

DRAFT

**ENVIRONMENTAL ASSESSMENT FOR THE
SHILOH IV WIND PROJECT
HABITAT CONSERVATION PLAN**

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Acronyms and Abbreviations

AADT	Annual Average Daily Traffic
AB	Assembly Bill
AFB	Air Force Base
AFFSA	U.S. Air Force Flight Standards Agency
ALUC	Airport Land Use Commission
ALUCP	Airport Land Use Compatibility Plan
AMC	Air Mobility Command
amsl	above mean sea level
AMW	Air Mobility Wing
ANSI	American National Standards Institute
APN	assessor's parcel number
ARB	California Air Resources Board
area of impact	area of potential effects
AST	aboveground storage tank
BAAQMD	Bay Area Air Quality Management District
BGEPA	Bald and Golden Eagle Protection Act
BMP	best management practice
BP	before present
CAA	Clean Air Act
CAAA	Clean Air Act Amendment (1990)
CAAQS	California Ambient Air Quality Standards
CAISO	California Independent System Operator
CAL FIRE	California Department of Forestry and Fire Protection
Cal-OSHA	California Occupational Safety and Health Administration
Caltrans	California Department of Transportation
CAP	Climate Action Plan
CBC	California Building Standards Code
CCA	community choice aggregations
CCAA	California Clean Air Act
CCR	California Code of Regulations
CCR	California Code of Regulations
CDC	California Department of Conservation
CEC	California Energy Commission
CEQ	Council on Environmental Quality
CEQA	California Environmental Quality Act
CFC	chlorofluorocarbon
CFR	Code of Federal Regulations
CGS	California Geological Survey

CH ₄	methane
CNDDB	California Natural Diversity Database
CNEL	Community Noise Equivalent Level
CNPS	California Native Plant Society
CO	carbon monoxide
CO ₂	carbon dioxide
CO ₂ e	CO ₂ equivalents
County	Solano County
CPUC	California Public Utilities Commission
CRADA	Cooperative Research and Development Agreement
CRHR	California Register of Historical Resources
CTS	California tiger salamander
CUP	conditional use permit
CWA	Clean Water Act
dB	decibel
Delta	Sacramento-San Joaquin Delta
DFG	California Department of Fish and Game
DO	Dissolved Oxygen
DOGGR	Department of Conservation Division of Oil and Gas
DPM	diesel particulate matter
DPR	California Department of Parks and Recreation
EA	environmental assessment
ECP	Eagle Conservation Plan
EDR	Environmental Data Resources
EIR	environmental impact report
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
ESP	energy service provider
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FIRM	Flood Insurance Rate Maps
FMMP	Farmland Mapping and Monitoring Program
FR	Federal Register
frac-out	drilling fluid leak
GHG	greenhouse gas
GIS	geographic information system
GMF	Government Master File
GWP	global warming potential

HCP	Habitat Conservation Plan
HDD	horizontal directional drilling
HFC	hydrofluorocarbon
High GWP GHG	high global warming potential gases
HRA	health risk assessment
Hz	Hertz
I-80	Interstate 80
IOU	investor-owned utility
IPCC	Intergovernmental Panel on Climate Change
IRAC	Interdepartmental Radio Advisory Committee
ITP	incidental take permit
JDA	JDA Aviation Technology Solutions
KPFF	KPFF Consulting Engineers, Inc.
kV	kilovolt
kWh	kilowatt hours
L_{eq}	energy-equivalent noise level
L_{max}	maximum A-weighted noise level during the measurement period.
L_{min}	minimum A-weighted noise level during the measurement period.
LOS	level of service
LUCP	Land Use Compatibility Plan
LUST	Leaking underground storage tank
MBTA	Migratory Bird Treaty Act
MEI	maximum exposed individual
mpg	miles per gallon
mph	miles per hour
MW	Megawatt
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NAHC	Native American Heritage Commission
NEMA	National Electrical Manufacturers Association
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NO_2	nitrogen dioxide
NO_x	oxides of nitrogen
NPDES	National Pollutant Discharge Elimination System
NWIC	Northwest Information Center

NTIA	National Telecommunications Information Agency
NWIC	Northwest Information Center
O&M	operations and maintenance
OA&E	Oakland, Antioch & Eastern Railway
OES	Office of Emergency Services
Pb	lead
PCB	polychlorinated biphenyl
Pd	probability of detection
PFC	perfluorocarbon
PG&E	Pacific Gas and Electric Company
Plan Area	3,513-acre Shiloh IV project area
PM	particulate matter
PM10	particulate matter less than or equal to 10 micros
PM2.5	particulate matter less than or equal to 2.5 microns
ppm	parts per million
Proposed Action	Shiloh IV Wind Project
pVIC	potential vapor intrusion conditions
Qa	Quaternary Alluvium
Qmz	Quaternary Montezuma Formation
Qpf	Quaternary alluvial fan deposits
quad	quadrangle map
RCRA	Resource Conservation and Recovery Act
Regional Water Board	Regional Water Quality Control Board
Rio Vista Airport	Rio Vista Municipal Airport
RNAV	United States Standard for Area Navigation
ROG	reactive organic gas
RPS	Renewable Portfolio Standard
SB	Senate Bill
SEMSC	Solano Emergency Medical Services Cooperative
SF ₆	sulfur hexafluoride
SFBAAB	San Francisco Bay Area Air Basin
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan
SMUD	Sacramento Municipal Utility District
SNR	Sacramento Northern Railway
SO ₂	sulfur dioxide
SPCC	spill prevention, control, and countermeasure
SR 12	State Route 12

SRC	Scientific Review Committee
Superfund	Comprehensive Environmental Response, Compensation, and Liability Act
SVAB	Sacramento Valley Air Basin
SWANCC	Solid Waste Agency of Northern Cook County
SWPPP	storm water pollution prevention plan
TAC	toxic air contaminate
TCM	traffic control measure
TDS	total dissolved solids
Travis ALUCP	Travis Air Force Base Airport Land Use Compatibility Plan
UCMP	University of California, Berkeley Museum of Paleontology
USACE	U.S. Army Corps of Engineers
USC	United States Code
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UST	underground fuel storage tanks
USTRANSCOM	United States Transportation Command
VHF	very high-frequency
VOC	volatile organic carbon
VOR	VHF Omni-directional Radio Range
WCFZ	worst case Fresnel zone
WEGE	Western Geo-Engineers
WKA	Wallace Kuhl & Associates
WRA	wind resource area
YSAQMD	Yolo-Solano Air Quality Management District

Chapter 1

Purpose and Need

This environmental assessment (EA) has been prepared by the U.S. Fish and Wildlife Service (USFWS) pursuant to the National Environmental Policy Act (NEPA). It evaluates the effects of issuing an incidental take permit (ITP) under Section 10 (a)(1)(B) of the federal Endangered Species Act (ESA) for activities covered by the Shiloh IV Wind Project Habitat Conservation Plan (HCP). Under Section 10(a)(2)(A) of the ESA, any application for an ITP must include a “habitat conservation plan” that details the impacts of the incidental take allowed by the ITP on affected species and how the impacts of incidental take will be minimized and mitigated to the maximum extent practicable.

The permit applicant, Shiloh IV Wind Project, LLC (Shiloh IV), proposes to construct and operate a commercial wind energy facility within the Montezuma Hills Wind Resource Area of Solano County, California, that would collect and deliver renewable energy to the California Independent System Operator (CAISO) power grid. The project would contribute to California’s Renewable Energy Portfolio Standard goals and help reduce greenhouse gas (GHG) emissions pursuant to California Assembly Bill (AB) AB32 and Solano County’s General Plan. California has a goal of generating 33% of the energy it uses through renewable energy sources such as wind and solar energy by 2020. The project would reduce greenhouse gas emissions when compared to traditional generation methods such as fossil fuel power plants. The project would also contribute to policies in the Solano County General Plan which encourage local power production and allow the conditional development of wind projects in this area.

To achieve a generation capacity of up to 100 megawatts (MW), Shiloh IV’s covered activities include the installation of up to 50 wind turbines, each with a rated capacity of 2.0 MWs to be built in the approximately 3,513 acre Shiloh IV project area (i.e., the HCP Plan Area) in Solano County (Figure 1-1). The wind energy facility project would be constructed in a location that is already predominately being used as a wind farm. The proposed wind-energy turbines and associated facilities would be located primarily in cultivated dryland farmed agricultural lands, with limited annual grassland habitat and aquatic habitat within the planning area. The project would be constructed in a location that supports suitable aquatic habitat (i.e., ponds) for California tiger salamander (*Ambystoma californiense*) (CTS), a species listed as threatened under the ESA. The HCP has been developed to ensure that impacts on this federally listed species are adequately avoided, minimized, and mitigated in accordance with requirements pursuant to Section 10 of the ESA.

The ESA and its implementing regulations prohibit take of any fish or wildlife species that is federally listed as threatened or endangered without prior approval pursuant to either Section 7 or Section 10(a)(1)(B) of the ESA. ESA defines *take* as “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.” 50 Code of Federal Regulations (CFR) 17.3 further defines the term *harm* in the take definition to mean any act that actually kills or injures a federally listed species, including significant habitat modification or degradation.

Issuance of a Section 10 ITP constitutes a discretionary federal action by USFWS and is thus subject to NEPA, which requires that all federal agencies assess the effects of its action on the human environment.

1.1 Background

The Shiloh IV Wind Project would be constructed in the 3,513-acre Plan Area in the Montezuma Hills Wind Resources Area (WRA) adjacent to existing energy producing facilities, most notably wind turbine generators in the High Winds LLC project area, the Shiloh I and proposed Montezuma II project areas. The Shiloh IV project boundary overlaps a large portion of the enXco V (formerly U.S. Windpower) site (Figure 1-2).

The primary land uses in the Plan Area are grazing, dryland farming, and wind power production. Five rural residential dwellings are present in the Plan Area, five additional residences are within 1,000 feet of the Plan Area. Surrounding communities include Bird's Landing, less than 0.25 mile from the western border of the Plan Area, and Rio Vista, approximately 9 miles east of the Plan Area. The Plan Area is entirely under private ownership. It comprises all or portions of 30 parcels owned by 13 different landowners. Shiloh IV does not own any of the land in the Plan Area, but would lease it for the proposed wind plant project.

Land within the Plan Area is zoned Exclusive Agriculture (A-160) according to the Code of Solano County, Zoning Regulations. Wind farms are allowed as conditional uses in Exclusive Agricultural zone designations. The project is also within one of the County's designated WRAs identified in the Resources Element of the general plan.

Shiloh IV must obtain a conditional use permit (CUP) from Solano County to develop the project. As conditions of approval, the project must also comply with requirements, including setbacks, set forth in the Solano County General Plan with respect to wind energy development.

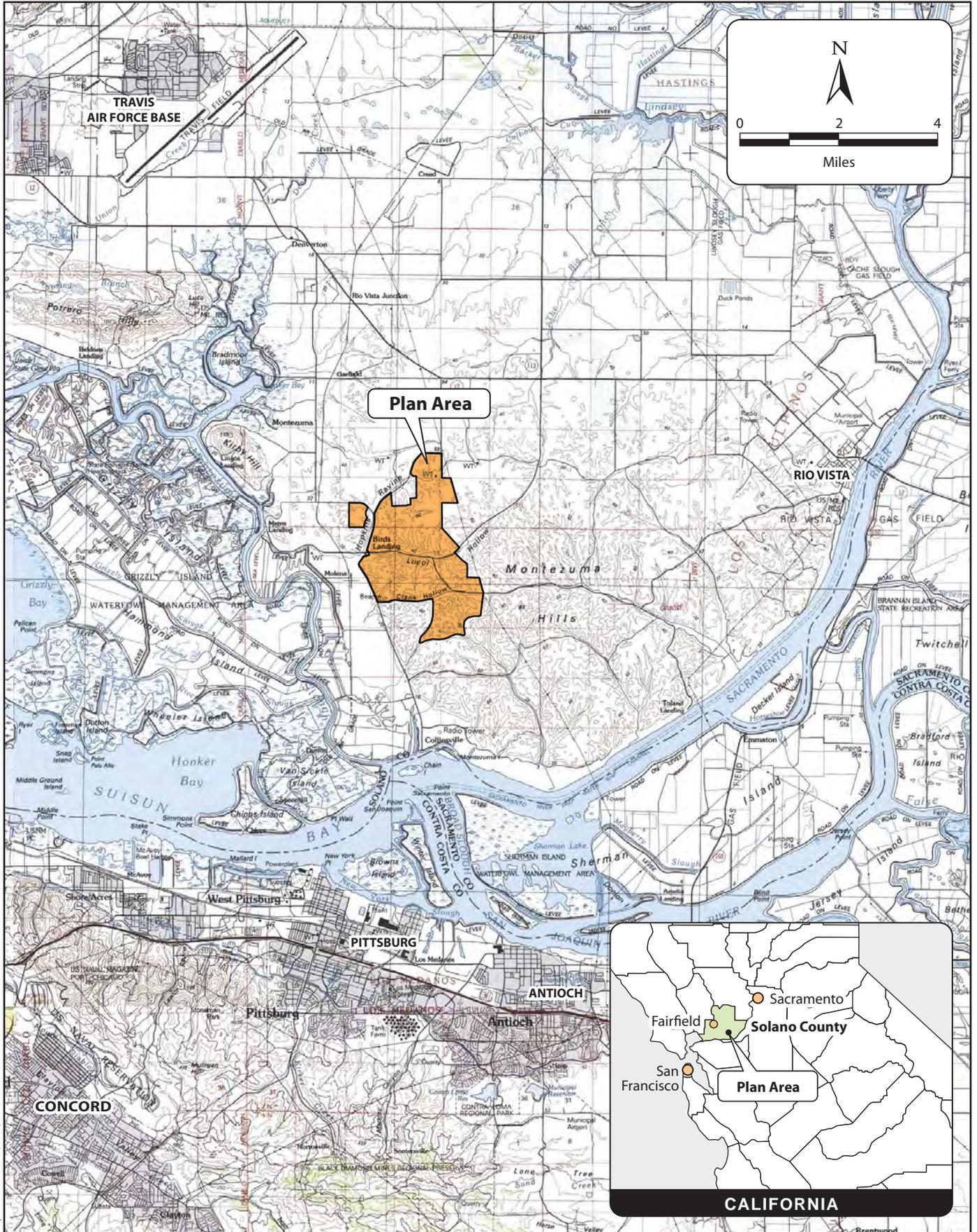
1.2 Species Covered by the HCP

California tiger salamander (*Ambystoma californiense*) (CTS), federally listed as threatened under the ESA, is the single species covered by the HCP. An additional 23 state- and federally listed species potentially occurring in the Montezuma Hills Region were considered for inclusion in the HCP but are not covered for various reasons. These species, and the rationale for not including each in the HCP, are discussed in Appendix A of the HCP.

1.3 Proposed Action Addressed in this EA

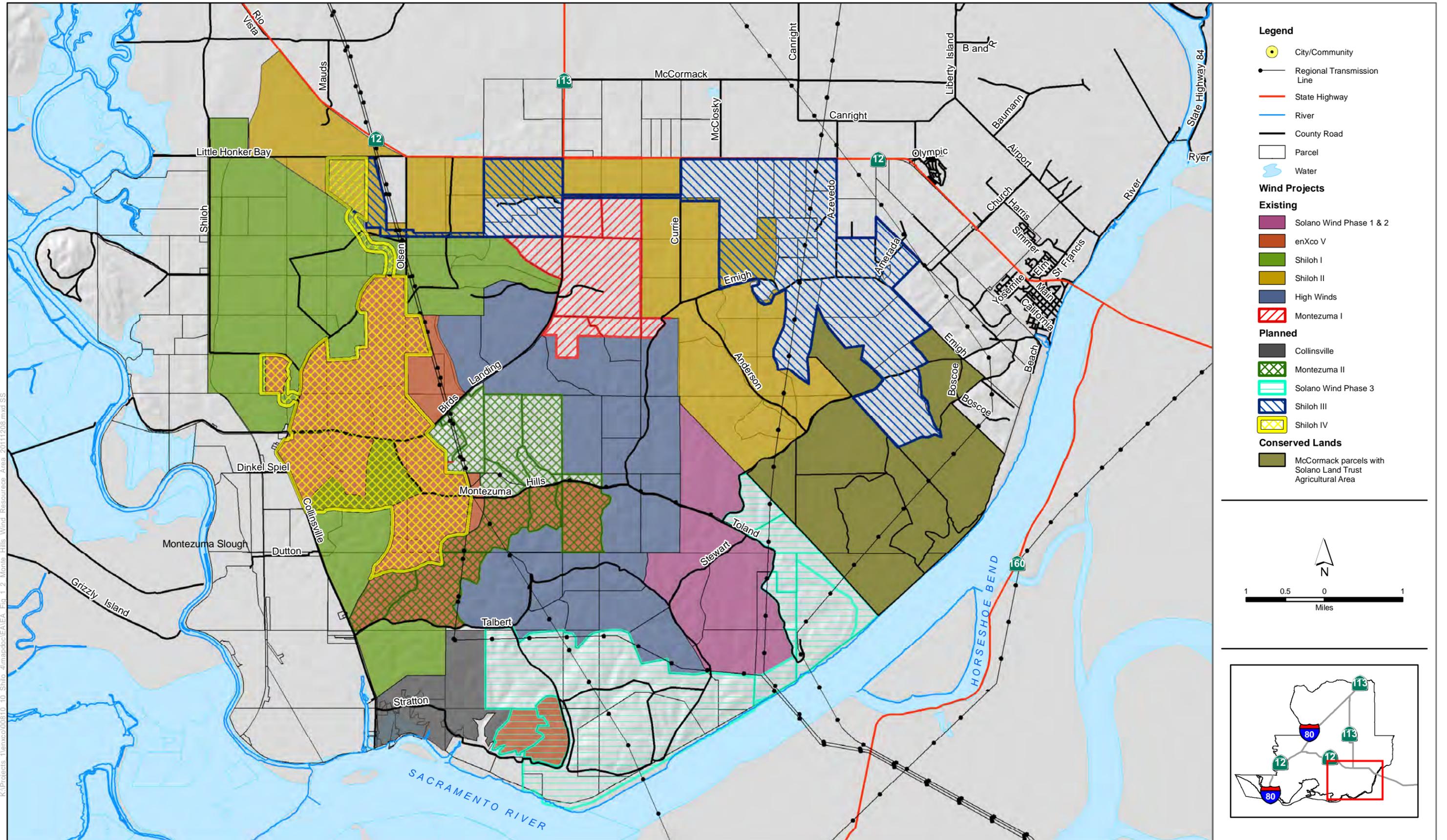
The Proposed Action is USFWS's issuance of a Section 10 ITP for activities covered by the proposed HCP. The HCP addresses two sets of activities: (1) construction and operation of facilities to implement the proposed Shiloh IV Wind Project (referred to as covered activities in the HCP), and (2) those activities proposed to protect and conserve CTS in the course of carrying out the covered activities. The Section 10(a)(1)(B) permit holder would be Shiloh IV Wind Project, LLC. The permit duration for the HCP is 36 years, corresponding with a 30-year lease of the project properties, an expected option for a 4-year extension, and up to 2 years to complete decommissioning of the project.

Accordingly, this EA analyzes the direct, indirect, and cumulative impacts of approving the HCP and issuing an ITP, including impacts of the covered activities and conservation measures proposed to avoid, minimize, or mitigate potential effects on CTS.



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Figure 1-1
Shiloh IV Project Region



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Figure 1-2
Montezuma Hills Wind Resource Area

1.4 Purpose of and Need for the Proposed Action

USFWS needs to ensure compliance with ESA and continue to protect, conserve, and enhance the survival of CTS and its habitat. The CTS population in Solano County (itself part of the central California Distinct Population Segment) is limited in its distribution to the central portion of Solano County, and USFWS has a need to conserve this population for its conservation value.

The purpose of the federal action is to respond to and potentially issue an ITP to Shiloh IV that enables Shiloh IV to develop a commercially viable wind energy facility that produces 100 MW of power in the Montezuma Hills WRA. This is driven by a need for USFWS to make a decision to authorize take while allowing the applicant to produce and deliver renewable energy to the CAISO power grid to meet California's Renewable Portfolio Standard goals and help reduce GHG emissions pursuant to AB32 and Solano County's General Plan.

This purpose and need establishes the basis for determining whether other viable alternatives to the Proposed Action may meet the project's intended purpose and reduce potential effects. Alternatives considered for this analysis are the No-Action Alternative and the Proposed Action.

Chapter 2

Proposed Action and Alternatives

As referenced in the Council for Environmental Quality's (CEQ's) NEPA regulations regarding the contents of an EA (40 CFR 1508.9[b]), NEPA Section 102[2][E] requires federal agencies to develop, study, and briefly describe alternatives to any proposed action with the potential to result in unresolved resource conflicts. This chapter describes the alternatives considered by USFWS during preparation of the HCP: the Proposed Action, the No-Action Alternative, and alternatives considered but rejected from further evaluation.

2.1 Alternative 1: Proposed Action

The Proposed Action comprises issuance of the ITP requested by the permittee and implementation of the proposed Shiloh IV project HCP, including covered activities and conservation measures to avoid, minimize, or mitigate effects on CTS. A number of environmental commitments have been incorporated into the covered activities to reduce the effects of the project on the human environment.

2.1.1 Covered Activities

The Shiloh IV Wind Project is a repowering project to be developed in the Montezuma Hills area adjacent to the Shiloh I, High Winds, and proposed Montezuma II project areas (Figure 1-2). Shiloh IV proposes to install up to 50 new wind turbines in the Montezuma Hills. The Proposed Action would have a generation capacity of up to approximately 100 MW of electrical energy production (depending on the make and model of wind turbine selected), providing electricity for distribution to customers throughout northern California. Two turbine types are being considered for the project.

- REpower MM92—generation capacity of 2.0 MW.
- Vestas V90—generation capacity of 1.8/2.0 MW.

Support facilities, storage, and parking areas would be included to provide for operational access to the projects. Physical access to the Shiloh IV project would be by existing public roads to the edge of the Plan Area, at which point new access roads would be constructed in the Plan Area, or existing roads would be improved to accommodate project requirements.

The power generated by the turbines would be conveyed to a new 230 kilovolt (kV) substation (built on an existing pad) by an electrical power collection system that would be installed as part of the Proposed Action. The system would comprise pad-mounted transformers, buried cables, and junction boxes. The pad-mounted transformers would be connected to each turbine by buried power cables. Junction boxes—part of the buried cable system—would house cable splices and allow access to the cable. The cables would be buried between turbines and transformers and between transformers and the new substation. The existing operations and maintenance (O&M) facility would be expanded by 8,000 square feet.

The existing 230 turbines that are part of the enXco V wind project would be decommissioned in compliance with the permit for that project, which expires in 2014.

The project would require the construction of access roads, foundations for wind turbine towers and meteorological towers, underground power collection lines, a 230 kV substation, and other minor support facilities such as staging and storage areas. In addition, an 8,000-square-foot building would be added to the existing O&M facility. Grading would be required for the construction of new access roads, the improvement of existing access roads to deliver project materials, and the construction of pads to support wind turbine foundations. To minimize the amount of earth movement, grading would follow existing elevation contours to the degree possible; moreover, the project has been designed to avoid wetlands, low-lying drainage areas, and residences throughout the Plan Area. Wetlands are being avoided through siting and subsurface horizontal directional drilling (HDD).

2.1.1.1 Project Components

Construction of the project would involve construction of up to 50 wind turbines, each with a maximum height of 415 feet (126.5 meters). Each wind turbine would require a foundation, access roads, and a power collection system, which includes underground cables and a dedicated substation. Additional information and detail on the project components can be found in the Shiloh IV project HCP (ICF International 2011).

2.1.1.2 Turbines

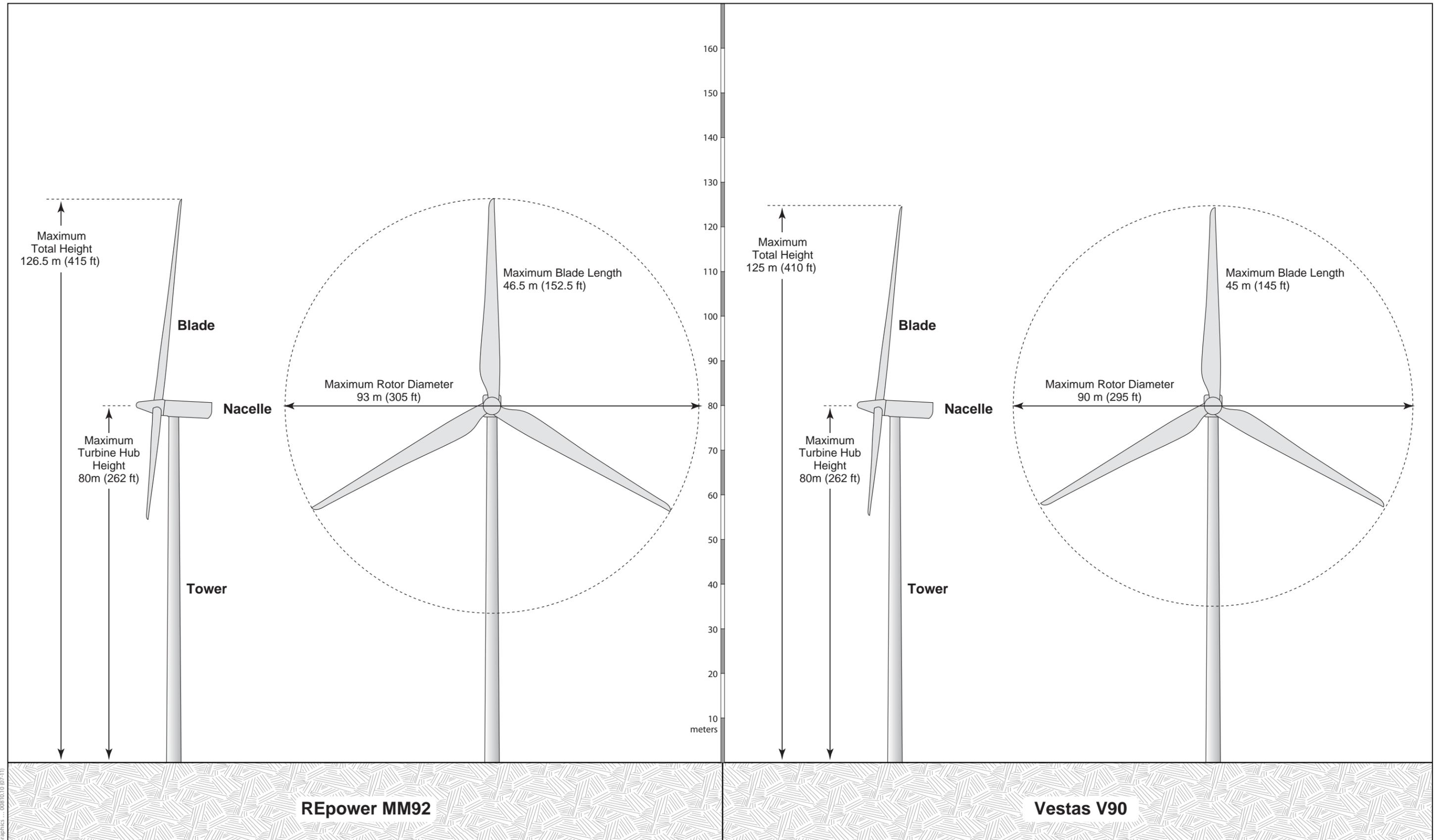
Up to 50 wind turbines would be placed in the Plan Area. Two turbine types (REpower MM92 2.0 MW and Vestas V90 1.8/2.0 MW) are being considered for the project. Both turbines have the same approximate rotor diameter. The turbine type ultimately selected for the Proposed Action would depend primarily on product availability and the manufacturer's ability to support the construction schedule.

Each wind turbine, including the rotor blade (when pointing straight up), would be a maximum of 415 feet (126.5 meters) tall (Figure 2-1). Each tower (measured to the rotor hub) would be a maximum of 262 feet (80 meters) tall. The rotor blades would be a maximum of 305 feet (93 meters) in diameter. The turbine towers would be painted a neutral color to reduce their visibility.

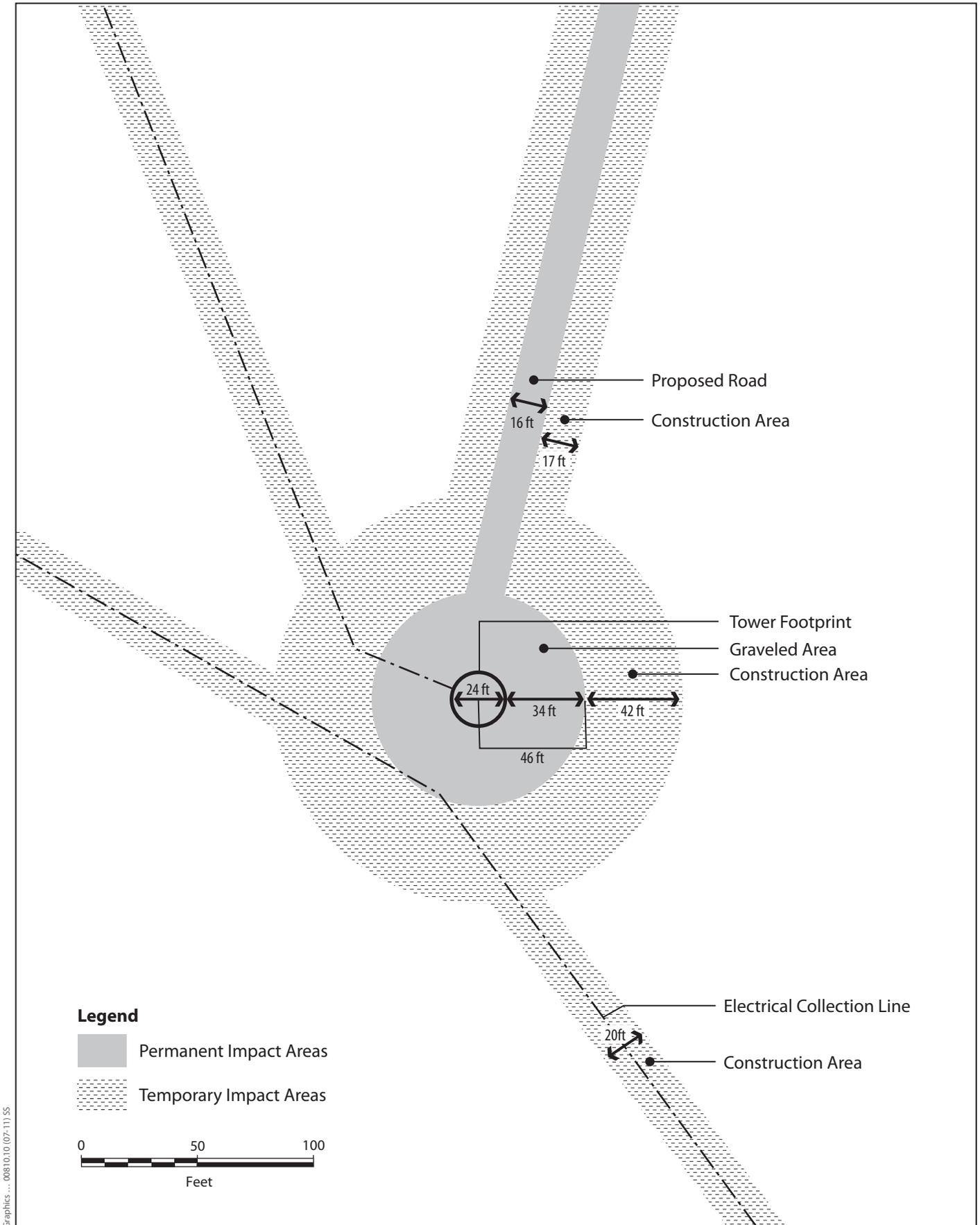
Wind turbine towers would be set back from public rights-of-way and existing residences in accordance with Solano County requirements. All turbine towers would be locked, and the substation and O&M facilities would be fenced and locked to prevent unauthorized entry.

Each tower foundation would be 24 feet in diameter in the center of a 92-foot-wide graveled building pad. Sixteen-foot-wide graveled access roads would be constructed from existing roadways in the Plan Area to each turbine location. The project would require the construction of approximately 16 linear miles of new roads. Figure 2-2 is a schematic of the proposed foundation and construction pad size as well as roadway dimensions used to evaluate physical impacts of the Proposed Action.

The access roads would be sited to avoid drainages and water features to the extent feasible. Roads that must cross drainages would incorporate standard culvert design to ensure the integrity of the road structure and adequately pass storm flows.



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2.1.1.3 Turbine Locations

Up to 50 turbines would be placed in the Plan Area at the locations shown in Figure 2-3. The preliminary turbine placement plan was developed considering topography and environmental factors including the location of wetlands ponds, and sensitive plant species. The turbine placement plan includes 50 proposed locations and two alternate locations that may be used only if engineering constraints make any of the proposed locations infeasible. No more than 50 turbines would be constructed for the project.

2.1.1.4 Power Collection System

The project's power collection system would collect the power produced by the turbines. Power generated by each turbine would be directed into a pad-mounted transformer, which is in turn connected to an array of electrical junction boxes distributed throughout the Plan Area to facilitate power collection. Collection lines for the project would be installed underground from each turbine site to the substation within a 20-foot corridor.

Collection lines are constructed by excavating a trench; laying power collection lines; and recovering, recompacting, and reseeded soil above the collection line. Where the collection lines could intersect with seasonal wetlands, Shiloh IV will use HDD. HDD is expected to be necessary in approximately five locations. HDD bores can be steered: this allows the bore machine to sit at ground level, bore down and along the alignment, and direct the bore back up to the surface at a distant point.

2.1.1.5 Facility Maintenance

Maintenance activity in the Plan Area would consist of equipment maintenance and replacement, collection system repair, fire control and avoidance activities, and gravel application and repair to roads as necessary. Maintenance-related ground disturbance would occur within the footprint of the initial construction-related disturbance areas. Road gravelling and road repairs would take place within the footprint of the 16-foot wide corridor for existing and new roads. Turbines may need to be repaired or replaced at a rate of approximately one every 5 years. No new permanent effects are anticipated during maintenance activities, and temporarily affected areas would be restored within 1 year of disturbance.

2.1.1.6 Facility Decommissioning

Shiloh IV is securing a 30-year lease for properties in the Plan Area. If the lease is renewed following that period, Shiloh IV could request an extension of the ITP; however, there is no guarantee that the request would be granted. If the lease is not renewed, then the site would be decommissioned within the ITP duration of 36 years. The turbine access roads would be removed unless the landowner desires that they be retained (in accordance with County regulations and County permit terms). All hard facilities, including turbine foundations and wires at the substation, would be removed to a depth of 3 feet during the dry season. Large equipment such as graders and bulldozers would be necessary to remove the roads by returning them to grade. All decommissioning-related ground disturbance would be temporary, occur within the original construction footprint, and returned to cultivated agriculture.

2.1.2 Conservation Strategy for California Tiger Salamander

This section describes the conservation strategy that the permittee will implement to minimize and mitigate impacts on CTS as required under Section 10(a)(2)(B) of the ESA. Please refer to the HCP for a description of the proposed conservation strategy for CTS.

2.1.2.1 Biological Goal

Biological goals are the broad, guiding principles for development and operation of conservation plans and provide the rationale for the mitigation strategy. The biological goal for the CTS conservation strategy was developed subsequent to the analysis of potential project-related impacts on CTS as presented in Chapter 4 of the HCP. The biological goal as set forth in the HCP is to provide the continuing protection and existence of CTS in Solano County by purchasing CTS mitigation credits at a USFWS and California Department of Fish and Game (DFG)-approved conservation bank in Solano County.

2.1.2.2 Conservation Approach

The conservation approach comprises avoidance and minimization measures and compensatory mitigation.

The permittee will minimize impacts through the use of various minimization measures such as setbacks from CTS aquatic habitat, flagging and avoidance of sensitive areas, and limits on work season. Best management practices (BMPs) will also be implemented to ensure that indirect impacts from such causes as erosion, sedimentation, and hazardous spills are avoided to the extent possible. In addition to these avoidance and minimization measures, the permittee will mitigate unavoidable impacts on CTS through the purchase of conservation credits at a USFWS- and DFG- bank or banks, as appropriate for this species.

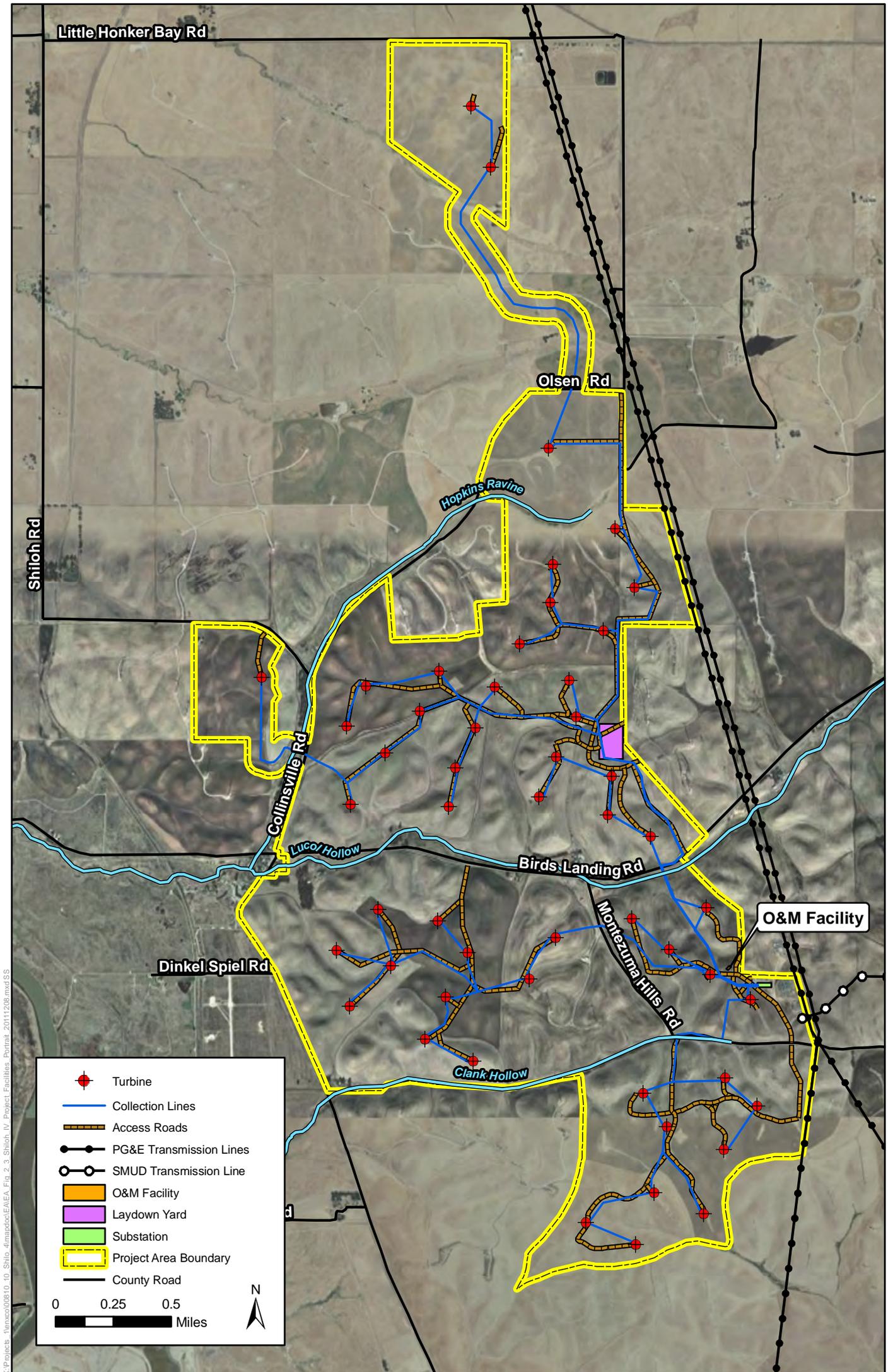
Additional information on the conservation approach, including monitoring requirements, adaptive management, and reporting requirements, can be found in the Shiloh IV project HCP (ICF International 2011).

2.1.2.3 Monitoring

Under USFWS policy, compliance monitoring must involve evidence of compliance with the terms of the HCP, verification of anticipated effects, and a measure of effectiveness of the HCP. A biological monitor will be present during construction activities in the vicinity of suitable aquatic habitat and a superintendent or other appropriate staff person will be responsible for ensuring adherence to the other environmental commitments. Compensatory mitigation for the project will be completed at a USFWS- and DFG-approved mitigation bank. USFWS- and DFG-approved mitigation banks have approved monitoring plans, reporting, and adaptive management measures, and thus compliance monitoring will be completed by the mitigation bank under the terms of their banking agreement(s).

2.1.2.4 Adaptive Management

The Shiloh IV HCP would mitigate effects at a USFWS- and DFG-approved mitigation bank that has adaptive management measures already in place under the terms of its banking agreement(s).



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2.1.3 Environmental Commitments

In addition to the conservation measures set forth in the HCP to avoid, minimize, or mitigate impacts on CTS, the following environmental commitments are incorporated into the covered activities to reduce the effects on the human environment associated with implementing the Shiloh IV project. These environmental commitments are similar to the requirements of Solano County the local agency with discretionary approval of the project. The requirements will become conditions of approval in the County's CUP for the project, and implementation of the requirements will be ensured by the County. Failure to comply with any of the County's conditions of approval can result in revocation of the CUP. If the final requirements of the CUP differ from those identified below, USFWS and DFG will be contacted to determine if the changes require an amendment to the Shiloh IV HCP, this EA or, if issued, the Section 10(a)(1)(B) permit.

EC-1: Limit marking and lighting to Federal Aviation Administration requirements

Nighttime lighting will be limited to the minimum required by the Federal Aviation Administration (FAA). In keeping with these requirements, only synchronized red flashing lights will be installed for nighttime visibility. There will be no daytime lighting, and strobe lighting will not be used unless specifically required by FAA.

EC-2: Remove all Proposed Action facilities and restore the Plan Area

Upon decommissioning, the permittee will remove Shiloh IV project facilities to a depth of 3 feet below grade and properly dispose of unsalvageable materials. The Plan Area will be restored through regrading, recontouring, and revegetation of disturbed areas based on site-specific conditions. Decommissioned roads will be reclaimed or left in place per landowner preference.

EC-3: Confine construction activities to necessary work areas

Prior to construction, the permittee will ensure the construction contractor provides fencing or flagging of the construction area boundaries to limit the construction footprint and avoid intrusion into adjacent agricultural or other areas. The construction boundary fencing or flagging will be in addition to and distinguished from other exclusionary fencing or flagging to be implemented according to other environmental commitments to protect sensitive biological resources.

EC-4: Restore and decompact temporarily disturbed agricultural areas

The permittee will restore temporarily disturbed agricultural areas to preconstruction conditions to the extent feasible, through decompaction, restoration of natural contours, and revegetation where appropriate.

EC-5: Restore agricultural areas to previous conditions after decommissioning

Following decommissioning, the permittee will undertake any additional actions required by Solano County to restore agricultural areas to preconstruction conditions, to the extent feasible.

EC-6: Implement emission controls

The permittee will implement standard emission control measures, such as reduction of idling time, proper maintenance and adjustment of equipment, limiting the hours of operation for heavy

equipment, and ensuring that sources of emissions are equipped with appropriate emission control systems. Moreover, any stationary sources of emissions (e.g., generators, compressors) within 100 feet of a residence or other sensitive receptor will be equipped with a control system to reduce normal exhaust emissions.

EC-7: Prepare and implement a construction fugitive dust control plan

The permittee will develop, implement, and adhere to the conditions of a construction fugitive dust control plan in accordance with industry standards and appropriate Bay Area and Yolo-Solano Air Quality Management District requirements. This plan will also require stabilization/restoration of all temporarily disturbed areas. The plan will be sufficiently detailed to demonstrate that the best available control measures are being implemented. It will also establish a process for addressing complaints received from sensitive receptors (either directly or through the County) and procedures for resolving such complaints.

EC-8: Conduct preconstruction surveys for sensitive biological resources

Prior to any ground-disturbing activities, qualified biologists will conduct preconstruction surveys to identify any sensitive biological resources present in the Plan Area. These resources will be accurately depicted on design drawings, and the permittee will ensure that project design avoids these resources to the extent possible, and avoids ground-disturbing activities within 250 feet of aquatic resources. Preconstruction surveys will be conducted to identify the boundaries of occurrences of Gairdner's yampah (*Perideridia gairdneri* ssp. *gairdneri*) and pappose spikeweed (*Centromadia parryi* ssp. *parryi*). Surveys for nesting raptors will be conducted in accordance with USFWS and DFG guidelines for nesting raptors and agency and California Burrowing Owl Consortium protocols for western burrowing owl (*Athene cunicularia hypugea*). If western burrowing owls are determined to be subject to disturbance from project activities, owls may be passively relocated during the nonbreeding season (September 1–January 31). During the breeding season, avoidance measures will be implemented in accordance with DFG guidelines.

EC-9: Conduct environmental awareness training for all construction and operational personnel

A qualified biologist will provide training for all construction personnel prior to their commencing work in the Plan Area. This training will address the identification of sensitive resources, the need to protect them, the appropriate practices to ensure their protection, the appropriate action in response to accidental infractions, and the possible consequences (e.g., fines, imprisonment) for violation of state or federal environmental law.

EC-10: Avoid and minimize disturbance or removal of sensitive biological resources

Under the direction of a qualified biologist, all sensitive biological resources—special-status plant occurrences; wetlands and other aquatic features; observed nests/dens of raptors, migratory birds, or western burrowing owls—will be fenced or flagged as appropriate. Construction activities will be excluded from designated sensitive areas. In addition, construction activities will be confined to necessary work areas, thereby minimizing the extent of ground disturbance and vegetation removal even in common habitats. Staging areas will be sited, when possible, in areas that are already disturbed or of marginal quality as wildlife habitat (e.g., near the existing maintenance building). Appropriate buffer zones around sensitive biological resources will be established. For the purposes of the this document, the impact analysis assumes the following minimum buffers would be

implemented: 500 feet for raptor nests, 250 feet for other special-status bird nests, 250 feet for sensitive aquatic habitats, and 500 feet for groves of mature trees that could support raptor nesting habitat. Where western burrowing owls are present, DFG guidelines will be followed to ensure that disturbance is avoided or, when necessary, owls are properly relocated.

EC-11: Avoid disturbance of wetlands and other aquatic features

In addition to avoidance measures described in EC-8, where underground power lines (either power collection lines or transmission lines) cannot be routed to avoid aquatic features, it may be necessary to use HDD to install the line beneath the feature. If such is the case, HDD will be used during the dry season (typically April–October, or when surface water is not present). A qualified environmental monitor will be present during drilling operations to ensure that proper procedure is being followed and that there is no evidence of a drilling fluid leak (frac-out). In the event of a frac-out, or if the potential for a frac-out is suspected, work will stop and appropriate containment and cleanup procedures will be initiated. Containment materials (e.g., straw bales, sediment fences) will be installed between the bore site and nearby sensitive resources prior to drilling. In addition, response equipment (e.g., vacuum truck) and additional containment materials will be available onsite for rapid response to a frac-out. Finally, the exit and entry pits will be at least 100 feet from the boundaries of the feature that is being crossed.

EC-12: Avoid impacts on California tiger salamander through avoidance, minimization, and compensatory mitigation measures

The conservation strategy for CTS is detailed in the HCP for the Shiloh IV Wind Plant project. Implementation of the HCP and issuance of the ITP constitute the federal action that triggers the need for NEPA compliance.

EC-13: Mitigate potential turbine-related mortality of birds and bats

The wind project has been designed to avoid specific high use areas, and it incorporates the latest turbine design, which has been shown in recent studies to reduce levels of mortality. Offsite mitigation will be achieved through conservation at a USFWS- and DFG-approved location (through fee title purchase, conservation easement, or purchase of mitigation bank credits) of an area of habitat suitable to support breeding opportunities for affected raptor species; such mitigation will also minimize effects on avian and bat species. This conservation area will be equal to or greater than the total rotor-swept area of the wind project—up to 84 acres based on the worst-case wind turbine scenario (i.e., the largest wind turbine proposed for the project). An Avian and Bat Protection Plan (ABPP) has also been developed to avoid, minimize, and mitigate the effects of the project on birds and bats.

EC-14: Avoid known cultural resources

Prior to construction, a cultural resources specialist will flag the perimeter of a no-disturbance buffer extending 50 feet from potentially eligible cultural resources, and construction personnel will be instructed to avoid the resources.

EC-15: Conduct supplemental evaluation and cultural surveys

Surveys for cultural resources within the area of potential effect have been completed for the Proposed Action. If the permittee revises the footprint outside areas addressed by cultural resource

surveys, supplemental surveys will be conducted by a qualified archaeologist to ensure that no cultural resources are present. If cultural resources are identified, appropriate avoidance and mitigation measures will be implemented in accordance with regulatory requirements and standard cultural resource management practice.

EC-16: Avoid impacts on unanticipated cultural and paleontological resources

The permittee will post signs at the construction facilities identifying the potential for cultural and paleontological resource discovery and the required notification procedures in the event of a find. The permittee will retain a qualified archaeologist to train construction personnel and conduct periodic construction monitoring and provide on-call consultation of potential finds. If unanticipated cultural resources (e.g., chipped or ground stone, historic debris, building foundations, human remains) or paleontological resources are discovered during activities within the previously surveyed area, all work within 100 feet of the discovery site will stop until a qualified archaeologist or paleontologist can assess the significance of the find and implement appropriate measures (i.e., recovery and documentation and/or evaluation and avoidance). In the event that unanticipated human remains are discovered, work in the vicinity will stop until the County coroner can determine whether the remains are those of a Native American and undertake appropriate notification procedures.

EC-17: Conduct a site-specific geotechnical study

The permittee will conduct a geotechnical study to evaluate soil conditions and geologic hazards in the Plan Area. The study will be signed by a California-registered geologist. The study will evaluate the location of seismic features and the potential for associated hazards such as ground shaking, liquefaction, and landslides; the stability of existing cut-and-fill slopes; the presence and location of collapsible or expansive soils; the potential for wind erosion, water erosion, sedimentation, and flooding; and the foundation material upon which project components will be constructed.

EC-18: Implement appropriate facility design

In accordance with the findings and recommendations of the geotechnical study, all new facilities and appurtenant features (e.g., roadbeds, cut-and-fill slopes) will be designed to withstand ground shaking and changes in soil density and to avoid landslide- and mudflow-prone areas.

EC-19: Develop and implement a storm water pollution prevention plan

To minimize loss of soils through erosion and to reduce impacts (e.g., effects on water quality, sediment transport, impacts on agricultural activities), the permittee will prepare and implement a storm water pollution prevention plan (SWPPP). The SWPPP will include such measures as erosion control practices, watering disturbed areas, stockpiling and reuse of topsoil for restoration of temporarily disturbed areas, monitoring of disturbed areas for eroding or slump areas and rehabilitating as needed, as well as BMPs for management of construction equipment and fluids that could contribute to water quality impacts.

EC-20: Restore temporarily disturbed areas to preconstruction conditions

Following ground-disturbing activities, all areas that are not occupied by project facilities will be graded to their original contours and revegetated to prevent erosion and possible water quality effects associated with sediment transport.

EC-21: Develop a hazard materials emergency response plan (business plan) and a spill prevention, control, and countermeasure plan

In accordance with the California Health and Safety Code and California Code of Regulations (CCR), the permittee will prepare a hazard materials emergency response plan (business plan) and a spill prevention, control, and countermeasure (SPCC) plan to avoid spills and minimize impacts in the event a spill occurs. The plan will discuss hazardous materials management, delineation of hazardous material and hazardous waste storage areas, prevention and response procedures, access and egress routes, and notification procedures. All hazardous materials (e.g., paints, solvents) will be stored in accordance with manufacturer's specifications and federal regulations.

EC-22: Develop a waste management plan

To avoid effects associated with wastes generated by construction activities, the permittee will prepare and implement a waste management plan to address storage, transportation, and handling of wastes, including recycling construction waste when possible. The plan will identify the specific landfill(s) to be utilized. Construction waste will be managed in accordance with the Resource Conservation and Recovery Act (RCRA), RCRA implementing regulations and other applicable state and local regulations. The permittee will submit a copy of the waste management plan to the Solano County Department of Resource Management.

EC-23: Develop a plan for encountering hazardous materials

To minimize potential adverse effects associated with the unexpected encounter of hazardous materials (e.g., contaminated soil, groundwater, natural gas wells, or other hazards), the permittee will develop a written plan to specify the proper reporting, handling, and disposal of any such materials. The plan will specify that, should any such materials be encountered, construction activities will stop, the permittee will notify the Solano County Department of Resource Management, and a licensed waste disposal contractor will remove the materials from the site in accordance with federal, state, and local requirements.

EC-24: Implement additional storm water discharge and sedimentation controls

To further minimize potential effects related to construction activity that may be necessary within 100 feet of water resources or during the rainy season, additional measures to minimize erosion, storm water discharges, and sedimentation would be undertaken pursuant to the Solano County grading permit. These additional precautions would further protect Lucol Hollow and other aquatic resources from construction vehicle operation and maintenance, equipment storage, grading or other ground-disturbing activities.

EC-25: Comply with Solano County requirements for public road, property line, residential, and transmission facility setback waivers

The Shiloh IV project is designed to comply with public road, property line, residential, and transmission facility setback requirements established in the Solano County General Plan and Zoning Ordinance. In the event that site-specific considerations warrant setback reductions, the permittee will comply with alternative minimum setback requirements in the general plan and zoning ordinance. In addition, Shiloh IV will provide the County with appropriate written setback waiver documentation signed by affected and consenting landowners.

EC-26: Comply with Solano County's Zoning Ordinance parking requirements

The permittee will avoid conflict with Solano County planning regulations by complying with the Solano County Zoning Ordinance parking requirements (Section 28-55) for the O&M buildings.

EC-27: Avoid hazards to air navigation

To ensure the Proposed Action does not result in a hazard to air navigation, the permittee will obtain Determinations of No Hazards from FAA and submit evidence of these filings and related forms and notifications, including any conditions required by the FAA prior to commencement of construction. This requirement applies to any subsequent changes to the height and/or location of a wind turbine or meteorological tower requiring re-notifying FAA.

EC-28: Prohibit penetration of Travis AFB outer horizontal surface

To ensure the Proposed Action does not penetrate the Travis AFB outer horizontal surface, the permittee will submit documentation to the Solano County Department of Resource Management demonstrating the total height of project turbines and meteorological towers that are within the Travis AFB outer horizontal surface, as measured with the turbine blade tip in the 12 o'clock position, is less than 562 feet above mean sea level (amsl).

EC-29: Execute a set-aside guarantee bond or corporate surety

To ensure future land uses in the Plan Area are not inhibited after decommissioning of the Proposed Action, the permittee will set aside decommissioning funds in a form acceptable to the County (e.g., guarantee bond or corporate surety bond) to cover all decommissioning costs. Shiloh IV will maintain the bond for the life of the Proposed Action, including through any transfer of ownership.

EC-30: Implement noise-reducing construction practices

The permittee will implement noise-reducing construction practices such that noise from construction activities does not exceed 50 dBA-energy-equivalent noise level (L_{eq}) at residences during evening and nighttime hours. Measures to be implemented include ensuring that equipment mufflers are in good working condition, restricting work to daytime hours (7:00 a.m. to 7:00 p.m. Monday through Friday, and 8:00 a.m. to 6:00 p.m. Saturdays and Sundays), limiting the use of pneumatic tools, and implementing a noise complaint plan.

EC-31: Comply with Solano County noise standards and develop and implement an operational noise complaint plan

Shiloh IV will reduce or avoid impacts of operational noise by configuring the proposed Shiloh IV project such that the operation of wind turbines will not exceed a community noise equivalent level (CNEL) of 50 dBA (or the equivalent 44 dBA- L_{eq}) at nearby residences (see Table 3.10-2 for a description of typical noise levels). Compliance will be achieved or waived by implementing one or more of the measures listed below.

- Conduct additional analysis demonstrating that noise from actual turbines to be installed will not exceed the 50 dBA CNEL or 44 dBA- L_{eq} steady noise level criteria at any existing residence.
- Obtain a waiver from affected landowners that waives their right to any noise mitigation by the wind energy operator after the turbine(s) become operational.

- Relocate the turbines near the affected residences such that the exterior noise level standards are no longer exceeded.
- Commit to operational limitations or adjustments (e.g., partial “feathering” of the turbine blades) during nighttime hours or other provisions that would be implemented in response to noise complaints from nearby residents and verified exceedence of the 50 dBA CNEL criterion.

If the Proposed Action turbine configuration is modified such that County noise criteria would be exceeded at residences other than already described, then a supplemental noise analysis will be performed and additional measures taken as outlined above to comply with the requirements.

Further, to avoid adverse operational noise effects, the permittee will prepare and submit an operational noise complaint plan to the Solano County Department of Resource Management. The plan will identify the noise complaint process including documentation of complaint resolution, additional site-specific studies when warranted, and steps for keeping the County informed.

EC-32: Develop and implement a grass fire control plan

The permittee will prepare and implement a grass fire control plan that specifies safety restrictions pertaining to construction activities and operations. The permittee will submit the plan to the County and the Montezuma Fire Protection District for approval, upon which commencement of construction activities will be contingent. The plan will include the specifications listed below.

- Construction
 - All internal combustion engines will be equipped with spark arresters in good working order.
 - Light trucks and cars with factory-installed (or equivalent) mufflers in good condition may be used on roadways that are cleared of vegetation.
 - Equipment parking areas and stationary engine sites will be cleared of all extraneous flammable material.
 - Smoking restrictions and fire rules will be prominently posted during fire season.
- Operations
 - Warning signs for high-voltage equipment will be appropriately posted.
 - Vegetation will be annually cleared around pad-mounted transformers and riser poles.
 - Employees will be trained in use of fire extinguishers and proper communications with the Montezuma Fire Protection District.
 - Inspections by the Montezuma Fire Protection District will be accommodated.
 - Shiloh IV will provide the Montezuma Fire Protect District access to its water storage tanks as necessary.

EC-33: Comply with fire code requirements for access roads

To ensure safe access for fire apparatus, the permittee will design and construct Proposed Action access roads in compliance with applicable fire code standards in consultation with the Montezuma Fire Protection District to ensure that the access roads would be adequate for maintaining acceptable service and response times and providing access to fire water tanks as needed.

EC-34: Conform with turbine design standards, building codes, and siting requirements

To prevent the exposure of the public or project employees to safety hazards, the permittee will ensure that all turbines conform to international standards for wind turbines, that all construction activities (i.e., construction of foundations and mounting of turbines on them) conform to state and local building codes, and that turbine placement is designed in compliance with the Solano County General Plan and Zoning Ordinance.

EC-35: Install grounding and shut-off mechanisms on Proposed Action facilities

The Proposed Action will be designed and constructed to meet all appropriate electrical safety standards related to grounding and automatic- and manual-disconnect safety features. All features will be installed and tested to verify performance prior to interconnection to the electrical grid.

EC-36: Develop an injury and illness prevention plan

The permittee will develop a project-specific injury and illness prevention plan to reduce the risk of accidents during construction and operation. The plan will include emergency contacts, location of the nearest hospital, and proper emergency protocols. In addition, the permittee will ensure that all personnel receive adequate training and appropriate level supervision.

EC-37: Limit public access to the Plan Area

To reduce the risk of accidents involving members of the public, the permittee will restrict public access by installing locks on wind project facilities (wind turbine towers, maintenance buildings, substation); installing locked gates on new access roads to exclude unauthorized entry; limiting distribution of keys to authorized personnel; posting appropriate signage warning of high-voltage facilities, underground cables, and the associated hazards; and training personnel to monitor for unauthorized access and follow proper procedure in the event of trespass. During operation of the Proposed Action, personnel will conduct periodic surveillance of the Plan Area and report any incidents or need to repair or replace security devices (locks or signs) to the superintendent on duty.

EC-38: Develop and implement a traffic control plan and a transportation plan

To minimize the potential effects of construction-related traffic on local circulation, the permittee will develop and implement a traffic control plan specifying the location, schedule, and safety procedures for lane and road closures; minimizing the duration and timing of lane closures (e.g., no overnight closures); providing signage pertaining to road conditions; scheduling of construction traffic; coordinating with local jurisdictions; notifying local residents of alternate routes; ensuring access for emergency vehicles at all times; and other BMPs, as appropriate, to address potential traffic impacts. The transportation plan will also describe the location, schedule, and safety procedures for lane and road closures as well as provide information regarding the transport of: all equipment to the site, equipment removal, and building materials; circulation, security bonding; vehicular traffic types and amounts anticipated; extra-legal loads; signage; road maintenance and means and documentation related to obtaining necessary grading, transportation, and encroachment permits from the county and Caltrans.

EC-39: Minimize road damage and repair road surfaces

To minimize damage to existing County roads, the permittee will obtain an encroachment permit for work within the County right-of-way; obtain hauling permits from the appropriate agencies, enter into a secured agreement with the County ensuring that any damage to County roads be repaired to preconstruction conditions by the appropriate method; and post a security bond to cover the costs of road maintenance during construction.

EC-40: Meet facility siting and notification requirements to microwave, television, and radio station owners

To minimize effects to microwave transmissions, the Proposed Action will locate turbines and meteorological towers outside of microwave paths and adhere to CBC requirements. If the Proposed Action layout is revised and a turbine is located within 328 feet (100 meters) of a microwave path, the permittee will update the microwave search and worst case Fresnel zone (WCFZ) analysis and ensure turbines are sited to avoid adverse effects to FCC microwave facilities. In addition, if construction is initiated after November 2011, a FCC database search will be conducted and the microwave search and WCFZ analysis will be updated to reflect any new facilities.

Prior to issuance of building permits for the Shiloh IV project, the permittee will notify all frequency-based communication stations, towers, and microwave station owners as recorded by the FCC, television and radio station owners, and owners of any other unrecorded but physically observed cellular, PCS, or other mobile communications service antennas within 2 miles of the Plan Area; all telecommunications facilities in the Plan Area will be identified; and effects on local residents' reception will be resolved through appropriate measures, such as enhancing reception on receiving equipment.

2.2 Alternative 2: No Action

Under the No-Action Alternative, the HCP would not be implemented, the proposed ITP would not be issued, and the covered activities for the proposed Shiloh IV project would not occur. There would be no take of CTS as a result of the project. Agricultural uses—dryland farming and grazing—would continue in the Plan Area. This alternative assumes that currently planned wind production facilities in the Montezuma Hills WRA would continue in the vicinity of the Shiloh IV Plan Area.

2.3 Alternatives Eliminated from Further Consideration

USFWS considered several alternatives that were not carried forward for analysis in this EA. Reasons for eliminating alternatives from further consideration are listed below.

- The alternative would not adequately meet project objectives.
- The alternative site was found not to be feasible for project construction.
- The alternative was assessed as likely to result in unacceptable adverse environmental and/or economic effects.

2.3.1 Alternative Development Sites

Construction of the Shiloh IV project at several alternative locations was considered. A number of other WRAs in California are listed below.

- Altamont Pass (Alameda and Contra Costa Counties).
- Pacheco Pass (Merced County).
- San Geronio (Riverside County).
- Tehachapi Pass (Kern County).

Limitations constrain additional wind power development in all these WRAs, or existing development is planned for the available properties. Developing the Shiloh IV project in the Altamont Pass area is restricted by a one-to-one replacement of older wind turbines and could contribute to bird strike issues in this area. Development in the San Geronio, Tehachapi Pass, or Pacheco Pass WRAs could reduce impacts on CTS, migrating birds, and bats, but would likely not reduce air quality issues and would displace other planned wind power developments in these areas.

The potential for development in the Cordelia Hills WRA in Solano County was considered, but such a site was found to have additional wind development restrictions, including a greater number of sensitive residential receptors, potential impacts on other federally listed species (i.e., callippe silverspot butterfly and California red-legged frog), potential recreation conflicts and fewer agricultural areas that may be compatible with wind turbine development (Solano County Department of Resource Management 2011a).

Because developing the Shiloh IV project on potential alternative sites would be restricted by the availability of developable areas in existing WRAs and by the potential for similar or greater impacts, these alternatives were considered infeasible.

2.3.2 Reduced Take Alternative

The Reduced Take Alternative could involve instituting additional setbacks from aquatic habitat. By instituting setbacks of 500 feet to 2,640 feet (0.5 mile), Shiloh IV may further reduce the potential for take; however, these reductions would result in the construction of 2–10 fewer turbines with a negligible decrease in habitat loss because of the existing habitat conditions (i.e., agricultural lands). Aquatic habitat would remain unaffected. While dispersal habitat could be degraded, temporary effect areas are expected to fully recover their dispersal value within 1 year of disturbance, and permanent effect areas (i.e., roads) would not cause migration barriers, would still be suitable for dispersal, and would be mitigated. Overall, the magnitude of the degradation to dispersal habitat is very small compared to total suitable dispersal habitat. This alternative was rejected because the purpose of the project would not be achieved and project effects are already expected to be minimal in CTS dispersal habitat.

Alternative siting of facilities and routing of collection lines are still preliminary. Shiloh IV will seek to minimize its project footprint and further reduce its habitat effects without reducing the number of turbines. Such project modifications are expected to result in a nominal reduction in take because of the proposed avoidance and minimization measures and the project's limited effects on dispersal habitat.

2.3.3 References

ICF International. 2011. *Draft Habitat Conservation Plan for the Proposed Shiloh IV Project, Solano County, California*. December. (ICF 00810.10.) Sacramento, CA. Prepared for Shiloh IV Wind Project, LLC, San Ramon, CA.

Solano County Department of Resource Management. 2011a. *Draft Environmental Impact Report—Shiloh IV Wind Energy Project*. August. State Clearinghouse #2011032062. Submitted by Point Impact Analysis, Inc., Palo Alto, CA.

Solano County Department of Resource Management. 2011b. *Final Environmental Impact Report—Shiloh IV Wind Energy Project*. November. State Clearinghouse #2011032062. Submitted by Point Impact Analysis, Inc., Palo Alto, CA.

Chapter 3

Affected Environment and Environmental Consequences

This chapter describes the affected environment (e.g., environmental setting, regulatory setting) and the potential environmental consequences that could result from implementation of the Proposed Action. The analysis considers the resource areas as shown below.

- 3.1 Aesthetics
- 3.2 Agricultural Resources
- 3.3 Air Quality and Climate Change
- 3.4 Biological Resources
- 3.5 Cultural Resources
- 3.6 Geology, Seismicity, Soils, Mineral Resources, and Paleontological Resources
- 3.7 Hazardous Materials
- 3.8 Hydrology and Water Quality
- 3.9 Land Use and Planning
- 3.10 Noise
- 3.11 Public Health Hazards
- 3.12 Recreation
- 3.13 Traffic and Transportation
- 3.14 Utilities and Public Service Systems

3.1 Aesthetics

The aesthetic value of an area is a measure of its visual character and quality, combined with the viewer response to the area. The scenic quality component can best be described as the overall impression that an individual viewer retains after driving through, walking through, or flying over an area. Viewer response is a combination of viewer exposure and viewer sensitivity.

3.1.1 Affected Environment

3.1.1.1 Regulatory Setting

Aesthetics and visual resources are regulated indirectly through a variety of federal, state, and local laws and programs. For example, the federal government does not explicitly regulate visual resources, but recognizes their value and preserves them under the aegis of the National Park, National Wildlife Refuge, National Monument, and National Scenic Byway Systems. Similarly, aesthetic values are preserved at the state level through the establishment of state parks and preserves and through the California Scenic Highway Program. In addition, although local jurisdictions are not required to address visual resources as a separate topic in their general plans, most do consider aesthetic values in developing their planning framework.

The Solano County General Plan (Solano County 2008, p. RS-36) requires the protection of views along scenic highways. In the vicinity of the Plan Area, State Route (SR) 12 and SR 113 north of its intersection with SR 12 have been designated as scenic roadways. Specific policies for roads with marshland and grassland foregrounds were developed to preserve the integrity of these views. Policies include retaining the open space around the marshland; preventing modifications to natural water movement; burying utility lines underground; avoiding development on the steeper slopes; maintaining setbacks between the proposed development and the viewshed; using materials and colors subordinate to the surrounding natural environment; minimizing grading and padding; and preventing the spread of noxious weeds.

In addition, the general plan requires a 0.25-mile setback from scenic roadways (i.e., SR 12) to minimize visual impacts (Solano County 2008, pp. RS-56–RS-57). The Shiloh IV Plan Area is approximately 1.5 miles south of SR 12 and the SR 113/SR 12 intersection and not within the 0.25-mile visual impact setback buffer.

3.1.1.2 Environmental Setting

The Plan Area is in the Montezuma Hills region of southeast Solano County, about halfway between San Francisco and Sacramento. The Montezuma Hills region is a rural agricultural area in the Sacramento Valley, south of County Scenic Roadway SR 12, north of the Sacramento River, and east of Suisun Marsh. The easternmost point of the Plan Area is about 6 miles west of the Rio Vista city limits and about 7 miles southeast of Fairfield city limits. The Montezuma Hills region is sparsely populated compared to the larger metropolitan areas to the east and west, and contains two small communities: Birds Landing at the intersection of Collinsville and Birds Landing Roads and Collinsville at the south end of Collinsville Road.

Low rolling hills, separated by valleys and intermittent drainages characterize the landscape of the Plan Area. The hills are relatively constant in elevation, with ridge crests ranging from 100 to 272 feet amsl. Dominant vegetation in the area consists of wheat grass and other grasses planted by landowners for agriculture and livestock grazing. Although there are very few trees and shrubs, eucalyptus and other trees grow adjacent to drainages and in lowland areas.

Over 800 utility-grade wind turbines have been installed throughout the hills between SR 12 and the Sacramento River since 1987, permanently altering the previous aesthetic of this area of the county. As of March 2011, there were five existing wind facilities in the Montezuma Hills.

- enXco V: 505 individual KCS 56 turbines, 90 to 110 feet tall, and 6 GE 1.5 turbines, 340 feet tall.
- High Winds: 90 V-80 turbines 330 to 350 feet tall.
- Shiloh I and Shiloh II: 100 GE 1.5 turbines, 340 feet tall, and 75 REpower MM92 turbines, 372 to 415 feet tall.
- Montezuma I: 16 Siemens 2.3 turbines, 415 feet tall.
- Solano Wind Phase 1, 2A and 2B: 23 V-47 turbines, up to 291 feet tall, and 29 Vestas V-90 turbines, 410 feet tall.

The total existing wind energy development in the Montezuma Hills, as of March 2011, was 844 turbines with a production capacity of 661 MW of power. Two additional wind projects, comprising another 114 turbines, are under construction and are expected to be completed in early 2012.

- Solano Wind Phase 3: 55 Vestas V-90 turbines.
- Shiloh III: 50 REpower MM92 turbines, 377 to 409-feet tall.

Another wind project, Montezuma II, with 34 Siemens 2.3 turbines, 415 or 428 feet tall, was approved by the County in July 2011 and is expected to be under construction in 2011.

The enXco V project, the first wind energy project built in the Montezuma Hills, is nearing the end of its permit life. enXco V uses KCS-56-100 turbines ranging between 90 and 110 feet tall. A steel lattice tower supports the nacelle and rotor. Decommissioning of the enXco V project, including the removal of 191 turbines within the Montezuma II project area in the summer of 2011, has resulted in 314 older enXco V turbines remaining. Portions of the enXco V project including approximately 255 turbines and associated infrastructure currently occupy the Shiloh IV Plan Area. The owner of the enXco V project plans to remove the existing turbines in the Plan Area before construction of the Shiloh IV Proposed Action and no later than 2015 as required by the enXco V use permits.

Existing conditions for visual resources were identified using the Federal Highway Administration (FHWA) methodology (Federal Highway Administration 1988), which provides a systematic, standardized approach for evaluating effects on visual resources. This approach identifies a view's aesthetic value based on its inherent visual character, its visual quality, and viewers' response to it.

- **Visual character** refers to the nature of a view—put simply, what does it look like, or what is there to see? Visual character may depend on a combination of natural and artificial (urban or built) elements.
- **Visual quality** of a view is described in terms of its vividness, intactness, and unity. *Vividness* describes the power or “memorable-ness” of landscape components as they combine in visual patterns. *Intactness* refers to the visual integrity of the natural or built landscape and its

freedom from encroaching elements; this factor can be present in well-kept urban and rural landscapes, as well as in natural settings. *Unity* is the visual coherence and compositional harmony of the landscape considered as a whole. Typically, high-quality views are highly vivid, are relatively intact, and exhibit a high degree of visual unity. Low-quality views lack vividness, are not visually intact, and possess a low degree of visual unity (Jones et al. 1975; Dunne and Leopold 1978; Federal Highway Administration 1983, 1988).

- **Viewer response** to a view—and to potential changes in that view—depends on viewer exposure and viewer sensitivity. This analysis emphasizes the sensitivity of individual viewers rather than overall viewer exposure. *Viewer exposure* reflects the number of viewers, the distance from which they view the resource, and the duration of viewing. *Viewer sensitivity* describes the public's level of concern for particular views. It depends in part on viewer exposure, but is also affected by viewer activity, awareness, and expectations. For example, visual sensitivity is higher for views seen by people who are driving for pleasure; people engaging in recreational activities such as hiking, biking, or camping; and homeowners. Visual sensitivity tends to be lower for views seen by people driving to and from work or as part of their work (Soil Conservation Service 1978; Federal Highway Administration 1983; U. S. Department of Agriculture, Forest Service 1995).

Existing Views

The most extensive views of the Plan Area are those from local roadways including Olsen, Shiloh, Birds Landing, Collinsville, and Montezuma Hills Roads, which run adjacent to or through the Plan Area. These views are expansive landscapes of open grazing land, some agricultural fields, and rolling hills, covered at varying distances with wind turbines constructed in the course of several independent projects (Figure 1-2). Because of their expansiveness and the striking presence of the wind turbines, these would be considered highly vivid views. The views would be considered to exhibit moderate to low intactness and unity because of the presence of the turbines. Overall, visual quality would be moderate. Because of the subjective nature of aesthetics, some viewers might find the juxtaposition of wind turbines with a rolling rural landscape to be pleasing, while others might find it unattractive.

Viewpoints in Birds Landing with views of the Shiloh IV Plan Area would also include the western portions of the Shiloh I wind project area.

Sensitive Viewers

Sensitive viewer groups are the categories of viewers, in the context of a given project, for whom aesthetic impacts must be evaluated. The Proposed Action could potentially affect the following groups.

- Drivers on County Scenic Roadways SR 12, SR 113, and Grizzly Island Road.
- Residents in or immediately adjacent to the Shiloh IV Wind Energy Plan Area, including members of the communities of Birds Landing and Collinsville.
- Residents of Antioch, Pittsburg, and Rio Vista.
- Visitors to the Plan Area, rural communities, the Western Railway Museum, and the Suisun Marsh.

Based on these, three categories of viewer groups are considered in this analysis: motorists, residents, and recreationists.

Motorists

The Solano County Board of Supervisors designated the following roads as Scenic Roadways: Interstate 80 (I-80) from Vallejo to Davis, I-680 from Benicia to Cordelia, SR 12 from Fairfield to Rio Vista, SR 113 from Dixon to SR 12, and Grizzly Island Road from Suisun City to the end on the western side of Montezuma Slough (Solano County Planning Services 2008). Travelers on I-680 and I-80 would not be able to view the Proposed Action facilities (Solano County Department of Resource Management 2011a).

The Plan Area boundary is 1.5 miles from SR 12. Approximately 26,500 vehicles travel on SR 12 per day. Motorists driving southeast along SR 12 towards the town of Rio Vista traverse a roadway that rises and falls gently with the rolling hills, often dipping down into road cuts that obscure views toward the Plan Area. Foreground, middleground, and background views are of flatlands, marshlands, rolling grasslands, and open fields. Portions of the Shiloh II project and, once construction is completed, Shiloh IV project would be visible in the foreground, and the High Winds and Montezuma I projects are seen in the background. Topography blocks the views of the existing enXco V project turbines from SR 12 (Solano County Department of Resource Management 2011a).

Motorists traveling on SR 113 southbound from I-80 have direct views of the Montezuma Hills as they approach SR 12. At this intersection, travelers see rolling hills in the foreground along with the existing Shiloh II project. Approximately 4,200 vehicles travel on SR 113 per day. The Plan Area is visible to these travelers, although obscured by topography, at distances greater than 2 miles in the background view. The closest views occur at or near the intersection with SR 12 (Solano County Department of Resource Management 2011a).

Motorists traveling on Grizzly Island Road, which starts at SR 12 and traverses the Suisun Marsh west of the Plan Area, have views of the Montezuma Hills to the east. The nearest Plan Area boundary is approximately 2 miles from the endpoint of Grizzly Island Road at Montezuma Slough. Travelers on this road see marshland, flat grassland and cropland, and rolling grassland in foreground views. When looking toward the east, travelers also see open fields with distant windbreaks, flatlands, marshlands, and open fields in distant views. The Plan Area is visible in distant views from Grizzly Island Road; however, existing enXco V turbines are not visible (Solano County Department of Resource Management 2011a).

Residents

Residents and land and business owners traveling on public roads in or immediately adjacent to the Plan Area would be the most affected by changes to the landscape. There are eight landowners within the Plan Area boundaries. These landowners have agreed to lease their property to enXco under long-term agreements for the installation of the wind turbines and associated facilities. There are five residences within the Plan Area, and four rural residences within 1,000 feet of the Plan Area boundary, not including residences in Birds Landing.

In addition to rural residents within and near the Plan Area boundaries, there are also sensitive viewers in the two nearby communities. Birds Landing, at the intersection of Collinsville Road and Birds Landing Road, is adjacent to the western Plan Area boundary. Approximately 130 people live in the vicinity of the Plan Area (Solano County Department of Resource Management 2011a). Residents of Birds Landing have views of portions of the Plan Area, but most views are obscured by

topography and vegetation. Turbines from existing projects are also visible to the north, northeast, and east. The enXco V KCV-56-100 turbines are not visible from Birds Landing, but the repowered GE 1.5 turbines can be seen to the east.

Collinsville is located at the southern end of Collinsville Road. Views of the Plan Area from Collinsville are obscured by the hills to the north. However, the roads leading to and from Birds Landing and Collinsville have direct foreground views of the turbines. The local topography blocks views of the enXco V project turbines, but existing Shiloh I turbines are visible to the north of Collinsville.

Other cities with potential views of the Plan Area are Antioch, Pittsburg, and Rio Vista, all of which are more than 4 miles distant. Antioch and Pittsburg, on the south side of the Sacramento River in Contra Costa County, are approximately 6 and 4 miles south of the Plan Area, respectively. Approximately 100,330 people live in Antioch, and 64,967 people live in Pittsburg (Solano County Department of Resource Management 2011a). The City of Antioch General Plan identifies views of the San Joaquin River from several view corridors as city resources. The Plan Area is visible in the background distance zone from the Antioch riverfront as well as from SR 4, which runs through Antioch. Existing enXco V turbines are difficult to see because of their lattice towers and small blades. The larger, more visible turbines from the Shiloh I Project and the rolling topography of the Montezuma Hills tend to obscure the view of the enXco V project turbines from Antioch and Pittsburg.

The Rio Vista city limits are approximately 6 miles from the Plan Area. The city is on the eastern side of the High Winds, Shiloh II, and Solano Winds projects. Approximately 8,324 people live in Rio Vista (Solano County Department of Resource Management 2011a). Views of the Shiloh IV Plan Area to the southwest from Rio Vista are blocked by the intervening topography. The enXco V turbines are not currently visible from Rio Vista.

Recreationists

Because the Plan Area and its vicinity are devoted to intensive agricultural uses, recreationists are not likely to be present in the Plan Area and therefore will not have direct views of the Plan Area. However, the Western Railway Museum, a private nonprofit facility, is on the south side of SR 12 east of Shiloh Road. The nonprofit Bay Area Electric Railway Association, which owns and operates the museum, operates a tourist train along the Sacramento Northern Railroad, near the western portion of the Shiloh II Wind Project. Passengers on the southern portion of this line experience existing views of the Shiloh I and Shiloh II Wind projects to the east of the railway lines. The southern-most portion of the rail line would be less than 1 mile from the closest Shiloh IV project turbine. The existing enXco V turbines, however, are not visible. Visitors travelling to the museum from the east along SR 12 would experience background views of portions of the Plan Area starting at the intersection with SR 113. Also, recreational boaters use the Suisun Marsh/Bay west of the Plan Area and the Sacramento River to the south. Visitors access the marsh by watercraft and Grizzly Island Road. The Plan Area and other existing wind projects would be visible in the background distance zone from along Grizzly Island Road and from the eastern edge of the marsh.

3.1.2 Environmental Consequences

3.1.2.1 Approach and Methods

The assessment of effects on aesthetics was based on the preliminary siting plan for the Shiloh IV project, evaluation of existing conditions (i.e., existing wind projects in the vicinity), and preparation of visual simulations (Figure 3.1-1 and Figure 3.1-2a-f).

3.1.2.2 Effects

Proposed Action

Impact AES-1: Temporary visual impacts caused by construction activities

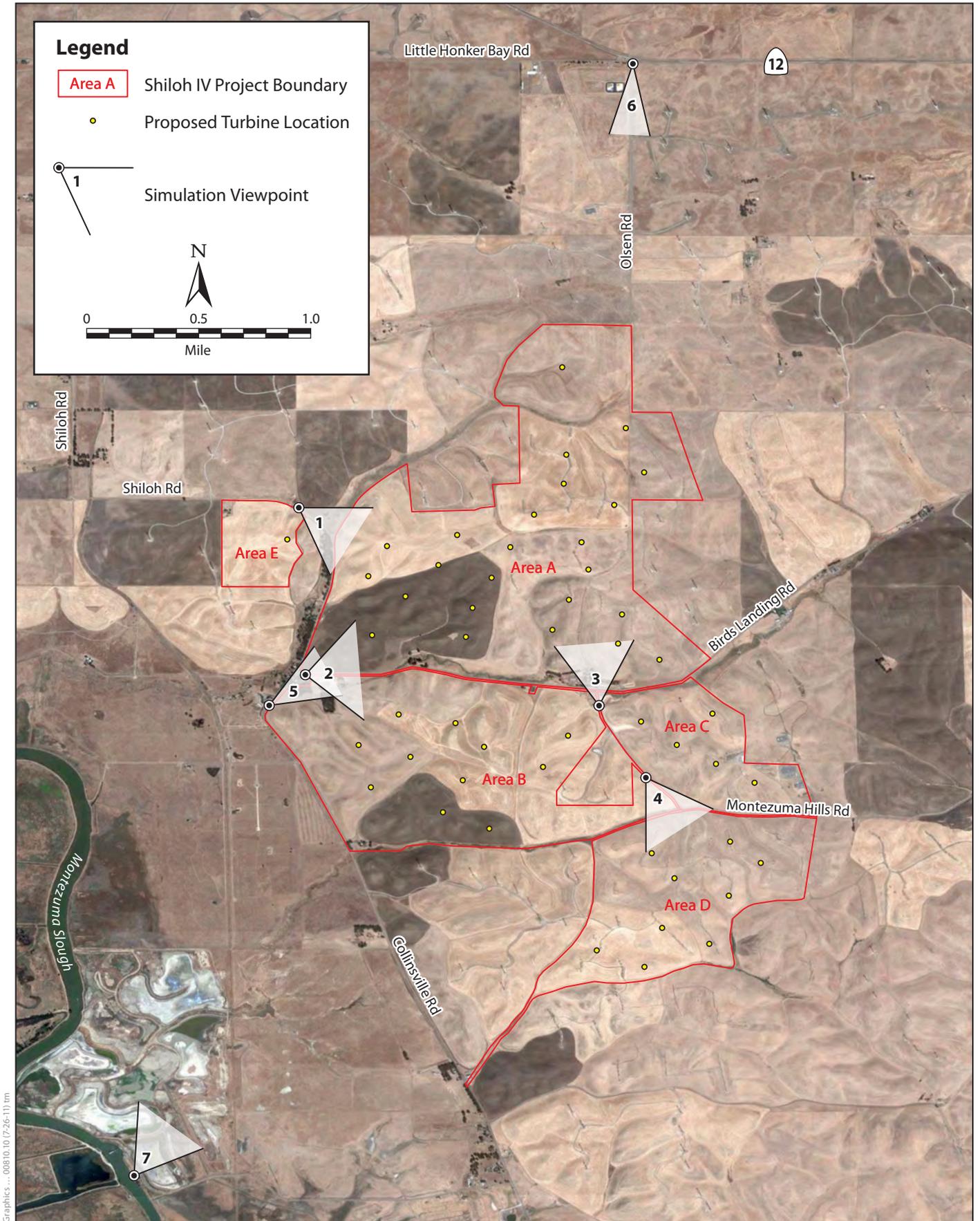
Construction of the Shiloh IV project would entail grading activities and the presence of heavy equipment associated with the installation and construction of new turbine pads and towers, access roads, electrical collection lines, a laydown yard, a substation, and expansion of the O&M facility. Construction activities would be visible from various locations, including from portions of the local roads that run adjacent to or through the Plan Area; however, views from these local roads and residences in and near the Plan Area would be visible to relatively few people during construction. Visual effects on nearby residences would not be expected to elicit negative viewer responses because proposed construction activities would be consistent with existing wind turbine development immediately adjacent to the Plan Area, views of construction areas would be intermittent across a 3,513-acre area, only five local residences would be affected in the Plan Area, and most of these have agreed to long-term leases of property for wind turbine use. Four additional local residences within 1,000 feet of the Plan Area would also be affected by views of construction. Views for residents of Birds Landing and Collinsville have intervening topography and vegetation however construction activity in the southern Plan Area or along Collinsville, Birds Landing, and Montezuma Hills Roads may be visible for some duration of construction. Because the number of viewers from local roads and residences would be relatively minor, this impact is not considered to be significantly adverse.

Impact AES-2: Long-term changes in visual character

The Proposed Action would result in the introduction to the Plan Area of up to 50 wind turbines with a maximum height of 415 feet. The Plan Area overlaps and is immediately adjacent to existing and planned wind farms (Figure 1-2). This potential effect is addressed separately for the three viewer groups: motorists, residents, and recreationists.

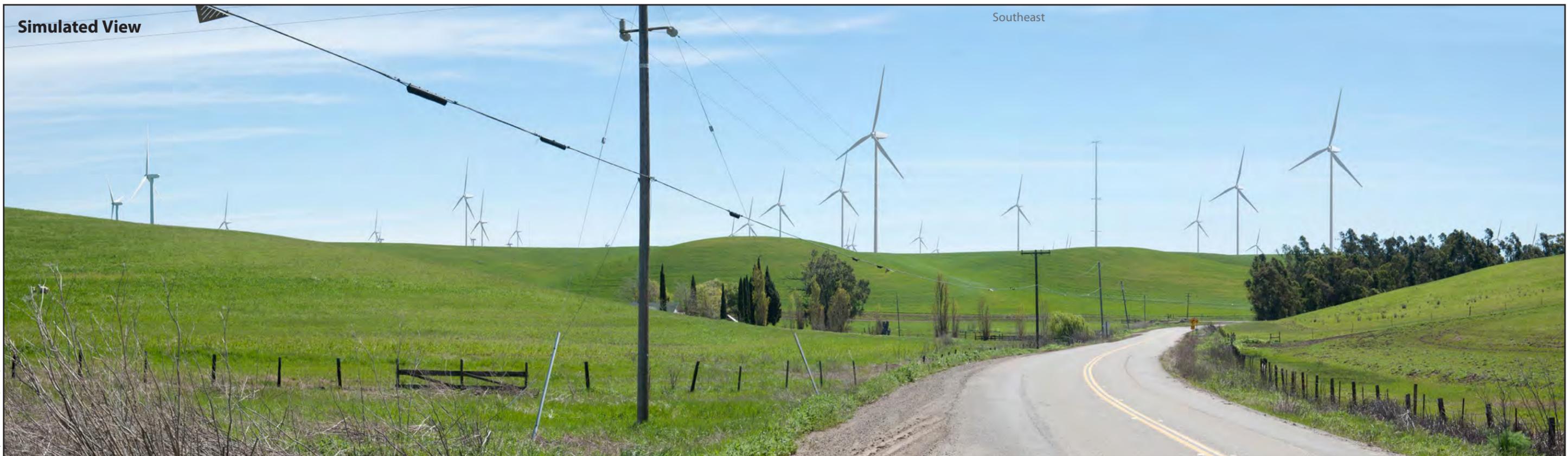
Motorists

The Proposed Action in the Plan Area would introduce new turbines to the viewshed on the south side of Olsen Road in an area that already has views of Shiloh I and enXco V turbines; on the north and south sides of Birds Landing and Montezuma Hills Roads in areas that also already have views of Shiloh I and enXco V wind turbines; on the south side of Shiloh Road, which runs through the Shiloh I wind farm; and on the east side of Collinsville Road which has existing views of the Shiloh I wind farm. The Proposed Action would introduce wind turbines to a portion of the Shiloh IV site that presently does not have wind turbines, and this area would be visible south of Birds Landing Road, east of Collinsville Road, and north of Montezuma Hills Road. As required by local regulations,

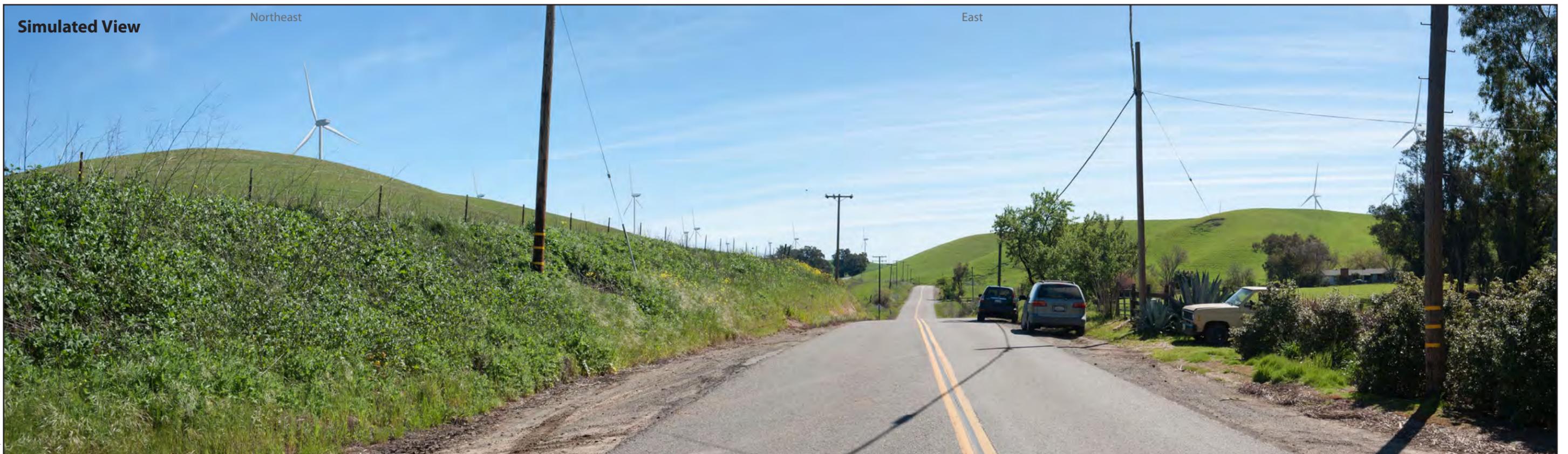


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Figure 3.1-1
Locations of Visual Simulation Viewpoints



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Southeast

Existing View

Looking southeast from Montezuma Hills Road,
0.65 mile south of Birds Landing Road
(angle of view approximately 65°)



Southeast

Simulated View



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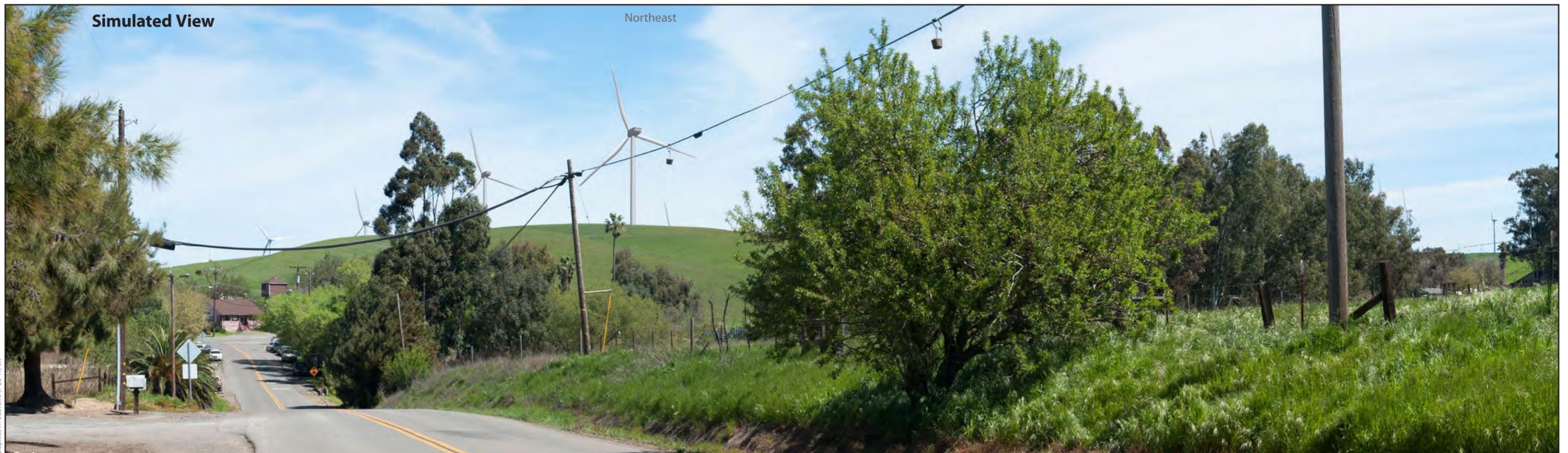
Southeast

Simulated View: No Project Alternative

In which enXco V is decommissioned
and Shiloh IV is not built.



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the wind turbines would be sited at least 0.25 mile from the roadways. The visual character and quality in the Plan Area would not change substantially because the addition of 50 turbines near the existing Shiloh I Wind Project and the replacement of existing enXco V project turbines would be consistent with the current overall visual experience from these local roadways. For example, as shown in Figures 3.1-2a, b, and c, the change in visual character from several locations would mainly entail an increase in the perceived density of existing turbines in the viewshed across middle and background views from local roadways. The visual quality, as expressed by viewshed vividness, intactness, and unity, would remain similar to current conditions because the pattern of wind turbine development would be consistent with existing development, the visual integrity of turbines in an agricultural setting would not change, and the visual unity would continue to be moderate to low depending on individual viewer preference. Viewer response to proposed wind plant development from motorists on these local roadways is subjective, but based on the visual simulations presented in Figures 3.1-2a, b, and c, this response is not expected to be substantial because viewing time would be brief while passing by or through the Plan Area. These changes to visual character in the established WRA are not considered to be adverse because the visual context in the area would be similar to existing conditions and the change in the viewshed would be subtle for most motorists.

The closest project turbines would be located more than 1.5 miles south of both SR 12 and the southern terminus of SR 113 and 2 miles from the eastern terminus of Grizzly Island Road. The turbines would not affect immediate views from the scenic road rights-of-way but would affect views within the background view zone from the roads. At this distance, color and lines are imperceptible and the only visible attribute is form.

The existing shorter enXco V turbines in the Plan Area are not visible from SR 12, but the turbines from the existing Shiloh I, Shiloh II, High Winds, and Montezuma I projects are clearly visible in the foreground, middle ground, and background view zones. Existing wind projects in the Montezuma Hills are also visible in the background view zone from Grizzly Island Road. The Proposed Action would contribute additional visible turbines to the distant views from SR 12, SR 113, and Grizzly Island Road but would not significantly modify the overall character of the views, which already include multiple turbines as important visual elements.

The Proposed Action substation and interconnection line would not be visible from SR 12 or SR 113. The substation would be slightly visible, although partially obscured by hills, in foreground views for drivers along Montezuma Hills Road. However, the existing Russell substation and Birds Landing switchyard are closer to the road than the proposed substation and would occupy most of the view that Montezuma Hills Road motorists would see. Also, travelers on this road have a low expectation for scenic views and neither the County nor State has specifically designated the road as scenic. Additionally, the duration of view for a motorist on Montezuma Hills Road is short. The combination of low expectation for scenic views and short duration of view results in low viewer sensitivity for motorists traveling on Montezuma Hills Road.

Residents

Residents within the Plan Area would be exposed to the replacement of existing wind turbine structures and introduction of taller nearby wind turbine structures. The visual experience for these residents would likely intensify compared to existing conditions, although not as much as if there had previously been no wind turbines in the area, because of the scale of towers compared to residential structures. However, the configuration would disperse turbines throughout the 3,513-

acre Plan Area (50 turbines spread across 3,513 acres equates to 1 turbine per 70 acres). The change in visual character, quality, and response would be expected to be minor because the Proposed Action would be constructed within the context of an existing WRA and the intensity of development is consistent and potentially even less intense because of the reduced overall number of turbines compared to the existing enXco V and nearby High Wind and Shiloh I Wind Projects. Accordingly, the visual impact on residents who have agreed to lease their properties to Shiloh IV under long-term agreements is not considered significantly adverse.

Birds Landing

Residents in Birds Landing would have views of the western portion of the Plan Area; however, as noted previously, local regulations require that the turbines be placed 0.25 mile from roadways thus providing some distance between these communities and the nearest turbines. The nearest turbine would be approximately 1,900 feet northeast of Birds Landing. Other turbines to the northeast, east, and southeast would be visible at varying distances from different points within Birds Landing. Although the existing structures, vegetation, and topography near Birds Landing would limit the extent of views of the nearby turbines, the project turbines would change the existing views from most locations in the community. When visible, new turbines would be immediately obvious in foreground views and have clear form and massing in middle ground views. The existing older, shorter Kenetech turbines in the Plan Area are not visible from Birds Landing; however, several of the enXco V GE 1.5 repowered turbines are visible to the east in the same view that would contain the Proposed Action turbines. However, overall, the number of viewers is relatively small, most residences are surrounded by trees that partially block the view, the turbines would comply with local regulations and would be setback from roads that are between the Plan Area and communities. Accordingly, changes in views from Birds Landing are not considered to be a significant adverse effect.

Collinsville

The hills north of Collinsville obstruct the views of the most of the Plan Area from Collinsville. The nearest turbine would be approximately 2 miles from the community, in the background distance zone. The existing Shiloh I turbines are already a part of this view and establish the visual character of the landscape. In those locations where the Shiloh IV turbines would be visible above the hills, the size and shape of the closest turbine would be visible, but the details such as line and color would not be noticeable. Because of the topographic obstruction, the dominant effect of closer turbines, and distance from Collinsville, the Proposed Action would not result in significant adverse effects on views from Collinsville.

Antioch and Pittsburg

Antioch and Pittsburg would both have unobstructed distant views of portions of the Plan Area. The views are from across the Delta. Project turbines would be approximately 4 to 6 miles north of these urban areas, in the background distance zone. Views of the Montezuma Hills from Antioch and Pittsburg are partially obscured by the landforms and vegetation on islands in the Delta including Browns Island, Winter Island, Kimball Island, and Sherman Island. The existing views of the Antioch riverfront already include a significant number of wind turbines in the distant view zone.

Although the Plan Area would add some visual contrast to the dominant color of the vegetation and predominant landforms seen from Antioch and Pittsburg, the addition would not affect the views of the Delta and surrounding landforms typically visible in the middle ground distance zone. The

Proposed Action would result in an increase in the number of wind turbines visible in the distance from these locations, and the white color of the tubular poles and longer blades of the wind turbines would stand out against the surrounding landscape. However, because the Plan Area would be in the background distance zone, behind existing Shiloh I turbines, views would not dominate the landscape. There would be no significant adverse visual effect on these communities.

Rio Vista

The nearest turbine to Rio Vista would be more than 6 miles away and would be in the seldom-seen distance view zone. Project turbines would be located behind several existing and planned turbines in the Solano Wind, Shiloh II, and High Winds project areas. Because of the viewing distance and the location of the community within a topographic depression, Plan Area views would be diminished or nonexistent and would not dominate the landscape. There would be no significant adverse visual effect on this community.

Recreationists

Visitors to the Western Railroad Museum may have distant views of the northern portion of the Shiloh IV project; however, the Shiloh II, III, and I projects lie between the Shiloh IV project and the museum; accordingly, there would be no adverse effect. Museum visitors may travel in restored vintage railroad cars on a segment of the former track of the Sacramento Northern Railway. The railroad trips would have views of project components, particularly at the endpoint of the rail line near Shiloh Road. One turbine would be 0.5 mile from the endpoint. Two other project turbines would be approximately 1 mile from the rail line, in the middle ground distance zone. Views of the remaining project turbines would be within the background distance zone where only the form of the turbines would be noticeable. Several hundred distant existing turbines can already be seen from several miles of the track. The addition of the Proposed Action would not permanently remove or exclude dryland farming within or near the Plan Area nor substantially change the rural agricultural landscape character. Thus, there would not be a significant adverse effect on recreation-related views of the Plan Area.

Recreational boaters on the Sacramento River would not be likely to have views of the Plan Area because of distance and intervening topography and levees. Other wind projects—both existing and planned—lie nearer to the river than the Shiloh IV project. Accordingly, because the visual character of the Montezuma Hills has already been defined by the extensive development of wind projects, there would not be significant adverse visual effects on existing recreationists.

The Suisun Marsh Secondary Management Area is adjacent to the west edge of the project boundary, but most visits to the marsh occur west of Montezuma Slough at a greater distance from the Plan Area. The Montezuma Slough day use area is approximately 2 miles from the Plan Area boundary. Proposed Action turbines would not interfere with visitors' views of the Suisun Marsh landscape and would be in the background distance zone from most marsh viewpoints. There would be no significant adverse effects.

Impact AES-3: Potential increase of light and glare

The shadow flicker and related potential aesthetic nuisance effects would be directly dependent on the distance and orientation of a subject property (or a structure's windows) relative to the turbines causing the effect as well as the brightness of the sun and duration. All residences within and adjacent to the Plan Area would either experience no shadow flicker effects or effects of less than 30

hours per year, in the expected case, and less than 30 minutes per day on average. Given the short duration of potential exposure, this aesthetic effect is not considered to result in a substantial adverse effect. (Solano County Department of Resource Management 2011a). (Also see Section 3.11, *Public Health Hazards*, for additional discussion of shadow flicker effects of the Proposed Action.)

FAA will require safety lighting on the turbines and Shiloh IV must consult with FAA, and apply for a No Hazard Determination (also see Section 3.9, *Land Use and Planning*, which identifies EC-27 to avoid effects to air navigation). The consultation with FAA will result in development of specific requirements for the Proposed Action, including turbine color and lighting, in accordance with FAA Advisory Circular 70/7460-1, Obstruction Marking and Lighting. FAA requirements are based on turbine height, layout, terrain, and other factors. Based on requirements implemented for recently built wind projects, it is anticipated that FAA would require lighting for some of the turbines on the perimeter of the Plan Area and at the ends of turbine strings. Per FAA standards, night lighting would entail synchronized red flashing lights; additional daytime lighting would not be required, provided the turbines are painted white or off-white. EC-1 specifies marking and lighting on turbines will be in accordance with FAA requirements and the turbines will not be lighted for any other reason. The overall change in lighting in the Plan Area would not result in significant adverse effects.

Impact AES-4: Potential aesthetic/visual resource effects from decommissioning of the Proposed Action increase of light and glare

Commercial wind turbines typically have a 20- to 30-year design life span and require maintenance to remain cost-effective. Other project components may have a service life of 45 years or longer. (Solano County Department of Resource Management 2011a). If the turbines or other ancillary equipment are left abandoned on site there could be an effect on visual resources. EC-2 would ensure all Proposed Action facilities are removed and the Plan Area is restored, there would be no adverse visual effect.

No-Action Alternative

Under the No-Action Alternative, the Proposed Action would not be implemented and no new turbines would be constructed. The Plan Area would continue under current agricultural uses and no effects on visual resources in the WRA would occur.

3.1.3 References

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3.2 Agricultural Resources

This section describes the affected environment pertaining to agricultural resources and the potential environmental consequences that could result from implementation of the Proposed Action.

3.2.1 Affected Environment

3.2.1.1 Regulatory Setting

Williamson Act (California Land Conservation Act of 1965)

The Williamson Act (California Government Code Section 51200 et seq) allows county governments to enter into contracts with private landowners who agree to restrict parcels of land to agricultural uses or uses compatible with agriculture for at least 10 years. In return, landowners receive property tax assessments that are much lower than normal because they are based on income derived from farming and open space uses as opposed to full market value of the property.

Section 51238(a) of the Williamson Act establishes electric facilities such as wind energy projects as land uses compatible with Williamson Act lands. Wind energy facilities are “electric facilities” within the meaning of Section 51238 and therefore have been deemed to be compatible uses by the statute. Solano County has also independently determined that wind facilities are compatible uses on Williamson Act land (Solano County Department of Resource Management 2011a).

In addition to the Williamson Act, the California Department of Conservation (CDC) administers the Farmland Mapping and Monitoring Program to rate lands by agricultural potential. The first three categories in descending order of potential are Prime Farmland, Farmland of State Importance, and Unique Farmland; these are collectively classified as Important Farmland. No lands in the Plan Area are classified as Important Farmland under this rating system.

Resource Management Plan for the Primary Zone of the Delta

The Delta Protection Act of 1992 (Public Resources Code Section 29760 et seq) requires the Delta Protection Commission to prepare, adopt, and maintain a comprehensive long-term resource management plan for land uses within the Primary Zone. The Primary Zone of the Sacramento-San Joaquin Delta (Delta) includes approximately 500,000 acres of waterways, levees, and farmed lands extending over portions of five counties, including Solano and Contra Costa counties. The goals of the Plan are to “protect, maintain, and where possible, enhance and restore the overall quality of the Delta environment,” including agricultural lands. With respect to agricultural resources, the Plan’s goal is to support the long-term viability of commercial agriculture and discourage inappropriate development of agricultural lands. The Primary Zone of the Delta is located about two miles south of the nearest project boundary. (Solano County Department of Resource Management 2011a).

The Delta Protection Act also established the Secondary Zone of the Delta, which covers all Delta land and water within the legal boundary of the Delta that are not included within the Primary Zone. Secondary zone lands are subject to the land use authority of local government. The Secondary Zone of the Delta abuts the south side of Talbert Lane near its intersection with Collinsville Road,

approximately 0.2 miles south of the Shiloh IV Project's southwest boundary. (Solano County Department of Resource Management 2011a).

Solano County General Plan

The Solano County General Plan designates the Montezuma Hills as a distinct agricultural region with a minimum lot size of 160 acres (A-160) with identified uses of agricultural and energy production (Solano County 2008, p. AG-21). The General Plan includes provisions for multiple uses of agricultural lands and states (Page RS-53):

“Agricultural lands within the county are particularly appropriate for wind harvesting as turbines generally do not interfere with daily agricultural operations and can provide additional revenue on these properties.”

Therefore, wind energy development is advocated (by use permit) on agricultural lands in the Montezuma Hills agricultural region of Solano County.

Solano County Zoning Ordinance

All of the land in the Plan Area is zoned Exclusive Agriculture (A-160). The Solano County Zoning Ordinance permits construction and operation of commercial wind turbines on A-160 lands with a use permit. Conditions for wind energy development are related to general land use, not specifically agricultural uses.

3.2.1.2 Environmental Setting

Agricultural uses—primarily dryland farming and livestock grazing—are the dominant land uses in the Plan Area. As of May 2011, approximately 98% of the Plan Area was in wheat production or was in preparation for wheat production, with the remainder being utilized as grazing lands. The farmers in the Montezuma Hills typically use a 1- to 3-year crop rotation cycle, where grazing and fallow years follow planting and harvesting.

CDC Farmland Mapping and Monitoring Program (FMMP) defines the Montezuma Hills area as land with lower quality soils that can be used for non-irrigated agricultural production (Solano County Department of Resource Management 2011).

The Plan Area does not contain Prime Farmland, Farmland of Statewide Importance, Unique Farmland, or Farmland of Local Importance, as defined by the FMMP. The CDC maps the Plan Area as Grazing Land (Solano County 2008: AG-5 Figure AG-1, Important Farmland). Soil types in the Plan Area are primarily of the Altamont and Diablo series, which are not associated with important farmland (Solano County Department of Resource Management 2011). Wheat, barley, and oats are the main crops in the Montezuma Hills, and sheep are the primary livestock.

enXco currently holds a use permit to operate the enXco V (formerly U.S. Windpower) wind energy project on 13 of the 30 parcels that comprise the Shiloh IV Plan Area. Currently, the enXco V project components occupy approximately 24 acres of land on these 13 parcels. The enXco V use permits require enXco to decommission the enXco V project, which would include the removal of enXco V project components and reclamation of disturbed lands to preproject conditions (cultivated agriculture). enXco would decommission the wind turbines, unused access roads, and meteorological towers from within the Shiloh IV Plan Area prior to implementation of the Proposed Action.

The Shiloh IV Plan Area also contains land used for facilities related to other wind development projects, including the 2.3-acre O&M facility that serves the enXco V and Shiloh II projects, the 0.9-acre Shiloh I substation, the 3.6-acre PG&E Birds Landing switchyard, and the 0.9-acre Solano Wind substation. The Plan Area surrounds but does not include a 64-acre area that contains two Shiloh I turbines, access roads, and the Iberdrola O&M building.

As proposed, 29 of the 30 parcels that comprise the Plan Area where turbines and associated facilities would be installed are under Williamson Act contracts, including all 13 of the enXco V project parcels. A principal purpose of the Williamson Act is to preserve agricultural lands from conversion to residential, industrial, or other non-agricultural or non-compatible uses.

3.2.2 Environmental Consequences

3.2.2.1 Approach and Methods

The assessment of potential effects on agricultural resources entailed a qualitative evaluation of the Proposed Action's potential to conflict with existing agricultural resources or to increase demand for agricultural resources.

3.2.2.2 Effects

Proposed Action

Impact AG-1: Conversion of agricultural lands to non-agricultural use

Permanent Effects

Implementation of the Proposed Action would result in permanent conversion of some agricultural lands to non-agricultural use. The Proposed Action would result in a net permanent conversion of approximately 25 acres of agricultural lands to non-agricultural lands in the Plan Area. This conversion represents less than 1% of the Plan Area, and 0.005% of Solano County's estimated 2010 agricultural lands (346,948 acres). (Solano County Department of Resource Management 2011a). Agricultural and grazing activities would continue throughout 99.5 percent the Plan Area during project operation. Given the overall small percentage of agricultural land the Proposed Action would convert to non-agricultural uses and the fact these lands are not Prime Farmland, Farmland of Statewide Importance, or Unique Farmland, the Proposed Action would not have an adverse effect on agricultural lands.

Shiloh IV may re-use up to approximately 7 miles of existing 12-foot-wide enXco V project access roads for the Proposed Action (up to 10.9 acres), widening and regrading the roads as necessary for the Proposed Action. Reuse of enXco V roads would not affect the total acreage of permanent non-agricultural use in the Plan Area, but would reduce temporary disturbance from restoration and road construction activities.

Table 3.2-1 summarizes the permanent conversion of agricultural land to non-agricultural uses that would occur with development of the Shiloh IV Proposed Action.

Table 3.2-1. Impacts on Agriculture

Land Cover Type	Acres in Plan Area	Impact Type	Impact Acres	% of Specific Land Cover Type in Plan Area
Agriculture	3,347	Permanent	25.7	<1
		Temporary: construction	125.2	<4
		Temporary: maintenance	15	<1

Temporary Construction Effects

Temporary disturbance of 125 acres of agricultural land would result from construction activities including creation of access and work areas around each turbine pad, meteorological towers, temporary equipment access, and temporary laydown areas. Access roads and turbine pads and other work areas must be large enough to support large equipment used to deliver infrastructure, excavate turbine and meteorological tower foundations, and assemble and install infrastructure. The final footprint of these project components would ultimately be reduced from the construction footprint because routine operation and maintenance of the facility would not require use of oversized vehicles and equipment. Graded and cut-and-fill areas would be restored to preconstruction conditions, including power collection line areas, enabling agricultural activities to resume in these areas (Solano County Department of Resource Management 2011a). Given the overall limited area of disturbance and that the fact that the area is not Prime Farmland, Farmland of Statewide Importance, or Unique Farmland, the Proposed Action would not have a significant adverse effect on agricultural land in the Plan Area.

In addition, Shiloh IV may re-use approximately 7 miles of existing, enXco V project access roads, thus minimizing the need to reclaim existing roads and construct new access roads in different locations. The planned re-use of enXco V access roads is subject to County approval of enXco V decommissioning plans, which have not yet been submitted to the County. The reuse of enXco V roads would further reduce the temporary construction effects on agricultural lands.

In addition to temporary construction impacts on agricultural lands, overall agricultural and grazing operations in the Plan Area could be temporarily disrupted by use of construction equipment outside work areas, use of short cuts across agricultural land to access construction sites, release of dust during construction activities, accidental discharges of hazardous materials, or through inadvertent introduction of nonnative species or noxious weeds from equipment, vehicles, or personnel onsite. Implementation of the Proposed Action would include efforts to minimize adverse effects on agricultural lands throughout the construction period by implementing EC-3 to confine construction activities to the necessary work area, EC-4 to restore and decompact temporarily disturbed agricultural areas, and EC-5 to restore agricultural areas after decommissioning. In addition, EC-7 requires implementation of fugitive dust controls, and EC-21 and EC-23 require means to prevent, control and handle use and storage of hazardous materials, including minimizing effects in the event a spill occurs.

Impact AG-2: Potential conflict with Williamson Act contracts

Table 3.2-2 lists the landowner, assessor's parcel number (APN), Williamson Act status, and the potential Proposed Action features that would be located in the Plan Area. The 29 of the 30 parcels in the Plan Area are subject to Williamson Act contracts (Solano County 2008: AG-9, Figure AG-2, Williamson Act Contracts), 13 of these parcels currently have enXco V wind energy facilities. Under

the Williamson Act, the County is authorized to approve compatible uses of non-prime land if the use will not significantly alter or degrade the long-term productivity of agricultural lands or adjacent areas, remove a significant amount of land from agricultural or open land uses, or otherwise degrade or impair current and future agricultural activities. As described in Impact AG-1, the Proposed Action would not permanently remove a significant amount of land from agricultural use or affect long-term productivity in the Plan Area. Because of the dispersed character of the wind project and the relatively small footprints of the wind turbine generators, existing agricultural uses would be compatible with wind energy generation; consequently, implementation of the Proposed Action would not be in conflict with existing Williamson Act contracts in the Plan Area. This potential impact is not considered adverse because no loss of Williamson Act contracts would result from implementing the Proposed Action.

One of the primary purposes of the Williamson Act is to preserve agricultural lands from conversion to residential, industrial, or other non-agricultural or non-compatible uses. By providing an additional revenue source for the landowners of this agricultural land, the Project would help preserve continued use of the area for dry-land farming and deter large-scale conversion of agricultural land in the Plan Area into residential subdivisions or other non-compatible land uses. Solano County has designated the Montezuma Hills as suitable for wind development and determined that wind development is compatible with surrounding land uses, including agricultural lands under Williamson Act contracts. The County's rules and regulations governing agricultural preserves and land conservation contracts, adopted in 2008, clarify the compatibility of commercial wind development on lands under control of the Williamson Act. In particular, the adopted regulations identify commercial wind turbines as a compatible Communications and Infrastructure land use on prime and non-prime agricultural lands. The lands in the Plan Area are non-prime agricultural lands. The Proposed Action would not conflict with existing agricultural activities or Williamson Act contracts in the Plan Area (Solano County Department of Resource Management 2011a).

Table 3.2-2 Williamson Act Parcels in the Shiloh IV Plan Area

Landowner	APN	Williamson Act Contract	Proposed Action Features
Anderson, Edward A., Jr. Trust	0090-070-310	Yes	Turbines, roads, collection lines, meteorological tower
	0090-090-350	Yes	Turbines, roads, collection lines, project entrance
Anderson, Eric Ian	0090-090-230*	Yes	Turbines, roads, collection lines, laydown yard
Anderson, Jeanie	0090-090-300*	Yes	Turbines, roads, collection lines
	0090-090-310*	Yes	Turbines, roads, collection lines, meteorological tower
	0090-100-020*	Yes	Turbines, roads, collection lines

Landowner	APN	Williamson Act Contract	Proposed Action Features
Engel Bros et al.	0048-060-100*	Yes	Turbines, roads, collection lines
Coco Properties, LLC	0048-060-090*	Yes	Turbines, roads, collection lines, temporary laydown yard
	0090-090-220*	Yes	Turbines, roads, collection lines, project entrance
	0090-090-260*	Yes	Turbines, roads, collection lines, project entrance, substation, O&M warehouse building addition
	0090-090-270*	Yes	Collection lines
	0090-090-280*	Yes	Turbines, roads, collection lines, project entrance
	0090-090-290*	Yes	Turbines, roads, collection lines
Hale Trust	0090-100-040*	Yes	Turbines, roads, collection lines
	0090-090-240	Yes	Turbines, roads, collection lines
	0090-090-250	Yes	Turbines, roads, collection lines
Stewart, Thomas W., et al.	0090-090-180	Yes	Turbines, roads, collection lines
	0048-060-180*	Yes	Turbines, roads, collection lines, project entrance
	0048-070-340	Yes	Turbines, roads, collection lines, meteorological tower
	0090-070-070	Yes	Turbines, roads, collection lines
Zadwick Kenneth A and Dolores E	0090-070-010	Yes	Turbines, roads, collection lines
	0048-070-240	Yes	Turbines, roads, collection lines, project entrance
Elliott, Judith L., et al.	0048-050-070	Yes	Collection lines
Anderson, Ian and Margaret	0048-060-230	Yes	Collection lines
	0048-060-240	Yes	Collection lines
McGraugh	0048-050-070	No	Turbines, roads, collection lines
Stewart, Guy	0048-050-070	Yes	Collection lines
Stewart, Thomas	0090-070-260	Yes	Collection lines
	0090-070-380	Yes	Collection lines
	0090-070-400	Yes	Collection lines

Source: Solano County Department of Resource Management 2011a, 2011b.

* Denotes parcel is part of existing enXco V project.

Impact AG-3: Soil erosion, soil loss, and decrease in soil productivity

Implementation of the Proposed Action would not substantially increase soil erosion or soil loss, nor would it result in a decrease in soil productivity in or near the Plan Area. Ground-disturbing construction activities could result in minor loss of soils and marginal impacts on soils that could have a slight effect on soil productivity. Ground-disturbing and earthmoving activities could also

result in a relatively small amount of mixing fertile topsoil and less fertile subsurface soils, potentially leading to a slight decrease in soil productivity. The use of heavy equipment could result in rutting, which may also cause mixing of topsoil and subsoil, especially under excessively wet conditions. Inadequate compaction of backfilled (restored) materials in trenches and other excavated areas could result in soil subsidence and alter drainage patterns, while severe over-compaction could impede vegetation growth due to restricted movement of air and water in the soil. However, implementation of EC-4, EC-5, EC-17, EC-18, EC-19, and EC-20 as part of the Proposed Action would ensure the site is restored after construction and decommissioning, minimize soil erosion, soil loss, and a decrease in soil productivity on agricultural lands that are subject to temporary effects during construction or decommissioning by requiring land uses and habitat to be returned to pre-project conditions, mitigating geologic hazards, and implementing requirements of a SWPPP. In addition, a substantial decrease in soil productivity in the Plan Area is not expected from construction and operation because less than 1% of the agricultural land in the Plan Area would be permanently affected and soil productivity in dryland farmed areas of the Montezuma Hills is generally considered to be low. These potential soil impacts are not considered to be significantly adverse because the Proposed Action incorporates environmental commitments into the project design that would reduce soil erosion or loss in the Plan Area and soil productivity would not be substantially affected by temporary disruption of agricultural areas.

No Action

Under the No-Action Alternative, there would be no effects on agricultural resources, including soils, beyond current conditions because current uses would continue on the site.

3.2.3 References

Solano County. 2008. Solano County General Plan. November. Solano County, CA.

Solano County Department of Resource Management. 2011a. *Draft Environmental Impact Report—Shiloh IV Wind Energy Project*. August. State Clearinghouse #2011032062. Submitted by Point Impact Analysis, Inc., Palo Alto, CA.

Solano County Department of Resource Management. 2011b. *Final Environmental Impact Report—Shiloh IV Wind Energy Project*. November. State Clearinghouse #2011032062. Submitted by Point Impact Analysis, Inc., Palo Alto, CA.

3.3 Air Quality and Climate Change

This section describes the affected environment pertaining to air quality and the potential environmental consequences that could result from implementation of the Proposed Action. Where appropriate, mitigation measures are presented to address adverse effects.

3.3.1 Affected Environment

3.3.1.1 Regulatory Setting

Federal Regulations

The federal Clean Air Act (CAA), promulgated in 1970 and amended twice thereafter (including the 1990 amendment [CAAA]), establishes the framework for modern air pollution control. The act directs the U.S. Environmental Protection Agency (EPA) to establish National Ambient Air Quality Standards (NAAQS) for six pollutants: ozone, carbon monoxide (CO), lead, nitrogen dioxide (NO₂), particulate matter, and sulfur dioxide (SO₂) (Table 3.3-1).

Table 3.3-1. Applicable Federal and State Ambient Air Quality Standards

Pollutant	Symbol	Average Time	Standard (parts per million)		Standard (micrograms per cubic meter)		Violation Criteria	
			California	National	California	National	California	National
Ozone*	O ₃	1 hour	0.09	-	180	-	If exceeded	-
		8 hours	0.070	0.075	137	147	If exceeded	If fourth-highest 8-hour concentration in a year, averaged over 3 years, is exceeded at each monitor within an area
Carbon monoxide	CO	8 hours	9.0	9	10,000	10,000	If exceeded	If exceeded on more than 1 day per year
		1 hour	20	35	23,000	40,000	If exceeded	If exceeded on more than 1 day per year
(Lake Tahoe only)		8 hours	6	-	7,000	-	If equaled or exceeded	-
Nitrogen dioxide	NO ₂	Annual arithmetic mean	0.030	0.053	57	100	If exceeded	If exceeded on more than 1 day per year
		1 hour	0.18	0.100	339	188	If exceeded	-

Pollutant	Symbol	Average Time	Standard (parts per million)		Standard (micrograms per cubic meter)		Violation Criteria	
			California	National	California	National	California	National
Sulfur dioxide	SO ₂	24 hours	0.04	-	105	-	If exceeded	If exceeded on more than 1 day per year
		1 hour	0.25	0.075	655	196	If exceeded	-
		3 hour	-	0.5 ^a	-	1,300 ^a	-	-
Hydrogen sulfide	H ₂ S	1 hour	0.03	-	42	-	If equaled or exceeded	-
Vinyl chloride	C ₂ H ₃ Cl	24 hours	0.01	-	26	-	If equaled or exceeded	-
Inhalable particulate matter	PM10	Annual arithmetic mean	-	-	20	-	-	-
		24 hours	-	-	50	150	If exceeded	If exceeded on more than 1 day per year
	PM2.5	Annual arithmetic mean	-	-	12	15	-	If 3-year average from single or multiple community-oriented monitors is exceeded
		24 hours	-	-	-	35	-	If 3-year average of 98 th percentile at each population-oriented monitor within an area is exceeded
Sulfate particles	SO ₄	24 hours	-	-	25	-	If equaled or exceeded	-
Lead particles	Pb	Calendar quarter	-	-	-	1.5	-	If exceeded no more than 1 day per year
		30-day average	-	-	1.5	-	If equaled or exceeded	-
		Rolling 3-month average	-	-	-	0.15	If equaled or exceeded	Averaged over a rolling 3-month period

^a Refers to a secondary standard only.

Source: California Air Resources Board 2010a

The CAAA requires that all federally funded projects come from a plan or program that conforms to the appropriate State Implementation Plan (SIP) so that they do not interfere with strategies employed to attain the NAAQS. The rule applies to federal projects in areas designated as nonattainment areas for any of the six criteria pollutants and in some areas designated as maintenance areas. Project-level conformance with the SIP is demonstrated through a general conformity analysis.

A general conformity determination would be required if a proposed project's total direct and indirect emissions fail to meet the following condition.

- Emissions for each affected pollutant for which the region is classified as a maintenance or nonattainment area for the national standards are below the *de minimis* levels indicated in Table 3.3-2 and Table 3.3-3.

Table 3.3-2. Federal *de Minimis* Threshold Levels for Criteria Pollutants in Nonattainment Areas

Pollutant	Emission Rate (tons per year)
Ozone (ROG/VOC or NO _x)	
Serious nonattainment areas	50
Severe nonattainment areas	25
Extreme nonattainment areas	10
Other ozone nonattainment areas outside an ozone transport region¹	100
Other ozone nonattainment areas inside an ozone transport region ¹	
ROG/VOC	50
NO _x	100
CO: All nonattainment areas	100
SO ₂ or NO ₂ : All nonattainment areas	100
PM10	
Moderate nonattainment areas	100
Serious nonattainment areas	70
PM2.5	
Direct emissions	100
SO ₂	100
NO _x (unless determined not to be a significant precursor)	100
ROG/VOC or ammonia (if determined to be significant precursors)	100
Pb: All nonattainment areas	25

Source: 40 CFR 51.853.

Notes: *de minimis* threshold levels for conformity analysis.

Bold text indicates pollutants for which the region is in nonattainment and a conformity determination must be made with the corresponding emission threshold.

Ozone Transport Region is comprised of the states of Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, the Consolidated Metropolitan Statistical Area that includes the District of Columbia and northern Virginia (Section 184 of the Clean Air Act).

ROG = reactive organic gas

CO = carbon monoxide

VOC = volatile organic carbon

PM2.5 = particulate matter 2.5 microns in diameter or smaller

NO_x = oxides of nitrogen

PM10 = particulate matter 10 microns in diameter or smaller

SO₂ = sulfur dioxide

Pb = lead

Table 3.3-3 Federal *de Minimis* Threshold Levels for Criteria Pollutants in Maintenance Areas

Pollutant	Emission Rate (tons per year)
Ozone (NO _x , SO ₂ or NO ₂)	
All maintenance areas	100
Ozone (ROG/VOC)	
Maintenance areas inside an ozone transport region ^a	50
Maintenance areas outside an ozone transport region ^a	100
CO: All maintenance areas	100
PM10: All maintenance areas	100
PM2.5	
Direct emissions	100
SO ₂	100
NO _x (unless determined not to be a significant precursor)	100
ROG/VOC or ammonia (if determined to be significant precursors)	100
Pb: All maintenance areas	25

Source: 40 CFR 51.853.

Notes: *de minimis* threshold levels for conformity analysis.

Bold text indicates pollutants for which the region is in maintenance and a conformity determination must be made with the corresponding emission threshold.

^a Ozone Transport Region is comprised of the states of Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, the Consolidated Metropolitan Statistical Area that includes the District of Columbia and northern Virginia (Section 184 of the Clean Air Act).

ROG = reactive organic gas

CO = carbon monoxide

VOC = volatile organic carbon

PM2.5 = particulate matter 2.5 microns in diameter or smaller

NO_x = oxides of nitrogen

PM10 = particulate matter 10 microns in diameter or smaller

SO₂ = sulfur dioxide

Pb = lead

If the above condition is not met, a general conformity determination must be performed to demonstrate that total direct and indirect emissions for each affected pollutant for which the region is classified as a maintenance or nonattainment area for the national standards would conform to the applicable SIP.

If the above condition is met, the requirements for general conformity do not apply, as the Proposed Action is presumed to conform to the applicable SIP for each affected pollutant, and no further analysis or determination is required.

State and Local Regulations

The California Air Resources Board (ARB) and the local air districts have primary implementation responsibility for the NAAQS (Table 3.3-1). The Plan Area lies in two air basins: the Solano County portion of the San Francisco Bay Area Air Basin (SFBAAB) and the Sacramento Valley Air Basin (SVAB). The majority of the project is in an area where the Yolo-Solano Air Quality Management

District (YSAQMD) has enforcement authority for air quality projects. Only the portion of Shiloh IV west of Olsen Road is under the authority of the Bay Area Air Quality Management District (BAAQMD).

In addition to administering air quality regulations adopted at the federal, state, and local levels, the YSAQMD and BAAQMD are also responsible for implementing strategies for air quality improvement and recommending mitigation measures for new growth and development. The YSAQMD, along with other air districts in the Sacramento Valley, adopted a Rate of Progress Plan to attain the national 8-hour ozone standard. The YSAQMD also adopted an Air Quality Attainment Plan in 1992 to address nonattainment with the state ozone standard. The BAAQMD has prepared a 2005 Ozone Strategy and a 2009 Clean Air Plan to reduce ground level ozone and achieve attainment with the 8-hour ozone NAAQS.

Climate Change Regulations

Numerous efforts at legislation at the state and federal levels have resulted in policies with targets for GHG emissions reduction. Climate change research and policy efforts are primarily concerned with the emissions of GHG related to human activity.

The State of California has several existing programs in place that reduce and minimize GHG emissions.

- AB 1493 requires ARB to implement regulations to reduce automobile and light truck GHG emissions. On May 18, 2009, President Obama announced the enactment of a 35.5 miles per gallon (mpg) fuel economy standard for automobiles and light duty trucks to take effect in 2012.
- Executive Order S-3-05 is designed to reduce California's GHG emissions to: (1) 2000 levels by 2010, (2) 1990 levels by 2020 and (3) 80% below 1990 levels by 2050.
- AB 32, the Global Warming Solutions Act of 2006, sets the same overall GHG emissions reduction goals as S-3-05 while further mandating that ARB create a plan, which includes market mechanisms, and implement rules to achieve "real, quantifiable, cost-effective reductions of greenhouse gases." Executive Order S-20-06 further directs state agencies to begin implementing AB 32, including the recommendations made by the state's Climate Action Team.
- Senate Bills 1078/107, California's Renewable Portfolio Standard (RPS), obligates investor-owned utilities (IOUs), energy service providers (ESPs), and Community Choice Aggregations (CCAs) to procure an additional 1% of retail sales per year from eligible renewable sources until 20% is reached, no later than 2010. California Senate Bill 2 X1 sets forth a longer range target of procuring 33% of retail sales by 2020. This bill passed the legislature on March 29, 2011, and was signed by Governor Brown on April 12, 2011.
- State CEQA Guidelines require lead agencies to describe, calculate, or estimate the amount of GHG emissions resulting from a project. Moreover, the guidelines emphasize the necessity to determine potential climate change effects of the project and propose mitigation as necessary.

Climate change and GHG reduction are also a concern at the federal level. On December 7, 2009, the EPA Administrator found that current and projected concentrations of GHGs threaten the public health and welfare. Although this Endangerment Finding in itself does not place requirements on industry, it is an important step in EPA's process to develop regulation of GHGs through the CAA.

The CEQ has also issued a memorandum (Draft Guidance) providing guidance on the consideration of the effects of climate change and GHG emissions under NEPA. The Draft Guidance suggests that the effects of projects directly emitting GHGs in excess of 25,000 metric tons annually be considered in a qualitative and quantitative manner. Although the Draft Guidance provides 25,000 tons as a reference point, it does not propose it as a threshold for determining significance (Sutley 2010). Consequently, at this time, no legislation or binding regulations have been enacted specifically addressing GHG emissions reduction and climate change. Additionally, as discussed later in this chapter, the Proposed Action will generate 154 tons of GHGs annually, considerably less than the 25,000 tons outlined as a reference point in the draft guidance.

3.3.2 Environmental Setting

Climate and Meteorology

The climate in the Plan Area is characterized by the transition between the San Francisco Bay Area and the Sacramento Valley—cool air flowing from the Pacific Ocean and San Francisco Bay through the Carquinez Strait, where it mixes with warm air in the Sacramento Valley. This difference in temperature and atmospheric surface pressure circulation results in strong winds, dry summers, and rainy winters. From November to March, average temperatures recorded at Rio Vista range from lows of 37–44°F to highs of 53–65°F. From April to October, average temperatures range from lows of 47–58°F to highs of 71–91°F. When temperatures are highest, precipitation is lowest—averaging 0.3 inch in July and August. In winter, average precipitation ranges from 1.7 inches in November to 2.72 inches in January.

Local Monitoring Data

The existing air quality conditions in the Plan Area can be characterized by monitoring data collected in the region. The nearest air quality monitoring station is the Fairfield-Chadbourne monitoring station, approximately 13 miles northwest of the Plan Area. The Fairfield-Chadbourne station only monitors for 1-hour ozone. The next closest station is the Vallejo monitoring station, approximately 20 miles to the west. The Vallejo station is located within a different subregion of the SFBAAB than the Plan Area and has a different microclimate. It therefore does not appropriately characterize local air quality conditions in the Plan Area. Consequently, monitoring data for PM10, PM2.5, and CO were not available. Table 3.3-4 summarizes air quality monitoring data from the Fairfield-Chadbourne station for the last 3 years for which complete data are available (2007–2009). As shown in Table 3.3-4, the Fairfield-Chadbourne monitoring station has experienced occasional violations of the state and federal ozone standards.

Attainment Status

Areas are classified as either attainment or nonattainment with respect to state and federal ambient air quality standards. If a pollutant concentration is lower than the state or federal standard, the area is classified as being in *attainment* of the standard for that pollutant. If a pollutant violates the standard, the area is considered a *nonattainment* area. If data are insufficient to determine whether a pollutant is violating the standard, the area is designated *unclassified*. Unclassified designations are typically applied to urbanized areas where levels of the pollutant are not a concern. Areas that were previously designated as nonattainment areas but that have recently met the standard are called *maintenance* areas.

Table 3.3-4. Ambient Air Quality Monitoring Data Measured at the Fairfield-Chadbourne Monitoring Station

	2007	2008	2009
1-Hour Ozone (Fairfield-Chadbourne)			
Maximum 1-hour concentration (parts per million [ppm])	0.089	0.116	0.104
1-hour California designation value	0.10	0.10	0.10
1-hour expected peak day concentration	0.100	0.103	0.099
Number of days standard exceeded ^a			
CAAQS 1-hour (>0.09 ppm)	0	2	2
8-Hour Ozone (Fairfield-Chadbourne)			
National maximum 8-hour concentration (ppm)	0.067	0.090	0.085
National second-highest 8-hour concentration (ppm)	0.067	0.071	0.083
State maximum 8-hour concentration (ppm)	0.068	0.090	0.085
State second-highest 8-hour concentration (ppm)	0.067	0.071	0.084
8-hour national designation value	0.066	0.068	0.067
8-hour California designation value	0.077	0.077	0.085
8-hour expected peak day concentration	0.081	0.084	0.085
Number of days standard exceeded ^a			
NAAQS 8-hour (>0.075 ppm)	0	1	2
CAAQS 8-hour (>0.070 ppm)	0	2	5

Sources: California Air Resources Board 2010b; U.S. Environmental Protection Agency 2010a.

Notes: CAAQS = California ambient air quality standards.
 NAAQS = national ambient air quality standards.
 - = insufficient data available to determine the value.

An exceedance is not necessarily a violation.

National statistics are based on standard conditions data. In addition, national statistics are based on samplers using federal reference or equivalent methods.

State statistics are based on local conditions data, except in the South Coast Air Basin, for which statistics are based on standard conditions data. In addition, State statistics are based on California approved samplers.

Measurements usually are collected every 6 days.

State criteria for ensuring that data are sufficiently complete for calculating valid annual averages are more stringent than the national criteria.

Mathematical estimate of how many days' concentrations would have been measured as higher than the level of the standard had each day been monitored. Values have been rounded.

Table 3.3-5 summarizes the attainment status of Solano County with regard to the NAAQS and CAAQS.

Based on the attainment status of the SFAAB portion of Solano County, a federal conformity analysis will be required to determine if project-level emissions exceed *de minimis* thresholds for ozone, CO, and PM_{2.5} (Table 3.3-2 and Table 3.3-3).

Table 3.3-5. Federal and State Attainment Status of Solano County

Pollutant	NAAQS	CAAQS
1-hour ozone	-	Serious nonattainment
8-hour ozone	Marginal nonattainment ^a	Nonattainment
CO	Moderate maintenance ^b	Attainment
PM2.5	Nonattainment ^a	Nonattainment ^a
PM10	Unclassified/Attainment	Nonattainment

Sources: California Air Resources Board 2010c; U.S. Environmental Protection Agency 2010b

- = no applicable standard.

^a Applies to the SFBAAB portion of the County within the BAAQMD.

^b Applies to urbanized areas (50 Federal Register 12540, March 29, 1985) in the SFBAAB portion of the County within the BAAQMD.

Sensitive Receptors

A sensitive receptor is generally defined as a facility or land use that houses or attracts members of the population that are particularly sensitive to the effects of air pollutants, such as children, the elderly, and people with illnesses. Examples of sensitive receptors include schools, hospitals, convalescent facilities, and residential areas. The land surrounding the Plan Area is primarily used for grazing, pasture, and food crop production. Scattered rural residences are located within the Plan Area. Bird's Landing, which includes residences and Willow Springs School, is immediately adjacent to the project's western boundary. Scattered rural residences are located within the Plan Area. The Collinsville community is approximately 1.5 miles to the southwest, and the City of Rio Vista is approximately 9 miles to the northeast.

3.3.3 Environmental Consequences

3.3.3.1 Approach and Methods

As discussed in Chapter 2, the Proposed Action would require the construction of access roads, foundations for the wind turbines, towers, support facilities, and underground power lines. Emissions associated with these activities were estimated using information supplied by the project applicant (Lazarus pers. comm.), and the URBEMIS2007, Version 9.2.4 model, the currently accepted model for estimating emissions.

Once construction is complete, the wind turbines would require routine inspection and maintenance. Criteria pollutant emissions associated with workforce traffic and routine maintenance were estimated using URBEMIS2007. The project will also employ a diesel-powered back-up generator, and require routine upkeep of the operations facility. These sources are located in the SVAB portion of Solano County.

The Proposed Action would be considered to have an adverse effect on air quality and climate change if it would result in any of the conditions listed below.

- Exceed federal *de minimis* thresholds for ozone, CO, or PM2.5 (Tables 3.3-2 and 3.3-3).
- Generate a significant level of GHGs that exceeds local or federal air quality thresholds.

- Expose sensitive receptors to a substantial amount of diesel particulate matter (DPM).

3.3.3.2 Effects

Proposed Action

Impact AQ-1: Generation of emissions in excess of federal *de minimis* thresholds

Construction activities associated with the Proposed Action would generate short-term emissions of ROG, NO_x, CO, PM₁₀, and PM_{2.5}. Emissions would originate from mobile and stationary construction equipment exhaust, employee vehicle exhaust, and dust from site grading. Construction-related emissions would vary depending on the level of activity, specific construction operations, types of equipment, number of personnel, and climatic conditions.

Construction of the Shiloh IV project is scheduled to begin in April 2012 and would require up to 9 months to complete. Work would occur 7 days per week. Based on the information provided by the project applicant (Lazarus pers. comm.), the following scheduling assumptions were made.

- Phase 1: Laydown yard (April 15, 2012—May 5, 2012).
- Phase 2: Road construction (April 15, 2012—August 4, 2012).
- Phase 3: Foundation construction and electrical (May 6, 2012—August 25, 2012).
- Phase 4: Turbine installation and delivery (July 1, 2012—September 22, 2012).
- Phase 5: Electrical trenching (August 5, 2012—November 10, 2012).
- Phase 6: Cleanup (September 23, 2012—December 29, 2012).

Site grading would occur during Phases 1 and 2. It was assumed that an area of approximately 7 acres would be disturbed during Phase 1 and 31 acres would be disturbed during Phase 2. No more than one-quarter of the total area would be disturbed per day during each of the phases. All fill material would be used onsite (i.e., there would be no import or export of soil). No paving is required during construction.

Table 3.3-6 summarizes the equipment assumed in the emissions modeling. Equipment horsepower values were based on information received from the project applicant (Lazarus pers. comm.). Please refer to the *Air Quality and Climate Change Technical Study for the Shiloh IV Wind Project* Appendix A (ICF International 2011c) for model outputs.

Table 3.3-6. Summary of Construction Equipment

Phase	Equipment	Quantity	Horsepower	Load Factor	Hours per Day	Total Days
Phase 1	Grader	1	275	0.61	9	18
	Scraper	2	181	0.59	9	18
	Scraper	1	330	0.56	9	12
	Roller	1	153	0.56	9	18
	Water Truck	1	189	0.50	9	18
Phase 2	Grader	2	275	0.61	4.5	70
	Scraper	2	181	0.59	9	80
	Scraper	2	330	0.56	4.5	80
	Roller	1	153	0.56	9	60

Phase	Equipment	Quantity	Horsepower	Load Factor	Hours per Day	Total Days
Phase 3	Water Truck	1	189	0.50	9	80
	Crane	1	152	0.43	5	20
	Excavator	2	222	0.07	8	60
	Loader	1	140	0.68	8	80
	Dozer	1	275	0.59	8	60
Phase 4	Forklift	3	153	0.30	6.7	80
	Crane	5	250	0.43	4.4	14
	Crawler	1	330	0.43	11	55
	Crawler	2	450	0.43	12	55 ^a
	Forklift	4	60	0.03	12	40
	Grader	1	165	0.61	10	20
Phase 5	Dozer	2	140	0.59	10	20
	Grader	2	165	0.61	4.5	70
	Dozer	1	140	0.59	9	70
Phase 5	Loader	1	210	0.68	8	70
	Phase 6	Grader	1	275	0.61	4.5

^a One crawler will operate for 55 days, while the other will operate for 25.

Emissions from on-road workforce traffic were estimated using the URBEMIS2007 emissions model and the total number of personnel required to complete construction activities. It is estimated that approximately 100 workers would be required per phase, and that up to 300 workers would be required during periods of phase overlap. It was assumed that each employee will make two trips to the construction site per day. For the purposes of this analysis, it was assumed employees would travel from Fairfield, which is approximately 18 miles from the Plan Area. Employee commute distances were therefore assumed to be 18 miles.

Material and equipment delivery would occur during the six construction phases. A specific number of truck trips required to complete construction-related activities was not available. Consequently, assumptions made for the Shiloh III Wind Project were used to inform the construction analysis, based on guidance provided by the project applicant (Lazarus pers. comm.). According to the environmental analysis conducted for Shiloh III, 1,475 haul trips were assumed to occur during site preparation and 8,116 trips were assumed to occur during facility installation.¹ Because the Proposed Action is smaller than Shiloh III², and would likely require fewer trips for materials delivery, utilizing these estimates represents a conservative analysis. Round-trip haul truck distances from Fairfield were assumed to be 40 miles.

Turbine construction falls within the jurisdictions of the BAAQMD (SFBAAB) and YSAQMD (SVAB). Consequently, total modeled emissions associated with construction of Phases 3-6 were apportioned to each air district based on the number of turbines sited in each air district. Apportioning emissions by the number of turbines is required to accurately characterize the level of activity occurring within each air district.

Access roads and collector lines cannot be divided between the two air districts in the same proportion as done for the wind turbines, as a greater percentage of access roads will be located in

¹ Site preparation is defined as Phases 1 and 2 for the Proposed Action. Facility installation is defined as Phases 3 through 6.

YSAQMD, despite the small percentage of turbines in that area. Thus, emissions during Phase 2 (road construction) were scaled by the number of linear roadway miles to be removed and constructed in each district. Construction activities associated with Phase 1 (laydown yard) were apportioned to the YSAQMD, as the laydown yard is located solely within the YSAQMD.

Maintenance for each turbine will be required on a routine basis. It was assumed that 200 vehicle trips per year would be required to complete all necessary maintenance (Lazarus pers. comm.). Commute trip lengths were assumed to be 18 miles, as discussed above.³

As discussed above, the SFBAAB portion of Solano County is considered nonattainment for the federal ozone and PM_{2.5} NAAQS, and maintenance for the federal CO standard. In accordance with the CAAA, the Proposed Action must therefore be shown not to exceed federal *de minimis* thresholds for these pollutants and their precursors. Table 3.3-7 provides a summary of annual emissions associated with the Proposed Action.

Table 3.3-7. Summary of Annual Emissions for Nonattainment and Maintenance Pollutants (tons per year)

Source	ROG	NO _x	CO	PM _{2.5}
Emissions generated within the SFBAAB portion of Solano County				
Construction (2012) ^a	0.85	6.66	11.63	1.14
Operations (2013–2043)	0.00	0.00	0.01	0.00
<i>de minimis</i> threshold	100	100	100	100
Adverse?	No	No	No	No

^a The analysis originally assumed construction electricity would be supplied by one diesel-powered generator operating for 2 hours per day. Since completion of the original emissions modeling, the project description has been revised with the assumption that the generators would be replaced with electricity supplied by the grid. Consequently, the emissions presented above may slightly overestimate actual emissions levels. Inclusion of the generator in the analysis has a minimal effect on overall emissions and does not influence the significance determination.

Based on the results presented in Table 3.3-7, emissions are well below the federal *de minimis* thresholds. Therefore, the project satisfies federal conformity without a general conformity analysis. Further, EC-6 requires implementation of standard construction and operations emission control measures and EC-7 ensures development and implementation of a construction fugitive dust control plan. This impact is not considered to be significantly adverse.

Impact AQ-2: Generation of a significant level of greenhouse gas emissions

GHGs can be divided into those generated during construction and those generated during project operations.

² Shiloh III involved the installation of 59 turbines.

³ Emissions generated by vehicle trips for routine inspection were apportioned to the SVAB, as employees would be traveling to the maintenance facility, which is on the eastern edge of the project site. Likewise, emissions from the back-up generator and facility upkeep were assigned to the SVAB.

Construction

GHG emissions from construction activities are primarily the result of fuel use by construction equipment, as well as worker and vendor trips. To date, specific thresholds to evaluate adverse effects pertaining to GHG emissions have not been established by the federal government (see *Regulatory Setting* under Section 3.3.1, *Affected Environment*). However, this absence of thresholds does not negate NEPA's mandate to evaluate all potentially adverse effects associated with the Proposed Action. Consequently, for this analysis, an adverse effect related to GHG emissions is a net increase in GHG emissions for the project in its entirety (i.e., construction and operations considered together), compared to baseline emissions.

Emissions from construction are a result of fuel combustion from heavy-duty equipment and employee vehicle travel, as well as on-site electricity consumption. These emissions are emitted only during construction and are therefore considered short-term.

CO₂ emissions from equipment and employee commutes were estimated using URBEMIS2007 and assumptions described above. URBEMIS does not quantify CH₄ and N₂O emissions from off-road equipment or worker/vendor commutes. Emissions of CH₄ and N₂O from diesel equipment were determined by scaling the construction CO₂ emissions predicted by URBEMIS by the ratio of CH₄/CO₂ and N₂O/CO₂ emissions expected per gallon of diesel fuel according to the Climate Action Registry General Reporting Protocol Version 3.1 (California Climate Action Registry 2009). GHG emissions from worker and vendor commutes were determined by dividing the annual CO₂ emissions from construction worker and vendor commutes by 0.95. This statistic is based on EPA's recommendation that CH₄, N₂O, and hydrofluorocarbons (HFC) emissions account for 5% of on-road GHG emissions, accounting for global warming potential (U.S. Environmental Protection Agency 2011a).

Construction activities would require the use of electricity to power equipment (as necessary) and trailers. Based on electric demand for similar wind projects, construction of the project was assumed to require 246,857 kWh.⁴ GHG emissions would be generated through the distribution and transmission of this electricity. The project would receive power from Pacific Gas and Electric Company (PG&E). Currently, PG&E only has an emission factor for CO₂—0.537 pounds per kWh (Strum pers. comm.). Because PG&E does not have emission factors for CH₄ and N₂O, state-specific factors of 0.028 and 0.006 pounds per MWh, respectively, were obtained from EPA's eGrid database (2011b). GHG emissions associated with the generation of electricity were estimated by multiplying the expected annual electricity usage by the calculated emission factors.

Table 3.3-8 summarizes construction-related GHG emissions in metric tons.⁵

⁴ The Montezuma II Wind Project, which is located near the project site in Solano County, will require a total of 192,000 kWh over a seven month construction period. This project is an appropriate proxy for energy use consumed during construction for Shiloh IV as it will erect turbines of a similar capacity, is located within the same geographical area, and involves a similar construction timeframe. Based on Montezuma II's electrical usage, project energy requirements were calculated assuming an electrical demand of 27,429 kWh per month (192,000 kWh/7 months). Note that the Shiloh III Wind Project, which was used as a basis for the diesel powered delivery truck assumptions above, did not include an analysis of construction-related electricity. Consequently, it could not be used as a proxy for electrical demand.

⁵ Per standard air quality impact analysis practices, the construction analysis does not include emissions generated indirectly during the production and manufacturing of the wind turbines. These processes would produce GHG emissions from activities such as energy consumption and equipment transport. All new energy generation facilities have embedded production GHG emissions; these emissions are not factored into air quality analysis because of the variability of the data on processing, materials production, and country of origin and

As shown in Table 3.3-8, construction of the Proposed Action will generate 2,926 total metric tons of GHG emissions, which is equivalent to adding 585 typical passenger vehicles to the road during the construction period (U.S. Environmental Protection Agency 2011a).

Table 3.3-8. Summary of GHG Emissions from Construction Activities (metric tons)

Year	Diesel Equipment ^a			Gasoline Vehicles		Electricity			CO ₂ e
	CO ₂	CH ₄	N ₂ O	CO ₂	Other	CO ₂	CH ₄	N ₂ O	
2012	1,158	0.07	0.03	1,619	77	60	0.003	0.001	2,926

^a The analysis originally assumed construction electricity would be supplied by one diesel-powered generator operating for 2 hours per day. Since completion of the original emissions modeling, the project description has been revised with the assumption that the generators would be replaced with electricity supplied by the grid. Consequently, the emissions presented above may slightly overestimate actual emissions levels. Inclusion of the generator in the analysis has a minimal effect on overall emissions and does not influence the significance determination.

Operation

CO₂ emissions from employee commutes and the back-up generator were estimated using the assumptions described above under “criteria pollutants.” CH₄ and N₂O emissions were determined by scaling the construction CO₂ emissions by the California Climate Action Registry ratios.

The maintenance facility would require 15,000 kWh of electricity annually (Lazarus pers. comm.). As discussed above, the project would receive power from PG&E. GHG emissions associated with the generation of electricity were estimated by multiplying the expected annual electricity usage by the energy emission factors for PG&E and the state (discussed above).

In addition to electricity consumption, the maintenance facility would generate minor amounts of high global warming potential (GWP) gases (high GWP GHGs) through the use of refrigeration and air conditioning units and electrical insulation for power distribution equipment. It was assumed that the building would contain one central air conditioning unit and one refrigerator (Lazarus pers. comm.). These appliances are sources of HFCs, used as substitute refrigerants for chlorofluorocarbons (CFCs), which have been phased out of use under the Montreal Protocol. Emissions of HFCs were estimated using recent studies that document refrigerant types, GWPs, charge sizes, and leak rates (Intergovernmental Panel on Climate Change/Technology & Economic Assessment Panel 2005; United Nations Environment Programme 2006; World Bank 2007).

Table 3.3-9 presents the assumptions used to quantify HFC emissions. Annual emissions were calculated by multiplying the number of equipment pieces by the charge size, leak rate, and GWP of the associated HFC refrigerant installed in the refrigeration and AC units.

Table 3.3-9. Assumptions for Annual Project-Related Emissions of HFCs from Refrigeration and Air Conditioning

Equipment Type	Refrigerant	GWP	Charge Size (kg)	Leak Rate
Refrigerators/freezer	R-134a	1430	0.10	0.90%

emission controls. Moreover, it is anticipated that the manufacturer would be responsible for reporting and reducing GHG emissions associated with manufacture of the turbines.

Central AC Unit	R-134a	1430	450	1.00%
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Sources: Chapter 3 Intergovernmental Panel on Climate Change/Technology & Economic Assessment Panel 2005; World Bank 2007; United Nations Environment Programme 2006.

The Proposed Action includes installation of an electrical substation in the southeast corner of the Plan Area. Deterioration of sulfur hexafluoride (SF₆)-containing equipment fittings and materials can lead to leaks over time. An analysis of 2,300 high voltage circuit breakers conducted by EPA and ICF revealed a lower- and upper-bound average leak rate of 0.2–2.5%, respectively (U.S. Environmental Protection Agency and ICF International 2002). It is assumed the electrical substation would be equipped with six circuit breakers with an SF₆ storage capacity of 60 pounds each. Fugitive emissions of SF₆ were calculated using the conservative leak rate of 2.5%.

Table 3.3-10 summarizes GHG emissions associated with project operation. As discussed above, operation of the Proposed Action is expected to begin in January 2013. Emissions presented in Table 16 will be generated annually during the project's 30 year lifetime.

Table 3.3-10. Summary of Operational-Related GHG Emissions (metric tons)

Source	CO ₂	CH ₄	N ₂ O	R-134a	SF ₆	CO ₂ e
Generator	8.37	0.00	0.00	-	-	8
Vehicle travel	32.37	1.54		-	-	34
Electricity consumption	3.66	0.19	0.00	-	-	8
AC/refrigeration	-	-	-	0.005	-	6
Electrical substation	-	-	-	-	0.004	98
Total ^a	44.40	1.73		0.005	0.004	154

- Pollutant is not generated by this source.

^a Emissions generated annually until project decommissioning (30-year project lifetime).

Operation of the Proposed Action would generate a maximum of 154 metric tons of GHG emissions per year, which is equivalent to adding 31 typical passenger vehicles to the road each year in which the project is in operation (U.S. Environmental Protection Agency 2011a).

Summary of GHG Emissions

The ultimate purpose of the Proposed Action is to deliver renewable energy to meet California's RPS goals. The 50 wind turbines proposed would have a generation capacity to 100 MW. Assuming an operational efficiency of 35%, the Shiloh IV project has the potential to deliver 306.6 million kWh⁶ of renewable electricity per year. If emissions generated by traditional energy sources (e.g., fossil fuels) remained constant at current levels, implementation of the Proposed Action could offset production of 75,094 metric tons of CO₂e per year.⁷ Accounting for construction and operational emissions, the project has the potential to offset over 2.2 million metric tons of CO₂e over its 30-year lifetime (Table 3.3-11).

⁶ Calculated according to the following equation: $((100 \text{ MW} * 365 \text{ days per year} * 24 \text{ hours per day}) * 35\%) * 1,000 \text{ kWh per MWh}$.

⁷ Calculated by multiplying the PG&E and state-specific emission factors (see discussion above) for electricity consumption by the anticipated annual generation capacity.

While innovations in energy efficiency and renewable energy standards (e.g., RPS) will likely reduce future emissions generated by traditional energy sources, the Proposed Action would nevertheless result in a cumulative reduction in long-term GHG emissions (Table 3.3-11). The 7,548 metric tons of CO₂e emitted during the lifetime of the Proposed Action would thus be offset by the Proposed Action's contribution to the ongoing production of renewable energy in place of traditional energy facilities. Consequently, the Proposed Action would neither exceed the BAAQMD threshold nor result in a significant impact on climate change.

Table 3.3-11. Summary of Lifetime GHG Emissions and Reductions (metric tons)

Activity	Total CO ₂ e
Construction emissions	2,926
Project operational emissions ^a	4,622
Subtotal direct project emissions	7,548
Avoided emissions from elimination of fossil fuel electricity generation ^b	2,252,817
Net reduction in GHG emissions	2,245,269

^a Represents total emissions over the 30 year project lifetime, assuming 154 metric tons of CO₂e would be emitted each year.

^b Represents total emissions over the 30 year project lifetime, assuming 75,094 metric tons of CO₂e would be offset each year.

Impact AQ-3: Expose sensitive receptors to substantial amounts of diesel particulate matter

DPM, which is classified as a carcinogenic TAC by ARB, is the primary pollutant of concern with regard to health risks to sensitive receptors. Cancer health risks associated with exposure to diesel exhaust are typically associated with chronic exposure, in which a 70-year exposure period is assumed. In addition, DPM concentrations, and thus cancer health risks, dissipate as a function of distance from the emissions source. The BAAQMD has determined that construction activities occurring at distances of greater than 1,000 feet from a sensitive receptor likely do not pose a significant health risk.

There are scattered rural residencies within the Plan Area, which may be located within 1,000 feet of construction. Due to safety regulations, the project's wind turbines cannot be placed closer than 723 feet from any sensitive receptors. The distance was determined based on a blade throw study conducted for the project and was the worst case (i.e., closest) distance. Because construction may occur within 1,000 feet of sensitive receptors, a screening-level health risk assessment (HRA) was performed to ascertain whether increased cancer risks to residential receptors would exceed the BAAQMD's thresholds of significant (Please refer to the *Air Quality and Climate Change Technical Study for the Shiloh IV Wind Project* Appendix B [ICF International 2011c]). The results of the HRA are summarized in Table 3.3-12 and demonstrate that the BAAQMD's thresholds would not be exceeded at the nearest maximum exposed individual (MEI) receptor location, which is defined as a residential receptor located 723 feet from multiple turbine construction sites. This impact is not considered to be significantly adverse.

Table 3.3-12. HRA Screening Analysis Results

Parameter	Cancer Risk to DPM	hazard index	PM2.5 concentration
Project Risk ^a	1.71 in 1 million	0.043 (unitless)	0.194 µg/m ³
<i>BAAQMD Threshold</i>	<i>10 in 1 million</i>	<i>1.0 (unitless)</i>	<i>0.3 µg/m³</i>
Significant?	No	No	No

^a Project risk is measured at the MEI receptor location, which is defined as a residential receptor located 723 feet from multiple turbine construction sites
Please refer to Appendix B for modeling procedures

No Action

Under the No-Action Alternative, the Proposed Action would not be implemented. Consequently, no construction or operational emissions would be generated. Also under the No-Action Alternative, the Proposed Action would not offset fossil fuel electrical generation, and therefore a net reduction in GHG emissions totaling 2,245,269 tons would not occur. The No-Action Alternative would not provide the GHG emission reductions of the project and would be environmentally worse from a climate change perspective, but because the No-Action Alternative represents existing baseline conditions, it is assumed to result in no adverse effect on air quality or climate change.

3.3.4 References Cited

3.3.4.1 Printed References

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3.3.4.2 Personal Communication

- Lazarus, Josh. Permitting Specialist. enXco—an EDF Energies Nouvelles Company, San Ramon, California. April 14, 2011—email message to Laura Yoon, ICF International.

3.4 Biological Resources

This section describes the existing conditions pertaining to biological resources and the potential environmental consequences that could result from implementation of the Proposed Action. Information in this section is summarized from a separate biological resources report prepared for the Shiloh IV project (ICF International 2011d).

3.4.1 Affected Environment

For the purposes of this analysis, the *study area* comprises the Plan Area plus a 250-foot buffer.

3.4.1.1 Regulatory Setting

Federal Endangered Species Act

USFWS has jurisdiction over species listed as threatened or endangered under ESA. Because there is no federal nexus for the proposed Shiloh IV project, consultation with USFWS, including preparation of an HCP for potential impacts on CTS (federally listed as threatened), has been initiated pursuant to Section 10 of the ESA; as discussed in Chapter 1, this EA has been prepared to evaluate the environmental effects of implementation of the HCP, approval of which—and issuance of the associated ITP—constitute the federal nexus triggering NEPA compliance.

Section 404 of the Clean Water Act

The U.S. Army Corps of Engineers (USACE) and EPA regulate the discharge of dredged or fill material into waters of the United States under Section 404 of the federal Clean Water Act (CWA). Project proponents must obtain a permit from USACE for all discharges of fill material into waters of the United States, including wetlands, before proceeding with a proposed action.

Waters of the United States are defined in the CFR as:

- (1) all waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide;
- (2) all interstate waters including interstate wetlands;
- (3) all other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation, or destruction of which could affect interstate or foreign commerce including any such waters...;
- (4) all impoundments of waters otherwise defined as waters of the United States under the definition;
- (5) tributaries of waters identified in paragraphs (a)(1)–(4) of this section;
- (6) the territorial seas; and
- (7) wetlands adjacent to waters (other than waters that are themselves wetlands) identified in paragraphs (a)(1)–(6) of this section (33 CFR § 328.3).

Wetlands are defined for regulatory purposes in the CFR as areas “inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal conditions do support, a prevalence of vegetation typically adapted for life in saturated soil conditions” (33 CFR 328.3, 40 CFR 230.3). To be considered subject to federal jurisdiction, a wetland must normally exhibit positive indicators for three distinct features: hydrophytic vegetation, hydric soil, and wetland hydrology (Environmental Laboratory 1987; U.S. Army Corps of Engineers 2008).

Although a majority, if not all, of the wetlands in the study area would likely be considered jurisdictional by USACE, relatively recent federal rulings (January 9, 2001, *Solid Waste Agency of Northern Cook County [SWANCC] vs. United States Army Corps of Engineers* (121 S.Ct. 675, 2001)) may affect whether some wetlands are considered jurisdictional. However, for the purposes of this report and when determining effects on waters of the United States, it is assumed that all potential waters would be considered jurisdictional by USACE. If the project would affect potential waters, a final determination on the jurisdiction of those waters must be made through consultation with USACE.

Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA) (16 United States Code [USC] 703) protects migratory birds, their occupied nests, and their eggs (16 USC 703, 50 CFR 21, 50 CFR 10). Most actions that result in taking of or the permanent or temporary possession of a protected species constitute violations of the MBTA. USFWS is responsible for overseeing compliance with the MBTA. Most bird species and their occupied nests that occur in the Plan Area would be protected under the MBTA.

Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act (BGEPA) makes it illegal to import, export, take (which includes molest or disturb), sell, purchase, or barter any bald eagle (*Haliaeetus leucocephalus*) or golden eagle (*Aquila chrysaetos*), or parts thereof. USFWS oversees enforcement of this act. The 1978 amendment authorizes the U.S. Secretary of the Interior to permit the taking of golden eagle nests that interfere with resource development or recovery operations.

With the removal in 2007 of bald eagle from the list of threatened and endangered species, USFWS issued new regulations to authorize the limited take of bald eagles and golden eagles under the BGEPA, where the take to be authorized is associated with otherwise lawful activities. USFWS proposed the regulations on June 5, 2007 (72 FR 31141), and provided a 90-day comment period, which closed on September 4, 2007. A draft EA of the action was released on August 14, 2008 (73 FR 47574) and reopened the public comment period on the proposed rule with some revisions noted in the Federal Register (FR). A final rule was published on September 11, 2009 (74 FR 46836).

The permits will authorize limited, non-purposeful take of bald and golden eagles, authorizing individuals, companies, government agencies (including tribal governments), and other organizations to disturb or otherwise take eagles in the course of conducting lawful activities such as operating utilities and airports. Most permits issued under the new regulations would authorize disturbance. In limited cases, a permit may authorize the physical take of eagles, but only if every precaution is taken to avoid physical take.

The USFWS published *Draft Eagle Conservation Plan Guidance* in the federal register on February 18, 2011 and solicited public comments through May 19, 2011 (76 FR 9529). The draft guidance document outlines the USFWS's approach to issuing programmatic eagle take permits under the BGEPA and provides guidance to project proponents for the development of Eagle Conservation Plans (ECP's) to support issuance of take permits. The USFWS is currently in the process of reviewing public comments received on the draft guidance and adoption of final guidance is not anticipated until 2012. USFWS expects Shiloh IV to apply for a BGEPA permit prior to the Shiloh IV Wind Project becoming operational.

3.4.1.2 Environmental Setting

Biological Communities

Agricultural Lands

Dryland farming and livestock grazing are the dominant land uses in the Plan Area. Approximately 3,347 acres (98%) of the Plan Area is in wheat production or preparation for wheat production. Farmers in the Montezuma Hills typically use a 1- to 3-year crop rotation cycle, where grazing and fallow years follow planting and harvesting (Allen pers. comm.).

Depending on the crop pattern and their proximity to native habitats, agricultural lands (particularly fallow croplands) can provide relatively high-value foraging habitat for avian wildlife. Raptor species such as red-tailed hawk (*Buteo jamaicensis*), American kestrel (*Falco sparverius*), prairie falcon (*Falco mexicanus*), barn owl (*Tyto alba*), and great horned owl (*Bubo virginianus*) use agricultural lands for foraging because rodents often congregate in these fields. Ground-feeding granivorous passerines such as savannah sparrow (*Passerculus sandwichensis*), western meadowlark (*Sturnella neglecta*), Brewer's blackbird (*Euphagus cyanocephalus*), and red-winged blackbird (*Agelaius phoeniceus*) also forage in the stubble and disked crop fields. While agricultural practices can make the area attractive foraging habitat, the routine disturbance associated with agricultural practices can also make the area unsuitable for nesting by groundnesting species and for terrestrial species such as California ground squirrels (*Spermophilus beecheyi*) and western burrowing owls (*Athene cunicularia hypugea*). Such species are often extirpated from cultivated areas or only remain in portions that escape cultivation such as along fences or near wetlands and drainages.

Annual Grassland

Annual grassland is limited in the Plan Area to a few small areas totaling approximately 80 acres (2% of the total Plan Area), primarily adjacent to Birds Landing Road and to wetland areas in the northern portion of the Plan Area. These small patches of grassland are currently being utilized for grazing or as staging areas for farming operations. Annual grassland habitat such as that found in the Plan Area is relatively uncommon in the Montezuma Hills region because most areas in the region are under intensive cultivation.

The annual grassland in the study area is dominated by nonnative annual grasses such as ripgut brome (*Bromus diandrus*), soft chess (*Bromus hordeaceus*), and Italian ryegrass (*Lolium multiflorum*). No native grasses appear to be present. Annual grassland in the study area also supports a forb flora that includes filaree (*Erodium* spp.), fiddleneck (*Amsinckia menziesii* var. *intermedia*), yellow star-thistle (*Centaurea solstitialis*), and scattered native perennial and annual forbs. Annual grasslands can provide valuable nesting and foraging habitat for many wildlife species and foraging and resting habitat for migrating and wintering birds.

Eucalyptus and Ornamental Trees

Eleven groves (defined for the purposes of this document as 2 or more adjacent trees) of eucalyptus and other ornamental trees, comprising approximately 15 acres, are present in the Plan Area. These groves are typically found around residences or abandoned homesteads and were planted as windbreaks or for landscaping.

Eucalyptus and other ornamental trees can provide roosting and nesting habitat for a variety of raptor species such as red-tailed hawk, great horned owl, golden eagle (*Aquila chrysaetos*), and barn owl, as well as passerines and other birds.

Wetland and Aquatic Resources

Three types of wetlands and other waters are present in the Plan Area. Each of these types is discussed below; their locations are shown in Figure 3.4-1. All these features could potentially qualify as waters of the United States (including wetlands).

Alkali Meadow

Alkali meadow habitats are uncommon in the Plan Area, occurring at two locations along a proposed collection line route. In total, they occupy approximately 3 acres (less than 1% of the total Plan Area). Generally, they occur in low, uncultivated areas. Typical vegetation consists of saltgrass (*Distichlis spicata*), fiddle dock (*Rumex pulcher*), and Mediterranean barley (*Hordeum marinum ssp. gussoneanum*), with a seasonal moisture regime.

Alkali meadows, when present, typically occur within a mosaic of other types of wetlands (described below), and thus can provide habitat for several wildlife species.

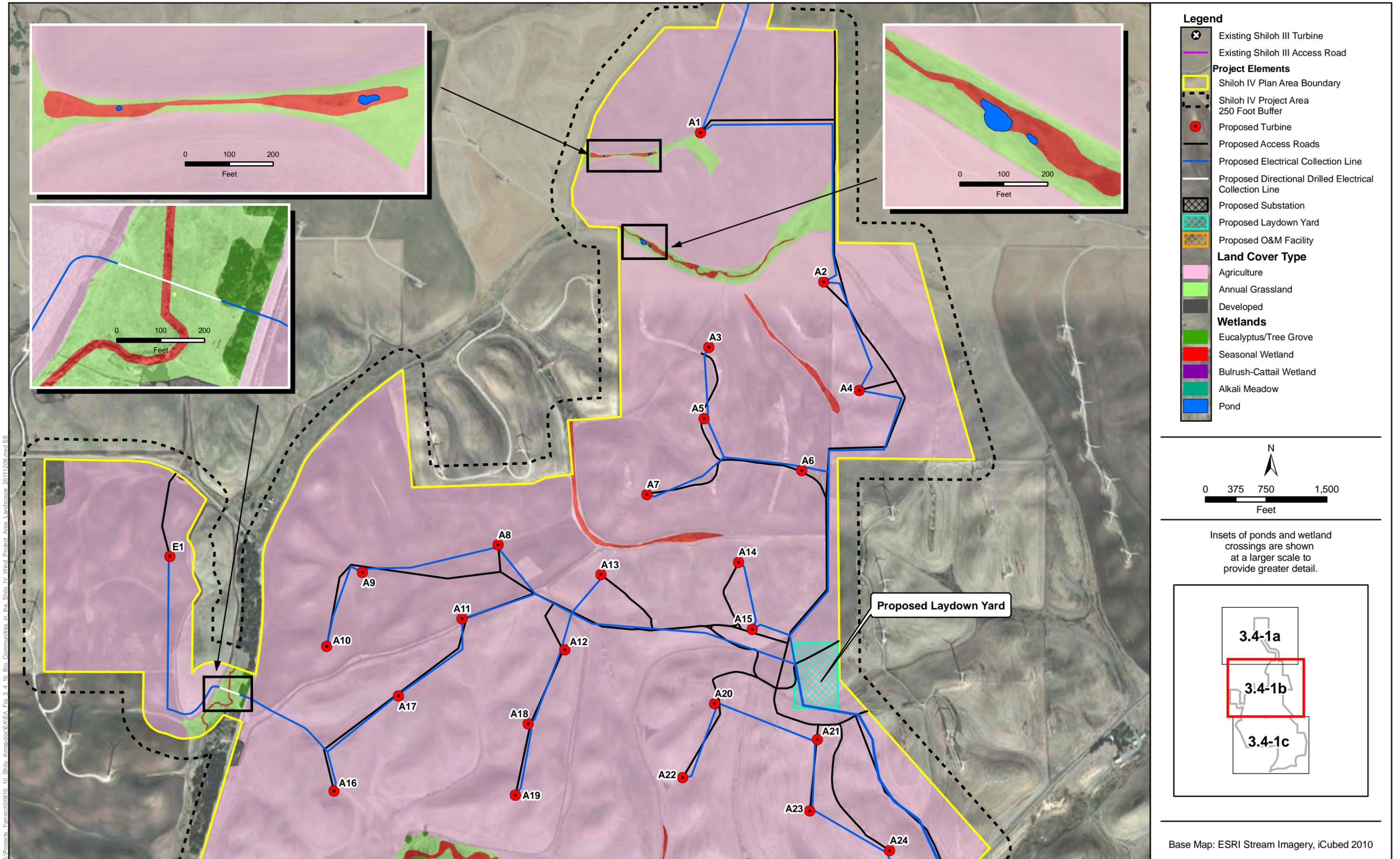
Alkali meadows in the Plan Area would likely meet USACE criteria to be considered wetlands under Section 404 of the CWA and would typically be subject to USACE jurisdiction as waters of the United States.

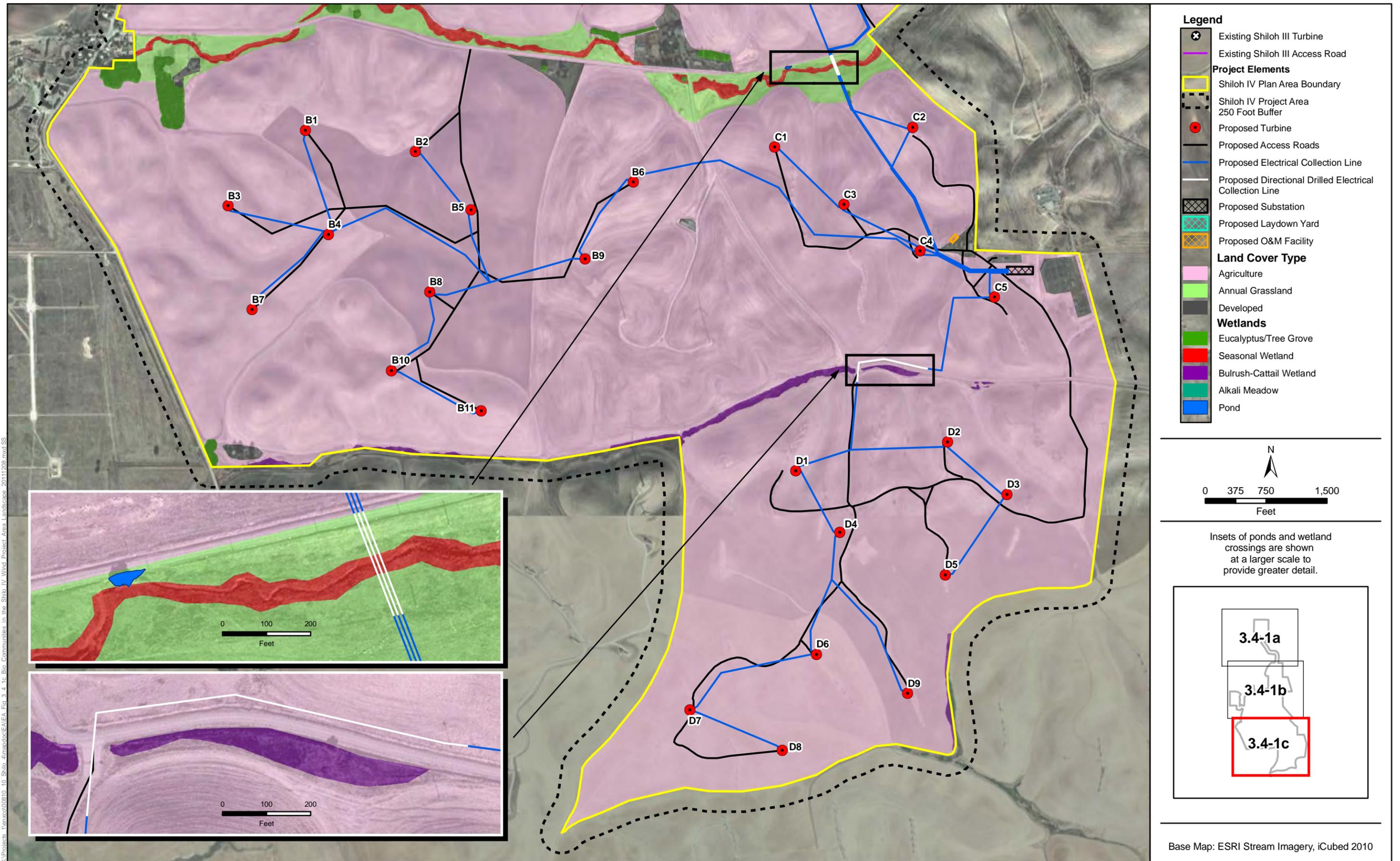
Bulrush-Cattail Wetland with Willow Riparian Scrub Inclusions

Bulrush-cattail wetlands are relatively common in the project area (and within the Montezuma Hills), occurring in topographically low-lying areas adjacent to Birds Landing Road and Montezuma Hills Road and in scattered locations within valleys. In total, they occupy approximately 11 acres (less than 1% of the total Plan Area). Generally, they are long, relatively narrow corridors characterized by erect, rooted, herbaceous hydrophytes (i.e., species adapted to very wet conditions). The species composition varies in these wetlands, but many are monotypic stands of cattail (*Typha latifolia*), common tule (*Scirpus acutus*), or three square (*Scirpus americanus*). Willow riparian scrub inclusions occur within these wetlands. These areas, dominated by willows (*Salix* spp.), encompass approximately 2 acres (less than 1% of the total Plan Area). Additionally, these wetlands are sometimes surrounded by a very narrow fringe of the seasonal wetland (described below), which constitutes a transition to the upland community.

Bulrush-cattail wetlands provide valuable nesting and foraging habitat for many bird and small mammal species, including pied-billed grebe (*Podilymbus podiceps*), mallard (*Anas platyrhynchos*), green-winged teal (*Anas crecca*), great blue heron (*Ardea herodias*), great egret (*Ardea alba*), Virginia rail (*Rallus limicola*), marsh wren (*Cistothorus palustris*), song sparrow (*Melospiza melodia*), red-winged blackbird, and California vole (*Microtus californicus*).

Bulrush-cattail wetlands and the associated willow riparian scrub inclusions in the project area meet USACE criteria to be considered wetlands under Section 404 of the CWA and would typically be subject to USACE jurisdiction as waters of the United States.





K:\Projects\1\enxco\00810_10_Shilo_4\mapdoc\EAREA_Fig_3_4-1c_Bio_Communities_in_the_Shilo_IV_Wind_Project_Area_Landscape_20111208.mxd:SS

Figure 3.4-1c
Biological Resources in the Plan Area

Seasonal Wetland

As mentioned above, seasonal wetlands typically occur in topographically low-lying areas along the edges of bulrush-cattail wetlands and along seasonal creeks. Seasonal wetlands cover approximately 26 acres (approximately 1%) of the total Plan Area. The primary distinction between these two types of wetlands is the length of time each is inundated. Bulrush-cattail wetlands typically retain water for extended periods into the growing season, while seasonal wetlands usually flood or are saturated for only short periods and do not remain inundated into the growing season. Dominant species found in seasonal wetlands in the study area include Italian ryegrass, pale spikerush (*Eleocharis macrostachya*), bird's-foot treefoil (*Lotus corniculatus*), Baltic rush (*Juncus balticus*), and curly dock (*Rumex crispus*).

Several wildlife species use seasonal wetlands. When wetlands are ponded, waterbirds such as mallard, killdeer (*Charadrius vociferus*), black-necked stilt (*Himantopus mexicanus*), American avocet (*Recurvirostra americana*), greater yellowlegs (*Tringa melanoleuca*), and long-billed curlew (*Numenius americanus*) commonly forage on floating and emergent vegetation and invertebrates.

Seasonal wetlands in the study area meet USACE criteria to be considered wetlands under Section 404 of the CWA and would typically be subject to USACE jurisdiction as waters of the United States.

Seasonal Stream

Two seasonal streams, named Lucol Hollow and Clank Hollow on USGS topographic maps, are present in the study area. Several other features that are shown as "blue-line" streams on the USGS topographic maps are also present in the study area. In the Montezuma Hills, these blue-line streams typically possess only intermittent stream characteristics (such as a defined bed and bank and/or scour) or no stream characteristics at all and would not likely be considered waters of the United States under Section 404 of the CWA. Several roadside drainages specifically constructed for the purpose of removing and channeling runoff from Birds Landing Road and Montezuma Hills Road are also present in the study area. Unless these features have been created within historical streams, they are not likely to be considered waters of the United States because most are artificially created in uplands solely for the purpose of transporting runoff water from roadbeds.

The seasonal streams in the Plan Area appear to possess intermittent but defined beds and banks and evidence of scour and deposition, and thus appear to meet USACE criteria to be considered waters of the United States under Section 404 of the CWA and would typically be subject to USACE jurisdiction as waters of the United States.

Pond

Five ponds are present in the Plan Area (ponds 2–5 and pond 12 as identified in the CTS site assessment (ICF International 2011e). Two ponds are within the 250-foot buffer around the Plan Area and 18 additional ponds are within 1.24 miles of the Plan Area. The ponds are variable in size and duration of ponding, and most have been constructed by landowners for agricultural or personal use. All the ponds appear to impound seasonal streams and are entirely supported by runoff from surrounding lands. Pond 12, a ponded area in Lucol Hollow, is fed by an intermittent drainage. Vegetation is variable, but most ponds are open water with a narrow ring of emergent wetland vegetation along the edges. Most dry completely or nearly completely by mid to late summer. A few small willows (*Salix* sp.) are often present around ponds in the Montezuma Hills area, but extensive riparian areas are generally lacking.

Ponds can provide habitat for waterfowl and shorebirds such as mallard, green-winged teal, great blue heron, great egret, greater yellowlegs, and other species commonly found in wetland habitats. In addition, ponds can provide important habitat for several amphibian species that depend on these temporary water bodies for successful reproduction, including CTS.

Because the ponds in the study area appear to impound water from seasonal creeks, they would likely be subject to USACE jurisdiction as waters of the United States.

Special-Status Wildlife

Based on a review of the California Natural Diversity Database (CNDDDB) (California Natural Diversity Database 2011) and other environmental documents prepared for projects near the Plan Area, 37 special-status wildlife species were identified as having the potential to occur in the study area (Table 3.4-1). Of these species, 13 have not been observed and are not expected to occur in the study area because they have extremely limited ranges or are limited to habitats that are not present in the study area. The rationale detailing why each of these species does not occur in the study area is also provided in Table 3.4-1.

Of the remaining 24 potentially occurring special-status species, 13 have been documented in or immediately adjacent to the Plan Area: American white pelican, California horned lark, Cooper's hawk, Ferruginous hawk, golden eagle, loggerhead shrike, long-billed curlew, northern harrier, prairie falcon, Swainson's hawk, tricolored blackbird, white-tailed kite, and western red bat. The remaining 11 species—vernal pool tadpole shrimp, CTS, western pond turtle, giant garter snake, California red-legged frog, California black rail, merlin, short-eared owl, yellow-breasted chat, California yellow warbler, and pallid bat—have not been documented in the Plan Area, but have a potential to occur (Table 3.4-1).

Groves of mature trees in the Plan Area, primarily nonnative eucalyptus trees, provide nesting habitat migratory birds and raptors (Figure 3.4-1).

Special-Status Plants

Based on a review of the CNDDDB (2011) and environmental documents prepared for other projects in the Montezuma Hills, 29 special-status plant species were identified as having the potential to occur in the region (Table 3.4-2). Three species, pappose spikeweed, heartscale, and Gairdner's yampah, are known to occur in the Plan Area (Figure 3.4-1). Twenty other species do not occur in the study area because they have extremely limited ranges (e.g., Antioch Dunes evening-primrose) or are limited to habitats that are not present in the Plan Area (i.e., serpentine soils, brackish marsh, tidal salt marsh, or dunes). Several other species occur in vernal pools, which are not present in the Plan Area. The rationale detailing why each of these species does not occur in the study area is provided in Table 3.4-2.

Areas that are in agricultural production or being prepared for agricultural production (i.e., disked, plowed, or fallow) have no potential to support special-status plants. Intensive agricultural activity in a majority of the Plan Area essentially eliminates the potential for special-status plants to occur within areas under agricultural production. Habitat for several remaining special-status plants is limited to uncultivated annual grassland or wetland areas which are extremely limited in the Plan Area.

Table 3.4-1. Special-Status Wildlife Species Potentially Occurring in the Montezuma Hills Region, Solano County

Common Name <i>Scientific Name</i>	Status		Geographic Distribution	Habitat Requirements	Potential Occurrence in the Project Area
	Federal/State				
Insects					
Valley elderberry longhorn beetle <i>Desmocerus californicus dimorphus</i>	T/-		Streamside habitats below 3,000 ft throughout the Central Valley	Riparian and oak savanna habitats with elderberry shrubs; elderberry is the host plant	None; no suitable habitat (i.e., elderberry shrubs) found in project area
Crustaceans					
Conservancy fairy shrimp <i>Branchinecta conservatio</i>	E/-		Disjunct occurrences in Solano, Merced, Tehama, Ventura, Butte, and Glenn Counties	Large, deep vernal pools in annual grasslands	None; no suitable habitat (i.e., vernal pools) found in project area
Vernal pool fairy shrimp <i>Branchinecta lynchi</i>	T/-		Central Valley, central and south Coast Ranges from Tehama to Santa Barbara Counties; isolated populations in Riverside County	Common in vernal pools; also found in sandstone rock outcrop pools	None; no suitable habitat (i.e., vernal pools) found in project area
Vernal pool tadpole shrimp <i>Lepidurus packardii</i>	E/-		Shasta to Merced Counties	Vernal pools and ephemeral stock ponds	Low; no suitable vernal pool habitat found in project area; seasonal ponds may provide habitat but no known occurrences nearby.
Reptiles and Amphibians					
California tiger salamander <i>Ambystoma californiense</i> (= <i>A. tigrinum</i> c.)	T/SSC		Central Valley, including Sierra Nevada foothills to approximately 1,000 ft, and coastal region from Butte to northeastern San Luis Obispo Counties	Small ponds, lakes, or vernal pools in grasslands and oak woodlands for larvae; rodent burrows, rock crevices, or fallen logs for cover for adults and for summer dormancy	High; nearest record is adjacent to the project area. Potential aquatic and upland habitat are present in the project area but are limited in extent
Western spadefoot <i>Spea hammondi</i>	-/SSC		Sierra Nevada foothills, Central Valley, Coast Ranges, coastal counties in southern California	Shallow streams with riffles and seasonal wetlands such as vernal pools in annual grasslands and oak woodlands	None; no suitable habitat present; study area is outside the current range of the species; species is not known to occur in Solano County

Table 3-4.1. Continued

Common Name <i>Scientific Name</i>	Status		Geographic Distribution	Habitat Requirements	Potential Occurrence in the Project Area
	Federal/State				
California red-legged frog <i>Rana draytonii</i>	T/SSC		Along the coast and coastal mountain ranges of California from Marin to San Diego Counties and in the Sierra Nevada from Tehama to Fresno Counties	Permanent and semipermanent aquatic habitats, such as creeks and cold-water ponds, with emergent and submergent vegetation; may aestivate in rodent burrows or cracks during dry periods	Low; project area is outside species' range
Western pond turtle <i>Actinemys marmorata</i>	-/SSC		From Oregon border of Del Norte and Siskiyou Counties south along the coast to San Francisco Bay, inland through the Sacramento Valley and on western slope of Sierra Nevada	Ponds, marshes, rivers, streams, and irrigation canals with muddy or rocky bottoms and with watercress, cattails, water lilies, or other aquatic vegetation in woodlands, grasslands, and open forests	Low; potential habitat present in the project area, although no known records nearby
Giant garter snake <i>Thamnophis gigas</i>	T/T		Central Valley from the vicinity of Burrel in Fresno County north to near Chico in Butte County; has been extirpated from areas south of Fresno	Sloughs, canals, low-gradient streams and freshwater marsh habitats with prey base of small fish and amphibians; irrigation ditches and rice fields; requires grassy banks and emergent vegetation for basking and areas of high ground protected from flooding during winter	Low; project area is outside species' current range
Birds					
American white pelican <i>Pelecanus erythrorhynchos</i> (nesting colony)	-/SSC		Historically, nested at large lakes throughout California; only breeding colonies in the state occur at lower Klamath National Wildlife Refuge, Siskiyou County, and at Clear Lake, Modoc County; winters along the California coast	Freshwater lakes with islands for breeding; inhabits river sloughs, freshwater marshes, salt ponds, and coastal bays during the rest of the year	Present; observed in project area, but no suitable breeding habitat present
Bank swallow <i>Riparia riparia</i>	-/T		Much of the state, less common in mountainous areas of the north coast and in coniferous or chaparral habitats	Nests in bluffs or banks, usually adjacent to water, where soil consists of sand or sandy loam	None; no suitable habitat present; species not observed during at least 4 years of monitoring in Montezuma Hills
California horned lark <i>Eremophila alpestris actia</i>	-/SSC		Much of the state; less common in mountainous areas of the north coast and in coniferous or chaparral habitats	Common to abundant resident in variety of open habitats, usually where large trees and shrubs are absent; grasslands and deserts to dwarf shrub habitats above tree line	Present; observed in project area

Table 3-4.1. Continued

Common Name <i>Scientific Name</i>	Status		Geographic Distribution	Habitat Requirements	Potential Occurrence in the Project Area
	Federal/State				
California clapper rail <i>Rallus longirostris obsoletus</i>	E/E		Marshes around San Francisco Bay and east through Sacramento–San Joaquin River Delta to Suisun Marsh	Restricted to salt marshes and tidal sloughs; usually associated with heavy growth of pickleweed; feeds on mollusks in sloughs	None; no suitable habitat present; species not observed during at least 4 years of monitoring in Montezuma Hills
California black rail <i>Laterallus jamaicensis coturniculus</i>	–/T, FP		Permanent resident in San Francisco Bay and east through Delta into Sacramento and San Joaquin Counties; small populations in Marin, Santa Cruz, San Luis Obispo, Orange, Riverside, and Imperial Counties	Tidal salt marshes associated with heavy growth of pickleweed; also brackish marshes or freshwater marshes at low elevations	Moderate; no suitable habitat is present in the project area; however, two individuals have been found during mortality surveys at nearby Shiloh II project
Cooper’s hawk <i>Accipiter cooperii</i>	–/SSC		Throughout California except high altitudes in Sierra Nevada; winters in Central Valley, southeastern desert regions, and plains east of Cascade Range	Nests in a wide variety of habitat types, from riparian woodlands and gray pine–oak woodlands through mixed conifer forests	Moderate; observed at nearby High Winds and Shiloh III projects
Double-crested cormorant <i>Phalacrocorax auritus</i> (rookery site)	–/SSC		Winters along entire California coast and inland over Coast Ranges into Central Valley from Tehama to Fresno Counties; permanent resident along coast from Monterey to San Diego Counties; along Colorado River; Imperial, Riverside, Kern, and King Counties; and the islands off San Francisco; breeds in Siskiyou, Modoc, Lassen, Shasta, Plumas, and Mono Counties; also breeds in San Francisco Bay Area and Yolo and Sacramento Counties	Rocky coastlines, beaches, inland ponds, and lakes; needs open water for foraging; nests in riparian forests or on protected islands, usually in snags	None; no suitable habitat present; species not observed during at least 4 years of monitoring in Montezuma Hills
Ferruginous hawk <i>Buteo regalis</i>	–/SSC		Does not nest in California; winter visitor along coast from Sonoma to San Diego Counties, east to Sierra Nevada foothills and southeastern deserts, Inyo-White Mountains, plains east of Cascade Range, and Siskiyou County	Open terrain in plains and foothills where ground squirrels and other prey are available	Present; observed in project area

Table 3-4.1. Continued

Common Name <i>Scientific Name</i>	Status		Habitat Requirements	Potential Occurrence in the Project Area
	Federal/State	Geographic Distribution		
Golden eagle <i>Aquila chrysaetos</i>	BGEPA/FP	Foothills and mountains throughout California; uncommon nonbreeding visitor to lowlands (e.g., Central Valley)	Nests on cliffs and escarpments or in tall trees overlooking open country; forages in annual grasslands, chaparral, and oak woodlands with plentiful medium and large-sized mammals	Present; observed in project area
Loggerhead shrike <i>Lanius ludovicianus</i>	-/SSC	Resident and winter visitor in lowlands and foothills throughout California; rare on coastal slope north of Mendocino County, occurring only in winter	Prefers open habitats with scattered shrubs, trees, posts, fences, utility lines, or other perches	Present; observed in project area
Long-billed curlew <i>Numenius americanus</i>	-/SSC	Nests in northeastern California in Modoc, Siskiyou, and Lassen Counties; winters along coast and in interior valleys west of Sierra Nevada	Nests in high-elevation grasslands adjacent to lakes or marshes; during migration and in winter frequents coastal beaches and mudflats and interior grasslands and agricultural fields	High; observed at nearby High Winds project
Merlin <i>Falco columbarius</i>	-/SSC	Does not nest in California; rare but widespread winter visitor to Central Valley and coastal areas	Forages along coastline in open grasslands, savannas, and woodlands; often forages near lakes and other wetlands	Moderate; observed infrequently at nearby High Winds, Shiloh I, Shiloh II, and Shiloh III projects
Mountain plover <i>Charadrius montanus</i>	-/SSC	Does not breed in California; in winter, found in Central Valley south of Yuba County; along coast in parts of San Luis Obispo, Santa Barbara, Ventura, and San Diego Counties; parts of Imperial, Riverside, Kern, and Los Angeles Counties	Open plains or rolling hills with short grasses or very sparse vegetation; nearby bodies of water not needed; may use newly plowed or sprouting grain fields	None; no suitable habitat present; species not observed during at least 4 years of monitoring in Montezuma Hills
Northern harrier <i>Circus cyaneus</i>	-/SSC	Throughout lowland California; has been recorded in fall at high elevations	Grasslands, meadows, marshes, and seasonal and agricultural wetlands	Present; observed in project area

Table 3-4.1. Continued

Common Name <i>Scientific Name</i>	Status		Geographic Distribution	Habitat Requirements	Potential Occurrence in the Project Area
	Federal/State				
Prairie falcon <i>Falco mexicanus</i>	-/SSC		Permanent resident in south Coast, Transverse, Peninsular, and northern Cascade Ranges; southeastern deserts, Inyo-White Mountains, foothills surrounding the Central Valley; and in the Sierra Nevada in Modoc, Lassen, and Plumas Counties; winters in Central Valley, along the coast from Santa Barbara to San Diego Counties, and in Marin, Sonoma, Humboldt, Del Norte, and Inyo Counties	Nests on cliffs or escarpments, usually overlooking dry, open terrain or uplands	High; observed at High Winds, Shiloh I, Shiloh II, and Shiloh III projects
Sharp-shinned hawk <i>Accipiter striatus</i> (nesting)	-/SSC		Permanent resident in Sierra Nevada, Cascade, Klamath, and North Coast Ranges at mid-elevations and along coast in Marin, San Francisco, San Mateo, Santa Cruz, and Monterey Counties; winters over rest of the state except very high elevations	Dense canopy ponderosa pine or mixed-conifer forest and riparian habitats	None; no suitable habitat present; species not observed during at least 4 years of monitoring in Montezuma Hills
Short-eared owl <i>Asio flammeus</i> (nesting)	-/SSC		Permanent resident along coast from Del Norte to Monterey Counties although very rare in summer north of San Francisco Bay, in Sierra Nevada north of Nevada County, in plains east of the Cascades, and in Mono County; small, isolated populations	Freshwater and salt marshes, lowland meadows, and irrigated alfalfa fields; needs dense tules or tall grass for nesting and daytime roosts	Low; observed twice at High Winds in 2000–2001
Suisun song sparrow <i>Melospiza melodia maxillaris</i>	-/SSC		Restricted to the extreme western edge of the Sacramento–San Joaquin River Delta between Vallejo and Pittsburg near Suisun Bay	Brackish and tidal marshes supporting cattails, tules, various sedges, and pickleweed	None; no suitable habitat present; species not observed during at least 4 years of monitoring in Montezuma Hills
Swainson’s hawk <i>Buteo swainsoni</i>	-/T		Lower Sacramento and San Joaquin Valleys, Klamath Basin, and Butte Valley; highest nesting densities near Davis and Woodland, Yolo County	Nests in oaks or cottonwoods in or near riparian habitats; forages in grasslands, irrigated pastures, and grainfields	Present; observed in project area

Table 3-4.1. Continued

Common Name <i>Scientific Name</i>	Status		Geographic Distribution	Habitat Requirements	Potential Occurrence in the Project Area
	Federal/State				
Tricolored blackbird <i>Agelaius tricolor</i>	-/SSC		Permanent resident in Central Valley from Butte to Kern Counties; breeds at scattered coastal locations from Marin to San Diego Counties and at scattered locations in Lake, Sonoma, and Solano Counties; rare nester in Siskiyou, Modoc, and Lassen Counties	Nests in dense colonies in emergent marsh vegetation, such as tules and cattails, or upland sites with blackberries, nettles, thistles, and grainfields; habitat must be large enough to support 50 pairs; probably requires water at or near the nesting colony	Present; observed in project area
Yellow-breasted chat <i>Icteria virens</i>	-/SSC		Nests locally in coastal mountains and Sierra Nevada foothills, east of Cascades in northern California, along Colorado river, and very locally inland in southern California	Nests in dense riparian habitats dominated by willows, alders, Oregon ash, tall weeds, blackberry vines, and grapevines	Low; observed at nearby High Winds and Shiloh I projects
California yellow warbler <i>Dendroica petechia brewsteri</i>	-/SSC		Nests over all California except Central Valley, Mojave Desert region, and high altitudes in Sierra Nevada; winters along Colorado River and in parts of Imperial and Riverside Counties	Nests in riparian areas dominated by willows, cottonwoods, sycamores, or alders or in mature chaparral; may also use oaks, conifers, and urban areas near stream courses	Low; suitable habitat is not present but observed during mortality surveys at the nearby Shiloh I project.
Western burrowing owl <i>Athene cunicularia hypugea</i>	-/SSC		Lowlands throughout California, including Central Valley, northeastern plateau, southeastern deserts, and coastal areas; rare along south coast	Level, open, dry, heavily grazed or low-stature grassland or desert vegetation with available burrows	High; not known to occur in project area, but several documented records in Montezuma Hills and suitable habitat is present
White-tailed kite <i>Elanus leucurus</i>	-/FP		Lowland areas west of Sierra Nevada from head of Sacramento Valley south, including coastal valleys and foothills, to western San Diego County at Mexico border	Low foothills or valley areas with valley or live oaks, riparian areas, and marshes near open grasslands for foraging	High; observed at High Winds and Shiloh 1
Mammals					
Salt marsh harvest mouse <i>Reithrodontomys raviventris</i>	E/E, FP		San Francisco, San Pablo, and Suisun Bays; Sacramento–San Joaquin River Delta	Salt marsh with a dense plant cover of pickleweed and fat hen; adjacent to an upland site	None; no suitable habitat present or nearby

Table 3-4.1. Continued

Common Name <i>Scientific Name</i>	Status		Geographic Distribution	Habitat Requirements	Potential Occurrence in the Project Area
	Federal/State				
Pallid bat <i>Antrozous pallidus</i>	-/SSC		Throughout California except high Sierra from Shasta to Kern Counties and northwest coast, primarily at lower and mid-elevations	Variety of habitats from desert to coniferous forest; most closely associated with oak, yellow pine, redwood, and giant sequoia habitats in northern California and oak woodland, grassland, and desert scrub in southern California; relies heavily on trees for roosts	Low; within the species' range and may forage over the project area but not thought to roost.
Western red bat <i>Antrozous pallidus</i>	-/SSC		Scattered throughout much of California at lower elevations.	Found primarily in riparian and wooded habitats. Occurs at least seasonally in urban areas. Day roosts in trees within the foliage. Found in fruit orchards and sycamore riparian habitats in the Central Valley.	High; known to occur in project area. May forage over project area but not thought to roost. Documented during mortality monitoring at High Winds and Shiloh 1.
Suisun ornate shrew <i>Sorex ornatus sinuosus</i>	-/SSC		Restricted to San Pablo Bay and Suisun Bay, both in Solano County	Tidal, salt, and brackish marshes containing pickleweed, grindelia, bulrushes, or cattails; requires driftwood or other objects for nesting cover	None; no suitable habitat is present or nearby

Common Name <i>Scientific Name</i>	Status Federal/State		Geographic Distribution	Habitat Requirements	Potential Occurrence in the Project Area
Status explanations:					
Federal					
E = listed as endangered under the federal Endangered Species Act.					
T = listed as threatened under the federal Endangered Species Act.					
– = no listing.					
State					
E = listed as endangered under the California Endangered Species Act.					
T = listed as threatened under the California Endangered Species Act.					
FP = fully protected under the California Fish and Game Code.					
SSC = species of special concern in California.					
– = no listing.					
Potential Occurrence in the Project Area:					
High: California Natural Diversity Database (or other documents) records the known occurrence of the species within a 10-mile radius of the project area. Suitable habitat is present within the project area.					
Moderate: California Natural Diversity Database (or other documents) records the known occurrence of the species within a 10-mile radius of the project area. Poor quality suitable habitat is present within the project area.					
Low: California Natural Diversity Database (or other documents) does not record the occurrence of the species within a 10-mile radius of the project area. Suitable habitat is present within the project area.					
None: California Natural Diversity Database (or other documents) does not record the occurrence of the species within a 10-mile radius of the project area. Suitable habitat is not present in the project area.					

Table 3.4-2. Special-Status Plants Potentially Occurring in the Montezuma Hills Region, Solano County

Common Name <i>Scientific Name</i>	Legal Status	Geographic Distribution	Habitat Requirements	Blooming Period	Occurrence in the Project Area
	Federal/State/CNPS				
Mt. Diablo manzanita <i>Arctostaphylos auriculata</i>	-/-/1B.3	Endemic to Contra Costa County, especially Mt. Diablo area, San Francisco Bay Area	Chaparral in canyons and on slopes on sandstone; 490–1,650 ft	Jan–Mar	None; no suitable habitat present in project area; no chaparral or shrub habitat present
Suisun Marsh aster <i>Aster lentus</i>	-/-/1B.2	Sacramento–San Joaquin Delta; Suisun Marsh; Suisun Bay; Contra Costa, Napa, Sacramento, San Joaquin, and Solano Counties	Brackish and freshwater marsh; below 500 ft	Aug–Nov	None; no suitable habitat present in project area; species occurs only in brackish and freshwater marsh in the Sacramento–San Joaquin Delta
Alkali milk-vetch <i>Astragalus tener</i> var. <i>tener</i>	-/-/1B.2	Alameda, Merced, Napa, Solano, and Yolo Counties	Alkali playa, valley and foothill grassland, vernal pools; below 200 ft	Mar–Jun	Low; no nearby records although suitable habitat may be present in wetland habitats in the project area
Heartscale <i>Atriplex cordulata</i>	-/-/1B.2	Western Central Valley and valleys of adjacent foothills	Alkali grassland, alkali meadow, alkali scrub; below 660 ft	May–Oct	Present; one location has been documented in the project area
Brittlescale <i>Atriplex depressa</i>	-/-/1B.2	Sacramento Valley and valleys of adjacent foothills on west side of San Joaquin Valley	Alkali grassland, alkali meadow, alkali scrub, chenopod scrub, playas, valley and foothill grasslands on alkaline or clay soils; below 660 ft	May–Oct	Low; no nearby records although suitable habitat may be present in wetland habitats in the project area
San Joaquin spearscale <i>Atriplex joaquiniana</i>	-/-/1B.2	Western edge of Central Valley from Glenn to Tulare Counties	Alkali grassland, alkali scrub, alkali meadows, saltbush scrub; below 1,000 ft	Apr–Sep	Moderate; nearby records although suitable habitat appears to be absent from the project area
Pappose spikeweed <i>Centromadia parryi</i> ssp. <i>parryi</i>	-/-/1B.2	Solano County	Meadows and seeps, marshes and swamps, coastal prairie, grassland; moist, alkaline; below 1,000 ft	May–Nov	Present; one location has been documented in the project area
Suisun thistle <i>Cirsium hydrophilum</i> var. <i>hydrophilum</i>	E/-/1B.1	Known only from the Suisun Marsh in Solano County	Salt marshes and swamps; below 3 ft	Jul–Sep	None; no suitable habitat present in project area; species only occurs at or slightly above sea level

Table 3.4-2. Continued

Common Name <i>Scientific Name</i>	Legal Status		Geographic Distribution	Habitat Requirements	Blooming Period	Occurrence in the Project Area
	Federal/State/CNPS					
Hispid bird's-beak <i>Cordylanthus mollis</i> ssp. <i>hispidus</i>	-/-/1B.1		Central Valley; Alameda, Kern, Merced, Placer, and Solano Counties	Meadow, grassland, playa, on alkaline soils; below 500 ft	Jun-Sep	None; no suitable habitat present in project area and no nearby records
Soft bird's-beak <i>Cordylanthus mollis</i> ssp. <i>mollis</i>	E/R/1B.2		San Francisco Bay region; Suisun Marsh; Contra Costa, Marin*, Napa, Solano, Sacramento*, and Sonoma* Counties	Tidal salt marsh	Jul-Sep	None; no suitable habitat present in the project area; species only occurs in tidally influenced salt marsh
Hoover's cryptantha <i>Cryptantha hooveri</i>	-/-/1A		Northern and central San Joaquin Valley; Alameda, Contra Costa, Madera, Merced, San Joaquin, and Stanislaus Counties	Coarse sandy soil in grassland	Apr-May	None; no suitable habitat present in project area; no sandy habitats of any kind
Dwarf downingia <i>Downingia pusilla</i>	-/-/2.2		California Central Valley and South America	Vernal pools and mesic valley and foothill grasslands, 1,500 ft	Mar-May	None; no nearby records and no suitable habitat (vernal pools) in the project area
Round-leaved filaree <i>California macrophyllum</i>	-/-/1B.1		Sacramento Valley, northern San Joaquin Valley, central western California, South Coast Ranges, and northern Channel Islands (Santa Cruz Island)	Open sites, dry grasslands, and shrublands; below 4,000 ft	Mar-May	None; no suitable habitat present; no open clay soils capable of supporting the species
Contra Costa wallflower <i>Erysimum capitatum</i> ssp. <i>angustatum</i>	E/E/1B.1		Contra Costa County	Inland dunes	Mar-Jul	None; no suitable habitat present in the project area; species only occurs in dune habitats
Fragrant fritillary <i>Fritillaria liliacea</i>	-/-/1B.2		Coast Ranges from Marin to San Benito Counties	Adobe soils of interior foothills, coastal prairie, coastal scrub, annual grassland, often on serpentinite; below 1,350 ft	Feb-Apr	None; no suitable habitat present; no open clay soils capable of supporting the species
Brewer's western flax <i>Hesperolinon breweri</i>	-/-/1B.2		Southern inner North Coast Ranges, northeast San Francisco Bay region, especially Mt. Diablo. Known only from Contra Costa, Napa, and Solano Counties	Serpentine slopes in chaparral and grasslands; 100-2,300 ft	May-Jul	None; no suitable habitat present in project area; species occurs only on serpentine soils

Table 3.4-2. Continued

Common Name <i>Scientific Name</i>	Legal Status		Geographic Distribution	Habitat Requirements	Blooming Period	Occurrence in the Project Area
	Federal/State/CNPS					
Carquinez goldenbush <i>Isocoma arguta</i>	-/-/1B.1		Deltaic Sacramento Valley, Suisun Slough, Contra Costa and Solano Counties	Annual grassland on alkaline soils and flats; generally below 70 ft	Aug-Dec	Moderate; nearby records although suitable habitat appears to be absent from the project area
Contra Costa goldfields <i>Lasthenia conjugens</i>	E/-/1B.1		Scattered occurrences in Coast Range valleys and southwest edge of Sacramento Valley; Alameda, Contra Costa, Mendocino, Napa, Santa Barbara*, Santa Clara*, and Solano Counties; historically distributed through the north coast, southern Sacramento Valley, San Francisco Bay region, and south coast	Alkaline or saline vernal pools and swales; below 700 ft	Mar-Jun	None; no suitable habitat present in project area and no nearby records
Delta tule pea <i>Lathyrus jepsonii</i> var. <i>jepsonii</i>	-/-/1B.2		San Francisco Bay region; Alameda, Contra Costa, Fresno, Marin, Napa, Sacramento, San Benito, Santa Clara*, San Joaquin, and Solano Counties	Coastal and estuarine marshes; below 1,000 ft	May-Sep	None; no suitable habitat present in project area; species only occurs in coastal and estuarine marshes
Legenere <i>Legenere limosa</i>	-/-/1B.1		Primarily lower Sacramento Valley; also North Coast Ranges, northern San Joaquin Valley, and Santa Cruz mountains.	Deep, seasonally wet habitats such as vernal pools, ditches, marsh edges, and riverbanks; below 500 ft	May-Jun	None; no nearby records and no suitable habitat (vernal pools) in the project area
Heckard's pepper-grass <i>Lepidium latipes</i> var. <i>heckardii</i>	-/-/1B.2		Southern Sacramento Valley; Glenn, Solano, and Yolo Counties	Annual grassland on margins of alkali scalds; below 660 ft	Apr-May	None; no suitable habitat present in project area and no nearby records
Woolly-headed lessingia <i>Lessingia hololeuca</i>	-/-/3.1		Southern North Coast Ranges; southern Sacramento Valley; northern San Francisco Bay region; Alameda, Monterey, Marin, Napa, Santa Clara, San Mateo, Solano, Sonoma, and Yolo Counties	Clay or serpentinite soils of coastal scrub, lower montane coniferous forest, valley and foothill grassland; below 1,000 ft	Jun-Oct	None; no suitable habitat present in project area and project area is outside of known range.

Table 3.4-2. Continued

Common Name <i>Scientific Name</i>	Legal Status		Geographic Distribution	Habitat Requirements	Blooming Period	Occurrence in the Project Area
	Federal/State/CNPS					
Mason's lilaepsis <i>Lilaeopsis masonii</i>	-/R/1B.1		Southern Sacramento Valley; Sacramento-San Joaquin Delta; northeast San Francisco Bay area; Alameda, Contra Costa, Marin*, Napa, Sacramento, San Joaquin, and Solano Counties	Freshwater and intertidal marshes, streambanks in riparian scrub; generally at sea level	Apr-Nov	None; no suitable habitat present in project area; species only occurs in tidally influenced habitats at sea level
Robust monardella <i>Monardella villosa</i> ssp. <i>globosa</i>	-/-/1B.2		North Coast Ranges and eastern San Francisco Bay Area; Alameda, Contra Costa, Humboldt, Lake, Marin, Napa, San Mateo, and Sonoma Counties	Oak woodland and grassy openings in chaparral	Jun-Jul	None; no suitable habitat present in the project area; species only occurs in oak woodland or chaparral habitats
Little mouseltail <i>Myosurus minimus</i> ssp. <i>apus</i>	-/-/3.1		Central Valley, San Francisco Bay region, outer South Coast Ranges, south coast. Alameda, Butte, Contra Costa, Colusa, Kern, Riverside, San Bernardino, San Diego, Solano, and Stanislaus Counties	Alkaline vernal pools and marshes; below 5,000 ft	Mar-Jun	None; no suitable habitat present in project area and no nearby records
Baker's navarretia <i>Navarretia leucocephala</i> ssp. <i>bakeri</i>	-/-/1B.1		Inner North Coast Ranges, western Sacramento Valley; Colusa, Lake, Mendocino, Marin, Napa, Solano, Sonoma, and Tehama Counties	Vernal pools and swales in woodland, lower montane coniferous forest, mesic meadows, and grassland; generally below 5,600 ft	May-Jul	None; no nearby records and no suitable habitat (vernal pools) in the project area
Antioch Dunes evening-primrose <i>Oenothera deltooides</i> ssp. <i>howellii</i>	E/E/1B.1		Northeast San Francisco Bay region, known from three native occurrences; Contra Costa and Sacramento Counties	Inland dunes; generally below 330 ft	Mar-Sep	None; no suitable habitat present in project area; species only occurs in dune habitats
Gairdner's yampah <i>Perideridia gairdneri</i> ssp. <i>gairdneri</i>	-/-/4.2		Kern, Los Angeles, Mendocino, Monterey, Marin, Napa, Orange, San Benito, Santa Clara, Santa Cruz, San Diego, San Luis Obispo, San Mateo, Solano, and Sonoma Counties	Broadleaved upland forest, chaparral, coastal prairie, valley and foothill grassland, vernal pools, in mesic areas	Jun-Oct	Present; one location has been documented in the project area

Common Name <i>Scientific Name</i>	Legal Status	Geographic Distribution	Habitat Requirements	Blooming Period	Occurrence in the Project Area
	Federal/State/CNPS				
Bearded popcornflower <i>Plagiobothrys hystriculus</i>	-/-/1B.1	Endemic to Solano* County, previously presumed extinct	Mesic grassland, vernal pools	Apr-May	Moderate; nearby records although suitable habitat appears to be absent from the project area

Status explanations:

Federal

E = listed as endangered under the federal Endangered Species Act.

- = no listing.

State

R = Listed as Rare under the Native Plant Protection Act

E = listed as endangered under the California Endangered Species Act

- = no listing.

California Native Plant Society

1A = List 1A species: presumed extinct in California.

1B = List 1B species: rare, threatened, or endangered in California and elsewhere.

2 = List 2 species: rare, threatened, or endangered in California but more common elsewhere.

3 = List 3 species: plants about which more information is needed to determine their status.

- = no listing.

* = known populations believed extirpated from county.

CNPS Listing Extensions:

0.1 = seriously threatened in California

0.2 = fairly threatened in California

0.3 = not very threatened in California

Definitions of Levels of Potential Occurrence (prior to field surveys):

High: California Natural Diversity Database (or other documents) records known occurrence of plant in the project vicinity; or presence of suitable habitat conditions and suitable microhabitat conditions.

Moderate: California Natural Diversity Database (or other documents) records known occurrence of plant in the project vicinity; or presence of suitable habitat conditions but suitable microhabitat conditions are not present.

Low: California Natural Diversity Database (or other documents) records no known occurrence of plant in the project vicinity; or habitat conditions of poor quality.

None: California Natural Diversity Database (or other documents) records no known occurrence of plant in the project vicinity; or suitable habitat not present in any condition.

3.4.2 Environmental Consequences

3.4.2.1 Approach and Methods

A prefield investigation and field surveys were conducted to identify and describe biological resources in the Plan Area.

Prefield Investigation

Existing information was reviewed to prepare lists of special-status plant and wildlife species known to occur or with potential to occur in the project region. ICF botanists and wildlife biologists reviewed the information listed below to develop lists of special-status species that could occur in the project region.

- A search of DFG's CNDDDB (2011) for the Birds Landing 7.5-minute U.S. Geological Survey (USGS) quadrangle map (quad) and surrounding quads.
- CNPS's *Inventory of Rare and Endangered Plants of California* (California Native Plant Society 2011).
- USFWS lists of endangered and threatened species for the Birds Landing USGS 7.5-minute quad (U.S. Fish and Wildlife Service 2011).

A number of wind energy projects have been constructed or permitted or are in the construction phase in the Montezuma Hills WRA. Environmental documentation available for each of these projects addressed potential impacts on biological resources, and each report was reviewed as part of this study. These projects are listed below.

- High Winds LLC (Environmental Science Associates 2001).
- SMUD–Solano Wind (Sacramento Municipal Utility District 2003).
- Shiloh I (Ecology and Environment 2005).
- enXco V Repowering (Jones & Stokes 2005).
- Shiloh II (Ecology and Environment 2007a).
- Montezuma Wind (Ecology and Environment 2007b).
- Shiloh III (Solano County Department of Resource Management 2010).
- Montezuma II Wind (Solano County Department of Resource Management 2011).

Additionally, a recent study of avian issues for Shiloh IV, *Avian Monitoring Study and Risk Assessment for the Shiloh IV Wind Power Project, Solano County, California* (Curry & Kerlinger 2011) was reviewed. All the information sources described above were used to develop lists of special-status species that could occur in the Plan Area (Table 3.4-1 and Table 3.4-2).

Field Surveys

ICF conducted field studies to map and describe the biological resources present in the Plan Area. Each of these studies is described below.

General Vegetation

Field surveys to identify and map the general vegetation types (i.e., habitats) present in the study area were conducted between January and March 2011 and again in October 2011. Habitats were visually inspected in the field, mapped on aerial photographs at a scale of 1 inch = 400 feet, and digitized into a geographic information system (GIS) format. Representative photographs of vegetation communities were also taken.

Special-Status Wildlife

ICF wildlife biologists conducted surveys and habitat assessments between January and March 2011 and in October 2011 for special-status wildlife species and their habitats in the study area. The surveys focused on locating the species or habitat for the species identified as potentially occurring in the Plan Area. Protocol-level surveys (i.e., formal surveys conducted to DFG and/or USFWS standards) were not conducted as part of this study and are not necessary to describe the biological resources in the Plan Area.

As the first step in reaching a determination on the presence of CTS in the Plan Area, a site assessment was conducted in accordance with the procedures set forth in *Interim Guidance on Site Assessment and Field Surveys for Determining Presence or a Negative Finding of the California Tiger Salamander* (interim guidance) (U.S. Fish and Wildlife Service and California Department of Fish and Game 2003). The interim guidance describes two components to the assessment process: an assessment of potential habitat and documented CTS occurrences in and around the project site, and protocol-level field surveys of breeding pools and associated uplands to determine presence or absence.

The formal site assessment for CTS salamander was conducted in late in March 2011 and was submitted to USFWS and DFG for review early in April 2011.

Avian and Bat Species

Preconstruction surveys for avian species, conducted consistent with CEC/DFG Guidelines (primarily point counts at scattered and representative locations across the Plan Area) were conducted for the Shiloh IV project. Over the last 10 years, several other preconstruction surveys have been conducted at adjacent (and now operating) wind projects (i.e., High Winds, Shiloh I, Shiloh II, and SMUD Solano). Additionally, operational mortality studies have been completed at High Winds (2 years postconstruction), Shiloh I (3 years postconstruction), and Shiloh II (year 1 of 3 is complete). In general, the methods used in all studies have been similar and the available data on avian and bat mortality can be used to predict mortality rates at Shiloh IV.

Raptors

In the Montezuma Hills, dominated by mostly treeless rolling hills, raptor nesting habitat is generally limited to small groups of nonnative eucalyptus trees. Exceptions are nesting habitat for northern harriers and short-eared owls (*Asio flammeus*), which nest on the ground in various grassland and marshland settings where tall grasses and reedbeds provide sufficient cover. Several raptor nest surveys have been conducted in and around the WRA. Several special-status species were observed during these surveys: golden eagle (fully protected species), Swainson's hawk (state-listed as threatened), peregrine falcon (*Falco peregrinus*) (fully protected species), American white pelican (*Pelecanus erythrorhynchos*) (California species of special concern [SSP]), northern harrier

(*Circus cyaneus*) (SSP), black swift (*Cypseloides niger*) (SSP), loggerhead shrike (*Lanius ludovicianus*) (SSP), and tricolored blackbird (*Agelaius tricolor*) (SSP).

In March 2007, Hunt et al. (2007) conducted a raptor nesting survey of the entire Montezuma Hills WRA (plus a 3-mile radius for all species and a 5-mile radius for golden eagles) using both aerial and ground-based surveys (results also summarized in Kerlinger et al. 2009a). In this 350-square-mile study area, the biologists documented 150 confirmed or likely raptor nests and confirmed 8 species to be breeding. The most common and ubiquitous species were red-tailed hawk, American kestrel, and great horned owl. Five special-status species were documented: golden eagle, Swainson's hawk, northern harrier, white-tailed kite (*Elanus leucurus*), and short-eared owl. Barn owl was also documented to be nesting. The results of this study indicate species composition and relative abundances similar to those found in previous surveys conducted in the Montezuma Hills WRA since the late 1980s (Howell and DiDonato 1988; Orloff and Flannery 1992; Kerlinger et al. 2006a).

Golden Eagle

Golden eagle presence in the Montezuma Hills WRA has been well studied. The California Natural Diversity Database lists records from the 1980s, and biologists have conducted a significant number of avian use surveys as part of both pre- and postconstruction wind energy project monitoring requirements. Several nesting raptor surveys have been carried out since 2001 (Kerlinger et al. 2006a:26); the most recent reported nesting raptor survey for the entire area was conducted in 2007. Surveys in 2004, 2005, and 2007 focused particularly on nesting golden eagles (Kerlinger et al. 2006a, 2009a).

Based on documented occurrences and nest surveys, it is apparent that golden eagles routinely forage and nest in and around the Montezuma Hills WRA throughout the year. Overall activity levels may appear low compared to areas such as the Altamont Pass WRA, which lies adjacent to the highest known density of nesting golden eagles; however, the density of known and historic nest sites and observed activity levels in the Montezuma Hills WRA are more typical for many other areas within the species' range where territory spacing of 1–2 miles or more is common. Because most of the Montezuma Hills WRA consists of active croplands (dryland grain crops), which do not support rich populations of ground squirrels and hinder accessibility of prey during much of the year, the area is doubtless less attractive to foraging golden eagles than the grasslands at the Altamont Pass WRA, which are comparatively rife with highly accessible ground squirrels (Orloff and Flannery 1992). This may also be why documented nesting success has been mixed in the Montezuma Hills WRA over the years.

Kerlinger et al. (2009a:19) documented 31 golden eagle observations during their 2007–2008 avian use studies conducted on the 4,500-acre Shiloh III wind-project site northeast of the proposed project area. In contrast, an avian use study conducted in association with the first year of avian mortality monitoring for the 400-acre Buena Vista Wind Farm repowering project in the Altamont Pass WRA documented more than 110 golden eagle observations (Insignia Environmental 2009)—or more than three times as many golden eagle observations in a project area less than one-tenth the size.

Bats

Twenty-seven species of bats are known to occur in California. Local mortality studies have identified four primary bat species in the area, all of which tend to migrate to warmer regions for the winter. Indicated priorities are designations developed by the Western Bat Working Group.

- Hoary bat (*Lasiurus cinereus*) (medium priority).
- Western red bat (*Lasiurus blossevillii*) (California species of special concern; high priority).
- Silver-haired bat (*Lasionycteris noctivagans*)(medium priority).
- Mexican free-tailed bat (*Tadarida brasiliensis*) (low priority).

Although these species are considered migratory, there is evidence to suggest that small numbers of each population remain year-round in the Bay Area, and likely in the Montezuma Hills WRA. All four species forage on flying insects in open airspace, often hundreds or even thousands of feet above ground level. Hoary bats are long-distance migrants, migrating into the Bay Area from a huge area, presumably including much of the northwestern United States and western Canada. Western red bats and Mexican free-tailed bats are regional migrants that breed primarily in the Central Valley of California and overwinter in the Bay Area and along the California coast. Very little is known about the migrations of silver-haired bats, except that this species is associated with forests and presumably migrates from the Sierra Nevada and Klamath mountains south into the Bay Area and along the California coast during winter months.

Three other bat species are likely to occur in the project area, but for demographic or behavioral reasons are not likely to be at high risk of turbine collision

- California myotis (*Myotis californicus*) (low priority).
- Yuma myotis (*Myotis yumanensis*) (low priority).
- Pallid bat (*Antrozous pallidus pacificus*) (California species of special concern; high priority).

Johnston et al. (2010) detected California myotis acoustically while surveying at the Shiloh I wind project. This species is a year-round resident of the Montezuma Hills WRA, although no fatalities have been observed at any of the wind energy sites in the area. California myotis is a relatively sedentary species and is not likely to migrate through the area. It is not expected to be at risk of turbine collision because it typically forages within a few meters of the ground or within 1 meter of the outsides of tree foliage, typically of oaks.

There are no known sizeable bat colonies and no known caves or large structures (e.g., bridges) in the project area that would support such a colony. The Montezuma Hills WRA does provide relatively plentiful small-scale roosting habitat in the form of barns, outbuildings, houses, a mature olive orchard, scattered stands of eucalyptus trees, ornamental trees, and some isolated native trees. Onsite drainages, cattail wetlands, and stock ponds, in addition to the Sacramento River to the south and Suisun Marsh to the west, are within foraging distance.

Of the four bat species that have been detected in postconstruction fatality studies, nearly all turbine-related fatalities have been hoary bats and Mexican free-tailed bats. Few western red bat or silver-haired bat fatalities have been observed at this WRA.

There are no data to indicate that any of the four identified species remain in the Montezuma Hills WRA during the winter, although bat fatalities were found in all other seasons. Mortality data for Montezuma Hills windfarms indicate an autumn period of intensified activity for all bat species recorded, with a decline in winter.

Special-Status Plants

ICF botanists conducted a literature review and habitat assessment for special-status plants in February and March 2011. The purpose of the habitat assessment was to determine (1) if habitat for special-status plants exists in the Plan Area, (2) if the habitat would be affected by the Proposed Action, and (3) if/when surveys would be necessary. The habitat assessment involved comparing the known range and habitat characteristics of each potentially occurring species with current conditions in the Plan Area. The results of the literature review and habitat assessment indicated that several species (described in Section 3.4.2.2 below) are known to occur in remaining uncultivated habitats in the Plan Area; however, the majority of the Plan Area is unsuitable for special-status plants because of the intensive agricultural land use.

Waters of the United States

ICF wetland ecologists conducted field surveys between January and March 2011 to identify and map potential waters of the United States in the study area. A formal wetland delineation using the methods outlined in the *Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory 1987) and the *Arid West Supplement to the Manual* (U.S. Army Corps of Engineers 2008) was not conducted in the study area as part of this study because there are no plans to place fill any of these features. Potential waters of the United States were identified and mapped on the basis of the presence of observable indicators such as wetland vegetation, wetland hydrology, a defined channel, or a defined bed and bank. An effort was made to be as conservative as possible when assessing whether a particular area would be considered a water of the United States and when mapping its boundaries. Although recent regulatory guidance from USACE may affect whether some wetlands in the Plan Area are jurisdictional, all wetlands and waters were considered to be potentially jurisdictional for the purposes of this assessment.

Potential waters of the United States were mapped in the field on aerial photographs at a scale of 1 inch = 400 feet and then digitized into a GIS format.

3.4.2.2 Effects

Proposed Action

Impact BIO-1: Potential impacts on habitat for special-status invertebrate species

Potential habitat for vernal pool tadpole shrimp is present in seasonal ponds within the Plan Area; however, the potential for occurrence is considered to be low based on a low habitat quality. The USFWS normally evaluates effects on habitat for federally listed invertebrates species (vernal pool fairy shrimp and vernal pool tadpole shrimp) when project activities are proposed to occur within 250 feet of potential habitat. Electrical collection lines would be placed in the Plan Area at a distance greater than 250 feet from seasonal ponds but within the watershed of these habitats. Consequently, the potential exists for upland areas around these habitats to be disturbed during construction. However, the likelihood of these activities having an adverse effect is minor, because of the limited extent of disturbance necessary to bury electrical collection lines and because implementation of EC-8, EC-10, and EC-11 would ensure direct and indirect effects on seasonal ponds are avoided. Therefore, implementation of the Proposed Action would not have an adverse effect on habitat for special-status invertebrates species.

Impact BIO-2: Potential impacts on habitat for California tiger salamander

The results of the CTS site assessment indicate that there are recent observations of CTS in the Montezuma Hills adjacent to the northern portion of the Plan Area, there is potential aquatic habitat (i.e., ponds) in and within 1.24 miles of the Plan Area, and suitable upland habitat is present but limited in extent within the project boundaries. The Interim Guidance from USFWS and DFG (October 2003) indicates that CTSs are known to travel up to 1.24 miles from aquatic breeding habitat and thus could conceivably occur within the Plan Area if suitable habitat is present. There are recent records within 0.5 mile and nearly all of the Plan Area is within 1.24 miles of breeding habitat.

Potential aquatic breeding habitat is present in the Plan Area. The uplands in the Plan Area are subject to an intensive agricultural regime, which has eliminated nearly all burrowing mammals (i.e., ground squirrels and gophers). Since CTSs cannot dig their own burrows, their presence is dependent on the occurrence of burrowing mammals or, in some instances, the presence of soil crevices.

According to the current site plan, all project components are located outside suitable aquatic habitat identified in the Plan Area (i.e., the ponds); consequently, the project as designed would not affect aquatic habitat for CTS. Similarly, nearly all project components are located outside suitable upland habitat for CTS (i.e., annual grasslands and wetland corridors). Moreover, because implementation of the grass fire control plan will entail vegetation management activities only in areas that have already been permanently affected (i.e., transformers and roadways), fire management plan activities would not result in incidental take of CTS. Because of project design and the intensive agricultural practices in the Plan Area, leading to a lack of suitable aestivation habitat in a majority of the Plan Area, the Proposed Action would not significantly affect upland habitat for CTS.

Temporary impacts on 126 acres of agricultural lands and approximately 1 acre of grassland habitat is, as well as permanent impacts on 25.7 acres of agricultural lands and 0.2 acre of grassland, are anticipated as part of the Proposed Action, but these impacts would be reduced by implementing avoidance and minimization measures set forth in the HCP and by offsetting unavoidable permanent and temporary impacts on CTS habitat through conservation of upland habitat at a USFWS- and DFG-approved conservation bank (EC-12).

Impact BIO-3: Potential impacts on western burrowing owl

Western burrowing owls are known to occur in the Montezuma Hills area and have a high potential to occur in the Plan Area. Although California ground squirrels are not known to occur in the Plan Area, burrowing owls have been observed using road cut features as burrow sites near the study area. These road features are typically deep fissures created by slump. This behavior increases the likelihood of burrowing owls being affected by construction-related activities on or near access roads. Additionally, culverts and other artificial structures may serve as potential burrowing owl roosting and nesting sites.

Potential impacts could result from construction disturbing existing owl burrows or foraging habitat. Potential impacts may also occur as a result of collision with wind turbines. Impacts on burrowing owl would be adverse if the Proposed Action would substantially reduce the numbers or range of the species. To date, no documented mortalities of burrowing owl have occurred at adjacent wind projects (Curry & Kerlinger 2009). Implementation of EC-8, EC-9, and EC-10 would

avoid and minimize impacts and EC-13 would mitigate the impacts through offsite conservation of suitable avian foraging habitat.

Impact BIO-4: Habitat removal, displacement, and disturbance impacts on nesting raptors and special-status birds

Implementation of the Proposed Action would result in the permanent removal of 25.7 acres of agricultural habitat and 0.2 acre of grassland that are used for foraging and nesting by some avian species. In addition, the presence of new facilities (primarily turbines and access roads) could result in the temporary or permanent displacement of some species from the Plan Area. Construction in the Plan Area could result in disturbance of some nesting species, potentially leading to nest abandonment. However, the habitat types being removed are common in the region and the acreage of habitats permanently removed is small. Studies of the potential effect of displacement of birds are often inconclusive because of large home range sizes, but are detectable for most common species with smaller home ranges. Implementation of EC-8, EC-9, and EC-10 would minimize any potential direct effects associated with disturbance from construction of the Shiloh IV project. Furthermore, the spacing of the new turbines and elevated blade heights provides more foraging and movement space between turbines.

Impact BIO-5: Mortality of raptors, other birds, and bats due to collisions with turbines

Operation of wind plants can cause mortality of raptors, other birds, and bats through collision with turbine blades. Extensive studies have been conducted in the Montezuma Hills WRA; data from those studies were incorporated into the *Avian Monitoring Study and Risk Assessment for the Shiloh IV Wind Power Project, Solano County, California* (Shiloh IV study) (Curry & Kerlinger 2011). These studies were conducted in accordance with protocols set forth in *Studying Wind Energy/Bird Interactions: A Guidance Document—Metrics and Methods for Determining or Monitoring Potential Impacts on Birds at Existing and Proposed Wind Energy Sites* (Anderson et al. 1999) and *California Guidelines for Reducing Impacts to Birds and Bats from Windplant Development* (California Energy Commission and California Department of Fish and Game 2007). The applicant is also preparing an ABPP to avoid, minimize, and mitigate effects as part of EC-13.

Because bird use at neighboring wind projects could be correlated with empirical mortality data, it was possible to project mortality levels for Shiloh IV on the basis of the results of the bird use surveys, during which roughly 42,000 observations of 70 avian species were recorded.

Although these studies reflect a great number of variables, the Shiloh IV study (Curry & Kerlinger 2011) suggests that raptors—the category of birds of most concern in the context of wind turbine collision—are relatively less abundant in the Plan Area than in the neighboring wind farms studied in the Montezuma Hills WRA. Of raptor species, golden eagle is probably the species of greatest concern: in part because it is a California Species of Special Concern and is protected under the Bald and Golden Eagle Protection Act, and because in many parts of its range it is a relatively scarce species.

Recent studies conducted in the Altamont Pass indicate adjusted mortality estimates of approximately 67 golden eagles annually (Smallwood and Thelander 2008:221). The recent Altamont Pass Wind Resource Area Bird Fatality Study (ICF International 2011f), prepared in support of the Alameda County Scientific Review Committee (SRC), indicated mortality rates similar to the results of the Smallwood and Thelander study. Data collected in the Montezuma Hills indicate that mortality in this area is considerably lower (Curry & Kerlinger 2009). In the Montezuma Hills,

golden eagles are relatively uncommon, in terms of both nesting and overall observations, compared to nearby areas such as the Altamont Pass. Currently, golden eagle nests in the Montezuma Hills are limited to three or four nest sites/territories. Observations by Curry & Kerlinger indicate that use of the known nests in the Montezuma Hills is somewhat erratic and nesting success has been inconsistent over the years the area has been monitored. In preconstruction use surveys conducted by Curry & Kerlinger, nearly three-quarters of golden eagle observations (23 out of 31 observations) were at heights above or below the rotor-swept area for a large modern wind turbine (Curry & Kerlinger 2009:59). Predicted mortality rates for the Shiloh IV project indicate one fatality every other year (Solano County Department of Resource Management 2011). These observations suggest that golden eagles in the Montezuma Hills WRA may be subjected to lower mortality rates than other wind resource areas in California, such as the Altamont Pass Wind Resource Area.

American kestrels and red-tailed hawks both suffer relatively high mortality rates at wind projects in the Montezuma WRA. Postconstruction monitoring conducted at the High Winds and Shiloh I projects generated estimated mortality rates of 32.5 and 42 fatalities per year for kestrels and 21 and 11 fatalities per year for red-tailed hawks, respectively.

In preconstruction use surveys conducted by Curry & Kerlinger, approximately 2% of all observations were waterfowl species (ducks and geese) (Curry & Kerlinger 2009 p. 18). Approximately 10% of the waterfowl were observed flying within the rotor-swept area, in contrast to approximately 30% for passerines, and 43% for other birds (Curry & Kerlinger 2009 p. 38). During postconstruction monitoring conducted in the Shiloh 1 project area, there were a total of six waterfowl incidents during the 3-year monitoring period (Curry & Kerlinger 2009 p. 69). This mortality rate is small in comparison to annual waterfowl hunting rates in California (more than 300,000 birds for mallards alone).

Finally, mortality studies at the High Winds and Shiloh I wind projects yielded an estimated mortality rate of two–three bats per MW per year (Solano County 2010) as calculated from monitoring results and the incorporation of correction factors for scavengers and searcher efficiency. This rate could result in 227–308 bat fatalities per year for the Shiloh IV project, depending on the type of turbine selected and the extent to which bats use the Plan Area. Most of these bats would likely be migrating (based on the time of year most fatalities occur), and consequently would not represent large populations (numerically and geographically).

The Proposed Action is not expected to result in turbine-related mortality that significantly adversely affects populations of raptors, other bird species, or bats through potential collisions with turbines.

Impact BIO-6: Potential impacts on special-status plants

No state- or federally listed species are present in the Plan Area; however, three non-listed special-status plant species are known to occur in the Plan Area: Gairdner's yampah, pappose spikeweed, and heartscale. Pappose spikeweed and heartscale are considered rare or endangered by CNPS. Gairdner's yampah is considered by CNPS to have a "limited distribution" and therefore is considered only on the basis of local significance (e.g., whether the population is in a unique habitat, is outside its normal range or elevation). Shiloh IV would use micro-siting and HDD to avoid rare plants and thus no impacts are anticipated. Additionally, limited uncultivated wetland and annual grassland habitats may support other special-status plant populations; however, no impacts on these features are proposed and therefore no impacts on special-status plants are anticipated.

Implementation of EC-8, EC-9, EC-10, and EC-11 would reduce the potential for any inadvertent effects on Gairdner's yampah, pappose spikeweed, and heartscale.

Impact BIO-7: Potential impacts on waters of the United States (including wetlands)

Implementing the Proposed Action could potentially affect waters of the United States, including wetlands at approximately five locations. Potential waters of the United States in the Plan Area comprise bulrush/cattail wetlands with willow riparian scrub inclusions, seasonal wetlands, alkali meadows, and seasonal streams. According to the site plan and the project description, all project components except the power collection system lines and one access road have been sited at least 100 feet from any potential waters of the United States, with most project components planned for installation at a much greater distance. Although almost all project components have been designed to avoid impacts on waters of the United States, the power collection system routes do cross potential waters of the United States and the proposed access road is adjacent to a wetland.

Power collection lines are typically installed by digging a trench, installing the line, and backfilling the trench (i.e., the open-cut trenching method). This method could result in the discharge of fill material into a jurisdictional wetland and would require a CWA Section 404 permit. However, the Proposed Action would avoid all waters of the United States and associated permitting requirements along the power collection system routes by using HDD to cross under wetlands and streams. This method of avoidance has been used successfully on similar projects in the Montezuma Hills, such as the High Winds Project Shiloh I, Shiloh II, and most recently the Montezuma Wind projects.

While the use of HDD is considered less intrusive than other construction methods (e.g., open-cut trenching), the "frac-out," or inadvertent release of drilling lubricant, is a potential concern when using HDD. Implementation of EC-11 would address these potential effects.

No Action

Under the No-Action Alternative, the proposed HCP, including covered activities, would not be implemented and none of the biological communities, special-status species, or waters of the United States would be affected by wind plant development in the Plan Area. Land uses would remain in agricultural uses. Under this alternative, the potential exists that future development in the Plan Area could occur that is compatible with agricultural and wind plant development.

3.4.3 References

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3.5 Cultural Resources

This section describes the existing conditions pertaining to cultural resources and the potential environmental consequences that could result from implementation of the Proposed Action. Information presented in this section has been summarized from the *Cultural Resources Inventory Report for the Proposed Shiloh IV Project, Solano County, California* (ICF International 2011) (Cultural Resources Inventory Report). Please refer to this report for additional detail related to the context of cultural resources in the Plan Area and detailed descriptions of the methods used for this analysis.

3.5.1 Affected Environment

3.5.1.1 Regulatory Setting

The cultural resources study was conducted in compliance with Section 106 of the National Historic Preservation Act (NHPA) of 1966 and its implementing regulations (36 CFR 800, as amended in 1999). Section 106 requires that federal agencies and entities that they fund or license consider the effects of their actions on properties that are listed in the NRHP, or that may be eligible for such listing. To determine whether an undertaking could affect NRHP-eligible properties, cultural resources (including archaeological, historical, and architectural properties) must be inventoried and evaluated. Although compliance with Section 106 is the responsibility of the lead federal agency, others can conduct the work necessary to comply.

The Section 106 review process consists of four steps.

1. Initiate the Section 106 process by establishing the undertaking, developing a plan for public involvement, and identifying other consulting parties.
2. Identify *historic properties* (resources that are eligible for inclusion in the NRHP) by determining the scope of efforts, identifying cultural resources in the area potentially affected by the project, and evaluating resources' eligibility for the NRHP inclusion.
3. Assess adverse effects by applying the Section 106 criteria of adverse effect to identified historic properties.
4. Resolve adverse effects by consulting with the State Historic Preservation Officer (SHPO) and other consulting agencies to develop an agreement that addresses the treatment of historic properties.

3.5.1.2 Cultural Setting

Prehistoric Context

The prehistoric context for the Plan Area provides an overview of the human occupation in the Plan Area region. The proposed Plan Area is within the boundaries of the Delta subregion of the Central Valley archaeological region, as defined by Moratto (1984). Little is known of human occupation of this region before 4500 before present (BP). As a result of rapid alluvial and colluvial deposition in the valley over the past 10,000 years, ancient cultural deposits have been deeply buried in many areas.

The earliest evidence of widespread occupation of the lower Delta region appears at archaeological deposits assigned to the Windmill Pattern (Early Horizon), dated between 4500 and 2500 BP. The Windmill Pattern has been associated by some archaeologists with the arrival of Utian peoples from outside of California (see *Ethnographic Context*) who had adapted to riparian and wetland environments (Moratto 1984). Windmill group subsistence-settlement patterns are poorly understood because few known archaeological sites are ascribed to this archaeological pattern. Available data indicate that Windmill group sites are typically located on low rises or knolls in the floodplains of creeks or rivers. Such locations would have provided protection from seasonal floods while retaining proximity to riparian, marsh, and grassland biotic communities.

The succeeding Berkeley Pattern (Middle Horizon) dates from 2500 to 1500 BP, overlapping in time at least some Windmill Pattern manifestations. Archaeologists have identified more Berkeley Pattern sites than Windmill Pattern sites, and sites representing the former pattern are also more widespread. Deep midden deposits, suggesting larger residential group size, greater frequency of site reuse, and/or a greater degree of sedentism, characterize Berkeley Pattern sites. Berkeley group subsistence, in contrast to Windmill groups, placed greater emphasis on acorns (*Quercus* sp.) and other vegetal food sources.

The Berkeley Pattern is superseded by the Augustine Pattern around 1500 BP. The Augustine Pattern reflects a change in subsistence and land use patterns to those of the ethnographically known people (Nisenan) of the historic era. This pattern exhibits a great elaboration of ceremonial and social organization, including the development of social stratification. Exchange became well developed, and an even more intensive emphasis was placed on the use of the acorn, as is evidenced by the presence of shaped mortars and pestles and numerous hopper mortars in the archaeological record. Other notable elements of the artifact assemblage associated with the Augustine Pattern include flanged tubular smoking pipes, harpoons, clam shell disc beads, and an especially elaborate baked clay industry, which included figurines and pottery vessels (Cosumnes Brownware). The presence of small projectile point types, referred to as Gunther Barbed series, suggests the use of the bow and arrow. Other traits associated with the Augustine Pattern include the introduction of preinterment burning of offerings in a grave pit during mortuary ritual, increased village sedentism, population growth, and incipient monetary economy in which beads were used as a standard of exchange (Moratto 1984).

Ethnographic Context

The ethnographic setting for the Plan Area provides an overview of Native American use in the region. The Plan Area is in a portion of the Delta that was most likely used by several Native American groups in recent prehistory and the historic period. Anthropologists have drawn conflicting pictures of Native American use of the Montezuma Hills: The region has been variously ascribed to the Southeastern Patwin (Bennyhoff 1977:164; Johnson 1978: Figure 1; Kroeber 1925: Plate 1), the Plains Miwok (Levy 1978: Figure 1; Theodoratus et al. 1980: Map 2), and the Bay Miwok (Bennyhoff 1977:164; Levy 1978: Figure 1; Theodoratus et al. 1980: Map 2).

Given that the Bay Miwok village *Ompin* was located in the vicinity of the present project area (Levy 1978), it is likely that Bay Miwok used the Montezuma Hills most intensively up to the historic period, although Plains Miwok, Southern Patwin, and possibly Northern Yokuts and Ohlone/Costanoan groups made periodic visits to the Montezuma Hills as well (Theodoratus et al. 1980). Please refer to the Cultural Resources Inventory Report for a summary description of Bay Miwok culture.

Historical Context

Early History

Solano County is one of California's original 27 counties. Mexican, American, and European settlers began to arrive and set down roots within the boundaries of Solano County in the 1840s and 1850s. Euroamerican encroachment into the Montezuma Hills began in 1844, when settler John Bidwell (1819–1900) petitioned the Mexican government for a land grant in southeastern Solano County (Kyle 1990:464). Governor Manuel Micheltorena gave the grant to Bidwell that same year for the 17,726-acre *Rancho Los Ulpinos*. The grant was located on the west bank of the Sacramento River and extended west to a point east of the proposed Plan Area (Beck and Haase 1974:29; Kyle 1990:464; cf. Gregory 1912:64; Hunt 1926:78, 228).

Montezuma Hills was one of the original townships created in 1854 and is located in the southeastern region of the county (Munro-Fraser 1879:30, 311). During the nineteenth century, the Montezuma Hills area maintained a small local population, with fewer than 500 residents as late as 1890. Over the next three decades the Montezuma Hills population varied but generally remained at under 500 residents. By the mid-twentieth century the regional population had declined to approximately 300 residents (United States Census 1895:74; 1913:150; 1924:16; 1942:126). Settlement in Montezuma Hills continued to be sparse into the latter half of the twentieth century and remains so, particularly in the Plan Area (United States Census 1913:150; 1921:16; and 1942:126).

The most notable early settlement in the western Montezuma Hills was Collinsville, located on the north bank of the Sacramento River near its confluence with the San Joaquin River. There, in 1846, emigrant Lansford W. Hastings built an adobe and laid out a new town. Hastings eventually established a ferry crossing between the town site, which came to be known as "Montezuma," and the Contra Costa County shore to the south. The site was eventually vacated by Hastings and resettled by C. J. Collins in 1856. Efforts to expand the town into a major commercial and residential center floundered. F. E. Booth and Company built a salmon cannery at Collinsville in 1873, and Italian fisherman employed at the cannery established a neighborhood of stilt-elevated homes on flood-tide lands that became known as "Little Venice" (Hoover et al 2002:493). By then, the modest settlement of Birds Landing had been established approximately 4 miles north of Collinsville.

Essentially a crossroads store and post office surrounded by farms to the north, east, and south and Montezuma Slough to the west, Birds Landing took its name from the shipping point established on the slough by John Bird, who emigrated to California in 1859. Acquiring 1,000 acres and establishing a storage and commission business, Bird built a wharf on Montezuma Slough, from where, according to J. P. Munro-Fraser's *History of Solano County (1879)*, "a large portion of grain" was regularly shipped during the 1870s. In 1876, Bird joined with members of the Dinkelspiel family, who had already established a merchandizing operation nearer to Collinsville, to build a general store and post office at the crossroads approximately one-half mile northeast of the wharf, now the intersection of Birds Landing and Collinsville Roads. The crossroads became the center of the small village of Birds Landing. During the early 1880s, John Bird's brother, Henry, bought out the Dinkelspiel family's share of interest in the store. The Birds later sold the store to members of the Benjamin family. Listed in the NRHP in 1999, and also listed as a State Point of Interest, the store is outside the Plan Area at the southwest corner of Birds Landing and Collinsville Roads (Hoover et al. 2002:503; Munro-Fraser 1879:275; Delaplane 1995a).

In addition to John Bird and members of the Dinkelspiel family, early settlers in the Birds Landing area included meat seller James W. Arnold (arrived in 1878), Irish immigrant and farmer William Donell (1874), farmer Robert Meins (1870s), H. E. Winter (1879), rancher Frank Taylor (arrival date unknown), and Robert Donald (arrived by 1877) (Munro-Frazier 1879:486–489; Thompson & West 1878:42–43.) Inasmuch as the Bird-Dinkelspiel store served as the commercial center of early Birds Landing, the community's cultural center was established approximately 3 miles to the northwest. There, in 1869, after a meeting of Montezuma Hills citizens, the community commissioned the construction of Shiloh Church, completed in 1870. The church continues to stand today northwest of the Plan Area (Robinson 1986:3-6).

The town of Rio Vista was created on land purchased in 1855 by Colonel N. H. Davis from Bidwell. During the late nineteenth and early twentieth centuries, Rio Vista functioned largely as an agricultural community. Aside from its downtown, much of its land remained undeveloped. An increasing population due to renewal and development during the early 1900s resulted in a rise in residential and infrastructure development including educational, religious, and community facilities. During the 1920s, Rio Vista and the surrounding region had approximately 1,900 residents. By the late 1940s and following World War II, Rio Vista had an established downtown area and the regional population reached more than 3,500 residents. Today, the Rio Vista region is approximately 25 percent developed and has more than 8,000 residents (City of Rio Vista 2005; Gunn and Hunt 1926:227; Pezzaglia 2005:101, 105).

Agriculture

Unlike other areas of Solano County, agricultural development in Montezuma Hills was limited to grain, hay, and wheat, which thrived. This was largely due to a combination of adobe soil and high winds, making fruit and vegetable crops, which were grown in other regions of the county, a more challenging endeavor in Montezuma Hills (Munro-Fraser 1879:24; Gregory 1912:71). By 1878, an estimated 23 ranches operated in the area (Delaplane 1995). Farming families settled in the Montezuma Hills and established wheat farms and livestock ranches that they passed down for generations (Delaplane 1999; Munro-Fraser 1879:471). Agricultural enterprise served as the main driving force of the Montezuma Hills economy throughout the late nineteenth and early twentieth centuries. Presently, agricultural land, including agriculture-related buildings and some residences, continues to dominate the local landscape for the region surrounding the Plan Area (Delaplane 1999; Eager 1890 and 1915; Munro-Fraser 1879:471; Gregory 1912:189–190; Hunt 1926:211–215, 232).

Sheep-raising has a long history in the region. Land use patterns developed early on were characterized by crop rotation, periods of fallow, and intermittent grazing. These patterns proved amenable to sheep-raising as the animals demonstrated an ability to thrive during what one author has described as the Montezuma Hills' "sticky winter soil conditions" (Theodoratus et al. 1980:18). Sheep-raising activity in the Montezuma Hills appears to have been suggested both by the region's climate and terrain, and by successful sheep ranches established in eastern Alameda and Contra Costa Counties prior to the founding of Birds Landing. Sheep barns were constructed throughout the region as the sheep-raising efforts spread across the Montezuma Hills. Numerous ranchers in the area began raising sheep in the late nineteenth and the early twentieth centuries. By the late twentieth century, sheep had largely replaced other types of livestock operations in Montezuma Hills (Theodoratus et al. 1980:12–13, 18, 49, 98, 102–103, 105, 137, 138, 141, 152, 157, 164, 198, 206).

Wind Energy Production

Windmill use in California began in 1854 when farmers and landholders in San Francisco, Sacramento, and Stockton began using windmills produced by local manufacturers to pump well water for livestock, crop irrigation, and other tasks. These windmills were constructed of wood. However, by the 1860s windmills were largely constructed of steel and sheet metal. During the mid-1870s, windmills constructed in the Midwest began arriving in California, although locally produced windmills continued.

During the late nineteenth century, oil and gasoline availability in combination with the advent of electricity led to a decline in windmill use in developed areas. Rural areas continued using windmills largely because of the lack of electrical development in these areas and because new windmills produced around the turn of the century featured all-metal construction. By the 1910s, windmills were almost entirely replaced by other forms of pumping power (Manning 1975:33–37).

During the 1930s, the Great Depression and the resulting prohibitive costs for oil and gasoline brought renewed popularity for energy production. Residences in rural areas maintained wind turbines as energy sources throughout the twentieth century. Since the 1980s, local utility company and private energy corporations have been installing wind farms in the Montezuma Hills region. These wind turbines stand 300–400 feet tall, feature modern design, and provide energy to power more than 700,000 homes (Baker 2006:B-2; Manning 1975:33–37; Massad 2009:1–2).

Transportation

Nineteenth century transportation to and from the Montezuma Hills was limited to river ferries along the Sacramento River and a small network of roads (Hunt 1926:38). Through the 1870s, road development was limited in this area, comprising a few tracks and unimproved roads (General Land Office 1877). The current system of roads from the Montezuma Hills to Fairfield, Rio Vista, and Dixon was established between 1872 and 1890 (Henning 1872; Eager 1890). Roads bordering or passing through the Plan Area include SR 12 (formerly Road 211), Collinsville Road (formerly Road 68), and Bird's Landing Road (formerly Road 249).

During the early twentieth century, SR 12 developed into the main thoroughfare through the Montezuma Hills area. In 1919, a bond issue passed, resulting in the addition of SR 12 (then called State Route 53) into the state highway system. More than 116 miles long, SR 12 extended east toward Lodi and west toward Fairfield. During the 1920s, the highway was paved, becoming one of the few improved roads in the vicinity of the Plan Area. By 1932, the route was renamed Highway 12 and underwent additional pavement improvement. Over the next two decades SR 12 remained relatively unchanged (Caltrans 1957:30).

An electric commuter railway was also developed within a mile west of the Plan Area during the early twentieth century. Originally opened in 1913, the Oakland, Antioch & Eastern Railway (OA&E) established interurban electric railroad service between San Francisco and Sacramento. The line was reorganized into the San Francisco–Sacramento Railroad in 1919, and then purchased by the Sacramento Northern Railway (SNR) in 1928, allowing for interurban travel between San Francisco and valley destinations as far north as Chico. In 1953, with retirement of the ferryboat *Roman*, which transferred SNR cars between Contra Costa and Solano Counties, the railroad's electrification system was removed between Collinsville and Sacramento. Plans to convert the line to a local shipping service were never implemented (Robertson 1998:193–196; Bay Area Electric Railroad Association 2011).

3.5.1.3 Methods

The effort to identify cultural resources in the Plan Area included a records search of previous cultural resource investigations and recorded sites; background research and a review of literature relevant to the prehistory, ethnography, and history of the project vicinity; consultation with Native American representatives, historical societies, and other interested parties; and site visits and pedestrian surveys of the Plan Area.

Area of Potential Effects

Mostly treeless rolling hills. For the purposes of this analysis, the area of potential effects (*area of impact*) is defined as the maximum possible area of direct impact resulting from the Proposed Action, including all areas of ground-disturbing activities. The area of impact is smaller than the Plan Area and is generally confined to corridors within which the project components are planned: the proposed wind turbine locations, access roads, substation, electrical lines, underground cables and O&M facility expansion area (Figure 2-3). The area of impact for the built environment includes all standing buildings and structures situated on parcels on which the project would be constructed.

Research and Consultation

A records search was conducted on December 20, 2010, by an ICF archaeologist at the Northwest Information Center (NWIC) of the California Historical Resources Inventory System in Rohnert Park, California. Records of previously conducted cultural resource investigations and previously recorded cultural resources were consulted for the Plan Area and a 1-mile radius around it. The records search included a review of the NRHP, the California Register of Historical Resources, Caltrans Bridge Survey, and the Directory of Properties in the Historic Property Data File for Solano County. Historic topographic maps and survey plats were also consulted (Henning 1872; General Land Office 1853; U.S. Geological Survey 1908).

The records search results show that seven studies were previously conducted within the Plan Area and 2 studies have been conducted within the 1-mile radius outside the Plan Area. No previously recorded resources were located in the Plan Area and 17 cultural resources were located within the 1-mile radius around the Plan Area.

Numerous studies conducted in the project vicinity have demonstrated that the potential for archaeological resources to exist in the Montezuma Hills area is low. Given the extensive level of historic period settlement and agricultural activities in the area, the potential for historic period archaeological resources is higher than that of prehistoric period resources. These resources are expected to include homesteading features, water capture features and conveyances, fencing, privies, and refuse deposits.

Research on the history of the region, Birds Landing, and individual properties within the APE was conducted at a variety of locations. Background research was conducted at the ICF International cultural library in Sacramento; the San Francisco Public Library; the Fairfield branch of the Solano County Library; the map rooms of the Shields Library, University of California, Davis; and the Earth Sciences library, University of California, Berkeley. Property-specific research was conducted at the Solano County Assessor-Recorder's office and the Solano County Archives, both located in Fairfield.

ICF contacted the Solano County Historical Association, the Solano County Genealogical Society, and the Rio Vista Museum by letter on January 12, 2011, to inquire if they had information pertinent to

the project or concerns regarding the Proposed Action. Additional background research, and research on the Donald Family and the Donald Ranch, was conducted at the offices of the Vacaville Heritage Council and the Solano County Genealogical Society Library, both located in Vacaville. Consultations were also held with managing staff at the offices of the Solano County Archives and the Vacaville Heritage Council. In addition, an interview with Birds Landing's longest residing inhabitant was held regarding possible concerns regarding the project.

ICF requested from the Native American Heritage Commission (NAHC) a search of its sacred lands file and a list of Native Americans with knowledge of and interest in local cultural resources. The NAHC informed ICF that no sacred lands have been reported in the project vicinity. Additionally, the NAHC provided a list of Native American contacts for Solano County, and correspondence was sent to gather input from these contacts. Copies of correspondence are in Appendix A of the Cultural Resources Inventory Report. Correspondence with Native American groups resulted in no response. During the week of March 7, 2011, follow-up phone calls were made to the Yocha Dehe Wintun Nation, the Cortina Band of Indians, the Wintun Environmental Protection Agency, and Kesner Flores. To date no responses to the phone calls have been received.

Cultural Resources Fieldwork

ICF archaeologists, qualified in identifying and documenting prehistoric and historic cultural resources, conducted pedestrian surveys of the Plan Area over the course of 3 partial-week field sessions between February 3 and February 22, 2011. The entire project footprint was surveyed: turbine locations, access roads, service roads, proposed roads, roads to be removed, staging areas, and the substation. Survey transects were spaced 66 feet apart.

On January 26, 2011, ICF historians and architectural historians conducted a field survey of the proposed Plan Area. As part of the field process, buildings, structures, and linear features 50 years old or older were inspected, photographed, and documented.

3.5.1.4 Results

Archaeological Resources

No prehistoric archaeological resources were observed during the archaeological surveys. One historic-period archaeological resource was identified during the archaeological surveys. One historic period resource, ICF-S4-1H (Table 3.5-1), consists of a water-pumping location with a metal A-frame windmill and well, one concrete water storage tank and three cast iron bathtubs that are likely used as water troughs. The water-pumping station appears to be functioning based on field observations of newly excavated trenches and activities in the area. A description of the resource and California Department of Parks and Recreation (DPR) 523 forms for the resource is included in the Cultural Resources Inventory Report.

Architectural Resources

The architectural inventory identified six parcels (APNs 0090-070-310, 0090-090-350, 0090-090-210, 0090-090-230, 0090-090-250, and 0090-070-070) (Table 3.5-1), containing a total of 22 buildings and structures that appear to be 50 years old or older, in the Plan Area. The resources were documented and evaluated for their eligibility for listing in the NRHP and the CRHR. Ten structures on APN 0090-090-230 (6269 Birds Landing Road) appear to meet the criteria for listing in the NRHP or the CRHR as part of the historic Donald Ranch complex. Table 3.5-1 lists the

resources identified. A description of each of the resources evaluated during the study and DPR 523 forms for these resources are included in the Cultural Resources Inventory Report.

Table 3.5-1. Cultural Resources in the Shiloh IV Plan Area

Site or APN #	Address	Description	NRHP / CRHR eligibility
ICF-S4-1H	n/a	Water pumping station (windmill, well, tank and bathtub troughs)	Assume Eligible
0090-070-310	5966 Birds Landing Road	Ranch complex (residence, barn, ancillary buildings)	Not Eligible
0090-090-350	Birds Landing Road	Agricultural building	Not Eligible
0090-090-210	6200 Birds Landing Road	Residence, outbuilding, tank stand	Not Eligible
0090-090-230	6269 Birds Landing Road	Donald Ranch (residence, barns, ancillary structures)	Recommended Eligible
	Montezuma Hills Road	Barn	Not Eligible
0090-070-070	725 Collinsville Road	Water tank stand	Not Eligible

Of the seven cultural resources recorded in the Plan Area, five were evaluated for eligibility to the NRHP (APNs 0090-070-310, 0090-090-350, 0090-090-210, 0090-090-250, 0090-070-070). These resources do not appear to meet the NRHP eligibility criteria due to insufficient historical and architectural significance and diminished historic integrity. Resource ICF-S4-1H was not evaluated for listing in the NRHP or CRHR and is assumed eligible until a formal evaluation is completed. The Donald Ranch complex, owned by members and descendants of the Donald family from 1877 through the 1980s, and occupying a portion of APN 0090-090-230, appears to be eligible for listing in the NRHP under criterion c and the CRHR under criterion 3 for its architectural significance. Specifically, the ranch's core cluster of buildings does appear significant for its exemplary residence exhibiting the late-nineteenth-century Italianate style, and for its numerous barns and outbuildings exhibiting the region's rural-vernacular architecture—the property's bunkhouses, California tank house, and barns. The property conveys distinctive characteristics of the kinds of agricultural complexes that were prevalent in the Montezuma Hills and the Birds Landing during the late nineteenth and early twentieth centuries. Refer to the Cultural resources Inventory Report for additional information regarding the specific properties evaluated in this analysis.

3.5.2 Environmental Consequences

This analysis documents that potential impacts pertaining to cultural resources are not considered adverse, because they would not result in any of the following conditions.

- Cause an adverse change in the significance of an archaeological resource.
- Cause an adverse change in the significance of a historical resource.

3.5.2.1 Effects

Proposed Action

Impact CUL-1: Change in significance of known archaeological sites

One historic period archaeological resource (ICF-S4-1H)—consisting of a windmill and well—was not evaluated but is assumed eligible for listing in the NRHP. The Proposed Action involves a gate, road, and one turbine in the general area of this resource. This potential impact is not considered adverse because EC-14, which is incorporated into the Proposed Action, would require that the location of resource ICF-S4-1H be flagged and for construction personnel to be instructed to avoid the resource. These precautions would avoid damage of the resource during project construction.

Impact CUL-2: Change in significance of potential buried archaeological sites

The potential exists for discovery of yet undiscovered buried archaeological resources in the Plan Area during construction of the Proposed Action, based on the general sensitivity for archaeological resources in the area. This potential impact is not considered adverse because EC-15, which is incorporated into the Proposed Action, would require additional cultural resource surveys if the location of project features change and EC-16 requires that work would stop if unanticipated cultural resources are discovered during construction.

Impact CUL-3: Change in significance of a historical resource

One historical resource—the Donald Ranch complex consisting of 10 historically related buildings and structures— appears to be eligible for inclusion in the CRHR and NRHP under Criteria 3 and C, respectively. The area of direct impacts in the vicinity of the Donald Ranch parcel is over 1,000 feet from the historic structures evaluated for this project. In addition, the direct impact area extends along a ridge line, where it is unlikely that buried archaeological remains would exist. None of the other buildings or structures in the Plan Area that are 50 years old or older appear to be historic properties under Section 106 of the NHPA. In addition, project construction and operations would not result in adverse effects on the Donald Ranch property the nearest area of project disturbance would be more than 1,000 feet away from these structures vibration-related effects would be avoided and the historic setting of the Donald Ranch would be retained.

No Action

Under the No-Action Alternative, the Proposed Action would not be implemented and the Plan Area would remain in agricultural uses. No adverse effects on archaeological or historic resources would occur in the Plan Area because none exist and no new activities that could affect unknown resources are proposed.

3.5.3 References

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3.6 Geology, Seismicity, Soils, Mineral Resources, and Paleontological Resources

This section describes the existing conditions pertaining to geology, seismicity, soils, mineral resources, and paleontological resources and the potential environmental consequences that could result from implementation of the Proposed Action.

3.6.1 Affected Environment

3.6.1.1 Regulatory Setting

Alquist-Priolo Earthquake Fault Zoning Act

The California Alquist-Priolo Earthquake Fault Zoning Act requires the delineation of zones along active faults in California for the purpose of regulating development on or near an active fault trace. Projects involving the construction of buildings or structures intended for human occupancy in a fault zone are subject to review under the Alquist-Priolo Act. The Plan Area is not located in, and does not cross, an Alquist-Priolo Earthquake Fault Zone. In the instance of seismic activity, however, it is important to note that a surface fault rupture may not be restricted to areas within the Alquist-Priolo Fault Zones, and that in many cases surface rupture is likely to occur outside of these fault zones as well as inside them.

Seismic Hazards Mapping Act

The California Seismic Hazards Mapping Act became effective January 1, 1992, and was developed to protect the public from the effects of ground shaking, liquefaction, landslides, and other hazards caused by seismic activities. The Act directs the California Geological Survey (CGS) to identify and map areas subject to potential ground shaking, liquefaction, and landslide hazards. The Act requires CGS to prioritize areas for mapping according to the population affected by the seismic hazard and the probability that the seismic hazard will affect public health and safety. To date, CGS has not prepared a seismic hazards map for Solano County or the Montezuma Hills region.

The California Department of Mines and Geology Special Publication 117a, *Guidelines for Evaluating and Mitigating Seismic Hazards in California*, details guidelines for evaluating seismic hazards in accordance with the Act and recommends appropriate measures to minimize these hazards.

California Building Code

Title 24, Part 2 of the CCR, also known as the California Building Standards Code (CBC), contains regulations governing building standards for the State of California. The Proposed Action will be subject to the latest edition of CBC adopted by the County and in effect at the time of building permit issuance. The current edition, 2010 CBC, became effective on January 1, 2011. The 2010 CBC assigns a seismic design category to each structure based on the existing acceleration and site classification, as well as the intended used of the structure, which affects the seismic design requirements for that structure.

Solano County General Plan

The Resources Chapter of the General Plan has established policies for conservation of mineral resources, as follows (Solano County 2008).

- **RS.P-33:** The County shall preserve, for future use, areas with important mineral resources by preventing residential, commercial, and industrial development that would be incompatible with mining practices to the extent feasible.
- **RS.P-34:** The County shall ensure that mineral extraction operations are performed in a manner compatible with land uses on the site and surrounding area and do not adversely affect the environment. At the end of such operations, the County shall ensure that the site is restored to conform with Surface Mining and Reclamation Act requirements and to a use compatible with surrounding land uses.

In addition, the Resources Chapter requires wind developers to prepare and submit a geotechnical report that conforms to standard County requirements for geotechnical analysis to mitigate potential impacts (RS.I-50). The study is to identify potential geologic hazards and include design to withstand them. A California-registered geologist is required to sign it and submit it to the County for review and approval.

Solano County Zoning Code

Chapter 31 of the Solano County Zoning Code contains the County's Grading, Drainage, Land Leveling and Erosion Control ordinance. The purpose of the ordinance is to control soil erosion, sedimentation, increased runoff rates, and related environmental damage by establishing standards that protect downstream waterways and wetlands. Section 31-16 requires written approval from the Solano County Director of Resource Management for grading work occurring between October 16 and April 14 (i.e., the rainy season). In addition, Section 31-20 requires a permit for work within or in areas 25 feet from the top of a bank of channels flowing or which will flow into the Suisun Marsh. Section 31-26 establishes the application requirements for major grading permits, including an engineered erosion, sediment, and runoff control plan. Section 31-26 requires submittal of a soil engineering report and engineering geology report with project-specific conclusions and recommendations for grading and design criteria.

3.6.1.2 Environmental Setting

Geology

Solano County is located in the Great Valley geomorphic province, an approximately 50-mile-wide by 400-mile-long alluvial plain between the Sierra Nevada to the east and the terminus of the Coast Ranges to the west (Solano County Department of Resource Management 2011). The Great Valley is composed of alluvial deposits underlain by the east-sloping Cretaceous and Cenozoic strata of the Coast Ranges and the west-sloping bedrock of the Sierra Nevada. Solano County is in the southwestern portion of the Sacramento Valley, bordered by Putah Creek on the north, Suisun and San Pablo Bays on the south, and the Sacramento River on the east (Solano County 2011).

The Plan Area is in the low-rolling Montezuma Hills in the southeastern portion of Solano County. The Montezuma Hills consist of the Quaternary Montezuma Formation (Qmz), which is characterized by poorly sorted quartz-lithic sand, silt, and pebble gravel). Drainage channels within the Plan Area consist of Quaternary Alluvium (Qa) and Quaternary alluvial fan deposits (Qpf). The

Qmz, Qa, and Qpf deposits include unconsolidated sand, silt, gravel, and clay that are subject to liquefaction, densification, settlement, lateral spreading, expansion, and lurching. Hills in the area have a relatively constant crest elevation between 100 and 272 feet amsl. Valleys in the Plan Area transition to slightly sloped hillsides with relatively flat ridgelines. (Solano County Department of Resource Management 2011).

Seismicity

The San Francisco Bay Area is considered very seismically active. Geologists focus their studies on Quaternary-active faults (faults with evidence of displacement during approximately the last 2 million years) and Holocene-active faults (faults with evidence of movement during approximately the last 11,500 years) (Ecology and Environment 2006, Solano County Department of Resource Management 2011).

Soils

Approximately 35% of the county, including most of the Montezuma Hills, is made up of gently sloping to very steep, well-drained, and somewhat excessively drained soils on dissected terraces and mountainous uplands. There are 17 soil associations in Solano County, classified into four groups based on slope and drainage characteristics. Of these 17 soil associations, 2 are present in the Montezuma Hills: the Altamont-Diablo and the San Ysidro-Antioch associations (Solano County Department of Resource Management 2011). The Altamont-Diablo association covers the entire Plan Area and is composed of gently sloping to steep, well-drained clays formed by weakly consolidated sediments on dissected terraces. Soil slopes in this association range from 2 to 50 percent. Twelve soil types occur in the area where facilities would be located. Four soil types make up approximately 81 percent of the Plan Area.

- Altamont-San Ysidro-San Benito complex (AlE), 9 to 30 percent slopes, which account for approximately 36 percent of the Plan Area.
- Altamont clay (AcE), 9 to 30 percent slopes, which account for approximately 21 percent of the Plan Area.
- Altamont-Diablo clays (AmE2), 9 to 30 percent slopes, eroded, which account for approximately 12 percent of the Plan Area.
- Diablo-Ayar clays (DaE2), 9 to 30 % slopes (eroded), which account for approximately 11 percent of the Plan Area.

The remaining soil types include Altamont clay (AcF2)(30 to 50 percent slopes), Altamont-San Ysidro-San Benito complex (AlC)(2 to 9 percent slopes), Antioch-San Ysidro complex (AoA)(0 to 2 percent slopes), Antioch-San Ysidro complex (AoC)(2 to 9 percent slopes), Altamont-Diablo clays (AmC), Diablo-Ayer clays (DaC)(2 to 9 percent slope), Omni clay loam, (Om) and Solano loam (Sh).

Mineral Resources

According to the Solano County Land Use and Circulation Element, many significant mineral resources occur in Solano County, including natural gas, sand, gravel, rock and other fill material, and sandstone (Solano County 2011). Clay and gas are extracted from the Suisun Marsh and eastern county areas, while salines are taken from the Napa Marsh area. Sand, crushed gravel, and stone are mined in the Vallejo-Benicia Hills, Potrero Hills, and Wolfskill and Putah Creek areas. There are also mercury deposits in the Vallejo-Benicia Hills area and a large gas field in Rio Vista. Though there are

several mineral resource zones in Solano County, none are located in or near the Shiloh IV Plan Area. The eastern Montezuma Hills region does contain several natural gas fields; however, the Shiloh IV project is not located in an active gas field (Wallace-Kuhl & Associates 2011). There are two plugged dry hole natural gas wells that were abandoned in 1922 and 1980 east of the Plan Area (in the Montezuma II project area)(Solano County Department of Resource Management 2011, Wallace-Kuhl & Associates 2011).

Paleontological Resources

The Plan Area is entirely underlain by the Montezuma Hills Formation. This formation has not historically been a source of fossils. A fossil locality search was conducted through the University of California, Berkeley Museum of Paleontology (UCMP) website database. The search included vertebrates, invertebrates, plants, and microfossils. The search did not identify any fossil localities in the Plan Area, but identified three fossil localities in the project vicinity (Table 3.6-1). The localities of these paleontological discoveries are all more than 1 mile outside of the Plan Area.

Table 3.6-1. Fossil Locality Search Results

Location	Description
Near Denverton Slough, 4.4 miles north of Plan Area	Anterior limb bones, mammal in the Camelidae family (UCMP V5704); Miocene epoch.
Northwest of Collinsville, 1.5 miles south of Plan Area	A skeleton of the Mammuthus genus and a lateral metapodial belonging to a mammal of the Equus genus; both from the Pleistocene epoch (UCMP V3719).
East of the Collinsville site (above), 1.7 miles south of Plan Area	Remains of <i>Sigmodon lindsayi</i> , a rodent from the Pleistocene epoch (UCMP V79073).
Along Montezuma Hills Road, 1.4 miles east of the Plan Area	A tooth fragment from a mammal in the Camelidae family and a Haplomastodon skull, both dating from the Pliocene epoch (UCMP V5913).

3.6.2 Environmental Consequences

3.6.2.1 Approach and Methods

Assessment of environmental consequences of alternatives on geological resources entailed a qualitative evaluation of the Proposed Action's potential to result in any of the conditions listed below.

- Exposure of people or structures to increased risk related to strong seismic ground shaking.
- Exposure of people or structures to increased risk of landslides or other slope failure.
- Substantial soil erosion or the loss of topsoil.
- Location on expansive soil, as defined in Table 18-1-B of the Unified Building Code (International Code Council 1997) creating substantial risks to life or property.
- Potential loss of availability of a mineral resource.
- Substantial damage to or destruction of significant paleontological resources.

3.6.2.2 Effects

Proposed Action

Impact GEO-1: Increased exposure to risk from ground shaking and landslides

In the event of a ground-shaking event, Plan Area facilities could be affected. Wind turbines, electrical transmission towers, power lines, and other facilities could be damaged or may collapse. Structural damage to the Shiloh IV Wind Project facilities could injure workers or other humans in the vicinity. In light of the historical seismic activity in the vicinity, an earthquake could cause damage to improperly designed structures. EC- 17 specifies preparation of a geotechnical study; EC-18 requires that design of structures follow recommendations provided in the geotechnical study to avoid structural failure due to ground shaking and landslides. Because standard building measures are incorporated into the Proposed Action to address potential landslide and ground-shaking risks, this potential impact is not considered adverse.

Impact GEO-2: Potential loss of soil from erosion

Soils in the Plan Area include those that are highly susceptible to water erosion (HSG D) and moderately susceptible to wind erosion (WEG 4–8). Construction activities involving vegetation clearing, slope cutting and filling would temporarily disturb soil surfaces and increase potential soil erosion and loss of topsoil. EC-19 involves preparation of a SWPPP that will include soil erosion controls to salvage and reuse topsoil disturbed by the Proposed Action and to monitor the disturbed areas each spring for areas of erosion and need for control measures. Shiloh IV will also develop and implement a fugitive dust control plan (EC-7). In addition, EC-20 requires that temporally disturbed areas are restored to preconstruction conditions which will further prevent erosion and minimize water quality effects associated with sediment transport. These measures will minimize soil erosion and loss and related air or water quality impacts so that there is no significant adverse effect.

Impact GEO-3: Location of facilities on expansive soils

Plan Area soils consist of clay soil types that generally have slow permeability and a medium to high water capacity and, as such, are potentially expansive. Without proper engineering, buildings and structures associated with the Proposed Action could be susceptible to damage from shrinking and swelling soils. Because of the clay content in the Plan Area's soils, use of heavy equipment during construction could result in soil compaction, and soil settlement could occur subsequent to project construction. EC-17 specifies preparation of a geotechnical study; EC-18 requires that design of structures follow recommendations provided in the geotechnical study to avoid failure resulting from placement of facilities on expansive soils. Because standard building measures are incorporated into the Proposed Action to address the potential for expansive soils, this potential impact is not considered adverse.

Impact GEO-4: Potential loss of availability of mineral resources

Because the Proposed Action would not affect any known mineral resources in the Plan Area and would not preclude future development of as yet unknown mineral resources that may occur in the Plan Area, there would be no adverse effect.

Impact GEO-5: Potential damage or destruction of significant paleontological resources

Although no paleontological resources have been documented in the Plan Area, it is possible that unanticipated discovery of such resources could result from construction-related activities, including use of HDD for installation of power collection lines crossing wetlands or seasonal drainages. Implementation of EC-16, which requires work to stop if unknown paleontological resources are discovered, would ensure that this is not a significant adverse effect.

No Action

Under the No-Action Alternative, the Proposed Action would not be implemented and the Plan Area would remain in agricultural uses. No adverse effects on geological or soil resources beyond those associated with current conditions would result.

3.6.3 References

Ecology and Environment. 2006. *Draft Environmental Impact Report Shiloh II Wind Plant Project*. Prepared for Solano County Department of Resource Management. October.

International Code Council. 1997. *Uniform Building Code*. Albany, NY: Delmar Publishers.

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3.7 Hazardous Materials

This section describes the existing conditions pertaining to hazardous materials and the potential environmental consequences that could result from implementation of the Proposed Action. The information in this section is derived from the *Phase I Environmental Site Assessment Shiloh IV Wind Farm, Solano County, California* prepared by Wallace Kuhl & Associates (WKA) (2011) (Phase I Study).

3.7.1 Affected Environment

3.7.1.1 Regulatory Setting

EPA is the principal federal regulatory agency responsible for the safe use and handling of hazardous materials. Two key federal regulations pertaining to hazardous wastes are described below. Other applicable federal regulations are contained primarily in CFR Titles 29, 40, and 49.

Resource Conservation and Recovery Act

RCRA enables EPA to administer a regulatory program that extends from the manufacture of hazardous materials to their disposal, thereby regulating the generation, transport, treatment, storage, and disposal of hazardous waste at all facilities and sites in the nation.

Comprehensive Environmental Response, Compensation, and Liability Act

The Comprehensive Environmental Response, Compensation, and Liability Act, also known as Superfund, was passed to facilitate the cleanup of the nation's toxic waste sites. In 1986, Superfund was amended by Title III of the Superfund Amendment and Reauthorization Act (community right-to-know laws), also called the Emergency Planning and Community Right-to-Know Act, which states that past and present owners of land contaminated with hazardous substances can be held liable for the entire cost of the cleanup even if the material was dumped illegally when the property was under different ownership. These regulations also establish reporting requirements that provide the public with important information on hazardous chemicals in their communities to enhance community awareness of chemical hazards and facilitate development of state and local emergency response plans.

3.7.1.2 Environmental Setting

During excavation and earth-moving activities associated with construction of the Shiloh IV project, there is the potential for encountering hazardous contaminants. To evaluate this potential, WKA was retained to conduct a Phase I environmental site assessment for the Shiloh IV Project. The objective of the assessment was to determine whether the properties comprising the Plan Area were subject to the presence or likely presence of hazardous materials or wastes, including petroleum products, or were under conditions that indicate an existing release, a past release, or any material threat of a release of those materials or wastes into the ground, groundwater, or surface water of the properties.

The current and historical uses of the Plan Area and vicinity were determined through an examination of the following information.

- Historical USGS topographical maps – Antioch North, Pittsburg, Collinsville and Birds Landing quadrangles.
- Historical aerial photographs.
- California Department of Conservation, division of Oil, Gas, and Geothermal Resources Map 612
- Ownership records
- Local street directories
- Zoning and land use records
- Interviews with public agency and landowner representatives
- Visual onsite inspections by WKA (March 29 and April 19, 2011)

Environmental Data Resources (EDR ®), a national commercial provider of environmental database information, was contacted to provide a summary of federal, state, and local regulatory agency database information regarding sites with known hazardous materials or wastes. No federally, state, or county-listed facilities were identified within the required search radii for each type of facility. See the Phase I Study for additional detail.

Grazing and Dryland Farming

Historical land uses have included livestock grazing and dryland grain crop production of wheat and oats. Typically, these land uses do not require application or use of persistent pesticides. Although the record search conducted for the study did not reveal use of any pesticides, the site investigation and interviews with landowner representatives determined that fertilizers and herbicides are used at one or more of the agricultural fields, typically applied in the fall. Anhydrous ammonia is a commonly used fertilizer applied directly in the field and herbicides are either applied in the field or broadcast by aerial spraying.

Permanent or Temporary Structures

Permanent and temporary structures in the Plan Area include those related to wind plant operations (i.e., wind turbines, electrical transmission towers and lines, O&M facility buildings) and rural residential land uses (i.e., houses, barns, sheds, ancillary structures).

The Shiloh IV Plan Area includes tower-mounted electrical lines across the eastern portion of the site, and enXco wind turbines on 13 of the 30 parcels, and the O&M facility near the east-central Plan Area boundary. The residences are not part of the Proposed Action and thus, were not included in the Phase I investigation.

The enXco V O&M area includes a small office building, a commercial building providing offices and two service shops for the enXco projects, and a communications tower with an associated enclosed generator. The service shops house multiple 55-gallon drums of gear oil, hydraulic oil, and waste oil. Other smaller containers holding filtered oil were also observed onsite. All drums and containers with fluids are stored on secondary containment pallets. Fire-safe lockers are used to store paint, lubricants, motor oil, and other flammable products. The communications tower generator has a self-contained 300-gallon emergency generator diesel aboveground storage tank (AST) and a

covered oil containment area is north of the emergency generator. A 250-gallon waste oil AST, multiple 55-gallon drums containing new oil, waste oil, solvent, and transformer oil were stored on secondary containment pallets or within a concrete secondary containment basin. A self-contained 1,000-gallon gasoline AST is north of the oil storage area. The O&M facility has several areas designated for storage of equipment, materials and parts, including spare transformers (stored without fluids). One well with a storage reservoir was observed in the eastern area of the O&M site. There was no evidence of underground fuel storage tanks (USTs) associated with existing enXco operations.

Municipal Infrastructure and Utilities

There are no municipal water or sewer services to the residential properties or to the O&M facility in the Plan Area. Residences obtain potable water through privately owned domestic wells and the O&M facility uses bottled water. The residences and O&M facility use septic systems. Neighborhood electrical distribution lines run through the Plan Area and along Birds Landing and Montezuma Hills Roads. A number of pad-mounted transformers were observed onsite, typically adjacent to existing wind turbines.

Oil and Gas Wells

There is one PG&E natural gas transmission pipeline that crosses the northern portion of the Plan Area in an east-west direction. Gas transmission lines are typically buried approximately 3–5 feet below ground surface.

3.7.2 Environmental Consequences

3.7.2.1 Approach and Methods

This assessment, based on WKA's Phase I study, involved a qualitative evaluation of the potential to expose people or properties to hazardous materials as a result of implementation of the Proposed Action.

3.7.2.2 Effects

Proposed Action

Impact HAZ-1: Potential hazardous materials spills

Implementation of the Proposed Action would not introduce substantial amounts of hazardous materials to the Plan Area. Construction and operation of the Shiloh IV project would not require treatment, disposal, or transport of significant quantities of hazardous materials. However, transformer oil would be stored onsite for the duration of operations and would be used and handled for the turbine maintenance. In addition, fuel and carburetor fluid would be used for equipment and motor vehicles during installation, and oil would be held in the substation transformers. As described, the O&M facility stores new oil, waste oil, solvents, lubricants, gasoline, and other potentially hazardous or flammable materials and waste. Implementation of EC-19 and EC-21, which require implementing a SWPPP and a business plan/plan as part of the Proposed Action, would substantially contribute to avoidance and minimization of the potential for hazardous materials spills during project construction. Operation of the project and storage and use of

hazardous materials at the O&M facility and within the Plan area would continue to be performed in compliance with applicable regulations. In addition, EC-22 involves development of a waste management plan to avoid any adverse effects associated with wastes generated by construction activity. Accordingly, no substantial hazardous materials spill or other construction-related waste concerns associated with the Proposed Action would be expected during construction or operation.

Impact HAZ-2: Encountering hazardous materials during construction

Implementation of the Proposed Action would not be likely to result in encounters with hazardous materials during construction activities because limited hazardous materials sources are known to occur in the Plan Area. There are no facilities within 0.5 mile of the Plan Area known to have experienced unauthorized hazardous materials release(s), including leaking UST (LUST) sites. No abandoned or stored items of an obvious hazardous materials nature were observed in the study area. In addition, as part of the Phase I Study, WKA conducted a preliminary screening for potential vapor intrusion conditions (pVIC) beneath the site using a pVIC-screening matrix⁸ to evaluate the potential for chemicals of concern to be present on properties surrounding or upgradient of the Plan Area within a specific search radius. The results indicate that it is unlikely that a pVIC exists beneath the site. Please see the Phase I Study for additional information.

In spite of the low potential to encounter hazardous materials at the site, it is possible that during grading, trenching, and other ground-disturbing activities construction crews could encounter unknown subsurface hazardous materials that were not identified during the Phase I Study. Implementation of EC-23, which specifies implementation of procedures should hazardous materials be encountered, would minimize the potential for a significant adverse impact to result from implementation of the Proposed Action.

No Action

Under the No-Action Alternative, potential hazardous materials would not be introduced into the Plan Area, and there would be no risk of encountering unknown hazardous materials through construction activities associated with the Proposed Action.

3.7.3 References

Wallace-Kuhl & Associates, Inc. 2011. *Phase I Environmental Site Assessment Shiloh IV Wind Farm Project*. April. Prepared for ICF International, Sacramento, CA.

⁸ The preliminary screen for potential vapor intrusion conditions was based on the guidelines presented in the ASTM E 2600-08 Standard Practice for Assessment of Vapor Intrusion into Structures on Property Involved in Real Estate Transactions (Wallace-Kuhl & Associates 2011).

3.8 Hydrology and Water Quality

This section describes the affected environment pertaining to hydrology and water quality and the potential environmental consequences that could result from implementation of the Proposed Action.

3.8.1 Affected Environment

3.8.1.1 Regulatory Setting

Federal Clean Water Act

The CWA is intended to restore and maintain the chemical, physical, and biological integrity of the nation's waters (33 CFR 1251). The regulations implementing the CWA protect waters of the United States, including wetlands (33 CFR 328.3). The CWA ensures that water quality in aquatic ecosystems is maintained at a level of integrity that enables biological resources to exist and function properly. Under Section 404, the discharge of dredged and fill material into waters of the United States are regulated by USACE.

Section 303(d) of the CWA lists streams and other waters of the United States that have "Water Quality Limited Segments" or portions that do not meet water quality standards, even after point sources of pollution have installed the minimum required levels of pollution-control technology.

National Pollutant Discharge Elimination System

Created under the CWA, the National Pollutant Discharge Elimination System (NPDES) permit program applies to stormwater and point source discharges. The EPA has delegated regulatory authority for the NPDES program to the Regional Water Quality Control Boards (Regional Water Boards). The Shiloh IV project would require an NPDES Construction General permit from the San Francisco and Central Valley Regional Water Boards) to control stormwater runoff during construction; some streams in the Plan Area flow into the Suisun Marsh watershed, which is regulated by the San Francisco Regional Water Board. Other unnamed drainages flow into the Sacramento River which is still under the regulation of the Central Valley Regional Water Board. A provision of an NPDES permit requires that a SWPPP be developed in advance of construction activity in accordance with the general permit and implemented concurrently with the beginning of construction activities.

Proposed Nationwide Permit for Land Based Renewable Energy Generation Facilities

In February, 2011, USACE announced its intent to reissue and modify nationwide permits. USACE proposes to issue a new nationwide permit, Land Based Renewable Energy Generation Facilities, to allow discharge or fill in up to 0.5 acre or 300 linear feet of non-tidal waters of the United States during construction, expansion, or modification of land-based renewable energy production facilities and associated infrastructure. The permit would go into effect no earlier than March 2012, after all the nationwide permits have been updated and finalized. (Solano County Department of Resource Management 2011.)

Federal Emergency Management Agency

The Federal Emergency Management Agency (FEMA) has delineated floodplains throughout the nation and presents the information on Flood Insurance Rate Maps (FIRMs). FIRMs are used to determine if existing or future projects are located in flood hazard areas. FIRMs are used for insurance purposes or to determine if certain projects are prone to future flood risks.

3.8.1.2 Environmental Setting

The Shiloh IV project covers approximately 3,513 acres in the Montezuma Hills in southwestern Solano County. The Montezuma Hills is an elevated generally treeless area within the Sacramento and San Joaquin River floodplain that consists of rolling hills and experiences dry summers and rainy winters. Rainfall in the area averages 16–20 inches per year and less than 0.3 inches of rain in July and August. The area has intermittent streams and wetlands, but no navigable waters. The Sacramento River borders the Montezuma Hills to the south and east, and the Suisun Marsh borders the area to the west. The southwestern portion of the Plan Area is on the opposite side of Collinsville Road from the eastern border of the Suisun Marsh Secondary Management Area, and is less than 1 mile north of the Delta Secondary Zone. (Solano County Department of Resource Management 2011.)

The Plan Area falls under the jurisdiction of two different Regional Water Boards. The San Francisco Bay Regional Water Board has jurisdiction over the northern and western portions of the Plan Area and the Central Valley Regional Water Board has jurisdiction over a small southeastern portion. (Solano County Department of Resource Management 2011.)

Hydrology (Drainages)

The Plan Area is within the Suisun Bay watershed (Hydrologic Unit Code 18050001), which is characterized by generally treeless rolling hills with elevations ranging between 100 and 272 feet amsl and low areas near the Delta to the south and east. In this region, permanent, temporary, and seasonal drainages are generally found in the low-lying areas between the rolling hills, but no perennial streams cross the Plan Area. Three seasonal streams flow through the Plan Area: Lucol Hollow flows adjacent and parallel to Birds Landing Road and eventually drains into Montezuma Slough; Hopkins Ravine runs along Olsen Road and Collinsville Road before joining Lucol Hollow, and Clank Hollow runs parallel to Montezuma Hills Road and along Collinsville Road before heading toward Montezuma Slough (Figure 3.4-1) Montezuma Slough and the Suisun Marsh drain into the Sacramento River, which eventually flows into the San Francisco Bay. As seasonal tributaries to navigable waters, the three streams in the Plan Area would be considered waters of the United States under Section 404 of the federal Clean Water Act according to new draft guidance proposed in April 2011 to clarify the definition of waters of the United States. (Solano County Department of Resource Management 2011.)

U.S. Geological Survey (USGS) topographic maps show numerous other blue line streams in the project area. In the Montezuma Hills most of these blue-line streams typically possess only intermittent stream characteristics (such as a defined bed and bank and/or scour) or no stream characteristics at all and may not constitute waters of the United States. Several roadside drainages specifically constructed for the purpose of removing or channeling runoff from roads are adjacent to the Plan Area along Collinsville Road and Olsen Road. These features were artificially created in

uplands solely for the purpose of transporting runoff water from roadbeds and are not likely to be considered waters of the United States. (Solano County Department of Resource Management 2011.)

Wetlands and Aquatic Features

The Plan Area supports several aquatic and wetland features considered sensitive natural communities as defined by the DFG. In addition to the intermittent streams mentioned above, aquatic and wetland features in the Plan Area include vernal pools, bulrush/cattail wetlands, seasonal wetlands, and willow riparian scrub (ICF International 2011). Many of these features are potentially waters of the United States and subject to USACE jurisdiction. (Solano County Department of Resource Management 2011).

Figure 3.4-1 shows the locations of these sensitive biological communities. Wetlands occur near Birds Landing Road, Montezuma Hills Road, in valleys adjoining these roads, and in valleys in the northern portion of the Plan Area. Four ponds are located in the northern portion of the Plan Area, and one is located in the eastern portion of the Plan Area along Birds Landing Road. (Solano County Department of Resource Management 2011).

Surface Water Quality

Grazing, agricultural activities, and runoff from roads and rural residences can contribute to degradation of surface water quality in the Plan Area. Grading for construction activity removes vegetation and exposes soil to wind and water erosion, which can result in sedimentation that ultimately flows into surface waters. Regional Water Boards consider sediment a pollutant because it may cause reduced light penetration, clog filter feeding organisms, and can transport hydrophobic contaminants such as organo-chlorine pesticides. Metals and petroleum hydrocarbons washed from roadways and parking lots, as well as fertilizers, pesticides, and herbicides from agricultural areas, may degrade water quality and wildlife habitat in receiving water bodies.

The San Francisco and Central Valley Regional Water Boards maintain a list of impaired or threatened water bodies under CWA Section 303(d) List of Impaired Waters that was last updated in 2006. Standards may be violated by an individual pollutant, multiple pollutants, thermal pollution, or an unknown cause of impairment. A water body is considered threatened if it currently attains water quality standards but is predicted to violate standards by the time the next Section 303(d) list is submitted to the EPA. The 303(d) list is a comprehensive public accounting of all impaired or threatened water bodies, regardless of the cause or source of the impairment or threat. Although there are no streams within the Plan Area listed as being impaired for any constituents, the "Tributary Rule" states that upstream unimpaired water shall not contribute to downstream water quality impairments. The Plan Area drains to the Sacramento River and the Suisun Marsh and ultimately the Suisun Bay. The Sacramento River from Knights Landing to the Delta is listed for being impaired for mercury and unknown toxicity (State Water Resources Control Board 2006a). The Suisun Marsh is listed as being impaired for metals, nutrients, organic enrichment or low Dissolved Oxygen (DO), and salinity/Total Dissolved Solids (TDS)/chlorides (State Water Resources Control Board 2006b). The Suisun Bay is listed as being impaired for chlordane, DDT, dieldrin, dioxin compounds (including 2, 3, 7, 8-TCDD), exotic species, furan compounds, mercury, nickel, PCBs, and selenium. Suisun Slough is listed for diazinon from urban runoff and storm sewer drainage. Some of the Suisun wetlands are also listed as impaired for high levels of metals and nutrients from agriculture and urban runoff. The Delta is listed for DDT, dioxins, exotic species and various other metals and toxins (State Water Resources Control Board 2006b).

As is evident in the reported water quality of Suisun Bay and associated wetlands, nonpoint source pollution has degraded regional water quality. The largest sources of nonpoint source pollution are agricultural and urban runoff which contribute sediments, nutrients, disease-carrying bacteria, and pollutants. Pollutants in agricultural runoff include organo-phosphate pesticides such as diazinon, and chloropyrifos, selenium, metals, phosphorus, nitrogen, and fertilizers. Metals can bioaccumulate in the food web of Suisun Marsh, resulting in mortality of aquatic life. Nutrients can cause algal blooms, or eutrophication, which can harm native aquatic plants.

Soil erosion potential is highest in silty soils on steep, unvegetated areas. Although the Plan Area is relatively flat terrain, construction involves clearing vegetation exposing soil. If topography allows, and proper BMPs are not used, sedimentation could be conveyed to the creeks in the Plan Area. In addition, construction access roads can also increase water runoff rates, resulting in accelerated soil erosion. Rocks, soil, sediment, and other eroded material can drain into nearby streams, wetlands, and other water bodies, increasing the existing sediment loads. Excessive sedimentation may clog streams and storm drains, reducing their capacity to carry water, potentially leading to flooding. The input of sediments into water bodies can also degrade the water quality of receiving streams and wetlands by increasing sediment loads. Sediment runoff into streams can increase the turbidity (concentration of suspended particles) in a stream, thereby reducing light penetration and inhibiting photosynthesis. Eroded soils can also carry fertilizers and other nutrients, which can lead to eutrophication.

Groundwater Quality

The Plan Area is located in the Sacramento Valley Groundwater Basin, Solano Subbasin (Basin Number 5-21.66) The Solano Subbasin is approximately 425,000 acres or 664 square miles. The elevation varies from 120 feet in the northwest corner to sea level in the south. Subbasin boundaries are defined by Putah Creek on the north, the Sacramento River to the East, and the San Joaquin River to the southeast. The western border is defined by the hydrologic divide that separates lands draining to the San Francisco Bay from those draining to the Delta. That divide is roughly delineated by the English Hills and Montezuma Hills (DWR 2004).

Groundwater quality within the Solano Subbasin is considered to be generally good quality, and useable for both domestic and agricultural purposes. Chemical water types within the basin are variable and classified general as magnesium bicarbonate in the central and northern areas, sodium bicarbonate in the southern and eastern areas, and calcium magnesium or magnesium calcium bicarbonate around the western portion of the basin which where the Plan Area is located. TDS ranges from between 250 and 500 parts per million (ppm) in the central and southern areas. Chloride concentrations are found over 100 ppm in the southern areas, while sulfate concentration is greater than 50 ppm in the southern areas. The maximum contaminant level for both chloride and sulfate is 600 ppm. Boron concentrations are less than 0.75 pm except in the southern areas where it may reach 2.0 ppm. Impairments include elevated levels of hardness, arsenic and manganese (DWR 2004).

In addition to the Solano Subbasin, the Plan Area is also located within the Suisun/Fairfield Valley Groundwater Basin, which encompasses approximately 133,600 acres. The Suisun/Fairfield Valley Groundwater basin is underlain by a thick sequence of low-permeability marine sedimentary rocks. Marine sedimentary units in the Fairfield-Suisun area are classified as non-water-bearing. The Solano Subbasin has water-bearing formations of sedimentary continental deposits. (DWR 2004, Solano County Department of Resource Management 2011).

Groundwater resources in the Montezuma Hills are extremely limited and are characterized by low well yields and poor water quality. However, many of the residences in the Plan Area rely on wells for their drinking water supply. Several domestic wells for landowners' private uses are located near landowners' homes. Based on the proposed turbine layout, the wind turbines would be sited at a distance of at least three times the maximum turbine height from existing residences and would not be located near wells that are close to residences.

Flood Hazards and Levees

The Federal Emergency Management Agency (FEMA) predicts and prepares for hazards and, in this role, designates 100-year flood zones nationwide under the National Flood Insurance Program. Some of the lower lying areas in the Montezuma Hills are within the 100-year flood zone. Generally, the region experiences heavy rainfalls during the storm season (November through May) and has low infiltration, often resulting in rapid runoff. Montezuma Slough is subject to overflows as a result of runoff from Montezuma Hills and other areas. Low-lying parts of the Plan Area along Lucol Hollow, Hopkins Ravine, and Clank Hollow are within the 100-year flood plain. Two small portions of the project would be within areas with a 0.2% annual chance of flood, one along the northern portion of Hopkins Ravine and Olsen Road, and the other at the southernmost boundary with Collinsville Road. (Solano County Department of Resource Management 2011).

No project turbines would be within any flood zones; however, construction of two access road entrances from Birds Landing Road and placement of collector lines via HDD in two locations, one below Collinsville Road and Hopkins Ravine, and the other beneath Birds Landing Road and Lucol Hollow, may occur within the 100-year flood plain. The access roads and collector lines would not change base flood elevations and would comply with applicable state and federal building standards.

DWR maintains a list of critical erosion levee sites identified for emergency repair within the Sacramento River Flood Control System. The 2006 list contains three critical erosion sites within Solano County, but none of these sites are adjacent to the Plan Area (Solano County Department of Resource Management 2011).

3.8.2 Environmental Consequences

3.8.2.1 Approach and Methods

Potential environmental effects were evaluated through consideration of existing conditions, project design features, and environmental commitments incorporated into the Proposed Action.

This analysis adapted criteria set forth in the State CEQA Guidelines to determine if adverse effects would result from implementation of the Proposed Action, including activities covered under the HCP. An effect would be considered adverse if the Proposed Action could lead to any of the conditions listed below.

- Substantial depletion of groundwater supplies or interference with groundwater recharge.
- Substantial alteration of the existing drainage pattern of the site or area in a manner that would result in substantial on- or offsite erosion or siltation.
- Substantial increase of the rate or amount of surface runoff in a manner that would result in on- or offsite flooding.

- Other substantial degradation of water quality.
- Placement of structures within a 100-year flood hazard area that would impede or redirect flood flows.

3.8.2.2 Effects

Proposed Action

Impact HYD-1: Potential to substantially deplete groundwater supplies

Implementation of the Proposed Action would not substantially deplete groundwater resources because it entails no construction or operational activities that could affect groundwater resources. There would be no adverse effect.

The Proposed Action would not require the use of groundwater during construction, but Shiloh IV would use up to 2,500 gallons of groundwater per day during operation for bathroom facilities. Provided Solano County review finds existing facilities adequate to support the Shiloh IV project, full-time project employees would likely use the existing bathroom in the enXco O&M building, which is served by a well and septic system. If Solano County finds that the existing well and septic system are not sufficient to support the project, Shiloh IV would expand the capacity of these facilities or develop a new well or septic system in accordance with applicable regulations to avoid impacts to groundwater quality. The water basin underlying the Montezuma Hills has limited water resources and does not supply municipal or county water suppliers or plans. Residents in the Montezuma Hills use well water for domestic uses and for livestock. The anticipated project water consumption would be equivalent to the water consumption of 5–10 single-family homes and would not result in adverse effects on the groundwater supplies available to Montezuma Hills residents.

Accidental spills of petroleum products or other hazardous materials could also result in degraded water quality if the spill were to reach the groundwater table. Shiloh IV would implement EC-21 and EC-23 which include plans to prevent, control and address any accidental spills or unexpected encounter of hazardous materials and avoid adverse effects of spills on groundwater. All hazardous materials (e.g., paints, solvents) will be stored in accordance with manufacturer's specifications and federal regulations.

Impact HYD-2: Potential to substantially increase erosion or siltation associated with alteration of existing drainage patterns

Implementation of the Proposed Action would not substantially increase erosion or siltation in existing drainages or water features in or near the Plan Area because wind turbine construction pads, access roads, collection lines, and construction staging areas would largely avoid all surface drainages and wetlands in the Plan Area. One collection line would be required to cross a seasonal wetland/pond area in the western portion of the Plan Area (Figure 3.4-1). In addition, construction in areas around seasonal streams and wetlands could result in soil erosion and siltation effects. However, these potential impacts are not considered adverse because implementation of EC-11, EC-19, and EC-20 would ensure avoidance of aquatic features, implementation of measures to reduce water quality effects of construction, and restoration of site conditions. EC-11 specifies the use of HDD to install electrical collection lines under wetlands and other aquatic features. EC-19 requires implementation of SWPPP measures to minimize soil erosion and reduce construction impacts associated with turbine access roads, pads, the laydown area, substation, and O&M facility

expansion. EC-20 requires that all temporarily disturbed construction areas be restored to the original contours and revegetated to prevent soil erosion or siltation of aquatic features.

Impact HYD-3: Potential to substantially increase the rate or amount of surface runoff

Implementation of the Proposed Action would entail construction of impervious surface in the form of turbine foundations, transformers, crane pads, the substation, meteorological towers new roads, and areas associated with expansion of the existing O&M facility. These impervious areas would no longer slow stormwater through percolation, potentially accelerating erosion and sedimentation rates. The Proposed Action would result in a net conversion of up to 37.2 acres of impervious and compacted surfaces relative to the existing enXco V project. The additional compacted and impervious surfaces represent approximately 1.2% of the total Plan Area and would be primarily along ridgelines and away from low-lying areas such as streams and wetlands. Thus, once construction is complete, significant changes to existing storm water runoff rates are not anticipated. Consequently, substantial changes to existing stormwater runoff rates are not anticipated.

Impact HYD-4: Potential to substantially degrade water quality

Construction activities associated with the Proposed Action could produce a short-term increase in erosion. Clearing and grading could cause accelerated erosion on steep slopes, in erosion-susceptible soils, or before vegetation is reestablished, leading to potential sedimentation of nearby creeks and drainages, thereby degrading water quality and increasing the risk of flooding. Implementation of EC-11, EC-19, and EC-20 would address this effect through the mechanisms discussed for Impact HYD-2.

Sediment and contaminants from project construction near aquatic resources, if not properly controlled, would have the potential to degrade water quality and aquatic habitats associated with Lucol Hollow, Hopkins Ravine, and the Suisun Marsh. However, no adverse water quality effects are anticipated to result from construction or operation because environmental commitments have been incorporated into the Proposed Action to minimize water quality effects, no major streams are located in the vicinity of planned construction areas, and the majority of Proposed Action facilities would be sited substantial distances from sensitive aquatic sites (Figure 3.4-1). In addition, Shiloh IV does not anticipate any grading or other earthmoving activities during the rainy season and may finish all construction before the rainy season begins in October (Solano County Department of Resource Management 2011). If construction takes place in the rainy season, as defined by Solano County (October 15–April 15), Shiloh IV would need to obtain written approval from the Director of the Solano County Department of Resource Management. EC-10, EC-11, EC-19, EC-20, and EC-7 require minimization of effects on biological resources including wetlands, streams, and ponds; restoration of disturbed areas; preparation and implementation of a SWPPP; and control of construction fugitive dust, respectively. Further, EC-24 requires that additional storm water discharge and sedimentation controls are employed in the event that construction is necessary within 100 feet of water resources or takes place during the rainy season. These commitments minimize and avoid adverse effects on water quality in the Plan Area. Construction and operation of the Proposed Action could result in accidental spills of materials that could potentially affect nearby wetlands, streams, and waters of the United States. Shiloh IV would implement EC-21 and EC-23 which include plans to prevent, control and address any accidental spills or unexpected encounter of hazardous materials and avoid adverse effects of spills on groundwater. All hazardous materials

(e.g., paints, solvents) will be stored in accordance with manufacturer's specifications and federal regulations.

Impact HYD-5: Potential to create substantial flood hazards

Implementation of the Proposed Action would result in development of permanent project features within a 100-year floodplain. Project access roads would traverse Flood Zone A, a Special Flood Hazard Area, in up to two locations and project collector lines would traverse the floodplain in up to three locations. Neither the access roads nor the buried collector lines would increase base flood elevations. As part of project development Shiloh IV would be required to comply with the Solano County Flood Damage Prevention Ordinance. Compliance with this requirement would minimize risks associated with flooding and no significant adverse impacts are anticipated.

No Action

Under the No-Action Alternative, the Proposed Action would not be implemented and the Plan Area would remain in grazing and agricultural use. No effects on seasonal drainages, wetland features, or waters of the United States would occur and there would be no effects on groundwater resources, water quality, or flood risk.

3.8.3 References

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3.9 Land Use and Planning

3.9.1 Affected Environment

3.9.1.1 Regulatory Setting

Federal Aviation Administration

The FAA regulates aviation at airports and objects affecting navigable airspace. 14 CFR 77 establishes standards and notification requirements for objects affecting navigable airspace. This notification enables the FAA to evaluate and determine any potential hazardous effects of proposed construction on airport operating procedures and air navigation. To comply with CFR standards and requirements, an applicant must notify the FAA of all construction exceeding 200 feet above ground level. The Proposed Action would be subject to FAA review because the proposed turbines and meteorological towers would be taller than 200 feet above ground level.

Solano County General Plan

The County's general plan reiterates the intention to maintain the rural, agricultural identity of unincorporated areas of the county, including the Plan Area, by limiting non-agriculture-related residential development. The general plan designates the Montezuma Hills as a distinct agricultural region, with a minimum lot size of 160 acres and agricultural and energy production identified as primary uses (Solano County 2008, p. AG-21). The general plan seeks to preserve the character of the area by curtailing non-agricultural land use, particularly non-agriculture-related residential development.

Moreover, the general plan requires turbines to be sufficiently removed from certain receptors to protect human health and safety, as well as to ensure land use compatibility. According to the general plan, turbines must be at least three times the turbine height from any zoning district that does not allow wind turbines, or from any property line, public roadway, transmission facility, or railroad. These requirements may be waived with permission from the County and the landowner if the adjoining property is a wind facility. The general plan also requires a 0.25-mile setback from scenic roadways (e.g., SR 12) to minimize visual impacts (Solano County 2008, pp. RS-56–57).

Solano County Zoning Ordinance

Solano County Zoning Ordinance Section 28-50 (b)(4) contains regulations for commercial and noncommercial wind turbine generators. The provisions summarized below pertain to the Proposed Action in the context of land use.

- Wind turbines shall be permitted in lands in zones designated A, A-L, P, C-H, C-N, C-G, C-S, C-O, M-L, M-G, I-WD, or W districts, among others, provided a use permit is first secured, except that commercial wind turbine generators are prohibited in the R-R and MP districts.
- Wind turbines shall be set back a minimum of 1.25 times the maximum height of the turbine to the property line, and a minimum of 10 feet from any other structure on the property. Setbacks determined by height may be waived when appropriate easements are secured from adjacent property owners or other acceptable mitigation is approved by the County.

Solano County Zoning Ordinance Section 28-53.1 provides an administrative permit process for meteorological towers.

Solano County Zoning Ordinance Section 28-55 describes County parking requirements. The Proposed Action would be classified as an industrial land use and would require one space per two employees.

Solano County Airport Land Use Commission

The Proposed Action is subject to Solano County Airport Land Use Commission (ALUC) review as a “major land use action” under Policies 1.5.3(a)(7) and 1.5.3(c) of the ALUC’s Airport Land Use Compatibility Review Procedures. In accordance with these policies, the ALUC reviews proposals for construction or alteration of objects anywhere in the county that require FAA review in accordance with 14 CFR 77 because they exceed 200 feet in height above the surrounding ground level. The review considers the Proposed Action’s compatibility with the applicable local ALUCP and general impacts on flight safety (Solano County 2011). The Proposed Action’s wind turbines and meteorological towers are taller than 200 feet, which necessitates ALUC review.

Rio Vista Municipal Airport Land Use Compatibility Plan

The 1988 Rio Vista ALUCP sets forth land use compatibility policies applicable to future development in the vicinity of the airport. These policies provide the basis by which the Solano County ALUC can carry out its land use development review responsibilities. The Rio Vista ALUCP indicates that unincorporated areas of Solano County surrounding the airport are mostly agricultural, with the exception of urban areas of the City of Rio Vista to the south, and this use is generally compatible with Rio Vista Municipal Airport (Rio Vista Airport) operations. The Rio Vista ALUCP also specifies the compatibility zones that surround the airport.

Travis Air Force Base Land Use Compatibility Plan

The 2002 Travis Air Force Base (AFB) Land Use Compatibility Plan (LUCP) sets forth land use compatibility policies applicable to future development in the vicinity of the base. These policies provide the basis by which the Solano County ALUC can carry out its land use development review responsibilities. The Travis AFB LUCP indicates that the surrounding unincorporated areas of Solano County are mostly agricultural, which is generally compatible with Travis AFB operations. To protect aviation patterns at Travis AFB, the AFB has designated compatibility zones and height restriction boundaries around the base. The Proposed Action is approximately 8 miles southwest of Travis AFB. A large portion in the north of the Plan Area and approximately 24 proposed turbines would be within Travis AFB compatibility zone C and the Travis AFB area of influence (Travis AFB LUCP Figures 2a and 2c as reported in Solano County Department of Resource Management 2011). Two turbine locations would be below the Travis AFB outer horizontal surface but would have reduced turbine heights to prevent piercing the surface. (Solano County Department of Resource Management 2011).

3.9.1.2 Environmental Setting

The entire Plan Area is zoned for agricultural use; moreover, the Montezuma Hills have been designated by Solano County as land suitable for wind energy development (Solano County 2008). The Montezuma Hills WRA was established on the basis of wind energy monitoring and assessment

studies conducted by the California Energy Commission (CEC), PG&E, and the Bureau of Reclamation in the late 1970s and 1980s.

Land uses immediately adjacent to the Plan Area include dryland farming, existing wind facility projects, and residential and commercial structures in Birds Landing. Other nearby land uses include small rural community centers in Collinsville (approximately 1.5 miles south of the nearest Plan Area boundary), and Rio Vista (approximately 6.2 miles east of the nearest Plan Area boundary). Rio Vista Airport and Travis AFB are both approximately 8 miles from the nearest project boundary.

Low density residential housing exists in the Montezuma Hills agricultural region. Five residences are within the Plan Area boundary; two on Birds Landing Road, two on Collinsville Road, and one on Shiloh Road. More than a dozen other residences are within approximately 1 mile of the Plan Area, including within the community of Birds Landing. Another residence is outside the Plan Area but is surrounded by the Proposed Action on all sides.

The Proposed Action would be immediately adjacent to the community of Birds Landing, which is zoned Residential Estate (R-E 1) and Neighborhood Commercial (C-N). Other zoning districts west of Collinsville Road and adjacent to or near the Plan Area include Limited Agricultural (A-L), Marsh Preservation (M-P), and Water Dependent Industrial (I-WD). Zoning districts east of the Plan Area, outside of Rio Vista, include Park (P) and Exclusive Agricultural (A-20) and (A-80).

Shiloh IV would install the Proposed Action entirely on private land leased under long-term agreements from landowners. The Proposed Action does not include any public lands, but County access roads cross the Plan Area and easements may be needed for certain access roads or feeder collection lines. Even with the installation of the proposed facilities, existing agricultural and residential land uses are expected to continue in the Plan Area, and the Proposed Action would not change the existing or planned land use of properties in or adjacent to the Plan Area. (Solano County Department of Resource Management 2011).

Existing Wind Plants

Several commercial wind energy-producing facilities are adjacent and near the Plan Area in the Montezuma Hills WRA (Figure 1-2). Existing wind energy projects installed in the Montezuma Hills include the High Winds, enXco V, Shiloh I, Shiloh II, Montezuma I, and Solano Wind Phase 1 and 2 wind energy projects. In addition, two other nearby wind energy projects are currently under construction and expected to be operational in 2012: Shiloh III and Solano Wind Phase 3. Another wind project, Montezuma II, was approved by the County in July 2011 and is expected to be under construction in 2011. In addition, PG&E may be planning a wind energy project in the southern Montezuma Hills area, east of Collinsville.

In August 2011, the Montezuma Hills region supported 844 turbines that had a capacity of 657 MW. An additional 148 turbines with 324 MW of generating capacity have been approved and are expected to be under construction in 2011. The total number of turbines in the region will decrease because the use permits issued for the 314 existing older enXco V turbines require removal of the turbines prior to use permit expiration in 2014 and 2015. enXco plans to remove approximately 255 of these older turbines located on 13 of the 22 parcels that comprise the Shiloh IV Plan Area, prior to construction of the Proposed Action. The County has not received plans for the removal of the remaining balance of the older enXco V turbines south of the Plan Area.

Airports

There are two public airports and one military airport in Solano County. Rio Vista Airport is approximately 8 miles east of the Plan Area (north of Birds Landing Road). The Nut Tree Airport is more than 15 miles northwest of the Plan Area. Travis AFB is approximately 8 miles northwest of the Plan Area (from Olsen Road). In addition, several other airports are in adjacent counties, including the larger metropolitan airports in San Francisco, Oakland, and Sacramento and regional airports in Davis, Franklin, Byron, Concord, and Napa. There are also small private air fields in Vacaville, Dixon, Lodi, Elk Grove, and Brentwood. Only Rio Vista Airport and Travis AFB are within 10 miles of the Plan Area and are discussed in this EA.

Rio Vista Airport

According to Figure 16b of the Rio Vista ALUCP Compatibility Map, the Plan Area is not in any compatibility zone associated with Rio Vista Airport. Moreover, the proposed Shiloh IV Project is not located within the airport's area of influence (Solano County Department of Resource Management 2011).

However, as identified in the Rio Vista ALUCP, the Solano County ALUC's area of concern encompasses all of Solano County for projects "having a height which would require that notice be given to the FAA in accordance with Part 77, Subpart B, of the Federal Aviation Regulations." The Proposed Action's turbines and meteorological towers would be greater than 200 feet in height above ground surface and would require FAA notification. Accordingly, the Proposed Action falls within the Solano County ALUC's area of concern and is subject to ALUC review for consistency with the Rio Vista ALUCP.

Travis Air Force Base

Travis AFB is approximately 8 miles northwest of the Plan Area. Travis AFB serves as the strategic airlift and aerial refueling base on the West Coast. Other tenant organizations at the base include the Air Force Reserve Command and the Navy's VQ3 Detachment (Solano County Department of Resource Management 2011). Potential design constraints associated with Travis AFB are discussed in Section 3.13, *Traffic and Transportation*.

The Solano County ALUC adopted the Travis AFB LUCP in 2002. According to Figures 2a and 2c of the Travis LUCP, some of the Plan Area is within Travis AFB land use compatibility zone C, the Travis AFB area of influence, as well as the AFB's outer horizontal surface.

Federal aviation regulations contained in 14 CFR 77 define a military airport's outer horizontal surface as "a plane, located 500 feet above the established airfield elevation, extending outward from the outer periphery of the conical surface for a horizontal distance of 30,000 feet." Travis AFB has an established elevation of 62 feet amsl; the Travis AFB outer horizontal surface is therefore at an elevation of 562 feet amsl. Two proposed turbines would be in the area covered by the outer horizontal surface. These two turbines would have 230-foot rather than 262-foot towers to prevent piercing the outer horizontal surface.

The Travis AFB LUCP prohibits hazards to flight within compatibility zone C and requires an airspace review for all objects greater than 100 feet in height. Travis AFB LUCP Policy 2.5.3 (Height Restriction Criteria) also limits the height of objects in the vicinity of Travis AFB so that they do not exceed an imaginary airport surface as defined by federal regulations, including the Travis AFB outer horizontal surface. The ALUC reviews any proposed projects with structures greater than 200

feet in height regardless of where they occur in Solano County. Proposed Action turbines and meteorological towers are over 200 feet in height. The Proposed Action would be subject to ALUC review for consistency with the Travis AFB LUCP.

3.9.2 Environmental Consequences

3.9.2.1 Approach and Methods

This assessment entailed a qualitative evaluation of the Proposed Action's potential to conflict with existing or future land use plans and policies.

3.9.2.2 Environmental Consequences and Mitigation Measures

Proposed Action

Impact LU-1: Potential to conflict with land use plans and policies

Implementation of the Proposed Action could cause conflicts with local land use plans and policies. The Solano County Zoning Regulations permit the installation of commercial wind turbine generators as a conditional land use subject to a use permit. Therefore, the Proposed Action would be compatible with existing zoning following issuance of a CUP from Solano County. The Proposed Action would be developed entirely on private lands leased under long-term agreements from eight private land owners, most of whom currently use their property for wheat farming or sheep grazing. Five of these landowners also currently lease their lands in the Plan Area for the use of wind energy turbines or substations.

Solano County General Plan and Zoning Ordinance

The proposed Shiloh IV project would be sited in accordance with the requirements of the Solano County General Plan. In the event, however, that setback reductions are required, implementation of EC-25 would address this potential impact by complying with specific setback waiver requirements. Additionally, Shiloh IV would have to obtain determinations of no hazard from FAA (EC-27).

Several County roads cross and are located in or adjacent to the Plan Area, including Birds Landing Road, Montezuma Hills Road, Collinsville Road, Olsen Road, and Shiloh Road. Permanent agricultural and grazing operations would continue on more than 98% of the Plan Area, and the project would not change the existing or planned land use of properties in or adjacent to the Plan Area.

Shiloh IV has proposed the installation of either REpower MM92 2.0 MW turbines or Vestas V90 1.8/2.0 MW turbines that would have a hub height of 262 feet and a blade length of either 153 feet or 148 feet, respectively. The maximum total turbine height would be 415 feet as measured from the ground to the top of the turbine blade in the 12:00 o'clock position. In addition, Shiloh IV has proposed the installation of three permanent, freestanding (i.e., no guy wires) 252-foot tall lattice meteorological towers. Shiloh IV has identified preliminary locations the meteorological towers and wind turbines, and has sited these structures in accordance with Solano County setback requirements for residential building sites and dwelling units.

Residential Building Sites and Dwelling Units

There are five residences within the Plan Area and four residences within 1,000 feet of the Plan Area boundary. Shiloh IV has sited all turbine locations a minimum of three times the total turbine height from all residences and dwelling units in the Plan Area in compliance with the Solano County General Plan and Zoning Ordinance. In addition, Shiloh IV has sited the three meteorological towers a minimum of 315 feet, or 1.25 times the total tower height, from dwelling units and other structures, consistent with Solano County requirements.

Lands Zoned for Residential Land Uses

All lands in the Plan Area are zoned Exclusive Agriculture (A-160). The project is adjacent to the community of Birds Landing, part of which is zoned for residential (Residential Estate, R-E 1) use. Shiloh IV has sited all project turbines more than three times the maximum turbine height, 1,245 feet, from areas zoned for residential land use.

Zoning District that does not Allow Commercial Wind Turbines

All lands in the Plan Area are zoned Exclusive Agriculture (A-160). The County's Zoning Ordinance allows commercial wind turbines and associated facilities greater than 100 feet in height on A-160 lands, subject to a use permit. Commercial wind turbines are not allowed within Residential Estate zoning districts. All project turbines would be sited more than 3 times the maximum turbine height, 1,245 feet, from these zoning districts. The project is also adjacent to a Neighborhood Commercial (C-N) zoning district in Birds Landing, but commercial wind turbines are allowed in this district.

Interior and Exterior (Plan Area Boundary) Property Lines

The Shiloh IV Project is located on 3,012 acres spread across 22 separate parcels of private land. The County's general plan establishes a setback requirement of three times the total turbine height from property lines. The General Plan, however, permits this setback requirement to be waived in the case of wind farms located on adjacent parcels, provided an agreement has been reached between the neighboring property owners. When a setback waiver is proposed, the County requires an alternative minimum setback for interior property lines equivalent to one turbine blade length plus 5 feet and an alternative minimum setback for exterior property lines equivalent to one turbine blade length plus the minimum setback distance required by the underlying zoning district for an accessory structure. The minimum setback distance for accessory structures in the Exclusive Agriculture A-160 zoning district is 20 feet. The alternative minimum setback for interior and exterior property lines is subject to change based on California Building Code requirements. A setback waiver is only required where the adjacent parcels are owned by different landowners. A setback waiver is not required if adjacent parcels are owned by the same landowner, provided that all such parcels are contained within the Plan Area.

For the REpower MM92 turbine, the larger of the two proposed turbine options, the required turbine setback from a property line, based on three times the maximum turbine height, would be 1,245 feet. The alternative minimum required setback for interior property lines, with a setback waiver, would be 158 feet, based on the maximum turbine blade length of 153 feet. For exterior property lines with a setback waiver, the alternative minimum setback would be 173 feet, based on the maximum turbine blade length of 153 feet. Except for one proposed turbine location, which will meet the full three times the total turbine height setback from a property line, all other proposed

turbine locations will meet or exceed the alternative minimum setback requirements and will be accompanied by a setback waiver (EC-25).

Shiloh IV has sited the three meteorological towers a minimum of 5 feet from all interior property lines and a minimum of 315 feet, or 1.25 times the total tower height, from all exterior property lines in compliance with the County setback requirements that have been applied to previous wind projects.

County and State Public Roads and Private Roads

Five public county roads are in or adjacent to the Plan Area: Birds Landing Road, Collinsville Road, Montezuma Hills Road, Olsen Road, and Shiloh Road. The General Plan requires turbines to be set back three times the total turbine height from (public) county and state roads. The General Plan, however, permits this setback requirement to be waived in the case of wind farms located on adjacent parcels, provided an agreement has been reached between the neighboring property owners. When a setback waiver is proposed, the County requires an alternative minimum setback equivalent to the maximum blade throw distance, plus added safety factor, for the particular wind turbine proposed.

Shiloh IV has sited 35 turbine locations more than 1,245 feet, or three times the total maximum turbine height, from public county roads in compliance with General Plan setback requirements, and is currently proposing alternative minimum setbacks for 15 proposed turbine locations along the roads adjacent to and within the Plan Area. The number of affected turbines could change as a result of final micrositing at the time of construction. As required by the General Plan, Shiloh IV must secure and furnish setback waivers from all property owners affected by the proposed reduced setbacks from public roads to be allowed the reduced setbacks (EC-25).

Shiloh IV is proposing a reduced setback along the above-referenced public road locations, equivalent to a minimum 723 feet. This proposed setback is based on the blade throw analysis that KPFF Consulting Engineers, Inc. (KPFF) conducted for the Proposed Action. KPFF determined the maximum blade throw distance for the REpower MM92 turbine with 153-foot long blades to be 602 feet. Shiloh IV added a safety factor of 20% to the calculated blade throw distance to develop its proposed alternative minimum setback of 723 feet, consistent with County requirements for previous wind projects. (Solano County Department of Resource Management 2011).

Given the proximity of turbines to the road, the risk of rotor and tower failure is a potentially adverse effect. Implementation of EC-25 and EC-34 would address this potential impact by complying with specific County siting requirements. Section 3.11, *Public Health Hazards*, further discusses maximum blade-throw distance and the potential hazards of siting turbines at less than Solano County's setback requirements from roads.

The nearest public state road, SR 12, is more than 1.5 miles north of the Proposed Action, over three times the total maximum turbine height. Consequently, all project turbines would meet the County setback requirements for public state roads.

Shiloh IV has sited the three meteorological towers a minimum of 315 feet, or 1.25 times the total tower height, from all public roads in and adjacent to the Plan Area.

The County currently does not maintain turbine or meteorological setback requirements for private roads. There are several dirt farm roads and driveways associated with residences and other

buildings in the Plan Area. The Proposed Action would not affect any private roads outside of the Plan Area.

Railroads

The Western Railway Museum operates a restored electric railroad to the northwest of the Plan Area. The endpoint of the restored railroad is within 0.5 mile of the Plan Area. All project turbines would be set back more than three times total maximum turbine height, 1,245 feet, from the railroad right-of-way or easement.

Transmission Facilities

Three electric transmission facilities are within the Plan Area. PG&E maintains 500-kV and 230-kV above-ground transmission lines that bisect the Plan Area in a north-south trend. PG&E also has a parallel 230-kV above-ground gen-tie line that connects the High Winds, Montezuma I, and Shiloh II substations to the Birds Landing Switchyard. The County's general plan requires turbines to be setback three times the total turbine height from transmission facilities. The general plan permits this setback requirement to be waived at the discretion of the landowner. When a setback waiver is proposed, the County, as applied to previous wind projects, requires an alternative minimum setback equivalent to maximum blade throw distance, plus an added safety factor, for the particular wind turbine proposed.

Shiloh IV has sited 46 turbines more than 1,245 feet, or three times the total maximum turbine height, from the PG&E 230-kV and 500-kV transmission facilities along the eastern boundary of the Plan Area in compliance with County setback requirements. Following discussions with PG&E, Shiloh IV is proposing to locate four turbines more than the project-specific blade throw analysis distance plus a 20% safety factor, equivalent to 723 feet, from these transmission facilities. All proposed wind turbines will exceed this alternative reduced setback for transmission lines. The closest turbine would be 1,010 feet from the nearest transmission line. As required by the General Plan, Shiloh IV must secure setback waivers from property owners affected by the proposed reduced setbacks from transmission lines (EC-25).

Shiloh IV has sited the three meteorological towers a minimum of 315 feet, or 1.25 times the total tower height, from all transmission facilities in and adjacent to the Plan Area.

Micrositing

The location and estimated number of turbines and meteorological towers proposed for reduced setbacks is based on proposed conceptual turbine locations. The final number of turbines and meteorological towers and their associated reduced setback distances may increase or decrease slightly as a result of turbine and meteorological tower micro-siting during project construction; however, under no circumstances will the alternative minimum setback be less than the minimum described herein. There is some potential for micro-siting of final turbine and meteorological locations to result in new reduced minimum setbacks that conflict with General Plan and zoning requirements. However, implementation of EC-25 and EC-34 would address this potential impact by complying with specific County setback requirements.

Parking

Parking spaces for Shiloh IV employees would be located at the enXco O&M facility. The Proposed Action would add up to 6 additional employees, contributing to a total number of 25 employees

working at the O&M facility, which serves several projects. Shiloh IV has not confirmed the number of existing or proposed parking spaces at the O&M facility. EC-26 would ensure parking for the facility complies with the specific County Zoning Ordinance parking requirements to avoid an adverse effect.

Rio Vista Airport Land Use Compatibility Plan

The Proposed Action will be subject to ALUC review for consistency with the Rio Vista ALUCP and to ensure there are no adverse effects.

Rio Vista Airport Master Plan Update

The City of Rio Vista provided comments to Solano County on the Shiloh IV Notice of Preparation of an Environmental Impact Report (EIR) on April 23, 2011 requesting assurances that the Proposed Action would not affect the safety, vitality, and efficiency of existing or planned Rio Vista Airport operations. Subsequently, Shiloh IV provided a response to the concerns raised by the comments (see Appendix J1 of the Draft EIR). Section 3.13, *Traffic and Transportation*, provides additional discussion of this topic.

Travis Air Force Base Airport Land Use Compatibility Plan (Travis ALUCP)

As previously described, the Proposed Action is located approximately 8 miles southwest of Travis AFB. Despite this distance, a large portion in the north of the Plan Area, including 24 Proposed Action turbines, would be within Travis AFB land use compatibility zone C and the Travis AFB area of influence, according to Figures 2a and 2c of the Travis AFB LUCP. Two turbine locations would also be within the Travis AFB's outer horizontal surface but would have reduced turbine heights to prevent piercing the surface. The Proposed Action is subject to review by the ALUC because Shiloh IV is proposing to construct structures that are taller than 200 feet tall and require FAA notification and because turbines would be constructed within the Travis AFB area of influence. The ALUC would review the project for consistency with the Travis AFB LUCP. The Travis AFB LUCP prohibits hazards to flight within compatibility zone C and requires an airspace review for all objects greater than 100 feet in height. EC-28 ensures the Proposed Action does not penetrate the Travis AFB outer horizontal surface through a review and approval process with the Solano County Department of Resource Management.

FAA Review

Shiloh IV has not yet submitted FAA Form 7460-1 to the FAA for each of the 3 meteorological and 50 potential turbine locations currently proposed, and, therefore, the FAA has not reviewed the project for its potential to pose a hazard to air navigation. Regardless of when the FAA completes its review of the turbine locations, however, a Determination of No Hazard to Air Navigation from the FAA is required to ensure the project has no adverse effects on aeronautical operations (EC-27). As currently sited, none of the proposed turbines would exceed the 562-foot height restriction imposed by location in the outer horizontal surface. However, if Shiloh IV modifies the location or height of proposed turbines, this height restriction could be exceeded; such an exceedance would be considered an airfield obstruction. EC-25, EC-27, and EC-34 require Shiloh IV to comply with Solano County and FAA siting requirements to avoid hazards to air navigation. No adverse effects would result.

To reduce potential conflicts with applicable land use plans and policies, the Proposed Action includes environmental commitments, EC-25, EC-16, and EC-27 that require Shiloh IV to provide

evidence of final planned turbine and meteorological tower locations, secure and furnish to the County setback waivers for proposed reduced setbacks, and conform to zoning regulations considering parking. There would be no adverse effects.

Impact LU-2: Inhibit future land use of the Plan Area

The Shiloh IV project's useful life is anticipated to be 30 years. Once the Shiloh IV project surpasses its useful lifespan, if the affected area were not decommissioned and properly restored, the County may be burdened with an area for which it could not properly initiate local or regional planning efforts. Proper decommissioning of the Shiloh IV project would require removal of the wind turbine nacelles, blades, towers, foundations, cables, and other components incorporated into the wind project to a depth of 3 feet below grade, and restoration of those lands disturbed by the decommissioned wind project. However, because decommissioning activities (and funding assurances) are specified as part of the project description (EC-29), there would be no adverse effect.

No Action

Under the No-Action Alternative, the Proposed Action would not be implemented and the Plan Area would remain in current land uses. No adverse effects on land use would occur.

3.9.3 References

Solano County. 2008. Solano County General Plan. November. Solano County, CA.

Solano County Department of Resource Management. 2011. *Draft Environmental Impact Report—Shiloh IV Wind Energy Project*. August. State Clearinghouse #2011032062. Submitted by Point Impact Analysis, Inc., Palo Alto, CA.

3.10 Noise

This section describes the affected environment pertaining to noise and the potential environmental consequences that could result from implementation of the Proposed Action. This discussion is based primarily on information in the *Noise Technical Report for the Proposed Shiloh IV Wind Project, Solano County, California* (ICF International 2011). Because of the specialized technical character of noise-related analyses, this section opens with a brief discussion of relevant terminology.

3.10.1 Terminology

Noise may be defined as unwanted sound. A *decibel* (dB) is a unit of measurement which indicates the relative amplitude of a sound. The zero on the dB scale is based on the lowest sound level that the healthy, unimpaired human ear can detect. Sound levels in dB are calculated on a logarithmic basis. An increase of 10 dB represents a ten-fold increase in acoustic energy, while 20 dB is 100 times more intense, 30 dB is 1,000 times more intense, etc. There is a relationship between the subjective noisiness or loudness of a sound and its intensity. Each 10 dB increase in sound level is perceived as approximately a doubling of loudness over a fairly wide range of intensities. Table 3.10-1 provides definitions of terms commonly used in noise analyses. Table 3.10-2 summarizes typical sound levels measured in the environment.

Table 3.10-1. Definition of Acoustical Terms

Term	Definition
Decibel, dB	A unit describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure, which is 20 micropascals (20 micro-newtons per square meter).
Frequency, Hz	The number of complete pressure fluctuations per second above and below atmospheric pressure.
A-Weighted Sound Level, dBA	The sound pressure level in decibels as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise. All sound levels in this report are A-weighted, unless reported otherwise.
C-Weighted Sound Level, dBC	The sound pressure level in decibels as measured using the C-weighting filter network. The C-weighting is very close to an unweighted or "flat" response. C-weighting is only used in special cases when low frequency noise is of particular importance.
L_{01} , L_{10} , L_{50} , L_{90}	The A-weighted noise levels that are exceeded 1%, 10%, 50%, and 90% of the time during the measurement period.
Equivalent Noise Level, L_{eq}	The average A-weighted noise level during the measurement period.
Community Noise Equivalent Level, CNEL	The average A-weighted noise level during a 24-hour day, obtained after addition of 5 decibels in the evening from 7:00 p.m. to 10:00 p.m. and after addition of 10 decibels to sound levels measured in the night between 10:00 p.m. and 7:00 a.m.
Day/Night Noise Level, L_{dn}	The average A-weighted noise level during a 24-hour day, obtained after addition of 10 decibels to levels measured in the night between 10:00 p.m. and 7:00 a.m.

Term	Definition
L_{max}, L_{min}	The maximum and minimum A-weighted noise level during the measurement period.
Ambient Noise Level	The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.
Intrusive	That noise which intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, and time of occurrence and tonal or informational content as well as the prevailing ambient noise level.

Table 3.10-2. Typical Noise Levels

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	— 110 —	Rock band
Jet fly-over at 1,000 feet	— 100 —	
Gas lawn mower at 3 feet	— 90 —	
Diesel truck at 50 feet at 50 mph	— 80 —	Food blender at 3 feet Garbage disposal at 3 feet
Noisy urban area, daytime	— 70 —	Vacuum cleaner at 10 feet
Gas lawn mower, 100 feet	— 60 —	Normal speech at 3 feet
Commercial area		
Heavy traffic at 300 feet	— 50 —	Large business office Dishwasher next room
Quiet urban daytime	— 40 —	Theater, large conference room (background)
Quiet urban nighttime	— 30 —	Library
Quiet suburban nighttime	— 20 —	Bedroom at night, concert hall (background)
Quiet rural nighttime	— 10 —	Broadcast/recording studio
Lowest threshold of human hearing	— 0 —	Lowest threshold of human hearing

Source: Caltrans 2009.

For a *point source*, such as a wind turbine, sound level attenuates at a rate of 6 dB per doubling of distance from the source. This attenuation rate is based on distance only. Other factors can result in additional attenuation; these factors are often lumped together into a term called *excess attenuation*. Some examples of these include attenuation by sound absorption in air; attenuation by barriers; attenuation by rain, sleet, snow, or fog; attenuation by grass, shrubbery, and trees; and attenuation from shadow zones created by wind and temperature gradients. When more than one point source contributes to the sound pressure level at a receiver point, the overall sound level is determined by combining contribution of the sources. This is done by adding the individual sound pressures together. For two sources that are independent and equal, the combined level results in a 3 dB

increase over the level of each alone. This is due to the logarithmic nature of sound level. In assessing environmental noise, a 3 dB increase in level is typically considered as just perceivable, while an increase of 1 dB is difficult to detect.

3.10.2 Affected Environment

3.10.2.1 Regulatory Setting

There are no state or federal noise regulations directly applicable to the Proposed Action. In California, noise from wind turbine generator operations is typically regulated at the county level. For Solano County, the documents listed below are applicable.

- The *Solano County General Plan* (Solano County 2008).
- Zoning regulations of the Solano County Code.

The County's general plan defines noise standards for non-transportation sources. For outdoor residential areas, an L_{eq} limit of 55 dBA is defined for daytime hours (7:00 a.m. to 10:00 p.m.) and 50 dBA for nighttime hours (10:00 p.m. to 7:00 a.m.) For interior locations, an L_{eq} limit of 35 dBA is defined for any time of the day. The zoning regulations for Solano County state that noise emitted by any wind turbine generator shall not exceed 50 dBA CNEL at any property line abutting a residential zone or 60 dBA CNEL at any other property line.

Low-frequency noise from wind turbines can also be a concern. Although Solano County does not have specific standards for low-frequency noise a criterion based on the difference of overall levels has also been proposed as a predictor of annoyance. This occurs when the C-weighted level exceeds the A weighted level by 20 dB or more (O'Neal et al. 2009).

3.10.2.2 Environmental Setting

The Plan Area contains scattered rural residences surrounded by agricultural land. Residences in the Plan Area are identified in Figure 3.10-1. The noise environment is defined primarily by local traffic on the local roads throughout the vicinity. In the Plan Area and surrounding areas, wind turbine generators are already in operation. In addition to these artificial noise sources, the windy conditions of the area can also create a somewhat elevated ambient noise condition in which the background noise increases with wind speed.

To objectively characterize the noise environment in the Plan Area, sound levels were measured over a 4 day period beginning on April 28, 2011. Long-term unattended sound level measurements were made at four locations in the vicinity of the Plan Area at locations indicated as LT1, LT2, LT3, and LT4 in Figure 3.10-1. Wind speed data was also collected at an 80-meter tall permanent meteorological tower located immediately east of the Plan Area. The location of this station is also indicated in Figure 3.10-1. Measured sound levels at each monitoring position were correlated with wind speed. Table 3.10-3 summarizes the noise monitoring results.

Table 3.10-3. Existing Noise Levels in the Plan Area (dBA)

Noise Monitoring Location	Hourly L_{eq}	Daytime ^a L_{eq}	Nighttime ^a L_{eq}	CNEL	Background L_{eq} for Wind Speed of 17.9 mph (8 m/s) ^b
LT-1	28.9 – 66.8	51.3 – 61.4	40.6 – 57.4	48.7 – 64.7	45.6
LT-2 ³	35.3 – 60.1	49.4 – 55.6	46.3 – 51.2	54.0 – 58.7	48.3
LT-3	30.5 – 61.3	44.7 – 55.5	39.7 – 53.4	47.5 – 60.2	44.8
LT-4	37.2 – 74.8	54.4 – 68.8	47.2 – 65.7	55.8 – 72.7	54.6

Source: ICF International 2011

^a Daytime values for the 7:00 a.m. to 10:00 p.m. time period; nighttime values for the 10:00 p.m. to 7:00 a.m. time period.

^b Background L_{eq} is based on regression analysis (see ICF International 2011).

LT-2 data based on three days' sound level monitoring as compared to four days for locations LT-1, LT-3, and LT-4.

3.10.3 Environmental Consequences

This section discusses the evaluation of noise impacts associated with implementation of the Proposed Action.

3.10.3.1 Approach and Methods

Construction noise has been evaluated using standard reference noise levels from various types of construction equipment and activity (U.S. Environmental Protection Agency 1971). The following two wind turbines are currently being considered for this project:

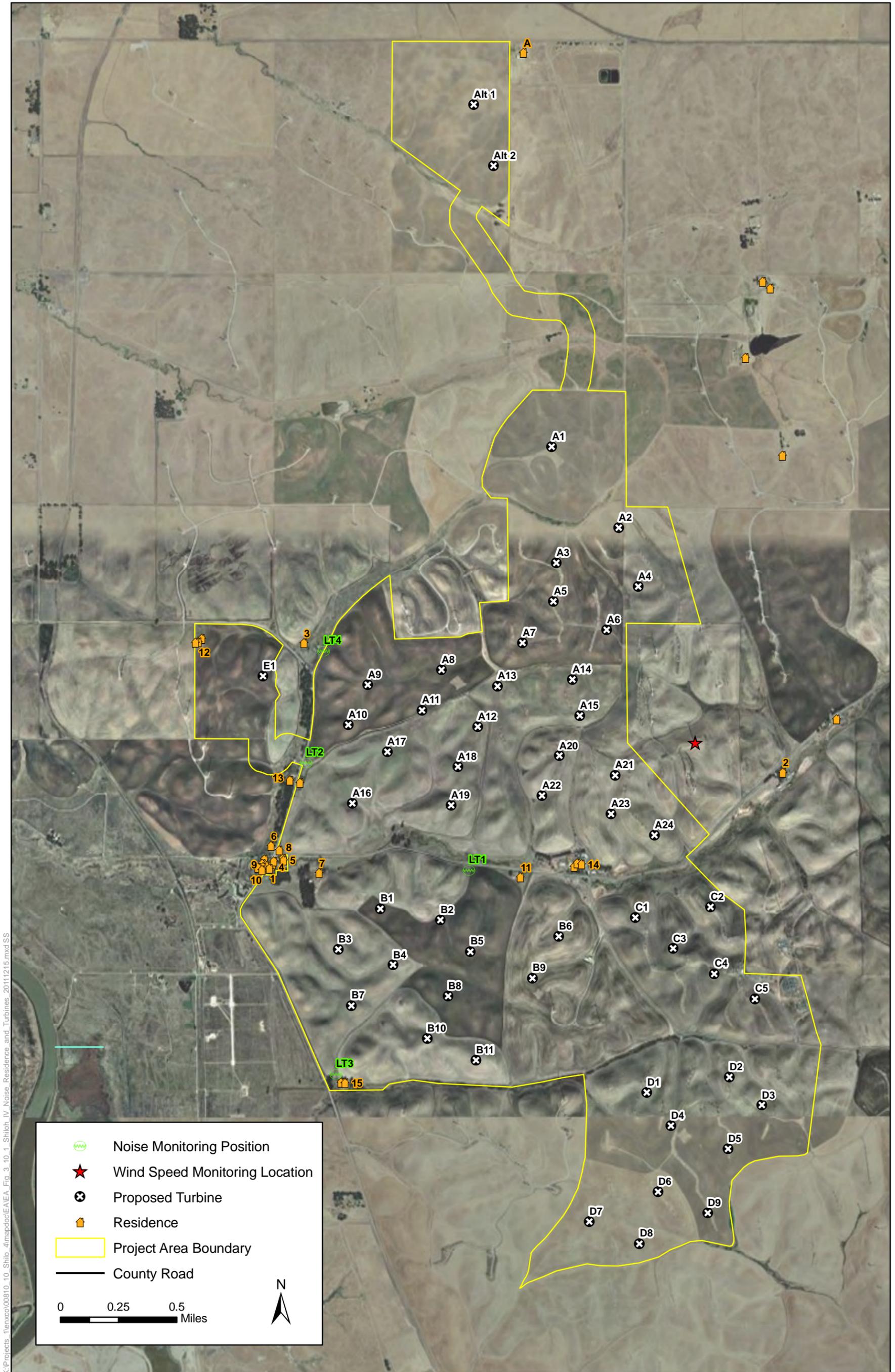
- Vestas V90 2.0 MW
- REpower MM92 2.0 MW

Wind turbine noise has been evaluated using source noise levels provided by these two turbine manufacturers. Predicted construction and wind turbine noise levels at various receiver locations have been estimated using the sound attenuation concepts described above and in ICF International 2011. Construction is considered to result in an adverse noise impact if construction noise is predicted to exceed 50 dB- L_{eq} during evening and nighttime hours at adjacent residences. Evening and nighttime hours are defined as 7:00 p.m.–7:00 a.m. Monday through Friday and 6:00 p.m.–8:00 a.m. Saturdays and Sundays.

Operation of the wind turbines is considered to result in an adverse noise impact if wind turbine noise is predicted to result in the following at residences.

- Exceedance of 50 CNEL (dBA).
- Exceedance of 44 dBA- L_{eq} .
- Substantial increases in noise defined as a 3 dB increase above the background sound level.
- Difference between dBC and dBA sound levels of more than 10 dB.

The 44 dBA- L_{eq} value has derived from the 50 CNEL criteria based on the fact that wind turbines do not operate continuously every day as a result of varying wind conditions. Refer to ICF International 2011 for details on the derivation of this L_{eq} value.



K:\Projects\1\enxco\00810_10_Shilo_4\mapdoc\EAEA_Fig_3_10_1_Shilo_IV_Noise_Residence_and_Turbines_20111215.mxd SS

Figure 3.10-1
Locations of Residences, Proposed Wind Turbines, and Noise Monitoring Positions

3.10.3.2 Effects

Proposed Action

Impact NOI-1: Exposure of residences to short-term noise from construction activity

Site preparation and construction activities would temporarily increase noise levels at residences in and around the Plan Area. The noise would occur mainly from heavy-duty construction equipment (e.g., graders, bulldozers, backhoes, drill rigs). A study conducted for EPA (U.S. Environmental Protection Agency 1971) estimated noise levels of multiple pieces of construction equipment associated with various stages of construction of a typical non-residential project.

For the Shiloh IV project, noise would be greatest during scraping, grading, crane pad development, and excavation for the turbine foundation. Road construction would also entail use of heavy equipment, and the noise levels would be similar to those of excavation and grading. Once the pads are constructed and the foundations excavated, the loudest source of noise would be the cranes lifting the turbines into place.

Using the point source attenuation assumption described above, calculations were performed to determine the distances at which noise levels associated with construction are reduced to 60 dBA, 55 dBA, and 50 dBA. The calculations are summarized in Table 3.10-4.

Table 3.10-4. Estimated Construction Noise Levels by Phase and Distance

Construction Phase	Noise Level at 50 feet (L_{eq}) ^a	Approximate Distance (feet) to Reduce Noise to Given L_{eq}		
		60 dBA	55 dBA	50 dBA
Ground Clearing (Grading)	84 dBA	800	1,410	2,510
Excavation	89 dBA	1,410	2,510	4,460
Foundations	78 dBA	400	710	1,260
Erection (Installation)	87 dBA	1,120	1,990	3,540
Finishing (Clean-up)	89 dBA	1,410	2,510	4,460

Source: Solano County 2010, derived from U.S. EPA *Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances*. December 31, 1971.

^a Noise values levels used correspond to typical range of noise levels at an office building, hotel, hospital, school, or public works construction site.

Residences are located as close as about 1,200 feet from turbine sites. The results in Table 3.10-4 indicate that construction noise could exceed the County's 50 dBA- L_{eq} standard at residences. This would be an adverse effect if this exceedance were to occur during evening and nighttime hours.

Implementation of EC-30 will avoid adverse noise impacts from construction activity by requiring construction equipment mufflers to be in good working condition, avoiding construction during nighttime hours, limiting the use of pneumatic tools, and implementing a noise complaint plan that is consistent with plans employed for recent WRA developments. There would be no adverse effect because construction noise levels would be adequately reduced, the number of residents potentially affected would be small, and construction activities would be temporary.

Impact NOI-2: Exposure of residences to long-term noise from operation of wind turbines

As described above noise from wind turbine operation has been evaluated using source levels provided by each of the two manufacturers currently being considered. The results of the analysis indicate that the Shiloh IV project would cause a long-term increase in exterior noise levels at up to 5 residences (Residences 3, 7, 11, 13, and 14) that exceed Solano County's noise criteria (50 CNEL or 44 dBA steady noise level) during operation of the wind turbines. In addition, the Proposed Action would increase ambient noise levels at residences 11 and 14 by more than 3 dBA, which is considered to be a substantial increase in noise. However, maintaining a CNEL of 50 dBA (or equivalent 44 dBA steady noise level) would result in noise increases of less than 3 dB at all residential locations. In all cases the difference between predicted C-weighted sound levels and A-weighted sound levels is less than 10 dB.

The Proposed Action also includes two alternative locations for wind turbines in the northernmost portion of the Plan Area, which overlaps the Shiloh III project area (Figure 3.10-1). The noise study for the Shiloh III project (Illingworth & Rodkin 2010) evaluated six turbines in this area, but only four were installed. The two Shiloh IV alternative turbines would occupy the locations previously assumed for Shiloh III turbines. As currently planned, the configuration of the six turbines in that area (including the two Shiloh IV turbines) would be slightly different than the configuration previously evaluated for the Shiloh III project. However, noise levels at the nearest receiver (identified as Receptor A in Figure 3.10-1) would be essentially the same as (i.e., within 0.5 dB of) the noise level previously predicted. Accordingly, no new or more severe noise impacts are predicted as a result of locating two Shiloh IV turbines in that area. In addition, the landowner at Receptor A has signed a noise waiver.

Table 3.10-5 indicates the amount of noise reduction that would be required to achieve the 50 dBA CNEL limit (and thus the 44 dBA steady state limit) at residences 3, 7, 11, 13, and 14.

Table 3.10-5. Noise Reduction Required to Achieve 50 dBa CNEL Limit at Each Residence Predicted to Exceed the Limit

Residence ID	3	7	11	13	14
Required Noise Reduction	2.0	1.6	2.2	1.2	3.8

Implementation of EC-31 will avoid adverse noise impacts from operation of wind turbines by requiring modifications to the Proposed Action to ensure compliance with County noise standards or through the use of waivers obtained from affected residents. With implementation of EC-31 adverse noise effects from wind turbine operation are not anticipated to occur.

No Action

Under the No-Action Alternative, no wind turbines would be installed and there would be no adverse noise effects on existing rural residences.

3.10.4 References

Caltrans. 2009. Technical noise supplement to the Caltrans Traffic Noise Analysis Protocol. Sacramento, CA.

- ICF International. 2011. *Noise Technical Report for the Proposed Shiloh IV Wind Project, Solano County, California*. May. Sacramento, CA. Prepared for enXco, San Ramon, CA.
- Illingworth & Rodkin. 2010. *Shiloh III Wind Project—Noise Technical Report*. Petaluma, CA.
- O’Neal, R., R. D. Hellweg, Jr., and R. M. Lampeter. 2009. *A Study of Low Frequency Sound And Infrasound From Wind Turbines*. July. Prepared by Epsilon Associates for NextEra Energy Resources, LLC, Maynard, MA.
- Solano County. 2008. *Solano County General Plan*. Prepared by: EDAW, Inc. and Englebright and Associates. Solano County, Ca. December 2008.
- _____. 2010. Solano County Planning Division. *Draft Environmental Impact Report Shiloh III Wind Energy Project*. June. Prepared by Ecology and Environment, Inc. for Solano County Planning Division, Solano County, CA.
- U.S. Environmental Protection Agency. 1971. *Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances*. Washington, DC.

3.11 Public Health Hazards

This section describes the affected environment pertaining to public health hazards and the potential environmental consequences that could result from implementation of the Proposed Action. Such hazards include wildfire, accidents involving wind turbine generators or appurtenant facilities, exposure to electric shock, shadow flicker, and abandoned gas wells.

The analysis references the April 6, 2011, analysis “Hazard Zones Resulting from Certain Defined Failures of REpower MM92 Wind Turbines at the Shiloh IV Wind Project” prepared by KPFF Consulting Engineers, Inc. for enXco (Solano County Department of Resource Management 2011, Appendix I) and the March 23, 2011, “Shiloh IV Wind Farm Shadow Flicker Impact Analysis” prepared by DNV Renewables, Inc. (Solano County Department of Resource Management 2011, Appendix H).

3.11.1 Affected Environment

3.11.1.1 Regulatory Setting

The National Electric Manufacturers Association (NEMA), the American National Standards Institute (ANSI), and the California Office of Safety and Health and Administration (Cal-OSHA) set safety standards for wind project equipment.

Cal-OSHA protects workers and the public from safety hazards according to its occupational health and safety laws. Additionally, Solano County follows the California Building Code requirements for turbine setbacks from gas or oil wells, with a minimum setback of one turbine blade length plus 30 feet from any gas or oil wells onsite or offsite.

The California Fire Code establishes minimum statewide standards to reduce the risk of fire and aid firefighting, including regulations for buildings, construction sites, and roads. Section 503 and Appendix D of the code describe standards for fire apparatus access roads. Chapter 49, Requirements for Wildland-Urban Interface Fire Areas, specifically addresses standards to reduce the threat of wildfires to structures.

According to the 1987 *Solano County Wind Turbine Siting Plan*, theoretically, the tip of a rotor blade could be thrown up to a distance of 1,300 feet, although in most reported cases blades were thrown 500–750 feet.

Solano County General Plan

The Solano County General Plan establishes safety policies for wind plant development. Implementation Program Regulation RS.he 1-37 provides the following proposed standards.

- Establish a procedure for plan check and testing of wind electric generators prior to use permit or building permit approval. Certification of all detailed plans for electrical systems, electrical substations, support towers, and foundations by California licensed professional engineers shall be required. Performance testing of wind turbine generators shall be required to ensure against catastrophic failure.

- Require a minimum setback of 1,000 feet or three times total turbine height, whichever is greater, from a dwelling unit, residential building site, or land zoned for residential uses.
- Require a minimum setback of three times (3x) total turbine height from any zoning district (other than residential) which does not allow wind turbines.
- Require a minimum setback of three times (3x) total turbine height from any property line, public roadway, transmission facility, or railroad. The minimum setback may be waived in the case of wind farms located on adjacent parcels, provided an agreement has been reached between the neighboring property owners. (For the Shiloh IV Wind Energy Project, the setbacks for the turbines would be 1,245 feet for the REpower MM92 turbines.)

The Health and Safety Chapter of the Solano County General Plan has policies to reduce fire hazards in high grassfire risk areas. According to these policies, in areas of high grassfire risk the County and cities should create fire buffers along heavily traveled roads by thinning, mowing, discing, or controlled burning of roadside grass.

Solano County Zoning Ordinance

Section 28-50(b)(4) of the Solano County Zoning Ordinance provides the following regulations pertaining to safety.

- Wind turbines shall be set back a minimum of 1.25 times the maximum height of the turbine to the property line, and a minimum of 10 feet from any other structure on the property. Setbacks determined by height may be waved when appropriate easements are secured from adjacent property owners or when the County approves other acceptable mitigation. (The setbacks from a property line under this standard would be 519 feet for the project turbines with the taller of the two proposed turbines.)
- The project applicant (i.e., Shiloh IV) shall provide the manufacturer's specifications certifying that the turbine is equipped with a braking system, blade pitch control, and/or other mechanism for rotor control, and that the turbine is equipped with both manual and automatic over-speed controls.

Solano County Department of Resource Management

The Project includes the installation of three permanent meteorological towers. The Solano County Department of Resource Management has previously established setback requirements for meteorological towers equivalent to tower height plus an additional 25%. The three proposed 252-foot towers would, therefore, require setbacks of 315 feet.

Montezuma Fire Protection District

The Montezuma Fire Protection District serves the Plan Area and has its own standards for emergency vehicle access and other requirements pertaining to private access roads and other features. The Proposed Action will be subject to the requirements of the Montezuma Fire Protection District, which in addition to any special standards specific to the Fire District, follows the minimum requirements for fire apparatus access roads found in the latest edition of the California Fire Code and Wildland Urban Interface Code, including appendices.

3.11.1.2 Environmental Setting

Wildland Fire

The Montezuma Hills area is classified as a high grassfire risk area due to the ignition potential of dry grassland environment and periodic strong winds. However, the risk is not as severe as in the mountainous areas northwest of Fairfield. The California Department of Forestry and Fire Protection (CAL FIRE) classifies most of the Plan Area as a *low or none* or *moderate* wildland fire hazard area. Four small areas of *high* wildland fire hazard are in the Plan Area. No areas with extreme or high wildfire risk are located in or near the Plan Area or Montezuma Hills (Solano County Department of Resource Management 2011).

Wind Turbine Rotor Failure and Tower Integrity

Public safety issues related to wind plants are usually associated with rotor failure or tower integrity. Wind turbines have the potential for blade throw, blade fragment throw, and tower failure. Although unlikely, all three failures have the potential to impact project personnel or public safety. Facilities that experience cold weather can also pose a risk to public safety by throwing collected ice (ice throw); however, the climate in the Plan Area makes ice throw unlikely. (Solano County Department of Resource Management 2011). The blade throw hazard poses the greatest risk for wind projects in the Montezuma Hills, and this analysis uses the project-specific blade throw distance plus a safety factor to determine the appropriate reduced setback for turbine locations that do not meet the General Plan setback requirement of three times the total turbine height.

Blade or Blade Fragment Throw

Blade throw—the loss of a blade due to hub failure—is an uncommon occurrence in wind energy projects, but blade or rotor failure can occur due to extremely high winds, excess rotor speed, or from electrical system failure. Most commercially available turbines, including the turbines proposed for the project, are equipped with safety and engineering features to reduce the risk of blade failure and are designed in accordance with international construction standards to ensure safe operation under normal conditions. (Solano County Department of Resource Management 2011). The potential exists for a turbine blade to fail or fragment. If the failure were to occur at the hub, the turbine would throw the full blade, posing the greatest potential for damage to infrastructure and public safety. The CEC's Permitting Setback Requirements for Wind Turbines in California, prepared by the California Wind Energy Collaborative, provides guidance for calculating blade throw (Solano County Department of Resource Management 2011).

If a blade were to fragment, rotational forces could throw one or more fragments into the surrounding environment. A blade fragment has the potential to fly farther than an entire blade because the aerodynamic forces on it would be relatively large compared to the fragment mass. Fragmentation is rare, and the frequency for blade fragment throw is low due to modern construction standards, quality control, and periodic inspections (Solano County Department of Resource Management 2011). If thrown, fragments have a 2% probability of striking nearby electrical lines at a distance of approximately 650 feet (Solano County Department of Resource Management 2011). The risk of a fragment striking a residence is even smaller because turbines are sited farther from residences and because residences are a single point rather than a linear feature.

A thrown blade could pose a hazard to people and infrastructure within and adjacent to the Plan Area. People potentially exposed to hazard include the five residences within the Plan Area, the four

rural residences within 1,000 feet of the project boundary, the community of Birds Landing, and visitors travelling along County roads. The important infrastructure in and adjacent to the Plan Area potentially susceptible to damage from blade throw includes the PG&E 500-kV transmission lines, two PG&E 230-kV transmission lines, wind project substations and switchyards, and the following County roads: Montezuma Hills Road, Birds Landing Road, Collinsville Road, Shiloh Road, and Olsen Road. The aboveground electrical distribution (collector and service) lines in the area are not considered critical infrastructure for purposes of this safety analysis because they are lower voltage lines, typically wood pole lines that are routinely subject to outages during winter storms and readily repaired without resulting in substantial impacts. The safety analysis also does not consider impacts on private agricultural roads.

To protect the public and important infrastructure against such hazards, the Solano County General Plan requires a minimum setback of 1,000 feet or three times (3x) the total turbine height, whichever is greater, from County roads, residences, property boundaries, transmission facilities, and railroads.

Blade throw is a function of hub height, blade length, and rotor speed and is a greater concern for large turbines than the small turbines in the enXco V project. The Kenetech KCS 65-100 turbines models have hub heights of 60 to 80 feet, 26-foot blades, and rotate at 144 feet/second. When the County approved these projects in 1990, the minimum 1,000-foot setback provided a sufficient buffer to protect the public safety from blade throw hazards from the enXco V project turbines.

Tower Failure

Tower failure—collapse of the turbine tower, particularly at the tower base—is a rare occurrence, and the risk is extremely low; however, excessive static stress, material fatigue, seismic activity, or ground settling could cause tower failure. The KPFF Consulting Engineers hazard zone analysis (Solano County Department of Resource Management 2011, Appendix I) identified the hazard zone for tower collapse as directly proportional to the height of the tower plus one half of rotor diameter. This analysis assumes the tower buckled from its base, as opposed to somewhere in the middle of the tower. A failure somewhere above the base (in the middle of the tower structure) would result in a smaller hazard zone. The minimum setback requirements for blade throw also provide protection against tower failure.

Section 3.6, *Geology, Seismicity, Soils, Mineral Resources, and Paleontological Resources*, further discusses the risk of tower collapse resulting from geologic hazards such as earthquakes and ground shaking.

Worker Safety

Persons working within the project site are at risk of electrical shock while working on energized facilities. There is also the potential for direct impacts on the public resulting from contact with energized equipment. However, impacts on non-project-related individuals associated with electrical transmission lines and electrical disconnect mechanisms would be reduced by limiting access to the project site through the use of appropriate fencing and warning signs.

Shadow Flicker

Shadow flicker is the on-and-off flickering effect of a shadow caused when the sun passes behind the moving rotor blade of a wind turbine. An indoor observer may notice shadow flicker as periodic

changes in the brightness of a room. An outdoor observer or automobile driver would see shadows of the rotating blades on the ground or nearby structures. A review of the effects of shadow flicker in the United Kingdom and Europe concluded that the shadow flicker effect does not constitute a significant harassment, based on psychology research by Pohl et al. into the impact of shadow flicker on performance indicators, mental and physical well-being, cognitive processing, and stress on the autonomic nervous system (Parsons Brinkerhoff 2011, as cited in Solano County Department of Resource Management 2011). In some documented cases, shadow flicker has caused human annoyance or mental stress, and flicker from a single turbine has occasionally caused driver distraction (Bittner-Mackin 2006, Voll 2006, as cited in Solano County Department of Resource Management 2011).

The shadow flicker analysis included the potential for wind turbines to cause epileptic seizures. According to the American Epilepsy Foundation, an epileptics' susceptibility to seizures caused by flashing lights varies from person to person. A wind turbine typically rotates at a frequency of 1 flash per second (i.e., 1 Hertz [Hz]), whereas epileptic seizures are typically most likely to be triggered at frequencies between 5 to 30 Hz. Shadow flicker from wind turbines is therefore considered too slow to trigger seizures in epileptics (Solano County Department of Resource Management 2011).

Oil and Gas Wells – Rio Vista Natural Gas Field

As discussed in Section 3.7, *Hazardous Materials*, natural gas exploration and extraction occurred near the Plan Area on two occasions between 1921 and 1980. According to the California Department of Conservation Division of Oil and Gas (DOGGR) records, the Shiloh IV Wind project site is not located within a natural gas oil field; however, DOGGR Map 612 from 2003 depicts two plugged and abandoned dry holes to the east of the Plan Area. There are no active DOGGR wells mapped on or adjacent to the site. However, if the Proposed Action were to uncover a well during construction, it could create a safety risk for workers, as well as an increased risk of soil or groundwater contamination.

3.11.2 Environmental Consequences

3.11.2.1 Approach and Methods

This analysis adapted criteria set forth in the State CEQA Guidelines to determine if adverse effects would result from implementation of the Proposed Action, including activities covered under the HCP. An effect would be considered adverse if the Proposed Action could lead to any of the conditions listed below.

- Exposure of people or structures to a significant risk of loss, injury, or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands.
- Exposure of people to a significant risk of loss, injury, or death associated with project infrastructure or operations.

3.11.2.2 Effects

Proposed Action

Impact PH-1: Increased risk of wildfire

Implementation of the Proposed Action could result in the increased risk of wildfires during construction activities in vegetated areas. During construction, heavy equipment and passenger vehicles driving on vegetated areas prior to clearing and grading could increase the danger of fire. Heated mufflers could potentially start surrounding vegetation on fire. Construction of the Project would also require the use of welding equipment, which produces sparks capable of igniting grassfires. Access roads throughout the Plan Area would reduce fire hazards because they act as firebreaks. Additionally, the roads would enable firefighting equipment access to the property that would not otherwise be available.

During operation, lightning strikes on wind turbines and electrical towers could create power surges that could result in a fire (Solano County Department of Resource Management 2011). Corona discharges could also increase fire risk. However, because the moving parts of the wind turbine generator are housed in the nacelle, potential sparks from moving parts would be contained within this housing. Implementation of EC-32, requiring a grass fire control plan, would minimize increased risk of wildfire by incorporating safety restrictions such as spark arresters, smoking restrictions, and vegetation management requirements during construction. Implementation of EC-33, requiring consultation with the Montezuma Fire Protection District when designing and constructing access roads, would ensure access for firefighting equipment. No significant adverse effects related to wildfire would result.

Impact PH-2: Turbine or meteorological tower failure

Implementation of the Proposed Action could result in turbine or meteorological tower failure through such conditions as excess rotor speed, electrical system failure, or turbine fire. Turbine or tower failure could cause hazard or injury to project personnel or the general public.

Blade or Blade Fragment Throw

The KPFF project-specific, worst-case blade throw hazard analysis (Solano County Department of Resource Management 2011, Appendix I) concluded that maximum blade throw distance was the governing case for a hazard zone; other hazards such as tower failure were only likely within a smaller radius around the turbine. The calculated maximum blade throw distance for the proposed turbine with a 262-foot hub height and 153-foot blade length—the tallest of the proposed turbines with the greatest potential blade throw distance—would be 602 feet (Solano County Department of Resource Management 2011).

The analysis recommended multiplying the calculated maximum blade toss distance by a safety factor of 1.2 to account for any simplifications and uncertainties in the calculations for a recommended 723-foot hazard zone. As allowed in the General Plan, when a proposed turbine location is less than the three times the total turbine height setback, in this case 1,245 feet for the REpower MM92 turbine, the County typically uses the hazard zone (1.2 times turbine blade throw distance) to determine the alternative minimum setback for public roads, railroads, transmission facilities, and residences.

As proposed, no wind turbine would be sited closer than three times the turbine height from any residence within or adjacent to the Plan Area. The closest a turbine would be sited to a residence would be approximately 1,180 feet, but the three times total turbine height setback for that turbine would be 1,146 feet because a shorter turbine model would be used at this location due to aviation requirements. All other project turbines would be farther than 1,245.

Ten proposed turbine locations would be less than three times the total turbine height from a public road. Four would be less than three times the total turbine height from a transmission line.

The alternative minimum 723-foot setback, based on the turbine with 153-foot blades, applies to the proposed locations that do not meet the General Plan requirement. All of the proposed and alternate locations are outside the 723-foot hazard zone from the transmission lines and roads identified as important infrastructure in the Plan Area.

As noted in Section 3.11.1.1, *Environmental Setting*, the risk of blade fragmentation to public safety and infrastructure is insignificant. While a fragment could potentially be thrown farther than a full blade, the probability of blade fragmentation occurring is less than 0.03% per turbine per year and the risk of a fragment actually striking transmission lines located more than 678 feet away from a turbine is another 2% (Solano County Department of Resource Management 2011), reducing the probably of damage to less than five in a million.

The risk to vehicles on roads is also insignificant because of the low traffic volumes on public roads in the Plan Area and the resulting low probability that a vehicle would be in the same place that a thrown fragment would land. Section 3.13, *Traffic and Transportation*, provides information on public road traffic in the Plan Area. The risk to residences is also not significant because turbines are sited far from residences and because residences are a single point rather than a linear feature.

New technologies and engineering design for wind turbines have significantly lowered the risk to public safety over the past decades. Both the REpower MM92 and Vestas V 90 turbine models have several safety features to prevent a rotor failure. If the control system detected an over-speed, the machine would be immediately halted using a combination of generator torque applied by the power electronics unit and rapid pitching of the blades to the feather position by the hydraulic pitch actuator and the hydraulic power unit. The gearbox also incorporates a fail-safe mechanical brake. In the event of hydraulic power unit failure or loss of electrical power, the turbines would power to the feather position using stored pressure. Additionally, critical components have temperature sensors and a control system to shut the system down and take it off-line if the sensors detect overheating (Solano County Department of Resource Management 2011).

Tower Failure

The hazard zone for tower collapse is the height of the turbine, in this case 415 feet. This distance is smaller than the blade throw hazard of 602 feet. The KPFF analysis used a 1.2 safety factor to define a hazard zone of 490 feet for tower failure. Tower failure would present a potential hazard only to people and vehicles within the 490-foot hazard zone and, equally important, would be very unlikely.

Shiloh IV has sited the three meteorological towers at a minimum distance of 315 feet, or 1.25 times the proposed tower height, from all public roads, residences, and transmission lines, in compliance with the County's setback requirements. Shiloh IV has additionally provided the same minimum setback to all property lines. Therefore, even in the event that a meteorological tower falls toward a County road, with the minimum proposed setback, it would not cause a significant safety hazard to the public.

Implementation of EC-34, which requires specific design standards and safety measures for wind turbines, and EC-32, which requires a grass fire control plan, would adequately address this potential effect. No significant adverse effects related to turbine failure would result.

Impact PH-3: Electrical shock and accidents

Personnel working on the Shiloh IV project are at risk of electrical shock from energized facilities and injury from work-related accidents that may occur during construction and operation. Implementation of EC-34, EC-35, and EC-36 - would address this effect by imposing specific safety requirements and turbine design specifications, including grounding and shut-off mechanisms and development of an injury and illness prevention plan to minimize these potential effects. No significant adverse effects related to electrical shock would result.

Impact PH-4: Accidents involving the general public (other than turbine failure)

Incidental or intentional entry onto the Shiloh IV project site could create risks to human safety. Implementation of EC-37 would address this effect by restricting access to the Plan Area during construction and operation. No significant adverse effects associated with public safety would result.

Impact PH-5: Impacts from shadow flicker

The Proposed Action would introduce turbines into the Plan Area that may cast flickering shadows onto adjacent parcels. The length of the flickering shadow varies with the height of the turbine and the size of the rotor, but the intensity decreases with distance. In addition to distance, the intensity of shadow flicker is affected by environmental factors such as the season, time of day, surrounding terrain and obstacles (including vegetation), wind speed and direction (orientation of the turbine), and weather.

No formal standards for the significance of shadow flicker impacts on human receptors have been adopted locally, in California, or at the federal level. A maximum of 30 hours per year has been used by some jurisdictions in New England and the Midwest as a limit for allowable flicker. This limit originated in Germany and has been used in Europe and elsewhere (Solano County Department of Resource Management 2011). The original German limit also includes a maximum of 30 minutes per day based on worst-case exposures (i.e., a scenario in which the sun is shining continuously within a cloudless sky, sufficient wind exists to turn the rotor, and there are no obstacles such as vegetation). These limits are provided here for general discussion purposes. Given the absence of any public complaints about shadow flicker caused by currently operating wind turbines in the Montezuma Hills, Solano County has not adopted, nor formally debated, an official threshold of significance for shadow flicker.

Nonetheless, because the project would add a number of wind turbines to the Montezuma Hills, Shiloh IV has prepared a study that predicts the extent and duration of the shadow flicker cause by the project. The study considers the potential impact of REpower MM92 turbines, the larger of the models being considered for the project, on the residences near and within the Plan Area (Solano County Department of Resource Management 2011, Appendix H) The analysis considered the impact to 33 receptors within 0.9 mile of the proposed turbine locations, 9 of which were later determined to be auxiliary structures, not residences. The study shows that of the 24 residences within and adjacent to the Plan Area, 20 would experience some level of shadow flicker impacts (see Table 3.11-1). The maximum shadow flicker impacts from the project, using the expected case, would be 38 hours annually, experienced by one residence within the Plan Area and one residence

outside the Plan Area, both owned by Thomas W. Stewart. On 162 days per year, the first residence would experience no shadow flicker at all. These residences experience a similar if not greater level of shadow flicker impacts from the existing Shiloh I project. The County has no record of the receipt of any landowner or other public complaints associated with shadow flicker impacts from operating wind turbines, which are inherent in the operation of wind projects. Stewart and other landowners within the Plan Area have agreed to the presence of wind turbines on these properties.

The Proposed Action would be adjacent to the community of Birds Landing, which has 13 residences. In addition, another offsite rural residential property, Peugh, is surrounded by the Plan Area. None of the landowners in Birds Landing are participants in the Proposed Action, and the residences do not currently experience shadow flicker impacts from any of the existing adjacent wind projects. As shown in Table 3.11-1, all of these residences would experience some shadow flicker impacts from the Proposed Action, of less than 30 hours per year, in the expected case and less than 30 minutes per day on average.

Table 3.11-1. Worst-Case and Expected Shadow Flicker Impacts

Residence	Worst Case ^a			Expected Case	
	Days Per Year	Total Annual Hours	Maximum Minutes Per Day	Total Annual Hours	Mean Minutes Per Day
Anderson, Edward A Jr.	0	0	0	0	0
Anderson, Eric Ian	135	80	45	21	9
Anderson, Jeanne E Le	0	0	0	0	0
Anderson, Wm S & Jeanne	0	0	0	0	0
Benjamin, John C	99	26	27	8	5
Benjamin, John C	102	28	29	8	5
Cirillo, Richard P	122	35	42	12	6
Dana, Dora	118	38	39	8	4
Hall, Robert W & Linda	143	39	38	11	5
Matthews, Michael L	109	25	27	8	4
Monahan, James L III	99	26	25	6	4
Ostrom, Rodney & Rebecca	112	31	27	7	4
Paolini, Shirley J	85	36	44	7	5
Paris, Adrienne	120	30	27	8	4
Paris, Adrienne	114	28	27	7	4
Peugh, Diana Marie	199	82	54	26	8
Stewart, Thomas W	158	167	128	38	15
Stewart, Thomas W	185	82	53	28	9
Whitfield, Ronald & Juliet	20	2	9	1	2
Winters, Julie M	110	31	25	7	4
Winters, Julie M	114	36	38	8	4
Zadwick, Kenneth & Dolores	113	61	49	10	5
Stewart, Thomas W	203	107	54	38	11
Hale Trust	0	0	0	0	0

^a Worst case calculations assume no reduction for turbine position, turbine operation, or cloud cover but include residence specific obstructions such as buildings or vegetation

In the expected case scenario, the analysis adjusts for cloud cover and turbine operation/yaw direction on a monthly basis and calculates the average daily impacts from the number of days when impacts would occur. This adjustment is substantial. Based on composite meteorological data from San Francisco, Stockton, and Sacramento, annual cloud cover would be 46% of the time. On days with little or no cloud cover and high wind speeds, shadow flicker impacts would exceed the average values in Table 3.11-1, up to up to the worst-case maximum minutes per day. The maximum predicted daily values, however, are not likely because the WindPRO model in the analysis uses assumptions that over predict shadow impacts. In the Montezuma Hills, cloud cover tends to be greater in the morning and evenings, which are the periods of greatest potential shadow flicker impacts.

Thus, the expected effects would be less than the average values presented in Table 3.11-1, and the shadow flicker effects from the project at nearby residents would not be significantly adverse.

Impact PH-6: Safety impacts related to accidentally damaging or uncovering gas storage wells in the Plan Area

No natural gas wells have been identified in the Plan Area. If an unknown natural gas storage well was uncovered or damaged during construction, remedial operations may be required. Shiloh IV must contact the DOGGR's Sacramento District office to obtain information on the requirements for and approval to perform remedial operations. According to the current proposed layout, the closest turbine to an existing natural gas well would be more than 7,000 feet from a well. This distance would exceed California Building Code requirements. Additionally, incorporation of EC-23, which requires development of a plan for encountering contaminated soil, groundwater, natural gas wells, and other hazards, ensures there would be no significant adverse effects.

No Action

Under the No-Action Alternative, there would be no increase in public health and safety issues beyond current conditions because the Plan Area would remain in current agricultural operations.

3.11.3 References

Solano County Department of Resource Management. 2011. *Draft Environmental Impact Report—Shiloh IV Wind Energy Project*. August. State Clearinghouse #2011032062. Submitted by Point Impact Analysis, Inc., Palo Alto, CA. Chapter 18, Safety; Appendices I and H.

3.12 Recreation

This section describes the affected environment pertaining to recreational activities and resources and the potential environmental consequences that could result from implementation of the Proposed Action.

3.12.1 Affected Environment

3.12.1.1 Regulatory Setting

There are no federal regulations relevant to potential impacts on recreational resources. However, local jurisdictions exercise authority over recreational facilities, designations, and uses.

Delta Protection Commission, Delta Protection Act, and Land Use and Resource Management Plan for the Primary Zone of the Delta

The Delta Protection Commission adopted a management plan for the Primary Zone in 1995, and updated it in 2010. The Proposed Action would not interfere with the Recreation and Access part of the plan, which includes policies for local governments regarding the development, operation, and maintenance of recreation areas. No part of the Plan Area is in either the Primary or Secondary Zone of the Delta, and, therefore, the Delta Protection Commission does not have jurisdiction and the Delta Protection Act and Management Plan does not apply to the Proposed Action.

Solano County General Plan

The Park and Recreation Element of the Solano County General Plan, as adopted in 2003, includes the following policies and implementation goals relevant to the Proposed Action.

- Objective 4, Policy A: Areas surrounding regional parks should be maintained in open space or other compatible uses to protect the natural setting and environment of the park site.
- Objective 4, Policy B: Land use development proposals adjacent to regional parks shall be reviewed for compatibility with natural and recreational features and uses of the park.
- Proposal 5: Development of a County-operated regional park near the Western Railway Museum is proposed, generally south of SR 12 and east of Shiloh Road, within the vicinity of the museum.

3.12.1.2 Environmental Setting

No recreation or park facilities are present in the Plan Area. The Western Railway Museum, a private nonprofit facility, is on the south side of SR 12 east of Shiloh Road, approximately 3 miles northwest of the Plan Area. The nonprofit Bay Area Electric Railway Association, which owns and operates the museum, operates a tourist train along the Sacramento Northern Railway, near the western portion of the Shiloh II Wind Project.

The Suisun Marsh is the largest natural recreation area in Solano County, Fishing, duck hunting; water sports, upland game hunting, and wildlife observation are popular recreational activities in the marsh. Duck hunting is the most prevalent activity occurring from late October until January (Solano County Department of Resource Management 2011).

Water oriented recreation activities—fishing, boating, water skiing, and swimming—occur in the Sacramento River corridor at the southern boundary of the Montezuma Hills WRA.

The Solano County General Plan Park and Recreation Element identifies development of a regional County park near the Western Railway Museum. The park is intended to attract visitors on its own and to increase visitation to the museum. The specific location is not specified but it is envisioned to be in the vicinity of the museum, south of SR 12 and east of Shiloh Road. According to the Park and Recreation Element, a regional park is typically 50 acres or larger. The proposed facility would have only minimal improvements, such as a group picnic area and playfields.

3.12.2 Environmental Consequences

3.12.2.1 Approach and Methods

Assessment of environmental consequences of alternatives on recreation resources involved a qualitative evaluation of the potential to conflict with existing and planned park and recreation facilities or to increase demand for recreation facilities.

3.12.2.2 Environmental Consequences and Mitigation Measures

Proposed Action

Impact REC-1: Potential to affect operation of the Western Railway Museum

Implementation of the Proposed Action would require construction activities over a 6–9 month period that could potentially affect the recreational experience at the museum. However, this potential effect is not considered substantial or adverse because the Plan Area is more than 3 miles from the museum and is buffered by the existing Shiloh I and II wind projects. Tourists riding the train would pass about a half mile west of the western-most project boundary and would not be likely to notice increases in noise and dust during construction.

During operation, the Plan Area would be visible from the train in the background, behind the Shiloh I project, and one project turbine would be within 1 mile of the train. However, because there are over 20 Shiloh I turbines within 1 mile of the railroad, the operation of one additional turbine within 1 mile of the train would not significantly alter the visual character of the existing landscape or detract from the recreational experience. Section 3.1, *Aesthetics*, discusses visual impacts in more detail, and Section 3.10, *Noise*, covers noise impacts.

Impact REC-2: Potential conflict with planned regional park

Solano County has identified the potential for a regional park adjacent to the Western Railway Museum. The Proposed Action would have no effect on this park because of the distance of the Plan Area from potential park sites and because the Shiloh I, II, and III wind projects currently buffer the Plan Area from these sites.

Impact REC-3: Potential effect on Suisun Marsh recreation areas

Though a small portion of the Plan Area borders the Suisun Marsh (Secondary Management Area), the nearest potential turbine site would be over 1,000 feet away from the Plan Area boundary. Implementation of the Proposed Action would have no effect on recreation activities in the Suisun

Marsh, including duck hunting, because the Plan Area is approximately 2 miles from the eastern edge of the marsh and would be buffered by existing wind farm development to the west.

No Action

Under the No-Action Alternative, there would be no effects on existing recreation activities or planned park sites because current agricultural and grazing operations would continue and are generally compatible with regional parks.

3.12.3 References

Solano County. 2008. Solano County General Plan. Prepared by: EDAW, Inc. and Englebright and Associates. Solano County, Ca. December 2008.

Solano County Department of Resource Management. 2011. *Draft Environmental Impact Report—Shiloh IV Wind Energy Project*. August. State Clearinghouse #2011032062. Submitted by Point Impact Analysis, Inc., Palo Alto, CA.

3.13 Traffic and Transportation

This section describes the affected environment pertaining to traffic and transportation and the potential environmental consequences that could result from implementation of the Proposed Action.

3.13.1 Affected Environment

3.13.1.1 Regulatory Setting

Federal Aviation Administration

FAA is responsible for ensuring the safe and efficient use and preservation of navigable airspace. FAA regulates and determines potential for obstructions to navigable airspace, such as the Proposed Action's proposed wind turbines and meteorological towers, through implementation of notification and obstruction review standards (14 CFR Part 77). The Proposed Action would be subject to these notification and review requirements. FAA reviews the notifications to complete the following.

- Evaluate the effect of proposed construction on the safety of air commerce and the efficient use and preservation of navigable airspace.
- Determine whether the proposed construction is a hazard to air navigation.
- Determine appropriate marking and lighting recommendations, using FAA Advisory Circular 70/7460-1, "Obstruction Marking and Lighting."
- Determine other appropriate measures to ensure continued air navigation safety.
- Notify the aviation community of proposed construction that affects navigable airspace, including the charting of new objects.

Entities failing to comply with the provisions of 14 CFR Part 77 are subject to civil penalty under Section 902 of the Federal Aviation Act of 1958, as amended, and pursuant to 49 USC Section 46301(a). (Solano County Department of Resource Management 2011).

California State Aeronautics Act / Caltrans Division of Aeronautics

The California State Aeronautics Act (California Public Utilities Code Section 21001 et seq.) promotes the understanding of air transportation issues including aviation safety, planning, airport noise, and airport development and management. Caltrans Division of Aeronautics administers the act and publishes the California Airport Land Use Planning Handbook, a guide to inform ALUCs, airports, cities, counties, and the public about airport land use compatibility planning issues.

Section 21656 of the act requires entities proposing to build or add to the height of any structure in the state more than 500 feet above ground level at the site to obtain a permit from the Caltrans Division of Aeronautics. This section of the act also requires entities proposing the construction of any structure that exceeds the obstruction standards set forth by the FAA in 14 CFR Part 77 to obtain a permit from the Division of Aeronautics unless the FAA has determined that the proposed construction does not constitute a hazard to, or create unsafe conditions for, air navigation.

California Department of Transportation

Caltrans District 4 has jurisdiction over state highways in Solano County. Caltrans requires that a traffic impact study be conducted for a project if it meets one or more of the following conditions.

- Generates over 100 peak hour trips on a state highway facility.
- Generates 50–100 peak-hour trips on a state highway facility experiencing noticeable delay, approaching unstable traffic flow conditions (level of service (LOS) C or D conditions).
- Generates 1–49 peak-hour trips on a state highway facility experiencing significant delay and unstable traffic flow conditions (LOS E or F conditions), or that significantly increase the potential risk for a traffic accident, or that change local circulation networks that impact a state highway facility. (Solano County Department of Resource Management 2011).

Caltrans also issues permits and sets safety requirements for oversized delivery loads and vehicles that exceed the maximum vehicle length, width, height, and weight limits established by the California Vehicle Code.

Solano County Department of Public Works

Local traffic is subject to the policies and regulations of the Solano County Public Works Agency. Solano County transportation policies and standards for roadways are discussed in the Transportation and Circulation chapter of the Solano County General Plan. The general plan has established a policy that proposals for new development be evaluated for their compatibility with and potential effects on transportation systems (Solano County 2008, p. TC-6). The Solano County Road Improvement Standards and Land Development and Subdivision Requirements have set specific guidelines for the construction of public road improvements and private roads, including design standards addressing slopes, widths, connection to county roads, and others (Solano County Department of Resource Management 2011).

The Solano County Department of Public Works Operations Division is responsible for providing and maintaining a safe and efficient county roadway system. The Department of Public Works implements the public and private road, emergency access road, and associated drainage facilities standards of the Solano County Road Improvement Standards and Land Development Requirements. These requirements include design and improvement standards such as road slope, width, right-of-way, design safety, erosion control, and encroachment, easement, and maintenance standards as well as drainage channel, culvert and runoff standards (Solano County Department of Resource Management 2011). The Department of Public Works Engineering/Surveying Division issues encroachment, grading, and transportation permits in accordance with Solano County Code requirements.

Chapter 24 of the Solano County Code and the Solano County Road Improvement Standards and Land Development Requirements require project developers to obtain a permit prior to constructing or significantly changing the use of any encroachment (e.g., driveway, private road, etc.) along or on any county road. In addition, as permitted by Chapter 24 of the Solano County Code, the Department of Public Works may require, prior to the start of work, encroachment permit applicants to deposit cash, a certified check, or approved surety bond in an amount sufficient to restore affected county roads to their original conditions prior to encroachment, as well as a maintenance agreement for the roads used during construction.

Chapter 31 of the Solano County Code requires developers to obtain a grading and drainage permit prior to commencing any activity that changes the topography of the land in a manner that alters or interferes with water drainage; fills, closes, or diverts a storm water drainage channel or water course; and grades, fills, excavates, or clears vegetation for any purpose.

In accordance with Chapter 17 of the Solano County Code, the Public Works Department requires a transportation permit for all vehicles that exceed the County's maximum legal load limit of 80,000 pounds.

3.13.1.2 Environmental Setting

The Project is located in the Montezuma Hills region of Solano County, east of I-680 and south of I-80 and SR 12 and SR 113. Locally, Birds Landing Road, Collinsville Road, Montezuma Hills Road, Olsen Road, and Shiloh Road provide access to the Plan Area; and Birds Landing Road bisects the Plan Area in an east–west direction. Rio Vista Airport and Travis AFB, as measured from the closest project boundaries, are each approximately 8 statute miles (7 nautical miles) from the Plan Area.

Circulation System

Regional Roadways

The regional circulation system near the Plan Area consists of I-80 and I-680, which connect the nearby city of Fairfield to other cities in the San Francisco Bay Area and northern California. From I-80, SR 12 provides access to the Plan Area. SR 12 continues east of the Plan Area and connects to SR 113, which provides access to Davis and Woodland to the north and turns into Birds Landing Road to the south. The Solano County Board of Supervisors has designated portions of I-80, SR 12, and SR 113 as Scenic Roadways (Solano County 2011).

SR 12 connects with I-80 just west of Fairfield and runs east–west through Solano County. Together with I-680 and I-80, SR 12 and SR 113 would provide regional access to the Plan Area from points north, east, and west. SR 4 and SR 160, located to the southeast of Solano County and the Montezuma Hills area, would provide regional access to the Plan Area from the south.

Table 3.13-1 lists the existing traffic volumes on the regional access routes that construction crews, delivery vehicles, and operational workers would use to reach the Plan Area.

Local Roadways

The local circulation system—public surface streets—provides access to properties and movement of people and goods.

Construction personnel and delivery vehicles would travel to the site via the regional circulation system described above, as well as local roadways. Specifically, I-80 would provide access to the Plan Area from San Francisco and Sacramento, while access from Contra Costa County would be via I-680 to I-80 or via SR 12 and SR 113 from the east and SR 4 and SR 160 from the. SR 12. Local access to the Plan Area will be available from SR 12, Currie Road, Emigh Road, Anderson Road, Shiloh Road, Little Honker Bay Road, Birds Landing Road, and Olsen Road (Figure 2-3).

Construction crews and delivery vehicles would travel along SR 12 or SR 113 to Shiloh Road and Birds Landing Road, the primary local access road for the Proposed Action, and then onto

Montezuma Hills Road, Collinsville Road, Olsen Road, and Shiloh Road. These local access roads are all paved, with the exception of Olsen Road, which is graveled.

Table 3.13-2 lists the existing traffic volumes on the local access routes that construction crews, delivery vehicles, and operational workers would use to access the Plan Area. The existing traffic volumes on these local roads include the approximately 25 enXco workers that presently maintain the enXco V project.

Table 3.13-1. Existing Traffic Volumes on Regional Access Routes

Route/ Road	Functional Classification	Intersection	Back Peak Hour ^{a,b}	Back AADT ^{a,c}	Ahead Peak Hour ^{d,b}	Ahead AADT ^d
I-680	Freeway	Cordelia Way, Junction I-80	4,800	62,000	NA	NA
SR 12	Major Arterial	Junction I-80	2,600	31,000	2,300	33,500
SR 12	Major Arterial	Fairfield, Beck Avenue	2,550	37,000	2,750	40,000
SR 12	Major Arterial	Pennsylvania Avenue	2,800	40,500	3,100	45,000
SR 12	Major Arterial	Marina Boulevard	3,050	44,000	2,700	36,000
SR 12	Major Arterial	Grizzly Island Road/ Sunset Avenue	2,700	36,000	2,450	30,500
SR 12	Major Arterial	Scandia Road/Lawler Ranch	1,750	21,700	1,250	15,500
SR 12	Major Arterial	Scally Road	1,250	15,500	1,050	12,900
SR 12	Major Arterial	Junction SR 113 North	950	11,500	1,250	15,000
SR 12	Major Arterial	Rio Vista, Drouin Drive	1,400	18,400	1,600	20,600
SR 12	Major Arterial	Junction Route. 84 North	1,500	19,600	1,600	21,000
SR 160	Major Arterial	Junction. SR 12	1,700	15,000	980	5,400
SR 4	Major Arterial	Junction I-680	7,600	86,000	6,600	82,000
SR 4	Major Arterial	Willow Pass Road	11,300	149,000	11,000	146,000
SR 4	Major Arterial	Pittsburg, Railroad Avenue Interchange	8,700	127,000	8,100	114,000
SR 4	Major Arterial	Antioch, Contra Loma Blvd. Interchange	8,200	115,000	7,600	107,000
SR 4	Major Arterial	Junction SR 160	1,750	23,900	1,850	21,700

Source: Solano County Department of Resource Management 2011.

^a California Department of Transportation (Caltrans) Annual Average Daily Traffic (AADT) and Peak-Hour counts taken for traffic just prior to intersection. Back AADT and Peak Hour usually represent traffic South or West of the count location. NA = Not Available.

^b An estimate of the “peak hour” traffic on the state highway system. This value is useful to traffic engineers in estimating the amount of congestion experienced, and shows how near to capacity the highway is operating. Peak hour values indicate the volume in both directions.

^c Annual average daily traffic is the total volume for the year divided by 365 days.

^d Caltrans AADT and Peak-Hour counts taken for traffic just prior to intersection. Ahead AADT and Peak Hour usually represent traffic North or East of the count location.

NA = Not Available.

Table 3.13-2. Existing Traffic Volumes on Local Access Routes

Route/Road	Functional Classification	Intersection	Average Daily Traffic Volume ^a
Birds Landing Road	Collector	SR 12 to the Collinsville Road Intersection	313
Collinsville Road	Collector	500 feet south of Birds Landing Road	393
Montezuma Hills Road	Collector	Rio Vista to Toland Road Intersection	West of Anderson Road: 135 Near Rio Vista City Limit: 382
Olsen Road	Collector	North of Shiloh Road	20
		South of SR 12	42
Shiloh Road	Collector	West of Collinsville Road	255

Source: Solano County Department of Resource Management 2011.

^aBased on average daily traffic volumes for 1979 (Olsen Road north of Shiloh Road), 1984 (Olsen Road south of SR 12), 1994 (Montezuma Hills Road), 1997 (Birds Landing Road), and 2004 (Collinsville Road south of Birds Landing Road and Shiloh Road west of Collinsville Road).

Air Transportation

Several airports are located in the region. Large metropolitan airports are in San Francisco, Oakland, and Sacramento; regional airports are in Franklin, Byron, Concord, Vacaville, and Napa (Solano County Department of Resource Management 2011). Small private airfields are in Dixon, Lodi, Elk Grove, Brentwood, and Vacaville. The closest public airport is in Rio Vista, approximately 8 miles east of the Plan Area's nearest boundary.

The Travis AFB military airport is approximately 8 miles north of the Plan Area's nearest boundary. The northwestern portion of the Plan Area is located within the Travis AFB *outer horizontal surface*, which restricts the height of structures to 562 feet amsl. To ensure compatibility with aircraft activities at the AFB, the Solano County ALUC developed the *Travis Air Force Base Land Use Compatibility Plan* in June 2002. The ALUC also reviews proposed projects with structures taller than 200 feet regardless of where they occur in the county. (Solano County Department of Resource Management 2011).

Rail Traffic

Rail traffic is present (but infrequent) in the vicinity for scenic and historical purposes. The Western Railway Museum, a private, nonprofit facility on the south side of SR 12, east of Shiloh Road, offers short local train rides to museum visitors. The nearest museum tracks are approximately 0.5 mile from the Plan Area's northwestern boundary.

3.13.2 Environmental Consequences

3.13.2.1 Approach and Methods

This analysis adapted criteria set forth in the State CEQA Guidelines to determine if adverse effects would result from implementation of the Proposed Action. An effect would be considered adverse if the Proposed Action could lead to any of the conditions listed below.

- An increase in traffic that is substantial in relation to the existing traffic load and capacity of the street system (i.e., a substantial increase in either the number of vehicle trips, the volume to capacity ratio on roads, or congestion at intersections).
- Exceedance, either individually or cumulatively, of level of service (LOS) standards established by the County for designated roads or highways.
- Substantial safety hazards for motorists, bicyclists, pedestrians, or rail operations.
- Restriction of one or more lanes of a primary or secondary arterial during peak-hour traffic, thereby reducing its capacity and creating congestion; or the closure of an arterial or collector roadway for more than 48 consecutive hours.
- Significant disruption of access to or from adjacent land uses for more than 14 days.
- Inadequate parking capacity.
- Inadequate emergency access.
- A change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risk.
- Noticeable and substantial deterioration of roadway surfaces by restoration of a road surface in a manner inconsistent with local requirements.
- Conflicts with planned transportation projects or adopted public transportation policies.
- Substantial increase in hazards due to a design feature (e.g., sharp curves, dangerous intersections) or incompatible uses.

3.13.2.2 Effects

Proposed Action

Impact TRA-1: Temporary increase in traffic during construction

Implementation of the Proposed Action could result in temporary and short-term increases in local traffic due to construction-related workforce (employee travel to and from the site), heavy equipment delivery (e.g., cranes and bulldozers), and material deliveries (e.g., gravel and concrete).

Shiloh IV estimates that project construction would occur in six phases and take between 6 to 9 months as follows.

- Phase 1: Laydown yard (April 15, 2012—May 5, 2012).
- Phase 2: Road construction (April 15, 2012—August 4, 2012).
- Phase 3: Foundation construction and electrical (May 6, 2012—August 25, 2012).
- Phase 4: Turbine installation and delivery (July 1, 2012—September 22, 2012).
- Phase 5: Electrical trenching (August 5, 2012—November 10, 2012).
- Phase 6: Cleanup (September 23, 2012—December 29, 2012).

Shiloh IV estimates that, under worst-case conditions, each phase of construction could require up to 100 workers. During the 3-month peak construction period when multiple phases of construction are occurring simultaneously (e.g., road construction, foundation installation, and turbine delivery

and installation) project construction could require up to 300 workers and 19 daily truck deliveries. Using these estimates, the project has the potential to result in up to 600 total automobile and light truck trips and 38 heavy-duty, oversized truck trips per day during peak construction activities; project construction would generate a total of approximately 101,000 automobile and light truck trips and 9,580 heavy-duty, oversized truck trips during the 6- to 9-month construction period.

Overall, employee-related vehicle trips would account for approximately 91% of the total vehicle trips generated during construction. Equipment and material deliveries would account for the remaining 9% of construction-related trips. Shiloh IV would deliver heavy equipment to the site at the beginning of the construction period and transport the equipment from the site at the completion of the construction period. The Project would generate several hundred total truck trips for delivery of the wind turbine towers, nacelles, and blades.

As described, Shiloh IV estimates that peak project construction activities would result in a maximum of 638 total daily vehicle trips. Project construction-related peak hour trips (7:00 to 9:00 a.m. and 4:00 to 6:00 p.m.), however, would be substantially fewer (less than 50 trips). Construction would take place from 7:00 a.m. to 7:00 p.m., Monday through Friday and 8:00 a.m. to 6:00 p.m. on Saturday and Sunday, resulting in mostly off-peak construction employee and workforce trips. Equipment and material deliveries would occur throughout the day.

From I-80, SR 12, and SR 113, project vehicles would travel to the project's staging area(s) and turbine locations using the network of local roads described in Table 3.13-2. Specifically, Birds Landing Road would be used to access the 11.8-acre temporary staging area located north of Birds Landing Road.

As Table 3.13-1 shows, the intersection of SR 12 and SR 113 has a combined Back and Ahead Annual Average Daily Traffic (AADT) volume of 26,500 vehicles. The project would temporarily add as many as 638 total daily vehicles to SR 12 and its junction with SR 113, or an approximate increase of 2.4% above existing traffic conditions.

Construction-related traffic also would increase the existing traffic on local roads. Traffic would, however, be dispersed among several roads. The Project's construction-related traffic would not disrupt access to or from adjacent land uses because existing or alternate access would be maintained at all times. The AADT for the roads that make up the local circulation system are significantly lower than SR 12. The addition of 638 daily vehicle trips on the local roads that would be travelled the heaviest to access the Plan Area, Birds Landing Road and Montezuma Hills Road, would increase the total daily vehicle trips on these roads by approximately 200 and 473%, respectively.

In addition to trip rates, the Proposed Action's construction traffic, in particular the large and oversized trucks that make wide turns at intersections, could inhibit road visibility, increasing the potential for accidents with other, non-project-related traffic that may not be aware of the presence of construction vehicles.

Implementation of EC-38 requires development and implementation of a traffic control and transportation plan that would address these issues. No significant adverse effect would result.

Impact TRA-2: Temporary disruptions of traffic flow during construction

The Proposed Action could result in temporary disruptions of traffic flow if it is necessary to widen or improve existing roads to accommodate equipment during construction. Temporary lane closures

(1 to 2 weeks in duration) could directly affect traffic flow by causing congestion on the roads, or could indirectly affect traffic flow if drivers avoid roads with lane closures and use alternate roads, potentially shifting traffic patterns and affecting existing traffic loads on the alternate roads. EC-38 requires development and implementation of a construction traffic control plan and a transportation plan that address potential lane/road closures, alternative routes, signage requirements, construction traffic scheduling, local jurisdiction coordination, and other BMPs needed to alleviate temporary traffic issues. No significant adverse effect would result.

Impact TRA-3: Damage to existing roads as a result of construction

Existing roads used to access the Plan Area could be damaged by increased use and heavy equipment. There is also the potential for tracking dust, soils, and other materials from graded construction sites onto public roads. EC-39 requires any damaged roads to be repaired to preconstruction conditions. No significant adverse effect would result.

Impact TRA-4: Operations-related traffic impacts

Project operations would only require approximately six full time staff who would work at the proposed O&M building located north of Montezuma Hills Road. Therefore, project operation would generate up to 12 trips per day on the local roads used to access the O&M building, including Birds Landing Road and Montezuma Hills Road. In total the enXco O&M facilities, which would also serve the Shiloh II, Shiloh III, and remaining portions of the enXco V project, would have approximately 25 workers. Additionally, the project could require periodic deliveries by large trucks and use of heavy equipment for maintenance once operational. In the long term, project-related trips from operation would replace existing employee and maintenance trips associated with the enXco V project. No significant adverse effect on local roads or highways is expected.

Impact TRA-5: Potential to affect aviation patterns

The potential for the Proposed Action to impact aviation patterns and/or result in a hazard to air navigation is primarily dependent on the height of the proposed structures and the proximity of the proposed structures to an airport, compatibility zone, or other protected surface. Shiloh IV is proposing to construct 50 wind turbines and 3 meteorological towers that, when erected, would be greater than 200 feet in height above ground level at the site. Because the turbines and meteorological towers would be more than 200 feet tall, Shiloh IV will require a Determination of No Hazard to Air Navigation from the FAA (EC-27). In June 2011, Shiloh IV submitted FAA Form 7460-1 to the FAA for each of the currently proposed wind turbine and meteorological tower locations. However, the FAA has not yet issued any determinations on whether the proposed turbines and meteorological towers would represent a potential hazard to air navigation. Shiloh IV may be required to re-notify the FAA of its planned construction activities if the current layout is modified.

On April 23, 2011, the City of Rio Vista provided comments to Solano County on the project use permit application expressing concern about the safety, vitality, and efficiency of Rio Vista Airport operations and requesting certain assurances that the airport would not be potentially impacted by the Proposed Action.

Shiloh IV's aviation expert, JDA Aviation Technology Solutions (JDA), reviewed the City's comments and the Proposed Action's layout and determined that the project would not result in the placement of any turbines within Rio Vista Airport's conical surface area, horizontal surface area, or any airport compatibility zones. JDA provided a map of Rio Vista Airport's conical and horizontal surfaces and

land use compatibility zones and their proximity to the project as part of its review and determined that the project would not have an impact on Rio Vista Airport's instrument approach or departure procedures because the project's closest planned turbine is located more than 8 statute miles (7 nautical miles) from Rio Vista Airport. JDA also determined that the project is unlikely to be a controlling factor in determining future precision instrument approach procedures at Rio Vista Airport, regardless of the removal of non-turbine obstacles such as PG&E towers, trees, etc. The design standards established by FAA for instrument procedures under FAAO 8260.3B United States Standard for Instrument Procedures and FAAO 8260.54A United States Standard for Area Navigation (RNAV) recommend optimal 5 nautical mile final approach segments. At approximately 8 statute miles (7 nautical miles) from Rio Vista Airport, the project boundary would be located within the intermediate segment of any approach likely to be developed. Existing turbines north and east of the project would likely be located within the final segment of any future procedure developed. The resulting procedure design would establish a minimum descent altitude for the intermediate segment (at the final approach fix) at a height in excess of the planned project turbines to include mandated required obstacle clearance.

The Solano County ALUC Airport Land Use Compatibility Review Procedures apply to any proposal for construction taller than 200 feet above ground level at the site, regardless of its location in the county. The Proposed Action would, therefore, be subject to ALUC review and determination that the Proposed Action is consistent with Rio Vista Airport LUCP.

The Plan Area is approximately 8 statute miles (7 nautical miles) southeast of Travis AFB. However, the northwestern portion of the Plan Area lies within the Travis AFB area of influence, land use compatibility zone C, and outer horizontal surface area. The current layout would place 24 turbines within the Travis AFB area of influence and land use compatibility zone C and 2 turbines within the Travis AFB outer horizontal surface, the elevation of which is fixed at 562 feet amsl.

The project would be subject to ALUC review regardless of its location within the County or its proximity to Travis AFB protected airspaces because the proposed turbines and meteorological towers would exceed 200 feet in height above ground level. In addition, the Travis AFB LUCP prohibits hazards to flight from being placed within land use compatibility zone C and also generally requires that the height of objects in the vicinity of Travis AFB be restricted so that they do not penetrate an imaginary protected airspace surface. Shiloh IV is proposing turbines with a hub height of 230-feet and a total height of 382 feet at locations within the Travis AFB outer horizontal surface in order to avoid penetrating this protected airspace.

As currently sited, none of the proposed turbines would exceed the 562-foot height restriction imposed by location in the outer horizontal surface. However, if Shiloh IV modifies the location or height of proposed turbines, this height restriction could be exceeded; such an exceedance would be considered an airfield obstruction. EC-25 and EC-27 require Shiloh IV to comply with Solano County and FAA siting requirements. No significant adverse effects would result.

Impact TRA-6: Reduction in probability of detection for Travis AFB ASR-11 radar

The Proposed Action would erect 50 wind turbines that have the potential to affect the performance level of Travis AFB's DASR-11 radar system. Approximately 32 of the proposed turbines would be located on lands currently occupied by approximately 240 smaller turbines associated with the enXco V project.

In December 2009, enXco, as well as two other wind developers, entered into a Cooperative Research and Development Agreement (CRADA) with representatives of the 60th Air Mobility Wing (AMW) at Travis AFB, the Air Mobility Command (AMC), the U.S. Air Force Flight Standards Agency (AFFSA), the Idaho National Laboratory, and the United States Transportation Command (USTRANSCOM) to assess the impact of three then-currently pending wind projects (Montezuma I, Shiloh III, and SMUD-Solano Phase 3) on air traffic operations over the Montezuma Hills. The results of this assessment concluded that an average degradation of 5% probability of detection (Pd) across the entire Montezuma Hills would pose an insignificant operational impact and would not impact air traffic safety. (Solano County Department of Resource Management 2011).

Shiloh IV requested that Westslope Consulting conduct a baseline analysis, simulation, and simulation analysis of Travis AFB radar coverage using the same methods and results that Westslope brought to and used under the CRADA process to simulate the Proposed Action's potential effects on the Travis AFB ASR-11 radar system and to predict the change in Pd that would occur with the project. (Solano County Department of Resource Management 2011).

The updated simulation analysis indicated that the Proposed Action would decrease the Pd out of the ASR-11 over the entire Montezuma Hills region by an additional 0.5% below 4,000 feet and an additional 0.6% below 10,000 feet amsl and, in combination with the recently built Montezuma I project, previously approved Shiloh III and Solano Wind Phase 3 projects, proposed Montezuma II project, and reasonably foreseeable PG&E Collinsville project, would result in a predicted drop in Pd of 4.6% below 4,000 feet and 4.4% below 10,000 amsl (as seen at the scope by air traffic controllers). This predicted drop in Pd is less than the 5% standard established by the Operations Working Group. (Solano County Department of Resource Management 2011).

Travis AFB has preliminarily reviewed the project and indicated that the project, in combination with other existing, approved, and foreseeable projects in the Montezuma Hills, would not reduce the minimum average Pd over the Montezuma Hills by more than 5% (Solano County Department of Resource Management 2011). This preliminary review, however, was based on modeling performed by Westslope Consulting in April 2011; Westslope has since updated its modeling to reflect the current project layout. The updated modeling resulted in a lower predicted drop in Pd than the original modeling performed for the project by Westslope and reviewed by Travis AFB. There would be no significant adverse effects.

No Action

Under the No-Action Alternative, there would be no effect on transportation systems or traffic patterns because existing agricultural uses would continue and no new development would occur.

3.13.3 References

Solano County Department of Resource Management. 2011. *Draft Environmental Impact Report—Shiloh IV Wind Energy Project*. August. State Clearinghouse #2011032062. Submitted by Point Impact Analysis, Inc., Palo Alto, CA.

Solano County. 2008. Solano County General Plan. Prepared by: EDAW, Inc. and Englebright and Associates. Solano County, Ca. December 2008.

3.14 Utilities and Public Service Systems

This section describes the affected environment pertaining to utilities and public service systems and the potential environmental consequences that could result from implementation of the Proposed Action.

The Plan Area is not connected to public water or sewer systems; residents obtain water from wells and manage individual septic systems. Solano County provides police, fire, medical, and educational services to the Montezuma Hills area and private entities provide solid waste disposal and gas and electric utility services. Communication systems in the area include microwave, radio/television, and aircraft navigation signals.

The existing wind turbines in the Montezuma Hills, including 255 small enXco V wind turbines and related facilities in the Plan Area place few demands on these public services and have been located to avoid interference with microwave and other communication systems. (Solano County Department of Resource Management 2011).

3.14.1 Affected Environment

3.14.1.1 Regulatory Setting

National Telecommunications Information Administration

The National Telecommunications Information Agency (NTIA) manages the operation of radio frequencies for federal government use and maintains the Government Master File (GMF), a classified database that contains all of the government telecommunications systems. When an applicant notifies the NTIA regarding a Proposed Action, the NTIA then notifies federal agencies operating telecommunications systems in nearby areas. (Energy and Environment 2011.).

The notification process includes provision of site maps and a letter that describes the wind energy project, the type of turbines, and turbine locations, if known to the Interdepartmental Radio Advisory Committee (IRAC). IRAC consists of government agencies that operate radar or telecommunication systems (e.g., the Department of Defense, Department of Justice, FAA, and the Department of Homeland Security). After 45–60 days, IRAC issues a determination of impact and the NTIA responds to the applicant. The NTIA response either states that government telecommunications concerns within the Plan Area have not been identified or identifies potential impacts to be addressed in coordination with relevant agencies. The IRAC consultation process may not reach all relevant federal entities, and a federal agency may raise concerns about radar system impacts outside of the IRAC process (Solano County Department of Resource Management 2011).

Solano County General Plan

The Housing Element of the County's general plan guides housing and development in the county. According to the general plan, the County "recognizes that the provision of essential public facilities and services is an important and necessary prerequisite to the maintenance of a satisfying living environment" (Ecology and Environment 2006). In the Solano County Housing Element Update, the County sets the following objectives and policies (Solano County 2008).

- **G.2:** Domestic water for rural development shall be provided principally through on-site individual wells. When individual well systems in an area of the unincorporated County become marginal or inadequate for serving domestic uses, public water service may be permitted in conformance with the General Plan. In such cases, public water service shall be provided and managed through a public agency. If lands proposed for water service are not within the boundaries of an existing public water agency, the Board of Supervisors shall, as a condition of development, designate a public agency to provide and manage the water service. Water facilities shall be designed to provide water service only to the developed areas and those designated for potential development. Such facilities shall be designed to prevent any growth inducing impacts on adjoining designated agricultural and open space lands.
- **G.3:** The County shall continue to work with the local school districts in implementing mechanisms and procedures for mitigating impacts on school facilities resulting from future County development.

The Resources Chapter of the Solano County General Plan specifies requirements for use permit applications within wind resource areas. Submittal requirements include “notification of application filing to microwave communications link owners within 2 miles of the proposed installation” (Solano County Department of Resource Management 2011).

In addition, the Public Facilities and Services Chapter of the general plan identifies the following policies and implementation programs:

- **PF.P-2:** Require new development and redevelopment to pay its fair share of infrastructure and public service costs.
- **PF.P-8:** Notify the appropriate agencies (e.g., school districts, public safety, water) of new development applications within their service area early in the review process to allow sufficient time to assess impacts on facilities.
- **PF.P-20:** Minimize the consumption of water in all new development.
- **PF.I-29:** Expand waste minimization efforts, including household recycling, food waste and green waste recycling, business paper recycling, and construction and demolition recycling. Require commercial and industrial recycling. Require building projects to recycle or reuse a minimum of 50 percent of unused or leftover building materials.
- **PF.I-35:** Coordinate with the fire districts and California Department of Forestry and Fire Protection (CAL FIRE) during project review to ensure that all new development incorporates appropriate fire safety techniques, including fire-safe building materials, early-warning systems, adequate clear spaces and fuel reduction, adequate escape routes and facilities, fire breaks, and sufficient water supply systems for fire suppression.
- **PF.P-41:** In the review and approval of County and City projects, identify and consider the law enforcement needs generated by the project.
- **PF.I-55:** Encourage local utility companies to provide high-speed wireless internet access for all residents; prioritize developing transmission lines for solar, wind, and other alternative energy sources; and ensure resiliency and redundant access to the utility grid. (Solano County Department of Resource Management 2011).

Solano County Zoning Ordinance

Solano County Zoning Ordinance Section 28-50 (b)(4) contains regulations for commercial and noncommercial wind turbine generators. The provision summarized below pertains to the Proposed Action.

- The wind turbines shall be filtered and/or shielded to prevent the emission of radio frequency energy, which would cause interference with radio and/or television broadcasting or reception. Alternate mitigation for such interference may be approved for commercial wind turbines.

3.14.1.2 Utilities

Electricity and Natural Gas

PG&E is the primary supplier of electricity to Solano County, including the Plan Area. Power lines and towers cross the Plan Area and connect with the San Francisco Bay Area grid. There is one PG&E natural gas transmission pipeline that crosses the northern portion of the Plan Area in an east-west direction.

The Plan Area contains other electrical facilities, including 255 small wind turbines that are part of the enXco V project, the Shiloh I substation, the PG&E Birds Landing Switchyard, and the Solano Wind substation. Nearby existing facilities include the PG&E 230- kV Gen-Tie line, the PG&E 230- and 500-kV transmission lines, and the Montezuma I and High Winds substations. To the north, the Montezuma II switchyard and substation are expected to be constructed and in operation before the end of 2011.

Telecommunications

Frequency-based communication signals traverse the Plan Area; these include microwave, radio/television, and aircraft navigation signals. Because of the height of the wind turbines and disturbance caused by the turbines, the blades may affect signal transmission and reception (Solano County Department of Resource Management 2011).

Water Supply

The Plan Area is suitable for dryland farming and grazing activities, which do not require irrigation or other large-scale water use. Water use in the Plan Area is primarily limited to domestic purposes at the rural residences and the enXco O&M building. According to the Solano County General Plan, unincorporated areas of the county provide most of their own water, largely from individual shallow groundwater wells (Solano County Department of Resource Management 2011).

Wastewater

Residences and establishments in unincorporated areas of the county, including those in the Plan Area, largely maintain their own sewer systems (i.e., septic tanks) under the authority of the Solano County Environmental Health Services Division (Solano County Department of Resource Management 2011).

Solid Waste Disposal

The Potrero Hills and Hay Road landfills, approximately 8.1 and 10.3 miles north of the Plan Area, respectively are the closest waste disposal sites to the Plan Area. (Solano County Department of Resource Management 2011). Landfills are also present in Sacramento, Vacaville, and the East Bay (Ecology and Environment 2006).

3.14.1.3 Public Service Systems

Fire Protection

The Montezuma Hills Fire District provides fire and rescue services to the Shiloh IV Plan Area. There are five fire stations equipped for grass fires operated by this district: one at Birds Landing Road, one on Collinsville Road near Collinsville, one on Shiloh Road, one in Rio Vista, and one at the intersection of Birds Landing Road and Collinsville Road. The department is dispatched by the Solano County Sheriff's Department and receives as-needed support from the County and State Office of Emergency Services. The Rio Vista Fire Department also provides fire and rescue services to the City of Rio Vista and surrounding areas, including the Plan Area. (Solano County Department of Resource Management 2011).

Police Protection

The Solano County Sheriff's Office in Fairfield provides protection for unincorporated sections of Solano County, including the Plan Area. The Solano County Sheriff's Office Dispatch Center provides law enforcement and fire services for the Solano County Sheriff's Office, Rio Vista/Delta Fire Districts, and Montezuma/Ryer Island Fire Protection District on a 24-hour basis (Solano County Department of Resource Management 2011). The nearest city police department is in Rio Vista.

Emergency Services and Medical

The Solano County Office of Emergency Services (OES) is in charge of protecting lives and property of Solano County residents in the event of natural or man-made disasters. OES trains and responds to disasters and any emergency-related function that supports the sheriff's office (Solano County Department of Resource Management 2011).

Solano County has major hospitals in Fairfield, Vacaville, and Vallejo. The Solano Emergency Medical Services Cooperative (SEMSC) handles emergency response in the County, including the Plan Area. Through a joint-party agreement, the SEMSC provides pre-hospital emergency care for any person within the jurisdiction of the agency through a single ambulance service that employs both paramedics and emergency medical technicians. Fire departments and districts also respond with emergency medical services personnel in order to reduce response times. In addition, the Rio Vista Fire Department provides a minimum of emergency medical technician-level care 24 hours per day (Solano County Department of Resource Management 2011).

Schools

Solano County is composed of six kindergarten through grade 12 school districts: Benicia, Dixon, Fairfield-Suisun, Travis, Vacaville, and Vallejo City (Ecology and Environment 2006; Solano County Department of Resource Management 2011). In addition, the River Delta Joint Unified School District serves students in Solano, Sacramento and Yolo Counties. Collectively, these schools serve

over 67,000 students. The River Delta District and Solano County's special education program both provide school bus service for qualifying students in the Shiloh IV Plan Area for (Solano County Department of Resource Management 2011). Students in the project vicinity are typically enrolled in the River Delta District; the Fairfield-Suisun School District serves students in nearby Collinsville (Solano County Department of Resource Management 2011).

3.14.2 Environmental Consequences

3.14.2.1 Approach and Methods

Evaluation of the potential utilities and public services effects of the Proposed Action is based on a qualitative evaluation of the context and intensity of potential effects. This analysis adapted criteria set forth in the State CEQA Guidelines to determine if adverse effects would result from implementation of the Proposed Action, including activities covered under the HCP. An effect would be considered adverse if the Proposed Action could lead to any of the conditions listed below.

- Significant adverse physical impacts on police, fire, medical, recreational, or educational services.
- Exceedance of wastewater treatment requirements of the applicable Regional Water Board.
- Need for expansion or construction of a utilities system, such as a wastewater treatment plant or landfill, where the construction would cause substantial environmental effects.
- The need for new or expanded entitlements for water supplies.
- Interference with existing microwave communication.
- Degradation in existing television or radio reception.
- Interference with existing civilian or military navigation systems.
- Failure to comply with local, state, or federal statutes and regulations related to public utilities and services.

3.14.2.2 Environmental Consequences and Mitigation Measures

Proposed Action

Impact PSU-1: Adversely affect public utilities and services

Water

Water for construction would be delivered by truck from the nearest metered distribution point on the Rio Vista water system. During the construction period, approximately 8.1 to 11.9 million gallons of water would be used for dust control, cement mixing, and other purposes. The actual amount of water needed would depend on the time of year; construction during summer months would require more water for dust suppression. The Proposed Action would require up to 264,019 cubic feet of water per month, equivalent to an increase of up to 2.3% of the service connections. (Solano County Department of Resource Management 2011). The Proposed Action would not adversely affect water supplies. During construction, drinking water for the construction crews would be delivered by truck from Rio Vista; during operation, bottled water delivered to the enXco O&M building would serve the needs of the full-time staff.

Many of the residences in the Plan Area rely on wells for their drinking water supply. In accordance with the Solano County General Plan, all of the proposed turbine locations are a distance of at least three times the turbine height from any residence. Construction of the Proposed Action would not damage or disrupt on-site wells supplying domestic water.

Wastewater

Portable restrooms would be provided for use during construction of the Proposed Action, in accordance with Solano County Division of Environmental Health requirements. The restroom contractor would also replace the portable restrooms periodically or arrange for them to be emptied in the appropriate manner. During operation of the Proposed Action, full-time staff would use the existing sanitary facilities in the enXco O&M facility. An on-site well and septic system, designed in compliance with state and local regulations, provides water and wastewater disposal for the restroom facilities in the O&M building. Prior to issuing a building permit, the County will evaluate the capacity of the well and sewage system to determine whether the demands of the Proposed Action, including the proposed 5,000-square-foot warehouse building addition, would require expansion of the existing facilities or the development of a new well or septic system. If a new well, expanded or new septic system are required, Shiloh IV would implement these changes in compliance with state and local regulations, including additional environmental review.

Solid Waste Disposal

Construction refuse and solid waste generated from construction activities would be stored at the temporary staging area and periodically disposed of at the Potrero Hills Landfill by the contractor. Because of the temporary nature of construction and the large amount of remaining capacity at the landfill, the Proposed Action would not have an adverse effect on the landfills' permitted capacity to accommodate the Proposed Action's solid waste disposal needs.

Electric/Gas Utilities

The Proposed Action includes construction of a new substation near the existing Shiloh I substation and the PG&E Birds Landing switchyard. The substation would connect to the existing Shiloh II gen-tie line into the switchyard. The connection of the Proposed Action to the grid through the PG&E switchyard would not cause any disruptions within the PG&E grid or to any residences in the area. The Proposed Action would have no adverse effect on electric or gas utilities in the Plan Area.

Fire/Emergency Medical Services

Construction of the Proposed Action would employ between 80 and 300 construction workers depending on the type of construction taking place, and could temporarily increase the risk of accidents potentially affecting the demand for fire and emergency medical services in the Plan Area. Construction in the Plan Area could increase the demand on the Montezuma Fire Protection District and Rio Vista Fire Department. Given the dry, grassy environment, the Montezuma Hills area has a high risk for grass fires (Solano County Department of Resource Management 2011). During the construction phase, heavy equipment and passenger vehicles driving on vegetated areas before clearing and grading could increase the danger of fire. Heated mufflers could ignite surrounding vegetation. The Proposed Action incorporates EC-32 which requires development and implementation of a grass fire control plan to minimize the potential for grass fires in the Plan Area. The plan would be subject to review and approval by the Montezuma Fire Protection District.

Restricting access to only properly trained personnel would reduce the likelihood of accidents and thus the need for emergency medical care. In addition, the Proposed Action incorporates EC-36 (injury and illness prevention plan) that would require training, planning, and protocols to reduce the risk of injuries to workers; and EC-21 that would require Shiloh IV to implement a hazardous materials emergency response plan (business plan) and SPCC to minimize the likelihood and potential effects of accidents related to hazardous materials. The implementation of these measures would reduce potential effects on fire and emergency service providers.

During operations, a maximum of six full-time staff members would provide maintenance and security for the Proposed Action. This small number of workers would not increase the demand for emergency response services. However, during operation, lightning strikes on wind turbines could create power surges that might start a fire (Solano County Department of Resource Management 2011). EC-33 requires that the fire protection district would review project plans to ensure that the access roads would be adequate for maintaining acceptable service and response times and providing access to fire water tanks as needed.

Police

The Proposed Action includes security measures (EC-37, limit public access to the Plan Area) to restrict public access to the Plan Area and individual facilities during construction and operations. Preventing public access to the site and towers would minimize the need for police surveillance or response to incidents. The Proposed Action would not have an effect on the capacity of the police to maintain acceptable service ratios, response times, or other performance objectives (Solano County Department of Resource Management 2011).

Schools

Construction and operation of the Proposed Action would not contribute to substantial population growth because it is expected that construction and operations workers would near the Plan Area or in nearby cities and metropolitan areas (Solano County Department of Resource Management 2011). Accordingly, there would be little to no increase in the population of school-age children in the project vicinity. There would be no adverse effect on educational services.

Impact PSU-2: Potential to interfere with existing utility service or infrastructure

Utility service infrastructure in the Plan Area would not be affected by construction or operation of the Proposed Action because compliance with relevant County requirements and building codes would ensure that construction activities or excavation do not affect electrical or natural gas utility lines.

Impact PSU-3: Potential to interfere with microwave transmissions

The Microwave Search and WCFZ Analysis (Evans Engineering Solutions 2011 as cited in Solano County Department of Resource Management 2011) suggests that the Proposed Action would not be likely to result in impacts to microwave transmissions. As reported in the Draft EIR, Evans Engineering Solutions evaluated surface, microwave path, and turbine elevations to identify portions of the Plan Area where either turbine towers or turbine blades would intersect the WCFZ of a microwave path, the zone where siting of obstructions should be avoided. According to the updated study, two turbines would be located within 100 meters of the center of a microwave path, but based on the licenses for the microwave links, these turbines would have minimum clearances

from the edge of a WCFZ of 61.7 feet and 28.9 feet and would therefore not result in a significant impact to the microwave path. This study found that none of the proposed turbines in the Plan Area would penetrate the WCFZ of a microwave path or the near-field radius of a known land mobile base station. However, some uncertainties and project unknowns remain. The FCC database may be incomplete and/or undocumented antennae may be present at or near the site and it is possible that the Proposed Action site layout could change during micro-siting. Finally, the NTIA determination of the Proposed Action is anticipated in late 2011. EC-40 requires Shiloh IV to provide notification and meet siting requirements to minimize potential effects on microwave communication. No significant adverse effects are anticipated.

Impact PSU-4: Interference with television or radio reception

Wind turbine towers could interfere with existing television or radio signals that traverse the Plan Area. Although the potential exists for the Proposed Action to affect television or radio reception, implementation of EC-40 would provide applicable notifications and avoid interference with land mobile services and over-the-air television signals by requiring enhancement of receiving equipment reception as necessary.

Impact PSU-5: Potential to cause navigational system interference

Operating the proposed wind turbines under the Proposed Action could potentially interfere with airport navigation systems. As stated in the *Solano County Wind Turbine Siting Plan*, a 100-foot (30.5-meter) wind turbine tower would have to be within 1 mile of a very high-frequency (VHF) omnidirectional range (VOR) station to cause potential interference. The nearest VOR station is more than 9 miles from the Plan Area, at Travis AFB, and no interference is expected. Accordingly, there would be no significant adverse effects associated with implementation of the Proposed Action.

No Action

Under the No-Action Alternative, there would be no effects pertaining to utilities and public service systems because the lands within the proposed Plan Area would continue under current agricultural uses.

3.14.3 References

Ecology and Environment. 2006. *Draft Environmental Impact Report Shiloh II Wind Plant Project*. October. Prepared for Solano County Department of Resource Management.

Solano County Department of Resource Management. 2011. *Draft Environmental Impact Report—Shiloh IV Wind Energy Project*. August. State Clearinghouse #2011032062. Submitted by Point Impact Analysis, Inc., Palo Alto, CA.

This chapter addresses required NEPA analyses beyond those addressed in Chapter 3: identification of unavoidable adverse effects, a discussion of potential irreversible and irretrievable commitments of resources, short-term uses versus long-term productivity, cumulative effects, and identification of the environmentally preferable alternative.

4.1 Unavoidable Adverse Effects

Implementation of the Proposed Action would not result in any unavoidable adverse impacts on the human environment.

4.2 Irreversible and Irretrievable Commitments of Resources

Implementation of the Proposed Action would result in an irretrievable commitment of construction materials used to construct the wind turbines, substation, electrical collection system and interconnections, and access roads. Energy resources would also be expended during construction; however, because the Proposed Action involves creation of a renewable energy source, this expenditure would be offset by operation of the wind turbines. Approximately 51 acres of grassland and agricultural land would be unavailable during the 36-year CUP period for the Shiloh IV project, but this acreage would be restored to current uses if the project is decommissioned.

4.3 Short-Term Uses versus Long-Term Productivity

Implementation of the Proposed Action would result in use of the Plan Area as a renewable energy source. Development would require 25 acres of the 3,513-acre Plan Area to be removed from agricultural and grazing uses during the 36-year CUP period. This short-term loss of dryland farming and grazing productivity would constitute less than 1% of the Plan Area.

4.4 Cumulative Effects

The CEQ's NEPA regulations (40 CFR 1580.25) require a reasonable analysis of the significant cumulative impacts of a proposed action. *Cumulative impacts* refers to "two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts."

There are two approaches to identifying cumulative projects and the associated impacts. The *list* approach identifies individual projects in order to identify potential cumulative impacts. The *projection* approach uses a summary of projections in an adopted general plan or related planning

document to identify potential cumulative impacts. This EA uses the list approach as presented in a number of environmental impact reports for wind development projects in the Plan Area vicinity.

4.4.1 Cumulative Development

Cumulative development in the general vicinity of the Plan Area consists mainly of existing and proposed wind development projects in the Montezuma Hills WRA. Existing projects, comprising 844 turbines (as of March 2011), are Solano Wind Phase 1 and 2, enXco V, Shiloh I, Shiloh II, and High Winds (although the enXco V project is planned for repowering, replacing an additional 255 turbines). Currently proposed projects are Montezuma 1, Solano Wind Phase 3, Shiloh III, Montezuma II and Shiloh IV (Figure 1-2).

As of March 2011, other planned projects the Montezuma Hills had 844 wind turbine generators installed. Subsequently, with the removal of 191 older enXco V turbines in the Montezuma II project area, and the addition of 141 new wind turbines which are either currently under construction (Solano Wind – Phase I and Shiloh III) or expected to be under construction soon (Montezuma II), it is reasonable to assume there will be 794 wind turbines in the Montezuma Hills by early 2012. For the other reasonably foreseeable future wind project besides Shiloh IV, PG&E Collinsville, the construction date is presently not known. In addition, the remaining enXco V turbines in the Shiloh IV project area will be removed prior to construction of the proposed Project in 2012.

Upon completion of the proposed project in 2012, the County anticipates that there would be 528 modern large turbines and 59 older small enXco V turbines operating in the Montezuma Hills. The County does not currently anticipate the construction of any other wind energy projects in the Montezuma Hills in 2012. This is the cumulative development scenario for the WRA considered for the purposes of this analysis. Other planned projects in Solano County that could potentially contribute to cumulative impacts include the Jepson Parkway project, a four-lane parkway planned for an area northwest of Travis AFB connecting I-80/Leisure Town Road in Vacaville with SR 12 in Suisun City; the SR 12 widening project near the WRA; and the Potrero Hills Landfill expansion on 245 acres of land currently occupied by CTS (U.S. Fish and Wildlife Service 2008).

4.4.2 Cumulative Effects Analysis

4.4.2.1 Aesthetics

Implementation of the Proposed Action combined with other developments in and around the Montezuma Hills WRA would result in changes to visual resources in the WRA. The addition of 50 wind turbines in the Plan Area would be visible from surrounding rural roads (Figures 3.1-1 through 3.1-2a-f). As shown in the visual simulations, the cumulative view from various locations would be of wind turbines in the foreground, middleground, and background, with the most pronounced changes from the Proposed Action related to placement of turbines in areas where they were not located previously near Birds landing and along Collinsville Road. Distant views of the Montezuma Hills region also would change due to the replacement of smaller existing enXco V turbines with larger turbines at the Proposed Action Plan Area and Montezuma II project site.

Previous EIRs for wind projects in the WRA have concluded that the addition of wind turbines in the WRA is significant and unavoidable under CEQA. For this analysis, NEPA requires that the context and intensity of the impact be considered in determining whether an adverse effect would result from the Proposed Action combined with other cumulative projects.

The context of this cumulative visual impact is an established WRA. There are currently more than 800 wind turbines in the WRA, although the cumulative projection is that at buildout the area will support a total of approximately 794 turbines because of changes in turbine types in the enXco V project area. The current established visual context is of large (400-foot-tall) wind turbine structures surrounded by open grazing and agricultural lands. A number of rural residences in and near the WRA have current views of a large number of wind turbine structures. The addition of 50 wind turbines to the currently projected number of structures would constitute approximately less than 10% of the total structures projected in the area (approximately 7%). Therefore, from an aggregate perspective, additional structures in this established WRA would have a minor effect on the environmental context of the viewshed.

In evaluating the intensity of the cumulative impact and the contribution of the Shiloh IV project, the number of viewers and views from aesthetically sensitive areas were considered. The most dominant views of the WRA are from SR 12 and SR 113 (County-designated scenic roadways). From this location large wind turbines occupy the foreground, middleground, and background views. However, while some portions of the Shiloh IV project turbine blades would be visible in occasional background views from SR 12 and SR 113, it would be at such a distance that the contribution to the cumulative effect would not be substantial or adverse. Other potentially sensitive viewing areas include rural roads in the WRA and rural residences. Daily vehicle trips on rural roads in the WRA generally average between 200 and 400, with far fewer (less than 50) on Olsen Road (Solano County 2011). There are nine rural residences in and within 1,000 feet of the WRA plus the community of Birds Landing with views of wind turbine development. The Proposed Action would not substantially contribute to the cumulative visual effects from Rio Vista, Antioch or Pittsburg.

A considerable number of individuals view the area on a daily basis from somewhat sensitive locations. Views of the WRA are of an altered landscape dominated by large wind turbine structures. However, these views have been in place for a number of years; most views from SR 12 and rural residences have been characterized by the presence of large wind turbines for the past 2–5 years, depending on the precise locale. While individual viewers may have differing subjective opinions regarding the visual quality of the WRA, the overall visual experience in this area has changed very little over the past year. The Proposed Action's contribution to the current visual resources would be subtle; from some viewpoints, wind turbines would be in the foreground or middleground rather than the background. These changes would modify the extent of turbine presence but not the fundamental visual character of the Plan Area vicinity.

Implementation of conservation measures set forth in the HCP would have no cumulative effect on visual resources because avoidance, minimization, and mitigation measures for impacts on special-status species would not substantially alter the visual resources in the area. Cumulative visual effects are not considered to be significantly adverse.

4.4.2.2 Agricultural Resources

Implementation of the Proposed Action together with other projects would not result in cumulative adverse effects on land use or agricultural resources because wind plant development in the WRA takes place in an area designated for wind plant development and because associated uses are compatible with continued agricultural uses in the WRA. Wind plants in the WRA are also developed in accordance with the County's general plan, which requires setbacks from property lines, roadways, railroads, residences, transmission lines, and sensitive habitats. In addition, the County has determined that wind energy projects are compatible with Williamson Act lands, and the

Proposed Action would not have cumulative effects from the conversion of Williamson Act lands to non-agricultural uses. EIRs for other wind development projects in the WRA (i.e., Shiloh I, Shiloh II, SMUD, and Montezuma I) have indicated either that no land use impacts would result from wind plant development or that they could be successfully mitigated. Similarly, the Proposed Action would not contribute to cumulative land use or agricultural impacts.

4.4.2.3 Air Quality and Climate Change

Many of the wind plant projects considered for the cumulative analysis are already constructed or would not be constructed concurrently with the Shiloh IV project. For this reason, and because air quality effects associated with wind plant development are relatively minor and temporary, cumulative effects associated with construction of wind projects in the WRA are not expected to result in adverse effects on regional air quality or climate change. Moreover, no substantial cumulative effects on air quality associated with operations have been identified in any of the numerous environmental documents prepared for wind plant projects in the WRA.

4.4.2.4 Biological Resources

The analysis of cumulative impacts on biological resources in the Montezuma Hills WRA is based on an evaluation of several EIRs prepared for existing and proposed wind plant projects in the WRA. The potential for cumulative impacts on avian species was assessed using data and conclusions presented in *Avian Monitoring Study and Risk Assessment for the Shiloh IV Wind Power Project, Solano County California* (Curry & Kerlinger 2011).

Cumulative effects on vegetation and wetlands and waters of the United States would not be adverse because permanent vegetation loss from cumulative wind plant development in the WRA is expected to amount to approximately .1% of the 42,972-acre WRA (Solano County Department of Resource Management 2011). The Proposed Action's 25-acre contribution to this potential cumulative effect would be minimal compared to the overall area of the WRA. Cumulative effects on special-status plants in the WRA are expected to be minor because individual projects, including the Proposed Action, have incorporated environmental commitments or mitigation measures designed to avoid or minimize effects on plant populations. Potential effects on special aquatic sites in the WRA would not be adverse because all the existing and proposed wind plant projects, including the Proposed Action, provide for avoidance of water features by siting wind turbines on hilltops, providing buffers from aquatic sites, and using HDD for crossing water features.

Cumulative effects related to temporary displacement of wildlife could result from concurrent construction of proposed wind plant projects; however, these potential impacts are not likely to occur because the proposed and planned projects are not likely to occur simultaneously. However, even if more than one project was constructed simultaneously, the disturbance effects would be widely dispersed over a large area and would occur at only one or a few turbine sites at any one time. Cumulative impacts on CTS are addressed in the HCP. Potential cumulative effects on CTS include continuing and future loss of suitable breeding, foraging, sheltering, and dispersal habitat resulting from conversion to urban and other development. The Proposed Action's contribution to CTS impacts is not expected to preclude survival or recovery of CTS when considered with other cumulative projects because the HCP conservation measures would adequately minimize and compensate for Plan Area impacts. In addition, the installation of turbines in the area effectively precludes other types of adverse effects that are potentially more detrimental to CTS—namely urban development.

Birds in the immediate vicinity and birds migrating through and wintering in the WRA could be subject to the cumulative effects of multiple wind projects. Some quantification of these potential cumulative effects has been attempted in a synthesis of information from two postconstruction monitoring reports for adjacent projects in the Montezuma Hills WRA and a bird use and behavior study completed for the Shiloh III project (Curry & Kerlinger 2009). The estimated mortality rates in the WRA for the two most common raptor species—red-tailed hawk and American kestrel—are notably higher than those for other avian species and bats, a phenomenon that has been noted in most studies of avian fatalities at wind farms. However, the local nesting populations of these two species appear to occur at densities commensurate with California Central Valley habitats and in line with available suitable nesting substrates, and they show no signs of decline. Regional populations of these two species also appear to be stable. The majority of fatalities of the two species occur primarily during the winter period. The geographic origin of these individuals is not known, making an assessment of cumulative effects difficult. However, estimated total avian fatalities for the WRA are substantially fewer than estimated fatalities from other types of collisions (e.g., power lines, buildings, automobiles); accordingly, avian fatalities from the Montezuma Hills WRA are not likely to be significant at a regional or higher scale (Curry & Kerlinger 2009). Moreover, these species are abundant locally, regionally, and nationally, and their populations are not expected to be substantially affected by wind plant operation. Therefore, these cumulative impacts are not considered adverse. No federally listed avian species have been identified in or adjacent to the Plan Area. Based on the best available information, implementation of the environment commitments, and conclusions of the *Shiloh IV Avian Monitoring Study and Risk Assessment*, no significant adverse cumulative impacts on avian species, including raptors, are expected in the Montezuma Hills WRA.

4.4.2.5 Cultural Resources

Implementation of the Proposed Action together with other projects would not result in adverse cumulative effects on cultural resources because standard avoidance and mitigation measures have been incorporated into all the wind plant development projects in the WRA; additionally, the Proposed Action is not anticipated to result in adverse effects on cultural resources.

4.4.2.6 Geology, Seismicity, Soils, Mineral Resources, and Paleontological Resources

Implementation of the Proposed Action together with other projects would not result in adverse cumulative impacts related to geology, seismicity, soils, mineral resources, or paleontological resources because all the potential hazards associated with wind plant development would be reduced by standard design measures incorporated into the Proposed Action and other cumulative projects.

4.4.2.7 Hazardous Materials

Implementation of the Proposed Action together with other projects would not result in adverse cumulative impacts associated with accidental hazardous materials spills or discovery of hazardous materials sites because cumulative wind plant development in the WRA requires standard spill prevention and hazardous materials discovery mitigation measures that reduce these potential effects as do the environmental commitments for the Proposed Action.

4.4.2.8 Hydrology and Water Quality

Implementation of the Proposed Action would place proposed wind turbines in agricultural land areas with established setbacks from wetlands, streams, and ponds. In areas where components of the electrical collection system would need to cross a seasonal stream, HDD would be used to route the component under the feature. Consequently, with implementation of the environmental commitments that are part of the project description, no direct or indirect impacts on drainage or aquatic features in the Plan Area are anticipated. The Proposed Action would result in minimal hydrological changes in the WRA. Cumulative hydrological effects in the WRA would also be minor because Solano County imposes conditions on wind development projects in the WRA similar to the environmental commitments incorporated into the Proposed Action.

Any potentially adverse effects on water quality during construction of the Shiloh IV project would be mitigated through implementation of a SWPPP required under EC-19. The Shiloh IV project would increase impervious surfaces in the Plan Area by approximately 1.2% of the Plan Area. Cumulative impacts on water quality would similarly be minor because of mitigation measures required to reduce water quality effects in the WRA (Solano County Department of Resource Management 2011).

4.4.2.9 Land Use and Planning

Refer to *Agricultural Resources* above.

4.4.2.10 Noise

Implementing the Proposed Action with other projects in the WRA would not result in adverse cumulative noise effects on sensitive receptors, because noise levels would not exceed most Solano County noise criteria and in cases where the potential exists for noise levels to exceed criteria, impacts have been or would be reduced by implementing EC-30 and EC-31 that would require implementing noise reducing construction practices and complying with Solano County noise standards.

4.4.2.11 Public Health Hazards

Implementation of the Proposed Action together with other projects in the WRA would not result in adverse cumulative impacts on public health and safety because all wind development projects in the WRA have been required to incorporate mitigation measures to reduce risk of wildfire, address the potential for turbine and meteorological tower failure, minimize the potential for electrical shock, and address access-related safety issues. These measures are similar to the environmental commitments incorporated into the Proposed Action.

4.4.2.12 Recreation

The Proposed Action is not anticipated to result in adverse effects on recreation and would not contribute to cumulative effects on recreation activities in or near the WRA.

4.4.2.13 Traffic and Transportation

Implementation of the Proposed Action together with other projects in the WRA would not result in adverse cumulative effects on transportation or traffic because the potential effects of project

construction on local traffic conditions would be temporary, are staggered as the projects are developed sequentially, and would be reduced by implementing standard traffic control plans required by Solano County. The Proposed Action's contribution to this potential cumulative effect would be minor and would be reduced by implementing transportation-related environmental commitments. Operations of the various wind energy projects would not create a cumulative effect on traffic conditions on area highways and roads because operation and maintenance of facilities requires very few workers generating daily trips on local roadways.

4.4.2.14 Utilities and Public Service Systems

Implementation of the Proposed Action together with other projects in the WRA would not result in adverse cumulative effects on utilities or public service systems. Increased demand on public services during construction of the Proposed Action would not be adverse because the potential effects are temporary and would be minimized by implementation of environmental commitments incorporated into the project. The Proposed Action would obtain water from nearby metered hydrants for use during construction; however, even in a worst-case estimate, the effect would not be substantial or adverse because construction of the Shiloh IV project is not expected to overlap with construction of other wind projects in the WRA; thus the Proposed Action would not contribute to a cumulative effect on local water utilities.

The Proposed Action would avoid effects on communication lines, microwave antenna, and television and radio by incorporating environmental commitments to notify owners and operators of this equipment, complete studies prior to construction to show the turbines do not interfere with these paths, and establish a mechanism to resolve any issues with affected owners or operators. No adverse effects on communications would be expected.

4.4.2.15 Population and Socioeconomic Conditions

Because none of the existing and proposed projects in the vicinity of the WRA, including the Proposed Action would result in population increases, and because the only potential socioeconomic effect would result from temporary construction employment for development of proposed wind projects, no cumulative impacts on population or socioeconomic conditions would result from the Proposed Action together with other projects.

4.5 Environmentally Preferable Alternative

NEPA requires identification of an environmentally preferable alternative (40 CFR 1505.2[b]). The environmentally preferable alternative is the alternative that would result in the least damage to the environment. Although the No-Action Alternative would result in current Plan Area conditions continuing with no effects associated with the Proposed Action, it would not meet the purpose of the project to construct a commercially viable wind plant, or the need to increase sources of renewable energy. Other alternatives that were considered but rejected, including offsite alternatives, would likely have similar or greater effects than the Proposed Action. Based on these considerations, the environmentally preferable alternative is the Proposed Action.

4.6 References

Curry & Kerlinger, LLC. 2009. *Avian Monitoring Study and Risk Assessment for the Shiloh III Wind Power Project Solano County, California*. December. McLean, VA. Prepared for enXco, San Ramon, CA.

Curry & Kerlinger 2011. Avian Use Study and Risk Assessment for the Shiloh IV Wind Project, Solano County, California. May. Prepared for enXco, McLean, VA. Solano County Department of Resource Management. 2011. *Draft Environmental Impact Report—Shiloh IV Wind Energy Project*. August. State Clearinghouse #2011032062. Submitted by Point Impact Analysis, Inc., Palo Alto, CA.

Chapter 5

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