County Water Resources Division

File: Castaic Lake Water Agency
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**SCOPE**

**Santa Clarita Organization for Planning and the Environment**

TO PROMOTE, PROTECT AND PRESERVE THE ENVIRONMENT, ECOLOGY AND QUALITY OF LIFE IN THE SANTA CLARITA VALLEY

POST OFFICE BOX 1182, SANTA CLARITA, CA 91386

8-6-03

Castaic Lake Water Agency
27234 Bouquet Cyn Rd.
Santa Clarita, Ca. 91350
Faxed to 661 297 1611 Hard copy to follow via regular mail

Re: Comments on Ground Water Management Plan

Dear Sirs:

Thank-you for the opportunity to comment on your plan. We are pleased that your agency has begun a ground water management plan in response to the community's concerns over the excessive use of ground water. This extensive pumping and lack of protection of re-charge areas has resulted in almost complete elimination of surface flows and summer ponding necessary to wildlife as well as causing water level drops in wells that have resulted in water quality and availability problems for small users.

## General Areas of Concern

We regret that environmental organizations, small well owners, the City of Santa Clarita, the County of Los Angeles (watershed and flood control divisions), Regional Water Quality Control and other members of the community interested in water issues in our valley were not included on your advisory board. We believe that inclusion of these groups early on would have helped resolved some of the issues with your plan at an earlier stage. Including only the water companies, Newhall Land and Robinson Ranch effectively excluded many of the groups and individuals that have voiced strong concerns over your present actions. The water agencies have consistently excluded these groups from all water planning, including water supply reports and the Urban Water Management Plan process. We strongly suggest that a more inclusive committee be formed to include representatives of the environmental community and rural well owners who are now being affected by overdraft of the Santa Clara River.

We also note that there are no timelines for completion of any of the components of the plan. Without such timelines, it would seem that there is little real intention or commitment to follow through on the various parts of the plan.

## The Land Use/Wellhead Protection Component of the Groundwater Management Plan

Perhaps the most significant out come of a ground water management plan in the Santa Clarita Valley would be implementation of the portion of Section 10753 which requires review of land use plans and coordination with land use agencies. Your plan assigns this area to

"secondary element 2", an indication that you do not intend to pay much attention to this important component.

The coordination of land use and water planning has been sadly lacking in the Santa Clarita Valley. A simple wellhead protection plan would help decision makers understand the potentially polluting impacts of certain land uses such as gas stations, auto repair shops, etc. and how they could negatively affect our water supply. Instead, these uses are routinely permitted next to water supply wells.

Paving over of prime re-charge areas is allowed without a word of protest from the water agencies, even though such loss of recharge capacity will severely affect water availability. Recreational uses should be encouraged in recharge areas that will accommodate and perhaps even enhance water re-charge and thus increase water availability.

Newhall County Water District began a well head protection program and educational presentations with its ground water management plan in the mid 90's, but efforts to both educate the planners and protect re-charge and water supply wells have been stifled by the strong developer involvement with water agency decisions. This involvement has precluded advocacy of long term decisions that would protect water availability and water quality in favor of short term profits for development companies.

The ground water management plan should stress the importance of avoiding the concreting of tributaries when approving new land uses and require adequate set back from natural water courses to allow those blue line streams to remain in a natural state. This will enhance water re-charge (and thus, ensure water availability). It will also aid water quality because riparian vegetation absorbs many pollutants before they can enter the ground water system.

It is an indication of the myopic view of the water agencies that this plan states its number one goal to be "Development of Local Groundwater for Water Supply". There are many other uses of ground water and surface water which are important to the community. These include recreational and aesthetic values, biological value and the quality of the water supply. More pumping will result in diminution of all these other aspects of our ground water resource and ignore the strong protests and demands for their protection which are already being heard from many voices in the community.

## Monitoring of Ground Water and Surface to Establish Safe Yield

### Agricultural Water Usage is Overestimated

In its presentation, Luhdroff and Scalmanini revise the previous perennial yield estimate of the Santa Clara River by Richard Slade (perennial yield 32,000 AF, Hydrology of the Alluvial Sediments of the Santa Clara River, 1988, page 109) to approximately 40,000 AF. This revision is based in part on an average agricultural usage from the 1940s to the 1960s. We believe that these calculations are incorrect for three reasons.

1. No inclusion of recharge from agricultural run off was included in the usage calculations as was included in previous reports. Agricultural run-off was a substantial source of re-charge to the river that no longer exists, therefore not as much water is available for extraction.

2. Agricultural withdrawal was not metered, so water usage is merely an estimate based on crops and weather. It appears that estimates of withdrawals may have been over-stated.
3. Agricultural lands provided a source of re-charge during wet years. Urbanization has paved over most of this area, so re-charge is no longer occurring. This will reduce that amount of recharge to the river alluvium and thus reduce the amount available for extraction. (Slade, 1988, Hydrological Investigation of the Perennial Yield of the Alluvial Aquifer, page 88)

These evaluation errors have caused the water companies to believe that they can withdraw a higher amount of water than can actually occur without causing impacts to public trust matters and small well users

## Monitoring and Managing Surface Water Flows

### Visual Historical Evidence has been ignored

There are numerous records and observations by long-time residents indicating that surface flow usually occurred year round. Ponding that harbored fish and amphibians (many of which are listed as threatened or endangered) in areas that did not support year round flow has also been attested to by local residents. The disappearance of year-round flows and ponding is an indication of overdraft of the alluvial system. The impacts to riparian life and water quality are substantial. A goal of returning or replacing these summer surface waters should be incorporated in your plan. Such replacement may help to avoid potential future litigation brought to enforce the Endangered Species Act.

## Water Quality Monitoring

### Water Pollution

We appreciate that the water agencies have finally admitted that 5 municipal wells are closed and that there is a concern that the pollution plume is moving in a westerly direction (Plan at page 32). It is very regrettable that these facts were not disclosed to decision makers over the past several years and, further, were even denied by representatives of the water agencies.

***However, we believe it is imperative that this plan additionally include a disclosure of the current reduction in production capability due to pollution of the Saugus and alluvial aquifer by ammonium perchlorate.*** Continued pumping may extend the pollution plume and increase clean-up costs. It is important that the extent of the problem be honestly outlined for the public so that alternative remedies may be devised and discussed. Failure to disclose the extent of the pollution problem and its real impact may lead to serious water quality problems if the Saugus aquifer is relied upon for drought supply.

## Conclusion

We submit the following recommendations

1. We encourage CLWA to re-form its advisory committee to be inclusive of the community and other local agencies.

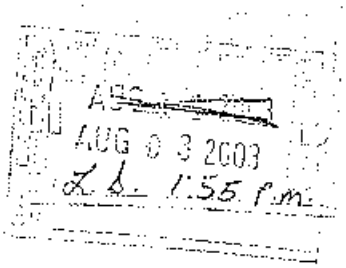
2. We suggest that the goals of the plan be re-ordered to place land use issues in a position of significance, and include recommendations from other agencies, organizations and individuals that might enhance water availability and water quality.
3. A time line must be established, financial commitment discussed and responsibility assigned so that the water management goals will actually be attained.

Sincerely

Pat Saletore

Pat Saletore

Cc: City of Santa Clarita
County of Los Angeles
Regional Water Quality Control Board
Local Newspapers




**Sand Canyon Area Well Owners Association**
**c/o 27363 Sand Canyon Road**
**Santa Clarita, CA 91387-3632**

August 8, 2003

Castaic Lake Water Agency
27234 Bouquet Canyon Road
Santa Clarita, CA 91350-2173

RE: Groundwater Management Plan ("AB 3030 Plan")

Gentlemen:

This letter is in response to your letter of June 16, 2003 which solicited comments about the above plan to ensure that the general public has had the opportunity to provide input on this local effort to manage our community's groundwater resources.

We are pleased to respond to your request for public participation. As well using residents of the Sand Canyon area who are affected by ground water use and plans for future use of it, we feel that our interests are very much at stake in determining how our river and ground water is to be used.

Our first and foremost concerns are that both river and ground water is being extensively pumped and that recharge areas are not being adequately protected. Surface flows and summer ponds have virtually vanished from our vicinity. In 1997, the water level in four wells adjacent to Sand Canyon Creek stood at twelve feet. As of last month, those same wells' water level now stands at ninety-three feet.

Other general concerns include the lack of representation on your advisory board by rural well owners. While water companies and the Robinson Ranch Golf Course have their own interests in how our community's water resources are used, many small well users have an equally valid interest in seeing that our area's water resources are managed in an equitable fashion that ensures no entity's use will result in the deprivation of others.

Also, none of we Sand Canyon area small well users have been consulted during the creation of water supply reports or the Urban Water Management Plan, despite the fact we are being affected by an increasingly serious overdraft of the Santa Clara River. Including members of our group in a groundwater management committee will bring important stakeholders to the planning process. We have important data to present.

It is disappointing to note that the ground water management plan specifies no timelines or dates for executing and completing its phases. We question whether there is sincere intent to carry out the plan given the lack of work plan.

On a broader scale, we are deeply concerned about the plan's land use and wellhead protection sections. Section 10753 calls for a review of land us plans and coordination with land use agencies, as stipulated in secondary element 2 of the plan. A critically important aspect of effective ground water management, such coordination has not taken place to any meaningful extent in the Santa Clarita Valley, and more specifically, in the Sand Canyon area. We have noted with dismay that vital recharge areas have been built upon and paved over with no comment from any water agencies, despite an obvious impact on water availability for all water users, particularly small well holders.

While intelligently planned development is meant to result in well designed, livable communities where all inhabitants are assured of fair access to resources, we note that ongoing strong developer involvement with water agency decisions has led to the potential compromise of water availability and quality in exchange for near term profits for developers and increased tax revenues for local governments.

In the draft plan's sections that deal with ground water monitoring to establish a safe yield, we believe that estimates of agricultural water consumption are not accurate. In Richard Slade's 1988 perennial yield estimate of the Santa Clara River, he stated on page 109 that it was approximately 32,000 acre-feet. Yet Luhdroff and Scalmanini raise this estimate to 40,000 acre-feet. They base their calculations on data measured for agricultural operations between the 1940's and 1960's.

Since our membership includes individuals who have farmed a large parcel in the Sand Canyon area from 1951, we feel qualified to comment on the above figures.

First, agricultural usage during the reference years was never metered. Usage during this period is estimated based on available crop reports (when they were recorded) and available weather data. A reading of withdrawal estimates raises a suspicion that they are overstated.

Second, the upward revision of Slade does not include agricultural runoff. Since agriculture in our area has virtually disappeared, it is no longer a contributing factor to aquifer recharge. Yet earlier estimates included agricultural runoff, a significant source of recharge.

Third, land in our area that previously was planted in both irrigated and dry land crops has now been paved over. During rainy years, farm fields were an important component of recharge, since rain soaked into them. Slade specifically mentions this reduction of extractable water on page 88 of his 1988 report.

Flawed calculations like these have caused water companies and other institutional users to think that they can extract more water than they can and should without adversely affecting small well users.

Primary element number two gives the appearance of an attempt to establish a commingled inter-relationship between the Saugus Formation and the Santa Clara River. With a clearly defined bed and banks, the Santa Clara River has historically behaved as a river, and despite severe depletion from over pumping, still exhibits the dynamics of a river during episodes of precipitation. With our members holding rights of diversion from the State Water Resources Board, we strongly feel that any attempt to define the river in terms of percolating groundwater defies logic and the laws of physics.

Also, in the "Existing and Projected Water Supplies" section, the draft report states that "...it is currently expected that ongoing utilization of local groundwater will continue to be in amounts that have historically been pumped, 30,000 to 40,000 afy from the Alluvium..."

As stated above, Slade's 1988 report clearly and unequivocally sets the upper pumping limit of the Santa Clara flow at 32,000 afy. By relying on generous overstatements and exaggerated potentials, a plan will go forward that will have serious negative impacts for small well users in the Sand Canyon area.

In primary element three, Determination of Basin Yield and Avoidance of Overdraft, we are concerned with the second paragraph's first sentence that states "...there has not been any widespread, steady degradation of groundwater conditions that might be indicative of overdraft..."

Again in Primary Element 4, the second sentence asserts..."Both ranges of numbers are consistent with recent historical pumping that has not resulted in any indication of overdraft or other undesirable conditions." And in Primary Element 5, the third sentence further posits that ..."Groundwater pumping has remained within a range that has not caused any evidence of overdraft, or associated undesirable impacts..."

It is the direct and incontrovertible evidence of water levels in our own wells that presents us with a clear contradiction to this assertion. Based on members' records that cover a fifty-year span, the current water levels in our wells have reached an unprecedented low. We are left with inescapable evidence that large users pumping from the Santa Clara River have contributed to a cone of depression that is negatively affecting our small wells.

In addition, riparian conditions along the tributaries and main channel of the Santa Clara River reflect highly stressed, water deprived environments. In areas away from river feeder creeks, some heritage California Coastal Oaks (Quericus Agrifolia) have begun showing signs of water deprivation.

In a related matter, the proposed plan calls for identification of potential sources of contamination to assure water quality. When Robinson Ranch Golf Course was granted permission to open and operate, the city stipulated that water quality adjacent to and on the golf course be monitored and that regular reports about it be published. These reports have not been included in the draft plan, despite the fact that Robinson Ranch is a participant on the advisory committee for this draft plan. Pesticide, insecticide, fertilizer, and other volatile organic compounds are all possible runoff and plume contaminants that may be leaching from the golf course.

As members of your advisory committee, we would be glad to share with others the data from five decades of small well usage. We believe that recent developments, specifically in our area, have seriously lowered both the alluvial water levels to historic levels.

While modeling, projection, and prediction can yield abstract theories, we small well users must live with the consequences of miscalculation, however unintentional or inadvertent.

Small well holders are franchised, integral, entitled members of the water using community, and as such, must be included in the planning process associated with any groundwater management plan that is to be implemented in the Santa Clarita Valley.

Primary element nine specifies a MOU (Memorandum of Understanding) executed between the United Water Conservation District in Ventura County as an example of..."a local agency relationship that has produced the beginnings of local groundwater management, now embodied in this comprehensive (sic) plan..." While we laud all attempts to widen the base of data and participation in the planning process for water resources, we are disappointed that as stakeholders in the Eastern Sub-basin of the Santa Clara River Valley, our interests are not being represented on the advisory committee that has been created to direct the groundwater management plan.

We ask to be included in the planning committee that is helping to shape the future of water use in our community.

Respectfully,

**The Sand Canyon Area Well Owners Association**
Robert and Jane Fleck
Eugene and Marylou Ruddell
Richard and Leslie Christensen
Shawn Clement
Joan Waldman

# Friends of the Santa Clara River

*660 Randy Drive, Newbury Park, California 91320-3036 • (805) 498-4323*



AUG 0 8 2003


August 7, 2003

Castaic Lake Water Agency
27234 Bouquet Canyon Road
Santa Clarita, CA 91350


Board of Directors

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Sierra Club
*Angeles Chapter*
*Los Padres Chapter*

Surfrider Foundation

Audubon Society
*Ventura Chapter*

Ventura County Environmental Coalition


Re: Groundwater Management Plan

Dear Sirs,

Friends of the Santa Clara River submits the following comments on the June 2003 Draft Groundwater Management Plan (Plan).

We are disappointed and dismayed that the Plan sets as its primary goal the "Development of Local Groundwater for Water Supply". While providing adequate water supplies is an important objective, it would seem to us that the primary goal should be the long-term protection of local groundwater resources, including groundwater quality. Groundwater resources provide many benefits to the community, including those related to the biological and environmental health of the river corridor. Long-term protection, if implemented, should curtail the over-pumping of local aquifers which is currently occuring.

We are also concerned that water agencies, in general, have failed to weigh-in on the paving over of recharge areas in the Santa Clarita Valley. Loss of recharge could have very substantial impacts on future water availability. The Plan should emphasize that concreting of ephemeral tributary streams reduces recharge, and thus should be avoided. Adequate setbacks, or buffer zones, around major streams should be stressed - an item that is rarely adequately addressed in development projects.

The Plan advisory board is too narrowly constituted. The Regional Water Quality Control Board should be represented, as should environmental groups and county agencies working on watershed protection.

Thank you for the opportunity to comment.

Sincerely,

Ron Bottorff

Ron Bottorff, Chair

Attention: CLWA Directors August 8, 2003
RE: Comments on Ground Water Management Plan

FAX: (661) – 297-1611

From: Henry Schultz
Phone: (661) 284-5613 or (805) 447-2863 (work) or FAX at (805) 480-1333
Email: hschultz@amgen.com, henry50@pacbell.net
Three pages total:

There follow 2 pages of comments on the water plan. If there are any questions I can be contacted at the above locations.

Henry Schultz
Chair, Santa Clarita Sierra Club Group

8/7/03

Castaic Lake Water Agency
272234 Bouquet Canyon Rd
Santa Clarita, CA 91350
FAX. 661-297-1611

RE: Ground Water Management Plan Comments

Dear Directors:

We appreciate the chance to comment on the ground water management plan. This plan has been a long time in the making. We hope that your response to concerned public input will make it a viable document. A few comments follow.

1. Based on the (too) long history of this plan, it is essential to include deadlines (with penalties for failure) for completion of the various components of the plan Otherwise our water will just slip away.

2. There is no accounting for loss of groundwater from pollution such as perchlorates. As soon as the magnitude of the problem has been adequately determined, a realistic plan can then be implemented. As it stands right now, the numbers do not adequately represent the real water supply

3. Loss of groundwater due to loss of percolation due to extensive development, which paves over permeable soil, is not considered It is a continuous and cumulative impact on the water supply. More generally, the water plan must address coordination of land use with water necessities such as the preservation of water percolation basins and similar amenities.

4 Drought planning is inadequate in the plan For example, if a water treatment plant is built, then a certain number of acre/ft of water can be reclaimed. Current planning would say that this is real water, which can be counted on. In a drought, not only do you lose primary water sources, but also the corresponding amount of reclaimed water, a double hit which must be accounted for in any realistic water plan.

5. The Sierra Club strongly supports an active river-monitoring program so that potential and existing water quality issues can be addressed in a timely manner. This must be an integral part of the plan. In lieu of the water agency producing reliable data, a citizen-monitoring program will have to be undertaken to assure the quality of our water.

6. The plan does not adequately discuss maintaining river and tributary habitats such as the biological unhealthy zones created from the Rio Vista Plant's outflow into the Santa Clara River. While there are green plants growing in the area, UCLA researchers have shown that it is barren of many insects, which would normally be present in such an environment. This engenders a ripple effect in the biota

7. Just as the City of Santa Clarita involves the public and other government and private agencies in its long range planning, CLWA should do the same with its water planning. People in the Santa Clarita Valley are just beginning to realize the importance and the fragility of their water supply. The time to start REAL planning is now.

Thanks for your kind attention.

Henry Schuitz
Chair, Santa Clarita Sierra Club Group
21827 Parvin Dr.
Santa Clarita, CA 91350
Henry50@pacbell.net
661-284-5613

AUG 0 8 2003
4:19 p.m.

Ed & Joan Dunn
15414 Rhododendron Dr.
Canyon Country, CA 91387
August 8, 2003

Castaic Lake Water Agency
27234 Bouquet Canyon Road
Santa Clarita, CA 91350-2173

RE: Groundwater Management Plan (AB 3030)

Dear Sirs:

We are pleased to have the opportunity to comment on your draft AB 3030 Plan. Enclosed please find copies of individual pages of this plan and associated comments for these pages.

We are disappointed that the writing of this plan appears to be following the same path of the UWMP. We are also displeased there has not been an attempt to hold more public meetings prior to this draft release. As required in AB 134, when has the agency met regularly with the advisory council to consult on this plan? What was the frequency of the meetings and how many were there?

We are quite interested in an AB 3030 Plan and would appreciated this draft be made into an honest and truthful document, allowing it to go ahead on a timely schedule without challenges and delays.

Respectly submitted,

Ed and Joan Dunn

Enclosures: 3 Exhibits, 16 draft groundwater pages and 16 associated comment pages

Top of page:
Basin objective "manage groundwater levels and discharge to the Santa Clara River, at the west end of the basin"?
Wording should include "the entire basin".

Bottom paragraph, last sentence:
The plan is replenishing the aquifer with WHAT sufficient water?

and effects, e.g. chronic water level decline, loss of groundwater storage, onset of land subsidence, groundwater quality degradation, a corresponding basin objective is to manage groundwater levels and associated groundwater discharge to the Santa Clara River at the west end of the basin, and thus not adversely impact surface and groundwater discharges to the downstream basin(s).

3. Preservation of groundwater quality for beneficial use in the basin, and for beneficial use of surface water and groundwater discharges from the basin. Included in this management goal will be the active characterization and solution of any groundwater contamination problems, through cooperation with responsible parties or through independent action if timely action by responsible parties is not forthcoming and the preceding management objectives are thereby impacted or constrained.

4. Preservation of interrelated surface water resources. Included in this management goal will be the maintenance of appropriate surface water flows and non-degradation of surface water quality as a result of managing groundwater conditions to meet the other management goals for the basin.

Quantitatively, the preceding goals translate into general preservation of groundwater levels and quality in the Alluvial aquifer system consistent with the last 30 years, including fluctuations through seasonal demands and local hydrologic variations (wet and dry periods). As discussed in more detail in the next chapter, the hydrogeologic setting in the area has resulted in smaller Alluvial groundwater level fluctuations toward the western half of the basin (generally west of Bouquet Canyon), and larger fluctuations to the east. However, largely due in part to the importation of supplemental surface water over the last 20 years, and the integrated or conjunctive use of that supplemental water with local groundwater, there has been no chronic decline in groundwater levels or storage. A continuation of such basin conditions, possibly complemented by management actions to decrease the historical water level fluctuations in the eastern part of the basin, will accomplish the second basin objective, continued avoidance of overdraft as has been the ongoing historical condition in the basin, while continuing to utilize local groundwater to meet part of projected water requirements, the latter being the first management objective for the basin. Corresponding management actions to sustain recharge and not overdraft groundwater storage will accomplish the third basin objective by replenishing the aquifer system with sufficient water to sustain what has been generally consistent quality of groundwater on a long-term basis.

We question Slades 1986 and 2002 Report stating the alluvium has the capacity of 240,000 acre feet.

# *III. Groundwater Basin Conditions*

**Occurrence of Groundwater**

Groundwater in the Santa Clara River Valley East groundwater subbasin occurs in two aquifer systems, the Alluvium associated with the Santa Clara River and its tributaries, and the Saugus Formation. There are also some scattered outcrops of Terrace deposits in the basin that likely have the capacity to contain limited amounts of groundwater; however, since these deposits are located in limited areas that are situated at elevations above the regional water table and are also of limited thickness, they are of no practical significance as aquifers and have consequently not been developed for water supply.

The Alluvial aquifer system, of Quaternary to Holocene (Recent) geologic age, consists primarily of stream channel and flood plain deposits of the Santa Clara River and its tributaries. The Alluvium is deepest along the center of the present river channel, with a maximum thickness of about 200 feet near the area known as Saugus. It thins toward the flanks of the adjoining hills and toward the eastern and western boundaries of the basin and, in the tributaries, becomes a mere veneer in their upper reaches. The spatial extent of the Alluvium throughout the basin is illustrated in Figure 3-1.

The Alluvium is the most permeable of the local aquifer units. Based on well yields and aquifer testing, transmissivity values in the range of 50,000 to 500,000 gallons per day per foot (gpd/ft) have been reported for the Alluvium, with the higher values where the Alluvium is thickest in the center of the valley and generally west of Bouquet Canyon (Slade 1986 & 2002). The amount of groundwater in storage can vary considerably because of the effects of recharge, discharge, and pumping from the aquifer. The maximum storage capacity of the Alluvium has been estimated to be about 240,000 acre-feet (af) (Slade, 1986 & 2002).

The Saugus Formation, of Pliocene to Pleistocene geologic age, has traditionally been divided into two stratigraphic units: the lowermost, geologically older Sunshine Ranch member, which is of mixed marine to terrestrial (non-marine) origin; and the overlying, of upper, portion of the Formation which is entirely terrestrial in origin. The Sunshine Ranch Member of the Saugus Formation has a maximum thickness of about 3,000 to 3,500 feet in the central part of the valley;

Top, bottom of first paragraph:
The plan states "the most significant period of Saugus pumpage was 1991 through 1994, when pumpage ranged from 10,600 afy to nearly 15,000 afy and averaged over 12,000 afy, during which time SWP water deliveries were reduced at the end of extended drought conditions".

It should be stated that the SWP water was INTERRUPTED for approximately 6 months. See Feb. 27,1991 Daily News newspaper article " Santa Clarita will turn to wells as state water supplies dry up". As stated in the article, the SWP water processing plant was shut down. Exhibit A.

"Officials say state's water delivery system inadequate". See Exhibit B

Since 1980, total pumpage from the Saugus Formation has ranged between about 3,850 afy and nearly 15,000 afy; average pumpage over that period has been about 6,900 afy. The great majority of pumpage from the Saugus is for municipal supply (nearly 6,300 afy, or 92 percent, on average). For comparison, although historical Saugus pumping records prior to 1980 are limited, there appears to have been essentially no pumping from the Saugus prior to 1960 (on the order of about 100 af in most years, beginning in 1948), and some increased pumping for agricultural water supply beginning in about 1962 (about 900 af). The largest amount of agricultural pumping from the Saugus was during the mid-1960's, when annual Saugus pumpage was about 3,000 af. Agricultural pumping from the Saugus declined to near zero by the late 1970's, but has been generally in the 500 to 1,000 afy range since 1982. There was no Saugus pumpage for municipal supply in the early 1960's; limited data suggests that municipal pumping from the Saugus began in the 1970's, and reached nearly 5,000 afy by 1980-81. The most significant period of Saugus pumpage was 1991 through 1994, when pumpage ranged from 10,600 afy to nearly 15,000 afy and averaged over 12,000 afy, during which time SWP water deliveries were reduced at the end of extended drought conditions.

**Groundwater Monitoring Network and Program**

There is no formal groundwater monitoring network of wells for groundwater level measurements and/or groundwater quality sampling in the basin. Consequently, one component of this Plan is to formalize both a network of wells for groundwater monitoring and a program for water level measurements, water quality sampling, and other pertinent groundwater data collection (Primary Plan Element 1). Despite the lack of an existing formal groundwater monitoring network and program, however, there is a significant amount of historical groundwater data, some of which dates back into the 1940's, on which to base reasonable assessments of groundwater conditions in the basin. For example, groundwater level measurements have been made over varying periods of record in a total of 154 wells, mostly alluvial wells, throughout the basin. Similarly, groundwater quality data, consisting of varying numbers of constituents analyzed, are available from some wells, but a much smaller number than is the case for groundwater level data. These data, along with direct measurements or indirect estimates of pumpage, primarily from high capacity municipal and agricultural wells, allow for analysis of groundwater basin conditions, as discussed in this Plan, and also provide the bases on which a groundwater model can be developed (Primary Plan Element 3) and on which various management criteria such as operational yield, baseline groundwater quality, etc. can be determined (Primary Plan Elements 3, 6 etc.).

Middle paragraph:
"Exceedence of action level of perchlorate".
Newhall County Water District perchlorate level was 19 micro-grams per liter and Santa Clarita Water Co. was 24 or more micro-grams per liter.
The statement that none (no wells) exceeded 18 micro-grams per liter is false. See Exhibit C

higher quality (low TDS) water and dry periods have resulted in the notable declines in water levels described above, with a corresponding increase in TDS (and individual component constituents) in the deeper parts of the Alluvium.

Due to a much more limited number of wells and the limited spatial extent of groundwater development in the Saugus Formation, long-term Saugus groundwater quality data are not sufficiently extensive to permit any sort of basin-wide analysis or assessment of pumping-related impacts on quality. Based on the most complete historical record, over the last 35 years, however, groundwater quality in the Saugus has remained generally constant, and the Saugus Formation is, on a groundwater quality basis, a viable agricultural and municipal water supply.

The most notable groundwater quality issue in the basin centers around the detection and impact of perchlorate on several Saugus wells and one Alluvial well in the central part of the basin near the location of the former Whittaker Bermite facility, which is immediately southeast of the confluence of the main Santa Clara River and its South Fork tributary. In 1997, routine water quality sampling detected the presence of perchlorate in four municipal wells completed in the Saugus Formation (CLWA Santa Clarita Water Division Saugus Wells 1 and 2, Newhall County Water District Well 11, and Valencia Water Company Well 157). While there remains no primary or secondary drinking water standard for perchlorate, and although the detected concentrations of perchlorate in the Saugus wells did not exceed the Action Level established by the State Department of Health Services at that time (18 ug/l), all those wells were inactivated by their respective owners after detection of perchlorate; those wells remain out of municipal water supply service to date.

More recently, in late 2002, routine water quality sampling of Alluvial wells detected perchlorate in one of them (CLWA Santa Clarita Water Division Stadium Well) at a concentration which slightly exceeds the current Action Level (4 ug/l). This well has also been voluntarily inactivated, and thus remains removed from municipal water supply service.

This Plan, notably through Primary Plan Elements 1, 6 and 8, is intended to incorporate both short-term and long-term groundwater quality considerations in the management of the groundwater basin in order to formalize groundwater quality monitoring and assessment, to investigate and correct groundwater contamination problems, and to preserve or improve groundwater quality for ongoing water supply as well as for avoiding adverse water quality impacts on interconnected surface waters.

Paragraph #2:
The statement of this paragraph is misleading. The correction should show "out of service wells significantly reduced groundwater capacity for existing groundwater supplies, so much so, that a substantial increase of state water use, has been initiated".

## Areas of Concern and Identified Problems

A number of concerns have been expressed about groundwater conditions in the basin. While not all of the expressed concerns have been substantiated, they are listed and briefly discussed here, and they are addressed in the management objectives for the basin, intended to be achieved via implementation of the various primary and secondary elements in this Plan.

The most notable concern in the basin, at least at present, is the impact of perchlorate contamination on a number of municipal water supply wells, thus affecting the available pumping capacity from some municipal wells. While perchlorate impacts on a few wells do not preclude the ability to pump groundwater in accordance with existing water supply plans, activities to characterize the contamination, and ultimately to control it and treat it, have been initiated in order to return the impacted wells' pumping capacity to water supply service. Primary Element 8 is included in this Plan to formalize the addressing of groundwater contamination issues in the basin.

Concern has also been expressed that groundwater development in the basin will adversely impact the quantity and/or quality of surface flows leaving the basin via the Santa Clara River. Such concern extends to the potential impact on groundwater in the next downstream basin, the Piru Basin in Ventura County. While there are no established provisions regarding surface flows out of the Santa Clara River Valley East subbasin, Primary Element 2 is included in this Plan to formally address the monitoring and management of surface water flows and quality within, and flowing out of, the basin. Some work is already ongoing related to this area of concern via a Memorandum of Understanding (MOU) among CLWA, other purveyors within CLWA's service area, and United Water Conservation District, which manages surface water and groundwater in the downstream basins on the Santa Clara River in Ventura County. That cooperative effort, which is incorporated into this Plan via Primary Element 9, includes integration of databases, development of a numerical groundwater flow model, and interpretation and reporting on surface water and groundwater conditions.

A third expressed concern in the basin, although never substantiated, is that groundwater is already overdrafted. Associated with that expressed concern is a related issue that reliance on overdrafted groundwater results in an overstated water supply in the basin. As discussed earlier in this Section, long-term groundwater levels, storage, and quality all indicate a lack of overdraft. As also discussed above, the importation of supplemental surface water over the last 23 years,

References to the Urban Water Management Plan (UWMP).
The UWMP of 2000 contains incorrect information and is under legal attack for correction. The UWMP does not address the total interruption of the state water supply in the event of drought, earthquake, or Delta problems. It is suggested that the UWMP not be utilized or referred to until its contents have been corrected to reflect accurate and truthful information.

32,000 afy. The history and trend of municipal groundwater use in the basin are illustrated in Figure 4-1.

As noted above, until 1980, all water supply in the basin was from local groundwater. Imported surface water was first available from the State Water Project (SWP) in 1980, when a total of 1,125 af were imported into the basin. Since then, importations of SWP water have increased in two separate steady trends, interrupted by a notable decrease at the end of, and following, the 1987-1992 drought period: a steady increase beginning in 1980, to about 21,600 afy in each of 1989 and 1990, followed by a substantial decrease, to less than 8,000 af in 1991, and then a steady increase back to about 21,000 afy in 1997 and 1998, followed by further increases to about 35,000 af in 2001. The history and trends in importation of SWP water to the basin are illustrated in Figure 4-2, which also illustrates the historical trends in groundwater pumping and total water use in the basin since the importation of SWP water.

In the context of this groundwater management plan, the historical utilization of imported SWP water to augment local groundwater represents the initiation of conjunctive use of surface water and groundwater supplies, a groundwater management principle which is intended to be continued via adoption of Primary Element 5 of this plan.

**Projected Water Requirements**

Detailed projections of municipal water requirements were most recently completed as part of the Urban Water Management Plan prepared by CLWA and the municipal water purveyors (Newhall County Water District, Santa Clarita Water Company, and Valencia Water Company) in 2000. Those projections, which are forecast for a 20 year period, also recognize an ongoing but decreasing agricultural water demand over the same period, from about 15,000 afy in 2005 to about 7,000 afy by 2020. The municipal water demand projections in the Urban Water Management Plan were derived from utilization and interpretation of multiple projection methods, including Per-Capita Water-Use applied to population projections; extrapolation of number of service connections (using two different projection techniques, an average rate and an accelerated rate projection) applied to the rate of service connection additions since 1990; and land use projections combined with unit water use factors on multiple land use categories (urban, including residential, commercial, industrial and recreational; irrigated agricultural; and vacant and open space). The water demand projections in the Urban Water Management Plan also considered weather effects (variations due to hot-dry years vs. cool-wet years) and conservation

References to the Urban Water Management Plan (UWMP).
The UWMP of 2000 contains incorrect information and is under legal attack for correction. The UWMP does not address the total interruption of the state water supply in the event of drought, earthquake, or Delta problems. It is suggested that the UWMP not be utilized or referred to until its contents have been corrected to reflect accurate and truthful information.

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Top
"Local Groundwater" The statement is made: "That for all practical purposes the Saugus Aquifer underlies the entire CLWA service area". That statement is absolutely false! It does not!
Please correct.

Bottom paragraph:
Supplemental (SWP) Surface Water

CLWA's SWP Water Entitlement
The CLWA, indeed, has purchased water in addition to the original Table A entitlement, but cannot obtain contractual agreement to transport the additional water to the Santa Clarita Valley.

water and possibly some water supply derived from water transfers and desalination outside the basin.

**Local Groundwater** - Local groundwater has historically been developed from the two aquifers that comprise the groundwater basin, the Alluvium that underlies the Santa Clara River and its tributaries, and the Saugus Formation that underlies, for all practical purposes, the entire CLWA service area. Those two aquifers, and the groundwater basin they comprise, are the focus of this groundwater management plan. Based on historical experience and observation of groundwater conditions, it is currently expected that ongoing utilization of local groundwater will continue to be in amounts that are generally comparable to what has historically been pumped, 30,000 to 40,000 afy from the Alluvium and 7,500 to 15,000 afy from the Saugus Formation. It is also expected that there is some additional development potential in the Saugus Formation, in the range of 10,000 to 20,000 af which might be intermittently extracted during one or more dry years when supplemental imported water might be reduced. Ultimately, it is expected that local groundwater will continue to be a component of water supply, at appropriate production levels in both aquifers, in the basin. The intent of this groundwater management plan is to ensure that ongoing utilization of local groundwater continues to result in acceptable aquifer conditions, i.e. avoidance of overdraft (Primary Plan Element 3), no degradation of quality (Primary Plan Element 6), no adverse impacts to surface waters (Primary Plan Element 2), all via continuation of conjunctive use operations that have been ongoing since the initial importation of supplemental surface water in 1980 (Primary Plan Element 5) and via monitoring and interpretation of surface water and groundwater conditions on an ongoing basis (Primary Plan Elements 1 and 2).

**Supplemental (SWP) Surface Water** - CLWA has a contractual Table A amount of 95,200 af of water from the SWP. CLWA's original contract, signed in 1963, was for 23,000 af; that Table A amount was later increased to 41,500 af. In 1988, CLWA purchased a Table A amount of 12,700 af from Devil's Den Water District, and it acquired another Table A amount of 41,000 af in 1999 from Kern County Water Agency and its member district, the Wheeler Ridge-Maricopa Water Storage District. There is ongoing CEQA-related litigation over the most recent acquisition of the additional SWP Table A amount, the 41,000 af acquired from Kern County Water Agency and Wheeler Ridge-Maricopa WSD. However, there has been no invalidation of the completed agreement to transfer the 41,000 af Table A amount to CLWA; and current water supply planning includes that Table A amount as CLWA corrects the CEQA technicality by preparing a new EIR to address the environmental consequences of the transfer.

Top:
Recycled Water

It should be noted CLWA's planned recycle water program is and has been for one private business only. No public agency is receiving or is planned to receive recycled water from CLWA.

**Recycled Water** - In 1993, CLWA prepared a draft Recycled Water System Master Plan that outlined a multi-phase program to integrate recycled water into the overall water supply system in the basin. Construction has begun on Phase I of that project, which will deliver approximately 1,700 afy, and deliveries are expected to begin in 2003. Overall, recycled water is expected to ultimately reclaim up to 17,000 afy of treated waste water suitable for irrigation use on golf courses, landscaping, and other non-potable uses.

Plan, page #25 Dunn, page 10

Top:
Number 7 should read: Valleywide integration of recycled water.

Middle:
Secondary (Potential Elements) Item #2 Change to: involvement in land use planning per Water Code 10753.7 (l).

4. Development of Regular and Dry Year/Emergency Water Supply
5. Continuation of Conjunctive Use Operations
    - active and passive groundwater recharge
6. Long Term Salinity Management
7. Integration of Recycled Water
8. Identification and Mitigation of Soil and Groundwater Contamination
    - involvement with other local agencies in investigation, cleanup, and closure
9. Development and Continuation of Local, State and Federal Agency Relationships
10. Groundwater Management Reports

**Secondary (Potential) Elements**

1. Continuation of Public Education and Water Conservation Programs
2. Identification and Management of Recharge Areas and Wellhead Protection Areas
    - involvement in land use planning process
3. Identification of Well Construction Abandonment, and Destruction Policies
    - water quality protection
    - manage vertical distribution of pumpage
4. Provisions to Update the Groundwater Management Plan

**Primary Element 1 - Monitoring of Groundwater Levels, Quality, and Production**

Prior to 1980, all water supply in the Upper Santa Clara River Area was developed from local groundwater; since 1980, imported surface water has become an increasing component of overall water supply in the area, but groundwater continues to meet all agricultural water demand and a significant part of municipal water demand. As a result of the long term development and use of groundwater in the area, there is a fairly substantial amount of historical groundwater level data, and a useful amount of groundwater quality data, and groundwater pumping data that has been collected in the basin. All the available historical groundwater level, quality, and pumping data have been organized into a computerized data base for the Upper Santa Clara River Area. That data base, while separate, has been coordinated with an equivalent data base maintained by United Water Conservation District for the downstream basins on the Santa Clara River. The intent of database coordination has been to facilitate interpretation and reporting on groundwater and other water resource related issues by the respective agencies overlying the various basins along the River.

Bottom:
As stated earlier the UWMP is inacurate and under legal attack-and not certified by the courts.
Primary Element 4 – Development of Regular and Dry Year/Emergency Water Supply

40,000 acre feet from the aluvium and 15,000 a/f from the Saugus is optimistic.
We strongly suggest developing an emergency plan for an extended interruption of the state water project. How many times must we ask for such an obvious safeguard?

conditions (and associated fluctuations in recharge and pumping). Such fluctuations are typical of groundwater basin conditions in any conjunctive use setting, such as in this basin: groundwater is utilized from storage during dry years, or dry periods, and that storage is replenished during alternate wet years, or periods. The observation of these historical groundwater conditions, in combination with knowledge of pumpage from both the Alluvial and Saugus Aquifers, has led to current operational practices as well as general expectations regarding the approximate yield of the local groundwater system as discussed in this plan.

While historical operating experience, complemented by observed groundwater conditions, is an appropriate basis for generally planning for available groundwater supplies, it is possible and appropriate to more precisely analyze the basin to determine values or ranges of yield under varying hydrologic conditions, and to assess the impacts of various management actions that might be implemented in the basin. The MOU process described in Primary Element 9 of this Plan includes the development of a numerical groundwater flow model which is intended to be utilized for determination of the yield of the basin under existing land use and under existing groundwater and surface water development conditions. It is also expected to be used for implementation of this Plan Element in order to assess the yield of the basin under future land use conditions as well as future ranges of surface water importation, groundwater development, and recycled water use through varying hydrologic conditions, i.e. wet and dry periods that affect the availability of imported surface water.

The ultimate intent of this Plan Element is to develop an understanding and quantification of the yield of the basin, under varying hydrologic conditions and developing local cultural conditions, in order that groundwater development and use be managed in such a way to meet an appropriate fraction of total water demand while avoiding levels of groundwater use that would result in overdraft conditions. Thus, implementation of this Plan Element is essential to accomplishing the first and second management objectives (goals) for the basin.

**Primary Element 4 - Development of Regular and Dry Year/Emergency Water Supply**

The most recent updated Urban Water Management Plan (UWMP, December 2000) prepared by CLWA and the other purveyors in the basin (Newhall County Water District, Santa Clarita Water Company, and Valencia Water Company) includes plans to develop 30,000 to 40,000 acre-feet per year (afy) from the Alluvial aquifer and 7,500 to 15,000 afy from the Saugus Formation in average/normal years. Both ranges of numbers are consistent with recent historical pumping that

Plan, page #Figure5-4 Dunn, page 12

The SWP water received in 1991 is erroneous. The chart indicates 8,000 a/f. It is incorrect. CLWA only received 10% of its then allocation 54, 200 a/f. The 10% was received in January and the plant shut down in March. See Exhibit A. It should be noted that this is a state water project interruption for months, not a reduction.

**Historical and Projected Water Use**
Upper Santa Clara Valley Groundwater Basin
East Subbasin

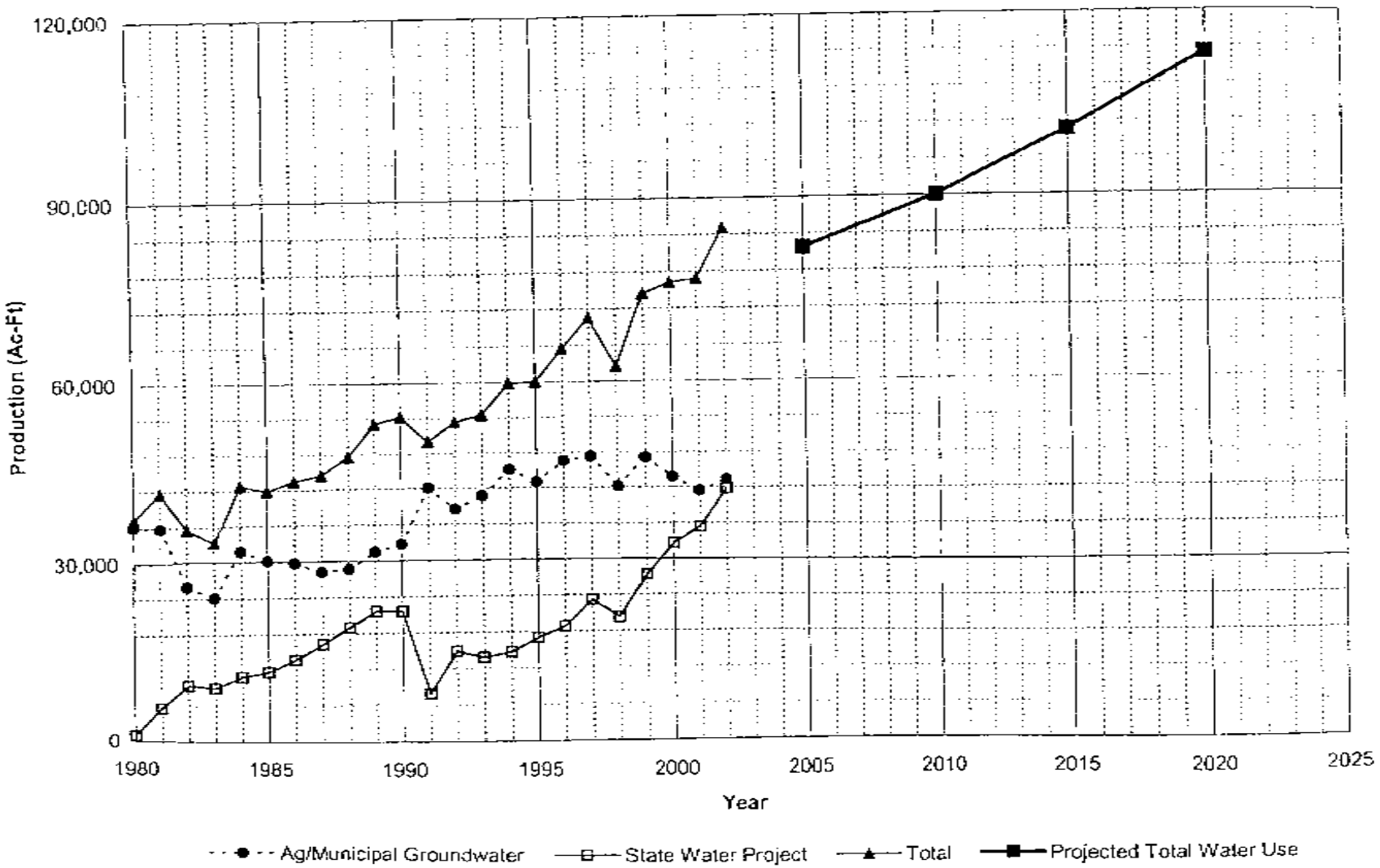



Figure 5-4

Plan, page #30 Dunn, page 13

Top paragraph:

There is no mention what the folks can do if groundwater cannot meet demand and the supplemental water is not there for an extended period of time. Please develop a plan to solve this most serious occurance.

Conjunctive use of local groundwater and imported surface water will continue to be a key element in meeting all the goals for the basin, most notably utilizing groundwater for water supply without overdrafting the basin. Historical experience with groundwater pumping and aquifer response to varying hydrologic conditions has shown that the groundwater basin can support notable variations in pumping during wet and dry periods, but it cannot support continuous pumping at rates high enough to meet total local water demand. Thus, utilization of imported surface water in conjunction with local groundwater will be essential to the management of groundwater for water supply without overdrafting that resource.

As part of conjunctively using surface water and groundwater, it is recognized that, particularly when the surface water supply is imported from the State Water Project, there will be variations in the amount of available surface water supply from year to year. Similarly, there are expected to be variations in local groundwater conditions as a function of local hydrologic conditions which affect, among other things, the natural recharge to the groundwater basin from year to year. In the case of this basin, local (Southern California) hydrology which affects local groundwater conditions may not necessarily be the same as the hydrology in a distant (Northern California) location that directly affects the availability of supplemental, imported surface water in any given year. Thus, conjunctive use management is challenging, but is notably important to ensure that the groundwater basin is maintained to meet a regular component of water supply and to also be able to meet a larger component of water supply during "dry periods" that affect supplemental surface water availability. Conjunctive use management is similarly important to ensure that local groundwater can be replenished, via reduced pumping and/or as a result of wetter local hydrologic conditions, during periods of wet/normal surface water availability. In light of all the preceding, implementation of this Plan Element is essential to accomplishing all the management objectives (goals) for the basin.

**Primary Element 6 - Long Term Salinity Management**

In general, groundwater quality in the basin is such that groundwater supplies meet standards for beneficial use in the basin, most of which now is for municipal (domestic) use but some of which remains for agricultural and some other irrigation (non-domestic) use. There also have been no notable historical trends of groundwater quality degradation in the basin over time. However, a number of geologic and hydrologic factors suggest that observations and interpretation of groundwater quality warrant some focus to ensure long-term preservation of groundwater quality. Notable among those geologic and hydrologic factors are: 1) the largely "closed" geologic nature

Bottom of page:

Is appears the entire paragraph is false. There is no knowledge of such meetings occurring.

Newhall County Water District, Los Angeles County Waterworks District No. 36, Valencia Water Company, and its own Santa Clarita Water Division. As such, CLWA has a historical and ongoing working relationship with all those local agencies, as well as with other local groundwater pumpers, to manage water supplies in order to effectively meet water demands within the available yields of imported surface water and local groundwater. In fact, the Advisory Council convened to assist in the preparation of this Plan is comprised representatives of all the local water purveyors and significant groundwater pumpers.

A local MOU process among CLWA, other purveyors within CLWA's service area, and United Water Conservation District in neighboring Ventura County is a classic illustration of a local agency relationship that has produced the beginnings of local groundwater management, now embodied in this comprehensive plan, most notably in Primary Elements 1 through 5. In 2001, out of a willingness to seek opportunities to work together and develop programs that mutually benefit the region as well as their individual communities, those agencies prepared and executed a Memorandum of Understanding (the MOU) that initiated a collaborative and integrated approach to several of the aspects of water resource management that are now included in this Plan. United WCD manages surface water and groundwater resources in seven groundwater basins, all located in Ventura County, downstream of the East Subbasin of the Santa Clara River Valley that is the focus of this Plan. United is thus a logical partner in the cooperation of management efforts to accomplish the objectives (goals) for this basin, particularly as they relate to preservation of surface water resources that flow through the respective basins. As a result of that MOU, the cooperating agencies have integrated their database management efforts (part of Primary Elements 1 and 2 of this Plan), have initiated the development of a numerical groundwater flow model (for utilization in Primary Elements 3, 4 and 5 of this Plan), and are continuing to prepare reports on the status of basin conditions, as well as on geologic and hydrologic aspects of the overall stream-aquifer system.

A local extension of the interaction among CLWA, the retail water purveyors, and United is an ongoing working relationship with the City of Santa Clarita. CLWA and the municipal purveyors meet regularly with City staff and also present water supply conditions via study sessions with the City Council on a regular basis. It is expected that the implementation of this Plan will result in the availability of a broader range of information transfer with the City relative to the existing and future water supply to its residents. OH?

This Primary Element is included in this Plan to formalize the historical local and state agency

Middle:

Primary Element 10-Groundwater Management Reports
These secretly created reports contain erroneous numbers to overstate supply and understate demand. The creators meet secretly, allow no public participation or oversight and meet without authority or sanction from any public agency. The meetings are held secretly and without benefit of the Brown Act. Since these reports are created with no public oversight, do not appear to have credibility, and usually are not signed by anyone, they should not be included as part of an AB3030 groundwater management plan. It is time to form an official joint powers authority between the purveyors and other participating parties.

working relationships as part of comprehensively managing local groundwater, in concert with imported surface water and local recycled water, to accomplish all the management objectives (goals) for the basin.

**Primary Element 10 - Groundwater Management Reports**

As briefly described in the Introduction of this Plan, local groundwater management planning already includes, among several other activities, analysis of groundwater conditions and preparation of annual reports on groundwater and all other aspects of water resources and water supplies in the Santa Clara River Valley East ground water basin. In addition, recently formalized cooperative work with neighboring United Water Conservation District includes both regular reporting on the status of groundwater conditions and specific reporting on geologic and hydrologic aspects of the overall stream-aquifer system. For example, documentation of the numerical groundwater modeling work currently in progress is expected to be the first of the latter reports in the next year.

Beginning in 1998, CLWA and the retail water purveyors in the basin have prepared a series of annual reports, known locally as the Water Report, to describe all aspects of water supply and water resource conditions in the basin. That report provides current information to local City and County land use agencies, and to other interested parties, about current water requirements, use of groundwater and treated imported surface water to meet those water requirements, groundwater conditions (pumping, groundwater levels and quality, etc.), local surface water conditions, the status of imported surface water supplies including details of delivered SWP water in the reported year as well as an up-to-date summary of available imported SWP water for the next year, a short-term projection of water requirements in the next year, and other appropriate details about water requirements and supplies such as, for example, the status of introducing recycled water as a component of non-potable water supply.

In light of the frequency and comprehensive nature of the annual Water Reports, and also in light of the planned preparation of more detailed technical reports on various aspects of the basin as appropriate, the continued preparation of those reports will serve as regular and complete reporting on all aspects of this groundwater management plan.

(Not much truth on this page.) CLWA constantly preaches conservation but continually sells more and more water. CLWA should provide the public with an accounting of the water CLWA is conserving.

**Secondary Element 1 - Continuation of Public Education and Water Conservation Programs**

CLWA has provided water conservation and public education programs that will continue and expand as a complement to and an element of this groundwater management plan. The expansion of water conservation will largely stem from CLWA's having signed the "Memorandum of Understanding Regarding Water Conservation in California" (Urban MOU) in 2001, which made CLWA a wholesaler member of the California Urban Water Conservation Council. CLWA has thus committed to implementation of cost-effective water conservation measures known as Best Management Practices (BMPs) that are included in the Urban MOU and are intended to reduce California's long-term urban water demands. The BMPs have been incorporated into the water demand management measures section of the Urban Water Management Planning Act.

Water conservation and related public education measures have generally been developed in California to achieve the following goals:

- meet legal mandates
- reduce average annual potable water demands
- reduce sewer flows
- reduce water demands during peak seasons
- meet drought restrictions.

As a wholesaler of imported surface water CLWA has implemented the following BMPs for several years prior to signing the MOU:

- distribution system water audits, leak detection and repair
- public information
- school education
- wholesale agency assistance ?
- conservation pricing ?
- conservation coordinator. ?

Top:

(Not much truth here either.) Mostly deception. The UWMP doesn't exist for the reasons mentioned earlier. The UWMP must not be considered here.

As a signatory to the MOU, CLWA's water conservation and public education program will expand to include the following BMPs found to be locally cost-effective, as detailed in the 2000 Urban Water Management Plan for CLWA and the Santa Clarita Valley retail purveyors.

- water survey programs for single-family residential and multi-family residential programs
- residential plumbing retrofits
- metering with commodity rates for all new connections and retrofit of existing connections
- large landscape conservation programs and incentives
- high-efficiency washing machine rebate programs (when also provided by local energy providers or wastewater utilities)
- conservation programs for commercial, industrial, and institutional accounts
- wholesale agency programs to financially or otherwise support water conservation efforts by retailers (this measure will be expanded)
- residential ultra-low-flow toilet replacement program.

This Primary Element, while identical to independent CLWA efforts in water conservation and public education, is incorporated in this Plan to complement other Plan elements, and to move toward accomplishment of all management objectives (goals) for the groundwater basin.

**Secondary Element 2 - Identification and Management of Recharge Areas and Wellhead Protection Areas**

The 1986 Amendments to the federal Safe Drinking Water Act (SDWA) established a new Wellhead Protection Program (WPP) to protect groundwater that supplies drinking water wells for public water systems. Each state was required to prepare a WPP and submit it to the USEPA by June 19, 1989. However, California did not develop an active state-wide Wellhead Protection Program at that time. Subsequently, in 1996, reauthorization of the SDWA established a related program called the Source Water Assessment Program. In 1999, the California Department of Health Services (DHS) Division of Drinking Water and Environmental Management developed its Drinking Water Source Assessment Program (DWSAP), and EPA approved it. The overall objective of the DWSAP is to ensure that the quality of drinking water sources is protected.

As discussed in Section 1 of this Plan, the potential groundwater management plan component

EXHIBIT A

# Suppliers driven into the ground

## *Drought forces area to rely on well water*

2-27-91

By Kimberly Heinrichs
*Daily News Staff Writer*

SANTA CLARITA — The state is expected to stop water deliveries March 15 to the Santa Clarita Valley, forcing the area to rely on ground water as California's worst drought on record continues, officials said Tuesday.

The Castaic Lake Water Agency, which treats, stores and distributes state water to local purveyors, will close its plant after the last of the imported water arrives, agency General Manager Robert Sagehorn said.

Related story:
■ Conservation law gets OK.
Page 4

"For all substantial purposes we're shutting the plant down on March 15," he said, adding, "No one's going to go bone dry over this."

Local water suppliers still will pump water from the Santa Clarita Valley's extensive network of wells, he said.

The state Department of Water Resources told Sagehorn on Saturday that the expected cut of 50 percent of the agency's water supply has been increased to 90 percent as the drought continues its fifth year. The agency will have received 10 percent of this year's water allocation by the middle of March, Sagehorn said.

Of the four purveyors receiving state water from the Castaic Lake agency, only the Los Angeles County Waterworks District No. 36 — which serves Val Verde

See WATER / Pg. 2

# *Santa Clarita will turn to wells as state water supplies dry up*

2-27-91 D.N.

WATER / From Page 1

and Hasley Canyon — does not have a ground-water supply.

The county agency has drilled a well about 1,000 feet northwest of the intersection of Hasley Canyon and Del Valle roads that it had planned on using in about a year after building a 250,000-gallon storage tank, Assistant Deputy Director Gary Hartley said. However, with the new cutback, the county is hurriedly seeking permission from several property owners to run a temporary pipeline from that well to customers, Hartley said.

County officials hope to have the pipeline operating in about six weeks, he said. Meanwhile, the county is working on agreements with the three other purveyors in the valley — the public Newhall County Water District and the private Valencia Water Co. and Santa Clarita Water Co., Hartley said.

If the county cannot set aside enough well water from the other purveyors, there is a chance the state would send emergency supplies through the Castaic agency, he said.

While the city considers a law that would restrict wasteful practices in the hopes of achieving a 25 percent reduction in water use, Hartley said that county water officials are drafting a conservation proposal that would require different levels of participation in different areas. Because of the severity of the water cuts in the Val Verde and Hasley Canyon areas, he said he would expect a 20 percent to 30 percent mandatory cutback in water use.

Although the plant near Castaic Lake will be closed, the agency most likely will lay off just a temporary maintenance worker, Sagehorn said. The worker was hired when one of the two permanent maintenance workers was on medical leave and was kept on.

FOR PG. 17 + FIG. 5-4

EXHIBIT B



# Officials say state's water delivery system inadequate

By Laura Myers
*Associated Press*

MONTEREY, Calif. — The tap has run dry too often and for too many years in California because of an inadequate water delivery system, representatives of the three main groups vying for the precious commodity complained Thursday.

The 5-year-old drought that saw everybody suffer when supplies were drastically cut only magnified the problem this year, said representatives of the urban, agriculture and wildlife interests.

"The biggest problem we have is that the reliability of the water supply is grossly inadequate," said Tim Quinn, conservation director for the urban Metropolitan Water District of Southern California. "The way the system works now, you just can't count on a steady water supply because the water delivery system just doesn't work like it should."

Quinn's comments came at the annual spring conference of the California Association of Water Agencies, which attracted more than 2,000 of the state's top water officials.

Stephen Hall, representing agriculture, and Charles Hanson, representing wildlife and the environment, agreed with Quinn that the State Water Project and the federal Central Valley Water Project can't satisfy competing supply needs.

All three men presented dire pictures of what would happen if they weren't the first in line for water if the drought continues — the quality of urban life will decline, farms will go under, workers will be jobless and wildlife will dwindle, with some species becoming extinct.

But beyond the growing instant competition for scarce supplies, they said water officials must improve the delivery and storage system that essentially hasn't developed for decades.

"We shouldn't have to continue to fight one another for resources," said Hall, executive director of the California Farm Water Coalition.

The Sacramento-San Joaquin Delta, the cornerstone of the delivery system, is a bottleneck even in non-drought years, Quinn and Hall said.

Part of the problem, according to Hanson, who has an environmental consulting business, is the growing importance on protecting endangered and threatened species while making water transfers in the delta.

The winter-run chinook salmon already is listed by state and federal wildlife officials as threatened and the delta smelt also is expected to make the U.S. Fish and Wildlife Service list soon.

Certain water flow rates from the river must be met when those fish spawn, under wildlife protection rules, he said.

"We need to manage the allocations to provide adequate water throughout the year," Hanson said.

PG. 12

EXHIBIT C

# A boost for toxic cleanup in state

## Feds back state on perchlorate

By Heather MacDonald
*Staff Writer* 8-8-03 D.N.

SANTA CLARITA — The Department of Defense agreed Thursday to obey California's drinking water standards for perchlorate and not try to avoid paying for cleanup of the toxic rocket fuel byproduct.

The agreement, announced by U.S. Sen. Barbara Boxer and Pentagon officials during a visit to a contaminated site in Rialto, could help speed the cleanup of the defunct Bermite explosives factory in the center of Santa Clarita, and dozens of other polluted sites all over California, officials said.

"This is an important breakthrough," said Boxer, a California Democrat. "Defense Department activities have been a major source of perchlorate contamination in California. This kind of active cooperation will help us find and fix perchlorate problems throughout the state."

The agreement also appeared to put to rest concerns expressed by Santa Clarita leaders that legislation introduced by President George W. Bush would exempt some defense contractors from having to pay for environmental cleanups in the name of military readiness.

The Newhall County Water District Board of Directors was afraid the language of the bill could be used to let Whittaker Corp., which operated the site until 1987 and has recently begun studying the best ways to clean up the pollution, off the hook.

"The well-being of millions of Californians depends on this agreement," Boxer said.

More than 7 million Californians drink water with at least traces of perchlorate, which can damage the thyroid gland and be risky for pregnant women, whose fetuses can be affected, according to the U.S. Environmental Protection Agency.

A provisional standard set by the EPA recommends that drinking water have no more than 1 part per billion of perchlorate. The old standard considered water with 32 parts per billion of perchlorate safe.

Although the EPA is not expected to set a final standard

See WATER / Page 2

# Help on the way for toxic cleanups

8-8-03 D.N.

WATER / From Page 1

until at least 2008, Boxer has called for the agency to act next year because of the threat perchlorate poses to California residents.

Five wells in Santa Clarita have been shut down because of high levels of perchlorate, with tests showing as much as 40 parts per billion of the toxin in the water, officials said. The wells draw on the Saugus Aquifer, which serves as a backup water supply for the Santa Clarita Valley in times of drought.

State officials believe the pollution is coming from the Bermite property near the Santa Clarita Metrolink Station on Soledad Canyon Road. From World War II to the end of the Cold War, several companies manufactured and tested munitions and explosives for the U.S. military on the 996-acre site.

While the California Department of Health Services requires that wells with more than 4 parts per billion of perchlorate be shut down, the state Office of Environmental Health Hazard Assessment has found that water with as much as 6 parts per billion is safe to drink.

Heather MacDonald, (661) 257-5257
heather.macdonald@dailynews.com

FOR PG. 15

-----Original Message-----
**From:** Diane Trautman [mailto:dianetrautman@comcast.net]
**Sent:** Friday, August 08, 2003 2:41 PM
**To:** Dan Masnada
**Cc:** Marsha McLean; Vince Bertoni
**Subject:** Draft Groundwater Management Plan

TO: Dan Masnada

RE: Draft Groundwater Management Plan

Following are my questions and comments related to the Agency's Draft Groundwater Management Plan:

1. What percentage of the 106,000 afy (needed over the next 20 years) will be drawn from local groundwater sources? Does the Agency expect to maintain roughly the same 60% SWP/40% local groundwater mix in most years?

2. If the Saugus Formation absorbs recharge much more slowly than the Alluvial Aquifer, won't pumping of the Alluvial Aquifer at the high end of the scale over a sustained period of time reduce recharge of the Formation and reduce the amount of potable water that can be drawn from the Formation in dry periods?

3. Both this report (p. 15) and the 2002 Water Report (p. 19) state that the Agency does not have sufficient groundwater quality data on the Saugus Formation to perform an analysis of "pumping related inpacts on quality." On page 25 of this report under Primary Element 1, the Agency states that it has "a useful amount of groundwater quality data." Is the latter in reference only to the Alluvial and not the Saugus? And if the Agency does not have sufficient data on quality of water from the Saugus Formation, how does the agency propose to collect that data to ensure quality in order to maintain the current pumpage level and to increase the yield as proposed on page 21?

4. Looking back at the 2002 Water Report, the Agency indicates (on page 19) that "there are limited Saugus (Formation) water level data." Does the Agency plan to collect more comprehensive data on the Saugus Formation general groundwater stability to determine reliability of projected yields and "artificial groundwater recharge" (p. 27) capacity?

5. Regarding Secondary Element 2,the Agency states: "The results of the DWSAPs can be used as a planning tool to guide land use development in the vicinity of water sources." Is the Agency currently sharing more recent, detailed information with the City regarding contamination risks in relation to the existing closed wells?

6. Where is the SCWC Stadium Well located?

7. Why is "Continuation of Public Education and Water Conservation listed as a Secondary (Potential) Element" when increased conservation savings are projected to reduce water demand by 10%? Shouldn't conservation be one of the primary elements of water management?

8. How is the Agency delivering recycled water to the TPC? Is it being run through a parallel piping system? Is so, what is the estimated cost and time frame for constructing such a system to carry the estimated 17,000afy? And how does the Agency propose to pay for this system?

9. How is the recycled water in locations, such as the golf course, reprocessed to remove pesticides and fertilizers?

10. What is the current average per capita water usage in afy?

11. The Semitropic Water Bank/Transfer is not mentioned in discussion of the Supplemental (SWP) Surface Water on page 21. Is that because it is a relatively short-term water supply? Are any of the other water transfers – Kern Water Bank, Kern Delta Water, North Las Posas Water Bank – as listed on UWMP p. 2-16, of limited duration? And if the Semitropic Water Bank Transfer is short term, how can it be included in the 105,000-106,000 afy need projected for the next 20 years? What will take its place?

12. What specific efforts will be made to manage salinity?

Thank you for giving me an opportunity to respond.

Diane Trautman

**Responses to Trautman**

1. In terms of groundwater management planning, projected urban water demand (the 106,000 afy projected urban demand in 2020) does not represent total valley-wide demand; total projected demand is 113,100 afy, including both urban and agricultural. In that light, on an average basis, local ground water is expected to be utilized to meet about 40 percent of total water demand.

   In regards to maintaining "roughly the same 60% SWP/40% local groundwater mix in most years", please refer to page 20 of the draft GWMP for a more complete response to your question. For example, about 54 percent of water demand in 2001 was supplied by local groundwater, and about 46 percent was supplied by imported SWP water. Also please refer to Table II-5 in the 2002 Santa Clarita Valley Water Report, which displays the build up of SWP water use through time, and the relative percentages of groundwater and SWP water used in a given year. As noted above, it is expected that, over time, again on an average basis, the annual amount of local groundwater pumping will not appreciably change but its fraction of total water supply will decrease. Conversely, over time, and once again on an average basis, both the annual volume of imported SWP water and its fraction of total water supply will increase.

2. No. Since the Saugus Formation is recharged over a much larger area, beyond the spatial extent of the Alluvium. There is a limited relationship between Alluvial pumping and recharge to the Saugus Formation.

   The fundamental tenet of the GWMP is to utilize groundwater for water supply within its sustainable yield (see the Management Objectives, or Goals, for the Basin, GWMP Section II; see also the various GWMP Elements intended to achieve those objectives, GWMP Section V). In that light, it is expected and intended to operate in such a way that recharge to the Saugus Formation will not be "reduced" by pumping from the Alluvial Aquifer and that groundwater will be available in varying amounts, as needed depending on weather year-types, within the sustainable yields of the respective aquifers (i.e. without overdrafting them).

3. The reference to "useful amount of groundwater quality data" in the GWMP includes both Alluvial and Saugus data. However, due to the historically greater development and use of groundwater from the Alluvium (number and distribution of wells, volume of pumping), and due to the historically smaller development and use of the Saugus Formation (fewer wells, smaller geographical distribution of wells, smaller pumpage), there is a comparatively limited ability to examine relationships among pumping, recharge, and quality in the Saugus. CLWA and the other purveyors intend to expand the overall knowledge of the Saugus Formation as that resource is further explored and

developed (number of wells, additional sampling as new wells are added, etc.). All that data will be included in ongoing implementation of GWMP Primary Element 1, Monitoring of Groundwater Levels, Quality, and Production.

4. The "limited nature of Saugus water level data" is a result of the same smaller extent of historical Saugus development described in the preceding answer. Acquisition of additional data on the Saugus Formation is planned as also described in the preceding answer.

5. All publicly available information regarding the investigation of perchlorate contamination, its extent, its impact on water supply, and plans for cleanup, control of migration, etc. is available to the City. Representatives of CLWA and the purveyors meet routinely with City representatives to review the status of perchlorate cleanup and remediation activities. CLWA and the impacted water purveyors will continue to pursue control and cleanup of perchlorate contamination in order to restore impacted groundwater pumping capacity and to ensure the long-term quantity and quality of groundwater in accordance with the GWMP. As a practical matter, there are no surface contamination risks relating to perchlorate that would affect land use development adjacent to the wells.

6. The stadium well is located on the south side of the Santa Clara River, approximately two miles upstream (east) of its confluence with the South Fork tributary, or about 4,000 feet east of the Bouquet Canyon Road crossing of the Santa Clara River.

7. The assignment of "primary" or "secondary" status to any GWMP element is discretionary and certainly not absolute. Secondary status is not intended to indicate that any element of the GWMP will not be implemented; all elements are intended to be implemented. Final status of all GWMP elements will be reviewed by the Advisory Council and decided by the CLWA Board.

8. Recycled water is being delivered to the TPC via the dedicated, recycled water distribution system, which is also capable of delivering water to other non-potable water users, and which will be expanded in accordance with the Draft Recycled Water Master Plan. The costs and time frame for expanding recycled water distribution and use are included in the Draft Recycled Water Master Plan, which is complementary to, but beyond the scope of the Groundwater Management Plan. The intent is to develop the 17,000 AFY of use by 2020. The capital cost of the complete system is estimated to be $68 million, and will be funded through CLWA's connection fee program.

9. Recycled water is not "reprocessed" at points of use such as the TPC golf course. In general, recycled water is highly treated (tertiary treated) waste water. In the case of the Santa Clarita Valley, treatment already occurs at the Valencia Reclamation Plant operated by the Sanitation Districts of Los Angeles County. The treated water, ready for non-potable use, is distributed from the plant site in a dedicated transmission pipeline system to end users such as the TPC. Pesticide and fertilizer uses, as part of cultural practices at end-user locations such as golf courses, are discretionary actions of the respective end users of recycled water.

10. Most water agencies no longer use "per capita" water use as a standard because it is not an accurate representation of actual per person water use, mainly due to the effects of landscape and commercial/industrial water use. (It is also expressed in "gallons per day," rather than "acre-feet per year, since it refers to individual water usage.") In general for the South Coast hydrologic region of California, water use is approximately 200 gallons per person per day (DWR Bulletin 160-98). Per capita use for the Santa Clarita Valley is slightly higher than this due to landscape irrigation demands caused by local climatic conditions.

11. The SWP is referred to as "supplemental" water because that is the original purpose of the SWP: to serve as a supply that would "supplement" local supplies (whether groundwater or local surface water or both). The specific amounts referred to in the GWMP are from the contractual terms between CLWA and the California Department of Water Resources.

    The water banked in the Semitropic Water Storage Program during 2002 is a short-term, dry period supply. The program has a term of ten years (i.e., the water must be returned to CLWA for use in its service area within that time period). Thus it is not included as a supply for long-term needs. However, the other programs listed in the UWMP (most of which, by the way, are not water "transfers," but are instead groundwater banking programs) are long-term sources of supply. As of this writing, the Agency is in the process of designing and implementing a Long-Term Reliability Plan to begin bringing such long-term programs on line as a means to store water available in wet years, for use in later dry years. CEQA analysis, with its accompanying public comment opportunities, will be part of the long-term reliability program approval process.

12. Primary Element 6 – Long Term Salinity Management is included in the GWMP for the reasons presented in the text discussion of that element. The element recognizes the need to plan for salinity management but also recognizes that, to the present, there has been no extraordinary trend of salinity increase. Hence, there are no specific efforts currently in place to "manage" salinity. It is envisioned that specific efforts will be developed over

time in response to implementation of the GWMP and, in particular, its Primary Element 6.

CLWA is participating in efforts by the Sanitation Districts of Los Angeles County to address the Los Angeles Regional Water Quality Control Board's proposed TMDL standard for chloride in the Santa Clara River. This effort is separate from and beyond the scope of the Groundwater Management Plan.

# Additional Comments

Ed and Joan Dunn
15414 Rhododendron Dr.
Canyon Country, CA 91387
November 25, 2003

Castaic Lake Water Agency
President Peter Kavounas and Board of Directors
27234 Bouquet Canyon Road
Santa Clarita, CA 91350-2173

Re: Groundwater Management Plan (AB 3030) Nov. 2003 Draft

Dear President Kavounas and Directors:

We would like to comment on some statements of your new draft plan. On page 38 there is a bullet - Conservation pricing. Since we have never seen any conservation pricing locally, this should be explained or removed. We seriously question this being presently implemented.

On page 41, we ask why you are stating that only the eastern portion of the alluvium has experienced historical fluctuations in groundwater levels. How can there be constant groundwater levels in the western portion of the basin, when the western basin is supposed to receive its re-charge primarily from the eastern portion of the river? You imply that tributaries in the Bouquet Canyon area are the source of water in that area. We believe you are avoiding the real source of water to the area. That source appears to be the large amount of effluent from Sanitation District #26, and is maintaining the water level. Why is this not explained?

As usual, there is no explanation for a total extended interrupt of the state wholesale water system or the CLWA facilities!

We are disappointed that of the numerous comments of August 8, 2003 that we supplied, only a few were considered. We spent our time and efforts to supply comments and suggestions to make the water plan a good plan. So much for that!

Sincerely,

Ed and Joan Dunn

November 25, 2003

Mary Lou Cotton
Water Resources Manager
CLWA
via fax only

Subject: November 25, 2003 Groundwater Management Plan Protest Hearing

I will not be attending the protest hearing this evening, but I do have three comments on the materials you provided to me.

First, I commented previously on the proposed network of monitoring wells and the public availability of data. The monitoring wells in figures 5-1 and 5-2 appear to cover a wide range of the valley. However, the text on p. 27 states the network will be "mostly as illustrated in figures 5-1 and 5-2, but possibly expanded..." I hope the final network is extensive and covers all areas of the valley. Further expansion of the network would add valuable data points and should be encouraged.

I did not see any indication of whether the collected monitoring data would be publicly available. I have heard comments from others that some well data is not being released to the public, even upon request. I think that concerned citizens and groups should be allowed access to the monitoring database.

Second, I have one new comment on the wording on page 34, regarding perchlorate cleanup. The last paragraph states "the proposed pumping would be combined with approved wellhead treatment to render the treated water suitable for municipal supply." This may be a wording issue, but my understanding is that wellhead treatment is not always approved or allowed by the permitting agencies. This wording implies that wellhead treatment is already an approved scenario, while it may be determined that treatment followed by re-injection or non-potable usage makes more sense. I think it would be more accurate to not specify the final treatment scenario until the plume characterization is complete and the pilot studies are finished and accepted.

Finally, the plan is clearly an overview that will have to be expanded upon with supporting policies and target dates. Some commenters requested this information go in the groundwater plan. If the agency does not add implementation strategies and target dates to the plan, they should be prepared separately, updated annually, and made available to the public upon request.

I understand the time for commenting may have past, but if you are able to address these concerns in the final draft it would be appreciated.

Sincerely,

Maria Gutzeit
24463 Shadeland Dr
Newhall, CA 91321

# Appendix H

Historical Imported Supply Deliveries by Purveyor
*(Expanded Table 3-3 from Section 3)*

## APPENDIX H
## HISTORICAL IMPORTED SUPPLY DELIVERIES BY PURVEYOR (AF)
(Expanded Table 3-3 from Section 3 Water Resources)

**Santa Clarita Water Division**

| Year | SWP Deliveries to Service Area[a] | Withdrawals from Out-of-Service Area Storage[b] | Other Imported Deliveries to Service Area[c] | Total Imported Supplies to Service Area |
|---|---|---|---|---|
| 1980 | 1,210 | 0 | 0 | 1,210 |
| 1981 | 4,558 | 0 | 0 | 4,558 |
| 1982 | 6,358 | 0 | 0 | 6,358 |
| 1983 | 5,379 | 0 | 0 | 5,379 |
| 1984 | 6,905 | 0 | 0 | 6,905 |
| 1985 | 7,248 | 0 | 0 | 7,248 |
| 1986 | 8,469 | 0 | 0 | 8,469 |
| 1987 | 9,642 | 0 | 0 | 9,642 |
| 1988 | 11,353 | 0 | 0 | 11,353 |
| 1989 | 12,850 | 0 | 0 | 12,850 |
| 1990 | 12,784 | 0 | 0 | 12,784 |
| 1991 | 5,686 | 0 | 0 | 5,686 |
| 1992 | 6,313 | 0 | 0 | 6,313 |
| 1993 | 3,417 | 0 | 0 | 3,417 |
| 1994 | 5,127 | 0 | 0 | 5,127 |
| 1995 | 8,304 | 0 | 0 | 8,304 |
| 1996 | 9,174 | 625 | 0 | 9,798 |
| 1997 | 9,410 | 0 | 0 | 9,410 |
| 1998 | 8,681 | 0 | 0 | 8,681 |
| 1999 | 11,368 | 0 | 0 | 11,368 |
| 2000 | 13,119 | 1,093 | 0 | 14,212 |
| 2001 | 15,764 | 0 | 0 | 15,764 |
| 2002 | 19,062 | 179 | 0 | 19,241 |
| 2003 | 24,072 | 0 | 0 | 24,072 |
| 2004 | 22,165 | 0 | 0 | 22,165 |
| 2005 | 15,954 | 0 | 0 | 15,954 |
| 2006 | 16,714 | 0 | 0 | 16,714 |
| 2007 | 15,921 | 0 | 5,015 | 20,937 |
| 2008 | 14,216 | 0 | 4,905 | 19,121 |
| 2009 | 12,009 | 759 | 5,062 | 17,830 |

**Los Angeles County Waterworks District 36**

| Year | SWP Deliveries to Service Area[a] | Withdrawals from Out-of-Service Area Storage[b] | Other Imported Deliveries to Service Area[c] | Total Imported Supplies to Service Area |
|---|---|---|---|---|
| 1980 | 0 | 0 | 0 | 0 |
| 1981 | 0 | 0 | 0 | 0 |
| 1982 | 143 | 0 | 0 | 143 |
| 1983 | 214 | 0 | 0 | 214 |
| 1984 | 250 | 0 | 0 | 250 |
| 1985 | 285 | 0 | 0 | 285 |
| 1986 | 346 | 0 | 0 | 346 |
| 1987 | 358 | 0 | 0 | 358 |
| 1988 | 431 | 0 | 0 | 431 |
| 1989 | 459 | 0 | 0 | 459 |
| 1990 | 525 | 0 | 0 | 525 |
| 1991 | 402 | 0 | 0 | 402 |
| 1992 | 419 | 0 | 0 | 419 |
| 1993 | 463 | 0 | 0 | 463 |
| 1994 | 460 | 0 | 0 | 460 |
| 1995 | 498 | 0 | 0 | 498 |
| 1996 | 521 | 35 | 0 | 556 |
| 1997 | 730 | 0 | 0 | 730 |
| 1998 | 564 | 0 | 0 | 564 |
| 1999 | 690 | 0 | 0 | 690 |
| 2000 | 763 | 64 | 0 | 827 |
| 2001 | 914 | 0 | 0 | 914 |
| 2002 | 1,077 | 10 | 0 | 1,087 |
| 2003 | 1,369 | 0 | 0 | 1,369 |
| 2004 | 859 | 0 | 0 | 859 |
| 2005 | 828 | 0 | 0 | 828 |
| 2006 | 1,257 | 0 | 0 | 1,257 |
| 2007 | 1,083 | 0 | 341 | 1,424 |
| 2008 | 1,035 | 0 | 357 | 1,392 |
| 2009 | 842 | 53 | 355 | 1,250 |

**Newhall County Water District**

| Year | SWP Deliveries to Service Area[a] | Withdrawals from Out-of-Service Area Storage[b] | Other Imported Deliveries to Service Area[c] | Total Imported Supplies to Service Area |
|---|---|---|---|---|
| 1980 | 0 | 0 | 0 | 0 |
| 1981 | 0 | 0 | 0 | 0 |
| 1982 | 0 | 0 | 0 | 0 |
| 1983 | 0 | 0 | 0 | 0 |
| 1984 | 0 | 0 | 0 | 0 |
| 1985 | 0 | 0 | 0 | 0 |
| 1986 | 0 | 0 | 0 | 0 |
| 1987 | 22 | 0 | 0 | 22 |
| 1988 | 141 | 0 | 0 | 141 |
| 1989 | 430 | 0 | 0 | 430 |
| 1990 | 815 | 0 | 0 | 815 |
| 1991 | 623 | 0 | 0 | 623 |
| 1992 | 797 | 0 | 0 | 797 |
| 1993 | 1,071 | 0 | 0 | 1,071 |
| 1994 | 919 | 0 | 0 | 919 |
| 1995 | 1,362 | 0 | 0 | 1,362 |
| 1996 | 1,186 | 81 | 0 | 1,266 |
| 1997 | 1,231 | 0 | 0 | 1,231 |
| 1998 | 1,727 | 0 | 0 | 1,727 |
| 1999 | 5,329 | 0 | 0 | 5,329 |
| 2000 | 5,747 | 479 | 0 | 6,226 |
| 2001 | 5,493 | 0 | 0 | 5,493 |
| 2002 | 6,031 | 57 | 0 | 6,087 |
| 2003 | 7,654 | 0 | 0 | 7,654 |
| 2004 | 5,928 | 0 | 0 | 5,928 |
| 2005 | 5,731 | 0 | 0 | 5,731 |
| 2006 | 5,749 | 0 | 0 | 5,749 |
| 2007 | 4,990 | 0 | 1,572 | 6,562 |
| 2008 | 4,149 | 0 | 1,432 | 5,581 |
| 2009 | 3,271 | 207 | 1,379 | 4,857 |

**Valencia Water Company**

| Year | SWP Deliveries to Service Area[a] | Withdrawals from Out-of-Service Area Storage[b] | Other Imported Deliveries to Service Area[c] | Total Imported Supplies to Service Area |
|---|---|---|---|---|
| 1980 | 0 | 0 | 0 | 0 |
| 1981 | 1,203 | 0 | 0 | 1,203 |
| 1982 | 3,015 | 0 | 0 | 3,015 |
| 1983 | 3,883 | 0 | 0 | 3,883 |
| 1984 | 4,321 | 0 | 0 | 4,321 |
| 1985 | 4,868 | 0 | 0 | 4,868 |
| 1986 | 5,113 | 0 | 0 | 5,113 |
| 1987 | 6,145 | 0 | 0 | 6,145 |
| 1988 | 6,979 | 0 | 0 | 6,979 |
| 1989 | 7,980 | 0 | 0 | 7,980 |
| 1990 | 8,014 | 0 | 0 | 8,014 |
| 1991 | 646 | 0 | 0 | 646 |
| 1992 | 6,301 | 0 | 0 | 6,301 |
| 1993 | 8,394 | 0 | 0 | 8,394 |
| 1994 | 8,097 | 0 | 0 | 8,097 |
| 1995 | 7,577 | 0 | 0 | 7,577 |
| 1996 | 6,805 | 463 | 0 | 7,269 |
| 1997 | 9,223 | 0 | 0 | 9,223 |
| 1998 | 8,799 | 0 | 0 | 8,799 |
| 1999 | 11,404 | 0 | 0 | 11,404 |
| 2000 | 11,452 | 954 | 0 | 12,406 |
| 2001 | 13,461 | 0 | 0 | 13,461 |
| 2002 | 15,910 | 149 | 0 | 16,059 |
| 2003 | 18,640 | 0 | 0 | 18,640 |
| 2004 | 18,511 | 0 | 0 | 18,511 |
| 2005 | 14,233 | 0 | 0 | 14,233 |
| 2006 | 15,902 | 0 | 0 | 15,902 |
| 2007 | 12,925 | 0 | 4,071 | 16,996 |
| 2008 | 12,478 | 0 | 4,306 | 16,784 |
| 2009 | 9,974 | 631 | 4,204 | 14,809 |

## Los Angeles County Honor Farm

| Year | SWP Deliveries to Service Area[(a)] | Withdrawals from Out-of-Service Area Storage[(b)] | Other Imported Deliveries to Service Area[(c)] | Total Imported Supplies to Service Area |
|---|---|---|---|---|
| 1980 | 0 | 0 | 0 | 0 |
| 1981 | 0 | 0 | 0 | 0 |
| 1982 | 0 | 0 | 0 | 0 |
| 1983 | 0 | 0 | 0 | 0 |
| 1984 | 0 | 0 | 0 | 0 |
| 1985 | 0 | 0 | 0 | 0 |
| 1986 | 0 | 0 | 0 | 0 |
| 1987 | 0 | 0 | 0 | 0 |
| 1988 | 0 | 0 | 0 | 0 |
| 1989 | 0 | 0 | 0 | 0 |
| 1990 | 0 | 0 | 0 | 0 |
| 1991 | 0 | 0 | 0 | 0 |
| 1992 | 981 | 0 | 0 | 981 |
| 1993 | 441 | 0 | 0 | 441 |
| 1994 | 316 | 0 | 0 | 316 |
| 1995 | 6 | 0 | 0 | 6 |
| 1996 | 762 | 52 | 0 | 814 |
| 1997 | 992 | 0 | 0 | 992 |
| 1998 | 12 | 0 | 0 | 12 |
| 1999 | 21 | 0 | 0 | 21 |
| 2000 | 3 | 0 | 0 | 3 |
| 2001 | 0 | 0 | 0 | 0 |
| 2002 | 0 | 0 | 0 | 0 |
| 2003 | 0 | 0 | 0 | 0 |
| 2004 | 0 | 0 | 0 | 0 |
| 2005 | 0 | 0 | 0 | 0 |
| 2006 | 0 | 0 | 0 | 0 |
| 2007 | 0 | 0 | 0 | 0 |
| 2008 | 0 | 0 | 0 | 0 |
| 2009 | 0 | 1,650 | 0 | 38,746 |

Source: DWR Bulletin 132, Management of the California State Water Project; and DWR delivery files.

Notes:

(a) Includes deliveries of Table A supplies, carryover water, Article 21 water, Turnback Pool water, local supply (from West Branch reservoirs) and water purchased through DWR.

(b) Out-of-service area storage includes flexible storage in Castaic Lake, the Semitropic Banking Program and the Rosedale-Rio Bravo Banking Program.

(c) Deliveries from Buena Vista-Rosedale.

# Appendix I

Perchlorate Contamination and Impact on Groundwater Supplies in the Santa Clarita Valley

# Appendix I

## *Perchlorate Contamination and Impact on Groundwater Supplies in the Santa Clarita Valley*

### Introduction

The detection of perchlorate in Santa Clarita Valley groundwater supplies has raised concerns over the reliability of those supplies, in particular the Saugus Formation where six wells have been impacted as a result of perchlorate. As discussed below, planning and implementation of remediation of the perchlorate, and restoration of impacted well capacity, have been substantially undertaken. While that work continues, non-impacted production facilities can be relied upon for the quantities of water projected to be available from the Alluvial Aquifer and Saugus Formation during the time necessary to fully restore perchlorate-impacted wells. CLWA, the local retail water purveyors, the California Department of Toxic Substances Control (DTSC) and the U.S. Army Corps of Engineers (ACOE) continue to work closely on the perchlorate contamination issue, which reasonably ensures a prompt response to any significant changes in conditions.

The following is a discussion of pertinent events related to perchlorate contamination. It illustrates that work toward the ultimate remediation of the perchlorate contamination, including the reactivation of impacted groundwater supply wells, has progressed on several integrated fronts over the last ten years. The following discussion is organized into several sections that focus on various aspects of the offsite impacts of perchlorate on water supply wells and the ongoing activities to remediate that problem and restore the impacted well capacity.

### On-Site Investigations and Clean-up

On-site investigation and clean-up have continued at the former Whittaker-Bermite facility. The on-site investigation and clean-up activities at the source of the contamination are under the regulatory authority and control of DTSC.

### Background

The Whittaker-Bermite site is located in the center of the Santa Clarita Valley and was operated as an explosives and munitions manufacturing, testing and storage facility since the late 1930's. It was first owned by the Los Angeles Powder Company and later by Golden State Fireworks, the Halifax Explosives Company, the Bermite Powder Company and the Whittaker Corporation (Whittaker), which assumed ownership of the site in 1967. Under contracts with the U.S. Department of Defense, Whittaker Corporation used perchlorate in the manufacture of solid propellants for rockets and missiles until operations ceased in 1987. There was a long history of perchlorate use and other chemical use at the site, and surface and subsurface investigations at the site revealed the presence of perchlorate and other contaminants in soil and groundwater.

The contaminants found in the soil that require clean-up are perchlorate and volatile organic compounds (VOCs). These chemicals were used in the manufacturing and testing of fireworks, dynamite, oil-field explosives, and munitions. The site encompasses 996 acres, with actual production facilities occupying approximately 50 acres. The property is characterized by chaparral covering the undisturbed portions of the site, fire breaks, dirt roads and remnants of facility foundations and buildings. The surrounding areas include commercial, light industrial and residential land uses. The facility was closed in 1987 and most of the structures on the property were removed at or about that time.

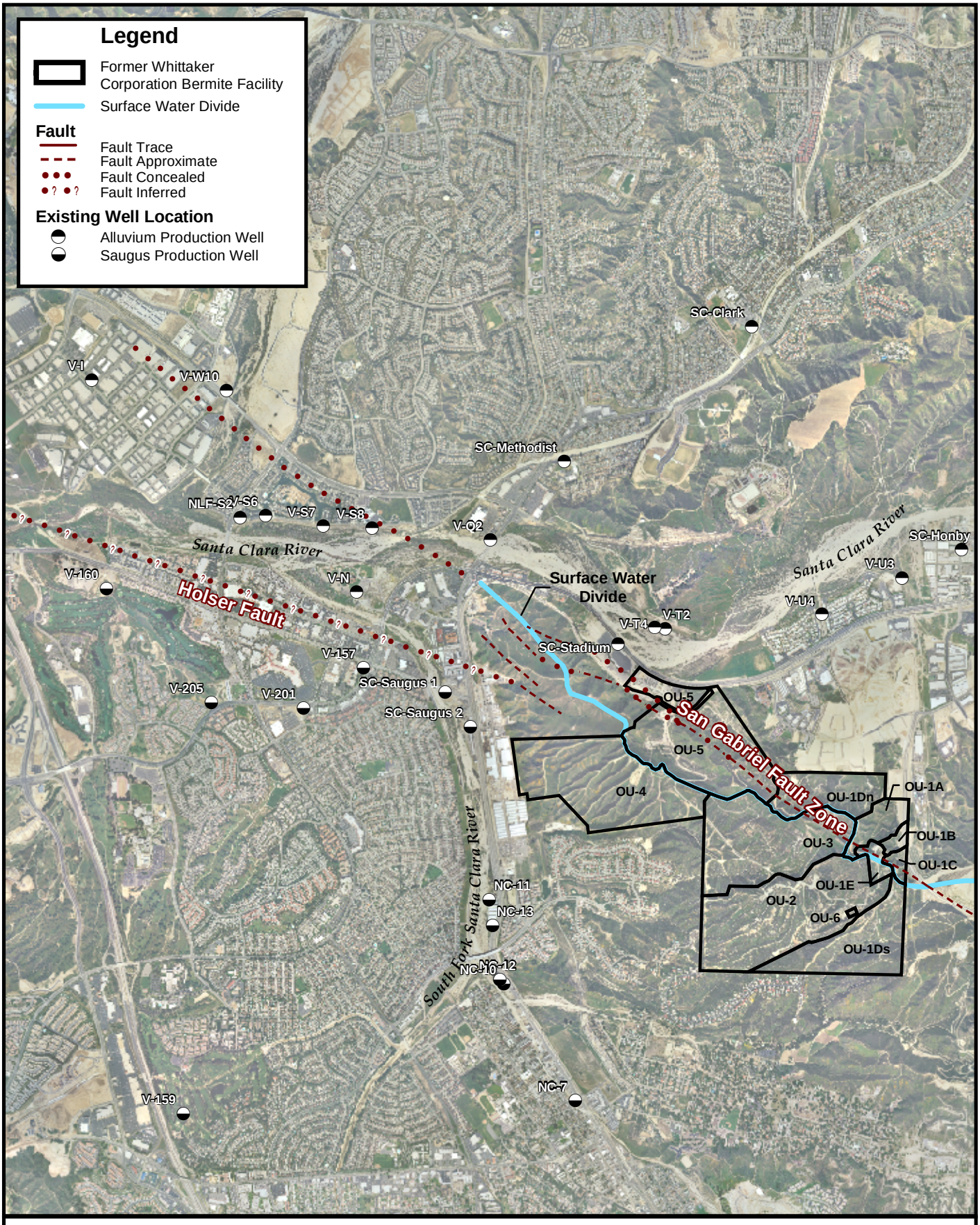
Between 1987 and 1998, Whittaker conducted environmental investigations and clean-up activities under the supervision of DTSC and its predecessor agency. In 1994, Whittaker entered into an enforceable agreement with DTSC to conduct a comprehensive site-wide investigation of areas of concern. In early 1997, with the remedial investigations under way, DTSC informed Whittaker that the soils, groundwater and surface runoff would have to be reassessed for the presence of perchlorate

In 1998, Whittaker sold the property to Santa Clarita LLC, a brownfield development company. In addition to assuming all clean-up responsibilities, Santa Clarita LLC acquired the right to develop the property contingent upon the full clean-up and certification of the property's reuse by DTSC. Between 1999 and 2001, Santa Clarita LLC expanded the site investigation and clean-up programs that had been initiated by Whittaker under the 1994 agreement. In 2002, however, with Santa Clarita LLC unable to fund additional site work due to financial difficulties, DTSC initiated negotiations with Whittaker to resume site investigation and clean-up work. In November 2002, DTSC issued an Order that required Whittaker to complete the site investigations and feasibility studies for all contaminants of concern under a tight time schedule.

## Perchlorate Impacted Water Purveyor Wells

Perchlorate was initially detected in four Saugus Formation production wells operating near the former Whittaker-Bermite site in 1997. These wells – CLWA Santa Clarita Water Division's (SCWD) Wells Saugus 1 and Saugus 2, Newhall County Water District's (NCWD) Well NC-11 and Valencia Water Company's (VWC) Well V-157 – were removed from service. In 2002, perchlorate was detected in the SCWD Stadium well located directly adjacent to the Whittaker-Bermite site. This Alluvial well was also removed from service and subsequently capped in 2009. It was replaced with a new well, the SCWD Santa Clara well, also in 2009. Locations of the impacted wells and other nearby non-impacted wells, relative to the Whittaker-Bermite site are shown on Figure I-1. The restoration and/or replacement of these wells to service is discussed below.

Since the initial detection of perchlorate and resultant inactivation of impacted wells, the retail water purveyors have continued to conduct regular monitoring of active wells near the Whittaker-Bermite site. In late March 2005, that monitoring detected the presence of perchlorate in VWC's Well Q2, an Alluvial well located immediately northwest of the confluence of Bouquet Creek and the Santa Clara River.




CH2MHILL

0 3,500 7,000 Feet

Figure I-1
Site Location
Former Whittaker-Bermite Facility

SCO \\GALT\GIS2\SNTA_CLRTA\PLOTS\FIGURE_121404\FIGURE_2-16.MXD 12/14/2004

As a result of the detection and confirmation of perchlorate in its Well Q2, VWC removed the well from active service and immediately pursued permitting and installation of wellhead treatment. The well was returned to water supply service in October 2005.

In 2006, Saugus well NCWD Well NC-13 had detectable concentrations of perchlorate below drinking water standards; it has remained in active water supply service.

Most recently, in August 2010, VWC's water sample tests, taken from August 2010 through April 2011, confirmed the presence of perchlorate above the regulatory standard at VWC's Saugus Well 201, located downgradient from the Whittaker Bermite site and downgradient from the initially impacted Saugus 1 and 2 and V-157 wells. VWC immediately took the well out of service and notified the California Department of Public Health (DPH). VWC continues to monitor the inactive well on a monthly basis. The most recent sample confirmed that perchlorate is still present and that remediation is needed as outlined by the 2007 Whittaker-Bermite Litigation Settlement Agreement (Settlement Agreement; discussed below in the section entitled "Water Supplier Litigation and Settlement Agreements").

VWC is currently evaluating remediation alternatives and intends to pursue restoration of the well's capacity through such means as wellhead treatment as provided for in the Settlement Agreement. This and several other wells were identified as being potentially threatened by perchlorate in the Settlement Agreement. Therefore, provisions were made in the Settlement Agreement to provide for treatment for any additional wells that may be impacted by perchlorate.

Analysis of the planned program for restoration of originally impacted wells using the basin groundwater model estimated that perchlorate-contaminated groundwater would be contained and captured by pumping Saugus 1 and 2. Ultimately, however, the combination of litigation, settlement, permitting and construction constrained actual implementation of the containment program until 2010, six years after the impact of the containment program on perchlorate migration in groundwater was analyzed. That time, combined with the preceding seven years since perchlorate first impacted water supply wells, resulted in a greater risk of downgradient migration of perchlorate in the Saugus Formation, and is interpreted to be the primary reason for the recent detection of perchlorate in VWC Well 201. However, as mentioned above, that possibility was addressed in the Settlement Agreement as it includes provisions for providing treatment to wells that are impacted by perchlorate not contained or captured by the original containment program.

## Regulatory Standards for Perchlorate

Perchlorate is a chemical salt and is very soluble in water. It is also very mobile in water and is persistent (i.e., does not degrade) under typical environmental conditions. The maximum contaminant level (MCL) for perchlorate of 6 micrograms per liter (ug/L) was established by DPH in October 2007. MCLs are based on health protection, technical treatment feasibility, analytical detection limits and costs.

## Water Supplier Litigation and Settlement Agreements

On November 29, 2000, CLWA and the local retail water purveyors filed suit against the current and prior owners of the Whittaker-Bermite facility. The lawsuit included causes of action relating to payment of all necessary costs of response, removal of the perchlorate contamination, payment of remediation action costs and compensation for other damages associated with the perchlorate contamination. CLWA and the local retail water purveyors had incurred substantial response costs and other expenses as a result of production lost on account of the contamination

In late summer 2003, CLWA, the local retail water purveyors, Whittaker and Remediation Financial, Inc. (RFI) and Santa Clarita LLC (SCLLC) entered into an interim settlement agreement, in which the parties agreed to work cooperatively for a minimum of one year to further define long-term costs and possibly achieve a long-term settlement. The interim settlement agreement specified that Whittaker, RFI and SCLLC and/or their insurers would reimburse certain past costs as well as fund studies and prepare cost estimates for the clean-up plan to restore water production and capacity of the impacted wells and protect other wells from future contamination. The interim settlement provided for a one-year stay of the lawsuit between the parties and was subsequently amended to extend the stay through January 31, 2005. This allowed the parties to focus on the final elements of the clean-up plan, which was submitted to the regulatory agencies in early 2005 and approved in 2007.

In May 2007, a comprehensive settlement was executed by CLWA, the retail purveyors and Whittaker, RFI and SCLLC (Settlement Agreement). The water suppliers were reimbursed certain costs incurred as a result of the perchlorate contamination and funds were deposited in escrow to pay for the costs of restoration of wells and construction of treatment facilities and related pipelines. The Settlement Agreement also provides funds to pay for operation and maintenance costs for the treatment system for up to 30 years, which the agencies estimate to cost as much as $50,000,000.

Approximately $31,000,000 has been reimbursed to the agencies for past expenditures pursuant to the Perchlorate Contamination Settlement. Another $5,000,000 to $10,000,000 will be used to construct wells and pipelines to supply water that will replace capacity lost from impacted wells. An additional $10,000,000 is available to allow the water suppliers to immediately treat any additional wells that could become impacted by perchlorate in the future (i.e., the “Rapid Response Fund”).

## DTSC/CLWA/Purveyor Environmental Oversight Agreement

In February 2003, DTSC and CLWA, NCWD, SCWD, and VWC entered into an Environmental Oversight Agreement (Agreement) whereby DTSC provides review and oversight of the response activities being undertaken by CLWA and the local retail water purveyors relating to the detection of perchlorate in the initially impacted wells.

The significance of the Agreement lies in the response actions to be undertaken in its “Scope of Work” (Exhibit B to the Agreement). Under the Scope of Work, CLWA and the retail water purveyors prepared (1) Well Characterization Reports, (2) a Health-Based Risk Assessment,

(3) a Regional Groundwater Flow Model and (4) a Treatment Technology Evaluation Report. The regional groundwater flow model and the treatment technology evaluation were key inputs to the permitting for restoring the impacted wells by returning them to water supply service as described below. Both were completed and utilized in conjunction to control contamination migration and restore impacted water supply well capacity. Most important, under the Scope of Work, CLWA and the retail water purveyors prepared and implemented a Remedial Action Plan (RAP) that is being used in connection with water treatment programs and/or well relocation. The RAP remains important to the retail water purveyors, who have been working cooperatively with DTSC to implement the groundwater clean-up.

## Treatment Technology

A number of full scale perchlorate treatment systems were evaluated by a technical group to ensure the most efficient and cost-effective process to remove perchlorate was selected. The technical group was comprised of representatives from CLWA, the retail water purveyors and consultants retained by Whittaker-Bermite. It initially agreed to solicit competitive bids for the design, construction and operation of two treatment systems – ion exchange and biological.

After thorough evaluation of several bids, the technical group determined that ion exchange was the preferred technology based upon treatment performance, ease of regulatory compliance and comparison of costs associated with construction and operations and maintenance.

The preferred single-pass ion exchange treatment technology does not generate a concentrated perchlorate waste stream that would require additional treatment before discharge to a sanitary sewer or a brine line (if one is available). This technology incorporates an active resin (a material that attracts perchlorate molecules) that safely removes the perchlorate from water. The resin is contained in pressure vessels and the water is pumped through the vessel. The resin is eventually replaced with new resin after a period of time. The old resin is removed and transported by truck to an approved waste disposal site where it is safely destroyed. This technology is robust and reliable for use in drinking water systems.

DPH has approved operation of the perchlorate treatment plants currently in operation at the following locations:

- La Puente Valley Water District (2,500 gpm)
- San Gabriel Valley Water Company, El Monte (7,800 gpm)
- California Domestic Water Company, Whittier (5,000 gpm)
- City of Riverside (2,000 gpm)
- West San Bernardino Water District, Rialto (2,000 gpm)
- City of Rialto (2,000 gpm)
- City of Colton (3,500 gpm)
- Fontana Union WC (5,000 gpm)
- City of Pomona (10,000 gpm)
- Valencia Water Company (1,700 gpm)
- CLWA Santa Clarita Water Division (2,400 gpm)

Based on (1) the results of CLWA's investigation of perchlorate removal technologies, (2) the technical group's evaluation and (3) DPH's approval of single-pass ion exchange for treatment in other settings, CLWA and the local retail water purveyors selected and installed single-pass ion exchange as the treatment technology for restoration of impacted capacity (wells). The perchlorate treatment facility includes an ion exchange process located at the Rio Vista Intake Pump Station. The same single-pass ion exchange wellhead treatment is being considered for installation at the recently impacted VWC Well 201 to restore that impacted Saugus well capacity. This same treatment also was successfully implemented at VWC Well Q2 in 2007.

## Restoration of Perchlorate Impacted Water Supply

Since the detection of perchlorate in the four Saugus wells in 1997, CLWA and the retail water purveyors recognized that one element of an overall remediation program would include pumping from impacted wells, or from other wells in the immediate area, to establish hydraulic conditions that would control the migration of contamination from further impacting the aquifer in a downgradient (westerly) direction. Thus, CLWA and the retail water purveyors expected that the overall perchlorate remediation program could include dedicated pumping from some or all of the impacted wells, with appropriate treatment, such that two desirable objectives could both be achieved. The first objective is control of subsurface flow and protection of downgradient wells and the second is restoration of some or all of the contaminated water supply. Not all of the initially impacted pumping capacity is required for control of groundwater flow. Some of the remaining capacity has been replaced by construction of replacement wells at other nonimpacted locations; and some capacity remains to be replaced by future new wells.

In cooperation with state regulatory agencies and investigators working for Whittaker-Bermite, CLWA and the local retail water purveyors developed an off-site plan that focuses on the above concepts of groundwater flow control and restored pumping capacity and is compatible with onsite and possibly other off-site remediation activities. Specifically relating to water supply, the plan includes the following:

- Constructing and operating a water treatment process that removes perchlorate from two impacted wells such that the produced water can be used for municipal supply
- Hydraulically containing the perchlorate contamination moving from the Whittaker-Bermite site toward the impacted wells by pumping the wells at rates that will capture water from all directions around them
- Protecting the downgradient non-impacted wells through the same hydraulic containment that results from pumping two of the impacted wells
- Restoring the annual volumes of water that were pumped from the impacted wells before they were inactivated, and also restoring the wells' total capacity to produce water in a manner consistent with the retail water purveyor's operational plan for groundwater supply.

An extended test of the wells that were eventually returned to service was performed as part of restoring a portion of the impacted well capacity and controlling the migration of perchlorate in the aquifer. Concurrent with the testing of the wells, several specific ion exchange resins were also tested to evaluate their performance and longevity.

The Final Interim Remedial Action Plan for containment and extraction of perchlorate was completed and approved by DTSC in January 2006. Construction of the perchlorate treatment facility and related distribution system, the main components of the "pump and treat program," began in November 2007 and was completed in May 2010. In combination with start-up of the treatment system, the SCWD Saugus 1 and 2 wells (two of the four wells that were taken out of service in 1997) were returned to service in January 2011 after DPH issued an amendment to CLWA's Operating Permit in December 2010 (see discussion of "Compliance with DPH Policy Memo 97-005" below). After consideration of groundwater modeling results and engineering analysis, the parties to the Settlement Agreement agreed to operate the Saugus 1 and 2 wells at 1,100 gallons per minute (gpm) each (2,200 gpm total) in order to optimize both the contaminant plume containment and well production.

Additionally, VWC well 157 that was taken out of service in 1997 was replaced by Well 206 in 2005.

In light of the preceding, with regard to the adequacy of groundwater as the local component of water supply in this UWMP, the impacted capacity of the previously out of service wells (not including VWC Well 201) is being restored by a combination of treatment (i.e., Saugus 1 and 2) and new wells in non-impacted areas (all funded by the Settlement Agreement), providing well capacity that is sufficient to meet near-term normal and dry-year water requirements. Achievement of the full range of normal and multiple dry-year groundwater supply as provided in the groundwater operating plan will require additional new well construction, as well as restoration of the recently impacted VWC Well 201.

## Compliance with DPH Policy Memo 97-005

Returning contaminated wells to municipal water supply service by installing treatment requires issuance of permit from DPH before the water can be considered potable and safe for delivery to customers. The permit requirements are contained in DPH Policy Memo 97-005 for direct domestic use of impaired water sources. Before issuing a permit to a water utility for use of an impaired source as part of the utility's overall water supply permit, DPH requires that studies and engineering work be performed to demonstrate that pumping the wells and treating the water will be protective of public health for users of the water. The Policy Memo requires that DPH review the local retail water purveyor's plan, establish appropriate permit conditions for the wells and treatment system and provide overall approval of returning the impacted wells to service for potable use. Ultimately, CLWA and the local retail water purveyors' plan and the DPH requirements are intended to ensure that the water introduced to the potable water distribution system has no detectable concentration of perchlorate.

The DPH 97-005 Policy Memo requires, among other things, the completion of a source water assessment for the impacted wells intended to be returned to service. The purpose of the assessment is to determine the extent to which the aquifer is vulnerable to continued migration of perchlorate and other contaminants of interest from the Whittaker-Bermite site. The assessment includes the following:

- Delineation of the groundwater capture zone caused by operating the impacted wells

- Identification of contaminants found in the groundwater at or near the impacted wells
- Identification of chemicals or contaminants used or generated at the Whittaker-Bermite facility
- Determination of the vulnerability of pumping the impacted wells to these contaminant sources

CLWA worked directly with the retail water purveyors and its consultants on the development of the DPH 97-005 Policy Memo permit application. Drafts of all six elements of the 97-005 Policy Memo were submitted to DPH and the retail purveyors for review, including the Source Water Assessment, Raw Water Quality Characterization, Source Protection Plan, Effective Monitoring and Treatment Evaluation, Human Health Risk Assessment and the Alternatives Sources Evaluation. The Engineer's Report, which summarizes these six elements for the 97-005 process, was completed in 2005.

As noted above, CLWA and the local retail water purveyors recognized the need for some form of pumping in or near the impacted wells to extract contamination and protect downgradient non-impacted wells. As part of the permitting for use of impacted wells with treatment, DPH 97-005 Policy Memo requires an analysis to demonstrate contaminant capture and protection of other nearby water supply wells. The development and calibration of a numerical groundwater flow model of the entire basin was initiated as a result of a 2001 Memorandum of Understanding among the Upper Basin Water Purveyors (CLWA, CLWA SCWD, LACWWD #36, NCWD and VWC) and the United Water Conservation District in Ventura County.

The basin-wide groundwater model was initially intended for use in analyzing the yield and sustainability of groundwater in the Basin. That model, and the current updated model, was used to develop the sustainable groundwater pumping rates reflected in Section 3 of this UWMP. The model was also used to analyze both the sustainability of groundwater under an operational scenario that includes full restoration of perchlorate-contaminated supply and the containment of perchlorate near the Whittaker-Bermite property (i.e., by pumping some of the contaminated wells), including preventing movement of perchlorate contamination to other portions of the aquifer system. DTSC reviewed and approved the construction and calibration of the regional model as described in the final model report "Regional Groundwater Flow Model for the Santa Clarita Valley, Model Development and Calibration" (CH2M Hill, April 2004).

After DTSC's approval of the model, it was used to simulate the capture and control of perchlorate by restoring impacted wells, with treatment, as described above. The results of that work were summarized in a second report "Analysis of Perchlorate Containment in Groundwater Near the Whittaker-Bermite Property, Santa Clarita, California" (CH2M Hill, December 2004).

The modeling analysis indicated that the pumping of impacted wells Saugus 1 and Saugus 2 at a rate of 1,200 gpm each on a nearly continual basis would effectively contain perchlorate migrating westward in the Saugus Formation from the Whittaker-Bermite property (as previously noted, subsequent technical analysis resulted in the selection of a pumping rate of 1,100 gpm for each well). The analysis also indicates that (1) no new production wells are needed in the Saugus Formation to meet the perchlorate containment objective, (2) impacted well NCWD-11 is not a required component of the containment program and (3) pumping at Saugus 1 and 2 is

necessary to prevent continued migration of perchlorate to other portions of the Saugus Formation. The modeling report also includes the general design of a sentinel groundwater monitoring network and program required by DPH as part of its 97-005 Policy Memo permitting. The perchlorate containment report was approved by DTSC in November 2004. With that approval, the model was then used to support the source water assessment and the remainder of the permitting process required by DPH under its 97-005 Policy Memo.

## Conclusions Regarding VWC Well 201

As noted above and in Section 3, perchlorate was detected in VWC Well 201 in the August 2010. This well was taken out of service and its capacity is not included in active groundwater sources delineated in Table 3-9 of this UWMP. VWC plans to actively seek remediation under the settlement agreement and rapidly restore the impacted well capacity. Given its experience of (1) bringing its Q2 well back into production, (2) actions under the DPH 97-005 Policy Memo, (3) participating in bringing treatment facilities on line for the Saugus 1 and Saugus 2 wells and (4) replacing capacity for its Well 157, VWC has determined that it could either install wellhead treatment to bring the well back into service or replace the capacity with a new well within two years.

**Valencia Water Company, Well E-15 Water Quality Compliance Monitoring Results – 2006 to 2009**

| E15 - GMIO | 2006 | 2007 | 2008 | 2009 | Units |
|---|---|---|---|---|---|
| TH (as CaCO3) | 497 | 468 | 418 | 434 | mg/L |
| Ca | 125 | 119 | 105 | 109 | mg/L |
| Mg | 45 | 41.3 | 38.1 | 39.2 | mg/L |
| Na | 104 | 103 | 88.3 | 99.4 | mg/L |
| K | 4 | 3.8 | 3.9 | 4.3 | mg/L |
| Tot Alk | 222 | 237 | 229 | 224 | mg/L |
| HCO3 | 271 | 289 | 279 | 273 | mg/L |
| SO4 | 315 | 311 | 286 | 271 | mg/L |
| Cl | 87.5 | 90.1 | 96 | 95 | mg/L |
| NO3 | 15.8 | 21.2 | 13.3 | 12.8 | mg/L |
| F | 0.59 | 0.83 | 0.8 | 0.79 | mg/L |
| pH | 7.43 | 7.2 | 7.3 | 7.35 | Unit |
| EC | 1293 | 1314 | 1308 | 1303 | mg/L |
| TDS | 1066 | 950 | 921 | 815 | mg/L |
| Color | <5 | <5 | <5 | <5 | Unit |
| Odor | 1 | 1 | 1 | 1 | Unit |
| Turbidity | 0.1 | 0.06 | 0.06 | 0.05 | NTU |
| Al | <DLR | <DLR | <DLR | <DLR | mg/L |
| An | <DLR | <DLR | <DLR | <DLR | mg/L |
| Ar | <DLR | <DLR | <DLR | <DLR | mg/L |
| Ba | <DLR | <DLR | <DLR | <DLR | mg/L |
| Br | <DLR | <DLR | <DLR | <DLR | mg/L |
| Cd | <DLR | <DLR | <DLR | <DLR | mg/L |
| Cr | <DLR | <DLR | <DLR | <DLR | mg/L |
| Fe | <DLR | <DLR | <DLR | <DLR | mg/L |
| Mn | <DLR | <DLR | <DLR | <DLR | mg/L |
| Ni | <DLR | <DLR | <DLR | <DLR | mg/L |
| Se | <DLR | <DLR | <DLR | <DLR | mg/L |
| Ag | <DLR | <DLR | <DLR | <DLR | mg/L |
| Th | <DLR | <DLR | <DLR | <DLR | mg/L |
| Zn | <DLR | <DLR | <DLR | <DLR | mg/L |
| LI | 1.6 | 1.34 | 1.38 | 1.44 | mg/L |
| Perchlorate | NA | <DLR | <DLR | <DLR | ug/L |

| E15 - VOC | 2006 | 2007 | 2008 | 2009 | Units |
|---|---|---|---|---|---|
| Benzene | <DLR | <DLR | <DLR | <DLR | ug/L |
| Carbon Tetrachloride | <DLR | <DLR | <DLR | <DLR | ug/L |
| 1,2-Dichlorobenzene (o-DCB) | <DLR | <DLR | <DLR | <DLR | ug/L |
| 1,4-Dichlorobenzene (p-DCB) | <DLR | <DLR | <DLR | <DLR | ug/L |
| 1,1-Dichloroethane (1,1-DCA) | <DLR | <DLR | <DLR | <DLR | ug/L |
| 1,2-Dichloroethane (1,2-DCA) | <DLR | <DLR | <DLR | <DLR | ug/L |
| 1,1-Dichloroethylene (1,1-DCE) | <DLR | <DLR | <DLR | <DLR | ug/L |
| cis-1,2-Dichloroethylene (c-1,2-DCE) | <DLR | <DLR | <DLR | <DLR | ug/L |
| trans-1,2-Dichloroethylene (t-1,2-DC | <DLR | <DLR | <DLR | <DLR | ug/L |
| Dichloromethane (Methylene Chloride | <DLR | <DLR | <DLR | <DLR | ug/L |
| 1,2-Dichloropropane | <DLR | <DLR | <DLR | <DLR | ug/L |
| Total 1,3-Dichloropropene | <DLR | <DLR | <DLR | <DLR | ug/L |
| Ethyl Benzene | <DLR | <DLR | <DLR | <DLR | ug/L |
| Methyl tert-Butyl Ether(MTBE) | <DLR | <DLR | <DLR | <DLR | ug/L |
| Monochlorobenzene (Chlorobenzene) | <DLR | <DLR | <DLR | <DLR | ug/L |
| Styrene | <DLR | <DLR | <DLR | <DLR | ug/L |
| 1,1,2,2-Tetrachloroethane | <DLR | <DLR | <DLR | <DLR | ug/L |
| Tetrachloroethylene (PCE) | <DLR | <DLR | <DLR | <DLR | ug/L |
| Toluene | <DLR | <DLR | <DLR | <DLR | ug/L |
| 1,2,4-Trichlorobenzene | <DLR | <DLR | <DLR | <DLR | ug/L |
| 1,1,1-Trichloroethane (1,1,1-TCA) | <DLR | <DLR | <DLR | <DLR | ug/L |
| 1,1,2-Trichloroethane (1,1,2-TCA) | <DLR | <DLR | <DLR | <DLR | ug/L |
| Trichloroethylene (TCE) | <DLR | <DLR | <DLR | <DLR | ug/L |
| Trichlorofluoromethane (FREON 11) | <DLR | <DLR | <DLR | <DLR | ug/L |
| Trichlorotrifluoroethane (FREON 113) | <DLR | <DLR | <DLR | <DLR | ug/L |
| Vinyl Chloride (VC) | <DLR | <DLR | <DLR | <DLR | ug/L |
| m,p-Xylene | <DLR | <DLR | <DLR | <DLR | ug/L |
| o-Xylene | <DLR | <DLR | <DLR | <DLR | ug/L |
| Total Xylenes (m,p, & o) | <DLR | <DLR | <DLR | <DLR | ug/L |
| tert-Amyl-Methyl Ether (TAME) | | | <DLR | | ug/L |
| Bromobenzene | | | <DLR | | ug/L |
| Bromochloromethane | | | <DLR | | ug/L |
| Bromomethane (Methyl Bromide) | | | <DLR | | ug/L |
| n-Butylbenzene | | | <DLR | | ug/L |
| sec-Butylbenzene | | | <DLR | | ug/L |
| tert-Butylbenzene | | | <DLR | | ug/L |
| Chloroethane | | | <DLR | | ug/L |
| Chloromethane (Methyl Chloride) | | | <DLR | | ug/L |
| 2-Chlorotoluene | | | <DLR | | ug/L |
| 4-Chlorotoluene | | | <DLR | | ug/L |
| Dibromomethane | | | <DLR | | ug/L |
| 1,3-Dichloropropane (m-DCB) | | | <DLR | | ug/L |
| Dichlorodifluoromethane (Freon 12) | | | <DLR | | ug/L |
| 1,3-Dichloropropane | | | <DLR | | ug/L |
| 2,2-Dichloropropane | | | <DLR | | ug/L |
| 1,1-Dichloropropene | | | <DLR | | ug/L |
| Diisopropyl Ether (DIPE) | | | <DLR | | ug/L |
| Ethy-tert-Butyl-Ether (ETBE) | | | <DLR | | ug/L |
| Hexachlorobutadiene | | | <DLR | | ug/L |
| Isopropyltoluene (Cumene) | | | <DLR | | ug/L |
| p-Isopropyltoluene | | | <DLR | | ug/L |
| Napthalene | | | <DLR | | ug/L |
| n-Propylbenzene | | | <DLR | | ug/L |
| 1,1,1,2-Tetrachloroethane | | | <DLR | | ug/L |
| 1,2,3-Trichlorobenzene | | | <DLR | | ug/L |
| 1,2,4-Trimethylbenzene | | | <DLR | | ug/L |
| 1,3,5-Trimethylbenzene | | | <DLR | | ug/L |
| Methyl ethyl ketone (Butanone) | | | <DLR | | ug/L |
| Methyl isobutyl ketone (MIBK) | | | <DLR | | ug/L |

| | Q1 2006 | Q2 2006 | Q3 2006 | Q4 2006 | Q1 2007 | Units |
|---|---|---|---|---|---|---|
| Uranium | | 3.1 | | | 4 | pCi/L |
| Radium 228 | | <1 | <1 | <1 | | pCi/L |
| Radium 228 (CE) | | | 0.3 | 0.354 | | pCi/L |
| Gross Alpha | <3 | 3.5 | <3 | 4 | | pCi/L |
| Gross Alpha (CE) | 1.9 | 2 | 1.7 | 2.2 | | pCi/L |
| Gross Beta | 5.2 | <3 | <4 | <3 | | pCi/L |
| Gross Beta (CE) | 1.6 | 1.5 | 1.5 | 1.6 | | pCi/L |

**Semitropic Water Storage District, December 31, 2010,**
**Letter to Newhall Land and Farming**

NEWHALL LAND

August 12, 2011

Sam Dea
Supervising Regional Planner
Los Angeles County Department of Regional Planning
Hall of Records, 13th Floor
320 West Temple Street, Room 1382
Los Angeles, California 90012

Re: Newhall Ranch Semitropic Groundwater Bank 2010 Annual Report

Dear Mr. Dea:

This correspondence and the attached communication from Semitropic Water Storage District is Newhall's status report to the County of Los Angeles, Department of Regional Planning, indicating that the amount of water placed in the Semitropic groundwater bank under Newhall's stored water account is 23,167 acre-feet as of December 31, 2010. This status report is a requirement of the Newhall Ranch Specific Plan Program EIR, Mitigation Measure SP-4.11-18.

If you should have any questions, please do not hesitate to call me.

Sincerely,

Newhall Land

Alex Herrell
Director, Community Development

Attachment: Semitropic letter

25124 SPRINGFIELD COURT, SUITE 300, VALENCIA, CALIFORNIA 91355-1088 • PHONE 661.255.4000 FAX 661.255.3960 WWW.VALENCIA.COM WWW.NEWHALLRANCH.NET

1101 Central Avenue, P.O. Box 8043
Wasco, California 93280-0877

Telephone: (661) 758-5113
Bakersfield: (661) 327-7144
Facsimile: (661) 758-3219
Email: mail@semitropic.com

Newhall Land & Farming Company
Attention: Beverly Langeveldt
25124 Springfield Court, Suite 300
Valencia, CA 91355

Dear Ms. Langeveldt:

As of December 31, 2010, Newhall Land and Farming has 23,167Acre Feet (AF) of water stored in Semitropic Water Storage District.

Please let me know if you need further information.

Sincerely,

Judy Burns

Judy Burns
Accounting Supervisor

# APPENDIX F4.11

## Wastewater Disposal

**Sanitation District of Los Angeles County – Memorandum, Response to SCOPE Letter and Testimony to the Board of Supervisors Regarding Formation of the Newhall Ranch Sanitation District (March 8, 2011)**

SANITATION DISTRICTS OF LOS ANGELES COUNTY

STEPHEN R. MAGUIN
*Chief Engineer and General Manager*

# Memorandum

**Date:** March 8, 2011

**To:** Supervisor Michael D. Antonovich, Mayor
Supervisor Gloria Molina
Supervisor Mark Ridley-Thomas
Supervisor Zev Yaroslavsky
Supervisor Don Knabe

**From:** Stephen R. Maguin SR Maguin
Chief Engineer and General Manager

**Subject:** **Response to SCOPE Letter and Testimony to the Board of Supervisors Regarding Formation of the Newhall Ranch Sanitation District (January 18, 2011 Board Agenda Item 25)**

On January 18, 2011, the Board of Supervisors (Board) approved a motion by Supervisor Antonovich directing the Sanitation Districts (Districts) to prepare a memorandum that responds to the issues raised by the testimony of Ms. Lynne Plambeck and Ms. Cam Noltemeyer of the Santa Clarita Organization for Planning and the Environment (SCOPE), and the letter from Ms. Plambeck dated January 13, 2011 (both documents are attached with issues numbered).

The memorandum presents background information on the proposed Newhall Ranch Development and the prior actions by the County and the Districts that provide context for the issues raised. SCOPE's issues are shown in bold followed by the Districts' response.

## I. Background

On March 23, 1999, and, again, on May 27, 2003, the Board certified the environmental documents (collectively, Newhall Ranch EIR) for the Newhall Ranch Specific Plan and Newhall Ranch Water Reclamation Plant (NRWRP). The certified Newhall Ranch EIR evaluated the NRWRP at a project level of detail, and the Board approved the NRWRP under Conditional Use Permit No. 94-087-(5). The NRWRP is to provide treatment of the wastewater generated within the Specific Plan area as well as produce recycled water for the Specific Plan area.

The environmental analysis of the NRWRP is found in Section 5.0 of the Newhall Ranch Revised Draft EIR (March 8, 1999) and Section 3.0 of the Newhall Ranch Revised Additional Analysis, Volume VIII (May 2003). Section 3.0 assessed and updated various NRWRP alternatives including the approved NRWRP site.

The Newhall Ranch EIR contained a mitigation measure (Mitigation Measure 5.0-52), also reflected in the adopted Mitigation Monitoring Plan, requiring formation of a county sanitation district for the Specific Plan area. To fulfill mitigation requirements and establish a logical plan for development of the new district and its infrastructure, the Newhall Land and Farming Company (NLFC) and Sanitation Districts Nos. 26 and 32, later consolidated as Santa Clarita Valley Sanitation District (SCVSD), entered into an agreement (Interconnection Agreement) dated January 9, 2002.

On December 13, 2005, the Board adopted the resolution of intent to form the county sanitation district to be known as the Newhall Ranch County Sanitation District (NRSD). The Board also approved an Addendum to the Newhall Ranch EIR and Additional Analysis, which evaluated the environmental effects of NRSD formation. The Addendum determined that formation of the NRSD would not result in new or substantially more severe environmental impacts than those discussed in the prior Newhall Ranch environmental documents.

Thereafter, the County initiated proceedings for the formation of the NRSD, pursuant to the Cortese-Knox-Hertzberg Local Government Reorganization Act of 2000. On June 14, 2006, the Local Agency Formation Commission (LAFCO) for Los Angeles County adopted a resolution approving formation of the NRSD. On July 27, 2006, LAFCO issued a Certificate of Completion for formation of the NRSD.

On January 18, 2011, the Board considered a resolution confirming formation of the NRSD within the scope of the previously certified Newhall Ranch EIR and Addendum. At the January 18, 2011 Board meeting, representatives from SCOPE expressed their concerns by oral testimony and a letter.

## II. Districts' Responses to SCOPE's Issues

1. "**Without the construction of the Sanitation plant as required by the Newhall Ranch Specific Plan, the public will bear the burden of the expensive clean up of chlorides required to comply with the Clean Water Act. This will entail a sharp increase in sewer fees to the general public."**

   Discharge of Newhall Ranch wastewater to the Valencia Water Reclamation Plant (VWRP) would be temporary until construction of the Newhall Ranch Water Reclamation Plant (NRWRP). The Newhall Ranch wastewater would neither add nor alleviate the SCVSD's financial burden to comply with the Upper Santa Clara River Chloride Total Maximum Daily load (Chloride TMDL).

   The Interconnection Agreement sets conditions under which the first 6,000 homes in Newhall Ranch may temporarily discharge wastewater to the VWRP. The conditions include payment of the standard SCVSD connection fee (fair share of the cost of the existing infrastructure) and transfer of title of the 22-acre NRWRP site to the NRSD. Newhall Ranch residents also would pay the SCVSD an annual service charge to recover the full cost of treating their wastewater at the VWRP. Temporary treatment of wastewater at the VWRP would not eliminate the need for the developer to construct the NRWRP. Prior to building more than 6,000 homes, the developer must construct the NRWRP.

   When operating at flows equal to or below the permitted plant capacity, compliance with the Chloride TMDL will depend on the chloride concentration in the treatment plant effluent. This concentration results from two primary sources: chloride concentration of the local water supply, and increased chloride concentration due to use of the water by the community. Local groundwater is the planned potable water source for the Specific Plan's Landmark and Mission Villages, the two developments whose wastewater might be temporarily treated at the VWRP under the Interconnection Agreement. The groundwater chloride levels for those communities are similar to that of the groundwater used by existing Santa Clarita Valley communities. Thus, no difference in chloride concentration is expected due to the water supply.

   Like Santa Clarita, Newhall Ranch will be a mixture of residential, commercial and industrial land uses. Use of automatic water softeners (AWS) was a significant chloride source for SCVSD wastewater prior to the 2008 ban on AWS. Per Specific Plan mitigation measure 5.0-52(b), the Newhall Ranch developer must request that NRSD ban AWS in Newhall Ranch. Districts' staff will also recommend that NRSD enact an AWS ban similar to the ban in the SCVSD. Consequently, the two communities are expected to produce similar increases in chloride concentrations due to use and similar overall wastewater chloride concentrations. Since final compliance will be determined by concentration, the addition of Newhall Ranch wastewater to the VWRP would neither add to nor alleviate the SCVSD's financial burden to comply with the Chloride TMDL.

2. **"…In addition, the agreement between the Santa Clarita Valley Sanitation District of Los Angeles County (SCV) and Newhall Land and Farming allows up to 6,000 capacity units to be treated at existing SCV wastewater treatment facilities as needed during construction of the Newhall Ranch Water Reclamation Plant. SCV has sufficient capacity to accommodate the use of its facilities." This statement cannot be made because the County is currently in the middle of analyzing the impacts for the first tract maps of Newhall Ranch. No certified EIR exists on either the Landmark tract or the Mission Village**

**tract, which comprise approximately 6,000 units. Further, there is not even a Development Monitoring System analysis for sewer capacity included in the Mission Village EIR as required by the Court Decision in 2003."**

Certification of an EIR is not required to estimate future flows and determine whether there is available capacity at existing treatment facilities. The 2003 Court Ruling by Judge Randall (Case Number S-1500-CV-239324, RDR) does not specify any requirements regarding a Development Monitoring System (DMS) analysis.

Wastewater flow projections for the two Newhall Ranch communities have been reviewed by the Districts. Estimates are 0.3 million gallons per day (mgd) for Landmark Village and 1.0 mgd for Mission Village (collectively 1.3 mgd). The Interconnection Agreement allows for temporary treatment at VWRP for up to 6,000 homes (about 1.6 mgd). The VWRP treated approximately 15 mgd in 2010 and currently has a capacity of 21.6 mgd (yielding 6.6 mgd of surplus capacity). Thus, the VWRP has sufficient capacity to accommodate the temporary use of its facilities as stated in the staff report for the January 18, 2011 Board agenda item. CEQA for the VWRP was addressed by the certified 2015 Santa Clarita Valley Joint Sewerage System Facilities Plan and EIR, which examined the environmental impacts of treating 27.6 mgd of wastewater at the VWRP.

The Newhall Ranch EIRs, certified by the Board in 1999 and 2003, evaluated the environmental impacts related to development of the Specific Plan, including construction of the NRWRP and the new sewage facilities to serve the Specific Plan area. At the project level, the County is in the process of completing further CEQA analysis for both Landmark Village and Mission Village. The CEQA compliance for Landmark Village is contained in the Landmark Village Draft EIR (November 2006), Final EIR (November 2007), and Recirculated Draft EIR (January 2010). CEQA compliance for Mission Village is contained in the Mission Village Draft EIR (October 2010). The EIRs contain a County DMS analysis and evaluate each project's wastewater conveyance/disposal effects including temporary wastewater treatment at the VWRP.

3. "**If the Sanitation Plant is not built in accordance with the mitigation requirements of the Newhall Ranch Specific Plan, the Plan cannot meet its requirements to provide non-potable water or to finance its own infrastructure expansion costs."**

   Temporary use of the VWRP for treatment of Newhall Ranch wastewater does not eliminate the Specific Plan requirement for the developer to construct the NRWRP and finance the new sewerage system. The temporary use of the VWRP addresses practical engineering considerations such as the need to build-up an adequate and steady flow of wastewater before start-up of the NRWRP. Whether Newhall Ranch wastewater is treated at the NRWRP or VWRP, the treated wastewater will be suitable for reuse and offsetting Newhall Ranch water demands.

4. "**Further, the Sanitation discharge permit granted by the Regional Water Quality Board required reverse osmosis treatment for the effluent from this plant. By attempting to evade this requirement, Newhall will put the added burden of removing salts from the Newhall Ranch effluent on the backs of the public."**

   Temporary use of the VWRP for treatment of Landmark Village and Mission Village wastewater does not eliminate the requirement for the developer to construct the NRWRP or finance the new sewerage system within the Specific Plan area. The developer must construct the NRWRP per the Specific Plan and must have it operating properly before the next phase after Landmark Village and Mission Village. As noted in the Item 1 response, temporary treatment of Landmark Village and Mission Village wastewater at the VWRP would neither add to nor alleviate the SCVSD's financial burden to comply with the Chloride TMDL.

   Temporarily treating wastewater from the first 6,000 Newhall Ranch homes at the VWRP is a practical engineering decision based on the need to build up an adequate, steady flow of wastewater before starting up

the NRWRP, especially the reverse osmosis units. Such an approach would match the slower pace of the development but would not eliminate the Specific Plan requirement for construction of the NRWRP.

5. "**The Santa Clarita Sanitation District's failure to meet the Clean Water TMDL standard for chloride of 100 mg/l in the Santa Clara River is a result in part due to the sharp and continuing increase in the use of imported State Water Project (SWP) water as seen by the chart below, (also supplied by the Sanitation Districts). This problem is aggravated by high levels of chlorides in the wells proposed to be used for these tracts, according to information found in both the Landmark and Mission Village DEIRs as indicated in the chart below. Therefore, if Newhall uses the Valencia treatment plant rather than building their own Sanitation Plant as required by the Specific Plan, the chloride levels in the effluent of that treatment plant will be substantially increased. Without the immediate construction of the Newhall Ranch Water Reclamation Plant, approved as an RO (reverse osmosis salt removal system) facility, the high chlorides in the wells proposed to be used by this project in the chart below and the additional imported Nickels water will add to this load."**

   Imported water did not cause the chloride standard to be exceeded. Effluent from the VWRP has exceeded 100 mgd/l since the 1970s despite the fact that imported water was not delivered to Santa Clarita Valley until the 1980s. Nonetheless, as noted in the Item 1 response, the chloride concentrations of Newhall Ranch and SCVSD wastewater are expected to be similar. Thus, temporary treatment of Newhall Ranch wastewater at the VWRP would not change the SCVSD's ability to comply with the Chloride TMDL.

   SCOPE implies that use of Nickel water[1] would contribute to increase the chloride load at the VWRP. While the Landmark Village and Mission Village projects are part of the potable water system for the entire Specific Plan, the projects do not rely on Nickel water to satisfy their potable water demands. As reported in the Newhall Ranch Revised Additional Analysis, Section 2.5, Water Resources (Volume VIII, May 2003), the Nickel water would only be needed in years when the Newhall Ranch agricultural water has been used, which is estimated to occur after approximately the 21st year of project construction. Therefore, the comment regarding use of Nickel water is not appropriate at this time.

6. **"How does a side agreement between the developer and the Sanitation Districts fit into the planning oversight purview of the Board of Supervisors? How can the Planning Department substantiate that sewer service complies with the County Development Monitoring System or is consistent with the general plan or specific plans if developers make side agreements with the Sanitation Districts?"**

   Formation of a new sanitation district was identified in the Specific Plan EIR as a mitigation measure. The Interconnection Agreement was developed to fulfill this Specific Plan requirement and establish a logical plan for the development and administration of the new district and its infrastructure. This agreement ensures that the developer provides the necessary land and infrastructure. The Interconnection Agreement was considered and approved by the Sanitation Districts Nos. 26 and 32 Boards at their January 9, 2002 meetings, which were open to the public. Further, this agreement was referenced in previous County and LAFCO resolutions supporting formation of the new sanitation district.

   As noted in the Item 2 response, the EIRs for both Landmark Village and Mission Village contain County DMS analysis. Moreover, the Newhall Ranch developer is required to build a new sewerage system to serve Newhall Ranch developments and, thus, the Specific Plan does not rely upon existing County sewerage facilities. The Districts and County have coordinated their efforts with regard to establishment of the new sanitation district and its sewerage conveyance system. This coordination enables the County to verify that the development is consistent with the County's General Plan and Specific Plan requirements.

[1] Nickel water refers to a source of potable water owned by NLFC that can be delivered to the Newhall Ranch development to supplement existing sources of potable water.

**7. "The agreement between the developer of the Newhall Ranch Project and the Sanitation District violates the conditions of the Newhall Ranch Specific Plan and puts the Santa Clarita Valley in jeopardy of continued non-compliance with the Clean Water Act Chloride TMDL. We therefore strongly object to this agreement and ask that the Board of Supervisors take action to rectify this issue."**

The Interconnection Agreement is not in conflict with the Specific Plan and does not impact the SCVSD's ability to comply with the Chloride TMDL. As noted in the Item 1 and 4 responses, temporary treatment of Landmark Village and Mission Village wastewater at the VWRP would not eliminate the need for the developer to construct the NRWRP and to finance the new sewerage system, nor would it impact compliance with the Chloride TMDL. As presented in the Item 2 response, the VWRP has available capacity for temporary treatment of Landmark Village and Mission Village wastewater. Thus, no negative impact to the SCVSD's sewerage system is expected, and this approach does not conflict with the Specific Plan's requirement for construction of the NRWRP.

**8. "The public should not have to pay the costs of bringing the chloride level into compliance with an increase to their sewer fees."**

By law, the users of the SCVSD's wastewater system must pay for Chloride TMDL compliance. As noted in the Item 1 and 4 responses, temporary treatment of Newhall Ranch wastewater would neither add to nor alleviate the SCVSD's financial burden to comply with the Chloride TMDL.

**9. "…but for the statement within the resolution that says that "The first 6,000 units of Newhall Ranch will be put through the Valencia Treatment Plant." That's not consistent with the Newhall Ranch that was passed for the formation of this, the Newhall Ranch sanitation plant."**

The temporary treatment of Landmark Village and Mission Village wastewater at VWRP does not conflict with Specific Plan's requirements as described in the Item 4 and 7 responses.

**10. "And we ask that that be struck from the staff report because it seems to be a backdoor way of getting those approved when there's no E.I.R. on that and it's not consistent with the Specific Plan."**

As noted in the Item 4 and 7 responses, temporary treatment of Landmark Village and Mission Village wastewater at the VWRP is not in conflict with the Specific Plan. Prior CEQA compliance was not required because temporary treatment at the VWRP was not proposed until the release of the Draft EIRs for both Landmark Village and Mission Village. Draft EIRs for both projects, including the Landmark Village Recirculated Draft EIR, have been the subject of extensive public review and comment as part of the County's environmental review process.

As stated in the Item 2 response, the environmental implications of the build-out of the VWRP to its capacity were assessed in the SCVSD's certified EIR for the 2015 Santa Clarita Valley Joint Sewerage System Facilities Plan. The Newhall Ranch EIR, evaluated the environmental impacts related to development of the Specific Plan, including construction of the NRWRP to a project level and the new sewerage facilities at a programmatic level to serve the Specific Plan. The County is in the process of completing further CEQA compliance at a project level for both Landmark Village and Mission Village.

**11. "The addendum itself that … was passed … for the formation on the Sanitation District specifically says that the wastewater treatment plant will be built in stages as the specific plan area is developed and will ultimately be sized to treat up to 6.8 million gallons. So it, too, is not consistent with what is being said in the Staff Report. So we wonder how the Sanitation District would have made an agreement like that that's in violation of your environmental documents and the Specific Plan."**

There is no inconsistency between the Staff Report and the Specific Plan. The fact that the Staff Report only addressed the temporary treatment of Newhall Ranch wastewater at the VWRP does not eliminate the Specific

Plan requirement for the developer to build the NRWRP and other sewerage infrastructure to serve the Specific Plan. For more information regarding consistency with the Specific Plan, see the Item 6 response. Regarding claims of violating CEQA, please see the Item 10 response.

12. **"Now we appear before you, and Newhall Land is claiming that they have this agreement with the Sanitation -- actually Santa Clarita Valley Sanitation District of Los Angeles County to allow these 6,000 units to be treated in our existing Santa Clarita wastewater facilities. Those facilities are not reverse osmosis plants. And if this is allowed, it will only create additional problem as far as the chlorides for our community. The reverse osmosis plant that is required with this Newhall Treatment Plant that will take care of chlorides. So definitely, they shouldn't be allowed to use any other treatment plant."**

    Discharge of Landmark Village and Mission Village wastewater to the VWRP will be temporary until construction and startup of the NRWRP. The Landmark Village and Mission Village wastewater would neither add to nor alleviate the SCVSD's financial burden to comply with the Chloride TMDL. For further explanation, see the Item 1 and 4 responses.

13. **"And it's a very, very expensive issue for our community. And we were promised that we would not be funding anything for the Newhall Ranch."**

    Temporary treatment of Landmark Village and Mission Village wastewater at the VWRP would neither add to nor alleviate the SCVSD's financial burden to comply with the Chloride TMDL as explained in the Item 1 and 4 responses.

14. **"And if that's what they're going to do, they have to have additional environmental analysis on it."**

    As noted in the Item 10 response, the EIRs for both Landmark Village and Mission Village evaluate wastewater disposal options including temporary treatment of Landmark Village and Mission Village wastewater at the VWRP. There will be no temporary treatment at the VWRP, unless and until the Board has considered and certified the project EIRs in accordance with CEQA.

Should you have any questions or concerns, please contact me, or Mr. Thomas J. LeBrun at (562) 908-4288, extension 2751 or via email at tlebrun@lacsd.org.

cc: Board of Directors – Santa Clarita Valley Sanitation District
Department of Public Works
Regional Planning Commission

SRM:TJL:ddg

WATER RECLAMATION
SOLID WASTE MANAGEMENT

COUNTY SANITATION DISTRICTS
OF LOS ANGELES COUNTY

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Mailing Address: P.O. Box 4998, Whittier, CA 90607-4998
Telephone: (562) 699-7411, FAX: (562) 699-5422
www.lacsd.org

STEPHEN R. MAGUIN
*Chief Engineer and General Manager*

March 8, 2011

Board of Directors
Santa Clarita Valley Sanitation District
of Los Angeles County

Directors:

**Memorandum to Board of Supervisors – Newhall Ranch Sanitation District**

Enclosed is the memorandum requested by the Board of Supervisors regarding formation of the Newhall Ranch Sanitation District and responses to the issues raised by the Santa Clarita Organization for Planning and the Environment.

Please contact me should you have any questions.

Very truly yours,

Stephen R. Maguin

Stephen R. Maguin

SRM:TJL:ddg

Enclosure

DOC # 1800048

Recycled Paper

**SCOPE**
**Santa Clarita Organization for Planning and the Environment**
TO PROMOTE, PROTECT AND PRESERVE THE ENVIRONMENT, ECOLOGY AND QUALITY OF LIFE IN THE SANTA CLARITA VALLEY
POST OFFICE BOX 1182, SANTA CLARITA, CA 91386

1-13-11

Attn: Executive Office
LA County Board of Supervisors
500 W. Temple St.
Los Angeles, CA 90012

Re: Agenda Item # 25 – Inconsistency with Newhall Ranch Specific Plan
***Please copy to all Supervisors***

Dear Sirs:

It has come to our attention that, while the staff report for this agenda item correctly states the timeline of the formation of the Newhall Ranch Sanitation District, it also includes erroneous information and brings to light an agreement made between the Sanitation Districts and Newhall Land and Farming that is inconsistent with the Newhall Ranch Specific Plan. Further, it misinforms the Board as to the financial impacts of such an agreement.

We ask that the Supervisors, and particularly Mr. Antonovich, as our representative on the Board of Sanitation District 26 and 32, immediately investigate and set aside this agreement. We request that Board of Supervisors, as ultimate oversight authority for the approval and conformity of the Newhall Ranch Specific Plan, object to this agreement between the Newhall Land Co. and the Sanitation Districts. We request that the Board delay approval of this agenda item until this investigation is completed and the staff report is corrected.

We particularly object to these two sections of the staff report:

1. **"FISCAL IMPACT/FINANCING**

   It is anticipated that the operation and maintenance of the District and its facilities would be funded through the imposition of service charges, which would be collected on the tax roll, and construction of the facilities would be financed by the developer for the Newhall Ranch project."

1 **Without the construction of the Sanitation plant as required by the Newhall Ranch Specific Plan, the public will bear the burden of the expensive clean up of chlorides required to comply with the Clean Water Act. This will entail a sharp increase in sewer fees to the general public.**

2. **"IMPACT ON CURRENT SERVICES (OR PROJECTS)**

2 This project will not have an adverse impact on current sewage services because the District will build facilities to serve all new developments within the Newhall Ranch Specific Plan area. In addition, the agreement between the Santa Clarita Valley Sanitation District of Los Angeles County (SCV) and Newhall Land and

Farming allows up to 6,000 capacity units to be treated at existing SCV wastewater treatment facilities as needed during construction of the Newhall Ranch Water Reclamation Plant. SCV has sufficient capacity to accommodate the use of its facilities."

2 **This statement cannot be made because the County is currently in the middle of analyzing the impacts for the first tract maps of Newhall Ranch. No certified EIR exists on either the Landmark tract or the Mission Village tract, which comprise approximately 6000 units. Further, there is not even a Development Monitoring System analysis for sewer capacity included in the Mission Village EIR as required by the Court Decision in 2003.**

## Background

The Mitigation Monitoring Plan of the Newhall Ranch Specific Plan states that:
**SP 4.11-1** The proposed Specific Plan **SHALL**[1] implement a water reclamation plant in order to reduce to specific plan's demand for imported potable water, The Specific Plan **SHALL** install a distribution system to deliver non-potable reclaimed water to irrigate land uses suitable to accept reclaimed water, pursuant to the Los Angeles County Department of Health Standards. **Mitigation 4.11-8 requires Newhall to pay for the cost of water expansion** by paying for connection fees and **Mitigation 4.12-7** ensured the public would not have to pay for the development of Newhall Ranch by requiring that future tracts would have to be annexed into a sewer district.
**SP 4.12-2** A 5.8 to 6.9 mgd water reclamation plant **SHALL** be constructed on the Specific Plan site, pursuant to County, State, and Federal design standards, to serve the Newhall Ranch Specific Plan.
**SP 4-12-3** A Conceptual Backbone Sewer Plan **SHALL** be implemented pursuant to County, state and federal design standards.

Please note: The mitigation monitoring system does NOT say "may", it says, "**SHALL**".

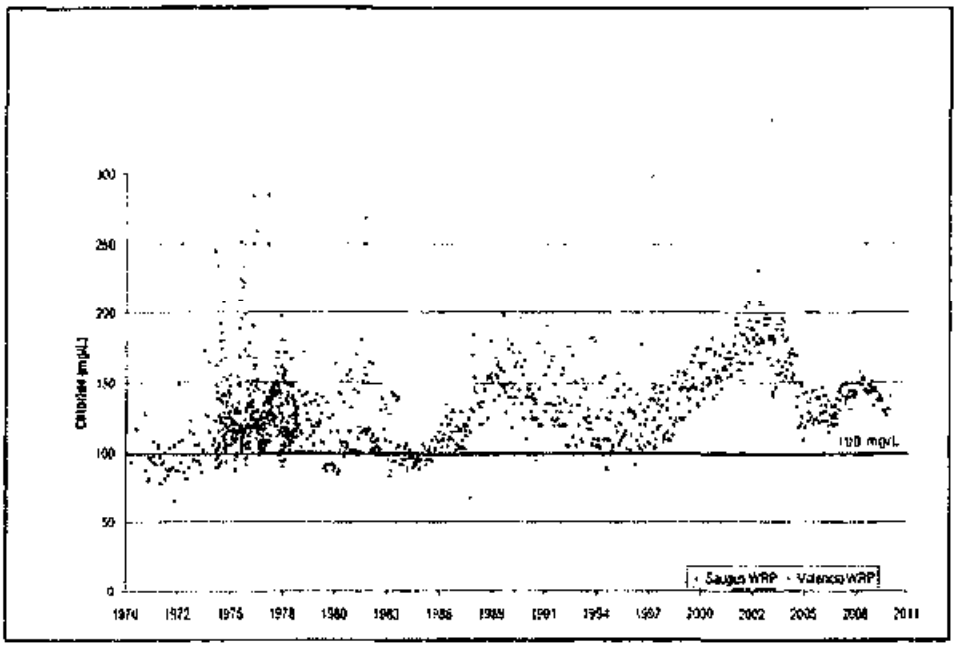
3 If the Sanitation Plant is not built in accordance with the mitigation requirements of the Newhall Ranch Specific Plan, the Plan cannot meet its requirements to provide non-potable water or to finance its own infrastructure expansion costs.

4 **Further, the Sanitation discharge permit granted by the Regional Water Quality Board required reverse osmosis treatment for the effluent from this plant. By attempting to evade this requirement, Newhall will put the added burden of removing salts from the Newhall Ranch effluent on the backs of the public.**

## The CHLORIDE issue

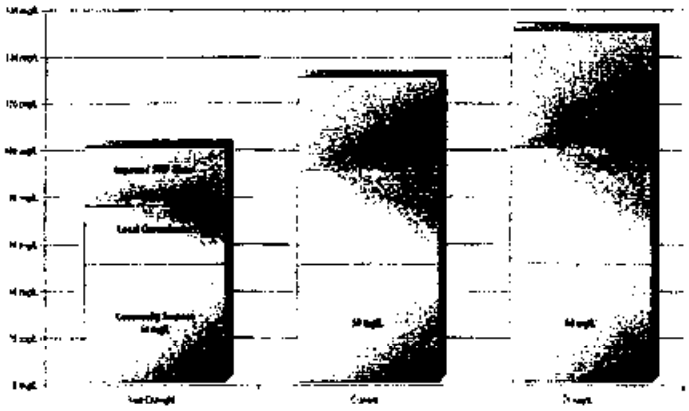
Currently the Sanitation Districts 26 and 32 in the Santa Clarita Valley do not comply with the Clean Water Act Act Total Maximum Daily Load (TMDL) effluent standard of 100 ugl for Cholride as indicated by the chart below supplied at a recent Sanitation District public hearing:

[1] Emphasis added to all "shalls" in this section




The Santa Clarita Sanitation Districts' failure to meet the Clean Water TMDL standard for chloride of 100mg/l in the Santa Clara River is a result in part due to the sharp and continuing
5 increase in the use of imported State Water Project (SWP) water as seen by the chart below, (also supplied by the Sanitation Districts).

Chloride Sources During
Drought & Non-Drought Conditions



This problem is aggravated by high levels of chlorides in the well proposed to be used for these tracts, according to information found in both the Landmark and Mission Village DEIRs as indicated in the chart below. Therefore, if Newhall uses the Valencia treatment plant rather than
5 building their own Sanitation Plant as required by the Specific Plan, the chloride levels in the effluent of that treatment plant will be substantially increased. Without the immediate construction of the Newhall Ranch Water Reclamation Plant, approved as an RO (reverse

osmosis salt removal system) facility, the high chlorides in the wells proposed to be used by this project in the chart below and the additional imported Nickels water will add to this load.

## Water Quality Constituents of Concern
### Secondary Standards:
**(from Mission Village DEIR Appendix F4.8)**

| Parameter | MCL | DLR | Units | E-14 | E-15 | E-16 | E-17 |
|---|---|---|---|---|---|---|---|
| Chloride | 250-500-600 | NA | mg/L | 75 | 88 | 89 | 74 |
| | pH 6.5 - 8.5 | NA | units | 7.5 | 7.7 | 7.3 | 7.4 |
| Specific Conductance (E.C.) | 900-1600-2,200 | NA | umho/cm | 1240 | 1290 | 1390 | 1360 |
| Sulfate | 250-500-600 | 0.5 | mg/L | 340 | 330 | 340 | 340 |
| Total Dissolved Solids (TDS) | 500-1000-1500 | NA | mg/L | 900 | 890 | 950 | 960 |

## Conclusion and Questions

How does a side agreement between the developer and the Sanitation Districts fit into the planning oversight purview of the Board of Supervisors? How can the Planning Department substantiate that sewer service complies with the County Development Monitoring System or is consistent with the general plan or specific plans if developers make side agreements with the Sanitation Districts? 6

The agreement between the developer of the Newhall Ranch Project and the Sanitation District violates the conditions of the Newhall Ranch Specific Plan and puts the Santa Clarita Valley in jeopardy of continued non-compliance with the Clean Water Act Chloride TMDL. We therefore strongly object to this agreement and ask that the Board of Supervisors take action to rectify this issue. 7

The public should not have to pay the costs of bringing the chloride level into compliance with an increase to their sewer fees. Thank you in advance for addressing these issues. 8

Sincerely,

Lynne Plambeck
President

**LYNNE PLAMBECK:** GOOD AFTERNOON. WHO WOULD YOU LIKE TO START? OKAY. MY NAME IS LYNN PLAMBECK, AND I'M HERE REPRESENTING SANTA CLARITA ORGANIZATION FOR PLANNING AND THE ENVIRONMENT. AND WE'RE CONCERNED ABOUT THIS AGENDA ITEM NOT FOR THE RESOLUTION ITSELF, WHICH IS PERFECTLY CORRECT, BUT FOR THE STATEMENT WITHIN THE RESOLUTION THAT SAYS THAT "THE FIRST 6,000 UNITS OF NEWHALL RANCH WILL BE PUT THROUGH THE VALENCIA TREATMENT PLANT." THAT'S NOT CONSISTENT WITH THE NEWHALL RANCH THAT WAS PASSED FOR THE FORMATION OF THIS, THE NEWHALL RANCH SANITATION PLANT. THE NEWHALL RANCH SANITATION PLANT IS SUPPOSED TO BE A REVERSE OSMOSIS PLANT, WHICH WILL HELP HANDLE THE CHLORIDE PROBLEM WHICH MAYOR ANTONOVICH, I KNOW YOU'RE WELL AWARE OF, AS YOU SIT ON OUR SANITATION DISTRICT AND HAD TO GO THROUGH ALL THOSE HEARINGS. SO OUR OBJECTION IS NOT TO THE RESOLUTION ITSELF, BUT TO THE FACT IN THE STAFF REPORT THAT SAYS THOSE FIRST 6,000 UNITS WILL GO THROUGH THE EXISTING VALENCIA TREATMENT PLANT, OR UP TO 6,000 UNITS. AND WE ASK THAT THAT BE STRUCK FROM THE STAFF REPORT BECAUSE IT SEEMS TO BE A BACKDOOR WAY OF GETTING THOSE APPROVED WHEN THERE'S NO E.I.R. ON THAT AND IT'S NOT CONSISTENT WITH THE SPECIFIC PLAN. THE ADDENDUM ITSELF THAT WAS PASSED FOR THE FORMATION IN 2005 AT L.A.F.C.O. FOR THE FORMATION OF THE SANITATION DISTRICT SPECIFICALLY SAYS THAT THE WASTEWATER TREATMENT PLANT WILL BE BUILT IN STAGES AS THE SPECIFIC PLAN AREA IS DEVELOPED AND WILL ULTIMATELY BE SIZED TO TREAT UP TO 6.8 MILLION GALLONS.

SO IT, TOO, IS NOT CONSISTENT WITH WHAT IS BEING SAID IN THE STAFF REPORT. SO WE WONDER HOW THE SANITATION DISTRICT WOULD
11 HAVE MADE AN AGREEMENT LIKE THAT THAT'S IN VIOLATION OF YOUR ENVIRONMENTAL DOCUMENTS AND THE SPECIFIC PLAN. SO WE ASK YOU TO INVESTIGATE THAT. AND THEN FURTHER WE ASK THAT THIS INFORMATION THAT 6,000 UNITS IS GOING TO GO THROUGH THE VALENCIA TREATMENT PLANT BE STRUCK FROM THE STAFF REPORT. BECAUSE THE NEXT THING THAT WILL HAPPEN IS IT WILL SHOW UP IN THE TRACT MAPS AS THOUGH YOU HAD APPROVED IT. WE DID SEND LETTERS TO EACH SUPERVISOR'S OFFICE. WE'D LIKE TO RESUBMIT THOSE LETTERS AT THIS TIME. THANK YOU. ONLY ENOUGH FOR THE SUPERVISORS. I'M SORRY I DIDN'T PROVIDE IT FOR YOU. THAT'S ALL I HAVE TO SAY, EVEN THOUGH I HAVE 35 SECONDS LEFT.

**SUP. ANTONOVICH, MAYOR:** THANK YOU, LYNNE, GOOD JOKE.

**CAM NOLTEMEYER:** MY NAME IS CAM NOLTEMEYER, ALSO SPEAKING FOR SANTA CLARITA ORGANIZATION FOR PLANNING AND THE ENVIRONMENT. MAYOR ANTONOVICH, I KNOW YOU WERE AT A MEETING IN SANTA CLARITA ALONG WITH A COUPLE OF OUR COUNCIL MEMBERS WITH REGARD TO THE SANITATION DISTRICT TRYING TO PUT UPON THE TAXPAYERS 250 MILLION TO 500 MILLION FOR THE COST OF A REVERSE OSMOSIS TREATMENT PLANT TO REMOVE CHLORIDES TO MEET THE CLEAN WATER STANDARD. BECAUSE OF THAT, THERE WAS A LOT OF PUBLIC PROTEST, AND THAT MEETING DECISION HAS BEEN POSTPONED. AT THAT TIME,

THEY NOT ONLY WERE OBJECTING TO THE COST OF 250 TO 500 MILLION, BUT THEY WERE ALSO CONCERNED ABOUT THE FACT THAT THEY WERE FUNDING THE SANITATION DISTRICT FOR NEWHALL RANCH. AT THAT TIME, THE SANITATION DISTRICT MADE IT VERY CLEAR THAT THAT WOULDN'T HAPPEN. NOW WE APPEAR BEFORE YOU, AND NEWHALL LAND IS CLAIMING THAT THEY HAVE THIS AGREEMENT WITH THE SANITATION -- ACTUALLY SANTA CLARITA VALLEY SANITATION DISTRICT OF LOS ANGELES COUNTY TO ALLOW THESE 6,000 UNITS TO BE TREATED IN OUR EXISTING SANTA CLARITA WASTEWATER FACILITIES. THOSE FACILITIES ARE NOT REVERSE OSMOSIS PLANTS. AND IF THIS IS ALLOWED, IT WILL ONLY CREATE ADDITIONAL PROBLEM AS FAR AS THE CHLORIDES FOR OUR COMMUNITY. THE REVERSE OSMOSIS PLANT THAT IS REQUIRED WITH THIS NEWHALL TREATMENT PLANT, THAT WILL TAKE CARE OF CHLORIDES. SO DEFINITELY, THEY SHOULDN'T BE ALLOWED TO USE ANY OTHER TREATMENT PLANT. THEY CAN BUILD THIS PLANT, AND IT'S QUITE CLEAR IN THE DOCUMENTS WE HAVE HERE THAT THEY CAN BUILD THAT IN STAGES IN THE SAME WAY THEY ARE PLANNING TO BUILD THE HOUSES IN STAGES. SO WE DEFINITELY ARE OBJECTING TO ANY IDEA OF 6,000 UNITS OF NEWHALL RANCH BEING ALLOWED TO USE THE CURRENT SANITATION FACILITIES BECAUSE OF THE CHLORIDE ISSUE. AND IT'S A VERY, VERY EXPENSIVE ISSUE FOR OUR COMMUNITY. AND WE WERE PROMISED THAT WE WOULD NOT BE FUNDING ANYTHING FOR THE NEWHALL RANCH. I HAVE 31 SECONDS, BUT THAT IS ALL I HAVE FOR TODAY, THANK YOU.

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**LYNNE PLAMBECK:** AND IF THAT'S WHAT THEY'RE GOING TO DO, THEY HAVE TO HAVE ADDITIONAL ENVIRONMENTAL ANALYSIS ON IT.

**SUP. ANTONOVICH, MAYOR:** OKAY.

**MARK DILLON:** MARK DILLON. GOOD AFTERNOON, SUPERVISORS. HERE SIMPLY TO SUPPORT YOUR STAFF AND THE ACTION HERE TODAY THAT IS BEFORE YOU. AND IF THERE ARE ANY QUESTIONS, I'M HERE TO ANSWER THOSE.

**SUP. ANTONOVICH, MAYOR:** OKAY, THANK YOU. THANK YOU. LET ME ASK DEPARTMENT OF PUBLIC WORKS? COULD YOU RESPOND TO THE NUMBER OF ISSUES THAT HAVE BEEN RAISED RELATIVE TO THIS PROPOSAL?

**SPEAKER:** TOM LE BRUN WITH THE SANITATION DISTRICT IS HERE WITH ME. HE MAY BE ABLE TO ANSWER THE QUESTIONS REGARDING THE CONCERNS REGARDING THE 6,000 UNITS.

**TOM LEBRUN:** THE SANTA CLARITA VALLEY BOARD APPROVED AN AGREEMENT WITH NEWHALL LAND AND FARMING IN 2002 WHICH ALLOWED UP TO 6,000 OF THE FIRST HOMES OF THE NEWHALL RANCH DEVELOPMENT TO GO THROUGH THE VALENCIA W.R.P. BUT IT REQUIRES THE NEWHALL COMPANY TO PAY THE SAME RATES THAT ANY OTHER DEVELOPER WOULD HAVE IN SANTA CLARITA SANTITATION DISTRICT, THAT BEING A CONNECTIONS FEE TO BUY INTO THE EXISTING SYSTEM,

AND THEN AN ANNUAL PAYMENT FOR THE COST TO OPERATE AND TREAT THE 6,000, THE WASTE FROM THE 6,000 HOMES. SO THAT AGREEMENT PREDATED SOME OF THE OTHER AGREEMENTS AND ACTIONS THAT THE BOARD AND L.A.P.C.O. HAVE TAKEN PREVIOUSLY. AND I THINK THAT WAS THE ONE QUESTION ABOUT WOULD THERE BE FUNDING BY SANTA CLARITA VALLEY RESIDENTS FOR NEWHALL RANCH? THE ANSWER IS NO. NEWHALL LAND AND FARMING WOULD HAVE TO PAY, JUST LIKE ANY OTHER DEVELOPMENT, TO USE THE VALENCIA W.R.P. I DON'T KNOW IF THERE WAS ANY OTHER SPECIFIC QUESTIONS ON --

**SUP. ANTONOVICH, MAYOR:** SO WHO PAYS FOR THE -- WHEN IT HAS TO BE ENLARGED, WHO PAYS FOR IT?

**TOM LE BRUN:** WHEN THE VALENCIA PLANT WOULD BE ENLARGED --

**SUP. ANTONOVICH, MAYOR:** THE NEW PROPOSAL, THE NEW DEVELOPMENT, IS THAT GOING TO HAVE A BUILT-IN FEE FOR EXPANSION OF THAT UNIT?

**TOM LE BRUN:** THE 6,000 HOMES WOULD USE UP SOME AVAILABLE CAPACITY IN SANTA CLARITA VALLEY. THIS IS A TEMPORARY ARRANGEMENT UNTIL THE NEWHALL RANCH W.R.P. IS CONSTRUCTED. THAT WOULD BE PAID FOR BY NEWHALL LAND AND FARMING. AND THEN THE FLOWS WOULD, INSTEAD OF BEING PUMPED TO VALENCIA, WOULD FLOW BY GRAVITY TO THE NEW TREATMENT PLANT AT THE COUNTY LINE.

**SUP. ANTONOVICH, MAYOR:** SO THEIR ADDITION IS NOT GOING TO MAXIMIZE THE CAPACITY, IT'S GOING TO USE EXISTING RESERVE CAPACITY SO WE DON'T HAVE TO BUILD A FUTURE ONE?

**TOM LE BRUN:** THAT IS CORRECT.

**SUP. ANTONOVICH, MAYOR:** AND THEY'RE GOING TO PAY A FEE TO USE THE EXISTING FACILITY WHILE THE NEW ONE'S BEING CONSTRUCTED?

**TOM LE BRUN:** THAT IS CORRECT.

**SUP. ANTONOVICH, MAYOR:** AND THE EXISTING FEE WILL PAY FOR ALL MAINTENANCE?

**TOM LE BRUN:** YES.

**SUP. ANTONOVICH, MAYOR:** IT WILL COVER THE MAINTENANCE.

**TOM LE BRUN:** THEY WILL PAY A FEE TO CONNECT, WHICH IS THE SAME THAT ANY DEVELOPER WOULD PAY ANYWHERE IN SANTA CLARITA VALLEY SANITATION DISTRICT, AND THEY WOULD HAVE TO PAY EVERY YEAR THE COST TO TREAT THE WASTE FROM THOSE 6,000 HOMES.

**SUP. ANTONOVICH, MAYOR:** WHAT ABOUT THE OTHER ISSUES THAT WERE RAISED?

**TOM LE BRUN:** I AM UNABLE TO TELL YOU BY MEMORY WHAT C.E.Q.A. COVERAGE THERE WAS IN 2002 WHEN THE AGREEMENT WAS PASSED. I JUST DO NOT HAVE THE ANSWER TO THAT. AND IN TERMS OF THE SPECIFIC COVERAGE IN THE NEWHALL SPECIFIC PLAN WITH THE ABILITY FOR THIS WASTEWATER TO TEMPORARILY GO TO THE VALENCIA PLANT, I AM UNAWARE OF THE DETAILS OF HOW THAT ISSUE'S COVERED IN THE NEWHALL RANCH SPECIFIC PLAN, THE E.I.R.

**SUP. ANTONOVICH, MAYOR:** COULD YOU ALSO REPORT TO THE BOARD ON THE POINTS THAT WERE RAISED AND THEIR TESTIMONY SO WE COULD HAVE THAT?

**TOM LE BRUN:** I'M SORRY, I DIDN'T HEAR YOU, SUPERVISOR.

**SUP. ANTONOVICH, MAYOR:** I WOULD LIKE YOU TO RESPOND TO THE BOARD IN A MEMO THE POINTS THAT WERE RAISED BY THE THREE SPEAKERS ON THIS ISSUE.

**TOM LE BRUN:** CERTAINLY.

**LYNNE PLAMBECK:** MR. MAYOR, COULD YOU SPECIFICALLY ASK HIM TO RESPOND TO WHO IS GOING TO PAY FOR THE COST OF THE CHLORIDES IN THE WATER? BECAUSE THERE IS NO REVERSE OSMOSIS.

**SUP. ANTONOVICH, MAYOR:** THAT'S ONE OF THE QUESTIONS THAT YOU RAISED, AND THAT WILL BE INCLUDED IN THAT REPORT.

**LYNNE PLAMBECK:** THANK YOU VERY MUCH.

**SUP. ANTONOVICH, MAYOR:** OKAY, THANK YOU. THANK YOU, THANK YOU. SO MOVED. SECONDED BY SUPERVISOR RIDLEY-THOMAS. WITHOUT OBJECTION, SO ORDERED. ITEM NO. 5. DAVID CZAMANSKE, LAURIE GOULD, CAMRON STONE, GLEN OWENS, AND CAROL, YOU'LL FOLLOW AFTER THE FIRST SPEAKER, OKAY? THAT'S THE ARTICLE FROM THE "WALL STREET JOURNAL." SO THE FIVE OF YOU ARE STILL HERE, RIGHT? COME ON UP AND TAKE YOUR SEAT. OKAY. YOU CAN GO IN THE ORDER YOU WANT.

**LAURIE GOULD:** I'M SPEAKING TO THE ESTABLISH A WORKING GROUP WITH COMMUNITY REPRESENTATIVES TO PROVIDE INPUT TO THE LOS ANGELES --

**SUP. ANTONOVICH, MAYOR:** GIVE YOUR NAME FOR THE RECORD, FIRST SO THAT WE CAN IDENTIFY YOU.

**Interconnection Agreement Between County Sanitation Districts Nos. 26 and 32 of Los Angeles County and the Newhall Land Farming Company (January 9, 2002)**

CSD Contr#3868

# AGREEMENT

## BETWEEN COUNTY SANITATION DISTRICTS NOS. 26 AND 32 OF LOS ANGELES COUNTY AND THE NEWHALL LAND AND FARMING COMPANY REGARDING A PLAN FOR THE COORDINATION OF WASTEWATER MANAGEMENT FACILITIES RELATING TO THE NEWHALL RANCH SPECIFIC PLAN DEVELOPMENT

This Agreement is made and entered into this 9th day of January, 2002, by and between **County Sanitation Districts Nos. 26 and 32 of Los Angeles County** (collectively **Districts** and individually **District No. 26** or **District No. 32**, respectively), special districts organized and existing pursuant to the County Sanitation District Act, California Health and Safety Code Sections 4700 et seq., and **The Newhall Land and Farming Company (NLFC)**, a California limited partnership.

## RECITALS

1. NLFC owns land in unincorporated Los Angeles County adjacent to and west of the Districts and is proposing to construct a new development pursuant to the Newhall Ranch Specific Plan.

2. NLFC is currently planning, designing, and engineering the wastewater conveyance, treatment and disposal systems to serve the Newhall Ranch Specific Plan development.

3. A site for a new wastewater treatment plant within the proposed development area is identified in the Newhall Ranch Specific Plan.

4. NLFC has proposed the formation of a new county sanitation district to provide wastewater management services for the Newhall Ranch Specific Plan area pursuant to the County Sanitation District Act of 1923 and the Cortese-Knox-Hertzberg Reorganization Act of 2000.

5. The Districts currently provide wastewater management services for areas immediately adjacent to the Newhall Ranch Specific Plan area.

6. The Districts, together with all of the other County Sanitation Districts of Los Angeles County, are signatory to the "Amended Joint Administration Agreement," effective July 1, 1980, (JAA) providing for the joint management, administration and staffing of the signatory districts.



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7. The Districts are signatory to the "Joint Powers Agreement for a Regional Sewerage System in the Santa Clarita Valley," effective May 8, 1984, (SCVJSSA), which provides for the joint operation of the wastewater management facilities within the Districts.

8. There are benefits in coordinating the wastewater management services between the Districts and the areas that would be served by a new county sanitation district. To this end, NLFC and the Districts have previously entered into a Reimbursement Agreement to cover the expenses for joint planning of wastewater management facilities.

9. It is desirable to prepare a plan for coordinated wastewater management facilities prior to the formation of the new county sanitation district. This plan will serve as a "road map" for the formation of the new county sanitation district and its subsequent operation.

10. The anticipated total flow originating from within the boundaries of the new county sanitation district is 6.9 million gallons per day (mgd).

**NOW, THEREFORE**, in consideration of the promises and mutual covenants herein contained, the parties hereto agree as follows:

I. FORMATION AND GOVERNING AGREEMENTS

A. NLFC shall request that the Los Angeles County Board of Supervisors petition the Local Agency Formation Commission (LAFCO) to:

1. approve the formation of a new county sanitation district; and

2. use the terms of this Agreement as a guide for the preparation of the conditions of formation for the new county sanitation district; and

3. require, as conditions of the formation, that the new county sanitation district make formal application to the Districts:

a. to become signatory to the JAA, and

b. to enter into an agreement substantially similar to the existing SCVJSSA regarding the ownership and operation of wastewater management facilities in the Santa Clarita Valley.

NLFC shall be responsible for preparing and submitting any necessary documents requested by the Board of Supervisors to complete the petition for formation. The Districts shall provide assistance and information to LAFCO and NLFC as requested.

B. The agreement specified in Section I.A.3.b shall be functionally the same as the existing SCVJSSA attached as Exhibit A hereto, except that it shall contain the following modifications:

1. All existing and future treatment and disposal facilities and all existing and future conveyance facilities that carry wastewater from more than one District shall be jointly owned by all of the parties signatory to the modified SCVJSSA. These jointly owned facilities shall be referred to as the Santa Clarita Valley Joint Sewerage System (SCVJSS). The rights to use these facilities shall be on a first-come, first-serve basis, except as provided below:

   a. The new county sanitation district, at its own cost and expense, shall have the right to build and use up to 6.9 mgd of capacity at the site identified in the Newhall Ranch Specific Plan for the proposed Newhall Ranch Water Reclamation Plant (NRWRP).

   b. The new county sanitation district shall have limited rights to use capacity at the Valencia Water Reclamation Plant (VWRP), pursuant to Section II.

2. The cost of operating the jointly owned facilities shall be apportioned to each party on the basis of the number of sewage units, as that term is defined in the JAA, attributable to that party's use of the wastewater management facilities. Any costs not attributable to jointly owned facilities shall be the sole responsibility of the party that caused those costs to be incurred.

3. The decision to expand the capacity of the NRWRP shall only require the approval of one party to the modified SCVJSSA until the new county

sanitation district uses 6.9 mgd of capacity in the SCVJSS. After the new county sanitation district uses 6.9 mgd of capacity in the SCVJSS, the decision to expand the capacity of the NRWRP shall require majority approval.

II. INITIAL CONNECTION OF DISCHARGERS IN THE NEW COUNTY SANITATION DISTRICT

A. NLFC shall be allowed to connect parcels located within the new county sanitation district to the SCVJSSA with a discharge of up to 3,000 capacity units, upon compliance with all of the following conditions:

1. The new county sanitation district is formed.

2. The new county sanitation district becomes a party to both the JAA and modified SCVJSSA with the consent of the other parties thereto.

3. The new county sanitation district has enacted appropriate connection fee ordinances providing for the new county sanitation district to pay into the SCVJSS Capital Improvement Fund the same amount for each discharger within the new county sanitation district that District No. 32 would have paid into the SCVJSS Capital Improvement Fund if that discharger had been located within District No. 32.

4. The new county sanitation district and NLFC have executed an agreement pertaining to the initial management expenses pursuant to Section VIII.

5. NLFC conveys title to 21.5 acres of land to the new county sanitation district for siting the NRWRP.

B. In addition to the 3,000 capacity units allowed in Section II.A, NLFC shall be allowed to connect additional parcels with a discharge of up to 3,000 capacity units provided that:

1. The conditions of Section II.A are fulfilled.

2. An NPDES permit has been obtained for the initial 2 mgd stage of the NRWRP, pursuant to the terms of Section III of this Agreement.

## III. NEWHALL RANCH WATER RECLAMATION PLANT

A. NLFC will design and obtain necessary permits from the Regional Water Quality Control Board for, and fund construction of, the initial 2 mgd stage of the NRWRP, including any necessary agreements or facilities for effluent disposal.

B. The initial 2 mgd stage of the NRWRP will be designed and permitted to have an effluent disposal system independent of the existing Districts' facilities, discharging either directly to the river or other permitted place of discharge or reuse. When the initial 2 mgd stage of the NRWRP is designed and permitted, a plan will be put in place to guarantee the discharge of up to 6.9 mgd of effluent to be disposed or reused in a manner similar to the first 2 mgd. This plan will be subject to the review and approval of the Districts' Chief Engineer and General Manager (Chief Engineer). This plan will include an agreement with the reclaimed water purveying agency to take effluent from the NRWRP. The Districts will allow, under terms agreeable to the Districts, available reclaimed water from the VWRP to be taken by a reclaimed water purveying agency for use on Newhall Ranch.

C. Upon completion of the construction of the initial 2 mgd stage of the NRWRP and a successful demonstration of its operation, the NRWRP shall become a jointly owned facility of the Districts and the new county sanitation district, and the Districts and the new county sanitation district will assume ownership of and responsibility for the operation and maintenance of the NRWRP and for future expansions of the NRWRP.

D. NLFC agrees to compensate the SCVJSS for any costs incurred by the SCVJSS to make the initial 2 mgd stage of the NRWRP compliant with any of the permits required for the operation and maintenance thereof if, upon initial start up and operation, it is unable to meet its permit conditions or requirements. The SCVJSS shall be responsible for bringing the NRWRP into compliance with any future changes to permit conditions or requirements.

## IV. MANAGEMENT OF THE SANTA CLARITA VALLEY JOINT SEWERAGE SYSTEM

A. Upon acceptance of the initial 2 mgd stage of the NRWRP by the SCVJSS, the Chief Engineer shall have the right to divert flow from the Districts to the NRWRP as he deems necessary for the proper and economic operation of the NRWRP and the SCVJSS as a whole.

B. Upon the initial 2 mgd stage of the NRWRP becoming a SCVJSS facility, the SCVJSS shall be responsible for future expansions of the NRWRP except that the new county sanitation district will retain its right to construct up to 6.9 mgd of capacity at the NRWRP site at its own cost and expense pursuant to Section 1.B. The SCVJSS shall be relieved of this responsibility to construct additional capacity for the use of the new county sanitation district if insufficient disposal capacity exists for the proposed NRWRP expansion.

## V. CONVEYANCE FACILITIES

A. NLFC will design, fund, and construct a sewer system to collect and convey all of the wastewater to be generated within the new county sanitation district to the proposed NRWRP.

B. NLFC will design, fund, and construct all sewers, pumping plants, or force mains required to convey any flow generated within the new county sanitation district that will be treated at the VWRP.

C. The Chief Engineer will identify those sewers, pumping plants, and force mains that will be owned and operated by the new county sanitation district or the SCVJSS during the review of the design for the sewer system. Sewers that will be owned by the new county sanitation district or the SCVJSS will be designated trunk sewers. Generally, an individual district or the SCVJSS will assume ownership of and operation and maintenance responsibilities for any sewers 18 inches in diameter and larger. The design of all sewers, pumping plants, and force mains to be owned by the new county sanitation district or the SCVJSS shall be subject to the design review and approval of the Chief Engineer.

D. NLFC will be responsible for operation and maintenance of the local sewers, pumping plants, and force mains, or transfer these responsibilities to another party willing to assume that responsibility.

E. If, during the design review, the Chief Engineer determines that the trunk sewers, pumping plants, or force mains should be increased in size for uses other than those in the new county sanitation district, then NLFC shall construct these facilities with the increased capacity specified by the Chief Engineer, subject to the reimbursement provisions, below.

## VI. REIMBURSEMENT

A. NLFC shall be reimbursed for its costs for the design, permitting, and construction of the initial 2 mgd stage of the NRWRP and the conveyance system.

1. NLFC's reimbursable costs for the initial 2 mgd stage of the NRWRP shall be determined as follows:

   a. The costs for the construction shall be based on the amount approved by Chief Engineer.

   b. The costs for the design and planning (including permitting) shall be based on the amount of the construction contract and the allowance factors utilized under the State Revolving Fund (SRF) loan program.

   c. The costs for the site improvements shall be based upon the difference between the cost of the site improvements for all 21.5 acres and the cost to improve the site to accommodate a 6.9 mgd treatment facility.

2. The costs for the conveyance facilities related to upsizing requested by the Chief Engineer shall be based on the difference between the actual cost of the conveyance facilities as designed and constructed, and the Chief Engineer's determination of the estimated cost for design and construction of the conveyance facilities if upsizing had not been requested by the Chief Engineer.

3. The costs for the conveyance system not related to upsizing shall be based upon the difference between the actual cost of the conveyance system designed and constructed, excluding the cost of upsizing, as calculated in accordance with Section VI.A.2, and the Chief Engineer's determination of the estimated cost to design and construct a conveyance system to serve the initial stages of the Newhall Ranch Specific Plan development. The size of the conveyance system required to support the initial stages of the Newhall Ranch Specific Plan Development shall be determined by the parties hereto, including the new county sanitation district if already formed, following the completion of design.

4. The reimbursement of costs and expenses related to the construction of the initial 2 mgd stage of the NRWRP shall be in the form of:

   a. A cash payment equivalent to the amount of the connection fees paid for up to 3,000 capacity units connected pursuant to Section II.B during construction of the initial 2 mgd stage of the NRWRP. This payment shall be made at the time the NRWRP becomes a jointly owned facility of the new county sanitation district and the Districts pursuant to Section III.C.

   b. Credits to be applied against connection fees imposed by the new county sanitation district on connections made after the NRWRP becomes a jointly owned facility of the new county sanitation district and the Districts pursuant to Section III.C.

   For purposes of this Section, no credit or reimbursement shall be given for costs that were financed pursuant to Section VII of this Agreement.

5. The reimbursement for costs related to upsizing of the conveyance system requested by the Chief Engineer shall be, at the option of NLFC, in the form of either a credit to be applied against future connection fees imposed by the new county sanitation district or a cash payment.

6. The reimbursement for costs for conveyance facilities for the new county sanitation district not related to upsizing requested by the Chief Engineer

shall be in the form of a credit to be applied against future connection fees imposed by the new county sanitation district.

## VII. STATE REVOLVING FUND LOANS

NLFC and the Districts agree to cooperate and use their best efforts to obtain low interest State Revolving Fund (SRF) loans to fund construction of the initial 2 mgd stage of the NRWRP. NLFC shall guarantee repayment of debt service if the connection fee revenue in the new county sanitation district is insufficient to meet the annual debt repayment.

## VIII. INITIAL MANAGEMENT COSTS FOR THE NEW COUNTY SANITATION DISTRICT

NLFC agrees to pay the new county sanitation district for all costs related to operation of the new county sanitation district until the new county sanitation district begins collecting user fees adequate to fund its ongoing obligations. Terms for this agreement, including reimbursement, will be delineated in an agreement between NLFC and the new county sanitation district following its formation.

## IX. CHLORIDE CONTROL MEASURES

A. NLFC shall support the efforts of both the new county sanitation district and the Districts (i) to implement ordinances regarding the control of chlorides; (ii) to defend the ordinances regulating chlorides against any legal or political challenges; and (iii) to implement or change chloride related legislation or regulatory requirements. As part of its assistance, NLFC shall not unreasonably withhold approval for the Districts to utilize lands owned by NLFC for a chloride threshold evaluation study.

B. NLFC will use its best efforts to assist in providing information to residential and commercial properties in the new sanitation district concerning regulations and issues pertaining to the control of chlorides.

## X. FAILURE TO IMPLEMENT/COMPLY

A. If, following formation of the new county sanitation district, the new county sanitation district fails to make formal application to become signatory to the JAA, or refuses to sign the JAA, this Agreement shall terminate, except that NLFC shall

continue to be responsible for any cost or expense incurred by the Districts pursuant to the terms of the Reimbursement Agreement. If any of the other County Sanitation Districts of Los Angeles County refuse to allow the new county sanitation district to become a party to the JAA, this Agreement shall terminate, except that NLFC shall continue to be responsible for any cost or expense incurred by the Districts pursuant to the terms of the Reimbursement Agreement and the Districts shall continue to be responsible for reimbursing NLFC for any cost or expense incurred on behalf of the Districts pursuant to Section V.E of this Agreement.

B. If, following the formation of the new county sanitation district, the new county sanitation district fails to request that the Districts enter into an agreement substantially similar to the SCVJSSA or refuses to sign such an agreement, this Agreement shall terminate, except that NLFC shall continue to be responsible for any cost or expense incurred by the Districts pursuant to the terms of the Reimbursement Agreement. If the Districts refuse to enter into such an agreement with the new county sanitation district, this Agreement shall terminate, except that NLFC shall continue to be responsible for any cost or expense incurred by the Districts pursuant to the terms of the Reimbursement Agreement and Districts shall continue to be responsible for reimbursing NLFC for any upsizing cost or expense incurred on behalf of the Districts pursuant to Section V.E of this Agreement.

C. If NLFC fails to obtain an NPDES permit pursuant to the terms of Sections II and III of this Agreement, then NLFC shall pay to the Districts the full amount of the fees required to annex to District No. 32 any parcels that have been connected pursuant to Section II, and this Agreement shall terminate except that the Districts shall retain title to any lands transferred pursuant to Section II.

## XI. EXCLUSIVE REMEDY

The parties to this agreement understand and agree that if the Districts or the SCVJSSA are unable, for reasons beyond their control, to construct further stages of the NRWRP, NLFC's sole and exclusive remedy is to construct or request the new county sanitation district to construct any needed capacity for the Newhall Ranch Specific Plan development at the NRWRP.

## XII. ASSIGNMENT

Any of the parties may assign their interests in this Agreement to a third party with the approval of the other parties. This approval shall not be unreasonably withheld. NLFC hereby consents and approves any assignment by the Districts to any of the other County Sanitation Districts of Los Angeles County.

## XIII. INDEMNIFICATION

A. NLFC agrees that neither the Districts, nor any of their officers, directors, or employees shall be liable for any costs or expenses arising out of NLFC's performance of its duties under the terms of this Agreement including, but not limited to, the formation of the new county sanitation district, the transfer of property related to the siting of the NRWRP, and the design and permitting of the initial 2 mgd stage of the NRWRP. NLFC shall fully indemnify and hold the Districts harmless from any and all claims, actions, liabilities, costs or expenses arising out of NLFC's performance of this Agreement, including reasonable attorneys fees, losses and/or liabilities incurred by the Districts as a result thereof.

B. NLFC agrees that neither the Districts, nor the SCVJSSA, nor any of their officers, directors, or employees shall have any liability to NLFC or its successors or assigns or otherwise have any responsibility to NLFC if, after assuming ownership and operation of the NRWRP, the SCVJSS is unable, for reasons beyond its immediate control, to construct further expansions of the NRWRP. NLFC shall hold the Districts and the SCVJSS harmless from any and all costs, expenses, and/or losses resulting from NLFC's inability to develop its holdings within the new county sanitation district under such conditions.

C. The Districts agree that neither NLFC, nor any of its officers, directors, or employees shall be responsible for any claims, liability, demands or actions arising out of the operation of the NRWRP once the SCVJSS has assumed ownership. It is also understood and agreed that the Districts shall fully indemnify and hold NLFC harmless from any and all costs or expenses incurred, including reasonable attorneys fees, losses and/or liability attributable to any such claims resulting from the Districts' actions unless otherwise provided for in this Agreement.

XIV. MISCELLANEOUS

A. Entire Agreement. This Agreement (i) contains, and is intended as, a complete statement of all the terms of the arrangements of the parties with respect to the matters provided for herein; (ii) supersedes any previous agreements, written or oral, and understandings among the parties with regard to those matters; and (iii) cannot be changed or terminated orally. Notwithstanding the foregoing, the parties acknowledge that the provisions of any other valid mutual written agreements shall remain in full force and effect.

B. Waiver. Any party may waive compliance by the other party with respect to any provisions of this Agreement. No waiver of any provision shall be construed as a waiver of any other provision. No waiver shall be construed as an ongoing waiver with respect to subsequent events unless it expressly so provides. Any waiver must be in writing, signed by the waiving party and recite the provisions being waived.

C. Binding Effect. Subject to the terms and conditions elsewhere in this Agreement, this Agreement shall be binding upon and inure to the benefit of the parties and their respective successors and assigns. Except for rights created pursuant to the indemnity provisions of this Agreement, nothing in this Agreement shall create or be deemed to create any third party beneficiary rights of any person or entity not a party to this Agreement.

D. Duplicate Originals. This Agreement shall be executed in duplicate originals.

E. Further Assurances. Upon request by any party, the parties covenant, at any time and from time to time, to cooperate reasonably with each other and take all such further actions, including without limitation the execution and filing of additional instruments or documents, as may be reasonably necessary to carry out the intent, purposes and terms of this Agreement. Such cooperation shall be exercised in good faith with respect to any additional instruments or documents that may be necessary to carry out the intent, purposes, and terms of this Agreement, and any such additional instruments or documents shall be reviewed on their own merits, and not as a basis for the introduction of unrelated matters, nor require any additional consideration.

F. Applicable Law. This Agreement shall be construed in accordance with the laws of the State of California. Venue for any proceeding shall be the Superior Court of Los Angeles County.

G. Incorporation of Recitals. The Recitals to this Agreement are incorporated herein by this reference and are acknowledged by the parties to be true and correct.

H. Action By The Chief Engineer. Except as otherwise provided in this Agreement, the Chief Engineer shall have the authority to take all actions on behalf of the Districts in connection with any approvals or actions required of or by the Districts under this Agreement.

I. No Joint Venture. This Agreement does not constitute and shall not be construed as constituting a partnership or joint venture between the Districts and NLFC in any matter whatsoever.

J. Construction/Interpretation. The parties to this Agreement acknowledge that they have been represented by counsel in respect of the negotiation and drafting of this Agreement, and that no term, covenant or condition of this Agreement shall be construed or interpreted by reference to the extent to which either party participated in the drafting of the Agreement, or any party thereof.

K. Attorneys' Fees. In any action or proceeding arising under this Agreement, or to enforce the provisions of this Agreement, the parties shall bear their own attorneys' fees and costs.

L. Amendments in Writing/Cooperation. This Agreement may be amended or modified, but only in writing, duly executed by the parties to this Agreement. The parties shall cooperate in good faith with respect to any amendment or modification proposed in order to clarify the intent and application of this Agreement, and shall treat any such proposal on its own merits, and not as a basis for the introduction of unrelated matters.

M. Time of Essence. Time is of the essence in the performance of the provisions of this Agreement.

N. Notices. All notices, requests, demands, or other communications under this Agreement shall be in writing (except for any emergency notice, which must be followed by written notice as soon as reasonably possible but in no event more than twenty-four (24) hours from the oral notice) and sent to the addressees of each party. Notice will be sufficiently given for all purposes as follows:

*PERSONAL DELIVERY*: When personally delivered to the recipient. Notice is effective on delivery.

*FIRST-CLASS MAIL*: When mailed first-class to the last address of the recipient known to the party giving notice. Notice is effective five mail delivery days after it is deposited in a United States Postal Service office or mailbox.

*CERTIFIED MAIL*: When mailed certified mail, return receipt requested. Notice is effective on receipt, if a return receipt confirms delivery.

*OVERNIGHT DELIVERY*: When delivery by an overnight delivery service such as Federal Express, charged prepaid or charged to the sender's account. Notice is effective on delivery, if delivery is confirmed by the delivery service.

*FACSIMILE DELIVERY*: When transmitted by facsimile to a party's fax number, a written notice shall be contemporaneously sent by personal delivery, first-class mail, certified mail or overnight delivery. A facsimile notice is effective if received within the hours of 8:00 a.m. to 4:00 p.m. (local time of the recipient) during the business day and a transmission report is generated reflecting the accurate transmission of this facsimile. If a facsimile is received at any other time, it shall be deemed received the next business day. A "business day" shall be Monday through Friday except for any holiday recognized by the Districts.

Addresses for purpose of giving notice are as follows:

DISTRICTS:

Mr. James F. Stahl
Chief Engineer and General Manager
County Sanitation Districts of Los Angeles County
1955 Workman Mill Road
Whittier, CA 90601-1400
Post Office Box 4998
Whittier, CA 90607-4998
Facsimile No.: (562) 695-8660

COPY TO:

B. Richard Marsh, Esq.
Daniel V. Hyde, Esq.
Lewis, D'Amato, Brisbois & Bisgaard LLP
221 North Figueroa Street, Suite 1200
Los Angeles, CA 90012
Facsimile No.: (213) 250-7900

NLFC:

Steven Zimmer
Vice President
The Newhall Land and Farming Company
23823 Valencia Boulevard
Valencia, CA 91355
Facsimile No.: (661) 288-1052

**IN WITNESS HEREOF, THE NEWHALL LAND AND FARMING COMPANY AND COUNTY SANITATION DISTRICTS NOS. 26 AND 32 OF LOS ANGELES COUNTY** hereby cause this Agreement to be executed and agree to be bound by the terms and conditions set forth herein.

**THE NEWHALL LAND AND FARMING COMPANY (A CALIFORNIA LIMITED PARTNERSHIP)**

By: Newhall Management Limited Partnership, a California limited partnership, Its Managing General Partner

By: Newhall Management Corporation, a California corporation, Its Managing General Partner

By: _____
Its Vice President

By: _____
Its Assistant Secretary

**ATTEST:**

**COUNTY SANITATION DISTRICT NO. 26 OF LOS ANGELES COUNTY**

By: M. Alma Horvath
Secretary

By: Jo Anne Darcy
Chairperson, Board of Directors
JAN 0 9 2002

**APPROVED AS TO FORM:**
**LEWIS, D'AMATO, BRISBOIS & BISGAARD, LLP**

By: Daniel V. Hyde
District Counsel

**ATTEST:**

**COUNTY SANITATION DISTRICT NO. 32 OF LOS ANGELES COUNTY**

By: M Alma Horvath
Secretary

By: Jo Anne Darcy
Chairperson, Board of Directors
JAN 0 9 2002

**APPROVED AS TO FORM:**
**LEWIS, D'AMATO, BRISBOIS & BISGAARD, LLP**

By: Daniel V. Hyde
District Counsel

# APPENDIX A

Joint Powers Agreement for a Regional Sewerage System
in the Santa Clarita Valley

CCRSTR # 2694

JOINT POWERS AGREEMENT
FOR A REGIONAL SEWERAGE SYSTEM
IN THE SANTA CLARITA VALLEY

THIS AGREEMENT is made and entered into this 8th day of May, 1984 by and between

COUNTY SANITATION DISTRICT NO. 26 OF LOS ANGELES COUNTY, hereinafter referred to as "DISTRICT NO. 26", and

COUNTY SANITATION DISTRICT NO. 32 OF LOS ANGELES COUNTY, hereinafter referred to as "DISTRICT NO. 32".

WITNESSETH

WHEREAS, pursuant to the provisions of the County Sanitation District Act of 1923 (Chapter 3, Part 3, Division 5, of the Health and Safety Code of the State of California), DISTRICT NO. 26 and DISTRICT NO. 32, hereinafter referred to collectively as the "Districts", have heretofore acquired necessary lands and rights-of-way and have carried out the construction of a sewage collection and treatment system to serve certain areas in the Santa Clarita Valley; and

WHEREAS, the Districts and their potential areas for annexation and expansion lie in the same drainage basin; and

WHEREAS, the projected wastewater flow from future development in the drainage basin exceeds the existing capacity of the treatment plants in both Districts; and

WHEREAS, the nature of the land adjacent to the Saugus Water Reclamation Plant (District No. 26) limits the area available for construction of expanded treatment works; and

WHEREAS, the Valencia Water Reclamation Plant (District No. 32) site has suitable land adequate in size for the construction of a regional treatment plant that would meet the needs of both Districts; and

WHEREAS, the wastewater flows attributable to both Districts can be managed most efficiently and economically through the creation and operation of a regional sewerage system; and

WHEREAS, the Districts entered into an Interim Joint Sewage Disposal Agreement dated April 24, 1979, which provided for the short-term disposal needs of both Districts and provided for the preparation of a facilities plan to assist in the development of a long-term regional wastewater treatment and disposal plan; and

WHEREAS, the Districts prepared a facilities plan dated April 1980, setting forth the long-term needs and solutions for the provision of adequate wastewater conveyance, treatment, and disposal facilities for both Districts; and

WHEREAS, it is the intent of the Districts to jointly finance, construct, and operate the regional conveyance, treatment, and disposal facilities necessary to provide for the long-term needs of the Districts;

NOW, THEREFORE, it is hereby agreed as follows:

1. DEFINITIONS

As used in this Agreement, the following terms shall have the meanings herein set forth:

a. Capital Improvement Fund

A separate fund for which any monies deposited therein and any interest derived thereon are to be used exclusively for payment of capital facilities, either local sewerage facilities or Santa Clarita Valley Joint Sewerage System facilities, as hereinafter defined.

b. Capital Costs

All expenditures made for the acquisition of or addition to fixed assets and all allocations to a fund for such purposes.

c. Chief Engineer

The Chief Engineer and General Manager of District No. 26 and District 32 or his duly authorized deputy or agent.

d. Connection Fee Ordinance(s)

Connection fee ordinance(s) shall refer to the "Connection Fee Ordinance for County Sanitation District No. 26 of Los Angeles County" adopted January 12, 1984 and as thereafter amended; and to the "Connection Fee Ordinance for County Sanitation District No. 32 of Los Angeles County", adopted January 12, 1984 and as thereafter amended.

e. Local Costs

Costs expended for the acquisition, construction, repair, replacement, reconstruction, and operation and maintenance of local sewerage facilities, as hereinafter defined.

f. Local Sewerage Facilities

Those sewer lines or portions thereof, pumping plants, and other sewerage facilities utilized solely by one District, and which serve to benefit only that District, and which have not been defined as part of the Santa Clarita Valley Joint Sewerage System, as hereinafter defined.

g. Joint Costs

Costs expended for the acquisition, construction, repair, replacement, reconstruction, and operation and maintenance of the Santa Clarita Valley Joint Sewerage System, as hereinafter defined.

h. Operation and Maintenance

The operation and maintenance of, and the repair, replacement, and upkeep of all sewerage facilities inclusive of all expenses incidental thereto.

i. Santa Clarita Valley Joint Sewerage System

The system of wastewater collection, treatment, and disposal facilities that provides a benefit to more than one District, which will initially consist of the facilities defined in Exhibit I; and as those facilities may from time to time be modified or expanded.

j. Service Charge Ordinance(s)

Service Charge Ordinance(s) shall refer to the "1983 Service Charge Ordinance of County Sanitation District No. 26", adopted April 12, 1983, and as thereafter amended; and to the "1983 Service Charge Ordinance of County Sanitation District No. 32", adopted April 12, 1983, and as thereafter amended.

k. Sewage Unit

The average daily quantity of sewage flow and strength from a single family home measured in terms of flow, chemical oxygen demand, and suspended solids as defined in the Service Charge Ordinance.

l. Surcharge Revenue

The revenue derived from the Wastewater Treatment Surcharge Program as provided in the Wastewater Ordinance, as hereinafter defined.

m. Wastewater Ordinance

An ordinance providing for the administration of an industrial wastewater control system, for regulating sewer construction or use, for the imposition of a permit requirement for industrial wastewater dischargers, for the prohibition or pretreatment of industrial wastewaters, for the imposition of fees and charges for the distribution of revenue and for other methods of controlling and regulating the discharge of wastewaters, adopted April 1, 1972, as amended July 1, 1980 and as thereafter amended.

2. ESTABLISHMENT OF AND JOINT PARTICIPATION IN A REGIONAL SEWERAGE SYSTEM

The parties hereto shall participate jointly according to proportions hereinafter specified in the acquisition, construction, ownership, mainte-

nance, and operation of the system of main trunk sewers, pumping plants, treatment plants, and sanitation works herein referred to as the "Santa Clarita Valley Joint Sewerage System" including the parts heretofore acquired or which may hereafter be acquired and/or constructed; and to pay for such ownership, maintenance, and operation in the manner hereinafter specified.

District No. 26 and District No. 32, together with other County Sanitation Districts of Los Angeles County, entered into an Amended Joint Administration Agreement on July 1, 1980, providing for a single and centralized administrative organization. District No. 26 and District No. 32 agree that this Joint Powers Agreement shall be administered and executed pursuant to the provisions of said Amended Joint Administration Agreement.

All contracts for construction of Santa Clarita Valley Joint Sewerage System facilities shall be awarded and administered by the District in which the facilities will be located. However, no such contract shall be awarded without the approval of both Districts.

3. CAPITAL IMPROVEMENT FUND

Each District shall establish a capital improvement fund, hereinafter referred to as the "Local Capital Improvement Fund", which shall be solely owned and maintained by that District. The Districts shall also establish a capital improvement fund, hereinafter referred to as the "Joint Capital Improvement Fund," which shall be jointly owned and maintained by both Districts.

All connection fees, as provided for in the connection fee ordinances, shall be apportioned into local and joint shares. The allocation percentages for the local and joint shares shall be determined annually by the Chief Engineer and shall be based upon the percentages of the connection fee which are attributable to local and joint costs, respectively. The local share shall be deposited into the Local Capital Improvement Fund of the District which collected the funds and the joint share shall be deposited into the Joint Capital Improvement Fund. All interest shall remain with the capital improvement fund from which it was derived.

Any monies on deposit in the existing local capital improvement funds at the execution of this Agreement shall likewise be apportioned between the local and joint capital improvement funds established by this Agreement. The allocation percentages for this procedure shall be the same as those in effect at the time of execution of this Agreement.

No monies shall be withdrawn from the Joint Capital Improvement Fund without the approval of both Districts.

4. ALLOCATION OF COSTS ATTRIBUTABLE TO THE SANTA CLARITA VALLEY JOINT SEWERAGE SYSTEM

a. Operation and Maintenance

All costs for operations and maintenance which are attributable to the Santa Clarita Valley Joint Sewerage System shall be apportioned

to each District in the ratio that the number of sewage units originating from each District bears to the aggregate number of sewage units in both Districts. The Chief Engineer and General Manager shall determine annually the total number of sewage units attributable to each District.

b. Original Capital Construction

Each District agrees that certain facilities, described in Exhibit 2 hereof, would have been constructed irrespective of this Agreement. Both Districts agree to construct those same facilities and allocate costs for such facilities not funded through the Joint Capital Improvement Fund as set forth in Exhibit 2.

c. Expansion Capital

All capital costs for projects which increase the capacity of the Santa Clarita Valley Joint Sewerage System but do not provide a greater level of treatment or disposal shall be financed through the use of the Joint Capital Improvement Fund to the extent possible. If the cost of such a project exceeds the resources available in the Joint Capital Improvement Fund, the remaining cost shall be apportioned to each District in the ratio that the number of sewage units attributable to each District bears to the aggregate number of sewage units in both Districts.

d. Upgrade Capital

All capital costs for projects which provide a greater level of treatment or disposal but do not increase the capacity of the Santa Clarita Valley Joint Sewerage System shall be apportioned to each District in the ratio that the number of sewage units attributable to each District bears to the aggregate number of sewage units in both Districts. If the capacity of the Santa Clarita Valley Joint Sewerage System exceeds the requirements of both Districts at the time a contract for an upgrade capital project is awarded, the costs associated with the excess capacity shall be financed through the use of the Joint Capital Improvement Fund to the extent possible.

5. LOCAL SEWERAGE FACILITIES

All costs associated with local sewerage facilities shall be the responsibility of the District for whose benefit such costs are incurred, and shall not be allocated in any manner to the other District.

6. ALLOCATION OF REVENUES

a. Grants

All monies received as grants to be expended for capital projects associated with the Santa Clarita Valley Joint Sewerage System shall be apportioned to each District in the same ratio that the cost of

said projects is apportioned to each District as provided for in Article 4 hereof.

b. Joint Contract Revenue

All revenue which is derived from a Joint Contract for the disposal of sewage, brine, or industrial wastewater originating from outside of the Districts' boundaries, as hereinafter defined, shall be apportioned into joint and local shares based upon the ratio of the local and joint costs to the total costs incurred due to said contract. The allocation percentages shall be determined annually by the Chief Engineer. The local share of said revenue shall be given to the District which has incurred local costs in conjunction with the execution of said contract. The joint share shall be apportioned to each District according to the ratio of its obligation to pay for the operation and maintenance costs of the system as provided in Article 4 hereof.

c. Other Joint Revenues

All revenue received from the sale of sludge, effluent, surplus energy or other by-products or which otherwise arises out of the ownership or operation of any Santa Clarita Valley Joint Sewerage System facility shall be apportioned to each District according to the ratio of its obligation to pay for operation and maintenance cost of the system as provided for in Article 4 hereof.

d. Local Revenue

All other revenue including, but not limited to, ad valorem taxes, surcharge revenue derived pursuant to the Wastewater Ordinance, service charges, annexation fees, investment income, payments from local contracts as hereinafter defined, and local capital improvement fund monies shall remain with the District from which it originates.

7. DISPOSAL OF SEWAGE ORIGINATING OUTSIDE DISTRICTS

Each District undertakes and agrees that it will not permit or knowingly countenance the use of the Santa Clarita Valley Joint Sewerage System, directly or indirectly, for the disposal of sewage, brine, or industrial wastes originating outside of its territorial limits except in the manner, to the extent, and on the conditions agreed upon by both Districts. In the event, however, that the anticipated sewage units from said outside source do not exceed one-half of one percent (.5%) of the aggregate number of sewage units originating from both Districts, such agreement by both Districts shall not be required. Any disposal contract for which agreement is not required shall be considered a local contract and the sewage units received from such a contract shall be regarded as having originated from the District with which the contract is made for the purpose of determining the total number of sewage units attributable to that District.

Any disposal contract heretofore or hereafter entered into, for which the actual or anticipated sewage units exceeds one-half of one percent (0.5%)

of the aggregate number of sewage units originating from both Districts shall be considered a joint contract. The sewage units attributable to a joint contract shall be apportioned to each District in the ratio that the number of sewage units originating in each District bears to the aggregate number of sewage units originating in both Districts.

8. TITLE TO REAL PROPERTY

Fee title to real property required for the Santa Clarita Valley Joint Sewerage System for the use and benefit of both Districts shall be acquired by, and in the name of, the District in which the said real property is located, whether such acquisition is by purchase, condemnation, gift, or otherwise.

9. SETTLEMENT OF DISPUTE OR CONTROVERSY

Should any dispute or controversy arise in connection with the books, records, or accounts of either District pertaining to the Santa Clarita Valley Joint Sewerage System or in connection with the acquisition, construction, maintenance, operation, repair, reconstruction, or enlargement of the Santa Clarita Valley Joint Sewerage System, or in connection with any of the affairs or operation thereof, the Boards of Directors of the Districts shall appoint a mutually agreed upon arbitrator, and the determination of said arbitrator shall be binding and conclusive.

10. WITHDRAWAL

This Agreement and the Santa Clarita Valley Joint Sewerage System provided hereby shall continue in effect so long as it shall be in the interest of both Districts. If at any time it should cease to be in the interest of either District to continue as a party to this Agreement, and its Board of Directors shall so find and declare by resolution, it may withdraw herefrom and terminate its obligation hereunder after sixty (60) days notice in writing of its intention to do so, and by the full and complete discharge of all its debts and obligations hereunder for which it shall be or become liable up to the date of its withdrawal.

Disposition of all assets of the Santa Clarita Valley Joint Sewerage System shall be in proportion to the number of sewage units attributable to each District on the date of withdrawal.

11. EFFECTIVE DATE

This Agreement shall become effective on July 1, 1984.

12. TERMINATION OF PRIOR AGREEMENT

It is mutually agreed that, upon the effective date of this Agreement; the Interim Joint Sewage Disposal Agreement, dated April 24, 1979, shall terminate and be of no further force and effect but the parties to such Agreement shall nevertheless pay and discharge all obligations previously accrued thereunder.

IN WITNESS WHEREOF, the parties have executed this Agreement the date and year above set forth.

ATTEST:

By _____
Secretary

COUNTY SANITATION DISTRICT NO. 26
OF LOS ANGELES COUNTY

By _____
Chairman

ATTEST:

By _____
Secretary

COUNTY SANITATION DISTRICT NO. 32
OF LOS ANGELES COUNTY

By _____
Chairman

APPROVED AS TO FORM:

KNAPP, GROSSMAN & MARSH

By _____
B. Richard Marsh, Counsel
for County Sanitation Districts
of Los Angeles County

EXHIBIT 1

The following facilities shall be defined as being part of the Santa Clarita Valley Joint Sewerage System:

(1) Saugus Water Reclamation Plant

(2) Valencia Water Reclamation Plant

(3) District 26 Interceptor

(4) District 32 Main, Sections 1 and 2

(5) Saugus Water Reclamation Plant Waste Activated Sludge Force Main

EXHIBIT 2

Per Article 4b of this Agreement, the facilities to be constructed are as follows:

Saugus Water Reclamation Plant (WRP) Filtration and Chlorination Facilities (Existing plant to be upgraded to advanced treatment):

- Primary sedimentation tank
- Return sludge pumps
- Waste activated sludge pump
- Filters with filter feed and backwash pump stations
- Filter waste backwash recovery tanks
- Chlorine contact tank
- Chlorination/dechlorination systems
- Alum/Polymer systems and appurtenances
- Standby power
- High pressure effluent system
- Office/lab addition

Saugus WRP Waste Activated Sludge Force Main (will convey waste activated sludge to the Valencia WRP):

- An approximately 14,900 L.F. force main

Valencia WRP Stage III Expansion (3.0 mgd expansion of plant capacity to receive additional flow):

- Influent pumps and metering
- Primary sedimentation tanks
- Aeration tank
- Final clarifier
- Return activated sludge pumps
- Waste activated sludge pumps
- Filters with filter feed pump station
- Waste backwash decant tank
- Chlorination/dechlorination equipment
- Maintenance building
- Effluent discharge line with meter
- High pressure effluent and non-potable water systems

Saugus/Valencia Solids Processing Facilities (construction of sludge digestion and dewatering facilities to handle solids from both District 26 and District 32):

- Dissolved air flotation thickener
- Anaerobic digesters
- Digester cleaning decant facility with submersible pump
- Digested sludge holding tanks
- Frame plate filter press and appurtenances

EXHIBIT 2 (cont.)

Filtrate equalization tank
Energy recovery system
Truck Maintenance Facility
Sludge Hauling Trucks

The Districts further agree to allocate the costs of these facilities according to the following percentages:

| FACILITY | DISTRICT NO. 26 PERCENTAGE | DISTRICT NO. 32 PERCENTAGE |
|---|---|---|
| Saugus WRP Filtration and Chlorination Facilities | 100% | 0% |
| Saugus WRP Activated Sludge Force Main | 100% | 0% |
| Valencia WRP Stage III Expansion (2.0 mgd which is grant fundable) | 100% | 0% |
| Valencia WRP Stage III Expansion (1.0 mgd which is not grant fundable) | 55% | 45% |
| Anaerobic Digesters at Valencia WRP (7.0 mgd which is grant fundable) | 100% | 0% |
| Anaerobic Digesters at Valencia WRP (1.0 mgd which is not grant fundable) | 55% | 45% |
| Solids Processing Facility (excluding anaerobic digesters) | 60% | 40% |
| Draft Tubes for Existing Valencia WRP Digesters | 0% | 100% |

# APPENDIX F4.18

## Agricultural Resources

**California Resources Agency, "Memorandum Regarding Resources Agency Policy On Projects Involving Agricultural Land" (May 4, 2005)**

STATE OF CALIFORNIA

RESOURCES AGENCY

ARNOLD SCHWARZENEGGER, Governor
MIKE CHRISMAN, Secretary

MEMORANDUM

TO: Resources Agency Departments, Boards and Commissions

FROM: MIKE CHRISMAN
Secretary for Resources *Mike Chrisman*

DATE: May 4, 2005

SUBJECT: Resources Agency Policy on Projects Involving Agricultural Land

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The purpose of this memorandum is to set forth the Resources Agency's policy with respect to projects undertaken by departments under Resources Agency involving agricultural lands. This policy flows from the joint memo issued by Secretaries Mike Chrisman of Resources Agency and A.G. Kawamura of the Department of Food and Agriculture (CDFA) in October 2004, which stated that the two agencies are "committed to working together to ensure that the policies of each agency are, to the fullest extent possible complementary rather than conflicting." The Secretaries asked staff to affirmatively and positively support efforts to harmonize policy between the agencies with respect to land and water use. The Secretaries also directed their respective departments to establish clear lines of communication and share information on actions. As indicated in this joint memo, it is the Resources Agency's policy that departments under Resources Agency should recognize the importance of both permanent preservation of productive agricultural land and restoration, protection and management of the state's natural, historical and cultural resources. Departments' activities should strive to benefit both agricultural and resource lands. The application of this policy to resource-related projects involving productive agricultural land is specified below.

<u>Project Development</u>

In selecting and developing resource-related projects, departments under Resources Agency should consider ways to reduce effects on productive agricultural lands. As a first step, all constituent departments should review the 24 different strategies for reducing the impact of the CALFED Ecosystem Restoration Program on agricultural land and water use, as set forth in Section 7.1 of Attachment 1 of the CALFED Programmatic Record of Decision in August 2000 (Impact 1, on pages 76-77). In certifying the CALFED Programmatic Environmental Impact Report, the Resources Agency committed, on its own behalf and on behalf of the Department of Water Resources and the Department of Fish and Game, to consider and adopt such strategies where appropriate in development and implementation of CALFED projects. Resources Agency believes that the strategies set forth in Section 7.1 are good examples of the types of approaches that can be used for many resource-related projects, not just CALFED projects. Resources Agency encourages all constituent departments to incorporate, where appropriate, one or more of these 24 strategies, or other similar strategies, in connection with their resource-related projects. Resources Agency also encourages departments to work with local agencies and other State departments, including Department of Conservation and CDFA, to identify other methods to benefit both agricultural and resource lands.

CEQA Review of Resource-Related Projects

The question whether conversion of productive farmland to a different use is per se a substantial adverse change in the physical environment is currently in litigation. Resources Agency is not taking a position on this issue outside of the litigation context. However, because Resources Agency and its departments are parties to litigation raising this issue, departments should avoid making statements in CEQA documents that could be used by litigants against Resources Agency in pending litigation.

While this legal issue remains open, as a matter of policy, departments should consider the following steps

First, as noted above, where feasible, the resource-related project should include both restoration and agricultural preservation benefits.

Second, CEQA documents (environmental impact reports and negative declarations) for resource-related projects that involve agricultural land should include a separate section that describes the social and economic consequences of a conversion. The inclusion of such information in CEQA documents is specifically authorized by Section 15131 of the CEQA Guidelines. Resources Agency encourages departments to identify within the document the steps the lead agency has taken in designing the project to minimize and avoid such consequences.

Third, the lead agency should analyze each situation on a case-by-case basis. Even if a court ultimately decides that conversion of productive farmland to some other use is not in itself a substantial adverse change in the physical environment, a resource-related project can still cause a potentially significant effect on the physical environment (*i.e.*, land, air, water, minerals, flora, fauna, etc.). For example, if intense activities to restore a wetland on former pasture land are required, there could be a loss of habitat for certain threatened or endangered species even though the project creates habitat for other threatened or endangered species. Therefore, the lead agency should carefully review physical changes associated with each project. If there is a reasonable possibility that the project will have a significant effect on the environment, a categorical exemption should not be used for the project.

Conclusion. Resources Agency encourages departments to implement this policy as a way to further the state's important policy goals of preserving productive agricultural land as well restoration, protection and management of the state's natural, historical and cultural resources.

# APPENDIX F4.22

## Cultural Resources

**PROGRAMMATIC AGREEMENT**
**BETWEEN**
**THE LOS ANGELES DISTRICT, U.S. ARMY CORPS OF ENGINEERS, AND**
**THE CALIFORNIA STATE HISTORIC PRESERVATION OFFICER**
**REGARDING**
**THE NEWHALL RANCH RESOURCE MANAGEMENT AND DEVELOPMENT PLAN PROJECT,**
**LOS ANGELES COUNTY, CALIFORNIA**

**WHEREAS**, the U. S. Army Corps of Engineers, Los Angeles District ("USACE"), under the authority of Section 404 of the Clean Water Act (33 U.S.C. §1344), plans to issue permits ("Undertaking") to the Newhall Land and Farming Company ("Newhall" or "Permittee") for the Newhall Ranch Resource Management and Development Plan Project ("project)" located in northern Los Angeles County, California; and

**WHEREAS**, the USACE has determined that the Area of Potential Effects ("APE") comprises the entire project area, and is shown graphically on page 4 of Appendix A; and

**WHEREAS**, the USACE has determined the Undertaking will have an adverse effect on archaeological sites CA-LAN-2133 and CA-LAN-2233, determined to be eligible for listing in the National Register of Historic Places under criterion d, and has consulted with the California State Historic Preservation Officer ("SHPO") and the Advisory Council on Historic Preservation ("Council"), pursuant to 36 C.F.R. Part 800, regulations implementing Section 106 of the NHPA, as amended; and

**WHEREAS**, the USACE has determined that historic property CA-LAN-962H, also determined to be eligible for the NHHP under criterion d, is located within the APE but has been purchased by the Archaeological Conservancy and it will therefore be avoided and is not further included in this programmatic agreement ("PA"); and

**WHEREAS**, in accordance with 36 C.F.R. § 800.6(a)(1), the USACE has notified the Council of its adverse effect determination providing the specified documentation, and the Council has chosen not to participate in the consultation pursuant to 36 C.F.R. § 800.6(a)(1)(iii); and

**WHEREAS**, the USACE has consulted with Newhall, the Fernandeño Tataviam Band of Mission Indians, ("Fernandeño Tataviam Band"), the San Fernando Band of Mission Indians, the LA City/County Native American Indian Community, Charles Cooke, Randy Guzman-Folkes, Beverly Salazar Folkes, and the California Department of Transportation regarding the effects of the Undertaking on historic properties and has invited them to participate in this PA as concurring parties; and

**NOW, THEREFORE**, the USACE and the SHPO, collectively, referred to as "Signatories" or "Parties" shall ensure that the Undertaking is implemented in accordance with the following stipulations in order to take into account the effects of the Undertaking on historic

properties until this PA expires or is terminated.

## STIPULATIONS

The Signatories shall ensure that the following measures are implemented.

### I. DEFINITIONS

The definitions found at 36 CFR § 800.16 apply throughout this PA except where another definition is offered in this PA.

### II. DETERMINATION OF TREATMENT AND EFFECTS

A. The USACE shall ensure that the Historic Properties Treatment Plan ("HPTP") entitled *Research Design and Treatment Plan for CA-LAN-2133 and CA-LAN-2233 for the Newhall Ranch Resource Management and Development Plan, Los Angeles County, California* (Appendix A) is implemented. The USACE shall further ensure the following measures are carried out by incorporating this PA as a special condition of any Clean Water Act Section 404 Permit ("Section 404 Permit") or Notices to Proceed ("NTP") under the permit issued by the USACE to Permittee. If the Permittee fails to carry out the measures necessary to implement the HPTP, the USACE will take steps in good faith to enforce the permit conditions and/or revoke the Section 404 Permit.

B. At any time following the execution of the PA, either Signatory may, in writing, propose that the HPTP be amended. The other Signatory and Concurring Parties shall have 30 days following receipt to review and comment on the proposed amendment. Should either Signatory and/or Concurring Parties propose modifications or object to modifications within the stipulated time frame, the Signatories and Concurring Parties shall consult for no more than 30 days following receipt of the proposed modifications or of the objection to consider the modifications or to resolve the objection. If at the end of this time frame either Signatory and/or Concurring Parties object to the proposed modifications or if the objection is not resolved, the Signatories shall proceed in accordance with Stipulation VII(D), Dispute Resolution.

C. Amendment of the HPTP will not require amendment of the PA.

### III. AMENDMENT OF THE APE

A. The USACE may propose, in writing, that the APE be amended. SHPO and Concurring Parties shall have 30 days following receipt to review and comment on the proposed amendment. Should SHPO and/or Concurring Parties propose modifications or object to modifications within the stipulated time frame, the Signatories and Concurring Parties shall consult for no more than 30 days following receipt of the proposed modifications or of the objection to consider the modifications or to resolve the objection. If at the end of this time frame either Signatory and/or Concurring Parties object to the proposed

modifications or if the objection is not resolved, the Signatories shall proceed in accordance with Stipulation VII(D), Dispute Resolution.

B. Amendment of the APE will not require amendment of the PA.

## IV. TREATMENT OF HUMAN REMAINS OF NATIVE AMERICAN ORIGIN

A. The USACE shall consult with the Signatory and Concurring Parties regarding recovery, analysis, and disposition of human remains and associated grave goods, in accordance with applicable State of California laws.

B. The Signatories agree that Native American burials and related items discovered during the implementation of the PA and the Undertaking will be treated in accordance with the requirements of 7050.5 (b) of the California Health and Safety Code. If, pursuant to 7050.5 (c) of the California Health and Safety Code, the county coroner/medical examiner determines that the human remains are or may be of Native American origin, then the discovery shall be treated in accordance with the provisions of 5097.98 (a)-(d) of the California Public Resources Code. To the extent permitted under 5097.98 and 5097.991 of the California Public Resources Code, the USACE will ensure any human remains and related items resulting from the work stipulated in this PA are returned by the Permittee to the Most Likely Descendant.

## V. REPORTING

A. Except as limited by Stipulation VII(C), the USACE shall ensure that all draft and final reports resulting from actions pursuant to this PA are provided to the SHPO, Concurring Parties, and other interested persons. The SHPO shall have 30 days (after receipt) to provide comments on all draft reports. The USACE shall ensure that all reports are prepared pursuant to professional standards, the Secretary of the Interior's Standards and Guidelines for Archaeological Documentation (as amended and annotated), and SHPO guidance.

B. Annually following execution of this PA, beginning in October 2011, and biennially thereafter, the USACE shall provide to all parties to this PA a report that summarizes the USACE's NTPs in relation to historic properties. Electronic reporting will be utilized as the preferred method to transmit this information.

## VI. DISCOVERIES AND UNANTICIPATED EFFECTS

A. The HPTP includes procedures for managing the discovery of unanticipated cultural resources (see Appendix A). If the USACE determines that implementation of the HPTP or the Undertaking will affect a previously unidentified property that may be eligible for the National Register, or affect a known historic property in an unanticipated manner, the USACE will address the discovery, or unanticipated effect, in accordance 36 CFR Part 800.13 and with those provisions of the HPTP that relate to the treatment of discoveries and unanticipated effects.

B. The USACE, at its discretion, may hereunder assume any discovered property to be eligible for inclusion in the National Register, and that compliance with this stipulation shall satisfy the requirements of 36 C.F.R. § 800.13(a)(2). The USACE agrees to include in its Section 404 Permit for the project a special condition requiring the Permittee to provide immediate notification if unanticipated cultural resources are discovered during project construction, to temporarily halt those activities, and to take steps to ensure that the area of the discovery is protected and secured. The USACE agrees to follow the procedures outlined in 36 C.F.R. § 800.13 if an unexpected archaeological discovery is made. Pursuant to 36 C.F.R. § 800.13, the USACE will notify SHPO and Concurring Parties within forty-eight (48) hours of the discovery. The notification shall describe the actions proposed by the USACE to resolve the adverse effects. The SHPO shall respond within seventy-two (72) hours of the notification. The USACE will ask the Concurring Parties to also respond within seventy-two (72) hours of the notification pursuant to 36 C.F.R. § 800.13. The USACE shall take into account their recommendations, and then carry out the appropriate actions.

## VII. ADMINISTRATIVE STIPULATIONS

A. STANDARDS

1. *Professional Qualifications*. The USACE shall ensure that activities prescribed by Stipulations II, IV, V, and VI of this PA are carried out by, or under the direct supervision of, a person or persons meeting at a minimum the Secretary of the Interior's Professional Qualifications Standards (36 C.F.R. Part 61) in the appropriate disciplines.

2. *Historic Preservation Standards*. All activities prescribed by Stipulations II, IV, V and VI of this PA shall conform to applicable standards and guidelines established by the Secretary of the Interior and SHPO.

B. CURATION

The USACE shall ensure that all materials and records resulting from the implementation of this PA are curated in accordance with 36 C.F.R. Part 79, except where an alternative plan for disposition of human remains is developed in the HPTP or Stipulation VI.

C. CONFIDENTIALITY

The Parties acknowledge that historic properties covered by this PA are subject to the provisions of Section 304 of the NHPA relating to the disclosure of archaeological site information and having so acknowledged, will ensure that all actions and documentation prescribed by this PA are consistent with Section 304 of the NHPA.

D. RESOLVING OBJECTION

1. Should SHPO object to the manner in which the terms of this PA are implemented,

the USACE will consult with the SHPO to resolve the objection. If the USACE determines that the objection cannot be resolved, the USACE shall forward all documentation relevant to the dispute, including the USACE' proposed resolution, to the Council for their assistance in resolving the dispute. In the event the Council provides timely advice or comments, the USACE, prior to reaching a final decision on the dispute, shall prepare a written response that takes into account the recommendation or comment provided by the Council pertaining to the subject of the dispute, and provide them a copy of this written response.

2. The USACE's responsibility to carry out all actions under this PA that is not the subject of a dispute will remain unchanged.

3. At any time during implementation of the terms of this PA, should a written objection pertaining to the PA be raised by a Concurring Party, the USACE shall immediately notify the SHPO about the objection and take the objection into account. The SHPO may comment on the objection to the USACE. The USACE shall consult with the objecting party for a period of no more than 30 days from the date of the objection. Within 14 days following closure of consultation, the USACE will render a decision regarding the objection and notify all parties of its decision in writing. In reaching its final decision the USACE will take into account all comments from the parties regarding the objection. Any dispute pertaining to the NRHP eligibility of historic properties covered by this PA will be addressed by the Signatories pursuant to 36 CFR § 800.4(c)(2). The Signatories shall determine if Stipulation VII(D)(1) shall be implemented to resolve a dispute regarding the eligibility of such historic properties.

4. The USACE may authorize any action subject to objection under this stipulation to proceed after the objection has been resolved in accordance with the terms of this stipulation.

E. AMENDMENTS

Either Signatory may at any time propose amendments, whereupon the Signatories shall consult among each other for no more than 30 days to consider such amendments pursuant to 36 C.F.R. §§ 800.6(c)(l) and 800.6(c)(7). This PA may be amended only upon the written agreement of the Signatories. Amendments to this PA shall take effect on the dates that they are fully executed by the Signatories.

F. TERMINATION

1. If a Signatory proposes to amend this PA, and it is not amended as provided for in Stipulation VII(E), or if either Signatory proposes termination of this PA for other reasons, the Signatory proposing termination shall notify the other Signatory in writing, explain the reasons for proposing termination, and consult with the other Signatory for at least 30 days to seek alternatives to termination. Such consultation shall not be required if the USACE proposes termination because the Undertaking no longer meets the definition set forth in 36 C.F.R. § 800.16(y).

2. Should such consultation result in an agreement on an alternative to termination, then the Signatories shall proceed in accordance with the terms of that agreement.

3. Should such consultation fail, the Signatory proposing termination may terminate this PA by promptly notifying the other Signatory in writing. Termination hereunder shall render this PA without further force or effect.

4. If this PA is terminated hereunder, and if the USACE determines that the Undertaking will nonetheless proceed, then the USACE shall either consult in accordance with 36 C.F.R. § 800.6 to develop a new PA or request the comments of the Council pursuant to 36 C.F.R. Part 800.

G. DURATION OF THE PA

1. Unless terminated pursuant to Stipulation VII(F), another agreement executed for the Undertaking supersedes it, or the Undertaking itself has been terminated, this PA will remain in full force and effect until the USACE, in consultation with SHPO, determines that all aspects of the Undertaking have been completed and that all terms of this PA have been fulfilled in a satisfactory manner. Upon a determination by USACE that all aspects of the Undertaking have been completed and that all terms of this PA have been fulfilled in a satisfactory manner, the USACE will notify SHPO and concurring parties of this PA in writing of the agency's determination. This PA will terminate and have no further force or effect on the day that the USACE so notifies SHPO.

2. The terms of this PA shall be satisfactorily fulfilled within ten (10) years following the date of execution by SHPO. If the USACE determines that this requirement cannot be met, the Signatories will consult to reconsider its terms. Reconsideration may include continuation of the PA as originally executed, amendment, or termination and the employment of a replacement agreement document. In the event of termination, the USACE will comply with Stipulation VII(F)(4) if it determines that the Undertaking will proceed notwithstanding termination of this PA.

H. EFFECTIVE DATE

This PA and any amendments will take effect on the date that it has been executed by the SHPO. Execution of this PA by the USACE and SHPO, its subsequent transmittal by the USACE to the Council in accordance with 36 C.F.R. § 800.6(b)(1)(iv), and implementation of its terms, evidences that the USACE has afforded the Council an opportunity to comment on the Undertaking and its effect on historic properties and that the USACE has taken into account the effects of the Undertaking on historic properties. The Signatories to this PA represent that they have the authority to sign for and bind the entities on behalf of whom they sign.

**SIGNATORIES:**

**U.S. ARMY CORPS OF ENGINEERS, LOS ANGELES DISTRICT**

By: _____ Date: 9-23-2010

Name: David J. Castanon

Title: Chief, Regulatory Division

**CALIFORNIA STATE HISTORIC PRESERVATION OFFICER**

By: _____ Date: 28 SEP 2010

Name: Milford Wayne Donaldson, FAIA

Title: California State Historic Preservation Officer

**CONCUR:**

**NEWHALL LAND AND FARMING COMPANY**

By: _____ Date: _____

Name: _____

Title: _____

**FERNANDEÑO TATAVIAM BAND OF MISSION INDIANS**

By: _____ Date: 11-9-10

Name: William Gonzalez

Title: THCB committee chair

**SIGNATORIES:**

**U.S. ARMY CORPS OF ENGINEERS, LOS ANGELES DISTRICT**

By: _____ Date: 9-23-2010

Name: David J. Castanon

Title: Chief, Regulatory Division

**CALIFORNIA STATE HISTORIC PRESERVATION OFFICER**

By: _____ Date: 28 SEP 2010

Name: Milford Wayne Donaldson, FAIA

Title: California State Historic Preservation Officer

**CONCUR:**

**NEWHALL LAND AND FARMING COMPANY**

By: _____ Date: Oct 20, 2010

Name: STEVEN ZIMMER

Title: EXECUTIVE VICE PRESIDENT

**FERNANDEÑO TATAVIAM BAND OF MISSION INDIANS**

By: _____ Date: _____

Name: _____

Title: _____

**CALIFORNIA DEPARTMENT OF TRANSPORTATION**

By: Ronald Kosinski Date: Oct 7, 2010

Name: RONALD KOSINSKI

Title: DEPUTY DISTRICT DIRECTOR, ENVIRONMENTAL PLANNING

**SAN FERNANDO BAND OF MISSION INDIANS**

By: Date:

Name: _____

Title:

**LA CITY/COUNTY NATIVE AMERICAN INDIAN COMMUNITY**

By: _____ Date: _____

Name:

Title: _____

**CHARLES COOKE**

By: Date:

Name: _____

Title:

**RANDY GUZMAN-FOLKES**

By: _____ Date: _____

Name:

Title: _____

**BEVERLY SALAZAR FOLKES**

By:_____Date:_____

Name: _____

Title: _____

## APPENDIX A:

## RESEARCH DESIGN AND TREATMENT PLAN FOR CA-LAN-2133 AND CA-LAN-2233 FOR THE NEWHALL RANCH RESOURCE MANAGEMENT AND DEVELOPMENT PLAN PROJECT, LOS ANGELES COUNTY, CALIFORNIA

**APPENDIX A:**

**RESEARCH DESIGN AND TREATMENT PLAN FOR CA-LAN-2133 AND CA-LAN-2233 FOR THE NEWHALL RANCH RESOURCE MANAGEMENT AND DEVELOPMENT PLAN PROJECT, LOS ANGELES COUNTY, CALIFORNIA**

# APPENDIX A CONTAINS CONFIDENTIAL INFORMATION RETAINED BY THE PUBLIC AGENCIES

## APPENDIX B:

## MEMORANDUM OF AGREEMENT BETWEEN NEWHALL LAND AND FARMING COMPANY AND THE FERNANDEÑO TATAVIAM BAND OF MISSION INDIANS

**EXHIBIT "E"**

**MEMORANDUM OF AGREEMENT**

This Memorandum of Agreement ("MOA") summarizes the terms and conditions of the Agreement for Cultural Enrichment Programs ("Agreement"), effective October 25, 2007, entered into by and between THE NEWHALL LAND AND FARMING COMPANY, Inc., a California limited partnership ("Newhall"), and the FERNANDEÑO TATAVIAM BAND OF MISSION INDIANS ("Tataviam").

RECITALS

A. Newhall is the owner and developer of certain real property located in the unincorporated northern portion of Los Angeles County in the Santa Clara River Valley, situated west of the Golden State Freeway/Interstate 5, and south and north of State Route 126. Newhall projects to be developed within this area include, but are not limited to, Newhall Ranch, Entrada, Legacy Village, and the build-out of the Valencia Commerce Center (collectively, "Newhall Projects").

B. The Tataviam is an historic Native American tribe of northern Los Angeles County. The Tataviam includes more than 700 members, the majority of whom live within the Tataviam's traditional homelands of the San Fernando Valley and Santa Clarita Valley described in Exhibit A. Newhall recognizes that the Tataviam is a Native American entity which is aboriginal to the lands described in Exhibit A and whose people have comprised a distinct community from historical times to the present. Newhall also acknowledges that the government of the Tataviam has exercised political authority over the Tataviam people from historical times to the present. The Tataviam is governed by an executive and the Tribal Senate, a nine-member legislative branch. The Tataviam is not presently included on the list of federally recognized tribes, but the Tataviam represents that it previously was recognized by the United States, and such recognition has not been lawfully terminated. For many years the Tataviam has taken an active role in environmental protection, and has registered sacred sites with the National Register of Historic Places in order to prevent destruction of culturally significant sites.

C. The Tataviam desires to further its existing working relationship with Newhall by contracting with Newhall for cultural resource management needs, including tribal monitoring, associated with development of the Newhall Projects. Based upon its experience, its ability to exert influence over tribal members to support Newhall Projects and to mobilize tribal members to serve as Native American consultants/monitors, and the fact that the Newhall Projects lie within the aboriginal territory of the Tataviam, the Tataviam is the most appropriate entity to provide such services for Newhall Projects located within the ancestral boundaries of the Tataviam people. The Native American Heritage Commission recognizes that the Tataviam is an organized Native American tribe, and includes the Tataviam on its Tribal Consultation list compiled pursuant to Government Code section 65352.3.

Under the Agreement, Newhall and the Tataviam have agreed as follows:

1. The recitals set forth above are true in all respects.

2. Newhall will provide funding to the Tataviam for use in the development of cultural enrichment programs associated with the Tataviam.

3. Newhall will convey to the Tataviam ownership of one-acre of land located within the proposed Newhall Ranch Homestead Central Neighborhood Park described in Exhibit B, or an alternative site, for use as a future Native American interpretive/cultural center.

4. Newhall will retain the Tataviam for all monitoring activities associated with grading and development of Newhall Projects.

5. The Tataviam will expend the funding provided by Newhall for cultural enrichment programs, including cultural research, professional consulting, and grant matching related to efforts by the Tataviam to become a federally recognized Native American tribe.

6. The Tataviam will utilize the land conveyed by Newhall to construct an interpretive/cultural center to enhance the activities of the Tataviam, educate the surrounding non-Native community, and allow the Tataviam an opportunity to preserve its rich heritage and culture for future generations.

7. The Tataviam, in its role as Newhall Projects monitor, will provide monitoring and consulting services and will supplement the more general knowledge of scientific experts with its special expertise relating to matters of Native American heritage and interest, and act as a liaison between the Native American community, archaeologists, developers, contractors, and public agencies.

8. The Tataviam will continue to support Newhall, and Newhall will continue to work with the Tataviam, to the maximum extent feasible as Newhall continues to build out the Newhall Projects.

9. In the event of a conflict between this MOA and the Agreement for Cultural Enrichment Programs ("Agreement"), the Agreement shall prevail.

THE NEWHALL LAND AND FARMING COMPANY
(a California limited partnership)

By: NWHL GP LLC
Its: General Partner

By: Steven D Zimmer

Name: Steven P. Zimmer

Its: Exec. VP

By: _____

Name: Glenn Acosta

Its: VP

THE FERNANDEÑO TATAVIAM BAND OF MISSION INDIANS

By: _____

Name: Rudy Ortega Sr.

Its: Tribal President

# APPENDIX F4.23

## Global Climate Change

Filed 6/10/11; pub. order 7/8/11 (see end of opn.)

COURT OF APPEAL, FOURTH APPELLATE DISTRICT

DIVISION ONE

STATE OF CALIFORNIA

| | |
|---|---|
| CITIZENS FOR RESPONSIBLE EQUITABLE ENVIRONMENTAL DEVELOPMENT,<br><br>Petitioner and Appellant,<br><br>v.<br><br>CITY OF CHULA VISTA,<br><br>Respondent; | D057779<br><br>(Super. Ct. No. 37-2009-00095947-CU-TT-CTL) |
| TARGET CORPORATION,<br><br>Real Party in Interest. | |

APPEAL from a judgment of the Superior Court of San Diego County, Ronald S. Prager, Judge. Affirmed in part, reversed in part, and remanded with directions.

Following preparation of an initial study under the California Environmental Quality Act (Pub. Resources Code, §§ 21000-21178.1; undesignated statutory references are to this code), the City of Chula Vista (City) adopted a mitigated negative declaration (MND) with respect to a project to replace a store operated by Target Corporation (Target), a smog check facility, and a small market (the existing

facilities) with a new larger Target store (the Project). Citizens for Responsible Equitable Environmental Development (Citizens) filed a petition for writ of mandate in the trial court against the City. Citizens appeals from the denial of the petition.

Citizens contends the trial court erred because there is substantial evidence of a fair argument that the Project may have a significant environmental impact on: hazards or hazardous materials; air quality for sensitive receptors; particulate matter and ozone; and greenhouse gas emissions and global climate change.

We conclude that the judgment denying Citizens's petition for a writ of mandate must be reversed to the extent it concluded that Citizens had not presented a fair argument that hazards and hazardous materials from the Project may create a potentially significant adverse environmental impact. In all other respects, the judgment is affirmed.

## FACTUAL AND PROCEDURAL BACKGROUND

The Project site is a 9.9-acre shopping center parcel at the northwestern corner of North Fourth Avenue and C Street in Chula Vista, California. The Project proposes to demolish the existing facilities and replace them with a new Target store, resulting in a net size increase of 9,844 square feet of commercial development. The Project would increase the site's green space from 3.17 percent to 10.6 percent, and provide drainage facility improvements.

In November 2008, Target applied for the Project's preliminary environmental review. In January 2009, the City circulated its initial study which determined that the Project may cause potentially significant impacts and required Target to comply with a

series of mitigation measures set forth in the MND and an associated mitigation monitoring and reporting program (monitoring program). The City received no comments during the public review period. The MND concluded that the Project could have significant environmental impacts in the areas of air quality, geology and soils, hazards and hazardous material, hydrology and water quality, and traffic/transportation, but that those impacts could be mitigated. In June 2009, the City's planning commission recommended that the City Council approve the Project.

On July 13, 2009, the day before the City Council meeting, Citizens submitted a letter along with a CD-ROM containing thousands of pages of materials, asking that the council deny the Project. The following day, the City responded to each of the concerns raised by Citizens. After receiving no oral comments at the meeting, the City Council voted to approve the MND, monitoring program, and amend the zoning map. Citizens filed this action challenging the City's approval of the Project without preparing an environmental impact report (EIR).

The trial court issued a tentative ruling denying the petition for writ of mandate, and the parties submitted to the ruling. The court filed a judgment, and Citizens timely appealed.

## DISCUSSION

### I. *Standard of Review*

An EIR must be prepared "whenever it can be fairly argued on the basis of substantial evidence that the project may have significant environmental impact." (*No Oil, Inc. v. City of Los Angeles* (1974) 13 Cal.3d 68, 75 (*No Oil*).) Under the fair

argument standard, we determine whether there is substantial evidence in the record to support a fair argument that the project may have a significant effect on the environment. (Cal. Code Regs., tit. 14, § 15064, subd. (f)(1).) (References to the "Guidelines" refer to title 14 of the California Code of Regulations.) Whether a fair argument exists is a question of law that we review de novo, with a preference for resolving doubts in favor of environmental review. (*Pocket Protectors v. City of Sacramento* (2004) 124 Cal.App.4th 903, 928.) Although our review is de novo and nondeferential, we must give the lead agency the benefit of the doubt on any legitimate, disputed issues of credibility. (*Ibid*.)

Under the fair argument standard, a project "may" have a significant effect whenever there is a "reasonable possibility" that a significant effect will occur. (*No Oil*, *supra*, 13 Cal.3d at pp. 83-84.) Substantial evidence, for purposes of the fair argument standard, includes "fact, a reasonable assumption predicated upon fact, or expert opinion supported by fact." (§ 21080, subd. (e)(1).) Substantial evidence is not argument, speculation, unsubstantiated opinion or narrative, evidence that is clearly inaccurate or erroneous, or evidence of social or economic impacts unrelated to physical impacts on the environment. (§ 21080, subd. (e)(2).)

## II. *Hazards and Hazardous Materials*

Citizens asserts the record contains substantial evidence of a fair argument that the Project may have a significant environmental impact due to contaminated soil, and the evidence does not show that the potential impact will be mitigated to a level of insignificance. We agree.

The MND notes that a gas station, formerly operating on a portion of the Project site, created environmental contamination "beneath the site" from leaking underground storage tanks and product lines. Since 1990, the groundwater at the site has been monitored. In 1996, "[c]onfirmatory soil sampling" was conducted. In 2008, a corrective action plan was created to reduce the remaining methyl tertiary butyl ether on the property. The Project's monitoring program indicates that the mitigation measures outlined in the corrective action plan must be complied with before building permits are issued. The MND anticipated that the required remediation would be completed before grading started, and if not completed, would continue during the grading activities.

The City asserts that the building permit stage is an acceptable deadline for completion of the remediation activities because it is groundwater that is contaminated and not soils; and existing groundwater contamination will not be affected by grading activities. The record, however, suggests otherwise.

The Guidelines define "substantial evidence" as "enough relevant information and reasonable inferences from this information that a fair argument can be made to support a conclusion, even though other conclusions might also be reached." (Guidelines, § 15384, subd. (a).) Here, the MND suggests that pollutants leaking from underground storage tanks contaminated the soil underneath the Project site before reaching the groundwater. Although the building permits are conditioned on compliance with the corrective action plan, it is unknown what, if any, mitigation measures in this plan address contaminated soils as the corrective action plan is not

part of the record. Thus, it can be fairly argued that the Project may have a significant environmental impact by disturbing contaminated soils.

Accordingly, the matter must be remanded to the trial court to determine whether the corrective action plan addresses contaminated soil. In the event the trial court determines that the corrective plan does not address contaminated soil, it is to order an EIR.

III. *Air Pollution Impact on Sensitive Receptors*

"Sensitive receptors" include children. Citizens contends that there are at least four schools and pre-schools within a mile of the Project, and that the nearest residence is within 500 feet of the Project; however, the MND does not mention sensitive receptors and merely identifies mitigation measures designed to reduce dust and exhaust emissions. It asserts that the Project will emit hazardous air pollutants, particularly diesel exhaust, during construction and normal operations, and that the emission of these pollutants warranted a health-risk assessment or, at a minimum, a health-risk screening. Because there is no analysis of the environmental impact of these pollutants, Citizens claims it is impossible to tell if the mitigation measures identified in the MND will be effective at reducing the sensitive-receptor impact to a level of insignificance. Thus, it concludes there is substantial evidence of a fair argument that the Project may have a significant impact by exposing sensitive receptors to increased air pollution. We disagree.

An "Air Quality Assessment" prepared for the Project analyzed potential air quality impacts caused by construction and operation of the Project. The Air Quality

Assessment states that a project would have a significant environmental impact if it would expose sensitive receptors, such as children or the elderly, to substantial pollutant concentrations. As required by the Guidelines, the Air Quality Assessment evaluated, among other things, whether the Project would expose sensitive receptors to substantial pollutant concentrations.

To determine whether the Project would produce emissions that could violate any air quality standard or contribute substantially to an existing or projected air quality violation, the City was guided by the CEQA Air Quality Handbook created by the South Coast Air Quality Management District (the District). The District is the agency responsible for regulating nonvehicular air pollution in certain counties in southern California. (*Communities for a Better Environment v. South Coast Air Quality Management Dist.* (2010) 48 Cal.4th 310, 317.) The District typically requires a health risk assessment of diesel particulate matter for projects that: (1) generate substantial truck traffic (such as a warehouse distribution center or a truck stop), or (2) substantially increase truck traffic over existing levels.

The Air Quality Assessment concluded that the Project would not significantly impact traffic, and determined that emissions associated with construction and operation of the Project did not exceed any air quality significance thresholds. Thus, there was no need for the City to conduct a health-risk assessment or screening. Citizens has not cited any evidence in the record to dispute these conclusions.

Finally, although a box in the initial study was marked to show that the impact of the Project with regard to exposing sensitive receptors to substantial pollutant

concentrations would be "less than significant *with mitigation incorporated*" (italics added), it appears this box was marked in error as the Air Quality Assessment established that the Project would not exceed any air quality significance thresholds. Additionally, the mitigation measures specified in the MND do not relate to mitigating pollution for sensitive receptors; rather, they relate to best management practices to control dust and reduce air emissions during construction activities, and design features in the Project to reduce greenhouse gas emissions.

Accordingly, we conclude there is no substantial evidence of a fair argument that the Project may have a significant impact by exposing sensitive receptors to increased air pollution.

IV. *Cumulative Impact on Particulate Matter and Ozone*

The federal Clean Air Act (42 U.S.C. § 7401 et seq.) requires that the United States Environmental Protection Agency establish national air quality standards. (42 U.S.C. § 7409(a), (b).) Additionally, the California Air Resources Board established its own standards for California. (Health & Saf. Code, § 39606, subd. (a)(2).) Areas that do not meet national or state standards for a particular pollutant are considered to be nonattainment areas for that pollutant. (42 U.S.C. § 7407(d).)

Citizens notes that the Air Quality Assessment indicated that the region where the Project is located is in nonattainment of federal standards for 8-hour ozone and in nonattainment of state standards for ozone and particulate matter. Citizens concludes that the Project may have a significant cumulative air-quality impact due to its

contribution of particulate matter and NOx (an ozone precursor) in a nonattainment area. The record does not support Citizens's assertion.

The Air Quality Assessment evaluated whether the Project would result in a cumulatively considerable increase of particulate matter, or exceed quantitative thresholds for ozone precursors. To determine whether the Project would cumulatively increase net particulate matter or exceed quantitative thresholds for ozone precursors for which the San Diego air basin is in nonattainment, the City evaluated Project emissions against the significance thresholds established by the District. (Guidelines, § 15064.7 [The lead agency may rely on a threshold of significance standard to determine whether a project will cause a significant environmental effect.].) For nonattainment pollutants, the Air Quality Assessment concluded that the Project could potentially result in "a cumulatively considerable net increase in these pollutants and thus could have a significant impact on the ambient air quality" if the emissions exceeded the screening level thresholds.

A table in the Air Quality Assessment shows the screening level criteria for impacting air quality. Other tables list the screening level criteria for various emissions during construction and operation of the Project, along with estimated emissions during construction and operation of the Project. These tables show that the net emissions *increases* over the existing amounts are below the significance level for all pollutants.

Although the Project will contribute additional air pollutants to an existing nonattainment area, these increases are below the significance criteria and are thus

considered to have no significant impact on ambient air quality based on the standard articulated in the Air Quality Assessment. Citizens has not presented any evidence to contradict the conclusion in the Air Quality Assessment that these increases are below the significance criteria, nor does it assert that the Air Quality Assessment articulated an erroneous standard for determining whether the increases in nonattainment pollutants have a significant impact on ambient air quality. Thus, we conclude no fair argument exists that the Project will cause a significant unavoidable cumulative contribution to an air quality impact.

V. *Cumulative Impact on Greenhouse Gas Emissions and Climate Change*

The Air Quality Assessment shows that greenhouse gas emissions come from a variety of sources, including waste, and that waste generates two percent of total greenhouse gas emissions. Citizens argues that the Air Quality Assessment underestimated the Project's contribution to greenhouse gases because it failed to include waste as a greenhouse gas producer in its inventory. Citizens contends that because the store will be larger, it is reasonable to assume that it will generate more waste.

While the proposed Target store will be larger, Citizens's assumption that it will generate more waste is erroneous as the proposed store will maintain the existing dumpster, which will be emptied at the same frequency as the existing Target store. Thus, the increased store size is not projected to increase waste, or greenhouse gas emissions generated from waste. Moreover, Citizens's argument ignores that the Project eliminated two existing facilities that generated waste, a market and a smog

check facility. Taking into account the elimination of these waste producers, it is more reasonable to assume that the Project will result in a net decrease of waste and resultant greenhouse gas emissions. Thus, under these facts, the City did not err when it failed to include waste as a source of greenhouse gas emissions.

Citizens observes that the Air Quality Assessment indicated that the first part of the threshold of significance for the Project's greenhouse gas emissions and climate change impacts was whether the Project would "[c]onflict with or obstruct the goals or strategies of the California Global Warming Solutions Act of 2006 (AB 32) or its governing regulation." As a preliminary matter, Citizens takes issue with the City's use of AB 32 as the significance threshold. It asserts that the Project exceeds the significance thresholds under three other well-recognized potential thresholds of significance. As such, it contends that a fair argument exists that the Project will significantly impact greenhouse gas emissions and climate change.

Citizens does not contend, however, that there is one universally accepted significance threshold, and that the City erred by utilizing AB 32. Rather, the Air Quality Assessment made clear that, while guidelines were being proposed, none existed at that time for determining the impact of a project on greenhouse gas emissions or climate change. Accordingly, the Air Quality Assessment noted that lead agencies may exercise their discretion on what criteria to use. (Guidelines, § 15064(b) ["The determination of whether a project may have a significant effect on the environment calls for careful judgment on the part of the public agency involved, based to the extent possible on scientific and factual data."].)

Effective March 18, 2010, the Guidelines were amended to address greenhouse gas emissions. (Guidelines, § 15064.4.) The amendment confirms that lead agencies retain the discretion to determine the significance of greenhouse gas emissions and should "make a good-faith effort, based to the extent possible on scientific and factual data, to describe, calculate or estimate the amount of greenhouse gas emissions resulting from a project." (Guidelines, § 15064.4(a).) When assessing the significance of impacts from greenhouse gas emissions on the environment the lead agency should consider: the extent the project may increase or reduce greenhouse gas emissions; whether the project emissions exceed a threshold of significance that the lead agency determines applies to the project; and the extent the project complies with regulations or requirements adopted to implement a statewide, regional, or local plan for the reduction or mitigation of greenhouse gas emissions. (Guidelines, § 15064.4(b).) Thus, under the new guidelines, lead agencies are allowed to decide what threshold of significance it will apply to a project.

Here, the City properly exercised its discretion to utilize compliance with AB 32 as the threshold. Accordingly, we reject Citizens's argument that the City erred by not applying a different threshold.

We also reject Citizens's argument that the standard and analysis used by the City were arbitrary and unsubstantiated. AB 32 sets a target of reducing greenhouse gas emissions to 2000 levels by 2010 and 1990 levels by 2020. The Air Quality Assessment estimated that to reach 2000 levels by 2010 required 11 percent below business as usual emissions; and to reach 1990 levels by 2020 required 25 percent

below business as usual emissions. The Air Quality Assessment then established a target of 20 percent below business as usual as the appropriate standard, and not the 25 percent below business as usual that would be needed to be consistent with the estimate for reaching 1990 levels by 2020, stating that this is "an appropriate midpoint between the 2010 and 2020 targets set forth in AB 32 considering the timeframe for Project operations is within these dates."

Citizens contends that the City arbitrarily picked a number falling somewhere between the 2010 and 2020 targets, and that the standard selected was not supported by substantial evidence. Citizens is correct that the Air Quality Assessment established a target of 20 percent below business as usual as the appropriate standard, and not the 25 percent below business as usual that would be needed to be consistent with AB 32. However, the Air Quality Assessment ultimately concluded that, with implementation of emission reduction programs, the Project would reduce greenhouse gas emissions by 29 percent by 2020. This is four percent more than the AB 32 goal of 25 percent. Thus, it is irrelevant whether the Air Quality Assessment utilized a 20 percent reduction or a 25 percent reduction as the target, because the 29 percent reduction exceeded both goals.

The record supports the 29 percent reduction. The Air Quality Assessment listed the operational emissions for "business as usual" for the existing Target store and the proposed store at 8,280 metric tons per year and 10,337 metric tons per year, respectively. Thus, under "business as usual" the proposed Target store would increase greenhouse gas emissions by 2,057 metric tons. However, through the

implementation of energy saving measures, the operational greenhouse gas emissions for the proposed store is reduced to 7,381 metric tons per year, or 2,956 metric tons *less than* "business as usual." This amounts to a 29 percent reduction from business as usual.

Finally, Citizens argues that even assuming consistency with the goals of AB 32 was the proper significance threshold and that the 29 percent reduction cited in the Air Quality Assessment is accurate, the Project does not achieve a 33 percent reduction below the business as usual threshold required for San Diego County as set forth in an "On-Road Transportation Report" (the Report) which is a component of the San Diego County Greenhouse Gas Inventory. As we explained above, the City had the discretion to not adopt this different threshold. Thus, we do not respond to Citizens's arguments premised on this different inventory. In any event, the Report acknowledged that AB 32 does *not* require cities or counties to reduce emissions by a certain amount, and noted that the required reductions listed were "theoretical."

In summary, we conclude no fair argument exists that the Project will have a significant greenhouse gas emissions and climate change impact.

## DISPOSITION

The judgment denying appellant's petition for writ of mandate is reversed to the extent it concluded that appellant had not presented a fair argument that hazards and hazardous materials from the Project may create a potentially significant adverse environmental impact. In all other respects, the judgment is affirmed. On remand, the trial court shall determine whether the corrective action plan addresses contaminated

soil. In the event the trial court determines that the corrective plan does not address contaminated soil, it is to order an EIR. The parties are to bear their own appellate costs.

MCINTYRE, J.

WE CONCUR:

MCDONALD, Acting P. J.

AARON, J.

Filed 7/8/11

CERTIFIED FOR PUBLICATION

COURT OF APPEAL, FOURTH APPELLATE DISTRICT

DIVISION ONE

STATE OF CALIFORNIA

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|---|---|
| CITIZENS FOR RESPONSIBLE EQUITABLE ENVIRONMENTAL DEVELOPMENT,<br><br>Petitioner and Appellant,<br><br>v.<br><br>CITY OF CHULA VISTA,<br><br>Respondent; | D057779<br><br>(Super. Ct. No. 37-2009-00095947-CU-TT-CTL)<br><br>ORDER CERTIFYING OPINION FOR PUBLICATION |
| TARGET CORPORATION,<br><br>Real Party in Interest. | |

THE COURT:

The opinion filed June 10, 2011, is ordered certified for publication.

The attorneys of record are:

Briggs Law Corporation, Cory J. Briggs and Mekaela M. Gladden for Petitioner and Appellant.

Bart C. Miesfeld, City Attorney, and Michael J. Shirey, Deputy City Attorney; Gatzke Dillon & Ballance LLP, Mark J. Dillon and Rachel C. Cook for Respondent.

Holland & Knight LLP, Amanda J. Monchamp and Shannon K. Little for Real Party in Interest.

MCDONALD, Acting P. J.

Copies to: All parties

**Kern County Order Denying Petition for Writ of Mandate and Judgment in Favor of Respondents and Real Parties in Interest**
**December 8, 2010**

ENDORSED

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TEJON RANCHCORP, sued herein under
the name of its parent TEJON RANCH CO.

FILED
SUPERIOR COURT, METROPOLITAN DIVISION
COUNTY OF KERN
DEC 08 2010
TERRY McNALLY, CLERK
BY _____ DEPUTY

**SUPERIOR COURT OF THE STATE OF CALIFORNIA**

**COUNTY OF KERN**

CENTER FOR BIOLOGICAL DIVERSITY, WISHTOYO FOUNDATION, TRICOUNTY WATCHDOGS, and CENTER ON RACE, POVERTY & THE ENVIRONMENT,

Petitioners,

v.

KERN COUNTY and KERN COUNTY BOARD OF SUPERVISORS,

Respondents;

TEJON MOUNTAIN VILLAGE, LLC, TEJON RANCH CO., and DOES 1-30,

Real Parties in Interest.

Case No. S-1500-CV-268902 KCT

[Proposed]

**ORDER DENYING PETITION FOR WRIT OF MANDATE AND JUDGMENT IN FAVOR OF RESPONDENTS AND REAL PARTIES IN INTEREST**

Before: Hon. Kenneth C. Twisselman II
Dept.: 8
Petition Filed: November 12, 2009

The Petition for Writ of Mandate ("Petition") filed by Petitioners Center for Biological Diversity ("CBD"), Wishtoyo Foundation, TriCounty Watchdogs, and Center on Race, Poverty & the Environment (collectively, "Petitioners") came on regularly for trial before this Court on November 5, 2010, in Department 8, the Honorable Kenneth C. Twisselman II presiding. Adam Keats appeared for Petitioners CBD and Wishtoyo Foundation, Matthew Vespa appeared for Petitioner CBD, Jason A. Weiner appeared for Petitioner Wishtoyo Foundation, and Caroline Farrell appeared for Petitioners Center on Race, Poverty & the Environment and TriCounty Watchdogs. Charles F. Collins, Deputy County Counsel, appeared for Respondents County of Kern ("County") and Kern County Board of Supervisors. Jennifer L. Hernandez and Charles L. Coleman III appeared for Real Parties in Interest Tejon Mountain Village, LLC and Tejon Ranchcorp, sued under the name of its parent Tejon Ranch Co. (collectively, "Real Parties").

Having read and considered the pleadings, the parties' briefs and the administrative record in this matter, and having considered the arguments of counsel, the Court finds and orders as follows:

I. **Requests for Judicial Notice**

1. The Court grants the request for judicial notice as to Petitioners' Exhibits 1 and 3 (letters from the California Attorney General's office to the San Joaquin Valley Air Pollution Control District ("SJVAPCD")) and grants the request for judicial notice as to Respondents' and Real Parties in Interest's Exhibits A through E (consisting of: SJVAPCD Response to Attorney General's letter; SJVAPCD Guidance for Addressing GHG Emission Impacts; CEQA Guidelines Amendments regarding Greenhouse Gas Emissions; Thresholds of Significance from State CEQA Guidelines Amendments Pursuant to SB 97; and Presidential Memorandum re California Request for Waiver under the Clean Air Act). No party objected to the Court's taking judicial notice of the foregoing documents. The Court denies all other requests for judicial notice. Extra- record evidence is generally not admissible in CEQA proceedings and may never be admitted to contradict the evidence relied on or to question the correctness of the agency's decision. *See Western States Petroleum Association v. Superior Court* (1995) 9 Cal. 4th 573,

579; *San Joaquin Local Agency Formation Commission v. Superior Court* (2008) 162 Cal.App.4th 159, 169.

**II. Matters Raised in the Pleadings But Not in Petitioners' Brief**

2. Petitioners filed their writ petition ("Petition") challenging the Kern County Board of Supervisors' decision under the California Environmental Quality Act ("CEQA") on November 19, 2009 to approve the Tejon Mountain Village project ("TMV" or "the project") as proposed by Real Parties. The Petition raised many issues not covered in Petitioners' brief, including traffic effects and impacts on other biological resources (such as native vegetation, wildlife and plants), seismic road hazards, impacts on the Condor as a cultural resource, underestimating outdoor water requirements, growth inducing impacts, and other issues. Those issues which are not presented in Petitioners' brief are deemed waived for purposes of this Court's review. *See State Water Resources Control Board Cases* (2006) 136 Cal.App.4th 674, 836.

**III. Standard of Review**

3. The standard of review is well established in CEQA proceedings. In reviewing a lead agency's compliance under CEQA, the Court must determine whether the agency prejudicially abused its discretion. *See City of Long Beach v. Los Angeles Unified School District* (2009) 176 Cal.App.4th 889, 897; *Bakersfield Citizens for Local Control v. City of Bakersfield* (2004) 124 Cal.App.4th 1184, 1197. "Abuse of discretion is established if the agency has not proceeded in a manner required by law or if the determination is not supported by substantial evidence." Pub. Res. Code § 21168.5. The reviewing court is not to determine whether the EIR's ultimate conclusions are correct but only whether they are supported by substantial evidence in the record and whether the EIR is sufficient as an informational document. *See Association of Irritated Residents v. County of Madera* (2003) 107 Cal.App. 4th 1383, 1391 *citing Laurel Heights Improvement Association. v. Regents of the University of California* (1988) 47 Cal.3d 376, 407. Of course, the reviewing court is also to determine whether the agency has proceeded in a manner required by law.

4. The substantial evidence standard of review will apply in this case to challenges to the methodologies used, the reliability or accuracy of data upon which the EIR is based, and the formulation of significance thresholds, as these are factual determinations. *See Bakersfield Citizens*, 124 Cal.App.4th at 1198; *Mira Mar Mobile Community v. City of Oceanside* (2004) 119 Cal.App.4th 477, 493 (which held that "a lead agency has the discretion to determine whether to classify an impact described in an EIR as 'significant' depending on the nature of the area affected", citing CEQA Guidelines ("Guidelines"), including Guideline § 15064 (b)).

5. The Petitioner bears the burden to establish that the administrative record does not contain substantial evidence to support the County's conclusions. The Petitioner must lay out evidence favorable to the other side and then show why it is lacking. *See Defend the Bay v. City of Irvine* (2004) 119 Cal.App.4th 1261, 1266.

**IV. Exhaustion of Remedies**

6. The Respondents and Real Parties (sometimes referred to hereafter, collectively, as "Respondents") contend that the Petitioners have failed to exhaust administrative remedies concerning specific issues involving water supply, air quality, and greenhouse gas emissions. In deciding whether Petitioners properly exhausted administrative remedies, the Court must first examine the "true character" of the issue raised by Petitioners to the EIR. *See State Water Resources Control Board Cases* (2006) 136 Cal.App.4th 674, 793.

7. If the issue is properly raised in the administrative forum by Petitioners, then the Court may consider the validity of their challenge. *See Woodward Park Homeowners Association v. City of Fresno* (2007) 150 Cal.App.4th 683, 712. If not, then Petitioners' failure to exhaust will bar judicial review. *See Gilroy Citizens for Responsible Planning v. City of Gilroy* (2006) 140 Cal.App.4th 911, 920.

8. Respondents' exhaustion challenges will be addressed within the relevant topic areas of water supply, air quality, and greenhouse gases discussed below.

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V. **Water Supply**

***A. Independent Assessment of the Water Supply by the County***

9. A water supply and demand assessment, also referred to as a "WSA", is required for a project with more than 500 residential dwelling units. *See* Cal. Water Code §§ 10910(a); 10912 (a)(1). Pursuant to the Water Code, the public water system which serves or will serve the proposed project area prepares the WSA. *See* Water Code § 10910(b). In this case, the Tejon Castac Water District ("TCWD") is the only public water supply with boundaries overlapping the project area. Administrative Record ("AR") 17:5034, 5036; 13:3672. It was also disclosed in the Draft EIR that TCWD's boundaries would be expanded to cover the entire project site. AR 13:3672.

10. The TCWD did prepare the WSA in this case. Petitioners claim that TCWD's ties to the project proponent inherently preclude an independent evaluation of water supply as required under CEQA and the Water Code. *See California Water Impact Network v. Newhall County Water District* (2008), 161 Cal.App.4th, 1464, 1488 ("*C-WIN*"). Water Code § 34700 requires that each director of the local water district be: "(a) A holder of title to land within the district; (b) The legal representative of a holder of title to land within the district....(c) A representative designated by a holder of title to land within the district....". TCWD is, pursuant to § 34700 of the Water Code, wholly made up of management from Tejon Ranch Company. AR 170:48075.

11. The contention of Petitioners, the Court finds, is unsupported as far as an independent evaluation of the water supply being precluded. The authority cited by Petitioners, the *C-WIN* case, clearly describes the WSA as a technical informational advisory opinion of the water provider. *See C-WIN* 161 Cal.App.4th at 1486. It is not a final independent decision of the lead agency. In this case, the County explained in the Draft EIR that, as the lead agency, it would make the final determination regarding water supply for CEQA purposes and that TCWD's WSA served an advisory role. AR 17:5037, 17:5038. Further, the Final EIR addressed the Petitioners' conflict of interest concerns, noting the overlap between the Tejon Ranch

Company and TCWD directors and their duties under California's Political Reform Act (Government Code §§ 81000, *et seq.*). AR 82:23882.

12. Petitioners fail to cite evidence in the record which reflects a lack of independent analysis by the County. The County's independent evaluation is particularly evident in the Final EIR. In response to comments on the DEIR and WSA, the County employed a more conservative methodology to evaluate water availability in light of the evolving legal issues affecting the Sacramento Delta. As discussed in the next section of this Order, which deals with the criteria discussed in *Vineyard Area Citizens for Responsible Growth v. City of Rancho Cordova* (2007) 40 Cal.4th 412 at pages 430, *et seq.* ("*Vineyard*"), the project in this case will utilize three water supplies: first, State Water Project ("SWP") deliveries; second, recycled water produced by the project's wastewater treatment plant; and third, water recovered during dry years from the TCWD water banking facilities in the Kern Water Bank and Pioneer Project. AR 83:24141-24142. The water source for the Kern Water Bank is derived from the SWP. The DEIR and WSA incorporated the most conservative levels of water delivery published by the California Department of Water Resources ("DWR") in its then-most recent SWP reliability report.

13. With growing climate change concerns and pending litigation over fish protection measures in the Delta, SWP system delivery levels could change. To address this, the County employed an additional fifteen percent reduction in SWP deliveries in response to a June 4, 2009, National Marine Fisheries Service ("NMFS") biological opinion estimating a seven percent SWP impact, in addition to climate change and smelt-related impacts. In effect, the County doubled the NMFS opinion by going from a seven percent to a fifteen percent reduction. AR 83:24141-24145.

14. The County requested additional analysis in the WSA concerning water supply alternatives. AR 75:21763 - 21769. The Kern County Water Agency ("KCWA") provided additional technical support in that analysis (AR 83:24073), with review and comment by other agencies and stakeholders, including, for example, the Department of Water Resources (AR 91:26310-26315); the State Water Resources Control Board (AR 91:26318); the Central Valley

Water Board (AR 91:26411-26414); and the Santa Clarita Organization for Planning and Environment (AR 91: 24110- 24113). This evidence is substantial evidence demonstrating the County met its independent obligation to assess the sufficiency of the project's water supply.

***B. Compliance with Vineyard Area Citizens***

15. The project's WSA utilizes three water sources: (1) A water bank of nearly 30,000 acre feet of water; (2) SWP water delivery of 2100 acre feet per year; and (3) 800 acre feet per year of recycled water for outdoor irrigation produced by a proposed wastewater treatment facility. AR 17:5044-5056; 75:21743-21751; 82:23648-23663.

16. Initially, the Notice of Preparation for the project included local groundwater as a primary water source. AR 89:25765. However, several comments were received from community members questioning the potential groundwater impacts to local aquifers as a result of the project. AR 18:5402- 5405; 89:25765. In response, the TMV project's water components were revised to exclude any groundwater use. TMV, however, does retain senior overlying rights to extract water from the local aquifer for beneficial use within the project area. AR 75:21766. Additionally, the County, through DEIR Mitigation Measure 4.16, required TCWD to maintain a seven-year reserve for indoor water demand in its banking facilities for use by TMV in the event of extreme drought. AR 82:23648.

17. The California Supreme Court in the *Vineyard* decision prescribed four criteria that an EIR's water supply analysis must satisfy under CEQA. *First*, the decision makers must be presented with sufficient facts to evaluate the pros and cons of supplying the amount of water that the project will need. *Second*, the analysis cannot be limited to the first stage or the first few years. *Third*, the future water supplies identified and analyzed must bear a likelihood of actually proving available, so that speculative sources and unrealistic allocations, also referred to as "paper water," are insufficient bases for decision making under CEQA. *Fourth*, if it is impossible to confidently determine that anticipated future water sources will be available, CEQA requires some discussion of possible replacement sources or alternatives to use of the anticipated water and of the environmental consequences of those contingencies. *See Vineyard*

*Area Citizens for Responsible Growth v. City of Rancho Cordova* (2007) 40 Cal.4th 412, 430-432.

18. The EIR in this case expressly applied *Vineyard*'s principles in its water supply evaluation. AR 82:23661- 23363; 128:36689-36690. Petitioners contend the EIR fails to meet each prong of the *Vineyard* case. Specifically, Petitioners contend that the EIR: (1) fails to disclose water contracts and entitlements, the source of banked water or how banked water will be replenished; (2) improperly limits the analysis to a 20-year period; (3) impermissibly relies on "paper water" through an unfunded wastewater facility, unreliable SWP delivery estimates versus historical delivery, and finite banked water with no independent source of replenishment; and (4) fails to consider reasonably feasible alternatives. These contentions are addressed separately below.

***(i)*** **Sufficient Facts Regarding Water Supply**

19. First, as to the issues relating to water entitlements and water banking, the court in *C-WIN* interpreted Water Code § 10910(d) to require that the WSA shall include an identification of any existing water supply entitlements, water rights, or water service contracts relevant to the identified water supply for the proposed project. *See C-WIN*, 161 Cal.App.4th at 148020.

20. Contracts, therefore, need not be included in the EIR as Petitioners contend, but entitlements must be identified. The EIR sufficiently identifies the water supply and entitlements thereto. AR 17:5047-5048; 75:21743- 21751 (WSA and Draft EIR). The Final EIR response to comments also relates to that subject. AR 82:23648, 23652-23654, 23661-23363. Although not required, the water service contracts were added to the administrative record in response to comments. AR 101:29149. The Petitioners do not challenge the accuracy or completeness of these entitlements. The EIR is, therefore, sufficient on this point.

21. Petitioners further claim that the EIR fails to identify the source for banked water and how it will be acquired by TCWD to sustain the project beyond the 20-year progression

required under Water Code § 10910(c) and (d).[1] This contention by Petitioners with regard to the failure to identify the source was not supported. The Petitioners themselves identified the source as TCWD's deliveries from the SWP. Petitioners' opening brief at 10:16-17. The record clearly confirms this source. AR 75:21754; 82:23658. The record also contains a substantial amount of information about the Kern Water Bank, water bank storage and recharge, and the Pioneer Project/SWP water storage option. *See* Respondents' brief at pages 20-21, footnote 23 and extensive AR citations therein.

22. Moreover, substantial evidence supports the County's assessment that water banking is an appropriate component of the project's water supply. The record reflects that TCWD receives an average of 3,325 acre feet per year of SWP Table A water, which is potable water, and existing supply totals 9,233 acre feet. The project will require 2100 acre feet per year of Table A water, while TCWD'S projected future water demand inclusive of the project is 4,102 acre feet per year. Sufficient evidence, and simple math, supports the conclusion that TCWD has a future water supply which will permit water banking deposits which may be tapped in dry- or drought-stricken years.

23. Further, in response to comments, the County employed an even more conservative assumption of future availability using the "worse drought scenario" recorded in 1977 through 1981, and notwithstanding these assumptions, the County found the water supplies adequate to meet project needs and TCWD demand. AR 17:5049; 83:24142-24145; 128:36691. The Petitioners' policy disagreement with the use of banked water as a supply source may not be transformed into a CEQA challenge regarding the sufficiency of the EIR. *See* Guidelines § 15003(i).

***(ii) Water Supply Analysis Not Limited to First Few Years***

24. Under the second criterion in *Vineyard*, the Petitioners claim the EIR improperly limits this analysis to the first few years of development. The EIR, however, did not limit the

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[1] This was one issue that Respondents contend Petitioners failed to exhaust. However, I do find that TriCounty did sufficiently raise this question in its request concerning the source of banked water. AR 81: 23529 -23530. Accordingly, I find that the administrative remedy was properly exhausted as to that issue.

analysis to the first phases of the project. Rather, the water supply was analyzed under the assumption the project will require 100 percent of its full build-out needs in the first year and continue over an 82-year period.

25. As modeled by the KCWA, the WSA is based on an 82-year record of water delivery, taking into consideration climate and other conditions. This quantitative model includes DWR's 2008 final SWP Reliability Report, which significantly reduced DWR's previous estimates of future SWP deliveries in response to ongoing endangered fish litigation and potential climate change conditions. AR 17:5048; 75: 21756; 83:24072-24073; 131: 37432-37433, 37435-37436; 75: 21757; 128:36691.

26. Petitioners next challenge the reliability of the "black-box" CalSim-II model used in the WSA. Petitioners contend that the model overestimates water deliveries. *See Planning & Conservation League v. Department of Water Resources* (2000) 83 Cal.App.4th 892 ("*PCL*"). In *PCL*, the evidence showed that the SWP delivers about half of the forecast goal. The issue in this case, however, is not whether the CalSim-II model is irrefutable, but whether the study in this EIR sufficiently supports the County's decision. *See State Water Resources Control Board Cases*, 136 Cal.App.4th at 795; *see also*, CEQA Guidelines § 15151 (disagreement among experts does not invalidate an EIR).

27. The CalSim-II model was developed by the DWR to estimate future SWP deliveries. AR 75: 21754-21755. The predecessor to the CalSim-I and CalSim-II models was recently upheld in *Planning & Conservation League v. Castaic Lake Water Agency* (2009) 180 Cal.App.4th 210, 248-249. ("*PCL II*"). The record sufficiently explains the "Delta risk factors," in other words, climate change, pumping restrictions, *et cetera*, which are built into the CalSim-II model. AR 119:34197-34199, 34346-34363, 34091-34098.

28. Moreover, what Petitioners fail to note is that the County applied an additional fifteen percent reduction in SWP delivery estimates, notably in response to the ruling in *PCL*, reducing projected delivery below 48 percent. Nevertheless, the County concluded that future water supply would be adequate. AR 83:24142-24145.

29. The Court finds that the County's decision concerning adequate water supply is supported by a reasoned analysis and substantial evidence.

***(iii) No Reliance on "Paper Water"***

30. The Court will next address the issue of "paper water" versus real water. Petitioners assert that the EIR used inflated SWP reliability estimates in the range of 63 to 68 percent provided by the DWR, which runs afoul of the historical yield found in the *PCL* case, 83 Cal.App.4th at 908, footnote 5, and thus constitutes reliance on "paper water." As the court has discussed earlier, this contention lacks merit. The EIR adequately discusses use of the most conservative assumptions of CalSim-II, which provides an average delivery of 63 percent over an 82-year period, with a further fifteen percent reduction that brings delivery down to 48 percent under the analysis imposed by the County. AR 119:34087-34090, 34101-34102; 83:24142-24145.

31. Additionally, the EIR incorporated several additional conservative assumptions not mentioned by Petitioners. For example, the TCWD would not obtain any future supplemental supplies or storage augmentation rights, the County required maintenance of a seven-year indoor water reserve in the water banks, the analysis assumed a limitation on stored water of 24,000 rather than the current level of 30,000 acre feet, and further assumptions included no use of area groundwater, and no use of supplemental water which has historically been available from non-SWP sources to TCWD. ("Non-SWP" sources refers to sources historically available to TCWD other than the contractual SWP water. AR 17:5049.)

32. Next, Petitioners contend that reclaimed water from the project's proposed — not financed, cited or permitted -- wastewater treatment facility constitutes "paper water." The EIR, however, adequately describes facility location, build-out, permit requirements, financing, and evaluates impacts and prescribes mitigation measures for the wastewater treatment facility. AR 17:5055; 1:43, 66, 73, 146, 305-309; 75:21860; 76:21888-21916; 128: 36699. The EIR, therefore, adequately addresses the certainty of this source. The EIR further explained that the interim and permanent wastewater treatment facilities will be constructed in phases, matching project development and service needs over time, inclusive of the golf courses, ending with a full

wastewater treatment facility by project build-out. AR 17: 5055; 82:23665. And as a result of this analysis, the County found that no bonding or other financial security would be deemed necessary. AR 82:23665.

33. Finally, the Petitioners contend that water bank replenishment is based on "paper water" as it is "impossible to forecast any reliable supply" from the Kern Water Bank. Petitioners' brief at page 16, line 2. Again, however, Petitioners' emphasis is on disagreement with the methodology used rather than the sufficiency of the EIR. As discussed earlier and explained in the EIR, Table A SWP water deliveries will recharge the banks during wet years under the conservative assumptions of DWR, KCWA and TCWD which were used in the WSA. AR 128:36996-36697; *see also*, AR 128:36991-36992; 17:5050. Those estimates predict surplus water delivery which, as the EIR explains, will be conveyed for water bank replenishment and used in single and multiple dry years. AR 73:5050-5052; 128:36696-36697.

***(iv) Reasonable Feasible Alternatives***

34. As Petitioners note, the fourth criterion of *Vineyard* requires that the EIR address possible alternative supplies if future water sources cannot be confidently determined. The Court finds here, however, that there is sufficient evidence in the record to support the County's determination that the project's water supplies were, even under "worst-case scenarios" and also taking into account additional conservative assumptions, adequate to meet the project's full demand. A discussion of contingencies or alternatives is therefore unnecessary under *Vineyard*. Notwithstanding, the County did request, and the EIR sufficiently discusses, alternative sources. The WSA analyzes five additional sources of water supply. AR 75:21763-21769.

**VI. Castac Lake**

35. Petitioners object to the exclusion of Castac Lake from the project description and maintain that "the lake was omitted so that the EIR would not have to disclose or analyze the impacts of the lake management scheme" which itself includes depletion of area groundwater and increased flood risk. The Petitioners particularly emphasize that the Notice of Preparation initially included the lake and its uses, which were to be recreational (inclusive of a new marina) and also its groundwater sources. AR 18:5274.

36. The history of Castac Lake is detailed in the record. AR 79:22943-22958. What the review of that history reveals is that the lake is a natural resource, and activities relating to floodwater quality and fire control predate the TMV project by several years, having commenced around 2001. AR 79:22948.

37. For the reasons that were addressed in the EIR and also for the reasons summarized below, the Court finds that Petitioners' objections relating to Castac Lake are not proper challenges under CEQA. The CEQA scoping process fosters early review to address and resolve public concerns before a particular concern becomes a bigger problem later in the review process. *See* Guidelines § 15083. Castac Lake is a good example of project revisions resulting from early consultation and resolution prior to preparation of the DEIR. In response to community concerns about planned recreational use and groundwater extraction for the project, the proponents significantly altered the TMV Specific Plan to fully exclude the lake which, Petitioners acknowledge, benefited both the environment and the neighboring communities. *See* Petitioners' brief at page 18, line 16; *see also*, AR 13:3612-3613. The project does not include any development or use of the lake. AR 79: 22943. The FEIR explained in response to comments:

> "Lake management was not 'caused by' the project, in fact, the Pace Report and other information show that the lake has always existed, flooding and other lake management issues predate the project by decades, and the current lake management strategy was undertaken after a costly road relocation effort prompted by a 1999 through 2000 flood that predated any use of groundwater to stabilize the lake level." AR 79:22952.

38. The record further states: "CEQA requires that all components of a project being proposed for approval must be described in the EIR." 1 S. Kostka and M. Zischke, Practice Under the California Environmental Quality Act § 12.8 (2d Ed., CEB, 2008) ("*Kostka CEB Treatise*"). "The lake is an existing environmental feature for which no agency approvals are being sought, nor does the project propose any modifications to the lake. The lake is identified throughout the Draft EIR as part of Tejon Ranch and as part of the setting against which project impacts must be and have been evaluated. Major excerpts of the Draft EIR relating to the lake

are compiled in Part A of Global Response 7.5.1 above for the convenience of reviewers." AR 79:22956.

39. "Because the lake is not part of the project, TRC's[2] management of the lake," TRC's "management of the lake is not dependent on or otherwise a component of the project, and the project is not seeking to modify or change the uses or physical configuration of the lake. The management of the lake is considered part of the existing environmental setting for EIR purposes, and CEQA does not require or authorize mitigation for existing environmental conditions that are unrelated to a proposed project." AR 79:22958.

40. Where, as in this case, Castac Lake management and the TMV project are not interdependent (in other words, no changes are proposed to preexisting lake management), the lake management activity need not be included in the TMV project description. *See Communities for a Better Environment v. City of Richmond* (2010) 84 Cal.App.4th 70, at 101 ("*Richmond*"). In the *Richmond* case, the city's treatment of a hydrogen pipeline as being separate from a refinery project did not constitute illegal piecemealing. *See also*, *Black Property Owners Association v. City of Berkeley* (1994) 22 Cal.App.4th 974, 985, which held that because no changes were proposed to preexisting, exempt, housing-related ordinances, no assessment of their environmental effect was required under CEQA.

41. In the Petitioners' opening brief at page 19, line 13, the Petitioners assert that the EIR fails to adequately analyze the groundwater pumping impacts relating to ongoing Castac Lake management by TRC. The Court finds upon review of the record that there is substantial evidence in the record supporting the EIR's analysis of all potential project-specific and cumulative impacts relating to Castac Lake. AR 79:22943-22958.

42. The County evaluated comments critical of Tejon Ranch Company's management of Castac Lake. It reviewed expert reports, reviewed comments and conclusions by experts and nonexperts, and ultimately concluded that existing lake management activities are not adversely impacting the local aquifer or local water wells. AR 81: 23376 -23379.

[2] "TRC" refers to Tejon Ranch Company.

43. In Petitioners' opening brief at page 20, line 2, they also assert that the EIR fails to analyze the increased flood risk relative to Castac Lake. The FEIR summarizes those portions of the DEIR which evaluated Castac Lake in relation to the project identified both impacts and mitigation measures to protect the lake. AR 79:22943-22947. Mitigation Measure 4.8-43 requires TMV to obtain a written commitment from Tejon Ranch Company ("TRC") that TRC will manage Castac Lake at an elevation of 3500 feet above sea level, providing an additional 1,076 acre feet of water storage below the elevation of 3,503 feet. AR 2:550. A flood risk analysis was conducted based on a Castac Lake level of 3,503 feet above mean sea level. AR 80:23208-23211. The County determined that the flood hazard relating to Castac Lake was reduced to less than a significant level by adopted mitigation measures. AR 1:266-271.

**VII. Air Quality**

44. Petitioners contend that the EIR fails to disclose the project's impacts on the adjacent Mojave Desert Air Basin ("MDAB") and relies on a deferred mitigation program to mitigate the significant quantities of air pollution that would be generated by the project. *See* Petitioners' brief, page 38, lines 12 through 14.

45. The Petitioners' first contention is that "the project will result in a significant increase in vehicle traffic in the MDAB primarily as a result of increased vehicle trips on State Route 138 running east from the project vicinity to the Lancaster-Palmdale metropolitan areas." The Court finds that this issue was not, as Respondents have noted, first presented to the County in the administrative process. The Petitioners fail to cite to anywhere in the administrative record where this issue was previously raised. Additionally, and though not used as the basis for Petitioners' argument that they have fully exhausted this issue, Petitioners' reference to indirect impacts from motor vehicle emissions in the MDAB (*e.g.*, the record citations at page 13, note 18, of Petitioners' reply brief) does not support Petitioners' contention that this direct impact from traffic on State Route 138 was raised in the administrative proceeding. *See* AR 135:38689-38690; 81:23360-23361, 23468; 95:27457.

46. The purpose of the exhaustion doctrine is to give public agencies the opportunity to decide matters within their expertise, respond to objections, and correct any errors before the

courts intervene. *See California Native Plant Society v. City of Rancho Cordova* (2009) 172 Cal.App.4th 603, 616. The County did not get that opportunity. The issue of direct impacts on the MDAB from motor vehicle traffic on State Route 138 is, therefore, barred under the exhaustion doctrine. *See Coalition for Student Action v. City of Fullerton* (1984)153 Cal.App.3d 1194 at 1197, which held that Petitioners cannot rely on generalized environmental comments at public hearings to satisfy the exhaustion doctrine. *See also, Resource Defense Fund v. Local Agency Formation Commission* (1987) 191 Cal.App.3d 886 at 894, which held the exact issue raised in the lawsuit must have been presented to the administrative agency so that it will have had an opportunity to act and render the litigation unnecessary.[3]

47. Petitioners' second contention is that "air quality in the MDAB will be further impacted because meteorological conditions of the region contribute to the transport of criteria pollutants from the SJVAB to the MDAB across the project site." Petitioners' brief at page 40, line 7 through 10. However, the Court finds that this is more of a policy disagreement than a valid CEQA compliance argument. The EIR sufficiently discloses and explains the following: (1) "The nonattainment status of the three affected air basins - San Joaquin valley Air Basin (SJBAB), in which project development will occur, South Coast Air Basin (SCAB), and Mojave Desert Air Basin (MDAB)" (AR 13:3767 -3769) "and the challenges faced as a result."; (2) "The potential for air pollutant transport to the MDAB," AR 13:3762-37 63; 79:22720-27721; 128:36682-36683; (3) "TMV'S agreement with the San Joaquin Valley Air Pollution Control District ("SJVAPCD"), entitled Voluntary Emission Reduction Agreement" ("VERA"), "which commits the project to fully offset all project emissions of nitrogen oxide, reactive organic gas, and particulate matter within the SJAB," AR 13:3853-3857, "and explains how the VERA will

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[3] Notwithstanding the Petitioners' failure in this case to exhaust administrative remedies on this specific issue, the EIR does sufficiently explain that the project will not result in motor vehicle emissions within the MDAB, and the Court finds that Petitioners have failed to prove that this conclusion is not supported by substantial evidence. AR 13:3759. The record suggests no operational emissions within MDAB (AR 13:3879)), and indicates all trips outside of the San Joaquin Valley Air Basin ("SJVAB") would be in the South Coast Air Basin ("SCAB") (AR 14:3942). Respondents' brief, page 35, Note 57, citing the EIR'S traffic model, which demonstrated that no significant trips would continue east to Lancaster-Palmdale along State Route 138.

alleviate impacts to the MDAB," AR 79:22720-22721; 81:23399-233400; and (4) "The more than 15 air quality mitigation measures," AR 12:3458-3477. The Respondents note in their brief that the VERA is already being implemented before project approval and construction. AR 128:36681.

48. The Court finds that the EIR further explains that without mitigation and the VERA, the project could adversely affect air quality within the MDAB, but with the offset requirements in the VERA, the project will not adversely affect the MDAB. It also is noted that the SJVAPCD takes the position that the VERA fully mitigates the project's air pollutants to a less than significant level. AR 81:23316. Additionally, the Kern County Air Pollution Control District covers a large portion of the MDAB and has indicated that the EIR satisfies all of its concerns. AR 81:23399.

49. Also, with regard to the Court's reference to the offset requirements in the VERA, the project will not adversely affect the MDAB. AR 13:3865, 3878 and 3879. The Petitioners disagree with the County's conclusion. The court, however, may not pass on the correctness of the County's conclusion but only upon the sufficiency of the EIR as an informational document. *See Citizens of Goleta Valley v. Board of Supervisors* (1990) 52 Cal.3d 553, 564.

50. Lastly, Petitioners contend that the EIR improperly defers the formulation of specific mitigation measures concerning emission reductions undermining CEQA's disclosure and public participation requirements. Specifically, Petitioners contend that Mitigation Measure 4.3-1, which relates to conflicts with or obstructing implementation of the applicable air quality plan, unlawfully defers the formulation of specific mitigation measures to future site development and, therefore, fails to address "what measures will actually be formulated to achieve the purported reductions required to comply with the EIR'S less than significant finding." Petitioners' brief, page 42, lines 13 and 14. Respondents argue that Mitigation Measure 4.3-1 meets all criteria set forth in *Communities for a Better Environment v. City of Richmond* (2010) 184 Cal.App.4th 70, 93-95, which affirms under what circumstances a lead agency may defer the formulation of specific mitigation measures.

51. Deferral is permitted after the lead agency: (1) undertook a complete analysis of the significance of the environmental impact; (2) proposed potential mitigation measures early in the planning process; and (3) articulated specific performance criteria that would ensure that adequate mitigation measures would eventually be implemented. As Respondents note, the EIR includes a detailed analysis of potential air quality impacts and a description of the mitigation measures, all of which were presented in the DEIR at the earliest possible point in the CEQA process. AR 13:3830-14, 3982. The Court finds that this satisfies the first and second criteria in the *Richmond* case.

52. Mitigation Measure 4.3-1 provides:

> "Prior to issuance of any building permit, the applicant shall submit evidence verified by the SJVAPCD specific to any portion of site development that the residential and/or commercial development has total project construction and operations mitigated below two tons per year for nitrous oxide (total project construction and operations) and mitigated below two tons per year for PM10 emissions (total project construction and operations) within the SJVAB. Required reductions can be achieved from any combination of project design, compliance with the ISR[4] and/or a DMC[5] or VERA. If a DMC/VERA is utilized, a copy of the executed agreement and implementing reports shall be provided to the Planning Department to substantiate compliance. As there still could be unmitigated emissions of [ROG] under this mitigation measure, participation in any air mitigation program adopted by Kern County that provides equal or more effective mitigation than this mitigation measure can be utilized as a replacement for the requirements of this mitigation measure." AR 12:3458-3459.

53. Mitigation Measure 4.3-1 contains a clear performance standard and prohibits the issuance of building permits unless the project proponent demonstrates compliance with a two-ton-per-year performance standard. Further, VERA requires that mitigation must be implemented. Finally, the mitigation measure requires both the County and SJVAPCD to verify the adequacy of the emission reductions. AR 13:3863-3864. As a result, the Court finds the third criterion in *Richmond* is met.

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[4] "ISR" refers to the SJVAPCD's Indirect Source Review Program. AR 13:3817-3818.

[5] "DMC" refers to the Development Mitigation Contract. AR 13:3763, 3818.

54. Petitioners also argue that the two-tons-per-year emission standard is a "significant undertaking" and questions its feasibility. As Respondents point out, however, the EIR presents quantified mitigation measure reductions which do not include other anticipated reductions from other commitments, such as other motor vehicle and transit emissions reductions, as well as reductions under VERA, and although not anticipated by TMV, any shortfall in mitigation may be satisfied through the payment of mitigation fees calculated by SJVAPCD to fund emission reduction projects. AR 128:36684-36687.

**VIII. Climate Change**

55. California's AB 32, the Global Warming Solutions Act set forth in Health and Safety Code §§ 38500, *et seq.*, requires the California Air Resources Board ("CARB") to establish measures to roll back "business as usual" ("BAU") greenhouse gas ("GHG") emissions produced in 2020 to 1990 levels. Health and Safety Code § 38550. CARB determined the percentage of needed reduction is 28.356 percent and allocated as a part of CARB's scoping plan eight percent of the GHG emission reduction to the residential/commercial development sector. AR 232:64614 - 64615. Notwithstanding the eight percent allocation to residential/commercial, the County determined in this case that the significance threshold for analyzing the project's impacts concerning GHG emissions is AB 32's overall GHG reduction goal of 29 percent below BAU. AR 13:3858-3860; 79:22959-22962; 128:36656-36680.

56. The Petitioners' primary objection is that the "EIR's heavy reliance on state regulatory action to address project emissions functions to relieve the project applicant of any independent obligation to adopt needed additional measures to further reduce project emissions." Petitioners' brief, 35:6-9. They contend the Attorney General has opined that the 29 percent below BAU "does not withstand legal scrutiny" because it lacks factual support and "it seems new development must be more GHG-efficient than this average given that past and current sources of emissions, which are substantially less efficient than this average, will continue to exist and emit." Exhibit 1 to Petitioners' Request for Judicial Notice.

57. Petitioners contend the County disregarded other expert analyses, disregarded Executive Order S-3-05, which provides a longer range goal of 80 percent below 1990 levels by

2050, and improperly defers mitigation. For reasons the Court will discuss hereafter, the Court finds that the County's climate change analysis is supported by substantial evidence.

58. First, relating to the County's 29 percent below BAU threshold of significance: Significance thresholds may be based on existing environmental standards, such as statutes or regulations. *See Protect the Historic Amador Waterways v. Amador Water Agency* (2004) 116 Cal.App.4th 1099, 1107, which held that a lead agency's use of existing environmental standards to determine the significance of a project's environmental impacts is an effective means of promoting consistency in significance determinations and integrating CEQA environmental review activities with environmental program planning and regulation.

59. The CEQA Guidelines which were pending during the CEQA review process for the project, and that were addressed in the EIR, recognize the agency's discretion in setting significance thresholds. *See* CEQA Guidelines Amendments § 15064.4. That provision is also referenced in Exhibit C to Respondents' and Real Parties' Request for Judicial Notice, of which (without objection) the Court has taken judicial notice.

60. New Guidelines § 15064.7(c) further provides that a lead agency "may consider thresholds of significance previously adopted or recommended by other public agencies..., provided the decision...is supported by substantial evidence." Notably, after EIR certification, the SJVAPCD issued its final guidelines applying the 29 percent below BAU goal for new projects. *See* Exhibit B to Respondents'/Real Parties' Request for Judicial Notice and AR 341:92867-92868. The EIR's methodological approach is consistent with SJVAPCD'S analysis.

61. The EIR also analyzes and explains why a significance threshold of zero emissions at 900 tons per year, as suggested by Petitioners, was not adopted by the County. The record reflects that other agencies have rejected a net zero approach, and CNRA, California Natural Resources Agency, similarly rejected adopting a zero emission threshold in the new CEQA Guidelines Amendments. AR 79:22964-22966; 316:86170.

62. Further, the EIR sufficiently addressed the California Air Pollution Control Officers Association ("CAPCOA") white paper relative to CEQA and climate change and explained the document was not a guidance document but rather intended as a resource and

explains that the standard of 29 percent below BAU is appropriate for the project. Like AB 32's Scoping Plan, the EIR also recognizes that additional GHG emission reductions may be necessary after AB 32's mandates are satisfied. The EIR further requires compliance with any Climate Change Action Plan developed by the County, including the requirements of SB 375. AR 79:22869, Mitigation Measure 4.3-18.

63. The Court finds that the issue of how to establish a significance threshold for GHG was sufficiently raised to apprise the County of the relevant facts and issues and the purpose of the exhaustion doctrine was satisfied. *See Center for Biological Diversity v. County of San Bernardino* (2010) 185 Cal.App.4th 866, 890.[6] The Court finds, however, that this issue was adequately addressed in the EIR.

64. Petitioners' argument that the EIR disregarded the Executive Order S-3-05 target goal of 80 percent below 1990 levels by 2050 is not supported by the evidence. The EIR reflects that in amending AB 32, the Legislature declined to adopt the longer-term emission reductions, (AR 128:36675-36676), and that AB 32's goals for 2020 are not only grounded in hard science but represent the only legally enforceable emission limit under California law. AR 128:36663-36668; *see also* 128:36675-36677. Petitioners' disagreement does not make the EIR inadequate. *See* Guidelines § 15151.

65. On the subject of deferred mitigation, as discussed under "air quality" previously, the *Richmond* case affirms that details of mitigation may be deferred to a future date so long as the mitigation measure includes specified performance standards and identifies measures that may be implemented to achieve these standards. *See Richmond*, 184 Cal.App.4th at 95; *see also*, Guidelines § 15126.4 (a)(1)(b). The EIR addressed the significance standard early in the review process in the DEIR. AR 14:3962-3963. It also provided details how the GHG calculations

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[6] In the Real Parties in Interest's brief at page 8, lines 21 through 28, Real Parties in Interest argue that the issue of adopting a significance threshold by using the methodology developed by the Bay Area Air Quality Management District ("BAAQMD") was not raised in the administrative proceedings and, therefore, administrative remedies were not exhausted as to that issue. However, as the Petitioners note in their reply brief to the Real Parties in Interest at 4:9-11 and at pages 23 through 27, the BAAQMD proposal was before the County (AR 79:022960) and the Petitioners raised concerns that the County's significance threshold for GHG was not supportable and was contrary to expert evidence. AR 135:38684-38688.

were derived. AR13:3837-3853; 32:9256-37:11027. The EIR gives assurances of implementation with both County and SJVAPCD oversight, Mitigation Measure 4.3-18 (AR 79:22869), and it sets forth in detail criteria to assess the success of the mitigation measures.

66. The Court finds the Petitioners have failed to meet their burden to prove that the EIR is less than sufficient and complete in light of the foregoing.

**IX. Condors**

67. Petitioners' argument concerning the EIR'S condor impact analysis, mitigation measures and the conclusions reached by the County, is another example in the parties' briefs of expert disagreement, which does not invalidate the EIR. Petitioners' disagreements with the EIR's use of Global Positioning System ("GPS") data, whether loss of foraging habitat is a limiting factor concerning condor recovery and survival as opposed to lead poisoning, and the effect of a supplemental feeding program as mitigation, do not demonstrate that there is insufficient evidence in the record to support the County's findings and conclusions. The burden is on Petitioners to demonstrate that the EIR is inadequate as an informational document. By pointing to evidence in the record favorable to their position, Petitioners do not carry the required burden. *See California Native Plant Society v. City of Rancho Cordova* (2009) 172 Cal.App.4th 603 at 626.

68. Petitioners do not dispute that the EIR discusses at length the factual and legal status of the California Condor. AR 14:4083-4095; 41:12113-12206. *See* the Tejon Ranch California Condor Conservation and Management Plan, also referred to as the Condor Report (AR 41:12113-12206); the US Fish & Wildlife Service ("FWS") California Condor Recovery Plan (AR 278:76668-76679 and 76981); the 2008 report from the American Ornithologists' Union and Audubon California entitled "Status of the California Condor and Efforts to Achieve its Recovery" ("AOU/Audubon Report") (AR 342:93236- 93360); TRC's pending application with FWS for approval of the Tehachapi Uplands Multispecies Conservation Plan ("HCP")(AR 13:3683;14: 4094); the Tejon Ranch Conservation and Land Use Agreement, also referred to as the "Ranchwide Agreement" (AR13:3679-3683); state and federal laws protecting the condor (AR 14:4093-4095); project impacts on foraging habitat (AR14:4092); project design to avoid

ridgelines and peaks (AR14:4089); mitigation requirements, particularly Mitigation Measure 4.4-6 requiring FWS-directed supplemental feeding (AR14:4118-4119); and opponents'/Petitioners' comments and responses thereto, noting in particular the EIR'S explanation why supplemental feeding results in a positive net effect on condor recovery (AR 128:36786-36787; 41:12120). This is substantial evidence supporting the conclusion that the EIR is adequate.

69. The Condor Report analyzed the TMV project and found that the proposed development associated with TMV will result in the loss of approximately 1,337 acres of foraging habitat for condors. In the opinion of condor expert Peter Bloom and other experts, this is not an impact that will significantly adversely affect the condor, nor rise to the level of causing injury or harm to condors or interfere with essential condor behavior patterns. AR 41:12158-12160.

70. The Condor Report (AR 41:12140) states that the latest version of the Condor Recovery Plan, the FWS 1996 version, suggests that habitat loss is not an important factor in recovery of the condor. Similarly, another expert, Snyder, in 2007 did not identify habitat loss as a limiting factor for wild California condors. The most important factor is to eliminate lead from the diet of condors. AR 41:12140.

71. In Petitioners' opening brief at page 25, line 9, they contend that the Ranchwide Agreement, referring to the Tejon Ranch Conservation and Land Use Agreement, the prior agreement between Tejon Ranch and the five conservation organizations in 2008, and also the HCP, referring to the Tejon Uplands Multispecies Habitat Conservation Plan, applied for by Tejon Ranch and being considered by the USFWS, are not valid mitigation relative to impact on the California Condor. Petitioners further assert in their brief, page 26, line 16, that neither the Ranchwide Agreement nor the HCP are actually projects properly included in the analysis of the cumulative impacts under CEQA. Petitioners assert at page 27, line 7, of their brief that mitigation measures must be fully enforceable through permit conditions, agreements, or other legally binding instruments (Guidelines § 15126.4 (a)(2)), and also the formulation of mitigation measures should not be deferred until some future time (Guidelines § 15126.4 (a)(1)(b)). Petitioners also note that the Ranchwide Agreement purports to conserve approximately 240,000

acres of the ranch, but 62,000 acres must be purchased from Tejon Ranch Company in order to be conservation land or else they may be subject to development. AR 13:3680. And Petitioners assert that the HCP is an unenforceable mitigation measure because it is a federal requirement, not a state requirement, that has yet to be approved. AR 128:36789.

72. The Court notes that in the County staff's response to comments from Petitioner Center for Biological Diversity ("CBD"), the County staff notes that CBD is arguing that approval of the HCP by FWS should be required as a mitigation measure. AR 128:36789. County staff further notes that the County has included substantive mitigation measures to address significant and potentially significant impacts on the condor. CEQA does not allow for deferral of mitigation measures based on later actions that may or may not be taken by third-party agencies not within the jurisdiction or control of Kern County. AR 128:36789. The County asserted that it was not relying on either the HCP or the Ranchwide Agreement as mitigation measures relative to the condors.

73. Real Parties in Interest in their opposition brief, at page 24, dispute the claim by Petitioners that the Ranchwide Agreement and HCP are used as mitigation measures. They note that they are not part of the project (AR 13:3679 and 3683), that they are not identified as mitigation measures (AR 14:4115-4119), and that they are not included in the project in the mitigation monitoring plan (AR 2:337-592). Real Parties in Interest also contend that the Ranchwide Agreement and HCP both have land use consequences and are properly considered in the EIR's cumulative impact analysis, and they cite Public Resources Code § 21100(e), which provides that "previously approved land use documents, including but not limited to general plans, specific plans, and local coastal plans may be used in cumulative impact analysis".

74. In Petitioners' reply to the Real Parties in Interest's opposition brief at page 10, line 18, Petitioners contend that the EIR mischaracterizes expert reports regarding the importance of protection of habitat for condors. AR 342:93304. However, the reference to that citation is from the AOU/Audubon Report, which is making reference to future condor release sites and associated habitat. It is not referring to condor foraging habitat within the boundaries of the Tejon Mountain Village project.

75. A cumulative impact analysis should include all sources of related impacts, not simply similar sources or projects. *See City of Long Beach v. Los Angeles Unified School District* (2009)176 Cal.App.4th 889, 907. In the *Kostka CEB Treatise* §13.27, page 638, the authors note that, "[t]he lead agency has discretion to determine the appropriate way to analyze environmental impacts in an EIR. Disagreements with the adequacy of an EIR's impact analysis will be resolved in favor of the lead agency if there is any substantial evidence in the record supporting approach used." *See Laurel Heights Improvement Association v. Regents of the University of California,* (1988) 47 Cal.3d 376, 408-409; *Eureka Citizens for Responsible Government v. City of Eureka* (2007)147 Cal.App.4th 357 at 372; *State Water Resources Control Board Cases* (2006)136 Cal.App.4th 674, 795. Strike that. 674 at page 795. The authors further note that an EIR "need not follow the analytical methods recommended by regulatory agencies or other interested agencies as long as the method of analysis employed is supported by substantial evidence." *See Association of Irritated Residents v. County of Madera* (2003) 107 Cal.App.4th 1383 at 1396-97; *see also, Gray v. County of Madera*, (2008) 167 Cal.App.4th 1099 at 1125; *Sierra Club v. City of Orange* (2008)163 Cal.App.4th 523 at 544-545.

76. *Bakersfield Citizens for Local Control,* 124 Cal.App.4th at 1213-1219 supports the proposition that a cumulative impacts analysis should inform the public and decision makers of future growth and land uses in the vicinity of a proposed project and how their impacts will interact with the proposed project. One of CEQA's most fundamental objectives is to disclose information to the public and decision makers about the environmental context and consequences. *See* Guidelines § 15002 (a)(4); *Protect Our Water v. County of Merced* (2003) 110 Cal.App.4th 362, 371-372;

77. In the *Kostka CEB Treatise*, at §12.10, page 588, the authors suggest that: "When additional future projects are anticipated or when a project is related to a larger series of independent actions, a discussion of the related projects and their potential effects can be included in general terms in the EIR for a particular project. Although inclusion is not mandated by the project description cases, it may be helpful in defending against challenges to the scope of the EIR." The authors refer to the following cases: *National Parks and Conservation*

*Association v. County of Riverside* (1996) 42 Cal.App.4th 1505 at 1514-1515; *Rio Vista Farm Bureau Center v. County of Solano* (1992) 5 Cal.App.4th 351 at 372-373; *Del Mar Terrace Conservancy v. City Council* (1992) 10 Cal.App.4th 712 at 735; *Christward Ministry v. County of San Diego* (1993) 13 Cal.App.4th 31, 44-45. The authors state that in those cases:

> A factor supporting the adequacy of the project description was the inclusion of a general discussion of the contingent future projects. The *Christward Ministry* EIR discussed the relationship between the landfill expansion project and other proposed landfill and solid waste processing projects; the *National Parks* EIR generally described solid waste transfer stations; the *Rio Vista* EIR included some generalized discussion of the likely impacts of siting hazardous waste facilities under the hazardous waste plan; the *Del Mar* EIR disclosed potential future projects and their contingent nature so that the overall transportation scheme was discussed. Attorneys for project applicants or public agencies should try to anticipate creative arguments made by project opponents concerning reasonably foreseeable consequences of a project.

78. Having considered all of the positions argued by counsel, the authorities cited, and looking at the administrative record, the Court finds that substantial evidence in the record supports the methods employed by the County in analyzing the environmental impacts relating to the California Condor, including discussion and analysis of the Ranchwide Agreement and the HCP in the cumulative impact analysis. The Court does not find a prejudicial abuse of discretion by the County in this process.

**X. <u>Cultural Resources</u>**

79. Petitioners claim that Respondents' failure to disclose to the National American Heritage Commission ("NAHC") and Most Likely Descendant ("MLD") the exact location of cultural and historical resources on the project site violated Public Resources Code § 5097.98 and Guidelines § 15064.5(d). The Court finds that this contention misstates the requirements under these provisions. Neither Public Resources Code § 5097.98 nor Guidelines § 15064.5(d), requires the release of precise locational data. Rather, as the EIR explains, Native American consultation with the MLD regarding the recommendations when human remains are discovered is required. The EIR, in fact, evidences an incident when consultation did occur due to discovery of human remains in one location on the project site. AR 15:4560. Further, Mitigation Measure 4.5-42 requires ongoing compliance with Public Resources Code § 5097.98. AR 15:4570-4572.

80. As Respondents note, Petitioners have identified no legal authority requiring disclosure of exact site location information. To the contrary, and as the EIR explains, the County has a statutory duty to "protect the confidentiality of information concerning the specific identity, location, character, and use of those places, features, and objects." *See* Government Code §65352.3(b) and § 6254(r), which permits the County to withhold from public disclosure records of Native American graves, cemeteries, and sacred places, features, and objects.

81. The Court finds, based on the evidence in the EIR and the record, that the County did comply with all Native American consultation requirements.

82. Petitioners next allege that the EIR failed to analyze impacts to several identified resources such as the "Ridge Route"; Castaic Creek Trail; the Huerta De Arriba Cemetery on Paso Creek; the Native American Schoolhouse; the Tejon Creek Cemetery; the Chumash Kaiawasu, Kitanemuk and Yowlumne "cultural landscapes"; and the KashtiqVillage within Castac Lake.

83. The Court finds that Petitioners have not correctly cited the record, have failed to accurately note comments raised, and have failed to disclose other information which is in the EIR. Only two cultural resources, the "Ridge Route" and Kashtiq, were generally addressed in comments within the vicinity of the project (AR 83:23902 and 23916-23). The EIR explains that the "Ridge Route" reference did not identify any new cultural site which could be impacted when compared to sites already surveyed (AR 83:23946 and 23956), and that the village of Kashtiq was fully discussed and analyzed in the EIR and is identified as site CA-KER-307 (AR 15:4538- 4539, and 4554, 4563).

84. Respondents, in their opposition brief, note that:

> "The EIR explains that Kashtiq is not currently underwater but was previously capped and preserved in place (AR 83:23944) No burial site associated with Kashtiq was identified (AR 83:23947), no Native American villages or burial sites were covered or disturbed when the lake level was stabilized (AR 82:23787), and that it is not possible to determine if any potential burial site is underwater due to fluctuating lake levels (AR 83:23947)." Real Parties in Interest's brief at page 33, footnote 70.

85. The remaining sites were raised by Petitioners in comments to a separate Environmental Impact Statement (" EIS") prepared by FWS for the HCP. Nonetheless, the EIR identified and discussed the sites within the project development envelope. AR 128:36793. The EIR also explained that cultural sites outside the project's development will not be impacted because they lie within permanent open space. AR 128:36793, AR 15:4556, AR 83:23942. Further, Petitioners fail to present legal authority that Native American "cultural landscapes" or "viewscapes" must be analyzed. These features are not "cultural resources" under Public Resources Code § 5097.98, nor are they included in the Guidelines. AR 15:4552.

86. Finally, Petitioners argue that the EIR failed to adequately mitigate significant effects on cultural resources by failing to consider the preferred "preservation-in-place" mitigation measure. *See* Guidelines § 15126.4(b)(3). However, Petitioners cite no authority which requires use of a particular "preservation-in-place" methodology. Moreover, Petitioners do not show that the County's 44 mitigation measures (AR 15:4560-4573), which include preservation-in-place, do not adequately mitigate cultural impacts to less than significant levels. When substantial evidence exists, as in this case, that the Court finds to support the agency's determination, the Court will defer to the agency's judgment that mitigation is adequate. *See Laurel Heights Improvement Association v. Regents of the University of California* (1988) 47 Cal.3d 376 at 407.

**XI. Wildfires**

87. Petitioners claim Respondents failed to proceed in the manner required by law by failing to evaluate increased wildland fire risk associated with changes in grazing management since the project will reduce cattle grazing to an unknown extent, increasing wildland fire risk. As with other topical areas discussed previously, the Court finds that Petitioners' objection is a disagreement with the conclusion reached rather than a demonstrated legal defect in the EIR. The EIR's analysis is based on a detailed Fire Protection Plan ("FPP"). AR 22:6422-6549. The EIR evaluates the project's potential wildfire risk considering grazing, site characteristics, and proposed project development, including analysis supporting County's determination that wildfire risk would be significant even with the FPP. AR 16:4677. Mitigation Measure 4.7-10

through 4.7-16 (AR 16:4682-4683), when implemented, adequately ensures that wildfire impacts are reduced to a less than significant level.

**XII. Compliance with CEQA**

88. In their briefs and again during oral argument, Petitioners have asserted that the standard of review applicable to many of Petitioners' challenges to the EIR is not the substantial evidence standard but is instead a matter of determining whether the County failed to proceed in the manner provided by law, *i.e.*, that the County engaged in a prejudicial violation of CEQA. To the limited extent, if any, that the "failure to proceed in the manner provided by law" standard is applicable to Petitioners' challenges to the EIR, the Court finds that the County did proceed in compliance with the law. Petitioners have failed to identify any prejudicial violations of CEQA or any other applicable law by the County. *Compare Berkeley Keep Jets Over the Bay Committee v. Port of Oakland* (2001) 91 Cal.App. 4th 1344 (involving multiple and substantial failures to comply with CEQA).

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**Conclusion and Judgment of the Court**

Based on the record and argument presented to the Court and on the findings summarized and set forth above, and good cause appearing therefor, IT IS HEREBY ORDERED, ADJUDGED AND DECREED that:

1. Petitioners' Petition for Writ of Mandate is DENIED, with prejudice;

2. Judgment is granted in favor of Respondents County of Kern and Kern County Board of Supervisors ("Respondents"), as well as Real Parties in Interest Tejon Mountain Village, LLC and Tejon Ranchcorp, sued herein under the name of its parent Tejon Ranch Co. ("Real Parties"); and

3. Respondents and Real Parties are awarded and shall recover their costs of suit in this action from Petitioners. Upon approval of memoranda of costs to be filed by Respondents and Real Parties, the Clerk of Court shall add to this Judgment the costs awarded to Respondents County of Kern and Kern County Board of Supervisors in the amount of $_____, and the costs awarded Real Parties in Interest Tejon Mountain Village, LLC and Tejon Ranchcorp, sued herein under the name of its parent Tejon Ranch Co. in the amount of $_____.

IT IS SO ORDERED.

Dated: DEC 08 2010

KENNETH TWISSELMAN II

Hon. Kenneth E. Twisselman II
JUDGE OF THE SUPERIOR COURT

# Summary of Existing Emissions

**Summary of Existing Emissions**

This appendix summarizes ENVIRON International Corporation's (ENVIRON) estimates for existing greenhouse gas (GHG) emissions associated with the project site.

By way of background, the applicant periodically leases the Landmark Village area to the movie industry for set locations. Minor existing on-site structures within the Landmark Village area include employee houses, an oil company office, and miscellaneous structures. Portions of the Landmark Village area are leased for cattle grazing and agricultural operations. All existing emission sources would be eliminated during project buildout.

In light of the existing conditions, ENVIRON evaluated the following sources that currently exist on the project site:

1. Farmland/Agricultural Operations
    a. Water use
    b. Fertilizer
    c. Equipment

Please note that emissions associated with the periodic lease of the Landmark Village area to the movie industry were not accounted for in this emissions estimate as such activities are intermittent, limited, and unpredictable. Additionally, the emissions estimate does not account for the minor existing structures within the Landmark Village area due to the lack of data for these accessory structures. Finally, the cattle grazing and ranching activities were not accounted for as the lease of the project site for such uses is minimal. Because the emissions estimate does not fully account for these existing emission sources, the estimate likely understates existing emission levels on the project site.

That said, ENVIRON estimated the emissions associated with existing site conditions, and particularly farmland, to be roughly 553 metric tonnes of $CO_2e$ per year (Table 2).

**Farming/Agricultural Operations**

Table 1 outlines ENVIRON's approach to calculating GHG emissions from farming operations that would be eliminated due to project buildout. GHG emissions include indirect emission associated with estimated water use, and direct emissions associated with fertilizer and equipment use. A variety of crops currently is grown on the site; however, because of limited data availability, ENVIRON relied upon general crop water use factors, general corn fertilizer factors, and general barley equipment-use factors. ENVIRON does not expect these assumptions to systematically over- or under-estimate actual emissions. ENVIRON then used appropriate emission factors to determine GHG emissions from water use, fertilizer emissions, and equipment fuel use.

**Table 1 - Baseline Conditions**
**FARMING**

| Description | Activity Data | Units | Source(s) |
|---|---|---|---|
| Area of disturbed farmland | 341 | acres | Landmark Village Climate Change Technical Report |
| US average amount of water used for irrigation, in 2003 | 1.65 | acre-feet water/acre irrigated | USDA. *Farm and Ranch Irrigation Survey (2003).* Table E (PDF page 20). (available from: http://www.agcensus.usda.gov/Publications/2002/FRIS/fris03.pdf Accessed April 9, 2010). |
| Total acre-feet used | 563 | acre-feet | Calculations: Area of disturbed farmland * US average amount of water used for irrigation, in 2003 |
| kWh/acre-foot | 3,170 | kWh/acre-foot | Chino estimate. Landmark Village Climate Change Technical Report |
| Electricity use for water | 1,783,601 | kWh/year | Calculations: Total acre-feet used x kWh/acre-foot |
| | | | |
| Crop grown on an acre, per year | 3,421 | kg | Source: US Life Cycle Inventory (via SimaPro). "Corn, at field/kg/US". Included processes: Initially derived from data on farming of corn on 1 planted acre for 1 year ( **yield=3421kg**). The module includes: - seed production, - tillage, - fertilizer and pesticide application, - crop residue management, - irrigation, - harvesting. Remark: Agricultural Crop Production, Harvested acres represent 91% of the planted acres (1998-2000 US average). 1 bu (corn) = 56 lbs. The impacts of producing 1 kg of seed are assumed equal to those of producing 1kg of grain. |
| Nitrogen fertilizer required to produce 1 kg of crop | 0.0169 | kg | Ibid. |
| Nitrogen fertilizer required for one acre of crop production | 57.7 | kg | Calculations: Crop grown on an acre, per year x Nitrogen fertilizer required to produce 1 kg of crop |
| Nitrogen fertilizer required for acreage | 19,690 | kg | Calculations: Area of disturbed farmland x Nitrogen fertilizer required for one acre of crop production |
| N2O Emission Factor for emissions from N inputs | 1% | | UNFCCC Clean Development Mechanism. "Estimation of direct nitrous oxide emission from nitrogen fertilization" Page 3. (Available from: http://cdm.unfccc.int/methodologies/ARmethodologies/tools/ar-am-tool-07-v1.pdf Accessed April 10, 2010) |
| Total N2O Emissions | 197 | kg | Calculations: Nitrogen fertilizer required for acreage x N2O Emission Factor for emissions from N inputs |
| Total N2O Emissions (in CO2e) | 61,040 | kg | Calculations: Total N2O Emissions * GWP of N2O using IPCC Second Assessment Report references (310) |
| | | | |
| Tractor diesel fuel usage rate | 6 | gallons/acre | USDA estimates that the typical cropping and tillage system in the area requires six gallons of diesel per acre of barley. |
| Diesel fuel usage for acreage | 2,046 | gallons | Calculations: Area of disturbed farmland * Tractor diesel fuel usage rate |

**Acronyms:**
bu - bushel
CO2e - carbon dioxide equivalents
GWP - global warming potential
hp - horsepower
IPCC - Intergovernmental Panel on Climate Change
kg - kilogram
kW - kilowatts
kWh - kilowatt-hour
lb - pound
N - nitrogen
N2O - nitrous oxide

UNFCCC - United Nations Framework
Convention on Climate Change
USDA - Unites States Department of Agriculture

**Table 2 - Baseline Conditions**
**TOTAL EMISSIONS**

| Description | Emissions | Units | Source(s) |
|---|---|---|---|
| Energy use associated with water | 471 | tonnes CO2e | Calculations: 582.7 lbs per MWh/2,205 lbs per metric ton x Electricity use for water / 1000 kWh per MWh. The Landmark Village 2010 RPS emission factor is 582.7 lbs CO2/MWh. |
| N2O emissions associated with fertilizer use | 61 | tonnes CO2e | Calculations: Total N2O Emissions (in CO2e) / 1000 kg per metric ton |
| Diesel fuel usage | 21 | tonnes CO2e | Calculations: Diesel fuel usage * 10.15 kg CO2 per gallon / 1000 kg per metric ton. 10.15 kg CO2 is produced by combusting one gallon of diesel fuel. This data is from The Climate Registry's General Reporting Protocol, Table 13.1. |
| TOTAL EMISSIONS | 553 | tonnes CO2e | |

**Acronyms:**
bu - bushel
CO2e - carbon dioxide equivalents
kg - kilogram
kWh - kilowatt-hour
lb - pound
MWh - megawatt-hour
RPS - renewable portfolio standard

**COURT OF APPEAL OF THE STATE OF CALIFORNIA**
**FIFTH APPELLATE DISTRICT**

| | | |
|---|---|---|
| CENTER FOR BIOLOGICAL DIVERSITY, WISHTOYO FOUNDATION, TRICOUNTY WATCHDOGS, and CENTER ON RACE, POVERTY & THE ENVIRONMENT,<br><br>Appellants / Petitioners,<br><br>vs.<br><br>KERN COUNTY and KERN COUNTY BOARD OF SUPERVISORS<br><br>Respondents,<br><br>TEJON MOUNTAIN VILLAGE, LLC, TEJON RANCH CO., and DOES 1-30,<br><br>Real Parties in Interest. | ) | Case No. F061908<br><br>On Appeal from the Superior Court of Kern, Case No. S-1500-CV-268902 KCT<br><br>The Hon. Kenneth C. Twisselman<br>Department 8 |

## APPELLANTS' OPENING BRIEF

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**APP-008**

| COURT OF APPEAL, APPELLATE DISTRICT, DIVISION | Court of Appeal Case Number: F061908 |
|---|---|
| ATTORNEY OR PARTY WITHOUT ATTORNEY (Name, State Bar number, and address): Adam Keats, SB# 191157 — Center for Biological Diversity 351 California St., Suite 600 San Francisco, CA 94104 TELEPHONE NO.: 415-436-9682 FAX NO. (Optional): 415-436-9683 E-MAIL ADDRESS (Optional): akeats@biologicaldiversity.org ATTORNEY FOR (Name): Petitioners Center for Biological Diversity et al. | Superior Court Case Number: Kern County CV-268902 |
| APPELLANT/PETITIONER: Center for Biological Diversity, et al. RESPONDENT/REAL PARTY IN INTEREST: Kern County et al. | FOR COURT USE ONLY COURT OF APPEAL FIFTH APPELLATE DISTRICT FILED MAR – 9 2011 By Deputy |

**CERTIFICATE OF INTERESTED ENTITIES OR PERSONS**

*(Check one):* ☑ INITIAL CERTIFICATE ☐ SUPPLEMENTAL CERTIFICATE

**Notice: Please read rules 8.208 and 8.488 before completing this form. You may use this form for the initial certificate in an appeal when you file your brief or a prebriefing motion, application, or opposition to such a motion or application in the Court of Appeal, and when you file a petition for an extraordinary writ. You may also use this form as a supplemental certificate when you learn of changed or additional information that must be disclosed.**

1. This form is being submitted on behalf of the following party (*name*): Center for Biological Diversity

2. a. ☑ There are no interested entities or persons that must be listed in this certificate under rule 8.208.

   b. ☐ Interested entities or persons required to be listed under rule 8.208 are as follows:

| Full name of interested entity or person | Nature of interest (*Explain*): |
|---|---|
| (1) | |
| (2) | |
| (3) | |
| (4) | |
| (5) | |

☐ Continued on attachment 2.

**The undersigned certifies that the above-listed persons or entities (corporations, partnerships, firms, or any other association, but not including government entities or their agencies) have either (1) an ownership interest of 10 percent or more in the party if it is an entity; or (2) a financial or other interest in the outcome of the proceeding that the justices should consider in determining whether to disqualify themselves, as defined in rule 8.208(e)(2).**

Date: May 7, 2011

Adam Keats ▶ Adam Keats

(TYPE OR PRINT NAME) (SIGNATURE OF PARTY OR ATTORNEY)



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| APPELLANT/PETITIONER: Center for Biological Diversity, et al.<br>RESPONDENT/REAL PARTY IN INTEREST: Kern County et al. | |

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1. This form is being submitted on behalf of the following party (*name*): Wishtoyo Foundation

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(TYPE OR PRINT NAME)

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(SIGNATURE OF PARTY OR ATTORNEY)



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| APPELLANT/PETITIONER: Center for Biological Diversity, et al.<br>RESPONDENT/REAL PARTY IN INTEREST: Kern County et al. | |

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1. This form is being submitted on behalf of the following party (*name*): Center on Race, Poverty, & the Environment

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| APPELLANT/PETITIONER: Center for Biological Diversity, et al. RESPONDENT/REAL PARTY IN INTEREST: Kern County et al. | FOR COURT USE ONLY: COURT OF APPEAL FIFTH APPELLATE DISTRICT FILED MAR - 8 2011 by Deputy |
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1. This form is being submitted on behalf of the following party (*name*): Tricounty Watchdogs

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## INTRODUCTION

In October of 2009, Respondents Kern County and its Board of Supervisors ("Respondents") approved Tejon Mountain Village ("TMV" or the "Project"), a massive luxury resort development to be located in the Tehachapi Mountains east of Interstate 5. Appellants, four public interest organizations composed of environmental advocates, environmental justice advocates, Native Americans and local residents ("Appellants"), challenged the approval of the Project for its violation of the California Environmental Quality Act ("CEQA") and the Government and Water Codes. A hearing was held before the Honorable Kenneth C. Twisselman, II, Judge of the Superior Court of Kern County, on November 5, 2005, with an order denying Appellants' petition for writ of mandate and judgment in favor of Respondents being entered on December 8, 2010. (CT 3:823.)[1] Notice of entry of the order was served on Appellants by mail on December 10, 2010, and filed with the Superior Court on December 13, 2010. (CT 3:852A.) The order being the final judgment of this matter, Appellants filed their Notice of Appeal on February 8, 2011. (CT 3:862.)

The TMV site is located on Tejon Ranch, the largest single privately-owed property in California. It is one of three major developments proposed for the ranch, which has been used almost exclusively for ranching, hunting, agriculture, and some mining for its entire post-colonial ownership. The property was historically home to several Native American tribes, all of whom were displaced and dispossessed of their homes in the latter part of

[1] Citations to the Clerk's Transcript on Appeal are in the format (CT[*volume number*]:[*page number*]); citations to the Administrative Record are in the format ([*volume number*]:[*page number*]).

the 19th century but whose burial sites, ruins of villages, and other cultural resources still remain.

Much of Tejon Ranch, including all of the TMV site, has even longer been home to the California condor, one of the world's most endangered species and the subject of one of this country's greatest and most expensive wildlife recovery efforts. Its operation as a cattle ranch and hunting grounds—and its concomitant lack of development—is largely responsible for the continued survival of the last remaining condors before the start of the recovery program.

The rugged and steep Project site, sitting in the confluence of three major valleys, connecting three separate mountain ranges, and straddling multiple earthquake faults including the San Andreas, has for years resisted much of the urban growth and industrial agriculture pressures borne by surrounding areas. Despite these impediments, along with the site's sharing of three of the most polluted air districts in the state and its being nearly devoid of reliable natural surface water, Tejon Ranch now seeks to capitalize on its investment and build a sprawling luxury golf and vacation-home resort on nearly 26,000 acres in the heart of the ranch.

The TMV proposal, so dependent on the aesthetic appeal of its beautiful and wild surroundings, would sadly destroy most of those qualities: laundering water in its water banks to secure short-term entitlements; unsustainably pumping groundwater to keep its signature Castac Lake full of glistening water; replacing prime condor foraging habitat with a controlled, artificial feeding program; adding thousands of vehicle trips and their exhaust to an already overburdened and polluted region; destroying dozens of Native American cultural sites, many or most of which are now unknown to the area's Native Americans themselves; and placing

thousands of people in harm's way in an area known almost as much for its parched, tinderbox landscape as it is for its condors and "Grapevine" of a highway.

Respondents' approval of the Project, through their certification of the Project's Environmental Impact Report ("EIR") and granting of other approvals, violated CEQA, the Water Code, Government Code, and failed to comply with the procedures required by law. The trial court should be instructed to set aside the Project approval and the EIR and order that Respondents and Real Parties in Interest be barred from acting to implement the Project unless and until Respondents prepare and circulate for public comment a legally adequate EIR.

## STATEMENT OF FACTS

The Tejon Mountain Village project is located entirely on land owned by the Tejon Ranch Company, approximately 60 miles north of Los Angeles and 40 miles south of Bakersfield just east of Interstate 5. (12:3435.) The Project site consists of approximately 26,417 acres of mixed terrain, including steep and rugged hillsides and ridgelines, oak woodlands, and savannah grasslands. (13:3621.) It is currently undeveloped, being used primarily as open ranchland but also for hunting and film production. (13:3624.) The Project would consist of 3,450 residences, up to 160,000 square feet of commercial development, two golf courses, riding and hiking trails, two helipads, community centers, and various assorted utility and infrastructure facilities. (13:3621.) The Project would be primarily a low-density development, scattering approximately 7,867 acres of developed land throughout the 26,417 acre Specific Plan site. The remaining 21,335

acres would remain ranchlands and various degrees of open space. (13:3629-33.)

TMV will require 2,900 acre-feet per year ("AFY") of water; approximately 2,100 AFY of potable water and 800 AFY of non-potable water. (75:21738.) The EIR, relying heavily on a Water Supply Assessment ("WSA") prepared by the Tejon-Castac Water District ("TCWD"), identifies three sources for this water: the State Water Project, stockpiled water in water banks, and recycled water from a yet-to-be-built facility. (17:5048, 81:23393-94.) Both the stockpiled water in the water banks and the recycled water from the treatment facility will come from the State Water Project ("SWP"), resulting in the Project's exclusive reliance on the state water delivery system that has long ago exceeded its ability to meet demand. TCWD's creative use of water banking and recycling allows it to claim that its (optimistic) average deliveries of 2,826 to 3,483 acre-feet per year will reliably satisfy its demands of 4,102 acre-feet per year. (17:5050; 83:24143.)

The Project's boundaries have been drawn to exclude yet surround Castac Lake, a natural but artificially maintained water body that provides the Project one of its primary geographical features. (16-4694-95; 13:3626.) The lake is located in the southwest portion of the Project site, adjacent to the Project's main entrance road. (*Id*.) Castac Lake's natural water level varies widely depending on the season and drought conditions, but since 2001 Tejon Ranch Company has been artificially maintaining the levels of the lake by discharging groundwater into the lakebed, as well as engaging in other management such as aeration. (16:4694.) The lake was originally included in the Project description when the Notice of Preparation ("NOP") was issued; the filled lake has been expressly linked to the planned

recreational components and aesthetic characteristics of the Project ever since. (18:5295; 133:38125-26.) After various commenters expressed concerns with the Project's pumping of groundwater in order to maintain the lake, however, the boundaries of the Project were redrawn to exclude the lake. (16:4698; 79:22943.) The Project applicant claimed that the lake was excluded to "improve the environmental 'footprint' of the TMV project," as "the lake itself was identified as a significant resource that should be avoided by the project." (89:25767.)

The TMV site sits at the heart of ancient and current habitat for the California condor, considered so important to the survival of the species that much of it has been designated as Critical Habitat by the U.S. Fish and Wildlife Service. (41:12164.) The California condor is one of the world's most endangered and iconic species, with a total of 327 birds in existence, 167 of which are in the wild, and 84 of which are in California. (41:12133.) The TMV site is located at the lynchpin of the two halves of the species' historical habitat (136:38780) and to this day it remains vital foraging habitat for the species. (136:38799-800.)

Tejon Ranch contains the former communities, ancestral homes, sacred places, burial sites, and historical remains of the Chumash, Kaiawasu, Kitanemuk, and Yolumne Native Americans. (83:23901-02.) Over a century after they were forcibly evicted by the Ranch, these Tribes retain strong cultural and religious attachments to the area in and around the Project development envelope. (83:23901.) The Project site includes several important cultural and historical resources important to Native Americans, including the "Huerta de Arriba" (the high orchard) cemetery on Paso Creek (135:38601; 135:38555); the historic Native American schoolhouse (135:38552-53; 135:38555; 135:38601-02); the Tejon Creek

cemetery (135:38555; 135:38601-02); the Native American village of Kashtiq, now apparently submerged by Castac Lake (83:23903, 83:23916-20.); and finally, the traditional Chumash, Kaiawasu, Kitanemuk, and Yowlumne Native American cultural landscapes which include the villages and associated sacred sites and burial sites and historical inter-community passageways including the "Ridge Route" chronicled by Bonnie Ketter Kane (83:23902; 83:23946) and the Castaic Creek Trail (83:23918) with their natural viewscapes scattered within and outside the TMV development envelope. (135:38552-55; 135:38600-03.)

The Project sits at the juncture of three of California's most polluted air basins: the San Joaquin Valley Air Basin ("San Joaquin Air Basin"), South Coast Air Basin ("SCAB"), and Mojave Desert Air Basin ("Mojave Air Basin"). (13: 3760). All three air basins are designated as "nonattainment" for ozone and particulate matter ("PM"), pollutants regulated under Clean Air Act's federal and state ambient air quality standards. (13:3767-9).

On September 10, 2009, the Kern County Planning Commission held a public hearing regarding the Project, recommending approval by a vote of 3 in favor to 2 against. On October 5, 2009, Respondent Kern County Board of Supervisors held a public hearing on the Planning Commission's recommendation, unanimously voting to approve the Project, approve and certify the EIR, and approve the associated resolutions, ordinances, maps, and plan amendments. A Notice of Determination was filed on October 13, 2009, with the Kern County Clerk, who posted it on October 14, 2009. (1:1-3.)

## APPLICABLE LAW

### Environmental Review Under CEQA

"CEQA is a comprehensive scheme designed to provide long-term protection to the environment." (*Mountain Lion Found. v. County of Kern* (1997) 16 Cal.4th 105, 112.) Environmental protection is the guiding concept in interpreting CEQA. "The foremost principle under CEQA is that the Legislature intended the act 'to be interpreted in such manner as to afford the fullest possible protection to the environment within the reasonable scope of the statutory language.'" (*Laurel Heights Improvement Ass'n of San Francisco v. Regents of the University of California* (1988) 47 Cal.3d 376, 390 ("*Laurel Heights*") [citation omitted].)

"The EIR is the primary means of achieving the Legislature's considered declaration that it is the policy of the state to 'take all action necessary to protect, rehabilitate, and enhance the environmental quality of the state.'" (*Laurel Heights*, 47 Cal.3d at 392 [citation omitted].) "The EIR is also intended to demonstrate to an apprehensive citizenry that the agency has, in fact, analyzed and considered the ecological implications of its action." (*Id.*) Thus, the EIR is an accountability document and the EIR process "protects the environment but also informed self-government." (*Id.*)

An EIR must identify the significant effects on the environment of a project, identify alternatives to the project, and indicate the manner in which those significant effects can be mitigated or avoided. (Pub. Resources Code § 21002.1(a).) A project may also have a significant effect on the environment where the project's environmental effects are "individually limited but cumulatively considerable." (CEQA Guidelines, 14 Cal. Code Regs. (hereinafter "Guidelines") § 15065(a)(3).) Public agencies may not approve projects as proposed if there are feasible alternatives or feasible mitigation measures available which would substantially lessen or avoid the

project's significant environment effects. (Pub. Resources Code § 21001; Guidelines § 15065(c)(3).)

**Standard of Review Under CEQA**

In evaluating an EIR for CEQA compliance, a reviewing court must determine whether the agency has prejudicially abused its discretion. (Pub. Resources Code § 21168.5.) "An abuse of discretion is established if the agency has not proceeded in a manner required by law or if the determination or decision is not supported by substantial evidence." (*Id*.) The California Supreme Court has clarified that there are two distinct grounds for finding that the agency abused its discretion under CEQA, each of which has a significantly different standard for determining error. (*Vineyard Area Citizens for Responsible Growth, Inc. v. City of Rancho Cordova* (2007) 40 Cal.4th 412, 435 ("*Vineyard Area Citizens"*); *Save Tara v. City of West Hollywood* (2008) 45 Cal.4th 116, 131.) "In evaluating an EIR for CEQA compliance … a reviewing court must adjust its scrutiny to the nature of the alleged defect, depending on whether the claim is predominantly one of improper procedure or a dispute over the facts." (*Vineyard Area Citizens*, 40 Cal.4th at 435.)

Challenges to an agency's failure to proceed in the manner required by CEQA, such as the failure to address a subject required to be covered in an EIR or to disclose information about a project's environmental effects, are subject to a less deferential standard than challenges to an agency's substantive factual conclusions. (*Vineyard Area Citizens*, 40 Cal.4th at 435.) In reviewing these claims, the court must "determine de novo whether the agency has employed the correct procedures, 'scrupulously enforc[ing] all legislatively mandated CEQA requirements.'" (*Id*.) In reviewing whether the agency proceeded in the manner required by CEQA,

the court must determine whether the EIR is sufficient as an informational document. (*Dry Creek Citizens Coalition v. County of Tulare* (1999) 70 Cal.App.4th 20, 26.) Thus, as a matter of law, courts reject EIRs that do not "provide certain information mandated by CEQA and [] include that information in the environmental analysis." (*Vineyard Area Citizens,* 40 Cal.4th at 435; *see also Communities for a Better Environment v. City of Richmond* (2010) 184 Cal.App.4th 70, 83 ("*Richmond*") [conclusion the project would not result in capacity to process lower quality crude oil not adequately supported by facts and analysis]; *Berkeley Keep Jets Over the Bay Com. v. Board of Port Cmrs.* (2001) 91 Cal.App.4th 1344, 1371 ("*Berkeley Keep Jets*") [EIR failed to support conclusory statements with scientific or objective data]; *San Joaquin Raptor/Wildlife Rescue Center v. County of Stanislaus* (1994) 27 Cal.App.4th 713, 729; *Sierra Club v. State Bd. of Forestry* (1999) 7 Cal.4th 1215, 1236.)

The substantial evidence standard of review applies to factual disputes such as a dispute over a finding that mitigation measures adequately mitigate project impacts. (*Vineyard Area Citizens*, 40 Cal.4th at 435.) While a court reviewing an agency's decisions under CEQA does not pass on the correctness of an EIR's environmental conclusions, it must determine whether these conclusions are supported by substantial evidence, which includes "facts, reasonable assumptions predicated upon facts, and expert opinion supported by facts" and excludes "[a]rgument, speculation, unsubstantiated opinion or narrative, [and] evidence which is clearly inaccurate or erroneous…" (Pub. Resources Code § 21082.2(c); *see also Californians for Alternatives to Toxics v. Dept. of Food and Agric.* (2005) 136 Cal.App.4th 1, 17 ["[C]onclusory statements do not fit the CEQA bill."].)

## ARGUMENT

## I. WATER SUPPLY

An EIR's analysis of a Project's water supply must meet each of four criteria set forth in *Vineyard Area Citizens* to comply with CEQA:

> (1) Decision makers must be presented with sufficient facts to evaluate the pros and cons of supplying the amount of water that the project will need;
>
> (2) The analysis cannot be limited to the first stage or the first few years;
>
> (3) Future water supplies identified and analyzed must bear a likelihood of actually proving available; speculative sources and unrealistic allocations ('paper water') are insufficient bases for decisionmaking under CEQA;
>
> (4) If it is "impossible to confidently determine that anticipated future water sources will be available, CEQA requires some discussion of possible replacement sources or alternatives to use of the anticipated water, and of the environmental consequences of those contingencies.

(*Vineyard Area Citizens*, 40 Cal.4th at 430-432.)

The EIR fails to satisfy the *Vineyard* requirements, resulting in an analysis of the Project's water supply that fails to comply with CEQA and that is not supported by substantial evidence.

### A. The EIR Contains Insufficient Water Supply Information

The first prong of the *Vineyard Area Citizens* analysis requires the EIR to disclose and analyze sufficient facts to evaluate the pros and cons of supplying the amount of water that the project will need. (*Vineyard Area Citizens*, 40 Cal.4th at 430-431.) The EIR did not satisfy this requirement for several reasons. First, neither the Draft EIR nor the WSA reveal that Tejon Ranch Corp., the land owner and primary proponent of the Project, completely controls TCWD, the author of the WSA. (17:5034; 17:5037-38 [EIR's description of TCWD with no mention of Tejon Ranch Corp.];

75:21736-37 [WSA's description of TCWD with no mention of Tejon Ranch Corp.].) Second, the EIR fails to provide sufficient information regarding the source of the water banked water.

Several commenters raised the issue of Tejon Ranch's control of TCWD, warning that it called into question the usefulness of the WSA and created a heightened obligation by Respondents to independently assess the project's water supply. (135:38694-95; 81:23523; 170:47996-97.) The EIR's responses were evasive, failing to admit that the allegations of Tejon Ranch's control were true and ducking behind an irrelevant discussion of California's conflict of interest laws. (128:36692-93; 82:23647-48.) It was not until the final Board of Supervisors' hearing, when the project was approved and the FEIR certified, that Respondents finally admitted to Tejon Ranch's complete control of TCWD. (170:48074-75 [discussion at Board of Supervisors hearing][2].)

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[4] *Supervisor Watson, questioning a representative of TCWD*: "Mr. Conant, while you're up there, I just happened to think of a comment that was made much earlier today, and that has to do with the relationship of Tejon Ranch to the water district up there. Could you elaborate on that?"
*Mr. Conant*: "Like any water district in the state that's based on landowner voting, that is the landowners select the Board; the landowners in Tejon-Castac elect the Board. And so there's nothing unique about that. There are representatives, of course, of Tejon Ranch on the Board of Directors. The approach that we took in preparing this water supply assessment was to ensure that it received a lot of scrutiny from the very beginning, including involvement of County Planning, the Kern County Water Agency, and others under, you know, my supervision to ensure that it was done in a conservative, straightforward approach."
*Supervisor Watson*: "Mr. Conant, are there board members who are not employees of Tejon Ranch?"
*Mr. Conant*: "There are not."
*Supervisor McQuiston*: "Thank you."
(170:48074-75.)

By hiding Tejon's control of the water district, Respondents failed this essential first prong of the *Vineyard* analysis, and therefore failed to proceed in a manner required by CEQA. This misled the public and decisionmakers into thinking that there was independent support for the EIR's assessment of the Project's water supply. (*See Kings County Farm Bureau v. City of Hanford*, (1990) 221 Cal.App.3d 692, 718 ["The misleading nature of the discussion and the failure to include relevant evidence… related to the project renders the EIR inadequate as an informational document."].) But TCWD is not an "independent" public agency—it is controlled by the Project applicant. Without disclosing these important facts, it was impossible for the public or decisionmakers to make an informed decision regarding the Project's water supply or the impacts that supplying that water will cause.

Respondents also fail to provide sufficient information regarding the source of water that will replenish the water banks. The EIR's use of water banking as a significant source of water for a permanent housing development is novel, and raises legitimate and serious questions about the Project's long term water supply.[3] A water bank is not truly a "supply," as it is nothing more than a temporary storage facility for a finite amount of water, not a naturally replenishing aquifer, reservoir, spring, or river. A water bank is thus only as good as is its own supply of water, and without assurances that these supplies exist—and that the public agency has fully

[3] These questions were asked of Respondents (81:23529-30), who assured the skeptical public that they fully analyzed the Project's water supply needs for the next 82 years and that these supplies were more than adequate. (82:23658.) As described below, this assurance is not supported by the evidence.

analyzed these supplies—banked water cannot be properly considered for a project's long-term supply. (*Vineyard Area Citizens*, 40 Cal.4th at 431.) The EIR states generally that the water banks will be replenished during wetter years (75:21754), but offers insufficient details and no guarantees of replenishment beyond a 7-year reserve of potable water. (2:305.) Significantly, while the EIR conclusively states that TCWD "holds contractual rights to SWP water" (75:21743) and that it holds "rights to receive a maximum of 5,278 AFY of SWP Table A Water" (75:21745), neither these contracts nor any other "proof of entitlement" are contained in the WSA, in violation of the Water Code. (Water Code § 10910 (d)(1) and (2).)

### B. The EIR's Analysis is Limited to the First Few Years of Development

The second prong of the *Vineyard Area Citizens* analysis requires that an EIR's analysis of a project's water supply not be limited to the first stage or the first few years, but rather "must assume that all phases of the project will eventually be built and will need water, and must analyze, to the extent reasonably possible, the impacts of providing water to the entire project." (*Vineyard Area Citizens*, 40 Cal.4th at 431 *citing Stanislaus Natural Heritage Project v. County of Stanislaus* (1996) 48 Cal.App.4th 182, 206.) The EIR must enable decision-makers to "evaluate the pros and cons of supplying the amount of water that the [project] will need." (*Id*., *quoting Santiago County Water Dist. v. County of Orange* (1981) 118 Cal.App.3d 818, 829.) An assessment of a project's water supplies thus cannot be artificially limited in time: "the entire project" must assume the entire

lifespan of the project, to the extent that an analysis of it is reasonably possible.[4]

Here, the EIR limits its analysis to the first 20 years:

> …TCWD would have sufficient water supplies to meet the project demands… throughout the 20-year analysis period. …The analysis of TCWD's available water supplies under applicable California Water Code criteria and additional conservative assumptions demonstrates that the District has sufficient water resources to meet the project's demands in normal, dry-year, and multiple-dry-year conditions over a 20-year period.
>
> (17:5053.)[5]

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[4] This is supported by the Water Code, which requires that a WSA assess whether the "total projected water supplies…will meet the projected water demand associated with the proposed project" (Water Code § 10910 (c)(3) and (4)), as well as the Government Code, which requires that subdivisions be approved only if they prove that they have a sufficient water supply "that will meet the projected demand associated with the proposed subdivision." (Gov. Code § 66473.7 (b)(3).)

[5] The EIR is replete with references to its 20-year analysis; *see* 17:5047 ["California Water Code Section 10910 et seq. requires an analysis of the sufficiency of a project's water supplies over a 20-year period...]; 17:5048 ["Significant factors that could affect TCWD's water supplies during the 20-year analysis period required by the California Water Code include…"]; 17:5049 ["The analysis assumed that TCWD would be required to meet full-buildout demand for both projects in the first year of the 20-year analysis period."]; 17:5050 ["If average-year deliveries were maintained throughout the 20-year analysis period…"]; 17:5050 [Table 4.16-4, showing analysis from 2008-2028]; 17:5051 [Table 4.16-5, showing analysis from 2008-2028]; 17:5053 ["…TCWD would have sufficient water supplies to meet the project demands…throughout the 20-year analysis period. …The analysis of TCWD's available water supplies under applicable California Water Code criteria and additional conservative assumptions demonstrates that the District has sufficient water resources to meet the project's demands in normal, dry-year, and multiple-dry-year conditions over a 20-year period."]; 82:23661 ["A 20-year water supply analysis is specifically mandated by Water Code Section 10910(c)(3) for CEQA purposes. There is no requirement in the Water Code or in CEQA

The EIR erroneously interprets the Water Code's requirement that a "20-year projection" be included in water supply assessments as defining the maximum that the EIR is required to demonstrate and discuss. (Water Code § 10910 (c) and (d); *see* 82:23661; 75:21759-60 [WSA Tables 11 and 12 assuming 20 year supply]; *see also* FN 5, above.) Section 10910 of the Water Code is meant to ensure that a water supply assessment will properly consider California's periodic drought and surplus cycles, as a 20-year projection should sufficiently include these high and low periods. But this provision should not be read to limit the requirements (found in CEQA, Water Code § 10910 (c)(3) and (4), and Gov. Code § 66473.7 (b)(3)) that water supply assessments and EIRs analyze the total water needs of the entire project. At the minimum, Respondents' statement that "[a] 20-year water supply analysis is specifically mandated by Water Code Section 10910(c)(3) for CEQA purposes," (82:23661) is in error, as CEQA clearly requires more. (*Vineyard Area Citizens*, 40 Cal.4th at 431.)

This is an important issue because this Project relies so heavily on banked water for its supply. Although the WSA's figures show a net bank surplus over a twenty year period (assuming overly-optimistic average year SWP deliveries of about 3,325 AFY), the more reasonable figures supplied in the responses to comments that attempt to consider endangered species and climate change issues show a net loss of water bank water—even assuming average-year deliveries. (17:5050 [Table 4.16-4]; 83:24143 [Table A].) The net loss of water banked water is far greater in the single-

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that water supplies be 'available on an insurable basis' for any time period or in any manner to certify an EIR."]; 83:24143; 128:36691 ["the analysis shows that TCWD can meet all future requirements, including Project demand, over the 20-year period required by the Water Code and CEQA."].

dry and multi-year drought analyses that follow. (83:24144-45 [Table B and C].) By limiting their analyses to 20 years, the WSA and EIR avoid answering the difficult and essential questions of how long the water banked water will last over the lifespan of the Project and whether it will be a sustainable, replenishing source.[6]

The EIR claims that its analysis actually extends for 82 years, based on its use of the "CalSim II" model. (82:23658 ["model was used to project TCWD water supplies over the 82-year period..."]; 83:24073; 128:36691; 128:36697.) But CalSim II was not used to analyze 82 years of the Project's water supply needs; it was used only to determine the "most significant factors that may affect TCWD's supplies during the twenty-year analysis period..." (75:21754.) In other words, CalSim II was used to help form the required range of possibilities that might occur during the 20-year projection:

> The CalSim II model was utilized by KCWA at the request of TCWD to provide the statistical basis for analyzing potential hydrological conditions during average years, a single dry year, and multiple dry years in this WSA.

(75:21755; *see also* 17:5048; 75:21754-63.)

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[6] Another problem with the analysis is that it misleadingly uses inappropriate starting volumes of stockpiled water for each of its models. Table B suggests that this figure is 15,077 acre feet, and then confidently states that five different modeled single-dry years won't appreciably change this figure, while Figure C starts with 19,813 acre feet and shows the bank being reduced to 15,692 after 4 years. (83:24144-45.) Although the WSA asserts that TCWD has currently stockpiled 29,728 acre feet of water (75:21748), the only reasonably assured stockpile available at any given time in the future is 7,000 acre feet. (2:305 [MM 4.16-5].) By using inflated amounts of 15,077 acre feet and 19,813 acre feet rather than 7,000 acre feet, the model prevents an accurate assessment of the water banks' ability to supply water to the Project.

This limited use of CalSim II is demonstrated clearly in Table 10 of the WSA, which lists these estimated delivery percentages and shows the years within the *historical* 82-year period on which they are based. (75:21756.)

There is simply no evidence that the EIR or the WSA analyzed the project's water supply needs beyond twenty years. The responses to comments (82:23658; 83:24073; 128:36697) point to WSA Tables 12, 13, and 14 and EIR Tables 4.16-5, 4.16-6, and 4.16-7 as evidence of the 82-year analysis, but these tables only prove the above point: Tables 12 / 4.16-5 show single dry year projections over a 20-year period (75:21760, 17:5051); Tables 13 / 4.16-6 show a 4-year multi-year drought analysis based on 1931-34 conditions (75:21761; 17:5052), and Tables 14 / 4.16-7 show six years of water bank reserves based on 1987-92 conditions. (75:21762; 17:5052.) The EIR's lack of any evidence or support for its conclusions regarding the Project's supposed "82-year water supply" constitutes a clear violation of CEQA. (Pub. Resources Code § 21082.2 (c); *Bakersfield Citizens for Local Control v. City of Bakersfield* (2004) 124 Cal.App.4th 1184, 1198.)

### C. The Project Impermissibly Relies on Speculative Sources

The third prong of the *Vineyard Area Citizens* analysis prohibits a project from relying on speculative sources and unrealistic allocations. (*Vineyard Area Citizens*, 40 Cal. 4th at 432; *Santa Clarita Organization for Planning the Environment v. County of Los Angeles*, (2007) 157 Cal.App.4th 149, 158-159.) According to the EIR, TMV will use 1,158 AFY of recycled water that will be supplied by a wastewater reclamation facility to be built by TCWD. (17:5050; 17:5054-56.) But with no enforceable mechanism to

ensure that this facility will actually be built, the inclusion of recycled water from this source is paper water, representing nothing more than the "hopes and dreams" of Respondents. (*Planning and Conservation League v. Department of Water Resources* (2000) 83 Cal.App.4th 892, 919.)

The EIR discusses the wastewater reclamation facility in numerous places, but contains no provisions ensuring that it will actually be built. (*See* 1:303-307; 13:3672-77; 17:5054-56; 75:21860-77; 80:23087-91.) The Project is not conditioned on construction of the wastewater reclamation facility, and the EIR specifically acknowledges that it contains no guarantees for funding the construction of the facility. (82:23665 ["…the facilities will be expanded as necessary to accommodate increased service requirements. …[a]s a result, no bonding or other financial security is necessary to ensure that the wastewater and water treatment facilities required by the Project will be constructed…"].) And although there is a conceptual plan for the facility (75:21860-77), there is only minimal information provided for its location within the Project site (13:3677) and even this is just hypothetical, as the "location of facilities may deviate from the conceptual plan due to site-specific physical constraints and land use considerations." (13:3675.)

The wastewater reclamation facility is important because it provides a very large portion of the Project's water supply already stretched to an extreme through its use of water banking. (17:5050.) Without the facility, the Project will not have a reliable water supply, especially after endangered species and climate change considerations are taken into account. (17:5050; 83:24143-45 [Tables A, B, and C].) This creates a justifiable fear that the Project will ultimately rely on alternate water supplies, the impacts of which

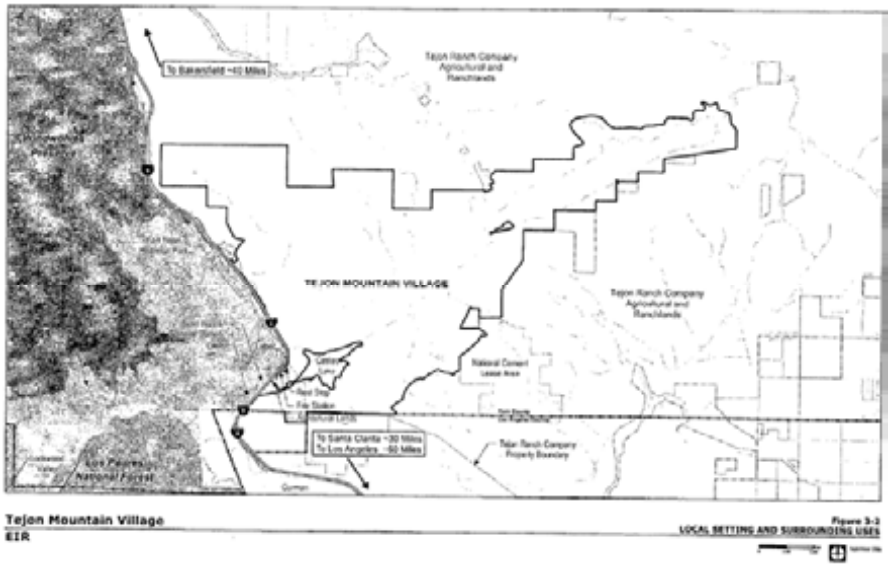
were either not analyzed in the EIR or are determined to be infeasible. (75:21767-70.)

The provisioning of recycled water and wastewater treatment for TMV is of greater uncertainty than the measures found inadequate in *Napa Citizens.* (*Napa Citizens for Honest Gov't v. Napa County Bd. Of Supervisors (2001)* 91 Cal.App.4th 342, 373.) Even though the project in that case had already contracted with an existing wastewater facility, the court concluded that the EIR was deficient for failing to discuss the possibility that it might become necessary to treat wastewater elsewhere while the additional facilities were constructed. (*Id*.) In the present case, TMV lacks both a present-day facility with which to contract for the water and provisions to supply water in the interim from elsewhere. Further, the timeline of development assures that the Project's golf courses will require their full allotment of water (792 AFY) before the Project reaches full build-out and produces an equivalent amount of reclaimed water, meaning the golf courses will have to use potable water for irrigation, further depleting the projected SWP supplies beyond the forecasts in the WSA and EIR. (75:21750 [WSA explaining that the 800 AFY of recycled water available at full build-out is for supplying the 792 AFY required for the golf courses].) By assuming the TMV wastewater facility will be built despite a lack of firm assurances, the water to be supplied by the wastewater treatment facility is nothing more than a speculative source.

## II. CASTAC LAKE AND WATER QUALITY

The Project's heaviest concentration of development –including most of the Project's commercial and public facilities—will envelop Castac Lake and the immediate vicinity. (12:3441; 133:38125-26 [comments describing

EIR, Figure 1-3].) Castac Lake is an integral part of the Project, being both within the Project's "geographical boundaries" and quite obviously one of the Project's chief "environmental characteristics." (Guidelines §§ 15124 (a) and (c), 15378(a); *County of Inyo v. City of Los Angeles* (1977) 71 Cal.App.3d 185, 192 ("*County of Inyo*").) But rather than properly including Castac Lake as part of the Project and fully analyzing the impacts of the lake management activities in the EIR, the boundaries of the Project were gerrymandered to exclude the lake:




(13:3626.)

### A. Castac Lake Is Impermissibly Excluded From the Project Description

CEQA encourages an applicant to revise a project after receiving comments about potential impacts (*see* Guidelines § 15082(b)), but rather than actually addressing the concerns raised by the management of the lake, the exclusion of the lake from the Project reflects a calculated attempt to avoid disclosure and analysis of significant Project impacts.

The EIR claims that pumping groundwater in order to maintain the lake at high levels is an activity unrelated to the Project (79:22949), but this is unconvincing. The management of the lake and the Project are not "independently justified, separate projects with different project proponents[,]" but "are piecemealed components of the same project." (*Richmond*, 184 Cal.App.4th 70, 99.) Though the two activities might theoretically be independent, that alone is not sufficient "for segmenting the environmental analysis of the two matters." (*Tuolumne County Citizens for Responsible Growth v. City of Sonora* (2007) 155 Cal.App.4th 1214, 1230.) A demonstration of independence must be based "on what is actually happening." (*Id*.)

Tejon Ranch's filling of the lake was and is in anticipation of and for the benefit of the Project. The use of groundwater to stabilize lake levels has direct and important benefits to the Project, including reducing flood risks, reducing alkali dust, providing a source of water for fire fighting, and avoiding "potential adverse consequences to Ranch access" caused by fluctuating lake levels. (79:22950-51.) The artificially-filled lake also provides clear aesthetic benefits to current Project plans, including the Project's detailed lakeside open space and trail amenities that depend on the filled lake. (79:22950; 13:3673.) As Tejon Ranch CEO Bob Stine admitted, this aesthetically-pleasing condition of the lake was specifically produced for the benefit of the Project. (133:38126.) The reasons for maintaining lake levels demonstrate that "a larger project was contemplated and the County is chopping it up into smaller projects rather than dealing with it as a total 'program.'" (*City of Santee v. County of San Diego* (1989) 214 Cal.App.3d 1438, 1454.)

The EIR further demonstrates this interrelationship by containing several specific mitigation measures that alter the current management of the lake, including that it be kept at a level no more than 3,500 feet to provide for additional flood storage (lowering its level by 3 feet (81:23344); that flood control berms be constructed; and that various culverts be raised and redesigned in order to provide flood control benefits. (1:269-270; *see also* 89:25765.) Finally, although the EIR claims that "swimming or other contact recreational activity shall be permanently prohibited in Castac Lake," (2:539) "[r]esidents of [TMV], like other Mountain Community residents, will have access to the Lake only through [Tejon Ranch Co.] or the Tejon Ranch Conservancy." (79:22950.) In other words, aside from swimming, recreational use of the lake—such as boating—has not been prohibited; its management has merely been shifted from one Tejon entity (TMV) to another Tejon entity (Tejon Ranch Co. or Tejon Ranch Conservancy) in order to avoid the environmental review required by CEQA.

Because management of Castac Lake is part of the Project, the lake must be included in the Project description. (Guidelines § 15378(a); *Riverwatch v. Olivenhain Mun. Water Dist.* (2009) 170 Cal.App.4th 1186, 1201 ["If a final EIR does not 'adequately apprise all interested parties of the true scope of the project …,' informed decisionmaking cannot occur under CEQA and the final EIR is inadequate as a matter of law."]; *County of Inyo*, 71 Cal.App.3d at 192 ["A curtailed or distorted project description may stultify the objectives of the reporting process."]; *Santiago County Water Dist.*, 118 Cal.App.3d at 829; *San Joaquin Raptor/Wildlife Rescue Center v. County of Stanislaus* (1994) 27 Cal.App.4th 713, 730.) Whether certain activities constitute "the 'whole of an action'…is a question of law that

appellate courts independently decide based on the undisputed facts in the record." (*Tuolumne,*155 Cal.App.4th at 1224.)

### B. The EIR Avoids Analysis of Significant Impacts by Excluding Castac Lake

Due to the EIR's failure to provide a complete and accurate project description that includes Castac Lake, the EIR avoids the required disclosure and analysis of the Project's significant environmental impacts. (*See, e.g.*, *Santiago County Water Dist.*, 118 Cal.App.3d at 829 [inadequate project description leads to inadequate discussion of impacts]; *San Joaquin Raptor*, 27 Cal.App.4th at 730.) These impacts include the heavy use of the area's groundwater to artificially maintain the lake and the increased risk of flooding of the lake and points downstream due both to the increased runoff from the project and the maintenance of artificially high lake levels.

#### 1. The EIR Fails to Adequately Analyze Groundwater Pumping Impacts

The maintenance of the lake at an artificially high level has required pumping of copious amounts of groundwater: 1,500 acre-feet in 2002, 400 acre-feet in 2003, and 1,300 acre-feet in 2004. (16:4694.) TMV's extraction of groundwater was a major concern for many commenters, including several agencies and neighboring residents of communities dependent on the same groundwater basin for their water supply. (*See* 80:23272 [comments by Regional Water Quality Control Board]; 81:23343 [comments by Kern County Engineering Department]; 81:23505-16.) The EIR's primary response to these concerns is to repeatedly emphasize that the maintenance of Castac Lake, including the pumping of groundwater, is not part of the Project and need not be analyzed in the EIR. (79:22943-58; 80:23282-83.)

The EIR nonetheless does provide some analysis in its responses, but this analysis raises more questions than it answers, emphasizing the need for a full analysis of the impacts that would be afforded if the lake was properly part of the Project and the EIR. For example, the EIR cites to figures from a 2006 report commissioned by Tejon Ranch (Stetson) for the proposition that the groundwater pumping for Castac Lake is sustainable. (81:23376.) But this proposition relies on the continuation of average historic groundwater pumping rates from the Tejon Basin between 1940 and 2004. (81:23376.) By relying on historic rates over this period, the EIR fails to consider the cumulative effects in light of anticipated future withdrawals.

Moreover, though the EIR relies on Stetson, the report itself expressly rejects the claim that groundwater pumping for Castac Lake is sustainable. For its estimated lower range of groundwater withdrawals, the EIR cites Stetson's finding that TRC pumped an average of 740 AFY between 1940 and 2004. *Id*. Stetson, however, also estimated that TRC would or presently does extract an average of 1,026 AFY. (330:90219.) The EIR ignores this figure without explanation. The EIR also ignores anticipated groundwater extraction by other proposed developments in the area—including the nearby proposed Frazier Park Estates—that will further deplete the neighboring water tables. (330:90010 [downward gradient supplies "Tejon Lake" aquifer from neighboring aquifers].) Relying on historic withdrawals, the EIR states that estimated pumping rates from the Tejon Basin are as low as 1,345 AFY, which it notes is within Stetson's estimated perennial yield of the basin (1,950 AFY to 2450 AFY). (81:23376.) But Stetson estimates that total future pumping would be 2,499 AFY, exceeding the estimated perennial yield. (330:90219.)

Properly including Castac Lake as part of the Project would reveal the true extent of Tejon Ranch's past groundwater pumping and provide an opportunity to ensure that future extractions will not overdraw the basin—a scenario Tejon Ranch so desperately sought to avoid it was willing to gerrymander the borders of its Project.

### 2. The EIR Fails to Analyze Increased Flood Risks of the Filled Lake

The filling of Castac Lake combined with the run-off caused by TMV impermissibly increases the flood risk for TMV and surrounding areas. (16:4719.) California Department of Parks and Recreation expressed concern over increased flood risk to Fort Tejon State Park caused by the lake and TMV's development; a concern with merit considering damage the park suffered in 2005 due to Castac Lake's flooding. (80:23199; 133:38132-33.) Likewise, Kern County's Engineering Department warned that TMV's development will exacerbate flood risk to Castac Lake, and that the lake's filling has significantly reduced the flooding storage capability. (81:23343.) Yet the EIR's primary response to these concerns is that the lake is outside the Project area. (80:23208.)

Indeed, the EIR's own calculations demonstrate that construction of TMV will cause increased flooding of Castac Lake, which has already occurred twice since the lake level was artificially raised in 2001. (16:4694.) The EIR states that the lake is maintained at 3,503 feet, that flooding occurs at 3,505 feet (16:4694) and that run-off will double without mitigation from 1,216 to 2,527 acre-feet. (16:4719.) Though the EIR purports to address flood risks, it only considers impacts associated with future Project construction. (1:268-270 [noting that the Project could result in flooding impacts due to certain drainage modifications].) The EIR fails to

discuss flooding impacts caused by the artificial filling of the lake itself or how these impacts will be mitigated.

The EIR's failure to disclose and analyze the high-impact maintenance of the lake by the Project proponents, with its increased flood risks and unsustainable drawing down of the regional aquifer, constitutes a failure to proceed in the manner required by law by precluding informed public participation. (*See Sierra Club*, 7 Cal.4th at 1236; *Sunnyvale West Neighborhood Association v. City of Sunnyvale City Council* (2010) 190 Cal.App.4th 1351, 1383; *Riverwatch*, 170 Cal.App.4th at 1201; *Ass'n of Irritated Residents v. County of Madera* (2003) 107 Cal.App.4th 1383, 1391.)

## III. CALIFORNIA CONDOR

The EIR promises to mitigate all of the Project's impacts to condors to a less-than-significant level, but it ignores and improperly downplays these impacts, while still failing to adequately mitigate them. In so doing, it fails to be the informational document CEQA requires. (*Dry Creek Citizens*, 70 Cal.App.4th at 26.) The EIR fails to clearly admit or properly analyze the sad trade-off the Project proposes: the destruction of thousands of acres of some of the most important foraging habitat of one of the world's most endangered species in exchange for 50 years of artificial food subsidies that will condemn the species to a permanent zoo-like existence. (165:46810; 165:46840.)

### A. The EIR Mischaracterizes Essential Facts and Significant Impacts

#### 1. The EIR Mischaracterizes the Importance of Foraging Habitat to Condors

The EIR repeatedly declares that "the USFWS [U.S. Fish and Wildlife Service] does not consider the loss of foraging habitat as a limiting factor with respect to condor recovery and survival," citing the 1996 Condor Recovery Plan.[7] (15:4519.) This is a serious mischaracterization of the Recovery Plan, which actually states the *exact opposite*. (94:27185 ["An important factor in the successful establishment of wild condor sub-populations is the existence of suitable habitat… [P]reservation [of foraging habitat] is necessary to the maintenance of wild populations of California condors."].) Protecting condor habitat is one of five specific goals for the program described in the Recovery Plan, which devotes four pages to the subject and even highlights the importance of Tejon Ranch itself as foraging habitat. (94:27180-88.)[8] This is not a trivial mischaracterization, as the EIR uses it to justify its conclusion that the Project will not have a significant adverse effect on condors. (41:12159-60; 128:36783.) Indeed, it goes to the

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[7] *See also* 41:12140 ["Importantly, the latest version of the Condor Recovery Plan (FWS 1996) suggests that habitat loss is not an important factor in the recovery of the condor."]; 41:12159-60 ["because the loss of foraging…habitat is not considered an important factor with respect to the recovery of the condor (FWS 1996), the loss of a small amount of foraging habitat…is not considered an impact that will significantly adversely affect this species…"]; 128:36783. The EIR also cites to the Recovery Plan for the premise that habitat loss is not considered the primary cause of the historical decline of the species; although this (very different) statement is essentially accurate on its own, it is improperly and illogically used as support for the EIR's conclusion that the Project's impacts on habitat will not significantly affect the species. *See* 14:4090-91, 14:4093; 130:37319.

[8] As stated clearly in the Recovery Plan, the five goals of the recovery program are: 1) preserve the gene pool; 2) reintroduce California condors to the wild; 3) provide habitat for condor recovery in the wild; 4) minimize mortality factors in the natural environment; and 5) implement information and education programs on condor habitat use and protection needs. (94:27180-88.)

heart of the conflict caused by this Project: important foraging habitat would be destroyed, mitigated primarily by a supplemental feeding program that would itself significantly impact the species (*see* Section III.B., below).

Falsely claiming that the Recovery Plan (a USFWS document that serves as the foundation for all efforts to bring the species back from the brink of extinction) does not consider the loss of foraging habitat as either a "limiting factor" or an "important factor" to the recovery of the species is a clear failure to make "a reasoned and good faith effort to inform decisionmakers and the public" about the significant impacts of the Project and therefore violates CEQA. (*Berkeley Keep Jets*, 91 Cal.App.4th at 1367; *Dry Creek Citizens*, 70 Cal.App.4th at 26.) Just as in *Berkeley Keep Jets*, the EIR's mischaracterization of this essential point acts to "prevent a decisionmaker and the public from gaining a true understanding of one of the most important environmental consequences" of the project: the loss of foraging habitat, which is absolutely important to the recovery of the species. (*Id*.)

Respondents' mischaracterization of the Recovery Plan is a failure to proceed in the manner required by the law, and therefore not deserving of any deference from the Court. (*Save Our Peninsula Comm. v. Monterey County Bd. of Supervisors* (2001) 87 Cal.App.4th 99, 118; *Berkeley Keep Jets*, 91 Cal.App.4th at 1367.) Respondents have argued, however, that Appellants' concerns are mere "policy disagreements among experts (and are thus subject to review under the substantial evidence standard)." (CT 2:397.) Respondents appear to suggest that if the EIR's overall analysis is supported by substantial evidence (which Appellants contest), it is irrelevant whether it blatantly mischaracterizes a key fact used in support. Had the EIR accurately described the Recovery Plan and its conclusions regarding

foraging habitat, perhaps this would be a dispute among experts, with deference given to the agency if its conclusion was supported by substantial evidence. But this is not the case: the EIR expressly states that in light of the preservation of some foraging habitat, the implementation of some mitigation measures, "*and because the loss of foraging…habitat [sic] is not considered an important factor with respect to the recovery of the condor (FWS 1996)*, the loss of a small amount of foraging habitat associated with…TMV is not considered an impact that would significantly adversely affect this species..." (41:12159-60 (emphasis added); 128:36783.) In order for Respondents to be granted any deference on this issue, they must first make a "good faith effort" to inform the public and decisionmakers of the essential facts on which they base their conclusion. Here, by completely mischaracterizing the Recovery Plan, they fail this essential requirement and thus fail to proceed in the manner required by law.

### 2. The EIR Uses the Ranchwide Agreement and HCP to Skew Its Analysis

#### a. Use of the Ranchwide Agreement and TUMSHCP Precludes Informed Decisionmaking

The EIR repeatedly cites to, references, and discusses the "Tejon Ranch Conservation and Land Use Agreement" and the "Tejon Uplands Multi-Species Habitat Conservation Plan" ("Ranchwide Agreement" and "TUMSHCP", respectfully), including both in the Project Description chapter off the EIR. (13:3679-83.) The Ranchwide Agreement is a private agreement struck between Tejon Ranch Company and five conservation organizations in 2008 that provides for some protection of some of Tejon Ranch in exchange for those groups' not opposing Tejon's development plans. (13:3679-80.) TUMSHCP refers to a Habitat Conservation Plan

applied for by the Tejon Ranch Company and currently being considered by the U.S. Fish and Wildlife Service. (13:3683.)

The FEIR contains at least 74 explicit references to the Ranchwide Agreement[9] and 37 explicit references to the TUMSHCP[10] as circumstances that help ensure that impacts within TMV do not rise to the level of "potentially significant" under CEQA. The "preservation" of land related to these documents is even directly referred to as mitigation:

> [T]he preservation of up to 240,000 acres of Tejon Ranch, including approximately 80% of the Project area, combined with management measures that ensure clean food sources will be available to Condors within the preserved areas of the Ranch, will provide and enhance sufficient foraging habitat for Condors and *mitigate for all Project impacts to the species*.

(165:46700, emphasis added.)

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[9] *See, e..g.*, 14:4088; 14:4095; 15:04454 ["Due to these measures, the conservation and management of mountain landscapes provided for in the Ranchwide Agreement, and conservation measures for this species incorporated in the draft TUMSHCP, cumulatively considerable impacts to this species are not anticipated"]; 15:4455-58; 15:4469-73; 15:4475; 15:4477; 15:4479; 15:4482-83; 15:4492; 15:4494; 15:4496; 15:4498-500; 15:4505; 15:4511; 15:4514-15; 15:4518-19; 41:12141; 41:12158-59; 41:12183-85; 41:12187-88; 41:12198; 82:23712; 82:23715; 82:23718-19; 82:23721-25; 82:23831-32; 83:24106-07; 98:28300; 128:36649; 128:36777; 128:36779; 128:36782-83; 128:36787; 128:36790; 131:37441; 131:37444 ["[t]he Project, in conjunction with the Ranchwide Agreement, will avoid all historical Condor roosting habitat within the Ranch and permanently preserve and manage up to approximately 240,000 acres (90%) of the Ranch for the benefit of the Condor and other species"]

[10] *See, e.g.*, 15:4452-58; 15:4469-73; 15:4475; 15:4477; 15:4479; 15:4482-83; 15:4492; 15:4494: 15:4496; 15:4498-500; 15:4505; 15:4511; 15:4514-15; 15:4515; 15:4519; 41:12184-85; 128:36781; 128:36790; 129:36948; 129:36949 ["Project-related impacts to condor foraging land are fully compensated with the extensive preservation of land in the TMV and throughout the Ranch combined with the management measures described in the EIR and TUMSHCP."]

The effect of the EIR's repeated references to the Ranchwide Agreement and the TUMSHCP is that they are used as *de facto* mitigation; although they are not included as official mitigation measures in the EIR (14:4115-19), and therefore are not enforceable, they are cited throughout the EIR in order to lessen or soften the Project's impacts.[11] Proposed "mitigation measures must be fully enforceable through permit conditions, agreements, or other legally binding instruments" (Guidelines § 15126.4(a)(2)) and cannot be deferred (Guidelines § 15126.4(a)(1)(B).) Given their ubiquitous presence throughout the EIR, one might be excused for believing that the Ranchwide Agreement and the TUMSHCP are parts of the Project and that the TUMSHCP is a final, approved plan. Yet the Ranchwide Agreement is a private agreement between private parties, with limited enforceability provisions available only to the parties to that agreement (13:3679) while the TUMSHCP is a federal permit that has yet to be approved. (128:6789.) By conflating the Project, the Ranchwide Agreement and the TUMSCHP, and repeatedly analyzing the Project's potential impacts only through the lens of two independent and unenforceable plans (one that is a mere proposal), the EIR fails to adequately describe the Project or analyze its significant impacts and unfairly determines that potential impacts will be less than significant. (*See Gray v. County of Madera* (2008) 167 Cal.App.4th 1099, 1129 [County's reliance on an unenforceable mitigation measure precluded informed decisionmaking and informed public participation]; *cf. Kings County Farm*

[11] *See, e.g.*, FN 9 and 10, above; 165:46601 ["The design of the project, the proposed conservation planning documents [the TUMSHCP and the Ranchwide Agreement], and proposed mitigation measures made all project related impacts less than significant."]

*Bureau*, 221 Cal.App.3d at 728 ["failure to evaluate whether the [mitigation] agreement was feasible and to what extent water would be available for purchase was fatal to a meaningful evaluation by the city council and the public"].)

**b. The Ranchwide Agreement and TUMSCHP are Improperly Included in Cumulative Impacts Analysis**

The Ranchwide Agreement and the TUMSHCP are also included in the EIR's cumulative impacts analysis, where they are described as "two further undertakings that are relevant to the cumulative analysis of biological resources within the vicinity of" TMV. (15:4451.) The EIR concludes that the Ranchwide Agreement and TUMSHCP "projects… would result in substantial conservation" of special-status species and therefore the Project would "result in less-than-significant [and even beneficial] cumulative impacts to special-status species within the cumulative study area." (15:4453.)

However, an EIR's cumulative impacts analysis is meant to consider effects that are together "considerable or which compound or increase other environmental impacts" (Guidelines § 15355.); it does not serve as a forum to recite potential beneficial effects in order to avoid discussion of adverse impacts. The Ranchwide Agreement and the TUMSHCP certainly are not described by the EIR as compounding or increasing other environmental impacts. (15:4453.) Moreover, their effects are not cumulatively considerable. Two or more individual effects are cumulatively "considerable" when the incremental effects of an individual project are "significant" (Guidelines § 15065 (a)(3)); that is, when the effects produce "a substantial *adverse* change." (Guidelines § 15002(g), emphasis added.)

In sum, "[t]he project must make some contribution to the impact; otherwise, it cannot be characterized as a cumulative impact of that project." (*Sierra Club v. West Side Irrigation Dist.* (2005) 128 Cal.App.4th 690, 700, *quoting* 1 Kostka & Zischke, Practice Under the Cal. Environmental Quality Act (Cont.Ed.Bar 2003) § 13.36, p. 533.)

Respondents discuss both the Ranchwide Agreement and the TUMSHCP as beneficial considerations in order to reduce and minimize the Project's impacts. It matters not that Respondents nonetheless found the Project's cumulative impacts to be significant and unavoidable because Respondents cannot assure that other agencies will take proper actions to benefit the species (15:4521); the "purposes [of the statement of overriding considerations] are undermined if its conclusions are based on misrepresentations of the contents of the EIR or it misleads the reader about the relative magnitude of the impacts and benefits the agency has considered." (*Woodward Park Homeowners Assn., Inc. v. City of Fresno* (2007) 150 Cal.App.4th 683, 718 "*Woodward Park*".) Because the EIR's cumulative impacts analysis skews the EIR's perspective by including the Ranchwide Agreement and the TUMSHCP in its cumulative impacts analysis, it misleads the reader and thus fails as a matter of law.

### 3. The EIR Improperly Rejects the Use of Buffers around GPS Data Points

Respondents reject out-of-hand the suggestion of using buffers around GPS data points, claiming that they are "unsupported by any science or precedent." (128:36779.) Not only does this response ignore the support for buffers by distinguished condor biologists and the literature (136:38793-94, 136:38801) but it ignores the fundamental point of buffers: they are a means to more accurately account for the species' use of an area, including active foraging over a wide

expanse, and not merely the sporadic occupancy of a pinpoint location at any given time. (135:38727.) This is especially important given that Respondents were warned that the available GPS data, while useful in showing where condors *may* forage and roost, is useless in determining where they do *not* forage and roost, due to the fact that the GPS data reflects an extremely small sample size (a maximum of 14 to 17 birds)[12] comprised of recently released condors entirely dependent on artificial feeding and rarely engaging in natural foraging behavior. (41:12131; 135:38726-28.) As the EIR repeatedly makes assertions such as "[l]ess than 1% of the data points are within the Tejon Mountain Village site," it is incumbent that it accurately describe the usage of the Project site reflected by these data points; failure to do so here "precludes informed decisionmaking and informed public participation, thereby thwarting the statutory goals of the EIR process." (*Dry Creek Citizens*, 70 Cal.App.4th at 26; 135:38727-28.) This point raised by commenters is again ignored by Respondents. (129:36778-82.)

### B. The EIR Fails to Properly Analyze the Impacts of Artificial Feeding of Condors

The EIR ignores the significant impacts of a core proposed mitigation measure: the artificial feeding of condors. Mitigation Measure 4.4-6 is intended to mitigate for the loss of suitable condor foraging habitat, the threat of lead poisoning, and habituation-related problems including the ingestion of microtrash. (*See* 14:4092; 14:4095; 14:4118.) Numerous

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[12] Although the Addendum to the Condor Conservation and Management Plan admits that the number of condors "equipped with GPS units" is "an important variable in the GPS dataset," it fails to identify how many condors are represented in the data it analyzes. Nor does the EIR or the Condor Plan itself reveal this number. (129:36934.)

commenters (including a number of condor experts) expressed serious concerns about supplemental feeding-related impacts that—far from compensating effectively for the loss of foraging habitat associated with TMV—could jeopardize the long-term prospects for California condor recovery and eventual delisting. (82:23674; 83:24105; 135:38734-37; 165:46807-08; 165:46810; 165:46840-41; 165:46851-53.) The EIR largely ignores these concerns, resorting to conclusory analyses, over-simplification of the issues,[13] and mischaracterization and minimization of the available evidence, concluding that there are no potential significant impacts related to supplemental feeding.

As argued by several commenters, the risks associated with supplemental feeding are many and include creating a regime of dependency in which condors, in the short term, have no incentive to engage in natural foraging behaviors and, in the long term, have no ability to do so, in part because increasing development pressures and an increasing condor population could result in insufficient habitat for individual birds to successfully find enough widely dispersed, "natural" sources of food. (*See* 135:38724; 135:38735; 165:46807-08; 165:46810; 165:46851; 270:74556.) Commenters also pointed out that artificial feeding manipulates other natural behaviors of the species: influencing where condors roost, narrowing the composition of their diet, detrimentally altering the frequency with which chicks are fed, and, due to the protected nature of the feeding stations,

[13] (*E.g.*, 128:36786. [the "opinion that supplemental feeding 'dooms' the condor to [existence as] a 'virtual zoo animal' . . . . is at odds with the reality of every California condor feeding program, which in turn exists and has been determined to be critical to the success of every released population of California condors."].)

fostering an unnatural lack of awareness of potential threats that leaves condors more vulnerable to predators. (*See* 165:46807-08; 165:46852; 259:71814-17; 270:74548-49; 342:93280.) Commenters further observed that because artificially-fed condors do not need to spend most of their time searching the landscape for food, they generally devote more time to "non-essential activities," including finding and ingesting human-generated microtrash. (*See* 135:38736; 165:46807; 165:46851; 270:74546; 342:93269; 342:93277-80.)

Respondents initially ignored these concerns and then subsequently denied any potentially significant negative impacts of the artificial feeding mitigation measure. (128:36787.) The EIR, however, addresses only one of the many concerns raised about artificial feeding, summarily dismissing the conclusions of peer-reviewed literature that artificial feeding may increase the risk of micro-trash ingestion as mere "conjecture" (128:36787.) Respondents fail to discuss the many other identified impacts of artificial feeding; instead dismissing all concerns on the grounds that artificial feeding is necessary because of the threat of lead poisoning. (128:36786.) But even if artificial feeding is necessary at this time because of lead poisoning risks, its potential impacts still must be disclosed, discussed, and mitigated or avoided. (*See Sunnyvale West Neighborhood Association v. City of Sunnyvale City Council* (2010) 190 Cal.App.4th 1351, 1392 [decisionmakers and ordinary citizens should not be left wondering" about the extent of a project's impacts]; *Woodward Park*, 150 Cal.App.4th at 709.) Respondents' failure to acknowledge the many potential impacts that would be caused by the artificial feeding mitigation measure is a failure to proceed in the manner required by CEQA. (*See* Guidelines § 15126.4 (a)(1)(D); Guidelines § 15088 (c); *Save Our Peninsula*, 87 Cal.App.4th at 130.)

To the extent that Respondents supported their conclusion at all, they failed to do so with substantial evidence. (*See Woodward Park*, 150 Cal.App.4th at 723; *cf. Uphold Our Heritage v. Town of Woodside* (2007) 147 Cal.App.4th 587, 599.) Respondents provide little more than a conclusory statement that the feeding programs will not adversely impact condor behavior, relying on the deficient logic that since the artificial feeding provides short-term benefits, negative impacts are necessarily insignificant. (*See* 128:36787.) But as demonstrated by Petitioners and numerous independent commenters, including almost all of the independent condor conservation scientific community, artificial feeding causes significant impacts. (*See* 135:38735-6; 165:46807-08; 165:46810, 165:46851-2; 270:74546; 270:74556; 342:93269; 342:93277-80.) The EIR's response is nothing more than argument, speculation, unsubstantiated opinion and narrative, and therefore in no way qualifies as substantial evidence. (Pub. Resources Code § 21082.2 (c); *Bakersfield Citizens*, 124 Cal.App.4th at 1198.)

### C. The EIR Improperly Defers Analysis of Impacts Caused by Reductions in Grazing and Hunting

The Project is made up of a series of narrow development peninsulas totaling 7,867 acres interspersed among 18,550 acres of open space. (13:3657.) The fragmentation of the open space significantly impacts its habitat qualities and exposes the development areas to hazards, including that of wildfire risk. The EIR reveals that both hunting and grazing will be limited within the Specific Plan's open space, but fails to give any more details. (14:4092; 130:37319.) The EIR neither discusses nor references any sort of detailed hunting management plan and defers a required Grazing Management Plan until after Project approval. (2:395.) As a result, the EIR

fails to reveal the extent that either hunting or grazing will be reduced and what may be the environmental impacts of that reduction.

One of the foreseeable significant impacts of reducing current hunting and grazing activities in TMV will be a loss of food availability for foraging condors. As the EIR acknowledges, condors are opportunistic scavengers that maintain wide-ranging foraging patterns—and consequently habitat use—depending on overall food availability (165:46601), which in turn largely depends on hunting and grazing activities. (14:4092.) But the EIR fails to describe how much either hunting or grazing will be curtailed as a result of the Project, ignoring comments by Appellants and submitted expert opinion. (14:4092; 135:38730; 136:38795.) As to grazing, the EIR simply provides that a grazing management plan will be prepared in the future without disclosing how grazing practices will in fact be altered. (14:4129.) The EIR consequently is incapable of making any determination as to how many acres of condor foraging habitat will be lost and what the impact of this loss would be.

The EIR similarly fails to evaluate the consequences of altering the grazing regime on fire safety. As the EIR notes, it is likely that the relatively low frequency of fires on the site is directly related to the presence of ongoing grazing operations. (16:4677 ["Cattle remove or reduce fuel, resulting in a lower probability that a wildfire will ignite and spread."].) The reduction of grazing will have a concomitant effect on the vegetation that provides the fuel for wildland fires, but the EIR fails to disclose or analyze this apparent increase the wildland fire risk. Similarly, it is impossible for the public or decisionmakers to determine whether the Project's Fire Protection Plan and additional mitigation measures are adequate because

none of them consider the future changes to grazing. (16:4677; 16:4682-83.)

Because the EIR fails to include any detail on its hunting management plans and defers its grazing management plan until after Project approval, it does not and cannot evaluate the consequences of altering either activity on condor foraging activities or fire safety. The EIR thus violates CEQA's demand for meaningful information, which "is not satisfied by simply stating information will be provided in the future." (*Vineyard Area Citizens*, 40 Cal.4th at 431, *quoting Santa Clarita Organization for Planning the Environment v. County of Los Angeles* (2003) 106 Cal.App.4th 715, 723.) As the courts have long emphasized, "the time to analyze the impacts of the Project and to formulate mitigation measures to minimize or avoid those impacts [is] during the EIR process, *before* the Project [receives] final approval. (*Richmond*, 184 Cal.App.4th at 95.) By deferring development of the grazing management plan, Respondents fail to disclose foreseeable impacts and are "obviously unable to gather sufficient information during the EIR process itself to develop specific mitigation measures." (*Richmond*, 184 Cal.App.4th at 95.) Respondents therefore failed to proceed in the manner required by law by violating CEQA's disclosure requirements. (*See* Guidelines §§ 15126 [all project phases must be considered in evaluating environmental impacts]; 15358 (a)(2) ["effects" include project's indirect or secondary effects]; 15144 [lead agency must use best efforts to "disclose all it reasonably can."].)

## IV. CULTURAL RESOURCES

Properly followed, CEQA's procedures should not only fully inform Native American communities about the Project's impacts to their

resources, but should also identify and prevent significant impacts to their cultural, religious, and historical resources. Despite the numerous important Native American historical, cultural, and religious sites contained within the Project footprint, these sites are reduced to insignificance in the EIR. In failing to adequately inform local tribes about the Project's impacts to their resources, and to adhere to procedures needed to identify and protect Native American historical and cultural resources, Respondents did not proceed in the manner required by CEQA.

### A. The EIR Contains Inadequate Descriptions of Native American Historic Sites

The EIR contains curtailed and distorted descriptions of Native American historic and cultural site locations, making it "simply impossible to know" the precise location of the Native American historic and cultural sites, and "render[ing] the protection of cultural resources a guessing game at best…." (83:23901.) Native American representatives such as Delia Dominguez[14] have been prevented from obtaining practical knowledge of what cultural sites the EIR identifies as within the Project envelope because the EIR does not indicate the likely significance of sites, broadly categorizes sites as prehistoric camps or bedrock mortar station, does not include figures displaying the location of the sites on maps, and includes only rough proxies such as: "immediately north of Tejon Lake Drive, about 2.6 miles east of Tejon Lake (Figure 3)… near the top of a small north south tributary of Pastoria Creek/Bear Trap Canyon," as the totality of site

[14] Ms. Dominguez, Chairwoman of the Kitanemuk and Yowlumne Tejon Indians (83:23901), is identified in the EIR as a Most Likely Descendant (hereinafter "MLD") for the Kitanemuk and Yowlumne Yokuts Indian Tribes (15:4560) and is identified by the Native American Heritage Commission ("NAHC") as a Tribal Contact for the Project (80:23161-63).

descriptions.[15] (49:14356.) In addition, although sacred burial and ritual sites are among the best known of the uses and descriptions which would be useful to Native Americans, the EIR's mere labeling of sites as, for example, "bed rock mortar stations" fails to help identify these significant cultural sites. (83:23901-05; 48:14263-70; 48:14277-78; 48:14282-301; 49:14327-14338; 49:14356-72; 49:14508-16.) As a result, Native American representatives are unable to judge the importance of these sites or whether their cultural and sacred sites have been identified because their location and purpose cannot be ascertained.

### B. The EIR Fails to Disclose Information to Native Americans as Required

CEQA instructs lead agencies to "work with the appropriate Native Americans as identified by the Native American Heritage Commission" to mitigate project impacts on Native American burial sites. (Guidelines § 15064.5 (d).) Local Native Americans requested, as observed by Respondents, that Respondents disclose the exact location of the cultural and historical resources on the Project site, including burial sites, sacred

[15] Other examples include the EIR's descriptions of CA-KER-4010 ("It is located in a small creek that is tributary to Castac Valley, about two miles east of Tejon Lake (Figure 6)") (49:14358); CA-KER-5357 ("It is located near the southeastern limits of the Tejon Mountain Village study area, just north of the Los Angeles County line. More specifically, it is located on the northern slope of a small east-west canyon that is tributary to southern Oso Canyon (Figure 6))" (49:14361); CA-KER-6720 ("This site is located on another high ridge immediately north of Tejon Lake Drive. In this case the ridge containing this second site is south of CA-KER-6719 and separated from the ridge containing the previous site by a low saddle (Figure 3))" (49:14366); CA-KER-6732 ("This site is located in a limestone bedrock outcrop near the southeastern limits of the Tejon Mountain Village study area on the southern slopes of a high peak (Figure 6), at 1270 meters elevation") (49:14370-71). The referenced Figures 3 and 6 were not included in the EIR.

places, villages, and objects. (83:23901; 83:23942; 82:23856; 80:23198; 80:203208; 135:38739-40.)[16] Rather than providing this information to or working with Ms. Dominguez, Respondents provided a map to the Kern County Planning Department but required that it be kept confidential, in order to "ensure the protection of these cultural resources" from defilement, and because "publicly disclosing the exact locations of cultural resources sites is not lawful." (15:4560; 128:36793-95; 83:23941-42; 82:23864-65.) While Appellants agree the information should not be made "public," it is crucial that the information is made available to tribal representatives such as Ms. Dominguez so local Native Americans can intelligently assess the impact of the TMV development on their cultural and historical resources.

Guidelines Section 15064.5(d) provides that Respondents had a continuing duty to work with the appropriate Native Americans as identified by the NAHC when the initial study identified the existence of or probable likelihood of Native American human remains. Guidelines Section 15064.5(d) and Pub. Resources Code Secion 5097.98 mandate that Native Americans be made aware of the location of their burial sites through a "discuss and confer process" process, in order to identify and mitigate the impacts to Native American cultural resources.

Respondents failed utterly in complying with the disclosure and consultation requirements of both provisions. Kern County and TMV claim their failure to work with local Native Americans and their intentional failure to reveal the location of Native American burial sites to

[16] Ms. Dominguez stated in her comments that "[u]sing numeric identifiers makes it simply impossible to know if the many villages and sacred sites around the Castac Lake site are the ones identified in the DIER ... This is a critical problem with the DEIR that renders the protection of cultural resources a guessing game at best." (83:23901.)

the appropriate Native Americans are supported by nondisclosure laws. (15:4560 4.5-1; 128:36793-95; 83:23941-42; 82:23864-65.) However, nondisclosure to affected Native Americans is contrary to CEQA per Guidelines Section 15064.5(d), and not justified under other laws cited by Respondents. While Government Code Sections 6254.10 and 6254 (r) allow for the discretionary withholding of Native American archaeological site information, the provision is not intended to block disclosure to Native Americans, especially those with a MLD designation or that are listed as Tribal Contacts by the NAHC. Moreover, the State of California Tribal Consultation Guidelines specifically state that *tribal designees* may obtain information about a given Native American site. (State of California Tribal Consultation Guidelines (November 14, 2005), pp. 27-28, at http://www.opr.ca.gov/programs/docs/09_14_05%20 Updated%20Guidelines%20(922).pdf.) Respondents' withholding of information runs contrary to *EPIC*, which held that an agency's refusal to provide to Native Americans a report evaluating the presence of Native American archeological resources on the project site violated CEQA, because disclosure of the report was needed to allow the Native Americans to intelligently assess the impact of the Plan on the archeological site. (*Environmental Protection Information Center, Inc. v. Johnson* (1985) 170 Cal.App.3d 604, 628-30 ("*EPIC*").) Like the Native Americans in *EPIC*, Ms. Dominguez and the Tejon Indian Tribe should have been provided with all information concerning their cultural resources.

Respondents' failure to disclose the location of Native American cultural, religious, and historical resources to local Native Americans on the NAHC's list of tribal contacts and designated as MLDs violates CEQA's requirement for a good faith and full disclosure of a project's significant environmental effects and precludes informed decision-making and

informed public participation. (*See Laurel Heights*, 47 Cal.3d at 392; *Bakersfield Citizens*, 124 Cal.App.4th at 1197; *Association of Irritated Residents*, 107 Cal.App.4th at 1390; 15:4560; 128:36793-95; 83:23941-42; 82:23864-65; 174:49152; 174:49156; 174:49158.)

### C. Respondents Failed to Adequately Consult with Trustee Agencies

Respondents violated CEQA's requirement to consult with trustee agencies by not disclosing the reports detailing the precise location and complete description of Native American cultural resources on the project site to the NAHC. (Pub. Resources Code §§ 5097.94, 5097.95, 21080.4, 21104(a), 21153(a), 21092.5; Guidelines § 15086; Gov. Code § 65352.4; *EPIC*, 170 Cal.App.3d at 626-27.) If Respondents had disclosed the detailed archeological reports to the NAHC, the NAHC could have provided the exact locations of the Native American sites to the MLD and local Native Americans on the NAHC's list of tribal contacts, allowing MLD's and tribal contacts to conduct an adequacy and completeness analysis and to make mitigation recommendations. In addition, by refusing the Native Americans' requests for complete disclosure of the exact location of cultural resources, Respondents ignored the NAHC's specific request for Respondents to consult with the Native Americans the NAHC listed as tribal contacts regarding their cultural resources. (Guidelines § 15040(e); 80:23161-4; 83:23901; 83:203208; 174:49159; 83:23941-42.) Respondents' mere mailing of form notice letters to the NAHC and corresponding failure to adequately consult deprived Native Americans of any meaningful opportunity to protect their cultural resources under CEQA.

### D. The EIR Fails to Analyze Impacts to Significant Historic, Cultural, and Sacred Sites

Due largely to the vague and inadequate project description, the Project's impacts to significant Native American cultural and historical resources are unidentified and unanalyzed in the EIR, despite being highlighted by commenters. (*See* Statement of Facts, above.) This failure makes the EIR insufficient as an informational document, violating CEQA. (Pub. Resources Code § 21100 (b)(1); Guidelines § 15126.2(a); *Laurel Heights*, 47 Cal.3d at 390; *Dry Creek Citizens*, 70 Cal.App.4th at 26.)

Numerous comments from Native Americans raised the issue of the submerged village of Kashtiq (83:23903; 135:38600-03, 135:38740-41; 170:47898-99; 171:48208; 81:23363-64), yet Respondents argue that Castac Lake is not part of the Project and that the filling of Castac Lake does not require an analysis of impacts. (16:4698; 79:22943.) As described in Section II, above, Castac Lake is properly considered part of the Project, but even if not, the EIR must still discuss the Project's impacts on the village of Kashtiq, which will be entirely surrounded by the Project. (81:234555-56; 82:23853.)

### E. The EIR Fails to Adequately Mitigate Significant Impacts on Cultural Resources

For mitigation of impacts to Native American sites, the Guidelines state a preference for the use of "preservation-in-place," which maintains the relationship between artifacts and the archaeological context. (Guidelines § 15126.4 (b)(3).) Notably, the Guidelines require that the EIR consider and discuss different means that may achieve preservation-in-place, and also that the EIR identify the basis for selecting a particular measure. (*Id*.; Guidelines § 15126.4 (a)(1)(B).) Yet the EIR repeatedly fails to discuss different means that would achieve preservation-in-place and fails to state whether a greater degree of mitigation would be achieved

by implementing one method of preservation in place over the other. (15:4560-66.)

Similarly, where the EIR identifies Project features such as roadways, utility infrastructure, or grading that may impact a Native American cultural and historical resource, the EIR leaves to the developer's discretion whether to implement avoidance and preservation via open space, or to use other methods that actually exacerbate impacts to the historic cultural resources. (15:4560-66.) At the minimum, these decisions should include a mitigation effectiveness analysis. For example, Mitigation Measures 4.5-22 and 4.5-25, 26, and 27 merely state that "utilities that may overlie the geotextile matting and fill will be embedded within the fill cap, above the geotextile mat, or routed northeast of the site" or that "if the construction requires encroachment on the bedrock mortars on the south side of the site and upslope of the archaeological deposit, these shall be covered with geotextile matting and fill." (15:4560-66.) These mitigation measures were imposed without analyzing the relative impacts resulting from different methods that may achieve preservation-in-place, despite the clear disadvantage of using geotextile covering, a "preservation" method that could obliterate many of the cultural historic resources. (15:4560-66; Guidelines § 15126.4 (a)(1)(B), 15126.4 (b)(3).) Notably, many Native American sacred sites and burials can only truly be preserved by avoidance due to their sacred, religious, and spiritual values, or need to be visually observed in order for their historic and cultural significance to be recognized. (170:47943-44; 170:47924; 170:47955; 83:23901-05.) Respondents' failure to analyze the effectiveness and adequacy of proposed mitigation measures to protect, and preserve in place, Native American cultural and historical resources as required by

CEQA threatens to permanently erase vital components of the local Tribes' culture, history, and connection to their ancestors.

## V. AIR QUALITY

### A. The EIR Improperly Defers Mitigation for Air Quality Impacts

Californians experience the worst air quality in the nation, with annual health and economic impacts estimated at 8,800 deaths and $71 billion per year. (314:85755.) The Project will degrade the air quality in three air basins (12:3459; 12:3466), yet the EIR claims that the Project will not conflict with or obstruct implementation of the applicable air quality mitigation plan within the San Joaquin Air Basin—and will thus have a less than significant impact—because Mitigation 4.3-1 will reduce ozone precursors and PM pollution within the San Joaquin Air Basin to below two tons per year. (*See, e.g.*, 12:3458; 13:3863.) Mitigation 4.3-1, however, improperly defers formulation of specific mitigation to future site development when the applicant is required to "submit evidence" of reductions below two tons per year through several vaguely defined future mitigation programs: project design, compliance with the San Joaquin Valley Air Pollution Control District ("SJVAPCD") Independent Source Review Program ("ISR"), a Voluntary Emissions Reduction Agreement ("VERA"), or "participation in any air mitigation program adopted by Kern County that provides equal or more effective mitigation than this mitigation measure." (12:3458; 13:3863-64.) While Respondents' findings relating to the Project claim to rely upon the VERA as the primary mechanism to reduce the Project's air quality impacts (1:161), the Mitigation and Monitoring Program approved as part of the EIR reveals that any of the above programs could be used as mitigation. (2:342.)

Deferral of mitigation measures is not normally permitted under CEQA. (Guidelines § 15126.4(a)(1)(B); *Richmond*, 184 Cal.App.4th at 92.) Deferral may be appropriate only when the lead agency "(1) undertook a complete analysis of the significance of the environmental impact, (2) proposed potential mitigation measures early in the planning process, and (3) articulated specific performance criteria that would ensure that adequate mitigation measures were eventually implemented." (*Id.* at 95.) The EIR fails to meet this standard as (1) its analysis of the significant impacts to air quality is inadequate, (2) mitigation measure 4.3-1 contains vague and undefined programs, and (3) the VERA cannot ensure that adequate mitigation measures will be implemented to meet the ostensible performance standards.

### 1. The EIR's Analysis of the Significant Impacts to Air Quality is Inadequate

The EIR fails to conduct the necessary analysis and disclosure of significant air quality impacts, contributing to the erroneous conclusion that mitigation measures will address the potentially significant impacts of the Project's air quality emissions on the adjacent Mojave Air Basin. The EIR must analyze whether the Project "[v]iolates *any* air quality standard or contributes substantially to an existing or projected air quality violation." (Guidelines App. G § III(b) (emphasis added).) The EIR's analysis of air quality impacts is acutely important where, as here, the Project borders—and impacts—three of the most heavily polluted air basins. *Kings County Farm Bureau*, 221 Cal. App. 3d 692, 723-724.

Appellants emphasized that because of the Project's location "at the southern end of the San Joaquin Valley, emissions from the project affect not only the San Joaquin Valley but also the adjacent South Coast

(metropolitan Los Angeles) air basin and Mojave Desert air basin." (135:38689.) It was thus crucial to model the Project's potential contribution to exceedances of National Ambient Air Quality Standards in the region "even if the speculative emissions reductions achieved through compliance with" the ISR and VERA actually do equal the amounts alleged in the EIR. (135:38689-90; *see* Guidelines § 15125(c) ["the regional setting is critical to the assessment of environmental impacts" to "permit the significant effects of the project to be considered in the full environmental context"].)

Appellants further noted that it was not adequate to simply assert that the purchase of emissions reduction credits ("ERCs") under the VERA would alleviate the Project's air quality impacts on the Mojave Air Basin because the Project "will still emit ozone, and ozone will be carried to the Mojave." (81:23360.) The purchase of ERCs "fail[s] to ensure that the emission reductions will occur locally," allowing locally emitted pollutants to travel to adjacent air basins. (*Id*.) Because the ERCs will not offset local emissions that would impact communities within or adjacent to the Project, the "exact same amount of ozone will be transported from the San Joaquin Valley to the Mojave as a result of this Project." (*Id*.)

Despite the Project's additional impacts on the already severe air quality in adjacent air basins, the EIR asserts that the ozone and PM pollution impacts on the adjacent air basins are "not analyzed in depth" because of the Project's VERA with the SJVAPCD. (13:3763; 128:36683.) Reliance on the VERA, however, does not excuse the EIR's failure to disclose the Project's significant impacts on adjacent basins. (*City of Marina v. Board of Trustees of California State University* (2006) 39 Cal. 4th 341, 348 *citing* Pub. Resources Code § 21002.1(a).)

The EIR repeatedly recognizes that the meteorological conditions of the region contribute to the transport of air pollution from the San Joaquin Air Basin to the Mojave Desert Air Basin across the Project site. (*See, e.g.*, 13:3763 "ozone transport does occur from the [San Joaquin Air Basin] to the [Mojave Air Basin]"; 13:3761; 27:22720). The transport of pollutants like ozone from the San Joaquin Air Basin to the Mojave Air Basin is a significant contribution to the Mojave Air Basin's air quality problems. (13:3763.) The EIR similarly admits that the transport of PM pollution "can occur" between the basins yet "the EIR does not specifically discuss the possibility of $PM_{2.5}$ transport" into the Mojave Air Basin. (128:36683.)

The Project's emission of particulate pollutants adjacent to the Project area cannot simply be mitigated by offsetting emissions in other portions of the San Joaquin Air Basin. Respondents acknowledge that particulate pollution "is considered to be a localized as well as regional pollutant," (13:3781), and "not all emission reduction projects achieved pursuant to the VERA will necessarily occur in the immediate Project vicinity." (CT 464-5 fn 60.) When emission reductions occur far from the Project site the localized pollution generated by the Project on the edge of the Mojave Air Basin will have a greater affect on the Mojave Air Basin than an offset of localized pollution generated in Fresno.

Given the Mojave Air Basin's non-attainment of air quality standards for PM (13:3768), the transport of air pollutants from the Project vicinity that results in the Mojave Air Basin's failure to meet federal and state ambient air quality standards (CT 461), the Project's adjacency to the Mojave Air Basin, and the Project's 164.7 tons per year of PM pollution even after mitigation (13:3895), the EIR must disclose and analyze to what extent PM pollution will be transported from the Project and impact the Mojave Air Basin. Simply proposing mitigation to address an

environmental problem does not allow the lead agency to short circuit CEQA's informational requirement of first fully disclosing and analyzing the extent of the problem. (Guidelines § 15144 ["an agency must use its best efforts to find out and disclose all that it reasonably can."].) These impacts are not "hypothetical" as alleged by Respondents, but real and can lead to severe health impacts. (13:3788-89.) This type of informational omission is particularly egregious when the EIR admits that the Project will have significant impacts due to ozone and PM pollution and the adjacent Mojave Air Basin receiving the Project's emissions is in nonattainment for those very same pollutants. (12:3459, 12:3466; 13:3768.) An EIR's failure to analyze the air quality impacts by improperly limiting the scope of analysis for applicable air basins runs contrary to CEQA. (*Kings County Farm Bureau*, 221 Cal.App.3d at 723-724.) Where, as here, Respondents mask the Project's impacts on adjacent air basins by improperly narrowing the impact area, the EIR must be rejected.

### 2. Mitigation Measures to Reduce the Emissions in the Deferred Program Have Not Yet Been Proposed

The EIR fails to describe the potential mitigation measures to reduce the Project's significant air quality impacts within the San Joaquin Air Basin through the deferred mitigation scheme. CEQA requires that when a performance standard is relied upon to reduce the Project's impacts to below a significant level, the potential mitigation measures to reduce those impacts must be disclosed. (*See Richmond*, 184 Cal. App. 4th at 95.)

Respondents incorrectly argue that because they provided "a description of extensive mitigation measures… at the earliest possible point in the process" that the EIR can properly defer the mitigation measures that actually reduce the air quality impacts to a less than significant level. (CT 2:465.) While the EIR proposes some mitigation measures to reduce air

quality impacts, those impacts remain significant. Contrary to CEQA, the EIR punts on defining the mitigation measures to achieve the two tons per year performance standard. The analysis of other mitigation measures to reduce the Project's significant impacts below two tons per year is improperly deferred.

Formulation of the specific mitigation measures is deferred to future site development when the applicant is required to "submit evidence" of those reductions through a range of undefined and vague mitigation measures: project design, compliance with the San Joaquin Air District's ISR program, the Project VERA, or "participation in any air mitigation program adopted by Kern County that provides equal or more effective mitigation than this mitigation measure." (12:3458; 13:3863-64.)

There is no discussion of how future "project design" or "participation in any air mitigation program adopted by Kern County" would function to mitigate air quality emissions. The EIR provides some detail regarding the ISR and VERA program. Off-site emissions reductions under the San Joaquin Air District's ISR program are achieved through upgraded existing diesel engines to clean diesel or electric engines.[17] The VERA first refers to coordination with the San Joaquin Air District and existing commitments in the EIR to support the deferred mitigation scheme. (13:3854-5). Like the ISR, the VERA then proposes the same emissions reductions engine replacement program, but the total VERA program has only achieved a 0.35 tons per year reduction for PM. (13:3857.) Finally, the VERA proposes off-

[17] ISR off-site emissions reductions were achieved through "re-powering various type of diesel powered industrial portable equipment such as top grinder, oil drill rig, plastic granulator and agricultural irrigation pumps, with either cleaner diesel engines or by conversion to electric motors." (23:6661.)

site mitigation from a Container Trip Reduction Facility that has not been built and an unapproved Biodiesel Research Facility. (13:3857-95.) In sum, the EIR fails to describe the full range of emissions reductions projects contemplated in the VERA, to what extent those emission reductions would occur, and how much emissions could feasibly be reduced. This is the same type of "nonexclusive, undefined, untested" mitigation measures "of unknown efficacy" that have been condemned by the courts. (*Richmond*, 184 Cal. App. 4th at 93.)

### 3. The EIR Cannot Ensure That Adequate Mitigation Measures Will be Implemented to Meet Alleged Performance Standards

An EIR can only appropriately defer the formulation and analysis of mitigation measures where "'mitigation is known to be feasible'." (*Richmond*, 184 Cal. App. 4th at 94, *citing Sacramento Old City Association v. City Council* (1991) 229 Cal.App.3d 1011, 1028-1029.) In this case the EIR does not provide substantial evidence that the daunting task of mitigating emissions to two tons per year is feasible. On the contrary, there is clear evidence that the mitigation is infeasible.

The EIR is clear that even after the existing mitigation measures are implemented the Project will result in 164.7 tons per year of $PM_{10}$ emissions. (13:3895; 26:7588-89; 23:6658-59.) At least 51 tons per year of PM pollution must be eliminated through the VERA or ISR program through the payment of fees for off-site projects because they cannot be reduced on-site. (*Id*.) Individually or together, the four vague and deferred mitigation schemes—project design, the ISR program, VERA, or "any air mitigation program"—cannot demonstrate the type of emission reductions to achieve the two tons per year performance standard. Somehow hoping future project design or mitigation schemes will reduce the impacts that

cannot be reduced now does not meet CEQA's requirements. (*See, e.g., Sundstrom v. County of Mendocino* (1988) 202 Cal.App.3d 296, 308 [mitigation conditions require "'meaningful information' reasonably justifying expectation of compliance"].)

After current project design mitigation the Project will result in 164.7 tons per year of $PM_{10}$ emissions. (13:3895; 26:7588-89; 23:6658-59.) The data provided to demonstrate the feasibility of the ISR program can only demonstrate off-site reductions of 9 tons of $PM_{10}$ within the entire San Joaquin Air District. (23:6656.) Similarly, the VERA can only demonstrate the feasibility of reducing $PM_{10}$ emissions by 0.35 tons. (13:3894; 128:36681.) There is no showing whatsoever regarding the emission reductions achieved through "participation in any air mitigation program adopted by Kern County."

Even assuming that the Project can take credit for the emission reductions from the Biodiesel and Container Trip Reduction Facility mentioned in the VERA, which have yet to be completed and are speculative at best, the additional reductions for $PM_{10}$ would amount to 19.5 tons per year. (13:3895.) Thus, even under the most optimistic scenario, total potential emission reductions identified in the EIR would result in less than 30 tons of $PM_{10}$ reductions per year, which is just a fraction of the total 164.7 tons per year emitted from the Project as a whole, or directly within the San Joaquin Air Basin.[18]

[18] Even if the EIR only intends to apply measure 4.3-1 to the 29% of total Project's operational emissions the EIR claims occur within the San Joaquin Air Basin, not only does the EIR fail to clearly disclose this more limited mitigation obligation, but the identified mitigation would fall short of reaching this objective.

Respondents' assertion that on-site reductions achieved by other projects, as required by the ISR, can somehow constitute available emission reductions for this Project is inaccurate and misleading. (128:36687.) As both the EIR and the 2008 Annual Report on the ISR program recognize, the ISR program requires individual developers to reduce their on-site emissions themselves. (128:36681; 23:6658.) On-site reductions from other projects involved in the ISR program demonstrate that 1,087 tons of PM that have been reduced. (CT 467 fn. 64.) However, "nine tons of reductions reflects only those off-site projects funded by mitigation fees." (CT 467 fn. 64.)

The EIR relies on over 51 tons per year of off-site mitigation, which is several times greater than the yearly allowance for the entire San Joaquin Air Basin. The EIR's assertion that the emissions credits available for the Project are *more* than the total off-site emission reductions for the entire San Joaquin Air District is a "clearly erroneous or inaccurate" statement that does not constitute substantial evidence. (Guidelines § 15384(a). The EIR's use of emissions credits would leave no other projects in the San Joaquin Basin with available off-site mitigation opportunities and still not achieve the ostensible two tons per year threshold. Because of the failure to provide substantial evidence of whether sufficient mitigation opportunities even exist in the San Joaquin Air Basin, the EIR does not provide the requisite assurances that proposed mitigation is "both feasible and efficacious" and fails as a matter of law. (*Richmond*, 184 Cal.App.4th at 95.)

Importantly, deferral of mitigation to another time and in consultation with another agency violates CEQA's fundamental policy that public agencies "should not approve projects" when there are feasible mitigation measures to reduce significant environmental impacts. (Pub. Resources Code § 21002.) By relying on a vague and infeasible mitigation scheme the

EIR repeatedly asserts that it has adopted all the feasible mitigation because it has already reduced the emissions to below two tons per year, then fails adopt other feasible mitigation.

Respondents use the deferred mitigation scheme as a tool to avoid their obligations to further reduce the Project's air quality impacts. In circumstances where the lead agency cannot demonstrate the feasibility of potential mitigation measures to reduce the Project's impacts, the "solution [is] not to defer the specification and adoption of mitigation measures…, but, rather, to defer approval of the Project until proposed mitigation measures were fully developed, clearly defined, and made available to the public and interested agencies for review and comment." (*Richmond,* 184 Cal. App. 4th 70, 95.)

## CONCLUSION

For each of the reasons discussed above, Appellants respectfully request that this Court reverse the court's denial of Appellants' Petition for Writ of Mandate, with instructions that Respondents' approval of the Tejon Mountain Village project be vacated and granting other such relief as requested and appropriate.

I certify that the total word count of this brief, including footnotes, is 13932 words, as determined by the word count of the Microsoft Word program on which this brief was prepared.

DATE: June 15, 2011 Respectfully Submitted,

Adam Keats
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## PROOF OF SERVICE BY MAIL

I, Candice McLaughlin, declare as follows:

I am employed in the County of San Francisco, State of California. I am over the age of eighteen and my business address is 351 California St., Suite 600, San Francisco, CA 94104.

On June 15, 2011, I served the following document(s) entitled:

**APPELLANTS' OPENING BRIEF**

by placing a copy thereof enclosed in a sealed envelope addressed as follows:

*For Respondents County of Kern and Kern County Board of Supervisors:*
Charles F. Collins, Esq.
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*For Real Parties in Interest Tejon Ranch Co. and Tejon Mountain Village, LLC:*
Jennifer L. Hernandez, Esq.
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Kern County Superior Court
Hon. Kenneth C. Twisselman
Department 8
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Bakersfield, CA 93301

California Supreme Court (via electronic mail)

I am readily familiar with my office's practice for collection and processing of correspondence and other materials for mailing with United States Postal Service. On this date, I sealed the envelope(s) containing the above materials and placed the envelope(s) for collection and mailing on this date at the address stated above, following our office's ordinary business practices.

I declare under penalty of perjury under the laws of the state of California that the foregoing is true and correct and that this Proof of Service was executed on June 16, 2011, at San Francisco County, California.

C. McLaughlin

Candice McLaughlin