APPENDICES

BIOTA REPORT FOR THE APPROXIMATELY 3,901-ACRE WILDFLOWER GREEN ENERGY FARM SITE LOCATED IN LOS ANGELES COUNTY, CALIFORNIA

Permit No: RCUPT201000121
Project No: R2010-00256

Prepared For: **Los Angeles County**
Department of Regional Planning
320 West Temple Street
Los Angeles, California 900123

and

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and

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Date: **December 15, 2011**

Appendix A:

Guideline Compliance Checklist

GUIDELINE COMPLIANCE CHECKLIST

	PREPARER'S INITIALS	PAGE
Setting	**DAL**	**3-1**
Original U.S. G.S. Topographical Quad Sheet (or color photocopy)	**DAL**	**1-2**
Project Site Photographs or Color Photocopies	**DAL**	**Appendix D**
Color Aerial Photographs	**DAL**	**1-1**
Biota Survey of the Project Site	**DAL**	**4-1**
Flora and Fauna Lists in Alphabetic/Systematic Order	**DAL**	**Appendix E and Appendix F**
Table of Sensitive Species Impacts Matrix	**DAL**	**Appendix G**
Document showing CNDDB Contact	**DAL**	**4-4**
Site/Grading Plans	**DAL**	**2-1 and Appendix C**
Initial Study Questionnaire	**DAL**	**Appendix B**
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Preparers Resume/Qualifications	**DAL**	**Appendix H and Appendix I**

Appendix B:

Environmental Checklist Form (Initial Study) Questionnaire

Environmental Checklist Form (Initial Study)

County of Los Angeles, Department of Regional Planning

Project title: "Wildflower Green Energy Farm"/R2010-00256-(5), Conditional Use Permit No. 201000121, Environmental Assessment No. 201000063

Project location: 16700 Lancaster Rd. and 47031 167th St., Lancaster, CA 93536
APN: See Figure 2 in attached Project Description *Thomas Guide*: _____ *USGS Quad*: Lake Hughes/Fairmont Butte/Del Sur

Gross Acreage: 4,092 ac. (3,708 ac. Energy Farm + 384 ac. Gen-Tie Line Corridor)

Description of project: Antelope Power, LLC (the "Applicant") is proposing to construct, own, and operate the Wildflower Green Energy Farm (the "Project") that includes: (1) a solar/wind energy facility with a generating capacity of up to 300 megawatts (MW) (the "Energy Farm"); and (2) an underground 230-kilovolt (kV) gentie line (the "Gen-Tie Line") that would connect the Energy Farm either to Southern California Edison's ("SCE") existing Antelope Valley Substation in the City of Lancaster (a distance of 4.8 miles), or to Los Angeles Department of Water and Power's ("LADWP") Barren Ridge–Rinaldi renewable transmission line (a distance of 1.5 miles). For purposes of environmental impact analysis, a Gen-Tie Line "Corridor" has been defined, extending approximately one-eighth mile on both sides of Avenue J, from the southeastern corner of the Energy Farm site, to the Antelope Valley Substation. The entire geographic area in which the Energy Farm and Gen-Tie Line corridor would be located are referred to collectively as the "Site."

The Energy Farm is comprised of two parts: a 2,116-acre "Northern Energy Farm" containing all of the solar arrays and approximately two-thirds of the wind turbines, and a 1,592-acre "Southern Energy Farm" containing the remaining one-third of the wind turbines. The geographic area over which these two Project components would occur is referred to as "the Energy Farm Site." The Project also includes two voluntary conservation areas within the Energy Farm, to protect habitat and provide buffers adjacent to the Fairmont and Antelope Buttes Significant Ecological Area (the "SEA") and the Antelope Valley California Poppy State Natural Reserve (the "Poppy Reserve"). Other notable features within the Energy Farm are extensive open space/habitat management areas, three wildlife migration corridors, and

pedestrian/equestrian trails to provide public access through the Energy Farm with scenic viewing opportunities of the Poppy Reserve, the SEA and the more distant mountains.

The purpose of the Project is to provide utility companies with electricity generated from clean renewable wind and solar technologies. The Project seeks to optimize the renewable energy generation potential of the Site, while minimizing potential adverse environmental effects. The Applicant would implement the Energy Farm through a development plan that harnesses the wind and solar resources of the Site, with a combined output of up to 300 MW of renewable/clean energy. The Applicant has prepared a plan that sets forth a proposed number and configuration of wind turbines and solar panels based on current technology and knowledge of the Site's localized topographic features and meteorological resources. Nonetheless, renewable energy technology is undergoing rapid advancements and the Applicant is collecting meteorological data, conducting geotechnical analysis and other technical studies, and these may necessitate minor adjustments in the final siting of the on-site wind turbines and solar panels. In addition to the proposed renewable energy generating facilities, Project support facilities proposed include an operations and maintenance building with a water storage tank and a septic tank/leachfield wastewater disposal system, a surface parking lot, a temporary lay down yard, access roads, an electrical substation, and a second water storage tank for semi-annual solar panel washing.

The Applicant is requesting a Conditional Use Permit (CUP) to authorize grading for the Energy Farm and Gen-tie Line of up to 4,145,200 cubic-yards (combined cut and fill quantity), to allow development of a renewable energy farm within an A-2-5 (Heavy Agricultural) zone; and to allow development within the Fairmont Buttes Significant Ecological Area (SEA No. 57).

Development Area: Based on the Project's siting criteria, the Energy Farm would be constructed within an overall maximum development envelope of 2,350 gross acres; this plan provides some flexibility for adjusting final locations of solar and wind improvements, based on micrositing factors. Total construction disturbance would actually affect approximately 970 acres, including 870 acres in the Northern Energy Farm and 100 acres in the Southern Energy Farm. Construction of the Gen-Tie Line would occur within a 20-foot-wide easement area, totaling 12.4 acres with an interconnection to the SCE Antelope Valley Substation or 3.4 acres with an interconnection to the LADWP Barren Ridge–Rinaldi renewable transmission line.

General plan designation: R (Non-Urban), 0.2 dwelling units/acre (du/ac)

Community/Areawide Plan designation: Antelope Valley Area Plan: N1 (Non-Urban 1), 0.5 du/ac

Zoning: A-2-5 (Heavy Agricultural—Five Acre Minimum Required Lot Area)

Surrounding land uses and setting: The Project is located within the Fairmont area of the unincorporated Antelope Valley in Los Angeles County, approximately 1 mile south of Avenue D (State Route 138) and 3.3 miles west of the western edge of the City of Lancaster, California. Site topography varies, with the lowest elevation being approximately 2,700 feet above mean sea level (msl) located near Broad Canyon in the northern periphery, and the highest elevation being approximately 2,900 feet above msl located near the California Aqueduct in the southwestern portion of the Site. The Southern Energy Farm consists of moderately sloping plateaus from south to north with limited canyons. The Northern Energy Farm consists of moderately sloping plateaus from north to south. Elevations along the Gen-tie Line Corridor range from approximately 2,760 feet above msl at the southeast corner of the Site, to 2,460 feet above msl at the east end near Southern California Edison's existing Antelope Valley Substation. The landscape within the Site consists mainly of alfalfa grasses (planted as a crop), desert grass, and sagebrush scrub.

Since the 1950s, approximately 2,200 acres concentrated in the area of the Northern Energy Farm have been utilized for ranching activities including horse breeding, boarding and training, and related farming of alfalfa hay fields. The developed part of the ranch, called Healy Farms, is concentrated southeast of the intersection of Lancaster Road and 170th Street West. It consists of: (1) one single-family home, two trailers, and a single-family residence north of the Healy Ranch; (2) horses and associated grazing areas, which are assumed to have been previously graded; (3) a horse barn with an apartment; (4) a shop to provide limited maintenance for farm equipment, as well as the storage of equipment and materials for construction, operation, and maintenance; (5) two diesel and gasoline aboveground fuel tanks (ASTs) to fuel farming vehicles and equipment; and (6) fields used for hay production. Fallow alfalfa fields, cattle grazing, dry washes, scrubland, two residential sites and a hunting club occur in the Southern Energy Farm. Land uses within and surrounding the Gen-Tie Line corridor consist of undeveloped grazing land, Avenue J (a two-lane road), crossings by two high-voltage transmission line corridors, and three single family residences just west of the SCE Substation.

A majority of the surrounding lands are unoccupied agricultural and grazing lands. The nearest residential communities are Fairmont, approximately 1 mile to the west, Antelope Acres, located approximately 5.2 miles to the east/northeast, and Neenach, located approximately 8.7 miles to the northwest, along the north side of State Highway 138. County Significant Ecological Area (SEA) 57 is located partially within and immediately east of the northern part of the Northern Energy Farm area. Approximately 475.8 acres of this SEA occurs on site. To the northeast are the Poppy Reserve, the Antelope and Fairmont Buttes, with residential development located further to the east. To the south are the Angeles National Forest and lands administered by the Bureau of Land Management (BLM). The LADWP operates the Fairmont Reservoir, a water retention facility, located southwest of the Site. This reservoir collects water from the Eastern Sierra Mountains via the Los Angeles Aqueduct before the water enters an intake below the reservoir for the Elizabeth Lake Tunnel. Land to the west is primarily undeveloped, with several residences scattered across large lots between 180th and 190th Streets. Scattered residences are visible from the western border of the Energy Farm Site; however, most residences are not visible due to distance and topography.

Adjacent land uses consist of low-density rural residential and related light agricultural activities, as well as a church, undeveloped grazing lands, and open space areas, including the Poppy Reserve. The Poppy Reserve lands are adjacent to portions of the Northern and Southern Energy Farm sites. Two homes are located adjacent to the southwestern boundary of the Energy Farm Site, adjacent to the California Aqueduct. Between the Northern and Southern Energy Farms there is one residence within a complex maintained by the Leona Valley Hunt Club (also known as the Antelope Valley Sportsman's Club) and one residence located north of the Leona Valley Hunt Club. There is also one residence located due west of the Healy Farms, on the south side of Lancaster Road, and three other homes north of that road, all of which are accessed from Lancaster Road outside of the Site. One church property, the Church at Fairmont, located at Lancaster Road and 160th Street, is surrounded by the Northern Energy Farm area. The California Aqueduct, which is part of the State Water Project, runs along the southwestern edge of the Northern Energy Farm site and along the entire western edge of the Southern Energy Farm site.

Major projects in the area (Expanded discussion of projects in the area will be discussed in the EIR)**:**

Project/Case No.	*Description and Status*
R2009-02089	Alpine Solar Project/NRG—92 MW/800 ac Approved; 35 ac addition approved.

R2009-02239	AV Solar Ranch One Project—230 MW/2300 ac—Approved
SCH 2007081156	Tehachapi Renewable Transmission Project—CPUC approved December 17, 2009, Supplemental Draft Environmental Impact Statement (EIS underway)
R2011-0377	Antelope Solar Farm/FRV—20 MW/320 ac—early environmental review
R2011-00410	Ruby Solar/Ruby Solar LLC—20 MW/160 ac—early environmental review
R2011-00408	Blue SkyWind Energy Project/NextEra—225 MW/7,500 ac—early environmental review
R2010-00911	Recurrent—Antelope Solar 1/Recurrent Energy—10 MW/111 ac—early environmental review
R2008-00878	Recurrent—Antelope Solar 2/Recurrent Energy—10 MW/80 ac—early environmental review
R2010-00808	Antelope Valley Solar/Renewable Resources Group—650 MW/5,175 ac—Approved October 19, 2011.

Reviewing Agencies:

Responsible Agencies

- ☐ None
- Regional Water Quality Control Board:
  - ☐ Los Angeles Region
  - ☒ Lahontan Region
- ☐ Coastal Commission
- ☒ Army Corps of Engineers
- ☒ U.S. Fish & Wildlife
- ☒ Caltrans

Special Reviewing Agencies

- ☐ None
- ☒ Santa Monica Mtns. Conservancy
- ☐ National Parks
- ☐ National Forest
- ☒ Edwards Air Force Base
- ☐ Resource Conservation District of Santa Monica Mtns. Area
- ☒ City of Lancaster, City of Palmdale
- ☒ Kern County, Ventura County
- ☒ Antelope Valley AQMD
- ☒ DTSC, DOGGR
- ☒ NAHC, CUSF, CHP
- ☒ Antelope Valley Conservancy
- ☒ California Dept. of Conservation
- ☒ SCE, LADWP

Regional Significance

- ☒ None
- ☐ SCAG Criteria
- ☒ Air Quality
- ☒ Water Resources
- ☐ Santa Monica Mtns. Area

Trustee Agencies

- ☐ None
- ☒ State Fish and Game
- ☒ State Parks
- ☒ CA DHS, DWR, SWRCB
- ☒ FAA

County Agencies

- ☐ Subdivision Committee
- ☒ DPW: *GMED; Traffic & Lighting; Environmental Programs; Land Development (NPDES review; drainage & grading, water supply); Watershed Management; Flood Maintenance; Transportation Planning; Waterworks & Sewer*
- ☒ Sheriff, SEATAC
- ☐ Sanitation Districts
- ☒ Parks and Recreation
- ☒ Fire Department (+ Hazardous Materials Division)
- ☒ Public Health: Environmental Hygiene, Land Use Program, Environmental Health

Public agency approvals which are or may be required:

AGENCY NAME	PERMIT/APPROVAL/COORDINATION ROLE
Federal Agencies	
Environmental Protection Agency	Section 404 Clean Water Act Review
U.S. Fish and Wildlife Service	Federal Endangered Species Act Section 7 consultation and incidental take authorization and Section 10 incidental take permit
Federal Aviation Administration	Notice of Proposed Construction (Form 7461-1) Hazard Determination; Approval of Lighting Plan
Department of Defense/Homeland Security	Consultation Regarding Military Air Space
Other Federal Agencies	Other actions that may be required to implement the Project.
State Agencies	
Antelope Valley Air Quality Management District	Comply with requirements of SCAQMD Rule 403 as a large operation.
Regional Water Quality Control Board	Porter Cologne Water Quality Act, Clean Water Act, National Pollutant Discharge Elimination System Permit; Water Quality Certification, Discharges to Surface Water, Regional General Permits, Report of Waste Discharge (ROWD)/Waste Discharge Requirements (WDR)
State Water Quality Control Board	Statewide General Permit: Water Quality Order 99-08-DWQ: General Permit for Storm Water Discharges Associated with Construction Activity
California Department of Fish and Game	Section 1600, Streambed Alteration Agreement; State Endangered Species Consultation Incidental take permit/authorization
California Public Utility Commission	Interconnect Approval
California Department of Transportation	Encroachment of Right-of-Way; Transportation Permits for Hauling Oversized Loads
Other State Agencies	Other actions that may be required to implement the Project.
Local Agencies	
County of Los Angeles	CEQA Review
	Conditional Use Permit for construction in an agricultural zone; for grading (cut and fill) of approximately 4,145,200 cubic yards of soil; and for development within an SEA
	Grading Permit, Building Permit
	County Road Encroachment Permit; Transportation Permits for Hauling Oversized Loads
	Fuel Modification/Vegetation Management Plan
City of Lancaster	CEQA Review (Responsible Agency), Conditional Use Permit, for construction of portion of underground transmission line.
Other Local Agencies	Other actions that may be required to implement the Project.

Lead agency name and address:
County of Los Angeles
Attn: Department of Regional Planning
320 West Temple Street
Los Angeles, CA 90012

Project sponsor's name and address:
Antelope Power, LLC

Contact person and phone number: Anthony Curzi, Planner, Zoning Permits—North Section
(213) 974-6461

ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED:

IMPACT ANALYSIS SUMMARY MATRIX		No Impact	Less than Significant Impact	Less than Significant Impact w/ Project Mitigation	Potentially Significant Impact	
Environmental Factor	Pg.					*Potential Concern*
1. Aesthetics	12	☐	☐	☐	☒	*Wind turbines and/or solar array fields would be visible from nearby public trails at the California Poppy Reserve and from the Los Angeles Backbone Trail System; new night lighting sources*
2. Agriculture/Forest	14	☐	☐	☐	☒	*Site is zoned for agricultural uses; presence of prime and unique farmland*
3. Air Quality	16	☐	☐	☐	☒	*Construction exhaust emissions and fugitive dust; limited operational emissions, avoids emissions from traditional thermal energy plants*
4. Biological Resources	18	☐	☐	☐	☒	*Development within an SEA; natural drainage modification; sensitive plants and wildlife resources*
5. Cultural Resources	24	☐	☐	☐	☒	*Disturbance of potential presence of buried archaeological and paleontological resources from grading and excavation*
6. Energy	27	☐	☐	☐	☒	*Positive regional and statewide effect through expansion of clean, renewable electricity generation sources. On-site energy use minor.*
7. Geology/Soils	28	☐	☐	☐	☒	*Fault/Liquefaction zone; potential unstable ground hazards; grading*
8. Greenhouse Gas Emissions	30	☐	☐	☐	☒	*Gaseous construction emissions, minor operational emissions. Positive long-term effects by providing emission-free, renewable electrical power generation at utility scale.*
9. Hazards/Hazardous Materials	31	☐	☐	☐	☒	*Moderate and High Fire Hazard Severity Zones; use of flammable materials during construction and operation; hazardous solid waste disposal*
10. Hydrology/Water Quality	36	☐	☐	☐	☒	*Alterations to surface drainages; potential for increased erosion and runoff; potential water contaminants from construction or developed site runoff; subsurface septic system*
11. Land Use/Planning	40	☐	☐	☐	☒	*Conditional Use Permit required to permit Energy Farm in Agricultural Zone and for proposed grading. SEA conformance criteria apply.*
12. Mineral Resources	42	☒	☐	☐	☐	*None*
13. Noise	43	☐	☐	☐	☒	*Short-term construction noise; long-term noise associated with wind turbines and periodic maintenance activities*
14. Population/Housing	45	☐	☐	☐	☒	*Construction of 23 miles of access roads.*
15. Public Services	46	☐	☐	☐	☒	*Limited potential for increase in demand for Fire and Sheriff services*
16. Recreation	48	☐	☐	☐	☒	*Public trail linkages (Los Angeles Backbone Trail System); views from Poppy Reserve*
17. Transportation/Traffic	49	☐	☐	☐	☒	*Construction and operation traffic; site access*
18. Utilities/Services	52	☐	☐	☐	☒	*Solid waste disposal; water supply/storage for fire suppression*
19. Mandatory Findings of Significance	55	☐	☐	☐	☒	*Geotechnical, drainage and flood control, wildfire, noise, hydrology and water quality, air quality, biological resources, cultural resources, agriculture, aesthetics, recreation, traffic, fire/sheriff services, utilities, environmental safety, cumulative impacts*

DETERMINATION: (To be completed by the Lead Department.)
On the basis of this initial evaluation:

☐ I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.

☐ I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.

☒ I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.

☐ I find that the proposed project MAY have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.

☐ I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.

Signature — Date: 11/2/11

Signature — Date: 11/2/11

EVALUATION OF ENVIRONMENTAL IMPACTS:

1) A brief explanation is required for all answers except "No Impact" answers that are adequately supported by the information sources the Lead Department cites in the parentheses following each question. A "No Impact" answer is adequately supported if the referenced information sources show that the impact simply does not apply to projects like the one involved (e.g., the project falls outside a fault rupture zone). A "No Impact" answer should be explained where it is based on project-specific factors as well as general standards (e.g., the project will not expose sensitive receptors to pollutants, based on a project-specific screening analysis).

2) All answers must take account of the whole action involved, including off-site as well as on-site, cumulative as well as project-level, indirect as well as direct, and construction as well as operational impacts.

3) Once the Lead Department has determined that a particular physical impact may occur, then the checklist answers must indicate whether the impact is potentially significant, less than significant with mitigation, or less than significant. "Potentially Significant Impact" is appropriate if there is substantial evidence that an effect may be significant. If there are one or more "Potentially Significant Impact" entries when the determination is made, an EIR is required.

4) "Negative Declaration: Less Than Significant With Mitigation Incorporated" applies where the incorporation of mitigation measures has reduced an effect from "Potentially Significant Impact" to a "Less Than Significant Impact." The lead agency must describe the mitigation measures, and briefly explain how they reduce the effect to a less than significant level. (Mitigation measures from Section XVII, "Earlier Analyses," may be cross-referenced.)

5) Earlier analyses may be used where, pursuant to the tiering, program EIR, or other CEQA processes, an effect has been adequately analyzed in an earlier EIR or negative declaration. (State CEQA Guidelines § 15063(c)(3)(D).) In this case, a brief discussion should identify the following:

   a) Earlier Analysis Used. Identify and state where they are available for review.

   b) Impacts Adequately Addressed. Identify which effects from the above checklist were within the scope of, and adequately analyzed in, an earlier document pursuant to applicable legal standards, and state whether such effects were addressed by mitigation measures based on the earlier analysis.

   c) Mitigation Measures. For effects that are "Less than Significant with Mitigation Measures Incorporated," describe the mitigation measures which were incorporated or refined from the earlier document and the extent to which they address site-specific conditions for the project.

6) Supporting Information Sources: A source list should be attached, and other sources used or individuals contacted should be cited in the discussion.

7) The explanation of each issue should identify: the significance threshold, if any, used to evaluate each question, and; mitigation measures identified, if any, to reduce the impact to less than significance. Sources of thresholds include the County General Plan, other County planning documents, and County ordinances. Some thresholds are unique to geographical locations.

8) Climate Change Impacts: When determining whether a project's impacts are significant, the analysis should consider, when relevant, the effects of future climate change on: 1) worsening hazardous conditions that pose risks to the project's inhabitants and structures (e.g., floods and wildfires), and 2) worsening the project's impacts on the environment (e.g., impacts on special status species and public health).

1. AESTHETICS

Would the project:	*Potentially Significant Impact*	*Less Than Significant Impact with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*
a) Have a substantial adverse effect on a scenic vista, including County-designated scenic resources areas (scenic highways as shown on the Scenic Highway Element, scenic corridors, scenic hillsides, and scenic ridgelines)?	☒	☐	☐	☐

No designated scenic highways or designated scenic corridors are located in the vicinity of the Site; however, the proposed solar panel arrays and wind turbines might be visible from SR-138 which is a second priority scenic route. Development of the Energy Farm could also affect viewsheds from and of public recreation areas in the vicinity of the Proposed Project, such as the Antelope Valley California Poppy Reserve. Further analysis of this issue will be included in the EIR.

b) Be visible from or obstruct views from a regional riding or hiking trail?	☒	☐	☐	☐

Planned segments of the Los Angeles County Backbone Trail System run through the Energy Farm site, which is visible from adjacent recreational areas, including trails at the adjacent Antelope Valley California Poppy Reserve Park managed by the California State Parks Department. Further analysis of potential visual impacts from recreational trails will be included in the EIR.

c) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, historic buildings, or undeveloped or undisturbed areas?	☒	☐	☐	☐

The Energy Farm site and underground transmission line corridor consist of both disturbed and natural areas. Scenic features in the vicinity include Fairmont and Antelope Buttes (which incorporate the Antelope Valley California Poppy Reserve) to the north and hillsides and ridgelines to the south, as well as Broad Canyon and Myrick Canyon which traverse through the northern and southern portions of the Proposed Energy Farm. No direct alterations of these natural features are proposed. Flat bottomlands and mesas within the Energy Farm site contain fields of wildflowers, including California Poppy, that are similar to wildflower fields in the adjacent Poppy Reserve. The Project includes 342 acres for conservation and approximately 1,000 acres of open space/wildlife habitat management land that would retain existing open space features. Assessment of visual impacts involving development of wind and solar facilities on portions of the Energy Farm site containing wildflower fields will be included in the EIR.

d) Substantially degrade the existing visual character or quality of the site and its surroundings because of height, bulk, pattern, scale, character, or other features?	☒	☐	☐	☐

The Project would develop a large number of 15-foot-high solar module arrays and up to 50 wind turbine towers, that could reach a height of 328 feet, plus the distance of fully extended blades, which could extend the total height to nearly 500 feet. These facilities would be developed on a mostly underdeveloped site in a rural area and thus would alter the visual character of the Site and possibly its surroundings. Since the Gen-Tie Line would be placed underground, it would not permanently alter the visual character of that part of the project area. Further analysis of construction period and long-term impacts to the existing visual character of the Site and surroundings will be included in the EIR.

e) Create a new source of substantial shadows, light, or glare which would adversely affect day or nighttime views in the area?	☒	☐	☐	☐

Shadow impacts are not anticipated to occur on or off site as a result of Project development. Proposed solar PV panel surfaces are designed to absorb sunlight to enable conversion of that light into electrical power; reflective surfaces that could generate significant daytime glare, therefore, would not be used. The Proposed Project would include minimal amounts of outdoor security lighting, along with wind turbine-mounted lighting that would flash intermittently to warn aircraft; these new light sources might increase nighttime lighting and in the immediate vicinity. Potential impacts associated with proposed outdoor lighting sources will be addressed as part of the EIR.

2. AGRICULTURE/FOREST

Would the project:	*Potentially Significant Impact*	*Less Than Significant Impact with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☒	☐	☐	☐

Portions of the Energy Farm site are designated Prime Farmland, Unique Farmland, and Farmland of Local Importance pursuant to the State Farmland Mapping and Monitoring Program. Development of solar and wind energy facilities in these areas, as well as construction of the Gen-Tie Line would preclude farming in these areas. Effects of converting farmland to non-agricultural uses will be evaluated in the EIR.

b) Conflict with existing zoning for agricultural use, with a designated Agricultural Opportunity Area, or with a Williamson Act contract?	☒	☐	☐	☐

Portions of the Energy Farm site have been used for a variety of agricultural purposes over the last few decades, including grazing, horse breeding/training, and alfalfa farming. The Energy Farm site and most of the Gen-Tie Line are on land zoned A-2-5 (Heavy Agriculture), a classification that provides for renewable energy development as a conditionally permitted use. No part of the Site is under a Williamson Act Contract. The effects of the reduction of the use of land for agricultural activities will be addressed in the EIR.

c) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code § 12220 (g)) or timberland zoned Timberland Production (as defined in Public Resources Code § 4526)?	☐	☐	☐	☒

The Site does not contain forest land or timberland zoned for Timberland Production. The Angeles National Forest, the closest forest to the Site is located more than 1 mile south of the Site.

d) Result in the loss of forest land or conversion of forest land to non-forest use?	☐	☐	☐	☒

See preceding response.

e) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use?	☐	☐	☐	☒

This Project would not directly affect any land outside of the Project limits and since there is no forest land in this area and since this Site is not producing crops or other forms of agriculture that contribute to the agricultural sector of the economy, it would not result in conversion of other agricultural lands or any forest lands. Impacts involving conversion of land designated as Important Farmland by the California Department of Conservation will be evaluated in the EIR, as discussed in the response to item a in this section.

3. AIR QUALITY

Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations.

Would the project:	*Potentially Significant Impact*	*Less Than Significant Impact with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*
a) Conflict with or obstruct implementation of applicable air quality plans of the South Coast AQMD (SCAQMD) or the Antelope Valley AQMD?	☒	☐	☐	☐

The Site is located in the western Mojave Desert area, where air pollution control is under the jurisdiction of the Antelope Valley Air Quality Management District. Construction activities would contribute additional air pollutant emissions. It is anticipated that any operational emissions that may be generated to support the Project would be outweighed by the emissions reductions realized by the generation of up to 300 MW of clean electrical energy. Further analysis of this impact, with respect to conformance with the Antelope Valley Air Quality Management District regulations, will be conducted as part of an air quality assessment to be included in the EIR.

b) Violate any applicable federal or state air quality standard or contribute substantially to an existing or projected air quality violation (i.e. exceed the State's criteria for regional significance which is generally (a) 500 dwelling units for residential uses or (b) 40 gross acres, 650,000 square feet of floor area or 1,000 employees for nonresidential uses)?	☒	☐	☐	☐

The Proposed Project meets at least one of the criteria established to be classified as a "regionally significant project" per the definition provided in Section 15206 of the CEQA Guidelines. Project construction could result in localized concentrations of criteria pollutants that may exceed federal or state air quality standards. Construction emissions will be quantified to determine if applicable federal and/or state pollutant standards could be exceeded and to identify measures to mitigate such impacts.

c) Exceed a South Coast AQMD or Antelope Valley AQMD CEQA significance threshold?	☒	☐	☐	☐

Please refer to the earlier response to items a) and b) in this section.

d) Otherwise result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard?	☒	☐	☐	☐

Air quality monitoring has determined that this area is in non-attainment for state air quality standards regarding ozone and particulate matter (PM_{10}), and for federal air quality standards for ozone. Construction of the Proposed Project would contribute additional air pollutant emissions, including emissions of criteria pollutants that would contribute to regional ozone and PM_{10} levels. It is anticipated that any operational emissions that may be generated to support the Project would be outweighed by the emissions reductions realized by the generation of up to 300 MW of clean electrical energy. Further analysis of this impact, with respect to the significance thresholds established by the Antelope Valley Air Quality Management District, will be conducted as part of an air quality assessment to be included in the EIR.

e) Expose sensitive receptors (e.g., schools, hospitals, parks) to substantial pollutant concentrations due to location near a freeway or heavy industrial use?	☐	☐	☒	☐

There are no existing or planned freeways or heavy industrial uses on or near the Site; thus, there is no threat of exposure to significant pollution concentrations from such sources. The limited number of nearby residences could be temporarily exposed to localized concentrations of criteria pollutants generated during Project construction. Operation of the Energy Farm is not anticipated to generate sufficient emissions such that it could result in exposing sensitive receptors to significant pollution levels. However, any potential impacts to sensitive receptors will be analyzed further in the EIR.

f) Create objectionable odors affecting a substantial number of people?	☐	☐	☒	☐

Odors associated with exhaust from construction vehicles and machinery would occur on a temporary and periodic basis, but would not be noticeable beyond the immediate vicinity of the active construction site. No significant odor impacts during construction are anticipated. The completed solar and wind power facilities would not generate atmospheric emissions and would not involve outdoor activities that could generate odors on- or off-site.

4. BIOLOGICAL RESOURCES

Would the project:	*Potentially Significant Impact*	*Less Than Significant Impact with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game (DFG) or U.S. Fish and Wildlife Service (USFWS)?	☒	☐	☐	☐

The Site is located in the western Antelope Valley. Approximately 475.8 acres of the Energy Farm (12.8 percent of the total site) occur within the Fairmont & Antelope Buttes Significant Ecological Area (SEA) No. 57. The Portal Ridge–Liebre Mountain SEA No. 58 lies adjacent to the Site's southwestern boundary across the California Aqueduct, and the Joshua Tree Woodland SEA No. 60 is found 2 miles to the northwest. Other open space areas within the region include: the Antelope Valley California Poppy State Natural Reserve (immediately east and southeast of the Northern Energy Farm and north of the Southern Energy Farm), Angeles National Forest (approximately 1 mile southwest), Desert Pines County Wildlife Sanctuary (approximately 2.5 miles west), Arthur B. Ripley Desert State Park (approximately 2.5 miles west), and Ritter Ridge SEA No. 56 (approximately 10 miles southeast).

Between March 2010 and May 2011, a team of biologists surveyed all portions of the Energy Farm site. Field surveys include focused studies for vegetation communities, wetlands and waters, sensitive plants, and wildlife species. Wildlife studies include focused surveys for burrowing owls, eagles and other raptors, nesting birds, migratory birds, bats, and butterflies. Botanical surveys included detailed vegetation surveys following procedures described by the California Native Plant Society for all observed vegetation types on the Energy Farm Site and focused surveys for sensitive plants. (A copy of the completed Biological Constraints Analysis that contains the results of the biological investigations is on file with the Los Angeles County Department of Regional Planning.) The biologists also reviewed recent aerial photos of the Gen-Tie Line corridor to identify basic habitat characteristics for that Project component.

No special status invertebrate, fish, or amphibian species have been observed on the Site. In 2010, an active Swainson's hawk nest was identified approximately 4 miles northeast of the Energy Farm site along Highway 138. This nest failed in 2010 and was occupied by ravens in 2011. Golden eagles, protected under the federal Bald and Golden Eagle Protection Act and a California fully protected species, have been documented foraging over the Energy Farm site but no suitable nesting habitat is present. Six additional California bird species of special concern were recorded within the Energy Farm site during surveys conducted in 2010 and 2011: American white pelican (migrating high over the site), northern harrier, burrowing owl, loggerhead shrike, tricolored blackbird, and yellow-headed blackbird. Of these, the shrike and burrowing owl are likely to breed on the Energy Farm site and the tricolored blackbird breeds nearby and forages within the Energy Farm Site; the others are likely transients or winter visitors only. Peregrine falcon, a State fully protected species, was observed during fall surveys; however, no suitable nesting habitat is present on the Energy Farm site. Five bird species on the State watch list were also observed as a winter resident or migrant including: Cooper's hawk, ferruginous hawk, merlin, prairie falcon, and white-faced ibis. No nests or nesting colonies were observed for any of these five species. No federal- or State-listed mammals have been observed or are likely to occur on the Energy Farm or within the Gen-Tie Line corridor.

Data collected by the United States Fish and Wildlife Service (USFWS) from telemetered California condors indicate that the Site and surrounding portions of the Antelope Valley are not used by the California condor for foraging, nesting, breeding, or any diurnal or nocturnal roosts (USFWS 2009). Furthermore, the Site contains no habitats that are known for condor nesting (Snyder and Snyder 2000). There are no historical records of condor use in this area (Willett 1933), and the Site is located approximately 11 miles south from the nearest limits of U.S. Fish and Wildlife Service-designated Critical Habitat for this species.

One of the three vernal pools on-site (2.27 acres) supports a population of spreading navarretia, a federally threatened plant species. Short-joint beavertail cactus, a California Native Plant Society (CNPS) 1B.2 plant, is also found on ridgetops in perennial grasslands and California buckwheat scrub.

The Project limits potential Energy Farm development areas to approximately 23 percent of the entire Energy Farm 3,708 acres. All of the solar arrays, along with two-thirds of the wind turbines, would be located in the Northern Energy Farm, and the remaining one-third of the wind turbines in the Southern Energy Farm. This concept follows the natural topography, limits total grading, and provides additional open space for wildlife migration between the Liebre Portal Ridge to the south and the Poppy Reserve to the north. Project design features include 342 acres of land for conservation, along with approximately 1,000 acres for open space and wildlife/habitat management, and three, 300-foot-wide wildlife migration corridors. The Southern Energy Farm is designed with a minimal development footprint (construction would disturb approximately 100 acres or about 6.3 percent of that 1,592 acres) to reduce direct impacts to plants and wildlife habitat, and to provide open space and habitat linkages to the north and south.

A Biological Constraints Analysis ("BCA") has been completed and reviewed by the County's Significant Ecological Area Technical Advisory Committee ("SEATAC"). In addition, a comprehensive Biota Report will be prepared, in accordance with Los Angeles County SEATAC recommendations, to assess the Project's potential impacts to sensitive plants and wildlife species observed or which have a potential to occur within the Energy Farm and Gen-Tie Line corridor because of suitable habitat conditions will be included in the EIR.

b) Have a substantial adverse effect on sensitive natural communities (e.g., riparian habitat, coastal sage scrub, oak woodlands, non-jurisdictional wetlands) identified in local or regional plans, policies, and regulations DFG or USFWS? These communities include Significant Ecological Areas (SEAs) identified in the General Plan, SEA Buffer Areas, and Sensitive Environmental Resource Areas (SERAs) identified in the Coastal Zone Plan.	☒	☐	☐	☐

Approximately 475.8 acres of the occur within the Fairmont & Antelope Buttes SEA No. 57. Of those 475.8 acres, approximately 26.3 acres (5.5 percent) will be within the development envelope of the Northern Energy Farm. Development of two solar arrays and two wind turbines on approximately 26.3 acres that have been altered by irrigated alfalfa farming, occurs within this SEA. The Portal Ridge–Liebre Mountain SEA No. 58 lies adjacent to the Site's southwestern boundary across the California Aqueduct, and the Joshua Tree Woodland SEA No. 60 is found 2 miles to the northwest. Other open space areas within the region include: the Antelope Valley California Poppy Reserve (immediately southwest of the Site), Angeles National Forest (approximately 1 mile southwest), Desert Pines County Wildlife Sanctuary (approximately 2.5 miles west), Arthur B. Ripley Desert State Park (approximately 2.5 miles west), and Ritter Ridge SEA No. 56 (approximately 10 miles southeast).

Approximately 1,277.5 acres of the Energy Farm site (30.5 percent) is comprised of non-native annual grasslands and agricultural fields and is actively grazed by cattle. A horse ranch occupies a small area in the west-central portion. These vegetation types and land uses are regionally abundant and do not generally support habitat for special status plant and wildlife species. Native annual grasslands are the most extensive vegetation type on the Energy Farm Site, covering 1,021.1 acres (24.3 percent of the Energy Farm site). Native scrub and shrublands, mostly dominated by rubber rabbitbrush, comprise another 896.1 acres (21.4 percent, of the Energy Farm site) and non-native grasslands an additional 836.1 acres (20.0 percent of the Energy Farm site). Native annual forblands comprise 703.9 acres (16.8 percent) and agriculture comprises 441.4 acres (10.5 percent). Disturbed, developed, native perennial grasslands, non-native forblands, native perennial forblands, non-native trees, and all waters comprise less than 5 percent each. Seven special status plant communities have been identified on the Energy Farm site: purple needlegrass grassland (52.2 acres), desert needlegrass grassland (2.3 acres), one-sided bluegrass grasslands (11.2 acres), oak gooseberry thickets (0.8 acre), narrowleaf goldenbush scrub (2.7 acres), southern willow scrub (3.1 acres), and desert olive patches (0.9 acre). Wildflower fields, a locally important vegetation type covering 703.9 acres, are dominated by California poppy and miniature lupine. A portion of the Energy Farm would encroach into these fields. In addition, there are three vernal pools on the Energy Farm site, totaling 2.38 acres. One vernal pool (2.27 acres) supports a population of spreading navarretia, a federally threatened plant species. Short-joint beavertail cactus, a CNPS 1B.2 plant, is also found on ridgetops in perennial grasslands and California buckwheat scrub. The majority of the vegetation within the Gen-Tie Line corridor is non-native annual grasslands; however, there could also be some annual grasslands, native perennial grasslands, and wildflower fields that will be differentiated based on subsequent field verification.

Three broad washes traverse the northern and southeastern portions of the Site (Broad Canyon, Myrick Canyon and Willow Springs Canyon), and a number of smaller ephemeral washes and drainage channels were observed within the Energy Farm site and Gen-Tie Line corridor. The Project would not encroach into the three larger wash areas; however, some of the smaller drainage courses could be altered by project construction. If these natural drainage features contain the elements that qualify as a "Streambed" under the California Fish and Game Code, impacts to such features would require approval of a Streambed Alteration Agreement by the California Department of Fish and Game (CDFG). Such impacts might affect riparian resources or other sensitive communities. Further analysis of such impacts will be included in an EIR.

The Project limits potential Energy Farm development areas to approximately 23 percent of the entire 3,708 acres. All of the solar arrays, along with two-thirds of the wind turbines, would be located in the Northern Energy Farm, and the remaining one-third of the wind turbines in the Southern Energy Farm. This concept follows the natural topography, limits total grading, and provides additional open space for wildlife migration between the Liebre Portal Ridge to the south and the Poppy Reserve to the north. Project design features include 342 acres of land for conservation, along with approximately 1,000 acres for open space and wildlife/habitat management, and three, 300-foot-wide wildlife migration corridors. The Southern Energy Farm is designed with a minimal development footprint (construction would disturb approximately 100 acres or about 6.3 percent of that 1,592 acres) to reduce direct impacts to plants and wildlife habitat, and to provide open space and habitat linkages to the north and south.

A Biological Constraints Analysis ("BCA") has been completed and approved by the County's Significant Ecological Area Technical Advisory Committee ("SEATAC"). A comprehensive Biota Report will be also prepared, in accordance with Los Angeles County SEATAC recommendations, to assess the Project's potential impacts to sensitive natural communities on and adjacent to the Site and will be included in the EIR.

c) Have a substantial adverse effect on federally protected wetlands (including marshes, vernal pools, and coastal wetlands) or waters of the United States, as defined by § 404 of the Clean Water Act through direct removal, filling, hydrological interruption, or other means? ☒ ☐ ☐ ☐

The Site is mostly flat in the west and north, with the remainder comprised of low rolling hills. Three broad washes traverse the northern and southeastern portions of the Site (Broad Canyon, Myrick Canyon and Willow Springs Canyon), and a number of smaller ephemeral washes and drainage channels occur elsewhere within the Energy Farm site and Gen-Tie Line corridor. Field surveys conducted as part of the Biological Constraints Analysis ("BCA") determined that none of the drainages within the Energy Farm site are hydrologically connected to Waters of the U.S. and are not under the jurisdiction of the U.S. Army Corps of Engineers (ACOE).

Based on the scarcity of trees and water sources that provide shelter and rehydration, the Site is not likely to provide significant stopover points for migrating songbirds. A total of 3.51 acres of wetlands and 31 waterbodies, comprising 8.26 acres (not including portions of the drainage occupied by wetland areas), were identified within the Energy Farm site, as potentially jurisdictional by the ACOE, the California Department of Fish and Game (CDFG), or the Regional Water Quality Control Board (RWQCB). All wetland and waters features were determined to be isolated and, therefore, likely outside of the jurisdiction of the ACOE; however, CDFG and RWQCB jurisdiction is anticipated. A number of surface drainages occur within the Gen-Tie Line corridor; additional field surveys will be required to determine whether construction of that major Project component could impact federal or state jurisdictional water features and if so, to identify associated permitting/mitigation requirements. This additional research will be included in the EIR.

There are three vernal pools, totaling 2.38 acres, within the Energy Farm site. One vernal pool (2.27 acres) supports a population of spreading navarretia, a federally threatened plant species. Potential impacts to the vernal pool resources and measures to avoid significant impacts will be discussed in the Biota Report to be prepared for the EIR.

d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites? ☒ ☐ ☐ ☐

The ridges and valleys associated with the Tehachapi Mountains to the west and northwest provide a primary southwest-northeast wildlife movement corridor of regional significance that bridges the Sierra Nevada and San Gabriel Mountain Ranges. In addition, the broad-front linkage between the San Gabriel Mountains (including Portal Ridge) and the Mojave Desert provide a primary northwest-southeast wildlife corridor running south of the Site. These two corridors may be used by large mammal species moving to and from wintering grounds in the high desert, as well as for summer feeding, denning, and breeding. The Site is not an integral part of either of these primary regional corridor or the secondary linkages associated with these topographic features. There is potential for localized wildlife movement on tertiary corridors between the Energy Farm site and SEA No. 57; however, movement away from these features is constrained by the California Aqueduct just south of the Site, Highway 138 north of the Site, and the general absence of tall vegetation throughout the Antelope Valley. There are no wildlife nurseries on or near the Site.

The Energy Farm site falls entirely within the Antelope Valley (Lancaster) Important Bird Area (IBA) which encompasses the Antelope Valley of the western Mojave Desert in northern Los Angeles County and southern Kern County. The Antelope Valley IBA is experiencing rapid conversion of the wild and agricultural landscape to an urban environment. Within the

IBA, remnant Joshua tree woodlands to the north and east of the Energy Farm site support one of the western-most populations of Le Conte's thrasher (Toxostoma lecontei) in the state. The grasslands within the IBA support impressive wintering bird communities, including large number of raptors, large flocks of vesper sparrows (Pooecetes gramineus), horned larks (Eremophila alpestris), mountain bluebirds (Sialia currucoides), and mountain plovers (Charadrius montanus). Swainson's hawk maintains its southern-most breeding area in the state, mainly in association with the alfalfa fields to the north and east of the Energy Farm site. The IBA falls within the path of a major spring migration route for songbirds, and windbreaks throughout the region host hundreds of vireos, thrushes, and warblers in April and May.

The Project limits potential Energy Farm development areas to approximately 23 percent of the entire Energy Farm's 3,708 acres. All of the solar arrays, along with two-thirds of the wind turbines, would be located in the Northern Energy Farm, and the remaining one-third of the wind turbines in the Southern Energy Farm. This concept follows the natural topography, limits total grading, and provides additional open space for wildlife migration between the Liebre Portal Ridge to the south and the Poppy Reserve to the north. Project design features include 342 acres of land for conservation, along with approximately 1,000 acres for open space and wildlife/habitat management, and three, 300-foot-wide wildlife migration corridors. The Southern Energy Farm is designed with a minimal development footprint (construction would disturb approximately 100 acres or about 6.3 percent of that 1,592 acres) to reduce direct impacts to plants and wildlife habitat, and to provide open space and habitat linkages to the north and south.

Most bird species, including their nests and eggs, are protected under the federal Migratory Bird Treaty Act (MBTA) (1918). Further protection to bird nests, eggs and young, and birds of prey is provided by the California Fish and Game Code. Construction and/or operation of the Proposed Energy Farm could result in impacts to birds or their nests protected by the MBTA, or the abandonment of an active nest by the adult bird. Birds in flight could be injured or killed by wind turbine blades. Potential impacts to birds and bird nests will be evaluated as part of the Biota Report to be prepared as part of the EIR.

e) Convert oak woodlands (as defined by the state, oak woodlands are oak stands with greater than 10% canopy cover with oaks at least 5" inch in diameter measured at 4.5 feet above mean natural grade) or otherwise contain oak or other unique native trees (junipers, Joshuas, etc.)?	☐	☐	☐	☒

Biological surveys conducted as part of the project's Biological Constraints Analysis confirmed that oak trees, stands, or woodlands, as well as other unique native trees such as junipers and Joshuas, do not occur within or near the Energy Farm site or Gen-Tie Line corridor.

f) Conflict with any local policies or ordinances protecting biological resources, including Wildflower Reserve Areas (L.A. County Code, Title 12, Ch. 12.36) and the Los Angeles County Oak Tree Ordinance (L.A. County Code, Title 22, Ch. 22.56, Part 16)?	☒	☐	☐	☐

The State of California's Antelope Valley California Poppy Reserve is adjacent to the northern and eastern sides of the proposed Energy Farm. This reserve is one of the areas protected by the County's Wildflower Reserve regulations, set forth in Title 12, Chapter 12.36 of the Los Angeles County Code. These regulations prohibit animal grazing within a wildflower reserve during the main growing seasons. The Project would develop some of the grazing land within the Energy Farm site, but would also allow for the possibility of animal-based vegetation management such as sheep grazing within the solar arrays. The Project would not conflict with the County Code provisions concerning the Poppy reserve. There are no oak trees on the Site; therefore, provisions of the County's Oak Tree Ordinance do not apply. As discussed in the response to item b), a portion of SEA 57 occurs within the Northern Energy Farm, and approximately 26.3 acres (5.5 percent) of that land, which has been under active cultivation as an irrigated alfalfa field, is within a proposed development envelope. The EIR will address the Project's impacts to biological values in that SEA, as well as the SEA conformance criteria set forth in the County General Plan and the Antelope Valley Area Plan.

g) Conflict with the provisions of an adopted state, regional, or local habitat conservation plan?	☒	☐	☐	☐

Potential impacts to sensitive biological resources within County SEA's 57 and 58 and the Poppy Reserve will be assessed in the EIR, as noted in the previous response to item b) in this section.

5. CULTURAL RESOURCES

Would the project:	*Potentially Significant Impact*	*Less Than Significant Impact with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*
a) Cause a substantial adverse change in the significance of a historical resource as defined in CEQA Guidelines § 15064.5?	☒	☐	☐	☐

A preliminary cultural resources investigation was conducted, including a review of records of past surveys for historic resources, a review of records of recorded resources that may occur on or around the Energy Farm site, and field surveys to look for signs of resources that may not have been identified in the past (SRI, July 2010). This research covered approximately 2,300 acres of the Energy Farm development envelope and none of the Gen-Tie Line corridor. Three historical-period resources have been recorded within the 2,300-acre initial survey area: the historic townsite of Fairmont and two historical-period refuse deposits. Some historical-period resources—sites associated with tuff mining related to the construction of the first Los Angeles Aqueduct in the early 20th century—are also located on Fairmont Butte, about one mile east of the Project area.

The site record for the townsite of Fairmont identifies five separate historical-period elements, including a group of several destroyed structures, a school, a tree line, a horse ranch, and an earthen-bermed reservoir. That site record indicates that several buildings were not examined during the recording of the townsite, and it is possible that additional historical-period resources could be present on site. Field surveys identified a historic-period earthen dam and buried pipes that had not been recorded. Project development, as proposed, could potentially impact historic resources, but the scale and significance of such impacts is not currently known.

Shea's Castle, a 7,000-square-foot stone structure, was built in 1924 as a replica of a medieval Irish castle; it is located on a 512-acre site in the Southern Energy Farm area. Related facilities include a similarly styled stone stable, several outbuildings, and a house. There is also a 3,000-foot dirt runway for small planes (inactive), a dirt track for all terrain vehicle racing and a stone arch dam to hold 7 to 8 acres of storm water runoff. This site includes an artesian well and storage tank, along with electrical infrastructure to supply an all-electrical power system. The Castle site was built for his wife by Richard Peter Shea, a successful real estate developer who made a fortune developing properties in the Hancock Park area of Los Angeles. The Castle site has been associated with entertainment industry celebrities and was used as a backdrop in filming of several movies and television shows. The Proposed Project would not affect the Castle site or any of its structures or other improvements.

There are no structures within the proposed Gen-Tie Line corridor, which follows the alignment of Avenue J, a partially improved road, and the likelihood of uncovering historic resources during excavation for this underground transmission line is considered low. This corridor has not been subject to formal records search or a field survey; therefore, the potential for impacts to significant historic resources in this area cannot be ruled out at this point.

Additional historic research and field surveys will be conducted for the remaining portion of the Energy Farm and Gen-Tie Line corridor as part of the EIR to determine if the Project could result in any impacts to significant historic resources and if so, to identify measures to avoid or mitigate such impacts.

b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to CEQA Guidelines § 15064.5? ☒ ☐ ☐ ☐

In the initial cultural resources survey as noted above, it was determined that a total of 30 archaeological sites and 11 isolated artifacts have been recorded within a 1-mile radius of the 2,300-acre survey area, none of which are listed in the National Register of Historic Places (NRHP) or as a California Historic Landmark (CHL). Three historical-period resources have been recorded within the Northern Energy Farm area. In addition, a preliminary field survey identified 11 prehistoric and historical-period resources within the Northern Energy Farm that had not been previously recorded. Full documentation and recordation of these sites will be completed and included in the EIR. Further investigations of past archaeological survey records, along with field surveys, will be conducted for the remaining portion of the Energy Farm and the Gen-Tie Line corridor, as part of the EIR.

The Fairmont Butte area is a large and well-known group of prehistoric and historical-period sites that lay on and around Fairmont Butte, which is located adjacent to the eastern edge of the Northern Energy Farm area. A majority (seven sites and one isolate) of the previously recorded sites and isolates (10 sites and one isolate) within the surveyed part of the Energy Farm are associated with the Fairmont Buttes archaeological area and include resources that are prehistoric in age (midden deposits, bedrock milling features, and several sites with enigmatic circular rock alignment). These sites were likely food-processing and habitation areas. Some historical-period resources—sites associated with tuff mining related to the construction of the first Los Angeles Aqueduct in the early 20th century—are also located on Antelope Butte, about 1 mile east of the Project area.

As noted above, the initial cultural resources investigations covered approximately 2,300 acres of the Energy Farm site. To date, a review of cultural resources and potential Native American sacred lands and sites within approximately 1,408 acres of the Energy Farm site and the 384-acre Gen-Tie Line Corridor has not been undertaken. The types of previously recorded sites (if any) that may be located within the Proposed Gen-tie Line Corridor are expected to be similar to those found in the initial survey area. Further investigations of past archaeological survey records, consultation with Native American resources, and archaeological field surveys, will be conducted for the remainder of the Site, as part of the EIR.

The Project would set aside 384 acres as conservation land, along with approximately 1,000 acres for open space and wildlife/habitat management and 3,300-feet wide wildlife corridors. Potential Energy Farm development areas are limited to approximately 23 percent of the entire Energy Farm site. These design features could avoid potential impacts to prehistoric resources. Potential impacts to archaeological resources within the proposed limits of development will be assessed in the EIR.

c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature, or contain rock formations indicating potential paleontological resources? ☒ ☐ ☐ ☐

Most of the Site is situated on flat-lying areas, which are underlain almost entirely by older and younger alluvium. The potential for fossil remains being encountered by earthwork at depths less than five feet below the current ground surface in areas underlain by younger alluvium is considered to be low. At such shallow depths, any remains likely would be too young to be considered fossilized unless contradicted by the definite local occurrence of fossil remains. At depths greater than 5 feet in these areas and at any depth in areas underlain by older alluvium, the potential for fossil remains being encountered by earthwork at the Site is undetermined, because the region is so poorly known with regard to paleontologic resources. Excavation for construction of foundations for solar panels would be approximately 15 feet deep and wind turbines foundations would be excavated 8 to 15 feet deep. These construction activities and possibly other grading for the Project could potentially uncover buried paleontological resources. Further analysis of this issue will be included in the EIR.

d) Disturb any human remains, including those interred outside of formal cemeteries?	☒	☐	☐	☐

The initial Cultural Resources investigations for the 2,300 acres of the Energy Farm site (see response to item a, above), found no evidence of any human burial sites. The remainder of the Energy Farm and the Gen-Tie Line corridor have not been surveyed; therefore, further research to examine those remaining parts of the Site for indications of potential human remains will be conducted as part of the EIR.

6. ENERGY

Would the project:	*Potentially Significant Impact*	*Less Than Significant Impact with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*
a) Comply with Los Angeles County Green Building Standards?(L.A. County Code Title 22, Ch. 22.52, Part 20 and Title 21, § 21.24.440.)	☐	☐	☒	☐

The proposed 16,000-square-foot (sf) operations and maintenance building exceeds the threshold of 10,000 sf that is subject to compliance with the County's Green Building standards. The entire Project is subject to compliance with other aspects of the County's Green Building Program, pertaining to low impact drainage controls and water conservation in landscaping. Compliance is anticipated, although design specifications have not been completed. Specific building design, low-impact development, and landscaping/irrigation features that achieve or exceed the County's standards will be discussed in the EIR.

b) Involve the inefficient use of energy resources (see Appendix F of the CEQA Guidelines)?	☐	☐	☐	☒

The Proposed Project will provide a significant benefit to the region's energy efficiency through production and transmission of 300 MW annually of clean, renewable electrical power. On-site operations and maintenance facilities will be powered by electricity produced by on-site wind and/or solar sources, and possibly with natural gas trucked in and stored in a tank. There would be no impact due to inefficient use of energy resources.

7. GEOLOGY AND SOILS

	Potentially Significant Impact	*Less Than Significant Impact with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*
Would the project:				
a) Be located in an active or potentially active fault zone, Seismic Hazards Zone, or Alquist-Priolo Earthquake Fault Zone, and expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:				
i) Rupture of a known earthquake fault.	☒	☐	☐	☐

The Site is located in a seismically active region with both active and potentially active faults. An Alquist-Priolo hazard zone crosses the center portion of the Energy Farm site. The San Andreas Fault is located approximately 3 miles south of the Site. Other mapped faults may impact the Site, as well. Further geotechnical investigation and analysis of potential building constraints and related design measures concerning surface fault rupture will be included in the geotechnical report to be prepared as part of the EIR.

ii) Strong seismic ground shaking?	☒	☐	☐	☐

Given this location in a seismically active region and its proximity to the San Andreas Fault, strong seismic ground-shaking at some time in the Project's operating life is something to be considered in the project design. Further analysis of potential ground shaking magnitudes and design measures to prevent significant damage to the proposed energy facilities will be included in the geotechnical report to be prepared as part of the EIR.

iii) Seismic-related ground failure, including liquefaction?	☒	☐	☐	☐

The Background Report for the draft update of the Antelope Valley Area Plan indicates that there are numerous locations within this area that are susceptible to seismically induced liquefaction hazards. A geotechnical investigation and report will be conducted as part of the EIR, which will include evaluation of the surface and subsurface materials, groundwater conditions, and identification of seismic constraints such as liquefaction that may occur on-site.

iv) Landslides?	☒	☐	☐	☐

The Background Report for the draft update of the Antelope Valley Area Plan indicates that earthquake-induced landslides is a seismic hazard that exists throughout many areas of the valley. The steeper portions of the Energy Farm site may be susceptible to landslides, depending on localized soil conditions. The entire Gen-Tie Line corridor is comprised of relatively flat land and is not subject to landslide hazards. A geotechnical investigation and report will be conducted as part of the EIR, which will include an evaluation of the surface and subsurface materials and landslide potential throughout the Energy Farm site. This will support an analysis of proposed wind turbine and solar array locations, relative to potential landslide hazards, and provide a basis to determine the need for design or mitigation measures to prevent significant impacts due to landslides.

b) Result in substantial soil erosion or the loss of topsoil? ☒ ☐ ☐ ☐

Proposed grading would affect approximately 870 acres in the Northern Energy Farm and approximately 100 acres in the Southern Energy Farm, where the existing topsoil would be removed and either returned to where it was excavated or relocated within the site as part of fill material. Additional excavation for the Gen-Tie Line would disturb topsoil and expose ground surfaces to erosion. Grading would expose substantial ground surface areas to potential erosion from wind or storm water and site improvements would alter existing drainage patterns and amounts of runoff. Further analysis of potential erosion impacts due to construction activities and developed site conditions will be included in the EIR.

c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse? ☒ ☐ ☐ ☐

Please refer to the previous responses to items a) and b) herein. A geotechnical investigation and report will be conducted as part of the EIR to identify areas of known or potential ground instability that represent a hazard or design constraint for the proposed energy production and transmission facilities.

d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property? ☒ ☐ ☐ ☐

The occurrence of expansive soils underlying the Site and the scope of any associated mitigation measures will be evaluated as part of the geotechnical study to be prepared and incorporated in the EIR.

e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water? ☒ ☐ ☐ ☐

Wastewater generated by the existing residence(s) and ranch facilities is discharged into a subsurface septic system on site. Wastewater from the proposed operations and maintenance facilities would be discharged into a new underground septic tank/ leach field system. Soil suitability and design parameters for this new system will be addressed in the geotechnical study to be prepared as part of the EIR.

f) Conflict with the Hillside Management Area Ordinance (L.A. County Code, Title 22, § 22.56.215) or hillside design standards in the County General Plan Conservation and Open Space Element? ☒ ☐ ☐ ☐

A number of proposed wind turbines/towers would be located on hillsides of varying steepness. Approximately 15 acres in the proposed development areas occur on land with natural slopes of 25 percent or more; therefore, Project compliance with the provisions of the County's hillside development standards and policies will be discussed in the EIR.

8. GREENHOUSE GAS EMISSIONS

Would the project:	*Potentially Significant Impact*	*Less Than Significant Impact with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*
a) Generate greenhouse gas (GhGs) emissions, either directly or indirectly, that may have a significant impact on the environment (i.e., on global climate change)? Normally, the significance of the impacts of a project's GhG emissions should be evaluated as a cumulative impact rather than a project-specific impact.	☒	☐	☐	☐

Project development would require grading with large, diesel-powered machinery to prepare suitable sites for wind turbine towers, solar arrays, energy collection lines, operations and maintenance facilities, substation, vehicular access and outdoor storage/activity yards, as well as the Gen-Tie Line. A variety of combustion-engine driven construction machinery and vehicles would be employed throughout the construction phases that would be fueled with gasoline, diesel, and natural gas, all of which generate greenhouse gases within their emissions. Potential levels of GHG emissions during the construction phases will, therefore, be quantified and assessed in the EIR. Sources of GHG emissions associated with long-term operations of the Proposed Project would include vehicular emissions associated with employee commuting trips and maintenance vehicles, and natural gas consumption. These operational emissions containing greenhouse gases would be minor and would not contribute to significant impacts involving global climate change. By providing a utility-scale source of clean and renewable electricity, this project is expected to avoid significant GHG emissions that could otherwise occur if this energy were generated by traditional thermal energy production processes. A comprehensive quantitative assessment of the project's GHG-emission impacts and benefits, relative to climate change, will be provided in the EIR.

b) Conflict with any applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases including regulations implementing AB 32 of 2006, General Plan policies and implementing actions for GhG emission reduction, and the Los Angeles Regional Climate Action Plan?	☒	☐	☐	☐

This Project, as a clean, renewable energy power project, would help implement a key statewide and regional strategy to reduce GHG emissions from power generation by providing a utility-scale source of clean electrical power that would not involve any combustion processes. Gaseous emissions generated by construction machinery and vehicles would include GHG emissions, which will be quantified and assessed in the EIR. Project operations would generate only very limited GHG emissions associated with Project operations, which would be largely offset by the GHG benefits of the Project. This project would not conflict with any plans, policies or regulations adopted to reduce GHG emissions. This will be demonstrated through a discussion of how this project will implement key GHG reduction strategies established by state legislation and regional planning programs will be provided in the EIR.

9. HAZARDS AND HAZARDOUS MATERIALS

Would the project:	*Potentially Significant Impact*	*Less Than Significant Impact with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*
a) Create a significant hazard to the public or the environment through the routine transport, storage, production, use, or disposal of hazardous materials or use of pressurized tanks on-site?	☒	☐	☐	☐

Construction methods and materials for this project would be typical of projects of this type and would involve the use of hazardous materials, such as gasoline, diesel fuel, oils, lubricants, solvents, detergents, degreasers, paints, ethylene glycol, and welding materials/supplies. All hazardous materials would be stored on-site in vessels/containers that are specifically designed for the characteristics of the materials to be stored; as appropriate, and these would be supplemented with secondary containment, if needed.. Transport, storage, use and disposal of hazardous substances during the construction phases would be carefully managed to prevent a significant impact, through implementation of a Hazardous Materials Construction Management Program, to be developed for approval by the Los Angeles County Fire Department. This would define hazardous materials storage areas and methods, accident prevention and response procedures, hazardous waste collection and disposal methods, and all related Contractor responsibilities. The approved program would be implemented throughout the construction phases and would be sufficient to reduce potential impacts to less than significant. Construction phase impacts and proposed mitigation measures will be discussed in the EIR.

Limited quantities of hazardous materials would be used and stored on-site at the Operations and Maintenance ("O & M") Building for operational and maintenance purposes. These materials would include oils, lubricants, paints, solvents, degreasers and other cleaners, FM200 fire suppressant, and transformer mineral oil. Due to the limited quantities involved, the controlled environment, and the concrete floor of the operations and maintenance building, a spill can be cleaned up without adverse environmental consequences. Natural gas would be stored in a pressurized container, for minor applications such as water heating within the O & M facilities. Maintenance of wind turbines would involve use of common greases and oils that are flammable and thus considered hazardous. Solar panel bearings would also require application of a common, but flammable grease material. A variety of batteries may be stored on site, which could be hazardous if damaged or leaking occurs. Transformers within the substation will be cooled with a fire resistant mineral oil or a synthetic equivalent. Hazard levels associated with these aspects of the Energy Farm are considered low, but will require further analysis. A Hazardous Materials Management Plan (HMMP) would be developed for approval by the Los Angeles County Fire Department, prior to Project operations and would include procedures for hazardous materials handling, use, and storage, emergency response, and spill control and prevention. Implementation of the HMMP would reduce potential operational impacts to less than significant. Storage, use, and disposal of hazardous materials as part of Project operations and the key elements of the Project's HMMP will be discussed in the EIR.

b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials or waste into the environment?	☒	☐	☐	☐

A Phase I Environmental Site Assessment ("Phase I ESA") has been completed for the Energy Farm portion of the Site, in accordance with the American Society for Testing and Materials (ASTM) Standard Practice E 1527-05, to identify

Recognized Environmental Conditions ("RECs") onsite.[1] *A REC indicates the presence or likely presence of any hazardous substances or petroleum products on a property under conditions that indicate an existing release, a past release, or a material threat of a release of any hazardous substances or petroleum products into structures on the property or into the ground, groundwater, or surface water of the property. The Phase I ESA identified four RECs on the Energy Farm site. An underground storage tank (UST) suspected to have been used for fuel storage, and inactive for more than 20 years, was identified within the Healy Farms, and a small solid waste dump site was identified in a low area formerly used for water storage, just south of the farms. The dump contained solid wastes associated with onsite ranching activities and a variety of municipal solid wastes from neighboring properties. Among these wastes were some drums and smaller containers that may have contained hazardous substances. There was no evidence that the UST had leaked any hazardous materials before it was filled with dirt and buried; however, water testing was conducted at a nearby deep water well and beneath the dump site. Detectable traces of common metals were found in the well testing area, at concentrations below California Maximum Contaminant Levels for drinking water. Groundwater was not encountered to depths of 102 feet beneath the solid waste dump site and it was concluded that the dump site did not result in a release of hazardous substances to groundwater. The dump site was removed and all wastes disposed of in June 2010. Solid waste materials within a former irrigation vault and a small solid waste dump site, estimated at covering just over an acre in surface area, were identified on a residential site in the Southern Energy Farm. The origin and composition of the wastes within the concrete vault are unknown. Wastes identified in the small dump site include inert materials such as scrap metal, wood and plastic, along with a variety of above-ground containers ranging in size from one quart to 55 gallons. Some of the containers were in a degraded condition and evidence of release of paints and petroleum substances was observed. Additional evaluation of these waste materials is necessary to determine whether a release of hazardous materials has occurred and how to most effectively dispose of the kinds of wastes that are identified. This additional evaluation and the recommended mitigation measures will be presented in the EIR.*

Several other drips of petroleum product releases associated with ranching and farming equipment were observed on site; however, these were not characterized as RECs. Two Above-Ground Storage Tanks (AST's) were identified in the Farms complex; these provide fuel for farm machinery and equipment. No signs of leaking or hazardous conditions were observed at these tanks.

c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within 500 feet of sensitive land uses (e.g., homes, schools, hospitals)?	☐	☐	☒	☐

Approximately 10 residential dwelling units are located within 500 feet of the Energy Farm boundaries. Three adjacent properties contain dwelling units located within 500 feet of the Gen-Tie Line corridor. No schools or hospitals are located within 500 feet of Proposed Project. Proposed wind turbines and solar arrays, as well as the Project substation, do not include any equipment or processes that require handling of acutely hazardous materials and would not generate any hazardous or emissions. As discussed in the response to item a), further analysis of the use, storage and disposal of a variety of common hazardous substances as part of regular Project operations will be provided in the EIR. Since the Gen-Tie Line would be placed in underground ducts covered with a cementitious fill material, this Project component would not generate any hazardous emissions or represent a threat involving hazardous materials to any adjacent land uses.

[1] *KTA Associates, Inc., Phase I Environmental Site Assessment for the Fairmont Project in Southern California, November 9, 2009, and KTA Associates, Inc. Phase I Environmental Site Assessment for the Wildflower Project in Southern California, May 18, 2011.*

Public safety issues related to wind electrical generation could arise from tower or rotor failure if wind turbines experience excess speed, material fatigue, excessive stresses, or vibration from seismic ground shaking causing a rotor blade to crack or dislocate from a turbine tower. To prevent potential hazards to Energy Farm personnel and individuals in the vicinity of the Site, the Project is designed with setbacks for wind turbines and associated facilities from residences, roads, property lines, and other features. For example, wind turbines would be setback a minimum of 0.25 mile (1,320 feet) from any non-participating off-site residence and at least the overall height of the tower plus the fully extended blade from any public street. Based on current 3.0-MW turbine technology, this distance is approximately 498 feet. Solar PV arrays and ancillary facilities involve a low hazard level from potential electrical fires involving electrical circuitry. In addition to compliance with Los Angeles County Fire Department regulations for design and operations of the solar facilities, all arrays would be set back at least 50 feet from any side or rear property line, public street, public access, utility easement, or pedestrian easement and at least 50 feet from any off-site residence or other structure. With the proposed setback standards, adjacent land uses would not be exposed to significant hazards associated with the placement of wind turbines or solar PV arrays. Nonetheless, this issue will be further discussed in the EIR.

d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code § 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☒	☐	☐	☐

A search of available environmental regulatory databases for sites of concern (SOCs) was conducted the ASTM E-1527-05 standard, to screen for potential sources of contamination or activities of environmental concern within the Energy Farm and a 1-mile area surrounding the Site. No SOCs were found in the search of available ("reasonably ascertainable") government records. A similar records search has not been conducted for the Gen-Tie Line corridor; therefore, this research will be conducted and included in the EIR.

e) For a project located within an airport land use plan, or where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒

The Proposed Energy Farm is not located within an airport land use plan or within 2 miles of an airport.

f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☒	☐

The eastern terminus of the Proposed Gen-tie Line (only for the SCE transmission line interconnection option) is located approximately one mile southwest of the Bohunk's Airpark Airport, a privately owned dirt airstrip with two runways. The Project would not be affected by and would not affect air traffic associated with that private airstrip. There is an inactive private landing strip within the Shea's Castle property in the Southern Energy Farm. This would not be activated for any Project-related operations.

g) Impair implementation of, or physically interfere with, an adopted emergency response plan or emergency evacuation plan? ☒ ☐ ☐ ☐

Emergency access to and in the vicinity of the Site could be adversely affected during construction activities. A traffic impact study will be prepared to quantify estimated construction traffic volumes and distribution patterns, and to consider the effects of oversized vehicles hauling large containers of wind turbines and solar field components, as well as large construction machines such as cranes. A Construction Traffic Management Plan will be developed, including provisions to maintain sufficient access by emergency vehicles during Project construction. The traffic impact study and the recommended Construction Traffic Management Plan will be included in the EIR.

During operations, emergency access to and in the vicinity of the Project area could potentially be affected by wildfires or flooding. The proposed Project would have established plans and procedures for responding to emergency situations, including potential disruption of emergency access during wildfires or localized flooding. Since the operating solar and wind generation facilities would not involve regular truck traffic and small volumes of commuter traffic for the 15 to 20 on-site personnel, it would not interfere with emergency response efforts utilizing State Highway 138, Lancaster Road or local streets. The Healy Farms has not been included in any emergency response or evacuation plans in the past, and this Site has not been identified as a key resource in any such plans. This project would not impair implementation of, or physically interfere with, an adopted emergency response plan or emergency evacuation plan.

h) Expose people or structures to a significant risk of loss, injury or death involving fires, because the project is located: ☒ ☐ ☐ ☐

See discussion below

i) in a Very High Fire Hazard Severity Zones (Zone 4)? ☒ ☐ ☐ ☐

The southern portion of the Energy Farm site, generally south of Lancaster Road, is classified by the County within a High Fire Hazard Severity Zone. A moderate fire hazard zone occurs along the southern edge of Lancaster Road, just east of the existing Healy Farm facilities. Development of the proposed energy farm will alter several hundred acres of existing surface topography and vegetation and will reduce much of the flammable characteristics of this landscape; however, the extensive remaining open space on and surrounding the Site will continue to exhibit wildland fire hazards. The Project will be designed in accordance with the County's vegetation management and fuel modification standards for development in a wildland fire hazard area, to minimize such hazards. Assessment of existing and post-development fire hazards will be included in the EIR.

ii) in a high fire hazard area with inadequate access? ☐ ☐ ☒ ☐

Lancaster Road and 170 St. SW provide public vehicular access to and through the Site. Both are considered adequate to carry a range of fire trucks and emergency response vehicles in the event of a wildfire. The 23 miles of new roads constructed for the project will also greatly enhance access across the site for possible firefighting operations.

iii) in an area with inadequate water and pressure to meet fire flow hazards?	☒	☐	☐	☐

Private, on-site water wells are the only water source available to the Site and have been adequate to support the hay farming, horse ranching, and residential uses that have occurred here in the past. The Project is being designed to meet all applicable standards for water flow and pressure established by the County Fire Department. Current plans include a 56,000-gallon water storage tank, an additional water well, a duplex fire pump assembly, and two fire hydrants to be installed near the planned operations and maintenance building in the Proposed Energy Farm. Adequate water pressure must be demonstrated to verify compliance with Fire Department requirements. A 70,000-gallon water storage tank would be built within the Healy Farms area, to provide a water supply for semi-annual solar panel washing. This could potentially provide a supplemental source of water for fire suppression on site. Additional analysis of the proposed water supply and flows will be conducted, in consultation with the County Fire Department, and included in the EIR.

iv) in proximity to land uses that have the potential for dangerous fire hazard (such as refineries, flammables, and explosives manufacturing)?	☐	☐	☐	☒

The surrounding land is sparsely mostly undeveloped, with several scattered residences, a church, the Fairmont Water Reservoir, and the California Aqueduct. None of those uses represent a dangerous fire hazard.

10. HYDROLOGY AND WATER QUALITY

Would the project:	*Potentially Significant Impact*	*Less Than Significant Impact with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*
a) Violate any water quality standards or waste discharge requirements?	☒	☐	☐	☐

Construction activities would involve grading and ground surface alterations which could expose soils to potential erosive forces of wind or storm water. A variety of construction materials would be stored on site and some of these could include constituents that could impact surface water quality conditions, such as fuels, lubricants, solvents, coatings, etc. Without proper construction controls, loose sediments and a variety of construction materials could be captured within Site runoff and potentially threaten on-site water quality or downstream receiving waters. Construction activities would be conducted in accordance with the water quality control measures required for a General Construction Permit ("GCP"), issued by the Lohantan Regional Water Quality Control Board, to prevent construction discharges that could violate water quality standards. Further discussion of the GCP requirements and anticipated construction period water quality control measures will be provided in the EIR.

Impervious surfaces would increase due to site development, including compacted internal roads, building pads and buildings for operations and maintenance facilities, and pad areas for solar arrays and wind towers. As a result, there could be an increase in site runoff during rain storm events, compared to current conditions. In the operations and maintenance site, there could be a variety of machinery, materials, supplies, including liquid and solid substances, within the laydown/storage yard, during periods when wind turbines and solar arrays are being assembled and maintained. If there is improper storage and cover of such items, or if there are accidental spills of any hazardous materials, there could be impacts to surface water quality constituents. A long-term water quality management plan would be developed, in accordance with the countywide SUSMP, to ensure that the developed site runoff does not generate water pollution impacts or violate any water quality standards. Further discussion of potential sources of water pollutants in developed site runoff and best management practices to be incorporated into the project design to avoid significant water quality impacts, will be provided in the EIR.

b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?	☒	☐	☐	☐

Water demands for the Energy Farm would occur primarily at the operations and maintenance building(s), along with semi-annual washing of the solar panels, and water storage for emergency fire suppression needs. Total water demand is expected to be lower than the historical demand associated with the ranching/hay farming that has occurred for the last several decades. Water supply for the Project would be from an existing deep well (>1,000 feet) within the ranch compound, and/or from a new well that may be drilled within the operations and maintenance area. Significant impacts to the groundwater table are not anticipated; however, analysis of the project's total water demand and impact on local groundwater supply sources will be provided in the EIR.

c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site? ☒ ☐ ☐ ☐

There are no rivers on or adjacent to the Site. The Project is being designed to control runoff from developed areas without a substantial alteration to the existing site drainage patterns. No development would be located within the segments of the three broad washes that traverse edges of the Energy Farm site, and no development would occur within any known flood hazard area. The proposed grading plan would alter existing drainage conditions on-site, including alterations to ephemeral drainages. A Hydrology Study will be prepared to evaluate pre- and post-development surface hydrology and to identify design measures to prevent on or off-site potential siltation or erosion impacts associated with changes in drainage conditions. Results of this hydrology study will be discussed in the EIR.

d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site? ☒ ☐ ☐ ☐

There are no rivers on or adjacent to the Site. The Project is being designed to control runoff from developed areas without a substantial alteration to the existing site drainage patterns. The proposed grading plan would alter existing drainage patterns on-site, including alterations to ephemeral drainages. A Hydrology Study will be prepared to evaluate pre- and post-development surface hydrology and to identify design measures to prevent on- or off-site potential flooding impacts associated with changes in volumes of site runoff. Results of this hydrology study will be discussed in the EIR.

e) Create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems? ☐ ☐ ☒ ☐

There are no public storm water drainage systems or private, community-scale systems that collect storm water runoff from the Energy Farm, and none are planned. No impact to storm water drainage systems is anticipated. Nonetheless, changes in site runoff and a discussion of the proposed on-site drainage network will be discussed in the EIR.

f) Generate construction or post-construction runoff that would violate applicable storm water NPDES permits or otherwise significantly affect surface water or groundwater quality? ☒ ☐ ☐ ☐

The Project will be designed to comply with applicable NPDES Permits, and as such, violations of such permit conditions are not expected. Potential water quality impacts and measures to avoid significant impacts during construction and as a result of the developed site conditions will be evaluated in the EIR. Please refer to the previous response to item a) herein.

g) Conflict with the Los Angeles County Low Impact Development Ordinance (L.A. County Code, Title 12, Ch. 12.84 and Title 22, Ch. 22.52)?	☐	☐	☒	☐

A conceptual drainage plan is being developed for the proposed project, in accordance with the provisions of the County's Low Impact Development Ordinance (LIDO) and conflicts are not anticipated. Nonetheless, this plan and its LID compliance measures will be described in the EIR.

h) Generate construction or post-construction runoff that would violate applicable storm water NPDES permits or otherwise significantly affect surface water or groundwater quality?	☒	☐	☐	☐

The Project will be designed to comply with applicable NPDES Permits, and as such, violations of such permit conditions are not expected. Potential water quality impacts and measures to avoid significant impacts during construction and as a result of the developed site conditions will be evaluated in the EIR. Please refer to the previous response to item a) herein.

i) Result in point or nonpoint source pollutant discharges into State Water Resources Control Board-designated Areas of Special Biological Significance?	☐	☐	☐	☒

"Areas of Special Biological Significance" is a formal designation reserved for ocean waters, which do not occur on or near the Site. The State Water Resources Board also created a "Preservation of Biological Habitats of Special Significance" (BIOL) classification, which allows the regional boards to identify other beneficial waters as areas or habitats requiring special protection. The Site is located within the jurisdiction of the Lahontan Regional Water Quality Control Board, which administers statewide water quality regulations for point and nonpoint sources of water pollution. Within the Lahontan region, BIOL-designated areas include some watercourses, lakes, and wetlands to protect unique combinations of plants and/or wildlife species. There are no BIOL-designated areas within the Antelope Hydrologic Unit in which the Site is located;[2] therefore, this Project would have no impacts on such areas.

j) Use septic tanks or other private sewage disposal system in areas with known septic tank limitations or in close proximity to a drainage course?	☒	☐	☐	☐

Wastewater from the existing ranch facilities is currently disposed of with an on-site, underground septic system. Los Angeles County Department of Public Health records indicate this was installed in accordance with a permit for a 1,000-gallon system issued in 1974. It is located within the ranch compound, near the home and trailers. Proposed operations and maintenance facilities would discharge wastewater into a new subsurface septic tank/leach field system. Wastewater discharges from the operations and maintenance facility would consist of similar kinds of gray water and black water currently discharged from the ranch facilities. The proposed operations and maintenance site is relatively flat, and there are no drainage courses in that area. Soil suitability for an underground wastewater disposal system and measures to prevent groundwater quality impacts will be discussed in the EIR.

[2] *Water Quality Control Plan for the Lahontan Region, Table 2-1. Beneficial Uses of Surface Water of the Lahontan Region.*

k) Otherwise substantially degrade water quality? ☐ ☐ ☐ ☒

This project does not include any point sources of water discharges that could degrade water quality. Potential effects from non-point sources as a result of construction and in the fully developed conditions will be evaluated in the EIR, as noted in prior responses.

l) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map, or within a floodway or floodplain? ☐ ☐ ☐ ☒

No housing or other residential uses are included in the proposed project; therefore, there would be no impact involving placement of housing within either of these flood hazard areas.

m) Place structures, which would impede or redirect flood flows, within a 100-year flood hazard area, floodway, or floodplain? ☐ ☐ ☒ ☐

Part of the northern edge and part of the southeastern corner of the Proposed Energy Farm are located within a 100-year flood plain established by the Federal Emergency Management Agency (FEMA). These same areas are identified as Floodplain Management Areas in the Antelope Valley Area Plan's Hazards and Resources Map. Proposed solar arrays and wind turbines would be located outside of those flood hazard zones. The site plan is designed to avoid development within the two flood hazard zones that affect the northern edge of the Site and a portion of the eastern edge of the Site. This will be confirmed as part of the analysis conducted in the Hydrology Study to be prepared for the EIR.

n) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam? ☐ ☐ ☐ ☒

There are no levees or dams in this area and this Site is not within any known inundation areas from such facilities.

o) Place structures in areas subject to inundation by seiche, tsunami, or mudflow? ☒ ☐ ☐ ☐

There are no natural surface water bodies in this area that could overflow onto the energy farm or transmission line corridor as a result of seismically-induced seiche conditions. The Fairmont Reservoir is located approximately 0.35 mile (1,800+ feet) west of the southwestern corner of the Site, at an elevation approximately 100 feet higher than the nearest edge of the Energy Farm site. Intervening topography slopes from the reservoir toward the Site. If it were full and there was a strong enough earthquake event to generate seiche conditions at the reservoir, it is considered unlikely that reservoir spillover water would inundate any of the proposed energy farm facilities, due to the distance involved and because the California Aqueduct lies between the reservoir and any proposed Project improvements, and thus would intercept the spillover. Located in the "upper desert" region of northern Los Angeles County, there is no threat of tsunami conditions at the Site. The potential for mudflow risks associated with heavy storm runoff from local hillsides and drainages will be evaluated in a geotechnical study and hydrology report to be prepared and incorporated into the EIR.

11. LAND USE AND PLANNING

Would the project:	Potentially Significant Impact	Less Than Significant Impact with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Physically divide an established community?	☐	☐	☐	☒

Much of the Northern Energy Farm site has been operated as a private horse ranch and hay farm for the last several decades, and it is surrounded by primarily undeveloped lands, with some scattered residences, a church and water storage/transmission facilities. No physical components of a broader community structure occur around the Energy Farm site. Thus, this Project would not physically divide an established community.

b) Be inconsistent with the plan designations of the subject property? Applicable plans include: the County General Plan, County specific plans, County local coastal plans, County area plans, County community/neighborhood plans, or Community Standards Districts.	☒	☐	☐	☐

The majority of the Energy Farm and Gen-tie Line corridor is designated in the Los Angeles County Antelope Valley General Plan as N1-Non-Urban (0.5 du/ac) and is zoned A-2-5 (Heavy Agriculture), a designation and zoning that allows for renewable energy projects as conditionally permitted uses. In addition, portions within the northern, central, and eastern portions of the Proposed Energy Farm are located within the Fairmont & Antelope Buttes SEA No. 57.

The County of Los Angeles is currently in the process of updating the Antelope Valley Areawide Plan, known as the "Town and Country Plan." According to the June 1, 2010, Preliminary Draft Land Use Map, the Proposed Energy Farm will be primarily located within the Rural Land ("RL") designation, with residential densities ranging from 1 du/10 acres to 1 du/40 acres.

Within Los Angeles County, the Gen-Tie Line corridor will be located in RL 20 and Rural Land 10 (RL 10) land use designations. The RL 10 designation allows a maximum residential density of 1 du/10 acres and a maximum FAR of 0.5. The eastern 1.5 miles of the Gen-Tie Line corridor is located within the City of Lancaster, and is designated in the Lancaster General Plan mostly as NU (Non-Urban Residential, 0.4–2.0 du/acre) and is zoned RR-2.5 (Rural Residential, 1 du/2.5 acres). A small segment is designated in the City's General Plan as UR Urban Residential (2.1–6.5 du/acre) with a Specific Plan overlay.

This Project would not conflict with the County's existing or proposed Area Plan designations; however, it would require the issuance of a Conditional Use Permit (CUP) for construction of the proposed up to 300-MW renewable energy project in an agricultural zone; for grading (cut and fill) of approximately 4,145,200 cubic-yards of soil; and for development within a County-designated Significant Ecological Area 57 ("SEA No. 57"). Project consistency with the planning policies for SEA No. 57 and with the County's existing and proposed land use policies for the Fairmont area will be addressed in the EIR.

Construction of the segment of the Gen-Tie Line within the City of Lancaster would not conflict with the City's land use plans and policies in that area; however, it may require some form of land use approval or construction permit. This will be determined as part of the land use analysis conducted for the EIR

c) Be inconsistent with the zoning designation of the subject property?	☐	☐	☒	☐

As discussed in the preceding response, the Energy Farm and Gen-Tie Line would not conflict with County of Los Angeles or City of Lancaster zoning provisions, but requires a Conditional Use Permit process for the Los Angeles County portion of the Site, to ensure the Project is compatible with surrounding land uses and result in minimal environmental harm. As such, the EIR will include a discussion of the Project's consistency with local land use policies and regulations, including the applicable zone district regulations.

d) Conflict with Hillside Management Criteria, SEA Conformance Criteria, or other applicable land use criteria?	☒	☐	☐	☐

The Project's development footprint occurs within approximately 26.3 acres (5.5 percent) of the Site area within the Fairmont & Antelope Buttes SEA No. 57 (a total of 475.8 acres, or 12.8 percent, of the total Project Site is located within the SEA), and also includes approximately 15 acres on land with natural slopes of 25 percent or greater. Compliance with the SEA Conformance Criteria and the Hillside Management criteria will be evaluated in the EIR.

12. MINERAL RESOURCES

Would the project:	*Potentially Significant Impact*	*Less Than Significant Impact with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☐	☐	☐	☒

The Phase I ESA did not identify any mining, oil or gas wells on or near the Energy Farm site, and there is no evidence of any prior mining on site. According to Map 3-1 of the Antelope Valley General Plan Update—Background Report, the Site is not designated as a mineral resource area by the County.

b) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?	☐	☐	☐	☒

Please refer to the preceding response.

13. NOISE

Would the project result in:	*Potentially Significant Impact*	*Less Than Significant Impact with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*
a) Exposure of persons to, or generation of, noise levels in excess of standards established in the County noise ordinance (Los Angeles County Code, Title 12, Chapter 12.08) or the General Plan Noise Element?	☒	☐	☐	☐

When fully developed and operational, the proposed energy farm would employ 15 to 20 people on a daily basis. For the most part, these people would work inside the operations and maintenance building and would periodically travel around the Site for routine monitoring and maintenance activities. There are few noise sources in this sparsely settled rural area, and future workers on-site would not be exposed to significant noise levels. The Proposed Project would generate different kinds of noise than presently occur on site. During construction, noise would be generated by a variety of machinery and vehicles, with a range of noise levels, depending on the types and numbers of machines and vehicles and their locations. During operations, noise sources would include street traffic associated with on-site employee commute trips, wind rotors turning, activities in the outdoor laydown/storage yard, vehicles arriving and departing within the on-site parking lot serving the Operations and Maintenance building, and periodic maintenance activities within the solar arrays and at wind turbines. Project design features include minimum setbacks for all wind turbines, of at least one-quarter mile from any non-participating off-site residence or other noise-sensitive land use, to reduce potential noise impacts. A noise study will be prepared for the EIR, to evaluate the potential construction and operational noise impacts of the Project, and to determine whether any surrounding land uses noise levels generated by this Project that exceed the County's noise ordinance or General Plan Noise Element standards.

b) Exposure of sensitive receptors (e.g., schools, hospitals, senior citizen facilities) to excessive noise levels?	☒	☐	☐	☐

Sensitive noise receptors in the area of the Energy Farm include several scattered residences and one church, but there are no sensitive receptors such as schools, hospitals, senior citizen facilities, libraries, or similar land uses located in the Project area. During construction, the nearest residences might be exposed to periodically high levels of noise, depending on the type and number of machinery and vehicles that are active at a particular time and where the construction activity occurs. Temporary construction noise impacts will be evaluated as part of the noise study to be included in the EIR. Long-term noise impacts from this Project are not anticipated to significantly affect any sensitive receptors; however, further assessment of potential long-term noise impacts will be included in the EIR.

c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project, including noise from parking areas?	☒	☐	☐	☐

Long-term operational activity would result in some new noise sources that are not expected to result in significant increases in ambient noise levels. Nonetheless, as discussed in the response to item b) above, a noise study evaluating the change in noise levels associated with the long-term project operations will be prepared for the EIR to determine whether there could be a substantial permanent increase in off-site noise levels.

d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project, including noise from amplified sound systems?	☒	☐	☐	☐

During the construction phases, a variety of machinery, tools, and vehicles will be active. Noise levels associated with construction activities will vary, based on the range of machinery and vehicles involved and the intensity level of the construction activity. There might be some construction work that generates substantial increases in local noise levels that could negatively affect the nearest residential uses. Construction phase noise impacts will be evaluated in a noise study, as part of the EIR.

No outdoor sound systems are proposed; however, there will be regular maintenance activities at the solar arrays and wind turbines involving large equipment that would generate noise for short-time periods. Noise impacts associated with periodic and ongoing maintenance work will be evaluated in the noise study prepared for the EIR.

e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒

There are no public airports within 2 miles, and the proposed energy farm and the Gen-Tie Line corridor are not within any airport land use plan area.

f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☒	☐

The eastern terminus of the Gen-tie Line (only for the SCE transmission line interconnection option) is located approximately 1 mile southwest of the Bohunk's Airpark Airport, a privately owned dirt airstrip with two runways. There is minimal air traffic associated with this airstrip and, therefore, insignificant aircraft noise from this facility. Future workers at the Energy Farm would not be exposed to excessive noise levels from this private airstrip.

14. POPULATION AND HOUSING

Would the project:	*Potentially Significant Impact*	*Less Than Significant Impact with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*
a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	☒	☐	☐	☐

When fully operational, the proposed solar and wind energy generation facilities would produce enough electricity to power more than 114,000 homes. The electricity would be transmitted to the regional electric grid for distribution to electricity consumers. The Project would not directly induce any population growth, but it would indirectly support continued regional growth that relies on electricity for many needs. Decisions as to which areas will receive the electricity generated by this Project is beyond the control of this Project, and future growth that would benefit from this renewable energy source would occur when and where it is approved by the local governmental agency with land use decision-making powers. A total of 23 miles of private, internal access roads are proposed within the Energy Farm. These would be graded and compacted, but not paved. These would provide access to and within solar arrays, wind turbines, the operations and maintenance site and the substation. As such, these internal circulation elements would not induce growth by providing additional capacity for the local or regional transportation network. However the issue will be further studied in the EIR.

b) Cumulatively exceed official regional or local population projections?	☐	☐	☒	☐

Since this project would have no residential uses and a small workforce of about 15 to 20 people on site at any time, it would not materially affect local or regional population projections.

c) Displace existing housing, especially affordable housing?	☐	☐	☐	☒

The on-site housing on-site will remain in place with the Project.

d) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?	☐	☐	☒	☐

As noted in the preceding response, existing housing on-site would remain in place. Thus, the Project would not displace anyone.

15. PUBLIC SERVICES

	Potentially Significant Impact	*Less Than Significant Impact with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*
a) Would the project create capacity or service level problems, or result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:				
Fire protection?	☒	☐	☐	☐

Fire protection services in the project area are provided mainly by the 11 fire stations that comprise Battalion 11 of the County of Los Angeles Fire Department. Battalion 11 headquarters is in Lancaster. The southern portion of the Energy Farm site, generally south of Lancaster Road, is classified by the County within a High Fire Hazard Severity Zone. A moderate fire hazard zone occurs along the southern edge of Lancaster Road, just east of the existing Healy Farm facilities.. During the construction phases, there could be more than 330 workers on site on a given day, along with a variety of machinery, construction supplies and materials, and fuels and other hazardous materials on-site. It is possible that construction activities could accidentally ignite a fire that could spread to off-site land uses. It is also possible that a wildfire off-site could impact the Site. At various times in the construction process, there might be a need for temporary traffic controls to ensure through traffic and emergency access is maintained. The need for specific mitigation measures for the construction phases will be discussed in the EIR. Given that the Site is located in a landscape susceptible to wildfires, the developed and operational solar, wind, operations/maintenance, and substation facilities may require protection from wildfires at some time in the project's operating life. Project design features will include special measures such as a fuel modification plan and vegetation management, to reduce the threat of wildfire within the developed portions of the Energy Farm; this will be addressed in the EIR. Response times from LA County Fire Stations might be adversely affected during peak construction traffic periods, when the most oversize vehicles are traveling to the Site; this potential impact will be addressed in the traffic study to be prepared for the EIR. Fire Department response times would not be adversely affected by the small workforce traffic associated with this Project. Fire suppression resources would not be impacted by the underground Gen-Tie Line, which would not be exposed to potential wildland fire or other ground surface based fires. The need for fire suppression resources to protect proposed structures and energy facilities, and impacts related to meeting those needs will be evaluated in the EIR.

Sheriff protection?	☒	☐	☐	☐

The nearest sheriff station is located in the City of Lancaster, approximately 17 miles east of the Proposed Energy Farm. During the construction phases, on-site storage of machinery, supplies, materials, vehicles, etc. could be targets of theft or vandalism, possibly requiring response from the Sheriff Department. Demand for Sheriff response would be reduced through private on-site security measures to be implemented throughout construction by the Project developer. Specific security measures will be identified in construction plans and approved by the Sheriff Department prior to the issuance of grading permits. This routine procedure would reduce demand for Sheriff resources during construction to less than significant. As discussed in the preceding response, there could be an adverse effect on emergency response times during periods of peak construction traffic involving oversize vehicles that might restrict normal traffic flows. This potential impact will be addressed in the traffic study to be prepared for the EIR.

The fully developed and operational energy farm would be privately operated and maintained by 15 to 20 people on a daily basis that would represent a secure presence during normal business hours. Low-level security lighting will be provided at the

operations and maintenance and substation sites. Given the fixed nature and size of the solar arrays, wind turbines, and substation, opportunity for theft of those is negligible. Periodic maintenance activities at solar arrays and wind turbines would be handled by a small work crew and, in the case of wind turbines, some large machinery. This work is not likely to require Sheriff Department resources for surveillance and security. Public access would be restricted by fencing around the solar arrays, substation and operations and maintenance site, to minimize threats of burglary or vandalism and to protect people from accidental harm. The Project includes new public recreation trails, for pedestrian and equestrian use. This occasional recreational trail usage is not expected to result in circumstances that would require an increase in demand for Sheriff Department resources. The underground Gen-Tie Line would have no impact on Sheriff services. This project is not expected to place a significant demand on the County Sheriff Department; nevertheless, a discussion of proposed on-site security measures will be provided in the EIR.

Schools? ☐ ☐ ☐ ☒

Since this project consists entirely of energy generation and transmission facilities, with a small on-site workforce, it would not add any students to the local school district and this project would have no effect on public schools.

Parks? ☐ ☐ ☐ ☒

This renewable energy generation and transmission project would have no demands for public park services or public parkland and would not encroach into any existing or planned parkland; therefore, no impact is anticipated. Other potential effects on public parkland, i.e. the Poppy Reserve, will be addressed in the EIR with respect to Aesthetics and Land Use.

Libraries? ☐ ☐ ☐ ☒

This renewable energy generation and transmission project would have no demands for library services and would have no impact with respect to levels of service for parks and recreation resources.

Other public facilities? ☐ ☐ ☐ ☒

This project would not require staffing resources or facilities from any other kinds of public services.

16. RECREATION

	Potentially Significant Impact	*Less Than Significant Impact with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*
a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☐	☒

This renewable energy generation and transmission project would have no demands for public park services or public parkland and would not encroach into any existing or planned parkland.

b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?	☐	☐	☒	☐

Approximately 6.7 miles of new pedestrian/equestrian trails are included in the plan for the Energy Farm, to implement planned segments of the County's Backbone Trail Network that could potentially link to recreation areas on the Fairmont and Antelope Buttes, and to provide opportunities for views of scenic areas visible from the Site, such as the Poppy Reserve and distant mountains. Construction of these trails would involve some limited grading outside of Energy Farm development areas, but this is not expected to result in significant environmental impacts. Potential effects of trail construction and use on wildlife habitat will be addressed as part of the Biota Report to be included in the EIR.

c) Is the project consistent with the Department of Parks and Recreation Strategic Asset Management Plan for 2020 (SAMP) and the County General Plan standards for the provision of parkland?	☐	☐	☐	☒

This renewable energy production/transmission project is not subject to any of the standards concerning parkland that are set forth in the SAMP or General Plan.

d) Would the project interfere with regional open space connectivity?	☒	☐	☐	☐

Healy Farms has functioned as a private horse-breeding and training ranch, with alfalfa and hay farming, since the mid-1950s. This land is adjacent to the Antelope Valley California Poppy Reserve, a regionally significant open space area. This Site does not currently provide any public access to regional recreational open spaces, including the adjacent Antelope Valley California Poppy Reserve. There are planned elements of the County's Backbone Trail network that would link the Energy Farm to the Poppy Reserve and recreational trails to the north and south, but these remain unbuilt at the present time. The Project includes approximately 6.7 miles of pedestrian/equestrian trails that incorporate segments of the County's planned trail network. Trail routing and design features that would provide connections through the Energy Farm to adjacent open spaces would have beneficial effects that will be discussed in the EIR. The Gen-Tie Line does not traverse nor connect regional recreational open space resources and as such, would have no effect on regional open space connectivity.

17. TRANSPORTATION/TRAFFIC

Would the project:	*Potentially Significant Impact*	*Less Than Significant Impact with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*
a) Conflict with an applicable plan, ordinance, or policy establishing a measure of effectiveness for the performance of the circulation system, taking into account all modes of transportation, including mass transit and non-motorized travel, and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit? Measures of performance effectiveness include those found in the most up-to-date Southern California Association of Governments (SCAG) Regional Transportation Plan, County Congestion Management Plan, and County General Plan Mobility Element.	☒	☐	☐	☐

Relatively minor volumes of vehicular traffic are currently generated by activities at the Healy Farms, where horse ranching activities have diminished from historic levels. The Proposed Project would generate higher traffic volumes during the construction phases, comprised of varying numbers of heavy-, medium-, and light-duty trucks and passenger vehicles. The mix and volumes of traffic will depend upon the nature of the activities underway; for example, heavy truck traffic would occur primarily during short time periods when deliveries of large machinery and materials are required. Trucks would also travel to/from the Site regularly to haul away waste materials. Light duty trucks and passenger vehicle traffic would vary depending upon the number and size of construction crews that are active at a particular time. Construction traffic could potentially result in increased travel on local streets and highways, including State Highway 138, Lancaster Road and 170th St. W, the primary routes of access to the Site. Increased traffic during peak hours is of particular concern. An assessment of construction phase traffic will be conducted to determine whether there could be periods of significant congestion impact that would result in declined performance of the affected portions of the transportation network. This study will also identify key parameters for a construction traffic management plan to ensure that impacts to the surrounding travel network are minimized.

The fully developed Project would generate daily vehicular traffic throughout the work week, consisting of commute trips in private automobiles by the 15 to 20 employees at the operations and maintenance facilities. Periodically, there would be additional traffic, including a variety of trucks associated with special maintenance activities, such as cleaning solar panels and repairs and maintenance of wind turbines. This project would not affect other transportation systems involving walking, biking, bus, or train. While long-term traffic impacts are not expected to result in lower performance standards on the surrounding street and highway network, a traffic impact analysis will be prepared as part of the EIR to determine what the level of impact would be and to identify mitigation measures, if needed, to maintain performance standards.

b) Exceed the County Congestion Management Plan (CMP) Transportation Impact Analysis thresholds? ☒ ☐ ☐ ☐

Please refer to the following response to item c).

c) Conflict with an applicable congestion management program, including, but not limited to, level of service standards and travel demand measures, or other standards established by the CMP, for designated roads or highways (50 peak hour vehicles added by project traffic to a CMP highway system intersection or 150 peak hour trips added by project traffic to a mainline freeway link)? ☒ ☐ ☐ ☐

A traffic impact study will be prepared for the EIR to determine the volume of peak-hour trips that would be generated during construction and by the fully developed and operational Project and to assess whether those trips would exceed the thresholds of significance for the nearest element of the CMP network, State Route 138.

d) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks? ☒ ☐ ☐ ☐

With full extended blades, wind turbines would reach heights of approximately 500 feet, which could potentially affect lower level air traffic patterns. Further analysis of potential effects of wind towers relative to air traffic patterns, and assessment of consistency with applicable Federal Aviation Administration (FAA) safety standards will be included in the EIR. Solar panel arrays would be 15 feet in height and would not affect any air traffic. The proposed operations and maintenance building would be approximately 22 feet high and would not affect any air traffic. Substation structures would not exceed a height of 40 feet and would not affect air traffic. Structures within a potential LADWP switchyard for that transmission line interconnection would not exceed 30 feet in height and would have no effect on air traffic. A cable riser structure for an interconnection with the SCE Antelope Valley Substation would include a steel monopole that could reach a height of 100 to 120 feet; therefore, this will also be evaluated with respect to potential effects on air traffic. The underground Gen-tie Line would have no effect on air traffic.

e) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)? ☒ ☐ ☐ ☐

Oversized truck loads for delivery of the wind turbine components would occur during the construction phases. The potential for these oversized loads to create hazardous traffic conditions will be evaluated as part of the traffic study to be incorporated into the EIR. The Proposed Project would not change any existing public street alignments. A new driveway connection is proposed on Munz Ranch Road for access to the substation. This would be designed to be a perpendicular connection and would meet all County design standards for driveway connections to public streets. This driveway would generate minimal traffic on an infrequent basis and would not represent a traffic hazard. Vehicular access would also be created for the proposed operations and maintenance center, including three driveways on 160th St. W and two on Avenue H. Each of these would be oriented perpendicular to the public street and designed in accordance with County specifications. There is minimal traffic on both streets at the present time, and the Project would add minor volumes. The driveways associated with the O&M site would not represent a traffic hazard.

No hazardous traffic conditions are associated with the construction or operation of the Proposed Gen-tie Line.

f) Result in inadequate emergency access? ☒ ☐ ☐ ☐

As discussed in the response to item a) and b) in this section, construction traffic, especially during periods where oversize vehicles are involved, could impede traffic flow along affected routes, including Highway 138, which could adversely affect emergency vehicle response. Further analysis of the characteristics of the construction vehicle fleet at different times and potential need for lane closures or other through traffic restrictions will be conducted as part of the traffic impact study to be included in the EIR. A construction traffic management plan will also be developed as part of the traffic study, to minimize impacts on through travel and to ensure maintenance of adequate access by emergency vehicles. Construction work within the Proposed Energy Farm area would not require closure of any public streets and would not affect emergency access to this Site or surrounding properties. Excavation work for the underground Gen-tie Line along Avenue J might result in some temporary closure of a traffic lane along that street. This street carries relatively low volumes of traffic and the affected segment provides access to four residences. Temporary traffic controls such as use of a flagman will be implemented by the Contractor, if necessary, to ensure that emergency vehicle access to any adjoining residential properties is maintained at all times. This is a routine procedure for construction of underground utilities that occur within a street right-of-way, and significant impacts to emergency access are not expected due to construction of the Gen-Tie Line.

g) Conflict with the Bikeway Plan, Pedestrian Plan, Transit Oriented District development standards in the County General Plan Mobility Element, or other adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks)? ☐ ☐ ☒ ☐

The County's Draft Bicycle Master Plan (January 2011) identifies on-site segments of Munz Ranch Road and Lancaster Road as Proposed Class III Bike Routes. The Project would not hinder the ability to implement these routes; however, this will be discussed further in the EIR. There are no plans or programs in effect to support any other alternative transportation modes or facilities in this area. The Antelope Valley Transit Authority does not currently provide bus service in this area. The Proposed Project would have a less than significant effect on plans, policies, or programs supporting alternative transportation.

h) Decrease the performance or safety of alternative transportation facilities? ☐ ☐ ☐ ☒

There are no alternative transportation facilities on or near the Site; therefore, the Proposed Project would have no impact on such facilities.

18. UTILITIES AND SERVICE SYSTEMS

Would the project:	*Potentially Significant Impact*	*Less Than Significant Impact with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*
a) Exceed wastewater treatment requirements of the Los Angeles or Lahontan Regional Water Quality Control Boards?	☒	☐	☐	☐

An underground septic tank wastewater disposal system was constructed on site in 1974 and has handled all wastewater discharges from the existing ranch facilities. The Proposed Project includes a new septic system to dispose of wastewater from the operations and maintenance facility. A permit to install this system from the Lahontan Regional Water Quality Control Board may or may not be required; this will depend on the volume of wastewater discharge and results of a review by the County of Los Angeles relative to the system characteristics and potential water quality effects. This will be discussed in the EIR.

b) Create water or wastewater system capacity problems, or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☒

The Proposed Project will utilize a private, on-site septic tank system for wastewater disposal and private on-site water wells for potable water demands. As such, this project would have no impact on any community-scale water or wastewater systems.

c) Create drainage system capacity problems, or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☒	☐	☐	☐

The Proposed Project will include a local, privately maintained drainage control system and would not affect any drainage facilities off site. Design standards and key elements of the proposed on-site drainage system and related effects on surface hydrology and water quality will be discussed in the EIR, within the Hydrology/Water Quality section.

d) Have sufficient reliable water supplies available to serve the project demands from existing entitlements and resources, considering existing and projected water demands from other land uses?	☒	☐	☐	☐

Healy Farms (current land use) has relied on a private on-site water well to meet its domestic and irrigation water demands for many years. Based on past well performance and a recent analysis of groundwater quality on-site, high-quality water is available at depths of 1,000 feet or more below the ground surface. The Proposed Project will rely on this same well to provide a water supply for semi-annual solar panel washing and for daily water demands at the operations and maintenance building. A new well may be drilled at the operations and maintenance site to meet its water demands, including requirements for adequate flow and pressure for fire suppression. An analysis of the water demands associated with daily and annual operations

at the fully developed energy farm will be conducted in the EIR, to determine if a higher volume of water will need to be extracted to meet the project's needs and to confirm that increased extraction of groundwater on site would not exceed existing entitlements or have a significant impact on local groundwater resources.

e) Conflict with the Los Angeles County Low Impact Development Ordinance (L.A. County Code, Title 12, Ch. 12.84 and Title 22, Ch. 22.52) or Drought Tolerant Landscaping Ordinance (L.A. County Code, Title 21, § 21.24.430 and Title 22, Ch. 21, Part 21)?	☐	☐	☒	☐

The Project drainage and landscape plans are being designed to comply with the applicable provisions of these regulatory standards, and is not requesting any variances or exceptions from these standards. Nonetheless, proposed storm drainage and landscape/irrigation plans will be described and features that achieve compliance with applicable standards will be noted in the EIR.

f) Create energy utility (electricity, natural gas, propane) system capacity problems, or result in the construction of new energy facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☒	☐	☐	☐

The Proposed Project's electricity and gas demands would be provided from on-site electrical energy facilities or containers of natural gas that are periodically trucked in; no off-site utility facilities would be affected. When completed, this Project would generate up to 300 MW of clean and renewable electrical energy that would be added to the regional electrical supply system, a positive impact. Environmental effects resulting from construction and operation of the proposed energy production and transmission facilities will be examined in an EIR, focusing on numerous types of impacts as noted throughout the other responses in this Initial Study.

g) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	☐	☒	☐	☐

A variety of solid and liquid wastes would be generated throughout the construction phases. Many of these wastes would eligible for disposal at a landfill; i.e., non-hazardous. Volumes of construction wastes to be disposed of are difficult to estimate; however, diversion of construction wastes from landfill disposal through recycling or other means will be emphasized. A discussion of the Project's construction waste generation characteristics and targets for diversion of wastes from landfill disposal will be provided in the EIR.

The fully developed and operational energy farm would generate minor volumes of solid wastes that could require landfill disposal; these wastes would consist of typical municipal wastes that are generated by administrative office operations that would occur at the operations and maintenance facilities only. Proposed solar arrays and wind towers would not generate wastes due to daily operations, but would generate some wastes during periodic maintenance activities when parts are replaced, cleaning occurs, etc. The underground Gen-tie transmission line would not generate wastes. Solid waste disposal needs of the operating energy farm would not have a significant impact on landfill capacity.

h) Comply with federal, state, and local statutes and regulations related to solid waste?	☐	☐	☒	☐

Disposal of solid wastes during construction and throughout the operating life of the Project would comply with all applicable regulations governing waste disposal. No exceptions from any such regulations are being requested and no unique methods of solid waste disposal are proposed that could conflict with applicable standards.

19. MANDATORY FINDINGS OF SIGNIFICANCE

	Potentially Significant Impact	*Less Than Significant Impact with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*
a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, substantially reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	☒	☐	☐	☐

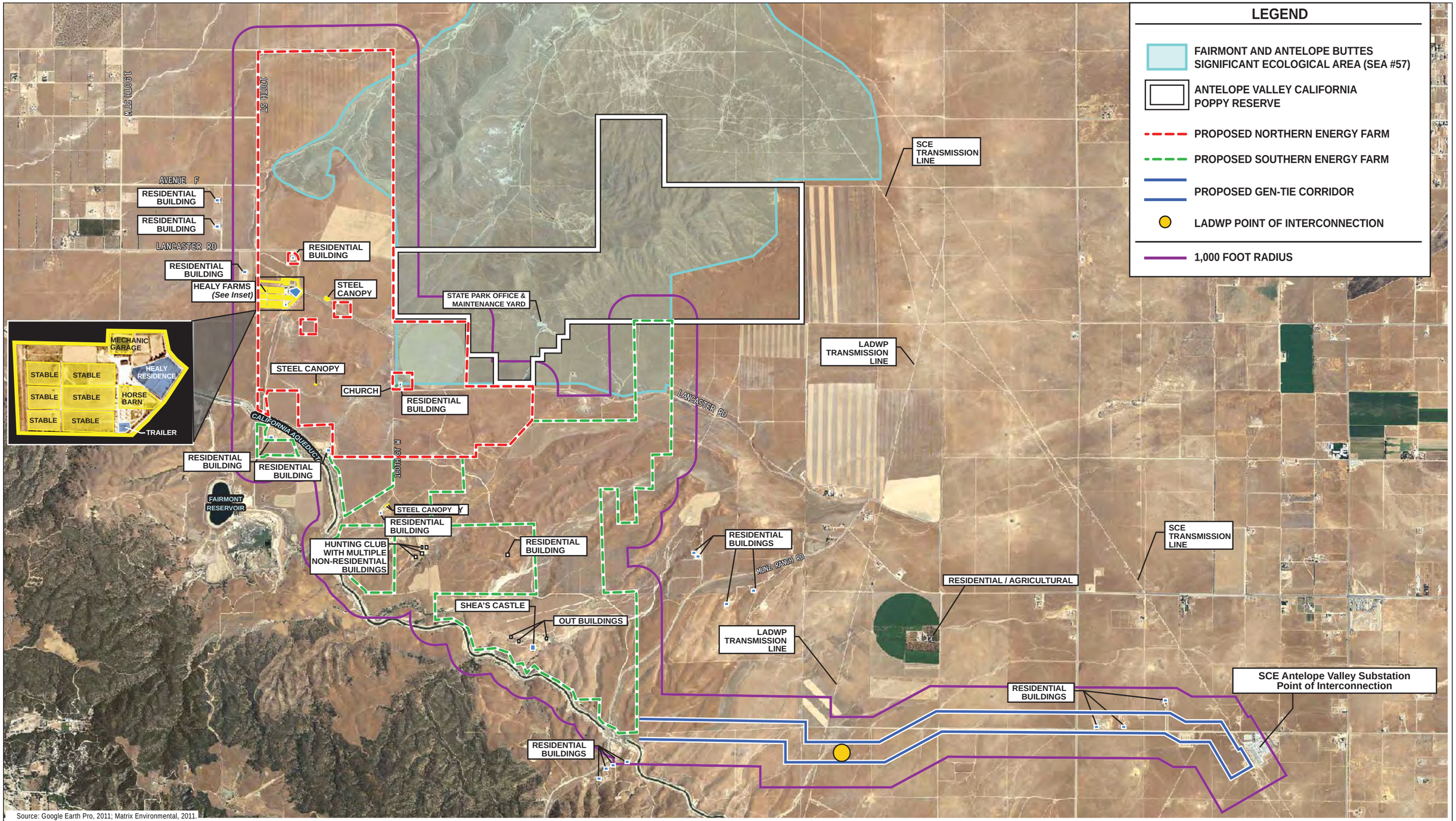
As discussed in the preceding checklist responses, the Project could potentially degrade the environment due to impacts involving aesthetics, agricultural resources, air quality, sensitive plants and wildlife species, cultural and paleontological resources, hazardous materials management, changes in surface water hydrology and water quality, noise, vehicular traffic. An EIR will be prepared to address all of these potential impacts.

b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?	☒	☐	☐	☐

There are several other solar and wind energy projects proposed in the Antelope Valley Area, along with other development projects which, in combination with the Proposed Project, could result in a variety of cumulative impacts. For example, the AV Solar Ranch One project, a solar energy generation facility, has been approved for development immediately north of this Site. The Blue Sky Wind Farm is proposed to the west and south of the Site. Further analysis is required to estimate potential effects that could combine with the effects of the Project, resulting in potentially significant cumulative impacts. The traffic study to be prepared for this Project, for example, will need to account for traffic generated by other projects that would affect the same elements of the affected roadway network. Cumulative impacts may not occur with respect to all types of impacts; nevertheless, potential cumulative impacts will be examined for each topic that is addressed in the EIR.

c) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	☒	☐	☐	☐

Construction activities would generate noise and pollutant emissions that could have a negative impact on the few neighboring homes near the project boundaries. Operational activities, such as the wind tower blade rotations and periodic maintenance activities, would generate noise that does not presently occur on-site and which might have some impact at the few homes surrounding the Site. Solar arrays and wind towers would change the aesthetic character of this Site, and this could have some adverse effects on views to and from the Antelope Valley California Poppy Reserve and possibly from more distant viewing locations. A majority of the Energy Farm site is located in a County-designated High Fire Hazard Area, which presents challenges for fire prevention and suppression during and after construction. Construction phase traffic could impede travel and emergency vehicle access on affected routes such as State Highway 138. Any or all of these impacts could have significant adverse consequences for human beings and further evaluation of these issues will be conducted in the EIR.



Source: Google Earth Pro, 2011; Matrix Environmental, 2011.

Wildflower Renewable Energy Farm

matrix environmental

0 1 2 Miles

Approximate Scale in Miles

Attachment 3

1,000 Foot Land Use Map

Appendix C:

Los Angeles County Assessor Parcel Numbers found within the Wildflower Green Energy Farm Site and Staff Package

Assessor Parcel Numbers

3203034022	3236015021	3236020016	3236027007	3267006009	3267017014
3203034027	3236015030	3236020017	3236027008	3267006018	3267017015
3203034804	3236015032	3236020018	3238009006	3267006025	3267023014
3203034805	3236015043	3236020900	3238009007	3267006026	3267023015
3203034806	3236015044	3236020901	3238009015	3267006037	3267023016
3235001023	3236015051	3236020903	3238009021	3267006038	3267023017
3235001024	3236015052	3236020906	3238009022	3267007012	3267023018
3235001904	3236015054	3236020907	3240009009	3267007023	3267030001
3235002022	3236016001	3236020908	3240010006	3267007024	3267030002
3235002023	3236016002	3236020909	3240010007	3267007025	3267030003
3235002900	3236017003	3236021004	3240010009	3267007030	3267030004
3236008001	3236017005	3236021006	3240010901	3267007038	3267030006
3236008002	3236017006	3236021007	3267001001	3267007039	3267030007
3236009001	3236017007	3236021900	3267001002	3267011001	3267030032
3236009002	3236018020	3236021902	3267001003	3267011003	3267030033
3236009003	3236018021	3236022012	3267001004	3267014009	3267030034
3236010001	3236018024	3236022013	3267001005	3267014010	3267030036
3236010002	3236018025	3236022022	3267001007	3267014012	3267030037
3236010003	3236018900	3236022023	3267001008	3267014013	3267030038
3236010004	3236018901	3236022024	3267001009	3267014014	3267030039
3236010005	3236019002	3236022026	3267001019	3267014015	3267030040
3236010006	3236019003	3236022027	3267001903	3267014016	3267030043
3236010007	3236019007	3236022028	3267002001	3267014017	3267030901
3236010009	3236019008	3236022029	3267002004	3267014021	3267032013
3236010010	3236019010	3236023001	3267002005	3267016001	3267032014
3236010011	3236019013	3236023007	3267002011	3267016009	3267032015
3236011001	3236019014	3236023012	3267002013	3267016014	3267032016
3236011002	3236019015	3236023013	3267002270	3267016015	
3236011003	3236019900	3236023018	3267004004	3267016016	
3236011004	3236019901	3236023022	3267004005	3267016023	
3236012002	3236020001	3236024001	3267004009	3267016024	
3236012003	3236020002	3236024002	3267004011	3267016040	
3236012006	3236020003	3236024003	3267004036	3267016050	
3236012007	3236020004	3236024005	3267004037	3267016275	
3236012008	3236020006	3236024007	3267004041	3267017001	
3236012009	3236020007	3236027001	3267004042	3267017009	
3236012010	3236020008	3236027002	3267004043	3267017010	
3236012011	3236020013	3236027003	3267004044	3267017011	
3236015012	3236020014	3236027004	3267004045	3267017012	
3236015017	3236020015	3236027006	3267004046	3267017013	

WILDFLOWER GREEN ENERGY FARM

APPLICANT : ANTELOPE POWER, LLC

ENTITLEMENT SUBMITTAL : OCTOBER 10, 2011

SHEET INDEX:

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A-2 PROJECT BOUNDARY
A-3 PROJECT SITE CHARACTERISTICS
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B-2 WIND TURBINE TYPICAL LAYOUT PLAN
B-3 SOLAR ARRAY TYPICAL LAYOUT PLAN
B-4 PROJECT SUBSTATION LAYOUT
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D-4 ACCESS ROAD TYPICAL DETAILS
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D-6 SWITCH STATION DETAIL PLAN
D-7 FENCE LAYOUT & DETAIL PLAN

elementpower

NO.	DESCRIPTION	DATE	BY

REVISIONS

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www.fuscoe.com

ANDREW J. WILLRODT, R.C.E. 49881 DATE:

CUP APPLICATION PLAN

WILDFLOWER GREEN ENERGY FARM

DRAWN BY: JG	PROJECT COVER	SCALE: AS SHOWN
DESIGNED BY: JG		DATE: 10/5/2011
CHECKED BY: AW		SHT NO.:

PROJECT NAME:
WILDFLOWER GREEN ENERGY FARM

PROJECT ADDRESS:
16700 LANCASTER ROAD
AND 47031 WEST 167TH STREET
LANCASTER, CA 93536

APPLICANT:
ANTELOPE POWER. LLC
421 SW SIXTH AVENUE, SUITE 1000
PORTLAND, OR 97204
(503) 416–0831
CONTACT: NAT PARKER

ENGINEERS:
FUSCOE ENGINEERING, INC
600 WILSHIRE BLVD., STE. 1470
LOS ANGELES, CA 90017
(213) 988–8802
CONTACT: ANDREW J. WILLRODT, P.E., LEED AP

PROJECT DESCRIPTION:
THE PROJECT CONSISTS OF THE CONSTRUCTION AND OPERATION OF AN UP–TO 300–MEGAWATT (MW) RENEWABLE ENERGY FACILITY THAT WOULD GENERATE ENERGY THROUGH WIND TURBINES AND SOLAR PHOTOVOLTAIC PANELS. THE APPLICANT WILL IMPLEMENT THE PROJECT USING A COMBINATION OF WIND TURBINES AND SOLAR ARRAYS. IN ADDITION, THE PROJECT INCLUDES AN OPERATIONS AND MAINTENANCE BUILDING, SURFACE PARKING LOT, A LAY DOWN YARD, ACCESS ROADS, UNDERGROUND COLLECTION LINES, AN ELECTRICAL SUBSTATION. AND WILL INCLUDE AN OFF–SITE 230 KV SUB–SURFACE GEN–TIE TRANSMISSION FACILITY TO TRANSFER THE ENERGY TO THE ELECTRICAL GRID.

GENERAL SUMMARY:

1. PROPERTY GROSS AREA: 3,708 AC (SEE FOOT NOTE 1 HEREON)
2. EXISTING ZONING: A–2, HEAVY AGRICULTURAL
3. PROPOSED ZONING: A–2, HEAVY AGRICULTURAL
4. EXISTING STRUCTURES: FARM BUILDINGS, RESIDENTIAL BUILDINGS, FIXED CANOPY,AND A BARN
5. PROPOSED STRUCTURES: WIND TURBINE FACILITY, SOLAR ENERGY FACILITY, OPERATIONS AND MAINTENANCE BUILDING, SUBSTATION
6. PROPOSED LAND USE: RENEWABLE ENERGY FACILITY (CONDITIONAL USE PERMIT)
7. GROSS DEVELOPMENT AREA: SEE SHEET B–1
8. DISTURBED AREA: SEE SHEET B–1.
9. PROPOSED HEIGHT OF STRUCTURES:
   - OPERATIONS & MAINTENANCE BLDG –22'
   - SUBSTATION FACILITY –40'
   - WIND TURBINE FACILITY (2.3–3.4 MW) –500'
   - SOLAR ARRAY FACILITY –15'
   - OFF–SITE SWITCH STATION –30
10. CUT AND FILL WILL BE "0" BALANCE: SEE SHEET B–1 FOR QUANTITIES.
11. PARKING REQUIRED:

STRUCTURE	SIZE(GSF)	PRKG REQ'D	PRKG PROVIDED
O&M BLDG	16,000	0	32
SUBSTATION	––	0	2
WIND FACILITY	––	0	0
SOLAR FACILITY	––	0	0
SWITCH STATION	*	0	2

* OFF–SITE TRANSMISSION LINE (LADWP ALTERNATIVE)

12. NO OAK TREES HAVE BEEN IDENTIFIED ON PROJECT SITE.
13. PROPOSED METHOD OF DRAINAGE: NO EXTENSIVE SUBSURFACE STORM DRAIN LINES ARE REQUIRED. ALL INCREASES IN STORM WATER RUN–OFF DUE TO PROJECT IMPROVEMENTS WILL BE DETAINED FOR 50 YEAR STORM EVENTS, AND RELEASED ONTO EXISTING OFFSITE DRAINAGE WATER COURSES AT (OR BELOW) THE PRE–PROJECT FLOW RATES.
14. TOPOGRAPHIC SURVEY: IS A COLLECTION OF QUAD MAPS CONTENT AND SUPPLEMENTED WITH A SURVEY PREPARED BY INFOTECH ENTERPRISES (JAN. 2006), EXISTING CONTOUR INTERVAL 2–FOOT.
15. ALL DIMENSIONS SHOWN ARE APPROXIMATE.

	ASSESSOR'S PARCEL NO.	PARCEL OWNER	APN LEGAL	APN[1] ACREAGE
1	3235-002-023	GENZ DEVELOPMENT INC	LOT COM AT NE COR OF SEC 18 T 7N R 14W T	152.74
2	3236-008-001	WATT BUILDERS LLC	W 1/2 (EX OF ST) OF SEC 25 T 8N R 15W	317.56
3	3236-008-002	HEALY ENTERPRISES INC	E 1/2 OF SEC 25 T 8N R 15W	323.49
4	3236-009-001	HEALY ENTERPRISES INC	FAIRMONT SUB OF SEC 1 T 7N R 15W AND SEC	86.31
5	3236-009-002	HEALY ENTERPRISES INC	FAIRMONT SUB OF SEC 1 T 7N R 15W AND SEC	144.91
6	3236-009-003	HEALY ENTERPRISES INC	FAIRMONT SUB OF SEC 1 T 7N R 15W AND SEC	55.78
7	3236-010-002	HEALY ENTERPRISES INC	FAIRMONT SUB OF SEC 1 T 7N R 15W AND SEC	63.53
8	3236-010-003	HEALY ENTERPRISES INC	FAIRMONT SUB OF SEC 1 T 7N R 15W AND SEC	55.10
9	3236-010-005	HEALY ENTERPRISES INC	FAIRMONT SUB OF SEC 1 T 7N R 15W AND SEC	30.71
10	3236-010-006	HEALY ENTERPRISES INC	FAIRMONT SUB OF SEC 1 T 7N R 15W AND SEC	26.26
11	3236-010-007	HEALY ENTERPRISES INC	FAIRMONT SUB OF SEC 1 T 7N R 15W AND SEC	25.60
12	3236-010-009	HEALY ENTERPRISES INC	THAT PART (EX OF ST) OF SW 1/4 LYING S A	6.98
13	3236-010-010	HEALY ENTERPRISES INC	LAND DES IN PAR 4 DOC 2850, 74-7-25 FAIR	16.05
14	3236-010-011	HEALY ENTERPRISES INC	FAIRMONT SUB OF SEC 1 T 7N R 15W AND SEC	8.34
15	3236-011-001	HEALY ENTERPRISES INC	FAIRMONT BEING A PART OF SW 1/4 OF SEC 3	1.44
16	3236-011-002	HEALY ENTERPRISES INC	FAIRMONT BEING A PART OF SW 1/4 OF SEC 3	4.04
17	3236-011-003	HEALY ENTERPRISES INC	FAIRMONT BEING A PART OF SW 1/4 OF SEC 3	1.46
18	3236-011-004	HEALY ENTERPRISES INC	FAIRMONT BEING A PART OF SW 1/4 OF SEC 3	4.17
19	3236-012-002	HEALY ENTERPRISES INC	FAIRMONT BEING A PART OF SW 1/4 OF SEC 3	1.43
20	3236-012-003	HEALY ENTERPRISES INC	FAIRMONT BEING A PART OF SW 1/4 OF SEC 3	3.98
21	3236-012-006	HEALY ENTERPRISES INC	LAND DES IN PAR 3C DOC 2850, 74-7-5 FAIR	2.60
22	3236-012-007	HEALY ENTERPRISES INC	FAIRMONT BEING A PART OF SW 1/4 OF SEC 3	1.60
23	3236-012-009	HEALY ENTERPRISES INC	LAND DES IN PAR 3C DOC 2850, 74-7-25 FAI	0.77
24	3236-012-010	HEALY ENTERPRISES INC	LAND DES IN PAR 3B DOC 2850, 74-7-25 FAI	1.09
25	3236-012-011	HEALY ENTERPRISES INC	FAIRMONT BEING A PART OF SW 1/4 OF SEC 3	1.89
26	3236-015-017	HEALY ENTERPRISES INC	THAT PART OF LOT 1 IN SE 1/4 OF NE 1/4 A	78.67
27	3236-016-001	HEALY ENTERPRISES INC	S 1/2 OF S 1/2 AND NE 1/4 OF SE 1/4 OF S	207.63
28	3236-017-003	SALAZAR ENRIQUE & MACLOVIA	80 ACS LOT 1 IN SW 1/4 OF SEC 6 T 7N R 1	83.48
29	3236-017-005	KAY SAUL H & RIMA S	THAT PART (EX OF ST) IN CONSOLIDATED FIR	17.15
30	3236-017-006	KAY SAUL H & RIMA S	THAT PART (EX OF ST) OUTSIDE CONSOLI- DA	64.77
31	3236-017-007	HEALY ENTERPRISES INC	SE 1/4 OF SEC 6 T7N R14W	164.61
32	3236-018-024	HEALY ENTERPRISES INC	*E 1/2 OF LOTS 1 AND 2 AND E 1/2 OF W 1/	149.28
33	3236-018-025	HEALY ENTERPRISES INC	*THAT POR IN CONSOLIDATED FIRE PRO DIST	11.06
34	3236-018-900	ANTELOPE VALLEY EAST KERN WATER AGENCY	*LAND DESC IN DOC 0000259, 76-3-22 *THAT	0.84
35	3236-018-901	ANTELOPE VALLEY EAST KERN WATER AGENCY	*LAND DESC IN DOC 0000259, 76-3-22 *THAT	0.51
36	3236-019-002	HEALY ENTERPRISES INC	FAIRMONT SUB OF SEC 1 T 7N R 15W AND SEC	77.29
37	3236-019-007	HEALY ENTERPRISES INC	LOT (EX OF ST) COM AT NW COR OF SEC 1 T	13.23
38	3236-019-010	HEALY ENTERPRISES INC	FAIRMONT SUB OF SEC 1 T 7N R 15W AND SEC	0.81
39	3236-019-013	HEALY ENTERPRISES INC	*TR=FAIRMONT SUB OF SEC 1 T 7N R 15W AND	151.47
40	3236-019-014	HEALY ENTERPRISES INC	*TR=FAIRMONT SUB OF SEC 1 T 7N R 15W AND	11.69
41	3236-019-015	HEALY ENTERPRISES INC	*TR=FAIRMONT SUB OF SEC 1 T 7N R 15W AND	49.45
42	3236-020-001	HEALY ENTERPRISES INC	LOT COM AT W1/4 COR OF SEC 1 T 7N R 15W	3.45
43	3236-020-002	HEALY ENTERPRISES INC	LOT COM AT INTERSECTION OF W LINE OF SEC	6.21
44	3236-020-008	HEALY ENTERPRISES INC	FAIRMONT, SUB OF SEC 1 T 7N R 15W AND SE	15.32
45	3236-020-013	HEALY ENTERPRISES INC	FAIRMONT SUB OF SEC 1 T 7N R 15W AND SEC	60.81
46	3236-020-018	HEALY ENTERPRISES INC	*TR=FAIRMONT SUB OF SEC 1 T 7N R 15W AND	111.93
47	3236-020-908	ANTELOPE VALLEY EAST KERN WATER AGENCY	*TR=FAIRMONT SUB OF SEC 1 T 7N R 15W AND	2.46
48	3236-021-004	LEONA VALLEY HUNTING CLUB	LOT COM AT SE COR OF SEC 12 T 7N R 15W T	120.46
49	3236-021-006	HEALY ENTERPRISES INC	*LOT COM N ON E LINE OF SEC 12 T 7N R 15	81.00
50	3236-022-022	BAYSHORE LLC	THAT PART IN S 1/2 OF LOT 1 IN NW 1/4 OF	40.24
51	3236-022-023	BLUE RIBBON ENTERPRISES LLC	SW 1/4 OF NE 1/4 OF SEC 7 T 7N R 14W	40.36
52	3236-022-024	TSE KING F	SE 1/4 OF NE 1/4 OF SEC 7 T 7N R 14W	41.28
53	3236-022-028	BAYSHORE LLC	T07N R14W Sec. 7 NW NE	0.00
54	3236-022-029	BAYSHORE LLC	T07N R14W Sec. 7 NE NE	0.00
55	3236-024-001	HEALY ENTERPRISES INC	160 ACS NW 1/4 OF SEC 8 T 7N R 14W	164.61
56	3236-024-002	MADAN S K & SHOBHANA	W 110 ACS OF SW 1/4 OF SEC 8 T 7N R 14W	111.40
57	3236-024-003	SIMIELE ANTHONY J	E 50 ACS OF SW 1/4 OF SEC 8 T 7N R 14W	50.47
58	3236-027-001	BAYSHORE LLC	P M 241-4-5 LOT 1	20.57
59	3236-027-002	BAYSHORE LLC	P M 241-4-5 LOT 2	20.54
60	3236-027-003	BAYSHORE LLC	P M 241-4-5 LOT 3	20.51
61	3236-027-007	BAYSHORE LLC	P M 241-4-5 LOT 7	20.36
62	3267-001-001	GENZ DEVELOPMENT INC	NW 1/4 OF NW 1/4 OF SEC 17 T 7N R 14W	39.58
63	3267-001-002	GENZ DEVELOPMENT INC	NE 1/4 OF NW 1/4 OF SEC 17 T 7N R 14W	39.60
64	3267-001-003	GENZ DEVELOPMENT INC	LOT COM AT NW COR OF SW 1/4 OF NW 1/4 OF	39.26
65	3267-001-004	GENZ DEVELOPMENT INC	40 ACS SE 1/4 OF NW 1/4 OF SEC 17 T 7N R	39.31
66	3267-001-005	GENZ DEVELOPMENT INC	W 1/2 OF NE 1/4 OF SEC 17 T 7N R 14W	79.95
67	3267-001-007	GENZ DEVELOPMENT INC	LOT COM AT CENTER OF SEC 17 T 7N R 14W T	46.06
68	3267-001-009	GENZ DEVELOPMENT INC	LOT (EX OF ST) COM AT CENTER OF SEC 17 T	72.54
				3708.05

PARCEL SUMMARY

FOOT NOTE 1: ACREAGE EXPRESSIONS ARE BASED ON ASSESSOR'S PARCEL NUMBER RECORD TABULATIONS AND ARE APPROXIMATE. FINAL ACREAGE EXPRESSIONS WILL BE FINALIZED AFTER FIELD VERIFIED PROPERTY BOUNDARIES ARE CONFIRMED.

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NO.	DESCRIPTION	DATE	BY

REVISIONS

REGISTERED PROFESSIONAL ENGINEER ANDREW JEFFERSON WILLRODT No.C49881 Exp. 09/30/12 CIVIL STATE OF CALIFORNIA

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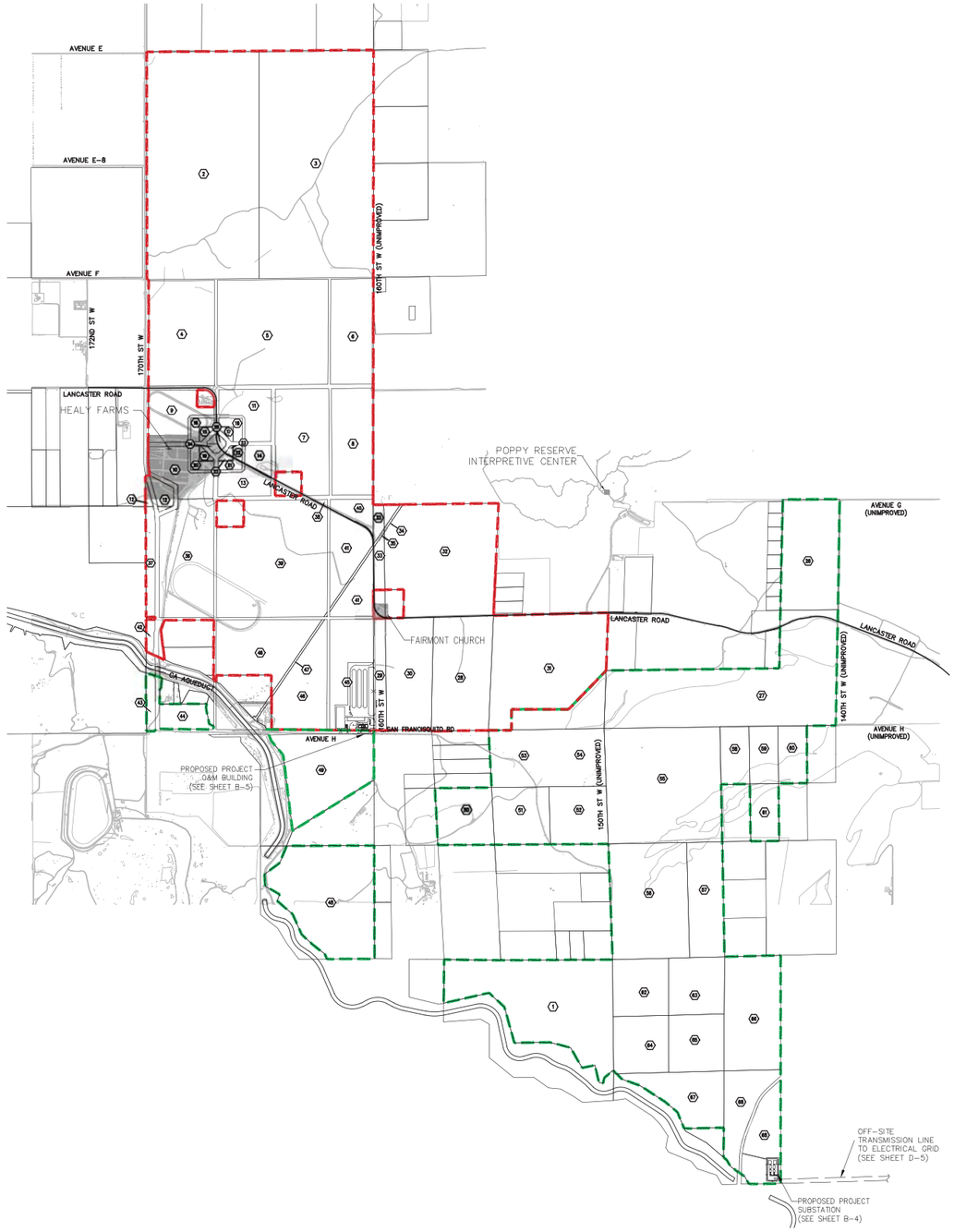
ANDREW J. WILLRODT, R.C.E. 49881 DATE:

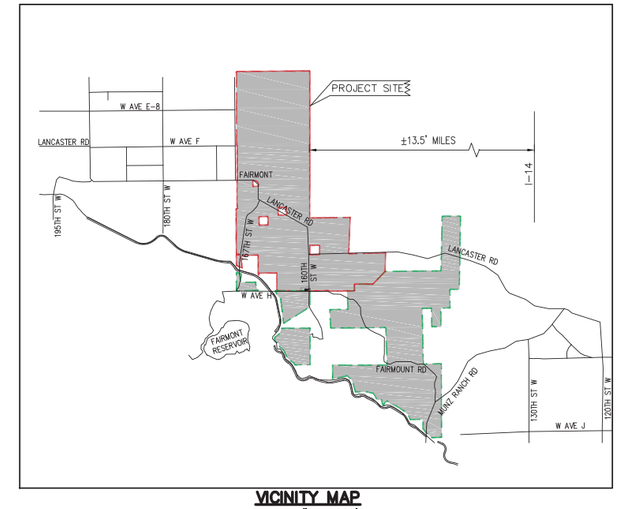
CUP APPLICATION PLAN
WILDFLOWER GREEN ENERGY FARM

DRAWN BY: JG
DESIGNED BY: JG
CHECKED BY: AW

PROJECT SUMMARY

SCALE:
DATE: 10/5/2011
SHT NO.: A-1





VICINITY MAP
SCALE 1" = 5000'
(FOR SPECIFIC APNs REFER TO SHEET A-1)

LEGEND:

- PROJECT BOUNDARY (NORTHERN ENERGY FARM - WIND & SOLAR SYSTEM); 2,116 ACRES
- PROJECT BOUNDARY (SOUTHERN ENERGY FARM - WIND ONLY SYSTEM); 1,592 ACRES
- PROJECT PARCEL BOUNDARIES
- (#) PARCEL # - SEE PARCEL SUMMARY TABLE ON SHEET A-1

N

1500 0 1500 3000
scale 1"= 1500' feet

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NO.	DESCRIPTION	DATE	BY

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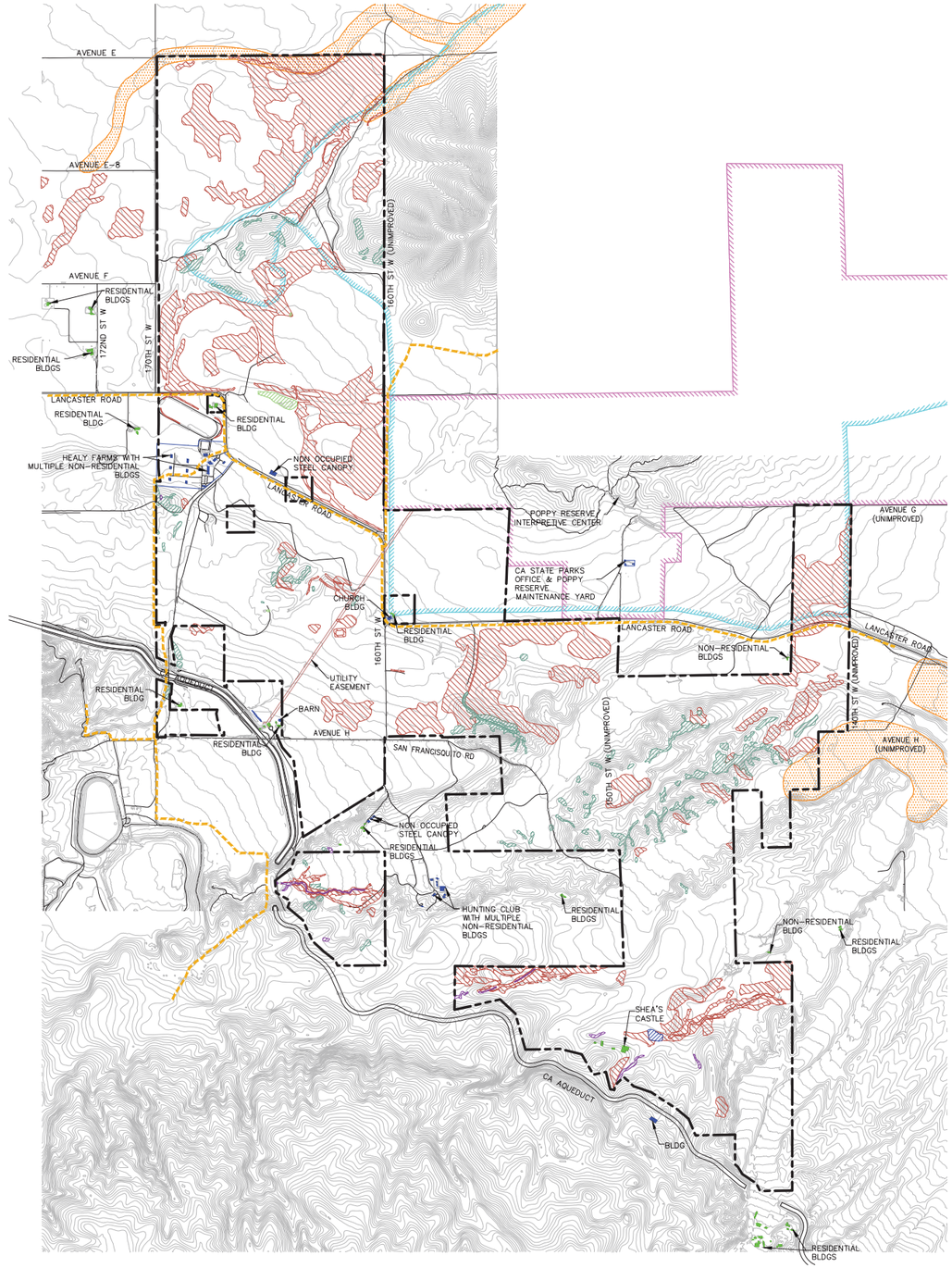
ANDREW J. WILLRODT, R.C.E. 49881 DATE:

CUP APPLICATION PLAN
WILDFLOWER GREEN ENERGY FARM

DRAWN BY: JG
DESIGNED BY: JG
CHECKED BY: AW

PROJECT BOUNDARY

SCALE: 1"=1500'
DATE: 10/5/2011
SHT NO.: A-2



LEGEND:

- FLOOD HAZARD LIMITS (PER FEMA)
- FAIRMONT-ANTELOPE BUTTES SEA LIMITS
- POPPY RESERVE BOUNDARY
- UTILITY EASEMENT LIMIT
- VERNAL POOL
- OPEN WATER
- PERENNIAL GRASSLAND
- RIPARIAN WOODLAND AND SCRUB
- LOS ANGELES COUNTY MASTER PLANNED TRAILS
- WILDFLOWER GREEN ENERGY FARM PROJECT BOUNDARY
- EXISTING NON-RESIDENTIAL BUILDING LIMITS
- EXISTING RESIDENTIAL BUILDING LIMITS
- NATIVE ANNUAL FORBLAND

N

GRAPHIC SCALE 1"=1500'

0 750 1500 3000

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NO.	DESCRIPTION	DATE	BY

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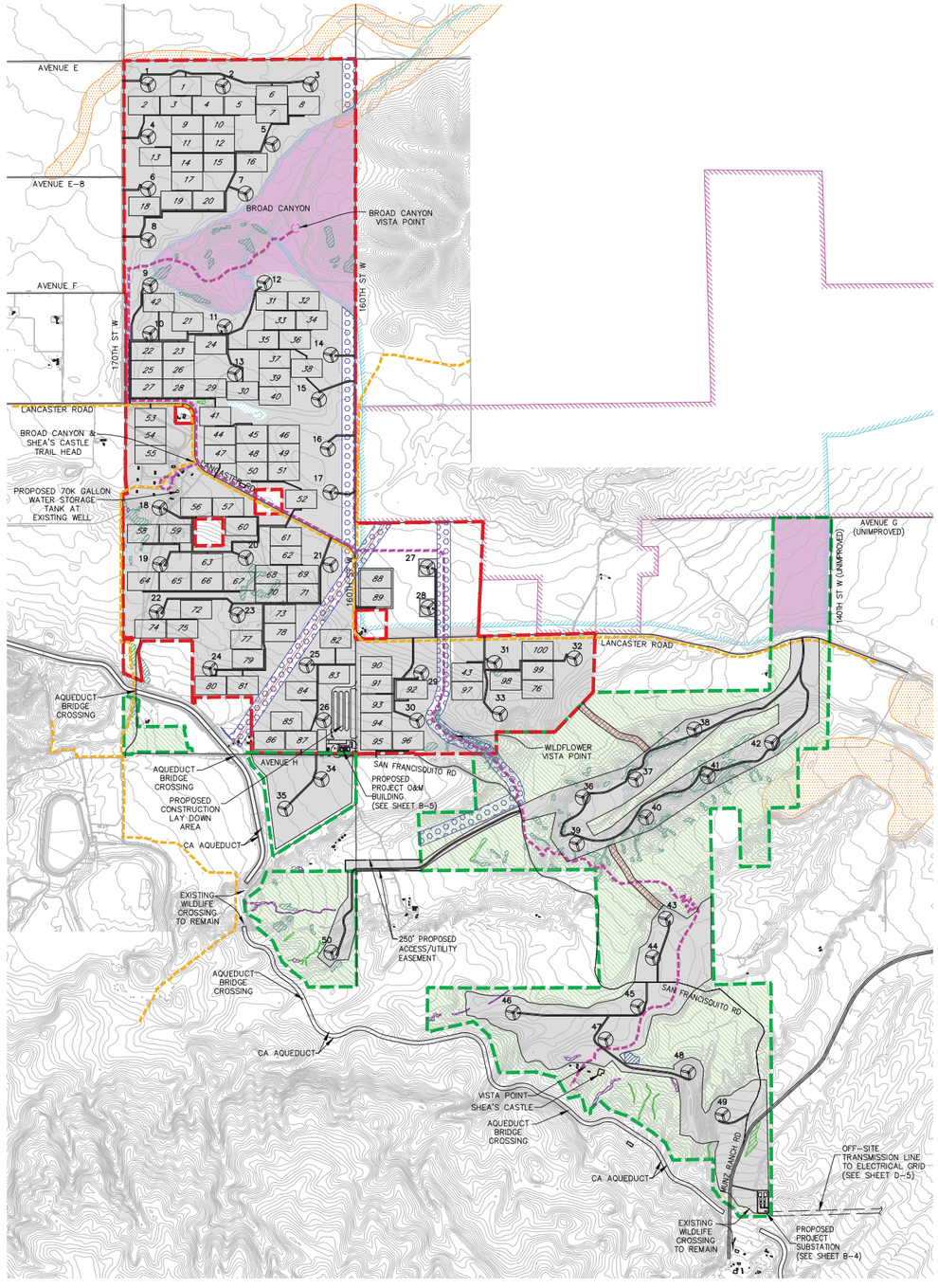
CUP APPLICATION PLAN

WILDFLOWER GREEN ENERGY FARM

DRAWN BY: JG
DESIGNED BY: JG
CHECKED BY: AW

PROJECT SITE CHARACTERISTICS

SCALE: AS SHOWN
DATE: 10/5/2011
SHT NO.: A-3



WIND TURBINE - PROPOSED SETBACK CRITERION

ZONING METRIC	"WILDFLOWER" RECOMMENDED VALUE
MAX. STRUCTURE OVERALL HEIGHT (OAH)	500 FEET
MAX. ACCOUSTICAL/NOISE LEVEL OFF-SITE	55 DBA
ON-SITE STRUCTURE SETBACK	BLADE LENGTH
NON-PARTICIPATING PROPERTY LINE SETBACK	400 FEET
NON-PARTICIPATING RESIDENCE SETBACK	1320 FEET
PUBLIC STREET/HIGHWAY SETBACK	1.0 x OAH
PUBLIC ACCESS/UTILITY EASEMENT SETBACK	ROTOR BLADE LENGTH
PUBLIC TRAIL/PEDESTRIAN EASEMENT SETBACK	ROTOR BLADE LENGTH

PV SOLAR - PROPOSED SETBACK CRITERION

ZONING METRIC	"WILDFLOWER" RECOMMENDED VALUE
MAX. STRUCTURE OVERALL HEIGHT (OAH)	15 FEET
MAX. ACCOUSTICAL/NOISE LEVEL OFF-SITE	55 DBA @ PL
ON-SITE STRUCTURE SETBACK	50 FEET
NON-PARTICIPATING PROPERTY LINE SETBACK	50 FEET
NON-PARTICIPATING RESIDENCE SETBACK	50 FEET
PUBLIC STREET/HIGHWAY SETBACK	50 FEET
PUBLIC ACCESS/UTILITY EASEMENT SETBACK	50 FEET
TRAIL/PEDESTRIAN EASEMENT SETBACK	50 FEET

PV SOLAR: 1.0 MW BLOCK - 100 BLOCKS (100 MW)
WIND TURBINE: 3.0 MW UNIT - 50 UNITS (150 MW)

SITE PLAN INFORMATION

	NORTHERN ENERGY FARM	SOUTHERN ENERGY FARM
GROSS DEVELOPMENT AREA	1725 AC	625 AC
TOTAL CONSTRUCTION DISTURBANCE AREA	870 AC	100 AC
EARTHWORK (CUT)	1,600,000 CY	450,000 CY
EARTHWORK (FILL)	1,600,000 CY	450,000 CY
EARTHWORK (NET/IMPORT)	0 CY	0 CY
TOTAL PERMANENT DISTURBANCE AREA	780 AC	60 AC

LEGEND:

- DEVELOPMENT AREA
- SUBSURFACE COLLECTION SYSTEM CORRIDOR (12.8 ACRES)
- CONSERVATION AREA (342 ACRES)
- WILDLIFE / HABITAT MANAGEMENT AREA (1000 ACRES)
- 300-FOOT WILDLIFE CORRIDOR
- PROJECT BOUNDARY (NORTHERN ENERGY FARM - WIND & SOLAR SYSTEM) (W/FENCE)
- PROJECT BOUDNARY (SOUTHERN ENERGY FARM - WIND ONLY SYSTEM) (W/O FENCE)
- FLOOD HAZARD LIMITS (PER FEMA)
- FAIRMONT-ANTELOPE BUTTES SEA LIMITS (475.8-ACRES ON-SITE) (26.3-ACRES ~5.5%~ DISTURBED)
- POPPY RESERVE BOUNDARY
- UTILITY EASEMENT LIMIT
- VERNAL POOL
- OPEN WATER
- PERENNIAL FORBLAND
- PERENNIAL GRASSLAND
- RIPARIAN WOODLAND AND SCRUB
- WIND TURBINE GENERATING SYSTEM (APPROXIMATE LOCATION)
- SOLAR PANEL ARRAY BLOCK-SINGLE AXIS TRACKING (APPROXIMATE LOCATION)
- 20-FooT WIDE PEDESTRIAN/EQUESTRIAN TRAIL (6.7 MILES ±)
- LOS ANGELES COUNTY MASTER PLANNED TRAILS

elementpower

NO.	DESCRIPTION	DATE	BY

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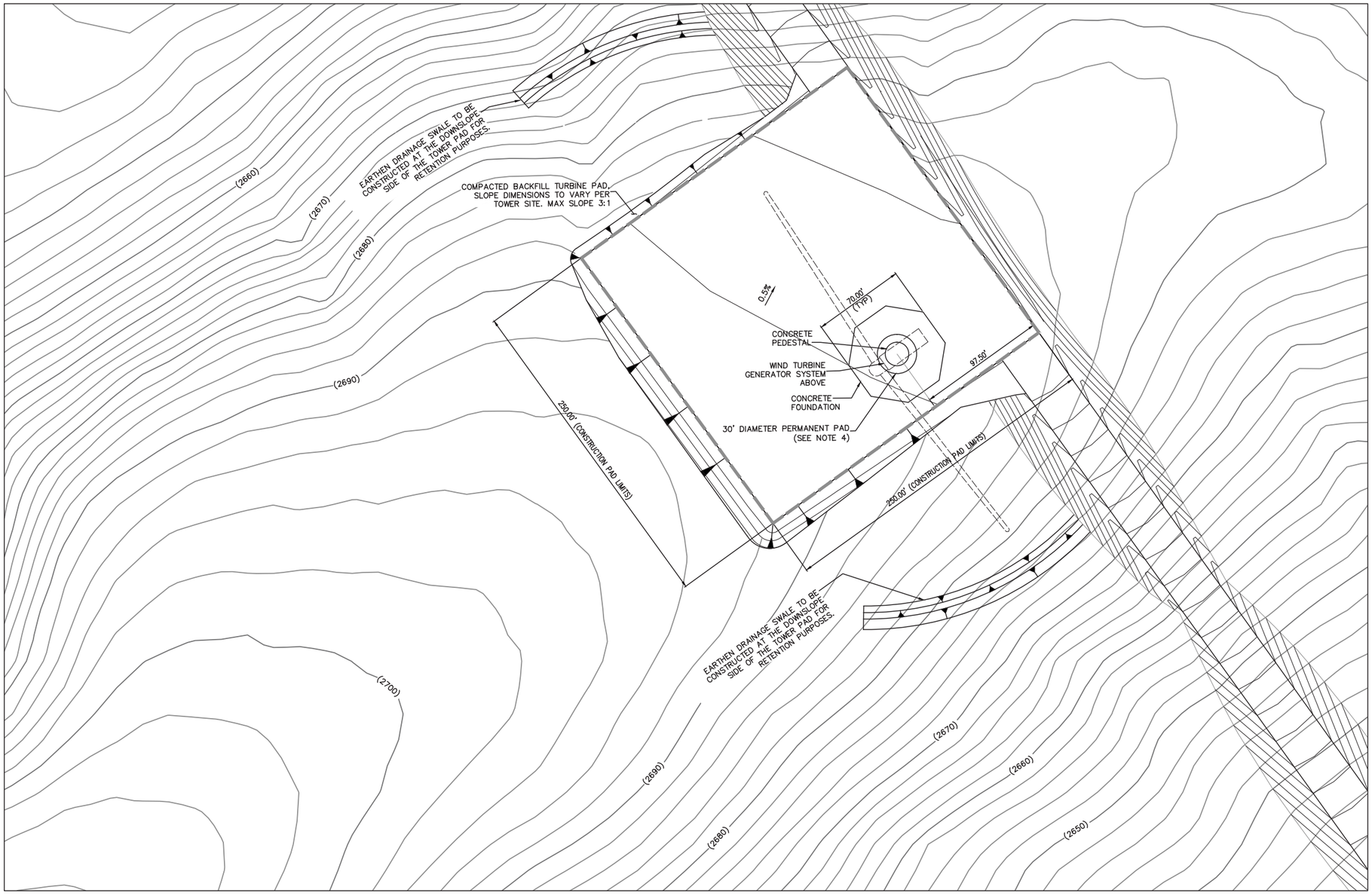
CUP APPLICATION PLAN
WILDFLOWER GREEN ENERGY FARM

DRAWN BY: JG
DESIGNED BY: JG
CHECKED BY: AW

COMBINED SOLAR & WIND TURBINE SITE PLAN

SCALE: AS SHOWN
DATE: 10/5/2011
SHT NO.: B-1



TYPICAL WIND TURBINE CRANE PAD AND FOUNDATION LAYOUT

SCALE: 1" = 40'

NOTES:

1. PRIVATE VEHICLE ACCESS ROADS ARE TO BE INSTALLED FOR DELIVERY, CONSTRUCTION AND ASSEMBLY OF WIND TURBINE GENERATOR SYSTEM (WTGS).
2. TOWER SECTION INTERFACE SHALL BE BOLTED TO FOUNDATION AND WTGS. ALL MATERIALS AND CONSTRUCTION MATERIALS SHALL BE AS NOTED ON WTGS MANUFACTURES SPECIFICATIONS.
3. BACKFILLED GRADED PAD SHALL HAVE A SURFACE SLOPE NO GREATER THAN 0.5%.
4. PERMANENT PAD WILL CONSIST OF 30' DIAMETER YARD AREA COVERED WITH STONE AGGREGATE ALL WEATHER SURFACE.

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www.fuscoe.com
ANDREW J. WILLRODT, R.C.E. 49881 DATE:

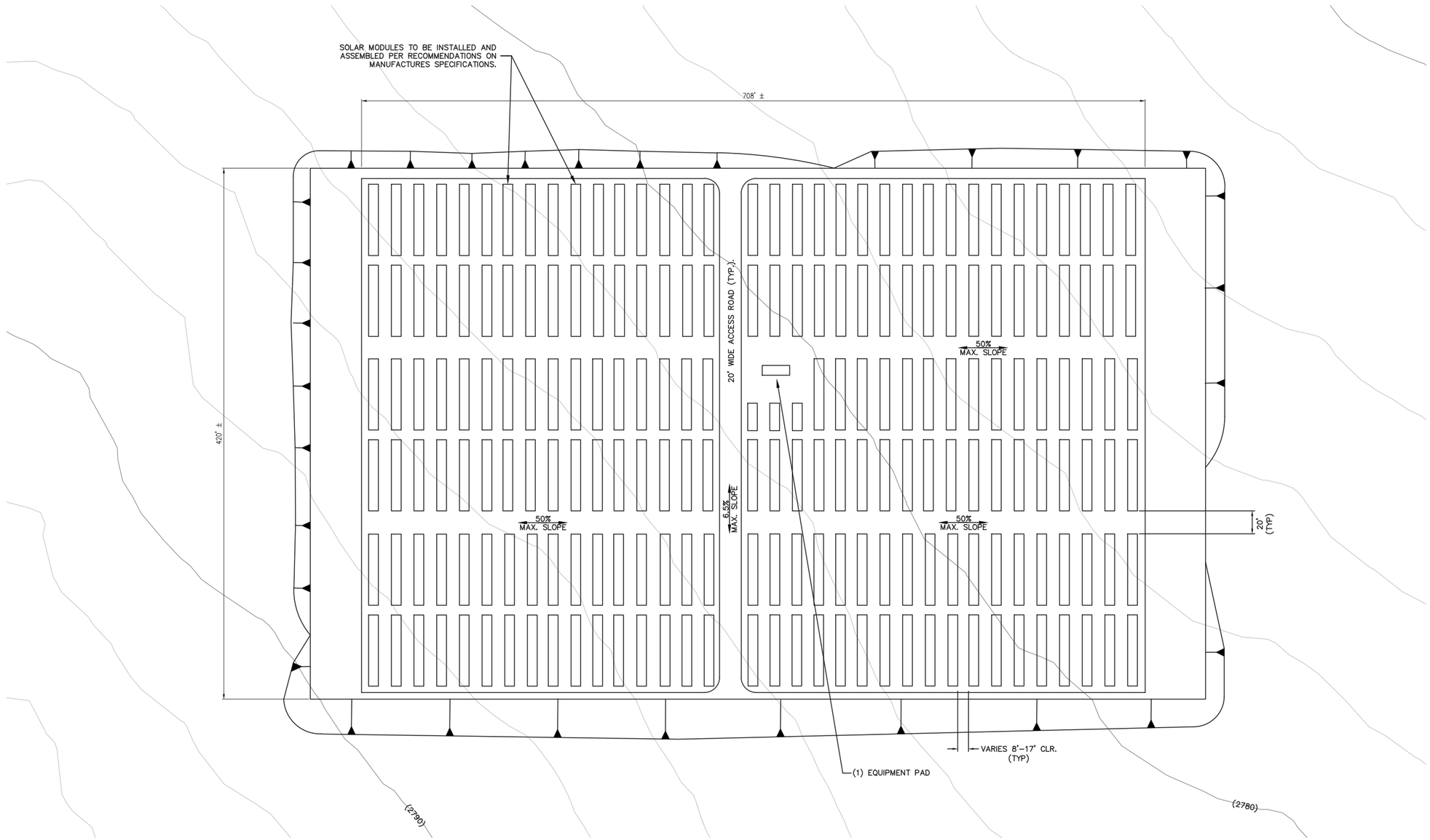
CUP APPLICATION PLAN

WILDFLOWER GREEN ENERGY FARM

DRAWN BY: JG
DESIGNED BY: JG
CHECKED BY: AW

WIND TURBINE
TYPICAL LAYOUT PLAN

SCALE: 1"=40'
DATE: 10/5/2011
SHT NO.: B-2



TYPICAL SOLAR ARRAY LAYOUT
SCALE: N.T.S.

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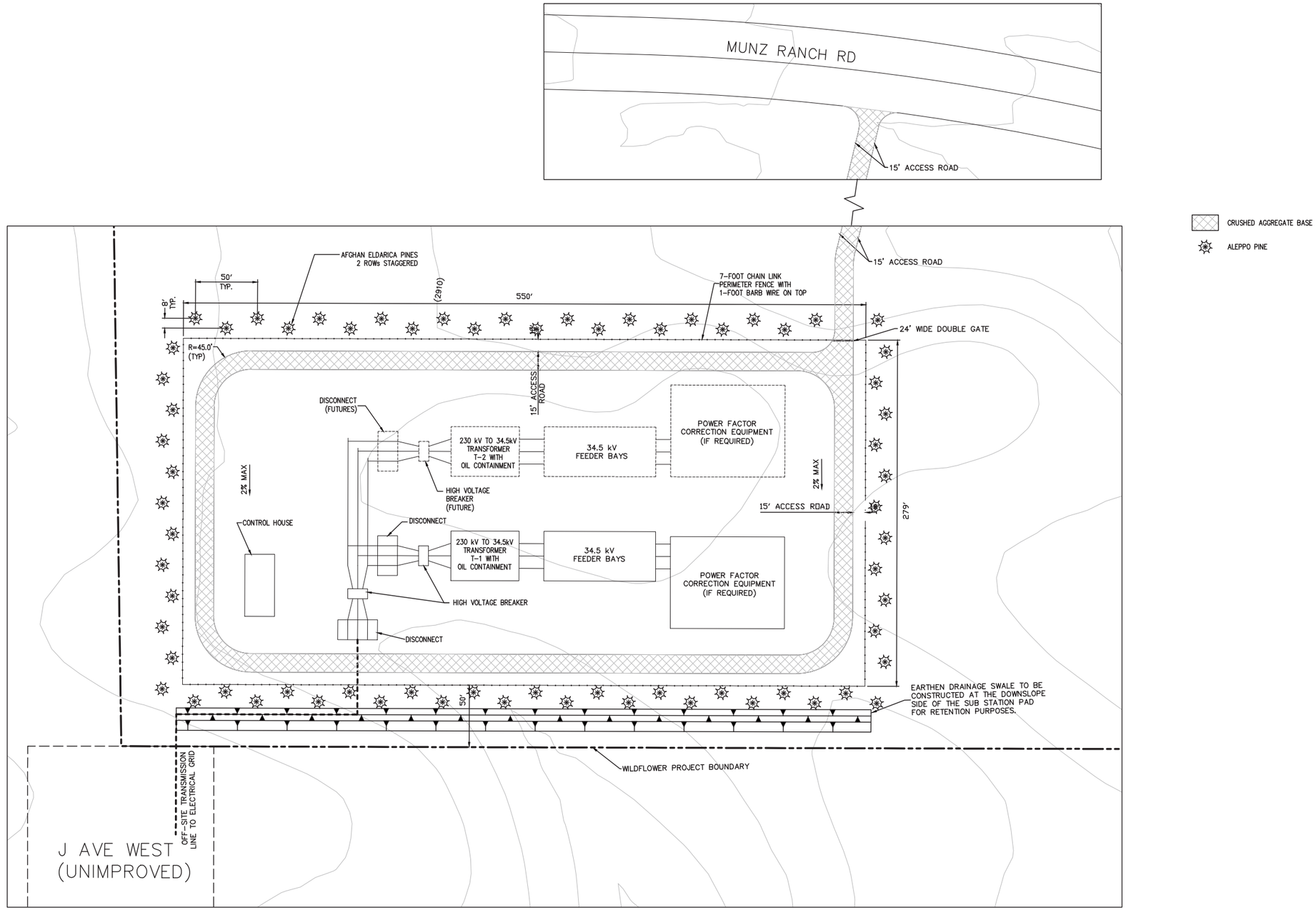
CUP APPLICATION PLAN
WILDFLOWER GREEN ENERGY FARM

SOLAR ARRAY
TYPICAL LAYOUT PLAN

DRAWN BY: JG
DESIGNED BY: JG
CHECKED BY: AW
SCALE: AS SHOWN
DATE: 10/5/2011
SHT NO.: B-3



SUBSTATION LAYOUT
SCALE: 1"= 40'

40 0 40 80
scale 1"= 40' feet

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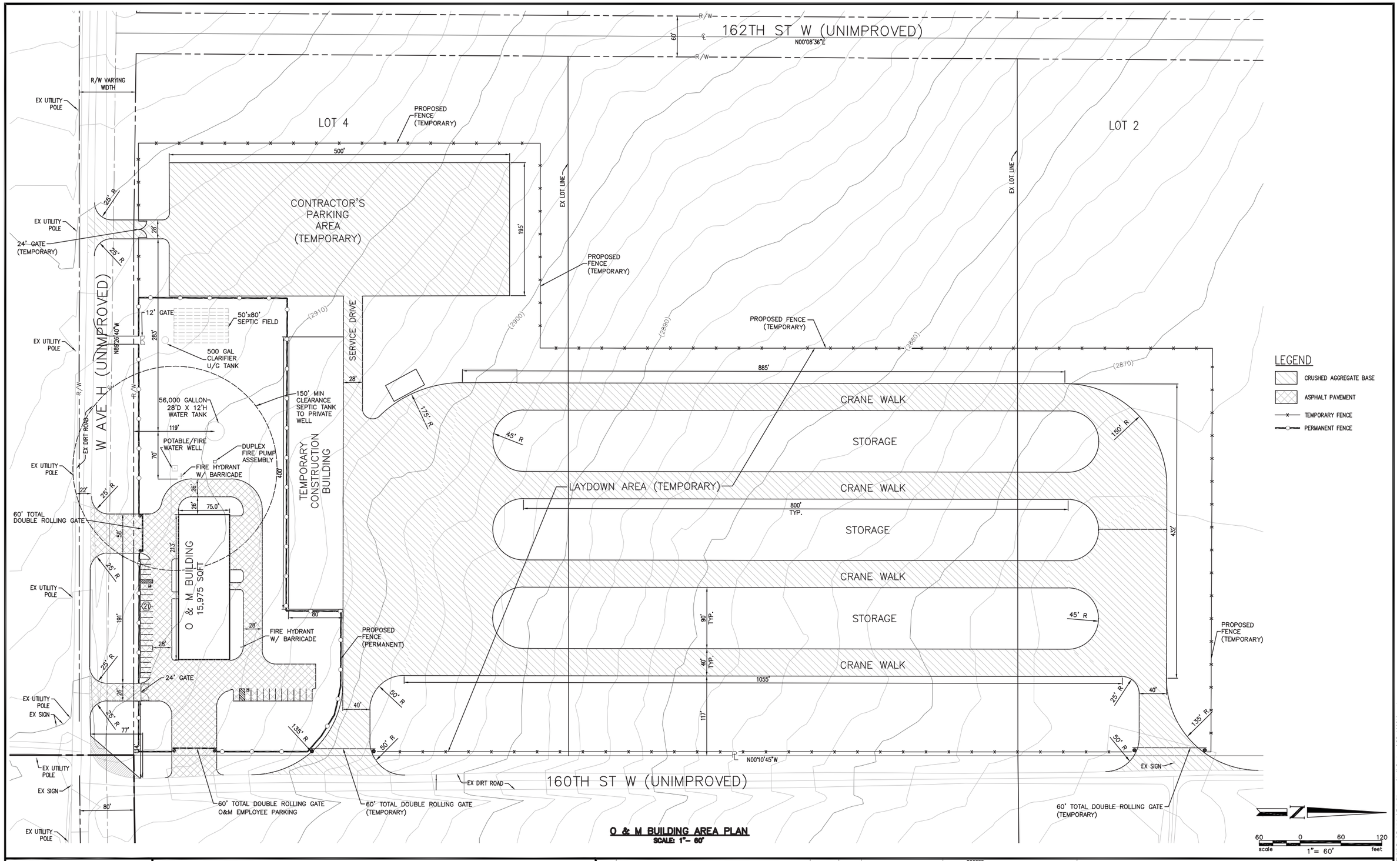
CUP APPLICATION PLAN
WILDFLOWER GREEN ENERGY FARM

DRAWN BY: JG
DESIGNED BY: JG
CHECKED BY: AW

PROJECT SUBSTATION LAYOUT

SCALE: AS SHOWN
DATE: 10/5/2011
SHT NO.: B-4



O & M BUILDING AREA PLAN
SCALE: 1"= 60'

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CRUSHED AGGREGATE

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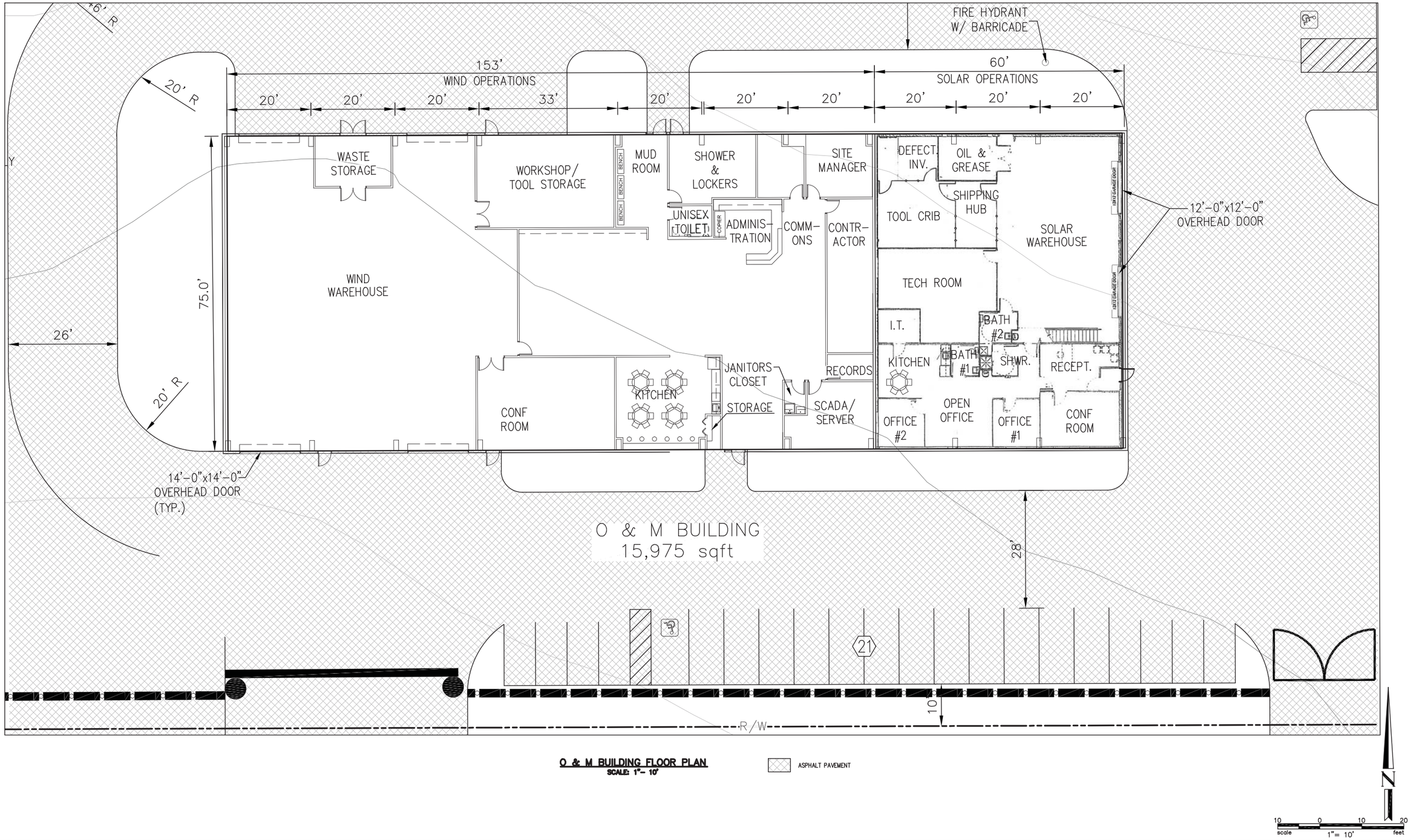
CUP APPLICATION PLAN
WILDFLOWER GREEN ENERGY FARM

DRAWN BY: JG
DESIGNED BY: JG
CHECKED BY: AW

OPERATIONS AND MAINTANENCE BUILDING AREA PLAN

SCALE: 1"=60'
DATE: 10/5/2011
SHT NO.: B-5



O & M BUILDING FLOOR PLAN
SCALE: 1"= 10'

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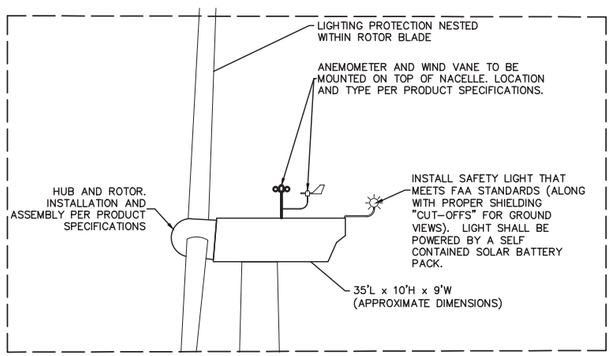
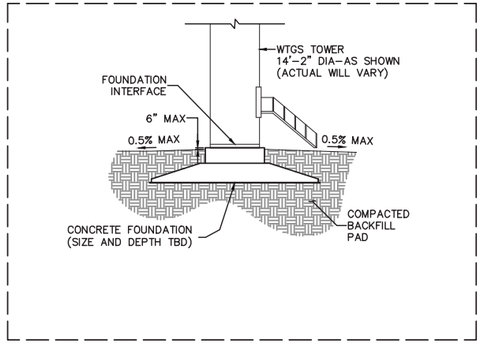
DRAWN BY: JG
DESIGNED BY: JG
CHECKED BY: AW

OPERATIONS AND MAINTENANCE
BUILDING FLOOR PLAN

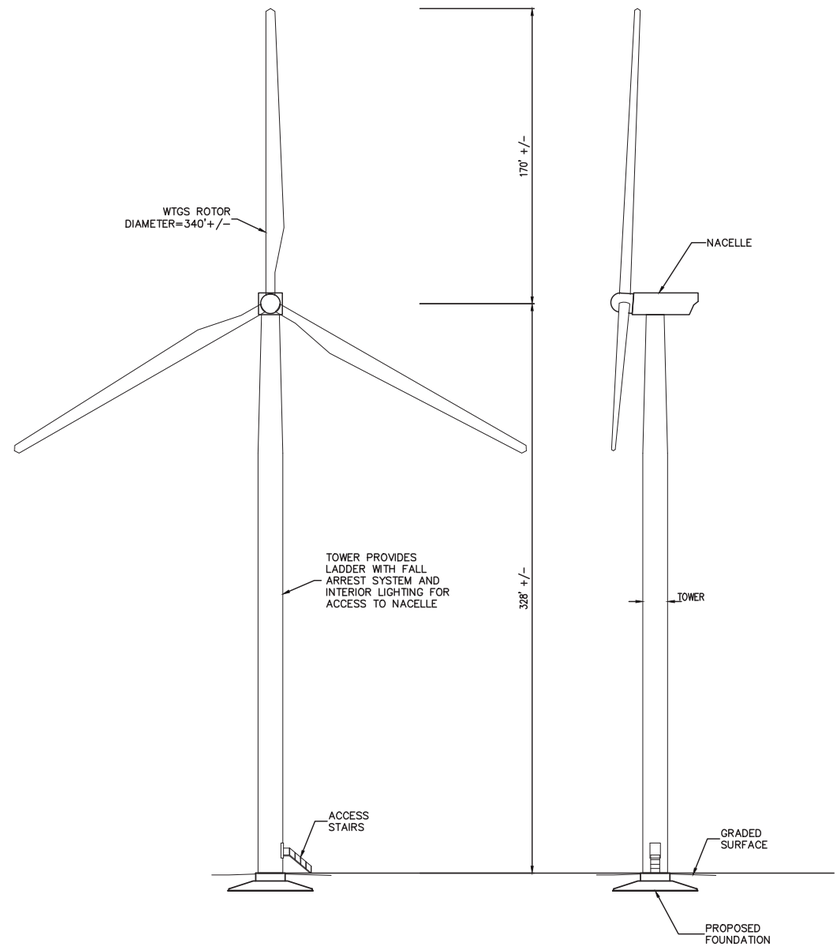
SCALE: AS SHOWN
DATE: 10/5/2011
SHT NO.: C-1



NACELLE EQUIPMENT DETAIL
SCALE: 1" = 20'



TYPICAL FOUNDATION DETAIL
SCALE: 1" = 20'



EXAMPLE 2.3-3.4 MW WIND TURBINE TYPE (SHOWN 3.0 MW)
SCALE: 1" = 40'

NOTES:

1. PRIVATE VEHICLE ACCESS ROADS ARE TO BE INSTALLED FOR DELIVERY, CONSTRUCTION AND ASSEMBLY OF WIND TURBINE GENERATOR SYSTEM (WTGS).
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3. BACKFILLED GRADED PAD SHALL HAVE A SURFACE SLOPE NO GREATER THAN 0.5%.
4. PERMANENT PAD WILL CONSIST OF 30' DIAMETER YARD AREA COVERED WITH STONE AGGREGATE ALL WEATHER SURFACE.

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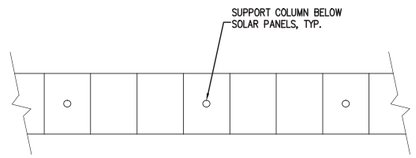
WILDFLOWER GREEN ENERGY FARM

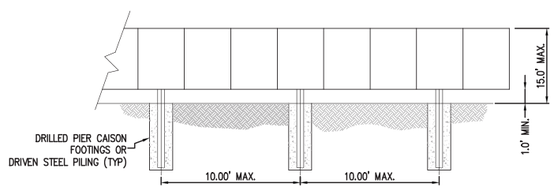
DRAWN BY: JG
DESIGNED BY: JG
CHECKED BY: AW

WIND TURBINE
EXAMPLE ELEVATION PLAN

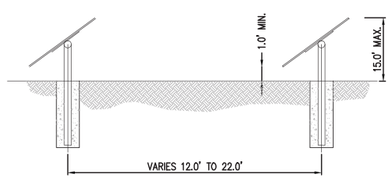
SCALE: AS SHOWN
DATE: 10/5/2011
SHT NO.: D-1



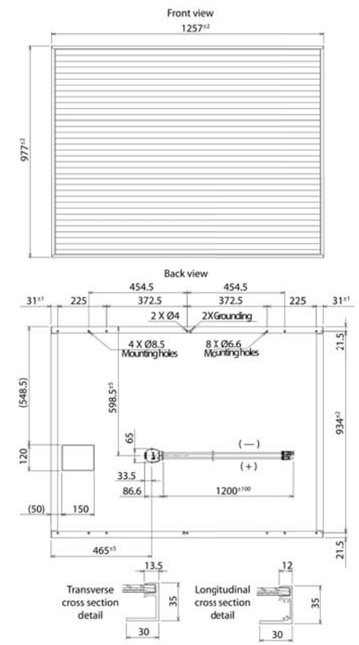
TOP VIEW
SCALE: NOT TO SCALE



FRONT VIEW ELEVATION
SCALE: NOT TO SCALE



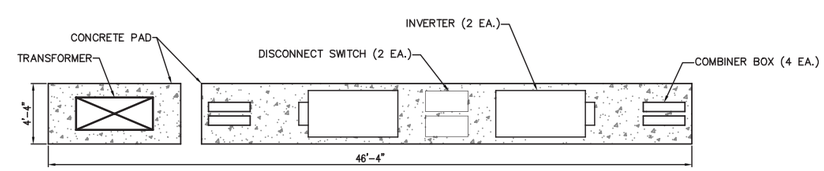
EXAMPLE SINGLE AXIS TRACKING
SCALE: NOT TO SCALE



SOLAR FRONTIER SF-150L
(ACTUAL MODEL MAY VARY)
SCALE: NOT TO SCALE

Mechanical Characteristics	
Dimensions (L x W x H)	1,257 x 977 x 35 mm (49.5 x 38.5 x 1.4 in.)
Weight	20 kg (44.1 lbs)
Application class (IEC 61730)	A
Fire rating (IEC 61730)	Class C
Safety class (IEC 61140)	II
Snow/wind load*	2,400 Pa (IEC 61646) / 1,600 Pa design load (UL 1703)
Cell type	CIS glass substrate (cadmium free)
Front cover	Clear tempered glass, 3.2 mm
Encapsulant	EVA
Back sheet	Weatherproof plastic film (color: black & silver)
Frame	Anodized aluminum alloy (color: black)
Edge sealant	Butyl rubber
Junction box	Protection rating: IP 67 (with bypass diode)
Adhesive	Silicone
Output cables (conductor)	2.5 mm² /14 AWG (halogen free)
Cable lengths (symmetrical)	1,200 mm (47.2 in.)
Connectors	MC 4 compatible
Packing information	25 panels/pallet • 36 pallets/40' container (900 panels)

* UL: 1.5 x design load is applied to the module, i.e. 2,400 Pa (50.1 lbs/ft²) is applied to meet the 1,600 Pa UL design load standard.



TYPICAL INVERTER/ TRANSFORMER PAD-TYPICAL
SCALE: 1" = 5'

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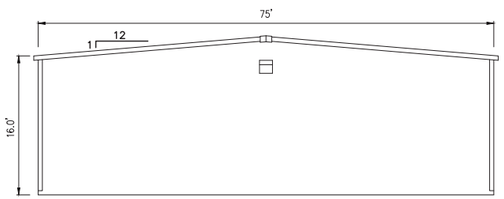
ANDREW J. WILLRODT, R.C.E. 49881 DATE:

CUP APPLICATION PLAN
WILDFLOWER GREEN ENERGY FARM

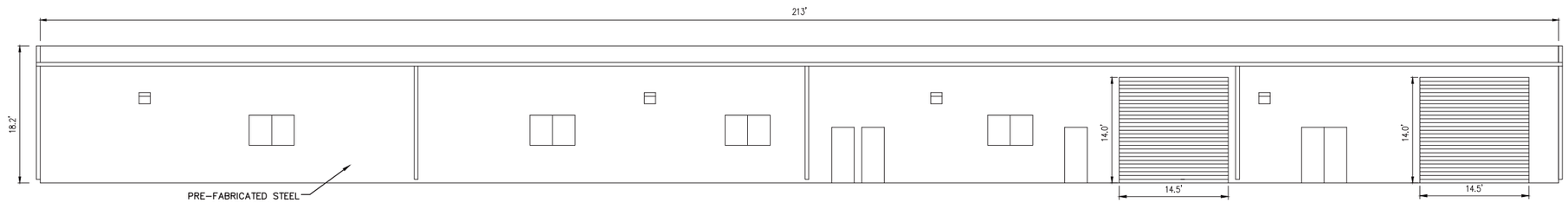
DRAWN BY: JG
DESIGNED BY: JG
CHECKED BY: AW

SOLAR ARRAY
EXAMPLE ELEVATION PLAN

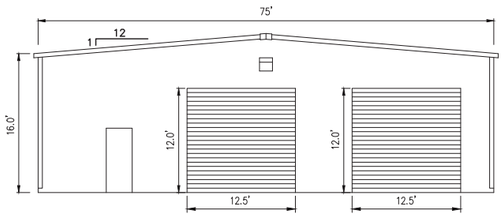
SCALE: AS SHOWN
DATE: 10/5/2011
SHT NO.: D-2



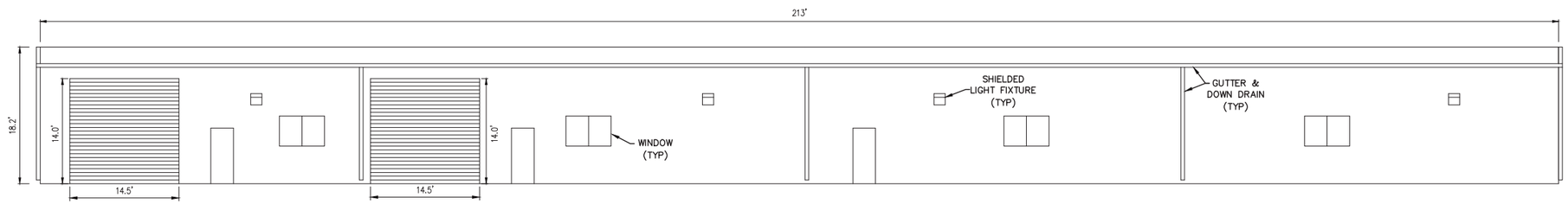
WEST ELEVATION
NTS



NORTH ELEVATION
NTS



EAST ELEVATION
NTS



SOUTH ELEVATION
NTS

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NO.	DESCRIPTION	DATE	BY

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No.C49881
Exp. 09/30/12
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ANDREW J. WILLRODT, R.C.E. 49881 DATE:

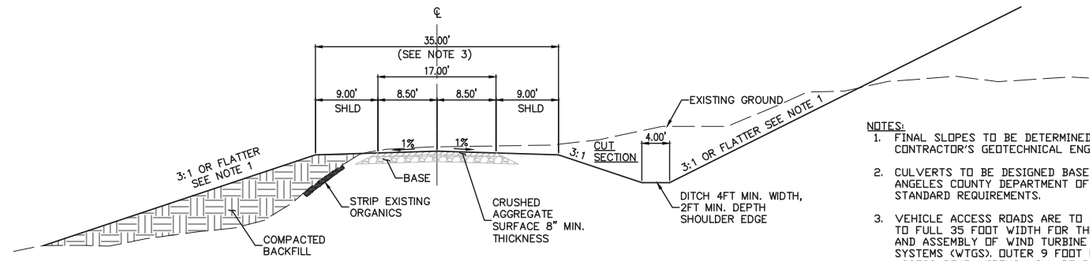
CUP APPLICATION PLAN

WILDFLOWER GREEN ENERGY FARM

DRAWN BY: JG
DESIGNED BY: JG
CHECKED BY: AW

OPERATIONS & MAINTENANCE
BUILDING ELEVATIONS

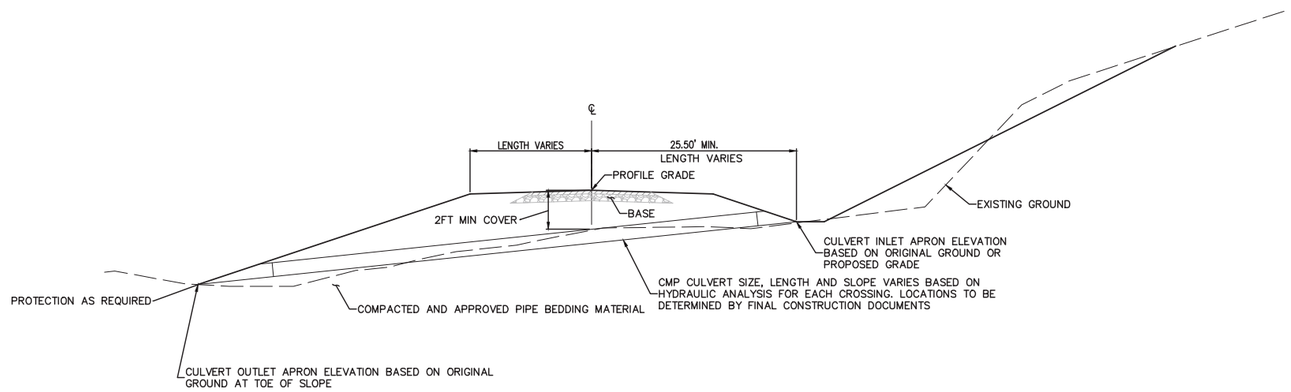
SCALE: AS SHOWN
DATE: 10/5/2011
SHT NO.: D-3



NOTES:

1. FINAL SLOPES TO BE DETERMINED BY CONTRACTOR'S GEOTECHNICAL ENGINEER.
2. CULVERTS TO BE DESIGNED BASED ON LOS ANGELES COUNTY DEPARTMENT OF PUBLIC WORKS STANDARD REQUIREMENTS.
3. VEHICLE ACCESS ROADS ARE TO BE INSTALLED TO FULL 35 FOOT WIDTH FOR THE CONSTRUCTION AND ASSEMBLY OF WIND TURBINE GENERATOR SYSTEMS (WTGS). OUTER 9 FOOT OF 35 FOOT ACCESS ROAD WIDTHS WILL BE REVEGITATED LEAVING 17 FOOT PERMANENT ROAD WIDTH TO REMAIN AND BE USED SOLELY WITHIN PRIVATE PROPERTY.

TYPICAL 35 FOOT ACCESS ROAD SECTION
SCALE: 1" = 5'



TYPICAL DRAINAGE CULVERT PLACEMENT
SCALE: 1" = 5'

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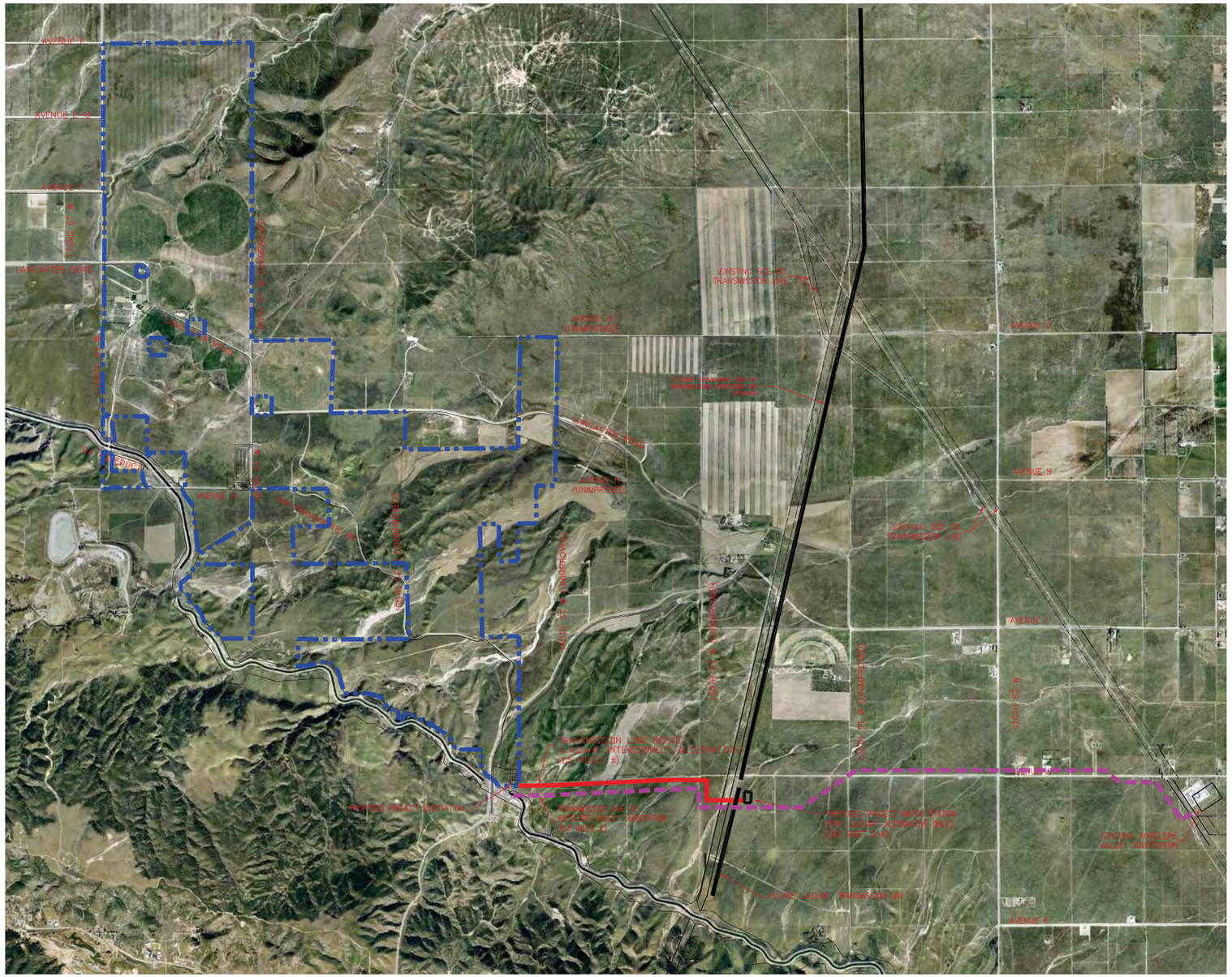
CUP APPLICATION PLAN
WILDFLOWER GREEN ENERGY FARM

DRAWN BY: JG
DESIGNED BY: JG
CHECKED BY: AW

ACCESS ROAD TYPICAL DETAILS

SCALE: 1"=5'
DATE: 10/5/2011
SHT NO.: D-4

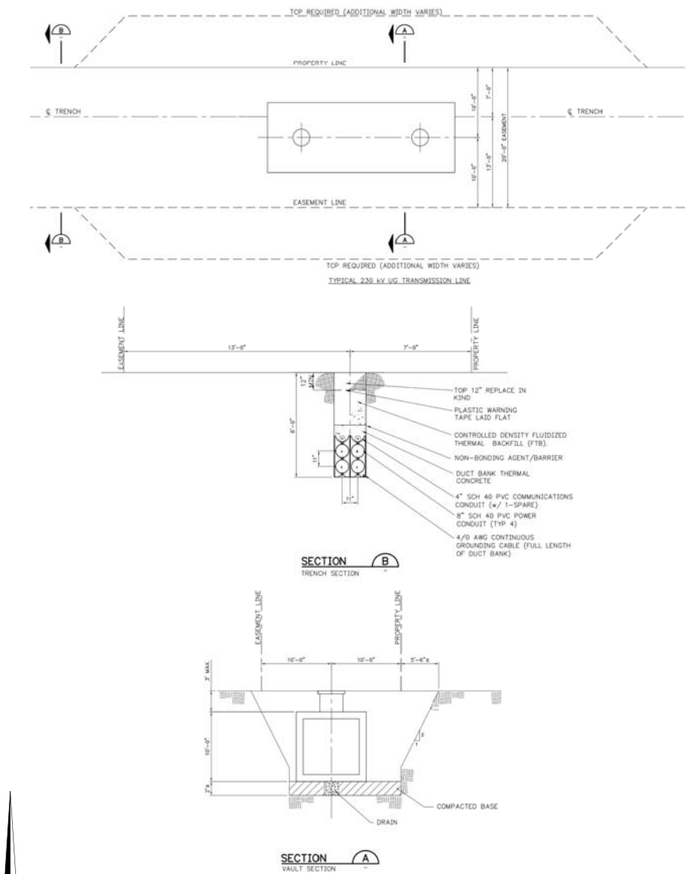


LEGEND:

- WILDFLOWER GREEN ENERGY FARM PROJECT BOUNDARY
- 4.8 MILE TRANSMISSION LINE ROUTE (S.C.E. INTERCONNECT)
- 1.5 MILE TRANSMISSION LINE ROUTE (L.A.D.W.P. INTERCONNECT ALTERNATIVE)
- FUTURE TEHACHAPI 230 KV TRANSMISSION CORRIDOR (BY OTHERS)

S.C.E. OPTION - EARTHWORK QUANTITIES:
CUT: 27,300 CY
FILL: 17,900 CY
NET EXPORT: 9,400 CY (BACK TO PROJECT SITE)

L.A.D.W.P. OPTION - EARTHWORK QUANTITIES:
CUT: 8,500 CY
FILL: 5,500 CY
NET EXPORT: 3,000 CY (BACK TO PROJECT SITE)



TYPICAL U/G 230 kV LAYOUT
NTS

2000 0 2000 4000
scale 1" = 2000' feet

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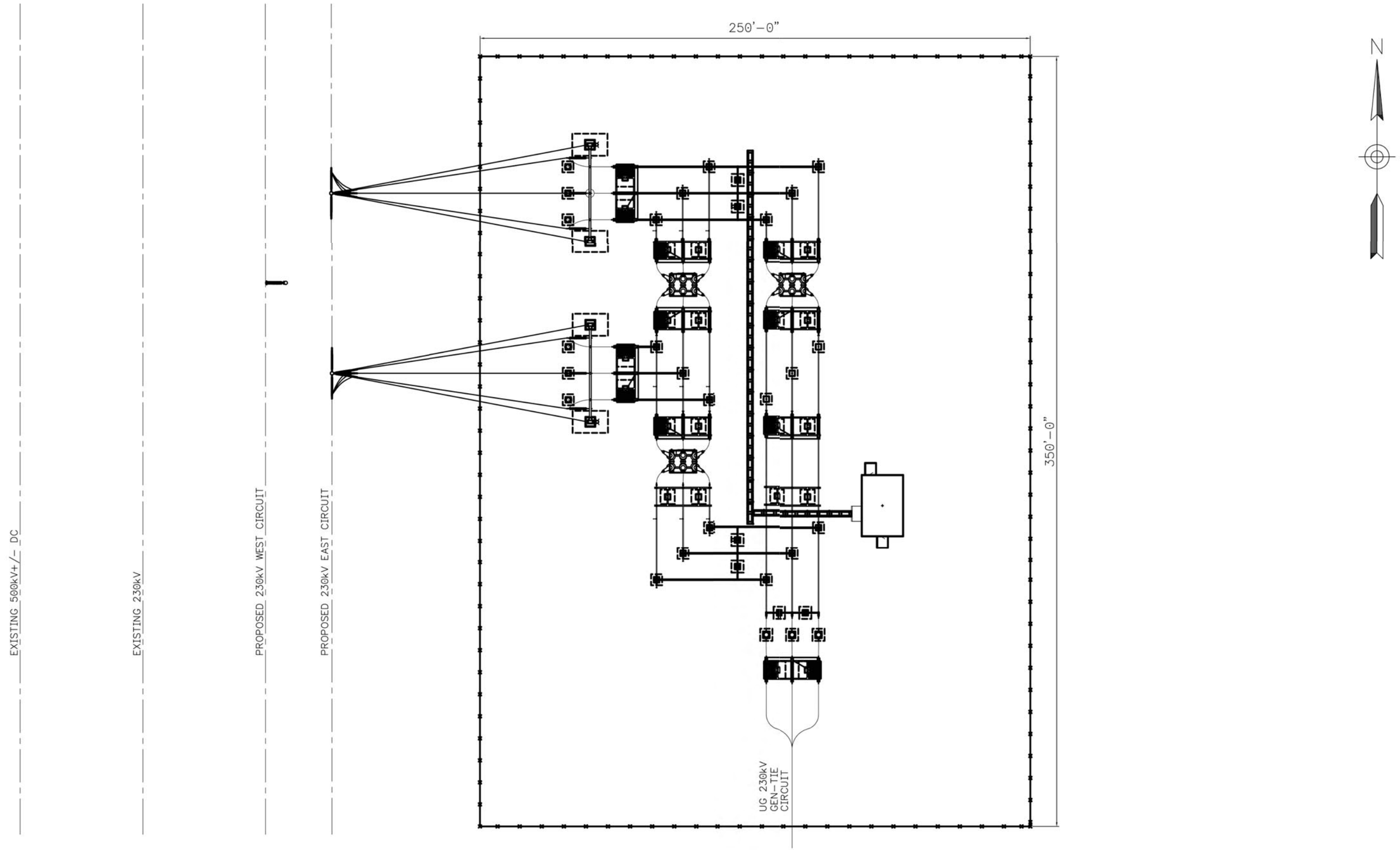
CUP APPLICATION PLAN
WILDFLOWER GREEN ENERGY FARM

DRAWN BY: JG
DESIGNED BY: JG
CHECKED BY: AW

OFF-SITE TRANSMISSION LINE PLAN & U/G DUCT BANK FACILITIES

SCALE: 1"=2000'
DATE: 10/5/2011
SHT NO.: D-5



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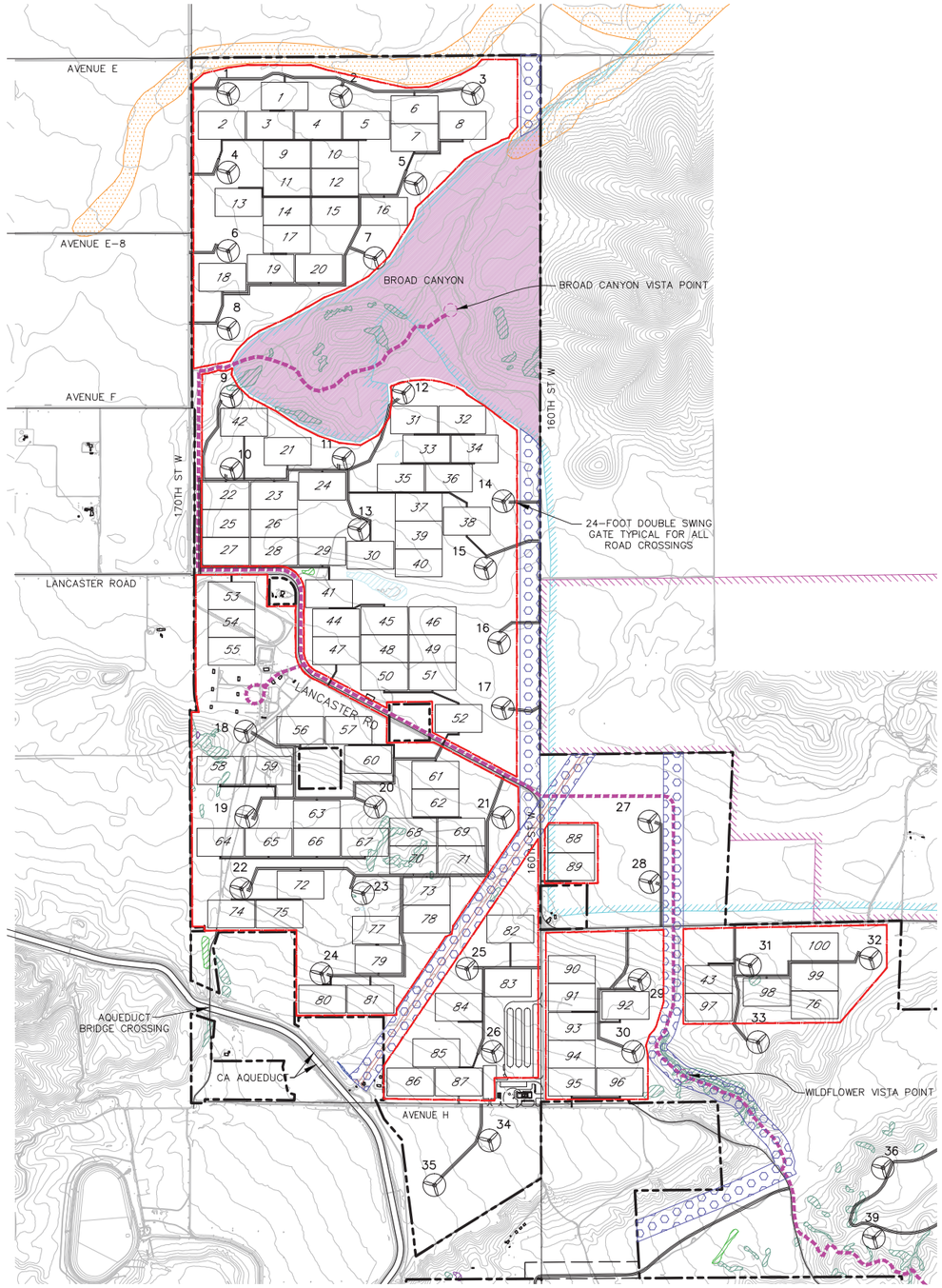
ANDREW J. WILLRODT, R.C.E. 49881 DATE:

CUP APPLICATION PLAN

WILDFLOWER GREEN ENERGY FARM

SWITCH STATION DETAIL PLAN

DRAWN BY:	JG
DESIGNED BY:	JG
CHECKED BY:	AW
SCALE:	1"=20'
DATE:	10/5/2011
SHT NO.:	D-6

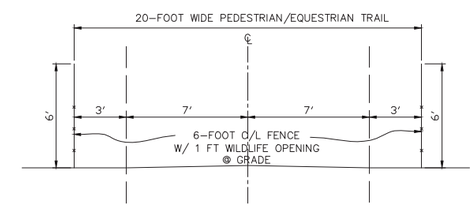


PARTIAL SITE PLAN - NORTHERN ENERGY FARM

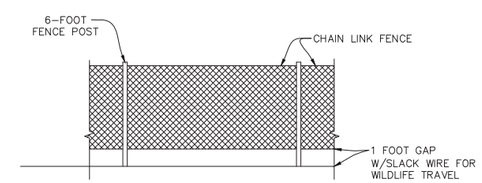
GRAPHIC SCALE 1"=1000'
0 500 1000 2000

LEGEND:

- CONSERVATION AREA (342 ACRES)
- 300-FOOT WILDLIFE CORRIDOR
- FLOOD HAZARD LIMITS (PER FEMA)
- FAIRMONT-ANTELOPE BUTTES SEA LIMITS
- POPPY RESERVE BOUNDARY
- UTILITY EASEMENT LIMIT
- VERNAL POOL
- OPEN WATER
- PERENNIAL FORBLAND
- PERENNIAL GRASSLAND
- RIPARIAN WOODLAND AND SCRUB
- WIND TURBINE GENERATING SYSTEM (APPROXIMATE LOCATION)
- SOLAR PANEL ARRAY BLOCK-SINGLE AXIS TRACKING (APPROXIMATE LOCATION)
- 20-FOOT WIDE PEDESTRIAN/EQUESTRIAN TRAIL PER TYPICAL DETAIL HEREON (6.7 MILES ±)
- PROJECT BOUNDARY
- 6-FOOT PERIMETER FENCE PER TYPICAL DETAIL HEREON



PEDESTRIAN/EQUESTRIAN TRAIL
NORTHERN ENERGY FARM –
TYPICAL SECTION
SCALE: 1"=4'



PERIMETER FENCE TYPICAL DETAIL
SCALE: 1"=4'

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DRAWN BY: JG
DESIGNED BY: JG
CHECKED BY: AW

FENCE LAYOUT AND DETAIL PLAN

SCALE: AS SHOWN
DATE: 10/5/2011
SHT NO.: D-7

Appendix D:

Photos taken during site visits and field surveys conducted at the Wildflower Green Energy Farm site in March – July, 2010.

Photo A: Broad Canyon in the northwest of the site, with Fairmont Butte in the distance.

Photo B: Rock outcrop on the northwest face of Fairmont Butte.

Photo C: Active burrowing owl burrow in the northwest of the site.

Photo D: California poppy field at the site, looking north towards Fairmont Butte.

Photo E: California poppy field.

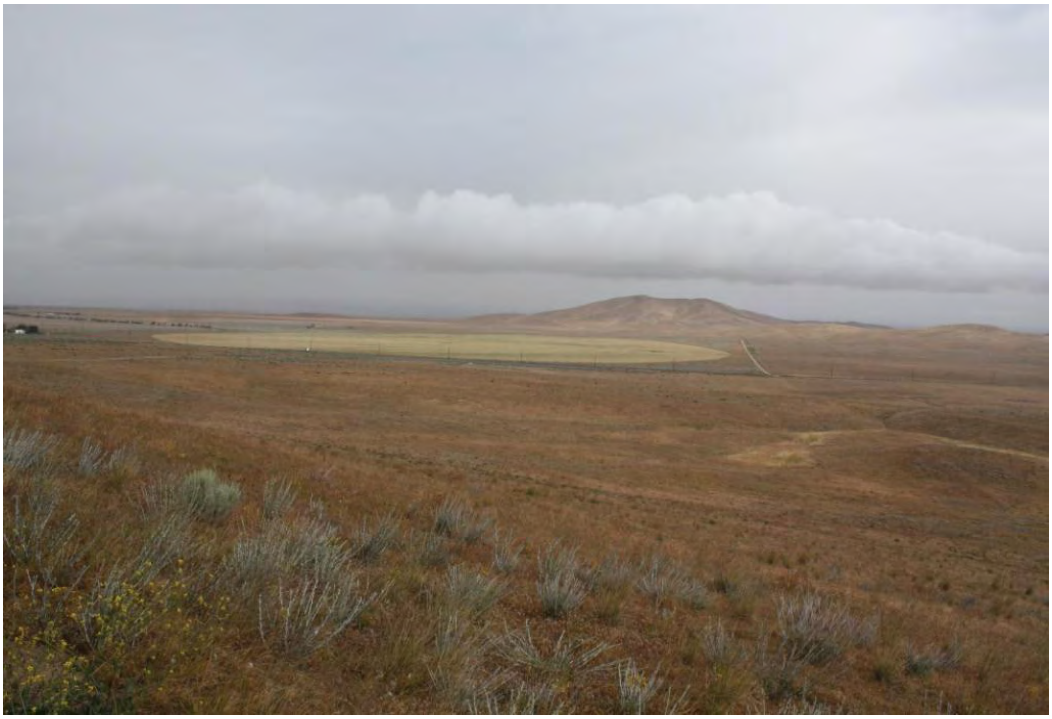

Photo F: Center-pivot crop field near center of the site.

Photo G: Non-native annual grassland in west-central portion of the site.

Photo H: Healy Farms in the west-central portion of the site.

Photo I: Rolling hills and low ridges in southeast of the site (non-native annual grassland).

Photo J: Rabbitbrush scrub in the southwest corner of the site.

Photo K: Myrick Canyon in the southeast corner of the site (rabbitbrush scrub/non-native annual grassland with agricultural field in distance).

Photo L: Red-tailed hawk nest in windbreak along 170th Street in the west-central portion of the site.

Photo M: The California Aqueduct where it crosses the southwestern corner of the site.

Photo N: Fairmont Reservoir, approximately 1.5 miles southwest of the site.

Photo O: Photograph taken from ridge in southeast of the site, looking southwest towards chaparral-covered hills of the Angeles National Forest.

Photo P: California poppy field in the northeast of the site.

Photo Q: Looking east along the proposed transmission line route towards Antelope Substation.

Photo R: Looking west along the proposed transmission line route.

Photo S: Swainson's hawk nest in tree along Highway 138.

Photo T: Vernal pool located in central portion of the site.

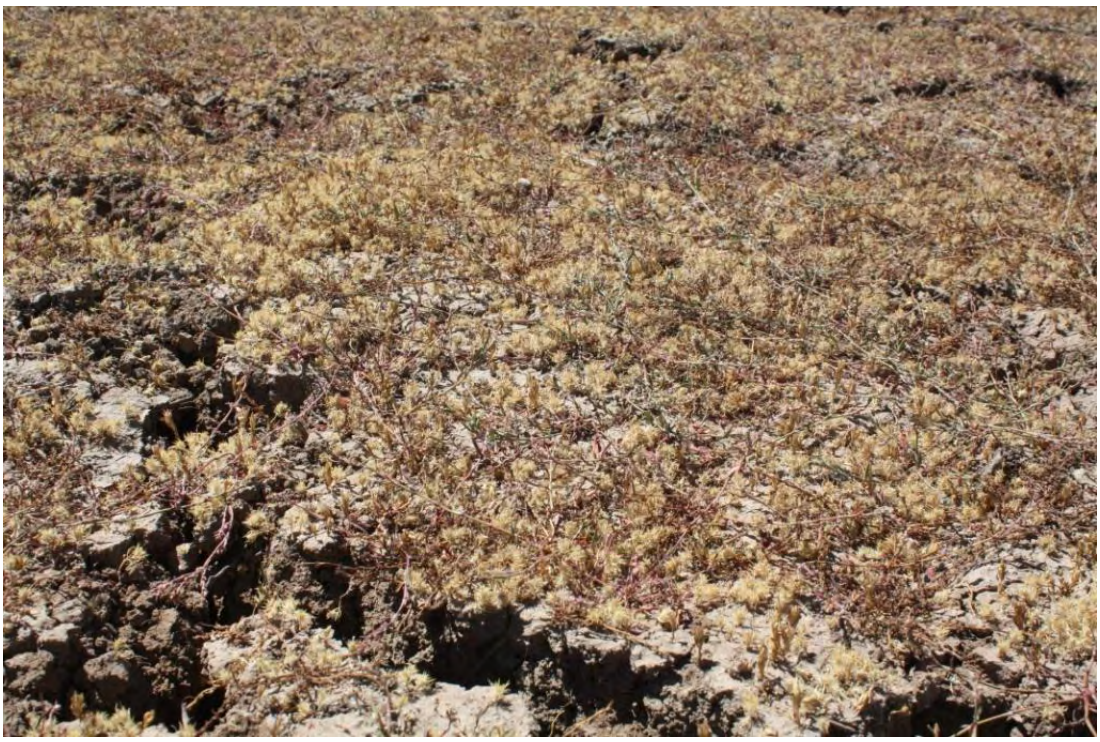

Photo U: *Navarretia fossalis* identified within seasonal depression pictured above.

Photo V: *Navarretia fossalis*

Photo W: California goldfields-Six-weeks fescue flower fields

Photo X: Purple needlegrass grassland.

Photo Y: Desert needlegrass grassland

Photo Z: One-sided blue grass grassland.

Photo AA: Cheatgrass grasslands.

Photo AB: Soft brome grasslands

Photo AC: Wild oats grasslands and agricultural fields

Photo AD: Rat-tail fescue grasslands

Photo AE: Prickly lettuce patches.

Photo AF: Hedgemustard and other mustard patches

Photo AG: California poppy fields

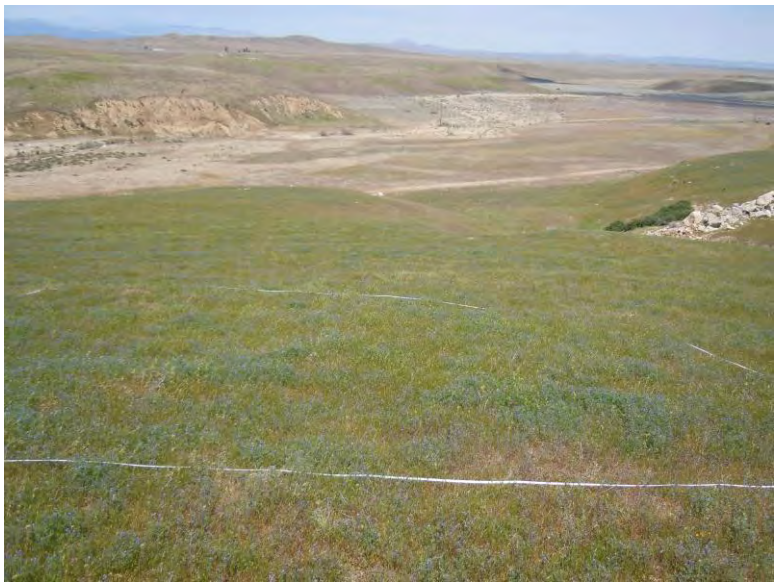

Photo AH: Miniature lupine fields

Photo AI: Desert dandelion- white layia floodplains.

Photo AJ: Scalebud- Chia-Scarlet lupine washes

Photo AK: Fiddleneck fields.

Photo AL: Annual hair grass- Finebranched popcornflower vernal pools

Photo AM: California buckwheat scrub.

Photo AN: Rubber rabbitbrush scrub

Photo AO: Oak gooseberry thickets

Photo AP: Narrowleaf goldenbush scrub

Photo AQ: Mixed willow riparian scrub.

Photo AR: Mulefat thickets

Photo AS: Desert olive patches.

Photo AT: Baltic and Mexican rush marshes

Photo AU: Wild tarragon patches.

Appendix E:

Plant Species Observed or with the Potential to Occur within the Wildflower Green Energy Farm Site

Plant species observed within the Antelope Valley Renewable Energy Project.

Scientific Name	Common Name	Estimated Abundance within Project site*	Native/non-native/planted
FERNS AND FERN LIKE PLANTS			
Pteridaceae			
Pellaea mucronata	birdfoot cliffbrake	rare	native
GYMNOSPERMS			
Cupressaceae			
Juniperus californica	California juniper	rare	native
Pinaceae			
Pinus sp.	pine	rare	planted
ANGIOSPERMS - DICOTYLEDONS			
Adoxaceae			
Sambucus mexicana	blue elderberry	uncommon	native
Anacardiaceae			
Rhus trilobata	skunkbush sumac	rare	native
Apiaceae			
Conium maculatum	poison hemlock	rare	non-native
Lomatium nevadense	Nevada biscuitroot	uncommon	native
Lomatium utriculatum	common lomatium	common	native
Asclepiaceae			
Asclepias erosa	desert milkweed	rare	native
Asteraceae			
Agoseris hetrophylla	annual mountain dandelion	uncommon	native
Ambrosia acanthicarpa	annual bursage	uncommon	native
Ancistrocarphus filagineus	wooly fishhooks	uncommon	native
Anisocoma acaulis	scalebud	abundant	native
Artemisia douglasiana	mugwort	rare	native
Artemisia dracunculus	tarragon	uncommon	native
Artemisia tridentata	big sagebrush	rare	native
Baccharis salicifolia	mulefat	uncommon	native
Balsamorhiza deltoidea	deltoid balsamroot	rare	native
Brickellia sp.	brickelbush	rare	native
Chaenactis glabriuscula	yellow pincushion	common	native
Chaenactis xantiana	Fremont pincushion	abundant	native
Chamomilla suaveolens	pineapple weed	abundant	non-native
Cirsium occidentale	western thistle	rare	native
Cnicus benedictus	blessed thistle	uncommon	non-native

Plant species observed within the Antelope Valley Renewable Energy Project.

Scientific Name	Common Name	Estimated Abundance within Project site*	Native/non-native/planted
Conyza canadensis	horseweed	uncommon	native
Coreopsis bigelovii	Bigelow's tickseed	rare	native
Corethrogyne (Lessingia) filaginifolia	common sandaster	abundant	native
Ericameria (Chrysothamnus) nauseosus	rabbitbrush	abundant	native
Ericameria cooperi	Cooper's goldenbush	common	native
Ericameria linearifolia	interior goldenbush	common	native
Erigeron foliosus	leafy fleabane	uncommon	native
Eriophyllum confertiflorum	golden yarrow	rare	native
Filago gallica	narrowleaf cottonrose	abundant	non-native
Gnaphalium californicum	California everlasting	uncommon	native
Gnaphalium palustre	western marsh cudweed	rare	native
Helianthus annuus	annual sunflower	common	native
Heterotheca sessiliflora	false goldenaster	abundant	native
Holocarpha heermannii	Heermann's tarweed	abundant	native
Hypochaeris glabra	smooth catsear	common	non-native
Isocoma acradenia	desert isocoma	uncommon	native
Iva axillaris ssp. robustior	poverty weed	rare	native
Lactuca serriola	prickly lettuce	abundant	non-native
Lagophylla ramosissima	common harelead	abundant	native
Lasthenia californica	California goldfields	abundant	native
Layia glandulosa	white layia	abundant	native
Lepidospartum squamatum	California broomsage	rare	native
Lessingia lemmonii	Lemmon's lessingia	uncommon	native
Malacothrix californica	California dandelion	abundant	native
Malacothrix glabrata	desert dandelion	common	native
Microseris douglassii ssp. douglassii	Douglas' silverpuffs	rare	native
Senecio vulgaris	common groundsel	rare	non-native
Stephanomeria exigua	small wirelettuce	abundant	native
Stephanomeria pauciflora	wire-lettuce	abundant	native
Stephanomeria virgata	virgate wirelettuce	uncommon	native
Uropappus lindleyi	Lindley's silverpuffs	uncommon	native
Boraginaceae			
Amsinckia menziesii	Menzie's fiddleneck	abundant	native
Amsinckia tessellata	bristly fiddleneck	abundant	native
Cryptantha circumscissa	cushion cryptantha	common	native
Cryptantha nevadensis ssp. rigida	Nevada cryptantha	abundant	native

Plant species observed within the Antelope Valley Renewable Energy Project.

Scientific Name	Common Name	Estimated Abundance within Project site*	Native/non-native/planted
Cryptantha oxygona	sharpnut cryptantha	abundant	native
Pectocarya linearis ssp. ferocula	slender combseed	abundant	native
Pectocarya penicillata	sleeping combseed	abundant	native
Plagiobothrys acanthocarpus	adobe popcornflower	rare	native
Plagiobothrys arizonicus	Arizona popcornflower	abundant	native
Plagiobothrys canascens	valley popcornflower	abundant	native
Plagiobothrys leptocladus	finebranched popcornflower	uncommon	native
Plagiobothrys nothofulvus	rusty popcornflower	uncommon	native
Brassicaceae			
Capsella bursa-pastoris	shepherd's purse	uncommon	non-native
Descurainia pinnata	western tansy mustard	uncommon	native
Descurainia sophia	Tansy mustard	common	non-native
Hirschfeldia incana	short-podded mustard	common	non-native
Lepidium nitidum	shining peppergrass	common	native
Sisymbrium altissimum	skyrocket	abundant	non-native
Sisymbrium orientale	Oriental mustard	uncommon	non-native
Thysanocarpus cuvipes	fringe pod	uncommon	native
Tropidocarpum gracile	dobie pod	common	native
Cactaceae			
Opuntia basilaris var. *basilaris* x. *O.b.* var. *brachyclada*	beavertail	uncommon	native
Chenopodiaceae			
Atriplex polycarpa	cattle spinach	common	native
Chenopodium californicum	California goosefoot	uncommon	native
Chenopodium sp. (C. strictum or *C. berlandieri)*	goosefoot	rare	unknown
Salsola tragus	Russian thistle	uncommon	non-native
Convolvulaceae			
Calystegia occidentalis	western morning glory	common	native
Convolvulus arvensis	field bindweed	uncommon	non-native
Crassulaceae			
Crassula connata	sand pygmyweed	rare	native
Caryophyllaceae			
Cerastium glomeratum	mouseear chickweed	uncommon	non-native
Cucurbitaceae			
Marah fabaceus	California manroot	uncommon	native

Plant species observed within the Antelope Valley Renewable Energy Project.

Scientific Name	Common Name	Estimated Abundance within Project site*	Native/non-native/planted
Ericaceae			
Arctostaphylos glauca	bigberry manzanita	rare	native
Euphorbiaaceae			
Chamaesyce albomarginata	rattlesnake weed	abundant	native
Eremocarpus setigerus	turkey mullein	abundant	native
Fabaceae			
Astragalus didymocarpus var. *didymocarpus*	dwarf milkvetch	common	native
Astragalus douglasii	Jacumba milkvetch	abundant	native
Astragalus lentiginosus var. *variabilis*	freckled milkvetch	uncommon	native
Lathyrus vestitus var. *vestitus*	Pacific pea	rare	native
Lotus humistratus	foothill deervetch	uncommon	native
Lotus scoparius	deerweed	common	native
Lotus strigosus	hairy lotus	abundant	native
Lupinus bicolor	miniature lupine	abundant	native
Lupinus concinnus	scarlet lupine	common	native
Lupinus excubitus	grape soda lupine	rare	native
Lupinus excubitus ssp. austromontanus	grape soda lupine	rare	native
Lupinus formosus var. *robustus*	summer lupine	abundant	native
Lupinus microcarpus	chick lupine	uncommon	native
Lupinus sparsiflorus	Mojave lupine	uncommon	native
Medicago polymorpha	California burclover	uncommon	non-native
Trifolium albopurpureum	Indian clover	abundant	native
Trifolium gracillentum	pinpoint clover	abundant	native
Trifolium willdenovii	tomcat clover	common	native
Geraniaceae			
Erodium botrys	filaree	common	non-native
Erodium cicutarium	red-stem filaree	abundant	non-native
Saxifragaceae			
Ribes cf. quercetorum	oak gooseberry	uncommon	native
Hippocastaneaceae			
Aesculus californica	California buckeye	rare	native
Hydrophyllaceae			
Heliotropium curassavicum var. *oculatum*	salt heliotrope	rare	native
Nemophila pedunculata	littlefoot nemophila	rare	native
Phacelia cicutaria	caterpiller phacelia	common	native
Phacelia distans	distant phacelia	rare	native

Plant species observed within the Antelope Valley Renewable Energy Project.

Scientific Name	Common Name	Estimated Abundance within Project site*	Native/non-native/planted
Phacelia imbricata	imbricate phacelia	common	native
Phacelia ramossisima	branching phacelia	uncommon	native
Phacelia tanacetifolia	tansy leafed phacelia	uncommon	native
Turricula parryi	poodle dog bush	rare	native
Lamiaceae			
Marrubium vulgare	horehound	abundant	non-native
Salvia columbariae	chia	abundant	native
Stachys albens	whitestem hedgenettle	rare	native
Trichostema lanceolatum	vinegarweed	abundant	native
Loasaceae			
Mentzelia veatchiana	Veatch's blazingstar	uncommon	native
Myrtaceae			
Eucalyptus sp.	gum tree	rare	planted
Nyctaginaaceae			
Mirabilis laevis	California four-o' clock	uncommon	native
Oleaceae			
Forestiera pubescens	desert olive	uncommon	native
Onagraceae			
Camissonia campestris	Mojave sun cup	common	native
Camissonia graciliflora	hill suncup	common	native
Camissonia claviformis	browneyes	uncommon	native
Camissonia pusilla	little wiry suncup	uncommon	native
Camissonia strigulosa	strigose suncup	uncommon	native
Clarkia purpurea	purple clarkia	uncommon	native
Epilobium canum	California fuchsia	uncommon	native
Oenothera californica ssp. californica	California evening primrose	common	native
Papaveraceae			
Argemone sp.			
Eschscholzia californica	California poppy	abundant	native
Platystemon californicus	cream cups	common	native
Polygonaceae			
Eriogonum cf. baileyi	Bailey's buckwheat	abundant	native
Eriogonum davidsonii	Davidson's buckwheat	abundant	native
Eriogonum elongatum	longstem buckwheat	common	native
Eriogonum fasciculatum ssp. foliolosum	California buckwheat	common	native
Eriogonum fasciculatum ssp. polifolium	California buckwheat	common	native

Plant species observed within the Antelope Valley Renewable Energy Project.

Scientific Name	Common Name	Estimated Abundance within Project site*	Native/non-native/planted
Eriogonum roseum	wand buckwheat	common	native
Rumex salicifolia	willow dock	rare	non-native
Rumex crispus	curly dock	rare	non-native
Rumex hymenosepalus	wild-rhubarb	uncommon	native
Plantaginaeaea			
Plantago erecta	dotseed plantain	uncommon	native
Polemoniaceae			
Gilia capitata	bluehead gilia	uncommon	native
Gilia latiflora ssp. davyi	broad-flowered gilia	uncommon	native
Gilia minor	little gilia	uncommon	native
Gilia ochroleuca	volcanic gilia	uncommon	native
Linanthus liniflorus	narrowleaf flaxflower	common	native
Linanthus parviflorus	common linanthus	uncommon	native
Linanthus parryae	Parry's linanthus	uncommon	native
Navarretia fossalis	spreading navarretia	uncommon	native
Phlox gracilis	slender phlox	rare	native
Portulacaceae			
Calandrinia ciliata	red maids	uncommon	native
Claytonia parviflora ssp. parviflora	miner's lettuce	uncommon	native
Rhamnaceae			
Ceanothus cuneatus	wedgeleaf ceanothus	rare	native
Rhamnus ilicifolia	hollyleaf buckthorn	rare	native
Rosaceae			
Adenostoma fasciculatum	chamise	rare	native
Prunus dulcis	almond	uncommon	planted
Rubiaceae			
Galium aparine	common bedstraw	rare	native
Galium parisiense	wall bedstraw	rare	non-native
Salicaceae			
Populus fremontii	Fremont cottonwood	rare	native
Salix laevigata	red willow	rare	native
Salix gooddingii	Goodding's willow	rare	native
Salix exigua	sandbar willow	rare	native
Scrophulariaceae			
Castilleja subinclusa	longleaf indian paintbrush	rare	native
Castilleja exserta	purple owl’s clover	abundant	native

Plant species observed within the Antelope Valley Renewable Energy Project.

Scientific Name	Common Name	Estimated Abundance within Project site*	Native/non-native/planted
Castilleja tenuis	hairy owl's clover	rare	native
Mimulus guttatus	yellow monkeyflower	uncommon	native
Penstemon centranthifolius	scarlet begler	rare	native
Veronica peregrina ssp. xalapensis	speedwell	rare	native
Veronica sp.	neckweed	uncommon	unknown
Solanaceae			
Datura wrightii	Jimson weed	common	native
Nicotiana sp.	tobacco	rare	native
Solanum xantii	purple nightshade	uncommon	native
Tamaricaceae			
Tamarix sp.	tamarisk	rare	non-native
Ulmaceae			
Ulmus sp.	elm	rare	planted
ANGIOSPERMS - MONOCOTYLEDONS			
Cyperaceae			
Eleocharis cf. obtusa	spikerush	rare	native
Juncaceae			
Juncus balticus	baltic rush	common	native
Juncus bufonius	toad rush	rare	native
Juncus xiphioides	irisleaf rush	rare	native
Liliaceae			
Allium lacunosum var. *davisiae*	Davis' pitted onion	uncommon	native
Bloomeria crocea	common goldenstar	common	native
Chlorogalum spp.	soapplant	rare	native
Dichelostemma capitatum	blue dicks	common	native
Muilla maritima	common muilla	common	native
Yucca brevifolia	Joshua tree	rare	planted
Yucca whipplei	chaparral yucca	rare	native
Poaceae			
Achnatherum speciosum	desert needlegrass	common	native
Avena barbata	wild oat	abundant	cultivated, non-native
Avena fatua	wild oat	abundant	cultivated, non-native
Bromus diandrus	ripgut	common	non-native
Bromus hordeaceus	soft brome	abundant	non-native

Plant species observed within the Antelope Valley Renewable Energy Project.

Scientific Name	Common Name	Estimated Abundance within Project site*	Native/non-native/planted
Bromus madritensis ssp. rubens	foxtail chess	abundant	non-native
Bromus tectorum	cheat grass	abundant	non-native
Cynodon dactylon	Bermuda grass	uncommon	non-native
Deschampsia danthonioides	annual hairgrass	common	native
Elymus cf. glaucus	wildrye	common	native
Elymus elymoides	bottlebrush	common	native
Elymus multisetus	big squirreltail	common	native
Hordeum murinum	foxtail barley	abundant	non-native
Nassella pulchra	purple needlegrass	abundant	native
Piptatheum miliaceum	smilo grass	uncommon	non-native
Poa secunda	one-sided bluegrass	abundant	native
Polypogon monspeliensis	rabbitsfoot grass	uncommon	non-native
Schismus barbatus	Mediterranean grass	common	non-native
Secale cereale	rye	abundant	cultivated, non-native
Triticum aestivum	wheat	uncommon	cultivated, non-native
Unknown grass in vernal pool	unknown grass	rare	unknown
Vulpia microstachys var. *ciliata*	small fescue	abundant	native
Vulpia myuros	rattail fescue	abundant	non-native
Vulpia octoflora	sixweeks fescue	common	native

* *Abundant*: observed or expected to occur in substantial numbers (>500 observations) in suitable habitat and in the appropriate season; *Common*: observed or expected to occur in high numbers (100-500 observations) in suitable habitat and in the appropriate season; *Uncommon*: observed or expected to occur in low numbers (10-100 observations) in suitable habitat and in the appropriate season; may be restricted to few habitat types; *Rare*: observed or expected to occur in very low numbers (<10 observations) in suitable habitat and in the appropriate season; restricted to specific habitat types

Appendix F:

Animal Species Observed or with the Potential to Occur within the Wildflower Green Energy Farm Site

Animal species observed or with the potential to occur within the Antelope Valley Renewable Energy Project.

Scientific Name	Common Name	Occurrence	Estimated Abundance within Project site	Status
INSECTA	**INSECTS**			
Papilionidae				
Papilio rutulus	western tiger swallowtail	Potential	Uncommon	
Papilio eurymedon	pale swallowtail	Potential	Uncommon	
Papilio zelicaon	anise swallowtail	Potential	Uncommon	
Papilio cresphontes	giant swallowtail	Potential	Rare	
Nymphalidae				
Danaus gilippus	striated queen	Potential	Uncommon	
Danaus plexippus	monarch	Potential	Common	
Ceononympha tullia californica	California ringlet	Potential	Rare	
Agraulis vanillae incarnata	Gulf fritillary	Potential	Rare	
Basilarchia lorquini	Lorquin's admiral	Potential	Rare	
Adelpha bredowii californica	California sister	Potential	Rare	
Euphydryas chalcedona	chalcedon checkerspot	Potential	Uncommon	
Junonia coenia	buckeye	Potential	Common	
Charidryas gabbii	Gabb's checkerspot	Potential	Uncommon	
Phyciodes mylitta	Mylitta crescent	Potential	Uncommon	
Polygonia satyrus	satyr anglewing	Potential	Rare	
Nymphalis californica	California tortoise-shell	Potential	Rare	
Nymphalis milberti	Milbert's tortoise-shell	Potential	Rare	
Nymphalis antiopa	mourning cloak	Potential	Rare	
Vanessa virginiensis	Virginia lady	Potential	Uncommon	
Vanessa atalanta	red admiral	Observed	Uncommon	
Vanessa cardui	painted lady	Observed	Abundant	
Vanessa annabella	West Coast lady	Observed	Common	
Riodinidae				
Apodemia mormo	Mormon metalmark	Potential	Common	
Lycaenidae				
Atlides halesus	great purple hairstreak	Potential	Uncommon	
Callophrys perplexa	bramble hairstreak	Potential	Common	
Euphilotes bernardino	Bernardino blue	Potential	Common	
Incisalia augustinus iroides	western elfin	Potential	Common	
Icaricia acmon	acmon blue	Potential	Common	
Icaricia lupini	lupine blue	Observed	Common	
Everes amyntula	western tailed-blue	Potential	Uncommon	

Animal species observed or with the potential to occur within the Antelope Valley Renewable Energy Project.

Scientific Name	Common Name	Occurrence	Estimated Abundance within Project site	Status
Glaucopsyche lygdamus australis	southern blue	Potential	Common	
Hemiargus ceraunus gyas	Edward's blue	Potential	Uncommon	
Hemiargus isola alce	Reakirt's blue	Potential	Rare	
Leptotes marina	marine blue	Potential	Common	
Brephidium exilis	pygmy blue	Potential	Common	
Lycaena xanthoides	great copper	Potential	Rare	
Satyrium californica	California hairstreak	Potential	Rare	
Strymon melinus	common hairstreak	Potential	Common	
Pieridae				
Colias (Zerene) eurydice	California dogface	Potential	Rare	
Colias (Zerene) cesonia	southern dogface	Potential	Rare	
Colias alexandra harfordii	Harford's sulfur	Potential	Rare	
Colias eurytheme	alfalfa sulfur	Observed	Common	
Nathalis iole	dwarf yellow	Potential	Common	
Anthocharis cethura	Felder's orange-tip	Potential	Uncommon	
Anthocharis sara sara	sara orange-tip	Potential	Common	
Anthocharis lanceolata	gray marble	Potential	Rare	
Euchloe lotta	desert marble	Potential	Uncommon	
Eurema nicippe	nicippe yellow	Potential	Uncommon	
Phoebis sennae	cloudless sulfur	Potential	Rare	
Pieris rapae	cabbage white	Potential	Uncommon	
Pontia protodice	checkered white	Observed	Common	
Pontia beckeri	Becker's white	Potential	Uncommon	
Pontia sisymbrii	spring white	Potential	Uncommon	
Hesperiidae				
Lerodea eufala	eufala skipper	Potential	Common	
Paratrytone melane	umber skipper	Potential	Rare	
Hylephila phyleus	fiery skipper	Potential	Common	
Atalopedes campestris	field skipper	Potential	Uncommon	
Ochlodes agricola	rural skipper	Potential	Uncommon	
Polites sabuleti	sandhill skipper	Potential	Uncommon	
Erynnis funeralis	funereal duskywing	Observed	Common	
Erynnis tristes	mournful duskywing	Potential	Rare	
Heliopetes ericetorum	large white skipper	Potential	Uncommon	
Pyrgus albescens	white checkered-skipper	Potential	Common	

Animal species observed or with the potential to occur within the Antelope Valley Renewable Energy Project.

Scientific Name	Common Name	Occurrence	Estimated Abundance within Project site	Status
AMPHIBIA	**AMPHIBIANS**			
Bufonidae				
Bufo punctatus	red spotted toad	Potential	Uncommon	
Ranidae				
Lithobates catesbeianus	bullfrog	Potential	Uncommon	
Hylidae				
Pseudacris hypochondriaca hypochondriaca	Baja California treefrog	Observed	Uncommon	
REPTILIA	**REPTILES**			
Anguidae				
Elgaria multicarinata webbii	San Diego alligator lizard	Potential	Common	
Phrynosomatidae				
Sceloporus occidentalis	western fence lizard	Observed	Abundant	
Uta stansburiana	side-blotched lizard	Observed	Abundant	
Phrynosoma blainvillii	Blainville's horned lizard	Observed	Rare	SSC
Phrynosoma platyrhinos	desert horned lizard	Potential	Uncommon	
Crotaphytidae				
Gambelia wislizenii	Long-nosed leopard lizard	Observed	Rare	
Xantusiidae				
Xantusia vigilis	desert night lizard	Potential	Common	
Scincidae				
Plestiodon skiltonianus	western skink	Potential	Rare	
Plestiodon gilberti	Gilbert's skink	Potential	Rare	
Teliidae				
Aspidoscelis tigris	western whiptail	Observed	Uncommon	
Angidae				
Elgaria multicarinata	southern alligator lizard	Potential	Common	
Anniellidae				
Anniella pulchra pulchra	silvery legless lizard	Potential	Rare	SSC
Leptotyphlopidae				
Leptotyphlops humilis	western blind snake	Potential	Rare	
Botidae				
Lichanura trivirgata	rosy boa	Potential	Rare	
Colubridae				
Coluber constrictor mormon	western yellow-bellied racer	Potential	Uncommon	
Coluber flagellum piceus	red coachwhip	Observed	Common	

Animal species observed or with the potential to occur within the Antelope Valley Renewable Energy Project.

Scientific Name	Common Name	Occurrence	Estimated Abundance within Project site	Status
Masticophis lateralis	California whipsnake	Potential	Uncommon	
Salvadora hexalepis	western patch-nosed snake	Potential	Uncommon	
Pituophis catenifer	gopher snake	Observed	Abundant	
Arizona elegans	glossy snake	Potential	Uncommon	
Lampropeltis getula californiae	California kingsnake	Observed	Common	
Lampropeltis zonata	California mountain kingsnake	Potential	Rare	
Rhinocheilus lecontei	long-nosed snake	Observed	Common	
Tantilla planiceps	western black-headed snake	Potential	Rare	
Trimorphodon biscutatus	western lyre snake	Potential	Uncommon	
Hypsiglena ochrorhyncha	California night snake	Potential	Common	
Viperidae				
Crotalus oreganus	northern Pacific rattlesnake	Observed	Common	
Crotalus scutulatus	Mojave rattlesnake	Observed	Common	
AVES	**BIRDS**			
Podicipedidae				
Podilymbus podiceps	pied-billed grebe	Observed	Uncommon on Aqueduct	
Aechmophorus occidentalis	western grebe	Observed	Uncommon on Aqueduct	
Pelecanidae				
Pelecanus erythrorhynchos	American white pelican	Observed	Common during migration	SSC
Phalacrocoracidae				
Plalacrocorax auritus	double-crested cormorant	Observed	Uncommon on Aqueduct	
Ardeidae				
Ardea herodias	great blue heron	Observed	Uncommon	
Ardea alba	great egret	Observed	Common	
Egretta thula	snowy egret	Observed	Uncommon	
Butorides virescens	green heron	Observed	Uncommon	
Threskiornithidae				
Plegadis chihi	white-faced ibis	Observed	Uncommon	SWL, CS
Anatidae				
Anser albifrons	greater white-fronted goose	Potential	Uncommon	CS
Chen caerulescens	snow goose	Potential	Uncommon	CS
Branta canadensis	Canada goose	Potential	Common during migration	
Anas platyrhynchos	mallard	Observed	Abundant on Aqueduct	
Anas strepera	gadwall	Observed	Common on Aqueduct	
Aythya collaris	ring-necked duck	Observed	Abundant on Aqueduct	
Aythya affinis	lesser scaup	Observed	Common on Aqueduct	

Animal species observed or with the potential to occur within the Antelope Valley Renewable Energy Project.

Scientific Name	Common Name	Occurrence	Estimated Abundance within Project site	Status
Bucephala clangula	common goldeneye	Observed	Uncommon on Aqueduct	
Bucephala albeola	bufflehead	Observed	Common on Aqueduct	
Mergus merganser	common merganser	Observed	Common on Aqueduct	
Cathartidae				
Cathartes aura	turkey vulture	Observed	Common	CS
Accipitridae				
Circus cyaneus	northern harrier	Observed	Common	CS, SSC
Accipiter striatus	sharp-shinned hawk	Observed	Uncommon	SWL
Accipiter cooperii	Cooper's hawk	Observed	Uncommon	SWL
Buteo lineatus	red-shouldered hawk	Potential	Uncommon	
Buteo swainsoni	Swainson's hawk	Observed	Uncommon	BCC, CS, ST
Buteo jamaicensis	red-tailed hawk	Observed	Abundant	
Buteo regalis	ferruginous hawk	Observed	Uncommon (winter only)	BCC, CS, SWL
Buteo lagopus	rough-legged hawk	Potential	Uncommon (winter only)	
Aquila chrysaetos	golden eagle	Observed	Uncommon	BCC, CS, SFP, SWL
Falconidae				
Falco columbarius	merlin	Observed	Uncommon	SWL
Falco sparverius	American kestrel	Observed	Common	
Falco mexicanus	prairie falcon	Observed	Uncommon	BCC, CS, SWL
Falco peregrinus anatum	peregrine falcon	Observed	Rare	BCC, CS, SFP
Odontophoridae				
Callipepla californica	California quail	Observed	Abundant	
Oreortyx pictus	mountain quail	Potential	Uncommon	
Phasianidae				
Alectoris chukar	chukar	Potential	Rare	
Phasianus colchicus	ring-necked pheasant	Observed	Uncommon	
Gruiformes				
Fulica americana	American coot	Observed	Uncommon on Aqueduct	
Charadriidae				
Charadruis semipalmatus	semipalmated plover	Observed	Uncommon	
Charadrius montanus	mountain plover	Potential	Rare	FPT, BCC, CS, SSC
Charadrius vociferus	killdeer	Observed	Abundant	
Scolopacidae				
Tringa melanoleuca	greater yellowlegs	Observed	Uncommon	

Animal species observed or with the potential to occur within the Antelope Valley Renewable Energy Project.

Scientific Name	Common Name	Occurrence	Estimated Abundance within Project site	Status
Actitis macularia	spotted sandpiper	Observed	Uncommon	
Numenius americanus	long-billed curlew	Potential	Rare	BCC, SWL, CS
Laridae				
Larus delawarensis	ring-billed gull	Potential	Uncommon	
Larus californicus	California gull	Observed	Uncommon	
Sterna caspia	Caspian tern	Observed	Uncommon	
Columbidae				
Zenaida macroura	mourning dove	Observed	Common	
Columba livia	rock pigeon	Observed	Uncommon	
Streptopelia decaocto	Eurasian collared-dove	Observed	Uncommon	
Cuculidae				
Geococcyx californicus	greater roadrunner	Observed	Uncommon	CS
Tytonidae				
Tyto alba	barn owl	Observed	Common	
Strigidae				
Asio otus	long-eared owl	Potential	Uncommon	SSC, CS
Asio flammeus	short-eared owl	Potential	Uncommon (winter)	CS, SSC
Bubo virginianus	great horned owl	Observed	Common	
Athene cunicularia	burrowing owl	Observed	Uncommon	BCC, CS, SSC
Megascops kennicottii	western screech-owl	Potential	Uncommon	
Caprimulgidae				
Phalaenoptilus nuttallii	common poorwill	Potential	Common	
Chordeiles acutipennis	lesser nighthawk	Potential	Uncommon	
Apodidae				
Chaetura vauxi	Vaux's swift	Observed	Uncommon (migration only)	SSC
Aeronautes saxatalis	white-throated swift	Potential	Common	
Trochilidae				
Calypte anna	Anna's hummingbird	Observed	Uncommon	
Calypte costae	Costa's hummingbird	Observed	Uncommon	
Selasphorus rufus	rufous hummingbird	Observed	Rare	
Alcedinidae				
Ceryle alcyon	belted kingfisher	Observed	Uncommon	
Picidae				
Melanerpes formicivorus	acorn woodpecker	Potential	Uncommon	
Sphyrapicus ruber	red-breasted sapsucker	Potential	Rare	
Picoides nuttallii	Nuttall's woodpecker	Observed	Rare	

Animal species observed or with the potential to occur within the Antelope Valley Renewable Energy Project.

Scientific Name	Common Name	Occurrence	Estimated Abundance within Project site	Status
Picoides scalaris	ladder-backed woodpecker	Observed	Uncommon	
Colaptes auratus	northern flicker	Observed	Common	
Tyrannidae				
Contopus sordidulus	western wood-pewee	Potential	Rare	
Empidonax difficilis	Pacific-slope flycatcher	Observed	Uncommon	
Empidonax trailii	willow flycatcher	Observed	Uncommon	BCC, SE
Sayornis nigricans	black phoebe	Observed	Rare	
Sayornis saya	Say's pheobe	Observed	Uncommon	
Myiarchus cinerascens	ash-throated flycatcher	Potential	Uncommon	
Tyrannus verticalis	western kingbird	Observed	Common	
Laniidae				
Lanius ludovicianus	loggerhead shrike	Observed	Common	BCC, CS, SSC
Vireonidae				
Vireo gilvus	warbling vireo	Observed	Uncommon	
Corvidae				
Cyanocitta stelleri	Steller's jay	Potential	Rare	
Aphelocoma californica	western scrub-jay	Observed	Uncommon	
Corvus corax	common raven	Observed	Abundant	
Alaudidae				
Eremophila alpestris	horned lark	Observed	Abundant	
Hirundinidae				
Stelgidopteryx serripennis	northern rough-winged swallow	Observed	Uncommon	
Tachycineta thalassina	violet-green swallow	Observed	Uncommon	
Tachycineta bicolor	tree swallow	Observed	Common	
Petrochelidon pyrrhonota	cliff swallow	Observed	Abundant	
Hirundo rustica	barn swallow	Observed	Common	
Paridae				
Baeolophus inornatus	oak titmouse	Potential	Rare	
Aegithalidae				
Psaltriparus minimus	bushtit	Potential	Rare	
Troglodytidae				
Thryomanes bewickii	Bewick's wren	Observed	Uncommon	
Troglodytes aedon	house wren	Observed	Uncommon	
Campylorhynchus brunneicapillus	cactus wren	Observed	Uncommon	
Salpinctes obsoletus	rock wren	Observed	Common	
Sylviidae				

Animal species observed or with the potential to occur within the Antelope Valley Renewable Energy Project.

Scientific Name	Common Name	Occurrence	Estimated Abundance within Project site	Status
Chamaea fasciata	wrentit	Potential	Rare	
Regulidae				
Regulus calendula	ruby-crowned kinglet	Observed	Rare	
Turdidae				
Sialia currucoides	mountain bluebird	Observed	Common	CS
Sialia mexicana	western bluebird	Observed	Common	
Turdus migratorius	American robin	Observed	Common	
Polioptilidae				
Polioptila caerulea	blue-gray gnatcatcher	Potential	Uncommon	
Mimidae				
Mimus polyglottos	northern mockingbird	Observed	Common	
Toxostoma redivivum	California thrasher	Potential	Uncommon	
Oreoscoptes montanus	sage thrasher	Observed	Uncommon	
Sturnidae				
Sturnus vulgaris	European starling	Observed	Common	
Motacillidae				
Anthus rubescens	American pipit	Observed	Common	
Ptilogonatidae				
Phainopepla nitens	phainopepla	Observed	Uncommon	
Bombycillidae				
Bombycilla cedrorum	cedar waxwing	Potential	Rare	
Parulidae				
Oreothlypis celata	orange-crowned warbler	Observed	Uncommon	
Dendroica petechia	yellow warbler	Observed	Uncommon	BCC, SSC
Dendroica coronata	yellow-rumped warbler	Observed	Common	
Geothlyps trichas	common yellowthroat	Potential	Rare	
Wilsonia pusilla	Wilson’s warbler	Observed	Uncommon	
Thraupidae				
Piranga ludoviciana	western tanager	Observed	Uncommon	
Cardinalidae				
Guiraca caerulea	blue grosbeak	Observed	Uncommon	
Emberizidae				
Melozone crissalis	California towhee	Observed	Common	
Amphispiza belli	sage sparrow	Observed	Uncommon	
Spizella breweri	Brewer's sparrow	Potential	Uncommon	
Passerculus sandwichensis	savannah sparrow	Observed	Common	

Animal species observed or with the potential to occur within the Antelope Valley Renewable Energy Project.

Scientific Name	Common Name	Occurrence	Estimated Abundance within Project site	Status
Pooecetes gramineus	vesper sparrow	Observed	Uncommon	CS
Chondestes grammacus	lark sparrow	Observed	Common	
Zonotrichia leucophrys	white-crowned sparrow	Observed	Common	
Melospiza melodia	song sparrow	Observed	Uncommon	
Melospiza lincolnii	Lincoln's sparrow	Observed	Uncommon	
Junco hyemalis	dark-eyed junco	Potential	Uncommon	
Icteridae				
Sturnella neglecta	western meadowlark	Observed	Abundant	CS
Molothrus ater	brown-headed cowbird	Observed	Common	
Xanthocephalus xanthocephalus	yellow-headed blackbird	Observed	Rare	CS, SSC
Agelaius tricolor	tricolored blackbird	Observed	Abundant	BCC, CS, SSC
Agelaius phoeniceus	red-winged blackbird	Observed	Common	
Euphagus cyanocephalus	Brewer's blackbird	Observed	Common	
Icterus bullockii	Bullock's oriole	Observed	Uncommon	
Icterus cucullatus	hooded oriole	Observed	Uncommon	
Icterus parisorum	Scott's oriole	Potential	Rare	CS
Fringillidae				
Carpodacus purpureus	purple finch	Potential	Rare	
Carpodacus mexicanus	house finch	Observed	Common	
Carduelis pinus	pine siskin	Observed	Common	
Spinus lawrencei	Lawrence's goldfinch	Observed	Uncommon	
Spinus psaltria	lesser goldfinch	Observed	Uncommon	
Spinus tristis	American goldfinch	Observed	Uncommon	
Passeridae				
Passer domesticus	house sparrow	Observed	Common	
MAMMALIA	**MAMMALS**			
Sciuridae				
Spermophilus beecheyi	California ground squirrel	Observed	Common	
Ammospermophilus leucurus	white-tailed antelope squirrel	Potential	Rare	
Geomyidae				
Thomomys bottae	Botta's pocket gopher	Potential	Common	
Heteromyidae				
Chaetodipus californicus	California pocket mouse	Observed	Uncommon	
Perognathus alticolus inexpectatus	Tehachapi pocket mouse	Potential	Rare	SSC
Perognathus longimembris	little pocket mouse	Potential	Rare	
Perognathus inornatus	San Joaquin pocket mouse	Observed	Rare	

Animal species observed or with the potential to occur within the Antelope Valley Renewable Energy Project.

Scientific Name	Common Name	Occurrence	Estimated Abundance within Project site	Status
Dipodomys deserti	desert kangaroo rat	Observed	Uncommon	
Dipodomys merriami	Merriam's kangaroo rat	Potential	Uncommon	
Muridae				
Peromyscus maniculatus	American deer mouse	Observed	Common	
Onychomys torridus	southern grasshopper mouse	Potential	Uncommon	
Reithrodontomys megalotis	western harvest mouse	Potential	Common	
Neotoma lepida	desert woodrat	Potential	Rare	
Microtus californicus	California vole	Potential	Rare	
Leporidae				
Sylvilagus audubonii	desert cottontail	Observed	Common	
Lepus californicus	black-tailed jackrabbit	Observed	Common	
Vespertilionidae				
Myotis californicus	California bat	Potential	Common	
Myotis ciliolabrum	western small-footed bat	Potential	Rare	
Lasionycteris noctivagans	silver-haired bat	Potential	Common during migration	
Parastrellus herperus	canyon bat	Potential	Common	
Eptesicus fuscus	big brown bat	Potential	Common	
Lasiurus blossevillii	western red bat	Potential	Uncommon during migration	SSC
Lasiurus cinereus	hoary bat	Potential	Common during migration	
Euderma maculatus	spotted bat	Potential	Uncommon	SSC
Corynorhinus townsendii	Townsend's big-eared bat	Potential	Uncommon	SSC
Antrozous pallidus	pallid bat	Potential	Common	SSC
Molossidae				
Tadarida brasiliensis	Brazilian free-tailed bat	Potential	Common	
Eumops perotis	western mastiff bat	Potential	Uncommon	SSC
Felidae				
Lynx rufus	bobcat	Observed	Rare	
Canidae				
Canis latrans	coyote	Observed	Common	
Vulpes macrotis	kit fox	Potential	Uncommon	
Urocyon cinereoargenteus	gray fox	Observed	Common	
Ursidae				
Ursus americanus	black bear	Potential	Rare	
Procyonidae				
Procyon lotor	northern raccoon	Potential	Common	

Animal species observed or with the potential to occur within the Antelope Valley Renewable Energy Project.

Scientific Name	Common Name	Occurrence	Estimated Abundance within Project site	Status
Mephitidae				
Spilogale gracilils	western spotted skunk	Potential	Rare	
Mephitis mephitis	striped skunk	Potential	Common	
Mustelidae				
Taxidea taxus	American badger	Potential	Uncommon	SSC
Cervidae				
Ococoileus hemionus	mule deer	Observed	Uncommon	

*FE=Federal Endangered; FT=federal threatened; FC=federal candidate for listing; FPT = federal proposed threatened; BCC= USFWS Birds of Conservation Concern; SE=State Endangered; ST=State Threatened; SSC=State Species of Special Concern; SFP=State Fully Protected; SWL=Watch List; CS=Los Angeles County Sensitive (USFWS 2010; CNDDB 2010a; CDFG, Fish and Game Code, Section 3511).

Appendix G:

Table of Sensitive Species Impact Matrix

Scientific Name	Common Name	Habitat Present and Species is Reasonably Expected to Occur On-site?	Species Impacted Directly by Habitat Loss?	Species Impacted by Alterations to Habitat Suitability?	Habitat Loss Substantial?	Species Impacted Indirectly on Adjacent Lands by Edge Effects?	Potential to Eliminate Species On-site?	Potential to Reduce Population size Below Self Sustaining Levels?	Potential for Substantial Reduction in Numbers of Individuals?	Potential Restriction of Range of Rare or Endangered Species?	Impact Significant?	Mitigation?	Impact Significant After Mitigation?
PLANTS													
Astragalus hornii var. *hornii*	Horn's milk-vetch	No	No	No	No	No	No	No	No	No	No	No	No
Astragalus preussii var. *laxiflorus*	Lancaster milk-vetch	No	No	No	No	No	No	No	No	No	No	No	No
California macrophylla	round-leaved filaree	No	No	No	No	No	No	No	No	No	No	No	No
Calochortus striatus	alkali mariposa-lily	No	No	No	No	No	No	No	No	No	No	No	No
Calystegia peirsonii	Peirson's morning-glory	No	No	No	No	No	No	No	No	No	No	No	No
Canbya candida	white pygmy-poppy	No	No	No	No	No	No	No	No	No	No	No	No
Chorizanthe parryi var. *fernandina*	San Fernando Valley spineflower	No	No	No	No	No	No	No	No	No	No	No	No
Chorizanthe parryi var. *parryi*	Parry's spineflower	No	No	No	No	No	No	No	No	No	No	No	No
Chorizanthe spinosa	Mojave spineflower	No	No	No	No	No	No	No	No	No	No	No	No

Scientific Name	Common Name	Habitat Present and Species is Reasonably Expected to Occur On-site?	Species Impacted Directly by Habitat Loss?	Species Impacted by Alterations to Habitat Suitability?	Habitat Loss Substantial?	Species Impacted Indirectly on Adjacent Lands by Edge Effects?	Potential to Eliminate Species On-site?	Potential to Reduce Population size Below Self Sustaining Levels?	Potential for Substantial Reduction in Numbers of Individuals?	Potential Restriction of Range of Rare or Endangered Species?	Impact Significant?	Mitigation?	Impact Significant After Mitigation?
Chorizanthe xanti var. *leucotheca*	white-bracted spineflower	No	No	No	No	No	No	No	No	No	No	No	No
Cryptantha clokeyi	Clokey's cryptantha	No	No	No	No	No	No	No	No	No	No	No	No
Cymopterus deserticola	desert cymopterus	No	No	No	No	No	No	No	No	No	No	No	No
Goodmania luteola	golden goodmania	No	No	No	No	No	No	No	No	No	No	No	No
Eriophyllum mohavense	Barstow woolly sunflower	No	No	No	No	No	No	No	No	No	No	No	No
Eschscholzia minutiflora ssp. *twisselmannii*	red rock poppy	No	No	No	No	No	No	No	No	No	No	No	No
Lasthenia glabrata ssp. *coulteri*	Coulter's goldfields	No	No	No	No	No	No	No	No	No	No	No	No
Layia heterotricha	pale-yellow layia	No	No	No	No	No	No	No	No	No	No	No	No
Lepechinia rossii	Ross' pitcher sage	No	No	No	No	No	No	No	No	No	No	No	No
Leptosiphon serrulatus	madera leptosiphon	No	No	No	No	No	No	No	No	No	No	No	No

Scientific Name	Common Name	Habitat Present and Species is Reasonably Expected to Occur On-site?	Species Impacted Directly by Habitat Loss?	Species Impacted by Alterations to Habitat Suitability?	Habitat Loss Substantial?	Species Impacted Indirectly on Adjacent Lands by Edge Effects?	Potential to Eliminate Species On-site?	Potential to Reduce Population size Below Self Sustaining Levels?	Potential for Substantial Reduction in Numbers of Individuals?	Potential Restriction of Range of Rare or Endangered Species?	Impact Significant?	Mitigation?	Impact Significant After Mitigation?
Loeflingia squarrosa var. *artemisiarum*	sagebrush loeflingia	No	No	No	No	No	No	No	No	No	No	No	No
Navarretia fossalis	spreading navarretia	Yes	No	No	No	No	No	No	No	No	No	No	No
Opuntia basilaris var. *brachyclada*	short-joint beavertail	Yes	No	No	No	No	No	No	No	No	No	No	No
Symphyotrichum greatae	Greata's aster	No	No	No	No	No	No	No	No	No	No	No	No
ANIMALS													
Antrozous pallidus	pallid bat	Yes	Yes	Yes	No	No	No	No	No	No	Yes	Yes	No
Corynorhinus townsendii	Townsend's big-eared bat	Yes	Yes	Yes	No	No	No	No	No	No	Yes	Yes	No
Euderma maculatus	spotted bat	Yes	Yes	Yes	No	No	No	No	Yes	No	Yes	Yes	Yes
Eumops perotis	western mastiff bat	Yes	Yes	Yes	No	No	No	No	Yes	No	Yes	Yes	Yes
Lasiurus blossevillii	western red bat	Yes	Yes	Yes	No	No	No	No	Yes	No	Yes	Yes	Yes
Lasiurus xanthinus	western yellow bat	Yes	Yes	Yes	No	No	No	No	Yes	No	Yes	Yes	Yes

Scientific Name	Common Name	Habitat Present and Species is Reasonably Expected to Occur On-site?	Species Impacted Directly by Habitat Loss?	Species Impacted by Alterations to Habitat Suitability?	Habitat Loss Substantial?	Species Impacted Indirectly on Adjacent Lands by Edge Effects?	Potential to Eliminate Species On-site?	Potential to Reduce Population size Below Self Sustaining Levels?	Potential for Substantial Reduction in Numbers of Individuals?	Potential Restriction of Range of Rare or Endangered Species?	Impact Significant?	Mitigation?	Impact Significant After Mitigation?
Onychomys torridus Ramona	southern grasshopper mouse	No	No	No	No	No	No	No	No	No	No	No	No
Perognathus alticola inexpectatus	Tehachapi pocket mouse	No	No	No	No	No	No	No	No	No	No	No	No
Taxidea taxus	American badger	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	No
Xerospermophilus mohavensis	Mohave ground squirrel	No	No	No	No	No	No	No	No	No	No	No	No
Accipiter cooperii	Cooper's hawk	Yes	No	No	No	No	No	No	No	No	No	Yes	No
Accipiter striatus	sharp-shined hawk	Yes	No	No	No	No	No	No	No	No	No	Yes	No
Agelaius tricolor	tricolored blackbird	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	Yes	No
Aimophila ruficeps canescens	Southern California rufous-crowned sparrow	No	No	No	No	No	No	No	No	No	No	No	No
Amphispiza belli belli	Bell's sage sparrow	No	No	No	No	No	No	No	No	No	No	No	No

Scientific Name	Common Name	Habitat Present and Species is Reasonably Expected to Occur On-site?	Species Impacted Directly by Habitat Loss?	Species Impacted by Alterations to Habitat Suitability?	Habitat Loss Substantial?	Species Impacted Indirectly on Adjacent Lands by Edge Effects?	Potential to Eliminate Species On-site?	Potential to Reduce Population size Below Self Sustaining Levels?	Potential for Substantial Reduction in Numbers of Individuals?	Potential Restriction of Range of Rare or Endangered Species?	Impact Significant?	Mitigation?	Impact Significant After Mitigation?
Anser albifrons	greater white-fronted goose	No	No	No	No	No	No	No	No	No	No	No	No
Aquila chrysaetos	golden eagle	Yes	Yes	Yes	No	No	No	No	Yes	No	Yes	Yes	No
Asio flammeus	short-eared owl (nesting)	Yes (winter only)	Yes	Yes	No	No	No	No	No	No	No	Yes	No
Asio otus	long-eared owl (nesting)	Yes	Yes	Yes	No	Yes	No	No	No	No	No	Yes	No
Athene cunicularia	burrowing owl	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Yes	No
Buteo regalis	ferruginous hawk	Yes	Yes	Yes	No	No	No	No	No	No	No	Yes	No
Buteo swainsoni	Swainson's hawk (nesting)	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	No
Cathartes aura	turkey vulture (nesting)	Yes	Yes	Yes	No	No	No	No	No	No	No	Yes	No
Charadrius montanus	mountain plover (wintering)	Yes	Yes	Yes	No	No	Yes	No	No	No	No	Yes	No
Chaetura vauxi	Vaux's swift	Yes (migration only)	No	No	No	No	No	No	No	No	No	Yes	No
Chen caerulescens	snow goose	No	No	No	No	No	No	No	No	No	No	No	No

Scientific Name	Common Name	Habitat Present and Species is Reasonably Expected to Occur On-site?	Species Impacted Directly by Habitat Loss?	Species Impacted by Alterations to Habitat Suitability?	Habitat Loss Substantial?	Species Impacted Indirectly on Adjacent Lands by Edge Effects?	Potential to Eliminate Species On-site?	Potential to Reduce Population size Below Self Sustaining Levels?	Potential for Substantial Reduction in Numbers of Individuals?	Potential Restriction of Range of Rare or Endangered Species?	Impact Significant?	Mitigation?	Impact Significant After Mitigation?
Circus cyaneus	northern harrier (nesting)	Yes	Yes	Yes	No	No	No	No	No	No	No	Yes	No
Dendroica petechia	yellow warbler	Yes (migration only)	No	No	No	No	No	No	No	No	No	Yes	No
Empidonax traillii extimus	southwestern willow flycatcher	Yes (migration only)	No	No	No	No	No	No	No	No	No	Yes	No
Eremophila alpestris actia	California horned lark	No	No	No	No	No	No	No	No	No	No	No	No
Falco columbarius	merlin	Yes	Yes	Yes	No	No	No	No	No	No	No	Yes	No
Falco mexicanus	prairie falcon (nesting)	Yes (foraging habitat only)	Yes	Yes	No	No	No	No	No	No	No	Yes	No
Falco peregrinus anatum	American peregrine falcon (nesting)	Yes (foraging habitat only)	Yes	Yes	No	No	No	No	No	No	No	Yes	No
Geococcyx californianus	greater roadrunner	Yes	Yes	Yes	yes	Yes	Yes	No	No	No	Yes	Yes	No
Gymnogyps californianus	California condor	No	No	No	No	No	No	No	No	No	No	No	No

Scientific Name	Common Name	Habitat Present and Species is Reasonably Expected to Occur On-site?	Species Impacted Directly by Habitat Loss?	Species Impacted by Alterations to Habitat Suitability?	Habitat Loss Substantial?	Species Impacted Indirectly on Adjacent Lands by Edge Effects?	Potential to Eliminate Species On-site?	Potential to Reduce Population size Below Self Sustaining Levels?	Potential for Substantial Reduction in Numbers of Individuals?	Potential Restriction of Range of Rare or Endangered Species?	Impact Significant?	Mitigation?	Impact Significant After Mitigation?
Icterus parisorum	Scott's oriole (nesting)	No	No	No	No	No	No	No	No	No	No	No	No
Lanius ludovicianus	loggerhead shrike (nesting)	Yes	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Yes	No
Numenius americanus	long-billed curlew (nesting)	Yes (migration/ winter only)	Yes	Yes	No	No	No	No	No	No	No	Yes	No
Pelecanus erythrorhynchos	American white pelican (nesting colony)	Yes (migration only)	No	No	No	No	No	No	No	No	No	Yes	No
Plegadis chihi	white-faced ibis (nesting colony)	Yes (foraging habitat only)	Yes	Yes	No	No	Yes	No	No	No	No	Yes	No
Pooecetes gramineus	vesper sparrow	Yes	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Yes	No
Sialia currucoides	mountain bluebird	Yes	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Yes	No
Sturnella neglecta	western meadowlark	yes	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Yes	No
Toxostoma lecontei	Le Conte's thrasher	No	No	No	No	No	No	No	No	No	No	No	No

Scientific Name	Common Name	Habitat Present and Species is Reasonably Expected to Occur On-site?	Species Impacted Directly by Habitat Loss?	Species Impacted by Alterations to Habitat Suitability?	Habitat Loss Substantial?	Species Impacted Indirectly on Adjacent Lands by Edge Effects?	Potential to Eliminate Species On-site?	Potential to Reduce Population size Below Self Sustaining Levels?	Potential for Substantial Reduction in Numbers of Individuals?	Potential Restriction of Range of Rare or Endangered Species?	Impact Significant?	Mitigation?	Impact Significant After Mitigation?
Vireo bellii pusillus	least Bell's vireo	No	No	No	No	No	No	No	No	No	No	No	No
Xanthocephalus xanthocephalus	yellow-headed blackbird	Yes	Yes	Yes	No	Yes	No	No	No	No	Yes	Yes	No
Anniella pulchra pulchra	silvery legless lizard	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	No
Emys marmorata	western pond turtle	No	No	No	No	No	No	No	No	No	No	No	No
Gopherus agassizii	desert tortoise	No	No	No	No	No	No	No	No	No	No	No	No
Phrynosoma blainvillii	Blainville's horned lizard	Yes	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Yes	No
Thamnophis hammondii	two-striped garter snake	No	No	No	No	No	No	No	No	No	No	No	No
Rana draytonii	California red-legged frog	No	No	No	No	No	No	No	No	No	No	No	No
Gasterosteus aculeatus williamsoni	unarmored threespine stickleback	No	No	No	No	No	No	No	No	No	No	No	No
Streptocephalus woottoni	Riverside fairy shrimp	Yes	No	Yes	Yes	No	Yes	No	No	Yes	Yes	Yes	No

Appendix H:

Resumes of Key Natural Resource Consultants, Inc. Personnel

DAVID A. LEVINE | PRINCIPAL

Education

Master of Science (Biology) 1985, University of California, Irvine
Program in Marine Ecology 1982, Stanford University, Pacific Grove, California
Bachelor of Science (Biology) 1982, Lewis and Clark College, Portland, Oregon

Permits and Certification

California Department of Fish and Game Scientific Collector Permit
Riverside County - List of Qualified Biological Consultants
San Diego County - CEQA Consultant List; Biological Resources
Los Angeles County - Approved Consultant for Significant Ecological Area
San Bernardino County - Authorized Biological Consultant

Other Training

Quino Checkerspot Butterfly Identification Seminar, 1997
Natural Communities Conservation Planning, 1993

Countries of Work Experience

USA (California and Hawaii)
Jakarta, Indonesia
China (Yunnan and Taiwan)
Bangkok, Thailand
Hong Kong
Koror, Republic of Palau

Professional Experience

Principal/Ecologist | Natural Resource Consultants 1993 - Present

Mr. Levine is the principal in charge of NRC's biological consulting services. He brings over 20 years of project experience to NRC's efforts and provides team leadership for complex environmental permitting projects, large-scale biological studies, and multi-agency conservation planning efforts. Mr. Levine has conducted hundreds of biological resource evaluations for public and private sector projects throughout California. As NRC's principal, Mr. Levine ensures that NRC's studies and documentation emphasize compliance with local, state, and federal environmental regulations and balancing development with conservation of regionally significant biological resources.

Environmental Planner/Biologist | MBA International 1988 - 1993

Between 1991 and 1993 and prior to founding NRC, Mr. Levine participated as a consultant to the World Bank and Asian Development Bank for environmental review of project loans in southeast Asia and the South Pacific islands. Prior to 1990, he prepared and implemented habitat management plans for federally endangered species in locations throughout southern California. Mr. Levine also has designed and instructed seminars on environmental regulations for land use planners with training focused on regional and federal environmental laws effecting resource development.

Environmental Analyst | The Planning Center 1987 - 1988

At The Planning Center Mr. Levine conducted site surveys to determine land uses and demographic profiles of study areas including the review of literature and historical records for potential hazardous materials within study areas. Mr. Levine coordinated input of air pollution, water pollution, traffic, and cultural experts and prepared environmental impact reports in compliance with California Environmental Quality Act.

Instructor | Orange County Marine Institute 1986 - 1987

As ecology instructor of students in marine and terrestrial ecology Mr. Levine prepared demonstrations of biological principles, conducted classes on use of scientific equipment, identification of marine invertebrates, and measurement of marine water temperature, pH, and turbidity

Lecturer | Yunnan University 1985 - 1986

Prepared daily lectures and writing assignments for Chinese graduate students in the Foreign Language Department of Yunnan University. All students were graduates of the English-language department with opportunities for further study in the United States and Europe. Lecture topics related directly to current world events, cultural change in the U.S. and Europe, and technical and creative writing.

Publications

Results of a Five-Year Monitoring Study for a Habitat Conservation Plan (HCP) Designed to Protect an Isolated Coastal California Gnatcatcher Population: Successful Management of a Small Populations and Breeding Success in Revegetated Habitats; Proceedings of CALGNAT 95.

H. LEE JONES, PH.D. | ORNITHOLOGIST

Education

Post-doctoral fellowships, University of California, Los Angeles and Irvine campuses 1974-1978
Ph.D., Biology, emphasis on biogeography and avian ecology, University of California, Los Angeles 1974
Bachelor of Science, Zoology, North Carolina State University 1968

Permits and Certification

U.S. Fish and Wildlife Service Section 10(a) permit for California Gnatcatcher
U.S. Fish and Wildlife Service Section 10(a) permit for Least Bell's Vireo
U.S. Fish and Wildlife Service Section 10(a) permit for Southwestern Willow Flycatcher (Permit No. TE829204-4).

Professional Experience

Consulting biologist	1993-present
Member, Board of Directors, Michael Brandman Associates	1991-1993
Director of Resources Management, Michael Brandman Associates	1984-1993
Consulting biologist	1978-1984

Dr. Jones is a biologist specializing in the environmental sciences. He is an Internationally recognized ornithologist but also has a solid working knowledge of the other terrestrial vertebrate groups (amphibians, reptiles, and mammals), butterflies, and vascular plants. He has been a professional environmental consultant for 30 years, principally in California, but also in Nevada, Arizona, and several other countries, including Belize, Mongolia, Cambodia, and the island Republics of Palau and Kiribati. Dr. Jones has been responsible for a wide variety of biological, ecological, and conservation studies ranging from local biological assessments to regional conservation planning. He has directly participated in or supervised the production of numerous environmental compliance documents including: environmental impact reports (California), environmental impact statements (federal), and environmental impact assessments (countries outside the US); resource management and habitat restoration plans; habitat conservation plans for Endangered Species Act Section 7 consultations and Section 10(a) permits; Clean Water Act Section 404 permits; and State of California Section 1600 streambed alteration agreements. For the past 18 years Dr. Jones has specialized in conflict resolution between project proponents and the resource agencies on endangered species and resource management issues. He also specializes in conducting and supervising U.S. Fish and Wildlife Service protocol-level surveys for the federally threatened California Gnatcatcher, and the federal and state endangered Least Bell's Vireo and Southwestern Willow Flycatcher (Permit No. TE829204-4). Dr. Jones was a member of the California Bird Records Committee from 1978 to 1983.

Representative Projects

Presence-absence surveys, population studies, and conservation plans for California gnatcatcher 1991-2008

Environmental compliance documents for wind and solar energy projects in southern California 1978-2009

Chief consulting biologist for Protected Areas Management Program, Government of Belize 2000-2006

Assisted the governments of Mongolia, Cambodia, and Kiribati in establishing environmental review processes, as well as the underlying environmental regulations, standards, and policies that serve as the foundation for environmental review 1992-1997

Selected Publications

(with Oliver Komar). Central America. [Quarterly column on seasonal bird distribution in Central America]. *North American Birds*, vols. 55-63: 2000-2009
Birds of Belize. Univ. of Texas Press, Austin. 317 pp.

(with A. C. Vallely). 2001. *Annotated checklist of the Birds of Belize*. Lynx Edicions, Barcelona, Spain.

2000. *Maiuia Mannikibani Kiritimati (The Birdlife of Christmas Island)*. Dames & Moore, Honolulu.

(with Stuart Pimm and Jared Diamond). 1988. On the risk of extinction. *American Naturalist* 132(6): 757–785

(with Kimball Garrett and Arnold Small). 1981. Checklist of the birds of California. *Western Birds* 12:57-73

(with Jared Diamond). 1980. Species turnover in island bird communities. In: *Proceedings of the 17th International Ornithological Congress* 2: 777-782. Berlin, June 5-11, 1978. (R. Nohring, ed.).

STEPHEN H. REYNOLDS | SENIOR PLANT ECOLOGIST

Education

Masters of Science (Conservation Biology). In progress. State University of New York, College of Environmental Science and Forestry. Syracuse, NY.
Bachelor of Science (Geology: Concentration in Environmental and Engineering Geology) 2001, James Madison University, Harrisonburg, VA.
Bachelor of Science (Biology: Concentration in Plant Biology) 2001, James Madison University, Harrisonburg, VA.

Other Training

USACE Federal and Arid West Region Wetland Delineation. 2007. WTI.
Rare Plants of San Diego County. 2008. CNPS.

Professional Experience

2007 - Present — Sr. Plant Ecologist/ GIS Specialist | Natural Resource Consultants

Mr. Reynolds has served as project manager for numerous projects throughout southern California, including the development, implementation, and supervision of a large scale, multiyear grassland monitoring program at Tejon Ranch. Principle management duties include hiring and supervision of field crews, coordinating and prioritizing daily field and office logistics for several sites, establishing and maintaining effective communication among clients, coworkers, review boards and regulatory agencies, data management and statistical analyses, GIS analyses and graphics, and preparation of formal reports. Mr. Reynolds has also served as senior botanist for all company projects and duties include identification of unknown plant specimens from various vegetation types, surveys for special status plant species, and development or review of all vegetation restoration programs. He has performed or assisted in protocol presence/absence and potential habitat surveys for numerous special status species including burrowing owl, Quino checkerspot butterfly, Western willow flycatcher, California gnatcatcher, and numerous plant taxa and is experienced in vegetation mapping, jurisdictional wetlands delineations, and suitable habitat evaluations, often across a large extent, for numerous taxa and within several vegetation types.

2003 – 2007 — Instructor | SUNY-CESF

Mr. Reynolds taught several laboratory and lecture sections in general ecology, zoology and ecosystem science. He served as head laboratory instructor for nine sections of general ecology in 2005 and 2006. Mr. Reynolds also served as a guest instructor and co-designed and taught all aspects of two graduate-level lecture and laboratory sections of plant ecology in 2006.

2004 – 2006 — Research Ecologist | The Research Foundation at SUNY-CESF

Mr. Reynolds contributed to several major research projects including paleoecological work with the Lake Ontario Biocomplexity Project, focused surveys and population demography of eight protected orchid species throughout NY and PA, elemental analyses in plant tissues in northern NY wetlands, and examinations of effects of nitrogen-fixing plants on community composition and diversity in Lake Ontario coastal peatlands.

Competencies

Computer Software: SAS, PC-ORD, IDRISI, ArcGIS, MODFLOW, GSLIB, RAMAS GIS

Field techniques: Study design, sampling techniques, wetland delineation, hydrologic modeling,vascular/nonvascular plant ID, GPS, sediment coring, community/geologic mapping.

Laboratory techniques: Inductively Coupled Plasma-Optical Emission spectroscopy, NMR, elemental C:N, and various other geochemical techniques.

Memberships

Ecological Society of America
Society of Wetland Scientists
Society for Conservation Biology
California Native Plant Society

Select Publications, Presentations and Guest Lectures

Hajek, KL, DJ Leopold, and SH Reynolds. (in review) A multiscale analysis of environmental influences on rich fen plant communities in central New York. Wetlands.

Reynolds, SH, MT Distler, and KL Hajek. June 27-29, 2006. Native Wetland Species Workshop and Field Trip. The Northeast Symposium on Native Plant Education, Conservation and Gardening. Mexico, NY.

Reynolds, SH and JJ Gillrich, RW Kimmerer, and DJ Leopold. April 19, 2006. Diversity and distribution pattern of bryophytes and vascular plants in two rich fens of the Fall Creek Watershed, NY. Spotlight on Student Research and Outreach Symposium. SUNY-CESF, Syracuse, NY.

Reynolds, SH, MT Distler, JJ Gillrich, KL Hajek and DJ Leopold. Oct. 7-10, 2005. Controlling Factorsof Plant Diversity Across Multiple Spatial Scales in Fens of New York State. Binghamton Geomorphology Symposium. University at Buffalo, Buffalo, NY.

Reynolds, SH. 2005. An Introduction to Field Identification of Graminoids. Wetland Ecology (SUNY-CESF). Cranberry Lake Biological Station. Cranberry Lake, NY.

Cloyd, ET, MS Lucash, NE Muir-Hotaling, JH Hornbeck, HJ Jensen, BJ Norelius, SH Reynolds and JD Wickham. 2004. Diversity and Productivity in Grassland Ecosystems. Conservation Biology: 18(4):1171-1173.

Grants Received

Environmental influences on plant diversity in rich fens of Central New York; A multiscale analysis. The New York Biodiversity Research Institute. May- December, 2006. SH Reynolds and DL Leopold.

Preliminary exploration of plant diversity patterns in fens of the Fall Creek Watershed, NY. The Edna Bailey Sussman Foundation; Internship with The Nature Conservancy (Central and Western NY Chapter). May-Aug., 2003. SH Reynolds.

Honors and Distinctions

Botanical Society of America's Young Botanist of the Year: 2002
JMU Geology Dept. Award for graduating senior with highest GPA: 2001
JMU Male Scholar-Athlete of the Year: 2001 finalist
Varsity Letter in NCAA Div. I Men's Gymnastics: 1997-2001
Verizon Academic Athlete Award: 1999-2001

MITCHELL C. PROVANCE, PH.D. | LEAD BOTANIST

Qualification

Dr. Provance is an expert botanist with project experience throughout southern California. Dr. Provance completed his doctorate work at U.C. Riverside and provides strong academic and professional biological support to our botanical team. Dr. Provance's expertise is taxonomy of vascular plants, floristics, and composition of vegetation communities, especially of southern California and Mexico and the taxonomy, biogeography and ethnobotany of *Diospyros* (Ebenaceae). Dr. Provance has performed numerous surveys for common and rare plant species within Riverside County and has acquired an intimate knowledge of the various vegetation communities found throughout the county. He has experience conducting surveys and construction monitoring for large development and utility infrastructure projects since 1998.

Related Experience

Museum Scientist	U.C. Riverside Herbarium, CA	2007-present
Consulting Botanist	Various	2004-present
Herbarium Assistant	U.C. Riverside	1997-2001
Graduate Researcher	U.C. Riverside	2002-2006

Representative Projects

Construction Monitoring and Surveys	San Bern. and Riverside Counties, CA	2009
Botanical Survey; Mormon Mesa	San Bernardino County, CA	2008
Botanical Survey; BrightSource Energy	San Bernardino County, CA	2008
Botanical Surveys; Tejon Ranch	Los Angeles, County, CA	2008
Rare Plant Survey; Lake Elsinore	Riverside County, CA	2007
Botanical Survey; Kern River	Kern County, CA	2003

Education

Ph.D., Plant Biology, emphases in plant taxonomy, biogeography, and ethnobotany, University of California, Riverside	2006
Bachelor of Science, Botany, University of California, Riverside	2000

Publications

Sanders, A.C. and M.C. Provance. (Book chapter in review). A Botanical Survey of Rancho El Jabalí, Colima/Jalisco, Mexico. Biodiversity of Colima (Biodiversidad de Colima).

Provance, M.C., Ignacio Garcia-Ruiz, A.C. Sanders. 2008. The *Diospyros salicifolia* complex (Ebenaceae) in Mesoamerica. Journal of the Botanical Research Institute of Texas. 2(2): (pagination pending).

Provance, M.C., A.C. Sanders. 2005. More American black sapotes: new *Diospyros* Ebenaceae) for Mexico and Central America. Sida 22(1): 277–304. http://www.brit.org/sida/PDF/PDF22(1)/15_Provance-Sanders _Diospyros_277-304.pdf

Provance, M.C., A.C. Sanders. 2005. *Diospyros torresii* (Ebenaceae): a new black zapote from tropical Mexico. Sida 21(4): 2045–2050. http://www.brit.org/sida/PDF/PDF21(4)/08_Provance-Sanders_Diospyros_2045-2050.pdf

Cahill, J. P. and M.C. Provance. 2002. Genetics of qualitative traits in domesticated chia (*Salvia hispanica* L.). The Journal of Heredity 93(1): 52–55. http://jhered.oxfordjournals.org/cgi/reprint/93/1/52

JUSTIN SMITH | GIS SPECIALIST

Education Master of Science (Biology, candidate) 2010. California State University, Fullerton
Bachelor of Science (Biological Sciences) 2006. California State University, Fullerton

Training Desert Tortoise Council Workshop 2010
Trimble Yuma Unit Workshop 2010

Awards Rachel Carson Award for Conservation Biology 2008

Professional Experience

Environmental Intelligence, LLC *2010 – present*
Monitor /GIS Specialist
Justin Smith is a monitor and GIS specialist. Mr. Smith has been involved in several biological surveys including burrowing owl, California gnatcatcher, desert tortoise, and other desert species. Mr. Smith has served as a lead field technician and managed complex geospatial data collected from vegetative mapping and rare plant surveys of over 10,000 acres throughout Los Angeles and Kern counties, California. Mr. Smith offers a strong background in CEQA as well as the biogeography and ecology of southern California. Most recently, he has conducted construction monitoring for Southern California Edison's El Casco System Project in Riverside and San Bernardino Counties as well as the Devers-Mirage 115kv Subtransmission System Split Project in Riverside County.

Cabrillo Marine Aquarium *2007 – 2009*
Laboratory Biologist
Mr. Smith developed an effective, collaborative Marine Protected Areas public outreach program for Cabrillo Marine Aquarium, Long Beach Aquarium of the Pacific, the Ocean Institute, and Birch Aquarium at Scripps. Mr. Smith represented these institutions in the Orange County Marine protected Areas committee. Mr. Smith helped to create novel larval rearing techniques for blue-banded goby, California halibut, California spiny lobster, red abalone, and the endangered white abalone.

California State University, Fullerton *2006 – 2008*
Volunteer
Mr. Smith participated in annual biodiversity surveys of the intertidal of southern California and conducted rapid assessment surveys in the Santa Monica Mountains and at Leo Carillo State Park for National Geographic.

CSUF Arboretum *2006 – 2007*
Horticulturist's Assistant
Mr. Smith served as assistant to the Living Collections Curator at the California State University, Fullerton Arboretum. Mr. Smith maintained the grounds of the largest botanical garden in Orange County; overseeing over 4,000 plant species from around the world.

Appendix I:

Resumes of Key WEST, Inc. Personnel

WALLACE P. ERICKSON, *Consulting Biometrician / Senior Manager*

EDUCATION

M.S.	University of Wyoming, Laramie, Wyoming	1992	*Statistics*
B.S.	Winona State University, Winona , Minnesota	1989	*Statistics and Mathematics*

PROFESSIONAL EXPERIENCE

1991-Present *Consulting Biometrician/Senior Manager*, Western EcoSystems Technology, Inc., Cheyenne, Wyoming
1990-1991 *Research Assistant*, University of Wyoming, Laramie, Wyoming
1990-1991 *Field Scientist*, University of Alaska, Fairbanks, Alaska
1989 *Research Assistant*, Alumni Office, Winona State University, Winona, Minnesota

SPECIALTY AREAS

Professional Summary: Statistician with over 18 years of experience in applying statistical solutions to a wide variety of natural resource problems. Has worked for state and federal wildlife agencies and industry throughout the U.S. Authored/co-authored over 40 professional publications on statistical applications in wildlife and other related fields.

Statistical Design and Analysis of Monitoring and Risk/Impact Assessment Studies: Numerous projects in designing and analyzing data collected to estimate or monitor the impacts of potential environmental perturbations or general monitoring programs. Was a principal Biometrician responsible for design and analysis of studies of impacts of the *Exxon Valdez* oil spill on marine organisms for the state of Alaska. Has had similar responsibility working for the States in several other NRDA studies, mainly involving mining impacts. Has participated in studies designed to assess impacts of windpower development on birds, bats and other wildlife in over 25 states. Has worked with numerous National Wildlife Refuges in Alaska and other states designing monitoring programs. Currently working with the Charles M. Russell NWR on innovative studies of plant, ungulate grazing interactions and development of new models for rangeland health.

Resource/Habitat Selection: Numerous projects in the study of resource selection by animals. Has participated in teaching workshops on resource selection. Experience includes the study of resource selection by moose in Alaska, study the effect of salvage logging on passerines in Oregon, study of brown bear habitat selection on the Kenai Peninsula in relation to development, study of brand habitat selection in wintering areas in Mexico, and the study of habitat selection by bighorn sheep in Idaho. Organized First International Conference on Resource Selection held in Laramie, Wyoming, January 2003. Co-author of book entitled "Resource Selection by Animals."

Wildlife Population Estimation: Knowledgeable in many techniques for estimation of abundance of wildlife. Participated in studies using mark/recapture techniques, line transect techniques, quadrat/plot methods, point counts surveys, etc. Designed studies to estimate moose populations in Alaska using line transect sampling. Participated in studies to estimate polar bear numbers, spotted owls and brant populations using capture/recapture techniques; neotropical migrants using point count/variable circular plot methods; walrus using adaptive sampling techniques.

Conducting Statistical Workshops for Biologists: Has developed material for, and conducted statistical workshops for biologists on the topics of general statistical methods, biological sampling and animal abundance estimation, resource selection, computer intensive statistics and spatial statistics.

SELECTED PUBLICATIONS

Arnett, E.B., W.K. Brown, W.P. Erickson, J.K. Fiedler, B.L. Hamilton, T.H.Henry, A. Jain, G.D. Johnson, J. Kerns, R.R. Koford, C.P. Nicholson, T.J. O'Connell, M.D. Piorkowski, and R.D. Tankersley. 2008. Patterns of Bat Fatalities at Wind Energy Facilities in North America. J. Wild. Man. 72(1).

Johnson, G. D., M. D. Strickland, W. P. Erickson, and D. P. Young, Jr. 2006. Use of data to develop mitigation measures for wind power development impacts to birds. In M. Ferrer, G. Janss and M. de Lucas, editors. Birds and windpower. Quercus Press, Spain. In Press.

Johnson, G.D., M.K. Perlik, W.P. Erickson, and M.D. Strickland. 2004. Bat activity, composition and collision mortality at a large wind plant in Minnesota. Wildlife Society Bulletin 32: in Press.

Erickson, W.P., R. Nielson, R. Skinner, B. Skinner and J. Johnson. 2004. Applications of resource selection modeling using unclassified Landsat Thematic Mapper imagery In Resource Selection Technique and Applications. Huzurbazar, editor. Omnipress, Madison Wisconsin.

Howlin, S., W.P. Erickson, and R. Nielson. 2004. Techniques for assessing predictive ability of resource selection functions. In Resource Selection Technique and Applications. Huzurbazar, editor. Omnipress, Madison, WI.

Erickson, W.P., G.D. Johnson, and D.P. Young. 2004. Summary of anthropogenic causes of bird mortality. Proceedings of the 2002 International Partner's in Flight Conference, Monterrey, California.

SCIENTIFIC ORGANIZATION MEMBERSHIPS

American Statistical Association	*Biometrics Society*
The Wildlife Society	*The National Audubon Society*

ANDREA H. CHATFIELD, *Wildlife Biologist / Project Manager*

EDUCATION

M.S.	University of Minnesota, St. Paul, Minnesota	2005	*Wildlife Conservation*
B.S.	University of Michigan, Ann Arbor, Michigan	1996	*Natural Resources & Environment*

PROFESSIONAL EXPERIENCE

2006-Present	*Wildlife Biologist/Project Manager*, Western EcoSystems, Inc., Arcata, California
2005-2006	*Wildlife Ecologist*, Williams Wildland Consulting, Inc., Marysville, California
1999-2005	*Research Assistant/Crew Leader*, Spotted Owl Demography Study, University of Minnesota, St. Paul, Minnesota
2001-2002	*Research Volunteer*, Wildlife Conservation Society, Wara Sara, Papua New Guinea
1999-2001	*Restoration Technician*, Circuit Rider Productions, Inc., Windsor, California
1999	*Biological Science Technician*, USFS, Lake Tahoe Basin and Sierra National Forest, California
1997-1998	*Task Force Coordinator and Research Assistant*, University of Michigan, Flint, Michigan
1997	*Field Research Assistant*, Sacramento State University, Sacramento, California
1997	*Field Research Intern*, USGS, Hakalau Forest NWR, Hawaii
1996, 1998	*Field Research Assistant*, University of Vermont, Hopland, California
1995	*Botany/Forestry Assistant*, USFS, San Juan National Forest, Colorado

TRAINING/CERTIFICATION

2010	Noninvasive Acoustic Monitoring of Bats, Field Techniques Workshop, Wind Wolves Preserve, California
2009	Anabat Techniques Training Course, Titley Scientific, Orange County, California
2007	Desert Tortoise Survey Techniques Workshop, Desert Tortoise Council, Ridgecrest, California

PROFESSIONAL SUMMARY

Andrea Chatfield has over fifteen years of experience working in the field of wildlife biology. Andrea has been involved in a variety of natural resource studies throughout the U.S., both in academia and in the private sector. Andrea joined WEST in 2006 as a field biologist and has since worked primarily on wildlife and environmental studies related to utility-scale wind-energy development throughout the U.S.

Project Management: Andrea is the Project Manager for a number of pre- and post-construction wildlife monitoring projects at wind-energy facilities primarily throughout California and other western states. As a project manager, Andrea has supervised wildlife and natural resource studies throughout all phases of wind project development from early site assessment to post-construction monitoring and mitigation. Andrea has experience with all aspects of project management including budget preparation, hiring and training field survey crews, coordinating with clients, designing wildlife studies to meet the needs of clients and resource agencies, study implementation, and report preparation. Studies have included initial site evaluation, pre-construction avian use surveys, threatened, endangered, and sensitive species surveys, ground and aerial raptor nest surveys, breeding bird surveys, acoustic bat surveys, land cover/habitat mapping, and post-construction avian and bat fatality monitoring.

Wildlife Studies: Andrea has extensive field experience conducting research and monitoring for a variety of wildlife species in a variety of habitats throughout the U.S. and overseas. She spent seven years as crew leader on a University of Minnesota long-term spotted owl demography study in the central Sierra Nevada of California. Andrea's graduate research involved creating a landscape-scale cover-class map and testing predictive models of spotted owl habitat use at multiple spatial scales using a GIS interface. Additional field experience includes the design and/or implementation of surveys for northern goshawk, great gray owl, burrowing owl, willow flycatcher, Hawaiian honeycreepers and other passerines, pine marten, pacific fisher, western fence lizard, and Cassowary. She has experience with a variety of wildlife survey techniques including mist-netting, banding of raptors and passerines, avian broadcast surveys, line transect and fixed-point avian surveys, nest searching, track plate surveys, camera trapping, radio telemetry, bat monitoring using Anabat acoustic detectors, and vegetation sampling. She is experienced with Garmin and Trimble GPS units and is proficient in ArcGIS 9.2. Andrea is currently managing pre- and post-construction environmental monitoring at wind-energy facilities primarily throughout California.

SCIENTIFIC ORGANIZATION MEMBERSHIPS

The Wildlife Society
Western Section of The Wildlife Society

KURT FLAIG, *Botanist / Wetland Ecologist*

EDUCATION

M.S.	Colorado State University, Fort Collins, Colorado	1999	*Range Ecology*
B.S.	Colorado State University, Fort Collins, Colorado	1995	*Natural Resource Management*
B.A.	Florida Atlantic University, Boca Raton, Florida	1989	*Political Science*

PROFESSIONAL EXPERIENCE

2003-Present *Botanist/Wetland Ecologist*, Western EcoSystems Technology, Inc., Cheyenne, Wyoming
2001-2003 *Plant Ecologist*, H.T. Harvey & Associates, San Jose, California
2000-2001 *Range Technician*, Colorado State Cooperative Extension Program and Division of Wildlife, Weston, Colorado
2000-2001 *Natural Resource Technician*, Center for Ecological Management of Military Lands, Fort Collins Colorado
1999-2000 *Biological Science Technician*, U.S. Forest Service, Canyon Lakes District, Fort Collins, Colorado
1998-1999 *Range Technician*, Colorado State Cooperative Extension Program, Fort Collins, Colorado and Y-Cross Ranch, Horse Creek, Wyoming
1996-1999 *Graduate Research Assistant*, Department of Rangeland Ecosystem Science, Fort Collins, Colorado and Fort Richardson, Alaska
1995-1996 *Research Assistant*, Department of Rangeland Ecosystem Science, Colorado State University, Fort Collins, Colorado
1994-1995 *Range Technician*, Colorado State Cooperative Extension Program, Fort Collins, Colorado

SPECIAL TRAINING AND COURSES

Functional Assessment of Colorado Wetlands (FACWet) Methodology Training, 2009
Biological Assessment/Biological Evaluation Preparation Training, USFS, 2008
Advanced Hydric Soils Course, Wetland Training Institute, 2005
Wetland Delineation Course, Wetland Training Institute, 2003
California Native Plant Society Rapid Assessment Course for Vegetation Mapping, 2001
EIR/EIS Preparation and Review, UC Davis Extension, 2001
Wetland Regulations, UC Davis Extension, 2001

SPECIALTY AREAS

Wetland delineation, mitigation and monitoring, functional assessment, permitting/regulations
Special-status plant survey and site/project evaluation
Special-status plant and habitat impact and mitigation assessment
Floristic inventory (including noxious weed)
Vegetation monitoring (short- and long-term) using a variety of sampling techniques
Vegetation community/association description and mapping
Preparation of technical reports

PROFESSIONAL SOCIETY MEMBERSHIPS

Society of Wetland Scientists
Wyoming Native Plant Society
Colorado Native Plant Society
California Native Plant Society

BOTANICAL EXPERIENCE – MOJAVE DESERT

Sidewinder Wind Project Special-status Plant Survey, Barstow, CA, 2008
White Hills Wind Project Special-status Plant Survey, White Hills, AZ, 2008
Eiastrum hooveri (Hoover's woolly-star) Inventory (in preparation for BA), Rosamond/Lancaster, CA, 2003

BILL DEPPE, *Field Technician/Avian Crew Leader*

EDUCATION

B.S.	University of Redlands 1968-1972
Teaching Credential	Cal. State University at Los Angeles 1973
Admin. Credential	Cal. State University at San Bernardino 1988
Various natural science/ornithology classes to present	

PROFESSIONAL EXPERIENCE

- Retired Teacher of 34 years. Last assignment was teaching Life Science at the secondary level.
- Worked on several projects for WEST, Inc. over past five years conducting following surveys:
  - Fixed-point avian use surveys
  - Raptor migration surveys
  - Breeding bird surveys
  - Raptor nest surveys
  - Acoustic bat surveys using AnaBat detectors
- Worked for Tierra Madre (Riverside office) in the following areas:
  - Least Bell's Vireo surveys along the Santa Ana River
  - Conducted a bio-survey for a wind generation facility in Palm Springs
  - Rodent trapping/surveys
- Licensed bird bander—I have banded for approximately 20 years. I operated a MAPS Banding station at the Lewis Center in Apple Valley, CA during the summers of 2003-4.
- Conducted raptor surveys in the Barstow/Newberry area since 2000.
- Volunteer participant in numerous bird surveys, including:
  - Mountain Plover and Tricolored Blackbird Surveys in Newberry Springs
  - San Bernardino County Breeding Bird Atlas
  - Numerous Christmas Bird Counts in San Bernardino and Riverside Counties
  - Rapid Bird Assessments along the Mojave River—2001 and 2002
  - Turkey Vulture/raptor migration monitoring in Victorville, CA for several years
  - Bird Breeding Survey route in Victorville, CA—1997 to 2001
- Active San Bernardino County birder. I know the desert areas very well and recently set the Big Year record for San Bernardino County.

PROFESSIONAL MEMBERSHIPS

- American Birding Association
- Western Field Ornithologists
- Founding member and current president of the Mojave Desert Bird Club, Victorville, CA

KENNETH M. LEVENSTEIN, PH.D., *Research Biologist / Project Manager*

EDUCATION

Ph. D..	Arkansas State University, Arkansas	2008	*Environmental Biology*
M.S. .	Antioch University, Keene, New Hampshire	1995	*Environmental Biology*
B.A.	Antioch College, Yellow Springs, Ohio	1985	*Communications*

PROFESSIONAL EXPERIENCE

2011-Present	*Project Manager*, Western EcoSystems Technology, Inc., Cheyenne, Wyoming
2009-2011	*Senior Ornithologist*, BHE Environmental, Inc., Cincinnati, Ohio
2008-2009	*Postdoctoral Research Associate*, University of Washington, Department of Psychology (Animal Behavior), Seattle, Washington.
2001-2008	*Ph.D. Research*, Arkansas State University, Jonesboro Arkansas and Galapagos, Ecuador
2007, 2008	*Independent Contract Biologist*, Arkansas Game and Fish Commission, Little Rock, Arkansas
2006-2007	*Field Supervisor*, The Cornell Lab of Ornithology, Ithaca, New York
2006	*Biologist*, The USGS Patuxent Wildlife Research Center, Vicksburg, Mississippi
2006	*Biologist*, USGS Arkansas Cooperative Fish and Wildlife Research Unit, Fayetteville, Arkansas
2005-2006	*Crew Leader/Biologist*, The Cornell Lab of Ornithology, Ithaca, New York
2000	*Crew Leader/Biologist*, Hamer Environmental, Mt. Vernon, Washington

SPECIALTY AREAS

Dr. Ken Levenstein has close to 20 years of experience studying avian ecology all over the United States and overseas as well both in academia and in the private sector. Raised in the Los Angeles area, Ken joined the staff of WEST as an Avian Ecologist and Project Manager in 2011 and is currently managing projects for renewable energy clients in Southern California.

Wind-Energy and Energy-Transmission Corridor Studies: Ken comes to WEST from an environmental consulting firm in the Midwestern U.S. where he worked primarily for wind energy clients conducting critical issues-, fatal flaw-, and Phase I and Phase II analyses; and for energy pipeline companies conducting MBTA compliance surveys and monitoring both on the ground (Oklahoma, Kansas, Wyoming, Montana, and South Dakota) and by air (raptor nest surveys by helicopter; Wyoming, Montana, and South Dakota). Ken has experience with all aspects of project management including budget preparation, hiring and training field survey crews, coordinating with clients, designing wildlife studies to meet the needs of clients and resource agencies, study implementation, and report preparation. Studies have included initial site evaluation, pre-construction avian use surveys, threatened, endangered, and sensitive species surveys, ground and aerial raptor nest surveys, breeding bird surveys, land cover/habitat mapping, and post-construction avian and bat fatality monitoring.

Wildlife Studies: Ken has close to twenty years experience conducting avian research throughout the U.S. and overseas and has extensive knowledge of avian research methodologies; fixed-point-, line-transect-, and territory mapping-surveys, nest searching, radio telemetry, constant effort and targeted mist-netting (1000s processed), capture-mark-recapture studies and analyses.

Threatened and Endangered Species: T&E species research, surveys, and monitoring; species include research on a number of rare, threatened, and endangered species include: southwestern willow flycatcher, California, Arizona, and Nevada, along the entire Lower Colorado River from the Grand Canyon to the Mexican border - searched for and monitored territories and nests, banded adults and nestlings, resighted color-banded individuals; Bicknell's thrush, Vermont - searched for and monitored territories and nests, banded adults and nestlings, resighted color-banded individuals; California Gnatcatcher, California - searched for and monitored territories, resighted color-banded individuals; Mariana crow, Rota, Northern Mariana Islands - searched for and monitored territories and nests, banded adults and nestlings, resighted color-banded individuals, radio-telemetry, conducted nest observations (video); Rota bridled white-eye, Rota, Northern Mariana Islands - searched for and monitored territories and nests, conducted nest observations (video); Galápagos hawk, Isla Santiago, Galápagos; marbled murrelet, Olympic Peninsula, Washington – surveyed old growth forest and timberlands for breeding adults.

SCIENTIFIC ORGANIZATION MEMBERSHIPS

The Wildlife Society	Cooper Ornithological Society
American Ornithologists Union	Raptor Research Foundation
Association of Field Ornithologists	Wilson Ornithological Society

DONALD I. SOLICK, *Wildlife Biologist*

EDUCATION

M.S.	University of Calgary, Alberta, Canada	2004	*Ecology*
B.S.	The Evergreen State College, Olympia, Washington	1998	*Wildlife Biology*
B.A.	The Evergreen State College, Olympia, Washington	1998	*Environmental Studies*

PROFESSIONAL EXPERIENCE

2007-Present *Wildlife Biologist*, Western EcoSystems Technology, Inc., Cheyenne, Wyoming
2007 *Wildlife Technician-Radar Ornithology*, ABR, Inc. Environmental Research, Forest Grove, Oregon
2005-2007 *Research Technician-Paleoecology*, Carleton & St. Olaf Colleges, Northfield, Minnesota
2006 *Research Assistant-Birds*, Warbler Ecology Studies, Ohio State University, Columbus, Ohio
2004-2005 *Adjunct Professor-Environmental Science*, Philadelphia University, Philadelphia, Pennsylvania
2000-2004 *Project Leader-Bats*, Bat Behavioral Ecology (Thesis Research), University of Calgary, Alberta, Canada
2000-2002 *Lab Instructor-Biology*, Department of Biological Sciences, University of Calgary, Alberta, Canada
2000 *Research Assistant-Bats*, Bat Landscape Study, University of Oregon, Corvallis, Oregon
2000 *Biological Technician-Birds*, (GS-05), Cowbird Study, USGS N. Prairie Wildl. Res. Center, North Dakota
2000 *Banding Assistant-Birds*, Braddock Bay Bird Observatory, Rochester, New York
1999 *Banding Assistant-Birds*, Migration Monitoring, Thunder Cape Bird Observatory, Ontario, Canada

SPECIALTY AREAS

Bat Ecology: Fifteen years of experience conducting bat research throughout North American and Canada. Extensive experience conducting acoustic monitoring surveys (using Anabat and full-spectrum detectors) to determine bat activity, radar and night-vision surveys to monitor bat migration and behavior, mist-netting and harp-trapping surveys to determine presence/absence of species (including threatened and endangered species), telemetry studies to determine roosting and foraging behavior, and nightly emergence counts of bats at building, mine and tree roots.

Wind Power Studies: Acoustic, radar, and night-vision surveys to assess impacts of wind power development on bats and birds.

Non-game Wildlife Surveys: *Birds:* point counts, migration monitoring, mist-netting, telemetry, nest-searching, owl call surveys; *Small Mammals:* live-trapping, telemetry, behavioral observations; *Insects:* collection, preservation, and identification of terrestrial and aquatic arthropods; *Fish:* electroshocking and stream health assessment; *Reptiles and Amphibians:* frog and toad call surveys, sea turtle monitoring; *T&E Species:* Indiana bat, gray bat, Townsend's big-eared bat, Utah prairie dog, cerulean warbler, olive ridley and loggerhead sea turtle, monarch butterfly.

PUBLICATIONS

Camill P., A. Barry, E. Williams, C. Andreassi, J. Limmer, and D. I. Solick. 2009. Climate-vegetation-fire interactions and their impact on long-term carbon dynamics in a boreal peatland landscape in northern Manitoba, Canada. *Journal of Geophysical Research* 114: G04017, doi: 10.1029/2009JG001071.

Solick, D. I. and RMR. Barclay. 2007. Geographic Variations in Use of Torpor and Roosting Behavior for Female Western Long-Eared Bats (*Myotis evotis*). *Journal of Zoology, London* 272: 358-366.

Solick, D. I. and RMR. Barclay. 2006. Morphological Differences Among Western Long-Eared Bat (*Myotis evotis*). Populations in Different Environments. *Journal of Mammalogy* 87:1020-1026

Solick, D. I. and RMR. Barclay. 2006. Thermoregulation and Roosting Behviour of Reproductive and Non-Reproductive Female Western Long-Eared Bats (*Myotis evotis*). *Canadian Journal of Zoology* 84: 589-599.

PROFESSIONAL DEVELOPMENT

***Instructor*, Anabat and Marine Radar Field Techniques, Western Bat Working Group Workshop, TX. 2009.**

Participant, Indiana Bat Study Techniques Workshop, Bat Conservation and Management, PA. 2008
Participant, Acoustic Monitoring Workshops, Bat Conservation International, KY and CA, 2007 and 2008.
Presenter and attendee, North American Symposium on Bat Research, various locations, 1999-2004, 2008-present.
Board of Directors, Hlami Association for Turtle Conservation and Hope (HATCH), Ghana, 2008-present.
Board of Directors, Colorado and Western Bat Working Groups. Present.

ANDREW P. KRAUSE, *Biologist*

EDUCATION

B.S. California State University, Bakersfield, California 2009 *Wildlife Conservation Biology*

PROFESSIONAL EXPERIENCE

2010-Present	*Biologist*, Western EcoSystems Technology, Inc., Cheyenne, Wyoming
2010	*Instructor Assistant*, California State University, Bakersfield, California
2007-2009	*Lead Environmental Field Technician*, Oak Creek Energy Systems, Mojave, California
2007	*Research Assistants*, California State University, Bakersfield, California

SPECIALTY AREAS

GPS Devices

Trimble Unit

Microsoft Office: (Excel, Word, PowerPoint, Access)

Operating small to large equipment: ATV, boat, tractor (small to mid) and 4-wheel drive vehicles

ARC GIS Software

Anabat Systems

CONTINUING EDUCATION

Human Resources for Class Management

Anabat Workshop, April 2008

BCI Mist Netting Workshop, July 2008

Mist Netting Workshop, SFSU Extended Campus, July 2009

ESRI Certified, Introduction to ArcGIS, May 2010

Appendix J:

Project Personnel Permits

State of California—The Resources Agency
DEPARTMENT OF FISH AND GAME

2009 SCIENTIFIC COLLECTING PERMIT APPLICATION

THIS PERMIT IS VALID: FROM 1/11/11 THROUGH 1/11/13

PERMANENT ID NUMBER SC- 009798

2010 CALIFORNIA RESIDENT SCIENTIFIC COLLECTING PERMIT $61.75
801050-01
Invalid after December 31, 2010
Date Issued 4/7/10

2009 DUPLICATE
No. 000
Date Issued

☐ NEW ☐ RENEWAL - Copy of previous permit and report of specimens captured/salvaged **MUST BE ATTACHED** or application will be returned.

CHECK ONE: ☒ RESIDENT—$61.25 ☐ NONRESIDENT—$205.00 ☐ STUDENT—$20.50—RESIDENT AND NONRESIDENT

BEFORE COMPLETING APPLICATION: Read instructions (last page), permit descriptions, mandatory conditions, and authorization requested or issued on reverse page of application. **Complete all three pages (FIVE SECTIONS) of the application (sponsor's section may be required).** Type or print clearly.

SECTION 1 - PERMITTEE INFORMATION

FIRST NAME	M.I.	LAST NAME	DRIVER'S LICENSE OR DMV ID NUMBER/STATE
ANDREW	P	KRAUSE	

AFFILIATION	☐ Check here if you want future correspondence mailed to your affiliation.	TITLE	DATE OF BIRTH
		FIELD TECHNICIAN	MM / DD / YYYY 01/30/1965

PERMITTEE'S MAILING ADDRESS	DAY TELEPHONE	FAX NUMBER
PO BOX 534	(661) 747-1573	(661) 822-5991

CITY	STATE	ZIP CODE	E-MAIL ADDRESS
LEBEC	CA	93243	ANDY@OAKCREEKENERGY.COM

AFFILIATION'S MAILING ADDRESS	CITY	STATE	ZIP CODE

SECTION 2 - SPONSOR INFORMATION

*All students must have at least one faculty sponsor's signature. Individuals who collect on the behalf of an organization they are not affiliated with must have two sponsor's signatures from members of that organization. Elementary and secondary school teachers must have their school principal sign as a sponsor. In some other **rare** cases, the Department may determine a sponsor's signature is needed and request this from the applicant.*

SPONSOR'S FIRST NAME	M.I.	LAST NAME	DAY TELEPHONE
			( )

TITLE	ORGANIZATION

MAILING ADDRESS	CITY	STATE	ZIP CODE

SPONSOR'S CERTIFICATION/SIGNATURE: *I verify the take described in this application is required by this organization.* DATE

X

SPONSOR'S FIRST NAME	M.I.	LAST NAME	DAY TELEPHONE
			( )

TITLE	ORGANIZATION

MAILING ADDRESS	CITY	STATE	ZIP CODE

SPONSOR'S CERTIFICATION/SIGNATURE: *I verify the take described in this application is required by this organization.* DATE

X

SECTION 3 - PERMIT INFORMATION

USE OF PERMIT: CHECK BOX(ES)

☒ BIOLOGICAL CONSULTING *(generally, catch and release only)* ☐ RESEARCH ☐ MUSEUM COLLECTION
☐ STATE, FEDERAL OR OTHER AGENCY BIOLOGIST ☐ EDUCATION ☐ OTHER _____

WILDLIFE AND ACTIVITY: Reminder - You must provide justification in Section 4 for each wildlife and activity circled here in Section 3.

*Circle the type of wildlife to be taken **AND** circle the type of activity requested: S=sacrifice; R=capture and release; C=take into captivity; SL=salvage; M=mark.*

MAMMALS	S	R	C	SL	M	FRESHWATER FISHES	S	R	C	SL	M
BIRDS *(See "L" on reverse)*	S	R	C	SL	M	FRESHWATER INVERTEBRATES	S	R	C	SL	M
REPTILES	S	R	C	SL	M	ANADROMOUS FISHES	S	R	C	SL	M
AMPHIBIANS	S	R	C	SL	M	MARINE FISHES	S	R	C	SL	M
VERNAL POOL/TERRESTRIAL INVERTEBRATES	S	R	C	SL	M	MARINE AQUATIC PLANTS	S		C	SL	
						MARINE/TIDAL INVERTEBRATES	S	R	C	SL	M

I certify that I have read, understand, and agree to abide by, all conditions of this permit, the applicable provisions of the FGC, and the regulations promulgated thereto. I certify that I am not currently under any Fish and Game license or permit revocation or suspension, and that there are no other legal or administrative proceedings pending that would disqualify me from obtaining this permit. I agree that if I make any false statement as to any fact required as a prerequisite to the issuance of this permit, the permit is void and will be surrendered where purchased, and I understand that I may be subject to prosecution pursuant to FGC Section 1054 or to other administrative actions pursuant to Section 746, Title 14, of the CCR.

SIGNATURE X Andrew P. Krause DATE 03/29/2010

California Natural Resources Agency
DEPARTMENT OF FISH AND GAME

SCIENTIFIC COLLECTING PERMIT AMENDMENT FORM

FEE - $60.00** ***(*The fee is required if your permit is an "Entity Permit" as described under Section 2 of your SCP.)

You are required to complete and submit an Amendment Form when requesting a change to an existing Scientific Collecting Permit or when your affiliation changes.

DFG USE ONLY

THIS AMENDMENT IS VALID:	PERMANENT ID NUMBER
FROM 6/23/2011 THROUGH 1/11/2013	**SC-** 9798

BEFORE COMPLETING AMENDMENT: Read instructions, permit descriptions, mandatory conditions, and authorization requested or issued on reverse page of this amendment form and current Scientific Collecting Permit (SCP) Application www.dfg.ca.gov/licensing/pdffiles/fg1379.pdf. **Complete all portions of the amendment**. If the DFG returns this amendment, it becomes part of and must be attached to your valid, existing SCP. Type or print clearly.

SECTION 1 - INDIVIDUAL PERMITTEE INFORMATION - Complete only if original SCP was issued to an individual.

FIRST NAME	M.I.	LAST NAME		SC-
Andrew	P.	Krause		009798
AFFILIATION		☐ Check here if you want future correspondence mailed to your affiliation.	TITLE	DATE OF BIRTH
Western EcoSystems Technologies, Inc.			Biologist	01/30/1965
PERMITTEE'S MAILING ADDRESS			DAY TELEPHONE	FAX NUMBER
P.O. Box 534			( ) (661) 248-6056	( )
CITY	STATE	ZIP CODE	E-MAIL ADDRESS	
Lebec	CA	93243	krausea@sbcglobal.net	
AFFILIATION'S MAILING ADDRESS		CITY	STATE	ZIP CODE
2003 Central Avenue		Cheyenne	WY	82001

SECTION 2 - ENTITY PERMITTEE INFORMATION - Complete and submit fee* only if original SCP was issued to a qualified entity.

Complete only *if you are a California certified small business or aquarium accredited by the Association of Zoos and Aquariums (AZA)* ***AND*** *you are requesting changes to your SCP and/or need to add or remove individuals from the list of temporary employees or volunteers conducting activities on your SCP.*

PERMITTEES'S BUSINESS NAME				SC-
				009798
PERMITTEE'S MAILING ADDRESS			DAY TELEPHONE	FAX NUMBER
			( )	( )
CITY	STATE	ZIP CODE		

PRINCIPAL SCIENTIFIC INVESTIGATOR INFORMATION - Provide information for the full-time permanent employee responsible for providing adequate supervision and training of the temporary employees and volunteers listed below or on current SCP.

FIRST NAME	M.I.	LAST NAME	TITLE
DRIVER'S LICENSE OR DMV ID NUMBER	STATE	DAY TELEPHONE	E-MAIL ADDRESS
		( )	

List **ALL** temporary employees or volunteers that you are adding or removing from current SCP under the Principal Investigator named above. Attach a seperate list if needed. An amendment form must be submitted, approved, and returned to you by the Department before you can add or remove temporary employees or volunteers from the current SCP.

FIRST NAME	LAST NAME	DRIVER'S LICENSE OR DMV ID NUMBER	STATE	MARK ONE	
				ADD	REMOVE

FOR DEPARTMENT OF FISH AND GAME USE ONLY

AUTHORIZATIONS AND CONDITIONS ARE ON PAGE FOUR

2010 APR -1 PM 1:39

REVIEWED BY/DATE	CASHIERED BY/DATE	TRANSACTION #	LRB ROUTED TO/DATE
Randi Logsdon Digitally signed by Randi Logsdon DN: CN=Randi Logsdon, C=US, O=Department of Fish and Game, OU=Wildlife Branch Date: 2011.05.23 10:36:22 -07'00'			1. 2. 3.

FG 1379e (Rev. 2/10)

California Natural Resources Agency
DEPARTMENT OF FISH AND GAME
SCIENTIFIC COLLECTING PERMIT AMENDMENT FORM *(Continued)*

FIRST NAME	M.I.	LAST NAME OR BUSINESS NAME *(If qualified entity)*	PERMANENT ID NUMBER
Andrew	P.	Krause	SC- 009798

SECTION 3 - PERMIT INFORMATION

USE OF PERMIT: CHECK ALL APPLICABLE BOXES

☑ BIOLOGICAL CONSULTING *(generally, catch and release only)* ☐ RESEARCH ☐ MUSEUM COLLECTION ☐ BIOLOGICAL COLLECTION SERVICES
☐ STATE, FEDERAL OR OTHER AGENCY BIOLOGIST ☐ EDUCATION ☐ OTHER _____

WILDLIFE AND ACTIVITY: Reminder - You must provide justification in Section 5 for each wildlife and activity circled here.

*Circle the type of wildlife to be taken **AND** circle the type of activity requested. S=sacrifice; R=capture and release; C=take into captivity; SL=salvage; M=mark.*

MAMMALS	S	R	C	SL	M	FRESHWATER FISHES	S	R	C		M
BIRDS* *Other activity* _____	S	~~R~~	C	SL	~~M~~	FRESHWATER INVERTEBRATES	S	R	C		M
REPTILES	S	R	C	SL	M	ANADROMOUS FISHES	S	R	C		M
AMPHIBIANS	S	R	C	SL	M	MARINE FISHES	S	R	C	SL	M
VERNAL POOL/TERRESTRIAL INVERTEBRATES	S	R	C	SL	M	MARINE AQUATIC PLANTS	S		C	SL	
***See Mandatory Condition "L"**						MARINE/TIDAL INVERTEBRATES	S	R	C	SL	M

CHECK ONE: Other SCP permittees are involved in activity or project. YES ☐ NO ☐ *(If yes, list the permittees below. Attach seperate list if needed.)*

FIRST NAME	LAST NAME	SCIN NUMBER	STATE
		SC-	
		SC-	
		SC-	

SECTION 4 - SPONSOR INFORMATION

Students, teachers and individuals collecting on behalf of an organization that they are not affiliated with must all have sponsors and those sponsors must fully complete this section of the application. Students must have two faculty members with affiliation to the student's college or university sponsor the student. Elementary and secondary school teachers must be sponsored by their principal. Individuals collecting on behalf of an organization that they are not affiliated with must have two members of the organization sponsor them. In some other cases, the DFG may review an application and determine that a sponsor is needed and will request this information directly from the applicant or organization.

SPONSOR'S FIRST NAME	M.I.	LAST NAME	DAY TELEPHONE ( )
TITLE		ORGANIZATION	E-MAIL ADDRESS
MAILING ADDRESS		CITY	STATE / ZIP CODE

SPONSOR'S CERTIFICATION/SIGNATURE: *I verify the take described in this application is required by this organization.* DATE

X

SPONSOR'S FIRST NAME	M.I.	LAST NAME	DAY TELEPHONE ( )
TITLE		ORGANIZATION	E-MAIL ADDRESS
MAILING ADDRESS		CITY	STATE / ZIP CODE

SPONSOR'S CERTIFICATION/SIGNATURE: *I verify the take described in this application is required by this organization.* DATE

X

APPLICANT CERTIFICATION

By checking all boxes, I hereby declare that the following information is provided in this amendment and in the justification section.

☑ Purpose ☑ Species + Numbers to be collected ☑ Collection Locations ☑ Species Disposition
☑ Methods/Activity *(Standard Exceptions)* ☑ Attached Federal/State Permit(s) *(Applicable/Not Applicable - Circle appropriate one)*

I understand that if I fail to provide all information, circle items or check the boxes, my amendment may be denied. I certify that I have read, understand, and agree to abide by, all conditions of this amendment and attachments, the applicable provisions of the FGC, and the regulations promulgated thereto. I certify that I am not currently under any Fish and Game license or permit revocation or suspension, and that there are no other legal or administrative proceedings pending that would disqualify me from obtaining this amendment. I agree that if I make any false statement as to any fact required as a prerequisite to the issuance of this amendment, the amendment is void and will be surrendered where purchased, and I understand that I may be subject to prosecution pursuant to FGC Section 1054 or to other administrative actions pursuant to Section 746, Title 14, of the CCR.

APPLICANT SIGNATURE	DATE
X Andrew P. Krause	03/29/2010

California Natural Resources Agency
DEPARTMENT OF FISH AND GAME
SCIENTIFIC COLLECTING PERMIT AMENDMENT FORM *(Continued)*

FIRST NAME	M.I.	LAST NAME OR BUSINESS NAME *(If qualified entity)*	PERMANENT ID NUMBER
Andrew	P.	Krause	SC- 009798

SECTION 5 - PERMIT JUSTIFICATION - Required for **ALL** activities.

☐ CHECK HERE IF PROPOSING TO TAKE STANDARD EXCEPTION SPECIES

IS A FEDERAL OR ADDITIONAL STATE PERMIT REQUIRED? ☑ YES ☑ NO *(If yes, attach copies.)*

PROVIDE START AND END DATE AND/OR EXPLAIN SEASONAL REQUIREMENTS FOR YOUR WORK.	START	END
	06/01/2011	10/30/2011

REMINDER - You must provide justification here for each wildlife and activity circled in Section 3. Use the space below to summarize your proposed research, as follows: purpose (include scientific or educational need for the requested activity); methods/techniques (include equipment/gear) and the reason for using them; species or groupings and numbers to be collected, if known (include scientific and common names); and collection locations (include counties and specific locales and reasons for choosing them). If you propose to collect in a marine protected area (MPA), give the proper name of the MPA and explain why collection is required within the MPA. If you are working in areas where special status species (listed, fully protected, or species of special concern) are expected to be incidentally captured, explain why collection is required in these areas, and describe how your methods/techniques and equipment/gear will avoid or minimize take of non-target sensitive species. If requesting standard exceptions, marking/tagging, captivity, or sacrifice, specific details as described above must be included for each species and activity requested. Also list all standard exceptions and/or non-standard methods (see Mandatory Conditions/Numbered Authorizations) in tabular format, along with the information requested above. Note: If you are working in areas where special status species are expected to be incidentally captured, you shall include such anticipated species in your list of standard exceptions. You may be asked to provide a detailed study proposal for standard exception species during the review process. Attach additional pages if needed. **Attach complete copies of appropriate federal permits and additional State permits (e.g., Memorandum of Understanding) to avoid delay of processing.**

I have attended 2 mist netting/acoustical workshops with Chris Corben, Kim Livengood, and Mike O'Farrell. We mist netted in the Las Vegas Wash for 4 nights, approximately 5 hours each night, each class. We set up triple high nets and harp traps. One class was the basic Anabat class which was held in 2008 and the advanced Anabat class which was held in 2010. I have also attended the BCI mist netting workshop with Janet Tyburec which was held in 2008. The BCI workshop I set up and attended single, double, and triple high nets. I assembled, attended, and disassembled harp traps. These were supervised by Janet Tyburec and Dave Johnson. We netted and identified 12 species. In 2010 I attended a mist netting workshop with SFSU field campus put on by Joe Szewczak. We mist netted for 4 nights 5 hours per night. We netted *L. blossevillii*, *A. pallidus, L. noctivagans, T. brasiliensis, E. fuscus,* and many others. I have mist netted in Maryland with our target species being *Myotis sodalis* for 6 nights. I ran two nets at two different net sites unattended and unsupervised with a field tech as a data collection assistant. Kevin Murray, also a WEST employee, was running two nets at two different locations for the same project. In addition, I have two mist netting projects in Arizona I will be working on in late June and early July, another BCI workshop for advanced capture techniques and another acoustical workshop with BCI.

This year we are proposing netting at least two locations in Kern County and two in Los Angeles County. These sites would be netted for approximately 5-10 nights for each site. The netting would be done by myself and at least one of the other bat biologists with WEST. We expect a wide variety of species as we have detected numerous Myotis calls as well as Hoary, Big Brown, Western Mastiff, Western Red, and Pallids just to name a few. The method of capture would be a combination of single, double, and triple high nets. No harp traps would be used and all protocols for WNS would be followed.

California Natural Resources Agency
DEPARTMENT OF FISH AND GAME
SCIENTIFIC COLLECTING PERMIT AMENDMENT FORM *(Continued)*

FIRST NAME	M.I.	LAST NAME OR BUSINESS NAME *(If qualified entity)*	PERMANENT ID NUMBER
Andrew	P.	Krause	SC- 009798

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☐ 6 **PAGES OF ATTACHMENTS NOTED IN THIS PERMIT SHALL REMAIN WITH THIS PERMIT AT ALL TIMES.**

ISSUED BY/DATE: Randi Logsdon Digitally signed by Randi Logsdon DN: CN = Randi Logsdon, C = US, O = Department of Fish and Game, OU = Wildlife Branch Date: 2011.06.24 16:54:45 -07'00'

CONDITIONS, AUTHORIZATIONS, AND APPROVALS ARE AS FOLLOWS:

Take of bats is authorized as described in the second justification, in accordance with the letter permit (MOU) attached.

See also additional conditions attached, and follow standard conditions on your SCP.

DFG REVIEWER(S) SIGNATURE		
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1.	2.	3.

California Natural Resources Agency
DEPARTMENT OF FISH AND GAME

SCIENTIFIC COLLECTING PERMIT AMENDMENT FORM

Reset Print

FEE - $62.83** ***(*The fee is required if your permit is an "Entity Permit" as described under Section 2 of your SCP.)

You are required to complete and submit an Amendment Form when requesting a change to an existing Scientific Collecting Permit or when your affiliation changes.

DFG USE ONLY

THIS AMENDMENT IS VALID:	PERMANENT ID NUMBER
FROM 9/23/2011 THROUGH 1/11/2013	SC- 009798

BEFORE COMPLETING AMENDMENT: Read instructions on this form and the permit descriptions, mandatory conditions, and number authorizations on the current Scientific Collecting Permit (SCP) Application www.dfg.ca.gov/licensing/pdffiles/fg1379.pdf. **Complete all appropriate portions of the amendment form.** If the DFG returns this amendment, it becomes part of and must be attached to your valid, existing SCP and carried with you while collecting. Type or print clearly.

SECTION 1 - INDIVIDUAL PERMITTEE INFORMATION - Complete only if original SCP was issued to an individual.

FIRST NAME	M.I.	LAST NAME		
Andrew	P.	Krause	SC-	009798

AFFILIATION		TITLE	DATE OF BIRTH
Western EcoSystems Technologies	☐ Check here if you want future correspondence mailed to your affiliation.	Biologist	01/30/1965

PERMITTEE'S MAILING ADDRESS	DAY TELEPHONE	FAX NUMBER
P.O. Box 534	( ) (661) 248-6056	( ) (661) 248-6056

CITY	STATE	ZIP CODE	E-MAIL ADDRESS
Lebec	Ca	93243	akrause@west-inc.com

AFFILIATION'S MAILING ADDRESS	CITY	STATE	ZIP CODE
2003 Central Avenue	Cheyenne	WY	82001

SECTION 2 - ENTITY PERMITTEE INFORMATION - Complete and submit fee* only if original SCP was issued to a qualified entity.

Complete only *if you are a California certified small business or aquarium accredited by the Association of Zoos and Aquariums (AZA)* ***AND*** *you are requesting changes to your SCP and/or need to add or remove individuals from the list of temporary employees or volunteers conducting activities on your SCP.*

PERMITTEES'S BUSINESS NAME		
	SC-	009798

PERMITTEE'S MAILING ADDRESS	DAY TELEPHONE	FAX NUMBER
	( )	( )

CITY	STATE	ZIP CODE

PRINCIPAL SCIENTIFIC INVESTIGATOR INFORMATION - Provide information for the full-time permanent employee responsible for providing adequate supervision and training of the temporary employees and volunteers listed below or on current SCP.

FIRST NAME	M.I.	LAST NAME	TITLE

DRIVER'S LICENSE OR DMV ID NUMBER	STATE	DAY TELEPHONE	E-MAIL ADDRESS
		( )	

List **ALL** temporary employees or volunteers that you are adding or removing from current SCP under the Principal Investigator named above. Attach a seperate list if needed. An amendment form must be submitted, approved, and returned to you by the Department before you can add or remove temporary employees or volunteers from the current SCP.

FIRST NAME	LAST NAME	DRIVER'S LICENSE OR DMV ID NUMBER	STATE	MARK ONE	
				ADD	REMOVE

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AUTHORIZATIONS AND CONDITIONS ARE ON PAGE FOUR

REVIEWED BY/DATE	CASHIERED BY/DATE	TRANSACTION #	LRB ROUTED TO/DATE
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FG 1379e (Rev. 10/10)

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FIRST NAME	M.I.	LAST NAME OR BUSINESS NAME *(If qualified entity)*	PERMANENT ID NUMBER
Andrew	P.	Krause	SC- 009798

SECTION 3 - PERMIT INFORMATION

USE OF PERMIT: CHECK ALL APPLICABLE BOXES

☑ BIOLOGICAL CONSULTING *(generally, catch and release only)* ☑ RESEARCH ☐ MUSEUM COLLECTION ☐ BIOLOGICAL COLLECTION SERVICES
☐ STATE, FEDERAL OR OTHER AGENCY BIOLOGIST ☐ EDUCATION ☐ OTHER _____

WILDLIFE AND ACTIVITY: Reminder - You must provide justification in Section 5 for each wildlife and activity circled here.

*Circle the type of wildlife to be taken **AND** circle the type of activity requested: S=sacrifice; R=capture and release; C=take into captivity; SL=salvage; M=mark.*

MAMMALS	S	(R)	C	SL	M	FRESHWATER FISHES	S	R	C		M
BIRDS* *Other activity* _____	S	R	C	SL	M	FRESHWATER INVERTEBRATES	S	R	C		M
REPTILES	S	R	C	SL	M	ANADROMOUS FISHES	S	R	C		M
AMPHIBIANS	S	R	C	SL	M	MARINE FISHES	S	R	C	SL	M
VERNAL POOL/TERRESTRIAL INVERTEBRATES	S	R	C	SL	M	MARINE AQUATIC PLANTS	S		C	SL	
***See Mandatory Condition "L"**						MARINE/TIDAL INVERTEBRATES	S	R	C	SL	M

CHECK ONE: Other SCP permittees are involved in activity or project. YES ☐ NO ☑ *(If yes, list the permittees below. Attach seperate list if needed.)*

FIRST NAME	LAST NAME	SCIN NUMBER
		SC -
		SC -
		SC -

SECTION 4 - SPONSOR INFORMATION

Students, teachers and individuals collecting on behalf of an organization that they are not affiliated with must all have two members of the organization sponsor them. Sponsors must fully complete this section of the application. Students must have two faculty members with affiliation to the student's college or university sponsor the student. Elementary and secondary school teachers must be sponsored by their principal. In some other cases, the DFG may review an application and determine that a sponsor is needed and will request this information directly from the applicant or organization.

SPONSOR'S FIRST NAME	M.I.	LAST NAME		DAY TELEPHONE ( )
TITLE		ORGANIZATION	E-MAIL ADDRESS	
MAILING ADDRESS		CITY	STATE	ZIP CODE

SPONSOR'S CERTIFICATION/SIGNATURE: *I verify the take described in this application is required by this organization.* DATE

X

SPONSOR'S FIRST NAME	M.I.	LAST NAME		DAY TELEPHONE ( )
TITLE		ORGANIZATION	E-MAIL ADDRESS	
MAILING ADDRESS		CITY	STATE	ZIP CODE

SPONSOR'S CERTIFICATION/SIGNATURE: *I verify the take described in this application is required by this organization.* DATE

X

APPLICANT CERTIFICATION

By checking all boxes, I hereby declare that the following information is provided in this amendment and in the justification section.

☑ Purpose ☑ Species + Numbers to be collected ☑ Collection Locations ☑ Species Disposition
☑ Methods/Activity *(Standard Exceptions)* ☑ Attached Federal/State Permit(s) *(Applicable/Not Applicable - Circle appropriate one)*

I understand that if I fail to provide all information, circle items or check the boxes, my amendment may be denied. I certify that I have read, understand, and agree to abide by, all conditions of this amendment and attachments, the applicable provisions of the FGC, and the regulations promulgated thereto. I certify that I am not currently under any Fish and Game license or permit revocation or suspension, and that there are no other legal or administrative proceedings pending that would disqualify me from obtaining this amendment. I agree that if I make any false statement as to any fact required as a prerequisite to the issuance of this amendment, the amendment is void and will be surrendered where purchased, and I understand that I may be subject to prosecution pursuant to FGC Section 1054 or to other administrative actions pursuant to Section 746, Title 14, of the CCR.

APPLICANT SIGNATURE DATE

X Andrew P. Krause

Applicant must sign and date above before this amendment may be considered valid.

California Natural Resources Agency
DEPARTMENT OF FISH AND GAME
SCIENTIFIC COLLECTING PERMIT AMENDMENT FORM *(Continued)*

FIRST NAME	M.I.	LAST NAME OR BUSINESS NAME *(If qualified entity)*	PERMANENT ID NUMBER
Andrew	P.	Krause	SC- 009798

SECTION 5 - PERMIT JUSTIFICATION - Required for **ALL** activities.

☐ CHECK HERE IF PROPOSING TO TAKE STANDARD EXCEPTION SPECIES

IS A FEDERAL OR ADDITIONAL STATE PERMIT REQUIRED? ☐ YES ☑ NO *(If yes, attach copies.)*

PROVIDE START AND END DATE AND/OR EXPLAIN SEASONAL REQUIREMENTS FOR YOUR WORK.	START	END
	06/01/2011	10/30/2011

REMINDER - You must provide justification here for each wildlife and activity circled in Section 3. Use the space below to summarize your proposed research, as follows: purpose (include scientific or educational need for the requested activity); methods/techniques (include equipment/gear) and the reason for using them; species or groupings and numbers to be collected, if known (include scientific and common names); and collection locations (include counties and specific locales and reasons for choosing them). If you propose to collect in a marine protected area (MPA), give the proper name of the MPA and explain why collection is required within the MPA. If you are working in areas where special status species (listed, fully protected, or species of special concern) are expected to be incidentally captured, explain why collection is required in these areas, and describe how your methods/techniques and equipment/gear will avoid or minimize take of non-target sensitive species. If requesting standard exceptions, marking/tagging, captivity, or sacrifice, specific details as described above must be included for each species and activity requested. Also list all standard exceptions and/or non-standard methods (see Mandatory Conditions/Numbered Authorizations) in tabular format, along with the information requested above. Note: If you are working in areas where special status species are expected to be incidentally captured, you shall include such anticipated species in your list of standard exceptions. You may be asked to provide a detailed study proposal for standard exception species during the review process. Attach additional pages if needed. **Attach complete copies of appropriate federal permits and additional State permits (e.g., Memorandum of Understanding) to avoid delay of processing.**

We have been asked by Los Angeles County to perform small mammal trapping on a project site to determine presence/absence. Sites will be sampled using Sherman live-traps (3X3X9 inch) arranged in transects through suitable small mammal habitats. Traps will be spaced approximately 10 m apart with each area having approximately 2,500 - 2,750 meters of transect (250-275 traps).
Traps will be baited with appropriate bait (e.g., grain, sweet feed, grain/peanut butter mix) and a 1" ball of polyester fiber will be added for bedding material. Traps will be set in late afternoon (within 3 hours of sunset) and checked in the early morning (within 3 hours of sunrise). Trapping will be conducted for two nights within each selected area during the fall and for two nights in each area during the spring, resulting in approximately 500-550 trap nights in each area during each season.

Data recorded will include locality data for each transect, date of survey, species, age, sex, and reproductive status of all captured specimens. General descriptions of the survey site will also be recorded. These will include site characteristics, dominant vegetation, transect orientation and weather conditions.Expected species to occur on the project site are:

Spermophilus beecheyi California ground squirrel
Ammospermophilus leucurus white-tailed antelope squirrel
Thomomys bottae Botta's pocket gopher
Chaetodipus californicus California pocket mouse
Chaetodipus formosus long-tailed pocket mouse
~~Perognathus alticolus inexpectatus Tehachapi pocket mouse SSC~~ - see conditions attached.
Perognathus longimembris little pocket mouse
Perognathus inornatus San Joaquin pocket mouse
Dipodomys merriami Merriam's kangaroo rat
Dipodomys deserti desert kangaroo rat
Peromyscus maniculatus American deer mouse
Onychomys torridus southern grasshopper mouse
Reithrodontomys megalotis western harvest mouse
Neotoma lepida desert woodrat
Microtus californicus California vole

From Andy (via email): No subspecies of special concern fall within our boundary. This project is on the northern part of Los Angeles county very close to the Kern county line.

California Natural Resources Agency
DEPARTMENT OF FISH AND GAME
SCIENTIFIC COLLECTING PERMIT AMENDMENT FORM *(Continued)*

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CONDITIONS, AUTHORIZATIONS, AND APPROVALS ARE AS FOLLOWS:

#5b is authorized for small mammals in accordance with conditions below.

Take of State-listed species is not authorized without a Memorandum of Understanding (MOU), letter permit, or other additional State authorization in which you are specifically named, and take of federally-listed species is not authorized without a valid federal permit **and** additional State authorization (*e.g.*, #8), MOU, or letter permit in which you are specifically named.

Your research project may be located in a special status natural community or in an area that provides habitat for a non-target special status plant or animal. It is your responsibility to determine whether or not implementation of your project could have potential adverse impacts to a listed or special status plant or animal or special status natural community. To minimize potential impacts, compile relevant biological information in the general project area prior to conducting field work or research. Generally, identify vegetation and habitat types occurring in your project area based on biological and physical properties of the site and surrounding ecoregion, unless a larger assessment area is appropriate. Conduct a Rarefind or California Natural Diversity Database (CNDDB) Quick Viewer search (http://www.dfg.ca.gov/biogeodata/cnddb/mapsanddata.asp) and check with other reliable resources for known occurrences of special status plants, animals, or natural communities at the site before conducting your research. Contact the Department of Fish and Game (Department) if non-target special status plant or animal species are likely to be encountered or are being handled or disturbed.

Incidentally-captured individuals of standard-exception species or subspecies (see Mandatory Condition A (1) and (5) in this permit) shall be released at the capture site immediately, once identified, without further handling, unless otherwise authorized for work on that species in this permit. You may find species included in Mandatory Condition A (1) and (5) in the Department's Special Animals List at the following link: http://www.dfg.ca.gov/biogeodata/cnddb/. Submit CNDDB data as soon as possible for any special status species encountered and correctly identified. Report any incidental injury or mortality of a standard exception species to Scott Osborn, sosborn@dfg.ca.gov. You may not continue to trap at a site where standard exception species (including Tehachapi pocket mouse) are captured without an MOU for capturing and handling the species.

You must have sufficient experience or training under an individual with mammal trapping experience before independently setting traps. When conducting presence/absence surveys using live-traps for small mammals (for this purpose, species in mammalian families Sciuridae, Geomyidae, Heteromyidae, and Muridae), you shall employ all reasonable measures to avoid injury to or mortality of individuals, particularly of standard-exception species or subspecies (*e.g.*, using traps of sufficient size and adjusting trap doors to create a gap to accommodate tails of kangaroo rats or pocket mice). To avoid the risk of Hantavirus, we recommend handling mammals in open areas and using a respirator when cleaning traps. See also Mandatory Condition M.

When trapping for authorized diurnal mammals within the known geographic range and habitat of the Mohave ground squirrel (*Spermophilus mohavensis*), you shall close all traps during hours of darkness, unless you are using the traps to capture nocturnal mammals, during inclement or extreme weather, during daylight periods when the ambient temperature in the shade at ground level exceeds 90° Fahrenheit (°F), or when the ambient temperature falls below 40 degrees °F. You shall protect each trap from excessive heating by placing and maintaining it in the shade of a non-metal structure set in a north-south orientation. You may place open-mesh traps without such a shelter, until and unless individuals of authorized *Spermophilus* or *Ammospermophilus* captured in these traps exhibit heat stress at 90° F or below. You shall check traps at least once every four hours. When working in squirrel colonies, report any burrowing owls seen on the California Native Species Field Survey Form and contact Esther Burkett at eburkett@dfg.ca.gov to report the owl location.

DFG REVIEWER(S) SIGNATURE		
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Appendix K-1:
2011 Vegetation Analysis

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1.0 INTRODUCTION

Natural Resource Consultants (NRC) was retained by Element Power to prepare a vegetation map of the approximately 4,192-acre Wildflower Green Energy Farm site (WGEF, "the site"), located in north-central Los Angeles County, California. The site is located approximately 16 miles (26 kilometers [km]) west of the city of Lancaster. NRC studies were conducted in April 2011 for the entire site. All woody and herbaceous vegetation types were mapped with a focus on herb (e.g. grasses, graminoids, forbs) dominated vegetation using the California Native Plant Society / Department of Fish and Game Protocol for Combined Vegetation Rapid Assessment and Relevé Sampling (CNPS 2009). This study used to create a detailed vegetation map and, in part, inform a biological constraints analysis for the WGEF site. Data collected in 2011 were used to map vegetation alliances from which a summarized community map was used to assess vegetation impacts on the WGEF site.

1.1 Grassland Ecology

Prior to European settlement, California's Mediterranean type grasslands were dominated by caespitose grasses, particularly *Nassella pulchra* and *N. cernua* (Bartolome et al. 1986). These grasslands, however, have undergone a vast and permanent change since pre-settlement conditions (Bartolome et al. 1986, Baker 1989, Heady et al. 1991). Currently, California grasslands are often a mosaic of various annual and perennial grass and forb stands that vary in distributions and composition based on yearly precipitation (Hobbs and Mooney 1995, Holmes and Rice 1996, Hamilton et al. 1999) as well as other ecological factors such as competition from other plants (Dyer et al. 1996, Seabloom et al. 2003*a*, Corbin and D'Antonio 2004), grazing (Mackey and Currie 2000, Hayes and Holl 2003, Bartolome et al. 2004), fire (Hervey 1949, Glenn-Lewin et al. 1990), soils (Stromberg and Griffin 1996, Seabloom et al. 2003*b*), and land use changes (Stromberg and Griffin 1996, Stylinski and Allen 1999). These factors can result in substantial yearly changes in the distribution, structure, and composition of grassland communities. While the botanical details (diversity, native cover, etc) vary from year to year, it is possible to classify these areas into useful vegetation classes for evaluation of potential impacts to these areas.

1.1 Vegetation Classification

The California Department of Fish and Game has recently adapted the system described in a Manual of California Vegetation, 2nd Edition (Sawyer et al. 2009) as a standard for the state. The following report describes the methods and results used to generate a vegetation map using this alliance-level system. The alliance data was summarized into community level classification system presented in the BCA

2.0 METHODS

2.1 Pre-Survey Analyses

Prior to the start of the field season, an exploratory GIS analysis was conducted to identify all areas of the study area dominated by woody plant dominated vegetation. The extent of this sampling area was delineated using recent aerial photographs of the region and field-checked in November 2010 and April 2011. From this analysis, approximately one third of the site was mapped as scrub or shrubland, or "other" (e.g. agriculture, disturbed, etc.).

2.2 Data Acquisition

Data were collected from April 6 to April 21, 2011. This time period coincides with the 2011 peak flowering period in the Antelope Valley for the majority of on-site native annual forbs. Vegetation mapping was done at the alliance level following Sawyer et al. (2009) with a minimum mapping unit of 1,000sq.ft (approximately 30m x 30m). This vegetation classification system is the preferred system by the California Native Plant Society and the California Department of Fish and Game and is the newly adapted system for ranking California vegetation type rarity (CDFG 2009). Woody vegetation types (e.g. shrub or tree dominated vegetation types) were delineated on aerial maps and ground-truthed in the field by NRC for the entire site in April 2011. Herb (e.g. grasses, graminoids, and forbs) dominated vegetation

types were mapped using the California Native Plant Society / Department of Fish and Game Protocol for Combined Vegetation Rapid Assessment and Relevé Sampling (CNPS 2009).

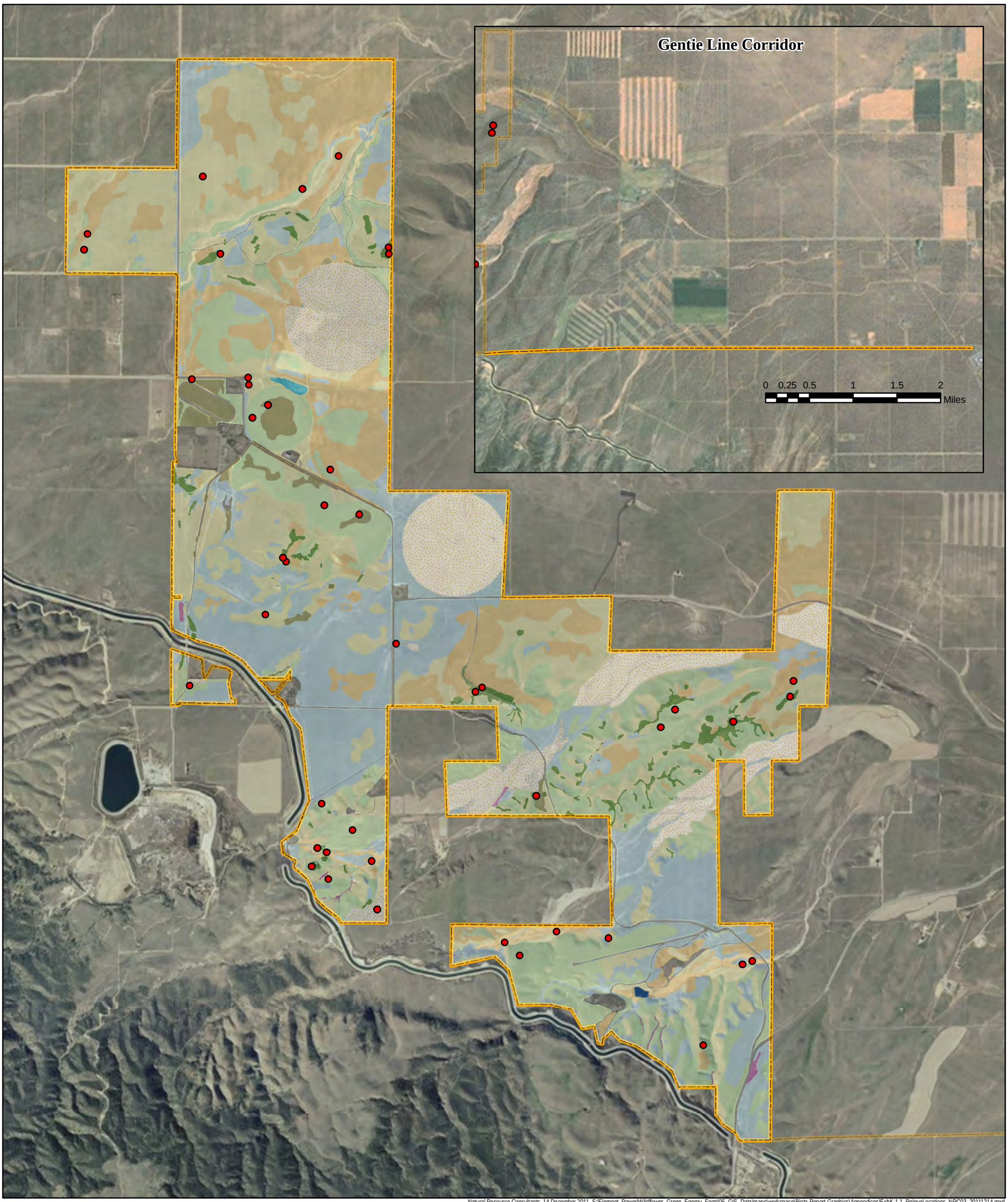
Based on previous mapping efforts by NRC in 2010 homogeneous stands with uniform structure and composition for each vegetation type were selected. Several 100m^2 survey plots (or "relevés") were established for each herbaceous stand type (N=44; Exhibit K-1.1), each within separate representative stands. At least three relevés were established for most presumed vegetation types. Within each relevé, various attributes were quantified including geographic and environmental data such as topography (e.g. slope, slope position, microtopography, aspect, etc.), geology (e.g. soil characteristics), and surface cover (e.g. percent water, percent litter). Structural and compositional data were also quantified including heights (e.g. mean tree height, mean forb height), total vegetative cover, and species-specific cover values for all species found within the relevé. Cover values were given using a modified Daubenmire cover class system as follows: 01 = <1%, 02 = 1-5%, 03 = 5-15%, 04 = 15-25%, 05 = 25-50%, 06 = 50-75%, 07 = >75%. Following surveys within the relevé, the boundaries of each herbaceous stand were walked using handheld GPS units or, where appropriate, drawn on small-scale detailed field maps. Based on the intergrading and transitional nature of these vegetation types, particularly in annual dominated vegetation types, best estimates of stand boundaries were made in the field but assumed to be an approximation. Additionally, all major dominant species within each stand type were recorded. All species were properly vouchered for submittal to the University of California, Riverside Herbarium.

2.3 Data Analysis

Relevé data from herb-dominated stands were transformed ($x' = x^{0.2}$) and correspondence analysis (COA) was used to determine dominant trends following methods described by Wildi (2010).

Cluster analysis, using Euclidean linkage, and subsequent oblique principle component analysis, was used to cluster and compare all plots based on similarities in cover of all observed species. All cluster and discriminant analyses were done using PC-ORD (McCune and Mefford 1999) and SAS/STAT® software.

The mapped boundaries of each vegetation type were digitized using geographic information system (GIS) software, ArcGIS, and overlain onto digital ortho-quarter quad (DOQQ) basemaps. Importance Values (IV) were calculated for each species within an alliance as the sum of the relative dominance and relative frequency. Species with a larger IV are, therefore, those showing greater cover and greater frequency within plots.



Natural Resource Consultants. 14 December 2011. S:\Element_Power\Wildflower_Green_Energy_Farm\05_GIS_Data\maps\workspace\Biota Report Graphics\Appendices\ExhK-1.1_ReleveLocations_NRC03_20111214.mxd

Project Boundary

Releve Locations

N
W E
S

0 0.25 0.5 1 Miles

0 500 1,000 2,000 Meters

Exhibit K - 1.1: Releve Sampling Locations

Wildflower Green Energy Farm
Los Angeles County, California

3.0 RESULTS

3.1 Native Scrub and Shrublands

Seven woody dominated scrub and shrubland vegetation alliances were identified at the WGEF site from aerial photo interpretation and field analyses (Table K-I; Exhibit K – 1.2)

3.1.1 CALIFORNIA BUCKWHEAT SCRUB

Holland: Mojave Mixed Woody Scrub (34210)
Sawyer et al.: *Eriogonum fasciculatum* Shrubland Alliance

Approximately 31 acres of California buckwheat (*Eriogonum fasciculatum*) scrub were observed at WGEF (Appendix A; Photo AM). This scrub, characterized by >5% cover of California buckwheat in the shrub layer, was found mostly on rocky slopes and ridges however several patches were also mapped in dry washes and north facing slopes in the south of the site. The canopy of this scrub is largely open and native annual plants including California goldfields, popcornflower, owl's clover, and others are found in these openings. Native grasses including purple needlegrass are also common. Along the buttes in the north of the WGEF site, short-joint beavertail (*Opuntia basilaris* var. *brachyclada*) is found associated with this scrub type.

3.1.2 RUBBER RABBITBRUSH SCRUB

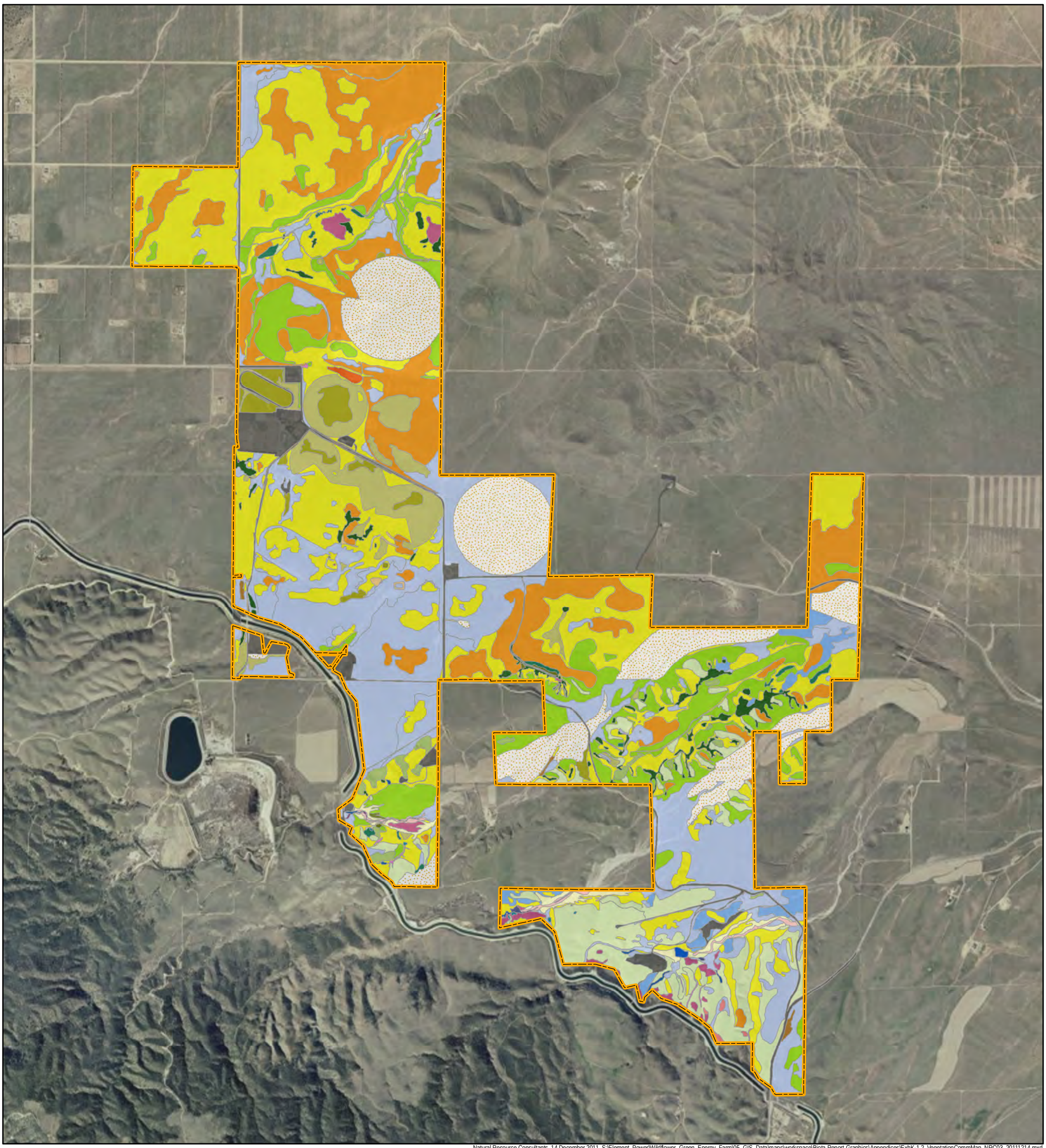
Holland: Rabbitbrush Scrub (35400)
Sawyer et al.: *Ericameria (Chrysothamnus) nauseosa* Shrubland Alliance

Rabbitbrush scrub covers 856.1 acres of the site (Appendix A; Photo AN). This vegetation community, found in flat bottomlands and ridges as well as dry washes, is typified by 25% or greater relative cover of rabbitbrush (*Chrysothamnus nauseosus*) in the shrub layer. The herbaceous vegetation observed in rabbitbrush scrub was composed of the same species found in the non-native and native annual grasslands within the site including California goldfields, California poppy, miniature lupine, red brome, cheatgrass, and small fescue.

3.1.3 OAK GOOSEBERRY THICKETS

Holland: Semi-desert Chaparral (37400)
Sawyer et al.: *Ribes quercetorum* Provisional Shrubland Alliance

Several oak gooseberry thickets were found in the southern portion of the WGEF site in areas with large exposed boulders and bedrock, particularly on north facing lower slopes (Appendix A; Photo AO). Although relatively small (0.8 acres), these dense thickets provide food and shelter for various birds, small mammals, and reptiles. These thickets are characterized by dominance of oak gooseberry (*Ribes quercetorum*) (cover > 75%). Skunkbush (*Rhus trilobata*) was also found at low (<5% cover) in at least one thicket. Herbaceous plants were uncommon in these thickets.



Natural Resource Consultants. 14 December 2011. S:\Element_Power\Wildflower_Green_Energy_Farm\05_GIS_Data\maps\workspace\Biota Report Graphics\Appendices\ExhK-1.2_VegetationCommMap_NRC03_20111214.mxd

Project Boundary

Valley Needlegrass Grasslands
- Purple Needlegrass Grasslands
- Curly Blue Grass Grasslands
- Desert Needlegrass Grasslands

Non-native Grasslands
- Soft Brome Grasslands
- Red Brome or Mediterranean Grass Grasslands
- Cheatgrass Grasslands
- Wild Oats Grasslands and Agricultural Fields
- Rat-Tail Fescue Grasslands
- Prickly Lettuce Patches
- Hedgemustard Semi0Natural Herbaceous Stands

Wildflower Fields
- California Poppy Fields
- Miniature Lupine Fields
- Desert Dandelion- White Layia Floodplains
- Scalebud- Chia-Scarlet Lupine Washes
- Fiddleneck Fields

Valley and Foothill Grasslands
- California Goldfields-Six Weeks Fescue Fields

Vernal Pools
- Annual Hair Grass- Finebranched Popcornflower Vernal Pools

Mojave Mixed Woody Scrub
- California Buckwheat Scrub

Rabbitbrush Scrub
- Rubber Rabbitbrush Scrub

Semi-Desert Chaparral
- Oak Gooseberry Thickets

Upper Sonoran Subshrub Scrub
- Narrowleaf Goldenbush- Cooper's Goldenbush Scrub

Coastal and Valley Freshwater Marsh
- Baltic and Mexican Rush Marshes

Central Coast Riparian Scrub
- Wild Tarragon Patches

Southern Willow Scrub
- Mixed Willow Riparian Scrub

Mulefat Scrub
- Mulefat Thickets

Mojave Desert Wash Scrub
- Desert Olive Patches

Irrigated/Dryland Grain and Seed Crops
- Agriculture

Disturbed and Urban/Developed
- Planted Joshua Trees
- Disturbed and Devloped
- Non-native trees

Fresh Water
- Open Water

N W E S

0 0.25 0.5 1 Miles

0 500 1,000 2,000 Meters

Exhibit K - 1.2: Vegetation Community Map (sensu Sawyer et al. 2009)

Wildflower Green Energy Farm
Los Angeles County, California

3.1.4 NARROWLEAF GOLDENBUSH SCRUB

Holland: Upper Sonoran Subshrub Scrub (39000)
Sawyer et al.: *Ericameria linearifolia* Provisional Shrubland Alliance

Approximately 2.7 acres of narrowleaf goldenbush scrub was observed on dry upper slopes, ridges, and saddles in the southern portion of WGEF (Appendix A; Photo AP). This scrub was dominated by narrowleaf goldbush (*Ericameria linearifolia*) with cover values greater than 30% for this species. Cooper's goldenbush (*Ericameria cooperi*) was also found in many of these scrublands and individuals intermediate in characteristics (e.g. leaf length, leaf shape) of these two species were observed, suggesting these two species may be hybridizing at the WGEF site. Narrowleaf goldenbush scrub was observed to grade into other shrubland types; both rubber rabbitbrush and California buckwheat were found at low (<10% cover) values. Annuals, particularly miniature lupine and *Bromus hordeaceus* (mean cover class= 25-50% for both), were common in openings between shrubs.

3.1.5 SOUTHERN WILLOW SCRUB

Holland: Southern Willow Scrub (63220)
Sawyer et al.: *Salix exigua* Shrubland Alliance *et seq*.

Southern willow scrub is composed of dense, broadleafed, winter-deciduous riparian thickets dominated by several *Salix* species, with scattered emergent *Populus fremontii* and/or *Platanus racemosa*. Most stands are too dense to allow much understory development. Sawyer et al. (2009) describe several woodland and shrubland riparian willow alliances. However, because of the 1,000 sq.ft. minimum mapping unit used in vegetation surveys at WGEF all willows were mapped as a single unit at the WGEF site. Four species of willow, red willow (*Salix laevigata*), Gooding's willow (*Salix gooddingii*), sandbar willow (*Salix exigua*), and Fremont's cottonwood (*Populus fremontii*) were observed to grow as co-dominants or alternating dominants along several riparian areas in the south of WGEF (Appendix A; Photo AQ). Mulefat (*Baccharis salicifolia*) and several riparian herbs were present. A single California buckeye (*Aesculus californica*) was also observed growing in this vegetation type.

3.1.6 MULEFAT SCRUB

Holland: Mulefat Scrub (63310)
Sawyer et al.: *Baccharis salicifolia* Shrubland Alliance

Approximately 1.5 acres of mulefat thickets were observed at WGEF (Appendix A; Photo AR). These thickets were characterized by >50% relative cover of mulefat (*Baccharis salicifolia*) in the shrub layer. Most stands of mulefat scrub were observed in active stream channels and dry washes found in the southern portion of the site, however at least one other stand was found in upland habitat. In riparian areas, mulefat scrub intergrades with southern willow scrub; a gradient of southern willow scrub to mulefat scrub is apparent moving down stream. Other perennial plants were found scattered in low cover within these stands including wild tarragon, brickelbush, and longstem buckwheat. Native annuals including chia, scalebud, and scarlet lupine, were also found at very low (<1%) cover.

3.1.7 DESERT OLIVE PATCHES

Holland: Mojave Desert Wash Scrub (63700)
Sawyer et al.: *Forestiera pubescens* Shrubland Alliance

Desert olive (*Forestiera pubescens*) is a tall (3-5m) evergreen shrub found often in monotypic and clonal stands. At WGEF, two patches of desert olive totaling 0.9 acres were found just above active channels in slightly drier conditions in the southern portion of the site (Appendix A; Photo AS). These patches, characterized by >50% relative cover of desert olive, were both presumed to be clonal as no evidence of sexual reproduction (e.g. flowers, fruits) were observed. Stands were generally monotypic with other plant species generally lacking and were found associated with large boulders and rock outcrops.

3.2 Other Alliances

3.2.1 AGRICULTURE

Holland: Irrigated/Dryland Grain and Seed Crops (11203/11204)
Sawyer et al.: NA

Agricultural fields comprise 441.4 acres (10.5%) of the site and 4.2 acres of the transmission line corridor. Historically, much of the site has been used for agricultural production, but, as of April 2011, there are only five agricultural fields in production. These consisted of two center-pivot irrigated fields, two fields in valley bottoms that appear to be naturally irrigated with channeled runoff water, and one dryland grain field on a leveled and tilled ridgetop. The predominant crops grown were oats (*Avena* spp.) and cereal rye (*Secale cereale*).

3.2.2 DISTURBED AND DEVELOPED

Holland: Disturbed and Urban/Developed (11300/12000)
Sawyer et al.: NA

Approximately 155 acres (3.7%) of the site and 30.5 acres within the transmission line corridor is composed of Disturbed and Urban/Developed land. These areas include residential houses and yards, ranch houses and associated outbuildings and compounds, and roads. All of the areas mapped as developed include landscape trees and shrubs, often planted as windbreaks. Commonly planted trees and shrubs observed included Siberian elm (*Ulmus pumila*), black locust (*Robinia pseudoacacia*), Fremont cottonwood (*Populus fremontii*), gum tree (*Eucalyptus* spp.), apple (*Malus sylvestris*), exotic pines (*Pinus* spp.), and sumac (*Rhus* spp.). Rows of junipers (*Juniperus* spp.) and cedars (*Cupressus* spp.) were planted along Lancaster Road near the Healy Farms. Additionally, several Joshua trees are (*Yucca brevifolia*) located near the entrance to the Castle property in the south central portion of the site. These trees were planted as ornamentals around the parcel gate when the area was first used as an almond orchard and are thus included here. No naturally occurring Joshua trees are found on the site.

3.2.3 WATER

Holland: Fresh Water (13140)
Sawyer et al.: NA

A single retention basin (1.6 acres) is located in Castle Ranch Property in the southern section of the WGEF site. This basin is a jurisdictional feature (See Section 5.1.3) and is most likely used for flood control and a water source for cattle. No aquatic vegetation was observed within the basin and the banks were predominantly planted with non-native ornamentals.

3.3 Herb dominated Alliances

3.3.1 SITE-WIDE RESULTS

A total of 215 plant species were observed within relevés or during the mapping effort (Appendix B). Relevés contained an average of 17 different species (mean cover= 81.9%) and were dominated by litter (mean cover= 47.25%) and fine grained sediments (mean cover=29.0%). Of the top twenty most important species (IV > 2.0 for all) encountered, eight were non-native herbs and grasses (Table K-II). Four non-native species, *Erodium cicutarium*, *Bromus tectorum*, *Bromus madritensis*, and *Vulpia myuros*, clearly dominated the sampling area with a cumulative relative importance value of 60.5%. The four most important native species, *Lupinus bicolor*, *Vulpia microstachys*, *Lasthenia californica*, and *Amsinckia tessellata* had a cumulative relative importance value of 39.5%.

TABLE K-I: VEGETATION TYPES AND ACREAGES AT THE WILDFLOWER GREEN ENERGY FARM SITE.

	Vegetation Type (Holland 1986)	Vegetation Alliance (Sawyer et al. 2009)	Rarity Ranking	Acreage	Percent of Site
Native annual grassland	Valley and Foothill Grasslands – 42000	California goldfields-Dwarf plantain-Six-weeks fescue flower fields (*Lasthenia californica- Plantago erecta- Vulpia microstachys* Herbaceous Alliance)	G4 S4	**1021.1**	**24.4**
Native perennial grassland	Valley Needlegrass Grassland – 42110	Purple needlegrass grassland (*Nassella pulchra* Herbaceous Alliance)	G4 S3?	52.2	1.2
		Desert needlegrass grassland (*Achnatherum speciosum* Herbaceous Alliance)	G4 S2.2	2.3	0.1
		One-sided blue grass grassland (*Poa secunda* Herbaceous Alliance)	G4 S3?	11.2	0.3
			Subtotal	**65.7**	**1.6**
Non-Native annual grassland/ Semi-natural stands	Non-native Grassland – 42200	Red brome or Mediterranean grass grasslands (*Bromus rubens- Schismus* (*arabicus, barbatus*) Semi-Natural Herbaceous Stands)	-----	1.1	0.0
		Cheatgrass grasslands (*Bromus tectorum* Semi-Natural Herbaceous Stands)	-----	385.9	9.2
		Soft brome grasslands (*Bromus* (*diandrus, hordeaceus*)-*Brachypodium distachyon* Semi-Natural Herbaceous Stands)	-----	263	6.3
		Wild oats grasslands and agricultural fields (*Avena* (*barbata, fatua*) Semi-Natural Herbaceous Stands)	-----	24.4	0.6
		Rat-tail fescue grasslands (*Vulpia myuros* Semi-Natural Stands)	-----	161.7	3.9
			Subtotal	**836.1**	**19.9**
Non-native pereenial forblands	Non-native Grassland – 42200	Prickly lettuce patches (*Lactuca serriola* Semi-Natural Stands)	-----	0.2	0.0
		Hedgemustard and other mustard patches (*Sisymbrium* (*altissimum*)- *Hirshfeldia incana* Provisional Semi-Natural Stands)	-----	61.9	1.5
			Subtotal	**62.1**	**1.5**

Native annual forblands	Wildflower Field - 42300	California poppy fields (*Eschscholzia* (*californica*) Herbaceous Alliance)	G4 S4	595.4	14.2
		Miniature lupine fields (*Lupinus bicolor* Provisional Herbaceous Alliance)	GNR SNR	60.1	1.4
		Desert dandelion- white layia floodplains (*Malacothrix californica-Layia glandulosa* Provisional Herbaceous Alliance)	GNR SNR	33.9	0.8
		Scalebud- Chia-Scarlet lupine washes (*Anisocoma acaulis- Salvia columbariae- Lupinus concinnus* Provisional Herbaceous Alliance)	GNR SNR	10.1	0.2
		Fiddleneck fields (*Amsinckia* (*menziesii, tessellata*) Herbaceous Alliance)	G4 S4	4.4	0.1
			Subtotal	**703.9**	**16.8**
Vernal pool	Vernal Pool – 44000	Annual hair grass- Finebranched popcornflower vernal pools (*Deschampsia danthonoides- Plagiobothrys leptocladus* Provisional Herbaceous Alliance)	GNR SNR	**2.4**	**0.1**
Native scrub and shrublands	Mojave Mixed Woody Scrub - 34210	California buckwheat scrub (*Eriogonum fasciculatum* Shrubland Alliance)	G5 S5	31	0.7
	Rabbitbrush scrub - 35400	Rubber rabbitbrush scrub (*Ericameria* (*Chrysothamnus*) *nauseosa* Shrubland Alliance)	G5 S5	856.1	20.4
	Semi-desert Chaparral – 37400	Oak gooseberry thickets (*Ribes quercetorum* Provisional Shrubland Alliance)	G2 S2?	0.8	<0.1
	Upper Sonoran Subshrub Scrub - 39000	Narrowleaf goldenbush scrub (*Ericameria linearifolia* Provisional Shrubland Alliance)	G4 S3.2	2.7	0.1
	Southern Willow Scrub – 63220	Mixed willow riparian scrub (Mixed *Salix* spp. riparian scrub)	G3 S 2.1	3.1	0.1
	Mulefat Scrub - 63310	Mulefat thickets (*Baccharis salicifolia* Shrubland Alliance)	G5 S4	1.5	<0.1
	Mojave Desert Wash Scrub – 63700	Desert olive patches (*Forestiera pubescens* Shrubland Alliance)	G3 S2	0.9	<0.1
			Subtotal	**896.1**	**21.4**

Native perennial forblands	Coastal and Valley Freshwater Marsh - 52410	Baltic and Mexican rush marshes (*Juncus arcticus* (var. *balticus, mexicanus*) Herbaceous Alliance)	G5 S4	2.4	0.1
	Central Coast Riparian Scrub - 63200	Wild tarragon patches (*Artemisia dracunculus* Herbaceous Alliance)	G4 S4	3.9	0.1
			Subtotal	**6.3**	**0.2**
Agriculture	Irrigated/Dryland Grain and Seed Crops – 11203/11204	Agriculture	-----	**441.4**	**10.5**
Disturbed and Developed	Disturbed and Urban/Developed - 11300/12000	Disturbed and Developed	-----	149.1	3.6
		Non-Native Trees	-----	5.8	0.1
			Subtotal	**155**	**3.7**
Water	Fresh Water – 13140	Open Water	-----	**1.6**	**0.0**
			Total	**4191.7**	

3.3.2 HERBACEOUS COMMUNITY ANALYSIS

Forty four relevé plots were established throughout the WGEF site in April 2011 (Exhibit K-1.1). Based on alliances defined by Sawyer and others and results from cluster and subsequent discriminant analysis, sixteen different alliance-level vegetation types were differentiated including ten herbaceous alliances and six semi-natural stands (Exhibit K-1.1). Of these sixteen vegetation types, three herbaceous alliances and one semi natural stand were not described by Sawyer et al (2009). None of these additional alliances are considered sensitive by any local, regional, or State resource protection agency or conservation organization. Two vegetation types (desert dandelion floodplains and scalebud washes) fall within features areas considered "Waters of the State" and are therefore under the jurisdiction of the CDFG. .

The most important species in each alliance (i.e. that with the greatest IV) differed, however, several species, including *Erodium cicutarium* and *Bromus tectorum*, were important within all alliances (Table K-II). Vegetative cover was greatest in red brome grasslands (mean cover = 98.0%) and lowest in scalebud-chia-scarlet lupine washes (mean cover = 48.3%) (Table K-III). Species richness was greatest in desert dandelion-white layia floodplains (mean = 23) and lowest in soft brome grasslands (mean = 10.7) (Table K-III).

Three alliances were not sampled in the field and were added to the list of observed alliances *post facto*. These include prickly lettuce patches (*Lactuca serriola* Provisional Semi-Natural Stands), wild tarragon patches (*Artemisia dracunculus* Herbaceous Alliance), and annual hairgrass-finebranched popcornflower vernal pools (*Deschampsia danthonoides – Plagiobothrys leptocladus* Provisional Herbaceous Alliance). The former two alliance types were not sampled due to the fact that their apparent distinguishing composition, environmental setting, and small distribution (less than 5 acres combined) were distinct enough where survey effort was deemed better utilized on other herbaceous alliances. Relevés were not used in the latter alliance due to the sensitivity of this vegetation type and presence of standing water during observed during the survey period. These provisional alliances are similar to other mapped alliances. Besides the vernal pool, these areas do not support any sensitive plant species, and none are considered sensitive by any local regional or State agency. A brief description of each alliance is given below.

3.3.2.1 Native Annual Grasslands

Holland: Valley and Foothill Grasslands (42000)
Sawyer et al.: *Lasthenia californica – Plantago erecta – Vulpia microstachys* Herbaceous Alliance

The most common type of grassland observed throughout the site is best described as *Lasthenia californica – Plantago erecta – Vulpia microstachys* Herbaceous Alliance (California goldfields-Dwarf plantain-Six-weeks fescue fields), covering 1,021.9 acres (24.4%) (Appendix A; Photo W). Sawyer et al. (2009) list membership criteria for this alliance of at least 30% cover of *Lasthenia californica*, *Plantago erecta*, *Vulpia microstachys*, or any combination of these three species. *P. erecta* is uncommon on site; both *V. microstachys* and *L. californica*, however, are abundant throughout. Two associations were mapped within the same alliance: however, it is possible that other associations occur on the site. While they are included together under the above association in the final vegetation map, they are discussed here merely as a means to express the relative diversity observed within this large alliance.

L. californica- V. microstachys - Corethrogyne filaginifolia Association
California goldfields-six-weeks fescue- California sandaster fields

This association, found mostly in flat bottomlands and west facing slopes, is co-dominated by California goldfields and small fescue at approximately equal cover values (25-50%). *Corethrogyne filaginifolia* and *Lagophylla ramossissima* are also characteristically present to codominant. Surface cover is dominated by plant litter (50-75%), however bare ground is characteristically present (25-50%). Native annual forbs (e.g., *Eschscholzia californica*, *Lupinus bicolor*, *Uropappus lindleyi*, *Pectocarya*

pennicilata, *Castilleja exserta*, *Stephanomeria exigua*) are found at low cover, typically less than 5%, in these patches of gravel and fine grained soils. Other grasses, including *Bromus madritensis* ssp. *rubens*, *Bromus tectorum*, and *Vulpia octoflora* are also present at low cover values. In southern sections of the site, *Corethrogyne filaginifolia* and *Lagophylla ramossissima* become less dominant and are seemingly replaced with annual buckwheat species (e.g. *Eriogonum* cf. *angulosum*, *Eriogonum* cf. *davidsonii*) and *Stephanomeria* spp.

Vulpia microstachys Association
Small fescue grasslands

This association occurs largely on flat plains and bottomlands. Total vegetative cover is greater than 90% with plant litter dominating the surface cover (>75%). Bare ground is mostly lacking (< 5%). Small fescue is characteristically dominant with cover values greater than 50%. Compared to the *L. californica- V. microstachys* Association, *L. californica* is significantly less abundant in this association with a mean cover values less than 5%. *Erodium cicutarium* is also abundant with cover values greater than 50%. Other native plant species are present at low (i.e. < 5%) cover including *Uropappus lindleyi*, *Lupinus bicolor*, *Corethrogyne filaginifolia*, *Eschscholzia californica*, and *Trichostemma lanceolata*. Other non-native species, typically occurring with < 5% cover, include *Bromus madritensis* ssp. *rubens*, *Bromus tectorum*, and *Lactuca serriola*.

3.3.2.2 Purple needlegrass grasslands

Holland: Valley needlegrass grassland (42110)
Sawyer et al.: *Nassella pulchra* Herbaceous Alliance

The *Nassella pulchra* Herbaceous Alliance (purple needlegrass grassland) is defined by Sawyer et al. as those vegetation types with >10% absolute cover of *Nassella pulchra*. At WGEF, this vegetation type is found along upper slopes and ridgetops in isolated patches in the northern and central portions of the site (Appendix A; Photo X). Purple needlegrass is largely dominant with mean cover values averaging 27 percent cover in all areas mapped. Surface cover, is dominated by fine grained sediments (mean = 60%), however, gravels and cobbles are characteristically present in these rocky substrates. Plant litter is characteristically low. Native diversity is high relative to other areas of the site. Common native species include *Eschscholzia californica*, *Lasthenia californica*, *Castilleja exserta*, *Chamaesaecae albomarginata*, *Linanthus* spp., *Gilia* spp., *Pectocarya* spp., *Lupinus bicolor*, *Poa secunda*, *Trifolium albomarginata*, *T. gracilente*, *Trichostemma lanceolata*, *Uropappus lindleyi*, *Vulpia microstachys*, and others. These mostly annual herbs occupy open spaces between the bunchgrasses. Non-native grasses and forbs are generally low.

3.3.2.3 Desert Needlegrass grasslands

Holland: Valley needlegrass grassland (42110)
Sawyer et al.: *Achnatherum speciosum* Herbaceous Alliance

Sawyer et al. (2009) describes the desert needlegrass herbaceous alliance as those areas with >50% relative cover of *Achnatherum speciosum*. At WGEF, these grasslands are generally small (<1 acre). Several small stands are found in stable sandy washes in the south of the site, however, this vegetation type is also found on dry north-facing slopes in the central and south (Appendix A; Photo Y). Within washes, these grasslands intergrade with scalebud-chia-scarlet lupine fields, desert dandelion- white layia fields, and central coast riparian scrub. As such, indicator species for all abovementioned alliances are present, although at lower cover values including *Layia glandulosa*, *Malacothrix californica*, *Anisocoma acaulis*, *Salvia columbariae*, *Lupinus concinnus*, *Artemisia dracunculus*, *Eriogonum elongatum*, *Chaenactis glabriuscula*, *C. xantiana*, and *Lasthenia californica*. Annual grass species are rare to absent. Surface cover is very sandy with small gravels and cobbles present at low cover. Shrubs are intermittent and include *Ericameria nauseosa* and *Eriogonum fasciculatum*. On dry ridgetops, this vegetation type is

similar to purple needlegrass grasslands except *Achnatherum speciosum* replaces *Nassella pulchra* as the dominant bunchgrass. *Elymus multisetus*, another native perennial bunchgrass, species is also common. These ridgetop patches are generally very small; many patches were observed but not mapped because they did not meet the minimum mapping unit of 1,000 sq.ft.

3.3.2.4 One-sided blue grass grasslands

Holland: Valley needlegrass grassland (42110)
Sawyer et al.: *Poa secunda* Herbaceous Alliance

One-sided bluegrass (*Poa secunda* ssp. *secunda*) is a native perennial bunchgrass species common in a variety of habitats including valley bottoms, slopes, and ridgetops. Sawyer et al. (2009) define one-sided bluegrass grasslands as those areas with >50% relative cover of this species (Hickson et al. 2007). At WGEF, one-sided bluegrass was found most often as a component species within purple needlegrass grasslands, rabbitbrush scrub, or buckwheat scrub. When present in these other vegetation types, one-sided bluegrass cover was low (range = 0-5%). One-sided bluegrass grasslands, where *Poa secunda* was the dominant bunchgrass species found and relative cover values were greater than 50 percent, were observed on 11.2 acres at WGEF (Appendix A; Photo Z). These stands were found, typically, on north facing mid to upper slopes. Surface cover was typified by low cover of litter (mean cover = 15%) and, similar to other native perennial grasslands, high cover values of fine grained sediment (mean cover = 50%). Many native herbs were found intermixed in these openings. Common native herbs include California poppy, California goldfields, blue dicks, miniature lupine, shining peppergrass (*Lepidium nitidum*), Indian clover (*Trifolium albopurpureum*), pinpoint clover (*Trifolium gracilentum*), and others. Other native perennial bunchgrass species, including purple needlegrass, and bottlebrush (*Elymus multisetus*) were also observed at low (<1%) cover. In several stands, particularly in the east, leafy fleabane (*Erigeron foliosus*) was codominant. Native subshrubs, particularly California sandaster, were found intermittently. Non-native grasses (e.g. *Bromus* spp.) and red-stem filaree were common at intermediate cover (mean cover of all non-natives = 15%).

3.3.2.5 Red brome or Mediterranean grass grasslands

Holland: Non-native grassland (42200)
Sawyer et al.: *Bromus rubens- Schismus* (*arabicus*, *barbatus*) Semi-Natural Stands

Red brome (*Bromus madritensis* ssp. *rubens* (*Bromus rubens* syn.)) is an invasive (Cal-IPC: High) annual grass native to Europe. This species is found, to varying degrees, naturalized in a variety of habitats and vegetation types. Sawyer et al. (2009) describe red brome grasslands as those vegetation types with >80% relative cover of *Bromus madritensis* ssp. *rubens* in the herbaceous layer. At WGEF, although red brome was found in almost every other vegetation type described, grasslands where red brome is the dominant are actually rare (total area = 1.1 acres). Instead, numerous patches, smaller than the project minimum mapping unit, of red bromes exist in a mosaic of other annual grasses. These stands are dominated by low species diversity. Native plants, including California poppy, doveweed, California goldfields, silverpuffs, and others, have low dominance values (mean cover = <%1 for all) when present.

3.3.2.6 Cheatgrass grasslands

Holland: Non-native grassland (42200)
Sawyer et al.: *Bromus tectorum* Semi-Natural Stands

Cheatgrass (*Bromus tectorum*) is a non-native annual grass ranked "High" in the California Invasive Plant Council Inventory. Cheatgrass greatly alters the extent, frequency, and timing of wildfires, thereby often reducing the viability of perennial plants (Young 2000). Sawyer et al. (2009) describe cheatgrass grasslands as herbaceous stands with *B. tectorum* dominant to codominant (>50% relative cover) in the herbaceous layer. At WGEF cheatgrass is abundant; these grasslands are common on lower slopes, flat bottomlands, and abandoned agricultural fields and other disturbed areas (Appendix A; Photo AA). Surface cover is dominated by plant litter (mean cover = 85%) with small patches of exposed soil.

Cheatgrass (cover = >75%) and red-stem filaree are abundant (cover = 25-50%). Native annuals are present at low values (<1%) and include California poppy, California goldfields, miniature lupine, vinegarweed, fiddleneck, wirelettuce (*Stephanomeria* spp.) and combseed. Other non-native species, including various other bromes, Mediterranean grass (*Schismus barbatus*), and mustards are also present at low values.

3.3.2.7 Soft brome grasslands

Holland: Non-native grassland (42200)
Sawyer et al.: *Bromus (diandrus, hordeaceus) – Brachypodium distachyon* Semi-Natural Stands

Soft brome (*Bromus hordeaceus*) is an invasive species (CalIPC: Moderate) native to Eurasia. Soft brome grasslands are defines as those areas with >50% relative cover of *Bromus hordeaceus* in the herbaceous layer (Sawyer et al. 2009). At the WGEF site, 263 acres of soft brome grasslands are found along slopes, particularly west facing slopes in the southern portion of the site intergrading with miniature lupine fields and native annual grasslands (Appendix A; Photo AB). Surface cover is predominantly litter (mean cover = 82%) with little (<5%) bare ground. Overall, diversity is low in these grasslands; soft brome is dominant in the herbaceous layer (mean cover class = 63%), red-stemmed filaree is codominant (mean cover = 50%), and miniature lupine is subdominant (mean cover = 30%) and variable. Emergent shrubs and subshrubs, including rubber rabbitbrush and California sandaster, are found at low cover.

3.3.2.8 Wild oats grasslands

Holland: Non-native grassland (42200)
Sawyer et al.: *Avena* (*barbata, fatua*) Semi-Natural Stands

Wild oats grasslands are defined as areas with >50% relative cover of Avena spp. and <10% relative cover of native herbs in the herbaceous layer (Sawyer et al. 2009). At the WGEF, these stands are dominated by slender oat (*Avena barbata*) (mean cover = 70%). These stands, totaling 24.4 acres, are found mostly on south facing slopes in the central and south portions of the site on sandy, exposed soils. Native plants are uncommon (mean cover <1% for all) and include combseed, wirelettuce (*Stephanomeria* spp.), small fescue and California goldfields. In two agricultural fields, *Avena* spp. was the dominant cereal crop being grown (Appendix A; Photo AC). These fields were included as agricultural fields and are not included here.

3.3.2.9 Rat-tail fescue grasslands

Holland: Non-native grassland (42200)
Sawyer et al.: NA

Rattail fescue (*Vulpia myuros*) is a common non-native, invasive (CalIPC: Moderate) annual grass throughout the WGEF site. Extensive stands of grasslands dominated by this species are found in fallow fields and valleys often intergrading with mustard fields (Appendix A; Photo AD). This grassland's coverage (161.7 acres) warranted identifying this vegetation type as verified by cluster and discriminant analysis results. These stands are dominated by non-native species including rattail fescue (mean cover = 46%), hedgemustard (mean cover = 26%), red-stemmed filaree (mean cover = 17%), Russian thistle (*Salsola tragus*) (mean cover = 3%), and foxtail barley (*Hordeum murinum*) (mean cover = 3%). Native plant cover is low for most species, including California goldfields, California poppy, miniature lupine, fiddlenecks, and valley popcornflower (*Plagiobothrys canescens*). Lindley's silverpuffs (*Uropappus lindleyi*) are found in dense patches throughout these grasslands.

TABLE K- II: SPECIES IMPORTANCE VALUES BY HERBACEOUS ALLIANCE
VERY IMPORTANT SPECIES (IV > 10) ARE SHOWN IN BOLD FOR EACH ALLIANCE; NON-NATIVE SPECIES ARE SHOWN IN ITALICS

Species	Desert needlegrass grassland	Fiddleneck fields	Scalebud- Chia-Scarlet lupine washes	Wild oats grasslands	Hedgemustard and other mustard patches	Soft brome grasslands	Red brome or Mediterranean grass grasslands	Cheatgrass grasslands	California poppy fields	Baltic and Mexican rush marshes	California goldfields-Six-weeks fescue flower fields	Miniature lupine fields	Desert dandelion-white layia floodplains	Purple needlegrass grassland	Curly blue grass grassland	Rat-tail fescue grasslands
Achnatherum speciosum	**57.6**															
Amsinckia tessellata		**53.1**						8.5	5.1	6.6		6.0				7.5
Anisocoma acaulis			**32.9**													
Avena barbata				***82.2***												
Bromus hordeaceus				*5.1*		***57.3***						*9.8*				
Bromus madritensis	*7.2*	*5.7*	*9.1*	*8.6*	*6.1*		***86.0***	*7.2*	***16.2***		*7.6*	*7.0*		***20.0***	*7.0*	*8.4*
Bromus tectorum	*7.2*	***12.0***	*6.8*	*9.4*	*5.2*	*9.8*	***10.4***	***74.3***	***10.5***	*6.6*	*8.5*	*6.0*		*8.5*	***10.5***	***10.8***
Castilleja exserta												6.0			7.0	
Chamaesyce albomarginata				5.1			8.1									
Chaenactis glabriuscula	5.5		6.8													
Chaenactis xantiana			9.1													
Dichelostemma capitatum															5.2	
Eremocarpus setigerus		5.7		7.7				4.8								
Eriogonum cf. *baileyi*					6.5											6.5
Eriogonum fasciculatum							5.2									
Erigeron foliosus															6.1	
Ericameria nauseosus	5.5		9.1	6.0		3.9							5.6			
Erodium cicutarium	*9.0*	***37.7***	***11.4***	***17.9***	***54.6***	***33.6***	***21.1***	***31.2***	***26.2***	***28.0***	***45.8***	*9.0*	***11.1***	*8.5*	***15.6***	***22.7***
Eschscholzia californica		7.2						7.8	**23.4**		6.6	8.0				
Heterotheca sessiliflora												6.0				
Holocarpha heermannii									11.7							
Hordeum murinum					*6.7*			*4.8*		*6.6*						*7.5*
Juncus balticus										**43.5**						
Lactuca serriola					*4.7*						*3.8*					*6.7*

Species	Desert needlegrass grassland	Fiddleneck fields	Scalebud- Chia-Scarlet lupine washes	Wild oats grasslands	Hedgemustard and other mustard patches	Soft brome grasslands	Red brome or Mediterranean grass grasslands	Cheatgrass grasslands	California poppy fields	Baltic and Mexican rush marshes	California goldfields-Six-weeks fescue flower fields	Miniature lupine fields	Desert dandelion-white layia floodplains	Purple needlegrass grassland	Curly blue grass grassland	Rat-tail fescue grasslands
Lagophylla ramosissima							8.1			**28.0**						
Lasthenia californica		5.7	6.8	5.1		9.8	8.1	7.2	**10.1**		**14.6**	6.0	**11.1**	8.5	7.9	
Layia glandulosa			6.8										**38.2**			
Lessingia filaginifolia	5.5									6.6	**10.4**			8.5		
Lupinus bicolor		6.4		6.0		**33.0**	8.1	7.8	**16.9**		8.1	**80.8**		**10.0**	7.9	6.7
Lupinus concinnus			**13.7**													
Malacothrix californica													**26.9**			
Nassella pulchra														**50.3**		
Pectocarya penicillata											3.8					
Plagiobothrys arizonicus	5.5															
Plagiobothrys canascens					6.7											
Poa secunda						6.5									**63.9**	
Salvia columbariae	**16.5**		**32.9**													
Salsola tragus					*4.7*											
Sisymbrium altissimum					***43.1***											***14.3***
Stephanomeria exigua	5.5	5.7						4.8				6.0				
Trifolium albopurpureum														7.0		
Trifolium gracillentum	5.5															
Uropappus lindleyi	5.5	5.7							**16.2**		7.6	6.0				
Vulpia microstachys		7.2	6.8	5.1	8.3		8.1	7.2	**11.6**	6.6	**44.4**	9.0	**11.1**	7.0	5.2	
Vulpia myuros		*5.7*			*7.8*	*7.1*				*6.6*						***53.2***

TABLE K- III: SUMMARY DATA FOR SIXTEEN HERBACEOUS ALLIANCES AT WGEF

		Desert needlegrass grassland	Fiddleneck fields	Scalebud- Chia-Scarlet lupine washes	Wild oats grasslands	Hedgemustard and other mustard patches	Soft brome grasslands	Red brome or Mediterranean grass grasslands	Cheatgrass grasslands	California poppy fields	Baltic and Mexican rush marshes	California goldfields- Six-weeks fescue flower fields	Miniature lupine fields	Desert dandelion- white layia floodplains	Purple needlegrass grassland	Curly blue grass grassland	Rat-tail fescue grasslands
Surface Cover	Water	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Stem Basal Area	5.0	3.3	3.0	5.0	13.3	14.0	16.5	10.7	11.0	10.0	14.3	16.0	2.0	15.0	18.3	10.0
	Litter	1.5	30.3	5.0	15.0	78.3	81.7	81.0	87.3	61.7	85.0	55.5	60.0	4.5	18.3	18.3	76.7
	Bedrock	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Boulder (>60cm diameter)	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0
	Stone (25-60cm diameter)	0.3	0.3	1.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.5	1.0	0.7	0.0
	Cobble (7-25cm diameter)	1.0	0.5	4.3	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.3	1.5	1.2	0.3	0.3
	Gravel (2mm-7.5cm diameter)	4.0	0.7	76.7	0.0	0.0	0.5	0.0	0.2	0.2	1.0	21.4	1.3	74.0	2.8	4.7	0.3
	Fines (<2mm diameter)	88.5	64.7	9.3	80.0	8.3	3.7	2.5	2.0	27.3	4.0	9.0	19.0	7.5	62.0	57.7	12.7
Absolute Cover	Total Vascular Cover	62.5	66.7	48.3	75.0	97.0	97.7	98.0	93.7	94.3	95.0	89.3	88.3	65.0	81.7	70.0	88.3
	Percent Cover (trees)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Percent Cover (saplings)	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Percent Cover (shrubs)	0.5	0.8	1.3	0.7	0.0	0.5	0.5	0.3	0.3	0.5	10.1	0.3	1.0	2.0	0.7	0.7
	Percent Cover (herbs)	62.5	66.7	48.3	75.0	97.0	97.3	98.0	93.7	93.3	95.0	85.5	88.3	65.0	81.0	70.0	95.0
Height (m)	Mean height (trees)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Mean height (saplings)	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Mean height (shrubs)	0.3	0.3	0.8	0.6	0.0	0.2	0.1	0.3	0.2	0.3	0.3	0.3	0.8	0.3	0.2	0.1
	Mean height (herbs)	0.3	0.3	0.3	0.3	0.4	0.3	0.3	0.3	0.3	0.8	0.3	0.3	0.3	0.3	0.3	0.3
Diversity	Relative Cover (Natives)	88.6	59.6	88.6	6.0	5.3	24.4	4.8	6.9	63.8	69.3	64.2	89.2	89.5	78.0	79.5	10.5
	Relative Cover (Non-natives)	11.4	40.4	11.4	94.0	94.7	75.6	95.2	93.1	36.2	30.7	35.8	10.8	10.5	22.0	20.5	89.5
	Species Richness	21.0	19.0	18.3	14.0	17.3	10.7	13.0	14.7	15.7	21.0	13.8	18.7	23.0	21.3	21.7	19.0
	Native Species Richness	17.5	12.7	15.0	8.0	8.7	6.7	8.5	9.7	11.0	11.0	10.3	13.7	19.0	17.3	17.7	9.3
	Non-Native Species richness	3.5	6.3	3.3	6.0	8.7	4.0	4.5	5.0	4.7	10.0	3.5	5.0	4.0	4.0	4.0	9.7

3.3.2.10 Prickly Lettuce patches

Holland: Non-native grassland (42200)
Sawyer et al.: NA

Prickly lettuce (*Lactuca serriola*) is found in various non-native dominated vegetation types. This non-native, invasive species also forms near monotypic stands at WGEF on lower slopes, valleys, and agricultural margins (Appendix A; Photo AE). While not described by Sawyer et al. (2009), these stands, as verified by cluster and correspondence analysis are included here. Prickly lettuce is dominant (cover > 30%) in these patches. Other non-native species, including rye (*Secale cereale*), mustards (*Sisymbrium altissimum*, *Hirshfeldia incana*), and foxtail barley are common to codominant. Native species are uncommon (<10% relative cover).

3.3.2.11 Hedgemustard and other mustard patches

Holland: Non-native grassland (42200)
Sawyer et al.: *Brassica* (*nigra*) and other mustards Semi-Natural Stands

Mustard patches are found throughout the WGEF site (61.9 acres) in fallow fields and disturbed areas (Appendix A; Photo AF). These stands are dominated by non-native, invasive mustards including hedgemustard (Sisymbrium altissimum; CalIPC: unranked), tansy mustard (*Descurainia sophia*, CalIPC: Limited) and/or shortpod mustard (*Hirschfeldia incana;* CalIPC: Moderate). These patches often intergrade with rattail fescue grasslands but are distinct in their dominance by various mustards; rattail fescue is present but not dominant in this vegetation type (mean cover = 3%). Other common non-native species include red-stemmed filaree (mean cover = 60%) and foxtail barley (mean cover = 3%). Native plant cover and diversity is low. Encountered native plants include small fescue, California goldfields, common hareleaf, California poppy, and miniature lupine. Isolated patches of fiddlenecks are found on piles of exposed soil.

3.3.2.12 California poppy fields

Holland: Wildflower Fields (42300)
Sawyer et al.: *Eschscholzia (californica)* Herbaceous Alliance

Sawyer et al. (2009) describes California poppy fields as those areas with significant (>30% relative cover) cover and even density of California poppies (*Eschscholzia californica*). The authors note, however, that little is understood regarding the relationships between this vegetation type and other herbaceous alliances. The authors continue to caution that other alliances with native annuals as dominants will likely be described (See "*Lupinus bicolor* Provisional Herbaceous Alliance") in future editions of the manual. At WGEF, poppy fields are found extensively throughout flat bottomlands and mesas. This vegetation type is found overlapping and transitioning with California goldfields-Dwarf plantain-Six-weeks fescue flower fields and various non-native annual grass dominated vegetation types (e.g. brome grasslands). As such, distinctions between these vegetation types can be difficult to discern in the field and, like other annual plants, germination and robustness of *Eschscholzia* varies between years with differing precipitation, temperature, and other factors. For these reasons, these delineations should be considered approximations based off of conditions observed in and leading up to April 2011 (Appendix A; Photo AG); actual acreages for these annual dominated vegetation types are expected to vary from year to year. Surface cover is approximately equal amounts of plant litter and fine grained sediments with occasional gravels or cobbles. In general, California poppy is dominant (cover = 25-50%) in these areas. Miniature lupines, small fescue, or California goldfields often codominate with cover values ranging from 1-5% in pure poppy fields to 25-50% in transitional areas. Other native annuals present, often in dense patches, include Lindley's silverpuffs (*Uropappus lindleyi*), Heermann's tarweed (*Holocarphus heermannii*), fiddlenecks (*Amsinckia tessellata*, *A. menziesii*), and branched lagophylla (*Lagophylla ramossissima*) (mean cover = 1-5% for all) while Douglas's milkvetch (*Astragalus douglasii*), purple owl's clover (*Castilleja exserta*), popcornflowers (*Plagiobothrys arizonicus*, *P.*

nothofulvus, *P. cansescens*), annual buckwheats (*Eriogonum spp.*), combseed (*Pectocarya penniclata*, *P. linearis*), dobiepod (*Tropidocarpum gracile*), and other native annuals are found at very low cover (mean = <1% for all). Non-native grasses, including bromes (*Bromus madritensis* ssp. *rubens*, *B. tectorum*, *B. hordeaceus*), wild rye (*Hordeum murinum*) and rattail fescue (*Vulpia myuros*) are common (range = <1 – 15-25%, mean cover = 5-15% for all). Rubber rabbitbrush (*Chrysothamnus nauseosus*) is intermittent.

3.3.2.13 Miniature lupine fields

Holland: Wildflower Field (42300)
Sawyer et al.: NA

While not described by Sawyer et al. (2009), expansive fields of miniature lupine (*Lupinus bicolor*) occur throughout the WGEF site (Appendix A; Photo AH). This provisional alliance was included due to its apparent distinction from other vegetation types and consistent occurrence on sloping hills and bottomlands as observed in the field and verified by cluster analysis results, This vegetation type is found often intergrading with California poppy fields and *Bromus hordeaceus* grasslands and is largely dominated (mean = 50-75%) by miniature lupine. Surface cover is predominantly litter (mean = 60%) with fine grained sediments averaging approximately 19% cover. Shrubs are lacking or, when present, very sparse and diminutive. While total vegetative cover is high (mean = 87%), species diversity is relatively low when compared to other vegetation types. Other native forbs are found at very low (typically, <1%) cover and include *Amsinckia tessellata*, *Castilleja exserta*, *Eschscholzia californica*, *Lasthenia californica*, *Stephanomeria exigua*, *Platystemon californicum*, and *Heterotheca sessiliflora*. *Bromus hordeaceus* and *Vulpia microstachys* are the only grass species with substantive cover averaging approximately 8% each while Erodium cicutarium is a common and abundant non-native forb.

3.3.2.14 Desert dandelion- white layia washes

Holland: Wildflower Field (42300)
Sawyer et al.: NA

This provisional alliance, not described by Sawyer et al. (2009), was surveyed independently due to its consistent occurrence on floodplains and terraces throughout the site and observable distinction from other vegetation types (Appendix A; Photo AI). Cluster and discriminant analyses verified this class independent from other vegetation types. The substrate is characteristically bare with greater than 75% of the surface covered by gravels (sediment size = 2mm-7.5cm). Both *Malacothrix californica* and *Layia glandulosa* are dominant or characteristically present (average cover = 5-15% for both) in the herbaceous layer. Perennial herbs (e.g. *Artemisia dracunculus*, *Heterotheca grandiflora*) and shrubs (e.g. *Eriogonum fasciculatum*, *Ericameria nauseosa*) are intermittent at low frequencies. A diverse number of native species are found within this alliance at cover values less than 5%, including *Stephanomeria exigua*, *Chaenactis xantiana*, *Chaenactis glabriuscula*, *Lotus strigosus*, *Castilleja exserta*, *Eriogonum* cf. *roseum*, *Trifolium gracilentum*, *Plagiobothrys arizonicus*, *Oenothera californica*, *Pectocarya pennicilata*, *Pectocarya linearis*, *Uropappus lindleyi*, and others. Non-native species, including *Erodium cicutarium*, *Bromus tectorum*, and *Bromus madritensis* ssp. *rubens* also occur at low cover.

3.3.2.15 Scalebud- Chia-Scarlet lupine washes

Holland: Wildflower Field (42300)
Sawyer et al.: NA

This provisional alliance, not described by Sawyer et al. (2009), was included due to its apparent uniqueness and consistent occurrence in washes throughout the site, particularly in the south and supported by cluster and discriminant analysis results (Appendix A; Photo AJ). The substrate is characteristically bare with almost 100% of the surface covered by gravels (sediment size = 2mm-7.5cm) or finer sediments. While similar to the *Malacothrix californica-Layia glandulosa* Provisional Herbaceous Alliance at first glance, scalebud (*Anisocoma acaulis*) replaces *M. californica*, a similar appearing pale yellow chicory-type of annual composite, in these washes. Additionally, while *Layia glandulosa* still occurs in isolated patches, the codominant and characteristic annuals within these washes

are chia (*Salvia columbariae*) and scarlet lupine (*Lupinus concinnus*) (mean cover = 1-5 % for each). Perennial herbs (e.g. *Artemisia dracunculus, Heterotheca grandiflora*) and shrubs (e.g. *Brickellia* spp., *Baccharis salicifolia, Eriogonum fasciculatum, and Ericameria nauseosa*) are intermittent at low frequencies and this alliance tends to grade into both the *Artemisia dracunculus* Herbaceous Alliance and the *Baccharis salicifolia* Shrubland Alliance. A diverse number of other native species are found within this alliance at cover values typically less than 1%, including *Stephanomeria exigua*, *Chaenactis xantiana*, *Chaenactis glabriuscula*, *Lotus strigosus*, *Eriogonum* cf. *roseum*, *Trifolium gracilentum*, *Plagiobothrys arizonicus*, *Oenothera californica*, *Pectocarya pennicilata*, *Pectocarya linearis*, *Uropappus lindleyi*, and others. Non-native species, including *Erodium cicutarium*, *Bromus tectorum*, and *Bromus madritensis* ssp. *rubens* also occur at very low cover.

3.3.2.16 Fiddleneck Fields

Holland: Wildflower Fields (42300)
Sawyer et al.: *Amsinckia* (*menziesii, tessellata*) Herbaceous Alliance

Sawyer et al. (2009) describe fiddleneck fields as those areas with greater than 30% cover of *Amsinckia menziesii*, *Amsinckia tessellata*, or any combination of these two species. These native annual species, while widespread and abundant throughout the site, form dense fields in areas with high levels of disturbance including road margins, fence rows, and other areas where soils have been disturbed and exposed (Appendix A; Photo AK). As such, substrates are typically bare with approximately 75% of the surface cover comprised of sands and finer grain sediments. While *A. menziesii* was commonly observed, fiddleneck fields are dominated by *A. tessellata* (cover > 50%) at the WGEF site. Red-stemmed filaree (*Erodium cicutarium*) is also abundant (cover > 50%) in these patches. Other species observed at low (< 1%) cover include *Vulpia microstachys*, *Lasthenia californica*, *Lupinus bicolor*, *Eschscholzia californica*, *Plagiobothrys canescens*, and others. Non-native annual grasses, including *Bromus madritensis* ssp. *rubens*, *B. tectorum*, and *V. myuros* are also common with a combined cover of approximately 10%. When present, shrubs are sparse and intermittent and include *Corethrogyne filaginifolia* and *Ericameria nauseosa*.

3.3.2.17 Annual hair grass- Finebranched popcornflower vernal pools

Holland: Vernal Pool (44000)
Sawyer et al.: NA

Three vernal pools were visited in April 2011. All three pools were visited when still holding water and several species of birds (e.g., killdeer (*Charadrius vociferous*), spotted sandpiper (*Actitis macularia*), ring-necked duck (*Aythya collaris*), mallard (*Anas platyrhynchos*), and others), amphibians (e.g., Baja California treefrog (*Pseudacris hypochondriaca hypochondriaca*)), and invertebrates (e.g. *Daphnia* spp.) were observed. Spreading navarretia (*Navarettia fossalis*), a federally threatened and CNPS List 1B.1 species, is known to occur in at least one pool. Due to the sensitivity of these areas and the fact that many plants were submerged or, due to their phenology, otherwise unidentifiable, protocol surveys were not conducted in these vernal pools. Instead, peripheries were walked and species composition was qualitatively surveyed. All three vernal pools were characterized by annual hair grass (*Deschamspia danthonoides*) and finebranched popcornflower (*Plagiobothrys leptocladus*; Appendix A; Photo AL). Pool A, the largest of the three pools, also contained adobe popcornflower (*Plagiobothrys acanthocarpus*). All three species are considered vernal pool indicator species in this region. Additional species found in these pools include speedwell (*Veronica* spp.), spikerush (*Eleocharis* cf. *obtusa*), and California goldfields. Non-native herbs, including red-stemmed filaree and pineapple weed (*Matricaria discoidea* (*Chamomilla suaveolens*, syn.)), were also observed, particular along disturbed margins.

3.3.2.18 Rush Marshes

Holland: Coastal and Valley Freshwater Marsh (52410)
Sawyer et al: *Juncus arcticus* (var. *balticus*, *mexicanus*) Herbaceous Alliance

Sawyer et al. (2009) list membership criteria of at least 50% relative cover of *Juncus arcticus* var. *balticus* (aka *J. balticus*), *Juncus arcticus* var. *mexicanus* (aka *J. mexicanus*), or a combination of the two for this alliance. At WGEF, this vegetation type was observed in subtle drainages and low lying flats (Appendix A; Photo AT). Surface cover was typically dominated by plant litter (mean cover = 70%) with patches of fine textured sediments (mean cover = 11%). Baltic rush (*J. balticus*) was dominant with cover at 50-75%. Other native plants were observed at low cover values including wild tarragon (*Artemisia dracunculus*), branched lagophylla (*Lagophylla ramossissima*), Lindley's silverpuffs (*Uropappus lindleyi*), and common sandaster were also present at low values and two other species of rushes, toad rush (*J. bufonius*) and irisleaf rush (*J. xiphioides*) were rarely found. While recognized as the *Juncus* (*oxymeris*, *xiphioides*) Provisional Herbaceous Alliance by Sawyer et al. 2009, only a few irisleaf rushes were found and the area was well below the minimum mapping unit determined for the project. For this reason, this area is included with other Baltic rush marshes here. Red-stemmed filaree and non-native grasses, particularly *Hordeum murinum*, *Vulpia myuros*, *Bromus tectorum*, *B. diandrus*, and *Piptatherum milliaceum*, were common at low (typically, 1-5%) cover.

3.3.2.19 Wild Tarragon Patches

Holland: Central Coast Riparian Scrub (63200)
Sawyer et al.: *Artemisia dracunculus* Herbaceous Alliance

Wild tarragon (*Artemisia dracunculus*) is a perennial herb found in washes, floodplains, and other periodically flooded areas with sandy alluvial soil (Appendix A; Photo AU). Sawyer et al. (2009) describe wild tarragon patches as those areas with >50% relative cover of this species in the herbaceous layer. At WGEF, wild tarragon patches are found over 3.9 acres. All patches are found on flat, alluvial soil with signs of intermittent flooding. Native shrubs, particularly rubber rabbitbrush, are also found at low (<10%) cover. The surface is lacking in plant litter (mean cover = 3%), yet fine grained sediments are abundant. Native annuals and perennial are also found at low (typically, <1%) cover including cushion cryptantha (*Cryptantha circumcissa*), sharpnut cryptantha (*C. oxygona*), and popcornflowers. Non-native plant cover is also low in these patches.

4.0 CONCLUSIONS

These results illuminate much regarding the overall plant community composition and distribution within the Wildflower Green Energy Farm site. All cover values and results are based solely on data gathered in 2011, an unusual climatic year and, while these results are accurate for this water-year, they must be used with caution and understanding that these communities will change between years and with differing climatic conditions. It is understood that the structure, composition, and distribution of vegetation types, particularly those dominated by annual species, will differ among years with differing temperature and water availability. However, these findings provide a general framework and provide several important conclusions:

- Evidence of historical and current use for orchard land, rangeland, agriculture, and recreational use is apparent. These land uses can greatly affect the composition, structure, and distribution of vegetation types via: altered fire regimes, introduction of viruses and other plant pathogens, soil depletion, seedbank manipulation, selective herbivory, trampling, nutrient deposition, propagule dispersal, and other factors.
- One third of the entire sampling area is dominated by native scrub and shrublands. While the majority of these areas consist of rubber rabbitbrush scrub, several other shrub dominated areas, although relatively small, are found. This includes four special status vegetation types: oak gooseberry thickets, desert olive patches, and southern willow scrub are found in washes and canyons while narrowleaf goldenbush scrub is found along ridges and saddles to the south.
- Four non-native species (*Erodium cicutarium*, *Bromus madritensis*, *B. tectorum*, and *Vulpia myuros*) are particularly widespread and prevalent. These species can be dominant in most areas they occur.
- Nineteen vegetation alliances were identified on the WGEF. These alliances were summarized into nine vegetation communities presented in the BCA. This community level analysis is sufficient for determination of impacts to vegetation resources for the BCA and subsequent CEQA analysis.
- Agricultural areas and non-native grasslands, including grasslands dominated by *Bromus madritensis*, *B. hordeaceus*, *B. tectorum*, *Avena barbata*, and *Vulpia* myuros cover 1,277.5 acres and 30.5 percent of the site and show the lowest species diversity. Native perennial grasslands (e.g. *Nassella pulchra*, *Poa secunda*, and *Achnatherum speciosum* Herbaceous Alliances) cover 65.7 acres of the site.
- Wildflower fields covering approximately 703.9 acres at WGEF are a regionally important resource. The ecological value of these areas relate to the diverse mix of native and non-native herbaceous and grass species and the yearly expression of flowering annuals. Wildflower blooms vary from year-to-year based on rainfall and other ecological factors. These communities are regionally abundant on the southern Tehachapi Mountain slopes and other lowlands of the Antelope Valley.

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Appendix K-2:

Wetlands and Other Surface Waters Report

Wetlands and Other Surface Waters Report
Wildflower Green Energy Farm
Los Angeles County, California

Prepared for:

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June 26, 2011

WEST Inc.

NATURAL RESOURCES ◆ SCIENTIFIC SOLUTIONS

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INTRODUCTION

Element Power has proposed to construct a wind and solar energy facility, the Wildflower Green Energy Farm (WGEF), in northern Los Angeles County, California, approximately 16 miles (26 kilometers [km]) west of the city of Lancaster. This report presents the results of a jurisdiction delineation conducted by WEST, Inc. for Element Power. The purpose of the delineation is to determine the extent of areas meeting the regulatory definition of "Waters of the United States" subject to the regulatory jurisdiction of the US Army Corps of Engineers (USACE), and to determine the extent of streambeds subject to the regulatory jurisdiction of the California Department of Fish and Game (CDFG). Under Section 404 of the Clean Water Act, a USACE permit is required for the discharge of dredged or fill material into waters of the United States. Pursuant to Section 1600 of the California Fish and Game Code, any entity proposing to divert, obstruct, or substantially alter the bed, bank, or channel of a stream must enter into a Streambed Alteration Agreement with the CDFG prior to commencing such activity. Additionally, isolated wetlands and other waters that are deemed by the USACE to be outside of federal jurisdiction are subject to regulation by the State of California (State). Under the Porter-Cologne Water Quality Control Act, the Regional Water Quality Control Board (RWQCB) regulates discharges to waters of the State, including isolated waters.

The proposed WGEF includes a main project area comprising approximately 4,192 acres (6.55 square miles [mi^2]), located along the west, south, and east sides of the Antelope Valley California Poppy State Natural Reserve, and an approximately 5-mile (8-km) generation tie-line (gen-tie) corridor, extending to the east of the main project area to the Antelope Substation.

The project area is primarily composed of native and non-native annual grassland, but includes large tracts of rabbitbrush scrub and native forbland. The site was historically grazed by domestic sheep and a large percentage of the project area was used for agricultural production in the recent past, but the majority of this has been converted to rangeland. Some agriculture still occurs, although it composes a small portion of the site. Foothills to the south and west of the project area are primarily composed of chaparral communities. Habitats to the north and east of the project area consist of a mixture of non-native annual grassland and desert plant communities (e.g., creosote bush [*Larrea tridentata*] scrub, Joshua tree [*Yucca brevifolia*] woodland). The southern border of the WGEF is bounded by the California Aqueduct.

Topography in the project area consists of a mosaic of relatively flat fields, low ridges, and hills. Elevations within the main project area range from 2,620 feet (ft; 799 meters [m]) along the eastern edge to approximately 3,000 ft (914 m) in the southern portion of the site near the California Aqueduct. Elevations along the transmission line route range from 2,867 ft (874 m) at the southwest corner of the corridor to 2,460 ft (750 m) at the east end near the Antelope Substation. The project area includes numerous washes and drainage channels, all of which convey runoff in a northeasterly direction.

The WGEF is primarily underlain by four soil series comprising eight soil mapping units, which are dependent upon topographic position. The four series include: Hanford coarse sandy loam, Hanford gravelly sandy loam, Greenfield sandy loam, terrace escarpments, and Vista coarse sandy loam. All of these soil series are formed in alluvium and residuum derived from granite and are classified in the same ecological range site, *Loamy 9-20"* (USDA NRCS 2010). The four soil series occur on alluvial fans and terraces.

METHODS

WEST biologists surveyed the study area for wetlands and other Waters of the US (WUS) and for CDFG streambeds. Surveys were conducted from April 28-April 30 and May12-May 13, 2010, and from May 12-May 13, 2011. The survey area included the main project area, comprising approximately 4,192 acres, and the 5-mile gen-tie corridor, defined as the 100-ft (30-m) wide area surrounding the proposed gen-tie line.

Prior to conducting the survey, WEST biologists reviewed US Geological Survey (USGS) topographic maps, soil survey information from the US Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS), and US Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) maps for the survey area.

Potential wetlands were examined in accordance with the 1987 Corps of Engineers Wetlands Delineation Manual (Environmental Laboratory 1987) and the Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West (USACE 2008). The 1987 manual outlines a three-parameter approach for an area to be considered a wetland, in which all three parameters must be met: hydrophytic plants must be the dominant vegetative cover, hydric soils must be present, and wetland hydrology must be present.

Criteria used to identify potential USACE WUS (waterbodies) in the field included presence of a defined bed and bank, a surface connection to another WUS, and evidence of periodic flow (e.g., litter, debris, natural scour line, shifted gravel/sand, eroded banks). In identifying CDFG streambeds, the term "bank" is interpreted to encompass the physical bank of the stream and all associated riparian vegetation. The lateral extent of the CDFG jurisdictional stream is therefore delineated as the top of the physical bank or the upland edge of riparian vegetation, whichever is broader.

Wetland boundaries and sample points were recorded in the field with a Trimble GeoXH Global Positioning System (GPS) unit with sub-meter accuracy. Other WUS and CDFG streambeds were recorded in the field on aerial photographs and later digitized using ArcView 10.0. Representative photographs were taken for each feature.

RESULTS

Wetlands

A total of 19 wetlands totaling 3.47 acres (0.01 mi^2) were delineated within the project area. Individual wetland acreages are provided in Table 1 while mapped locations of all wetlands are included in Appendix A. All of the 19 wetlands are classified as palustrine emergent wetlands (PEM) that are characterized by the dominance of erect, rooted, herbaceous wetland plants. The majority of these wetlands either occur within or along drainage channels or in hillside swales below seeps. Three of the wetlands, wetlands 17, 18, and 19 occur in vernal pools and comprise a total of 2.38 acres (Appendix A). Vernal pool wetlands 18 and 19 were identified by Natural Resources Consultants while conducting additional surveys on site. With the exception of the three vernal pool wetlands, the other wetlands are located below and in close proximity to the California Aqueduct. The hydrology of these other wetlands is either associated with spring- or seep-fed natural drainage channels or with ground water seepage associated with delivery losses from the California Aqueduct (presumably through cracks in the cement-lined aqueduct). Dominant herbaceous species observed in the majority of the wetlands included annual beard grass (*Polypogon monspeliensis*), Baltic rush (*Juncus balticus*), and clustered field sedge (*Carex praegracilis*). Hydrophytic species commonly encountered included monkeyflower (*Mimulus guttatus*), curly dock (*Rumex crispus*), watercress (*Nasturtium officinale*), and foxtail barley (*Hordeum jubatum*). Dominant hydrophytes occurring in the seasonal depression (wetland 17) included finebranched popcornflower (*Plagiobothrys leptocladus*) and spreading navarretia (*Navarretia fossalis*). Prostrate knotweed (*Polygonum aviculare*) and annual hairgrass (*Deschampsia danthonioides*) were also common in the depression. The Arid West wetland dataforms detailing the wetlands are provided in Appendix B while photos of the wetlands are included in Appendix C.

Table 1. Wetlands identified within the Wildflower Green Energy Farm.

Wetland ID	Area (acres)
Wetland 1	0.287
Wetland 2	0.015
Wetland 3	0.202
Wetland 4	0.015
Wetland 5	0.042
Wetland 6	0.005
Wetland 7	0.016
Wetland 8	0.004
Wetland 9	0.108
Wetland 10	0.088
Wetland 11	0.084
Wetland 12	0.107
Wetland 13	0.064
Wetland 14	0.027
Wetland 15	0.014
Wetland 16	0.012
Wetland 17	2.27
Wetland 18	0.054
Wetland 19	0.057

Total Area	**3.47**

Other Waters of the US

A total of 31 waterbodies, including one pond (open water), were identified within the project area that may qualify as waters of the US (see Appendix A for mapped locations of all waterbodies). One drainage feature, identified as WUS 37, did not have a defined channel and is not considered a potential water of the U.S.; however, it may qualify as CDFG jurisdictional stream and is included in Table 3. All of these waterbodies can be categorized as ephemeral/intermittent. Each of the drainage features was examined off site for downstream hydrologic connectivity (i.e., surface connection to other waters of the US). Several of the waterbodies reached their terminus within the project boundary. The majority of waterbodies extending through the project area "fanned out" on the valley floor (i.e., no longer exhibited the presence of a defined bed or bank) within two or three miles (three to five km) of downstream examination. As such, it is our recommendation that these are isolated waters and thus are not jurisdictional waters of the US. It is understood that this is only a recommendation, and that the final determination on the jurisdiction of any wetland or other WUS is solely the responsibility and duty of the USACE. The USACE jurisdictional area (in acres) and average ordinary high water mark (OHWM; in ft) of each waterbody identified within the survey corridors is provided in Table 2. Acreages for WUS identified along the transmission line corridor were based on a 125-ft wide survey corridor (i.e., 62.5 feet to either side of the transmission line). Representative photographs of all waterbodies encountered within the project area are included in Appendix D.

Four springs were identified within or immediately adjacent the project area. Two of the springs are located along WUS 27 and WUS 30, in the southern portion of the project area near the California Aqueduct. The other two springs occur in close proximity along WUS 3 in the northeastern corner of the project area. Water flow associated with these springs may not be daylighted (i.e., may be subsurface) during portions of the year but above ground flow was observed in early spring of 2010.

Table 2. Potential waters of the US identified within the Wildflower Green Energy Farm.

Waterbody ID	Average OHWM (feet)	Area (acres)[a]
WUS 1	3	0.34
WUS 2	4	0.67
WUS 3	6	0.80
WUS 4	3	0.11
WUS 5	1.5	0.04
WUS 6	2	0.05
WUS 7 (no defined channel)	n/a	n/a
WUS 8 (Myrick Canyon)	6	0.56
WUS 9	3	0.25
WUS 12	20	1.7
WUS 15	2	0.02
WUS 16	0.5	0.03
WUS 17	2	0.07
WUS 18	1	0.03

WUS 19	5	0.01
WUS 21	2	0.03
WUS 22	2	0.11
WUS 23	3	0.19
WUS 24	1	0.33
WUS 25	1	0.008
WUS 26 (Myrick Canyon)	5	0.29
WUS 27	2	0.15
WUS 28 (open water)	n/a	0.53
WUS 29	0.5	0.003
WUS 30	2	0.13
WUS 31	1	0.11
WUS 32	1	0.11
WUS 33	2	0.21
WUS 34	2	0.25
WUS 35	4	0.17
WUS 36	2	0.08
WUS 37	No defined channel	n/a
Total Area		**7.82**

[a] acreage estimates for waters of the US do not include portions of drainages occupied by wetlands.

California Department of Fish and Game Jurisdictional Streambeds

All of the 32 waterbodies encountered within the project area are considered potential CDFG jurisdictional streams. A total of 12 of the 32 waterbodies identified within the project area featured woody riparian vegetation. The majority of these supported only one or two riparian species. Riparian trees and shrubs observed within the project area included Fremont cottonwood (*Populus fremontii*), red willow (*Salix laevigata*), mule fat (*Baccharis salicifolia*), blue elderberry (*Sambucus mexicana*), skunkbrush (*Rhus trilobata*), and California buckwheat (*Eriogonum fasciculatum*). Potential CDFG jurisdiction along these 12 waterbodies was delineated along the outer limits of the woody riparian habitat. Potential CDFG jurisdiction along the other 18 waterbodies was extended to the top of the bank. The CDFG jurisdictional area (acres) and average width of top of bank and/or riparian extent of each waterbody identified within the survey corridors is provided in Table 3. Acreages for potential CDFG jurisdictional streams identified along the transmission line corridor were based on a 125-ft wide survey corridor. Representative photographs of all the waterbodies encountered within the project area were recorded (Appendix D).

Table 3. Potential CDFG jurisdictional streams identified within the Wildflower Green Energy Farm.

Waterbody ID	Average Bank/Riparian Width (feet)	Area Vegetated (acres)	Area Non-Vegetated (acres)
WUS 1	8	n/a	2.29
WUS 2	10	n/a	4.69
WUS 3	8	n/a	2.27
WUS 4	6	n/a	0.44
WUS 5	2	n/a	0.30
WUS 6	8	n/a	0.32
WUS 7	10	n/a	0.55

WUS 8 (Myrick Canyon)	15	n/a	1.95
WUS 9	15	n/a	1.68
WUS 12	100	0.12	16.07
WUS 15	25	n/a	0.04
WUS 16	20	n/a	0.04
WUS 17	2	n/a	0.002
WUS 18	2	n/a	0.005
WUS 19	15	n/a	0.03
WUS 21	6	n/a	0.04
WUS 22	13	0.36	0.89
WUS 23	50	0.59	2.95
WUS 24	9	0.34	1.48
WUS 25	6	n/a	0.08
WUS 26	100	0.66	14.6
WUS 27	45	0.33	1.60
WUS 28 (open water)	n/a	n/a	0.53
WUS 29	2	n/a	0.01
WUS 30	40	1.07	0.29
WUS 31	8	0.09	0.29
WUS 32	8	0.09	0.24
WUS 33	8	0.10	0.73
WUS 34	8	0.11	1.08
WUS 35	15	0.13	0.62
WUS 36	6	n/a	0.24
WUS 37	6	n/a	0.76
Total Area		**3.99**	**57.08**

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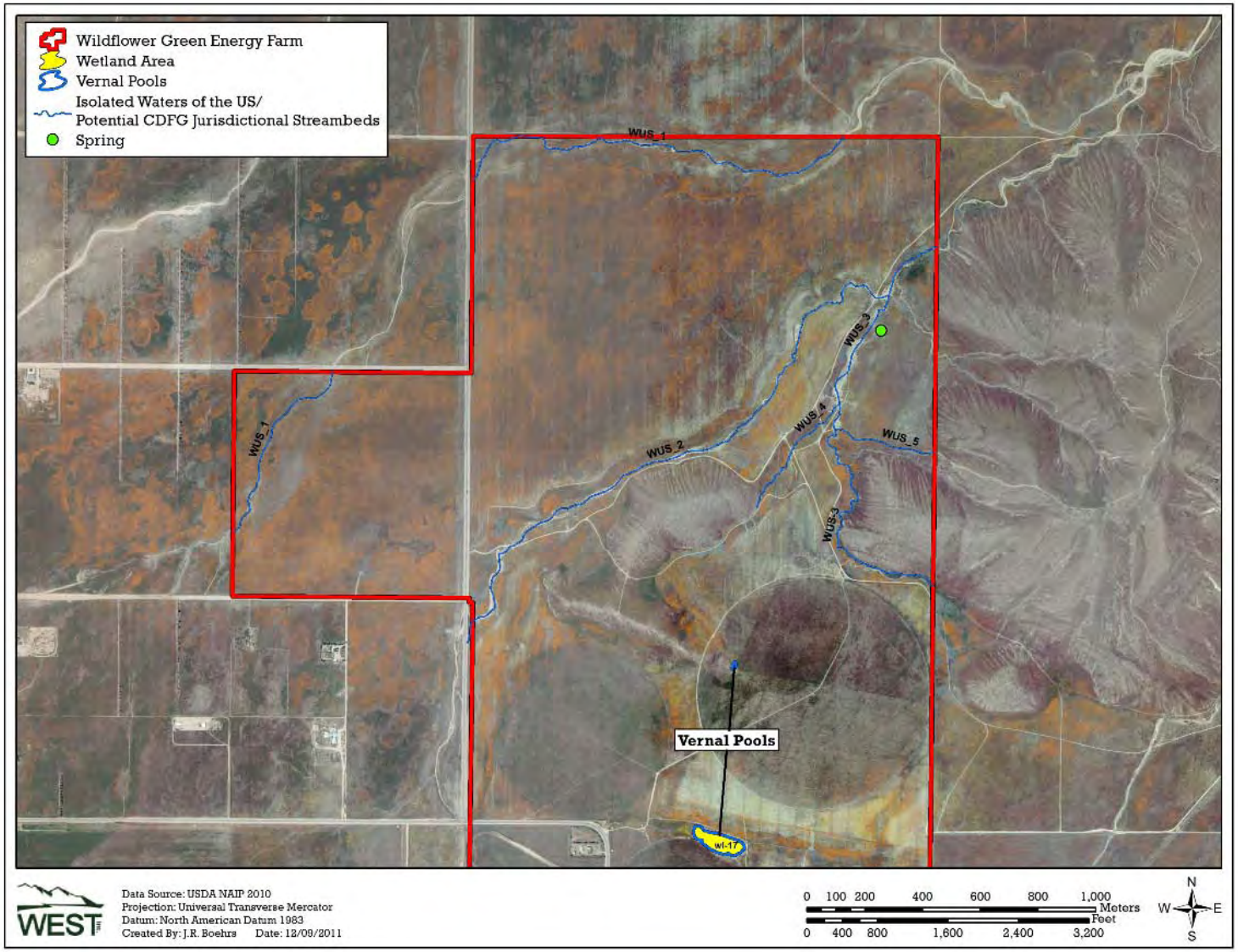
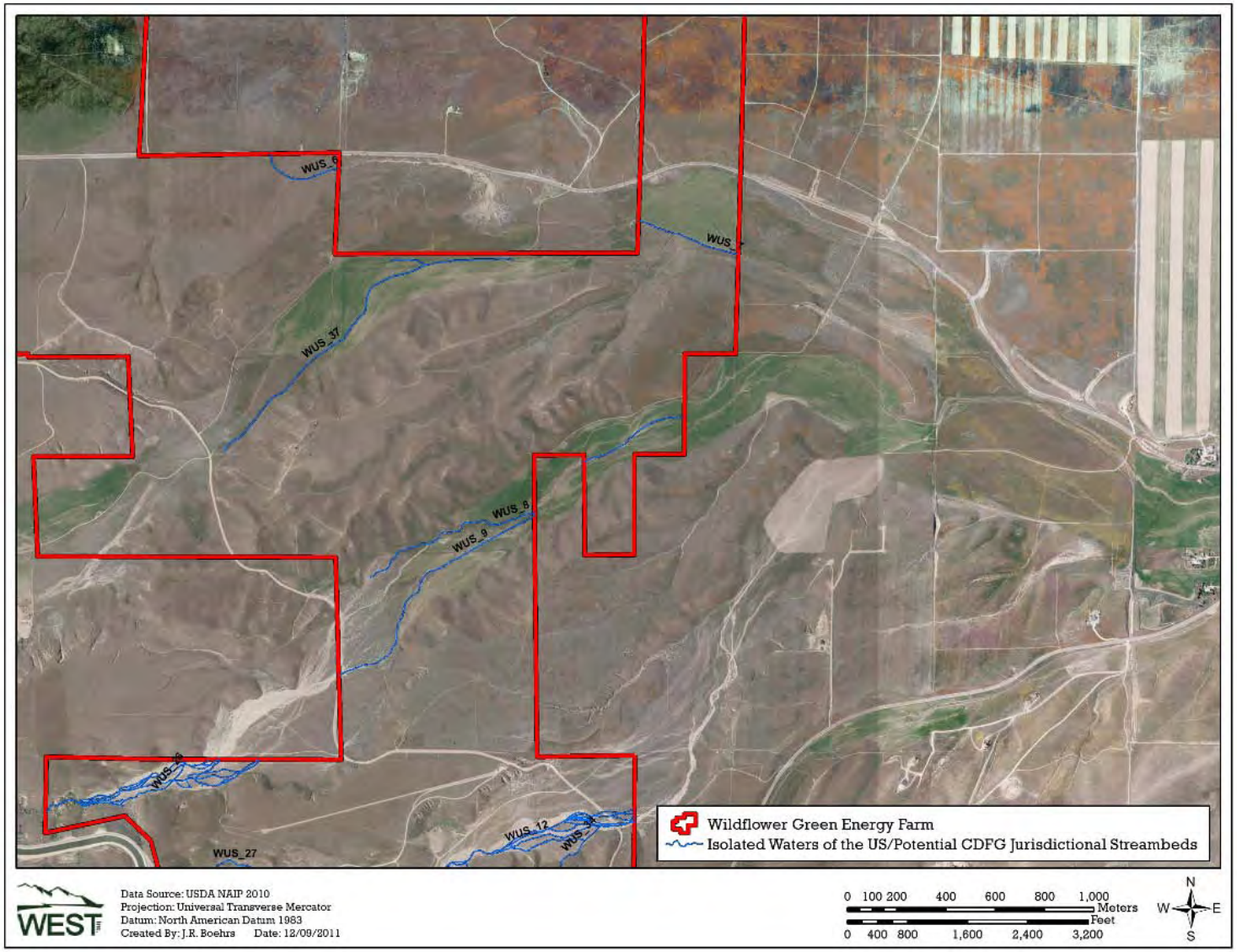
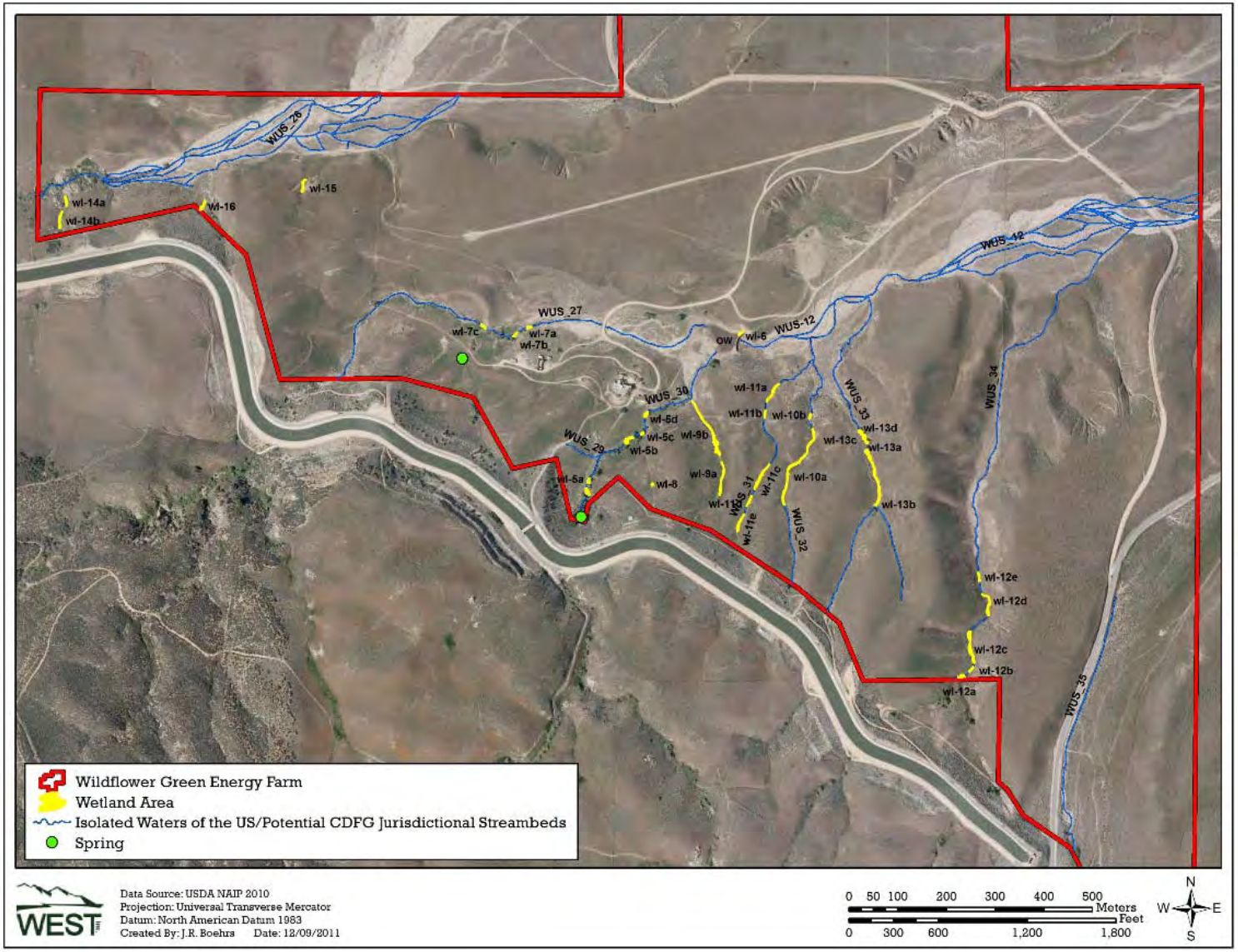
Appendix A. Mapped Locations of Wetlands, Other Waters of the US, and Potential CDFG Jurisdictional Streams



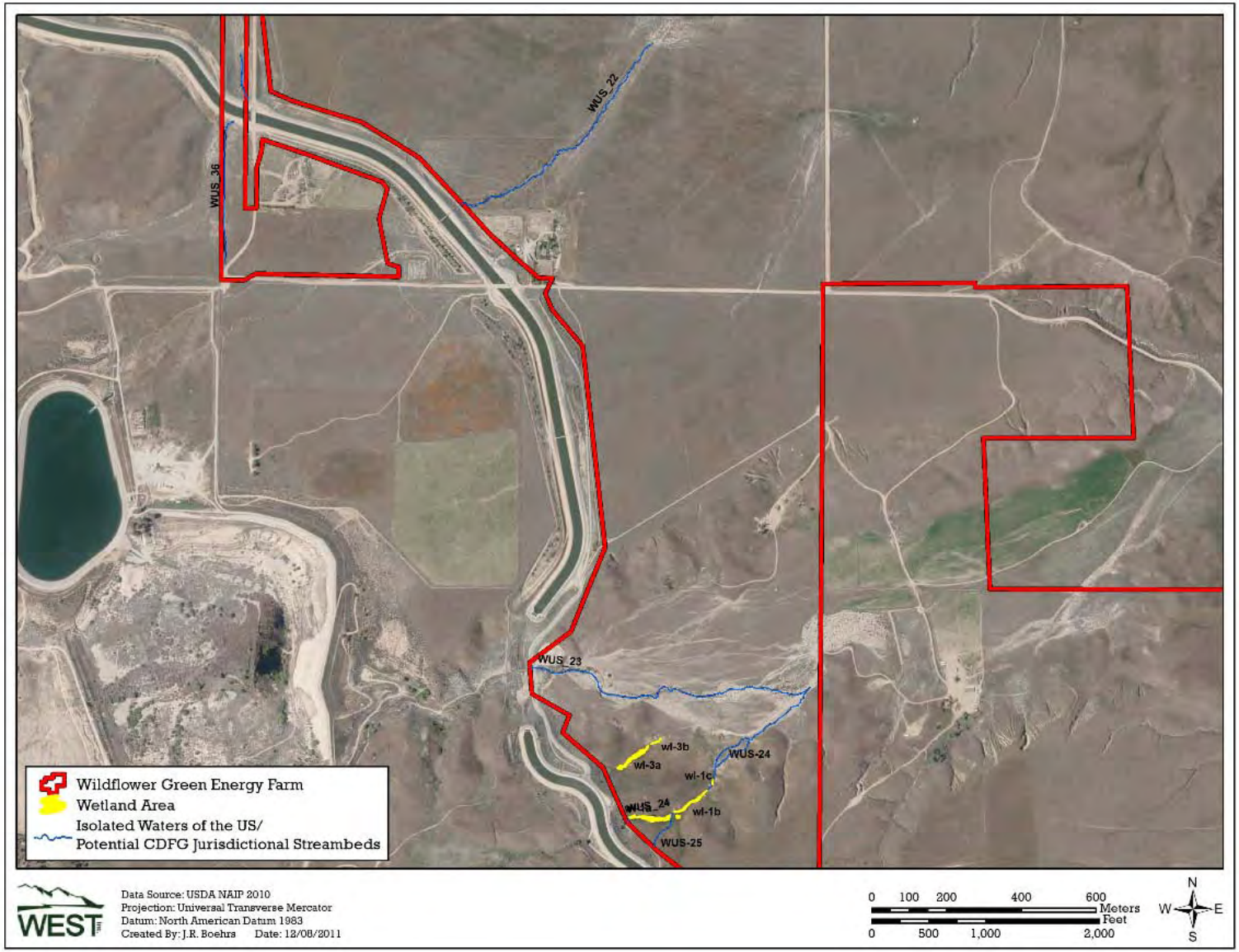
Appendix A-1. Wetlands, isolated waters of the US, and potential CDFG jurisdictional streambeds in the northwestern region of the Wildflower Green Energy Farm



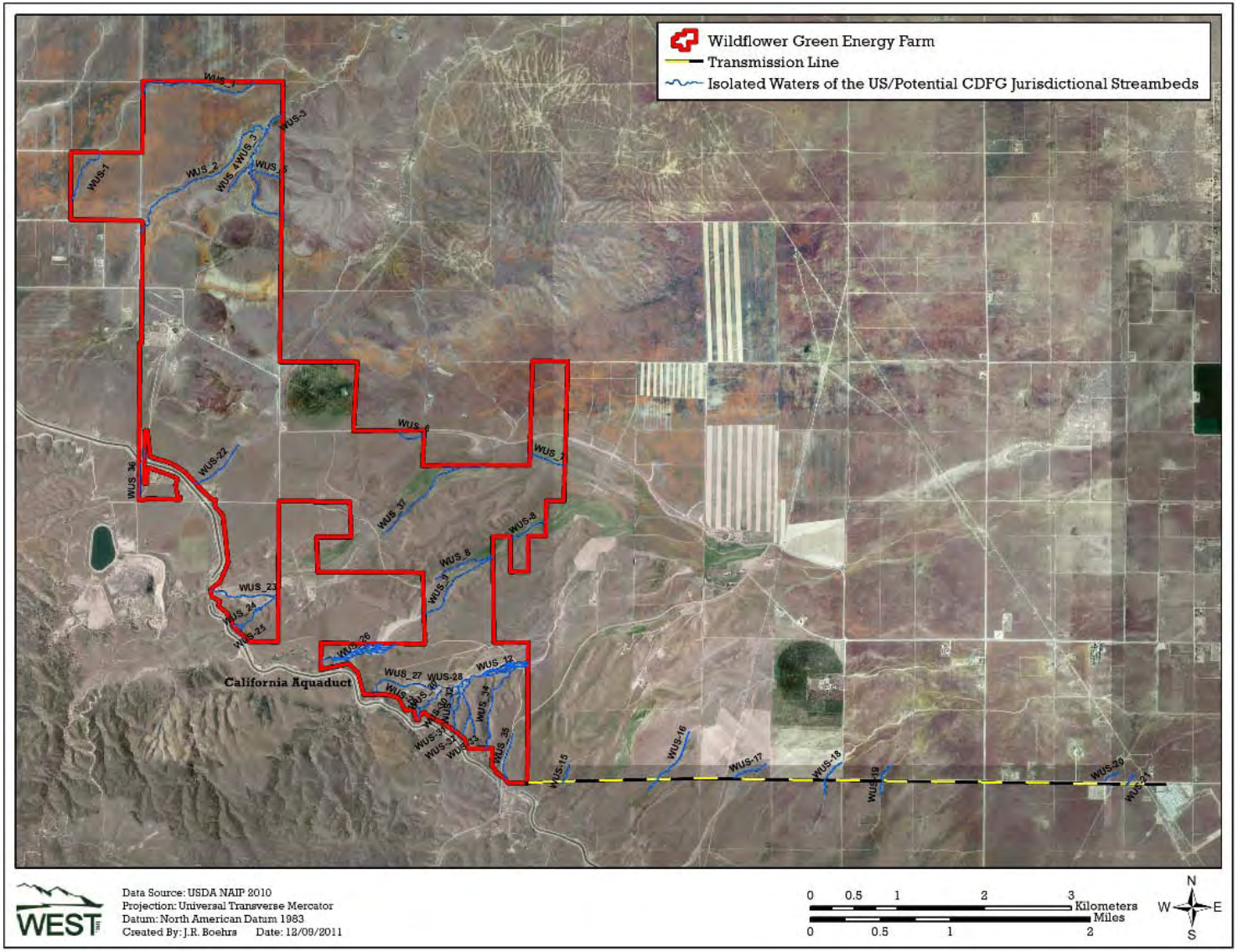
Appendix A-2. Isolated waters of the US and potential CDFG jurisdictional streambeds in the northeastern region of the Wildflower Green Energy Farm



Appendix A-3. Wetlands, isolated waters of the US, and potential CDFG jurisdictional streambeds in the southeastern region of the Wildflower Green Energy Farm



Appendix A-4. Wetlands, isolated waters of the US, and potential CDFG jurisdictional streambeds in the southwestern region of the Wildflower Green Energy Farm



Appendix A-5. Isolated waters of the US and potential CDFG jurisdictional streambeds in the Wildflower Green Energy Farm and associated generation tie-line

Appendix B. Survey Dataforms

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Wildflower Green / Antelope Valley City/County: Los Angeles Sampling Date: 5/12/11

Applicant/Owner: Element Power State: CA Sampling Point: usp-1a

Investigator(s): Kurt Flaig, Elizabeth Lack Section, Township, Range: 12, 7N, 15W

Landform (hillslope, terrace, etc.): valley bottom Local relief (concave, convex, none): _____ Slope (%): 8

Subregion (LRR): D Lat: _____ Long: _____ Datum: _____

Soil Map Unit Name: _____ NWI classification: UPL

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No X	**Is the Sampled Area within a Wetland?** Yes _____ No X
Hydric Soil Present?	Yes _____	No X	
Wetland Hydrology Present?	Yes _____	No X	

Remarks:
Sample point located on side slope above drainage.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Herb Stratum (Plot size: _____)			
1. Amsinckia tessellata	10	NOL	Y
2. Avena barbata	30	NOL	Y
3. Bromus diandrus	50	NOL	Y
4. Hordeum leporinum	10	NOL	Y
5.		L	
6.			
7.			
8.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	_____	x 1 = _____
FACW species	_____	x 2 = _____
FAC species	_____	x 3 = _____
FACU species	_____	x 4 = _____
UPL species	_____	x 5 = _____
Column Totals:	_____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes _____ No X

Remarks:
Dominant grasses are not on indicator list but are presumed upland species.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Wildflower Green / Antelope Valley City/County: Los Angeles Sampling Date: 5/12/11

Applicant/Owner: Element Power State: CA Sampling Point: wsp-1a

Investigator(s): Kurt Flaig, Elizabeth Lack Section, Township, Range: 12, 7N, 15W

Landform (hillslope, terrace, etc.): valley bottom Local relief (concave, convex, none): concave Slope (%): 5

Subregion (LRR): D Lat: ____ Long: ____ Datum: ____

Soil Map Unit Name: ____ NWI classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:
Wetland spans drainage channel located below CA aqueduct; hydrology likely associated with aqueduct seepage and/or natural seepage. Standing water and running water observed in drainage.

Photo: 670

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1. Populus fremontii	2	N	FACW
2. Salix laevigata	1	N	NOL
3.			
4.			
	3 = Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: ____)			
1. Carex praegracilis	44	FACW	Y
2. Juncus balticus	44	OBL	Y
3. Mimulus guttatus	2	OBL	N
4. Rumex crispus	10	FACW	N
5. Polypogon monspeliensis	T	FACW	N
6. Xanthium strumarium	T	FAC	N
7.			
8.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ____	x 1 = ____
FACW species ____	x 2 = ____
FAC species ____	x 3 = ____
FACU species ____	x 4 = ____
UPL species ____	x 5 = ____
Column Totals: ____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

- ___ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Wildflower Green / Antelope Valley City/County: Los Angeles Sampling Date: 5/12/11

Applicant/Owner: Element Power State: CA Sampling Point: usp-1b

Investigator(s): Kurt Flaig, Elizabeth Lack Section, Township, Range: 12, 7N, 15W

Landform (hillslope, terrace, etc.): valley bottom Local relief (concave, convex, none): _____ Slope (%): 8

Subregion (LRR): D Lat: _____ Long: _____ Datum: _____

Soil Map Unit Name: _____ NWI classification: UPL

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No X	**Is the Sampled Area within a Wetland?** Yes _____ No X
Hydric Soil Present?	Yes _____	No X	
Wetland Hydrology Present?	Yes _____	No X	

Remarks:
Sample point located on side slope above drainage.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1. Chrysothamnus nauseosus	3	NOL	N
2.			
3.			
4.			
5.			
	3 = Total Cover		
Herb Stratum (Plot size: _____)			
1. Juncus balticus	50	OBL	Y
2. Bromus diandrus	35	NOL	Y
3. Hordeum leporinum	10	NI	N
4. Rumex crispus	2	FACW	N
5.			
6.			
7.			
8.			
	97 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes _____ No X

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Wildflower Green / Antelope Valley City/County: Los Angeles Sampling Date: 5/12/11

Applicant/Owner: Element Power State: CA Sampling Point: wsp-1b

Investigator(s): Kurt Flaig, Elizabeth Lack Section, Township, Range: 12, 7N, 15W

Landform (hillslope, terrace, etc.): valley bottom Local relief (concave, convex, none): concave Slope (%): 5

Subregion (LRR): D Lat: ____ Long: ____ Datum: ____

Soil Map Unit Name: ____ NWI classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:
Wetland spans drainage channel located below CA aqueduct; hydrology likely associated with aqueduct seepage and/or natural seepage. Wetland located downstream of WL-1a.

Photo: 673

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	____ = Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	____ = Total Cover		
Herb Stratum (Plot size: ____)			
1. Carex praegracilis	12	FACW	N
2. Juncus balticus	85	OBL	Y
3. Rumex crispus	3	FACW	N
4. Polypogon monspeliensis	T	FACW	N
5. Nasturtium officinale	T	OBL	N
6.			
7.			
8.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	____ = Total Cover		

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ____	x 1 = ____
FACW species ____	x 2 = ____
FAC species ____	x 3 = ____
FACU species ____	x 4 = ____
UPL species ____	x 5 = ____
Column Totals: ____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

- ___ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Wildflower Green / Antelope Valley City/County: Los Angeles Sampling Date: 5/12/11

Applicant/Owner: Element Power State: CA Sampling Point: wsp-2

Investigator(s): Kurt Flaig, Elizabeth Lack Section, Township, Range: 12, 7N, 15W

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): concave Slope (%): 5

Subregion (LRR): D Lat: ____ Long: ____ Datum: ____

Soil Map Unit Name: ____ NWI classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:
Wetland occurs on side slope adjacent drainage; hydrology likely associated with aqueduct seepage and/or natural seepage along slope.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	____ = Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	____ = Total Cover		
Herb Stratum (Plot size: ____)			
1. Juncus balticus	80	OBL	Y
2. Rumex crispus	10	FACW	N
3. Carex praegracilis	5	FACW	N
4. Bromus mollis	5	FACU	N
5.			
6.			
7.			
8.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	____ = Total Cover		

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	____	x 1 = ____
FACW species	____	x 2 = ____
FAC species	____	x 3 = ____
FACU species	____	x 4 = ____
UPL species	____	x 5 = ____
Column Totals:	____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Wildflower Green / Antelope Valley City/County: Los Angeles Sampling Date: 5/12/11

Applicant/Owner: Element Power State: CA Sampling Point: usp-3

Investigator(s): Kurt Flaig, Elizabeth Lack Section, Township, Range: 12, 7N, 15W

Landform (hillslope, terrace, etc.): valley bottom Local relief (concave, convex, none): _____ Slope (%): 8

Subregion (LRR): D Lat: _____ Long: _____ Datum: _____

Soil Map Unit Name: _____ NWI classification: UPL

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No X	**Is the Sampled Area within a Wetland?** Yes _____ No X
Hydric Soil Present?	Yes _____	No X	
Wetland Hydrology Present?	Yes _____	No X	

Remarks:
Sample point located on side slope above drainage.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Herb Stratum (Plot size: _____)			
1. Bromus mollis	25	FACU	Y
2. Bromus madritensis	20	NI	Y
3. Carex praegracilis	20	FACW	Y
4. Juncus balticus	20	OBL	Y
5. Amsinokia tessellata	10	NOL	Y
6. Avena barbata	5	NOL	N
7.			
8.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 20 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	_____	x 1 = _____
FACW species	_____	x 2 = _____
FAC species	_____	x 3 = _____
FACU species	_____	x 4 = _____
UPL species	_____	x 5 = _____
Column Totals:	_____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes _____ No X

Remarks:
Dominant grasses are not on indicator list but are presumed upland species.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Wildflower Green / Antelope Valley City/County: Los Angeles Sampling Date: 5/12/11

Applicant/Owner: Element Power State: CA Sampling Point: wsp-3

Investigator(s): Kurt Flaig, Elizabeth Lack Section, Township, Range: 12, 7N, 15W

Landform (hillslope, terrace, etc.): valley bottom Local relief (concave, convex, none): concave Slope (%): 5

Subregion (LRR): D Lat: ____ Long: ____ Datum: ____

Soil Map Unit Name: ____ NWI classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:
Wetland spans drainage channel located below CA aqueduct; hydrology likely associated with aqueduct seepage and/or natural seepage. Standing water observed in drainage. Sample point representative of 2 wetlands (a,b) along the drainage; both wetlands are like in vegetation, soils, and hydrology.

Photo: 676

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	____ = Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	____ = Total Cover		
Herb Stratum (Plot size: ____)			
1. Carex praegracilis	50	FACW	Y
2. Juncus balticus	50	OBL	Y
3. Urtica dioica	T	FACW	N
4.			
5.			
6.			
7.			
8.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	____ = Total Cover		

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	____	x 1 = ____
FACW species	____	x 2 = ____
FAC species	____	x 3 = ____
FACU species	____	x 4 = ____
UPL species	____	x 5 = ____
Column Totals:	____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Wildflower Green / Antelope Valley City/County: Los Angeles Sampling Date: 5/12/11

Applicant/Owner: Element Power State: CA Sampling Point: usp-4

Investigator(s): Kurt Flaig, Elizabeth Lack Section, Township, Range: 18, 7N, 14W

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): none Slope (%): 3

Subregion (LRR): D Lat: ____ Long: ____ Datum: ____

Soil Map Unit Name: ____ NWI classification: UPL

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No X	Is the Sampled Area within a Wetland? Yes ____ No X
Hydric Soil Present?	Yes ____	No X	
Wetland Hydrology Present?	Yes ____	No X	

Remarks:
Sample point located on side slope above drainage.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	____ = Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1. Chrysothamnus nauseosus	10	NOL	Y
2.			
3.			
4.			
5.			
	10 = Total Cover		
Herb Stratum (Plot size: ____)			
1. Vulpia microstachys	75	NOL	Y
2. Bromus mollis	25	FACU	N
3.			
4.			
5.			
6.			
7.			
8.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	____ = Total Cover		

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ____	x 1 = ____
FACW species ____	x 2 = ____
FAC species ____	x 3 = ____
FACU species ____	x 4 = ____
UPL species ____	x 5 = ____
Column Totals: ____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No X

Remarks:
Vulpia microstachys is not on indicator list but is presumed an upland species.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Wildflower Green / Antelope Valley City/County: Los Angeles Sampling Date: 5/12/11

Applicant/Owner: Element Power State: CA Sampling Point: wsp-4

Investigator(s): Kurt Flaig, Elizabeth Lack Section, Township, Range: 18, 7N, 14W

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): none Slope (%): 5

Subregion (LRR): D Lat: ____ Long: ____ Datum: ____

Soil Map Unit Name: ____ NWI classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:
Wetland located on bench adjacent drainage channel, below CA aqueduct; hydrology likely associated with aqueduct seepage and/or natural seepage. Area is heavily grazed.

Photo: 680

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	____ = Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	____ = Total Cover		
Herb Stratum (Plot size: ____)			
1. Polypogon monspeliensis	40	FACW	Y
2. Juncus balticus	40	OBL	Y
3. Juncus bufonius	10	FACW	N
4. Hordeum brachyantherum	10	FACW	N
5.			
6.			
7.			
8.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	____ = Total Cover		

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	____	x 1 = ____
FACW species	____	x 2 = ____
FAC species	____	x 3 = ____
FACU species	____	x 4 = ____
UPL species	____	x 5 = ____
Column Totals:	____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Wildflower Green / Antelope Valley City/County: Los Angeles Sampling Date: 5/12/11

Applicant/Owner: Element Power State: CA Sampling Point: wsp-5

Investigator(s): Kurt Flaig, Elizabeth Lack Section, Township, Range: 18, 7N, 14W

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): none Slope (%): 5

Subregion (LRR): D Lat: ____ Long: ____ Datum: ____

Soil Map Unit Name: ____ NWI classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:
Wetlands located on low terraces/fringe along drainage channel, below CA aqueduct; hydrology likely associated with aqueduct seepage and/or natural seepage. Sample point representative of 4 wetlands (a,b,c,d) along the drainage; all wetlands are like in vegetation, soils, and hydrology. Area is heavily grazed.

Photo: 685

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	____ = Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	____ = Total Cover		
Herb Stratum (Plot size: ____)			
1. Polypogon monspeliensis	50	FACW	Y
2. Juncus balticus	40	OBL	Y
3. Nasturtium officinale	5	OBL	N
4. Hordeum brachyantherum	5	FACW	N
5.			
6.			
7.			
8.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	____ = Total Cover		

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	____	x 1 = ____
FACW species	____	x 2 = ____
FAC species	____	x 3 = ____
FACU species	____	x 4 = ____
UPL species	____	x 5 = ____
Column Totals:	____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Wildflower Green / Antelope Valley City/County: Los Angeles Sampling Date: 5/12/11

Applicant/Owner: Element Power State: CA Sampling Point: wsp-6

Investigator(s): Kurt Flaig, Elizabeth Lack Section, Township, Range: 17, 7N, 14W

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): none Slope (%): 30

Subregion (LRR): D Lat: ____ Long: ____ Datum: ____

Soil Map Unit Name: ____ NWI classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:
Wetland located on side slope below dam structure; hydrology associated with observed seepage from dam. Area is heavily grazed/trampled.

Photo: 687

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	____ = Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	____ = Total Cover		
Herb Stratum (Plot size: ____)			
1. Mimulus guttatus	70	OBL	Y
2. Hordeum jubatum	30	FAC	Y
3.			
4.			
5.			
6.			
7.			
8.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	____ = Total Cover		

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	____	x 1 = ____
FACW species	____	x 2 = ____
FAC species	____	x 3 = ____
FACU species	____	x 4 = ____
UPL species	____	x 5 = ____
Column Totals:	____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Wildflower Green / Antelope Valley City/County: Los Angeles Sampling Date: 5/12/11

Applicant/Owner: Element Power State: CA Sampling Point: wsp-7

Investigator(s): Kurt Flaig, Elizabeth Lack Section, Township, Range: 18, 7N, 14W

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): none Slope (%): none

Subregion (LRR): D Lat: ____ Long: ____ Datum: ____

Soil Map Unit Name: ____ NWI classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:
Fringe wetlands along drainage channel with flowing water; hydrology likely associated with aqueduct seepage and/or natural spring/seepage. Sample point representative of 2 wetlands (a,b) along the drainage; wetlands are like in vegetation, soils, and hydrology. Area is heavily grazed/trampled.

Photo: 694

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	____ = Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	____ = Total Cover		
Herb Stratum (Plot size: ____)			
1. Polypogon monspeliensis	80	FACW	Y
2. Juncus bufonius	10	FACW	N
3. Hordeum jubatum	10	FAC	N
4.			
5.			
6.			
7.			
8.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	____ = Total Cover		

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	____	x 1 = ____
FACW species	____	x 2 = ____
FAC species	____	x 3 = ____
FACU species	____	x 4 = ____
UPL species	____	x 5 = ____
Column Totals:	____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Wildflower Green / Antelope Valley City/County: Los Angeles Sampling Date: 5/12/11

Applicant/Owner: Element Power State: CA Sampling Point: wsp-8

Investigator(s): Kurt Flaig, Elizabeth Lack Section, Township, Range: 17, 7N, 14W

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): concave Slope (%): 10

Subregion (LRR): D Lat: ____ Long: ____ Datum: ____

Soil Map Unit Name: ____ NWI classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:
Wetland spans hillside swale; hydrology likely associated with aqueduct seepage and/or natural spring/seepage. Area is heavily grazed/trampled.

Photo: 698

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	____ = Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	____ = Total Cover		
Herb Stratum (Plot size: ____)			
1. Polypogon monspeliensis	50	FACW	Y
2. Juncus balticus	50	OBL	Y
3.			
4.			
5.			
6.			
7.			
8.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	____ = Total Cover		

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	____	x 1 = ____
FACW species	____	x 2 = ____
FAC species	____	x 3 = ____
FACU species	____	x 4 = ____
UPL species	____	x 5 = ____
Column Totals:	____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Wildflower Green / Antelope Valley City/County: Los Angeles Sampling Date: 5/12/11

Applicant/Owner: Element Power State: CA Sampling Point: wsp-9

Investigator(s): Kurt Flaig, Elizabeth Lack Section, Township, Range: 17, 7N, 14W

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): concave Slope (%): 7

Subregion (LRR): D Lat: ____ Long: ____ Datum: ____

Soil Map Unit Name: ____ NWI classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:
Wetlands span hillside drainage swale; hydrology likely associated with aqueduct seepage and/or natural spring/seepage. Sample point representative of two wetlands located along swale; wetlands are like in vegetation, soils, and hydrology. Area is heavily grazed.

Photo: 700

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	____ = Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	____ = Total Cover		
Herb Stratum (Plot size: ____)			
1. Polypogon monspeliensis	40	FACW	Y
2. Juncus balticus	40	OBL	Y
3. Hordeum jubatum	20	FAC	Y
4.			
5.			
6.			
7.			
8.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	____ = Total Cover		

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	____	x 1 = ____
FACW species	____	x 2 = ____
FAC species	____	x 3 = ____
FACU species	____	x 4 = ____
UPL species	____	x 5 = ____
Column Totals:	____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Wildflower Green / Antelope Valley City/County: Los Angeles Sampling Date: 5/12/11

Applicant/Owner: Element Power State: CA Sampling Point: wsp-10

Investigator(s): Kurt Flaig, Elizabeth Lack Section, Township, Range: 17, 7N, 14W

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): concave Slope (%): 10

Subregion (LRR): D Lat: ____ Long: ____ Datum: ____

Soil Map Unit Name: ____ NWI classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:
Wetland spans swale-like drainage channel located below CA aqueduct; hydrology likely associated with aqueduct seepage and/or natural seepage. Sample point representative of 2 wetlands (a,b) along the drainage; both wetlands are like in vegetation, soils, and hydrology.

Photo: 706

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	____ = Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	____ = Total Cover		
Herb Stratum (Plot size: ____)			
1. Polypogon monspeliensis	40	FACW	Y
2. Juncus balticus	60	OBL	Y
3.			
4.			
5.			
6.			
7.			
8.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	____ = Total Cover		

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	____	x 1 = ____
FACW species	____	x 2 = ____
FAC species	____	x 3 = ____
FACU species	____	x 4 = ____
UPL species	____	x 5 = ____
Column Totals:	____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Wildflower Green / Antelope Valley City/County: Los Angeles Sampling Date: 5/12/11

Applicant/Owner: Element Power State: CA Sampling Point: wsp-11

Investigator(s): Kurt Flaig, Elizabeth Lack Section, Township, Range: 17, 7N, 14W

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): concave Slope (%): 3

Subregion (LRR): D Lat: ____ Long: ____ Datum: ____

Soil Map Unit Name: ____ NWI classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:
Wetlands span swale-like drainage; hydrology likely associated with aqueduct seepage and/or natural spring/seepage. Sample point representative of 5 wetlands (a-e) along drainage; all are like in vegetation, soils, and hydrology.

Photo: 264

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	____ = Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	____ = Total Cover		
Herb Stratum (Plot size: ____)			
1. Polypogon monspeliensis	40	FACW	Y
2. Juncus balticus	60	OBL	Y
3.			
4.			
5.			
6.			
7.			
8.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	____ = Total Cover		

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	____	x 1 = ____
FACW species	____	x 2 = ____
FAC species	____	x 3 = ____
FACU species	____	x 4 = ____
UPL species	____	x 5 = ____
Column Totals:	____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Wildflower Green / Antelope Valley City/County: Los Angeles Sampling Date: 5/12/11

Applicant/Owner: Element Power State: CA Sampling Point: wsp-12

Investigator(s): Kurt Flaig, Elizabeth Lack Section, Township, Range: 17, 7N, 14W

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): concave Slope (%): 4

Subregion (LRR): D Lat: ____ Long: ____ Datum: ____

Soil Map Unit Name: ____ NWI classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:
Wetlands span swale-like drainage channel with flowing water; hydrology likely associated with aqueduct seepage and/or natural spring/seepage. Sample point representative of 5 wetlands (a-e) along drainage; all are like in vegetation, soils, and hydrology.

Photo: 713

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	____ = Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	____ = Total Cover		
Herb Stratum (Plot size: ____)			
1. Polypogon monspeliensis	30	FACW	Y
2. Juncus balticus	70	OBL	Y
3.			
4.			
5.			
6.			
7.			
8.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	____ = Total Cover		

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	____	x 1 = ____
FACW species	____	x 2 = ____
FAC species	____	x 3 = ____
FACU species	____	x 4 = ____
UPL species	____	x 5 = ____
Column Totals:	____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Wildflower Green / Antelope Valley City/County: Los Angeles Sampling Date: 5/12/11

Applicant/Owner: Element Power State: CA Sampling Point: wsp-13

Investigator(s): Kurt Flaig, Elizabeth Lack Section, Township, Range: 17, 7N, 14W

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): concave Slope (%): 10

Subregion (LRR): D Lat: ____ Long: ____ Datum: ____

Soil Map Unit Name: ____ NWI classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:
Wetland spans swale-like drainage channel located below CA aqueduct; hydrology likely associated with aqueduct seepage and/or natural seepage. Sample point representative of 4 wetlands (a,b,c,d) along the drainage; all wetlands are like in vegetation, soils, and hydrology.
Photo: 714

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	____ = Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	____ = Total Cover		
Herb Stratum (Plot size: ____)			
1. Polypogon monspeliensis	65	FACW	Y
2. Juncus balticus	35	OBL	Y
3.			
4.			
5.			
6.			
7.			
8.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	____ = Total Cover		

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	____	x 1 = ____
FACW species	____	x 2 = ____
FAC species	____	x 3 = ____
FACU species	____	x 4 = ____
UPL species	____	x 5 = ____
Column Totals:	____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Wildflower Green / Antelope Valley City/County: Los Angeles Sampling Date: 5/12/11

Applicant/Owner: Element Power State: CA Sampling Point: wsp-14

Investigator(s): Kurt Flaig, Elizabeth Lack Section, Township, Range: 17, 7N, 14W

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): concave Slope (%): 12

Subregion (LRR): D Lat: ____ Long: ____ Datum: ____

Soil Map Unit Name: ____ NWI classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:
Wetland spans swale-like drainage channel located below CA aqueduct; hydrology likely associated with aqueduct seepage and/or natural seepage. Sample point representative of 2 wetlands (a,b) along the drainage; both wetlands are like in vegetation, soils, and hydrology.

Photo: 732

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	____ = Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	____ = Total Cover		
Herb Stratum (Plot size: ____)			
1. Polypogon monspeliensis	80	FACW	Y
2. Juncus balticus	8	OBL	N
3. Mimulus guttatus	8	OBL	N
4. Rumex crispus	2	FACW	N
5. Bromus mollis	T	UPL	N
6.			
7.			
8.			
	98 = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	____ = Total Cover		

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	____	x 1 = ____
FACW species	____	x 2 = ____
FAC species	____	x 3 = ____
FACU species	____	x 4 = ____
UPL species	____	x 5 = ____
Column Totals:	____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

- ___ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Wildflower Green / Antelope Valley City/County: Los Angeles Sampling Date: 5/13/11

Applicant/Owner: Element Power State: CA Sampling Point: wsp-15

Investigator(s): Kurt Flaig, Elizabeth Lack Section, Township, Range: 18, 7N, 14W

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): concave Slope (%): 4

Subregion (LRR): D Lat: ____ Long: ____ Datum: ____

Soil Map Unit Name: ____ NWI classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:

Wetland occurs in hillslope swale; hydrology likely associated with aqueduct seepage and/or natural seepage. Area is heavily grazed/trampled.

Photo: 265

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	____ = Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	____ = Total Cover		
Herb Stratum (Plot size: ____)			
1. Polypogon monspeliensis	55	FACW	Y
2. Juncus balticus	40	OBL	Y
3. Mimulus guttatus	5	OBL	N
4.			
5.			
6.			
7.			
8.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	____ = Total Cover		

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	____	x 1 = ____
FACW species	____	x 2 = ____
FAC species	____	x 3 = ____
FACU species	____	x 4 = ____
UPL species	____	x 5 = ____
Column Totals:	____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Wildflower Green / Antelope Valley City/County: Los Angeles Sampling Date: 5/13/11

Applicant/Owner: Element Power State: CA Sampling Point: wsp-16

Investigator(s): Kurt Flaig, Elizabeth Lack Section, Township, Range: 18, 7N, 14W

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): concave Slope (%): 4

Subregion (LRR): D Lat: ____ Long: ____ Datum: ____

Soil Map Unit Name: ____ NWI classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:

Wetland occurs in hillslope swale; hydrology likely associated with aqueduct seepage and/or natural seepage. Area is heavily grazed/trampled.

Photo: 266

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	____ = Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	____ = Total Cover		
Herb Stratum (Plot size: ____)			
1. Polypogon monspeliensis	60	FACW	Y
2. Juncus balticus	30	OBL	Y
3. Mimulus guttatus	10	OBL	N
4.			
5.			
6.			
7.			
8.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	____ = Total Cover		

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	____	x 1 = ____
FACW species	____	x 2 = ____
FAC species	____	x 3 = ____
FACU species	____	x 4 = ____
UPL species	____	x 5 = ____
Column Totals:	____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Wildflower Green / Antelope Valley City/County: Los Angeles Sampling Date: 5/13/11

Applicant/Owner: Element Power State: CA Sampling Point: wsp-17-1

Investigator(s): Kurt Flaig, Elizabeth Lack Section, Township, Range: 36, 8N, 15W

Landform (hillslope, terrace, etc.): depression Local relief (concave, convex, none): concave Slope (%): 0

Subregion (LRR): D Lat: ____ Long: ____ Datum: ____

Soil Map Unit Name: ____ NWI classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:

Wetland spans large depression in field surrounded by upland annual grassland; hydrology likely associated with runoff from nearby road and low topographic position. No standing water or soil saturation at time of survey but other evidence of hydrology includes algal mats, soil surface cracks, and presence of reduced iron. Sample point recorded near edge of depression.

Photo: 767

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	____ = Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	____ = Total Cover		
Herb Stratum (Plot size: ____)			
1. Plagiobothrys leptocladus	45	OBL	Y
2. Navarretia fossalis	30	NOL	Y
3. Polygonum aviculare	5	FAC	N
4.			
5.			
6.			
7.			
8.			
	80 = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	____ = Total Cover		

% Bare Ground in Herb Stratum 20 % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ____	x 1 = ____
FACW species ____	x 2 = ____
FAC species ____	x 3 = ____
FACU species ____	x 4 = ____
UPL species ____	x 5 = ____
Column Totals: ____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

- ___ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:

Although it does not occur on the wetland indicator status list, Navarretia fossalis is considered a hydrophytic species (at least a FAC) based on habitats in which it is known to occur.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Wildflower Green / Antelope Valley City/County: Los Angeles Sampling Date: 5/13/11

Applicant/Owner: Element Power State: CA Sampling Point: wsp-17-2

Investigator(s): Kurt Flaig, Elizabeth Lack Section, Township, Range: 36, 8N, 15W

Landform (hillslope, terrace, etc.): depression Local relief (concave, convex, none): concave Slope (%): 0

Subregion (LRR): D Lat: ____ Long: ____ Datum: ____

Soil Map Unit Name: ____ NWI classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:

Wetland spans large depression in field surrounded by upland annual grassland; hydrology likely associated with runoff from nearby road and low topographic position. Sample point recorded along edge of depression.

Photo: 768

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	____ = Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	____ = Total Cover		
Herb Stratum (Plot size: ____)			
1. Deschampsia danthonioides	80	OBL	Y
2. Navarretia fossalis	8	NOL	N
3. Matricaria occidentalis	2	NOL	N
4. Eleocharis sp.	T	?	N
5.			
6.			
7.			
8.			
	90 = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	____ = Total Cover		

% Bare Ground in Herb Stratum 10 % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	____	x 1 = ____
FACW species	____	x 2 = ____
FAC species	____	x 3 = ____
FACU species	____	x 4 = ____
UPL species	____	x 5 = ____
Column Totals:	____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Wildflower Green / Antelope Valley City/County: Los Angeles Sampling Date: 5/13/11

Applicant/Owner: Element Power State: CA Sampling Point: wsp-17-3

Investigator(s): Kurt Flaig, Elizabeth Lack Section, Township, Range: 36, 8N, 15W

Landform (hillslope, terrace, etc.): depression Local relief (concave, convex, none): concave Slope (%): 0

Subregion (LRR): D Lat: ____ Long: ____ Datum: ____

Soil Map Unit Name: ____ NWI classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:

Wetland spans large depression in field surrounded by upland annual grassland; hydrology likely associated with runoff from nearby road and low topographic position. Sample point recorded near center of depression.

Photo: 769

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	____ = Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	____ = Total Cover		
Herb Stratum (Plot size: ____)			
1. Plagiobothrys leptocladus	80	OBL	Y
2. Bromus rubens	5	NOL	N
3. Hordeum murinum ssp. leporinum	3	NOL	N
4. Bromus mollis	2	NOL	N
5.			
6.			
7.			
8.			
	90 = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	____ = Total Cover		

% Bare Ground in Herb Stratum 10 % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	____	x 1 = ____
FACW species	____	x 2 = ____
FAC species	____	x 3 = ____
FACU species	____	x 4 = ____
UPL species	____	x 5 = ____
Column Totals:	____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Wildflower Green / Antelope Valley City/County: Los Angeles Sampling Date: 5/13/11

Applicant/Owner: Element Power State: CA Sampling Point: usp-17

Investigator(s): Kurt Flaig, Elizabeth Lack Section, Township, Range: 36, 8N, 15W

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): none Slope (%): 1

Subregion (LRR): D Lat: _____ Long: _____ Datum: _____

Soil Map Unit Name: _____ NWI classification: UPL

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No X	Is the Sampled Area within a Wetland? Yes ____ No X
Hydric Soil Present?	Yes ____	No X	
Wetland Hydrology Present?	Yes ____	No X	

Remarks:
Sample point recorded above "rim" of seasonal depression.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	____ = Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	____ = Total Cover		
Herb Stratum (Plot size: ____)			
1. Bromus rubens	70	NI	Y
2. Hordeum murinum ssp. leporinum	10	NOL	N
3. Erodium cicutarium	5	NOL	N
4. Lupinus bicolor	T	NOL	N
5.			
6.			
7.			
8.			
	85 = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	____ = Total Cover		

% Bare Ground in Herb Stratum 15 % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ____	x 1 = ____
FACW species ____	x 2 = ____
FAC species ____	x 3 = ____
FACU species ____	x 4 = ____
UPL species ____	x 5 = ____
Column Totals: ____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

- ___ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No X

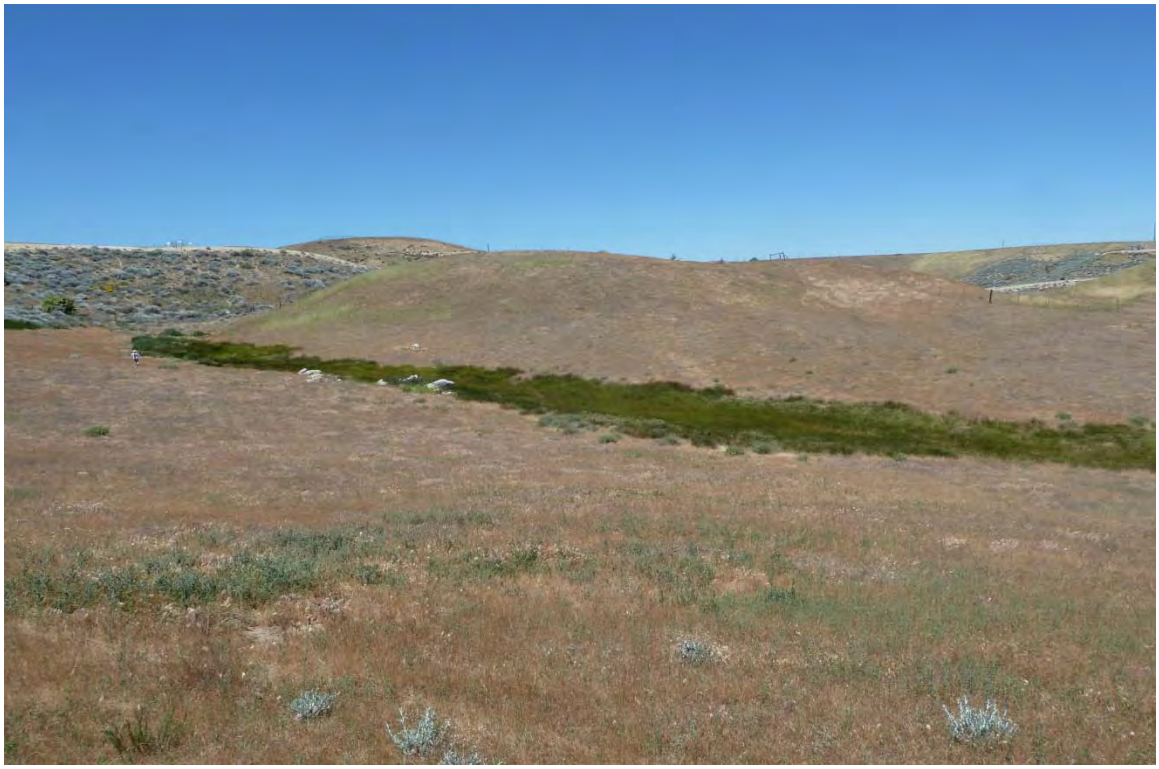
Remarks:

Appendix C. Photos of Wetlands

Appendix C-1: Wetland 1- looking upstream

Appendix C-2: Wetland 1 - looking downstream

Appendix C-3: Wetland 2 - looking upslope



Appendix C-4: Wetland 3 – looking out from adjacent knoll

Appendix C-5: Wetland 3 – looking upstream

Appendix C-6: Wetland 4 – looking upslope

Appendix C-7: Wetland 5 – looking upstream

Appendix C-8: Wetland 6 – looking across the dam at side slope seepage wetland

Appendix C-9: Wetland 7 – looking downstream

Appendix C-10: Wetland 8 – looking downslope

Appendix C-11: Wetland 9 – looking upslope

Appendix C-12: Wetland 10 – looking upstream

Appendix C-13: Wetland 11 – looking upstream

Appendix C-14: Wetland 12 – looking downstream

Appendix C-15: Wetland 13 – looking upstream

Appendix C-16: Wetland 14 – looking downslope

Appendix C-17: Wetland 15 – looking upslope

Appendix C-18: Wetland 16 – looking upslope

Appendix C-19: Wetland 17 – looking west

Appendix C-20: Wetland 17 – looking east

Appendix C-21: Wetland 17 – WSP -17-1

Appendix C-22: Wetland 17 – WSP-17-2

Appendix D. Photos of Potential Waters of the US and CDFG Jurisdictional Streams

Appendix D-1: WUS-1

Appendix D-2: WUS-2

Appendix D-3: WUS-3

Appendix D-4: WUS-4

Appendix D-5: WUS-5

Appendix D-6: WUS-6

Appendix D-7: WUS-7

Appendix D-8: WUS-8 (Myrick Canyon)

Appendix D-9: WUS-9 (immediately east of Fairmont Road)

Appendix D-10: WUS-9 (approximately 0.5 mile downstream of Fairmont Road)

Appendix D-11: WUS-12 (Downstream, in vicinity of proposed transmission line)

Appendix D-12: WUS-12 (Upstream, immediately below WUS-28 OW)

Appendix D-13: WUS-15

Appendix D-14: WUS-16

Appendix D-15: WUS-17

Appendix D-16: WUS-18

Appendix D-17: WUS-19

Appendix D-18:WUS-20

Appendix D-19: WUS-21

Appendix D-20: WUS-22 (Point of origin - overflow structure from California Aqueduct)

Appendix D-21: WUS 22 (Downstream near terminus – “fans out” in rabbitbrush)

Appendix D-22: WUS-23

Appendix D-23: WUS-24 (upstream near California Aqueduct)

Appendix D-24: WUS-24 (Downstream terminus of waterbody, within project boundary)

Appendix D-25: WUS-25

Appendix D-26: WUS-26 (Myrick Canyon - near west project boundary)

Appendix D-27: WUS-26 (Riparian corridor along upstream portion of drainage)

Appendix D-28: WUS-26 (Downstream along north project boundary)

Appendix D-29: WUS-27 (Upstream near CA Aqueduct)

Appendix D-30: WUS-27 (Downstream)

Appendix D-31: WUS-27 (Downstream near inlet to pond (WUS-28))

Appendix D-32: WUS-28 (Open water – portion of pond and dam)

Appendix D-33: WUS-29

Appendix D-34: WUS-30

Appendix D-35: WUS-31

Appendix D-36: WUS-32

Appendix D-37: WUS-33

Appendix D-38: WUS-34 (Wetland 12)

Appendix D-39: WUS-35 (Upstream – steep, eroded wash)

Appendix D-40: WUS-35 (Terminus – fans out in rabbitbrush near intersection of Fairmont and Willow Springs roads)

Appendix K-3:

Avian Baseline Studies

Avian Baseline Studies for the Wildflower Green Energy Farm Los Angeles County, California

Interim Report
March 18, 2010 – September 8, 2011

Prepared for:

Element Power

421 Southwest 6th Avenue, Suite 1000
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Prepared by:

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Western EcoSystems Technology, Inc.
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November 8, 2011

WEST Inc.

NATURAL RESOURCES ◆ SCIENTIFIC SOLUTIONS

EXECUTIVE SUMMARY

Element Power has proposed a renewable (wind and solar) energy facility in Los Angeles County, California, referred to as the Wildflower Green Energy Farm (WGEF). Element Power contracted Western EcoSystems Technology, Inc. (WEST) to conduct surveys and monitor wildlife resources in the WGEF to estimate the impacts of facility construction and operations on wildlife. The following document contains results for fixed-point bird use surveys, migrating/breeding bird surveys, golden eagle/raptor nest surveys, burrowing owl and general wildlife surveys, and nocturnal radar migration surveys.

The principal objectives of the study were to: 1) provide site-specific avian use data that would be useful in evaluating potential impacts from the proposed wind energy facility; 2) provide information that could be used in project planning and design of the facility to minimize impacts to birds; and 3) recommend further studies or potential mitigation measures, if warranted.

The objective of the fixed-point bird use surveys was to estimate the seasonal, spatial, and temporal use of the study area by birds, particularly diurnal raptors. Fixed-point surveys were conducted from March 18, 2010, through March 12, 2011, at eight points established throughout the WGEF. In the second year of surveys conducted from May 7, 2011, through September 8, 2011, four additional points were added for a total of twelve points. A total of 550 30-minute (min) fixed-point surveys were completed and 96 unique bird species were identified. Diurnal raptor use was highest during the winter (1.92 birds/plot/30-min survey) and lowest during the spring (0.59). The most frequently observed raptors were red-tailed hawk and American kestrel. The raptor species with the highest exposure index was red-tailed hawk (0.08), which was ranked third of all species.

Based on fixed-point bird use data collected for the WGEF, adjusted mean annual diurnal raptor use was 0.85 raptors/plot/20-min survey. The annual rate was moderate relative to raptor use at 43 other western and Midwestern wind energy facilities that implemented similar protocols to the present study and had data for three or four different seasons. Mean diurnal raptor use in the WGEF ranked seventh compared to these other proposed wind energy facilities.

A regression analysis of raptor use and raptor collision mortality for 16 new-generation wind energy facilities where similar methods were used to obtain raptor use estimates showed a significant (R^2 = 67.9%) correlation between raptor use and raptor collision mortality. Using this regression to predict raptor collision mortality the WGEF yields an estimated fatality rate of 0.16 fatalities per megawatt (MW) per year, or 16 raptors per year for each 100-MW of wind energy development. Based on species composition of the most common raptor fatalities at other western wind energy facilities and species composition of raptors observed at the WGEF during the surveys, the majority of the fatalities of diurnal raptors will likely consist of red-tailed hawk and American kestrel. Based on the seasonal use estimates, it is expected that risk to raptors would be unequal across seasons, with the lowest risk in the spring, and higher risk during the fall and winter.

Breeding bird surveys were conducted bi-weekly at eight points between May 10 and June 23, 2011, for a total of 32 surveys. A total of 2,713 individual bird observations within 282 separate groups were recorded, representing 50 unique bird species. One species, tricolored blackbird (2.0% of all species recorded), composed 40.9% of the individual observations. Excluding California quail, cliff swallow, and European starling (15.1%, 10.6% and 5.7% respectively), no other species made up more than 4% of the observations, individually.

Aerial surveys for golden eagle and other raptor nests were conducted via helicopter on April 14 and May 24, 2010. No golden eagle nests were recorded within a 10-mile radius of the study area. The only raptor nest recorded within the boundary of the WGEF was a single red-tailed hawk nest. Within a 2-mile (3.2 kilometer [km]) radius of the study area, five active red-tailed hawk nests, two active great horned owl nests, 16 active common raven nests, and six inactive nests were recorded. A Swainson's hawk (a state-threatened species) nest was identified during the aerial survey in May; however, upon subsequent follow-up visits, the nest was determined to have failed. In the spring of 2011, a Swainson's hawk nest survey was conducted within the WGEF and surrounding 5-mile (about 8-km) buffer of the WGEF. No active Swainson's hawk nests were observed during the survey.

Burrowing owl and general wildlife surveys were conducted throughout the WGEF from May 9 to July 12, 2010, and from May 17 to 31, 2011, within areas not surveyed in 2010. Two active burrowing owl territories were identified during the 2010 surveys: a territory occupied by a single adult owl in the northwest portion of the study area and a pair occupying a territory in the southwest of the study area. Each territory was visited periodically throughout the spring and summer to check for occupancy and nesting status. The single owl in the northwest abandoned the territory in early June, 2010, while the pair in the southwest successfully fledged six young. During the 2011 surveys, three additional active burrowing owl territories were identified along a wash in the northern portion of the WGEF.

Nocturnal radar migration surveys were conducted in the spring and fall of 2010 by Hamer Environmental, L.P, to characterize nocturnal avian migration over the WGEF. Modified marine radar was utilized at two sampling locations within the study area on 30 continuous nights in 2010 in the spring (April 20 to May 19, 2010) and fall (September 8 to October 8, 2010). The mean hourly passage rate during spring surveys was 156 ± 17 targets/hour, with a mean target flight height of 697 ± 8 meters (m). Approximately 11% of targets recorded during spring surveys were flying below 150 m (492 ft; within the zone of risk posed by turbines). During fall surveys, the mean hourly passage rate was 86 ± 17, with a mean flight height of 777 ± 17; only 2.0% of targets were recorded flying below 150 m.

A total of 15 species of conservation concern at the state and/or federal level were recorded during surveys at the WGEF. These included one state-endangered species (willow flycatcher), one state-threatened species (Swainson's hawk), and eight state species of special concern (tricolored blackbird, loggerhead shrike, American white pelican, northern harrier, Vaux's swift, yellow warbler, burrowing owl, and yellow-headed blackbird). Four federal species of concern

(loggerhead shrike, ferruginous hawk, burrowing owl, and peregrine falcon), and two state fully protected species (peregrine falcon and golden eagle). The golden eagle is further protected under the federal Bald and Golden Eagle Protection Act.

STUDY PARTICIPANTS

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REPORT REFERENCE

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ACKNOWLEDGEMENTS

A number of individuals from different organizations were instrumental in the completion of the studies at the Wildflower Green Energy Farm. Element Power provided funding for the field studies and access to the study area. Nat Parker and Todd Mattson with Element Power did an outstanding job of administering information and coordination for WEST personnel and guiding communications with other project and agency related personnel. Ashleigh Blackford of the US Fish and Wildlife Service, Erinn Wilson of the California Department of Fish and Game, and members of the Los Angeles County Significant Ecological Areas Technical Advisory Committee, provided valuable feedback on study protocols.

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INTRODUCTION

Element Power has proposed a wind and solar energy facility in Los Angeles County, California, referred to as the Wildflower Green Energy Farm (WGEF; Figure 1). Element Power contracted Western EcoSystems Technology, Inc. (WEST) to conduct surveys and monitor avian resources within the WGEF to estimate the impacts of wind energy facility construction and operation on birds.

The principal objectives of the study were to: 1) provide site-specific avian use data that would be useful in evaluating potential impacts from the proposed renewable energy facility; 2) provide information that could be used in project planning and design of the facility to minimize impacts to birds; and 3) recommend further studies or potential mitigation measures, if warranted. The protocols for the baseline studies are similar to those used at other renewable energy facilities across the nation, and follow the guidance of the California Wind Energy Guidelines (CEC and CDFG 2007) and the US Fish and Wildlife Service (USFWS) Wind Turbine Advisory Committee Guidelines (WTGAC 2010). The protocols have been developed based on WEST's experience studying wildlife at proposed wind and solar energy facilities throughout the US and were designed to help estimate potential impacts to birds (particularly raptors).

Baseline surveys were conducted from March 18, 2010, through September 8, 2011, at the WGEF and consisted of fixed-point bird use surveys, migrating/breeding bird surveys, golden eagle (*Aquila chrysaetos*)/raptor nest surveys, burrowing owl (*Athene cunicularia*) and general wildlife surveys, and nocturnal migration surveys. In addition to site-specific data, this report presents existing information and results of studies conducted at other renewable energy facilities. The ability to estimate potential bird mortality at the proposed WGEF is greatly enhanced by operational monitoring data collected at existing facilities. For several wind energy facilities, standardized data on fixed-point surveys were collected in association with standardized post-construction (operational) monitoring, allowing comparisons of bird use with bird mortality. Where possible, comparisons with regional and local studies were made.

Fixed-point bird use surveys are currently ongoing with a scheduled date of completion in early May, 2012.

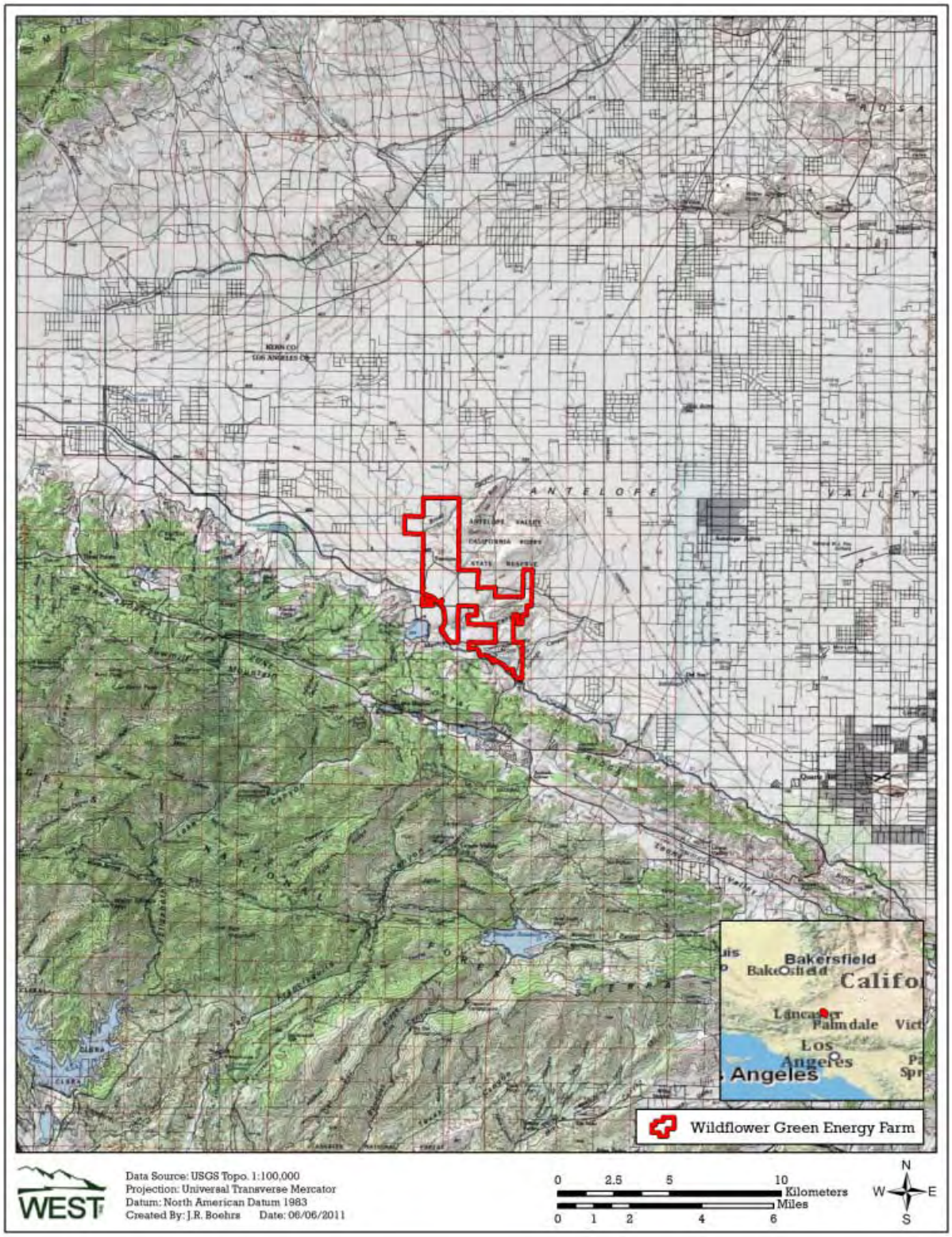


Figure 1. Location of the Wildflower Green Energy Farm.

STUDY AREA

The WGEF is located on 4,192 acres (6.6 square miles [mi^2]) of private land within the rural community of Fairmont in northern Los Angeles County (Figure 1). The closest city to the WGEF is Lancaster, located approximately 16 miles (about 26 kilometers [km]) to the east. The majority of the WGEF is composed of undeveloped land used as pasture for sheep grazing, with some areas of crop production and scattered rural homes. The proposed generation tie line (gen-tie) begins in the southeast corner of the WGEF and runs east along West Avenue J for approximately four miles (6.4 km) to the Antelope Substation. The Antelope Valley California Poppy Preserve is located immediately to the north and east of the WGEF and the California Aqueduct runs along the southern boundary of the study area.

The study area lies within the Antelope Valley region of the western Mojave Desert. Elevations within the study area range from approximately 792 to 914 meters (m; 2,600 – 3,000 feet [ft]), characterizing the area as a high desert environment. The primary vegetation community is non-native annual grassland with smaller areas of rabbitbrush (*Chrysothamnus nauseosus*) scrub and tilled cropland. Topography within the WGEF consists of a mosaic of relatively flat fields, low ridges and hills. The southwestern portion of the study area has nearly flat topography, while the remainder of the study area is characterized by gentle slopes and rolling hills. The greatest slopes occur along ridges, and are located in the southeast corner of the WGEF.

Northern portions of the WGEF (approximately 452 acres [0.7 mi^2]) fall within the Fairmont and Antelope Buttes Significant Ecological Area (SEA; see Los Angeles County 2009). The Fairmont and Antelope Buttes are the most westerly habitat of this type in the Mojave Desert and a unique feature of the region. Their proximity to the San Gabriel Mountains has allowed for a different species composition than other butte habitats in the desert. In addition, the buttes serve as a concentrated wintering ground for raptors, providing roosting sites surrounded by cultivated fields and grasslands for foraging opportunities. Native annual forbs (wildflower fields) and native perennial grasslands occur on the slopes of the buttes and are recognized features of the Fairmont and Antelope Buttes SEA. The Portal Ridge/Liebre Mountain SEA is adjacent to the southwest corner of the site, and the Joshua Tree (*Yucca brevifolia*) Woodland SEA lies approximately two miles (3.2 km) northwest of the site. The Portal Ridge/Liebre Mountain SEA bridges three major geographical ranges; the Mojave Desert, the San Gabriel Mountains, and the Tehachapi Foothills. This SEA was designated because of the presence of a diverse and unique flora representing 10 distinct plant communities, including foothill woodland, southern oak (*Quercus* spp.) woodland, valley grassland, riparian woodland, and coastal sage (*Artemisia tridentata*) scrub. The Joshua Tree Woodland SEA represents an excellent example of Joshua tree woodland habitat, which is becoming scarce in the region as a result of accelerated agricultural and urban expansion

METHODS

The study at the WGEF consisted of the following components: 1) fixed-point bird use surveys, 2) migrating/breeding bird surveys, 3) golden eagle/raptor nest surveys, 4) burrowing owl and general wildlife surveys, and 5) nocturnal migration surveys.

Fixed-Point Bird Use Surveys

The objective of the fixed-point bird use surveys was to estimate the seasonal and spatial use of the study area by birds, particularly diurnal raptors (defined here as kites, accipiters, buteos, harriers, eagles, falcons, and osprey). Fixed-point bird surveys (variable circular plots) were conducted using methods described by Reynolds et al. (1980).

Survey Plots

In the first year of study (March 18, 2010 to March 12, 2011), eight points were selected to survey representative habitats and topography of the WGEF, while achieving relatively even coverage of the study area (points 1-8; Figure 2). In the winter of 2011 the WGEF project boundary was expanded, primarily to the south. As a result, four additional survey points were added to the study during the second year of surveys (May 7 – September 8, 2011; points 9-12; Figure 2). Each survey plot was an 800-m (2,625-ft) radius circle centered on the point.

Survey Methods

Every bird observed during each 30-minute (min) fixed-point bird use survey was recorded by a unique observation number. Point counts were conducted for 30-min to be consistent with methodologies recommended by the California Wind Energy Guidelines (CEC and CDFG 2007) and those employed at other wind energy facilities. Observations of large birds beyond the 800-m radius were recorded, but were not included in the statistical analyses. For small birds, observations beyond the 100-m (328-ft) radius were excluded. Large birds included loons and grebes, waterbirds, waterfowl, rails and coots, gulls and terns, shorebirds, diurnal raptors, owls, vultures, upland game birds, doves and pigeons, large corvids (e.g., ravens, magpies, and crows), and large cuckoos (e.g., roadrunners). Passerines (excluding large corvids), swifts and hummingbirds, woodpeckers, and kingfishers were considered small birds.

The date, start and end time of the survey period, and weather information (e.g., temperature, wind speed, wind direction, and cloud cover) were recorded for each survey. Species or best possible identification, number of individuals, sex and age class (if possible), distance from plot center when first observed, closest distance, altitude above ground, activity (behavior), and habitat(s) were recorded for each observation. The behavior of each bird observed and the vegetation type in which or over which the bird occurred were recorded based on the point of first observation. Approximate flight height and distance from plot center at first observation were recorded to the nearest 5-m (16-ft) interval. Other information recorded about the observation included whether or not the observation was auditory only and the 10-min interval of the 30-min survey in which it was first observed.

Locations of raptors, other large birds, and species of concern seen during fixed-point bird use surveys were recorded on field maps by unique observation number. Flight paths and perched locations were digitized using ArcGIS 10.0. Comments were recorded in the comments section of the data sheet.

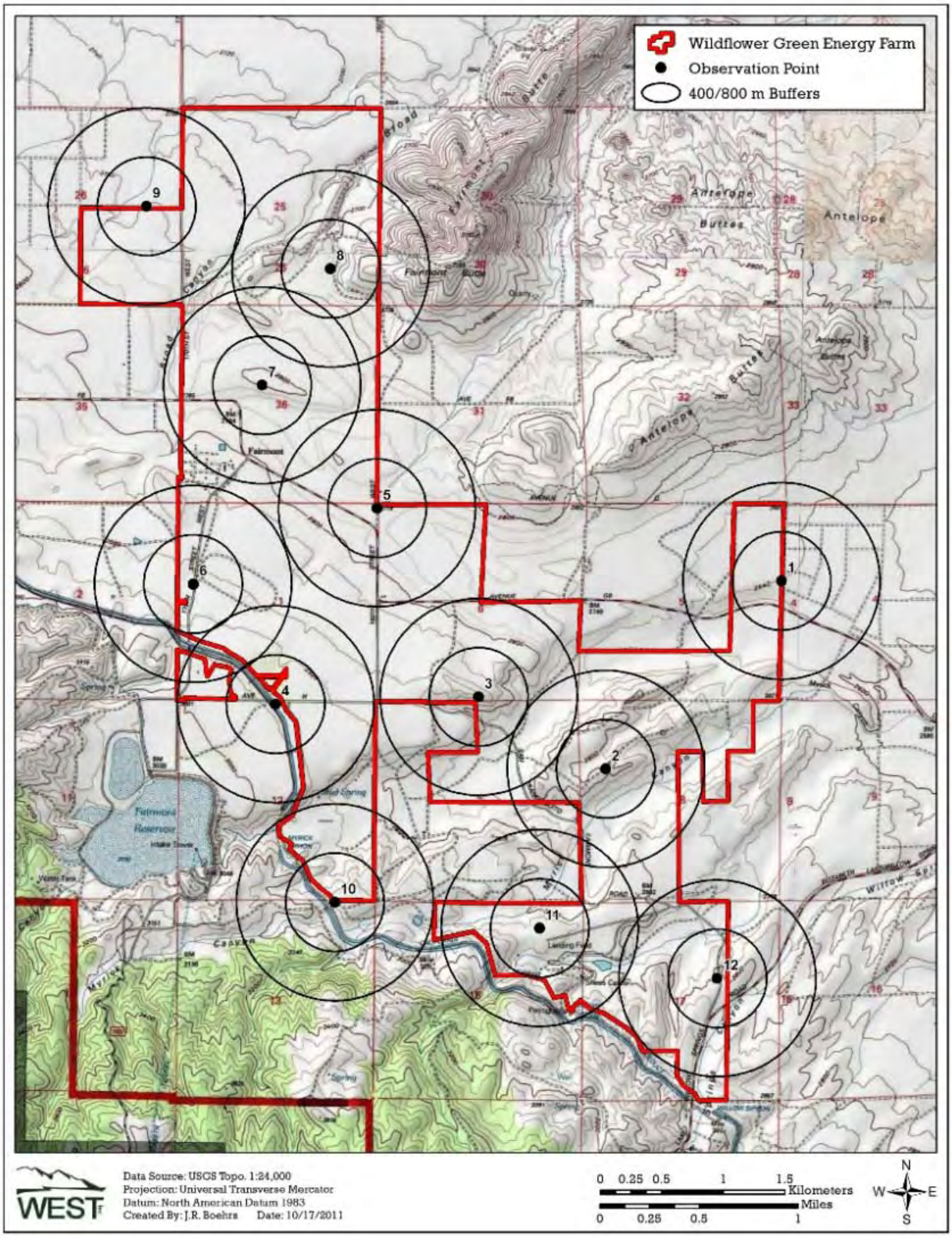


Figure 2. Fixed-point bird use survey locations at the Wildflower Green Energy Farm.

Observation Schedule

Sampling intensity was designed to document bird use and behavior by habitat and season within the WGEF study area. Fixed-point bird use surveys were conducted from March 18, 2010, through September 8, 2011. During the initial year of surveys (March 18, 2010 – March 12, 2011), only the original eight points were surveyed (points 1-8; Figure 2). At the start of the second year of surveys initiated on May 7, 2011, four additional points (points 1-4; Figure 2) were added to the study for a total of 12 points. Surveys were conducted approximately once per week during the spring (March 1 to May 31), summer (June 1 to August 31), fall (September 1 to November 15), and winter (November 16 to February 28). Surveys were conducted during daylight hours and survey periods varied to approximately cover all daylight hours during a season. To the extent practical, each point was surveyed about the same number of times.

Migrating/Breeding Bird Surveys

The objective of the migrating/breeding bird surveys was to identify songbird use within the WGEF's riparian habitats.

Survey Plots

Eight points were established within the WGEF's riparian habitats, all occurring with the southern portions of the study area (Figure 3). These points were established approximately 100 m (328 ft) apart in the best possible locations to hear or see all bird species, while avoiding potential disturbance to the habitat or nests of vireos, flycatchers, or other sensitive species. Each survey point was recorded with a global positioning system (GPS) unit. Ten-minute surveys were conducted at each of the eight points by a qualified biologist.

Survey Methods

Surveys at each point consisted of 10-min passive-listening surveys. While the focus of the surveys was songbirds, all birds seen or heard were recorded. Besides species observed and location, the following data were recorded for each point survey: date, start and end time of observation period, point number, species or best possible identification, sex, age, number of individuals, distance from point, behavior, first altitude above ground, flight direction, behavior, habitat, and auditory-only observations. Climate information, such as temperature, wind speed, wind direction, precipitation, and cloud cover also were also recorded for each point survey. If a sensitive species was detected, additional information such as location (UTM coordinates) and evidence of nesting was recorded.

Survey Timing

Surveys at all eight points were conducted every other week from May 10 through June 23, 2011. Surveys were conducted between dawn and 1000 hours.

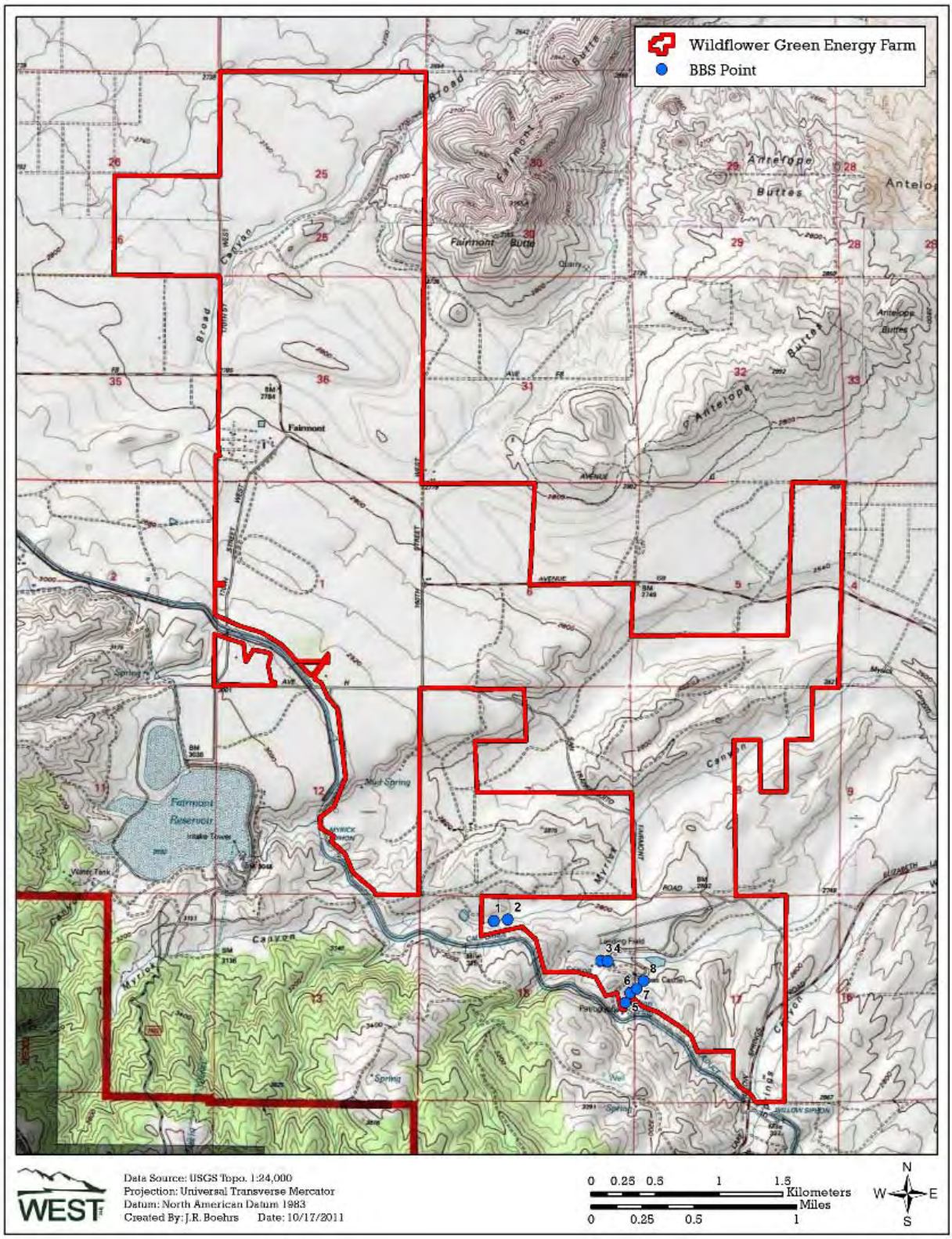


Figure 3. Breeding bird survey locations at the Wildflower Green Energy Farm.

Golden Eagle/Raptor Nest Surveys

The objective of the golden eagle/raptor nest surveys was to locate nests that may be subject to disturbance and/or displacement effects from facility construction and/or operation. The nest surveys gathered information on species nesting in the area, including nest locations, nesting season (timing), and nest success. While active and inactive nests of all raptor species were recorded. The surveys specifically targeted golden eagles, which are a California fully-protected species (CDFG 2011a) and further protected under the federal Bald and Golden Eagle Protection Act (BGEPA 1940). Survey methods were consistent with the USFWS Interim Golden Eagle Technical Guidance report (Pagel et al. 2010). Following this protocol, surveys for golden eagles included all suitable eagle nesting habitat within the WGEF boundary and transmission corridor, as well as the area within an approximate 10-mile (16-km) buffer of the study area. For all other raptor species (e.g., red-tailed hawk [*Buteo jamaicensis*] and great horned owl [*Bubo virginianus*]), the survey area included all potential nesting habitat within two miles of the project boundary.

In May of 2010, the CEC and CDFG drafted new Swainson's hawk (*Buteo swainsoni*) survey guidelines for the Antelope Valley (CEC and CDFG 2010). As a result, the survey buffer was modified for the second aerial survey conducted in May. During this survey, all trees and other nesting platforms within a 5-mile (8-km) buffer of the study area was searched for Swainson's hawk nests, as recommended in the new survey guidelines. In the spring of 2011, an additional season of focused Swainson's hawk nest surveys was conducted within the WGEF and surrounding 5-mile buffer following the new CEC and CDFG (2010) survey protocol.

Survey Methods

Consistent with the golden eagle survey protocol (Pagel et al. 2010), two aerial surveys were conducted via helicopter during the spring 2010 breeding season. The aerial survey method involved a comprehensive search of suitable nesting areas and substrate (e.g., isolated trees, open woodlands and savannas, rocky outcrops, cliffs, and other nest platforms such as power poles and transmission towers). During surveys, the helicopter was flown at an altitude of tree-top level to approximately 250 ft (76 m) AGL. If a nest was observed, the helicopter was moved to a position where nest status and species present could be determined. Efforts were made to minimize disturbance to breeding raptors, including keeping the helicopter a maximum distance from the nest at which the species could be identified, with distances varying depending upon nest location and wind conditions. Data recorded for each nest location included species occupying the nest, nest status (i.e., inactive, bird incubating, young present, eggs present, adult present, or unknown), nest substrate (e.g., pine [*Pinus* spp.], cottonwood [*Populus* spp.], rocky outcrop, cliff, or transmission line tower), number of young present, and the time and date of the observation. When nesting status and outcome could not be determined from aerial surveys, ground-based follow-up visits were made if the nest site was accessible from the ground. All raptor nests, regardless of nest status, were recorded with a Trimble Geo XH global positioning system (GPS) unit with sub-meter accuracy and mapped on a GIS ArcView project utilizing USGS topographic maps (1:24000 scale) as the base. Locations of common raven

(*Corvus corax*) nests or inactive nests were also recorded as nests of this species may be occupied by raptors during subsequent years.

In the spring of 2011, following CEC and CDFG (2010) survey guidelines, ground-based surveys for Swainson's hawk nests were conducted within the WGEF and surrounding 5-mile buffer. Surveys were conducted by driving through the survey area looking for observations of perched, foraging, or displaying adults, or nest structures within areas of suitable habitat.

Survey Timing

Surveys were conducted during the spring 2010 and 2011 breeding seasons. In 2010, the first aerial survey was flown on April 14, and the second survey was flown on May 24-25. Additional ground-based surveys were conducted in conjunction with fixed-point bird use surveys during the peak of the breeding season (March – June), when target species were actively incubating eggs or attending young. In 2011, ground-based surveys were conducted on April 13-14, April 21, May 11, May 24, and June 8.

Burrowing Owl and General Wildlife Surveys

The burrowing owl is a state species of special concern in California (CDFG 2011b). A burrowing owl survey was conducted within the WGEF following survey methods outlined in the Burrowing Owl Survey Protocol and Mitigation Guidelines (CBOC 1997) recognized by the CDFG. In southern California, burrowing owls may use a site for breeding, foraging, wintering, and/or temporarily as a migration stopover site. Occupancy of suitable burrowing owl habitat can be verified at a site by an observation of at least one burrowing owl, or alternatively, of observation of owl sign (i.e., molted feathers, cast pellets, prey remains, eggshell fragments, and/or whitewash) at or near a burrow entrance (CBOC 1997).

Survey Methods

Surveys for burrowing owls, burrows, and owl sign were conducted by walking transects throughout all suitable burrowing owl habitat within the project boundary and along the proposed transmission line corridor. The survey transects were spaced no greater than 30 m (approximately 100 ft) apart to allow 100% visual coverage of the ground surface. Right of entry to private land along the proposed transmission line was possible along approximately 40% of the proposed line. Within these accessible parcels, burrowing owl surveys were conducted within 150 m (492 ft) of the proposed transmission line route. Transverse Mercator (UTM) coordinates were recorded by a hand-held GPS unit for all burrowing owls observed during the survey, as well as burrows with sign of present or past use by burrowing owls. These coordinates were mapped on a GIS ArcView project utilizing USGS topographic maps (1:24000 scale) as the base.

If owls or burrows with owl sign were documented within the WGEF, at least four visits were made to the sites to determine occupancy and nesting status. Site visits were conducted on four separate days and were conducted from a distance via binoculars or a spotting scope such that the potential to disturb burrowing owls was minimized.

During the burrowing owl surveys, all wildlife observed were recorded. It was assumed that this level of coverage was sufficient for a general wildlife survey and allowed identification of other special status wildlife species and associated habitats present within the WGEF.

Survey Timing

Surveys for burrows and burrowing owls, as well as all follow-up visits to occupied sites, were conducted from May 9 to July 12, 2010. Burrows with evidence of past or current use by burrowing owls continued to be monitored through the fall and winter of 2010. In the spring of 2011, the burrowing owl survey was extended to include the approximately 1,900 acres (2.9 mi^2) not surveyed during the previous year. Surveys in 2011 were conducted from May 17 to 31. All identified burrows with sign of current or past burrowing owl use will continue to be monitored throughout the summer, fall, and winter to determine productivity and/or occupancy by migrating or wintering burrowing owls.

Nocturnal Radar Migration Surveys

Nocturnal radar migration surveys were conducted by Hamer Environmental L. P. (Hamer 2011; Appendix H). The objective of the surveys was to characterize nocturnal avian migration over the WGEF and to collect data that can be used to determine the relative magnitude of nocturnal migration over the proposed development area when compared to other sites. Modified marine radar was utilized to provide information about the pattern of spring and fall nocturnal migration over the proposed renewable energy facility. Baseline information was collected on flight direction, flight behavior, flight paths, passage rates/density, hourly changes in passage rates and flight altitude of nocturnal migrants at two representative sampling locations within the WGEF (Figure 4).

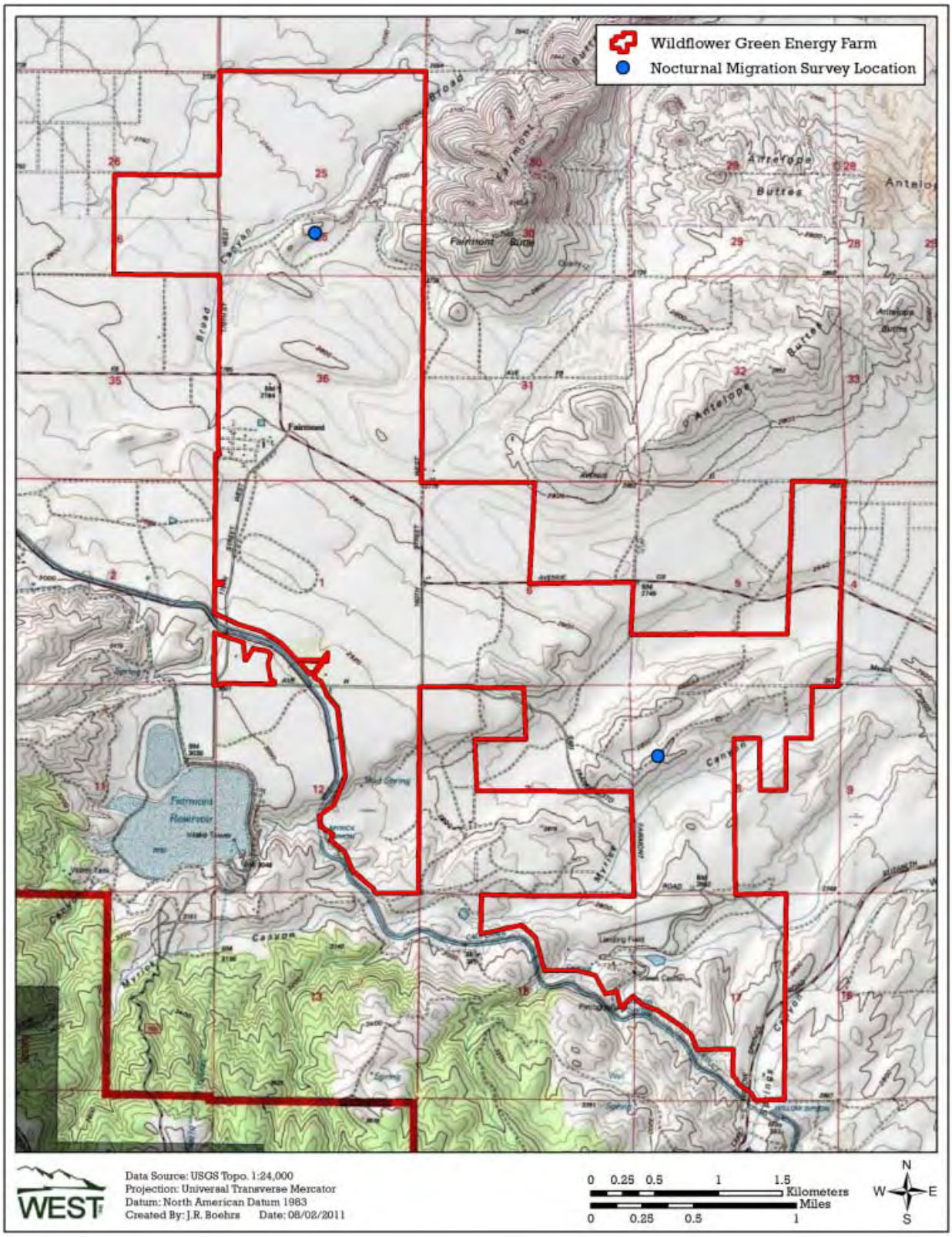


Figure 4. Nocturnal migration survey stations at the Wildflower Green Energy Farm.

Survey Methods

The mobile radar lab consisted of a marine radar unit mounted on a 4-wheel-drive pickup/mobile radar lab. The radar unit was an X-band, transmitting at 9,410 MHz with power output of 12 kilowatts (kW). Similar radar labs have been successfully used to monitor nocturnal avian migration and are described in Cooper et al. (1991) and Harmata et al. (1999). A single radar unit was used in the proposed development areas during the peak spring and fall migration periods. The radar unit was tilted to alternate between vertical and horizontal positions to collect data on altitudes and passage rates without requiring two radar units and two radar technicians. Due to the size of the WGEF, the sampling time was divided between two survey stations to cover a larger proportion of the proposed development area and capture potential west - east variation in the migration pattern across the area (Figure 4). Radar sampling locations were selected to maximize radar visibility in a 360 degree circle around the radar unit.

Statistical Analysis

Quality Assurance and Quality Control

Quality assurance and quality control (QA/QC) measures were implemented at all stages of the study, including in the field, during data entry and analysis, and report writing. Following field surveys, observers were responsible for inspecting data forms for completeness, accuracy, and legibility. A sample of records from an electronic database was compared to the raw data forms and any errors detected were corrected. Irregular codes or data suspected as questionable were discussed with the observer and/or project manager. Errors, omissions, or problems identified in later stages of analysis were traced back to the raw data forms, and appropriate changes were made in all affected steps.

Data Compilation and Storage

A Microsoft® ACCESS database was developed to store, organize, and retrieve survey data. Data were keyed into the electronic database using a pre-defined protocol to facilitate subsequent QA/QC and data analysis. All data forms, field notebooks (if provided), and electronic data files were retained for reference.

Fixed-Point Bird Use Surveys

Bird Diversity and Species Richness

Bird diversity was illustrated by the total number of unique species observed. Species lists (with the number of observations and the number of groups) were generated by season and included all observations of birds detected, regardless of their distance from the observer. Species richness was calculated as the mean number of species observed per plot per survey (i.e., number of species/plot/30-min survey). Species diversity and richness were compared among seasons for fixed-point bird use surveys.

Bird Use, Percent Composition, and Frequency of Occurrence

For the standardized fixed-point bird use estimates, only observations of large birds detected within the 800-m radius plot were used in the analysis. For small birds only observations within a 100-m radius were used. Estimates of mean bird use (i.e., number of birds/plot/30-min survey)

were used to compare differences between bird types, seasons, survey points, and other wind energy facilities. Mean use is calculated by determining the number of birds seen within each 800-m plot (or 100-m plot for small birds) for each given visit and then averaging by the number of plots surveyed during that visit. A second averaging occurs across the number of visits during the season and entire study period. A visit is defined as the required length of time to survey all of the plots once within the study area.

Percent composition was calculated as the proportion of the overall mean use for a particular bird type or species, and the frequency of occurrence was calculated as the percent of surveys in which a particular bird type or species was observed. Frequency of occurrence and percent composition provide relative measures of species use of the proposed wind resource area. For example, a particular species might have high use estimates for the study area based on just a few observations of large groups; however, the frequency of occurrence would indicate that the species only occurred during a few of the surveys, therefore the species would be less likely to be affected by the wind energy facility or the transmission corridor.

Bird Flight Height and Behavior

To calculate potential risk to bird species, the first flight height recorded was used to estimate the percentages of birds flying within the likely rotor-swept heights (RSH) for collision with turbine blades of 35 to 130 m AGL, which is the blade height of typical turbines likely to be used at the WGEF.

Bird Exposure Index

The bird exposure index is used as a relative measure of how often birds fly at heights similar to blades of modern wind turbines. A relative index of bird exposure (R) was calculated for bird species observed during the fixed-point bird use surveys using the following formula:

$$R = A*P_f*P_t$$

Where A equals mean relative use for species *i* (large bird observations within 800 m of the observer or 100 m for small birds) averaged across all surveys, P_f equals the proportion of all observations of species *i* where activity was recorded as flying (an index to the approximate percentage of time species *i* spends flying during the daylight period), and P_t equals the proportion of all initial flight height observations of species *i* within the likely RSH.

Spatial Use

Large bird flight paths were qualitatively compared to study area characteristics (e.g., topographic features). The objective of mapping observed large bird locations and flight paths was to look for areas of concentrated use by raptors and other large birds and/or consistent flight patterns within the study area. This information can be useful in turbine layout design or adjustments of individual turbines for micro-siting.

Breeding bird Surveys

Bird Diversity and Species Richness

Bird diversity was illustrated by the total number of unique species observed. Species lists (with the number of observations and the number of groups) were generated by season and included all observations of birds detected, regardless of their distance from the observer. Species richness was calculated as the mean number of species observed per plot per survey (i.e., number of species/100-m plot/10-min survey). Species diversity and richness were compared between seasons for breeding bird surveys.

Bird Use, Composition, and Frequency of Occurrence

For the standardized breeding bird use estimates, only observations within a 100 m (328 ft) radius were used in the analysis. Estimates of mean bird use (i.e., number of birds/plot/10-min survey) were used to compare and contrast among bird types, seasons, points, and other wind energy facilities. Mean use is calculated by determining the number of birds seen within each 100-m for each given visit and then averaging by the number of plots surveyed during that visit. A second averaging occurs across the number of visits during the season and entire study period. A visit is defined as the required length of time to survey all of the plots once within the study area.

Percent composition was calculated as the proportion of the overall mean use for a particular bird type or species, and the frequency of occurrence was calculated as the percent of surveys in which a particular bird type or species is observed. Frequency of occurrence and percent composition provide relative estimates of species exposure to the wind energy facility. For example, a species may have high use estimates for the study area based on just a few observations of large groups; however, the frequency of occurrence will indicate that the species occurs during very few of the surveys and therefore may be less likely to be affected by the proposed wind energy facility.

Spatial Use

Data were analyzed by comparing mean use among plots.

RESULTS

Baseline avian studies were completed at the WGEF from March 18, 2010, through September 8, 2011. Results of the fixed-point surveys, migrating/breeding bird surveys, golden eagle/raptor nest surveys, burrowing owl surveys, and nocturnal migration surveys are presented below.

Fixed-Point Bird Use Surveys

A total of 550 30-min fixed-point bird use surveys were conducted at the WGEF over 18 consecutive months, from March 18, 2010, through September 8, 2011 (Table 1). Two viewsheds were utilized when calculating species richness, use, percent composition, percent frequency, and exposure index: 800-m for large birds and 100-m for small birds.

Table 1. Summary of species richness (species/plot[a]/30-minute survey), and sample size by season and overall during the fixed-point bird use surveys at the Wildflower Green Energy Farm from March 18, 2010, to September 8, 2011.

Season	# of Visits	# of Surveys Conducted	# of Unique Species	Species Richness	
				Large Birds	Small Birds
Spring	17	137	66	1.86	2.85
Summer	26	197	42	2.08	2.13
Fall	13	96	61	2.44	3.00
Winter	15	120	46	2.76	2.33
Overall	**71**	**550**	**96**	**2.30**	**2.55**

[a] 800-m radius for large birds and 100-m radius for small birds.

Bird Diversity and Species Richness

Ninety-six unique species were observed over the course of all fixed-point bird use surveys (Table 1). A mean of 2.30 large bird species/800-m plot/30-min survey and 2.55 small bird species/100-m plot/30-min survey was recorded. Bird diversity (the number of unique species) was highest in the spring (66 species), followed by fall (61), winter (46), and summer (42). Large bird species richness (mean number of species per plot per survey) was higher in the winter (2.76 species/plot/survey) and fall (2.44) compared to summer (2.08) and spring (1.86). Small bird species richness was higher in fall (3.00 species/plot/survey) and spring (2.85) compared to winter (2.33) and summer (2.13; Table 1).

A total of 66,635 individual birds were recorded within 3,411 separate groups (defined as one or more individuals) during the fixed-point surveys (Appendix A). Regardless of bird size, one species (1.0% of all recorded species), tricolored blackbird (*Agelaius tricolor*; 43,201 observations), composed 64.8% of all observations. Excluding horned lark (*Eremophila alpestris*; 9,153 observations; 3.7% of all individuals), all other species composed less than 4% of the observations, individually. A total of 658 individual raptor observations, representing 11 distinct species, were recorded within the WGEF (Appendix A). The most frequently recorded raptor species were red-tailed hawk (*Buteo jamaicensis*; 285 observations) and American kestrel (*Falco sparverius*; 210 observations), which composed 75.2% of the total raptor observations.

Bird Use, Percent Composition, and Frequency of Occurrence

Mean bird use, percent composition, and frequency of occurrence were calculated by season for all bird types (Table 2) and species (Appendix B). Overall large bird usage was similar throughout the year with the highest use occurring during spring (8.97 birds/800-m plot/30-min survey), followed by winter (8.61), summer (8.38), and fall (8.22). Small bird use was significantly higher in the spring (274.98 birds/100-m plot/30-min survey), compared to summer (72.11), winter (64.30), and fall (27.56; Table 2).

Loons/Grebes

Loon and grebe use was higher during the fall (0.03 birds/plot/30-min survey), compared to spring and winter (both less than 0.01); no loons or grebes were observed during summer (Table 2). Use by loons and grebes was attributed to two species: pied-billed grebe (*Podilymbus podiceps*) and western grebe (*Aechmophorus occidentalis*; Appendix B1). Loons and grebes

composed less than 1% of the overall large bird use, and were observed during less than 2% of spring, fall, and winter surveys (Table 2).

Waterbirds

Waterbird use was observed only during the spring (0.74 birds/plot/30-min survey), summer (0.01), and fall (0.02; Table 2). Higher waterbird use in spring was primarily attributed to higher use by American white pelicans (*Pelecanus erythrorhynchos*; two groups totaling 92 individuals; Appendix A) which composed 93.9% of waterbird use during that season. Waterbirds composed 8.3% of the overall large bird use during the spring and 0.2% during the summer and fall. Waterbirds were observed during 7.5% of spring surveys, 1.3% of summer surveys, and 1.0% of fall surveys (Table 2).

Waterfowl

Waterfowl had higher use in the winter (2.66 birds/plot/30-min survey), compared to spring (1.55), fall (0.15) and summer (0.11; Table 2). High waterfowl use in winter was largely credited to use by bufflehead (*Bucephala albeola;* 1.66 birds/plot/30-min survey), while higher use in spring was primarily due to use by ring-necked duck (*Aythya collaris*; 1.07; Appendix B1). Waterfowl composed 30.9% of the overall large bird use during winter and 17.3% in spring, but only 1.9% in the fall and 1.3% in the summer. Waterfowl were observed during 20.0% of winter surveys, 9.6% of spring surveys, 4.7% of summer surveys, and 3.8% of fall surveys (Table 2).

Shorebirds

Shorebirds had the highest use in the winter (0.20 birds/plot/30-min survey), followed by summer (0.15), fall (0.10), and spring (0.08; Table 2). Killdeer (*Charadrius vociferous*) composed the majority of overall shorebird use (Appendix B1). Shorebirds composed less than 3% of overall large bird use during each season, and were observed during 6.0% of the surveys in the spring and summer, 5.0% in the winter, and 4.8% in the fall (Table 2).

Gulls and Terns

Gull and tern use was comprised of only two species, California gull (*Larus californicus*) and Caspian tern (*Sterna caspia*), and was recorded only during the spring and summer seasons (0.21 birds/plot/30-min survey and 0.09, respectively; Table 2). Gulls and terns were observed during less than 3% of the surveys and composed less than 3% of overall bird use during both seasons (Table 2).

Diurnal Raptors

Diurnal raptor use was highest in the winter (1.92 birds/plot/30-min survey) and fall (1.47), compared to summer (1.07) and spring (0.59; Table 2). Higher use in the winter was primarily due to high use of the area by red-tailed hawk (0.62 birds/plot/30-min survey), American kestrel (0.53), and northern harrier (*Circus cyaneus*; 0.38; Appendix B1). Red-tailed hawk also had the highest use of any raptor during the other three seasons (0.59 birds/plot/30-min survey in fall, 0.57 in summer, and 0.37 in spring; Appendix B1). Diurnal raptors composed 22.4% of the overall large bird use during the winter, 17.9% during the fall, 12.8% during the summer, and

6.6% during the spring. Diurnal raptors were observed during 85.8% of winter surveys, 70.2% of fall surveys, 51.5% of summer surveys, and 36.4% of spring surveys (Table 2).

Owls

Owl use consisted of eight great horned owls (*Bubo virginianus*) during the spring (0.07 birds/plot/30-min survey) and four burrowing owls in the summer (0.01; Appendices A and B1; Table 2). Owls composed less than one percent of the overall large bird during both seasons, and were observed during 1.6% of the spring surveys and 0.3% of the summer surveys (Table 2).

Vultures

Use by vultures, comprised solely of turkey vultures (*Cathartes aura*), was highest in the fall (0.56 birds/plot/30-min survey), compared to summer (0.15), spring (0.14), and winter (less than 0.01; Appendix B1; Table 2). Vultures composed 6.8% of overall large bird use in fall and less than two percent during all other seasons. Turkey vultures were observed during 11.0% of surveys in the spring, 9.6% in the fall, 9.3% in the summer, and 0.8% in the winter (Table 2).

Upland Game Birds

Upland game birds had fairly similar use during the fall (1.33 birds/plot/30-min survey), summer (1.29), and winter (1.16), but use was considerably lower in the spring (0.12; Table 2). California quail (*Callipepla californica*) made up the majority of upland game bird use during all four seasons (Appendix B2). Upland game birds composed 16.1% of overall large bird use during fall, 15.4% during summer, 13.5% during winter, and 1.3% during spring. Upland game birds were observed during 13.2% of surveys in the summer, 11.5% in the fall, 7.5% in the spring, and 4.2% in the winter (Table 2).

Large Corvids

Common raven was the only large corvid species observed (Appendix B). Use by common ravens was highest in the spring (5.40 birds/plot/30-min survey), followed by summer (4.13), fall (3.34), and winter (2.08; Table 2). Common ravens composed 60.2% of overall large bird use in spring, 49.2% in the summer, 40.6% in the fall, and 24.1% in the winter. Common ravens were observed during more than 65% of the surveys conducted during each season (Table 2).

Passerines

A 100-m viewshed was used for small birds, therefore descriptive statistics for small bird types are not directly comparable with large bird types. Passerine use was almost four times higher in the spring (274.91 birds/plot/30-min survey) compared to summer (72.09), winter (64.28), and fall (27.50; Table 2). This was mainly due to tricolored blackbird, which exhibited the highest use by any passerine species in the spring (261.92) and summer (57.61), but was absent in the fall and winter (Appendix B2). Horned lark had the highest use of any passerine species in winter (37.17) and fall (16.06; Appendix B). Passerines composed over 99% of overall small bird use during each season and were observed during 90% or more of the surveys during each season (Table 2).

Table 2. Mean bird use (number of birds/plot[a]/30-minute survey), percent of total composition (%), and frequency of occurrence (%) for each major bird type and raptor subtype by season during the fixed-point bird use surveys at the Wildflower Green Energy Farm from March 18, 2010, to September 8, 2011.

	Mean Use				% Composition				% Frequency			
Bird Type / Subtype	**Spring**	**Summer**	**Fall**	**Winter**	**Spring**	**Summer**	**Fall**	**Winter**	**Spring**	**Summer**	**Fall**	**Winter**
Loons/Grebes	<0.01	0	0.03	<0.01	<0.1	0	0.4	<0.1	0.7	0	1.9	0.8
Waterbirds	0.74	0.01	0.02	0	8.3	0.2	0.2	0	7.5	1.3	1.0	0
Waterfowl	1.55	0.11	0.15	2.66	17.3	1.3	1.9	30.9	9.6	4.7	3.8	20.0
Shorebirds	0.08	0.15	0.10	0.20	0.9	1.8	1.2	2.3	6.0	6.0	4.8	5.0
Gulls/Terns	0.21	0.09	0	0	2.3	1.1	0	0	2.9	1.0	0	0
Rails/Coots	<0.01	0	0	0	<0.1	0	0	0	0.7	0	0	0
Diurnal Raptors	0.59	1.07	1.47	1.92	6.6	12.8	17.9	22.4	36.4	51.5	70.2	85.8
Accipiters	*0*	*0.02*	*<0.01*	*0.02*	*0*	*0.3*	*0.1*	*0.3*	*0*	*2.4*	*1.0*	*2.5*
Buteos	*0.42*	*0.58*	*0.62*	*0.78*	*4.6*	*7.0*	*7.6*	*9.1*	*24.7*	*36.8*	*38.5*	*52.5*
Northern Harrier	*0.08*	*<0.01*	*0.14*	*0.38*	*0.9*	*<0.1*	*1.8*	*4.4*	*8.1*	*0.5*	*14.4*	*28.3*
Eagles	*0.02*	*<0.01*	*0*	*0.08*	*0.2*	*<0.1*	*0*	*1.0*	*2.2*	*0.8*	*0*	*6.7*
Falcons	*0.07*	*0.45*	*0.69*	*0.66*	*0.8*	*5.4*	*8.4*	*7.6*	*7.1*	*24.9*	*51.0*	*45.8*
Owls	0.07	0.01	0	0	0.7	0.2	0	0	1.6	0.3	0	0
Vultures	0.14	0.15	0.56	<0.01	1.5	1.7	6.8	<0.1	11.0	9.3	9.6	0.8
Upland Game Birds	0.12	1.29	1.33	1.16	1.3	15.4	16.1	13.5	7.5	13.2	11.5	4.2
Doves/Pigeons	0.06	1.34	1.21	0.57	0.6	16.0	14.7	6.6	4.7	32.4	19.2	5.0
Large Corvids	5.40	4.13	3.34	2.08	60.2	49.2	40.6	24.1	81.1	66.5	76.0	72.5
Large Cuckoos	<0.01	0.03	0.02	<0.01	<0.1	0.4	0.2	<0.1	0.7	3.0	1.9	0.8
Large Birds Overall	**8.97**	**8.38**	**8.22**	**8.61**	**100**	**100**	**100**	**100**				
Passerines	274.91	72.09	27.50	64.28	100	100	99.8	100	97.8	92.5	95.2	90.0
Swifts/Hummingbirds	0.07	0.02	0.04	0	<0.1	<0.1	0.1	0	4.2	1.9	2.9	0
Woodpeckers	0	0	0.02	0.02	0	0	<0.1	<0.1	0	0	1.9	2.5
Small Birds Overall	**274.98**	**72.11**	**27.56**	**64.30**	**100**	**100**	**100**	**100**				

[a.] 800-meter (m) radius plot for large birds and 100-m for small birds.

Bird Flight Height and Behavior

Flight height characteristics were estimated for both bird types and species based on initial flight height observations and estimated use (Table 3; Appendix C). During fixed-point bird use surveys, 1,116 groups (defined as one or more individuals) of large birds, totaling 3,351 individuals, were observed flying within the 800-m plots. Overall, 10.2% of flying large birds were recorded within the RSH, 87.6% were below the RSH, and 2.2% were flying above the RSH for turbine blades of 35 to 130 m AGL. The majority (82.8%) of flying raptors were observed below the RSH, 12.3% were within the RSH, and 4.8% were above the RSH. Waterbirds had the highest percentage of flying birds observed within the RSH (95.9%, based on only six groups observed flying) followed by shorebirds (46.9%, based on only 14 groups observed flying), and vultures (39.2%, based on 49 groups flying). Waterfowl, gulls and terns, upland game birds, doves and pigeons, large corvids, and large cuckoos were typically observed flying below the RSH. The majority of passerines (99.7%) were observed below the estimated RSH, while 0.3% was recorded within the RSH and none were observed flying above the RSH (Table 3).

Table 3. Flight height characteristics by bird type[a] and raptor subtype during fixed-point bird use surveys at the Wildflower Green Energy Farm from March 18, 2010, to September 8, 2011.

Bird Type	# Groups Flying	# Obs Flying	Mean Flight Height (m)	% Obs Flying	% within Flight Height Categories		
					0 - 35 m	35 - 130 m[b]	> 130 m
Loons/Grebes	0	0	0	0	0	0	0
Waterbirds	6	98	77.50	96.1	3.1	95.9	1.0
Waterfowl	23	82	10.00	14.4	84.1	15.9	0
Shorebirds	14	49	31.57	68.1	53.1	46.9	0
Gulls/Terns	3	26	12.33	100	100	0	0
Rails/Coots	0	0	0	0	0	0	0
Diurnal Raptors	419	478	25.13	73.3	82.8	12.3	4.8
Accipiters	*7*	*7*	*9.14*	*100*	*85.7*	*14.3*	*0*
Buteos	*170*	*202*	*42.87*	*64.3*	*69.3*	*22.8*	*7.9*
Northern Harrier	*67*	*70*	*5.25*	*98.6*	*97.1*	*2.9*	*0*
Eagles	*10*	*10*	*47.50*	*66.7*	*80.0*	*0*	*20.0*
Falcons	*165*	*189*	*14.24*	*77.1*	*92.1*	*5.3*	*2.6*
Owls	2	11	3.00	91.7	100	0	0
Vultures	49	97	55.33	97.0	55.7	39.2	5.2
Upland Game Birds	14	386	9.07	76.0	99.5	0.5	0
Doves/Pigeons	96	394	4.75	88.5	100	0	0
Large Corvids	486	1,726	18.23	78.8	90.9	6.5	2.5
Large Cuckoos	4	4	0.50	44.4	100	0	0
Large Birds Overall	**1,116**	**3,351**	**21.38**	**71.4**	**87.6**	**10.2**	**2.2**
Passerines	897	48,796	7.20	95.0	99.7	0.3	0
Swifts/Hummingbirds	11	14	7.55	82.4	78.6	21.4	0
Woodpeckers	3	3	6.00	60.0	100	0	0
Small Birds Overall	**911**	**48,813**	**7.20**	**95.0**	**99.7**	**0.3**	**0**

a. 800-meter (m) radius plot for large birds and 100-m for small birds.
b. The likely "rotor-swept height" for potential collision with a turbine blade, or 35 to 130 m (115 to 427 ft) above ground level (AGL).

Five large bird species had at least 30 groups observed flying (Table 4). Of these, the species with the greatest percentage of observations within the RSH were turkey vulture (52.6%), red-tailed hawk (40.9%), and common raven (25.3%; Table 4). Five large bird species were always observed flying within the RSH; however, these were based on only one or two observations. Among the small birds, four species had at least 30 groups observed flying. Of these, the species with the greatest percentage of observations within the RSH was tricolored blackbird (49.8%) followed by house finch (*Carpodacus mexicanus*; 6.4%; Table 4).

Table 4. Relative exposure index and flight characteristics for bird species[a] during fixed-point bird use surveys at the Wildflower Green Energy Farm from March 18, 2010, to September 8, 2011.

Species	# Groups Flying	Overall Mean Use	% Flying	% Flying within RSH[b] based on Initial obs	Exposure Index	% Within RSH at Anytime
			Large Bird Species[c]			
common raven	486	3.69	78.8	6.5	0.19	25.3
American white pelican	2	0.17	100	100	0.17	100
red-tailed hawk	144	0.53	63.1	22.7	0.08	40.9
turkey vulture	49	0.19	97.0	39.2	0.07	52.6
killdeer	13	0.11	64.8	25.7	0.02	25.7
unidentified shorebird	1	0.02	100	100	0.02	100
unidentified duck	1	0.02	100	100	0.02	100
American kestrel	136	0.39	76.2	5.0	0.01	13.1
ferruginous hawk	16	0.06	64.0	31.2	0.01	56.2
lesser scaup	1	0.08	13.9	100	0.01	100
northern harrier	67	0.16	98.6	2.9	<0.01	7.1
California quail	12	0.96	75.9	0.5	<0.01	0.5
great egret	1	<0.01	66.7	100	<0.01	100
prairie falcon	16	0.04	84.2	6.2	<0.01	6.2
Cooper's hawk	5	0.01	100	20.0	<0.01	20.0
unidentified falcon	5	<0.01	100	20.0	<0.01	20.0
Swainson's hawk	10	0.02	100	10.0	<0.01	60.0
			Small Bird Species[c]			
house finch	69	1.52	89.6	6.4	0.09	6.4
horned lark	237	17.11	93.2	0.4	0.06	0.8
tree swallow	11	0.14	100	38.7	0.06	48.0
tricolored blackbird	88	80.54	97.5	<0.1	0.02	49.8
Brewer's blackbird	36	0.45	95.2	4.2	0.02	8.8
Lawrence's goldfinch	6	0.04	87.0	15.0	<0.01	15.0
Vaux's swift	2	0.01	66.7	75.0	<0.01	75.0
Say's phoebe	6	0.02	70.0	28.6	<0.01	28.6
lark sparrow	21	1.26	97.6	0.2	<0.01	0.2
European starling	21	0.54	99.2	0.4	<0.01	0.4
unidentified sparrow	2	<0.01	100	50.0	<0.01	50.0

[a] Only includes species with actual exposure index values.
[b.] RSH: the likely rotor-swept heights for potential collision with a turbine blade, or 35 to 130 m (115 to 427 ft) above ground level (AGL).
[c.] 800-meter (m) radius plot for large birds and 100-m for small birds.

Bird Exposure Index

A relative exposure index was calculated for each bird species based on initial flight height observations and relative abundance (defined as the use estimate). Those species that had exposure to the estimated turbine RSH are listed in Table 4, and a complete list of all species is presented in Appendix C. The exposure index does not account for other possible collision risk factors, such as foraging or courtship behavior. Common raven and American white pelican had exposure indices over twice as high than any other species (0.19 and 0.17, respectively); all other large bird species had an exposure index of 0.08 or less. The raptor species with the highest exposure index was red-tailed hawk (0.08), followed by ferruginous hawk (*Buteo regalis*; 0.01) and American kestrel (0.01). Based on observations within a 100-m viewshed, small bird species with the highest exposure indices were house finch (0.09), tree swallow (*Tachycineta bicolor*; 0.06), and horned lark (0.06; Table 4).

Spatial Use

For all large bird species combined, use was highest at point four (15.34 birds/30-min survey; Appendices D and E). Large bird use at other points ranged from 4.32 to 9.19 birds/30-min survey. The high mean use estimate for point four was primarily due to higher use by waterfowl (6.66 birds/30-min survey) and upland game birds (3.92 birds/30-min survey; Appendix D). Waterfowl use occurred at only three other points: point six (2.53 birds/30-min survey), point 10 (0.44), and point seven (0.05). Waterbird use was highest at point two with 1.27 birds/30-min survey with use at other points ranging from zero to 0.28. Shorebird use ranged from zero to 0.33 birds/30-min survey. Use by the bird types loons/grebes and gulls/terns occurred only at point four (0.07 and 0.11, respectively) and point six (0.02 and 0.32, respectively). Rails and coots were observed only at point four (0.02). Diurnal raptor use was highest at point 11 (2.17 birds/30-min survey), and ranged from 0.50 to 1.75 at all other points. Higher diurnal raptor use at point 11 was largely attributed to use by buteos (1.17 birds/30-min survey) and falcons (0.94). Owls were only recorded at points two, eight and 11 (0.02, 0.07, and 0.39 birds/30-min survey, respectively). Vulture use was highest at point 10 (0.61 birds/30-min survey), and ranged from 0.02 to 0.42 at other points. Large corvid use was relatively high at all eight points, ranging from 1.83 birds/30-min survey at point 10 to 8.19 at point eight. Passerine use, focused within a 100-m viewshed, varied greatly among points, with the highest use occurring at point four (442.69 birds/30-min survey), then ranging from 8.88 at point two to 113.45 at point five (Appendices D and E).

Flight paths for all waterbirds, waterfowl, shorebirds, diurnal raptors, and vultures were digitized and mapped (Appendix E).

Sensitive Species Observations

Eleven sensitive species were recorded within the WGEF during fixed-point bird use surveys (Table 5). No federally listed species were recorded during surveys, however, 10 Swainson's hawks, a state threatened speices, were observed within the study area (CDFG 2011b). Additionally, seven state species of special concern (CDFG 2011a) were recorded during surveys: tricolored blackbird (122 groups comprising 43,201 individuals), loggerhead shrike (*Lanius ludovicianus*; 182 observations), American white pelican (two groups comprising 92

individuals), northern harrier (71 observations), Vaux's swift (*Chaetura vauxi;* six observations), burrowing owl (four observations), and yellow-headed blackbird (*Xanthocephalus xanthocephalus*; one observation; Table 5 and Appendix A). Additionally, four federal species of concern (USFWS 2011) were observed during surveys: loggerhead shrike and burrowing owl (also state species of special concern), ferruginous hawk (25 observations), and peregrine falcon (*Falco peregrinus*; three observations). Golden eagles (15 observations) were also recorded in the WGEF during surveys (Table 5). While not federal or state listed species, both the golden eagle and the peregrine falcon are designated as fully protected species in California (CDFG 2011a). The golden eagle is further protected under the federal BGEPA (1940).

During the baseline avian surveys conducted in 2011, two nesting colonies of tricolored blackbirds were identified in areas adjacent to the WGEF (Figure 5). The colony to the west was estimated to contain up to 300 nesting pairs of tricolored blackbirds, while the colony to east was estimated to contain 50-100 nesting pairs. A third, larger, colony is known to occur within the Fairmont Reservoir approximately 2 miles (3.2 km) southwest of the WGEF; however, the approximate size of this colony is unknown. Large flocks of tricolored blackbirds, numbering up to 1,500 individuals, were observed commuting between these colonies and their forging grounds within the Project's grasslands and agricultural fields in the spring and summer. Tricolored blackbird use of the WGEF by fixed-point survey station is presented in Figure 5.

Table 5. Summary of sensitive species observed at the Wildflower Green Energy Farm during migrating/breeding bird surveys (BBS) and fixed-point bird use surveys (FP) surveys from March 18, 2010, to September 8, 2011.

			BBS		FP		Overall	
Species	**Scientific Name**	**Status**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**
tricolored blackbird	*Agelaius tricolor*	SSC	16	701	122	43,201	138	43,902
loggerhead shrike	*Lanius ludovicianus*	SSC, FSC	0	0	141	182	141	182
American white pelican	*Pelecanus erythrorhynchos*	SSC	0	0	2	92	2	92
northern harrier	*Circus cyaneus*	SSC	0	0	68	71	68	71
ferruginous hawk	*Buteo regalis*	SSC	0	0	25	25	25	25
golden eagle	*Aquila chrysaetos*	SFP, EA	0	0	15	15	15	15
Swainson's hawk	*Buteo swainsoni*	ST	0	0	10	10	10	10
Vaux's swift	*Chaetura vauxi*	SSC	0	0	3	6	3	6
yellow warbler	*Dendroica petechia*	SSC	4	4	0	0	4	4
burrowing owl	*Athene cunicularia*	SSC, FSC	0	0	1	4	1	4
peregrine falcon	*Falco peregrinus*	SFP, FSC	0	0	3	3	3	3
willow flycatcher	*Empidonax traillii*	SE	1	1	0	0	1	1
yellow-headed blackbird	*Xanthocephalus xanthocephalus*	SSC	0	0	1	1	1	1
Total	**14 Species**		**21**	**706**	**391**	**43,610**	**412**	**44,316**

EA= federal Bald and Golden Eagle Protection Act (BGEPA 1940); FSC = federal species of concern (USFWS 2008, 2011); SE=state endangered (CDFG 2011b); ST = state threatened species (CDFG 2011b); SFP= state fully protected species (CDFG 2011a); SSC = state species of special concern (CDFG 2011b)

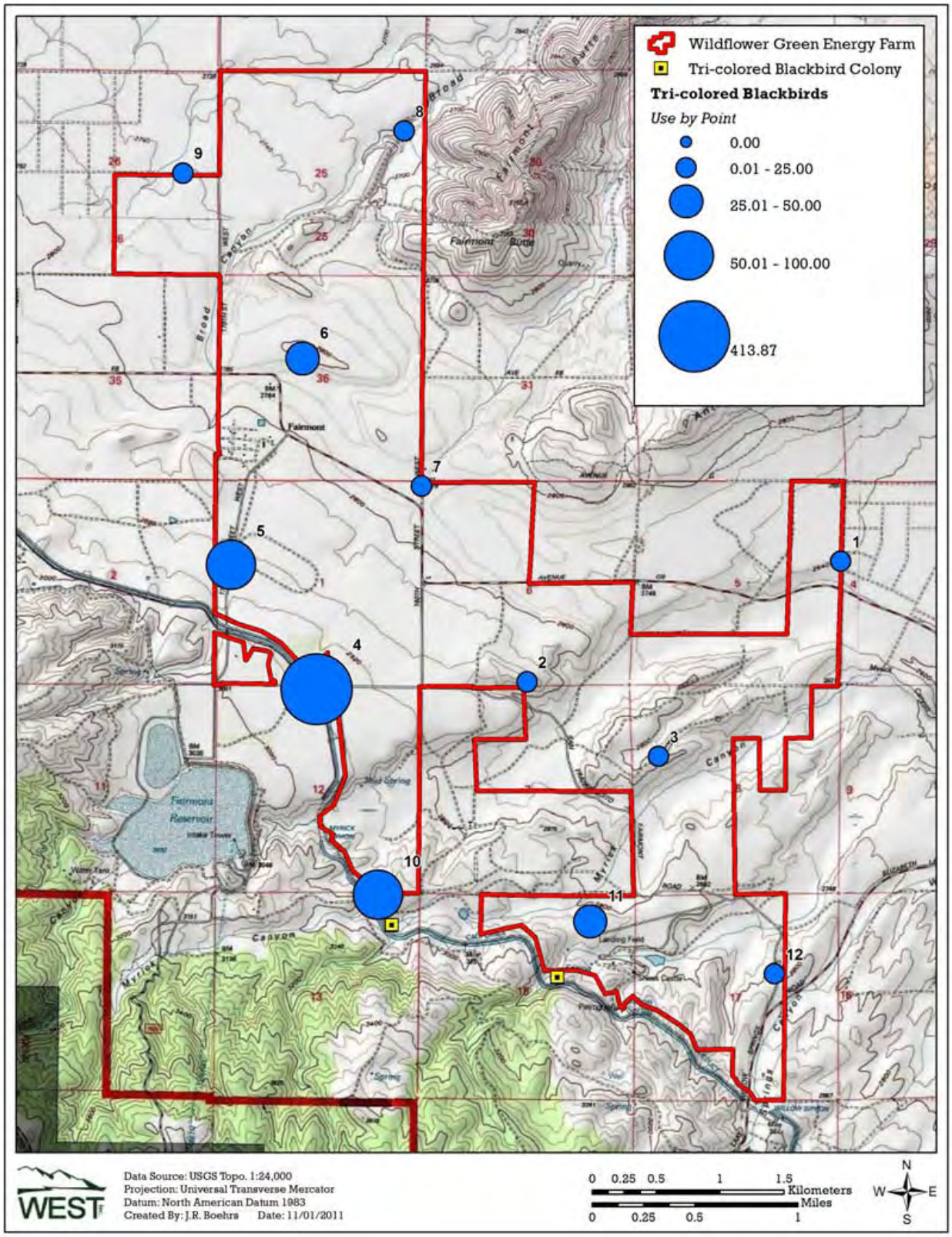


Figure 5. Tricolored blackbird use by survey station and nesting colony location at the Wildflower Green Energy Farm.

Migrating/Breeding Bird Surveys

A total of 32 ten-minute migrating/breeding bird surveys were conducted at the WGEF; two visits were conducted in spring and two visits in the summer (Table 6).

Table 6. Summary of species richness (species/plot/10-minute survey) and sample size during the breeding bird surveys in the Wildflower Green Energy Farm from May 10, 2011, to June 23, 2011.

Season	# of Visits	# of Conducted Surveys	# of Unique Species	Species Richness
Spring	2	16	40	8.44
Summer	2	16	38	8.62
Overall	**4**	**32**	**50**	**8.53**

Bird Diversity and Species Richness

Fifty unique species were identified during the migrating/breeding bird surveys, including 12 species not observed during fixed-point surveys described above. Overall species richness (the mean number of species observed per plot per survey) was 8.53 (Table 6). A total of 1,713 individual bird observations within 282 separate groups were recorded (Appendix G). Tricolored blackbird was the most frequently observed species, comprising 40.9% of all species, followed by California quail (15.1%) and cliff swallow (*Petrochelidon pyrrhonota*, 10.6%). All other species composed no more than six percent of the observations, individually.

Bird Use, Composition, and Frequency of Occurrence

Mean bird use estimates, percent composition, and frequency of occurrence for all species and bird types are shown in Table 7.

Waterbirds

Two waterbird species were observed, green heron (*Butorides virescens*) and snowy egret (*Egretta thula*), resulting in a use estimate of 0.25 birds/plot/10-min survey in spring and 0.06 in summer (Appendix F; Table 7). Waterbirds were observed during only 0.4% of spring surveys and 0.1% of summer surveys. Waterbirds composed 25.0% of overall bird use in the spring and 6.2% in the summer (Table 7).

Waterfowl

Waterfowl observations consisted of three species: mallards (*Anas platyrhynchos*; 48 observations), buffleheads (*Bucephala albeola*; six observations), and common goldeneye (*Bucephala clangula*; one observation; Appendix F). This resulted in a use of 2.94 birds/plot/10-min survey during the spring and 0.50 during the summer (Table 7). Waterfowl were observed during 12.5% of the spring and summer surveys, and composed 5.1% of overall use during spring and 1.0% during summer (Table 7).

Shorebirds

Killdeer (*Charadrius vociferous*; 20 observations), spotted sandpipers (*Actitis macularia*; 11 observations), and semipalmated plovers (*Charadrius semipalmatus*; six observations) were the

only shorebirds observed during surveys, resulting in a use of 1.62 and 0.62 birds/plot/10-min survey during spring and summer, respectively (Appendix F; Table 7). Shorebirds were observed in 12.5% of the spring surveys and 18.8% in the summer. Shorebirds composed 2.8% of the overall use in spring and 1.3% in summer (Table 7).

Diurnal Raptors

Most of the raptors were observed outside of the 100-m plot. Those observed within the plot resulted in a use of 0.62 birds/plot/10-min survey in the summer and 0.44 in the spring (Table 7). Only three diurnal raptor species were observed during surveys: American kestrel (11 observations), red-tailed hawk (five observations), and prairie falcon (one observation; Appendix F). Raptors were observed during 37.5% of the spring surveys and 18.8% of the summer surveys, but only composed 0.8% and 1.3 %, respectively, of the overall use (Table 7).

Owls

Only a single owl species was observed during surveys, a barn owl (*Tyto alba*; one observation), resulting in a spring use estimate of 0.06 birds/plot/10-min survey (Table 7; Appendix F). Owls composed 0.1% of the overall spring use and were observed during 6.2% of spring surveys (Table 7).

Vultures

Vultures, comprised of solely of turkey vultures (*Cathartes aura*; four observations) were observed only in the spring, resulting in a use estimate of 0.25 birds/plot/10-min survey (Appendix F; Table 7). Vultures composed 0.4 % of the overall spring use and were observed during 12.5% of spring surveys (Table 7).

Upland Game Birds

One species, California quail, accounted for all upland game bird use (14.19 birds/plot/10-min survey in the summer and 1.94 in spring; Appendix F; Table 7). Upland game birds composed 3.4% of overall bird use during spring and 28.9% during summer. Upland game birds were observed during 50.0% of spring surveys and 75.0% of summer surveys (Table 7).

Passerines

Passerines had the highest mean use of any bird type during both seasons (49.38 birds/plot/10-min spring survey and 30.50 summer survey), comprised primarily of the subtype blackbirds/orioles (40.00 and 14.19 birds/plot/10-min survey, respectively) and swallows (3.75 and 8.06, respectively; Table 7). Most of the passerine subtypes had a similar use between the two seasons with the exception of grassland birds/sparrows and swallows; both of which had a considerably higher use in the summer compared to the spring. Passerines were observed during 100% of surveys during both seasons and composed 85.7% of overall spring use and 62.0% of overall summer use (Table 7).

Table 7. Mean bird use (number of birds/plot/10-minute survey), percent of total composition (%), and frequency of occurrence (%) for each bird type and passerine subtypes by season during the breeding bird surveys in the Wildflower Green Energy Farm from May 10, 2011, to June 23, 2011.

	Mean Use		% Composition		% Frequency	
Bird Type / Subtype	**Spring**	**Summer**	**Spring**	**Summer**	**Spring**	**Summer**
Waterbirds	0.25	0.06	0.4	0.1	25.0	6.2
Waterfowl	2.94	0.50	5.1	1.0	12.5	12.5
Shorebirds	1.62	0.62	2.8	1.3	12.5	18.8
Diurnal Raptors	0.44	0.62	0.8	1.3	37.5	18.8
Owls	0.06	0	0.1	0	6.2	0
Vultures	0.25	0	0.4	0	12.5	0
Upland Game Birds	1.94	14.19	3.4	28.9	50.0	75.0
Doves/Pigeons	0.38	2.19	0.7	4.5	18.8	75.0
Large Cuckoos	0	0.06	0	0.1	0	6.2
Passerines	49.38	30.50	85.7	62.1	100	100
Blackbirds/Orioles	*40.00*	*14.19*	*69.4*	*28.8*	*87.5*	*93.8*
Corvids	*1.06*	*0.81*	*1.8*	*1.7*	*50.0*	*37.5*
Finches/Crossbills	*1.00*	*0.81*	*1.7*	*1.7*	*37.5*	*50.0*
Flycatchers	*0.50*	*0.25*	*0.9*	*0.5*	*37.5*	*25.0*
Grassland/Sparrows	*1.62*	*5.19*	*2.8*	*10.5*	*75.0*	*68.8*
Swallows	*3.75*	*8.06*	*6.5*	*16.4*	*56.2*	*43.8*
Tanagers/Grosbeaks/Cardinals	*0*	*0.06*	*0*	*0.1*	*0*	*6.2*
Thrushes	*0*	*0.06*	*0*	*0.1*	*0*	*6.2*
Vireos	*0.06*	*0*	*0.1*	*0*	*6.2*	*0*
Warblers	*0.69*	*0.06*	*1.2*	*0.1*	*50.0*	*6.2*
Waxwings	*0*	*0.12*	*0*	*0.3*	*0*	*12.5*
Wrens	*0.69*	*0.88*	*1.2*	*1.8*	*43.8*	*43.8*
Swifts/Hummingbirds	0.19	0.38	0.3	0.8	18.8	25.0
Woodpeckers	0.19	0.06	0.3	0.1	18.8	6.2
Overall	**57.62**	**49.19**	**100**	**100**		

Spatial Use

For all bird species combined, use between the points varied greatly ranging from 25.00 birds/10-min survey at point five to 88.75 at point eight (Appendix G). Passerines had the highest mean use for all points with the exception of point six at which upland game birds had the highest use. Passerines use was greatest at point eight (62.25), ranging from 12.00 to 58.75 at all other points. Waterfowl were observed only at point eight (13.75 birds/10-min survey), while shorebirds were observed at points eight (8.75) and five (0.25), and waterbirds were observed only at points two (0.50), three (0.50), and seven (0.25). Upland game bird use ranged from 0.75 to 24.50 birds/10-min survey, while use by doves/pigeons ranged from 0.25 to 3.00. Large cuckoos (i.e., greater roadrunner) were observed only at point three (0.25 birds/10-min survey).

Sensitive Species

A total of three sensitive species were recorded during migrating/breeding bird surveys (Table 5). A single willow flycatcher (*Empidonax traillii*) was observed within the WGEF's riparian habitat during spring surveys. All subspecies of willow flycatcher are listed as state-threatened. The southwestern willow flycatcher (*E. t. extmus*), which has federal endangered status in

addition to the state listing, breeds in southern California, while the little willow flycatcher (*E. t. brewsteri*) breeds on the west slope of the Sierra Nevada; however, both species are potential migrants through the WGEF. No willow flycatcher nesting habitat is present within the WGEF and the individual recorded during surveys was believed to be migrating through the area. The subspecies are not easily distinguishable in the field and it is not known which subspecies was observed. In addition, 701 tricolored blackbirds and four yellow warblers, both state species of concern, were observed during migrating/breeding bird surveys (Table 5).

Golden Eagle/Raptor Nest Surveys

No golden eagles or active or inactive golden eagle nests were identified within a 10-mile buffer of the WGEF during the 2010 aerial nest surveys. While golden eagle use of the WGEF was observed during fixed-point surveys, nesting habitat for golden eagles within 10 miles of the WGEF is limited and appears to be of marginal suitability. A Swainson's hawk nest was identified approximately 4.7 miles (7.6 km) to the northeast of the WGEF; however, upon subsequent follow-up visits, the nest was determined to have failed (Table 8). Several additional Swainson's hawk nests are known to occur approximately six to 12 miles (9 to 19 km) to the north and northeast of the WGEF, primarily in association with irrigated agricultural fields (E. Wilson, CDFG, pers. comm.). During focused surveys for Swainson's hawk nests in the spring of 2011, the above nest was found to be occupied by common ravens (Figure 6).

Table 8. Nesting raptor species and nest density (nests/mi^2) for the Wildflower Green Energy Farm and surrounding area. Includes active raptor nests only.

				Nest Density (nests/mi^2)		
Species	**# of nests within WGEF**	**# of nests within 2-miles of WGEF**	**# of nests within 5-miles of WGEF**	**within WGEF**	**within 2-miles of WGEF**	**within 5-miles of WGEF**
red-tailed hawk	2	6	10	0.30	0.12	0.06
great horned owl	1	4	5	0.15	0.08	0.03
Swainson's hawk	0	0	1	0	0	0.01
burrowing owl	5	-	-	0.76	-	-
Overall	**8**	**10**	**16**	**1.21**	**0.20**	**0.10**

The only raptor or raven nests within the boundary of the WGEF included two active red-tailed hawk nests, one active great horned owl nest, and one common raven nest located during 2010 and 2011 raptor nest surveys (Table 8; Figure 6), and five active burrowing owl nests located during 2010 and 2011 burrowing owl surveys (Table 8; Figure 7). Within an approximate 2-mile buffer of the WGEF, an additional two active red-tailed hawk nests, three active great horned owl nests, and 15 common raven nests were recorded (Table 8; Figure 6). The density of active raptor nests within the boundary of the WGEF is 1.21 nests/mi^2 (0.47 nests/km^2), while nest density within two miles of the WGEF is 0.20 nests/mi^2 (0.08 nests/km^2), and nest density within five miles of the WGEF is 0.10 nests/mi^2 (0.04 nests/km^2; Table 8).

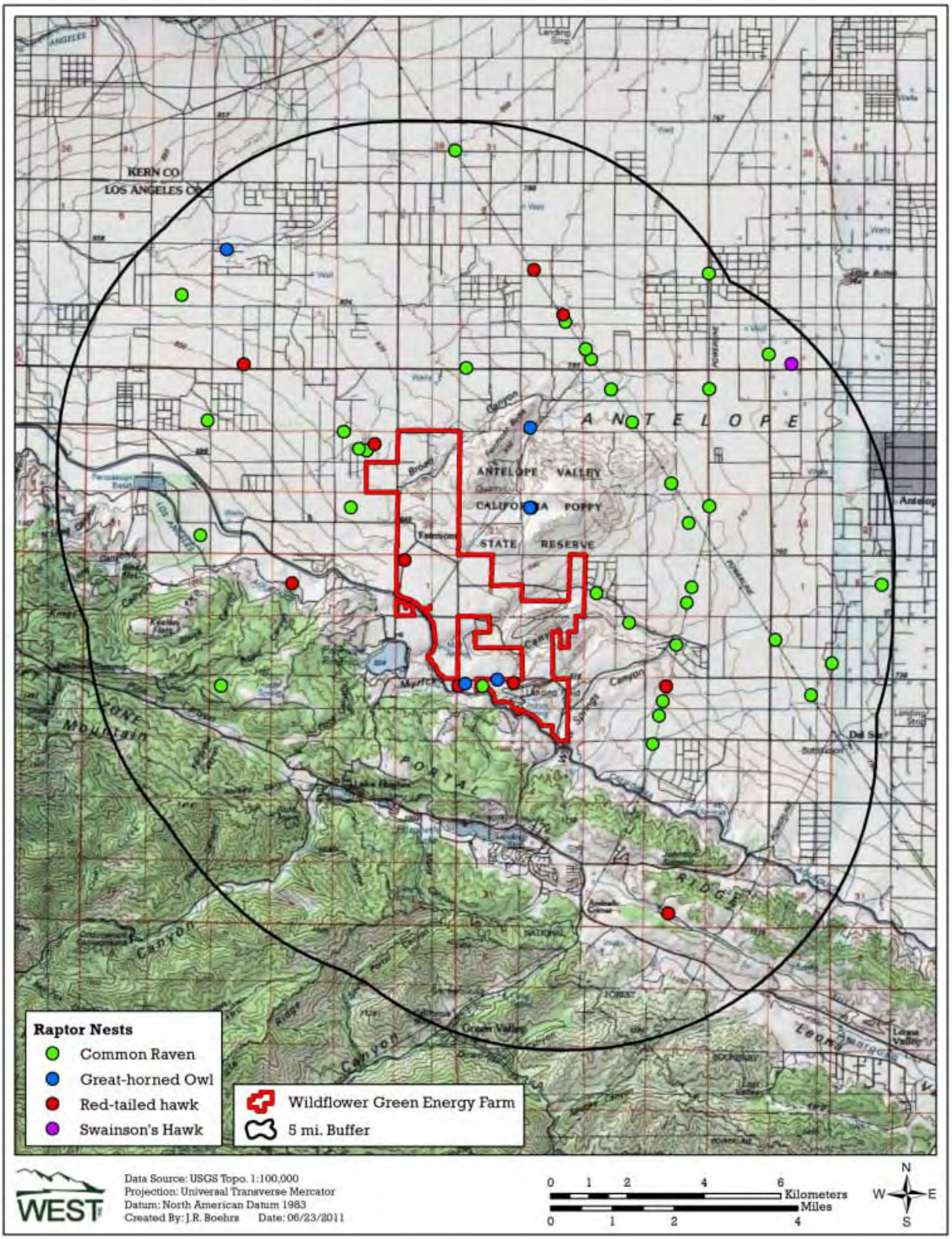


Figure 6. Location of raptor and raven nests within the Wildflower Green Energy Farm.

Burrowing Owl and General Wildlife Surveys

A burrowing owl and general wildlife survey was conducted throughout the WGEF from May 9 to July 12, 2010. Two active burrowing owl territories were identified during the 2010 surveys: an active burrow occupied by a single adult owl in the northern portion of the study area, first observed on May 17, and a pair occupying a burrow also in the northern portion of the study area, first observed on May 20 (Figure 7). Each territory was visited periodically throughout the spring and summer to check for occupancy and nesting status. The single owl was last observed near its burrow on June 10, and not observed on subsequent visits. The pair successfully fledged six young which were observed near their burrow on July 31. This territory continued to be occupied throughout the fall and winter.

Two additional burrows with sign of past use by burrowing owl were recorded during the 2010 surveys. These included a single pellet (less than one year old) found at the entrance to a pipe located at a debris pile near the center of the study area, and an old (greater than one year old) pellet found at a burrow along the proposed transmission line corridor. Follow-up visits were made to these locations and no further sign of use by burrowing owls was observed at either site.

Additional burrowing owl surveys were conducted from May 17 - 31, 2011 within areas not surveyed in 2010. During this survey effort three additional active territories were identified along a wash in the far northern portion of the WGEF (Figure 7). Visits were also made to burrows identified during the 2010 survey. The burrow that was active and fledged young in 2010 was again occupied and successfully fledged young in 2011, while the territory occupied by a single owl in 2010 was again occupied in 2011 but the primary burrow had moved approximately 150 m (492 ft) to the northwest (Figure 7). Active burrowing owl territories will continue to be monitored throughout the fall and winter.

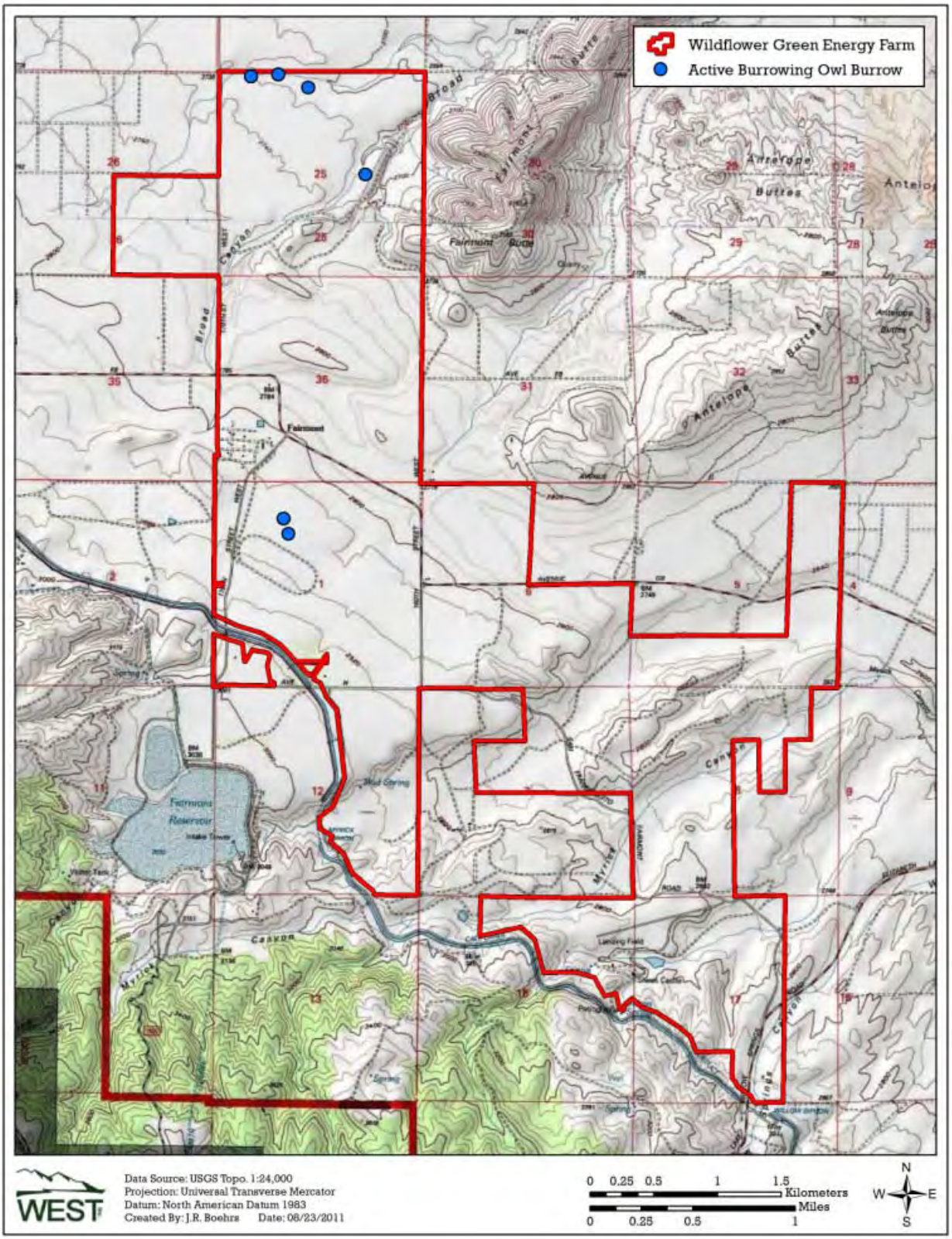


Figure 7. Location of active burrowing owl burrows identified during spring/summer 2010 and 2011 burrowing owl surveys at the Wildflower Green Energy Farm.

Nocturnal Radar Migration Surveys

Nocturnal migration surveys were conducted by Hamer Environmental, L.P. at two sampling locations within the WGEF during the 2010 spring and fall migration seasons (Hamer 2011; Appendix H). During spring, surveys were conducted from April 20 through May 19, 2010. During the fall, surveys were conducted from September 8 through October 8, 2010; with sampling occurring on 28 nights. Surveys were attempted on a total of 30 nights but only 27 nights of sampling were successful. The lost nights were due to heavy rain cluttering the radar screen and/or high and moderate gale force winds at the sampling locations.

Results of the spring and fall nocturnal migration surveys are summarized below. A more detailed report of survey results is presented in the *Spring and Fall Nocturnal Migration Surveys for the Proposed Wildflower Green Energy Farm, Los Angeles County, California* (Hamer 2011; Appendix H).

Passage Rates

Temporal use of WGEF by nocturnal migrants during the survey was defined as the average number of detected events per hour (hr) within the radar sampled area and expressed as a passage rate. During the spring sampling period, the average hourly passage rate for both sampling locations combined was 156 ± 17 targets/km/hr (mean ± SE). The highest passage rate of the spring survey period occurred on May 1 at the southeast sampling location (626 targets/hr/3 km), followed by May 3 at the northwest location (529 targets/hr/3 km). Not including nights with rained out sessions, the lowest passage rate occurred on April 21 at the northwest location (3 targets/hr/3 km).

During the fall sampling period, the average hourly passage rate for both sampling locations combined was 86 ± 8 targets/hr/3 km. The highest passage rate of the fall occurred on September 27 at the southeast sampling location (240 targets/hr/3 km), followed by September 25, also at the southeast location (235 targets/hr/3 km). Not including nights with rained out sessions, the lowest passage rate occurred on September 16 at the northwest location (8 targets/hr/3 km).

Flight Heights

Target altitude was measured in relation to a horizontal line running through the point of origin for the radar and thus termed above radar level (arl). During the spring, mean flight height of migrating birds across both sampling locations was 697 ± 8 m arl, with approximately 11% of targets with flight altitudes less than 150 m (within the estimated zone of risk posed by turbines at the WGEF). During the fall, mean flight height across both sampling locations was 777 ± 13 m arl, with approximately 2% of targets flying below 150 m.

Flight Direction

During the spring, the mean flight direction was 45 degrees at the northwest sampling location and 138 degrees at the southeast location. During the fall, the median flight direction at the northwest location was 128 degrees, and 133 degrees at the southeast location.

DISCUSSION AND IMPACT ASSESSMENT

Potential Impacts

Impacts to wildlife resources from wind energy facilities can be direct or indirect. Direct impacts are considered to be the potential for fatalities from construction and operation of the facility. Indirect impacts include the potential to displace wildlife, either temporarily or permanently, during the facility's construction or during the period of operation.

Direct Effects

The most probable direct impact to birds from wind energy facilities is mortality or injury due to collisions with turbines or guy wires of meteorological (met) towers. Collisions may occur with resident birds foraging and flying within the study area or with migrant birds moving seasonally through the study area. Project construction could affect birds through loss of habitat, or potential fatalities from construction equipment. Impacts from the decommissioning of the facility are anticipated to be similar to construction in terms of noise, disturbance, and equipment. Potential mortality from construction equipment is expected to be very low as equipment used in wind energy facility construction generally moves at slow rates or is stationary for long periods (e.g., cranes). The risk of direct mortality to birds from construction is most likely potential destruction of a nest for ground- and shrub-nesting species during initial site clearing.

Substantial data on bird mortality at modern wind energy facilities are available from studies throughout North America (Appendix I). For the purpose of comparison with the WGEF Project, a list of avian fatality estimates for facilities in California and the Pacific Northwest with publically-available data is presented in Table 9. Mortality rates for all bird species combined varied greatly at these facilities, ranging from 0.16 birds/MW/year to 6.66 birds/MW/year (Table 9; Figure 8). Not all studies with publically-available fatality data (see appendices J and K) have data on specific species or mortality estimates for avian subtypes. One study looked at 12 fatality studies, primarily in the Pacific Northwest, and found that diurnal raptor fatalities composed just 2% of the wind energy facility-related fatalities. Passerines (excluding house sparrows [*Passer domesticus*] and European starlings) were the most common collision victims, composing about 82% of the 225 fatalities documented (Erickson et al. 2002b). Another study, focusing on the western United States, reported passerines were the most common fatalities, composing 59.3% of all avian fatalities, while raptors composed 19.4% of all avian mortality. Upland game birds, shorebirds, waterbirds, and waterfowl were also found as fatalities, but were much less common (Johnson and Stephens 2011).

Table 9. Wind energy facilities in California and the Pacific Northwest with fatality data for all bird species.

Wind Energy Facility	Fatality Estimate[A]	No. of Turbines	Total MW
California			
Altamont Pass, CA	9.57	over 5,000	about 550
Pine Tree, CA	8.30[B]	90	135
Dillon, CA	4.71	45	45
Diablo Winds, CA	4.29	31	20
High Winds, CA (2004)	1.62	90	162
High Winds, CA (2005)	1.10	90	162
SMUD, CA	0.99	-	15
Alite, CA	0.55	8	24
Pacific Northwest			
Leaning Juniper, OR	6.66	67	100.5
Klondike III, OR	3.55	122	375
Stateline, OR/WA (2002)	3.48	454	300
Klondike II, OR	3.14	50	75
Stateline, OR/WA (2003)	2.95	454	300
Nine Canyon, WA	2.76	37	48
Combine Hills, OR	2.56	41	41
Big Horn, WA	2.54	133	199.5
Biglow Canyon I, OR (2009)	2.47	76	125.4
Biglow Canyon I, OR (2008)	1.76	76	125.4
Wild Horse, WA	1.55	127	229
Hopkins Ridge, WA (2006)	1.23	83	150
Vansycle, OR	0.95	38	24.9
Klondike, OR	0.95	16	24
Elkhorn, OR	0.64	61	101
Marengo I, WA	0.27	78	140.4
Marengo II, WA	0.16	39	70.2

A=number of bird fatalities/MW/study period
B= corrected for mathematical error in estimate reported by BioResource Consultants (2010).
Data from the following sources:

Facility	Fatality Estimate	Facility	Fatality Estimate
Altamont Pass, CA	ICF 2011	Stateline, OR/WA (03)	Erickson et al. 2004
Pine Tree, CA	BioResource Consultants 2010	Combine Hills, OR	Young et al. 2006
Dillon, CA	Chatfield et al. 2009	Big Horn, WA	Kronner et al. 2008
Diablo Winds, CA	WEST 2008	Biglow Canyon, OR (Phase I; 09)	Enk et al. 2010
High Winds, CA (04)	Kerlinger et al. 2006	Hay Canyon, OR	Gritski and Kronner 2010a
High Winds, CA (05)	Kerlinger et al. 2006	Pebble Springs, OR	Gritski and Kronner 2010b
SMUD Solano, CA	Erickson and Sharp 2005	Biglow Canyon I, OR (Phase I; 08)	Jeffrey et al. 2009a
Alite, CA	Chatfield et al. 2010b	Wild Horse, WA	Erickson et al. 2008
Biglow Canyon, OR (Phase II; 09-10)	Enk et al. 2011	Stateline II, OR/WA	Erickson et al. 2007
Leaning Juniper, OR	Gritski et al. 2008	Hopkins Ridge, WA (06)	Young et al. 2007a
Tuolumne (Windy Point I), WA	Enz and Bay 2010	Vansycle, OR	Erickson et al. 2000
Stateline, OR/WA (02)	Erickson et al. 2004	Klondike, OR	Johnson et al. 2003
Klondike II, OR	NWC and WEST 2007	Elkhorn, OR	Jeffrey et al. 2009b
Klondike III, OR	Gritski et al. 2009	Marengo I, WA	URS Corporation 2010a
Hopkins Ridge, WA (08)	Young et al. 2009c	Marengo II, WA	URS Corporation 2010b
Nine Canyon, WA	Erickson et al. 2003c		

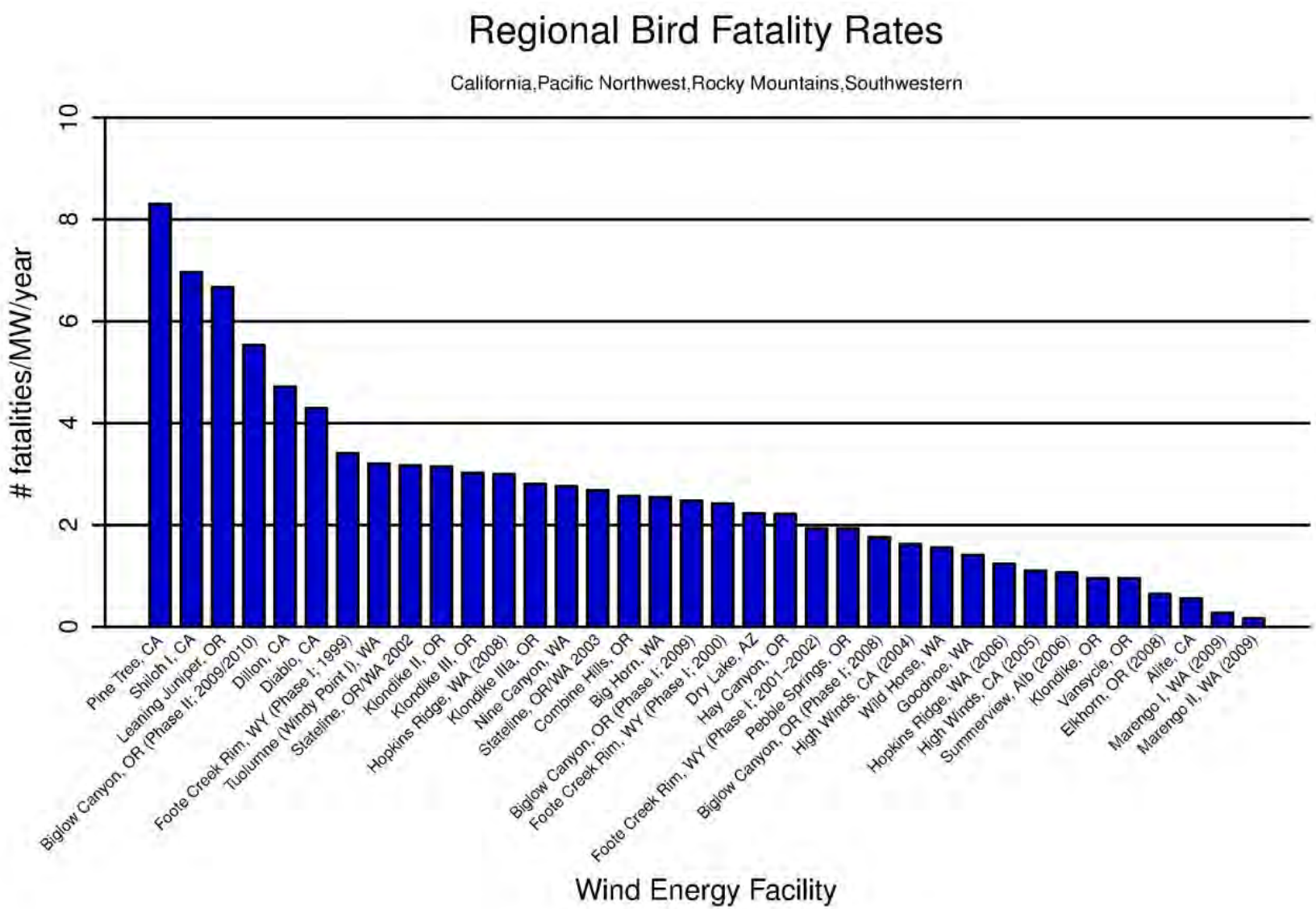


Figure 8. Comparison of all bird fatalities/MW/year at western North America wind energy facilities.

Figure 8 (*continued*). Comparison of all bird fatalities/MW/year at western North America wind energy facilities.

Data from the following sources:

Study and Location	Fatality Rate	Reference	Study and Location	Fatality Rate	Reference	Study and Location	Fatality Rate	Reference
Pine Tree, CA	8.30*	BioResource Consultants 2010	Klondike IIIa, OR	2.80	Gritski et al. 2009b	High Winds, CA (2004)	1.62	Kerlinger et al. 2006
Biglow Canyon, OR (Phase II; 2009/2010)	6.96	Enk et al. 2011	Nine Canyon, WA	2.76	Erickson et al. 2003c	Wild Horse, WA	1.55	Erickson et al. 2008
Shiloh I, CA	6.66	Kerlinger et al. 2010	Stateline, OR/WA (2003)	2.68	Erickson et al. 2004	Goodnoe, WA	1.4	URS Corporation 2010a
Leaning Juniper, OR	5.53	Kronner et al. 2007	Combine Hills, OR	2.56	Young et al. 2006	Hopkins Ridge, WA (2006)	1.23	Young et al. 2007a
Dillon, CA	4.71	Chatfield et al. 2009	Big Horn, WA	2.54	Kronner et al. 2008	High Winds, CA (2005)	1.10	Kerlinger et al. 2006
Diablo, CA	4.29	WEST 2006, 2008	Biglow Canyon, OR (Phase I; 2009)	2.47	Enk et al. 2010	Summerview, Alb (2006)	1.06	Brown and Hamilton 2006b
Foote Creek Rim, WY (Phase I; 1999)	3.40	Young et al. 2003c	Foote Creek Rim, WY (Phase I; 2000)	2.42	Young et al. 2003c	Klondike, OR	0.95	Johnson et al. 2003
Tuolumne (Windy Point I), WA	3.20	Enz and Bay 2010	Dry Lake, AZ	2.22	Thompson et al. 2011	Vansycle, OR	0.95	Erickson et al. 2000
Stateline, OR/WA (2002)	3.17	Erickson et al. 2004	Hay Canyon, OR	2.21	Gritski and Kronner 2010a	Elkhorn, OR (2008)	0.64	Jeffrey et al. 2009b
Klondike II, OR	3.14	NWC and WEST 2007	Foote Creek Rim, WY (Phase I; 2001-2002)	1.93	Young et al. 2003c	Alite, CA	0.55	Chatfield et al. 2010b
Klondike III, OR	3.02	Gritski et al. 2009a	Pebble Springs, OR	1.93	Gritski and Kronner 2010b	Marengo I, WA (2009)	0.27	URS Corporation 2010b
Hopkins Ridge, WA (2008)	2.99	Young et al. 2009c	Biglow Canyon, OR (Phase I; 2008)	1.76	Jeffrey et al. 2009a	Marengo II, WA (2009)	0.16	URS Corporation 2010c

*fatality estimate from Pine Tree, CA corrected for mathematical error in number reported by BioResource Consultants (2010).

The Altamont Pass Wind Resource Area (APWRA) located in west-central California, had the highest fatality rate among facilities in California and the Pacific Northwest, with a rate of 9.57 birds/MW/year (IFC 2011). The APWRA currently contains over 5,000 wind turbines, with a total capacity of 550 MW. The APWRA uses older, smaller wind turbines that typically range in size from 40 to 300 kW (Arnett et al. 2007), while most recent wind energy facilities use larger turbines, ranging in size from 600 kW to 2.5 MW. The higher mortality rates observed at the APWRA have not been observed at other old-generation wind energy facilities in California, namely the Tehachapi Pass and San Gorgonio Wind Resource Areas (Anderson et al. 2004, 2005). Based on studies conducted at newer wind energy facilities, overall bird mortality in California ranges from low to high compared to other sites in the Pacific Northwest (Table 9) and throughout North America (Appendix J1). Among more modern wind energy facilities, the Pine Tree Wind Farm (PTWF), located in southeastern Kern County, had the highest mortality rate among facilities in California and the Pacific Northwest, with a rate of 8.4 birds/MW/year, during 12 consecutive months of fatality monitoring in 2009-2010 (BioResource Consultants 2010). According to BioResource Consultants (2010), the estimated fatality rate at the PTWF may be inflated due to the dual effect of low searcher efficiency and high scavenger removal rates. The Dillon facility in Riverside County (Chatfield et al. 2009) and the Diablo Winds facility in Alameda County (WEST 2008) had more moderate fatality estimates (4.71 and 4.29 birds/MW/year, respectively). Two years of study were conducted at the High Winds facility, with an estimate of 1.62 bird/MW/year in 2004 and 1.10 birds/MW/year in 2005 (Kerlinger et al. 2006). The Alite facility, located approximately 17 miles (27 km) north of the WGEF, recorded the lowest mortality rate of sites reviewed in California, with an estimate of 0.55 birds/MW/year (Chatfield et al. 2010b; Table 9).

Raptor fatality rates are generally much lower than the rates for other species groups. With the possible exception of golden eagles at the APWRA, California, where an estimated 40–70 golden eagles are killed each year (Hunt 2002, Smallwood and Thelander 2004), no wind energy facilities have been documented to cause population declines of any species (Johnson and Stephens 2011). In the only study to quantitatively assess potential population level impacts, Hunt (2002) conducted a 4-year radio telemetry study of golden eagles at the APWRA and found that the resident golden eagle population appeared to be self-sustaining despite high levels of fatalities, but the effect of these fatalities on eagle populations wintering within and adjacent to the APWRA was unknown. All 58 territories occupied by golden eagle pairs in the APWRA in 2000 remained active in 2005 (Hunt and Hunt 2006). The APWRA currently contains over 5,000 wind turbines, with a total capacity of 550 MW. The higher mortality rates observed at the APWRA have not been observed at other old-generation wind farms in California, namely the Tehachapi Pass and San Gorgonio Wind Resource Areas (WRAs; Anderson et al. 2004, 2005).

Diurnal Raptor Use and Exposure Risk

Annual mean diurnal raptor use (number of raptors divided by the number of 800-m plots and the total number of surveys) at the WGEF was compared with 43 other western and Midwestern wind energy facilities that implemented similar protocols and had data for three or four seasons.

The annual mean raptor use at these wind energy facilities ranged from 0.06 to 2.34 raptors/plot/20-min survey (Figure 9). Based on the results from these wind energy facilities a ranking of seasonal raptor mean use was developed as follows: low (0 – 0.5 raptors/plot/20-min survey), low to moderate (0.5 – 1.0), moderate (1.0 – 2.0), high (2.0 – 3.0), and very high (more than 3.0). Under this ranking, the adjusted mean diurnal raptor use at the WGEF (0.85 raptors/plot/20-min survey) is considered to be low to moderate, ranking seventh compared to the other wind energy facilities (Figure 9). On a seasonal basis, the adjusted mean raptor use estimates at the WGEF are considered to be moderate in the winter (1.28 raptors/plot/20-min survey), low to moderate in the fall (0.98) and summer (0.72), and low in the spring (0.39), relative to other wind energy facilities (Appendix L).

Although high numbers of raptor fatalities have been documented at some wind energy facilities (e.g., the APWRA), a review of studies at wind energy facilities across the United States reported that only 3.2% of casualties were raptors (Erickson et al. 2001a). Indeed, although raptors occur in most areas with the potential for wind energy development, individual species appear to differ from one another in their susceptibility to collision (NRC 2007). Results from Altamont Pass in California suggest that mortality for some species is not necessarily related to abundance (Orloff and Flannery 1992). American kestrels, red-tailed hawks, and golden eagles were killed more often than predicted based on abundance. For example, American kestrel use at the High Winds wind energy facility in California was nearly seven times higher than that recorded at the Altamont facility (Kerlinger et al. 2005), however, fatality rates at the Altamont facility were nearly seven times higher than at the High Winds facility (Kerlinger et al. 2006, Altamont Pass Avian Monitoring Team 2008). In contrast, relatively few northern harrier fatalities at existing wind energy facilities have been reported in publicly-available documents to date, despite the fact they are commonly observed during fixed-point bird counts at these facilities (Erickson et al. 2001a, Whitfield and Madders 2006, Smallwood and Karas 2009). Because northern harriers often forage close to the ground (MacWhirter and Bildstein 1996), risk of collision with turbine blades is considered low for this species (Whitfield and Madders 2005, 2006). It is likely that many factors, in addition to abundance, are important in predicting raptor mortality.

Exposure indices analysis may also provide insight into which species might be the most likely turbine casualties; however, the index only considers relative probability of exposure based on abundance, proportion of observations flying, and proportion of flight height of each species within the RSH for turbines likely to be used at the wind energy facility. This analysis is based on observations of birds during the surveys and does not take into consideration behavior (e.g., foraging, courtship), habitat selection, the ability to detect and avoid turbines, and other factors that may vary among species and influence likelihood for turbine collision. For these reasons, the exposure index is only a relative index among species observed during the surveys and within the study area. Actual risk for some species may be lower or higher than indicated by these data. At the WGEF, the raptor species with the highest exposure index was red-tailed hawk, which was influenced by the relatively high use estimates for this species.

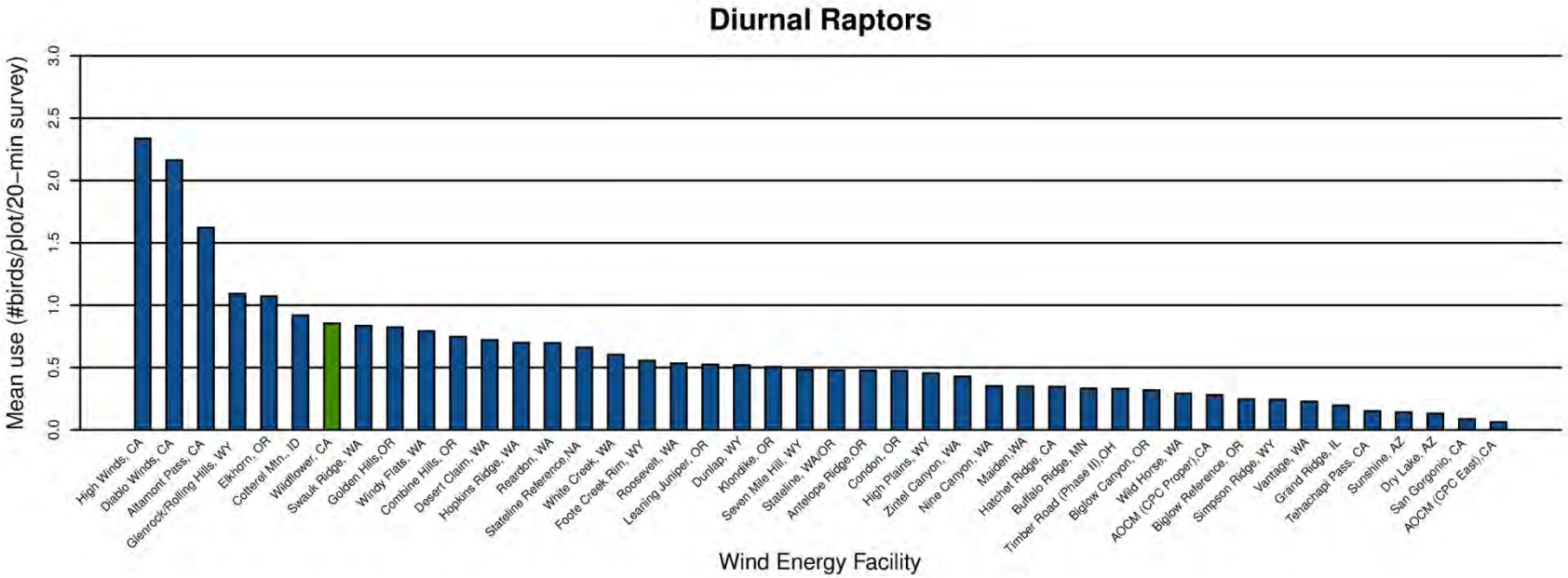


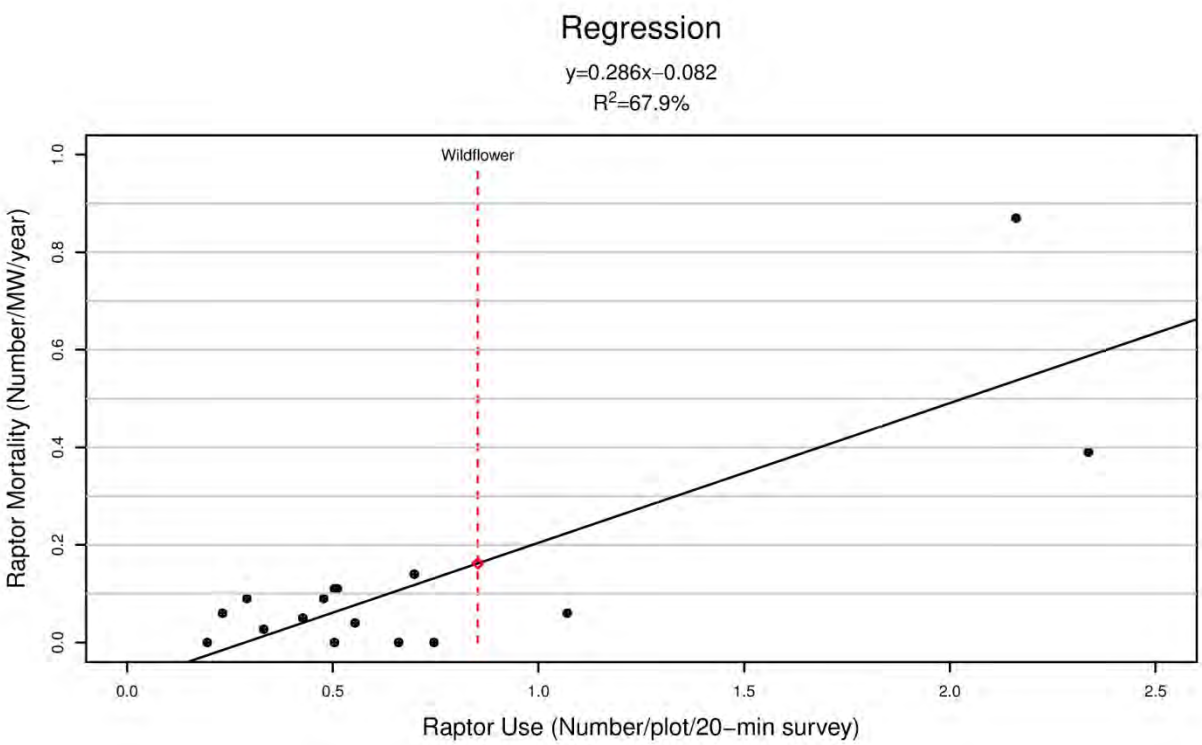
Figure 9. Overall comparison of annual diurnal raptor use between the Wildflower Green Energy Farm and other wind energy facilities in the western and Midwestern US.

Data from the following sources:

Study and Location	Reference	Study and Location	Reference	Study and Location	Reference
Wildflower Green, CA	This study.				
High Winds, CA	Kerlinger et al. 2005	Foote Creek Rim, WY	Johnson et al. 2000b	Timber Road (Phase II), OH	Good et al. 2010
Diablo Winds, CA	WEST 2006	Roosevelt, WA	NWC and WEST 2004	Biglow Canyon, OR	WEST 2005d
Altamont Pass, CA	Orloff and Flannery 1992	Leaning Juniper, OR	Kronner et al. 2005	Wild Horse, WA	Erickson et al. 2003d
Glenrock/Rolling Hills, WY	Johnson et al. 2008a	Dunlap, WY	Johnson et al. 2009a	AOCM (CPC Proper), CA	Chatfield et al. 2010a
Elkhorn, OR	WEST 2005a	Klondike, OR	Johnson et al. 2002a	Biglow Reference, OR	WEST 2005d
Cotterel Mtn., ID	BLM 2006	Seven Mile Hill, WY	Johnson et al. 2008b	Simpson Ridge, WY	Johnson et al. 2000b
Swauk Ridge, WA	Erickson et al. 2003b	Stateline, WA/OR	Erickson et al. 2003a	Vantage, WA	WEST 2007
Golden Hills, OR	Jeffrey et al. 2008	Antelope Ridge, OR	WEST 2009	Grand Ridge, IL	Derby et al. 2009
Windy Flats, WA	Johnson et al. 2007b	Condon, OR	Erickson et al. 2002b	Tehachapi Pass, CA	Anderson et al. 2000, Erickson et al. 2002b
Combine Hills, OR	Young et al. 2003d	High Plains, WY	Johnson et al. 2009b	Sunshine, AZ	WEST and the CPRS 2006
Desert Claim, WA	Young et al. 2003b	Zintel Canyon, WA	Erickson et al. 2002a, 2003c	Dry Lake, AZ	Young et al. 2007c
Hopkin's Ridge, WA	Young et al. 2003a	Nine Canyon, WA	Erickson et al. 2001	San Gorgonio, CA	Anderson et al. 2000, Erickson et al. 2002b
Reardon, WA	WEST 2005b	Maiden, WA	Young et al. 2002	AOCM (CPC East), CA	Chatfield et al. 2010a
Stateline Reference	URS et al. 2001	Hatchet Ridge, CA	Young et al. 2007b		
White Creek, WA	NWC and WEST 2005	Buffalo Ridge, MN	Johnson et al. 2000a		

A regression analysis of raptor use and mortality for 16 new-generation wind energy facilities, where similar methods were used to estimate raptor use showed a significant (R^2 = 67.9%) correlation between raptor use and raptor collision mortality (Figure 10). Using this regression to predict raptor collision mortality at the WGEF yields an estimated fatality rate of 0.16 fatalities/MW/year, or 16 raptor fatalities per year for each 100-MW of wind energy development based on an adjusted mean diurnal raptor use of 0.85 raptors/20-min survey. A 90% prediction interval around this estimate is zero to 0.40 fatalities/MW/year. The mean and range of mortality rates for sites considered to have low to moderate raptor use is 0.08 raptors/MW/year (0 – 0.21 raptors/MW/year; Table 10 and Appendix J2) and is likely a more realistic range to use for predicting mortality at the WGEF.

Mean annual diurnal raptor use at the WGEF was compared with other wind energy facilities in California and the Pacific Northwest with publically available post-construction fatality data and corresponding raptor use data (Table 10; Figure 11; Appendix J2). Raptor mortality rates at these facilities ranged from zero to 2.18 raptors/MW/year (Table 10; Figure 11). Raptor use estimates at these same facilities range from 0.21 raptors/20-min survey at the Stateline facility in Oregon and Washington (Erickson et al. 2003a), to 2.16 raptors/20-min survey at the Diablo Winds facility in California (WEST 2006). The adjusted annual raptor use estimate for the WGEF is considerably lower than the two facilities in California and more similar to sites in the Pacific Northwest (Table 10). Assuming a correlation between use and fatality rates exists, raptor mortality at the WGEF is expected to much lower than that observed at the High Winds or Diablo Winds facilities and more similar to facilities in the Pacific Northwest (Table 10; Figure 11).



Overall Diurnal Raptor Use 0.85
Predicted Fatality Rate 0.16 fatalities/MW/year
90.0% Prediction Interval (0, 0.40 fatalities/MW/year)

Figure 10. Regression analysis comparing raptor use estimations versus estimated raptor mortality.

Data from the following sources:

Study and Location	Raptor Use (birds/plot /20-min survey)	Reference	Raptor Mortality (fatalities/MW/yr)	Reference
Bighorn, WA	0.51	Johnson and Erickson 2004	0.11	Kronner et al. 2008
Buffalo Ridge, MN	0.33	Johnson et al. 2000a	0.03	Johnson et al. 2000a, 2002b
Combine Hills, OR	0.75	Young et al. 2003d	0	Young et al. 2006
Diablo Winds, CA	2.16	WEST 2006	0.87	WEST 2008
Dry Lake I, AZ	0.13	Thompson et al. 2011	0	Thompson et al. 2011
Elkhorn, OR	1.07	WEST 2005a	0.06	Jeffrey et al. 2009b
Foote Creek Rim, WY	0.55	Johnson et al. 2000b	0.04	Young et al. 2003c
Grand Ridge, IL	0.20	Derby et al. 2009	0	Derby et al. 2010g
High Winds, CA	2.34	Kerlinger et al. 2005	0.39	Kerlinger et al. 2006
Hopkins Ridge, WA	0.70	Young et al. 2003a	0.14	Young et al. 2007a
Klondike, OR	0.50	Johnson et al. 2002a	0	Johnson et al. 2003
Klondike II, OR	0.50	Johnson 2004	0.11	NWC and WEST 2007
Nine Canyon (Zintel), WA	0.43	Erickson et al. 2002a	0.05	Erickson et al. 2003c
Stateline, OR/WA	0.48	Kerlinger et al. 2006	0.09	Erickson et al. 2004
Vansycle, OR	0.66	WCIA and WEST 1997	0	Erickson et al. 2000
Wessington Springs, SD	0.23	Derby et al. 2008	0.06	Derby et al. 2010f
Wild Horse, WA	0.29	Erickson et al. 2003d	0.09	Erickson et al. 2008

Table 10. Wind energy facilities in California and the Pacific Northwest with comparable use and fatality data for raptor species.

Wind Energy Facility	Raptor Use Estimate[A]	Raptor Fatality Estimate[B]	No. of Turbines	Total MW
Wildflower Green, CA	**0.85**			
	California			
Diablo, CA	2.16	0.87	31	20.46
Shiloh I, CA		0.42	100	150
Pine Tree, CA		0.13*	90	135
Alite, CA		0.12	8	24
Dillon, CA		0	45	45
	Pacific Northwest			
Tuolumne (Windy Point I), WA		0.29	62	136.6
Leaning Juniper, OR		0.21	67	100.5
Biglow Canyon, OR (Phase II; 2009/2010)		0.20	65	150
Goodnoe, WA		0.17	47	94
Klondike III, OR		0.15	122	375
Hopkins Ridge, WA (2006)	0.70	0.14	83	150
Klondike II, OR	0.50	0.11	50	75
Big Horn, WA	0.51	0.11	133	199.5
Wild Horse, WA	0.29	0.09	127	229
Stateline, OR/WA 2002	0.48	0.09	454	263
Stateline, OR/WA 2003		0.09	454	263
Hopkins Ridge, WA (2008)		0.07	87	156.6
Elkhorn, OR (2008)	1.07	0.06	61	101
Klondike IIIa, OR		0.06	125	375
Nine Canyon, WA	0.43	0.05	37	48.1
Marengo II, WA (2009)		0.05	39	70.2
Pebble Springs, OR		0.04	47	98.7
Biglow Canyon, OR (Phase I; 2009)		0.04	76	125.4
Biglow Canyon, OR (Phase I; 2008)		0.03	76	125.4
Klondike, OR	0.50	0	16	24
Vansycle, OR	0.66	0	38	24.9
Combine Hills, OR	0	0	41	41
Marengo I, WA (2009)		0	39	70.2
Hay Canyon, OR		0	48	100.8

*fatality estimate from Pine Tree, CA corrected for mathematical error in number reported by BioResource Consultants (2010).
A = Number of raptors/800-m plot/20-min survey
B = Number of fatalities/MW/year

Table 10 (*continued*). Wind energy facilities in California and the Pacific Northwest with comparable use and fatality data for raptor species.

Data from the following sources:

Wind Energy Facility	Use Estimate	Fatality Estimate
Diablo Winds, CA	WEST 2006	WEST 2006, 2008
Shiloh I, CA		Kerlinger et al. 2010
Pine Tree, CA		BioResource Consultants 2010
Alite, CA		Chatfield et al. 2010b
Dillon, CA		Chatfield et al. 2009
Tuolumne (Windy Point I), WA		Enz and Bay 2010
Leaning Juniper, OR		Kronner et al. 2007
Biglow Canyon, OR (Phase II; 2009/2010)		Enk et al. 2011
Goodnoe, WA		URS Corporation 2010a
Klondike III, OR		Gritski et al. 2009a
Hopkins Ridge, WA (2006)	Young et al. 2003a	Young et al. 2007
Klondike II, OR	Johnson 2004	NWC and WEST 2007
Big Horn, WA	Johnson and Erickson 2004	Kronner et al. 2008
Wild Horse, WA	Erickson et al. 2003d	Erickson et al. 2008
Stateline, OR/WA 2002	Erickson et al. 2003a	Erickson et al. 2004
Stateline, OR/WA 2003		Erickson et al. 2004
Hopkins Ridge, WA (2008)		Young et al. 2009c
Elkhorn, OR (2008)	WEST 2005a	Jeffrey et al. 2009b
Klondike IIIa (Phase II), OR		Gritski et al. 2009b
Nine Canyon, WA	Erickson et al. 2002	Erickson et al. 2003c
Marengo II, WA (2009)		URS Corporation 2010c
Pebble Springs, OR		Gritski and Kronner 2010b
Biglow Canyon, OR (Phase I; 2009)		Enk et al. 2010
Biglow Canyon, OR (Phase I; 2008)		Jeffrey et al. 2009a
Klondike, OR	Johnson et al. 2002a	Johnson et al. 2003
Vansycle, OR	WCIA and WEST 1997	Erickson et al. 2000
Combine Hills, OR		Young et al. 2006
Marengo I, WA (2009)		URS Corporation 2010b
Hay Canyon, OR		Gritski and Kronner 2010a

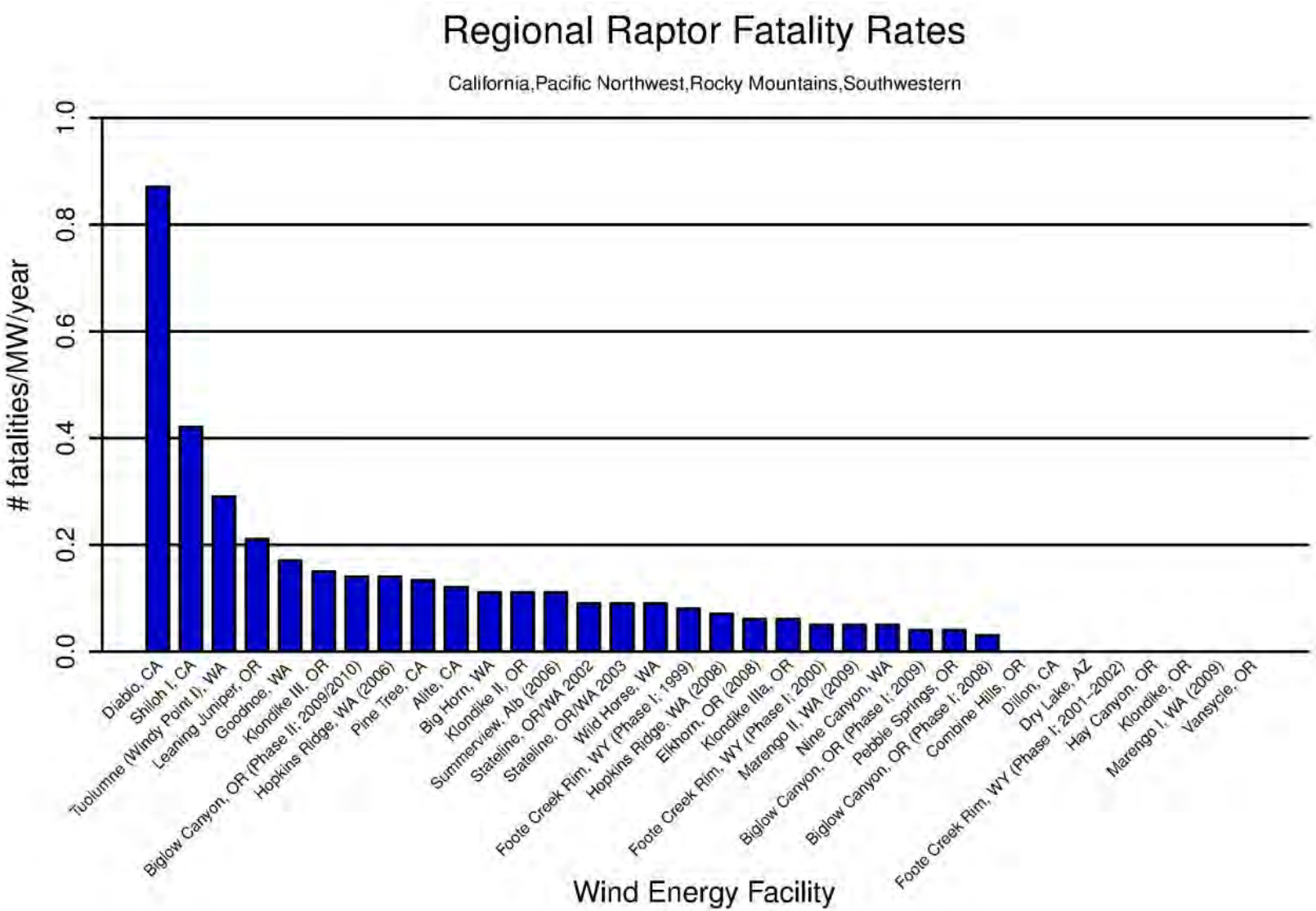


Figure 11. Comparison of all raptor fatalities/MW/year at western US wind energy facilities.

Figure 11 (*continued*). Comparison of all raptor fatalities/MW/year at western US wind energy facilities.

Data from the following sources:

Study and Location	Fatality Rate	Reference	Study and Location	Fatality Rate	Reference	Study and Location	Fatality Rate	Reference
Diablo, CA	0.87	WEST 2006, 2008	Summerview, Alb (2006)	0.11	Brown and Hamilton 2006b	Pebble Springs, OR	0.04	Gritski and Kronner 2010b
Shiloh I, CA	0.42	Kerlinger et al. 2010	Stateline, OR/WA 2002	0.09	Erickson et al. 2004	Biglow Canyon, OR (Phase I; 2008)	0.03	Jeffrey et al. 2009a
Tuolumne (Windy Point I), WA	0.29	Kerlinger et al. 2010	Stateline, OR/WA 2003	0.09	Erickson et al. 2004	Combine Hills, OR	0	Young et al. 2006
Leaning Juniper, OR	0.21	Kerlinger et al. 2010	Wild Horse, WA	0.09	Erickson et al. 2008	Dillon, CA	0	Chatfield et al. 2009
Goodnoe, WA	0.17	URS Corporation 2010a	Foote Creek Rim, WY (Phase I; 1999)	0.08	Young et al. 2003c	Dry Lake, AZ	0	Thompson et al. 2011
Klondike III, OR	0.15	Gritski et al. 2009a	Hopkins Ridge, WA (2008)	0.07	Young et al. 2009c	Foote Creek Rim, WY (Phase I; 2001-2002)	0	Young et al. 2003c
Biglow Canyon, OR (Phase II; 2009/2010)	0.14	Enk et al. 2011	Elkhorn, OR (2008)	0.06	Jeffrey et al. 2009b	Hay Canyon, OR	0	Gritski and Kronner 2010a
Hopkins Ridge, WA (2006)	0.14	Young et al. 2007a	Klondike IIIa, OR	0.06	Gritski et al. 2009b	Klondike, OR	0	Johnson et al. 2003
Pine Tree, CA	0.13*	BioResource Consultants 2010	Foote Creek Rim, WY (Phase I; 2000)	0.05	Young et al. 2003c	Marengo I, WA (2009)	0	URS Corporation 2010b
Alite, CA	0.12	Chatfield et al. 2010b	Marengo II, WA (2009)	0.05	URS Corporation 2010c	Vansycle, OR	0	Erickson et al. 2000
Big Horn, WA	0.11	Kronner et al. 2008	Nine Canyon, WA	0.05	Erickson et al. 2003c			
Klondike II, OR	0.11	NWC and WEST 2007	Biglow Canyon, OR (Phase I; 2009)	0.04	Enk et al. 2010			

*fatality estimate from Pine Tree, CA corrected for mathematical error in number reported by BioResource Consultants (2010).

Non-Raptor Use and Exposure Risk

Passerines (primarily perching birds) have been the most abundant bird fatalities at wind energy facilities outside California (Erickson et al. 2001a, Erickson et al. 2002b), often composing more than 80% of bird fatalities. Both migrant and resident passerine fatalities have been observed. Given that passerines made up a large proportion of the birds observed during the baseline study, passerines would be expected to make up the largest proportion of fatalities at the WGEF. Exposure indices indicate that house finch, tree swallow, and horned lark are the most likely small birds to be exposed to collision from wind turbines at the WGEF. At the PTWF located in southeastern Kern County, passerines composed approximately 58% of annual avian mortality, with western scrub-jay (*Aphelocoma californica*) and western meadowlark (*Sturnella neglecta*) the most common passerine fatalities encountered during a 12-month fatality monitoring study (BioResource Consultants 2010).

Of the large bird species observed at the WGEF, common raven exhibited the highest exposure index. Despite this relatively high exposure index and the high use estimates observed for ravens, post-construction fatality studies at other wind energy facilities in the western US reveal relatively low mortality for common ravens, suggesting this species is not very susceptible to collisions with turbines. Common ravens composed 4.2% of fatalities at the PTWF (BioResource Consultants 2010), and among 5,283 fatalities recorded at the APWRA, only 86 (1.6%) were common ravens (Smallwood and Karas 2009). Turkey vulture had the fourth highest exposure index at the WGEF (behind American white pelican and red-tailed hawk). Post-construction avian fatality monitoring studies at facilities in California have documented relatively few vulture fatalities, and Orloff and Flannery (1992) suggest that turkey vultures are killed less often than predicted based on abundance at older-generation wind energy facilities. Out of 127 fatalities at the Tehachapi Pass WRA (Anderson et al. 2004), there were no recorded vulture fatalities, and out of the 5,283 fatalities at APWRA (Smallwood and Karas 2009), there were only 32 documented vulture fatalities. During a two-year study at the new-generation High Winds WRA, only four vultures were found among 301 total fatalities (Kerlinger et al. 2006). While fatality data for new-generation WRAs is limited, Tierney (2007) suggests that turkey vultures may show higher susceptibility to collision at the new-generation facilities than previously believed. During post-construction monitoring conducted at the Buffalo Gap Wind Farm in Texas, turkey vultures comprised approximately 52% of total avian fatalities during two year of monitoring (Tierney 2007, 2009).

The project area appears to receive very little use by waterbirds or shorebirds; these groups composed only 0.6% of overall bird use during surveys. American white pelicans composed the majority of waterbird observations (two groups totaling 92 individuals). Despite relatively low use by American white pelicans, this species had the second highest exposure index (0.22), due to both groups observed flying within the RSH. Waterfowl were somewhat more abundant, composing 2.0% of overall bird use. Waterfowl observations were limited to the four survey points closest to the aqueduct (points four, six, seven, and ten; Figure 2), with the majority of birds observed on the water and only a few birds observed making short flights up or down the aqueduct (Appendix E).

Wind energy facilities with year-round use by water-dependent species have shown the highest mortality of these groups, although the levels of waterfowl, waterbird, and shorebird mortality appear insignificant compared to the use of the facilities by these groups. Of 1,033 bird carcasses collected at US wind energy facilities, waterbirds composed about 2%, waterfowl composed about 3%, and shorebirds composed less than 1% (Erickson et al. 2002b). Only two Canada goose (*Branta canadensis*) fatalities were documented at the Klondike wind energy facility in Oregon (Johnson et al. 2003) even though 43 groups totaling 4,845 individual Canada geese were observed during pre-construction surveys (Johnson et al. 2002a). The recently constructed Top of Iowa wind energy facility is located in cropland between three Wildlife Management Areas (WMAs) with historically high bird use, including migrant and resident waterfowl. During a recent study, approximately one million goose-use days and 120,000 duck-use days were recorded in the WMAs during the fall and early winter, and no waterfowl fatalities were documented during concurrent and standardized wind energy facility fatality studies (Jain 2005). Similar findings were observed at the Buffalo Ridge wind energy facility in southwestern Minnesota, which is located in an area with relatively high waterfowl and waterbird use and some shorebird use. Snow geese (*Chen caerulescens*), Canada geese, and mallards (*Anas platyrhynchos*) were the most common waterfowl observed. Three of the 55 fatalities observed during the fatality monitoring studies were waterfowl (two mallards and one blue-winged teal [*Anas discors*]); two American coots (*Fulica americana*), one grebe, and one shorebird fatality were also found (Johnson et al. 2002b). Based on available evidence, waterfowl do not seem especially vulnerable to turbine collisions and significant impacts are not likely.

Risk to Nocturnal Migrants

Some fatalities of nocturnal migrating birds have been observed at wind energy facilities within the US (Kerlinger et al. 2010), although the rates of fatalities at individual facilities appear to be relatively low compared to estimates of the numbers of migrants flying over the sites. Most nocturnal songbird migration is believed to occur at heights greater than 500 ft (152 m) above ground level (Longcore et al. 2005). There are several records of large mortality events at tall guyed communication towers (Kemper 1996, Kerlinger 2000) and these events are typically associated with bad weather conditions (low ceilings, fog). In contrast, there has never been a large episodic mortality event (e.g., more than 50 birds during a single night) recorded within a single US wind energy facility. Based on a review of collision fatalities at 30 wind energy facilities in North America, fatalities of nocturnal migrants have ranged from less than 1.0 fatality/turbine/year to about seven fatalities/turbine/year, with higher rates recorded in eastern North America and lower rates in the west (Kerlinger et al. 2010). Multi-bird mortality events (defined as more than birds killed in one night at one turbine) were recorded at only four out of approximately 25,000 turbine searches. The largest mortality events reported at US wind energy facilities to date include 14 migrant songbirds found at two turbines during spring migration at Buffalo Ridge, Minnesota (Johnson et al. 2002b), and 27 migrants at the Mountaineer facility in West Virginia (Kerns and Kerlinger 2004). The West Virginia mortalities apparently occurred during inclement weather and the fatalities occurred at a turbine near a heavily lit substation. Most migrant songbird casualties recorded during systematic carcass searches at turbines have been a single fatality found during a single search (Erickson et al. 2001a).

The data collected during spring and fall nocturnal radar surveys suggest that the WGEF is not within a major migratory pathway for nocturnal migrants. The project does also not appear to provide stopover habitat for large numbers of migrating songbirds based on fixed-point bird use surveys. Data collected during the radar study in spring 2010 demonstrated that nocturnal migrant passage rates at the WGEF are consistent with those observed at other wind resource areas (WRA) in the western US that used similar data collection methods as the current study. Passage rates at these other WRAs ranged from 45 to 191 targets/km/hour during spring, and from 19 to 290 target/km/hour during fall. Based on the 2010 radar study at the WGEF, the spring passage rate was 156 targets/km/hr, ranking third lowest among five other studies (Figure 12), and the fall passage rate of 77 target/km/hr ranked fifth lowest among six other studies (Figure 13).

Based on the 2010 radar, mean spring flight altitude of targets at the WGEF was 697 m, with approximatley 11% of targets flying below 150 m (the zone of risk posed by trubines at the WGEF). During fall the mean flight altitude at the WGEF was 777 m, with 2% of targets flying below 150 m. Based on similar spring and fall data collected at other WRAs in the western U.S., mean flight height has ranged from 146 – 579 m in the spring (Figure 14) and from 209 – 647 m in fall (Figure 15). Mean flight height at the WGEF during both spring and fall was greater than all other WRAs evaluated (Figures 14 and 15), further suggesting low risk to nocturnal migrants at the WGEF.

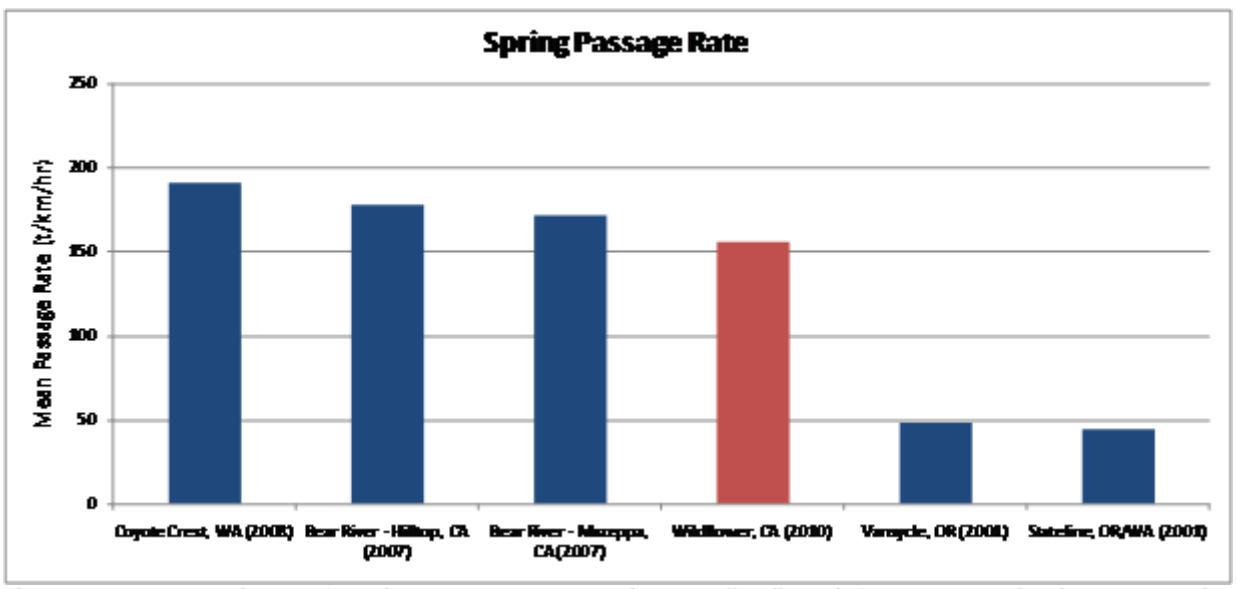


Figure 12. Comparison of spring passage rates (targets/km/hour) for nocturnal migrants at the Wildflower Green Energy Farm and other wind resource areas in the western US.

Data from the following sources:

Facility	Source	Facility	Source
Wildflower, CA	This study, Hamer 2011 (Appendix H)		
Coyote Crest, WA (08)	Mabee and Sanzenbacher 2008a	Vansycle, OR (01)	Mabee and Cooper 2004
Bear River – Hilltop, CA (07)	Sanzenbacher et al. 2007	Stateline, OR/WA (01)	Mabee and Cooper 2004
Bear River – Mazeppa, CA (07)	Sanzenbacher et al. 2007		

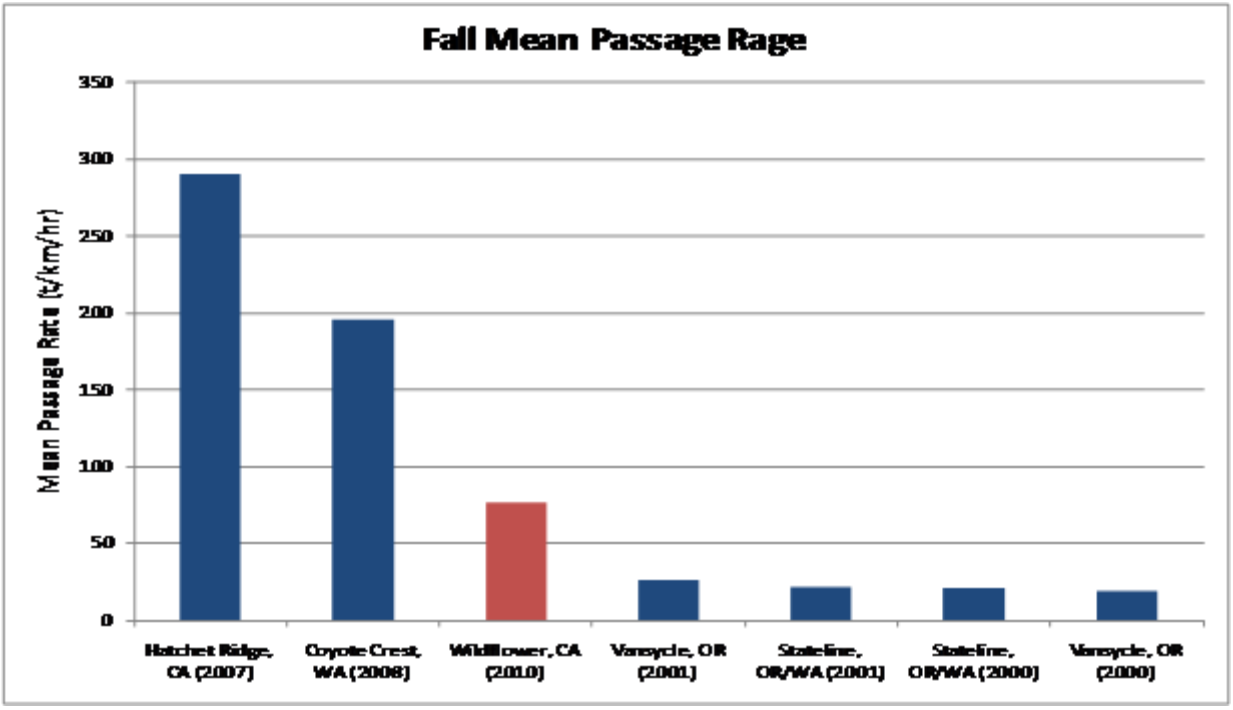


Figure 13. Comparison of fall passage rates (targets/km/hour) for nocturnal migrants at the Wildflower Green Energy Farm and other wind resource areas in the western US.

Data from the following sources:

Facility	Source	Facility	Source
Wildflower, CA	This study, Hamer 2011 (Appendix H)		
Hatchet Ridge, CA (07)	Mabee and Sanzenbacher 2008b	Stateline, OR/WA (01)	Mabee and Cooper 2004
Coyote Crest, WA (08)	Mabee et al. 2010	Stateline, OR/WA (00)	Mabee and Cooper 2004
Vansycle, OR (01)	Mabee and Cooper 2004	Vansycle, OR (00)	Mabee and Cooper 2004

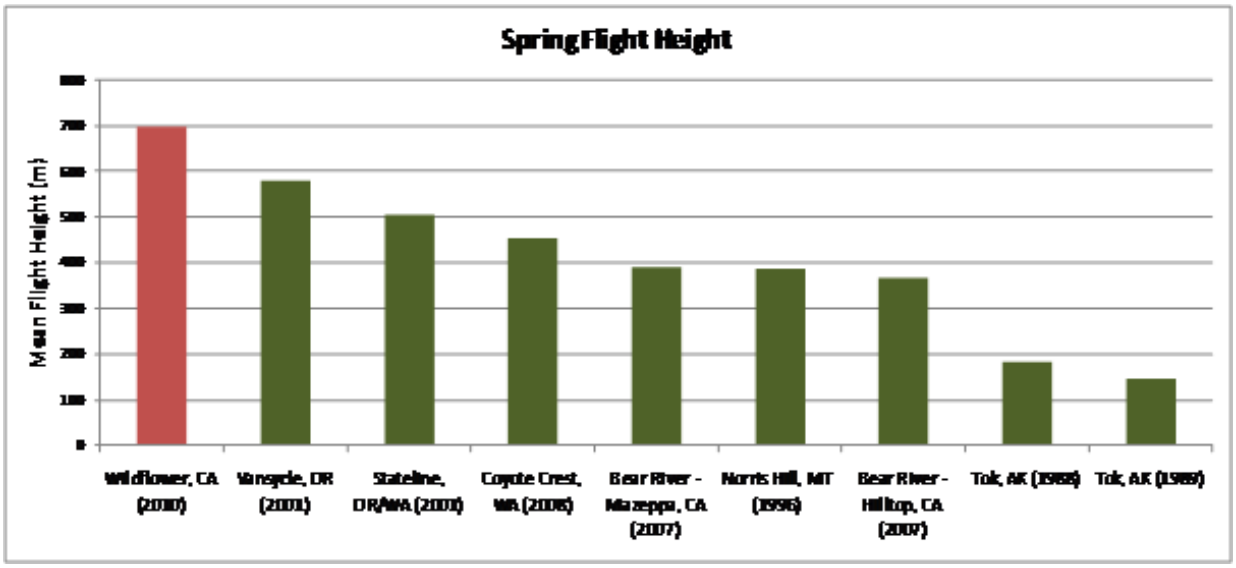


Figure 14. Comparison of spring flight height (m) for nocturnal migrants at the Wildflower Green Energy Farm and other wind resource areas in the western US.

Data from the following sources:

Facility	Source	Facility	Source
Wildflower, CA	This study, Hamer 2011 (Appendix H)		
Vansycle, OR (01)	Mabee and Cooper 2004	Norris Hill, MT (96)	Harmata et al. 2000
Stateline, OR/WA (01)	Mabee and Cooper 2004	Bear River – Hilltop, CA (07)	Sanzenbacher et al. 2007
Coyote Crest, WA (08)	Mabee and Sanzenbacher 2008a	Tok, AK (88)	Cooper and Ritchie 1995
Bear River – Mazeppa, CA (07)	Sanzenbacher et al. 2007	Tok, AK (89)	Cooper and Ritchie 1995

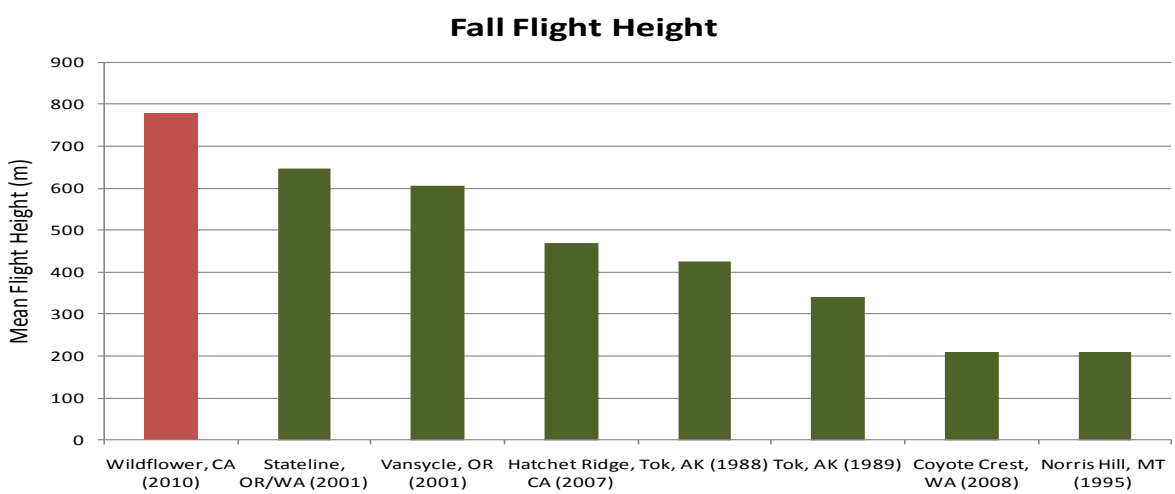


Figure 15. Comparison of fall flight height (m) for nocturnal migrants at the Wildflower Green Energy Farm and other wind resource areas in the western US.

Data from the following sources:

Facility	Source	Facility	Source
Wildflower, CA	This study, Hamer 2011 (Appendix H)		
Stateline, OR/WA (01)	Mabee and Cooper 2004	Tok, AK (89)	Cooper and Ritchie 1995
Vansycle, OR (01)	Mabee and Cooper 2004	Coyote Crest, WA (08)	Mabee et al. 2010
Hatchet Ridge, CA (07)	Mabee and Sanzenbacher 2008b	Norris Hill, MT (95)	Harmata et al. 2000
Tok, AK (88)	Cooper and Ritchie 1995		

Sensitive Species Use and Exposure Risk

Some species considered to be sensitive or of conservation concern (CDFG 2011a, 2011b; USFWS 2008, 2011) were observed within the WGEF. A total of 14 distinct species of conservation concern at the state and/or federal level were recorded, including one state endangered species (willow flycatcher) and one state threatened species (Swainson's hawk; CDFG 2011b). Also observed were eight state species of special concern (burrowing owl, tricolored blackbird, loggerhead shrike, American white pelican, northern harrier, Vaux's swift, yellow warbler, and yellow-headed blackbird; CDFG 2011b), five federal species of concern (burrowing owl, loggerhead shrike, prairie falcon, ferruginous hawk, and peregrine falcon; USFWS 2008, 2011), and two state fully-protected species (golden eagle and peregrine falcon; CDFG 2011a). The golden eagle is further protected under the BGEPA (1940). This is a tally that in some cases represents repeated observations of the same individual. Use of the WGEF by these species is not unexpected given the general site location. While golden eagles have been observed foraging within the WGEF, the site is not a concentrated foraging area for eagles, nor is the project within an eagle migration corridor. Similarly, while Swainson's hawks were observed foraging within the WGEF during the spring and summer, and likely migrate through the WGEF, their use of the study area was low. While Swainson's hawks are known to nest within the Antelope Valley, known nest locations are generally associated with irrigated croplands to the north and northeast of the WGEF. A single Swainson's hawk nest was identified within five miles of the WGEF during focused Swainson's hawk nest surveys conducted in 2010 and 2011 (Table 8).

Indirect Effects

The presence of wind turbines may alter the landscape so that wildlife use patterns are affected, displacing wildlife away from the project facilities and suitable habitat. Some studies from wind energy facilities in Europe consider displacement effects to have a greater impact on birds than collision mortality (Gill et al. 1996). The greatest concern with displacement impacts for wind energy facilities in the US has been where these facilities have been constructed in grassland or other native habitats (Leddy et al. 1999, Mabey and Paul 2007). Although Crockford (1992) suggests that disturbance appears to impact feeding, resting, and migrating birds (rather than breeding birds), results from studies at the Stateline wind energy facility in Washington and Oregon (Erickson et al. 2004) and the Buffalo Ridge wind energy facility in Minnesota (Johnson et al. 2000a) suggest that breeding birds are also affected by wind energy facility operations.

Raptor Displacement

Birds displaced from wind energy facilities might move to lower quality habitat with fewer disturbances, with an overall effect of reducing breeding success. Most studies on raptor displacement at wind energy facilities, however, indicate effects to be negligible (Howell and Noone 1992; Johnson et al. 2000a, 2003; Whitfield and Madders 2006). Notable exceptions include a study in Scotland that described territorial golden eagles avoiding the entire wind energy facility area, except when intercepting non-territorial birds (Walker et al. 2005), and a study at the Buffalo Ridge wind energy facility in Minnesota which found evidence of northern harriers avoiding turbines on both a small scale (less than 100 m from turbines) and a larger scale in the year following construction (Johnson et al. 2000a). Two years following

construction, however, no large-scale displacement of northern harriers was detected. Additionally, the only published report of avoidance of wind turbines by nesting raptors occurred at this same facility in Minnesota, where raptor nest density on 101 mi^2 (262 km^2) of land surrounding the wind energy facility was 5.94 nests/39 mi^2 (101 km^2), yet no nests were present in the 12 mi^2 (31 km^2) facility itself, even though habitat was similar (Usgaard et al. 1997). However, this analysis assumes that raptor nests are uniformly distributed across the landscape (an unlikely event), and only two nests would be expected for an area 12 mi^2 in size if the nests were distributed uniformly.

Based on extensive monitoring using helicopter flights and ground observations, raptors continued to nest at a wind energy facility in eastern Washington at approximately the same levels after construction, and several nests were located within a half-mile of turbines (Erickson et al. 2004). At the Foote Creek Rim wind energy facility in southern Wyoming, one pair of red-tailed hawks nested within 0.3 miles (0.5 km) of the turbine strings, and seven red-tailed hawk nests, one great horned owl nest, and one golden eagle nest located within one mile of the wind energy facility successfully fledged young (Johnson et al. 2000b). The golden eagle pair successfully nested a half-mile from the facility for three different years after it became operational. In Oregon, a Swainson's hawk also nested within a quarter-mile (0.4 km) of a turbine string at the Klondike I wind energy facility after the facility was operational (Johnson et al. 2003). These observations suggest that there will be limited nesting displacement of raptors at the WGEF, although the creation of a buffer surrounding known nests when siting turbines will further reduce any impact.

The extent to which raptors, particularly sensitive raptor species, will be displaced from foraging habitats within the WGEF is more uncertain, particularly in areas proposed for solar development. While it has been well-established that raptors forage within operating wind energy facilities, the extent to which they will forage within areas containing solar panels is unclear.

<u>Displacement of Non-Raptor Bird Species</u>

Studies concerning displacement of non-raptor species at wind energy facilities have concentrated on grassland passerines and waterfowl/waterbirds (Winkelman 1990, Larsen and Madsen 2000, Mabey and Paul 2007). Wind energy facility construction appears to cause small-scale local displacement of grassland passerines and is likely due to the birds avoiding turbine noise and maintenance activities. Construction also reduces habitat effectiveness because of the presence of access roads and large gravel pads surrounding turbines (Leddy 1996, Johnson et al. 2000a). Leddy et al. (1999) surveyed bird densities in Conservation Reserve Program (CRP) grasslands at the Buffalo Ridge wind energy facility in Minnesota, and found mean densities of 10 grassland bird species were four times higher at areas located 180 m (591 ft) from turbines than they were at grasslands nearer turbines. Johnson et al. (2000a) found reduced use of habitat by seven of 22 grassland-breeding birds following construction of the Buffalo Ridge wind energy facility. Results from the Stateline wind energy facility in Oregon and Washington (Erickson et al. 2004) and the Combine Hills wind energy facility in Oregon (Young et al. 2005) suggest a relatively small impact of the wind energy facilities on grassland-nesting

passerines. Transect surveys conducted prior to and after construction of the wind energy facilities found that grassland passerine use was significantly reduced within approximately 50 m (164 ft) of turbine strings, but areas further away from turbine strings did not have reduced bird use.

Currently, little information is available on displacement of wildlife species at photovoltaic (PV) solar energy facilities. Displacement effects during construction and operation of the facility will likely be more pronounced for the solar component of the development than for the wind component due to greater land disturbance and the potential for long-term alteration in the plant community beneath solar panels. The degree to which avian species will be displaced from nesting and foraging habitat is unclear at this time. One non-raptor species of particular concern is the tricolored blackbird. Several nesting colonies of tricolored blackbirds were identified in areas adjacent to the WGEF (Figure 5) and large groups numbering up to 1,500 individuals were observed commuting between these colonies and their forging grounds within the WGEF's grasslands in the spring and summer (Appendix A). While these birds were generally observed flying below the RSH and significant direct impacts due to collisions with wind turbines is not expected, there is potential for the birds to be displaced from foraging habitats within the WGEF, particularly in the northwestern portion of the WGEF where solar panels will be located. The extent of these effects is difficult to assess due to a lack of data on similar facilities in this region of the country. For other non-raptor species, even if there are some indirect effects associated with the proposed project, it is unlikely that local populations would be significantly impacted by project development given the relatively small project size and abundance of similar habitats in the surrounding region.

CONCLUSIONS

Based on data collected during this study, raptor and all bird use of the WGEF was typical of other wind resource areas evaluated throughout the western US using similar methods. Bird mortality at the WGEF would likely be within the range of that documented at other modern wind energy facilities located in the western United States where observed bird collision mortality has been relatively low to moderate.

Based on occurrence and observed behavior within the WGEF, as well as information on avian fatalities at other operational wind facilities, some raptor species (e.g., red-tailed hawk, American kestrel) likely have higher levels of risk of collision with project turbines than most other species. The most abundant raptor species observed during avian use surveys were red-tailed hawk and American kestrel which composed 43% and 32% of overall raptor observations, respectively. Alternatively, golden eagles composed only 2.3% and Swainson's hawk composed only 1.5% of overall raptor observations, and risk to these species is expected to be much lower. Mean raptor use varied considerably across seasons, with the highest mean raptor use observed in winter (1.28 birds/plot/20-min survey) followed by fall (0.98), summer (0.71), and spring (0.39; Appendix L). Based on seasonal raptor use estimates, it is expected that risk to raptors would be unequal across seasons with the greatest risk of collision occurring in winter and fall, and lower risk occurring in summer and spring. While potential direct impacts to

sensitive raptor species (e.g., Swainson's hawk, golden eagle, burrowing owl) are unavoidable, the risk of collision is estimated to be very low.

Based on the analysis completed by WEST, it is unlikely that non-raptors will be significantly adversely affected by direct mortality from operation of the WGEF due to relatively low exposure risks (i.e., a majority of observations occur below the rotor swept area). Indirect effects to some non-raptor species could occur, such as displacement of some grassland nesting and foraging songbirds. These effects will likely be more pronounced for the solar component of the development due to greater land disturbance and the potential for long-term alteration in the plant community beneath solar panels.

Baseline avian surveys at the WGEF are ongoing. Golden eagle observational surveys were initiated in May of 2011 and will continue for one full year, and fixed-point bird use surveys are scheduled to continue through April of 2012. A small mammal trapping study will be conducted during the fall of 2011 and spring of 2012, and additional avian use surveys using an area search methodology will be conducted during the winter of 2011/2012 and spring of 2012. Results of these surveys will be presented in subsequent technical reports.

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Appendix A. All Bird Types and Species Observed at the Wildflower Green Energy Farm during Fixed-Point Bird Use Surveys, March 18, 2010, to September 8, 2011.

Appendix A. Summary of individuals and group observations by species and bird type for fixed-point use surveys at the Wildflower Green Energy Farm[a] from March 18, 2010, to September 8, 2011.

		Spring		Summer		Fall		Winter		Total	
Bird Type / Species	**Scientific Name**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**
Loons/Grebes		**1**	**1**	**0**	**0**	**2**	**3**	**1**	**1**	**4**	**5**
pied-billed grebe	*Podilymbus podiceps*	1	1	0	0	0	0	1	1	2	2
western grebe	*Aechmophorus occidentalis*	0	0	0	0	2	3	0	0	2	3
Waterbirds		**7**	**98**	**2**	**2**	**1**	**2**	**0**	**0**	**10**	**102**
American white pelican	*Pelecanus erythrorhynchos*	2	92	0	0	0	0	0	0	2	92
double-crested cormorant	*Phalacrocorax auritus*	1	1	0	0	1	2	0	0	2	3
great blue heron	*Ardea herodias*	0	0	2	2	0	0	0	0	2	2
great egret	*Ardea alba*	2	3	0	0	0	0	0	0	2	3
green heron	*Butorides virescens*	1	1	0	0	0	0	0	0	1	1
white-faced ibis	*Plegadis chihi*	1	1	0	0	0	0	0	0	1	1
Waterfowl		**26**	**211**	**11**	**23**	**5**	**16**	**44**	**319**	**86**	**569**
bufflehead	*Bucephala albeola*	8	36	0	0	1	1	24	199	33	236
common goldeneye	*Bucephala clangula*	0	0	0	0	0	0	4	5	4	5
common merganser	*Mergus merganser*	0	0	0	0	1	4	0	0	1	4
gadwall	*Anas strepera*	1	3	0	0	0	0	0	0	1	3
lesser scaup	*Aythya affinis*	2	13	0	0	0	0	4	23	6	36
mallard	*Anas platyrhynchos*	8	14	11	23	2	3	0	0	21	40
ring-necked duck	*Aythya collaris*	7	145	0	0	0	0	12	92	19	237
unidentified duck	*n/a*	0	0	0	0	1	8	0	0	1	8
Shorebirds		**8**	**11**	**8**	**28**	**4**	**9**	**6**	**24**	**26**	**72**
greater yellowlegs	*Tringa melanoleuca*	1	2	0	0	0	0	0	0	1	2
killdeer	*Charadrius vociferus*	6	7	7	14	4	9	6	24	23	54
spotted sandpiper	*Actitis macularia*	1	2	0	0	0	0	0	0	1	2
unidentified shorebird	*n/a*	0	0	1	14	0	0	0	0	1	14
Gulls/Terns		**1**	**7**	**2**	**19**	**0**	**0**	**0**	**0**	**3**	**26**
California gull	*Larus californicus*	1	7	0	0	0	0	0	0	1	7
Caspian tern	*Sterna caspia*	0	0	1	17	0	0	0	0	1	17
unidentified gull	*n/a*	0	0	1	2	0	0	0	0	1	2
Rails/Coots		**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**1**
American coot	*Fulica americana*	1	1	0	0	0	0	0	0	1	1

Appendix A. Summary of individuals and group observations by species and bird type for fixed-point use surveys at the Wildflower Green Energy Farm[a] from March 18, 2010, to September 8, 2011.

		Spring		Summer		Fall		Winter		Total	
Bird Type / Species	**Scientific Name**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**
Diurnal Raptors		**70**	**77**	**177**	**214**	**123**	**136**	**224**	**231**	**594**	**658**
Accipiters		*0*	*0*	*3*	*3*	*1*	*1*	*3*	*3*	*7*	*7*
Cooper's hawk	*Accipiter cooperii*	0	0	3	3	0	0	2	2	5	5
sharp-shinned hawk	*Accipiter striatus*	0	0	0	0	0	0	1	1	1	1
unidentified accipiter	*n/a*	0	0	0	0	1	1	0	0	1	1
Buteos		*46*	*53*	*99*	*118*	*46*	*55*	*92*	*94*	*283*	*320*
ferruginous hawk	*Buteo regalis*	2	2	0	0	3	3	20	20	25	25
red-tailed hawk	*Buteo jamaicensis*	39	46	95	114	42	51	72	74	248	285
Swainson's hawk	*Buteo swainsoni*	5	5	4	4	1	1	0	0	10	10
Northern Harrier		*11*	*11*	*1*	*1*	*14*	*14*	*42*	*45*	*68*	*71*
northern harrier	*Circus cyaneus*	11	11	1	1	14	14	42	45	68	71
Eagles		*3*	*3*	*2*	*2*	*0*	*0*	*10*	*10*	*15*	*15*
golden eagle	*Aquila chrysaetos*	3	3	2	2	0	0	10	10	15	15
Falcons		*10*	*10*	*72*	*90*	*62*	*66*	*77*	*79*	*221*	*245*
American kestrel	*Falco sparverius*	7	7	64	82	53	57	62	64	186	210
merlin	*Falco columbarius*	0	0	0	0	3	3	5	5	8	8
peregrine falcon	*Falco peregrinus*	0	0	0	0	0	0	3	3	3	3
prairie falcon	*Falco mexicanus*	1	1	7	7	6	6	5	5	19	19
unidentified falcon	*n/a*	2	2	1	1	0	0	2	2	5	5
Owls		**2**	**8**	**1**	**4**	**0**	**0**	**0**	**0**	**3**	**12**
burrowing owl	*Athene cunicularia*	0	0	1	4	0	0	0	0	1	4
great horned owl	*Bubo virginianus*	2	8	0	0	0	0	0	0	2	8
Vultures		**17**	**20**	**23**	**31**	**13**	**53**	**1**	**1**	**54**	**105**
turkey vulture	*Cathartes aura*	17	20	23	31	13	53	1	1	54	105
Upland Game Birds		**7**	**12**	**23**	**260**	**9**	**97**	**6**	**139**	**45**	**508**
California quail	*Callipepla californica*	7	12	23	260	8	96	5	138	43	506
ring-necked pheasant	*Phasianus colchicus*	0	0	0	0	1	1	1	1	2	2
Doves/Pigeons		**4**	**6**	**83**	**251**	**19**	**120**	**6**	**68**	**112**	**445**
Eurasian collared-dove	*Streptopelia decaocto*	1	1	3	4	1	3	0	0	5	8
mourning dove	*Zenaida macroura*	3	5	80	247	17	115	6	68	106	435

Appendix A. Summary of individuals and group observations by species and bird type for fixed-point use surveys at the Wildflower Green Energy Farm[a] from March 18, 2010, to September 8, 2011.

		Spring		Summer		Fall		Winter		Total	
Bird Type / Species	**Scientific Name**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**
rock pigeon	*Columba livia*	0	0	0	0	1	2	0	0	1	2
Large Corvids		**190**	**791**	**180**	**820**	**130**	**398**	**109**	**249**	**609**	**2,258**
common raven	*Corvus corax*	190	791	180	820	130	398	109	249	609	2,258
Large Cuckoos		**1**	**1**	**5**	**5**	**2**	**2**	**1**	**1**	**9**	**9**
greater roadrunner	*Geococcyx californianus*	1	1	5	5	2	2	1	1	9	9
Passerines		**496**	**27,413**	**573**	**21,629**	**389**	**3785**	**374**	**9,011**	**1,832**	**61,838**
American goldfinch	*Carduelis tristis*	1	3	0	0	5	12	7	26	13	41
American pipit	*Anthus rubescens*	2	2	0	0	2	3	4	5	8	10
barn swallow	*Hirundo rustica*	5	7	15	58	18	67	0	0	38	133
Bewick's wren	*Thryomanes bewickii*	1	1	0	0	1	1	1	1	3	3
black phoebe	*Sayornis nigricans*	0	0	2	2	4	4	6	6	12	12
Brewer's blackbird	*Euphagus cyanocephalus*	11	83	18	342	13	118	7	203	49	746
brown-headed cowbird	*Molothrus ater*	1	1	0	0	0	0	0	0	1	1
Bullock's oriole	*Icterus bullockii*	8	9	7	10	0	0	0	0	15	19
California towhee	*Pipilo crissalis*	2	3	1	1	2	4	0	0	5	8
cliff swallow	*Petrochelidon pyrrhonota*	27	326	41	593	1	1	0	0	69	920
European starling	*Sturnus vulgaris*	13	57	10	110	9	563	12	415	44	1,145
hooded oriole	*Icterus cucullatus*	1	2	0	0	0	0	0	0	1	2
horned lark	*Eremophila alpestris*	125	651	189	2,082	86	1,656	58	4,764	458	9,153
house finch	*Carpodacus mexicanus*	23	97	25	54	32	284	36	340	116	775
house sparrow	*Passer domesticus*	14	114	11	88	4	38	8	86	37	326
house wren	*Troglodytes aedon*	0	0	0	0	1	1	0	0	1	1
lark sparrow	*Chondestes grammacus*	7	15	14	60	3	6	9	682	33	763
Lawrence's goldfinch	*Carduelis lawrencei*	6	9	1	1	3	14	0	0	10	24
lesser goldfinch	*Carduelis psaltria*	1	4	1	1	6	14	2	23	10	42
Lincoln's sparrow	*Melospiza lincolnii*	0	0	0	0	0	0	1	1	1	1
loggerhead shrike	*Lanius ludovicianus*	18	42	56	67	31	32	37	42	142	183
mountain bluebird	*Sialia currucoides*	0	0	0	0	0	0	9	992	9	992
northern mockingbird	*Mimus polyglottos*	0	0	1	1	1	1	0	0	2	2
northern rough-winged swallow	*Stelgidopteryx serripennis*	2	3	0	0	0	0	0	0	2	3

Appendix A. Summary of individuals and group observations by species and bird type for fixed-point use surveys at the Wildflower Green Energy Farm[a] from March 18, 2010, to September 8, 2011.

		Spring		Summer		Fall		Winter		Total	
Bird Type / Species	**Scientific Name**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**
orange-crowned warbler	*Vermivora celata*	1	1	0	0	1	1	0	0	2	2
pine siskin	*Carduelis pinus*	0	0	0	0	3	35	2	10	5	45
red-winged blackbird	*Agelaius phoeniceus*	2	4	0	0	0	0	0	0	2	4
rock wren	*Salpinctes obsoletus*	2	2	0	0	3	3	0	0	5	5
ruby-crowned kinglet	*Regulus calendula*	0	0	0	0	0	0	1	1	1	1
sage sparrow	*Amphispiza belli*	0	0	1	1	1	1	0	0	2	2
sage thrasher	*Oreoscoptes montanus*	0	0	0	0	1	1	0	0	1	1
savannah sparrow	*Passerculus sandwichensis*	15	47	0	0	31	92	49	445	95	584
Say's phoebe	*Sayornis saya*	1	1	0	0	6	7	5	5	12	13
tree swallow	*Tachycineta bicolor*	8	43	0	0	3	32	0	0	11	75
tricolored blackbird	*Agelaius tricolor*	59	25,444	63	17,757	0	0	0	0	122	43,201
unidentified blackbird		1	30	0	0	0	0	1	5	2	35
unidentified sparrow		0	0	1	1	2	8	0	0	3	9
unidentified swallow		1	1	2	16	4	34	0	0	7	51
vesper sparrow	*Pooecetes gramineus*	0	0	0	0	5	30	10	14	15	44
violet-green swallow	*Tachycineta thalassina*	3	7	0	0	2	12	1	7	6	26
western bluebird	*Sialia mexicana*	0	0	0	0	1	9	0	0	1	9
western kingbird	*Tyrannus verticalis*	10	15	16	23	0	0	0	0	26	38
western meadowlark	*Sturnella neglecta*	116	365	98	361	82	618	85	639	381	1,983
western scrub-jay	*Aphelocoma californica*	1	1	0	0	0	0	0	0	1	1
western tanager	*Piranga ludoviciana*	1	8	0	0	0	0	0	0	1	8
white-crowned sparrow	*Zonotrichia leucophrys*	3	10	0	0	18	78	19	295	40	383
yellow-headed blackbird	*Xanthocephalus xanthocephalus*	1	1	0	0	0	0	0	0	1	1
yellow-rumped warbler	*Dendroica coronata*	3	4	0	0	4	5	4	4	11	13
Swifts/Hummingbirds		**7**	**10**	**3**	**3**	**3**	**4**	**0**	**0**	**13**	**17**
Anna's hummingbird	*Calypte anna*	0	0	1	1	1	1	0	0	2	2
rufous hummingbird	*Selasphorus rufus*	1	1	0	0	0	0	0	0	1	1
unidentified hummingbird		4	5	2	2	1	1	0	0	7	8
Vaux's swift	*Chaetura vauxi*	2	4	0	0	1	2	0	0	3	6
Woodpeckers		**0**	**0**	**1**	**1**	**5**	**5**	**3**	**3**	**9**	**9**

Appendix A. Summary of individuals and group observations by species and bird type for fixed-point use surveys at the Wildflower Green Energy Farm[a] from March 18, 2010, to September 8, 2011.

		Spring		Summer		Fall		Winter		Total	
Bird Type / Species	**Scientific Name**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**
ladder-backed woodpecker	*Picoides scalaris*	0	0	0	0	2	2	0	0	2	2
northern flicker	*Colaptes auratus*	0	0	0	0	1	1	3	3	4	4
Nuttall's woodpecker	*Picoides nuttallii*	0	0	1	1	1	1	0	0	2	2
unidentified sapsucker		0	0	0	0	1	1	0	0	1	1
Kingfishers		**0**	**0**	**0**	**0**	**1**	**1**	**0**	**0**	**1**	**1**
belted kingfisher	*Ceryle alcyon*	0	0	0	0	1	1	0	0	1	1
Overall	**96 species**	**838**	**28,667**	**1,092**	**23,290**	**706**	**4,631**	**775**	**10,047**	**3,411**	**66,635**

[a] Regardless of distance from observer.

Appendix B. Mean Use, Percent Composition, and Frequency of Occurrence for Large Birds and Small Birds Observed During Fixed-Point Bird Use Surveys at the Wildflower Green Energy Farm from March 18, 2010, to September 8, 2011.

Appendix B1. Mean bird use (number of birds/plot[a]/30-min survey), percent of total composition (%), and frequency of occurrence (%) for each large bird type and species by season during the fixed-point bird use surveys at the Wildflower Green Energy Farm from March 18, 2010, to September 8, 2011.

	Mean Use				% Composition				% Frequency			
Bird Type / Species	**Spring**	**Summer**	**Fall**	**Winter**	**Spring**	**Summer**	**Fall**	**Winter**	**Spring**	**Summer**	**Fall**	**Winter**
Loons/Grebes	**<0.01**	**0**	**0.03**	**<0.01**	**<0.1**	**0**	**0.4**	**<0.1**	**0.7**	**0**	**1.9**	**0.8**
pied-billed grebe	<0.01	0	0	<0.01	<0.1	0	0	<0.1	0.7	0	0	0.8
western grebe	0	0	0.03	0	0	0	0.4	0	0	0	1.9	0
Waterbirds	**0.74**	**0.01**	**0.02**	**0**	**8.3**	**0.2**	**0.2**	**0**	**7.5**	**1.3**	**1.0**	**0**
American white pelican	0.68	0	0	0	7.5	0	0	0	1.5	0	0	0
double-crested cormorant	0.03	0	0.02	0	0.3	0	0.2	0	2.9	0	1.0	0
great blue heron	0	0.01	0	0	0	0.2	0	0	0	1.3	0	0
great egret	0.02	0	0	0	0.2	0	0	0	1.5	0	0	0
green heron	<0.01	0	0	0	<0.1	0	0	0	0.8	0	0	0
white-faced ibis	<0.01	0	0	0	<0.1	0	0	0	0.7	0	0	0
Waterfowl	**1.55**	**0.11**	**0.15**	**2.66**	**17.3**	**1.3**	**1.9**	**30.9**	**9.6**	**4.7**	**3.8**	**20.0**
bufflehead	0.26	0	<0.01	1.66	3.0	0	0.1	19.3	5.1	0	1.0	19.2
common goldeneye	0	0	0	0.04	0	0	0	0.5	0	0	0	3.3
common merganser	0	0	0.04	0	0	0	0.5	0	0	0	1.0	0
gadwall	0.02	0	0	0	0.2	0	0	0	0.7	0	0	0
lesser scaup	0.10	0	0	0.19	1.1	0	0	2.2	1.5	0	0	3.3
mallard	0.10	0.11	0.03	0	1.1	1.3	0.4	0	5.1	4.7	1.9	0
ring-necked duck	1.07	0	0	0.77	11.9	0	0	8.9	4.4	0	0	10.0
unidentified duck	0	0	0.08	0	0	0	0.9	0	0	0	1.0	0
Shorebirds	**0.08**	**0.15**	**0.10**	**0.20**	**0.9**	**1.8**	**1.2**	**2.3**	**6.0**	**6.0**	**4.8**	**5.0**
greater yellowlegs	0.01	0	0	0	0.2	0	0	0	0.7	0	0	0
killdeer	0.05	0.08	0.10	0.20	0.6	1.0	1.2	2.3	4.5	5.5	4.8	5.0
spotted sandpiper	0.01	0	0	0	0.2	0	0	0	0.7	0	0	0
unidentified shorebird	0	0.07	0	0	0	0.8	0	0	0	0.5	0	0
Gulls/Terns	**0.21**	**0.09**	**0**	**0**	**2.3**	**1.1**	**0**	**0**	**2.9**	**1.0**	**0**	**0**
California gull	0.21	0	0	0	2.3	0	0	0	2.9	0	0	0
Caspian tern	0	0.08	0	0	0	1.0	0	0	0	0.5	0	0
unidentified gull	0	<0.01	0	0	0	0.1	0	0	0	0.5	0	0
Rails/Coots	**<0.01**	**0**	**0**	**0**	**<0.1**	**0**	**0**	**0**	**0.7**	**0**	**0**	**0**
American coot	<0.01	0	0	0	<0.1	0	0	0	0.7	0	0	0
Diurnal Raptors	**0.59**	**1.07**	**1.47**	**1.92**	**6.6**	**12.8**	**17.9**	**22.4**	**36.4**	**51.5**	**70.2**	**85.8**
Accipiters	*0*	*0.02*	*<0.01*	*0.02*	*0*	*0.3*	*0.1*	*0.3*	*0*	*2.4*	*1.0*	*2.5*
Cooper's hawk	0	0.02	0	0.02	0	0.3	0	0.2	0	2.4	0	1.7
sharp-shinned hawk	0	0	0	<0.01	0	0	0	<0.1	0	0	0	0.8
unidentified accipiter	0	0	<0.01	0	0	0	0.1	0	0	0	1.0	0

Appendix B1. Mean bird use (number of birds/plot[a]/30-min survey), percent of total composition (%), and frequency of occurrence (%) for each large bird type and species by season during the fixed-point bird use surveys at the Wildflower Green Energy Farm from March 18, 2010, to September 8, 2011.

	Mean Use				% Composition				% Frequency			
Bird Type / Species	**Spring**	**Summer**	**Fall**	**Winter**	**Spring**	**Summer**	**Fall**	**Winter**	**Spring**	**Summer**	**Fall**	**Winter**
Buteos	*0.42*	*0.58*	*0.62*	*0.78*	*4.6*	*7.0*	*7.6*	*9.1*	*24.7*	*36.8*	*38.5*	*52.5*
ferruginous hawk	0.01	0	0.03	0.17	0.2	0	0.4	1.9	1.5	0	2.9	15.0
red-tailed hawk	0.37	0.57	0.59	0.62	4.1	6.7	7.1	7.2	22.7	36.5	35.6	44.2
Swainson's hawk	0.03	0.02	<0.01	0	0.4	0.2	0.1	0	3.3	1.9	1.0	0
Northern Harrier	*0.08*	*<0.01*	*0.14*	*0.38*	*0.9*	*<0.1*	*1.8*	*4.4*	*8.1*	*0.5*	*14.4*	*28.3*
northern harrier	0.08	<0.01	0.14	0.38	0.9	<0.1	1.8	4.4	8.1	0.5	14.4	28.3
Eagles	*0.02*	*<0.01*	*0*	*0.08*	*0.2*	*<0.1*	*0*	*1.0*	*2.2*	*0.8*	*0*	*6.7*
golden eagle	0.02	<0.01	0	0.08	0.2	<0.1	0	1.0	2.2	0.8	0	6.7
Falcons	*0.07*	*0.45*	*0.69*	*0.66*	*0.8*	*5.4*	*8.4*	*7.6*	*7.1*	*24.9*	*51.0*	*45.8*
American kestrel	0.05	0.41	0.57	0.53	0.6	4.8	6.9	6.2	5.1	23.5	45.2	40.8
merlin	0	0	0.03	0.04	0	0	0.4	0.5	0	0	2.9	4.2
peregrine falcon	0	0	0	0.02	0	0	0	0.3	0	0	0	2.5
prairie falcon	<0.01	0.04	0.10	0.04	<0.1	0.5	1.2	0.5	0.7	4.2	9.6	4.2
unidentified falcon	0.01	<0.01	0	0.02	0.1	<0.1	0	0.2	1.2	0.5	0	1.7
Owls	**0.07**	**0.01**	**0**	**0**	**0.7**	**0.2**	**0**	**0**	**1.6**	**0.3**	**0**	**0**
burrowing owl	0	0.01	0	0	0	0.2	0	0	0	0.3	0	0
great horned owl	0.07	0	0	0	0.7	0	0	0	1.6	0	0	0
Vultures	**0.14**	**0.15**	**0.56**	**<0.01**	**1.5**	**1.7**	**6.8**	**<0.1**	**11.0**	**9.3**	**9.6**	**0.8**
turkey vulture	0.14	0.15	0.56	<0.01	1.5	1.7	6.8	<0.1	11.0	9.3	9.6	0.8
Upland Game Birds	**0.12**	**1.29**	**1.33**	**1.16**	**1.3**	**15.4**	**16.1**	**13.5**	**7.5**	**13.2**	**11.5**	**4.2**
California quail	0.12	1.29	1.32	1.15	1.3	15.4	16.0	13.4	7.5	13.2	11.5	4.2
ring-necked pheasant	0	0	<0.01	<0.01	0	0	0.1	<0.1	0	0	1.0	0.8
Doves/Pigeons	**0.06**	**1.34**	**1.21**	**0.57**	**0.6**	**16.0**	**14.7**	**6.6**	**4.7**	**32.4**	**19.2**	**5.0**
Eurasian collared-dove	<0.01	0.02	0.03	0	<0.1	0.2	0.4	0	0.7	1.6	1.0	0
mourning dove	0.05	1.32	1.16	0.57	0.5	15.7	14.2	6.6	3.9	30.8	17.3	5.0
rock pigeon	0	0	0.02	0	0	0	0.2	0	0	0	1.0	0
Large Corvids	**5.40**	**4.13**	**3.34**	**2.08**	**60.2**	**49.2**	**40.6**	**24.1**	**81.1**	**66.5**	**76.0**	**72.5**
common raven	5.40	4.13	3.34	2.08	60.2	49.2	40.6	24.1	81.1	66.5	76.0	72.5
Large Cuckoos	**<0.01**	**0.03**	**0.02**	**<0.01**	**<0.1**	**0.4**	**0.2**	**<0.1**	**0.7**	**3.0**	**1.9**	**0.8**
greater roadrunner	<0.01	0.03	0.02	<0.01	<0.1	0.4	0.2	<0.1	0.7	3.0	1.9	0.8
Overall	**8.97**	**8.38**	**8.22**	**8.61**	**100**	**100**	**100**	**100**				

[a.] 800-meter (m) radius plot for large birds and 100-m for small birds.

Appendix B2. Mean bird use (number of birds/plot[a]/30-min survey), percent of total composition (%), and frequency of occurrence (%) for each small bird type and species by season during the fixed-point bird use surveys at the Wildflower Green Energy Farm from March 18, 2010, to September 8, 2011.

	Mean Use				% Composition				% Frequency			
Type / Species	**Spring**	**Summer**	**Fall**	**Winter**	**Spring**	**Summer**	**Fall**	**Winter**	**Spring**	**Summer**	**Fall**	**Winter**
Passerines	**274.91**	**72.09**	**27.50**	**64.28**	**100**	**100**	**99.8**	**100**	**97.8**	**92.5**	**95.2**	**90.0**
American goldfinch	0.02	0	0.12	0.18	<0.1	0	0.4	0.3	0.7	0	4.8	5.0
American pipit	0.01	0	0.03	0.04	<0.1	0	0.1	<0.1	1.5	0	1.9	3.3
barn swallow	0.05	0.35	0.48	0	<0.1	0.5	1.7	0	3.4	6.8	14.4	0
Bewick's wren	0.03	0	<0.01	<0.01	<0.1	0	<0.1	<0.1	2.9	0	1.0	0.8
black phoebe	0	<0.01	0.03	0.05	0	<0.1	0.1	<0.1	0	0.3	2.9	5.0
Brewer's blackbird	0.61	0.57	0.32	0.32	0.2	0.8	1.2	0.5	8.2	8.0	9.6	3.3
brown-headed cowbird	<0.01	0	0	0	<0.1	0	0	0	0.7	0	0	0
Bullock's oriole	0.05	0.04	0	0	<0.1	<0.1	0	0	4.7	1.9	0	0
California towhee	<0.01	<0.01	0.02	0	<0.1	<0.1	<0.1	0	0.7	1.0	1.0	0
cliff swallow	2.49	2.77	<0.01	0	0.9	3.8	<0.1	0	18.8	15.1	1.0	0
European starling	0.33	0.03	0.12	1.46	0.1	<0.1	0.5	2.3	7.8	1.6	5.8	4.2
hooded oriole	0.01	0	0	0	<0.1	0	0	0	0.7	0	0	0
horned lark	4.24	7.96	16.07	37.17	1.5	11.0	58.3	57.8	65.0	76.1	74.0	43.3
house finch	0.61	0.25	2.59	2.65	0.2	0.3	9.4	4.1	15.2	11.0	27.9	25.8
house sparrow	0.83	0.41	0.37	0.72	0.3	0.6	1.3	1.1	9.9	4.6	3.8	6.7
house wren	0	0	<0.01	0	0	0	<0.1	0	0	0	1.0	0
lark sparrow	0.10	0.44	0.10	3.83	<0.1	0.6	0.3	6.0	4.8	8.3	3.8	3.3
Lawrence's goldfinch	0.06	<0.01	0.13	0	<0.1	<0.1	0.5	0	3.8	0.5	2.9	0
lesser goldfinch	0.03	<0.01	0.12	0.19	<0.1	<0.1	0.5	0.3	0.7	0.3	4.8	1.7
Lincoln's sparrow	0	0	0	<0.01	0	0	0	<0.1	0	0	0	0.8
loggerhead shrike	0.29	0.24	0.12	0.14	0.1	0.3	0.5	0.2	11.7	18.7	12.5	12.5
mountain bluebird	0	0	0	7.15	0	0	0	11.1	0	0	0	3.3
northern mockingbird	0	0	<0.01	0	0	0	<0.1	0	0	0	1.0	0
northern rough-winged swallow	0.01	0	0	0	<0.1	0	0	0	0.7	0	0	0
orange-crowned warbler	<0.01	0	<0.01	0	<0.1	0	<0.1	0	0.7	0	1.0	0
pine siskin	0	0	0.34	0.04	0	0	1.2	<0.1	0	0	2.9	0.8
red-winged blackbird	0.03	0	0	0	<0.1	0	0	0	1.5	0	0	0
ruby-crowned kinglet	0	0	0	<0.01	0	0	0	<0.1	0	0	0	0.8
sage sparrow	0	<0.01	<0.01	0	0	<0.1	<0.1	0	0	0.8	1.0	0
sage thrasher	0	0	<0.01	0	0	0	<0.1	0	0	0	1.0	0
savannah sparrow	0.28	0	0.88	3.71	0.1	0	3.2	5.8	9.6	0	28.8	40.0
Say's phoebe	0	0	0.05	0.04	0	0	0.2	<0.1	0	0	3.8	4.2
tree swallow	0.32	0	0.31	0	0.1	0	1.1	0	2.2	0	2.9	0
tricolored blackbird	261.92	57.61	0	0	95.2	79.9	0	0	29.1	15.7	0	0

Appendix B2. Mean bird use (number of birds/plot[a]/30-min survey), percent of total composition (%), and frequency of occurrence (%) for each small bird type and species by season during the fixed-point bird use surveys at the Wildflower Green Energy Farm from March 18, 2010, to September 8, 2011.

	Mean Use				% Composition				% Frequency			
Type / Species	**Spring**	**Summer**	**Fall**	**Winter**	**Spring**	**Summer**	**Fall**	**Winter**	**Spring**	**Summer**	**Fall**	**Winter**
unidentified sparrow	0	<0.01	<0.01	0	0	<0.1	<0.1	0	0	0.3	1.0	0
unidentified swallow	<0.01	0.15	0.12	0	<0.1	0.2	0.5	0	0.7	1.9	2.9	0
vesper sparrow	0	0	0.29	0.12	0	0	1	0.2	0	0	4.8	8.3
violet-green swallow	0.04	0	0.12	0.06	<0.1	0	0.4	<0.1	1.5	0	1.0	0.8
western bluebird	0	0	0.09	0	0	0	0.3	0	0	0	1.0	0
western kingbird	0.08	0.07	0	0	<0.1	0.1	0	0	5.4	5	0	0
western meadowlark	2.29	1.16	3.88	4.03	0.8	1.6	14.1	6.3	61.6	32.9	50	38.3
western tanager	0.04	0	0	0	<0.1	0	0	0	0.5	0	0	0
white-crowned sparrow	0.07	0	0.70	2.33	<0.1	0	2.5	3.6	2.2	0	15.4	15.0
yellow-headed blackbird	<0.01	0	0	0	<0.1	0	0	0	0.7	0	0	0
yellow-rumped warbler	0.03	0	0.05	0.02	<0.1	0	0.2	<0.1	2.2	0	3.8	2.5
Swifts/Hummingbirds	**0.07**	**0.02**	**0.04**	**0**	**<0.1**	**<0.1**	**0.1**	**0**	**4.2**	**1.9**	**2.9**	**0**
Anna's hummingbird	0	<0.01	<0.01	0	0	<0.1	<0.1	0	0	0.5	1.0	0
rufous hummingbird	<0.01	0	0	0	<0.1	0	0	0	0.7	0	0	0
unidentified hummingbird	0.03	0.01	<0.01	0	<0.1	<0.1	<0.1	0	2.7	1.4	1.0	0
Vaux's swift	0.03	0	0.02	0	<0.1	0	<0.1	0	1.2	0	1.0	0
Woodpeckers	**0**	**0**	**0.02**	**0.02**	**0**	**0**	**<0.1**	**<0.1**	**0**	**0**	**1.9**	**2.5**
ladder-backed woodpecker	0	0	<0.01	0	0	0	<0.1	0	0	0	1.0	0
northern flicker	0	0	0	0.02	0	0	0	<0.1	0	0	0	2.5
unidentified sapsucker	0	0	<0.01	0	0	0	<0.1	0	0	0	1.0	0
Overall	**274.98**	**72.11**	**27.56**	**64.3**	**100**	**100**	**100**	**100**				

[a.] 800-meter (m) radius plot for large birds and 100-m for small birds.

Appendix C. Species Exposure Indices for Large Birds and Small Birds at the Wildflower Green Energy Farm from March 18, 2010, to September 8, 2011.

Appendix C1. Relative exposure index and flight characteristics by large bird species during the fixed-point bird use surveys at the Wildflower Green Energy Farm, March 18, 2010 - March 12, 2011.

Species	# Groups Flying	Overall Mean Use	% Flying	% Flying within RSH based on initial obs	Exposure Index	% Within RSH at anytime
common raven	486	3.69	78.8	6.5	0.19	25.3
American white pelican	2	0.17	100	100	0.17	100
red-tailed hawk	144	0.53	63.1	22.7	0.08	40.9
turkey vulture	49	0.19	97.0	39.2	0.07	52.6
killdeer	13	0.11	64.8	25.7	0.02	25.7
unidentified shorebird	1	0.02	100	100	0.02	100
unidentified duck	1	0.02	100	100	0.02	100
American kestrel	136	0.39	76.2	5.0	0.01	13.1
ferruginous hawk	16	0.06	64.0	31.2	0.01	56.2
lesser scaup	1	0.08	13.9	100	0.01	100
northern harrier	67	0.16	98.6	2.9	<0.01	7.1
California quail	12	0.96	75.9	0.5	<0.01	0.5
great egret	1	<0.01	66.7	100	<0.01	100
prairie falcon	16	0.04	84.2	6.2	<0.01	6.2
Cooper's hawk	5	0.01	100	20.0	<0.01	20.0
unidentified falcon	5	<0.01	100	20.0	<0.01	20.0
Swainson's hawk	10	0.02	100	10.0	<0.01	60.0
mourning dove	94	0.75	89.7	0	0	0
bufflehead	7	0.55	13.6	0	0	0
ring-necked duck	1	0.49	4.2	0	0	0
mallard	11	0.06	55.0	0	0	0
California gull	1	0.05	100	0	0	100
golden eagle	10	0.03	66.7	0	0	30.0
Caspian tern	1	0.02	100	0	0	0
merlin	6	0.02	75.0	0	0	0
great horned owl	1	0.02	87.5	0	0	0
greater roadrunner	4	0.02	44.4	0	0	0
Eurasian collared-dove	1	0.01	25.0	0	0	0
common goldeneye	1	0.01	20.0	0	0	0
double-crested cormorant	2	0.01	100	0	0	66.7
common merganser	1	<0.01	100	0	0	0
peregrine falcon	2	<0.01	66.7	0	0	0
western grebe	0	<0.01	0	0	0	0
gadwall	0	<0.01	0	0	0	0
ring-necked pheasant	2	<0.01	100	0	0	0

Appendix C1. Relative exposure index and flight characteristics by large bird species during the fixed-point bird use surveys at the Wildflower Green Energy Farm, March 18, 2010 - March 12, 2011.

Species	# Groups Flying	Overall Mean Use	% Flying	% Flying within RSH based on initial obs	Exposure Index	% Within RSH at anytime
pied-billed grebe	0	<0.01	0	0	0	0
rock pigeon	1	<0.01	100	0	0	0
spotted sandpiper	0	<0.01	0	0	0	0
greater yellowlegs	0	<0.01	0	0	0	0
great blue heron	1	<0.01	50.0	0	0	0
burrowing owl	1	<0.01	100	0	0	0
unidentified gull	1	<0.01	100	0	0	0
sharp-shinned hawk	1	<0.01	100	0	0	0
green heron	0	<0.01	0	0	0	0
unidentified accipiter	1	<0.01	100	0	0	0
white-faced ibis	0	<0.01	0	0	0	0
American coot	0	<0.01	0	0	0	0

RSH: The likely “rotor swept heights” for potential collision with a turbine blade, 35-130 m (115-427 ft) above ground level (AGL).

Appendix C2. Relative exposure index and flight characteristics for small birds during the fixed-point bird use surveys at the Wildflower Green Energy Farm from March 18, 2010, to September 8, 2011.

Species	# Groups Flying	Overall Mean Use	% Flying	% Flying within RSH based on initial obs	Exposure Index	% Within RSH at anytime
house finch	69	1.52	89.6	6.4	0.09	6.4
horned lark	237	17.11	93.2	0.4	0.06	0.8
tree swallow	11	0.14	100	38.7	0.06	48.0
tricolored blackbird	88	80.54	97.5	<0.1	0.02	49.8
Brewer's blackbird	36	0.45	95.2	4.2	0.02	8.8
Lawrence's goldfinch	6	0.04	87.0	15.0	<0.01	15.0
Vaux's swift	2	0.01	66.7	75.0	<0.01	75.0
Say's phoebe	6	0.02	70.0	28.6	<0.01	28.6
lark sparrow	21	1.26	97.6	0.2	<0.01	0.2
European starling	21	0.54	99.2	0.4	<0.01	0.4
unidentified sparrow	2	<0.01	100	50.0	<0.01	50.0
western meadowlark	92	2.83	67.0	0	0	0
mountain bluebird	4	2.06	100	0	0	11.7
cliff swallow	52	1.33	95.9	0	0	34.4
savannah sparrow	55	1.32	75.1	0	0	0
white-crowned sparrow	21	0.84	55.4	0	0	0
house sparrow	23	0.59	73.3	0	0	0
barn swallow	30	0.20	98.0	0	0	4.1
loggerhead shrike	35	0.20	40.5	0	0	0
vesper sparrow	10	0.09	86.4	0	0	0
lesser goldfinch	5	0.09	90.2	0	0	0
pine siskin	3	0.08	95.0	0	0	0
American goldfinch	8	0.08	83.3	0	0	0
unidentified swallow	6	0.07	100	0	0	0
violet-green swallow	5	0.05	100	0	0	28.0
western kingbird	13	0.04	87.5	0	0	0
yellow-rumped warbler	5	0.02	58.3	0	0	0
Bullock's oriole	7	0.02	64.7	0	0	0
American pipit	8	0.02	100	0	0	0
black phoebe	5	0.02	50.0	0	0	0
western bluebird	1	0.02	100	0	0	0
unidentified hummingbird	7	0.01	100	0	0	0
Bewick's wren	1	0.01	33.3	0	0	0
western tanager	1	<0.01	100	0	0	0
California towhee	0	<0.01	0	0	0	0

Appendix C2. Relative exposure index and flight characteristics for small birds during the fixed-point bird use surveys at the Wildflower Green Energy Farm from March 18, 2010, to September 8, 2011.

Species	# Groups Flying	Overall Mean Use	% Flying	% Flying within RSH based on initial obs	Exposure Index	% Within RSH at anytime
red-winged blackbird	2	<0.01	100	0	0	0
northern flicker	1	<0.01	33.3	0	0	0
sage sparrow	1	<0.01	50.0	0	0	0
orange-crowned warbler	2	<0.01	100	0	0	0
northern rough-winged swallow	1	<0.01	100	0	0	0
hooded oriole	1	<0.01	100	0	0	0
Anna's hummingbird	2	<0.01	100	0	0	0
ruby-crowned kinglet	0	<0.01	0	0	0	0
Lincoln's sparrow	0	<0.01	0	0	0	0
unidentified sapsucker	1	<0.01	100	0	0	0
sage thrasher	1	<0.01	100	0	0	0
northern mockingbird	0	<0.01	0	0	0	0
ladder-backed woodpecker	1	<0.01	100	0	0	0
house wren	0	<0.01	0	0	0	0
yellow-headed blackbird	0	<0.01	0	0	0	0
rufous hummingbird	0	<0.01	0	0	0	0
brown-headed cowbird	0	<0.01	0	0	0	0
northern shrike	1	<0.01	100	0	0	0

RSH: The likely “rotor swept heights” for potential collision with a turbine blade, 35-130 m (115-427 ft) above ground level (AGL).

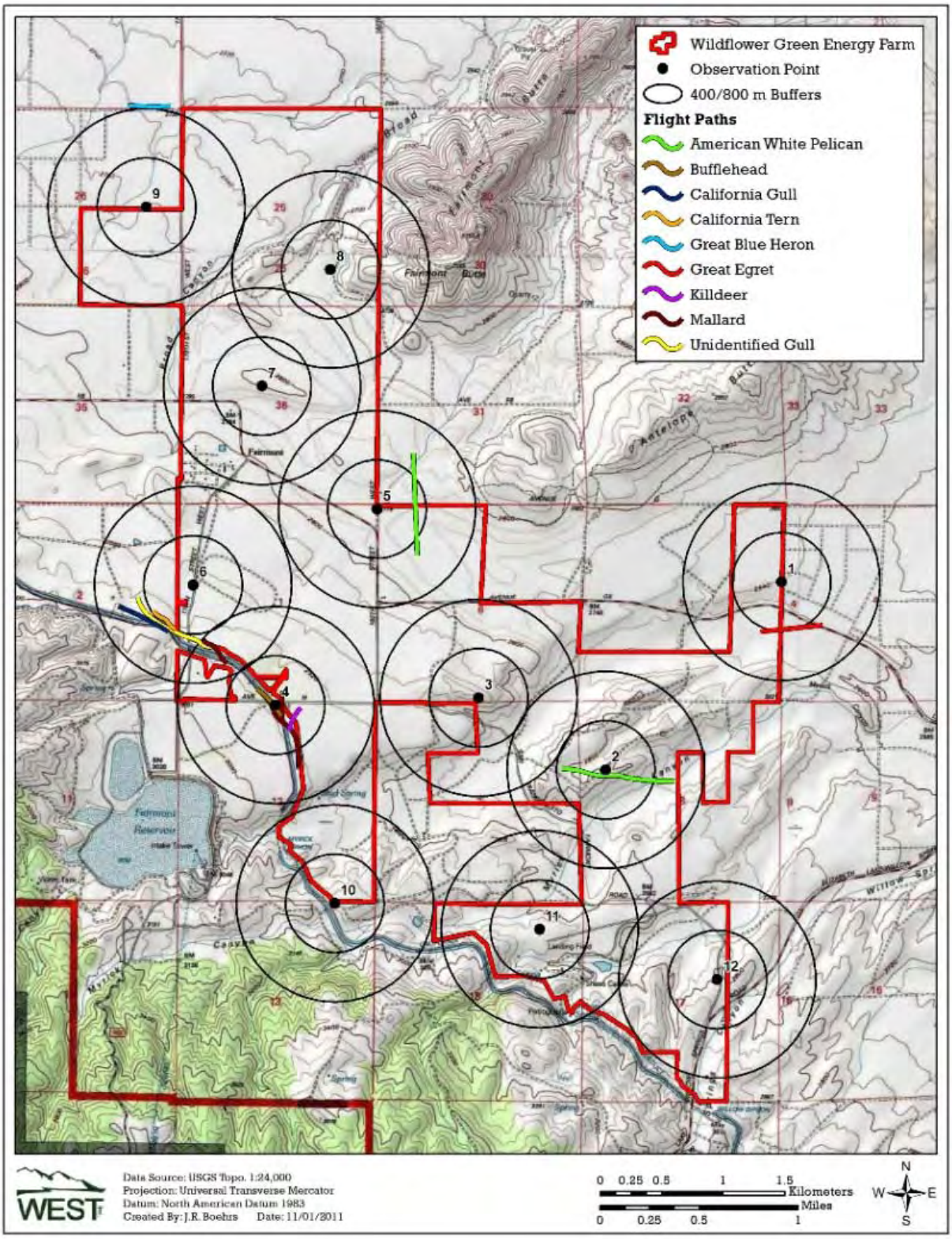
Appendix D. Mean Use by Point for All Birds, Major Bird Types, and Raptor Subtypes Observed during Fixed-Point Bird Use Surveys at the Wildflower Green Energy Farm from March 18, 2010, to September 8, 2011.

Appendix D. Mean use (number of birds/30-minute survey) by point for all birds[a], major bird types, and raptor subtypes observed at the Wildflower Green Energy Farm during fixed-point bird use surveys between March 18, 2010, and September 8, 2011.

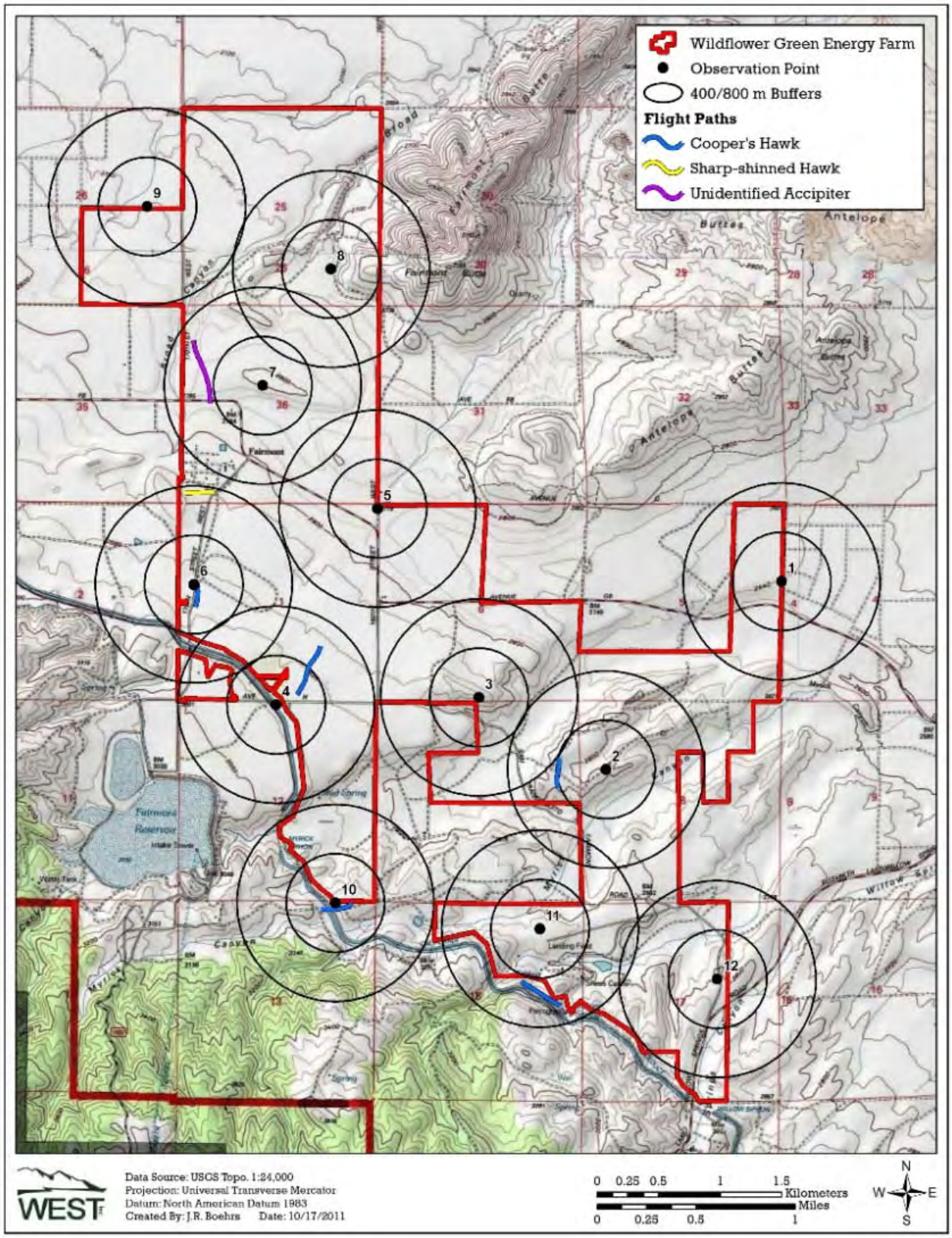
	Survey Point											
Bird Type / Subtype	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Loons/Grebes	0	0	0	0.07	0	0.02	0	0	0	0	0	0
Waterbirds	0.03	1.27	0	0.07	0.28	0.02	0.02	0	0.06	0	0.06	0
Waterfowl	0	0	0	6.66	0	2.53	0.05	0	0	0.44	0	0
Shorebirds	0	0	0	0.31	0	0.30	0.32	0	0	0.5	0.33	0.06
Gulls/Terns	0	0	0	0.11	0	0.32	0	0	0	0	0	0
Rails/Coots	0	0	0	0.02	0	0	0	0	0	0	0	0
Diurnal Raptors	1.22	1.63	0.87	0.59	1.75	1.20	1.29	0.78	0.50	1.00	2.17	1.61
Accipiters	*0*	*0.02*	*0*	*0.02*	*0*	*0.03*	*0.02*	*0*	*0*	*0.06*	*0.06*	*0*
Buteos	*0.68*	*0.83*	*0.43*	*0.33*	*0.84*	*0.68*	*0.19*	*0.22*	*0.33*	*0.83*	*1.17*	*1.17*
Northern Harrier	*0.08*	*0.27*	*0.13*	*0.13*	*0.10*	*0.10*	*0.14*	*0.22*	*0*	*0*	*0*	*0.06*
Eagles	*0.02*	*0.08*	*0.12*	*0.02*	*0*	*0*	*0.02*	*0*	*0*	*0*	*0*	*0*
Falcons	*0.44*	*0.42*	*0.18*	*0.10*	*0.82*	*0.38*	*0.93*	*0.34*	*0.17*	*0.11*	*0.94*	*0.39*
Owls	0	0.02	0	0	0	0	0	0.07	0	0	0.39	0
Vultures	0.08	0.15	0.42	0.16	0.13	0.13	0.02	0.15	0.33	0.61	0.28	0.17
Upland Game Birds	0	0	0	3.92	2.9	0.33	0	0	0.06	1.22	2.22	0.50
Doves/Pigeons	0	0	0.17	1.23	0.7	1.15	2.69	0	0.11	2.72	0.44	1.67
Large Corvids	6.73	2.69	2.87	2.18	2.79	2.87	4.51	8.19	7.00	1.83	2.28	2.06
Large Cuckoos	0	0.02	0	0.03	0.02	0.03	0	0	0.06	0.11	0	0
Large Birds Overall	**8.07**	**5.78**	**4.32**	**15.34**	**8.57**	**8.90**	**8.90**	**9.19**	**8.11**	**8.44**	**8.17**	**6.06**
Passerines	90.37	8.88	10.82	442.69	113.48	57.45	50.86	22.37	10.33	97.44	42.89	25.28
Swifts/Hummingbirds	0.03	0	0.03	0.08	0.05	0.07	0	0	0.06	0	0	0
Woodpeckers	0	0	0	0.07	0.02	0	0	0	0	0	0	0
Small Birds Overall	**90.41**	**8.88**	**10.85**	**442.84**	**113.54**	**57.52**	**50.86**	**22.37**	**10.39**	**97.44**	**42.89**	**25.28**

[a.] 800-meter (m) radius plot for large birds, 100-m for small birds.

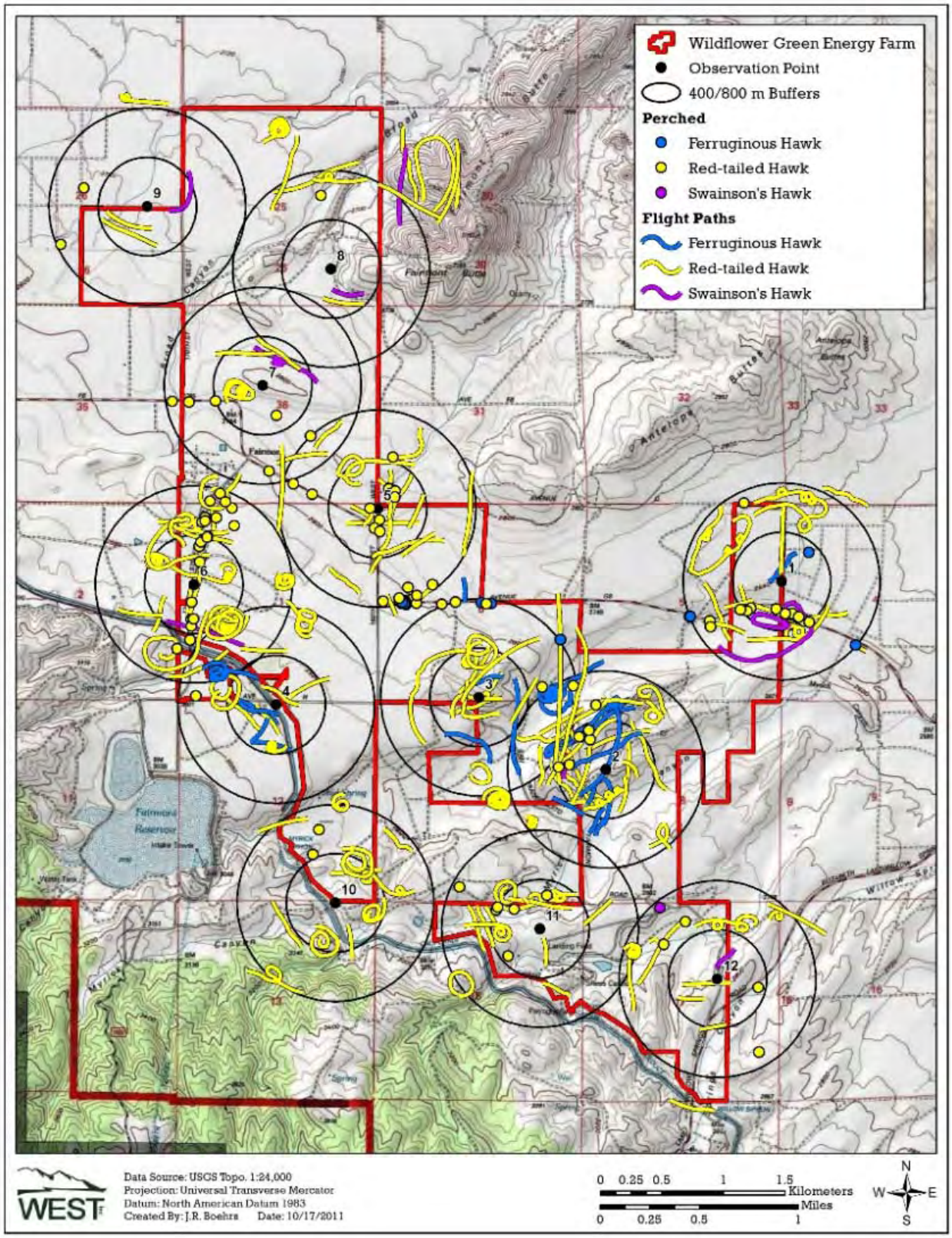
Appendix E. Large Bird Flight Paths Observed During Fixed-Point Bird Use Surveys at the Wildflower Green Energy Farm from March 18, 2010, to September 8, 2011.



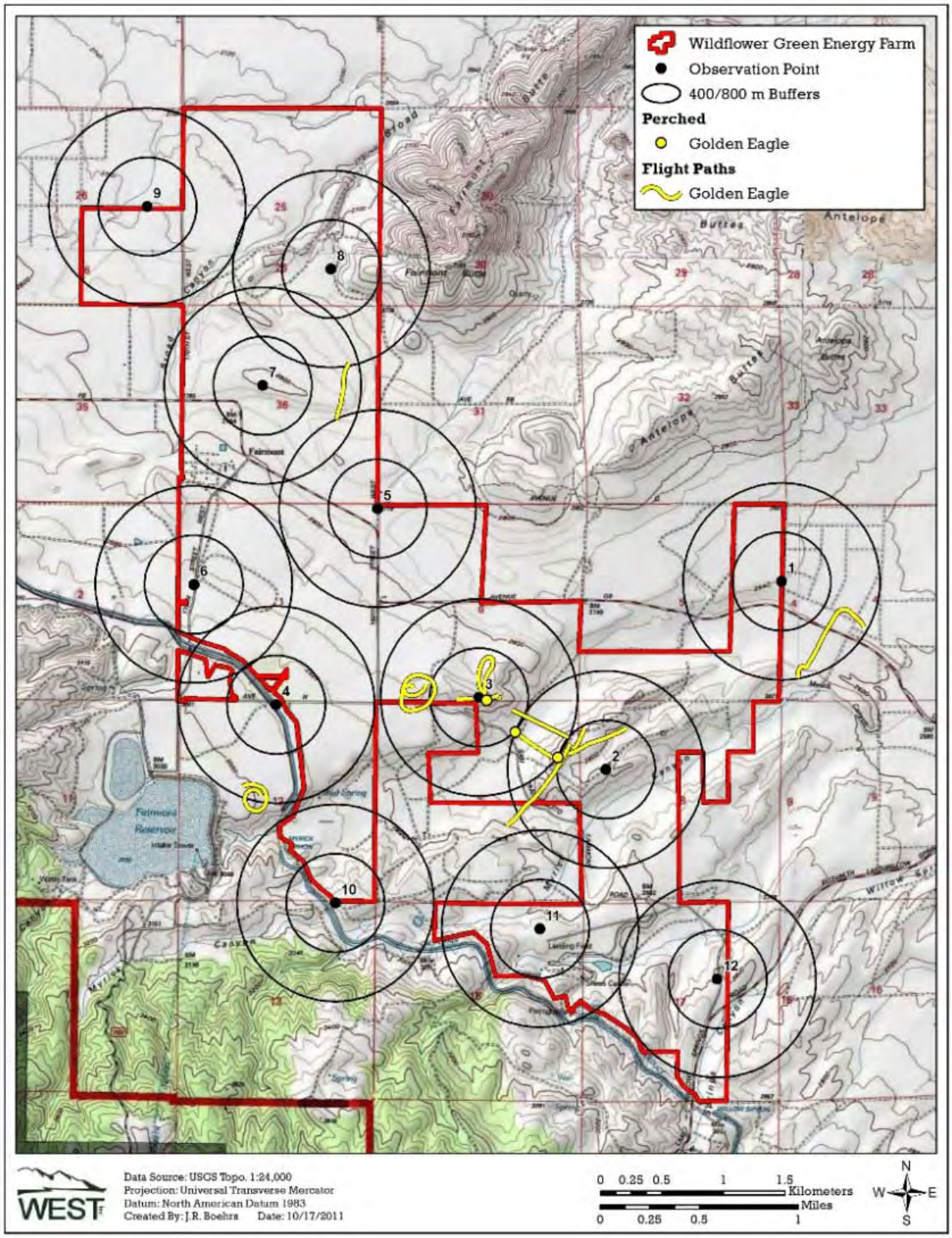
Appendix E1. Flight paths for waterbirds, waterfowl, and shorebirds within the Wildflower Green Energy Farm.



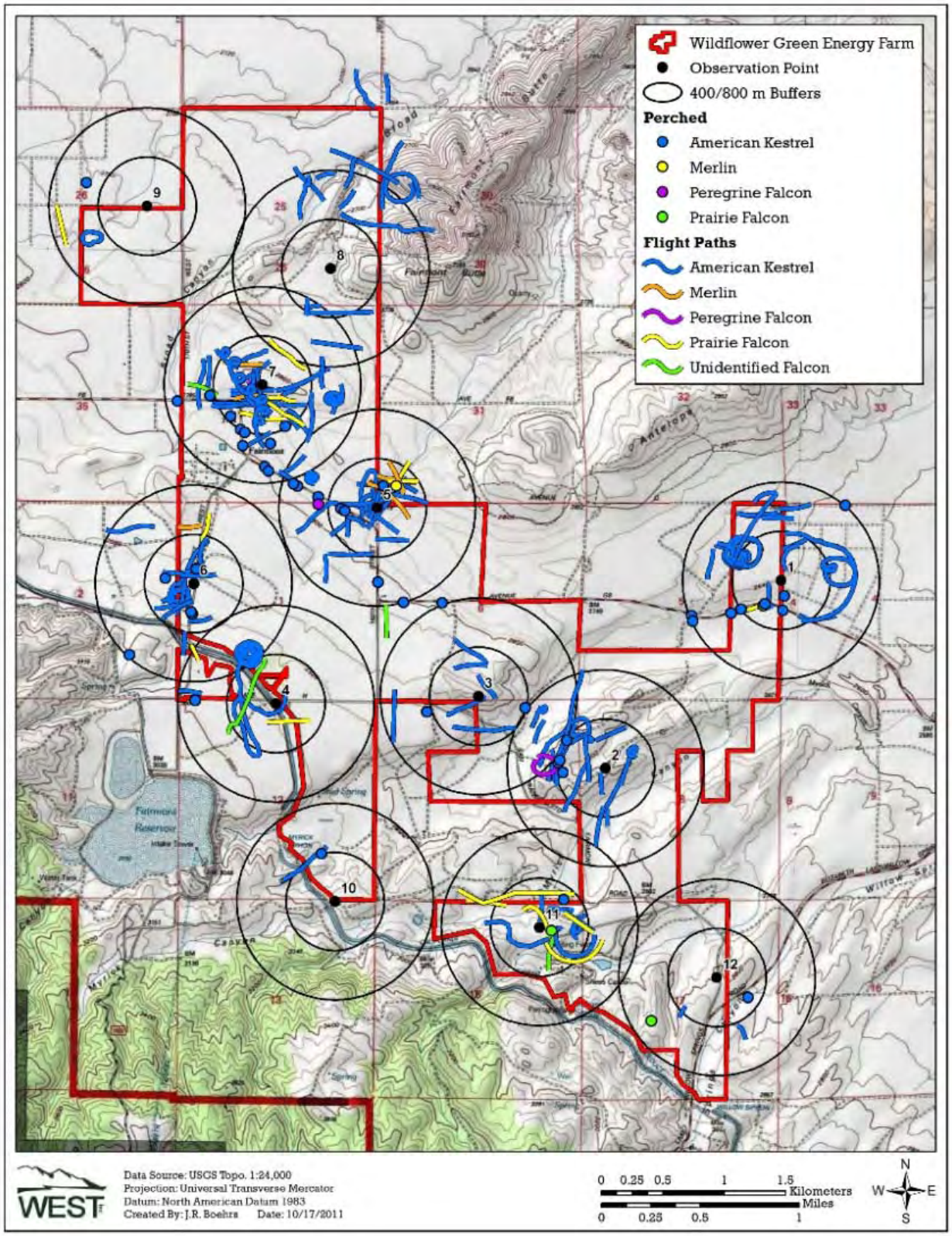
Appendix E2. Flight paths for accipiters within the Wildflower Green Energy Farm.



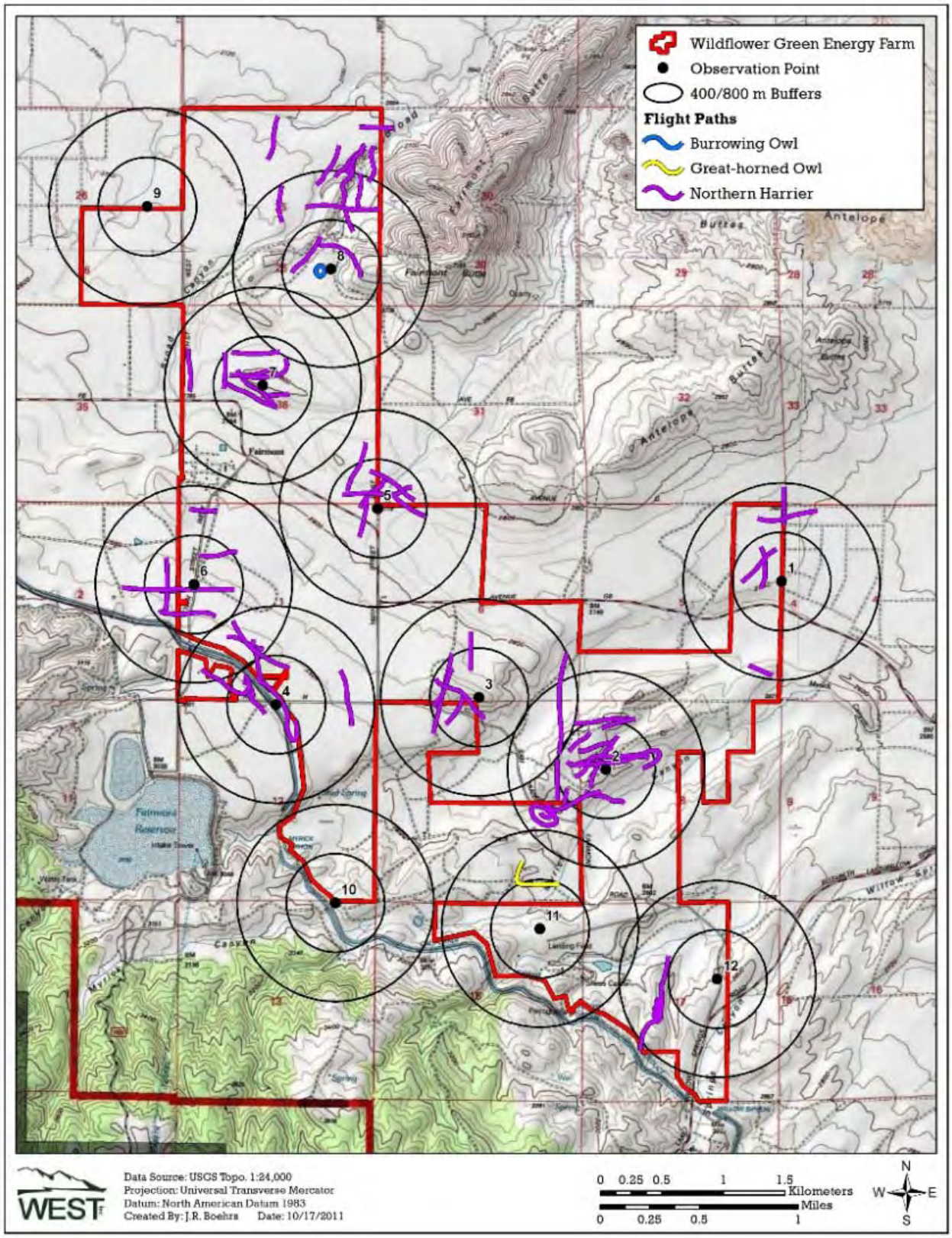
Appendix E3. Flight paths for buteos within the Wildflower Green Energy Farm.



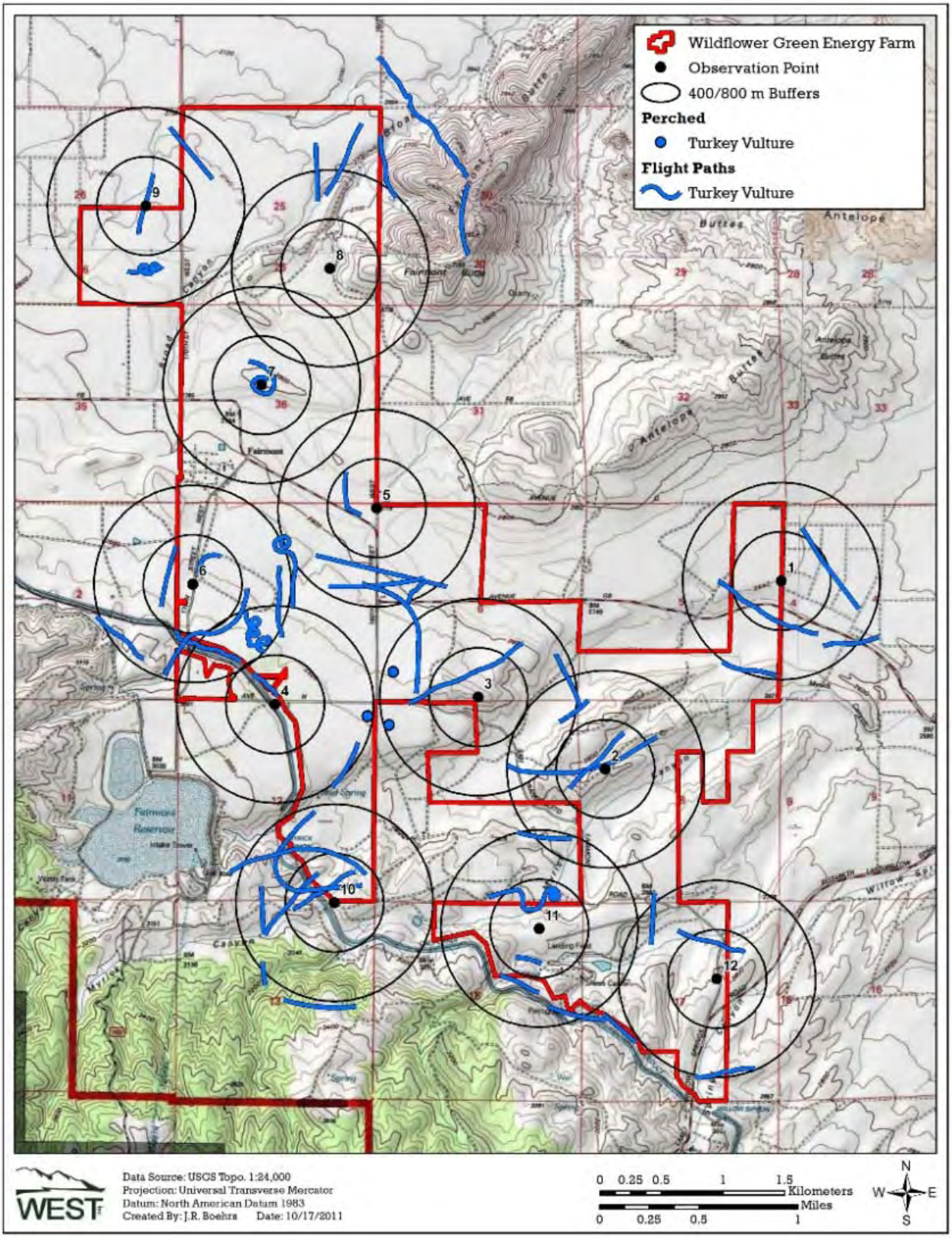
Appendix E4. Flight paths for eagles within the Wildflower Green Energy Farm.



Appendix E5. Flight paths for falcons within the Wildflower Green Energy Farm.



Appendix E6. Flight paths for northern harriers and owls within the Wildflower Green Energy Farm.



Appendix E7. Flight paths for turkey vultures within the Wildflower Green Energy Farm.

Appendix F. All Bird Types and Species Observed at the Wildflower Green Energy Farm during Migrating/Breeding Bird Surveys from May 10, 2011, to June 23, 2011.

Appendix F. Total number of groups and individuals for each bird type and species by season during the breeding bird surveys in the Wildflower Green Energy Farm from May 10, 2011, to June 23, 2011.

		Spring		Summer		Overall	
Bird Type / Species	**Scientific Name**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**
Waterbirds		**5**	**5**	**1**	**1**	**6**	**6**
green heron	*Butorides virescens*	4	4	0	0	4	4
snowy egret	*Egretta thula*	1	1	1	1	2	2
Waterfowl		**4**	**47**	**2**	**8**	**6**	**55**
bufflehead	*Bucephala albeola*	1	6	0	0	1	6
common goldeneye	*Bucephala clangula*	1	1	0	0	1	1
mallard	*Anas platyrhynchos*	2	40	2	8	4	48
Shorebirds		**5**	**26**	**3**	**10**	**8**	**36**
killdeer	*Charadrius vociferus*	2	11	2	9	4	20
semipalmated plover	*Charadrius semipalmatus*	1	5	0	0	1	5
spotted sandpiper	*Actitis macularia*	2	10	1	1	3	11
Diurnal Raptors		**7**	**7**	**5**	**10**	**12**	**17**
American kestrel	*Falco sparverius*	4	4	3	7	7	11
prairie falcon	*Falco mexicanus*	0	0	1	1	1	1
red-tailed hawk	*Buteo jamaicensis*	3	3	1	2	4	5
Owls		**1**	**1**	**0**	**0**	**1**	**1**
barn owl	*Tyto alba*	1	1	0	0	1	1
Vultures		**2**	**4**	**0**	**0**	**2**	**4**
turkey vulture	*Cathartes aura*	2	4	0	0	2	4
Upland Game Birds		**8**	**31**	**13**	**227**	**21**	**258**
California quail	*Callipepla californica*	8	31	13	227	21	258
Doves/Pigeons		**5**	**6**	**13**	**35**	**18**	**41**
Eurasian collared-dove	*Streptopelia decaocto*	1	1	2	3	3	4
mourning dove	*Zenaida macroura*	4	5	11	32	15	37
Large Cuckoo		**0**	**0**	**1**	**1**	**1**	**1**
greater roadrunner	*Geococcyx californianus*	0	0	1	1	1	1
Passerines		**100**	**793**	**96**	**488**	**196**	**1,281**
Blackbirds/Orioles		*27*	*643*	*35*	*227*	*62*	*870*
Brewer's blackbird	*Euphagus cyanocephalus*	0	0	6	28	6	28
brown-headed cowbird	*Molothrus ater*	0	0	1	1	1	1
Bullock's oriole	*Icterus bullockii*	8	12	8	18	16	30
European starling	*Sturnus vulgaris*	8	37	7	61	15	98
tricolored blackbird	*Agelaius tricolor*	9	590	7	111	16	701
western meadowlark	*Sturnella neglecta*	2	4	6	8	8	12

Appendix F. Total number of groups and individuals for each bird type and species by season during the breeding bird surveys in the Wildflower Green Energy Farm from May 10, 2011, to June 23, 2011.

		Spring		Summer		Overall	
Bird Type / Species	**Scientific Name**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**
Corvids		*12*	*17*	*7*	*13*	*19*	*30*
common raven	*Corvus corax*	8	12	5	11	13	23
western scrub-jay	*Aphelocoma californica*	4	5	2	2	6	7
Finches/Crossbills		*7*	*16*	*9*	*13*	*16*	*29*
house finch	*Carpodacus mexicanus*	6	15	8	12	14	27
Lawrence's goldfinch	*Carduelis lawrencei*	0	0	1	1	1	1
lesser goldfinch	*Carduelis psaltria*	1	1	0	0	1	1
Flycatchers		*6*	*8*	*4*	*4*	*10*	*12*
Pacific-slope flycatcher	*Empidonax difficilis*	0	0	1	1	1	1
western kingbird	*Tyrannus verticalis*	4	6	3	3	7	9
western wood-pewee	*Contopus sordidulus*	1	1	0	0	1	1
willow flycatcher	*Empidonax traillii*	1	1	0	0	1	1
Grassland/Sparrows		*17*	*26*	*20*	*83*	*37*	*109*
California towhee	*Pipilo crissalis*	8	14	6	9	14	23
horned lark	*Eremophila alpestris*	2	2	7	66	9	68
lark sparrow	*Chondestes grammacus*	4	7	4	4	8	11
song sparrow	*Melospiza melodia*	3	3	3	4	6	7
Swallows		*10*	*60*	*9*	*129*	*19*	*189*
barn swallow	*Hirundo rustica*	1	1	3	6	4	7
cliff swallow	*Petrochelidon pyrrhonota*	9	59	6	123	15	182
Tanagers/Grosbeaks/Cardinals		*0*	*0*	*1*	*1*	*1*	*1*
blue grosbeak	*Guiraca caerulea*	0	0	1	1	1	1
Thrushes		*0*	*0*	*1*	*1*	*1*	*1*
American robin	*Turdus migratorius*	0	0	1	1	1	1
Vireos		*1*	*1*	*0*	*0*	*1*	*1*
warbling vireo	*Vireo gilvus*	1	1	0	0	1	1
Warblers		*11*	*11*	*1*	*1*	*12*	*12*
Wilson's warbler	*Wilsonia pusilla*	6	6	1	1	7	7
yellow-rumped warbler	*Dendroica coronata*	1	1	0	0	1	1
yellow warbler	*Dendroica petechia*	4	4	0	0	4	4
Waxwings		*0*	*0*	*2*	*2*	*2*	*2*
phainopepla	*Phainopepla nitens*	0	0	2	2	2	2
Wrens		*9*	*11*	*7*	*14*	*16*	*25*
Bewick's wren	*Thryomanes bewickii*	2	2	2	2	4	4
house wren	*Troglodytes aedon*	7	9	5	12	12	21

Appendix F. Total number of groups and individuals for each bird type and species by season during the breeding bird surveys in the Wildflower Green Energy Farm from May 10, 2011, to June 23, 2011.

		Spring		Summer		Overall	
Bird Type / Species	**Scientific Name**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**
Swifts/Hummingbirds		**3**	**3**	**4**	**6**	**7**	**9**
Anna's hummingbird	*Calypte anna*	3	3	3	3	6	6
Costa's hummingbird	*Calypte costae*	0	0	1	3	1	3
Woodpeckers		**3**	**3**	**1**	**1**	**4**	**4**
Nuttall's woodpecker	*Picoides nuttallii*	3	3	1	1	4	4
Overall	**50 Species**	**143**	**926**	**139**	**787**	**282**	**1,713**

Appendix G. Mean Use by Point for All Birds, Major Bird Types, and Passerine Subtypes Observed during Migrating/Breeding Bird Surveys at the Wildflower Green Energy Farm from May 10, 2011, to June 23, 2011.

Appendix G. Mean use (number of birds/10-minute survey) by point for all birds, major bird types, and passerine subtypes observed at the Wildflower Green Energy Farm during migrating/breeding bird surveys from May 10, 2011, to June 23, 2011.

	Survey Point							
Bird Type / Subtype	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Waterbirds	0	0.50	0.50	0	0	0	0.25	0
Waterfowl	0	0	0	0	0	0	0	13.75
Shorebirds	0	0	0	0	0.25	0	0	8.75
Diurnal Raptors	0.50	0	1.25	2.25	0	0	0.25	0
Owls	0	0	0	0	0	0	0.25	0
Vultures	0	0	0.25	0	0	0.75	0	0
Upland Game Birds	8.50	0.75	6.25	24.50	4.25	15.00	1.50	3.75
Doves/Pigeons	0.25	0.25	0.50	2.50	2.00	3.00	1.50	0.25
Large Cuckoos	0	0	0.25	0	0	0	0	0
Passerines	58.75	58.50	25.75	49.25	17.75	12.00	35.25	62.25
Blackbirds/Orioles	*48.75*	*49.75*	*17.75*	*9.50*	*13.75*	*8.50*	*19.75*	*49.00*
Corvids	*2.50*	*1.00*	*2.25*	*1.00*	*0*	*0.25*	*0.25*	*0.25*
Finches/Crossbills	*3.50*	*1.00*	*0.25*	*1.00*	*0.25*	*0.25*	*0.50*	*0.50*
Flycatchers	*0.50*	*0.25*	*0*	*0.25*	*0*	*0.25*	*0.50*	*1.25*
Grassland/Sparrows	*2.50*	*2.75*	*4.25*	*3.75*	*0.50*	*0.50*	*7.50*	*5.50*
Swallows	*0.25*	*3.25*	*0*	*31.25*	*2.50*	*0.75*	*3.50*	*5.75*
Tanagers/Grosbeaks/Cardinals	*0.25*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Thrushes	*0*	*0.25*	*0*	*0*	*0*	*0*	*0*	*0*
Vireos	*0*	*0*	*0.25*	*0*	*0*	*0*	*0*	*0*
Warblers	*0.25*	*0.25*	*1.00*	*0.25*	*0*	*0.50*	*0.75*	*0*
Waxwings	*0*	*0*	*0*	*0.50*	*0*	*0*	*0*	*0*
Wrens	*0.25*	*0*	*0*	*1.75*	*0.75*	*1.00*	*2.50*	*0*
Swifts/Hummingbirds	0.50	0.25	0	0.75	0.25	0.25	0.25	0
Woodpeckers	0	0	0.25	0.25	0.50	0	0	0
Overall	**68.50**	**60.25**	**35.00**	**79.50**	**25.00**	**31.00**	**39.25**	**88.75**

Appendix H. Hamer 2011: Spring and Fall Nocturnal Migration Surveys for the Proposed Wildflower Green Energy Farm, Los Angeles County, California

Spring and Fall Nocturnal Migration Surveys for the Proposed Wildflower Green Energy Farm, Los Angeles County, California

Report Submitted to WEST, Inc.

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January 27, 2011

EXECUTIVE SUMMARY

- This report presents the results of a radar study of bird migration conducted in spring between 20 April and 19 May 2010, and in the fall between 8 September and 8 October 2010 at the proposed Wildflower Green Energy Farm, located in Los Angeles County, California.

- Radar and outside observations were conducted for 6 hours per night between the hours of 1900 h and 0600 h.

- The goal of this study was to collect information that will be used to help evaluate the potential impacts of the proposed wind-energy facilities on local and migratory birds during the peak spring and fall migration periods.

- The median flight direction in the spring was 45 degrees at the northwest survey site, and 138 degrees at the southeast survey site. In the fall, the northwest survey site had a median flight direction of 128 degrees, while the southeast survey site had an average of 133 degrees.

- Mean nocturnal flight altitude during the spring of 2010 across all survey hours and both survey locations was 697 ± 8 m agl. Mean flight altitude during the fall of 2010 across all survey hours and both survey locations was higher at 777 ± 13 m agl.

- The mean percentage of targets flying ≤ 150 m agl during the spring surveys was 11%. During the fall, 2% of the targets were flying ≤ 150 m above ground level.

- We found that the average hourly passage rate (targets/hr/3 km) for both sites combined during spring 2010 surveys was 156 ± 17 while during the fall 2010 the passage rate was lower at 86 ± 8.

- The mean flight speed of targets during the spring of 2010 for both survey sites combined was 54.2 ± 0.5 km/hr. Mean flight speeds during the fall 2010 survey for both sites combined was 68.2 ± 0.6 km/hr.

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INTRODUCTION

The overall purpose of the nocturnal marine radar surveys was to characterize avian migration over the energy resource area and provide data that can be used to determine the relative magnitude of nocturnal migration over the proposed development area when compared to other sites. The primary objective of the radar study was to collect baseline information on flight direction, passage rates, and flight altitude of nocturnal migrants at representative sampling locations for the proposed development area. The specific radar sampling locations were determined based on constraints of the radar (e.g., minimization of ground interference) and access, but were located within the proposed development area and chosen to maximize radar visibility in a 360° circle around the radar.

Modified marine radar was utilized to provide information about the pattern of spring and fall migration over the proposed Wildflower Green Energy Farm (WGEF) in Los Angeles County, California (Figure 1). Data was collected from 20 April to 19 May, and 8 September to 8 October 2010 to sample the peak periods of spring and fall migrations.

METHODS

All nocturnal migration monitoring followed the design and methodology guidance contained in the National Wind Citing Committee nocturnal monitoring methods document (Kunz et al. 2007) which states:

> "Typically, a single radar unit is deployed at a central location on a wind-energy project area to maximize observable airspace for 30–45 days during spring (approx.1 Apr through late May) and autumn (approx. early Aug through early Oct) migration periods…. Most monitoring studies of airborne targets near proposed or operational wind-energy facilities have deployed marine radar between civil sunset and 0230 hours, assuming this to be the peak period of nocturnal migration for birds on a given night…"

As a result, one radar unit was used in the proposed development area during the spring and fall migration seasons as defined above with 30 days of sampling in each season. However, due to the size of the project area we divided the sampling time between two sites to cover a larger proportion of the wind resource area and capture potential west - east variation in migration pattern across the ridge system (Figure 2). The mobile radar lab consisted of a marine radar unit mounted on a 4WD pickup/mobile radar lab (Figure 1). The radar was an X-band, transmitting at 9,410 MHz with power output of 12 kW. Similar radar labs have been successfully used to monitor nocturnal avian migration and are described in Cooper et al. (1991) and Harmata et al. (1999).

Figure 1. Furuno Model FR-1510 Mark 3 marine radar unit utilized for nocturnal radar sampling, as mounted on a pickup truck camper.

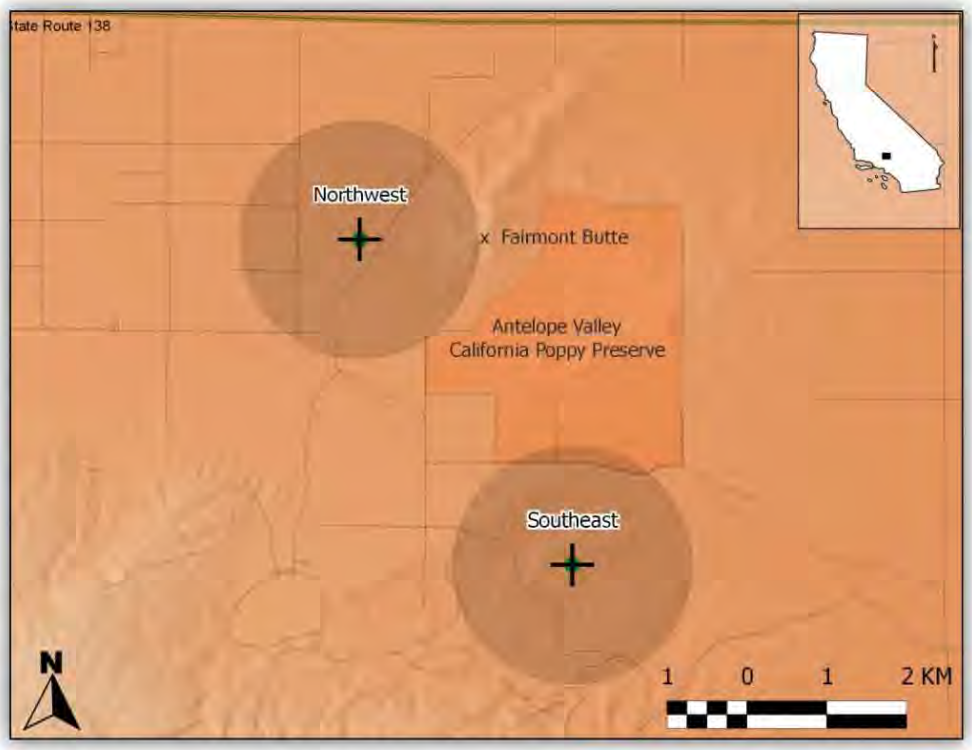

Figure 2. Modified marine radar survey locations (including 1.5 km radius survey coverage) used to measure nocturnal bird migration at the Wildflower Green Energy Farm, Los Angeles County, CA.

Data Collection

The study period for radar sampling was approximately 30 days during each of the spring and fall survey periods. On the majority of sampling nights, radar surveys occurred from approximately sunset until approximately 0130 hours to cover the peak period of nocturnal migration for birds. However, six nights during each sampling period were selected to sample the latter half of the nocturnal period (approx. 0030 through 0630 hours). Each sampling night was broken down into 60-min sampling periods that consisted of:

1) One 10-min session to collect weather data and adjust the radar to surveillance (i.e., horizontal) mode,
2) One 10-min short-range session (1.5 km range) with the radar in surveillance mode collecting information on migration traffic (passage) rates;
3) One 10-min short-range session (1.5 km range) with the radar in surveillance mode collecting information on flight direction, speed, and general location of migrants

4) One 5-min break to adjust radar to vertical mode; and
5) One 25-min short-range session (1.5 km range) in the vertical mode to collect information on flight altitudes.

The following weather data was collected at the beginning of each hour session: wind speed, wind direction; cloud cover (%); approximate ceiling height (m); approximate visibility (m); precipitation; barometric pressure; air temperature (°C). Noticeable changes in weather conditions, if any, were recorded when the radar unit was being adjusted to vertical mode. In addition, for 15 nights each season, an outside observer was stationed within 20 m of the radar to try and identify birds and bats by sight or sound passing through the site. Night vision goggles were used by the outside observer after periods of darkness.

Radar data collected during spring and fall surveys were filtered to remove any targets not-likely to be migrating birds. The following targets were filtered out: small-sized targets, slow targets (<21 km/hr), targets flying eastbound (61° - 120°) and targets flying west-bound (241° - 300°).

STUDY AREA

The proposed WGEF is located 14 miles west of Lancaster in Los Angeles County, California (Figure 2). The WGEF is located within the western extent of the Mojave Desert, bounded by the Tehachapi Mountains to the north and the San Gabriel Mountains to the south. The Antelope Valley Poppy Preserve, a state park, is located adjacent to the proposed AVAEF. Fairmont Butte, elevation 954 m (3130 ft), is just east of the Northwest survey site. Elevations in the radar survey area vary from 800 to 870 m (2,625 to 2,855 ft) above sea level. The semi-arid climate provides less than 20 cm (8 in) of rain per year, resulting in vegetation dominated by herbs and grasses.

RESULTS

Survey Effort

Radar sampling took place between 20 April and 19 May 2010 in the spring and between 8 September and 8 October 2010 in the fall. Due to the constraints of marine radar, sampling during some nights was shortened or cancelled due to heavy rain or high winds (>64 km/hr), so the total number of sampled nights was less than the total number of days within the study period (Table 1).

Table 1. Total radar sampling hours during the spring and fall 2010 surveys at the Wildflower Green Energy Farm.

Spring 2010				Fall 2010			
Survey #	Date	Site Name	Radar Sampling Hours	Survey #	Date	Site Name	Radar Sampling Hours
1	4/20 - 4/21	Southeast	19:39 - 1:39	1	9/8 - 9/9	Northwest	19:30 - 1:30
2	4/21 - 4/22	Northwest	19:33 - 1:33	2	9/9 - 9/10	Southeast	19:09 - 1:09
3	4/22 - 4/23	Southeast	19:31 - 1:31	3	9/10 - 9/11	Northwest	19:14 - 1:14
4	4/23 - 4/24	Northwest	19:32 - 1:32	4	9/11 - 9/12	Southeast	19:09 - 1:09
5	4/24	Southeast	0:34 - 6:34	5	9/13	Southeast	0:34 - 5:34
6	4/25 - 4/26	Northwest	19:34 - 1:34	6	9/13 - 9/14	Southeast	19:02 - 1:02
7	4/26 - 4/27	Southeast	19:36 - 1:36	7	9/14 - 9/15	Northwest	19:01 - 1:01
8	4/27 - 4/28	Northwest	19:36 - 1:37	8	9/15 - 9/16	Southeast	19:01 - 1:01
9	4/28 - 4/29	Southeast	19:35 - 1:35	9	9/16 - 9/17	Northwest	19:02 - 1:02
10	4/29 5/1	Northwest	high winds-cancelled	10	9/18	Southeast	0:36 - 5:36
11	5/1	Southeast	0:04 - 5:52	11	9/18 - 9/19	Northwest	18:55 - 0:55
12	5/1 - 5/2	Northwest	19:39 - 1:40	12	9/19 - 9/20	Northwest	18:54 - 0:54
13	5/2 - 5/3	Southeast	19:45 - 1:45	13	9/20 - 9/21	Southeast	18:52 - 0:52
14	5/3 - 5/4	Northwest	19:39 - 1:39	14	9/21 - 9/22	Northwest	18:52 - 0:52
15	5/4 - 5/5	Northwest	23:59 - 5:59	15	9/22 - 9/23	Southeast	18:49 - 0:49
16	5/5 - 5/6	Southeast	19:41 - 1:41	16	9/23 - 9/24	Northwest	18:54 - 0:54
17	5/6 - 5/7	Northwest	19:42 - 1:40	17	9/24 - 9/25	Southeast	18:50 - 0:50
18	5/7 - 5/8	Southeast	23:55 - 6:00	18	9/25 - 9/26	Northwest	18:51 - 0:51
19	5/8 - 5/9	Northwest	19:43 - 1:43	19	9/27	Southeast	0:44 -5:44
20	5/9 - 5/10	Southeast	19:44 - 1:44	20	9/27 - 9/28	Northwest	19:13 - 1:13
21	5/10 - 5/11	Northwest	19:45 - 1:45	21	9/28 - 9/29	Southeast	18:41 - 0:41
22	5/11 - 5/12	Southeast	19:46 - 1:46	22	9/29 - 9/30	Northwest	18:39 - 0:39
23	5/12 - 5/13	Northwest	19:46 - 1:46	23	9/30 - 10/1	Southeast	partially rained out
24	5/13 - 5/14	Southeast	19:47 - 1:47	24	10/1 - 10/2	Southeast	18:45 - 0:45
25	5/14 - 5/15	Northwest	23:45 - 5:45	25	10/2	Northwest	0:46 - 5:46
26	5/15 - 5/16	Southeast	19:49 - 1:49	26	10/4 - 10/5	Southeast	rained out
27	5/16 - 5/17	Northwest	20:00 - 2:00	27	10/5 - 10/6	Northwest	18:40 - 0:40
28	5/17 - 5/18	Southeast	rained out	28	10/6	Northwest	0:40 - 6:35
29	5/18 - 5/19	Southeast	19:47 - 00:39	29	10/6 - 10/7	Northwest	18:39 - 0:30
30	5/19	Southeast	high winds-cancelled	30	10/7 - 10/8	Southeast	18:38 - 0:38

Audio-visual surveys

Night vision goggles were used by an outside observer 2 hours per night for a total of 15 nights during each season (Table 2).

Table 2. Outside observer sampling hours during the spring and fall 2010 surveys at the Wildflower Green Energy Farm.

Site Name	Date	Radar Sampling Hours	Observations
Southeast	4/24	19:32 - 22:00	Many horned larks, insects
Northwest	4/27	19:34 - 21:40	Nighthawk, crow
Southeast	5/1	3:40 - 5:40	Horned lark
Northwest	5/1	19:38 - 21:48	Horned larks, insects
Southeast	5/2	19:38 - 21:40	—
Northwest	5/5	3:59 - 6:00	Ravens, crow
Southeast	5/7	11:50 - 2:00	Windy & dusty
Northwest	5/8	19:43 - 21:43	Many insects, great horned owl, songbirds
Southeast	5/9	19:43 - 21:43	Rained out
Northwest	5/10	19:45 - 21:45	Dusty
Southeast	5/11	19:46 - 22:15	Dusty, high winds, horned lark
Northwest	5/12	21:45 - 23:45	Many insects, bat seen through night vision goggles
Northwest	5/14 - 5/15	23:45 - 1:45	Many moths & crane flies, few passerines
Southeast	5/15	19:49 - 21:49	Many insects, horned larks
Northwest	5/16	19:45 - 21:45	Many insects
Southeast	9/11	19:09 - 21:09	Killdeer, moths
Northwest	9/13	4:10 - 6:35	Crows, dusty
Southeast	9/13	19:04 - 21:04	—
Southeast	9/15	19:00 - 21:00	Crow, killdeer, California thrasher, moths
Northwest	9/18	18:55 - 20:55	Many moths, horned larks, crow
Southeast	9/19	18:54 - 20:54	Horned larks, dusty, moths
Northwest	9/22	18:49 - 20:49	Crows, horned larks
Southeast	9/23	18:53 - 20:53	—
Southeast	9/25	18:45 - 20:45	Crow, dusty, many insects
Southeast	9/27	19:46 - 21:46	Horned lark, moths
Northwest	9/28	18:40 - 20:40	Horned lark, crow, many moths
Southeast	9/29	18:39 - 20:39	Horned lark
Northwest	9/30	18:38 - 20:38	Horned larks, crow, moths
Southeast	10/1	18:33 - 20:33	Owl, moths
Southeast	10/2	0:36 - 2:36	Great horned owl, curlew

Passage Rates

Temporal use of the WGEF by birds during survey sessions was defined as the average number of detected events per hour within the radar sampled area and expressed as a passage rate. Due to periods of rain or high winds (>64 km/hr), the total time sampled each hour or each night varied. We accounted for these differences in sampling periods by standardizing the data using the corrected average number of targets detected per hour. We present average migratory bird passage rates (± 1 SE) by survey day, survey hour, survey location, and season (Figures 3 & 5 [spring] and 4 & 6 [fall]).

During spring 2010, the survey day with the highest hourly passage rate occurred on the night of 1 May at the Southeast site with 626 targets/hr/3 km (Figure 3). The night of 3 May at the Northwest site also had a high mean passage rate at 529 targets/hr/3 km. The day with the lowest passage rate (3 targets/hr/3 km) was on 21 April at the Northwest site.

The average hourly passage rate for both sites combined during spring 2010 surveys was 156 ± 17 while during the fall 2010 the passage rate was lower at 86 ± 8.

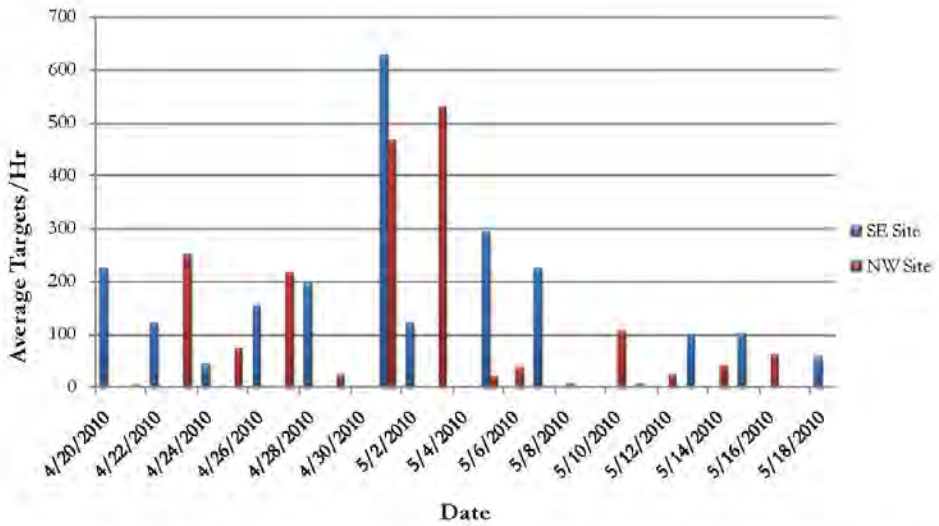

Figure 3. Daily average passage rate of avian targets detected on horizontal radar at each survey location during spring 2010 at the Wildflower Green Energy Farm.

During the fall, the highest hourly passage rate occurred on the night of 27 September at the Southeast site with 240 targets/hr/3 km (Figure 4). The second highest passage rate occurred on 25 September also at the Southeast site with 235 targets/hr/3 km. Not including the surveys with

rained-out sessions, the lowest passage rate was recorded on the night of 16 September at the Northwest site (8 target/hr/3 km).

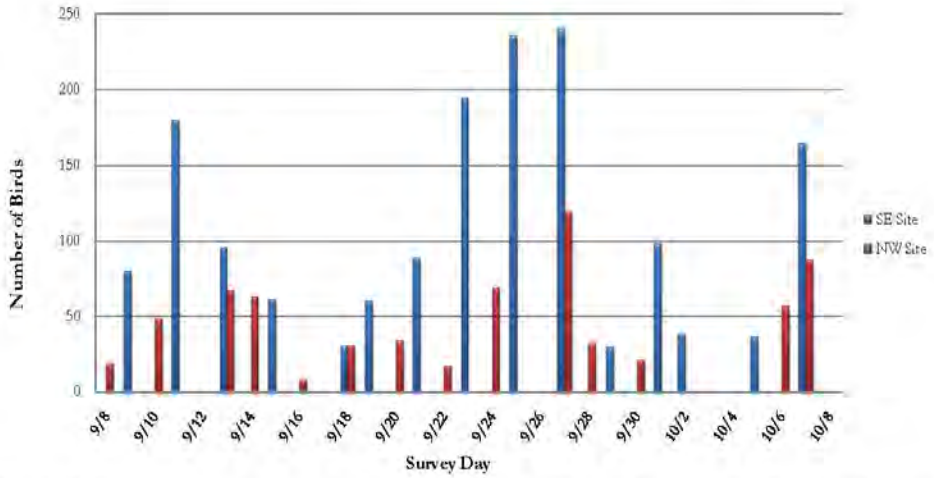

Figure 4. Daily average passage rate of avian targets detected on horizontal radar at each survey location during fall 2010 at the Wildflower Green Energy Farm.

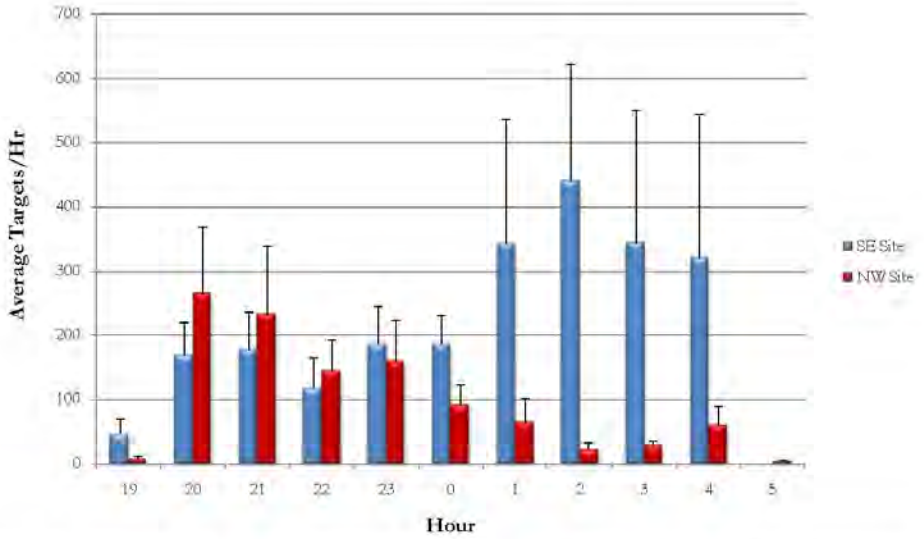

Figure 5. Average hourly passage rate of avian targets detected on horizontal radar at each survey location during spring 2010 at the Wildflower Green Energy Farm (1 SE).

In the spring, the highest hourly passage rate occurred at 02:00 at the Southeast site with 441 ± 183 targets/hr/3 km (Figure 5). The lowest hourly passage rate occurred at the Northwest site at 05:00 and 19:00 with 5 ± 1 and 8 ± 4 targets/hr/3 km, respectively. .

In the fall, the highest hourly passage rate occurred at the Southeast site at 23:00 and 20:00 with 181 ± 42 and 174 ± 48 targets/hr/3 km, respectively (Figure 6). The lowest hourly fall passage rate occurred at the Northwest site at 18:00 with 11 ± 2 targets/hr/3 km.

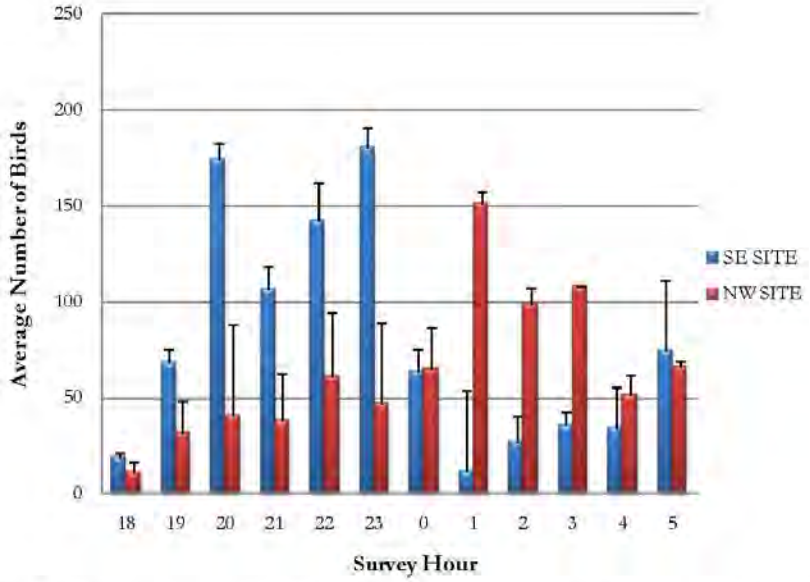

Figure 6. Average hourly passage rate of avian targets detected on horizontal radar at each survey location during fall 2010 by survey hour (1 SE).

Flight Direction

In the spring of 2010, the median flight direction was 45 degrees at the Northwest survey site (Figure 7) and 138 degrees at the Southeast survey site (Figure 8). In the fall of 2010, the median flight direction was 128 degrees at the Northwest survey site (Figure 9) and 133 degrees at the Southeast survey site (Figure 10).

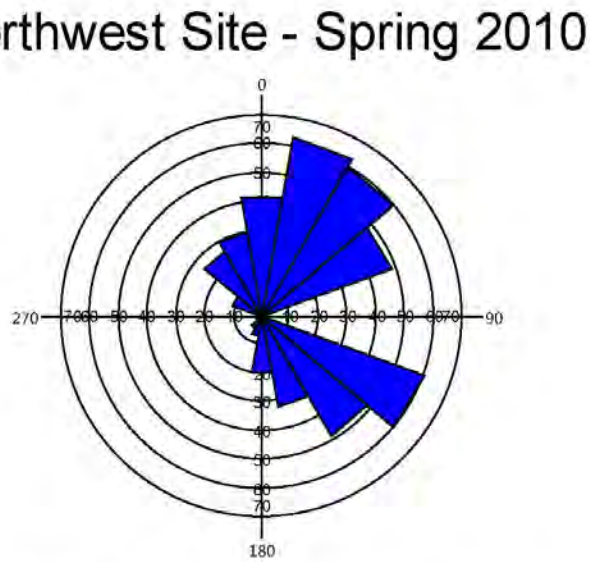

Figure 7. Rose diagram of flight directions (in degrees) of nocturnal migrants on surveillance radar at the Northwest survey site during spring 2010 at the Wildflower Green Energy Farm.

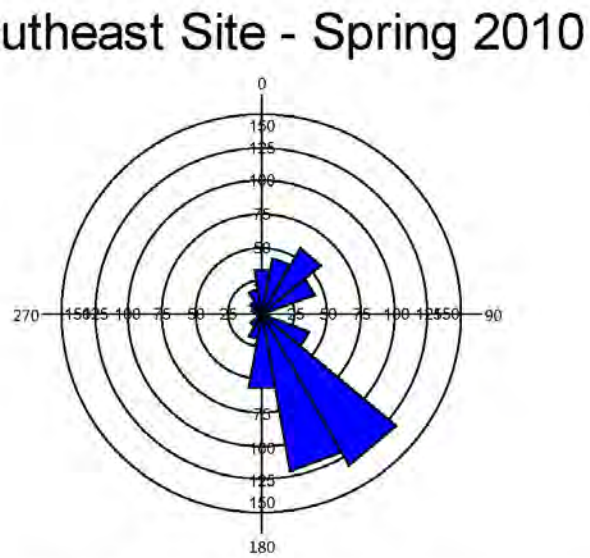

Figure 8. Rose diagram of flight directions (in degrees) of nocturnal migrants on surveillance radar at the Southeast survey site during spring 2010 at the Wildflower Green Energy Farm.

Figure 9. Rose diagram of flight directions (in degrees) of nocturnal migrants on surveillance radar at the Northwest survey site during fall 2010 at the Wildflower Green Energy Farm.

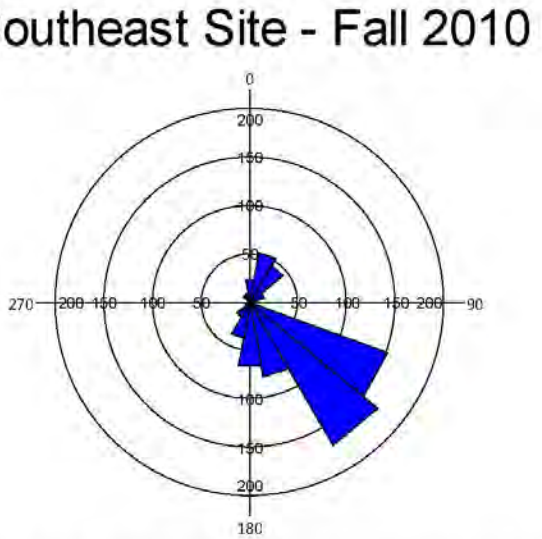

Figure 10. Rose diagram of flight directions (in degrees) of nocturnal migrants on surveillance radar at the Southeast survey site during fall 2010 at the Wildflower Green Energy Farm.

Wind Directions

Winds were consistently of an easterly direction at both sites and during both seasons (Figure 11). During spring 2010 wind speeds averaged 22.4 ± 0.3 km/hr during radar surveys. In fall 2010, wind speeds averaged 14.9 ± 0.6 km/hr during the radar surveys.

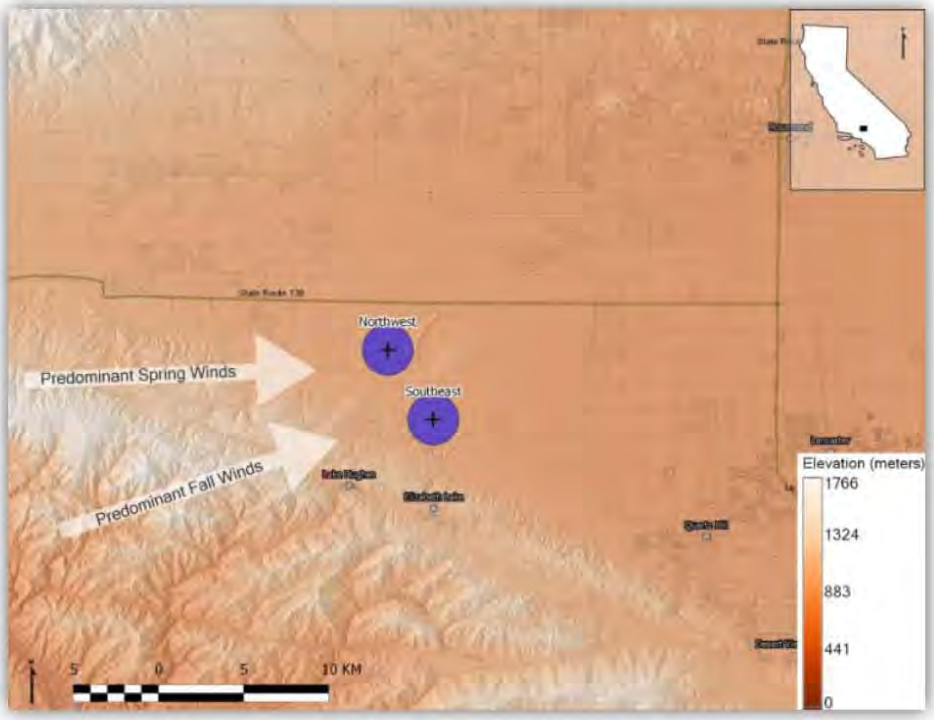

Figure 11. Predominant wind directions (in degrees) at the Northwest and Southeast survey sites during spring and fall 2010 survey sessions at the Wildflower Green Energy Farm.

Heights

Average target flight heights are shown by survey hour and location during the vertical radar surveys (Figures 12 [spring] and 13 [fall]). The average flight height of migrating birds during the spring of 2010 across all survey hours and both survey locations was 697 ± 8 m (1 SE). The average flight height of migrating birds during the fall of 2010 across all survey hours and both survey locations was higher at 777 ± 13 m (SE).

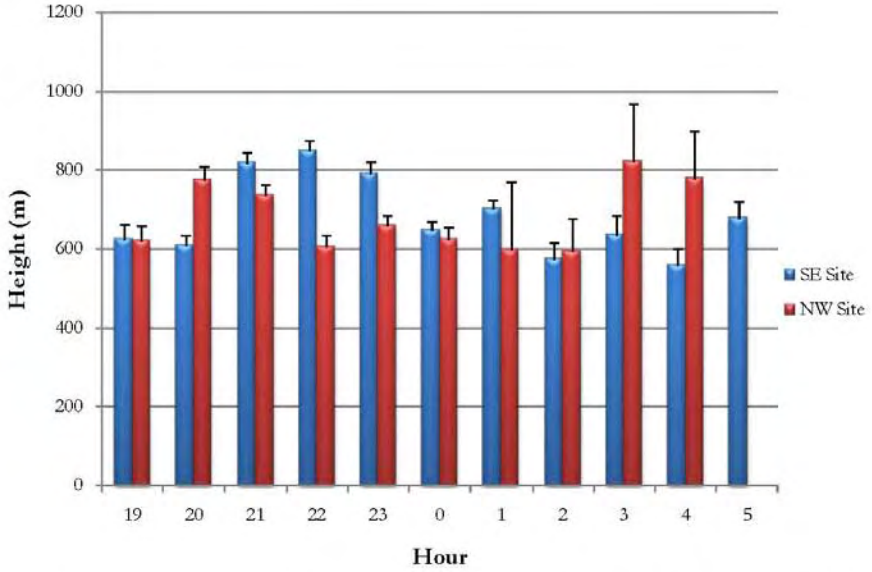

Figure 12. Average hourly target flight height during spring 2010 at the Wildflower Green Energy Farm (1 SE).

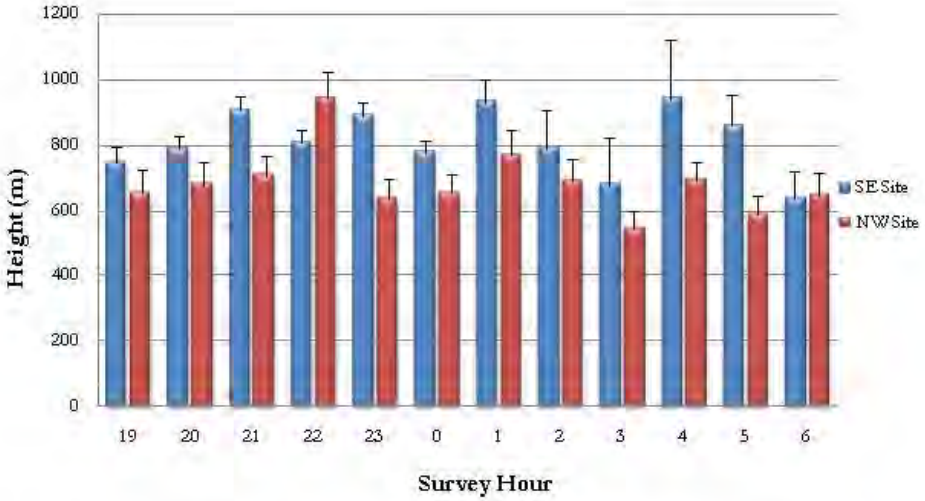

Figure 13. Average hourly target flight height during fall 2010 at the Wildflower Green Energy Farm (1 SE).

The percent of avian targets within 150 m flight height bins (recorded during all surveys) is presented across survey sites by season (Figures 14 [spring] and 15 [fall]). During the spring survey session, at both sites combined, the mean percentage of targets flying below 151 m was 11% (Figure 14). During the fall, at both sites combined, 2% of the targets were flying below 151 m (Figure 15).

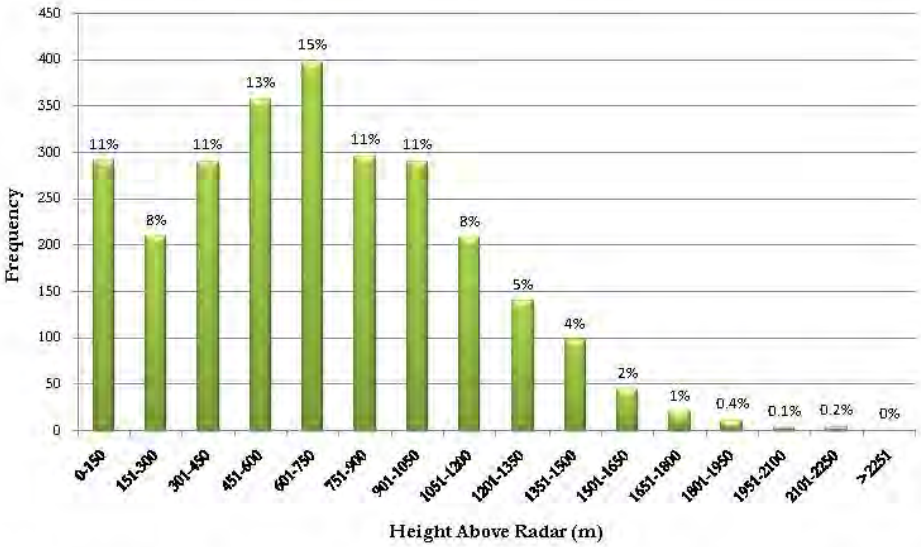

Figure 14. Percent of avian targets detected by flight height category for both survey sites combined during spring 2010 at the Wildflower Green Energy Farm.

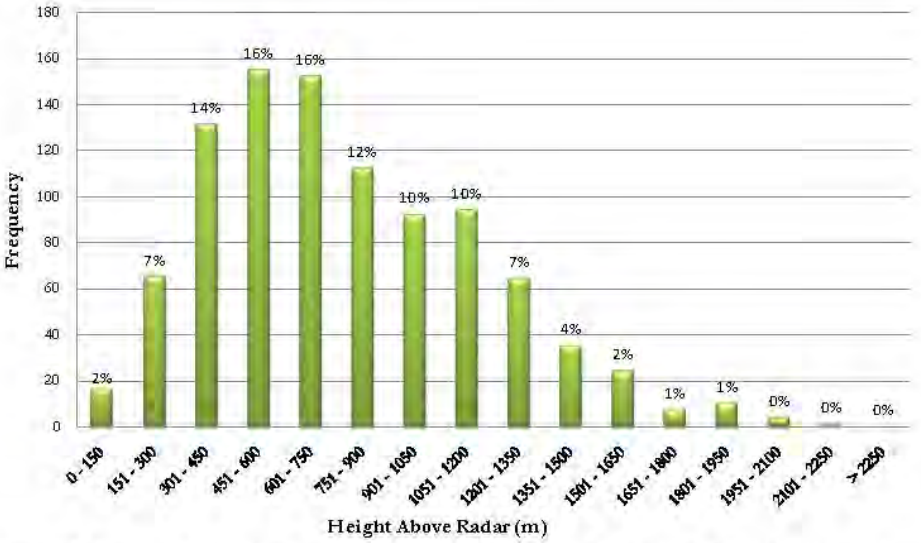

Figure 15. Percent of avian targets detected during by flight height category for both survey sites combined during fall 2010 at the Wildflower Green Energy Farm.

Flight Speeds

Average avian target flight speeds were 59.7 ± 0.5 km/hr in the spring and 68.2 ± 0.6 km/hr in the fall.

DISCUSSION

The Mojave Desert received a high amount of precipitation during the 2009-2010 winter months, resulting in more insects than in usually drier years. Insects, particularly moths, were in high numbers during the spring 2010 survey period and were detected both by the radar technician and the outside observer. Due to radar sensitivity, large quantities of flying insects can create clutter sometimes masking avian echos on the radar screen. Larger fast-flying insects can also be misidentified as small passerines on the radar. To reduce insect contamination of avian migration data, when an insect was positively identified on the radar screen it was not recorded as an avian target. Insect flight paths at both radar survey sites typically followed the predominant wind direction (eastbound) and were distinguished from birds and bats not only by their flight direction, but also based on a smaller echo size and slower flight speed. Additionally, insects were typically detected at close range on the radar, generally no more than 750 m out both horizontally and vertically from the radar. Filtering of radar flight data further reduced insect contamination by removal of small-sized targets and targets with east or west-bound flight paths.

The average passage rate for nocturnal migrants in spring was nearly double that of the fall passage rate, with 156 ± 17 targets/hr/3 km in the spring versus 86 ± 8 targets/hr/3 km in the fall (Figures 5, 6). Similarly confounding was that the median flight direction in spring, after filtering, was 45° (NE) at the Northwest survey site and 138° (SE) at the Southeast site (Figures 7, 8). Nocturnally migrating birds are expected to travel in a northerly direction in the spring and a southerly direction in the fall. The average flight direction in the fall was more consistent with the expected southerly (180°) migration with a median direction of 128° (SE) at the Northwest site and 133° (SE) at the Southeast site (Figures 9, 10). The slightly easterly flight paths documented in the fall and at the Northwest survey site in spring are likely a result of consistent strong, easterly winds (22.4 ± 0.3 km/hr in spring and 14.9 km/hr in fall, Figure 11) throughout the WGEF.

During both spring and fall study sessions, most radar targets were detected in the 451-600 m (13% spring, 16% fall), and 601-750 m (15% spring, 16% fall) height categories (Figures 14, 15). However, in the spring, flight heights exhibited a binary peak, with the second peak number of flights (11%) occurring in the 0-150 m height category. This contrasts strongly with fall flight heights where only 2% of all flights occurred within the 0-150 m height category. Spring flight speeds at both sites combined averaged 59.7 ± 0.5 km/hr (Figure 16). The average flight speed during fall was higher at 68.2 ± 0.6 km/hr (Figure 17). In addition, the outside observers occasionally observed insect flights that were not directly following the wind, but seemed to be flying ± 20-30° from the predominant wind direction. The higher passage rate, the median flight direction of 138° (SE) at the Southeast site, lower flight heights, and slower flight speeds during spring surveys indicate some insect

contamination occurred during the spring radar survey session, particularly at the Southeast survey site.

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Appendix I. Summary of Project Characteristics and Select Study Methodologies for All Known Publically Available Post-Construction Monitoring Studies in North America

Appendix I. Summary of project characteristics and select study methodologies for all known publically available post-construction monitoring studies in North America.

Project Name	Total # of turbines	Total MW	Tower size (m)	Number turbines searched	Plot Size	Length of Study	Survey frequency
Alite, CA	8	24	NA	8	200 m x 200 m	1 year	Weekly during spring and fall; bi-monthly in summer and winter
Barton Chapel, TX	60	120	78	30	200 m x 200 m	1 year	10 turbines weekly, 20 monthly
Big Horn, WA	133	199.5	80	133	180 m x 180 m	1 year	Bi-monthly(spring, fall)/monthly(summer, winter)
Biglow Canyon, OR (Phase I; 2008)	76	125.4	80	50	110 m x 110 m	1 year	Monthly (winter, summer), bi-monthly (spring, fall)
Biglow Canyon, OR (Phase I; 2009)	76	125.4	80	50	110 m x 110 m	1 year	Monthly (winter, summer), bi-monthly (spring, fall)
Biglow Canyon, OR (Phase II; 2009/2010)	65	150	80	50	250 m x 250 m	1 year	Bi-monthly (spring /fall), monthly (winter/summer)
Blue Sky Green Field, WI	88	145	80	30	160 m x 160 m	Fall and spring	Daily(10 turbines), weekly (20 turbines)
Buena Vista, CA (2008)	38	NA	45-55	38	75 m from turbine	1 year	Monthly to bi-monthly starting in September 2008
Buffalo Gap I,TX	67	134		21	215 m x 215 m	10 months	Every 3 weeks
Buffalo Gap II, TX	155	233	80	36	215 m x 215 m	14 months	Every 21 days
Buffalo Mountain, TN (2000-2003)	3	1.98	65	3	50-m radius	3 years	Bi-weekly, weekly, bi-monthly
Buffalo Mountain, TN (2005)	18	28.98	V47 = 65; V80 = 78	18	50-m radius	1 year	Bi-weekly, weekly, bi-monthly, and 2-5 day intervals
Buffalo Ridge I, SD (2010)	24	50.4	79	24	200 m x 200 m	1 year	Weekly (migratory), monthly (non-migratory)
Buffalo Ridge, MN (Phase I; 1996)	73	25	36	21	126 m x 126 m	1 years	Bi-monthly (spring, summer and fall)
Buffalo Ridge, MN (Phase I; 1997)	73	25	36	21	126 m x 126 m	1 year	Bi-monthly (spring, summer and fall)
Buffalo Ridge, MN (Phase I; 1998)	73	25	36	21	126 m x 126 m	1 year	Bi-monthly (spring, summer and fall)

Appendix I. Summary of project characteristics and select study methodologies for all known publically available post-construction monitoring studies in North America.

Project Name	Total # of turbines	Total MW	Tower size (m)	Number turbines searched	Plot Size	Length of Study	Survey frequency
Buffalo Ridge, MN (Phase I; 1999)	73	25	36	21	126 m x 126 m	1 year	Bi-monthly (spring, summer and fall)
Buffalo Ridge, MN (Phase II; 1998)	143	107.25	50	40	126 m x 126 m	4 years	Bi-monthly (spring, summer and fall)
Buffalo Ridge (Phase II; 1999)	143	107.25	50	40	126 m x 126 m	1 year	Bi-monthly (spring, summer and fall)
Buffalo Ridge, MN (Phase II; 1999)	143	107.25	50	83 (2001) 103 (2002) Lake Benton I & II combined	60 m x 60 m	Summer /fall	Bi-monthly
Buffalo Ridge, MN (Phase II; 2001/Lake Benton I)	143	107.25	50	83 (2001) 103 (2002) Lake Benton I & II combined	60 m x 60 m	Summer /fall	Bi-monthly
Buffalo Ridge, MN (Phase II; 2002/Lake Benton I)	138	103.5	50	30	126 m x 126 m	4 years	Bi-monthly (spring, summer and fall)
Buffalo Ridge, MN (Phase III; 1999)	138	103.5	50	83 (2001) 103 (2002) Lake Benton I & II combined	60 m x 60 m	Summer/fall	Bi-monthly
Buffalo Ridge, MN (Phase III; 2001/Lake Benton II)	138	103.5	50	83 (2001) 103 (2002) Lake Benton I & II combined	60 m x 60 m	Summer /fall	Bi-monthly
Casselman, PA (Fall 2008)	23	34.5	80	12 experimental, 10 control	126 m x 120 m	Summer /fall	Daily
Casselman, PA (Spring & Fall 2008)	23	34.5	80	12 experimental, 10 control	126 m x 120 m	Summer /fall	Daily
Castle River, Alb. (2001)	60	39.6	50	60	50 m	2 year	Weekly, bi-weekly
Castle River, Alb. (2002)	60	39.6	50	60	50 m	2 year	Weekly, bi-weekly
Cedar Ridge, WI (2009)	41	67.6	80	20	160 m x 160 m	Spring, summer, fall	Daily, every 4 days; late fall searched every 3 days

Appendix I. Summary of project characteristics and select study methodologies for all known publically available post-construction monitoring studies in North America.

Project Name	Total # of turbines	Total MW	Tower size (m)	Number turbines searched	Plot Size	Length of Study	Survey frequency
Cedar Ridge, WI (2010)	41	68	80	20	160 m x 160 m	1 year	5 turbines were surveyed daily, 15 turbines surveyed every 4 days in rotation groups each day. All 20 surveyed every 3 days during late fall
Cohocton/Dutch Hill, NY (2009)	50	125	80	17	130 m x 130 m	Spring, summer, fall	Daily (5 turbines), weekly (12 turbines)
Combine Hills, OR	41	41	53	41	90-m radius from turbine	1 year	Monthly (once every 4 weeks)
Condon, OR	84	NA	NA	NA	NA	NA	NA
Crescent Ridge, IL	33	54.45	80	33	70-m radius	1 year	Weekly (fall /spring)
Crystal Lake II, IA	80	200	80	NA	100 m x 100 m	Spring, summer, fall	3 times /week for 26 weeks
Diablo, CA	31	20.46	50 and 55	31	75 m x 75 m	2 years	Monthly
Dillon, CA	45	45	69	15	200 m x 200 m	1 year	Weekly, bi-monthly in winter
Dry Lake, AZ	30	63	78	15	160 m x 160 m	1 year	Weekly in spring, summer, and fall; bi-monthly in winter
Elkhorn, OR (2008)	61	101	80	61	110 m x 110 m	1 year	Monthly (winter, summer); bi-monthly (spring, fall)
Elm Creek, MN	67	100	80	29	200 m x 200 m	1 year	Weekly, monthly
Erie Shores, Ont.	66	99	80	66	40-m radius	2 years	Weekly, bi-monthly, 2-3 times weekly (migration)
Foote Creek Rim, WY (Phase I; 1999)	69	41.4	40	69	126 m x 126 m	3.5 years	Monthly
Foote Creek Rim, WY (Phase I; 2000)	69	41.4	40	69	126 m x 126 m	3.5 years	Monthly
Foote Creek Rim, WY (Phase I; 2001-2002)	69	41.4	40	69	126 m x 126 m	3.5 years	Monthly
Forward Energy Center, WI	86	129	80	29	160 m x 160 m	2 years	11 turbines daily, 9 every 3 days, 9 every 5 days

Appendix I. Summary of project characteristics and select study methodologies for all known publically available post-construction monitoring studies in North America.

Project Name	Total # of turbines	Total MW	Tower size (m)	Number turbines searched	Plot Size	Length of Study	Survey frequency
Goodnoe, WA	47	94	80	24	180 m x 180 m	1 year	14 days during migration periods, 28 days during non-migration periods
Grand Ridge, IL	66	99	80	30	160 m x 160 m	1 year	Weekly, monthly
Hay Canyon, OR	48	100.8	79	20	180 m x 180 m	1 year	Bi-monthly (spring/fall), monthly (winter/summer)
High Winds, CA (2004)	90	162	60	90	75-m radius	2 year	Bi-monthly
High Winds, CA (2005)	90	162	60	90	75-m radius	2 year	Bi-monthly
Hopkins Ridge, WA (2006)	83	150	67	43	180 m x 180 m	1 year	Monthly, weekly (subset of 22 turbines spring and fall migration)
Hopkins Ridge, WA (2008)	87	156.6	67	41-43	180 m x 180 m	1 year	Monthly (winter, summer), bi-monthly (spring, fall)
Judith Gap, MT	90	135	80	20	190 m x 190 m	7 months	Monthly
Kewaunee County, WI	31	20.46	65	31	60 m x 60 m	2 year	Bi-weekly (spring /summer), daily (spring /fall migration), weekly (fall /winter)
Klondike, OR	16	24	80	16	140 m x 140 m	1 year	Monthly
Klondike II, OR	50	75	80	25	180 m x 180 m	1 year	Bi-monthly (spring /fall), monthly (summer /winter)
Klondike III, OR	122	375	GE = 80; Siemens= 80	46	240 m x 240 m (1.5MW) 252 m x 252 m (2.3MW)	1 year	Bi-monthly (spring /fall migration), monthly (summer /winter)
Klondike IIIa, OR	125	375	GE = 80; Siemens= 80, Mitsubishi = 80	34	240 m x 240 m	2 year	Bi-monthly (spring /fall), monthly (summer /winter)
Leaning Juniper, OR	67	100.5	80	17	240 m x 240 m	1 year	Bi-monthly (spring /fall), monthly (winter /summer)
Lempster, NH (2009)	12	24	78	4	120 m x 130 m	6 months	Daily
Lempster, NH (2010)	12	24	78	12	120 m x 130 m	6 months	Weekly
Madison, NY	7	11.55	67	7	60-m radius	1 year	Weekly (spring /fall), monthly (summer)

Appendix I. Summary of project characteristics and select study methodologies for all known publically available post-construction monitoring studies in North America.

Project Name	Total # of turbines	Total MW	Tower size (m)	Number turbines searched	Plot Size	Length of Study	Survey frequency
Maple Ridge, NY (2006)	120	198	80	50	130 m x 120 m	5 months	Daily (10 turbines), every 3 days (10 turbines), weekly (30 turbines)
Maple Ridge, NY (2007)	195	321.75	80	64	130 m x 120 m	7 months	Weekly
Maple Ridge, NY (2008)	195	321.75	80	64	130 m x 120 m	7 months	Weekly
Marengo I, WA (2009)	39	70.2	67	39	180 m x 180 m	1 year	Bi-monthly (spring /fall), monthly (winter/summer)
Marengo II, WA (2009)	39	70.2	67	20	180 m x 180 m	1 year	Bi-monthly (spring/fall), monthly (winter/summer)
Mars Hill, ME (2007)	28	42	80.5	28	76-m diameter, 238-m diameter (2 extended plot searches)	Spring /summer /fall	Daily (2 random turbines), weekly (all turbines)
Mars Hill, ME (2008)	28	42	80.5	28	76-m diameter, extended plot search 238-m diameter (searched once per season)	Spring /summer /fall	Weekly
McBride, Alb. (2004)	114	75	50	114	4 parallel transects 120-m wide	1 year	Weekly, bi-weekly
Meyersdale, PA (2004)	20	30	80	20	130 m x 120 m	6 weeks	Daily (half turbines), weekly (half turbines)
Moraine II, MN	33	49.5	82.5	30	200 m x 200 m	1 year	Weekly (migratory), monthly (non-migratory)
Mount Storm, WV (Fall 2008)	82	164	78	27	Varied	Fall	Weekly (18 turbines), daily (9 turbines)
Mount Storm, WV (2009)	132	264	78	44	Varied	6 months	Weekly (28 turbines), daily (16 turbines)
Mount Storm, WV (2010)	132	264	78	2	Circular plots, 50-m radius	3 months	Daily
Mountaineer, WV	44	68	80	44	60 m from turbine base in concentric circles	7 months	Daily/weekly

Appendix I. Summary of project characteristics and select study methodologies for all known publically available post-construction monitoring studies in North America.

Project Name	Total # of turbines	Total MW	Tower size (m)	Number turbines searched	Plot Size	Length of Study	Survey frequency
Munnsville, NY (2008)	23	34.5	69.5	12	120 m x 120 m	Spring, summer, fall	Weekly
Nine Canyon, WA	37	48.1	60	37	90 m	1 year	Bi-monthly (Spring, Summer, Fall), monthly (Winter)
Noble Bliss, NY (2008)	67	100	80	23	120 m x 120 m	Spring /summer /fall	Daily (8 turbines), 3-day (8 turbines), weekly (7 turbines)
Noble Bliss, NY (2009)	67	100	80	23	120 m x120 m	Spring /summer /fall	Weekly, July 1-Aug 15 8 turbines searched daily
Noble Clinton, NY (2008)	67	100	80	23	120 m x 120 m	Spring /summer /fall	Daily (8 turbines), 3-day (8 turbines), weekly (7 turbines)
Noble Clinton, NY (2009)	67	100	80	23	120 m x120 m	Spring, summer, fall	Daily (8 turbines) Weekly (15), July 1-Aug 15 all turbines weekly
Noble Ellenburg, NY (2008)	54	80	80	18	120 m x 120 m	Spring /summer /fall	Daily (6 turbines), 3-day (6 turbines), weekly (6 turbines)
Noble Ellenburg, NY (2009)	54	80	80	18	120 m x120 m	Spring /summer /fall	Daily (6 turbines) Weekly (12 turbines) July 1-Aug 15 all turbines weekly
NPPD Ainsworth, NE	36	20.5	70	36	220 m x 220 m	Spring /summer /fall	Bi-monthly
Oklahoma Wind Energy Center, OK	68	102	70	68	5-, 10-, 15-m circular transects	3 months (2 years)	Bi-monthly
Pebble Springs, OR	47	98.7	79	20	180 m x 180 m	1 year	Bi-monthly (spring /fall), monthly (winter /summer)
Pine Tree, CA	90	135	65	40	NA	1 year	Bi-weekly
Prairie Winds (Minot), ND	80	115.5	89	35	Minimum of 100 m by 100 m	3 seasons	Bi-monthly

Appendix I. Summary of project characteristics and select study methodologies for all known publically available post-construction monitoring studies in North America.

Project Name	Total # of turbines	Total MW	Tower size (m)	Number turbines searched	Plot Size	Length of Study	Survey frequency
Red Canyon, TX	56	84	70	28	200 m x 200 m in fall and winter; 160 m x 160 m in spring and summer	1 year	Every 14 days in fall and winter; 7 days in spring, 3 days in summer
Ripley, Ont. (2008)	38	76	64	38	80 m x 80 m	Spring /fall	Twice weekly (odd numbered turbines), once weekly (even numbered turbines)
Ripley, Ont. (Fall 2009)	38	76	64	38	80 m x 80 m	6 weeks	Twice weekly for odd turbines; once weekly for even turbines
San Gorgonio, CA	3000	NA	24.4-42.7		Circular plots, 50-m radius	2 years	Quarterly
Searsburg, VT (2007)	11	7	65	11	Circles around turbine, radii 20-55 m	1997 spring /fall	Weekly (fall migration)
Shiloh I, CA	100	150	65	100	105 m from turbine	3 years	Weekly
SMUD Solano, CA	22	15	65	22	50-60 m	1 year	Bi-monthly
Stateline, OR/WA (2002)	454	263	50	399	63 m (minimum)	1 year	NA
Stateline, OR/WA (2003)	454	263	50	454	63 m (minimum)	1 year	NA
Stateline II, OR/WA (2006)	454	263	50	39	Variable turbine strings	1 year	NA
Stetson Mountain, ME (2009)	38	57	80	19	76 m diameter	27 weeks (spring /summer /fall)	Weekly
Summerview, Alb. (2006)	39	70.2	67	39	140 m x 140 m; 40-m radius (late Summer)	1 year	Weekly, bi-weekly (May-July, September)
Summerview, Alb. (2008)	39	70.2	65	39	52-m radius; 2 spiral transects 7 m apart	Summer /fall (2 years)	Daily (10 turbines), weekly (29 turbines)
Tehachapi, CA	3300	70.2	14.7 to 57.6	201	50-m radius	20 months	Quarterly

Appendix I. Summary of project characteristics and select study methodologies for all known publically available post-construction monitoring studies in North America.

Project Name	Total # of turbines	Total MW	Tower size (m)	Number turbines searched	Plot Size	Length of Study	Survey frequency
Top of Iowa, IA (2003)	89	80	71.6	26	76 m x 76 m	Spring /summer /fall	Once every 2-3 days
Top of Iowa, IA (2004)	89	80	71.6	26	76 m x 76 m	Spring /summer /fall	Once every 2-3 days
Tuolumne (Windy Point I), WA	62	136.6	80	21	180 m x 180 m	1 year	Monthly throughout the year, and a sub-set of 10 turbines were also searched weekly during the spring, summer, and fall periods
Vansycle, OR	38	24.9	50	38	126 m x 126 m	1 year	Monthly
Wessington Springs, SD	34	51	80	20	200 m x 200 m	Spring, summer, fall	Bi-monthly
White Creek, WA (2009)	89	204.7	80	NA	NA	NA	NA
Wild Horse, WA	127	229	67	64	110 m from 2 turbines in plot	1 year	Monthly, weekly (fall /spring migration at 16 turbines)
Winnebago, IA	10	20	78	10	200 m x 200 m	1 year	Weekly (migratory), monthly (non-migratory)
Wolfe Island, Ont. (May-June 2009)	86	197.8	80	86	60-m radius from turbine	Spring	43 turbines twice/week, other 43 turbines once/week
Wolfe Island, Ont. (July-December 2009)	86	197.8	80	86	60-m radius from turbine	Summer /fall	43 turbines twice/week, other 43 turbines once/week

NA = Not applicable/no data

Appendix J. Wind Energy Facilities in North America with Comparable Fatality Data for All Bird Species and Raptors

Appendix J1. Wind energy facilities in North America with comparable fatality data for all bird species, grouped by geographic region.

Wind Energy Facility	Fatality Estimate[A]	No. of Turbines	Total MW
California			
Pine Tree, CA	8.30*	90	135
Shiloh I, CA	6.96	100	150
Dillon, CA	4.71	45	45
Diablo, CA	4.29	31	20.46
High Winds, CA (2004)	1.62	90	162
High Winds, CA (2005)	1.10	90	162
Alite, CA	0.55	8	24
Pacific Northwest			
Biglow Canyon, OR (Phase II; 2009/2010)	5.53	65	150
Leaning Juniper, OR	6.66	67	100.5
Tuolumne (Windy Point I), WA	3.20	62	136.6
Stateline, OR/WA 2002	3.17	454	263
Klondike II, OR	3.14	50	75
Klondike III, OR	3.02	122	375
Hopkins Ridge, WA (2008)	2.99	87	156.6
Klondike IIIa, OR	2.80	125	375
Nine Canyon, WA	2.76	37	48.1
Stateline, OR/WA 2003	2.68	454	263
Combine Hills, OR	2.56	41	41
Big Horn, WA	2.54	133	199.5
Biglow Canyon, OR (Phase I; 2009)	2.47	76	125.4
Hay Canyon, OR	2.21	48	100.8
Pebble Springs, OR	1.93	47	98.7
Biglow Canyon, OR (Phase I; 2008)	1.76	76	125.4
Wild Horse, WA	1.55	127	229
Goodnoe, WA	1.40	47	94
Hopkins Ridge, WA (2006)	1.23	83	150
Klondike, OR	0.95	16	24
Vansycle, OR	0.95	38	24.9
Elkhorn, OR (2008)	0.64	61	101
Marengo I, WA (2009)	0.27	39	70.2
Marengo II, WA (2009)	0.16	39	70.2
Rocky Mountains			
Foote Creek Rim, WY (Phase I; 1999)	3.40	69	41.4
Foote Creek Rim, WY (Phase I; 2000)	2.42	69	41.4
Foote Creek Rim, WY (Phase I; 2001-2002)	1.93	69	41.4
Summerview, Alb (2006)	1.06	39	70.2
Southwest			
Dry Lake, AZ	2.22	30	63
Southern Plains			
Barton Chapel, TX	1.15	60	120

Appendix J1. Wind energy facilities in North America with comparable fatality data for all bird species, grouped by geographic region.

Wind Energy Facility	Fatality Estimate[A]	No. of Turbines	Total MW
Midwest			
Wessington Springs, SD	8.25	34	51
Blue Sky Green Field, WI	7.17	88	145
Cedar Ridge, WI (2009)	6.55	41	67.6
Buffalo Ridge, MN (Phase III; 1999)	5.93	138	103.5
Moraine II, MN	5.59	33	49.5
Buffalo Ridge I, SD (2010)	5.06	24	50.4
Buffalo Ridge, MN (Phase I; 1996)	4.14	73	25
Winnebago, IA	3.88	10	20
Cedar Ridge, WI (2010)	3.72	41	68
Buffalo Ridge, MN (Phase II; 1999)	3.57	143	107.25
Buffalo Ridge, MN (Phase I; 1998)	3.14	73	25
Ripley, Ont (2008)	3.09	38	76
Buffalo Ridge, MN (Phase I; 1997)	2.51	73	25
Buffalo Ridge, MN (Phase II; 1998)	2.47	143	107.25
Kewaunee County, WI	1.95	31	20.46
NPPD Ainsworth, NE	1.63	36	20.5
Elm Creek, MN	1.55	67	100
Prairie Winds (Minot), ND	1.48	80	115.5
Buffalo Ridge, MN (Phase I; 1999)	1.43	73	25
Top of Iowa, IA (2004)	0.81	89	80
Grand Ridge, IL	0.48	66	99
Top of Iowa, IA (2003)	0.42	89	80
Northeast			
Mount Storm, WV (2009)	5.73	132	264
Noble Ellenburg, NY (2009)	3.79	54	80
Maple Ridge, NY (2007)	3.44	195	321.75
Lempster, NH (2009)	3.38	12	24
Casselman, PA (Spring & Fall 2008)	3.13	23	34.5
Noble Bliss, NY (2008)	2.86	67	100
Noble Bliss, NY (2009)	2.81	67	100
Mountaineer, WV	2.69	44	68
Stetson Mountain, ME (2009)	2.68	38	57
Lempster, NH (2010)	2.64	12	24
Mount Storm, WV (2010)	2.60	132	264
Noble Clinton, NY (2008)	2.17	67	100
Maple Ridge, NY (2008)	2.07	195	321.75
Cohocton/Dutch Hill, NY (2009)	1.88	50	125
Mars Hill, ME (2008)	1.76	28	42
Mars Hill, ME (2007)	1.67	28	42
Munnsville, NY (2008)	1.48	23	34.5
Noble Ellenburg, NY (2008)	1.40	54	80
Noble Clinton, NY (2009)	1.17	67	100
Southeast			
Buffalo Mountain, TN (2000-2003)	13.93	3	1.98
Buffalo Mountain, TN (2005)	1.10	18	28.98

*fatality estimate from Pine Tree, CA corrected for mathematical error in number reported by BioResource Consultants (2010).
A = Number of fatalities/MW/year

Appendix J2. Wind energy facilities in North America with comparable use and fatality data for raptor species, grouped by geographic region.

Wind Energy Facility	Use Estimate[A]	Raptor Fatality[B]	No. of Turbines	Total MW
	California			
Diablo, CA	2.16	0.87	31	20.46
Shiloh I, CA		0.42	100	150
Pine Tree, CA		0.13*	90	135
Alite, CA		0.12	8	24
Dillon, CA		0	45	45
	Pacific Northwest			
Tuolumne (Windy Point I), WA		0.29	62	136.6
Leaning Juniper, OR		0.21	67	100.5
Biglow Canyon, OR (Phase II; 2009/2010)		0.20	65	150
Goodnoe, WA		0.17	47	94
Klondike III, OR		0.15	122	375
Hopkins Ridge, WA (2006)	0.70	0.14	83	150
Klondike II, OR	0.50	0.11	50	75
Big Horn, WA	0.51	0.11	133	199.5
Wild Horse, WA	0.29	0.09	127	229
Stateline, OR/WA 2002	0.48	0.09	454	263
Stateline, OR/WA 2003		0.09	454	263
Hopkins Ridge, WA (2008)		0.07	87	156.6
Elkhorn, OR	1.07	0.06	61	101
Klondike IIIa, OR		0.06	125	375
Nine Canyon, WA	0.43	0.05	37	48.1
Marengo II, WA (2009)		0.05	39	70.2
Pebble Springs, OR		0.04	47	98.7
Biglow Canyon, OR (Phase I; 2009)		0.04	76	125.4
Biglow Canyon, OR (Phase I; 2008)		0.03	76	125.4
Klondike, OR	0.50	0	16	24
Vansycle, OR	0.66	0	38	24.9
Combine Hills, OR	0	0	41	41
Marengo I, WA (2009)		0	39	70.2
Hay Canyon, OR		0	48	100.8
	Rocky Mountains			
Summerview, Alb (2006)		0.11	39	70.2
Foote Creek Rim, WY (Phase I; 1999)	0.55	0.08	69	41.4
Foote Creek Rim, WY (Phase I; 2000)		0.05	69	41.4
Foote Creek Rim, WY (Phase I; 2001-2002)		0	69	41.4
	Southwest			
Dry Lake, AZ	0.13	0	30	63
	Southern Plains			
Barton Chapel, TX		0.25	60	120

Appendix J2. Wind energy facilities in North America with comparable use and fatality data for raptor species, grouped by geographic region.

Wind Energy Facility	Use Estimate[A]	Raptor Fatality[B]	No. of Turbines	Total MW
	Midwest			
Buffalo Ridge, MN (Phase I; 1996)		0.47	73	25
Moraine II, MN		0.37	33	49.5
Winnebago, IA		0.27	10	20
Buffalo Ridge I, SD (2010)		0.20	24	50.4
NPPD Ainsworth, NE		0.06	36	20.5
Prairie Winds (Minot), ND		0.05	80	115.5
Kewaunee County, WI		0	31	20.46
Wessington Springs, SD	0.23	0	34	51
Grand Ridge, IL	0.20	0	66	99
Elm Creek, MN		0	67	100
Blue Sky Green Field, WI		0	88	145
	Northeast			
Noble Ellenburg, NY (2009)		0.49	54	80
Noble Ellenburg, NY (2008)		0.32	54	80
Noble Clinton, NY (2008)		0.29	67	100
Maple Ridge, NY (2007)		0.25	195	321.75
Noble Clinton, NY (2009)		0.24	67	100
Noble Bliss, NY (2008)		0.19	67	100
Noble Bliss, NY (2009)		0.18	67	100
Mount Storm, WV (2010)		0.1	132	264
Maple Ridge, NY (2008)		0.03	195	321.75
Lempster, NH (2009)		0	12	24
Lempster, NH (2010)		0	12	24
Mount Storm, WV (2009)		0	132	264
	Southeast			
Buffalo Mountain, TN (2000-2003)		0	3	1.98
Buffalo Mountain, TN (2005)		0	18	28.98

*fatality estimate from Pine Tree, CA corrected for mathematical error in number reported by BioResource Consultants (2010).
A = Number of raptors/800-m plot/20-min survey
B = Number of fatalities/MW/year

Raptor use data from the following sources (fatality sources may be found at the end of the appendices):

Project	Report Reference	Project	Reference
Big Horn, WA	Johnson and Erickson 2004	Klondike, OR	Johnson et al. 2002a
Combine Hills, OR	Young et al. 2003d	Klondike II, OR	Johnson 2004
Diablo, CA	WEST 2006	Nine Canyon, WA	Erickson et al. 2002a
Dry Lake, AZ	Thompson et al. 2011	Stateline, OR/WA (2002)	Erickson et al. 2003a
Elkhorn, OR	WEST 2005a	Vansycle, OR	WCIA and WEST 1997
Foote Creek Rim, WY (Phase I; 1999)	Johnson et al. 2000b	Wessington Springs, SD	Derby et al. 2008
Grand Ridge, IL	Derby et al. 2009	Wild Horse, WA	Erickson et al. 2003d
Hopkins Ridge, WA (2006)	Young et al. 2003a		

Appendix K Summary of All Bird, Raptor, and Bat Fatality Estimates and Habitat Types for All Known Publically Available Post-Construction Monitoring Studies in North America

Appendix K. Summary of all bird, raptor, and bat fatality estimates and habitat types for all known publically available post-construction monitoring studies in North America.

Project Name, Location	Bird fatality /MW/year	Raptor fatality /MW/year	Bat fatality /MW/year	Habitat
Alite, CA	0.55	0.12	0.24	Dominant vegetation community within the study area is California juniper (*Juniperus californicus*) woodland, with smaller areas of perennial native grassland, rabbitbrush (*Chrysothamnus* spp.) scrub, and Joshua tree (*Yucca brevifolia*) woodland.
Barton Chapel, TX	1.15	0.25	3.06	Area dominated by oak parks/woods, grassland, and some agricultural fields (primarily wheat)
Big Horn, WA	2.54	0.11	1.9	Agriculture/grassland
Biglow Canyon, OR (Phase I; 2008)	1.76	0.03	1.99	Agriculture/grassland
Biglow Canyon, OR (Phase I; 2009)	2.47	0.04	0.58	Agriculture/grassland
Biglow Canyon, OR (Phase II; 2009/2010)	5.53	0.14	2.71	Agriculture
Blue Sky Green Field, WI	7.17	0	24.57	Agriculture
Buffalo Mountain, TN (2000-2003)	13.93	0	31.54	Forest
Buffalo Mountain, TN (2005)	1.1	0	39.7	Forest
Buffalo Ridge I, SD (2010)	5.06	0.2	0.16	Agriculture/grassland
Buffalo Ridge, MN (Phase I; 1996)	4.14	0.47	NA	NA
Buffalo Ridge, MN (Phase I; 1997)	2.51	NA	NA	NA
Buffalo Ridge, MN (Phase I; 1998)	3.14	NA	NA	NA
Buffalo Ridge, MN (Phase I; 1999)	1.43	NA	0.74	Agriculture
Buffalo Ridge, MN (Phase II; 1998)	2.47	NA	2.16	Agriculture
Buffalo Ridge, MN (Phase II; 1999)	3.57	NA	2.59	Agriculture
Buffalo Ridge, MN (Phase II; 2001/Lake Benton I)	NA	NA	4.35	Agriculture
Buffalo Ridge, MN (Phase II; 2002/Lake Benton I)	NA	NA	1.64	Agriculture
Buffalo Ridge, MN (Phase II; 2002/Lake Benton I)	NA	NA	1.64	Agriculture
Buffalo Ridge, MN (Phase III; 1999)	5.93	NA	2.72	Agriculture
Buffalo Ridge, MN (Phase III; 2001/Lake Benton II)	NA	NA	3.71	Agriculture
Buffalo Ridge, MN (Phase III; 2002/Lake Benton II)	NA	NA	1.81	Agriculture
Casselman, PA (Spring & Fall 2008)	3.13	NA	12.61	Forest

Appendix K. Summary of all bird, raptor, and bat fatality estimates and habitat types for all known publically available post-construction monitoring studies in North America.

Project Name, Location	Bird fatality /MW/year	Raptor fatality /MW/year	Bat fatality /MW/year	Habitat
Cedar Ridge, WI (2009)	6.55	NA	30.61	Agriculture
Cedar Ridge, WI (2010)	3.72	NA	24.12	Agriculture
Cohocton/Dutch Hill, NY (2009)	1.88	NA	16.02	Agriculture/forest
Combine Hills, OR	2.56	0	1.88	Agriculture/grassland
Crescent Ridge, IL	NA	NA	3.27	Agriculture
Crystal Lake II, IA	NA	NA	7.42	Agriculture
Diablo, CA	4.29	0.87	NA	NA
Dillon, CA	4.71	0	2.17	Desert
Dry Lake, AZ	2.22	0	4.29	A mix of semi-desert grasslands and juniper woodlands, with greater amounts of grassland occurring in the northern portion of the project area
Elkhorn, OR (2008)	0.64	0.06	1.26	NA
Elm Creek, MN	1.55	0	1.49	Agriculture
Foote Creek Rim, WY (Phase I; 1999)	3.4	0.08	3.97	Grassland
Foote Creek Rim, WY (Phase I; 2000)	2.42	0.05	1.05	Grassland
Foote Creek Rim, WY (Phase I; 2001-2002)	1.93	0	1.57	Grassland
Forward Energy Center, WI	NA	NA	18.17	Agricultural land (corn/soybean rotations being the predominant crop types)
Goodnoe, WA	1.4	0.17	0.34	Grassland and shrub-steppe
Grand Ridge, IL	0.48	0	2.1	Agriculture
Hay Canyon, OR	2.21	0	0.53	Agriculture
High Winds, CA (2004)	1.62	NA	2.51	Agriculture/grassland
High Winds, CA (2005)	1.1	NA	1.52	Agriculture/grassland
Hopkins Ridge, WA (2006)	1.23	0.14	0.63	Agriculture/grassland
Hopkins Ridge, WA (2008)	2.99	0.07	1.39	Agriculture/grassland
Judith Gap, MT	NA	NA	8.93	Agriculture/grassland
Kewaunee County, WI	1.95	0	6.45	Agriculture
Klondike II, OR	3.14	0.11	0.41	Agriculture/grassland
Klondike III, OR	3.02	0.15	1.11	Agriculture/grassland
Klondike IIIa, OR	2.8	0.06	0.16	Grassland/shrub-steppe and agriculture
Klondike, OR	0.95	0	0.77	Agriculture/grassland
Leaning Juniper, OR	6.66	0.21	1.98	Agriculture

Appendix K. Summary of all bird, raptor, and bat fatality estimates and habitat types for all known publically available post-construction monitoring studies in North America.

Project Name, Location	Bird fatality /MW/year	Raptor fatality /MW/year	Bat fatality /MW/year	Habitat
Lempster, NH (2009)	3.38	0	3.08	Grasslands and rocky embankments
Lempster, NH (2010)	2.64	0	3.57	Grasslands and rocky embankments
Maple Ridge, NY (2006)	NA	NA	15	Agriculture/forested
Maple Ridge, NY (2007)	3.44	0.25	9.42	Agriculture/forested
Maple Ridge, NY (2008)	2.07	0.03	4.96	Agriculture/forested
Marengo I, WA (2009)	0.27	0	0.17	Agriculture
Marengo II, WA (2009)	0.16	0.05	0.27	Agriculture
Mars Hill, ME (2007)	1.67	NA	2.91	Forest
Mars Hill, ME (2008)	1.76	NA	0.45	Forest
Moraine II, MN	5.59	0.37	2.42	Agriculture/grassland
Mount Storm, WV (2009)	5.73	0	24.32	Forest
Mount Storm, WV (2010)	2.6	0.1	15.18	Previously strip mined for coal and consists of reclaimed areas primarily of oaks, maples, hickory species, black cherry, black and yellow birch, and beech trees
Mount Storm, WV (Fall 2008)	NA	NA	12.11	Forest
Mountaineer, WV	2.69	NA	31.69	Forest
Munnsville, NY (2008)	1.48	NA	1.93	Agriculture/forest
Nine Canyon, WA	2.76	0.05	2.47	Agriculture/grassland
Noble Bliss, NY (2008)	2.86	0.19	9.78	Agriculture/forest
Noble Bliss, NY (2009)	2.81	0.18	5.5	Agriculture/forest
Noble Clinton, NY (2008)	2.17	0.29	3.63	Agriculture/forest
Noble Clinton, NY (2009)	1.17	0.24	6.48	Agriculture/forest
Noble Ellenburg, NY (2008)	1.4	0.32	5.45	Agriculture/forest
Noble Ellenburg, NY (2009)	3.79	0.49	5.34	Agriculture/forest
NPPD Ainsworth, NE	1.63	0.06	1.16	Agriculture/grassland
Pebble Springs, OR	1.93	0.04	1.55	Grassland
Pine Tree, CA	8.30*	0.13*	NA	NA
Prairie Winds (Minot), ND	1.48	0.05	2.13	Area dominated by corn (*Zea mays*), soybean (*Glycine max*), and
Ripley, Ont (2008)	3.09	NA	4.67	Agriculture
Shiloh I, CA	6.96	0.42	3.92	Agriculture/grassland
Stateline, OR/WA 2002	3.17	0.09	1.09	Agriculture/grassland
Stateline, OR/WA 2003	2.68	0.09	2.29	Agriculture/grassland
Stetson Mountain, ME (2009)	2.68	NA	1.4	Forest

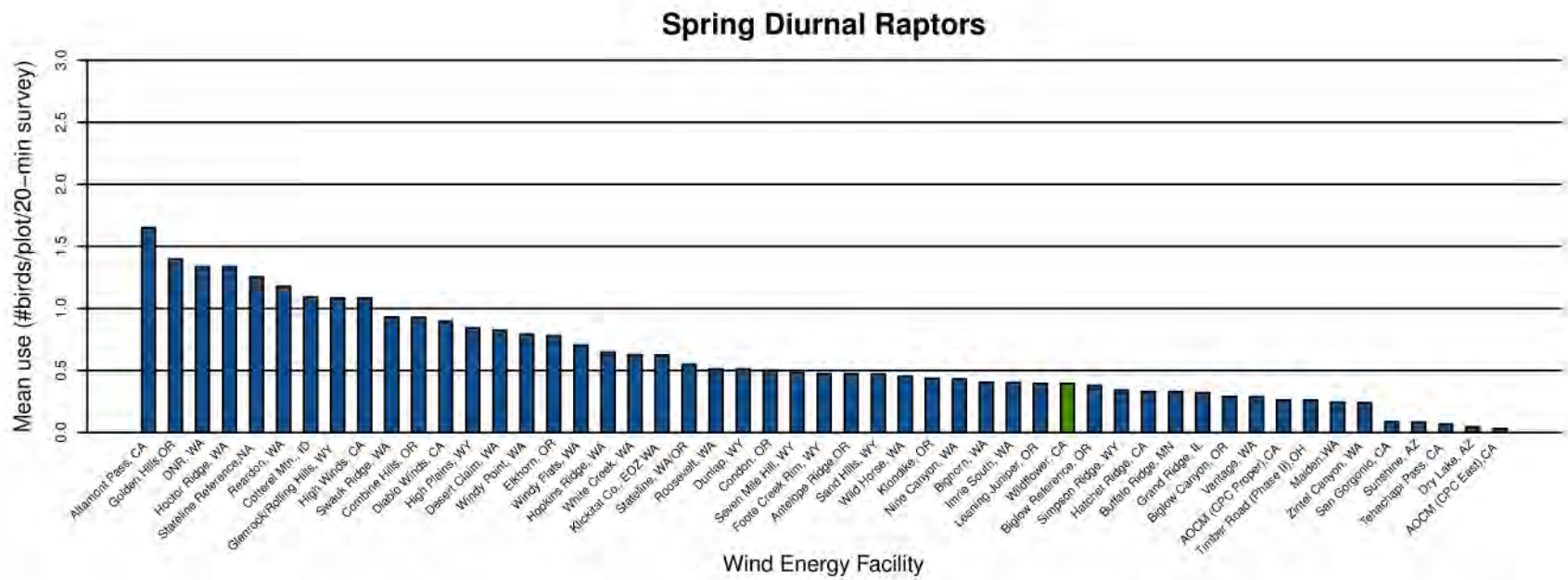
Appendix K. Summary of all bird, raptor, and bat fatality estimates and habitat types for all known publically available post-construction monitoring studies in North America.

Project Name, Location	Bird fatality /MW/year	Raptor fatality /MW/year	Bat fatality /MW/year	Habitat
Summerview, Alb (2006)	1.06	0.11	NA	NA
Summerview, Alb (2008)	NA	NA	11.42	Agriculture/grassland
Top of Iowa, IA (2003)	0.42	NA	7.16	Agriculture
Top of Iowa, IA (2004)	0.81	NA	10.27	Agriculture
Tuolumne (Windy Point I), WA	3.2	0.29	0.94	Grassland/shrub-steppe, agriculture and forest
Vansycle, OR	0.95	0	1.12	Agriculture/grassland
Wessington Springs, SD	8.25	0	1.48	Grassland
Wild Horse, WA	1.55	0.09	0.39	Grassland
Winnebago, IA	3.88	0.27	4.54	Agriculture/grassland
Wolfe Island, Ont (July-December 2009)	NA	NA	6.42	Grassland

NA = Not applicable/no data

*fatality estimate from Pine Tree, CA corrected for mathematical error in number reported by BioResource Consultants (2010).

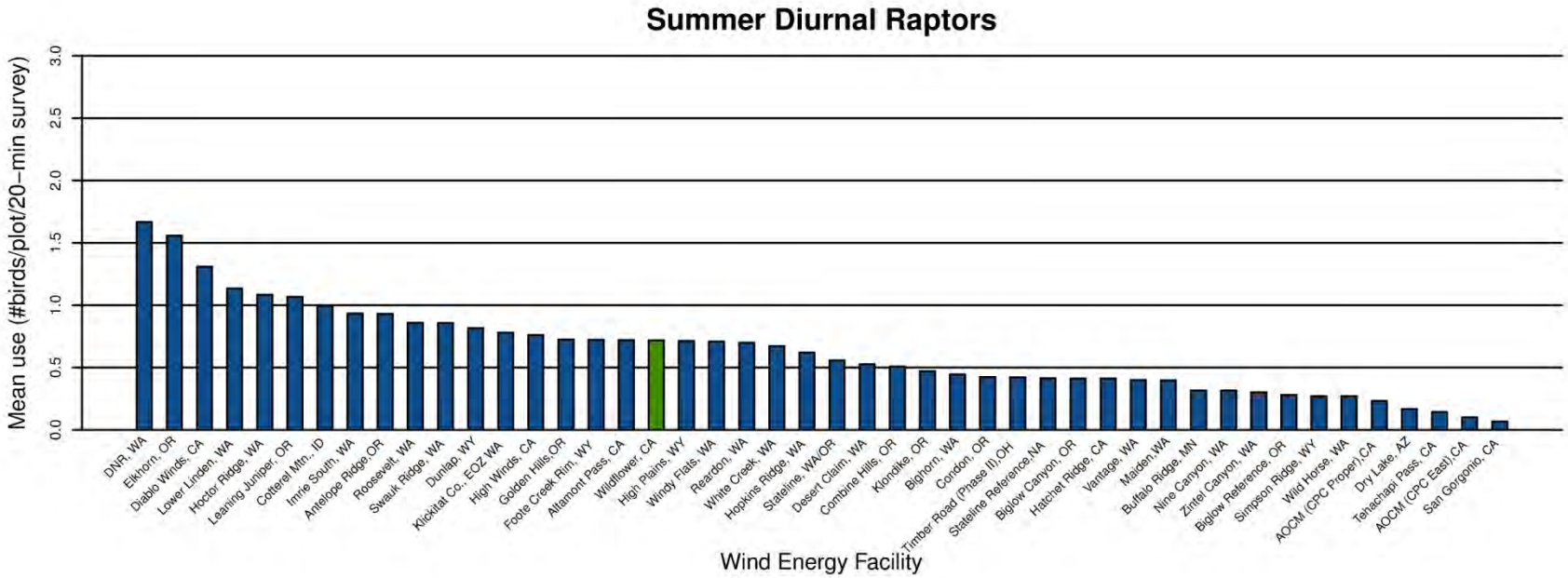
Appendix L. Comparison of Seasonal Diurnal Raptor Use Between the Wildflower Green Energy Farm and Other Wind Energy Facilities in the Western and Midwestern US.



Appendix L1. Comparison of spring raptor use between the Wildflower Green Wind Farm and other western and Midwestern US wind energy facilities.

Data from the following sources:

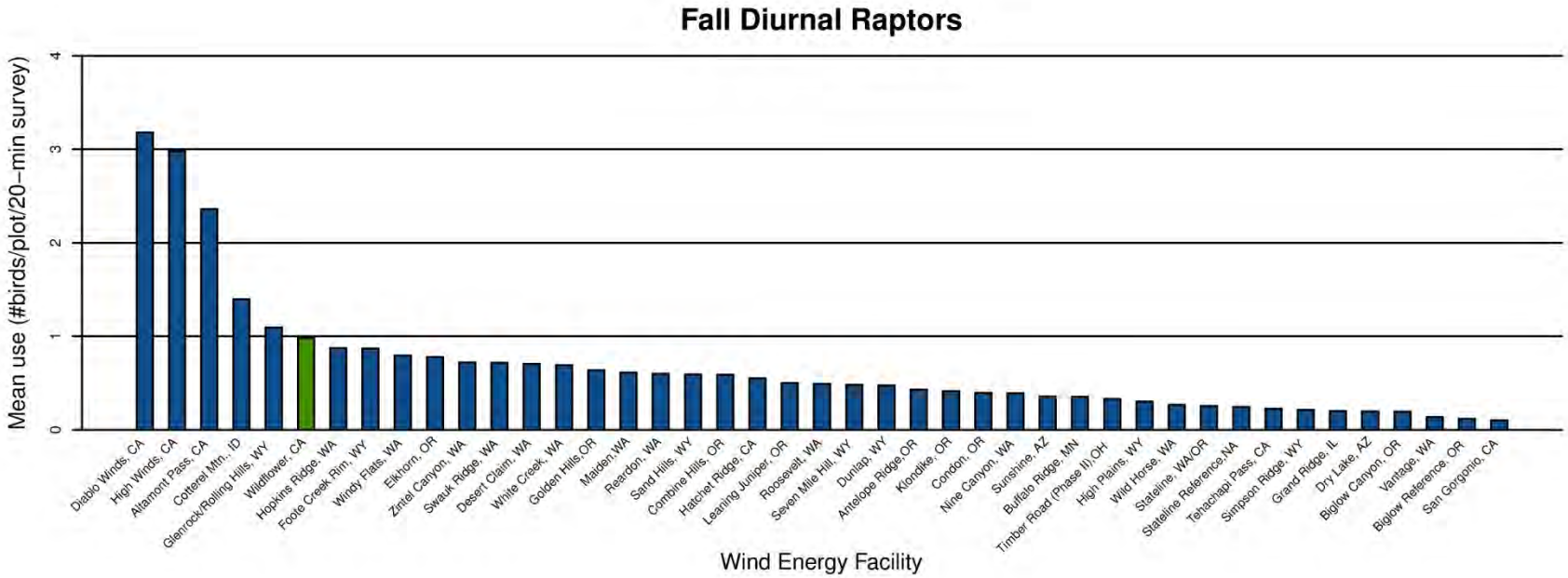
Wildflower Green, CA	This study.				
Altamont Pass, CA	Orloff and Flannery 1992	Hopkin's Ridge, WA	Young et al. 2003a	Biglow Reference, OR	WEST 2005d
Golden Hills, OR	Jeffrey et al. 2008	White Creek, WA	NWC and WEST 2005	Simpson Ridge, WY	Johnson et al. 2000b
DNR, WA	Johnson et al. 2006c	Klickitat Co., EOZ WA	WEST and NWC 2003	Hatchet Ridge, CA	Young et al. 2007b
Hoctor Ridge, WA	Johnson et al. 2006d	Stateline, WA/OR	Erickson et al. 2003a	Buffalo Ridge, MN	Johnson et al. 2000a
Stateline Reference	URS et al. 2001	Roosevelt, WA	NWC and WEST 2004	Grand Ridge, IL	Derby et al. 2009
Reardon, WA	WEST 2005b	Dunlap, WY	Johnson et al. 2009a	Biglow Canyon, OR	WEST 2005d
Cotterel Mtn., ID	BLM 2006	Condon, OR	Erickson et al. 2002b	Vantage, WA	WEST 2007
Glenrock/Rolling Hills, WY	Johnson et al. 2008a	Seven Mile Hill, WY	Johnson et al. 2008b	AOCM (CPC Proper), CA	Chatfield et al. 2010a
High Winds, CA	Kerlinger et al. 2005	Foote Creek Rim, WY	Johnson et al. 2000b	Timber Road (Phase II), OH	Good et al. 2010
Swauk Ridge, WA	Erickson et al. 2003b	Antelope Ridge, OR	WEST 2009	Maiden, WA	Young et al. 2002
Combine Hills, OR	Young et al. 2003d	Sand Hills, WY	Johnson et al. 2006a	Zintel Canyon, WA	Erickson et al. 2002a, 2003c
Diablo Winds, CA	WEST 2006	Wild Horse, WA	Erickson et al. 2003d	San Gorgonio, CA	Anderson et al. 2000, Erickson et al. 2002b
High Plains, WY	Johnson et al. 2009b	Klondike, OR	Johnson et al. 2002a	Sunshine, AZ	WEST and the CPRS 2006
Desert Claim, WA	Young et al. 2003b	Nine Canyon, WA	Erickson et al. 2001	Tehachapi Pass, CA	Anderson et al. 2000, Erickson et al. 2002b
Windy Point, WA	Johnson et al. 2006b	Bighorn, WA	Johnson and Erickson 2004	Dry Lake, AZ	Young et al. 2007c
Elkhorn, OR	WEST 2005a	Imrie South, WA	Johnson et al. 2006e	AOCM (CPC East, CA)	Chatfield et al. 2010a
Windy Flats, WA	Johnson et al. 2007b	Leaning Juniper, OR	Kronner et al. 2005		



Appendix L2. Comparison of summer raptor use between the Wildflower Green Wind Farm and other western and Midwestern US wind energy facilities.

Data from the following sources:

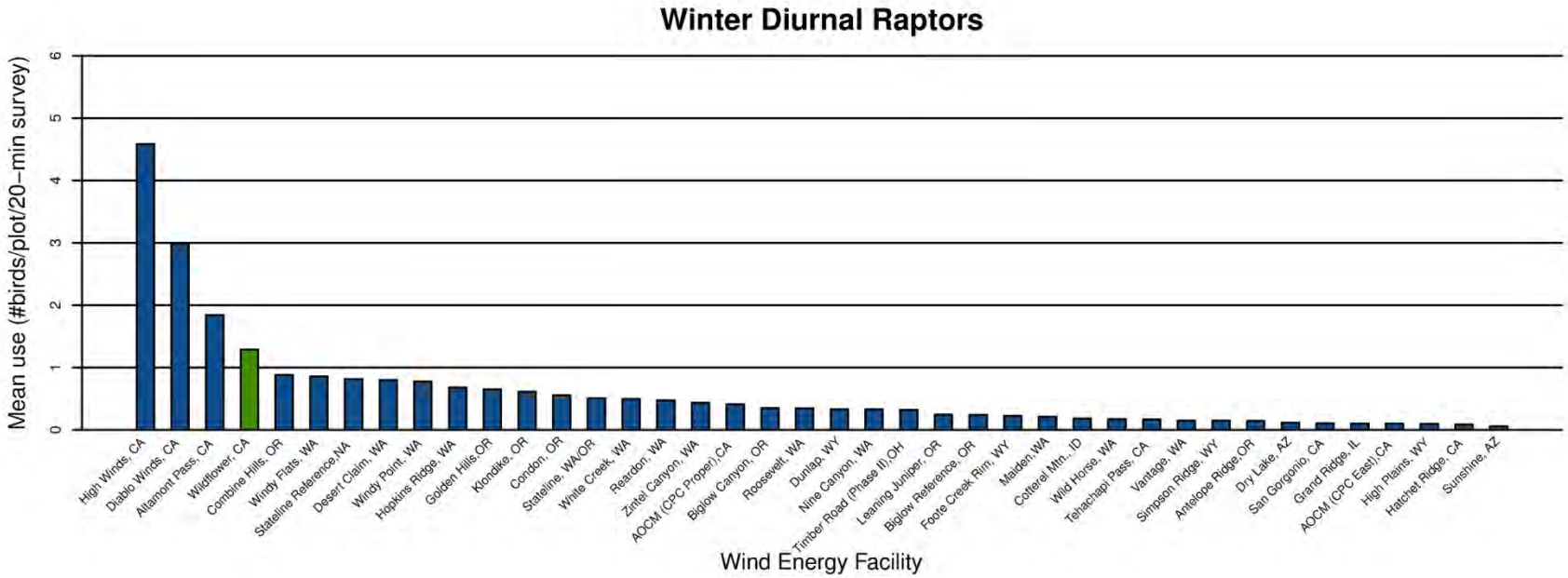
Wildflower Green, CA	This study.				
DNR, WA	Johnson et al. 2006c	Foote Creek Rim, WY	Johnson et al. 2000b	Biglow Canyon, OR	WEST 2005d
Elkhorn, OR	WEST 2005a	Altamont Pass, CA	Orloff and Flannery 1992	Hatchet Ridge, CA	Young et al. 2007b
Diablo Winds, CA	WEST 2006	High Plains, WY	Johnson et al. 2009b	Vantage, WA	WEST 2007
Lower Linden, WA	Johnson et al. 2007a	Windy Flats, WA	Johnson et al. 2007b	Maiden, WA	Young et al. 2002
Hoctor Ridge, WA	Johnson et al. 2006d	Reardon, WA	WEST 2005b	Buffalo Ridge, MN	Johnson et al. 2000a
Leaning Juniper, OR	Kronner et al. 2005	White Creek, WA	NWC and WEST 2005	Nine Canyon, WA	Erickson et al. 2001
Cotterel Mtn., ID	BLM 2006	Hopkin's Ridge, WA	Young et al. 2003a	Zintel Canyon, WA	Erickson et al. 2002a, 2003c
Imrie South, WA	Johnson et al. 2006e	Stateline, WA/OR	Erickson et al. 2003a	Biglow Reference, OR	WEST 2005d
Antelope Ridge, OR	WEST 2009	Desert Claim, WA	Young et al. 2003b	Simpson Ridge, WY	Johnson et al. 2000b
Roosevelt, WA	NWC and WEST 2004	Combine Hills, OR	Young et al. 2003d	Wild Horse, WA	Erickson et al. 2003d
Swauk Ridge, WA	Erickson et al. 2003b	Klondike, OR	Johnson et al. 2002a	AOCM (CPC Proper), CA	Chatfield et al. 2010a
Dunlap, WY	Johnson et al. 2009a	Bighorn, WA	Johnson and Erickson 2004	Dry Lake, AZ	Young et al. 2007c
Klickitat Co., EOZ WA	WEST and NWC 2003	Condon, OR	Erickson et al. 2002b	Tehachapi Pass, CA	Erickson et al. 2002b
High Winds, CA	Kerlinger et al. 2005	Timber Road (Phase II), OH	Good et al. 2010	AOCM (CPC East), CA	Chatfield et al. 2010a
Golden Hills, OR	Jeffrey et al. 2008	Stateline Reference	URS et al. 2001	San Gorgonio, CA	Anderson et al. 2000, Erickson et al. 2002b



Appendix L3. Comparison of fall raptor use between the Wildflower Green Wind Farm and other western and Midwestern US wind energy facilities.

Data from the following sources:

Wildflower Green, CA	This study.				
Diablo Winds, CA	WEST 2006	Maiden, WA	Young et al. 2002	Buffalo Ridge, MN	Johnson et al. 2000a
High Winds, CA	Kerlinger et al. 2005	Reardon, WA	WEST 2005b	Timber Road (Phase II), OH	Good et al. 2010
Altamont Pass, CA	Orloff and Flannery 1992	Sand Hills, WY	Johnson et al. 2006a	High Plains, WY	Johnson et al. 2009b
Cotterel Mtn., ID	BLM 2006	Combine Hills, OR	Young et al. 2003d	Wild Horse, WA	Erickson et al. 2003d
Glenrock/Rolling Hills, WY	Johnson et al. 2008a	Hatchet Ridge, CA	Young et al. 2007b	Stateline, WA/OR	Erickson et al. 2002b
Hopkin's Ridge, WA	Young et al. 2003a	Leaning Juniper, OR	Kronner et al. 2005	Stateline Reference	URS et al. 2001
Foote Creek Rim, WY	Johnson et al. 2000b	Roosevelt, WA	NWC and WEST 2004	Tehachapi Pass, CA	Anderson et al. 2000, Erickson et al. 2002b
Windy Flats, WA	Johnson et al. 2007b	Seven Mile Hill, WY	Johnson et al. 2008b	Simpson Ridge, WY	Johnson et al. 2000b
Elkhorn, OR	WEST 2005a	Dunlap, WY	Johnson et al. 2009a	Grand Ridge, IL	Derby et al. 2009
Zintel Canyon, WA	Erickson et al. 2002a, 2003c	Antelope Ridge, OR	WEST 2009	Dry Lake, AZ	Young et al. 2007c
Swauk Ridge, WA	Erickson et al. 2003b	Klondike, OR	Johnson et al. 2002a	Biglow Canyon, OR	WEST 2005d
Desert Claim, WA	Young et al. 2003b	Condon, OR	Erickson et al. 2002b	Vantage, WA	WEST 2007
White Creek, WA	NWC and WEST 2005	Nine Canyon, WA	Erickson et al. 2001	Biglow Reference, OR	WEST 2005d
Golden Hills, OR	Jeffrey et al. 2008	Sunshine, AZ	WEST and CPRS 2006	San Gorgonio, CA	Anderson et al. 2000, Erickson et al. 2002b



Appendix L4. Comparison of winter raptor use between the Wildflower Green Wind Farm and other western and Midwestern US wind energy facilities.

Data from the following sources:

Wildflower Green, CA	This study.				
High Winds, CA	Kerlinger et al. 2005	White Creek, WA	NWC and WEST 2005	Cotterel Mtn., ID	BLM 2006
Diablo Winds, CA	WEST 2006	Reardon, WA	WEST 2005b	Wild Horse, WA	Erickson et al. 2003d
Altamont Pass, CA	Orloff and Flannery 1992	Zintel Canyon, WA	Erickson et al. 2002a, 2003c	Tehachapi Pass, CA	Anderson et al. 2000, Erickson et al. 2002b
Combine Hills, OR	Young et al. 2003d	AOCM (CPC Proper), CA	Chatfield et al. 2010a	Vantage, WA	WEST 2007
Windy Flats, WA	Johnson et al. 2007b	Biglow Canyon, OR	WEST 2005d	Simpson Ridge, WY	Johnson et al. 2000b
Stateline Reference	URS et al. 2001	Roosevelt, WA	NWC and WEST 2004	Antelope Ridge, OR	WEST 2009
Desert Claim, WA	Young et al. 2003b	Dunlap, WY	Johnson et al. 2009a	Dry Lake, AZ	Young et al. 2007c
Windy Point, WA	Johnson et al. 2006b	Nine Canyon, WA	Erickson et al. 2001	San Gorgonio, CA	Anderson et al. 2000, Erickson et al. 2002b
Hopkins Ridge, WA	Young et al. 2003a	Timber Road (Phase II), OH	Good et al. 2010	Grand Ridge, IL	Derby et al. 2009
Golden Hills, OR	Jeffrey et al. 2008	Leaning Juniper, OR	Kronner et al. 2005	AOCM (CPC East), CA	Chatfield et al. 2010a
Klondike, OR	Johnson et al. 2002a	Biglow Reference, OR	WEST 2005d	High Plains, WY	Johnson et al. 2009b
Condon, OR	Erickson et al. 2002b	Foote Creek Rim, WY	Johnson et al. 2000b	Hatchet Ridge, CA	Young et al. 2007b
Stateline, WA/OR	Erickson et al. 2002b	Maiden, WA	Young et al. 2002	Sunshine, AZ	WEST and CPRS 2006

Appendix References: Post-Construction Monitoring Report Data

References for post-construction monitoring reports presented in Appendices I, J, and K. Full references are found in the Wildflower Avian Report list of references.

Project	Report Reference	Project	Reference
Alite, CA	Chatfield et al. 2010b	Klondike IIIa, OR	Gritski et al. 2009b
Barton Chapel, TX	WEST 2011	Leaning Juniper, OR	Kronner et al. 2007
Big Horn, WA	Kronner et al. 2008	Lempster, NH (2009)	Tidhar et al. 2010
Biglow Canyon, OR (Phase I; 2008)	Jeffrey et al. 2009a	Lempster, NH (2010)	Tidhar et al. 2011
Biglow Canyon, OR (Phase I; 2009)	Enk et al. 2010	Madison, NY	Kerlinger 2002b
Biglow Canyon, OR (Phase II; 2009/2010)	Enk et al. 2011	Maple Ridge, NY (2006)	Jain et al. 2007
Blue Sky Green Field, WI	Gruver et al. 2009	Maple Ridge, NY (2007)	Jain et al. 2009a
Buena Vista, CA (2008)	Insignia Environmental 2009	Maple Ridge, NY (2008)	Jain et al. 2009d
Buffalo Gap I, TX	Tierney 2007	Marengo I, WA (2009)	URS Corporation 2010b
Buffalo Gap II, TX	Tierney 2009	Marengo II, WA (2009)	URS Corporation 2010c
Buffalo Mountain, TN (2000-2003)	Nicholson et al. 2005	Mars Hill, ME (2007)	Stantec 2008a
Buffalo Mountain, TN (2005)	Fiedler et al. 2007	Mars Hill, ME (2008)	Stantec 2009a
Buffalo Ridge I, SD (2010)	Derby et al. 2010b	McBride, Alb. (2004)	Brown and Hamilton 2004
Buffalo Ridge, MN (Phase I; 1996)	Johnson et al. 2000a	Meyersdale, PA (2004)	Arnett et al. 2005
Buffalo Ridge, MN (Phase I; 1997)	Johnson et al. 2000a	Moraine II, MN	Derby et al. 2010d
Buffalo Ridge, MN (Phase I; 1998)	Johnson et al. 2000a	Mount Storm, WV (Fall 2008)	Young et al. 2009b
Buffalo Ridge, MN (Phase I; 1999)	Johnson et al. 2000a	Mount Storm, WV (2009)	Young et al. 2009a, 2010a
Buffalo Ridge, MN (Phase II; 1998)	Johnson et al. 2000a	Mount Storm, WV (2010)	Young et al. 2010b, 2011
Buffalo Ridge, MN (Phase II; 1999)	Johnson et al. 2000a	Mountaineer, WV	Arnett et al. 2005
Buffalo Ridge, MN (Phase II; 2001/Lake Benton I)	Johnson et al. 2004	Munnsville, NY (2008)	Stantec 2008b
Buffalo Ridge, MN (Phase II; 2002/Lake Benton I)	Johnson et al. 2004	Nine Canyon, WA	Erickson et al. 2003c
Buffalo Ridge, MN (Phase III; 1999)	Johnson et al. 2004	Noble Bliss, NY (2008)	Jain et al. 2009e
Buffalo Ridge, MN (Phase III; 2001/Lake Benton II)	Johnson et al. 2004	Noble Bliss, NY (2009)	Jain et al. 2010a
Buffalo Ridge, MN (Phase III; 2002/Lake Benton II)	Johnson et al. 2004	Noble Clinton, NY (2008)	Jain et al. 2009c
Casselman, PA (Fall 2008)	Arnett et al. 2009a	Noble Clinton, NY (2009)	Jain et al. 2010b
Casselman, PA (Spring & Fall 2008)	Arnett et al. 2009b	Noble Ellenburg, NY (2008)	Jain et al. 2009b
Castle River, Alb. (2001)	Brown and Hamilton 2006a	Noble Ellenburg, NY (2009)	Jain et al. 2010c
Castle River, Alb. (2002)	Brown and Hamilton 2006a	NPPD Ainsworth, NE	Derby et al. 2007
Cedar Ridge, WI (2009)	BHE Environmental 2010	Oklahoma Wind Energy Center, OK	Piorkowski and O'Connell 2010
Cedar Ridge, WI (2010)	BHE Environmental 2011	Pebble Springs, OR	Gritski and Kronner 2010b
Cohocton/Dutch Hill, NY (2009)	Stantec 2010	Pine Tree, CA	BioResource Consultants 2010
Combine Hills, OR	Young et al. 2006	Prairie Winds (Minot), ND	Derby et al. 2011
Condon, OR	Fishman Ecological Services LLC 2003	Red Canyon, TX	Miller 2008
Crescent Ridge, IL	Kerlinger et al. 2007	Ripley, Ont (2008)	Jacques Whitford 2009

References for post-construction monitoring reports presented in Appendices I, J, and K. Full references are found in the Wildflower Avian Report list of references.

Project	Report Reference	Project	Reference
Crystal Lake II, IA	Derby et al. 2010a	Ripley, Ont. (Fall 2009)	Golder Associates 2010
Diablo, CA	WEST 2006, 2008	San Gorgonio, CA	Anderson et al. 2005
Dillon, CA	Chatfield et al. 2009	Searsburg, VT (2007)	Kerlinger 2002a
Dry Lake, AZ	Thompson et al. 2011	Shiloh I, CA	Kerlinger et al. 2010
Elkhorn, OR (2008)	Jeffrey et al. 2009b	SMUD Solano, CA	Erickson and Sharp 2005
Elm Creek, MN	Derby et al. 2010c	Stateline, OR/WA (2002)	Erickson et al. 2004
Erie Shores, Ont.	James 2008	Stateline, OR/WA (2003)	Erickson et al. 2004
Foote Creek Rim, WY (Phase I; 1999)	Young et al. 2003c	Stateline II, OR/WA (2006)	Erickson et al. 2007
Foote Creek Rim, WY (Phase I; 2000)	Young et al. 2003c	Stetson Mountain, ME (2009)	Stantec 2009b
Foote Creek Rim, WY (Phase I; 2001-2002)	Young et al. 2003c	Summerview, Alb (2006)	Brown and Hamilton 2006b
Forward Energy Center, WI	Grodsky and Drake 2011	Summerview, Alb (2008)	Baerwald 2008
Goodnoe, WA	URS Corporation 2010a	Tehachapi, CA	Anderson et al. 2004
Grand Ridge, IL	Derby et al. 2010g	Top of Iowa, IA (2003)	Jain 2005
Hay Canyon, OR	Gritski and Kronner 2010a	Top of Iowa, IA (2004)	Jain 2005
High Winds, CA (2004)	Kerlinger et al. 2006	Tuolumne (Windy Point I), WA	Enz and Bay 2010
High Winds, CA (2005)	Kerlinger et al. 2006	Vansycle, OR	Erickson et al. 2000
Hopkins Ridge, WA (2006)	Young et al. 2007a	Wessington Springs, SD	Derby et al. 2010f
Hopkins Ridge, WA (2008)	Young et al. 2009c	White Creek, WA (2009)	Gritski et al. 2009c
Judith Gap, MT	TRC 2008	Wild Horse, WA	Erickson et al. 2008
Kewaunee County, WI	Howe et al. 2002	Winnebago, IA	Derby et al. 2010e
Klondike, OR	Johnson et al. 2003	Wolfe Island, Ont (May-June 2009)	Stantec Ltd. 2010a
Klondike II, OR	NWC and WEST 2007	Wolfe Island, Ont. (July-December 2009)	Stantec Ltd. 2010b
Klondike III, OR	Gritski et al. 2009a		

Appendix K-4:

Bat Studies

Bat Studies for the Wildflower Green Energy Farm Los Angeles County, California

Interim Report
March 23, 2010 – April 21, 2011

Prepared for:

Element Power

421 Southwest 6th Avenue, Suite 1000
Portland, Oregon 97204

Prepared by:

Andrea Chatfield, Wallace Erickson, and Kimberly Bay

Western EcoSystems Technology, Inc.
2003 Central Avenue
Cheyenne, Wyoming

August 26, 2011

WEST Inc.

NATURAL RESOURCES ◆ SCIENTIFIC SOLUTIONS

EXECUTIVE SUMMARY

Western EcoSystems Technology, Inc. initiated surveys in March, 2010 designed to assess bat activity within the proposed Wildflower Green Energy Farm (WGEF) in Los Angeles County, California. Acoustic surveys for bats were conducted within the WGEF using Anabat™ SD-II ultrasonic detectors at two fixed ground-based stations from March 23 to September 6, 2010, and at three paired (ground and raised) stations from September 7, 2010, to April 21, 2011. The objective of the acoustic bat surveys was to estimate the seasonal and spatial patterns of bat activity within the WGEF. A total of six Anabat detectors recorded 1,057 bat passes during 1,553 detector-nights. Averaging bat passes per detector-night across all locations, a mean of 0.63 bat passes per detector-night was recorded. The average bat activity (mean ± standard error) for ground detectors was 1.02 ± 0.16 bat passes per detector-night, and for raised detectors the average bat activity was 0.23 ± 0.04 bat passes per detector-night.

Bat activity varied among the six detectors in the WGEF, The highest bat activity was recorded at the ground detector at station EP3 (1.62 bat passes per detector night), followed by the ground detector at station EP1 (1.02 bat passes per detector-night). The majority (61.0%) of the calls were less than 30 kilohertz (kHz) in frequency (e.g., big brown bat, hoary bat, silver-haired bat), while 33.5% were greater than 40 kHz in frequency (e.g., *Myotis* species). The remaining calls were by mid-frequency (e.g., little brown bat) and very low frequency (e.g. spotted bat) species. The highest bat activity levels were recorded in early September (12.78 bat passes per detector night).

Mist-net surveys were conducted on two nights during the summer (June 5-7) of 2011. A total of 11 bats comprising two distinct species, little brown bat and western small-footed bat, were captured during 49 net-hours.

Anabat surveys are ongoing and will continue through April of 2012.

STUDY PARTICIPANTS

Western EcoSystems Technology

Andrea Chatfield	Project Manager
Donald Solick	Bat Biologist
Kimberly Bay	Data Analyst and Report Manager
Saif Nomani	Statistician
J.R. Boehrs	GIS Technician
Heather Darrow	Report Compiler
Elizabeth Baumgartner	Technical Editor
Melissa Nicholas	Technical Editor
Andy Krause	Field Supervisor
Bill Deppe	Field Technician

REPORT REFERENCE

Chatfield, A., W. Erickson, and K. Bay. 2011. Bat Studies for the Wildflower Green Energy Farm, Los Angeles County, California. Interim Report: March 23, 2010 – April 21, 2011. Prepared for Element Power, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. Cheyenne, Wyoming.

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Appendix A. North American Bat Fatality Table

INTRODUCTION

Element Power is proposing to develop a wind and solar energy facility in Los Angeles County, California, referred to as the Wildflower Green Energy Farm (WGEF). Element Power contracted Western EcoSystems Technology, Inc. (WEST) to develop and implement a standardized protocol for a baseline study of bat activity in the WGEF for the purpose of estimating the potential impacts of the proposed facility on bats, and to assist with siting turbines and solar panels to minimize impacts to bats. The protocol for the baseline study is similar to that implemented at other renewable energy projects in California and throughout the western US with modifications to accommodate site-specific characteristics of the WGEF. Additionally, the protocols follow guidance of the California Wind Energy Guidelines (California Energy Commission [CEC] and California Department of Fish and Game [CDFG] 2007) and the US Fish and Wildlife Service (USFWS) Wind Turbine Advisory Committee Guidelines (WTGAC 2010). The protocol has been developed based on WEST's experience studying wildlife and wind turbines at wind energy facilities throughout the US and included two components: 1) passive acoustic sampling using Anabat™ bat detectors, and 2) mist-netting surveys.

The following is an interim report describing the results of bat studies conducted at the WGEF from March 23, 2010, through April 21, 2011. In addition to site-specific data, this report presents existing information and results of acoustic bat studies conducted at other proposed and existing wind-energy facilities. Where possible, comparisons with regional studies were made.

STUDY AREA

The WGEF is located on 4,192 acres (6.6 square miles [mi^2]) of private land within the rural community of Fairmont in northern Los Angeles County (Figure 1). The closest city to the WGEF is Lancaster, located approximately 16 miles (about 26 kilometers [km]) to the east. The majority of the WGEF is composed of undeveloped land used as pasture for sheep grazing, with some areas of crop production and scattered rural homes. The proposed generation tie line (gen-tie) begins in the southeast corner of the WGEF and runs east along West Avenue J for approximately four miles (6.4 km) to the Antelope Substation. The Antelope Valley California Poppy Preserve is located immediately to the north and east of the WGEF and the California Aqueduct runs along the southern boundary of the study area.

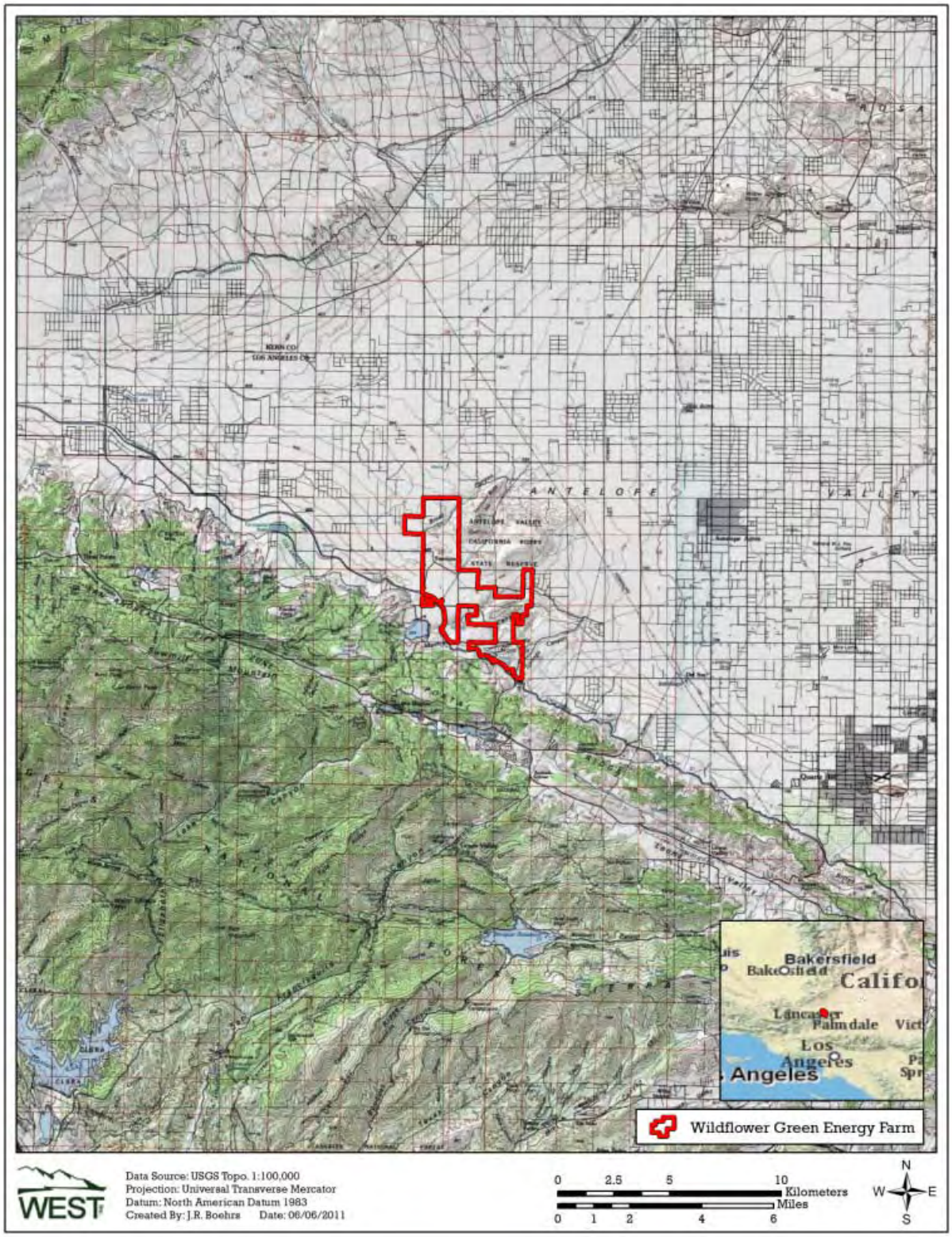

Figure 1. Location of the Wildflower Green Energy Farm.

The study area lies within the Antelope Valley region of the western Mojave Desert. Elevations within the study area range from approximately 792 to 914 meters (m; 2,600 – 3,000 feet [ft]), characterizing the area as a high desert environment. The primary vegetation community is non-native annual grassland with smaller areas of rabbitbrush (*Chrysothamnus nauseosus*) scrub and tilled cropland. Topography within the WGEF consists of a mosaic of relatively flat fields, low ridges and hills. The southwestern portion of the study area has nearly flat topography, while the remainder of the study area is characterized by gentle slopes and rolling hills. The greatest slopes occur along ridges located in the southeast corner of the WGEF.

Site Suitability for Bats

Based on range maps and species accounts from Bat Conservation International (BCI 2011), 26 species of bats are known to occur in California. Of those 26 species, 15 have an approximate range and habitat preferences that may include the WGEF. While none of these species are currently listed as federally or state threatened or endangered species, five species are considered California species of special concern (CDFG 2011): western red bat (*Lasiurus blossevillii*), pallid bat (*Antrozous pallidus*), spotted bat (*Euderma maculatum*), Townsend's big-eared bat (*Corynorhinus townsendii*), and western mastiff bat (*Eumops perotis*). A list of bat species with the potential to occur in the WGEF, habitat preferences, and likelihood of occurrence is included in Table 1.

In general, bat roost sites are varied and may include cliffs, rock crevices, caves, mines, buildings, bridges, and trees. Roosting habitat within the WGEF is limited to a few small riparian woodlands, windrows, isolated trees, and scatters buildings. Within the surrounding region, somewhat more roosting habitat is present in the form of a few rocky outcrops on Fairmont Butte, riparian corridors, shelterbelts, and buildings. It is unlikely that large numbers of bats roost within the WGEF and surrounding area; however, there is potential for bats to forage within the project area. Bats generally forage over water and open spaces such as agricultural fields, grasslands, streams, and wetlands/ponds. There is potential for bats to forage throughout the WGEF, concentrating seasonally over intermittent streams and irrigated cropland.

Table 1. Bat species determined from range-maps (Harvey et al. 1999, BCI 2011) with potential to occur within the Wildflower Green Energy Farm, sorted by call frequency.

Species	Status*	Habitat	Likelihood of Occurrence
High-Frequency (> 40 kHz)			
western red bat[†] *Lasiurus blossevillii*	SSC	Long-distant migrant and solitary tree-roosting bat. Project area is near the northern extent of species' range. Prefer riparian areas dominated by cottonwoods, oaks, sycamore, and walnut in otherwise arid regions; though also found in desert scrub. Roosts in tree foliage.	**Possible.** Limited suitable roosting habitat on the site, but may forage across the site; generally does not occur in desert habitats.
California bat *Myotis californicus*		Ranging throughout western North America, one of the most abundant bats in desert scrub habitat. Inhabit wooded canyons, open deciduous and coniferous forests, and brushy hillsides. Roost beneath loose bark, crevices of old snags and tree cavities. May also form small maternity colonies in cliff crevices, buildings, and bridges.	**Likely.** Likely roost and forage within site; probable year-round resident.
western small-footed bat *Myotis ciliolabrum*		Inhabit deserts, semi-deserts, and desert mountains. Day roost in crevices and cracks in canyon walls, tunnels, loose bark and buildings. Can be found hibernating in caves and mines in winter. Little else known about the species.	**Present.** Caught during mist-netting surveys in June.
cave bat[†] *Myotis velifer*	SSC	Forms nursery colonies usually numbering in the thousands in caves, mines, barns, buildings, and sometimes under bridges. Because the bats congregate in large groups, they are very susceptible to human disturbance.	**Unlikely.** Roost sites are very limited within the WGEF, and species known range is generally to the south and east; unlikely to be present.
long-legged bat[†] *Myotis volans*		Forest inhabitant, preferring high, open woods and mountainous terrain. Most common in woodland and forest habitats above 4,000 feet (ft; 1,219 meters [m]); uncommon in desert and arid grassland habitats. Roost in buildings, cliff crevices, and hollow trees. Maternity roosts have been found beneath bark and in other cavities.	**Unlikely.** Species does not occur in Mojave Desert expect in mountain ranges; preferred foraging habitat absent within WGEF.

Table 1. Bat species determined from range-maps (Harvey et al. 1999, BCI 2011) with potential to occur within the Wildflower Green Energy Farm, sorted by call frequency.

Species	Status*	Habitat	Likelihood of Occurrence
Yuma bat *Myotis yumanensis*		Common and widespread in California, but uncommon in Mojave Desert region. Inhabit range of habitats from humid forests to deserts, always near water. Optimal habitats are open forests and woodlands with sources of water over which to feed. Most often roost in buildings and bridges, but may also use rock crevices, caves, and mines. Thought to hibernate in caves or mines in winter.	**Possible.** May occur as year-round resident, though foraging habitat (water) is very limited.
canyon bat[†] *Parastrellus hesperus*		Common to abundant resident of deserts and arid grasslands and woodlands; the most common bat in desert regions where they are typically associated with rocky situations along watercourses. Roost primarily among boulders or in cracks and crevices in canyon walls or cliffs, and occasionally in mines and caves.	**Likely.** Probable year-round resident.
Mid-Frequency (30-40 kHz)			
western yellow bat[†] *Lasiurus xanthinus*	SSC	Uncommon in California; known only in Los Angeles and San Bernardino Counties south to Mexico border. Little known about species; has been recorded in valley foothill riparian, desert riparian, desert wash, and palm oasis habitats. Roost in trees—have been found roosting in palm trees.	**Possible.** May roost and forage in riparian habitats within WGEF.
western long-eared bat[†] *Myotis evotis*		Found throughout California, predominately in coniferous forest; typically found at higher elevations in southern areas (7,000-8,500 ft; 2,134 – 2,951 m). Roost in tree cavities and beneath exfoliating bark; pregnant females often roost at ground level in rock crevices, fallen logs, or stumps. Hibernation sites poorly known.	**Unlikely.** Preferred high elevation coniferous forest habitat not present.
little brown bat[†] *Myotis lucifugus*		Forms nursery colonies in buildings, attics, and other man-made structures. Uses a variety of habitats. Hibernates in caves or mines. Forages around trees and in open areas around water.	**Present.** Caught during mist-netting surveys in June.

Table 1. Bat species determined from range-maps (Harvey et al. 1999, BCI 2011) with potential to occur within the Wildflower Green Energy Farm, sorted by call frequency.

Species	Status*	Habitat	Likelihood of Occurrence
Low-Frequency (30-15 kHz)			
pallid bat *Antrozous pallidus*	SSC	Locally common species of low elevations throughout California. Inhabit wide variety of habitats including grassland, shrublands, woodlands, and forests. Prefer rocky, outcrop areas of arid regions where they commonly roost in crevices, caves, and mines. May also roost in barns, hollow trees, or buildings.	**Possible.** Limited roosting habitat is present, but species likely forages within the site.
Townsend's big-eared bat *Corynorhinus townsendii*	SSC	Found throughout California but details of distribution are not well known; found in all but alpine and subalpine habitats. In spring and summer form maternity roosts in mines, caves or buildings. Hibernate in caves or abandoned mines. Extremely sensitive to disturbance.	**Possible.** Limited roosting habitat present, but may forage within the site.
big brown bat[†] *Eptesicus fuscus*		Widespread and abundant species—has been found in nearly every North American vegetation type, but uncommon in hot desert habitats. Uses building and other human-made structures for roosting to such an extent that natural roosting habits are poorly known.	**Likely.** Probable year-round resident.
silver-haired bat[†] *Lasionycteris noctivagans*		Long-distant migrants and solitary tree-roosting bats. Form maternity colonies in tree cavities and small hollows. Roost and hibernate beneath lose bark, in snags and in manmade structures. Inhabit forested areas near streams and lakes.	**Likely.** Limited roosting habitat in site, but likely migrates through area in spring and fall.
hoary bat[†] *Lasiurus cinereus*		Long-distant migrant and solitary tree bat. Roosts in trees along forest borders and edges of forest clearings. Forages above water and forest openings such as grassy meadows.	**Likely.** Limited roosting habitat in site, but likely migrates through area in spring and fall.
fringed bat *Myotis thysanodes*		Widespread in California, occurring in all but the Central Valley and Mojave and Colorado Deserts. Optimal habitats are pinyon-juniper, valley foothill hardwoods, and hardwood-conifer, generally at 4,000 – 7,000 ft (1,219 – 2,134 m). Roosts in caves, mines, buildings, and crevices.	**Unlikely.** Preferred woodland habitat generally absent from site.

Table 1. Bat species determined from range-maps (Harvey et al. 1999, BCI 2011) with potential to occur within the Wildflower Green Energy Farm, sorted by call frequency.

Species	Status*	Habitat	Likelihood of Occurrence
pocketed free-tailed bat[†] *Nyctinomops femorosaccus*		Rare in California, occurring in pinyon-juniper woodlands, desert scrub, desert riparian, Joshua tree, and palm oasis habitats. Prefer rock crevices in cliffs as roost sites; must drop form roost to gain speed for flight.	**Unlikely.** No roosting habitat present; only known to south the WGEF in Riverside, San Diego and Imperial Counties.
Mexican free-tailed bat[†] *Tadarida brasiliensis mexicana*		Long distance migrant; occupies a variety of habitats from desert communities to pinyon-juniper woodland and pine-oak forests. These are primarily cave-dwelling bats though some smaller maternity colonies are in hollow trees.	**Possible.** No roosting habitat present, but may forage within, or migrate through, the site.
Very Low-Frequency (< 15 kHz)			
spotted bat *Euderma maculatum*	SSC	Inhabit a range of habitats including high-elevation pine forests, pinyon pine-juniper association, and open scrub associations in desert areas. In summer roost in crevices in cliff walls and canyons. Little known about winter habits.	**Possible.** No roosting habitat present, but may forage throughout the site.
western mastiff bat *Eumops perotis californicus*	SSC	Occurs in many open, semi-arid habitats including conifer and deciduous woodlands, coastal scrub, grassland, etc. Little is known about behavior and status. Roost in cliff face crevices and feed high above ground so they are rarely observed. Severely limited by available drinking water—long narrow wings preclude its drinking at pond less than 100 m (328 ft) in length.	**Possible.** No roosting habitat present, but may forage throughout the site.
big free-tailed bat[†] *Nyctinomops macrotis*		Typically live in desert and arid grassland areas where rocky out-crops, canyons, or cliffs provide ideal roosts; will occasionally roost in buildings.	**Unlikely.** No roosting habitat present in site vicinity; range is generally to south.

[†]species known to have been killed at wind energy facilities; fatality information from Anderson et al. 2004, Kunz et al. 2007b, Miller 2008, Chatfield et al. 2009, Piorkowski and O'Connell 2010, Thompson et al. 2011.

Canyon bat formerly known as western pipistrelle (*Pipistrellus hesperus*; BCI 2011).

*SSC = California species of special concern (CDFG 2011)

METHODS

Acoustic Bat Surveys

The objective of the bat surveys was to estimate the seasonal and spatial use of the WGEF by bats. Bats were surveyed using Anabat™ SD-I and SD-II (Titley™ Scientific, Australia) acoustic detectors. Bat detectors are recommended and widely used to index and compare habitat use by bats (Kunz et al. 2007a). Bat detectors have been used for calculating an index to bat impacts at numerous wind energy facilities throughout the US and are an economically feasible bat risk assessment tool (Arnett 2007).

Bat Survey Methods

Bat activity was surveyed using Anabat detectors at two fixed stations within the WGEF (EP1 and EP2; Figure 2) from March 23 to September 6, 2010. On September 7, 2010, meteorological (met) towers were installed at three locations within the WGEF. At this time, paired (ground and raised) detectors were installed at each of the three met towers locations (EP1, EP2, and EP3; Figure 2) and continued to survey bat activity from September 7, 2010, through April 21, 2011. For the raised detectors, Anabat microphones were mounted on the met tower at 20 m (66 ft) above the ground. Raised microphones were encased in a Bat-Hat weatherproof housing (EME Systems, Berkeley, California) and attached to a coaxial cable that transmitted ultrasonic sounds to an Anabat unit at the base of the tower. Both ground-based and raised detectors were programmed to collect data continuously from 30 minutes (min) before sunset to 30 min after sunrise, the period corresponding to greatest bat activity.

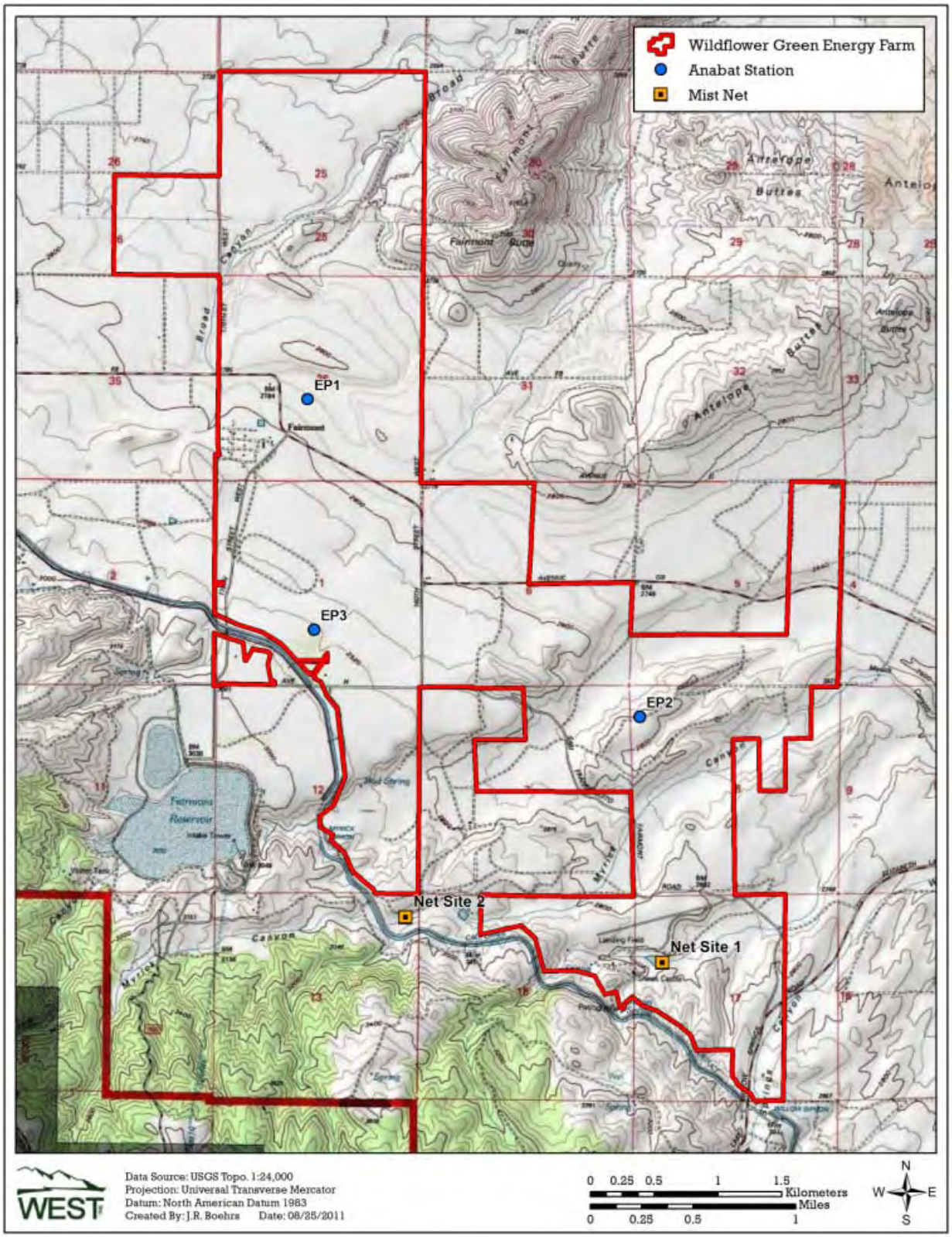

Figure 2. Study area map showing Anabat sampling stations and mist netting trap sites at the Wildflower Green Energy Farm.

Anabat detectors recorded bat echolocation calls and other ultrasonic sounds via a broadband, high-frequency microphone. Each series of echolocation calls was saved to a file on a high-capacity compact flash card, and these files were then transferred to a computer for analysis. Computer software was used to view digital "sonograms" of the echolocation calls showing change in frequency over time. During analysis, the frequency vs. time displays were used to separate bat calls from other types of ultrasonic noise (e.g., wind, insects, rain, etc.) and to assign calls to a high- or low-frequency group (see below). To help minimize interference from extraneous ultrasonic noise, the detectors were set to a sensitivity level of six, as this level of sensitivity is optimal for removing noise while still recording the majority of bat call in range (Brooks and Ford 2005).

For each station, bat passes were sorted into four groups (based on their minimum frequency) that correspond roughly to species groups of interest. For example, most species of *Myotis* bats echolocate at frequencies above 40 kilohertz (kHz), with the exception of a few Myotis species that have echolocation that fall between 30 and 40 kHz (e.g., western long-eared bat [*Myotis evotis*] and little brown bat [*Myotis lucifugus*]). Hoary bat (*Lasiurus cinereus*) and Mexican free-tailed bat (*Tadarida brasiliensis*) generally echolocate at frequencies that fall between 15 and 30 kHz, while species such as spotted bat and western mastiff bat have echolocation frequencies that fall at or below 15 kHz. Therefore, passes were classified as high-frequency (HF; more than 40 kHz), mid-frequency (MF; 30 - 40 kHz), low-frequency (LF; 15 - 30 kHz), or very low-frequency (VLF; less than 15 kHz). To establish which species may have produced passes in each category, a list of species expected to occur in the study area was compiled from range maps (Table 1; Harvey et al. 1999, BCI 2011). Data determined to be noise (produced by a source other than a bat) or call notes that did not meet the pre-specified criteria to be termed a pass were removed from the analyses.

Bat use for this report was defined as the total number of bat passes per detector night, and was used as an index to represent levels of bat activity in the WGEF. Bat pass data represented levels of bat activity rather than the numbers of individuals present as individuals cannot be differentiated by their calls. As one approach to assess potential for bat mortality, the mean number of bat passes per detector-night was compared to existing data from wind energy facilities where both bat activity and mortality levels have been measured.

Survey Timing

Nightly acoustic surveys were conducted within the WGEF from March 23, 2010, to April 21, 2011. Anabat detectors were visited approximately every two weeks for data recovery.

Bat Mist Netting Surveys

Because species identification can be difficult based on recordings from ultrasonic detectors, capturing bats using mist nets or other methods is recommended to survey bat populations (Kuenzi and Morrison 1998). Additionally, new Bat Survey Guidelines developed by the Los Angeles County Regional Planning Department recommend conducting ground mist-netting surveys at proposed wind energy projects in addition to acoustic monitoring. Mist netting captures only a small proportion of the bats present, and some species are more easily captured than others. Because of this, mist net captures do not reflect bat abundance or relative activity, and may not represent all species present in an area.

Study Methods

Bats were surveyed using mist nets (Avinet, Inc., Dryden, New York) set primarily across water at ponds, natural springs, and riparian corridors. A total of two survey efforts were conducted; one during the summer of 2011 and one during the fall of 2011. All trapping locations were located in the southern portion of the WGEF (Figure 2) and were chosen because bats tend to concentrate over open water in desert environments for drinking and foraging needs (von Frenckell and Barclay 1987, Kunz and Kurta 1988, Findley 1993). Few habitat features were suitable to trap within the project area, due to a lack of water, caves/mines, large rock outcrops, or other bat features. Nets were six, nine, 12, or 18 m (about 20, 30, 39, or 59 ft) long, 2.6 m () high, and had 38-millimeter (mm; 1.5-inch) mesh with four panels made of nylon. Both single and stacked nets totaling 5.2 m in height were used. Each bat captured was identified, aged, sexed, and weighed. Age and sex were determined based on criteria in Anthony (1988) and Racey (1988).

Survey Timing

Surveys were conducted on two nights, June 5 - 7, 2011.

RESULTS

Bat Acoustic Surveys

Bat activity was monitored on a total of 395 nights during the period March 23, 2010, through April 21, 2011. From March 23 to September 6, 2010, only ground units EP1g and EP2g were deployed and collecting data. Upon installation of met towers at the WGEF, stations EP1h, EP2h, EP3g, and EP3h were additionally deployed, totaling six detectors that monitored bat activity from September 7 to April 21, 2010. Unit EP2h had numerous technical issues throughout the sampling period, which compromised data collection during approximately 46% of the sampling period. Levels of wind and insect noise were relatively low throughout the study period (i.e., less than 1,000 noise files per detector-night; Figure 3). Anabat units recorded 1,057 bat passes on 1,553 detector-nights (Table 2). Averaging bat passes per detector-night across all stations, a mean (± standard error) of 0.63 ± 0.09 bat passes per detector-night was recorded. The average bat activity for ground stations was 1.02 ± 0.16 bat passes per detector-

night, and for raised stations the average bat activity was 0.23 ± 0.04 bat passes per detector-night (Table 2).

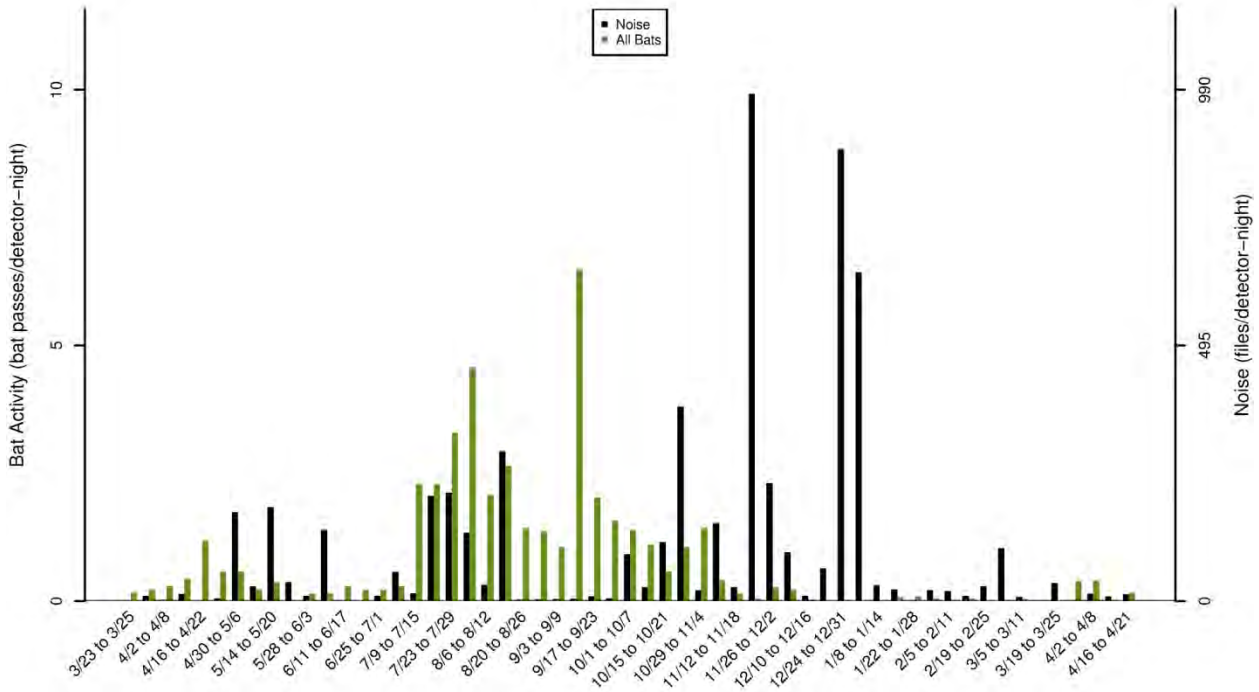

Figure 3. Bat activity and noise files recorded per detector-night at the Wildflower Green Energy Farm for the study period March 23, 2010 - April 21, 2011, presented by week. Noise files are indicated on the second axis.

Table 2. Results of acoustic bat surveys conducted at the Wildflower Green Energy Farm, March 23, 2010 - April 21, 2011, separated by call frequency: high frequency (HF), mid frequency (MF), low frequency (LF), and very low frequency (VLF).

Anabat Station	Location	# of HF Bat Passes	# of MF Bat Passes	# of LF Bat Passes	# of VLF Bat Passes	# of Hoary Bat Passes*	# of Western Red Bat Passes**	Total Bat Passes	Detector-Nights	Bat Passes/ Night***
EP1g	ground	67	20	314	1	6	3	402	395	1.02±0.12
EP1h	raised	12	2	65	0	1	1	79	227	0.35±0.06
EP2g	ground	42	8	100	4	4	1	154	358	0.43±0.04
EP2h	raised	0	0	0	0	0	0	0	180	0
EP3g	ground	226	17	119	1	8	0	363	224	1.62±0.36
EP3h	raised	7	4	47	1	1	0	59	169	0.35±0.08
Total ground		**335**	**45**	**533**	**6**	**18**	**4**	**919**	**977**	**1.02±0.16**
Total raised		**19**	**6**	**112**	**1**	**2**	**1**	**138**	**576**	**0.23±0.04**
Total		**354**	**51**	**645**	**7**	**20**	**5**	**1,057**	**1,553**	**0.63±0.09**

*Passes by hoary bats included in low-frequency (LF) numbers;
**Passes by western red bats are included in mid-frequency (MF) numbers;
***± bootstrapped standard error.

Spatial Variation

Bat activity varied among the six stations in the WGEF (Table 2; Figure 4). The highest bat activity was recorded at the ground detector at station EP3 (EP3g; 1.62 bat passes per detector-night), followed by the ground detector at station EP1 (EP1g; 1.02 bat passes per detector-night). Anabat detectors EP1h, EP2g, and EP3h had similar bat activity (0.35, 0.43, and 0.35 bat passes per detector-night, respectively). Due to technical difficulties, station EP2h was inoperable for much of the study period (Table 2; Figure 4).

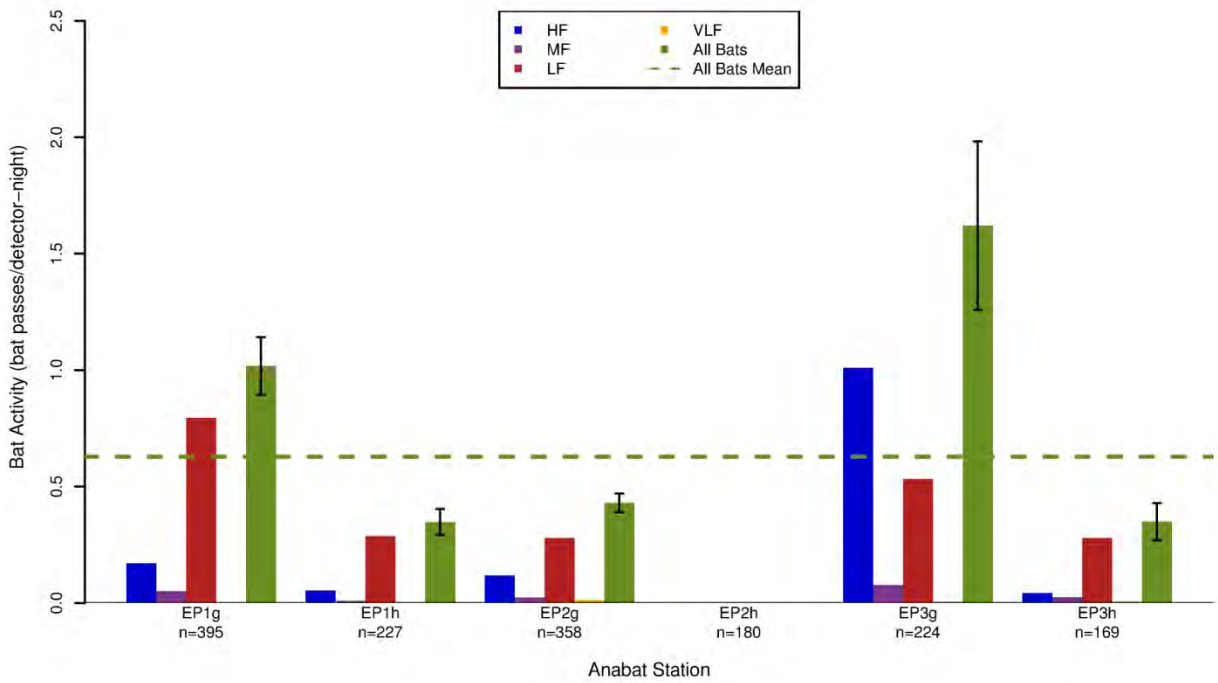

Figure 4. Number of bat passes per detector-night by Anabat station at the Wildflower Green Energy Farm for the study period March 23, 2010 – April 21, 2011. The bootstrapped standard errors are represented by the black error bars on the 'All Bats' columns.

Comparing ground and raised detectors at paired stations, ground-based detectors recorded the majority of overall bat activity (62.9%). Comparing paired stations on only the nights when both the ground and raised detectors were operating, ground detectors at each station still recorded greater activity than their raised counterparts (Figure 5).

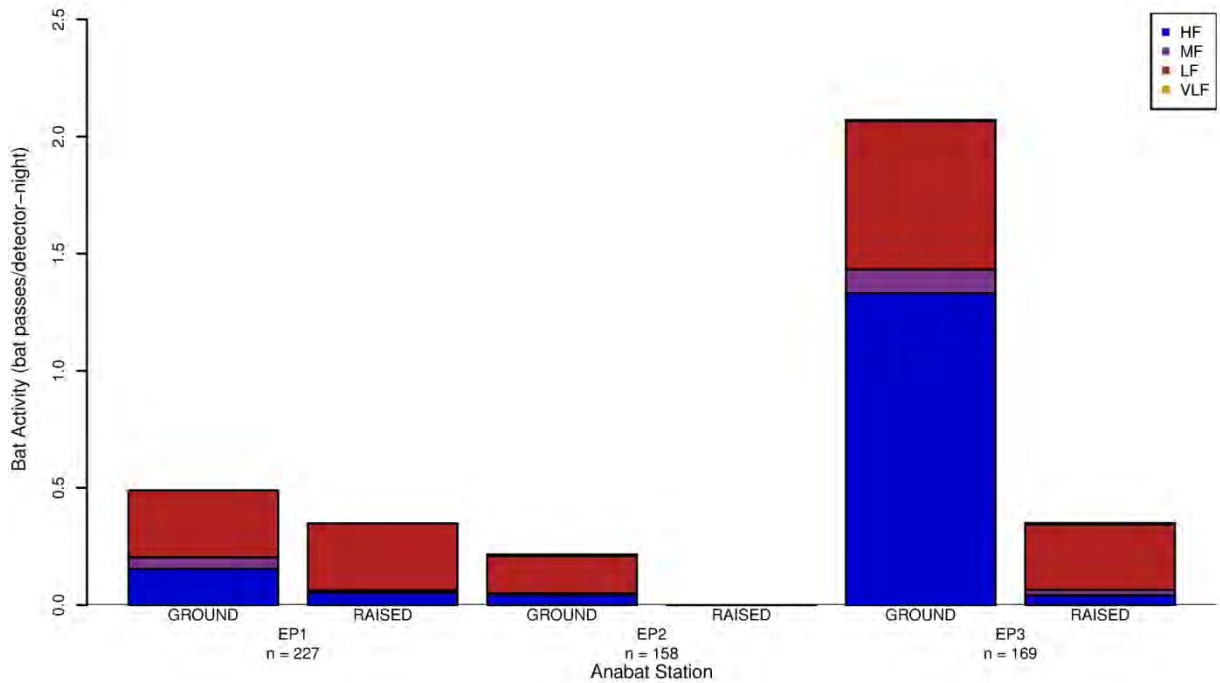

Figure 5. Number of high-frequency (HF), mid-frequency (MF), low-frequency (LF), and very low-frequency (VLF) bat passes per detector-night recorded at paired ground and raised Anabat stations at the Wildflower Green Energy Farm for the study period March 23, 2010 - April 21, 2011.

Temporal Variation

Bat activity was relatively low to moderate from March through early July, with a small peak in activity occurring in mid-late April (Figure 6). Activity sharply increased in mid-July and remained relatively high through early November. After the fall season, activity dropped to very low levels, and very little to no bat activity was recorded from December through the remainder of the study period. For all frequency groups combined, the highest number of bat passes per detector-night was recorded during the week of September 4 – 10 (12.78 bat passes per detector-night). For HF bats, the week with the highest recorded bat activity was congruent with the overall trend, also peaking during the week of September 4 – 10 (11.31 bat passes per detector-night). For LF bat passes, peak activity occurred several weeks earlier in the season, during the week of July 27 – August 2 (4.57 bat passes per detector-night; Figure 6).

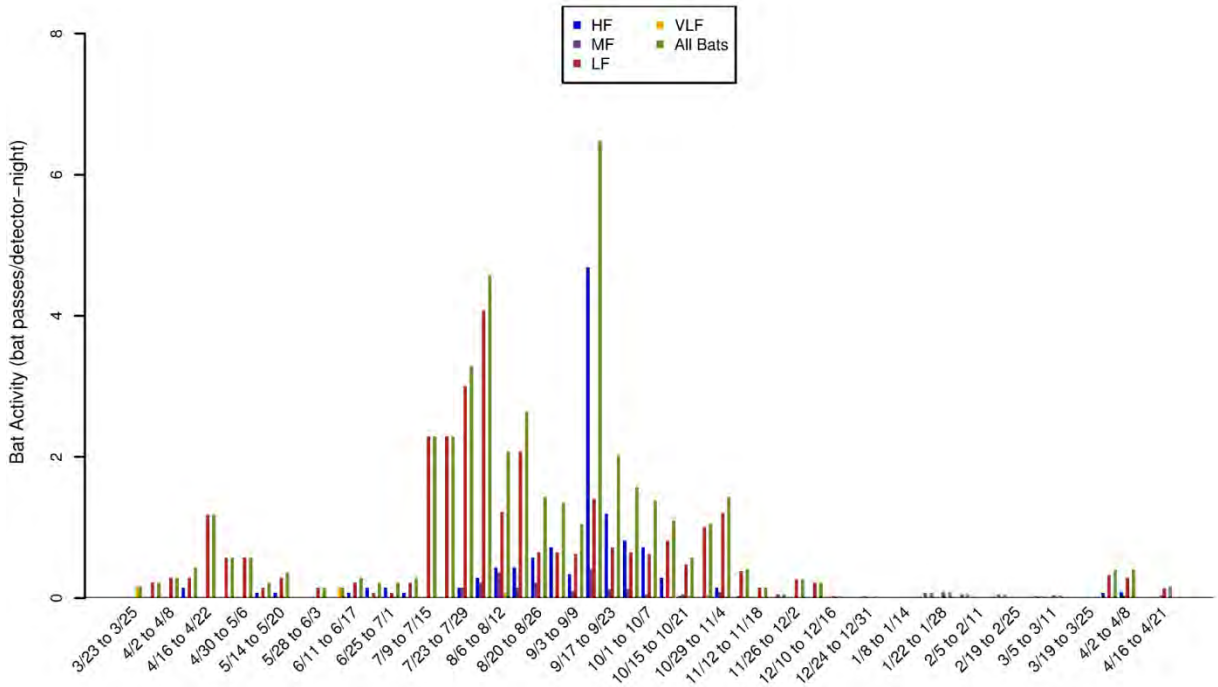

Figure 6. Weekly pattern of bat activity within the Wildflower Green Energy Farm for the study period March 23, 2010 – April 21, 2011.

Species Composition

Overall, LF bats had the greatest number of recorded calls (645), comprising 61.0% of total recorded activity among the six stations (Table 2; Figure 4). High-frequency bats composed 33.5% of total activity, MF bats composed 4.8% of the activity, and VLF bats comprised only 0.7% of total activity. Low-frequency bat calls outnumbered HF calls at all detectors with the exception of W3g, where 62.3% of activity was attributed to HF bats (Table 2; Figure 4).

While LF species composed the majority of activity at both raised (81.2%) and ground detectors (58.0%), LF species composed a greater proportion of activity at raised detectors. Alternatively, HF species composed a greater proportion of activity at ground detectors (36.5%) than at raised detectors (13.8%; Table 2).

Bat activity throughout the study period varied among the different frequency groups (Figure 6). Low-frequency bat activity peaked in late summer (late-July to early-August), whereas activity by HF bats peaked later in the fall (early-September). A second, smaller peak in activity by HF bats was also recorded in the spring (April), which was not observed for LF species. Activity by MF and VLF bats was too low throughout the study period to discern any temporal trends (Figure 6).

Bat Mist-Netting Surveys

Mist-netting surveys were completed at two sites from June 5 – 7, 2011 (Table 3; Figure 2). Survey effort incorporated both the number of nets utilized and the number of hours each net was open and was expressed as net-hours. Different net lengths (3.0, 6.0, 9.0, 12.0, or 18.0 m) were used depending on topography, ground cover, and site dimensions. On the first night, June 5, netting was conducted only at net site 1, during which five nets were open for a total of five hours each. On the second night, June 6, netting was conducted at both net sites. At net site 2, a total of three nets were open for three hours each and at net site 1, five nets were open for three hours each. A total of 49 net-hours were surveyed over the course of two nights, including 40 net-hours at net site 1 and nine net-hours at net site 2 (Figure 2; Table 3).

Eleven bats representing two distinct species were captured: little brown bat (five individuals) and western small-footed bat (*Myotis ciliolabrum*; five individuals; Table 4). One additional bat escaped from the net before it could be retrieved and identified to species. All 11 bats were captures at net site one (N1; Figure 2). All seven of the captured females were pregnant, while all three of the captured males were non-reproductive (Table 4).

Table 3. Capture locations during summer 2011 mist-netting surveys at the Wildflower Green Energy Farm (North American Datum [NAD] 83).

Site ID	Easting	Northing	Description	Number of Net-hours	Number Captured
Net site 1	0372494	3840429	Pond, riparian corridor	40	11
Net site 2	0370481	3840784	wetland	9	0

Table 4. Capture summary from summer 2011 mist-netting surveys at the Wildflower Green Energy Farm.

		Females		Males		
Common Name	**Species Name**	**Pregnant**	**Not Pregnant**	**Reproductive**	**Not Reproductive**	**Total**
little brown bat	*Myotis lucifugus*	2	0	0	3	5
western small-footed bat	*Myotis ciliolabrum*	5	0	0	0	5
unidentified bat	-	-	-	-	-	1
Totals		**7**	**0**	**0**	**3**	**11**

DISCUSSION

Potential Impacts to Bats

Assessing the potential impacts of wind energy development to bats at the WGEF is complicated because the proximate and ultimate causes of bat fatalities at turbines are poorly understood (Kunz et al. 2007b; Baerwald et al. 2008; Cryan and Barclay 2009; Long et al. 2010a, 2010b), and because monitoring elusive, night-flying animals is inherently difficult (O'Shea et al. 2003). In addition, although installed capacity for wind has increased rapidly in recent years, release of study results from these existing wind energy facilities has lagged the influx of newly proposed facilities (Kunz et al. 2007b). To date, monitoring studies of wind energy facilities suggest that:

1) bat mortality shows a rough positive correlation with bat activity (Appendix A; Kunz et al. 2007b);

2) the majority of fatalities occur during the post-breeding or fall migration season (roughly August and September; Johnson 2005, Arnett et al. 2008); and

3) migratory tree-roosting species (eastern red, hoary, and silver-haired bats) compose almost 75% of reported bats killed (Arnett et al. 2008, Gruver et al. 2011).

Based on these patterns, current guidance to estimate potential mortality levels at a proposed wind energy facility involves evaluation of the on-site bat acoustic data in terms of activity levels, seasonal variation, and species composition (Kunz et al. 2007b), as well as comparison to regional fatality patterns.

The three ground-based Anabat detectors recorded 919 bat passes over the course of 977 detector-nights. Averaging bat passes per detector-night across locations, a mean of 1.02 bat passes per detector-night was recorded. The highest activity rates at the WGEF were observed in late summer and early fall, when the majority of wind energy-related fatalities typically occur (see Johnson 2005, Arnett et al. 2008). The majority (61.0%) of the calls were between 15 and 30 kHz in frequency, suggesting higher relative abundance of species such as hoary bat, big brown bat, and Mexican free-tailed bat. Low-frequency bats comprised a greater proportion of activity at raised detectors (81.2%) than at ground detectors (58.0%), while the reverse was true for HF species (13.8% and 36.5%, respectively). Generally, LF species tend to forage in less cluttered conditions (e.g., at greater heights) than HF species due to their wing morphology and echolocation call structure (Norberg and Rayner 1987), which may help explain the different species composition between ground and raised detectors.

Due to the differences in study period length, type of equipment, placement of equipment, and presentation of data, it is not possible to directly compare the results from the WGEF with studies conducted at other proposed wind energy facilities that implemented similarly studies and had publically-available data; however, some generalizations can be made. In general,

reported fatality rates have been among the highest in the Northeast, Southern Plains, Midwest, and Southeast, and generally lower in the Pacific Northwest, Rocky Mountains, Southwest, and California, although a relatively high degree of variation in reported fatality rates is present for most regions. For studies that measured activity and fatality rates, the highest (38.3 bat passes per detector-night) and lowest (0.3) activity estimates corresponded with fatalities rates that were among the highest (31.69) and lowest (1.40) bat fatalities/megawatt (MW)/year, respectively (Appendix A). However, the relationship in bat activity estimates and bat fatality rates is not consistent. For example, despite relatively high activity at Top of Iowa in 2003 (35.7 bat passes/detector-night), fatalities were relatively low (7.16 bat fatalities/MW/year), whereas comparatively low bat activity at Blue Sky Green Field (7.7 bat passes/detector-night) corresponded with a relatively high fatality estimate (24.57 bat fatalities/MW/year; Appendix A).

Bat activity recorded at ground stations in the WGEF during this study (1.02 ± 0.16 bat passes per detector-night) was relatively very low compared to activity rates reported at other proposed and existing facilities. Based on reported fatality rates at wind energy facilities in California and the Pacific Northwest regions of the US (Appendix A), the bat activity observed at the WGEF during 13 months of study, and habitats within the project area, it is expected that the potential risk to bats from turbine operations to be lower than or similar to the rates observed at other western facilities, and not nearly as high as the rates observed at eastern ridgeline facilities. As well, comparatively very few bat mortalities have been found during post-construction fatality surveys at existing wind energy facilities in the region (see Anderson et al. 2004, M.H. Wolfe and Associates 2008, Chatfield et al. 2009, BioResource Consultants 2010), further suggesting that fatality rates at the WGEF will be relatively low.

Currently, impacts to bats from solar energy development are largely unknown. While photovoltaic solar projects are assumed to have minimal direct impacts to bats, there is potential for solar arrays to displace bats from foraging habitat, particularly species that forage close to the ground or larger species that prefer to forage in large open spaces. The extent to which bats may be displaced from portions of the project containing large solar arrays is uncertain; however, the presence of similar habitats in the surrounding landscape suggests that displacement effects may be minimal. Other potential impacts include the destruction of roosting habitat; however, this is unlikely at the WGEF, particularly in the portions of the WGEF where solar panels will be sited. Solar panels will not be constructed in the southern portions of the WGEF where riparian habitats are located, where bat activity is expected to be highest, and where potential bat roosting habitat is more abundant. Because bats forage at night, there should be minimal risk of bats encountering extreme heat sources, which could occur with some solar technologies during the day. The main risk to foraging bats would be collision with solar facility structures, but unlike most birds, which use vision as the primary sense while foraging, bats are unlikely to strike mirrored structures because they use echolocation to navigate, which should allow them to detect and avoid fixed structures related to the solar facility.

Acoustic bat monitoring is currently ongoing at the WGEF and scheduled to continue through spring of 2012. Upon installation of 60-m (197-ft) met towers in the fall of 2011, elevated Anabat

detectors will be raised to a height of 45 m (148 ft) and an additional paired Anabat station will be established in the southern portion of the WGEF.

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Appendix A. North American Bat Fatality Table

Appendix A. Wind energy facilities in North America with fatality data for bats.

Wind Energy Facility	Bat Activity Estimate[1]	Fatality Estimate[2]	No. of Turbines	Total MW
California				
Shiloh I, CA		3.92	100	150
High Winds, CA (2004)		2.51	90	162
Dillon, CA		2.17	45	45
High Winds, CA (2005)		1.52	90	162
Alite, CA		0.24	8	24
SMUD Solano, CA		0.07	22	15
Pacific Northwest				
Biglow Canyon, OR (Phase II; 2009/2010)		3.784	65	150
Nine Canyon, WA		2.47	37	48.1
Stateline, OR/WA 2003		2.29	454	263
Biglow Canyon, OR (Phase I; 2008)		1.99	76	125.4
Leaning Juniper, OR		1.98	67	100.5
Big Horn, WA		1.9	133	199.5
Combine Hills, OR		1.88	41	41
Pebble Springs, OR		1.55	47	98.7
Hopkins Ridge, WA (2008)		1.39	87	156.6
Elkhorn, OR (2008)		1.26	61	101
Vansycle, OR		1.12	38	24.9
Klondike III, OR		1.11	122	375
Stateline, OR/WA 2002		1.09	454	263
Tuolumne (Windy Point I), WA		0.94	62	136.6
Klondike, OR		0.77	16	24
Hopkins Ridge, WA (2006)		0.63	83	150
Biglow Canyon, OR (Phase I; 2009)		0.58	76	125.4
Hay Canyon, OR		0.53	48	100.8
Klondike II, OR		0.41	50	75
Wild Horse, WA		0.39	127	229
Goodnoe, WA		0.34	47	94
Marengo II, WA (2009)		0.27	39	70.2
Marengo I, WA (2009)		0.17	39	70.2
Klondike IIIa, OR		0.16	125	375
Rocky Mountains				
Summerview, Alb (2008)	5.3	11.42	39	70.2
Judith Gap, MT		8.93	90	135
Foote Creek Rim, WY (Phase I; 1999)		3.97	69	41.4
Foote Creek Rim, WY (Phase I; 2001-2002)		1.57	69	41.4
Foote Creek Rim, WY (Phase I; 2000)	2.2[A]	1.05	69	41.4
Southwest				
Dry Lake, AZ	6.9[B]	4.29	30	63

Appendix A. Wind energy facilities in North America with fatality data for bats.

Wind Energy Facility	Bat Activity Estimate[1]	Fatality Estimate[2]	No. of Turbines	Total MW
Midwest				
Cedar Ridge, WI (2009)		30.61	41	67.6
Blue Sky Green Field, WI	7.7[C]	24.57	88	145
Cedar Ridge, WI (2010)		24.12	41	68
Forward Energy Center, WI		18.17	86	129
Top of Iowa, IA (2004)	35.7	10.27	89	80
Crystal Lake II, IA		7.42	80	200
Top of Iowa, IA (2003)	35.7	7.16	89	80
Kewaunee County, WI		6.45	31	20.46
Ripley, Ont (2008)		4.67	38	76
Winnebago, IA		4.54	10	20
Crescent Ridge, IL		3.27	33	54.45
Buffalo Ridge, MN (Phase III; 1999)		2.72	138	103.5
Buffalo Ridge, MN (Phase II; 1999)		2.59	143	107.25
Moraine II, MN		2.42	33	49.5
Buffalo Ridge, MN (Phase II; 1998)		2.16	143	107.25
Prairie Winds (Minot), ND		2.13	80	115.5
Grand Ridge, IL		2.10	66	99
Elm Creek, MN		1.49	67	100
Wessington Springs, SD		1.48	34	51
NPPD Ainsworth, NE		1.16	36	20.5
Buffalo Ridge, MN (Phase I; 1999)		0.74	73	25
Buffalo Ridge I, SD (2010)		0.16	24	50.4
Southern Plains				
Barton Chapel, TX		3.06	60	120
Buffalo Gap II, TX		0.14	155	233
Buffalo Gap I, TX		0.10	67	134
Northeast				
Mountaineer, WV	38.3[A]	31.69	44	68
Mount Storm, WV (2009)		24.32	132	264
Cohocton/Dutch Hill, NY (2009)		16.02	50	125
Maple Ridge, NY (2006)		15.00	120	198
Casselman, PA (Spring & Fall 2008)		12.61	23	34.5
Mount Storm, WV (Fall 2008)		12.11	82	164
Casselman, PA (Fall 2008)		9.91	23	34.5
Noble Bliss, NY (2008)		9.78	67	100
Maple Ridge, NY (2007)		9.42	195	321.75
Noble Clinton, NY (2009)		6.48	67	100
Wolfe Island, Ont (July-December 2009)		6.42	86	197.8
Noble Bliss, NY (2009)		5.50	67	100
Noble Ellenburg, NY (2008)		5.45	54	80
Noble Ellenburg, NY (2009)		5.34	54	80
Maple Ridge, NY (2008)		4.96	195	321.75
Noble Clinton, NY (2008)		3.63	67	100
Lempster, NH (2010)		3.57	12	24
Lempster, NH (2009)		3.08	12	24
Mars Hill, ME (2007)		2.91	28	42
Munnsville, NY (2008)		1.93	23	34.5
Stetson Mountain, ME (2009)	0.3[D]	1.40	38	57
Mars Hill, ME (2008)		0.45	28	42

Appendix A. Wind energy facilities in North America with fatality data for bats.

Wind Energy Facility	Bat Activity Estimate[1]	Fatality Estimate[2]	No. of Turbines	Total MW
	Southeast			
Buffalo Mountain, TN (2005)		39.7	18	28.98
Buffalo Mountain, TN (2000-2003)	23.7[A]	31.54	3	1.98

1=bat passes per detector-night; 2=number of bat fatalities/MW/year

A= Activity rate calculated by WEST from data presented by associated source document (s) listed below; B= Estimate base on data from both ground and raised Anabat detectors; C= Estimate based on ground-based units only; D = Estimate based only on data from Anabat unit placed on nacelle as other units were places in trees and data may not have been comparable due to differences in habitats.

Data from the following sources:

Facility	Activity Estimate	Fatality Estimate	Facility	Activity Estimate	Fatality Estimate
Alite, CA		Chatfield et al. 2010	Klondike III, OR		Gritski et al. 2009a
Barton Chapel, TX		WEST 2011	Klondike IIIa, OR		Gritski et al. 2009b
Big Horn, WA		Kronner et al. 2008	Leaning Juniper, OR		Kronner et al. 2007
Biglow Canyon, OR (Phase I; 08)		Jeffrey et al. 2009a	Lempster, NH (09)		Tidhar et al. 2010
Biglow Canyon, OR (Phase I; 09)		Enk et al. 2010	Lempster, NH (10)		Tidhar et al. 2011
Biglow Canyon, OR (Phase II; 09/10)		Enk et al. 2011	Maple Ridge, NY (06)		Jain et al. 2007
Blue Sky Green Field, WI	Gruver 2008	Gruver et al. 2009	Maple Ridge, NY (07)		Jain et al. 2009a
Buffalo Gap I, TX		Tierney 2007	Maple Ridge, NY (08)		Jain et al. 2009d
Buffalo Gap II, TX		Tierney 2009	Marengo I, WA		URS Corporation 2010b
Buffalo Mountain, TN (00-03)	Fiedler 2004	Nicholson et al. 2005	Marengo II, WA		URS Corporation 2010c
Buffalo Mountain, TN (05)		Fiedler et al. 2007	Mars Hill, ME (07)		Stantec 2008a
Buffalo Ridge I, SD		Derby et al. 2010b	Mars Hill, ME (08)		Stantec 2009a
Buffalo Ridge, MN (Phase I; 99)		Johnson et al. 2000	Moraine II, MN		Derby et al. 2010d
Buffalo Ridge, MN (Phase II; 98)		Johnson et al. 2000	Mount Storm, WV (Fall 08)		Young et al. 2009a
Buffalo Ridge, MN (Phase II; 99)		Johnson et al. 2000	Mount Storm, WV (09)		Young et al. 2010
Buffalo Ridge, MN (Phase III; 99)		Johnson et al. 2000	Mountaineer, WV	Arnett et al. 2005	Kerns and Kerlinger 2004
Casselman, PA (Spring & Fall 08)		Arnett et al. 2009	Munnsville, NY		Stantec 2008b
Cedar Ridge, WI (09)		BHE Environmental 2010	Nine Canyon, WA		Erickson et al. 2003
Cedar Ridge, WI (10)		BHE Environmental 2011	Noble Bliss, NY (08)		Jain et al. 2009e
Cohocton/Dutch Hill, NY		Stantec 2010	Noble Bliss, NY (09)		Jain et al. 2010a
Combine Hills, OR		Young et al. 2006	Noble Clinton, NY (08)		Jain et al. 2009c
Crescent Ridge, IL		Kerlinger et al. 2007	Noble Clinton, NY (09)		Jain et al. 2010b
Crystal Lake II, IA		Derby et al. 2010a	Noble Ellenburg, NY (08)		Jain et al. 2009b
Dillon, CA		Chatfield et al. 2009	Noble Ellenburg, NY (09)		Jain et al. 2010c
Dry Lake, AZ	Thompson et al. 2011	Thompson et al. 2011	NPPD Ainsworth, NE		Derby et al. 2007
Elkhorn, OR (08)		Jeffrey et al. 2009b	Pebble Springs, OR		Gritski and Kronner 2010b
Elm Creek, MN		Derby et al. 2010c	Prairie Winds (Minot), ND		Derby et al. 2011
Foote Creek Rim, WY (Phase I; 99)		Young et al. 2003	Ripley, Ont.		Jacques Whitford 2009
Foote Creek Rim, WY (Phase I; 00)	Gruver 2002	Young et al. 2003	Shiloh I, CA		Kerlinger et al. 2010
Foote Creek Rim, WY (Phase I; 01/02)		Young et al. 2003	SMUD Solano, CA		Erickson and Sharp 2005
Forward Energy Center, WI		Grodsky and Drake 2011	Stateline, OR/WA (02)		Erickson et al. 2004
Goodnoe, WA		URS Corporation 2010a	Stateline, OR/WA (03)		Erickson et al. 2004
Grand Ridge, IL		Derby et al. 2010g	Stetson Mountain, ME	Stantec 2009b	Stantec 2009b
Hay Canyon, OR		Gritski and Kronner 2010a	Summerview, Alb. (08)	Baerwald 2008	Baerwald 2008
High Winds, CA (04)		Kerlinger et al. 2006	Top of Iowa, IA (03)	Jain 2005	Jain 2005
High Winds, CA (05)		Kerlinger et al. 2006	Top of Iowa, IA (04)	Jain 2005	Jain 2005
Hopkins Ridge, WA (06)		Young et al. 2007	Tuolumne (Windy Point I), WA		Enz and Bay 2010
Hopkins Ridge, WA (08)		Young et al. 2009b	Vansycle, OR		Erickson et al. 2000
Judith Gap, MT		TRC 2008	Wessington Springs, SD		Derby et al. 2010f
Kewaunee County, WI		Howe et al. 2002	Wild Horse, WA		Erickson et al. 2008
Klondike I, OR		Johnson et al. 2003	Winnebago, IA		Derby et al. 2010e
Klondike II, OR		NWC and WEST 2007	Wolfe Island, Ont. (Rprt 2: July-Dec. 09)		Stantec Ltd. 2010

Appendix K-5:

Results of Butterfly Surveys

Guy P. Bruyea
Bruyea Biological Consulting

May 25, 2010

Results of Butterfly Surveys on the Antelope Valley Renewable Energy Farm Site, Los Angeles County, California.

INTRODUCTION

At the request of WEST, Inc. (WEST), Guy P. Bruyea (GPB) conducted a field survey of the above-referenced site in the Antelope Valley/Fairmont Butte area in northwestern Los Angeles County, California. The specific goal of this survey was to assess potential suitability of the Antelope Valley Renewable Energy Farm (AVREF) site as habitat to support the San Emigdio blue butterfly (*Plebulina emigdionis*, herein referred to as SEB) and the alkali skipper (*Pseudocopaeodes eunus*, herein referred to as AS), both federal species of concern. In addition to surveys for habitat that may support the aforementioned butterfly taxa, a general butterfly inventory was performed during two site visits in May 2010. This report describes the relevant vegetation, topography, and present land use throughout the AVREF site in an effort to assess the overall quality of the habitat as it pertains to special-status butterfly species and general butterfly diversity on the site.

Survey Location

The ± 2500-acre AVREF site is generally located in the Antelope Valley west of Lancaster, south of Highway 138 and east of 170th Street in the Fairmont Butte area (**Exhibit 1**). Portions of the site are adjacent to the Antelope Valley California Poppy Reserve north and south of Lancaster Road. Much of the site lies north of the California Aqueduct, but a small area in the southwest corner of the site lies just south of the aqueduct. The site is located in Sections 1, 5, 6, 8, 12, 25 and 31 within the U.S.G.S. Fairmont Butte 7.5′ series quadrangle map.

SENSITIVE BUTTERFLY SPECIES BACKGROUND INFORMATION

There are approximately 135 recorded butterfly species from Los Angeles County, of which approximately 120 are considered resident. Some species have adapted well to ornamental landscapes, but many formerly common species have now become increasingly rare over the past few decades due to urban expansion and other factors. Several butterflies presently (and/or historically) found in Los Angeles County are now protected or are considered species of special concern by federal agencies. Several additional species are considered to be rare by professional entomologists in the region, but are afforded no protection status by any regulatory agencies. A complete list of all Los Angeles County sensitive butterfly species is

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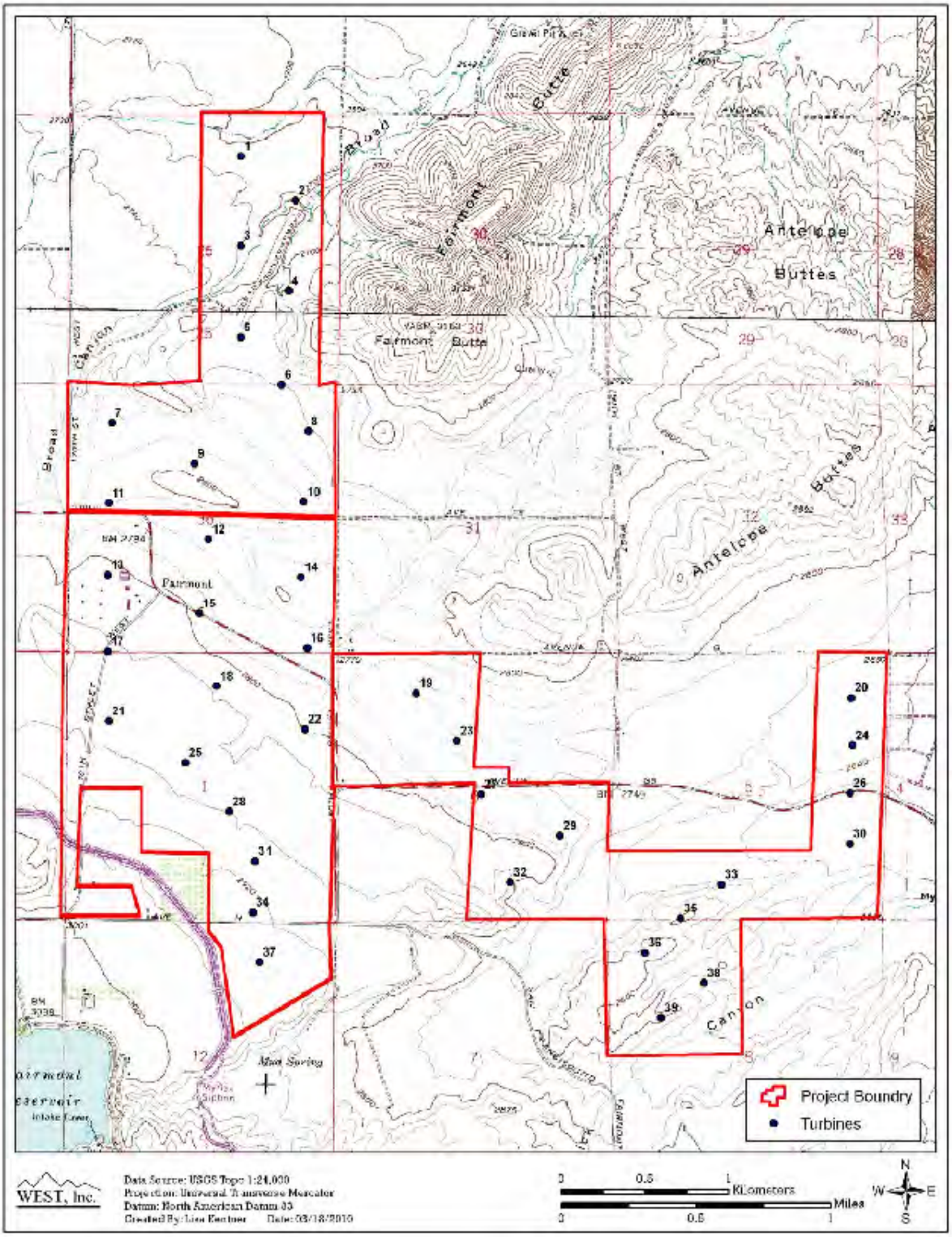
Exhibit 1


Project Boundry
Turbines
Fairmont Butte
Antelope Buttes
Fairmont
Antelope
Canyon
WEST, Inc.
Data Source: USGS Topo 1:24,000
Projection: Universal Transverse Mercator
Datum: North American Datum 83
Kilometers
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provided in **Table 1**. At least three butterfly species that once occurred in Los Angeles County are now presumably extinct. These include, 1) the unsilvered fritillary (*Speyeria adiaste atossa*), which was last observed near Mt. Pinos in 1959, 2) a very localized race of the Sonoran blue (*Philotes sonorensis*) that once occurred in the upper San Gabriel wash above Azusa (to 1968), and 3) the Palos Verdes blue (*Glaucopsyche lygdamus palosverdesensis*, herein referred to as PVB), which was last observed on the Palos Verdes peninsula in 1983.

Table 1.
Los Angeles County Sensitive Butterflies

Common Name	Scientific Name	Status	Range*
Quino Checkerspot	*Euphydryas editha quino*	FE	N
El Segundo Blue	*Euphilotes battoides allyni*	FE	N
Palos Verdes Blue	*Glaucopsyche lygdamus palosverdesensis*	FE	N
San Emigdio Blue	*Plebulina emigdionis*	[FSC]	**Y**
Santa Monica Mountains Hairstreak	*Satyrium auretorum fumosum*	[FSC]	N
Emmel's Elfin	*Callophrys mossii hidakupa*	[FSC]	N
Wandering Skipper	*Panoquina errans*	[FSC]	N
Alkali Skipper	*Pseudocopaeodes eunus*	[FSC]	**Y**
Tehachapi Mountains Silverspot	*Speyeria egleis tehachapina*	[FSC]	N
Monarch Butterfly	*Danaus plexippus*	**	**Y**
Comstock's Blue	*Euphilotes battoides comstocki*	r	N
Bright Blue Copper	*Lycaena heteronea clara*	r	N
Veined Blue	*Icaricia neurona*	r	N
Green (=Skinner's) Blue	*Icaricia lupini chlorina*	r	N
Unsilvered Fritillary	*Speyeria adiaste atossa*	X	N
San Gabriel Mountain Sonoran Blue	*Philotes sonorensis extinctus*	X	N

*Indicates whether survey area is within known historical range of indicated taxon (Y=yes, N=no)
FE=Federally endangered, [FSC]=Federal Species of Concern, r = species considered rare by professional entomologists (no status); X=Presumed extinct (no status), ** Over-wintering (or roosting) sites should be protected, butterfly probably not at risk currently

Three butterfly species known from Los Angeles County are now on the federal list of endangered wildlife. These include the El Segundo blue (*Euphilotes battoides allyni*, herein referred to as ESB), the Quino checkerspot butterfly (*Euphydryas editha quino*, herein referred to as QCB), and the PVB.

No recent records for QCB exist from Los Angeles County. Populations of QCB are historically known from two locations in the Santa Monica Mountains, 1) Tapia Camp (1947), and 2) Point Dume (1954). Both of these colonies appear to have been extirpated, as adults have not been observed at or in the vicinity of either location since the mid-1950's. Most extant populations of QCB are known from southwestern Riverside County in the vicinity of Temecula and Murrieta, and southern San Diego County in the vicinity of Otay Mountain, Campo and other areas east to the desert edge at Jacumba.

The ESB is restricted to the coastal dune systems in southwestern Los Angeles County. The ESB is presently known from only three locations: 1) the dunes west of the Los Angeles International Airport (LAX); 2) the dunes west of the Chevron Oil refinery immediately south

of LAX; and, 3) Malaga Cove north of the Palos Verdes peninsula. This butterfly is strongly associated with the flower heads of its host plant, coastal or dune buckwheat (*Eriogonum parviflorum*). Adults are active in a single brood from mid-July to early September.

The PVB was restricted to the Palos Verdes peninsula where it flew in a single generation during February and March. This butterfly was strongly associated with its principal host plant, milkvetch (*Astragalus trichopodus* var. *lonchus*). The closest relative of the PVB is the southern blue (*Glaucopsyche lygdamus australis*), which occurs throughout most of the remainder of southern California. The southern blue is known to feed in the larval stage primarily on deerweed (*Lotus scoparius*), although larvae occasionally have been found on milkvetch.

The PVB was believed to have become extinct in 1983 when the last known large stand (approximately 120 plants) of milkvetch was eliminated by construction of a baseball field at Hesse Park on the peninsula. In the spring of 1994, a colony of what is considered by some researchers to be the PVB was discovered at a slightly more inland locality on Navy property in San Pedro. At this locality the butterflies are associated with both milkvetch and deerweed. Some researchers maintain that it is possible that genetic differences exist between seaward-facing peninsular populations (PVB) and the extant Navy colony.

Several other butterfly species are considered uncommon in Los Angeles County, some having federal status (i.e., species of special concern), and others that warrant careful monitoring due to declining populations or extremely limited ranges within Los Angeles County. These include the Santa Monica Mountains hairstreak *(Satyrium auretorum fumosum*), the wandering skipper (*Panoquina errans*), and the Tehachapi Mountain silverspot (*Speyeria egleis tehachapina*).

Several additional butterfly species that appear to be declining (or may be extirpated) in Los Angeles County, but remain common in other areas of their respective ranges include the purplish copper (*Lycaena helloides*), giant copper (*Lycaena xanthoides*), Columella hairstreak (*Strymon columella istapa*), southern sylvan hairstreak (*Satyrium sylvinum sylvinum*), western tailed blue (*Everes amyntula*), coastal arrowhead blue (*Glaucopsyche piasus sagittigera*), California ringlet (*Cenonympha tullia californica*), and sylvan satyr (*Cercyonis sthenele sylvestris*).

Sensitive butterflies considered to have potential for occurrence on the subject property, based on known ranges, the presence of associated vegetation communities, elevations on site, host plant availability within the general vicinity, and other requirements, are discussed in more detail below.

San Emigdio Blue Butterfly (*Plebulina emigdionis*)

The SEB is a federal species of concern and is restricted to southern California in lower Sonoran and riparian habitats from the Owens Valley south to the Mojave River and west to northern Ventura and Los Angeles Counties. This butterfly can be locally abundant in association with its primary host plant, four-wing saltbush (*Atriplex canescens*). This butterfly has also been observed in association with quail bush (*Atriplex lentiformis*) at scattered locations. The limited distribution of SEB was perplexing to early researchers based

on the abundance and widespread distribution of its host plant, which occurs throughout the western United States. SEB larvae have formed a symbiotic relationship with at least one ant species, *Formica pilicornis* (Ballmer *et al*, 1991). This may account for, at least in part, SEB's limited range. These ants presumably extract droplets (containing glucose and amino acids) from the nectary glands of SEB larvae and the ants offer the larvae protection from predators. This relationship is actually quite common among other members of the butterfly family Lycaenidae, to which the SEB belongs. The male butterfly is small (approximately 20-25 millimeters in wingspan) and is blue with a wide brown border on the dorsal wing surface. The slightly larger female is primarily brown with blue at the wing bases and orange bands on the edges of the dorsal wing surface. The ventral wing surface of both sexes is mostly white with small black dots, with smaller blue dots along the hind wing edges.

SEB adults are active from late April to early September. The SEB can have up to three broods per year with the first brood in late April to May, the second brood from late June to early July, and the third brood in August to early September (Emmel et al, 1973). Adults are generally observed perching on their host plant or on other plants in the immediate vicinity, and have also been observed nectaring on nearby flowers. The females deposit single echinoid eggs on the leaves of the host plant after mating. These eggs hatch in about eight to ten days and the larvae begin feeding on the leaves immediately. Diapause normally occurs in the late or last instar of larval development, presumably in the second and/or third broods depending on climatic conditions. The mature larva is variable in color from blue, green, brown, and combinations thereof, and is densely covered with fine white hairs. Retractile glands located on the eleventh larval segment can be protruded when stimulated. Researchers believe these organs are attractive to ants (Emmel et al, 1973).

There are several other Lycaenid butterflies classified as 'blues' (subfamily Polyommatinae) that occur with the SEB in portions of its range. Some of these species are similarly sized and have markings that can be easily confused with SEB. Commonly observed sympatric butterfly species include the blue copper (*Lycaena heteronea*), southern blue (*Glaucopsyche lygdamus australis*), Boisduval's blue (*Icaricia icaroides*), acmon blue (*Icaricia acmon*), lupine blue (*Icaricia lupini*), western tailed-blue (*Everes amyntula*), marine blue (*Leptotes marina*), pigmy blue (*Brephidium exilis*), Bernardino blue (*Euphilotes bernardino*), and square-spotted blue (*Euphilotes battoides*). SEB can be initially distinguished from many of these species by its relatively large size and its strong association with four-wing saltbush or quail bush.

Due to its extremely limited distribution in southern California and its propensity for isolated small colonies, the SEB can be easily impacted by anthropogenic disturbances. Many colonies in the Mojave Desert and Owens Valley are isolated and are probably not under any immediate threat, but other colonies found closer to growing desert communities and suburban Los Angeles cities are situated near major roads, railroad tracks and other developments, which may contribute to further decline. Some of these populations have already been extirpated; others are threatened by these impacts.

Some of the known localities for this species include the Lower Haiwee Reservoir in Inyo County, Mojave River area near Victorville, and Bouquet and Mint Canyons in Los Angeles County. It is thought that populations in the Mint Canyon area near Santa Clarita were

extirpated in the late 1980's and early 1990's. However, GPB did observe one extant SEB population in nearby Soledad Canyon as recently as August 1999. An additional small colony was observed by GPB south of the Santa Clarita River basin and Highway 126 near Santa Clarita in 2004.

Alkali Skipper (*Pseudocopaeodes eunus*)

The alkali skipper is a small (approximately 20-22mm) butterfly with a bright brownish-orange upperside and conspicuously dark vein ends. The underside is similarly colored with veins that may or may not be dark in coloration. Unlike most other skippers within its range the alkali skipper lacks black markings on the upper surface of the wings, making it one of the more easily identified skippers in the field. This skipper ranges from southern Nevada to eastern and southern California south into Baja California Norte, Mexico.

The alkali skipper is strongly associated with its larval host plant, saltgrass (*Distichlis spicata*), and can be found from April through September, although it is most abundant during the summer months of June and July. It is usually observed on open alkali flats where its host plant occurs and frequently flies with the more common chusca sandhill skipper (*Polites sabuleti chusca*), which also utilizes saltgrass as a larval food plant in the desert areas. The alkali skipper is rather rare and sporadic throughout the lowland desert areas of southern California from the Scissors Crossing area in San Diego County north to the Mojave River and Victorville areas (Emmel and Emmel, 1973).

Monarch Butterfly (*Danaus plexippus*)

The widespread monarch butterfly can be observed throughout southern California in the coastal, lowland, and foothill areas, and occasionally in desert and mountain areas where it larval host plant, various milkweeds (genus *Asclepias*), occurs. Monarchs are renowned migrants, and large numbers can be observed along the California coast in the fall months as they migrate to overwintering sites along the California coast and into Mexico. A few California sites (e.g. Pacific Grove) support concentrated numbers of the overwintering adults on trees; usually the adults hibernate as scattered individuals or in small clusters (Emmel et al, 1973).

Although the monarch butterfly may be declining due to land conversion and loss of larval host plant resources throughout its range, populations of this butterfly appear to be stable. However, existing and potential over-wintering sites along the southern California coast supporting large trees (primarily Eucalyptus and/or Pines) are considered important for the long-term survival of western United States populations.

METHODS

Guy Bruyea and field assistant Patrick Luft surveyed the AVREF site for a total of four person-days on May 10 and 16, 2010. Date and times of the survey visits, weather conditions at the start and end of each survey period, and survey results are summarized in **Table 2.**

Table 2.
AVREF Site Butterfly Survey Information
May 2010

Date	Time PST	Weather	Wind	Biologists	Results
5/10	0900-1500	Sunny, 59-68 °F	10-25	GB, PL	No sensitive species observed
5/16	0900-1500	Sunny, 65-83 °F	5-15	GB, PL	No sensitive species observed

Biologists: GB (Guy Bruyea) and PL (Patrick Luft); Wind speed measured in mph

The primary focus of this survey was to determine the presence or absence of SEB, AS and their associated host plants. Special consideration was given to areas supporting native vegetation that may include specific larval host plant habitat requirements for any of the aforementioned sensitive species. The presence or absence of invasive, non-native plant species was noted in an effort to assess the level of previous disturbance in a given area. Other habitat requirements including the presence of potential nectar resources or tree overwintering sites (for monarch butterfly) were assessed.

This field survey was conducted during daylight hours from 0900 to 1500 Pacific Daylight (Savings) Time. Temperatures recorded during the survey ranged from 59 to 83 °F (degrees Fahrenheit) and conditions were clear with light to moderate winds (5 to 25mph). Guy Bruyea and Patrick Luft identified all butterfly species in the field.

Daily weather data were noted on field forms and/or a digital audio recorder approximately once per hour during survey visits. Weather data were recorded using a digital anemometer, thermometer, and by visual observation and estimation of cloud cover and other pertinent daily weather characteristics (rain, drizzle, marine layer, etc.). Digital recordings were later transcribed to field forms.

Not all plants and/or associated butterfly species that may have been present on site were necessarily observable (or identified) during this survey. For an exhaustive assessment of the butterfly fauna of a given area, surveys would be required throughout the year. Our general knowledge of the butterfly diversity for this area was utilized in an effort to locate specific habitats for some butterfly species. A California Natural Diversity Database (CNDDB) records search was conducted prior to the start of this survey to determine the probability that sensitive butterfly species may be present on the site.

Nomenclature used in this report was primarily derived from Hickman (1993) for plants; Emmel et al. (1973), Howe (1975), and Emmel (1998) for butterflies; and Arnett (2000) for other insects. WEST project botanist Kurt Flaig assisted with some plant identifications and presence/absence determinations. Additional resources are listed at the end of this report.

Site Description

Much of the site supports a mixture of disturbed and relatively undisturbed Mojave Desert grassland. Non-native grasses and a mixture of native and invasive low-growing annuals dominate much of the site Rabbitbrush (*Chysothamnus naseosus*) is the most conspicuous shrub on the site, and was observed in all areas away from agricultural fields. California buckwheat (*Eriogonum fasciculatum*) is present in low number on the southern and southwestern corner of the site. During this survey, many annual plants on the site had passed their peak bloom period and were in the process of senescing. However, many potential nectar resources were still commonly observed, due in part to unseasonably cool April and May temperatures and above-average spring precipitation. These included (but were not limited to) California poppy (*Eschscholzia californica*), goldfields (*Lasthenia* species), grape soda lupine (*Lupinus excubitus*), dove lupine (*Lupinus bicolor*), owl's clover (*Castilleja* species), Bigelow coreopsis (*Coreopsis bigelowi*), red-stemmed filaree (*Erodium cicutarium*) and many other annual species.

Topographically, the site is primarily flat in association with the Antelope Valley. Other areas within or adjacent to the AVREF site are characterized by gently to steeply sloping hills and ridgelines with a mixture of shallow to steep canyons and flat mesa areas. Adjacent lands are mostly flat or on rolling hills. More significant topographic relief is present on adjacent lands associated with the San Gabriel Mountains to the south and Tehachapi Mountains to the northwest. The AVREF site has a combined maximum vertical relief of roughly 300 feet between its highest and lowest on-site elevation points. Elevations on the site range from approximately 2700 to 3000 feet above mean sea level.

Land use varies considerably within and adjacent to the survey area, and includes anthropogenic disturbances such as actively cultivated in-use agricultural fields, fallow fields, livestock (primarily sheep) grazing, equestrian use, rural residential areas, paved and unimproved roads, transmission lines, and other developments. Other disturbances associated with off-road vehicle use, dumping, windblown trash and target shooting were observed. Less disturbed areas, including the Antelope Valley California Poppy Reserve, are located east and north of the site. A portion of the California Aqueduct lies along the southern edge of the AVREF site just north of Fairmont Reservoir.

RESULTS

No SEB were observed within the AVREF site during the present study. This species is strongly associated with its larval host plant where it occurs, and no suitable patches of *Atriplex* were observed within the AVREF site.

The present study indicates that all areas of the AVREF site do not currently support potential habitat for SEB. This conclusion is primarily based on the absence of *Atriplex* throughout the study area. In addition, no adult SEB were observed during surveys of the site, which were performed within the SEB flight period. Additionally, the lack of historical SEB data from this region of Los Angeles County illustrates its scarcity in the general area.

Based on the results of the present study, it can be reasonably concluded that the AVREF site does not support suitable SEB habitat and that SEB is not expected to occur on site.

This study indicates that the property does not currently support suitable habitat for AS. This conclusion is primarily based on the lack of historical AS data from this region of Los Angeles County, and the absence of its primary host plant, saltgrass, which was not detected on the subject property during this survey by GPB, PL or WEST botanical investigations.

Individual monarch butterflies were not observed on the subject property during the present study, but they are expected to at least ocassionally occur on site, especially during migration in the fall months. Milkweeds (*Asclepias* species), which serve as a larval hostplant, may be present on or near the subject property, and would be available as a potential oviposition site for passing females. Due to the site's distance away from coastal areas and more importantly, the lack of suitably tall trees as potential resting areas, it is improbable that the AVREF site would be utilized by large numbers of overwintering adult monarch butterflies.

It is our understanding that no recent data suggest that occupied habitat exists on any other portion of the AVREF site for the sensitive butterfly species discussed in this report and based on the survey results, none are expected to occur.

Other Lepidoptera Observations

A total of eight (8) butterfly species were observed on the property during the present survey and are summarized in **Table 3**. In general the AVREF site appears to support habitat conducive to a low to average diversity of butterfly fauna. Species observations during this study were low, in part, due to frequent high winds and/or time limits of the present survey. Many butterflies were uncommon and other species expected to occur on the site were not observed.

Table 3.
AVREF Site Lepidoptera Observations

Common Name / Scientific Name	**Notes**
Checkered White (*Pontia protodice*)	Common; all areas
Cabbage White (*Pieris rapae*)	Uncommon; shaded areas near residential property
Alfalfa Butterfly (*Colias eurytheme*)	Common; especially within or near agricultural areas
Painted Lady (*Vanessa cardui*)	Common throughout site; migratory
Red Admiral (*Vanessa atalanta*)	Uncommon, not expected to be resident on site.
West Coast Lady (*Vanessa annabella*)	Uncommon; observed on hilltop south end
Funereal Duskywing (*Erynnis funeralis*)	Common throughout site
Lupine Blue (*Icaricia lupini*)	Common in association with *Eriogonum fasciculatum*
8 Species Total	

Butterfly species commonly observed during the present study include painted lady (*Vanessa cardui*), checkered white (*Pontia protodice*) and lupine blue (*Icaricia lupini*). Other butterflies observed included alfalfa sulfur (*Colias eurytheme*) and west coast lady (*Vanessa annabella*). The site and survey area includes topographic features such as ridgelines and prominent hilltops, which can be considered significant as potential hilltopping sites for butterflies in the immediate area. Common hilltopping species observed on hilltops within the AVREF site included checkered white. None of the sensitive butterfly species discussed above as potentially occurring on the AVREV site are known hilltoppers.

Many additional butterfly species that are expected to occur on site were likely not observed during this study due to seasonal restrictions and other factors. A complete list of butterfly species with potential for occurrence, based on the vegetation present, the site's location, and other factors, is included as part of this report (Appendix A).

CONCLUSIONS

During the two-day survey effort, the entire AVREF site was specifically surveyed for the sensitive butterfly species described above. In addition, a general butterfly inventory (both observed and expected to occur) was performed. Based on seasonal precipitation patterns in the late winter and spring months of 2010, butterfly activity was considered relatively 'productive' for most areas of southern California, including the Antelope Valley and surrounding areas. No SEB, AS or other sensitive butterfly species were observed and are not expected to occur on the AVREF site based on the results of this study.

Based on our observations and other information presented in the above report, GPB is not able to make any conclusive statements regarding the butterfly diversity of the AVREF site. To determine the overall butterfly diversity of the site additional surveys would need to be performed, especially during the early spring months from late March through April.

If I can be of any further assistance regarding this project and report, please do not hesitate to contact me at 909.226.9268.

Sincerely,
Bruyea Biological Consulting

Guy P. Bruyea
Entomologist / Principal Biologist

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Certification and Signature Page

± 2500-acre AVREF Site
Los Angeles County, California
May 25, 2010

I hereby certify that the statements furnished above and in the attached exhibits present the data and information required for this biological evaluation, and that the facts, statements, and information presented are true and correct to the best of my knowledge and belief.

_____ **Date:** __May 25, 2010__

Guy P. Bruyea, Principal Biologist
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Appendix A

Butterfly Species with potential for occurrence on the **AVREF** Site (N=64)
Los Angeles County, California
May 2010

Observed butterfly species (N=8) are indicated with an asterisk. Two asterisks indicate special status and/or narrow-endemic species. Butterfly species included on this list have varying degrees of potential for occurrence on the subject property. Potential for occurrence is based on a combination of known range (historical and present), host plant presence/absence and other factors. Not all butterfly species that may be resident on the site were necessarily observed during this survey. Several species listed below may stray onto or fly through the site from adjacent areas with more suitable habitat. For an exhaustive butterfly assessment, surveys are best performed from February to September to achieve a thorough inventory.

Family / Scientific Name	**Common Name**
Order Lepidoptera	Butterflies and Moths
Papilionidae	**Swallowtails**
Papilio rutulus	Western Tiger Swallowtail
Papilio eurymedon	Pale Swallowtail
Papilio zelicaon	Anise Swallowtail
Papilio cresphontes	Giant Swallowtail
Nymphalidae	**Brush-footed Butterflies**
Danaus gilippus	Striated Queen
Danaus plexippus	Monarch
Ceononympha tullia californica	California Ringlet
Agraulis vanillae incarnata	Gulf Fritillary
Basilarchia lorquini	Lorquin's Admiral
Adelphia bredowii californica	California Sister
Euphydryas chalcedona	Chalcedon Checkerspot
Junonia coenia	Buckeye
Charidryas gabbii	Gabb's Checkerspot
Phyciodes mylitta	Mylitta Crescent
Polygonia satyrus	Satyr Anglewing
Nymphalis californica	California Tortoise-shell
Nymphalis milberti	Milbert's Tortoise-shell
Nymphalis antiopa	Mourning Cloak
Vanessa virginiensis	Virginia Lady
Vanessa atalanta	Red Admiral*
Vanessa cardui	Painted Lady *
Vanessa annabella	West Coast Lady*

Appendix A (continued)

Family / Scientific Name	Common Name
Order Lepidoptera	Butterflies and Moths
Riodinidae	**Metalmarks**
Apodemia mormo	Mormon Metalmark
Lycaenidae	**Blue, Hairstreaks, Coppers**
Atlides halesus	Great Purple Hairstreak
Callophrys perplexa	Bramble Hairstreak
Euphilotes bernardino	Bernardino Blue
Incisalia augustinus iroides	Western Elfin
Icaricia acmon	Acmon Blue
Icaricia lupini	Lupine Blue*
Everes amyntula	Western Tailed-blue
Glaucopsyche lygdamus australis	Southern Blue
Hemiargus ceraunus gyas	Edward's Blue
Hemiargus isola alce	Reakirt's Blue
Leptotes marina	Marine Blue
Brephidium exilis	Pigmy Blue
Lycaena xanthoides	Great Copper
Satyrium californica	California Hairstreak
Strymon melinus	Common Hairstreak
Pieridae	**Whites and Sulfurs**
Colias (Zerene) eurydice	California Dogface
Colias (Zerene) cesonia	Southern Dogface
Colias alexandra harfordii	Harford's Sulfur
Colias eurytheme	Alfalfa Sulfur *
Nathalis iole	Dwarf Yellow
Anthocharis cethura	Felder's Orange-tip
Anthocharis sara sara	Sara Orange-tip
Anthocharis lanceolata	Gray Marble
Euchloe lotta	Desert Marble
Eurema nicippe	Nicippe Yellow
Phoebis sennae	Cloudless Sulfur
Pieris rapae	Cabbage White
Pontia protodice	Checkered White*
Pontia beckeri	Becker's White
Pontia sisymbrii	Spring White
Artogeia rapae	Cabbage White *
Hesperiidae	**Skippers**
Lerodea eufala	Eufala Skipper
Paratrytone melane	Umber Skipper

Appendix A (continued)

Family / Scientific Name	**Common Name**
Order Lepidoptera	Butterflies and Moths
Hesperiidae (Continued)	**Skippers**
Hylephila phyleus	Fiery Skipper
Atalopedes campestris	Field Skipper
Ochlodes agricola	Rural Skipper
Polites sabuleti	Sandhill Skipper
Erynnis funeralis	Funereal Duskywing*
Erynnis tristes	Mournful Duskywing
Heliopetes ericetorum	Large White Skipper
Pyrgus albescens	West. Checkered Skipper